(C 102)

Open Basic Education (Adult)

Science

Level - C (Equivalent to Class 5)

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A Word With You

Dear learner,

Government has taken an initiative to educate the marginal sections of society in their entire life. This program works for the age group of 15-35 years for those who have gained the basic education or those who cannot have informal education. Further, this program works for the people who want to have the opportunities to learn in their life. This has the purpose of personal, social, intellectual and vocational development of the learners. The first step in this regard has been taken. National literacy mission and national institute of open schooling together have given learner certificates to around 2.35 crore people.

This plan is to provide new learners education equivalent to middle level. This is done in distance mode here.

Self learning material (equivalent for classes 3,5 and 8) are developed by National Institute of Open Schooling. The material prepared will create inquisitiveness in the learner, give them information about the latest policies and programs, made educational environment in peaceful area and will provide them new techniques and technology for learning.

We hope that you must have read environmental science book 'A' equivalent to chapter 3 and 'B' equivalent to chapter 5. This book 'C' is equivalent to class 8 and has many science related facts included in it. It has total 21 chapters which are divided into physics, chemistry, and biology and environmental science. The whole curriculum is divided into 7 modules, which includes organisms and their process, types of materials, change, heat, pressure, force, micro organisms, crop production, environmental disasters and management, with environmental topics like waste disposal.

This book is written in simple language. This has a section 'do it yourself' for better learning. In the end, sample paper and standard marking scheme is given with answer key.

We want to thank the science experts who have made this book successful. We hope that this book is useful to you. If you have any problem with this book, don't be hesitant to tell us.

Wishing you a successful future

Curriculum Development Committee

Contents

1

Why should We Study Science?

Look around objects surrounding you carefully. Book that you are reading, pen with which you write, bulb that you switch on for getting light, fan that gives you cold air during the summers, mobile phone that is used to connect to your friends and your relatives at any time and anywhere, television etc, are whose gift ? There are thousands of things around us which are based on knowledge of technology, that is developed from science. Besides this, there will be thousands of queries in your mind that you tried to explore like, How does the wind blow? How does a new organism grow from the older one? How does our Body work? Why does bread swell on tawa? How are clouds formed etc. To know the answers of these questions, to know the functioning of different machines and to understand the reasoning of different incidents properly we need to learn science. The knowledge of science makes a man intelligent, efficient, with the positive attitude in the society effectively. In this chapter we will learn- what is science and what will be the benefit of reading it. Simultaneously we will explore contribution of our scientist in the field of science.

Objective

After reading this chapter you will be able to learn

- What is science?
- Will be able to understand the principles of science and scientific temperament can be described.
- Will get information about the contribution of Indian philosophers and scientists in the field of scientific development.
- Will be able to know about science and technology.

1.1 What is Science

Science is a systematic and authentic process through which we are able to understand about different objects and activities. Science is simple, straight and clear. It has honesty, hard work and a truthful approach towards exploring the concepts of nature. Science is a continuous ongoing process. In this process everyday new knowledge is acquired which forms the foundation of new technology. Science is a combined approach in which participation of entire society is very much important. It helps in facing environmental challenges together like flood, earthquake, draught etc. Science is knowledge as well as process like- explaining the process of germination of seeds is knowledge. To understand the germination of seeds they are sown and every day change is observed in the form of table and drawings are made towards better understanding. Then exploring those changes, then giving explanation to the process and changes. So this process of germination can be systematically and scientifically acquired.

We came to know that during the process of science many skills are utilized. These skills are helpful in acquiring scientific knowledge. These skills are-

1. **Observation:** Observation is to explore, observe objects around us minutely. Writing about them making their drawings etc are part of observation skill.

2. **Development of hypothesis:** Hypothesis is formed on the basis of our observation and experiences, for example- if first rolling ball is stopped after moving a distance, it is assumed that the energy of the ball is finished. Or air in the ball is exhausted that is why it stopped quickly. Or due to friction of earth ball has stopped. You can hypothesize. In order to test the hypothesis we have to roll the ball many times and measure the distance covered simultaneously. Ball has to be rolled from different places, different balls from the same place. After doing all these activities we can conclude the main reason of stopping of the ball. Actually hypothesis is an idea concept. It is required to reach the conclusion of an event.

3. **Collection of data and its systematic writing:** We need evidences to accept or reject a hypothesis. To get these evidences we need to adopt certain process, experiment, survey, observation to collect appropriate data. At many times we need measurement for the collection of data and that is why there is need to develop skills for measurement length, weight, volume, time, temperature etc. Another need is to organize the data systematically, for example- a person wants to know, what are the products in his kitchen which are soluble and others which are not soluble; for this take a fixed quantity through a spoon and dissolve in half glass of water one after another and note down the observations in a tabular format.

Sl.	Soluble	Insoluble
1	Salt	-
2	Sugar	-
3	-	Gram cereal
4	-	Tea leaves (in cold water)
5	-	-

4. **Analysis and conclusion of Data:** Scientist do hypothesize, and similarly based on observation and experience they perform variety of experiments in order to test those hypotheses. It is easy to analyse data in the form of a table and it helps in reaching the conclusion. On the basis of these conclusions we can accept or reject any hypothesis.

5. **Theory:** Those hypotheses that are accepted many times, form the theory. Scientific theories are based on careful, logical examination. It is not necessary that one theory which has been proved today will be true till eternity. In the light of new knowledge old theories maybe found wrong and similarly knowledge acquired from science keeps on changing in forward direction.

Chapter Question 1.1

1. Define science?

_____

_____

2. What are the skills required to acquire scientific knowledge ?

(i) ..... (ii) .....

(iii) ..... (iv) .....

1.2 Principles and scientific temperament associated with Science

Scientific process is a systematic process. Persons involved in it live by certain principles as a part of their personality

1. Working systematically and smoothly.
2. Keep on at tempting again and again not accepting defeat.
3. Thinking why, how etc to find the answers.
4. Collect data through honest observations.
5. Working together and listening to others view carefully,
6. Logical thinking and not accepting anything without proof.
7. Always follow truth and be neutral.
8. Be always ready to learn new things and be curious for exploring the solution of problems.
9. New thinking and new creation.
10. Dare to ask the questions.

1.3 Contribution of Indian Philosophers and Scientist in the development of Science

During ancient time Indian Science was quite advanced. During Vedic period which was around 7000 years ago Indian philosophers and scientists had acquired great knowledge in the fields of mathematics, astrology, chemistry, medicine and other major fields. In mathematics knowledge of zero, calculation of speed, light approximate value of Pi, Pythagoras theorem (which is also known as film parimay) importance of 108 etc. was contributed significantly by Arya Bhatt, Brahmagupta, Kapila Madhav, Bhaskaracharya. In the field of medicine we have Sushruta (surgery), Charak (Ayurveda), Pantjali (yoga) as well known in the world even nowadays.

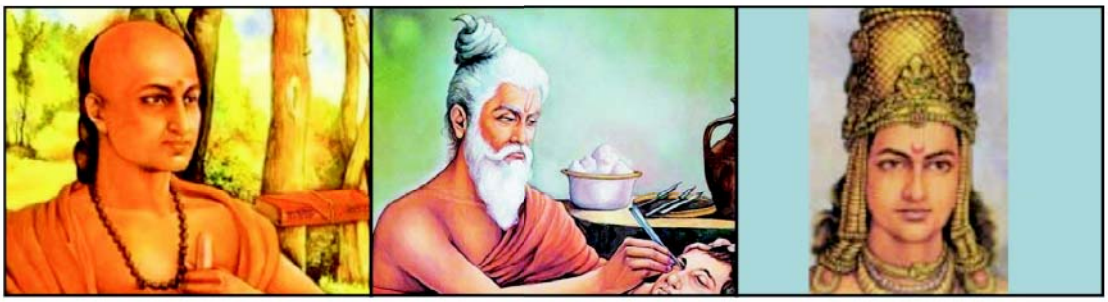
In the field of science Kanaad (Anu), Baraha Mihir (environment, information about earthquake and astrology), Nagarjuna (chemistry, metallurgy) have contributed tremendously.

Scientists who have contributed in the field of science and architecture may be summarised as under-

1. **Aryabhatt** was a great astrologer, mathematician and physicist during ancient time in India.
2. **Brahmagupta** was a well-known mathematician who discovered zero and explained the rules of its application.
3. **Bhaskaracharya** was a great scholar of Algebra. His work/composition like Leelavathi and algebra are famous in the world.

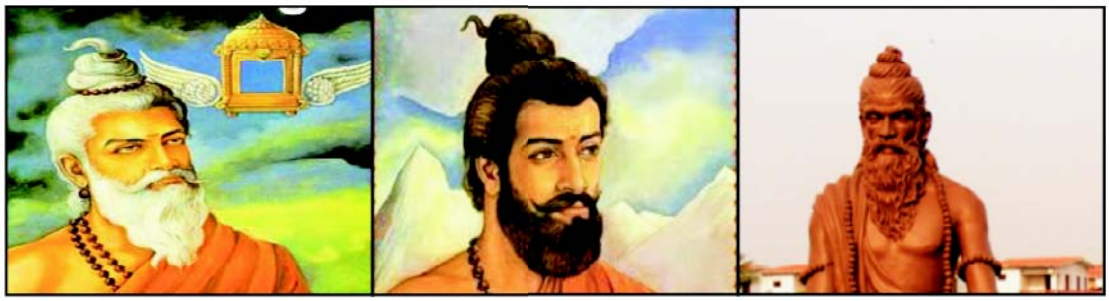
Aryabhatt *Brahmagupta* *Bhaskaracharya*

4. In the field of treatment **Acharya charak** is known as father of Ayurveda (treatment science).
5. **Acharya Sushruta** was well known for the surgery science.
6. **Acharya Kanad** is known for the atomic theory.



Acharya charak *Acharya Sushruta* *Nagarjun*

7. **Nagarjun** is famous for chemical science
8. **Acharya Bhardwaj** contributed in the field of vaimaniki (aeronautics).
9. **Acharya Kapil** contribute significantly in the field of space.
10. **Rishi Pantjali** is well known for the yoga science.



Acharya Bhardwaj *Acharya Kapil* *Rishi Pantjali*

Do you know that

India's contribution in the field of science is historically very old. Man knew counting for a very long time. Ancient religious books also refer to the numbers. Numbers are expressed through different symbols in different languages around the world. Aryabhatt introduced zero based decimal system in his book Aryabhatiya. Explained the principle of usage of 0. After 48 years of his death unborn great mathematician Brahmagupta who discovered zero. 12th century mathematician Bhaskaracharya-II had proposed last and most important rule about zero. This methodology reached Europe through Arabs from India. This is the reason why Europeans have referred to this as Hindu-Arabic numerical system.

Once upon a time **Albert Einstein** said that

"we should thank Indian, who taught us counting, without this probably…….. no discovery was possible in science."

1.4 Contribution of Indian Scientists in science in Modern era-

In modern India Indian scientists have brought a great name to the country through their work and scientific exploration. Major names are CV Raman in the field of light scattering and atomic structure of chemical compounds. He got Nobel Prize for his discovery in the field of Raman effect. Besides this Birbal Sahani, Palaentologist. Salim Ali Birds scientist; Ramanujan famous mathematician; Homi Jehangir Bhabha Atomic Energy and India's former President Bharat Ratna Shri APJ Abdul Kalam 'missile man'; and Vikram Sarabhai are prominent names.

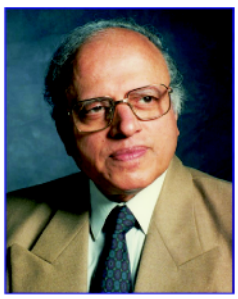
Let us discuss briefly about the significant achievements of a few famous Indian scientists of recent years

1. **Chandrashekhar Venkat Raman:** Chandrashekhar Venkat Raman was born in 3 Veerapalli Tamil Nadu Tiruchirappalli Tamil Nadu. He had a unique talent in the field of science. He became the member of Indian Association for cultivation of science at the age of 19 years. As per the wishes of his parents he worked in administrative position in Finance Department at Kolkata. But he did not lose his interest in the science. In the daytime he worked in the office and in the late night in his small laboratory. His discovery is known as Raman effect in the world. It was carried out with instruments costing rupees 200 only. He got the Nobel Prize of the Physics in the year 1930. He was the first man getting Nobel Prize in the field of Physics from India. He established Raman Institute. His message to the young scientist is *"look around and close yourself in your laboratory. Core of science is not instruments but independent, open thinking and hardworking."*

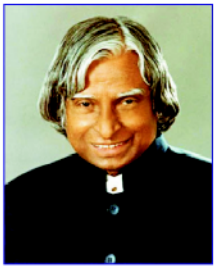
2. **Homi Jehangir Bhabha:** Homi Jehangir Bhabha is the founder of Indian atomic program. His discovery"rays coming from outer space consist of very small particles at a very fast speed when these particles enter in the earth atmosphere then they collide with the atoms present in the air and produce the reign of electrons". This made him world famous scientist. Bhaba carried out research work at Bangalore in Indian Institute of Sciences on space. In order to develop atomic energy, basic particle physics, and modern techniques in the country, he set up Tata Institute of Fundamental Research in 1945. He was the first president of Indian Atomic Energy Commission of free India. The famous Institute Bhabha Atomic Research Centre in India is named after him. Homi Jehangir Bhabha gave direction to our country, which gave us the reputation of superpower

3. **Hargovind Khurana:** Har Gobind Khorana was born on 9th January 1922. He completed his primary education in the tree shade of the village. He completed his BSc and MSc degree from Lahore in Punjab University and PhD from Liverpool University. He become famous in 1959 by producing a chemical coenzyme A. This chemical is essential for certain reactions in our body. Khurana got the Nobel Prize in 1968 in the field of medicine along with Marshall W Nirenberg and Robert W Holly jointly in the field of Medicine. His field of research was causes of genetic disorders, and approach towards their treatment. He died on 9th November 2011 at the age of 89 years.

4. **Mobcombo Sambashivam Swaminathan:** MS Swaminathan was born on 7th of August 1925 in Kumbakonam City. He completed his primary education in Tamil Nadu. He was awarded his PhD in 1952 from Cambridge School of Agriculture. By the end of 6th decade the crops production was quite low as compared to its demand. In order to eradicate this problem Swaminathan dedicatedly researched on different crops. He developed wheat and rice varieties of higher production along with different varieties of potato and jute. He pioneered in introducing scientific research to the farmers, there by introducing the enhancement of Agricultural production. He received many awards like Raman Megasasay award, SS Bhatnagar Award, Birbal Sahani Medal and Mendal Memorial Award.



5. **Bharat Ratna Dr APJ Abdul Kalam:** Dr Kalam was born on 15th of October 1931 in Dhanush Koti Rameshwaram Tamil Nadu in a very common family. He served in many sensitive government Technical Institutes in senior positions as President, Technology Forecasting and



Assessment Council (TIFAC) and Chief scientific advisor of Indian government. He received Bharat Ratna for his efforts in the field of science and technology. He is also known famously as Missile man of India. A great scientist, efficient designer, dedicated production and Engineering administrator, smart technical administrator with a very simple and humble personality. He was so dedicated towards his work at a time he forgot himself and his family. His role in bringing India among big atomic power, space science, manufacturing of missiles and launch is significant.

Dr APJ Abdul Kalam was 11th President of our country. His term was during 2002 to 2007. He died on 27th July 2015 while still delivering a lecture.

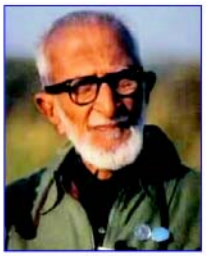
6. **Visvesvaraya:** He was born on 15th of September 1860. MG Visvesvaraya was a well-known engineer scholar. He received Bharat Ratna. He suggested to make India an industrial nation. He worked on atomic sluice Gates and block irrigation system that is why every year 15 September is celebrated as Engineers Day.

7. **S Chandrasekhar:** He was born in British India Lahore on 19th October 1910. He received Nobel Prize in 1983 for his research on Black Hole mathematical theory in the field of Physics. He was nephew of sir CV Raman. He died on 21st August 1995 at the age of 82 years in Chicago.

8. **Meghnath Saha:** He was born on 6th of October 1983 in Dhaka Bangladesh. His most important work was thermal ionization of elements which is known as Saha equation. This is most important and fundamental equation of Astrophysics. He prepared the main draft of Damodar Ghati project.

9. **Jagdish Chandra Bose:** Acharya JC Bose was born on 30th of November 1858 in Vikrampur West Bengal. His main works include radio and microwave light and plants study. He was the first to describe that plants do feel pain and comfort.

10. **Salim Ali:** Salim Moizuddin Abdul Ali was born in Mumbai on 12th November 1896. He was a famous bird and nature scientist and is well known for his work on birds. He systematically surveyed and observed the birds. He died on 20th June 1987 in Mumbai.



11. **Vikram Sarabhai:** Vikram Sarabhai is known for his space programs in the India. He was born on 12th August 1919 in Ahmedabad Gujarat. He was pioneer in bringing India to the world of space research. Besides this he made special contribution in the field of textile, atomic energy and electronics. He was honoured with Padma Vibhushan by Indian government for his contribution in the field of science and technology. He died on 31st December 1971.

12. **Birbal Sahani:** Birbal Sahani was born in western Punjab on 14th November 1891. He studied the fossils found in Indian subcontinent. He was interested in Geology as well as Archeology. He was the first Indian who was selected as fellow of Royal Society of London in 1936. He founded Institute of Palaeobotany on 10th September 1946.

13. **J.V. Narlikar:** The universe contains several stars, planets Galaxies etc. how did it originate? Philosophers and scientists are discussing these questions for centuries. These questions were answered by scientist Jayant Vishnu Narlikar. He explored these questions to the core and generated curiosity in world. He worked on the authenticity of The Big Bang Theory. His work in the field of Black Holes is commendable. Prof. Narlikar discussed and guided the talented students of National Open School.

Chapter Question 1.2

1. Activity running systematically is known as.

_____

2. Who is the father of medicine ?

_____

3. Pantjali is famous in the world for which work.

_____

4. Write names of any four modern Indian scientists.

_____

1.5 Relationship between science and technology

Today we are able to do our daily work, very easily and conveniently be it work of preparation of food, carrying heavy load. our life is very easy due to science on account of various techniques. We can do every work very easily. Application of scientific rules has simplified human work.

"Application of scientific rules and principles for production in the interest of human being is known as Technology"

There have been several inventions in different fields in this era, from steam engine to electric engine, from bullock cart to Supersonic aeroplanes, jet planes, rocket etc. It has all been evolved through technology. Earlier during illness only domestic remedies were available which caused untimely death. But today we have modern medical facilities which are capable of controlling illness to a large extent. In the field of agriculture Science and Technology have progressed well. Modern agricultural implements, advanced seeds, fertilizers, proper irrigation tools have contributed in the enhanced agricultural production and are responsible for Green Revolution

Different types of modern weapons are the result of development in technology. Now a days in addition to agriculture, vegetable production, fishery, poultry, Silk, piggery, Bee culture etc. are also using modern techniques. In this way we can say Science to Technology and technology to Science have contributed in the development. They have an integrated relationship. Scientific rules and principles are used in technological development in our day to day life; that is why technology is also referred as practical knowledge or applied science.

Activity 1.1

Prepare a list of tools available in your house using application of Science and Technology. Try to find out the benefit to every member of your house from these tools. Scientific development and inventions have brought about huge difference in our functioning. As good and bad things

are complementary similarly application of science has broght out certain problems as well like- application of scientific knowledge has contributed in the production of petrol, diesel, pesticides and other chemicals towards the enhanced agricultural production, which are essential to meet the demand of growing population but this has resulted into environmental imbalance enormously. In order to produce higher agricultural products over exploitation of groundwater has resulted into dropping of water table and causing shortage of drinking water in future. Excessive use of fertilizers and pesticides adds to soil and water pollution. High level of sounds produced through music, loud speaker and other instruments is contributing to sound pollution. Harmful gases introduced in the air through vehicle are the cause of major air pollution. Usage of automatic machine has contributed to the large number of un-employment Forests cut and cleared blindly result in the pollution in the environment. Simultaneously they are causing extinction of wildlife.

Chapter Questions 1.3

1. In daily life .....and .....are used.

_____

2. What do you understand by technology.

_____

3. What are the harmful effects to wildlife from Technology.

_____

What you have learned

- Science is a systematic and reliable process from which we come to know about different objects and processes.
- Science is a continuously running process which gives us different types of knowledge on day to day basis.
- In the process of science we use various skills like observation, development of hypothesis, collection of data and their systematic presentation and development of theory.
- Scientific process is a systematic activity; development of scientific thinking in a person working in the field of science is also part of personality development.

- Indian philosophers and scientists have contributed significantly in the development of Science from ancient times.
- Indian scientist is continuously contributing in modern era as well.
- Application of scientific rules and theories in human interest for the production of resources is called Technology.

End of Chapter Questions

1. Development of science made it possible.

   (1) television (2) mobile

   (3) aeroplane (4) all of above

2. Give name of 2 Indian scientists.
3. Give definition of science.
4. What is hypothesis?
5. What skills are required for acquiring scientific knowledge?
6. In ancient time Indian philosophers and scientists contributed in which fields?
7. Explain the role of Salim Ali and JC Bose in modern science.
8. What is the importance of technology in modern time?
9. What is the definition of Technology?
10. Which fields are negatively affected due to technology?

Answer Key for Chapter Questions

1.1

1. Science is a systematic and reliable process from which we come to know about different objects and processes.
2. 1. Observation
   2. development of hypothesis.
   3. collection and systematic organisation of data.

4. analysis and interpretation of data.
5. theory

1.2

1. Scientific process
2. Acharya Charak
3. yogvidya
4. CV Raman, Salim Ali, Meghnad Saha, Vikram Sarabhai

1.3

1. Science and Technology both.
2. Application of scientific rules and theories in human interest for the development of resources is technology.
3. Survival of wildlife is under threat

2

Living and their habitat

Ram and Sushila went outside for the first time. Sushila started talking to a statue placed outside a shop, by realizing it as a real woman. Ram started laughing after seeing this. Sushila was embarrassed and said 'look it's looking alive, like it will just start talking'. It is true living and nonliving things look alike but nonliving and living have remarkable difference. Living beings have certain characteristics that are not present in the non-living beings. In this chapter we will learn those characteristics of the living beings. In this chapter we will also learn what is diversity and what is its effect on them.

Objective

- After reading this chapter you will be able to learn main characteristics of living beings.
- We will discuss about the habitat of living beings.
- Will discuss about the causes of diversity in living beings.
- We will be able to describe the functional unit, cell of the animals.
- Will be able to explain different types of habitat and environment of living beings.

2.1 Characteristics of Living Beings

There are living and nonliving things around us. Living beings are made up of cells. They respire, take food and excrete, they exhibit growth, they show movement, they have reproductive power and after a specific period they die. Let's try to understand these features of living beings in detail.

(a) **Respiration:** Every living being respires to be alive. Similar to us every living being follows respiration. During the process of respiration, fresh air is taken inside the body and body takes oxygen from this gas. During the process of respiration the carbon dioxide accumulated in the body is exchanged with oxygen and carbon dioxide is expelled outside. The exchange of gases is called as gaseous exchange. In terrestrial animals the gaseous exchange process is carried out in lungs, in some animals this process is carried through skin, like- earthworm. Animals like cockroach and flies exchange through specialised structures called spiracles. For the purpose of gaseous exchange, animals living in the aquatic habitat use gills for the purpose of gaseous exchange. They use dissolved gases in water for the purposes of gaseous exchange. In plants gaseous exchange takes place in the small pores of leaves. Oxygen present in air or water enters into the body through these pores. This way respiration takes place in every organism day or night till it lives.

(b) **Nutrition:** Every living organism takes food. Energy required for all the activities is derived from this food. Herbivore animals eat plants while carnivore animals feed on other animals, whereas omnivorous eat both and derive their energy. Plants and trees make their food through photosynthesis. For this purpose they require the carbon dioxide present in air, water from soil and sunlight. Chlorophyll, a green pigment present in the leaves, is very important for the photosynthesis. Fungus which is not green, derives its nutrition from dead and decaying component of the earth. With this we can say that nutrition is extremely important for living beings and it is an integral character.

Fig. 2.1

(c) **Growth:** Growth is integral part of living beings. Chick or birds baby hatching out of the egg, cow, dog, cat, human baby everybody grows slowly and becomes an adult. The germinating seed slowly grows, producing roots, stems, leaves and branches and one day becomes fully grown tree. This way every living plant or animal exhibits growth.

Fig. 2.2

Do some living objects exhibit growth ?

> **Activity 2.1**
>
> Tie a small piece of Mishri with a thread. Take a half water filled glass and mix sugar until sugar stops mixing, now hang the mishri tied with thread in this solution and see if some growth takes place.
>
> How this growth is different from the living beings growth?

(d) **Movement and sensation:** Animals and birds exhibit movement. They move and run here and there, birds fly in the air. Do the plants and trees that are stagnant at a place exhibit movement through their roots? The reaction shown by the body of living organisms with reference to change in environment is called sensation. Sensation is the characteristic feature of living organism. Plants also exhibit sensation. We withdraw our hand away after touching a hot object, raise our leg after hitting a pointed object. Eyes pupil shrinks in the sharp sunlight. All these are the examples of sensation. In plants the flower of sunflower moves in the direction of the sun. Flowers open in the day and close in the night. Closing of leaves of Touch-me-not in response to touch are some of the examples of sensation in plants.

Fig. 2.3

Can you tell how non living objects like- cycle, tractor, bus etc. exhibit movements different to living beings.

Write your answer in the lines given above.

(e) **Excretion:** In living organisms many unuseful elements are formed, which are harmful for the body. The process of elimination of these elements from the body is known as excretion. Urine, faeces, sweat are the key examples of the substances excreted from the body. In plants harmful elements are released in the form of gases through pores or through secretions. Some of the harmful elements are assembled in the bark and they are removed from time to time with the bark. This way we can say that excretion is an important basic function for the living organisms.

(f) **Reproduction:** Every living organism produces offspring for the maintenance of its generation. Animals either in the form of eggs, which develop into the form of young ones or directly produce babies. Some organisms divide their body into two parts and produces like- hydra.

Fig. 2.4 (a)

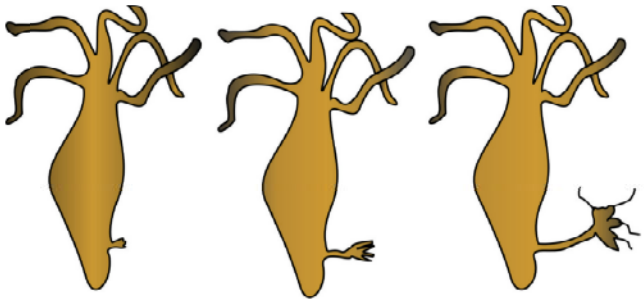


Fig. 2.4 (b)

In plants reproduction is by seeds and other somatic parts, most of the plants are produced by seeds but some plants like lemon, rose etc. can be grown by this type. Sweet potato, potato, ginger can be grown into a new plant by their parts. Some plants like Bryophyllum produce new plants through their leaves. This way reproduction is an integral part of the living organisms

Fig. 2.4 (c)

Fig. 2.4 (d)

(g) Death: Every organism which is born dies. The life is span may be different for different organisms. May fly lives for only one day, the lifespan of dog is 14-15 years, humans can live more than hundred years.

Chapter Questions 2.1

1. Mark correct as tick (✓) and wrong as cross (✗) from the given set -

(i) In plants respiration takes place through small pores. correct/ wrong.

(ii) There is no excretion in plants. correct/ wrong.

(iii) Urine-faeces and sweating in animals are representing respiration. correct/ wrong.

(iv) There is no movement in plants. correct/ wrong.

(v) Plants cannot do their own nutrition themselves. correct/ wrong.

(vi) Reproduction is an integral property of living organisms. correct/ wrong.

(vii) Growing rose from its stick is an example of reproduction. correct/ wrong.

(viii) Death is an integral character of living organisms. correct/ wrong.

2. Write down a list of non living objects which exhibit characters of living organisms.

Sl.	Object	Characters
A		
B		
C		
D		

2.2 Cell

The body of every living organism is made up of cells. Cells are functional and structural unit of life of living organisms. As the bricks are required for making house, similarly cells are required for making the body of living organisms. Some animals are unicellular. Their body is made up of a single cell, this single cell carries all the processes like respiration, nutrition, excretion, reproduction

and sensation etc. Amoeba, Paramecium are unicellular organisms. These organisms are so small that we require special instruments for observing them which are called microscope. Most of the organisms are multicellular. They are made up of many cells. Cells are of different types. Type of cell depends upon its function. Cells are very small. They can be seen only through microscope. The bird's egg is also a single cell but it contains food that is why it's so big and can be seen through naked eyes.

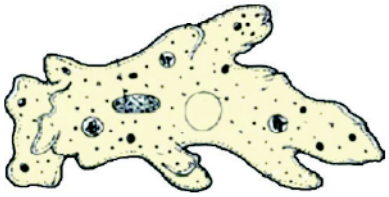


Fig. 2.5 (a)

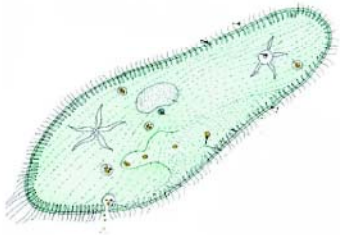


Fig. 2.5 (b)

Every cell has three main parts:

- **Cell Membrane:** It gives shape to the cell.
- **Nucleus/DNA:** It is found in the centre of the cell.
- **Cytoplasm:** The solution found inside the cell.

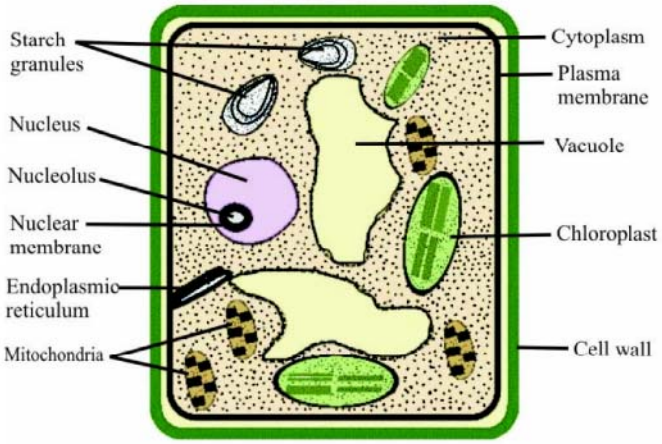


Fig. 2.6 (a)

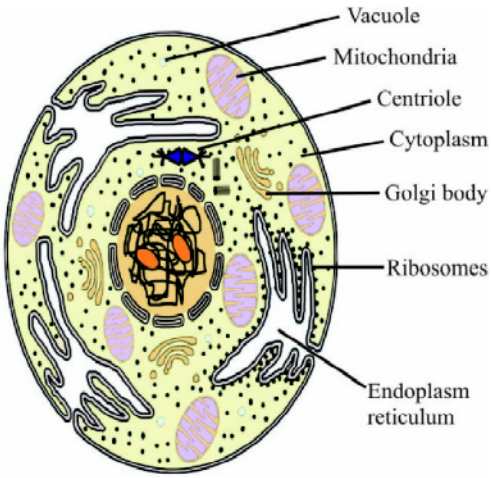


Fig. 2.6 (b)

Difference between plants and animal cells

The main differences between plant and animal cell are as under-

Plant cells have an external outer strong semipermeable layer, which is made up of cellulose. This layer protects cell membrane. But this layer is not present in animals. Plants and tree cells have three different types of plastid which are not present in animal cells.

(a) **Chloroplast:** This is a green coloured compound. It gives green colour to leaves and stems. It contains chlorophyll and carotenoids. It is well known that because of this green colour compound chlorophyll, leaves can perform photosynthesis.

(b) **Chromoplast:** It is a yellow, purple and red coloured compound. It is responsible for the colour of flower and fruits

(c) **Leucoplast:** It helps in the storage of food and it is a colourless plastid.

Animal cells have small components called centrosome which help in the cell division.

Plants and animal cells are of different types, which will be studied in the subsequent classes in detail. Similar type of cells form tissue and different types of tissue aggregate to form organ and many organs aggregate to form an organ system, which makes living organism.

Cell ⟶ Tissue ⟶ Organ ⟶ System ⟶ Living beings

2.3 Different types of habit and habitats of living beings

The surrounding of living organisms where they live is called their house. Like our house is our habitat, there we take shelter and it protects us from sunlight and rain etc. Here our requirement of food and other essential things is fulfilled in our house. For other living organisms like a spider, mosquito, fly and pet-animals, plants and tree planted by us also, our house is also their habitat. This way we can say different organisms can live in the same place jointly and it is called as their habitat.

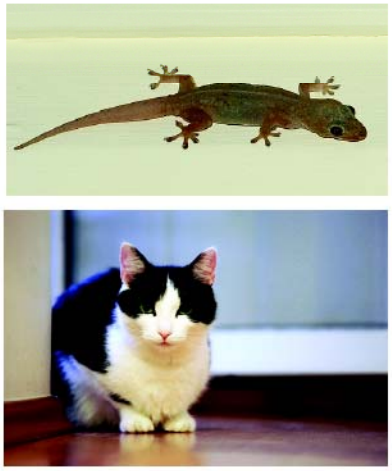


Fig. 2.7

Our Habitat is terrestrial so we call it as terrestrial habitat. All the types of forest, grasslands, desert, mountain, coastal area are its example. Crocodile, fish prawn, Octopus etc. are aquatic animals and they stay in water which is called as aquatic habitat. The examples are pond, lake, waterfall, ocean, river, swamps etc. Living organisms found in any of the habitat forms the biotic component, while non-living objects like air, water, temperature, soil, rocks form the abiotic component.

Nonliving and living components are dependent on each other. Non living components contribute in the survival of living components. That is why both the components are essentially most important for the habitats.

When the abiotic components of any place change, Organisms depending upon these abiotic factors also change slowly. Only those organisms will survive which are able to adapt to the changing

scenario. Those organisms which are not able to cope up with the changed environment are destroyed. Extinction of Dinosaurs from Earth is a good example. On account of living in different habitats living organisms exhibit diversity in organisms as a result of their adaptation. Diversity appears slowly over a period of thousands of years.

Fig. 2.8

Chapter Questions 2.2

1. Fill in the blanks :

(a) Soil, water, rock are …….. component.

(b) Surroundings of living organisms is their ……..

(c) As a result of changes in the abiotic factors living organisms also exhibit……..

(d) Main parts of the cells are ……..

2.4 Land/terrestrial Habitat

Terrestrial/land habitats are of many types, like-

2.4.1 Forest and Grassland

Lion, tiger, deer, rabbit all live in forest or grasslands. In case of the forest big trees provides them shelter and place to live, brown grass of the grassland provides them the area for hiding from lion and tigers trying to catch their prey. Whereas deer hides and saves itself, the sharp and pointed claws of lion facilitate it piercing its prey. Long legs of deer help in running to a longer distances. This way both the organisms have adapted in their habitat/shelter.

Can you tell us about any two other animals whose life is adapted for living in the forest ?

1. ..... 2. .....

In forests and grasslands the plants also adapt themselves in accordance with their habitat in forest. Tree grows big and larger to get maximum solar light, creepers reach the heights by attaching themselves to some trees for getting sunlight. Below trees only those shrubs survive which can utilise less light for the photosynthesis. Grassland area contains the grass which is green in the rainy season and feeds the herbivores whereas in summers it dries and becomes brownish providing a place to hide.

Fig. 2.9 (a)

Fig. 2.9 (b)

2.4.2 Mountain Area

Forest and grass are also found in the mountain area. Mountain regions are very cold, as fast winds blow in these areas. Due to low temperature snowfall takes place in the winter. Due to slope water cannot stop, that is why trees shed their leaves. Leaves of many trees are like needle, so that snow cannot settle on these leaves. In addition leaves have waxy cuticle, which prevents evaporation of water. Animals living in mountain our region have thick fur and thick skin, the fat content is also high which insulates body heat inside.

Fig. 2.10 (a)

Fig. 2.10 (b)

2.4.3 Desert

In contrast to the mountain area daytime temperature is very high and night temperature is very low in desert. In deserts days are warmer and night is cold, rain is negligible here. This is the reason organisms are adapted to survive in low water. Camel living in desert have long legs. Their are thick and flat and they are higher in size. It facilitates their movement on the sand. They do not sweat and urination quantity is very low. Fat present in their hump helps them in staying without water for longer duration. Because of low night temperature in desert, animals living in desert like,

snake, desert Scorpious, rats etc. hide in their underground burrow and they come out in night for their activities and search for food. This adaptation helps in their survival in desert. The leaves of desert plants are very small and spinous, Whereas stem is fleshy which can conserve water. There spinus leaves, prevent water evaporation. These adaptations help their survival. In addition they have very long and deep root system which help in water absorption from distant places.

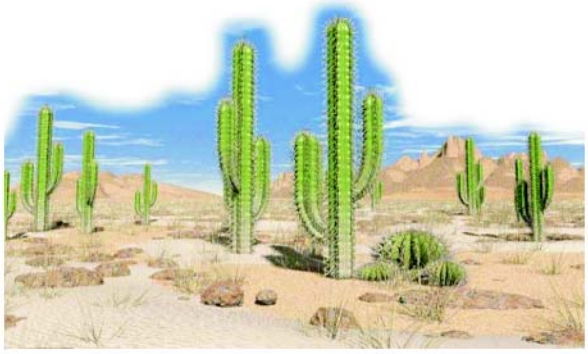


Fig. 2.11

2.4.4 Aquatic Habitat

Aquatic habitats are of two types : One with salty water like Ocean, Bays and other areas; second with sweet water like river, pond, lakes, waterfall etc. Organisms living in ocean have to balance the salt of the body. If they are not able to do this their body water will move out in the ocean. The gills of marine animals help in salt balance in their body. The structure of marine animals helps them in their survival in water. Their body is streamlined. These streamlined bodies are pointed in anterior and posterior side. It gives them power to move in water easily. Simultaneously the body is covered with scales which also help in swimming like fishes.

Fig. 2.12

Besides this some marine animals live in greater deapth or bottom like Octopus, squid, starfish etc. Their body is not streamlined. They have many arms with which they catch their prey. When they swim they can make their body streamlined. Most of the marine animals respire through gills, but some marine animals like whale, dolphin etc. do not have gills. They respire through nostrils present in their head. They can stay in water without respiration for a longer duration. Periodically they come to the surface of water and expire carbon dioxide and take fresh air through the nostrils. Water of ponds, rivers, lakes is sweet and they have a variety of organisms and plants. Fish, crocodile, tortoise are some examples.

Fig. 2.13

Reefs are plants similar to the algae. They either float on the surface of ocean like planktons or hold rocks on the sides so that they do not move away with sea tides like Calpis.

Stem of plants living in water is hollow, which facilitates them in swimming. Stems of some plants are below water and their leaves and flower floating above on the surface like lotus. Some other plants have their leaves inside water or they are thin and flat like ribbon; and so that they do not break in waves of water like Vallisneria.

Fig. 2.14

Fig. 2.15

Some of the animals live on the shores of the water like frog. They can live inside or on the side of the water. They have larger rear legs, their fingers have network, which helps them in jumping for catching preys and swimming. This way in nature frogs are adapted to survive inside water and outside as well.

You can observe a few more organisms living near water and see them for their adaptations.

2.5 Adaptation

With all examples given above, we can understand that organism lives and stays at a place. Their body structure and their food are adapted accordingly. Different shapes and habits of organisms, which help them in survival in their surroundings, are called adaptation. In this chapter we are able to express about only a few organisms and plants. Living organisms are present everywhere on land, water, air. Do we know that small organisms like bacteria are found in snow covered Antarctica as well as boiling hot sulphur springs living successfully? Their cellular organization helps their survival in such extreme conditions.

Activity 2.2

Prepare a list of five animals and plants around you that have adapted according to their environment.

Sl.	Animal	Adaptation	Plant	Adaptation

Chapter Questions 2.3

1. Mark correct as right (✓) and wrong as cross (✗) from the given set -

(i) Deer lives in desert. correct/ wrong

(ii) Most of the marine animals respire through gills. correct/ wrong

(iii) Leaves of mountain region plants are thin like needle. correct/ wrong

(iv) Lion store fat in its hump. correct/ wrong

(v) Adaptation helps plants and animals to survive in their habitat. correct/ wrong

2. Fill in the blanks

(a) Living being lives in the area that …….. is known as his……..

(b) Mountain region is normally very ……..

(c) Body of fish is ……

(d) Whale respire through ……

(e) The …….. of plants living in water are long, hollow and light in weight.

What you have learned

- Living and nonliving beings can be differentiated based on many characters.
- Respiration, nutrition, excretion, growth, movement, sensation, reproduction and response with reference to environment are the key features of living organisms.
- Every living organism is made up of cells, which are the structural and functional unit of life.
- Living organisms may be unicellular or multicellular.
- In multicellular organisms cells are of different types and the structure of cells is based on their function.
- Every cell contains cell membrane, cytoplasm and nucleus.
- A place where living organisms perform their functions and live is called as their habitat.
- Different living organisms and plants live together in different habitats.
- Among habitats main are terrestrial and aquatic. Desert, forest, grassland and mountains are the example of terrestrial habitat. Ocean, water bodies, lake, river waterfall etc. are aquatic habitats.
- The specialized structures of living organisms including plants, which allow them to adapt in their environment are called adaptation.

End of Chapter Questions

1. List five main characters of living organisms.
2. What are the main parts of the cell ?

3. What is adaptation and what is its importance in living organisms ?

4. Give example of Habitat and its definition.

5. What are the different types of aquatic habitat? Give two important features of animals living in this habitat, which facilitate their survival in water.

6. What is the difference between habit and habitat?

7. Do plants have movement, explain with example?

8. Mark tick on the correct answer

(i) What is the shape of body of the fish

(a) round (b) pointed

(c) rough (d) streamlined

(ii) How does whale respire ?

(a) from Gill (b) from skin

(c) from nostril (d) from mouth

(iii) What are the special features of the trees growing in the mountain region ?

(a) Leaves are irregular. (b) Leaves are lighter.

(c) Leaves are like needle. (d) Leaves are round.

9. Fill in the blanks-

(a) Plants make their ..... by photosynthesis themselves.

(b) Gaseous exchange in plants is carried out by..... present in leaves.

(c) Sensation is ..... of living organisms.

(d) Hydra can divide its body into two ..... for reproduction.

Answer key of chapter questions

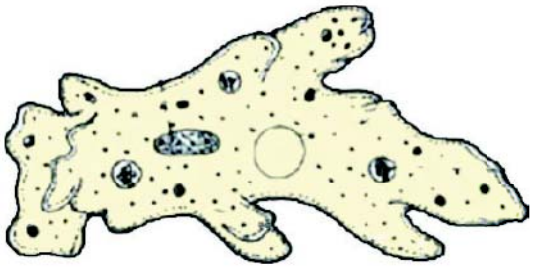
2.1

1. (i) Right (ii) Wrong (iii) Wrong (iv) Wrong (v) Wrong (vi) Right (vii) Right (viii) Right

2. Give some examples

2.2

1. Habit, change, three, cells

2. 

2.3

1. Wrong, Right, Right, Wrong, Right

2. Habit, cold, streamlined, nostrils, stems

3

Plants and Animal World

Shyam and Sushila were walking in the garden. The birds were on the trees the insects were hovering over the flowers and butterflies. All was very attractive. Sushila told Ram look it is looking very beautiful, there are so many varieties of plants and trees in the garden. Ram said look at these animals. On one side there is a very beautiful butterfly and on the other side there is a blood sucking mosquito. Both laugh.

This is true there is a huge diversity in plants and animals. In plant world there are different varieties of algae, fungus, shrubs, herbs and trees. Similarly in animal world also diversity is seen. Is this diversity external or their body organisation is also different, the habit is also different. So what are the similarities on the basis of which some living organisms are called as plants while others are called as animals. In this chapter we will study plants and animal diversity, their organs of movement and information about their food.

Objective

After reading this chapter you will be able to -

- classify plants on the basis of their age and size.
- identify different parts of plants such as root, stem, leaf, flower, fruit, seed.
- know the function of different parts of the plants.
- have information about the diversity in the animal world.

- see movement in animals as well as different parts of body of humans associated with the movement.
- know human skeletal system as well as the skeletal system of other animals.
- find difference between bones and cartilages.
- have description about the different types of joints.

3.1 Classification of plants and trees

We saw different types of plants and trees around us. Some are small others are big. Their leaves, fruits and flowers are of different colour. Have you noticed how their branches are arranged on their stem ?

In spite of huge differences among plants and trees, they appear to be similar. Let us try to understand some of the few characters on the basis of which they are distributed among different groups.

3.1.1 Classification on the basis of height of plants and trees

You know very well that some of the plants and trees are smaller and others are large. Some of the plants are so small that they appear like a dot on the earth. It means that the length of plants are different. Observe stem of plants and trees very carefully. Stem of some of the plants is soft and in others it is hard. Branching on a stem is also at different heights. These are such characters on the basis of which plants can be divided into three groups : Herbs, shrubs and trees.

(a) **Herbs:** Plants with green and soft stems are called as herbs. Usually they are small and do not have many branches. Like coriander, mustard, tomato, basil etc.

Fig. 3.1

(b) **Shrubs:** In some plants branching takes place near the stem at the base. They do have a strong stem but it is not too thick. Their length is also more than that of herbs. Such plants are called shrubs example- nerium, lemon, hibiscus, chandni etc.

Fig. 3.2

(c) **Trees:** Trees are very long. Their stem is very strong and is of dark brown colour. The branching starts at some height on the stem on the upper part such as neem, mango, drumstick, banyan tree, sheesham etc.

Fig. 3.3

Besides this there are creeper and climber plants.

Creeper and climber plants: Some plants have very weak stem but they are different from the herbs. Some plants cannot stand erect due to weak stem but they can spread on earth. These are called as creeper plants like mint. But some of them can climb with the help of surrounding structures such plants are called as climbers. Example grapes, money plant cucumber. Creepers and climbers are different from herbs and shrubs.

Fig. 3.4 (a)

Fig. 3.4 (b)

Activity 3.1

Write down the names of two trees, shrubs, Herbs, creepers and climber plants around your house

Type of plants	Name of Plants
Herb	
Shrub	
Tree	
Creeper Plant	
Climber Plant	

3.2 Classification of plants on the basis of different functions and parts

Let us learn about different parts of the plants. This will help us in understanding differences.

Activity 3.2

1. Label the different parts of a potted plant like root, stem, leaves, flower and seeds using a diagram; else visit to a garden and label the different parts of the plant.

3.2.1 Root

Roots are inside the soil, which help binding of plants in the soil, they absorb mineral and water from the soil. Plants absorb minerals and water through these from the soil. Roots are of two types.

(a) **Tap root:** One is the main root. They are smaller roots coming out of this main root, which are called as lateral roots like mango, guava, banyan Tree, hibiscus (China rose) etc.

(b) **Adventitious root:** These are associated with the lower part of the stem in the form of a fiber. None of the roots is the main root; all the roots are look alike like- wheat, grass, maize etc.

The main function of roots is to absorb water but some plants store their food in the roots. Some roots grow in size and become swollen like carrot, radish, sweet potato etc.

Fig. 3.5 (a)

Fig. 3.5 (b)

Activity 3.2

1. Visit to the orchard and remove weeds and classify taproot and adventitious roots.

Tap Root	Adventitious Root
1.	1.
2.	2.

2. Take two pots. Plant in one plant with roots and in another pot plant a plant without root. Keep both the pots in the light, give regular water, observe plants after a week, see if they are healthy and try to understand the reason.

_____

_____

3.2.2 Stem

Stem help plants to stand erect. Stems contain branches. Water and minerals absorbed by the roots reach the different parts of the plants like leaves and flowers through stem and branches. They help transportation of food prepared by leaves through their branches to the cells of the roots. This way material can move in both the directions in the stem; Water and Minerals absorbed by the roots towards leaves and food from top to down side. Different parts of the flower are associated with the stems like leaves, buds flowers, fruit etc.

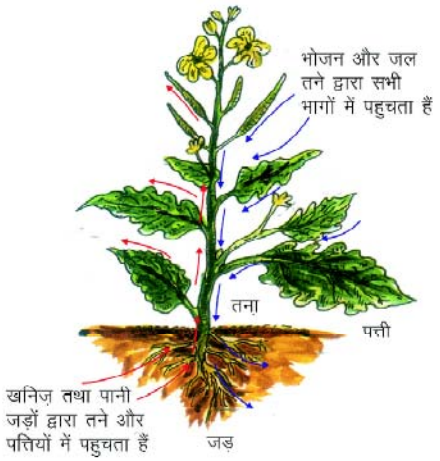


Fig. 3.6

Activity 3.3

Take one glass, fill it with red ink, dip branch of a plant inside it, see if water rises; If the veins of the leaves and branches are also colored red ?

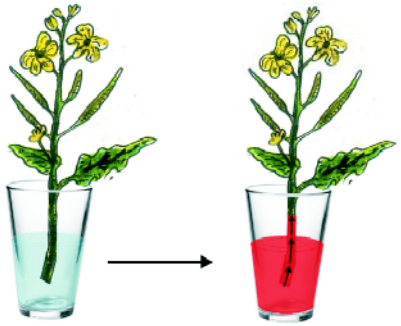


Fig. 3.7

3.2.3 Leaves

Leaves are very important part of the plant. They are of different shapes and types. The part with which leaves are attached to the branch is called as Petiole.

Activity 3.4

Look around your leaves of the plants. Do they all have petiole?

The flat part of the leaf is called vein or blade. Blade contains different types of veins. In some leaves there is a vein in the middle. This middle vein is thick and there is a network of veins around it. The design formed by the veins on the leaves is called venation. This design around

the mid vein is in the form of a network and it is called network venation. This venation can be very well seen in the leaves of the Peepal (Ficus religiosa)

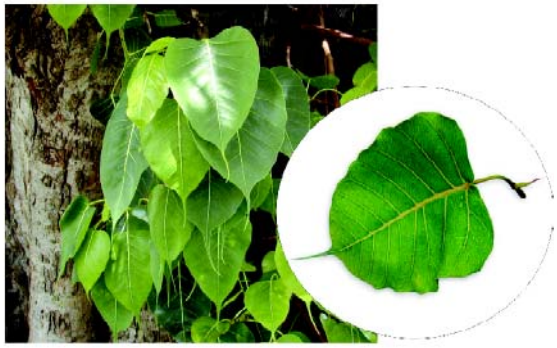


Fig. 3.8 (a)

Fig. 3.8 (b)

Venation in the leaves of grass, wheat, maize is parallel. This is called as parallel venation. In this all the veins are of the same type.

Activity 3.5

Collect the weeds from the orchard and segregate the plants on the basis of parallel venation and network venation and observe their leaves. Is some relationship seen? Tabulate the observation in the given table-

	Name of Plant	Type of Root	Leaf Vein configuration
1.			
2.			
3.			
4.			

Activity 3.6

Take healthy leaves from a potted plant and keep them in a plastic bag. Put it into the sunlight. You will see water droplets inside the plastic bag after sometime. Can you tell where do from these droplets come?

3.2.4 Flower

Root stem and leaves are the symmetric part of the plants but flowers help in the reproduction of the plants. You must have seen a variety of flowers while walking in the garden. Now you can add details in the given table about the flowers observed.

Name of flower	Colour of flower	Size of flower (Small/Big)	When Flower (Day/Night)	Fragrance in flower (Yes/No)
Rose				

From this table we can conclude that some of the flowers are big while others are small. Some colored, others are white, some are with scent, whereas others are without scent.

Let's now study the China rose (Hibiscus) flower as an example and understand different parts of the flower.

Flower of China rose : from outside there are green leaves called as sepals which protect petals in the bud. It is of green colour therefore, it can also carry out photosynthesis. The petals of the flower may be of different colours. They can be attached with each other or maybe separate. Their number may be different in different flowers. They make the flower group. If you open the petals of the flower then you can see their internal structures androecium and gynoecium.

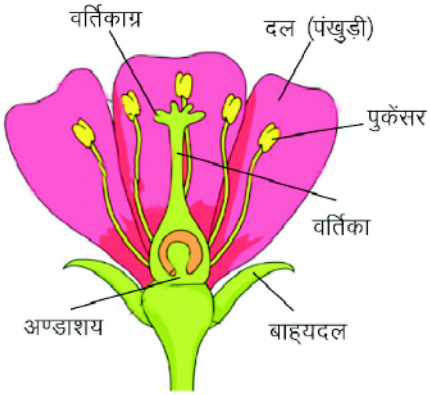


Fig. 3.9

Androecium is the male part and the gynoecium is the female part of the flower. The male gametes anthers are present in anther sac of the stamen. On the lower part of the gynoecium, inside the ovary, there are female gametes (you will study about androecium and gynoecium in detail in chapter 5 living process-II in detail).

After reproduction ovule present in the ovary produces the seed and ovary contributes towards the formation of fruit.

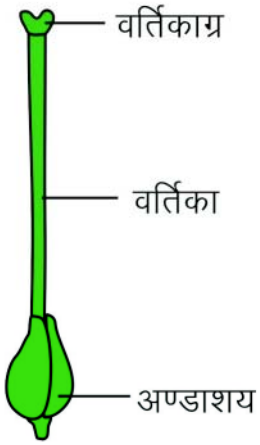


Fig. 3.10 (a)

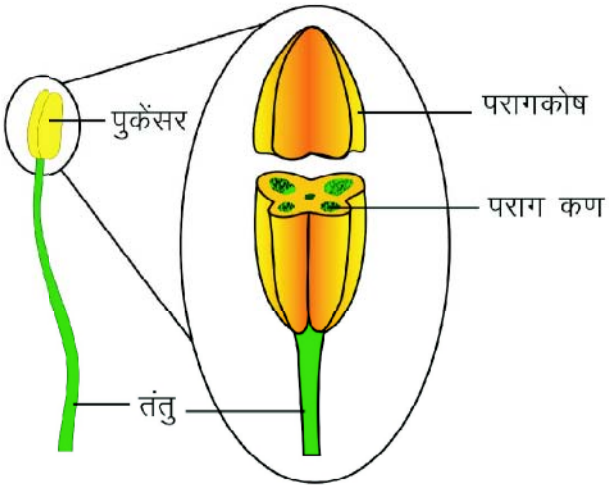


Fig. 3.10 (b)

Chapter Questions 3.1

1. Give answer in Yes or No:

(i) Roots help in holding plants in the soil. YES/ NO

(ii) Material can flow only upwards in the stems. YES/ NO

(iii) Creeping branches rise with the help on trees. YES/ NO

(iv) All the leaves have venation. YES/ NO

(v) Plants can make their own food. YES/ NO

2. Fill correct word in the blank:

(i) Adventitious roots do not have .....

(ii) Reddish is a type of .....

(iii) Venation in the leaves of the grass is .....type venation.

(iv) Transpiration is carried out by the..... present in the leaves.

(v) Green color of the leaves is due to.....pigment.

(vi) Process of making food is called .....

3. Match the flowers of the column A with that of column B.

	Column 'A'		Column 'B'
1.	Sepal	1.	Male part of flower.
2.	Petals	2.	Contain eggs.
3.	Androecium	3.	Attractive part of flower.
4.	Gynoecium	4.	Protects the petals.
5.	Ovary	5.	Contains female gametes.

3.3 Diversity in Animal world

Similar to plants animal world is also having a huge diversity. We saw different types of animals around us. On the basis of size blue whale is the largest animal, in which only the weight of its tongue is equal to full elephant.

Fig. 3.11

If we talk about small organisms then Amoeba and Paramecium etc. are so small that we cannot see them without microscope.

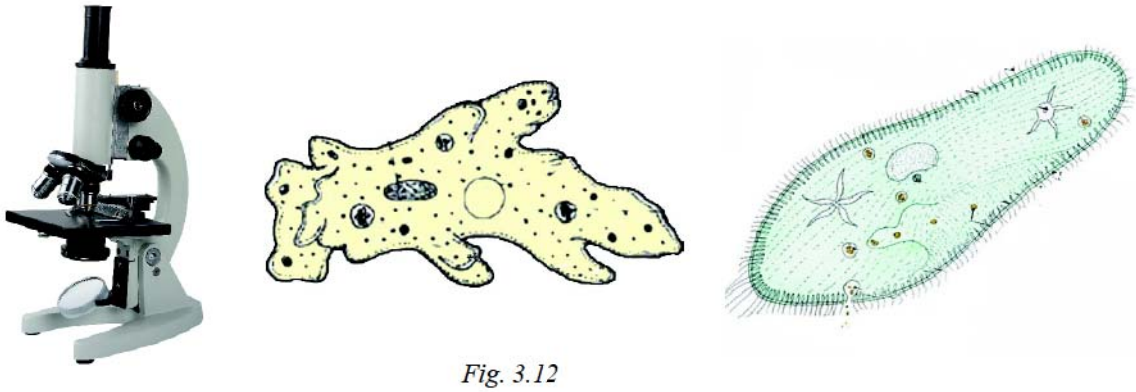


Fig. 3.12

Some organisms live in water some on land. Some organisms are seen flying in the air.

Fig. 3.13

Some have 2 legs others may have 4. Flies have 6 legs a mosquito has eight. Let us just try to count the legs of worm.

Body of some animals is covered with hairs of others with scales. Some have tail and some have long horns. Some animal gives eggs, and the other produces babies.

Fig. 3.14

Fig. 3.15

3.4 Movement in Animals

All the animals exhibit movement. In search of food, mate and self defense they have to move from one place to another. The method of movement may be different in all different animals. It includes walking, roaming, running, jumping, flying, crawling and swimming as the main. The method of movement in animals depends upon the organs of movement. Animal with wings will fly. With legs they will run, those without legs and wings will crawl. Let's learn something more about them.

3.4.1 Crawling animals

Some animals can crawl with the help of the abdomen or legs. In earthworm movement is by shrinking and expanding. The suckers present in his body help holding the soil and in the movement.

Snake can hold grip using its scales, which helps in the movement. In lizards the cup shaped structure in their legs allows them to stick to the wall and roof with which they can easily move.

Fig. 3.16

3.4.2 Flying Animals

Birds, bat, insects all fly with the help of their wings

Fig. 3.17

3.4.3 Walking Animals

Such animals walk on two or four legs. Cow, buffalo, tortoise, deer, ostrich and human are the example of such type of organisms.

Fig. 3.18

3.4.4 Running Animals

Such animals which can run on 2 or 4 legs like horse, deer, tiger, leopard etc.

Fig. 3.19

3.4.5 Swimming Animals

Animals living in the water have a boat shaped body. Animals with such shape can easily move through the water current. The fins of fish help them in swimming and change of direction, example fish, crocodile, tortoise, snail, dolphin, octopus etc.

Fig. 3.20

Chapter Question 3.2

1. Fill in the blanks

(i) The largest animal in the world is …….

(ii) …….can only be seen by microscope.

(iii) Spider has ……..legs.

(iv) ……..is a crawling animal.

(v) ……..lays egg.

2. Name of some animals are given in the below table. Write down their organs and method of movement.

Name of the Animal	Movement in Part	Method of movement
Rabbit		
Horse		
Parrot		
Lizard		
Fish		
Earthworm		
Snake		

3.5 Movements in human body

Have you ever observed, how many different types of movements are seen in human body ? Just think what are the different parts of your body that show movement when you-

- Eat food
- Comb your hair
- Play football
- Run to catch the bus.

What are the different organs and tissues that participate in the movements of the body? Just think if we do not have bones in our body, can we move? Yes the movement of our body is carried out with the help of bones. There are total 206 bones in our body. These bones form the skeletal system, after joining with each other. This skeleton gives a proper shape to our body. This is helpful in the movement of different organs of the body. Skeleton protects the soft organs of the body. Let us learn about the skeletal system.

3.5.1 Skeletal system of humans

Skeletal system is a strong structure of bones present in our body. This gives a proper shape to the body. These bones are joined with each other with the help of cartilages, bones and ligaments.

Fig. 3.21

Let us see what are the main parts of human skeleton.

1. **Bones of skull:** These bones are present in the upper part of our body whose main function is to protect the brain.

Fig. 3.22

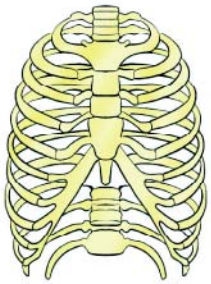


Fig. 3.23

2. **Ribs cage:** Heart and lungs are protected by the rib cage of our skeletal system.

3. **Vertebral Column:** Vertebral column is made up of 33 vertebrae, which includes 7 cervical vertebrae, 12 thoracic vertebrae, 5 abdominal vertebrae, 5 caudal vertebrae (trikasthi) and 4 tail vertebrae in it. Vertebral column protect the spinal cord inside it. Just imagine if there was a single long bone instead of vertebral column.

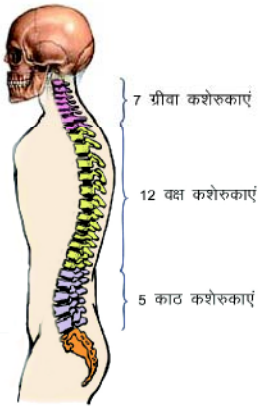


Fig. 3.24

4. **Girdle and arms:** There are two girdles. In shoulder it is pectoral girdle and in hip region it is pelvic girdle. Pectoral girdle joins with arms whereas pelvic girdle joins leg bone.

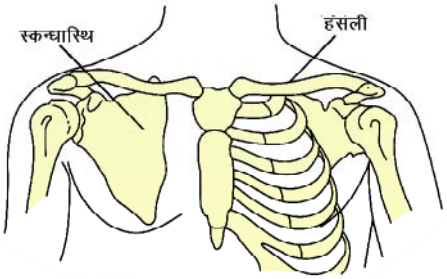


Fig. 3.25 (a)

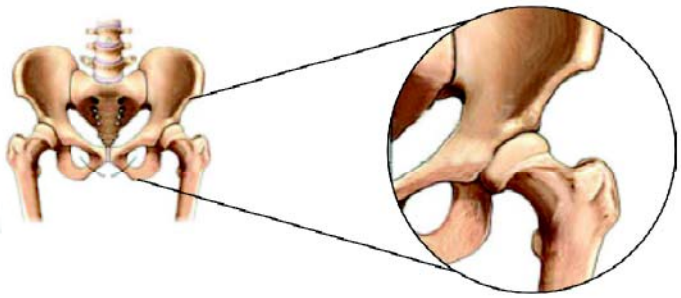


Fig. 3.25 (b)

3.6 Bones and cartilages

Just touch your ear, do you observe some feel of hard bone? You can fold your ear? This reveals that there is no bone in the ear, but some stronger structure is felt, which is strong as well as flexible. This is called cartilage. Cartilages are not as strong as bone but they are flexible. Cartilages are present in anterior part of nose and joints in our body.

Chapter Questions 3.3

1. **Fill in the Blanks:**

   (i) Our body has……. Bones.

   (ii) Vertebral Column has…….. vertebrae.

   (iii) …… bones are joined in Pectoral girdle.

   (iv) Skeletal system project the soft…….. of our body.

   (v) In addition to being strong cartilages are also …….

2. **Which soft part of our body is protected by the following:**

   (i) Skull bones .....

   (ii) Rib cage .....

   (iii) Vertebral column .....

3.7 Joints and their types

Different bones of our body are joined with each other through joints. With the help of these joints our bones and parts of the body move. Let us see different types of joints and how they help in the movement.

Different types of joints in our body are-

1. **Ball-Socket Joint:** Ball and socket joint is found in shoulder, where humorous of arm are joined with scapula of pectoral girdle. Ball and socket means ball and a cavity. The ball like head of humorous is fitted into cavity of scapula in pectoral girdle and can move. With the help of this joint hand can move in fully circular manner. Similar type of joint is present between pelvic girdle and femur bone of leg.

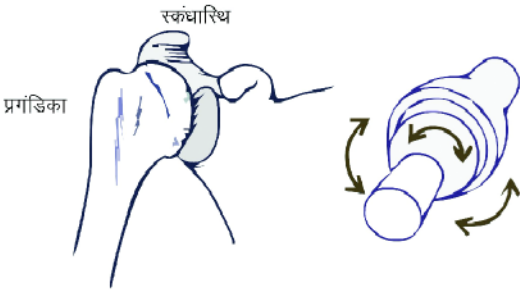


Fig. 3.26

2. **Hinge joint:** Try to fold your elbow (as shown in the diagram). Can you turn it into the reverse direction as well? This joint is like the hinge present in the gate, which can move only in one direction. Hinge joint is found in elbow, ankle, knee, wrist etc.

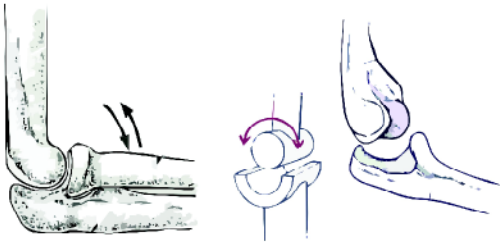


Fig. 3.27

3. **Pivot Joint:** This is a joint between head and neck. In Pivot joint cylindrical bone moves in a ring. Due to this head can be moved forward backward or left and right.

4. **Immovable Joints:** Our skull is made up of many bones. The joints between these bones prevent them from moving. Some joints are called as immovable joints. When you open your mouth, then you are moving your lower jaw away from your head. Now try to move your upper jaw. Are you able to move it? There is an immovable joint between skull and upper jaw.

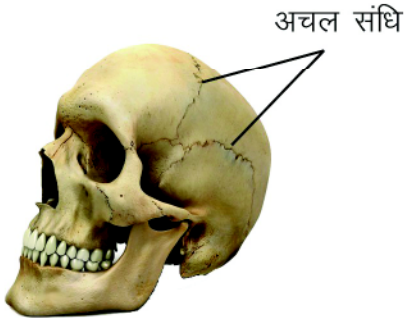


Fig. 3.28

So far you have learnt about different types of joints. Come let us understand joints with the help of a diagram.

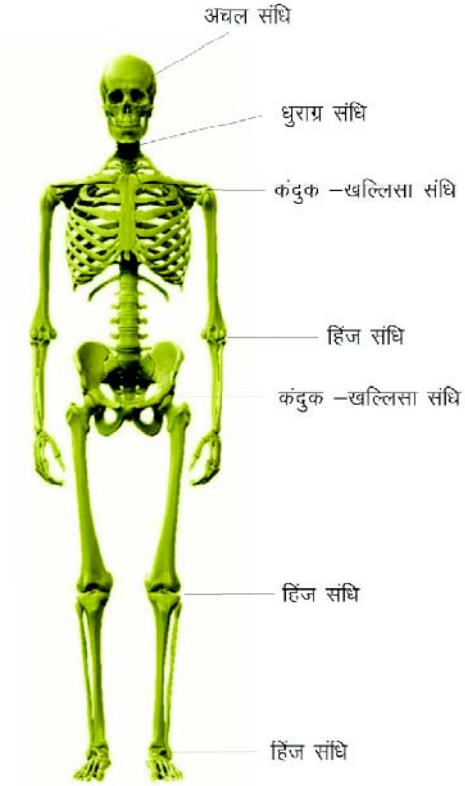


Fig. 3.29

3.8 Skeletal system of other animals

On the basis of organization of the body different types of Skeleton are found among different animals. Skeleton of some common animals is given below.

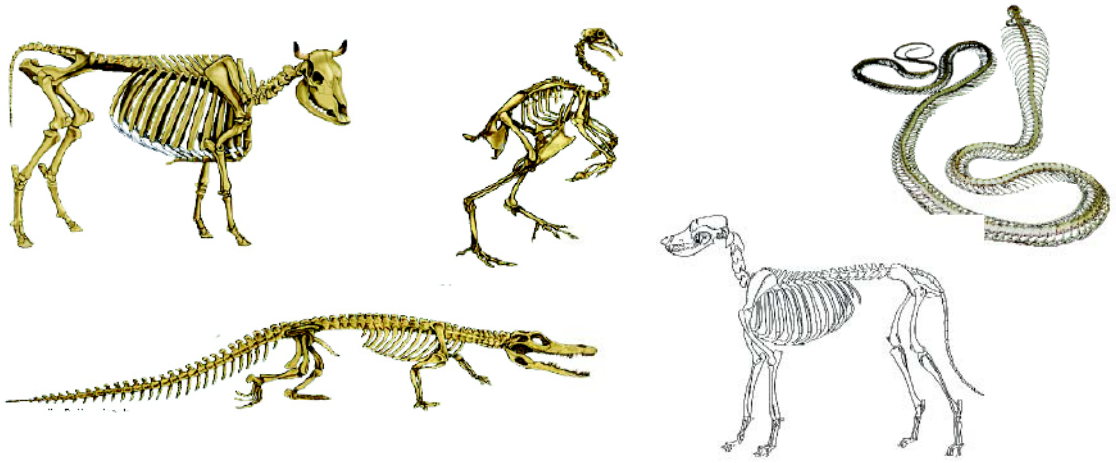


Fig. 3.30

Chapter Questions 3.4

1. Fill in the blanks:

(i) Different bones of our body are joined by……..

(ii) …….. can be rotated in full circle with the help of ball and socket joint.

(iii) In pivot joint cylindrical bones move in one …….

(iv) The joint between upper jaw and skull is…….

2. Match the following:

Column A		Column B	
(1)	Hinge Joint	(i)	Skull bones
(2)	Ball and Socket Joint.	(ii)	Knee bone
(3)	Immovable Joint.	(iii)	Between skull and neck
(4)	Pivot Joint	(iv)	Shoulder and Arms

What you have learned

- Plants are classified into three groups: herb, Shrub and trees, on the basis of their size strength of their stem, position of branches on their stem.
- The main parts of the plant are root, stem, leaf, flower, fruit, seed etc.
- Root attaches plant to the soil. They absorb water and minerals from the soil. Roots are of two types taproot and adventitious roots.
- Stem helps plant in standing in the air. The minerals and water absorbed by the roots are transported to upside and food made by leaves to downside through stems.
- Leaves are mostly green. They have petiole and blade. Leaves make food for the plant and function in transpiration.
- Flower is the reproductive part of the plant. The main parts are petals, androecium and gynoecium. Pollen is present in androecium and egg in the gynoecium.
- Ovary contains ovule, which is converted into seed after fertilization. The walls of ovary are converted into the fruit.

- There are several types of animals around us. On the basis of size blue whale is the largest animal. Amoeba, Paramecium etc. are so small that they cannot be seen without microscope. Some organisms live in water some on land and some can fly in the air.
- Bodies of some animals are covered by hair and of some by scales. Some are with tail others have horns. Some animal lays egg, whereas some give birth to young ones.
- All the animals show movement. They have to move from one place to another in search of food, mate and for defense.
- Skeleton protects soft organs of our body as well as give proper shape to body. We have total 206 bones in our body. These help in the movement of different parts of our body.
- Skull bones are found on the upper part of our body. Their main function is to protect our brain. Heart and lungs are protected by the rib cage
- Vertebral column is made up of 33 vertebrae. Inside vertebral column our spinal cord is protected.
- There are two girdles in our body- pectoral girdle in shoulder and pelvic girdle in hips. Bone of arms join in pectoral girdle, whereas legs in pelvic girdle.
- Bones are strong but cartilages are strong and flexible.
- Different bones in our body are joined with each other through joints. With the help of these joints our bones and (indirectly) parts of our body move.
- All such joints which allow bones to join but not to move are called immovable joints.

End of Chapter Questions

1. Write down the following statements after correcting:

   (i) Water is transported to leaves by roots.

   (ii) Stems absorbs the water.

   (iii) The sepal and petals of the flower are always same.

   (iv) If the units of sepals are joined then petals will also be joined.

   (v) Stomata is present of the upper surface of the leaf.

   (vi) Pollens are produced by gynoecium.

2. Label the different parts of the flower in the diagram.

3. If the venation of neem plant is network venation what would be the type of roots.

4. What is photosynthesis? In which part of the plant does it take place?

5. Draw a labeled diagram of plant showing different parts.

6. Select appropriate word to fill in the blanks:

   (a) weight of blue whales' ..... is equal to one full elephant.

   (i) Leg (ii) Tongue

   (iii) Tail (iv) Nose

   (b) .....joint is found in our upper jaw..

   (i) Hinge (ii) Ball and socket

   (iii) Immovable (iv) Spine

   (c) We have ..... cervical vertebrae in our vertebral column.

   (i) 4 (ii) 7

   (iii) 5 (iv) 12

   (d) .....can only be seen by microscope.

   (i) Paramecium (ii) Earthworm

   (iii) Ant (iv) Hydra.

7. Write name:

   (a) Flying animal.....

   (b) Crawling animal.....

   (c) Swimming animal.....

   (d) Running animal.....

8. Explain:

   (a) Difference between bones and cartilages.

   (b) In which parts Ball and socket joint is found ?

(c) How does our body protect heart and lungs ?

(d) What is immovable joint and where is it found?

(e) Imagine the impact/losses without bones in our body.

9. Write down the name of joints in the given diagram.

10. What would happen if-

- Vertebral column would be a long single bone.
- We did not have joints in our body.
- Cartilage of ear was replaced by bones.

Answer key of chapter questions

3.1

1. (i) Yes (ii) No (iii) No (iv) No (v) Yes

2. (i) Main (ii) Root (iii) Parallel (iv) air pores (v) Chlorophyll (vi) Photosynthesis

3. a. (iv) b. (iii) c. (i) d. (v) e. (ii)

3.2

1. (i) Blue whale (ii) Amoeba (iii) 8 (iv) Earthworm or snake (v) bird

2.

Name of Animal	Organ of Movement	Mode of Movement
Rabbit	4 legs	Running
Horse	4 legs	Running
Parrot	Wings	Fly
Lizard	Cup shaped structure in legs	Crawling
Fish	Shape of body and wings	Swimming
Earthworm	Suckers	Crawling
Snake	Scales	Crawling

3.3

1. (i) 206 (ii) 33 (iii) Arm (iv) (v) flexible

2. (i) Brain (ii) Heart and lungs (iii) vertebral column

3.4

1. (i) Joints (ii) Arm (iii) ring (iv) Immovable

2. (1) a (2) d (3) a (4)

4

Biological Processes 1

(Respiration, Circulation and Excretion)

All living organisms need energy to stay alive. Energy is essentially required for the proper functioning of the various activities of the body. But where does this energy come from? In the last chapter you have learnt that the living organisms derive nutrition by various means. The food procured by various sources is digested. The digested food is absorbed by the body so that it can be used for various functions in the body. The leftover, undigested waste material is thrown out of the body. Have you ever thought how energy is created from this digested food? How useful materials are sent to the cells in our body? Who takes away the waste materials out of the cells? How are they expelled out of the body? How all the organs of the body are controlled? You will get the answers to these questions in this chapter.

Objective

After reading this chapter you will

- Understand about the necessity of breathing.
- Be able to define respiration and describe the process of respiration in man.
- Know about respiration without oxygen.
- Know about the process of respiration in various animals and plants.
- Be able to describe the process of circulation of food, oxygen and other materials in the body.
- Gain knowledge about the structure of the circulatory system in humans.

- Describe the functioning of the heart.
- Gain knowledge about heart beat, pulse and blood pressure.
- Will be able to define excretion and describe the structure and function of human excretory system.
- Know the importance of coordination and gain information about the human nervous system.
- Learn about the names and functions of the endocrine glands in human body.
- Understand the process of circulation in plants.

4.1 Why is it essential to breathe?

Breathing is essential to produce energy in the body. Energy is essential for staying alive. In reality energy is needed by every object for moving, walking etc. diesel or gas is needed for driving car, bus, truck et. In the same manner all living organisms need food for movement and other functions.

4.1.1 Oxygen is an essential gas for producing energy from food

The energy accumulated in food is released only when, it burns in the oxygen gas, found in the air that is when it reacts with it. Along with energy, carbon dioxide and water are also formed in this reaction. This process of formation of energy from food is called respiration. All living things namely plants and animals acquire energy in this manner.

$$\text{Food} + \text{Oxygen} \longrightarrow \text{Carbon di oxide} + \text{Water} + \text{Energy}$$

If all the living organisms respire day and night, inhale oxygen and exhale carbon di oxide then why is it that all the oxygen of the air is not exhausted and it is not completely filled with carbondioxide?

This does not happen because all green plants on the earth undergo an important process called photosynthesis. In this process the green plants take water from the soil and oxygen from the air and convert it into food in the presence of sunlight. Oxygen is also produced in this process which is released in the air. That is why, it is said, plant more and more trees so that there is no scarcity of oxygen in air.

4.2 Process of Respiration in the Human Body

We can divide the respiratory process into two parts:

1. The process of breathing

2. The process of conversion of food to energy.

4.2.1 Process of breathing in man

You know that we breathe day and night. Try to hold your breath for some time. For how long could you do that? Can we live without breathing? Come let us determine how many times we breathe in 1 minute.

Keep two fingers of your hand under your nose. When you release your breath you will feel the warm air coming out. You have to count the number of times your fingers feel this warm air, that is how many times you took in and released your breath, in one minute. We call this as rate of respiration. The rate of breathing is not same in all individuals. Generally it lies between 15- 28 but can be more or less than this. The rate of respiration increases with fast running, exercise or when we are afraid. The rate of respiration decreases while sleeping.

Our body constantly receives oxygen through breathing. The amount of oxygen is more in the air inhaled through breathing. The amount of carbon - di - oxide is more in the air expelled through breathing.

When the body needs more energy, it demands more oxygen, thereby the rate of respiration increases (at the time of exercise). In the same manner when the body needs less energy the demand of oxygen decreases thereby the rate of respiration slows down (while sleeping).

4.2.2 How do we respire?

Generally we breathe through our nostrils. The air taken in through the nostrils passes through the respiratory tube in the body and reaches the lungs. Lungs are a soft part of our body. In the last chapter you have read that our lungs are protected by a cage of ribs. This cage comprises of the vertebral column at the back and of the chest bone at the front. And both these bones are connected by ribs on either side. The base of this cage is made up of a layer of muscles which is called diaphragm. The diaphragm keeps on moving up and down.

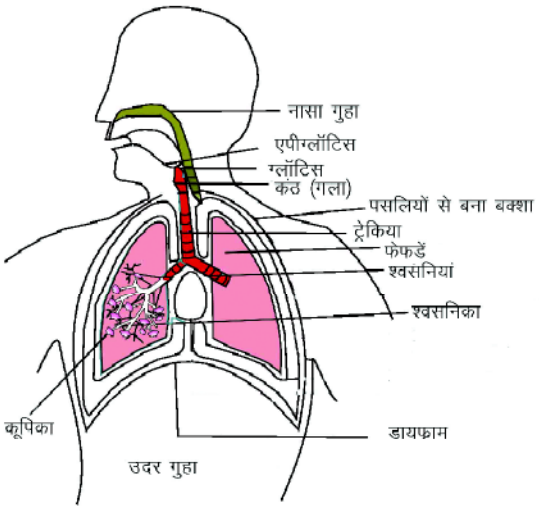


Fig. 4.1

The size of the lungs increases with the downward movement of the diaphragm and the outward movement of the ribs. This decreases the pressure of air inside the

lungs. Due to this low pressure of air inside the lungs and high pressure of air outside, air outside enters in to the lungs. This is called taking in of breath (inspiration).

On return of diaphragm to its normal position (upwards) and the inward movement of ribs the size of lungs decreases and the pressure of air inside the lungs increases. The pressure of air being higher in the lungs than on the outside causes the air from inside the lungs to come out. This is called breathing out (expiration).

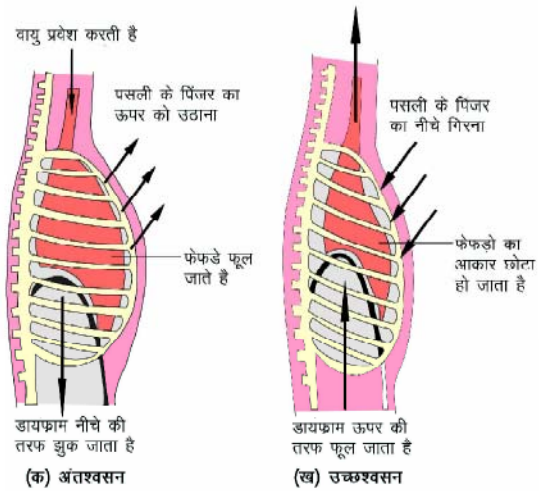


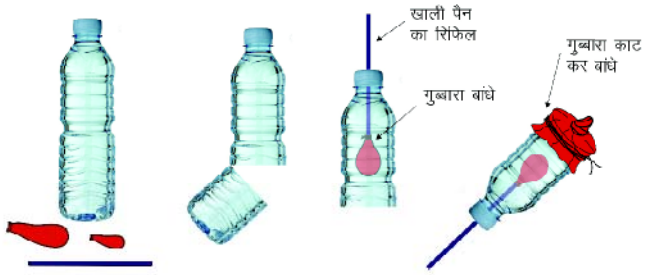
Fig. 4.2

Activity 4.1

Take an inch tape.Breathe out all the air that you can and measure your chest. Then breathe in all the air that you can take and again measure the chest. Is there any difference between the two measurements? If yes, then how much?

Activity 4.2

The process of breathing in and out can also be understood by a small model. Cut the base of a 500ml. cold drink bottle. Make a hole in the cap of the bottle and fit an empty pen refill in it.



Tie a small balloon on the inner side of the refill and close the cap as shown in the diagram. Cut a large balloon, stretch it and tie it on the base of the bottle. It will work as the diaphragm. The moment this balloon will be pulled downwards the air will rush through the refill and will fill the smaller balloon. The air reaches our lungs in the same way.

Chapter Questions 4.1

Complete the sentence using the suitable word.

(a) Breathing by our body is essential for the formation of .....

1. Food
2. Energy
3. Carbon dioxide
4. Oxygen

(b) When the food burns in ..... energy, water and carbon dioxide gas are produced.

1. Oxygen
2. Nitrogen
3. Hydrogen
4. Sulphur

(c) The rate of respiration increases while .....

1. Relaxation
2. Consuming Food
3. Talking
4. Exercise.

(d) The air breathed out of the body has a large amount of .....

1. Nitrogen
2. Carbon Dioxide
3. Oxygen
4. Helium

(e) The lungs are protected in a cage, which contains ..... at its back.

1. Breast bone
2. Shoulder Bone
3. Vertebral Column
4. Elbow bone.

(f) The air taken in through the nostrils reaches the lungs through .....

1. Respiratory Tube
2. Alveoli
3. Diaphragm
4. Food pipe.

(g) The size of lungs increases with the downward movement of ..... and the outward movement of the ribs.

1. Vertebral Column
2. Alveoli
3. Respiratory Tube
4. Diaphragm

4.3 The process of carrying of oxygen to blood by the air

Have you ever seen a bunch of grapes? The way in which the grapes are attached to the branches similarly many alveoli are attached to the branches of bronchi in the lungs. These alveoli are round and are surrounded by blood vessels. The exchange of gases (gaseous exchange) takes place inside these alveoli.

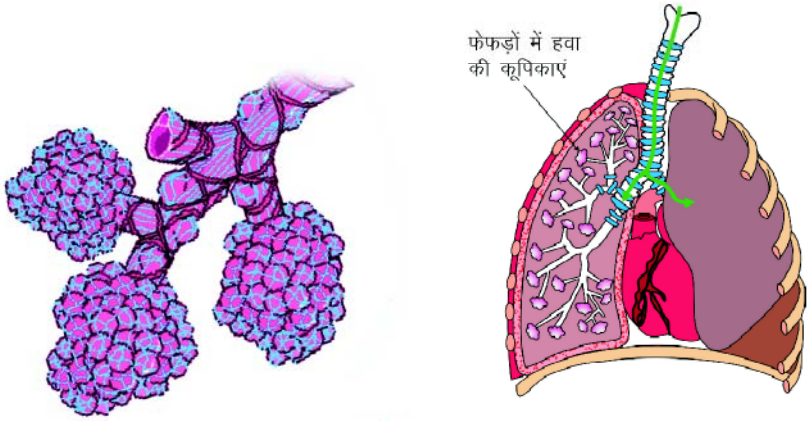


Fig. 4.3

The air entering the lungs contains more oxygen. When this air reaches the alveoli, the blood absorbs the molecules of oxygen and releases the carbon dioxide molecules, which it brings with itself. In this manner the more carbon dioxide is present in the air being breathed out. The blood takes oxygen from the lungs and returns it to the heart. The heart sends this blood to all the organs of the body to supply oxygen and food.

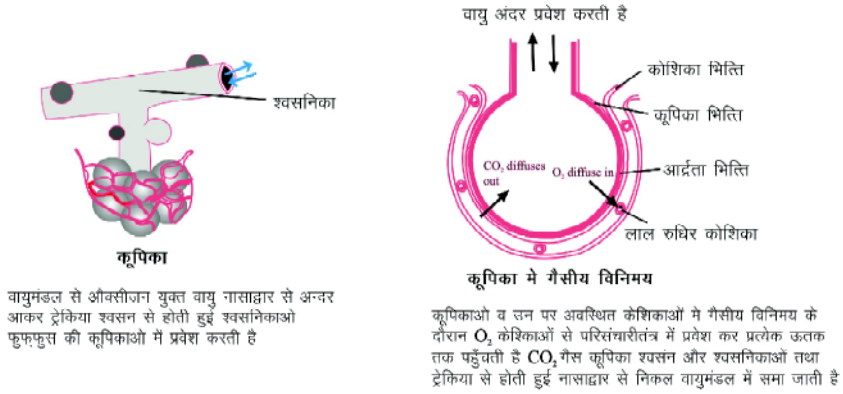


Fig. 4.4

4.4 The process of converting food to energy in the cells

The food after digestion gets converted to glucose and this glucose reacts with oxygen inside the cell. This reaction produces carbon dioxide, water and energy. This Carbon dioxide is returned to

the lungs,by being carried by the blood. This process is called cellular respiration.

$$\text{Food} + \text{Oxygen} \longrightarrow \text{Carbon di oxide} + \text{Water} + \text{Energy}$$

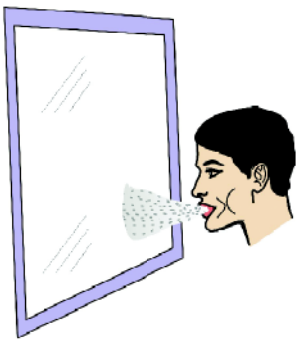
The energy produced by respiration keeps our body warm. With its help our body is able to perform various functions. To learn that Carbon dioxide and water are released during respiration let us perform some experiments/activity.

Activity 4.3

For this activity we need some lime water. To make lime water take some quick lime used for white washing and dissolve it in water. A lot of heat (energy) is released during this process. Stir this mixture and leave it for some time. After 1 - 2 hours collect the clear water which has accumulated at the top. This is lime water. It is a property of carbon dioxide that it turns lime water milky. Now take some lime water in a glass container. Blow some air bubbles into it with the help of a syringe or pump. Does the lime water turn milky? Now take some lime water in another glass container. Blow some air into it with the help of a straw. Does the lime water turn milky? You will see that the lime water in which air was added with the help of a syringe or pump did not turn milky whereas the lime water in which air was blown with the help of a straw turns milky. By this it is clear that the amount of carbon dioxide is not much in the atmospheric air. Whereas the air coming out of our body contains more carbon dioxide. This means carbon dioxide is formed in our body.

Activity 4.4

Blow hard on a mirror. Does the mirror become blurred? Why does this happen? When we breathe out air, it contains water in the form of vapour, which makes the mirror blur.



4.5 Respiration can take place even without oxygen (Anaerobic Respiration)

Yes there are some animals, which can respire without oxygen, for example yeast. This type of respiration is called anaerobic respiration. In this process the glucose molecules break down into alcohol, carbon dioxide and a small amount of energy.

Sometimes anaerobic respiration takes place in our body also. When we run very fast, do a lot of exercise or cycle for a long period of time our body suddenly needs a large amount of energy. In such cases the amount of oxygen falls short and so the body performs anaerobic respiration for a little while. Lactic acid is formed in the muscles of the organ, which has performed work during anaerobic respiration by the organ. There is a tingling sensation in the muscles due to the formation of lactic acid which subsides on massaging or hot fomentation.

Chapter Questions 4.2

1. Put a tick on the right and a cross on the wrong statements.

i. The alveoli in the lungs look like custard apple. Right/wrong

ii. Exchange of gases between the air and blood takes place in the alveoli. Right/wrong

iii. The blood carries oxygen from the lungs back to the heart. Right/wrong

iv. The blood is sent to all the organs to deliver carbon dioxide. Right/wrong

2. Complete the sentences.

a) Glucose formed after the digestion of food reacts with oxygen to form energy in .....

b) Carbon dioxide gas turns lime water .....

c) The air breathed out contains a large amount of .....

d) The respiration which takes place in the absence of oxygen is called .....

e) ..... is formed in the muscles during anaerobic respiration.

4.6 Process of respiration in other organisms

Like man most of the animals possess lungs for respiration. Animals such as cow, buffalo, dog, cat, goat, lion, all birds, alligator, frog etc. respire through their lungs. But many animals respire through, their skin, special pores found on their bodies or by gill slits.

4.6.1 Animals respiring through skin

Have you ever touched the skin of an earthworm? It is always wet and slimy. Earthworms absorb oxygen from the air by their skin and release carbon dioxide in the air through it. But to breathe the skin of earthworm should be moist. This is the reason that the earthworms die in the sun and hide inside the moist soil to keep themselves moist. Like earthworms, salamanders also breathe through their skins.

Fig. 4.5

Generally frogs breathe through their lungs but they can also breathe through their skin.

4.6.2 Animals breathing through special openings

Insects such as cockroach have characteristic tubules for breathing. These are called trachea. A network of these tubules is spread all over their body. These tubules open on the surface of the body through specialized openings called spiracles. The air enters this network of trachea through spiracles. All the cells of the body take oxygen from the air present in this network and release carbon dioxide in this air. This air comes out of the body through the spiracles and new oxygen rich air again enters the body.

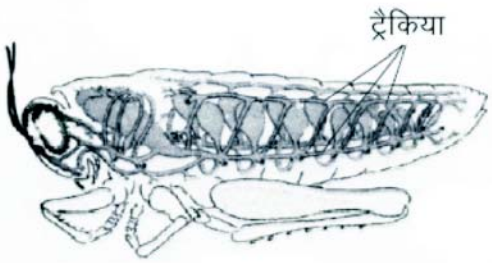


Fig. 4.6

4.6.3 Animals breathing through gill slits

Fishes have special organs for breathing which are called gill slits. Fishes take oxygen from water with the help of gill slits. Gillslits contain a lot of blood vessels. Fishes take in a lot of water in their mouth, which passes through gill slits. The blood flowing through gill slits absorbs the oxygen through water.

Many animals living in water like whale,dolphin etc. breathe through lungs. They have to frequently bring their mouth on the surface of water to breathe.

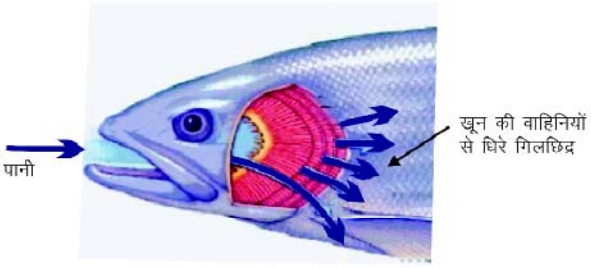


Fig. 4.7

4.7 Do plants also breathe? (Breathing in plants)

Like all living beings plants also need energy. In their cells also, the food particles in the presence of oxygen, breakdown to form carbon dioxide, water and energy. It means that plants also need oxygen. All parts of the plant take oxygen from the air. Roots also need oxygen. They take oxygen from the air trapped within the soil particles. That is why plants should not be watered too much, as then the water takes the place of air in the soil. That is why it is necessary to hoe the soil.

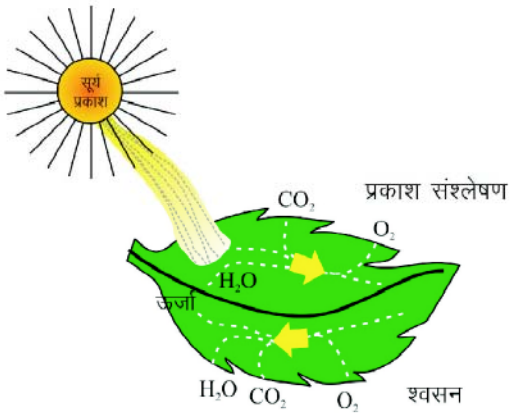


Fig. 4.8

Chapter Questions 4.3

1. Match column A with Column B

	Column A		Column B
(a)	Salamander	(i)	Gill slits
(b)	Cockroach	(ii)	Lungs
(c)	Fish	(iii)	Trachea
(d)	Whale	(iv)	Skin
(e)	Frog	(v)	Lungs and Skin

2. Answer the following questions

(a) Why does a whale have to take its mouth out of the water frequently ?

_____

(b) Why is it necessary for the earthworm to keep its skin moist?

_____

(c) Where do the organisms living in water get their oxygen from?

_____

(d) Why is hoeing of a plant necessary from time to time?

_____

4.8 Circulatory System

In respiration you have read that the blood flowing through our body carries digested food and oxygen to the cells, so that respiration can take place and energy is produced. Blood is that liquid in our body that connects all the organs of the body. The liquid part of the blood is called plasma. Plasma contains three types of blood cells - red blood cells, white blood cells and platelets. The red blood cells are the most abundant in blood. It contains a red pigment called hemoglobin. Hemoglobin attaches the oxygen to itself and carries it to various cells of the body.

If the hemoglobin content of the body becomes less, then the cells receive less oxygen and less amount of energy is produced. If there is less energy then a man feels weak and becomes tired quickly. For the production of hemoglobin iron is necessary in the body. Due to the deficiency of iron the hemoglobin production decreases and a man experiences weakness and fatigue. This condition is called anemia.

White blood cells are the soldiers (protectors) of our body. These destroy the disease causing micro organisms entering our body. Whenever we are hurt and the blood flows from our body the platelets form a clot and stop this blood flow.

4.8.1 Blood vessels

The blood in our body flows through blood vessels (tube like structures). These are of three types.

1. **Arteries:** These carry the blood from heart to different parts of the body. Their walls are thick

and elastic because the blood flowing in these is under high pressure. The amount of oxygen in the blood of arteries is high. (Except for the pulmonary artery which carries blood to the lungs.)

2. **Veins:** These vessels collect blood from various parts of the body and bring it towards the heart. Their walls are thin and contain valves to prevent the backflow of the blood. The amount of oxygen in the blood flowing through the veins is low.

3. **Capillaries:** These are formed of a single layer of cells through which exchange of materials to other cells takes place. Small arteries branch into many capillaries in the tissues of the body (group of cells) and then these capillaries rejoin to form veins.

4.8.2 Heart

Heart is that pump in our body that works nonstop since birth till death due to which the blood continuously circulates through the body.

The heart of a man is situated in the chest between the two lungs. This organ lies safe within a box like structure made of ribs and the vertebral column. The shape of the heart is somewhat like that of a fist. The heart is made up of four chambers. The two upper chambers are called auricles and the two lower chambers are called ventricles. The auricles and the ventricles are connected to each other through valves so that the blood can flow from auricles to the ventricles but the blood from the ventricles cannot flow back to the auricles. The work of bringing the blood to the heart is done by the two vena cava and the pulmonary veins and that of taking away of the blood from the heart is done by the aorta and the pulmonary arteries.

4.8.3 How does the heart work?

The veins coming from the upper and the lower parts of the body join and form the vena cava. The vena cava open in the right auricle of the heart. Pulmonary veins bring oxygenated blood from the lungs into the left auricle. The vena cava and the pulmonary veins bring the blood to the heart at the same time. The auricles and the ventricles contract and relax alternately. One cycle of contraction and relaxation of both the auricles and ventricles is called a beat. The heart of a human beats 72 times in one minute. We can feel this beat by our hands. Doctors use a stethoscope to hear this beat.

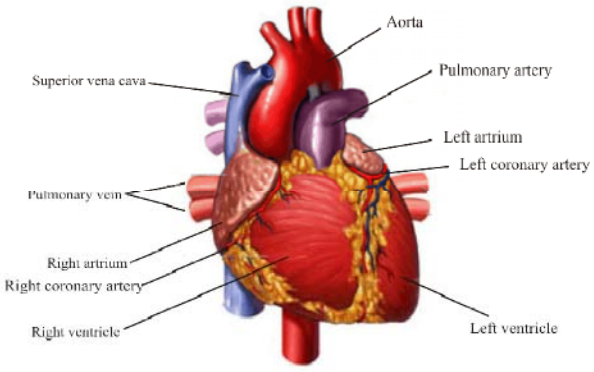


Fig. 4.9

The blood sent by the heart to the arteries is accompanied with a jerk, and exerts a pressure on the arterial walls. This is called as blood pressure. We can feel this pressure in our arteries. It can be felt quite well in the wrist. This is called pulse rate. It can be felt 72 times in one minute.

Activity 4.5

Place the fingers of your right hand on the thumb of your left hand and let them come slowly towards the wrist. Stop on reaching the wrist and feel the pulse with your fingers. Find out how many times you feel the pulse in one minute.

Chapter Questions 4.4

1. Fill in the blanks.

(i) The heart is protected within a cage like structure made of …….. and the vertebral column.

(ii) The heart is made up of four…….. the upper two chambers are called ……. and the lower two chambers are called ……

(iii) Auricles and Ventricles are connected to each other by……..

(iv) The pulse beat can be felt …… times in one minute.

2. Answer in one word.

(i) What is the liquid portion of blood known as? .....

(ii) What is the red coloured pigment present in blood called? .....

(iii) Which vessels take the blood to different parts of the body? .....

(iv) Where do the pulmonary veins bring the oxygenated blood from? .....

(v) Which blood cells destroy the disease causing microorganisms entering the body?

.....

4.9 Excretory system in man

Many chemical reactions take place in our body all the time. Many substances are formed due to these reactions, which are waste and it is essential to remove them from the body. Otherwise they cause poisonous effect on our body. The process of removal of waste substances from our body is called Excretion. The blood collects the waste substances from all cells of the body. Out of these carbon dioxide is taken to the lungs and is excreted through breath. For the removal of other soluble substances from the body a specialized system, an excretory system is there, the main parts of which are as follows.

1. **A pair of kidneys:** These organs are shaped like bean seed. They sieve the blood and remove the waste substances in the form of urine.
2. **Ureter:** A ureter comes out from each kidney. They collect the urine from kidneys and take it to the urinary bladder.
3. **Urinary bladder:** The urine brought through the ureter is collected in this bag like structure called urinary bladder. When it gets filled up to a certain level then there is an urge to urinate. The urine passes through the urethra and is released out of the body, and the body is cleansed.

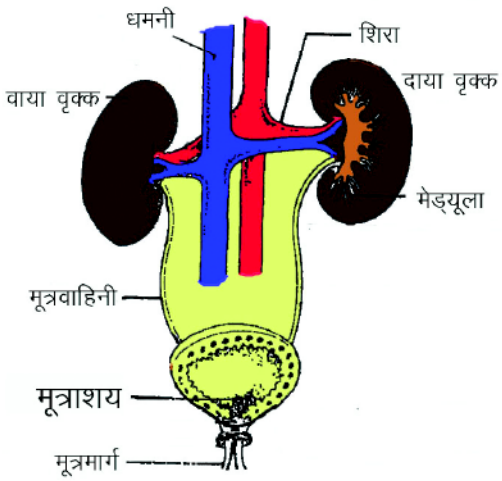


Fig. 4.10

Sometimes the kidneys of a person stop working. When this happens the excess of waste materials in the blood becomes very harmful. If the blood is not filtered in time then it leads to death. In such cases the blood is filtered through a machine. This process is called dialysis.

Some of the waste materials of our body are also removed through sweat. By sweating/ perspiration, the waste materials are removed from our body, and due to the evaporation of sweat the skin becomes cool as well.

4.10 Transport of substances in plants

Most of the gaseous exchange in plants takes place through stomata present on their leaves. Other than this the cells of the roots, stems etc. directly take oxygen from the air for respiration and release carbon dioxide into the atmosphere. Plants have vascular tissues for the transport of substances in liquid form.

The vascular tissues are of two types.

1. **Xylem tissue:** In plants the fibers of the xylem tissue form a pipe like structure from the roots up to the tips of the stem. The transport of water to the upper parts of the plant takes place through these.
2. **Phloem tissue:** The cells of this tissue are also pipe like. They take food from the leaves and transport it to all parts of the plant.

Water keeps on evaporating in the form of vapour from the leaves of the plant. This process is called transpiration. This continuous loss of water in the form of vapour creates a continuous low pressure and to fill this gap, water is pulled from the lower parts of the plants to its upper parts.

Chapter Questions 4.5

1. Fill in the blanks.

   (i) …….. sieve the blood and remove the waste substances in the form of urine.

   (ii) In case of kidney damage the blood is filtered through a machine. This process is called ……

   (iii) A group of cells performing similar functions is called ……

   (iv) Phloem tissue takes…..from the leaves and transports it to all parts of the plant.

   (v) The evaporation of water, in the form of vapour, from the leaves of plants is called ……

2. What is xylem tissue? What are its main functions?

   _____

3. When does a person need dialysis?

   _____

4. What is the advantage of perspiration?

_____

4.11 Co ordination in human body

The working together of all the organs of the body in a proper manner is called coordination. In human body this function is performed by two organ systems

1. Nervous system
2. Endocrine system.

Nervous system of the human body

All the organs and functions of the human body are controlled by the nervous system. There are three main parts of the nervous system. Brain, spinal cord and nerves, which are formed by these organs by special types of cells and these cells are called nerve cells.

1. **Brain:** It is a very soft and important part of the body. It is protected by a box, made up of skull bones. The thick skin and hair covering the box also protect the brain. The structure of the brain is like a walnut seed. The function of brain is to think,understand, memorise, intercept the messages from the sense organs, understand them and make the body perform the proper function, keep the body in balance, to direct all the body organs to work in coordination.

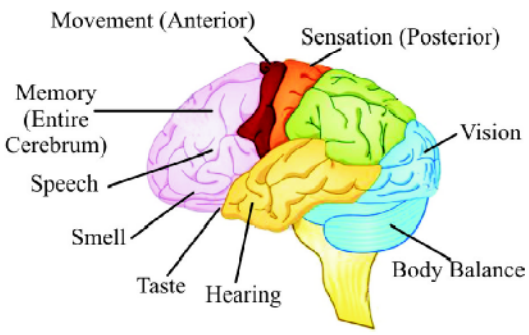


Fig. 4.11

2. **Spinal cord:** This is a soft and cylindrical pipe like structure, which starts from the hind brain and extends downwards into the vertebral column. It is protected by the vertebral column itself. It is the link between the brain and the nerves.

   Some functions of the body are performed by the spinal cord itself, without the order of the brain. For example, taking hand off a hot griddle after accidently touching it, swapping off of any insect as soon as it comes before the eyes etc. Such functions (which are controlled by the spinal cord without the intervention of the brain) are called Reflex Actions

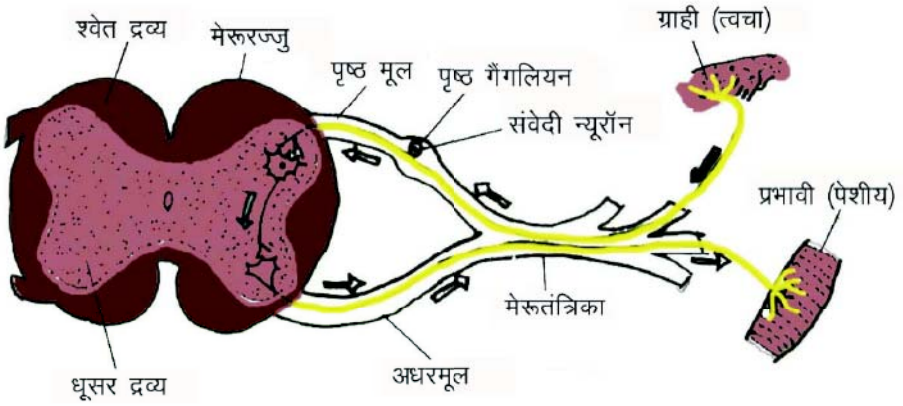


Fig. 4.12

3. **Nerves:** these are of two types-

   (1) Cranial Nerves, which receive the external stimulus through the sense organs and carry it to the brain and we become aware of the external objects.

   (2) Spinal Nerves, which arise from the spinal cord and branch out into the whole body. These control all the involuntary functions of the body.

4.12 Endocrine System

Apart from the nervous system our body has some glands which secrete some special types of chemical substances (hormones) and add them to the blood. These hormones control the important functions of our body. The main endocrine glands of the human body are:

1. **Pituitary Gland:** This endocrine gland is associated with the brain. It controls all the other glands so it is also called the master gland. The hormones secreted by this gland control the growth of human beings.

2. **Thyroid gland:** This gland situated in the throat produces the thyroid hormone which controls thc metabolic activities (digestion, respiration etc.)of the body. Iodine is necessary for the production of this hormone. Due to the deficiency of this Iodine the thyroid gland increases in size. This disease is called Goitre.

3. **Pancreas:** This gland also produces the digestive

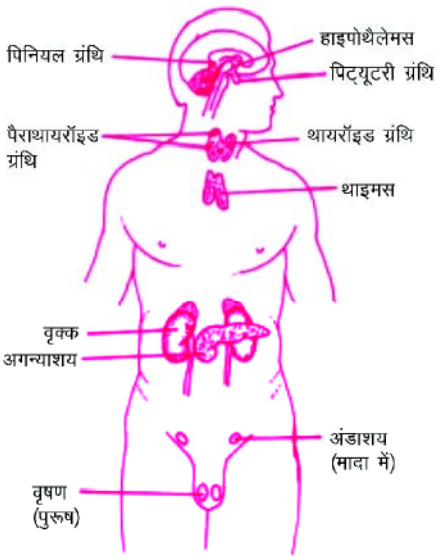


Fig. 4.13

juices (you have read about them in the digestive system) as well as hormones.The insulin hormone secreted by this gland keeps the level of glucose in the blood in control. The amount of glucose increases in the blood due to the deficiency of this hormone. This disease is called diabetes.

4. **Adrenal gland:** These are situated above the Kidneys. The hormones secreted by this gland regulate the amount of salt in the blood. It also controls the conditions of excitement (anger stress etc.)

5. **Testis and Ovary:** The ovary in female and the testis in males produce sex hormones. The estrogen is produced in the ovaries and testosterone is produced in the testis.

Chapter Questions 4.6

1. Answer the following questions

a. What is coordination ?

_____

b. What are the three main parts of the nervous system ?

_____

c. Where is the spinal cord situated ?

_____

d. Give two functions of the brain.

_____

e. Why is the pituitary gland called the master gland ?

_____

f. What is the function of the insulin hormone ?

_____

2. Match column A with column B

	column A		**column B**
1.	Iodine	i.	reflex action

2.	Spinal cord	ii.	balance of amount of salt in the blood
3.	Adrenal gland	iii.	thyroid gland
4.	Ovary	iv.	testosterone
5.	Testis	v.	diabetes
6.	Insulin	vi.	estrogen

What you have learnt

- It is necessary to breathe for the production of energy by the body.This process of production of energy in the body is called respiration.
- When the body needs more energy, it demands more oxygen and the rate of respiration in the body increases, for example, during exercise.
- The air taken in by the nostrils reaches the lungs through the respiratory tube. The lungs are the main part of the respiratory system.
- For the protection of the lungs there is a box made up of bones in our chest. The base of this box is made up of a muscular sheet called diaphragm. We can breathe because of the constant up and down motion of the diaphragm.
- Inside the Lungs the exchange of gases between air and blood takes place by the spherical alveoli present on the branches of bronchi.
- There are some animals, which can respire in the absence of oxygen, for example, yeast. This kind of respiration is called anaerobic respiration.
- Most of the animals have lungs for breathing. Some animals like earthworm, salamander etc. breathe through their skin. Insects like cockroach have special tubules called trachea for respiration. Fishes have gill slits for breathing.
- Plants also produce energy from food. All the parts of the plant themselves take oxygen from air. Therefore it is essential to hoe the soil so that the air reaches the roots.
- Blood is that fluid flowing through our body that connects all the organs of the body with each other. The liquid part of the blood is called plasma.
- There are three types of blood cells in the plasma - red blood cells, white blood cells and the platelets.

- The hemoglobin present in the red blood cells adds oxygen to itself and takes it to the various cells. White blood cells destroy the various disease causing microorganisms entering the body, the platelets present in the blood form a clot on the wound and stop the blood flowing from it.
- Our body has three types of vesicles- Arteries, veins and capillaries.
- Heart is one organ of our body that works without stopping throughout our life.
- The work of bringing the blood in the heart is done by the two vena cava and the pulmonary veins and the Aorta and the pulmonary arteries do the work of taking away of the blood.
- The heart of a human being beats 72 times in one minute. It is made up of two auricles and two ventricles. The blood is pushed into the arteries with a force, which creates a pressure on the walls of the arteries. This is called blood pressure.
- Many waste products are formed due to the chemical reactions taking place in the body and it is essential to remove them. The process of removing the waste materials from the body is called Excretion.
- The main parts of the excretory system are a pair of kidneys, ureters and a urinary bladder.
- If the kidneys stop working due to any reason then these harmful waste substances are removed through a machine. This process is called dialysis.
- Some of the waste products of our body are also removed through sweat.
- Most of the gaseous exchange occurring in the plants takes place through the stomata present on the leaves of the plants.
- Plants have vascular tissues for the transport of substances in liquid form. These are known as xylem and phloem.
- Vapours come out from the leaves of the plants every time. This is called as transpiration.
- All the organs of the body work in synchronization with each other. It is called as coordination.
- Nervous system and endocrine system together control all the processes of the body.
- Brain functions are of thinking, remembering, balancing and understanding IT sector.
- Spinal cord can perform emergency functions at its own. It is called as reflex action.
- Nervous system is made up of three parts- brain, spinal cord and nerves.
- Endocrine glands produce hormone.
- Hormone controls different functions of our body.

End of Chapter Questions

1. Select the correct word:

(a) Plants roots also require ……

(i) Carbon di oxide (ii) Hydrogen

(iii) Oxygen (iv) Nitrogen

(b) Dolphin respires through their……

(i) Skin (ii) Lungs

(iii) Spiracles (iv) Gills

(c) ……disease is caused by the deficiency of Iodine.

(i) Diabetes (ii) Goitre

(iii) Anemia (iv) Night blindness

(d) ……..acid is formed in the muscles that effects sensation.

(i) Nitric (ii) Sulphuric

(iii) Hydrochloric (iv) Lactic

(e) Transportation in our body is done by……

(i) Blood (ii) Sweat

(iii) Cells (iv) Air

(f) …….filters blood and waste is converted into urine.

(i) Lungs (ii) Kidney

(iii) Heart (iv) Pancreas

(g) …… coming out of brain and spinal cord are spread in whole body.

(i) Artery (ii) Nerves

(iii) Cells (iv) Veins

2. Give answers:

(a) Which gas plant takes in the respiration ?

_____

(b) From which organs frog take oxygen from the air ?

_____

(c) In which process Plant releases oxygen ?

_____

(d) How blood is filtered after defect in the Kidneys ?

_____

(e) What is formed from glucose in the in anaerobic respiration?

_____

(f) In females which gland produces estrogen ?

_____

(g) Where does brain remain safe ?

_____

3. Give reasons:

(a) Why the rate of respiration in a sleeping person is low ?

_____

(b) What happens inside alveolus of the lung ?

_____

(c) Why whale has to bring his mouth regularly outside water for respiration ?

_____

(d) Why do legs feel sensation after running very fast?

_____

(e) Why does earth worm die in sunlight ?

_____

(f) How many types of blood vessels are present in our body?

_____

(g) What is the meaning of hemoglobin in the blood ?

_____

(h) How pulmonary artery is different from others ?

_____

(i) How urine is formed ?

_____

(j) What is the function of xylem in the plants ?

_____

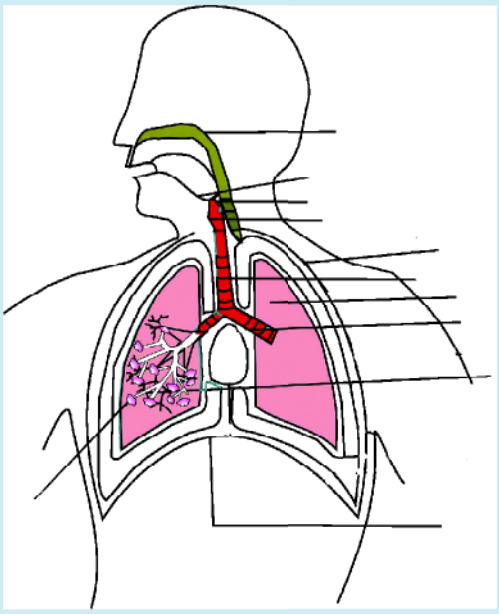
(k) What will happen if spinal cord doesn't perform reflex action ?

_____

(l) Why is control on the organs of the body required ?

_____

4. Label the diagram given below:



Answer key of the questions

4.1

1. (a) energy (b) oxygen
   (c) exercise (d) carbon dioxide
   (e) vertebral column (f) trachea
   (g) diaphragm

4.2

1. (a) wrong (b) right
   (c) right (d) wrong
2. (a) for taking air because it respirs through lungs.
   (b) moist skin can absorb oxygen from the air.
   (c) dissolved oxygen in water.
   (d) roots of the plant take oxygen present in the soil particles. This oxygen is essential for their respiration. In order to maintain the oxygen in the air regular tilling is required.

4.4

1. (i) ribs (ii) chambers, auricle, ventricle
   (iii) gates (iv) 72
2. (i) plasma (ii) hemoglobin
   (iii) artery (iv) from lungs
   (v) white blood cells

4.5

1. (i) kidney (ii) dialysis
   (iii) tissue (iv) please
   (v) transpiration
2. Xylem tissue is found in plants. This is a tube like structure from roots till the upper tip of the plant. Water absorbed by the roots is transported to the upper parts of the plant.
3. When both the Kidneys of the person stop functioning.

4. Sweat removes waste material of our body towards outside, its evaporation gives cooling effect to the body.

4.6

1. (a) keeping synchronization between different parts of the body is called coordination.

   (b) brain, spinal cord, nerves.

   (c) inside the vertebral column.

   (d) thinking, understanding and the balance of the body.

   (e) it controls all other endocrine glands.

   (f) regulate the level of glucose as per requirement.

2. (1) iii. (2) i

   (3) ii (4) vi

   (5) iv (6) v

5

Biological Processes II

(Reproduction in Animals)

Each organism wheather animal or plant produces young ones to maintain their species. But how much do we know about this miracle of nature? Do all organisms give birth to young ones? How does reproduction take place in birds, frog, fish and insects? How does a child look in the womb of the mother? What determines whether it will be a male or female? There is a difference between the adults and the young ones of almost all organisms. These differences may be small in some organisms and large in some others.In human beings also, a lot of changes take place, from infancy till adulthood. Why do these changes occur? What are the modes of reproduction in plants? Do all the plants form from seeds? Which plant is grown by which method? We will get information about some of such subjects in this chapter.

Objective

After reading this chapter you will :

- Know about the different methods of reproduction in animals;
- Be able to define internal and external fertilization;
- Know the process of reproduction in placental / viviparous and egg-laying animals;
- Be able to describe the process of reproduction and the development of the baby;
- Know about process of the sex determination of the child;
- Be able to describe the changes taking place during adolescence and their reasons; and
- Know about the various methods of reproduction in plants.

5.1 Modes of reproduction in animals

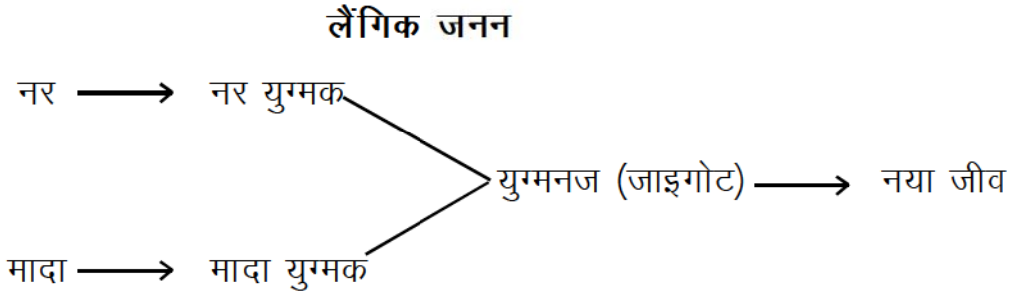
Reproduction in animals takes place by two methods:

1. Sexual reproduction
2. Asexual reproduction

Come let us learn about these in detail.

5.1.1 Sexual reproduction

Males and females are different in many animals. There is a large difference in their reproductive organs. Male and female seeds are produced in the reproductive organs. These are called gametes. A zygote is formed by the fusion of the male and female zygote. The zygote develops to form a new organism. This type of reproduction where the fusion of male and female gametes takes place is called sexual reproduction.



As an example of sexual reproduction, we will first try to understand the reproductive organs and the reproductive process in man

5.1.2 Reproduction in man

First we will learn about the reproductive organs of man.

1. Male reproductive organs

The male reproductive organs consist of a pair of testis, two vas deferens and one penis. These organs are present on the outer part of the body cavity.

Male gametes, which are also called sperms, are produced in the testis. Sperms are very small. Each sperm consists of a head, middle piece and a tail. Lacs

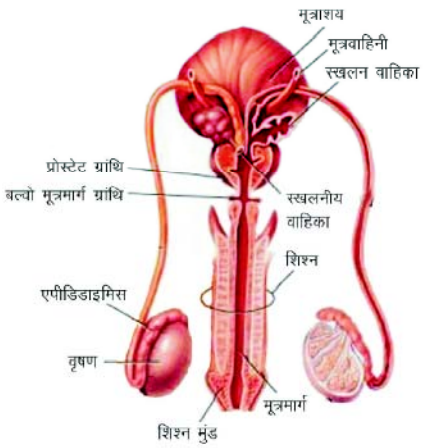


Fig. 5.1

of sperms are continuously formed in the testis. These sperms enter the vas deferens from the testis.But the sperms cannot exit the testis by themselves. They can exit only by the relaxation and contraction of the muscles of the testis.

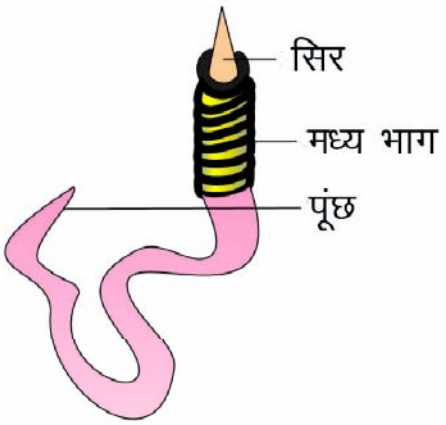


Fig. 5.2

The sperms cannot move forward by themselves in the seminal vesicles also. Their journey is completed by the relaxation and contraction of the vas deferens. During this journey the sperms become completely mature.

The mature sperms from the vas deferens enter the penis. Before entering the penis secretions from two different glands mix with the sperms. The mixing of these fluids and sperms forms semen.

The body absorbs the semen, which is not discharged out of the body at the time of ejaculation. In this manner everyday lacs of sperms are formed and destroyed in the body of the male.

2. Female reproductive organs

Female reproductive organs are present in the lower abdominal part (pelvis) of the female. The female reproductive organs consist of a pair of ovaries, fallopian tubes or oviducts and a uterus (womb).

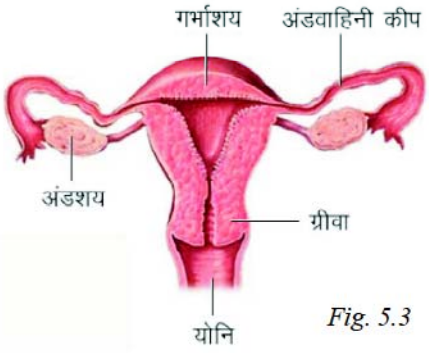


Fig. 5.3

The ovaries are about the size of almonds. These are situated a little below the waist. Female gametes (Ovum) are produced in the ovaries. These female gametes are very small. There is a regular cycle of the maturation of the female gametes. This cycle is of about 28 days. During this cycle only one ovum matures and comes out of the ovary.

Like the sperms the ovum is also unicellular. One tube each arises from each side above the womb. These are called oviducts. The second end of the oviduct is near the ovary. There it looks like a claw.

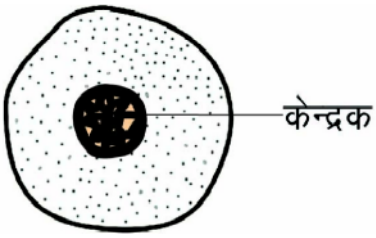


Fig. 5.4

Every month one mature ovum is released by any one of the ovaries. The moment this ovum is released out of the ovary, the claw like oviduct sucks it inside itself. In this manner ovum released from the ovaries reaches the uterus. The lower part of the uterus is open. It is called the neck of the uterus. It is situated somewhat above the vagina. The menstrual blood flows out of it every month.

5.1.3 How a child is conceived (fertilization)

During copulation the male releases its semen at the mouth of the vagina. This semen consists of not one or two but thousands of sperms. These sperms reach the uterus and the oviducts above it by swimming with the help of their tails.

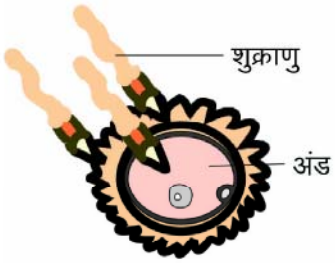


Fig. 5.5

If any mature ovum is present there at that time then, the sperm fuses with it. But only one of the lacs of sperms can enter the ovum.

The ovum and sperm fuse and become one cell. This is called a zygote. The rest of the sperms are destroyed. This process of fusion of a sperm and ova is called fertilization.

The zygote formed as a result of fertilization enters the uterus and sticks to its wall and implantation takes place.

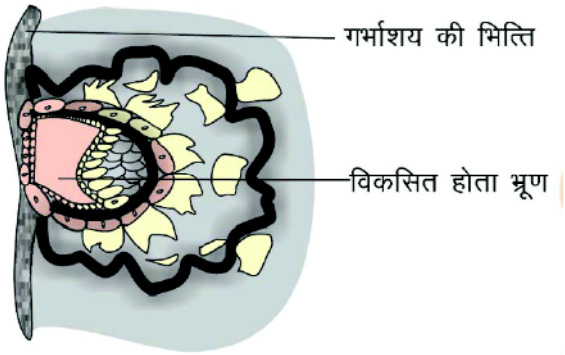


Fig. 5.6

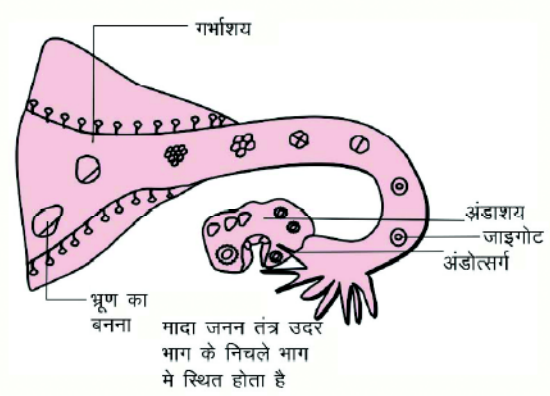


Fig. 5.7

Chapter Questions 5.1

1. What are the various types by which reproduction takes place in organisms?

_____

2 What do you mean by sexual reproduction?

_____

3 Mark (right) or (wrong)

i. Male reproductive organs consist of two pairs of testis. (right/ wrong)

ii. Semen is formed as a result of fertilization. (right/ wrong)

iii. The sperms enter the penis via the vas deferens. (right/ wrong)

iv. Ovary is situated below the waist. (right/ wrong)

v. There is no certain cycle of maturation of ova in women. (right/ wrong)

4. Give one word answer for:

i. Where are the male gametes formed?

.....

ii. What is formed by the mixing of the liquid materials and sperms?

.....

iii. Where are the female gametes formed?

.....

iv. How many ova are mature and are released by the ovary in one month?

.....

v. What is the process of the fusion of male and female gametes called?

.....

5.2 Various types of fertilization

In animals fertilization is of two types. (i) internal fertilization and (ii) external fertilization

5.2.1 Internal fertilization

Internal fertilization takes place in animals like man, cow, goat,dog,hen, pegion, lizard etc. In internal fertilization the fusion of the male's sperm and female's ova takes place inside the body of the female animal.

5.2.2 External fertilization

In many animals the fertilization takes place out of the body of the female animal. External fertilization takes place in frog, fish and other animals living in water. Come let us learn where and

how the fertilization in frog takes place.

The male and the female frog come together in water. There the female lays thousands of eggs. These eggs are very soft. A jelly like layer covers these eggs. This jelly like layer keps the eggs together and protects them from other animals. As soon as the female lays eggs the male frog releases its sperms. There sperms swim in water with the help of their long tail. The sperms that reach the egg, enter the egg and fertilize it. Rest of the sperms and ova are either destroyed or they become the food for other animals. In this manner, the fertilization in frog takes place outside in water and not inside the body of the female frog; therefore it is called external fertilization.

Fig. 5.8

Just think why fish and frog release thousands of eggs at once.

5.2.3 Development of the Embryo

As a result of fertilization a zygote (fertilized egg) is formed. This zygote develops into a zygote. Come let us learn how this happens. A small spherical mass of cells is formed as a result of continuous divisions of the zygote. After some time the cells get divided into many groups. These various groups of cells later on form the different organs and tissues.The structure thus developed is called embryo. In man and other animals, which give birth to young ones, this embryo attaches to the wall of the uterus and gradually completes its development. The state of the embryo in which all the body parts can be identified is called foetus. The mother gives birth to the child after the complete development of the child. Internal fertilization takes place in hen also but they lay eggs instead of giving birth to young ones. The development of their young ones takes place outside their body in eggs. Come let us learn how this happens.

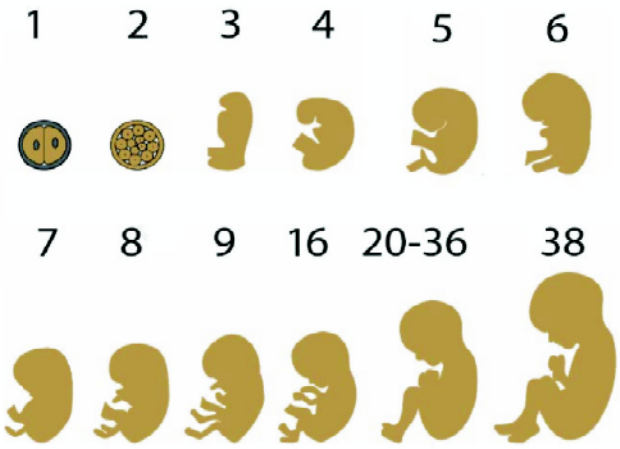


Fig. 5.9

In hens, the zygote continuously divides immediately after fertilization keeps on moving down the oviduct. As the zygote moves down the oviduct a hard layer starts accumulating on it. When this hard layer is completely formed the hen lays the egg. It takes about 3 weeks for the chick to form

Fig. 5.10

inside the egg. Heat is essential for the development of the chick inside the egg. Therefore the hen sits on the eggs and provides the heat to the egg. When the chick is fully developed then it breaks open the hard shell of the egg and comes out. In animals showing external fertilization the development of the embryo takes place out of the body of the female. The embryo develops inside the protective covering of the egg. After their complete development the young ones hatch out of the egg.

5.2.4 Viviparous and Oviparous animals

Here we have learnt that some animals give birth to young ones whereas some lay eggs. Those animals, which directly give birth to the young ones, are called viviparous. Those animals, which lay eggs, are known as oviparous animals. Frog, lizard, hen, butterfly, pigeon, parrot and other birds and insects are oviparous animals. We can get their eggs easily. We do not get the eggs of Cow, goat, man, cat, and such other animals because they do not lay eggs. Their eggs remain in the body of the female and they give birth to young ones only after their complete development. Therefore all these animals are called viviparous.

Chapter Questions 5.2

1. What is the difference between Internal and External fertilization?

_____

2. What is the type of fertilization in the listed animals?

Sl.	Animal	Fertilization Type
1.	Hen	
2.	Frog	
3.	Lizard	
4.	Fish	
5.	Pigeon	

3. Fill in the blanks:

(i) Animals laying egg are called as ..... animal.

(ii) Viviparous animal directly give birth to .....

(iii) Egg develops into .....

(iv) Human embryo develops after attaching to the wall of .....

(v) The stage of embryo where body organs can be detected is called as .....

4. Give answer in one word:

(i) What is the term used for animals giving birth directly to the young ones?

.....

(ii) What is formed after fertilization?

.....

(iii) Where the hard shell on the hen's egg is covered?

.....

(iv) How much time is taken in the formation of chick inside the egg?

.....

5.2.5 Develpoment of adult from young ones

The young ones of animals keep on developing until they become adults. But in some animals the young ones are quite similar to the adults. But in some animals the young ones are entirely different from the adults. Frog is one such animal. Its young ones look completely different from the adult. Here three distinct stages of development of young one to adult are seen. The young one of frog, which emerges from the egg, is called tadpole. It is looks cntircly diffcrcnt from thc frog. It is difficult to even imagine that this tadpole will one day turn into a frog.

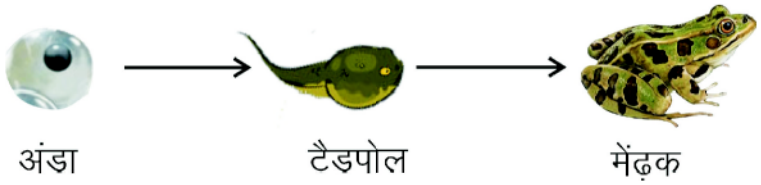


Fig. 5.11

In the same way silk worms also lay eggs. The larva emerges out of the egg and this larva forms pupa. After sometime the pupa changes into adult silkworm. It is interesting to note that the colour, structure, behavior of every stage is very different.

It means that the young ones of silkworm and frog undergo many changes, and only after that they look like the adult animals. This type of conversion from young ones to adults is called metamorphosis. Human beings also undergo many changes from childhood to youth (adulthood) but they do not undergo metamorphosis.

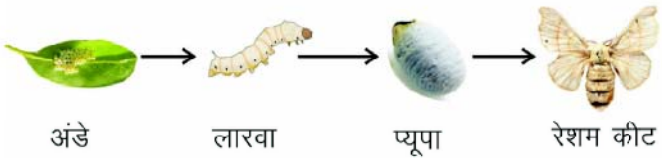


Fig. 5.12

5.2.6 Physical Changes

The height and weight of the children keep on increasing. The intelligence and knowledge also increases. Some changes occur at the age of 11- 12 years, which causes an upheaval. This happens because many changes suddenly take place in a very small period of time. Different types of changes take place in the bodies of boys and girls. The following table depicts the changes taking place in the bodies of girls and boys.

Physical changes taking place in girls (transformations)	**Physical changes taking place in boys (transformations)**
Sudden increase in height	Sudden increase in height
Change in the structure of the body, development of breasts	Cracking of voice
Broadening of hips	Growth of facial hair
Growth of hair under the arms and on pubic area	Growth of hair on the chest, under the arms and pubic area
Development of reproductive organs	Development of penis and reproductive organs
Onset of menstrual cycle	Onset of discharge of semen
Eruption of pimples and acne on face	Eruption of pimples and acne on face

5.2.7 Mental changes (transformations)

When the body undergoes so many changes then there is turmoil in the thoughts as well. The boys and girls are not accustomed to this altered physical condition. Their body feels new to them. They have a feeling of embarrassment due to their body. They start thinking themselves to be somewhat like adults. That is why they do not like the advice of adults and their words pinch them. They have feelings of shyness, fear, embarrassment, dismay, hesitation, angst, confusion and peevishness.

5.2.8 Why do these changes take place

There are some glands in the body. These glands secrete some special chemicals. These chemicals are called hormones. Hormones are of many types. They work in a different manner. Some hormones regulate the amount of sugar, salt, water and calcium in the body. Some hormones cause changes in the reproductive organs. Hormones also affect the mental state. In everyone hormones are produced according to the need of his/her body. When and how much, of the hormone is to be produced, is determined by a special gland. This gland is called the pituitary gland. This gland is present in the middle of the brain. At the age of 11-12 this gland orders the reproductive organs to produce special hormones. Testosterone is produced in the body of boys. This hormone is produced in testis. This hormone is responsible for the production of sperms and other changes in the body. Two hormones are produced in the boby of girls which cause changes in their body. These are estrogen and progesterone. They are produced in the ovaries.

5.2.9 Will it be girl or a boy

Chromosomes determine whether a boy or a girl will be born. 46 chromosomes are present in all cells of the human body. These chromosomes are present in pairs. Of the twenty-three pairs of chromosomes present in man twenty-two are such that they look same in male and female. But the twenty-third pair is different in male and female.

23	
22 + 1	23
XX XY	XX
Male chromosomes	Female chromosomes

Fig. 5.13

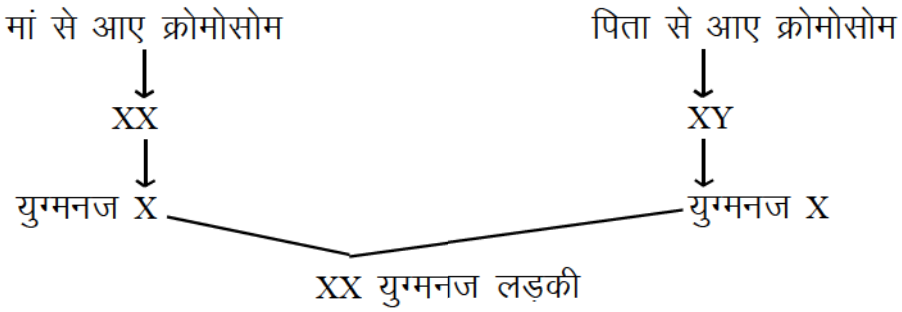
The twenty-third pair in male consists of two different chromosomes (XY), in females the twenty-third pair consists of the same chromosomes (XX). Their structure is also different.One is X

chromosome and the other is Y chromosome.This twenty-third pair of male determines whether a boy or a girl will be born.

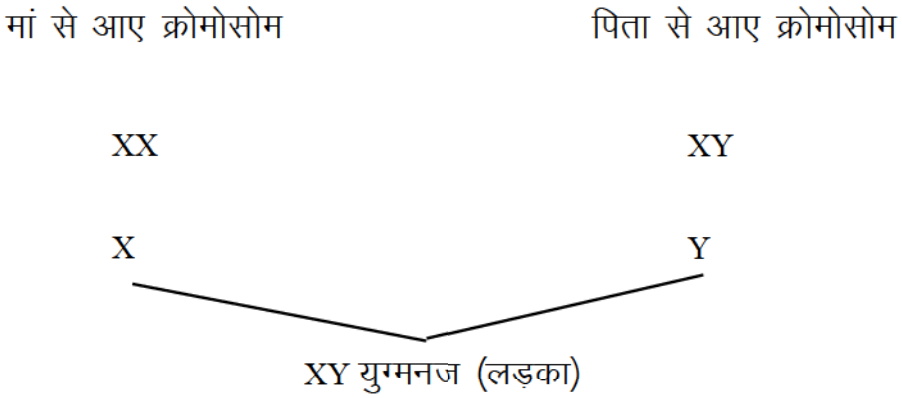
Come let us understand how this happens.

A child also possesses twenty-three pairs of chromosomes. Of which half of the chromosomes come from the mother and the other half from the father. On their combination the child gains 23 pairs of chromosomes. All the chromosomes from the mother are X chromosomes but from the twenty-third pair of the father either X or Y chromosome will be sentinto the child because only he possesses the Y chromosome.

If the child gets one X chromosome from the mother and another X chromosome from the father then the child will possess only X chromosomes and it will be a girl.



If the child gets Y chromosome from the father and X from the mother then it will possess one X and one Y chromosome and will be a boy.



5.3 Asexual reproduction

We have learnt about the reproduction in familiar animals like man, frog, hen etc. but there are many small and microscopic animals in which male and females are not differentiated and their reproductive organs are also not developed. Let us see how reproduction takes place in them.

5.3.1 Reproduction in hydra

Hydra is a very small animal. It possesses one or more protrubences on its body. These structures are called buds. These buds are new developing organisms. In hydra a new organism in formed by bud. That is why this type of reproduction is called budding. This type of reproduction where only one single organism gives rise to a new organism is called asexual reproduction.

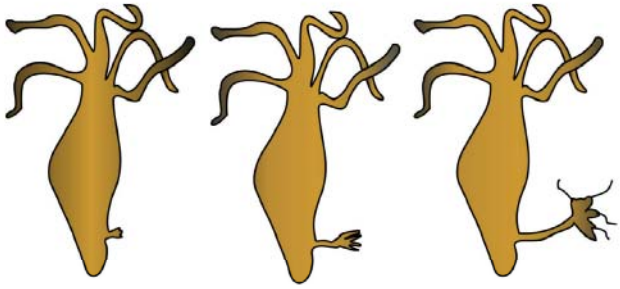


Fig. 5.14

5.3.2 Reproduction in amoeba

Amoeba is a microscopic, unicellular organism. In this organism the process of reproduction starts with the division of nucleus into two. After the nucleus the cell also divides into two. In this manner two amoebae are formed from one amoeba. This type of asexual reproduction is called binary fission because here one organism is split into two organisms.

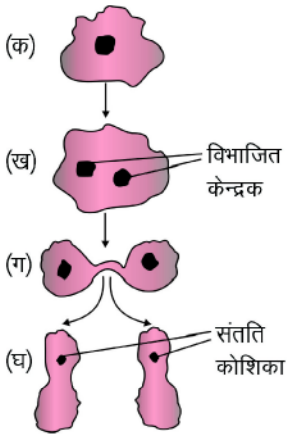


Fig. 5.15

Chapter Questions 5.3

1. What do you understand by the metamorphosis?

_____

2. Where is pituitary gland located? What are its functions?

_____

3. Testosterone hormone is formed in whose body?

_____

4. Which hormones are found in the girl's body?

_____

5. Fill in the blanks:

   (i) ..... pairs of chromosome in the human.

   (ii) The number of chromosomes is ..... in all the types of organisms.

   (iii) ..... Chromosome pair of male decide weather there will be a girl or a boy.

   (iv) If x chromosome comes from the mother and y from the father then it will be .....

6. Which type of fertilization takes place in the microscopic organisms?

   _____

7. What do you understand by the budding?

   _____

5.4 Reproduction in plants

Children were enjoying juicy mangoes. Mohan said, "mother how much fun it would have been if we had a mango tree in our courtyard. Mother laughed and said, "it is not a big deal. Just bury the seed in a corner. It will germinate in a few days. A new plant will emerge. In a few years it will blossom and juicy mangoes will form from those blossoms." Lalaram while sucking on a mango said, "you will get better varities of mango if it is grown by a cutting." Mohan got confused and asked," Does a mango plant grow by seeds and cuttings both? Lalaram said, "yes son, plants can be grown by various methods." Yes, as in animals, reproduction in plants also takes place by different methods.

These methods may be classified as:

1. Asexual reproduction
2. Sexual reproduction

In asexual reproduction the plants form without seeds but in sexual reproduction the new plants grow by seeds only. Come let us learn about them in detail.

5.4.1 Asexual reproduction

When new plants are formed without the formation of seeds then it is called asexual reproduction. There are various means of asexual reproduction, for example

(A) Vegetative propagation

In this method any vegetative part of the plant viz.,root, shoot, leaf or bud may give rise to a new plant. That is why it is called vegetative reproduction. The part of the branch or trunk which gives rise to leaf is called anode.

For loping branches are cut from the node. This cut part is known as lop. Loop is placed in the soil keeping a part of it above the soil. After some days roots and shoots are grown in this loop making it a new plant. Rose, temple tree, apple, peach etc can be grown with this method.

Activity 5.1

Put a branch of money plant in a container full of water and observe how much time it takes to sprout new roots and leaves. We know that buds give rise to flowers. But there are buds on the node also. These buds grow in the form of seedlings. These are called vegetative buds/axillary buds.

Take a potato. You know that potato has eyes. Observe these eyes with the help of a magnifying lens. Many small vegetative buds can be observed in these eyes. Actually each of these buds has a hidden shoot. Many small leaves are arranged around the shoot. These buds give rise to a new plant.

Fig. 5.16

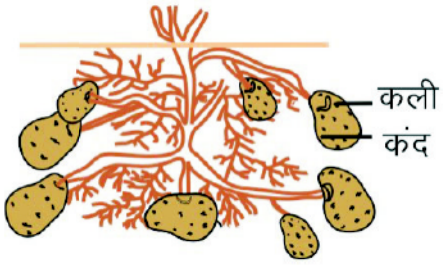


Fig. 5.17

Activity 5.2

Cut a potato into pieces. Make sure that each piece has an eye in it. Plant these seeds in soil. Water them everyday. Observe the changes taking place. After some days, dig out these pieces. What do you see?

Ginger and turmeric are also grown in the same manner.

Bryophyllum possesses buds on the outer edges of its leaves. These buds give rise to new plants. Buds are also present on cactus. These buds separate to form new plants. The roots of some plants produce new plants for example sweet potato and dahaliya.

Fig. 5.18

Fig. 5.19

Fig. 5.20

Importance of vegetative reproduction

Plants can be grown in less time by vegetative prpogation. In such plants flowers and fruits also appear in a short time. Most important thing is that the new plants are similar to their parent plant. They have the same characters of the parent plant, because only a single plant produces them.

5.4.2 Budding

Many microscopic plants are unicellular eg. Yeast. These plants reproduce rapidly under favourable conditions. They can increase by thousands in a short period of time. How does it happen? From the time of its formation one end of the unicellular plant starts growing in the shape of a bulb. This developing structure is called a bud. The bud breaks off from the parent cell and forms a new cell. Some times the division is so fast that a new bud starts forming even before the first bud seperates from its parent cell. Due to this a chain of buds is formed. In this manner many microscopic organisms are formed in a small period of time.

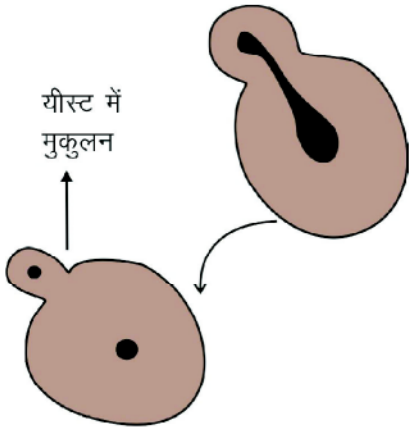


Fig. 5.21

Activity 5.3

Take a small amount of warm milk in a vessel. Mix a spoonful of curd in it. Now cover and keep the vessel under the sun. Open and observe it after three hours. Curd has started to set. Why does it happen? It happens because of the rapid reproduction of microscopic lactobacilli present in the curd.

5.4.3 Fragmantation

You might have seen the clusters of slippery green material in ponds and ditches. They are spirogyra algae. This algae grows rapidly in the presence of water and light. How do they reproduce or grow? This growth of the algae is due to fragmentation. An algae fragmants into two or more parts. This process keeps on repeating itself and in a short while algae cover the water.

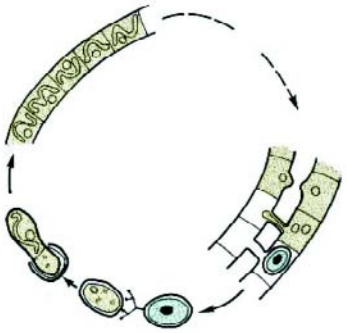


Fig. 5.22

5.4.4 Sporogenesis

In some plants for example fungi, fern, algae etc. the reproduction takes place by spores. Fungi grow on flat bread, if kept at a moist place. From where and how does this fungal growth take place on flat bread?Reproduction in fungi takes place through spores. The fungi on the flat bread are black structures. These are sporangium. Spores are formed in sporangium. Its outer layer ruptures and many spores are released everywhere. The spores are very light so the air carries them far off. They are covered with a hard outer layer. This layer protects them from high temperature, low temperature etc. The spores germinate in favourable conditions and give rise to new organism.

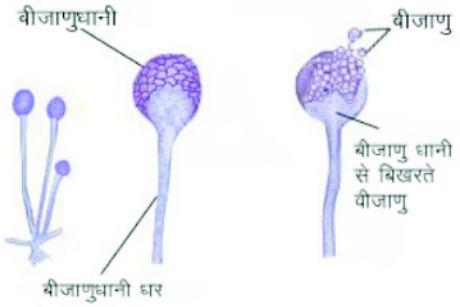


Fig. 5.23

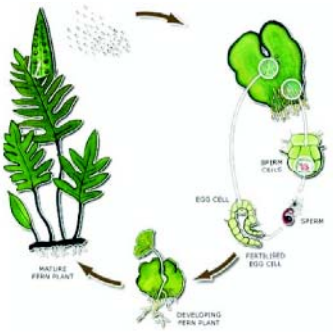


Fig. 5.24

Chapter Questions 5.4

1. Mark true or false:

   (i) Part of the branch where leaf comes is called as node. (True/False)

   (ii) Potato does not contain Eyes (True/False)

   (iii) In sexual reproduction new plants are produced by leaves (True/False)

   (iv) Formation in yeast is by budding (True/False)

   (v) Formation of fungus is by Spores (True/False)

2. Fill in the blanks:

   (i) Land Cruise without ..... a sexual reproduction.

   (ii) When plants are produced using somatic parts it is called a ..... Propagation.

   (iii) Outer edges of the bryophyllum leaves contain .....

   (iv) Algae growth is by .....

3. From which somatic part of the body somatic propagation takes place in the plants?

   .....

4. What are the two important characters of somatic propagation?

   (i) ..... (ii) .....

5.5 Sexual reproduction

The flowers play an important role in sexual reproduction because the sexual organs of plants are present on the flowers. These reproductive organs are of two types.

(i) Male reproductive organs (Androecuim) and

(ii) Female reproductive organs (gynoecium)

With reference to the reproductive organs flowers are of two types.

(i) Uni sexual flowers: they possess either only androecium (male reproductive organs) or

gynaecium(female reoroductive organs). They are called unisexual flowers. Maize, papaya, cucumber and gourd etc. have unisexual flowers.

(ii) Bisexual flowers: those flowers, which possess both androecium and gynaecium, are called bisexual flowers. Flowers of Mustard, Hibiscus, Rose, Sunflower etc. are bisexual.

Male and female unisexual flowers may be present on the same plant or on different plants. For example, in papaya the male and female flowers are present on different plants. but in maize the male and female flowers are present on the same plant.

Come let us understand the structure of androecium and gynaecium

Androecium: in each type of flower the number of stamens is different. The stamens consist of anther and filament. The anther is a small sack like structure, which contains pollen grains. These pollen grains form the male gametes.

Gynaecium: the main parts of the gynoceum are ovary,style and stigma. Ovary contains one or more ovules. Female gametes or ova are formed in ovule.

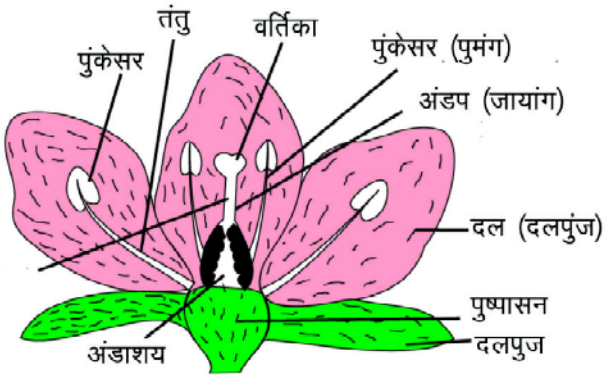


Fig. 5.25

Activity 5.5

Take a flower of hibiscus or mustard. Find the androecium and gynoecium in it. Study the various parts of the androecium and gynoecium. Draw their diagrams also.

In sexual reproduction zygote is formed after the fusion of zygote.but the fusion of the male and female gametes takes place only when the pollen reach the ovule.let us understand how does the pollen grains reach the ovule.

5.6 Pollination

Pollen grains reach the ovule through or via the stigma. This transfer of pollen grains from anthers to the stigma is called pollination. Pollen grains are light. They reach the stigma carried by air, water or stuck to the body of insects. Generally the pollen grains are covered by a strong envelope,which saves them from dessication.

Activity 5.6

Have you ever thought why the flowers are so colourful and fragrant?

The insects get attracted by the colours and scent of the flowers and visit them. At that time, the pollen grains adhere to the body of the insects.when the same insect visits another flower some of these pollen grains fall on its stigma. In this manner the pollination takes place by the insects. Study the pollination in plants around you. Observe how pollination takes place with the help of insects. Pollination is of two types:

1. Self Pollination: if the pollen grains fall on the stigma of its own flower then, it is called self-pollination.
2. Cross Pollination: if the pollen grains of the flower fall on the stigma of another flower of the same plant or on flower of another plant then it is called cross pollination.

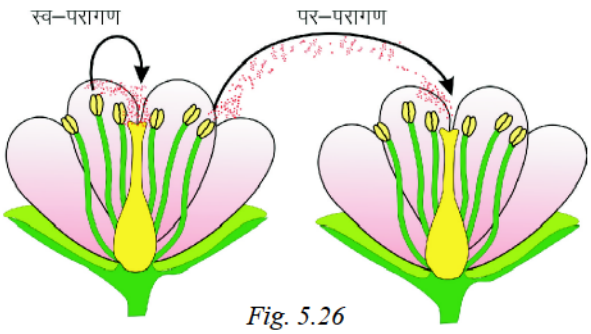


Fig. 5.26

5.6.1 Fertilization

The fusion of male and female gametes is called fertilization. A zygote is formed as a result of this fusion. This zygote develops into an embryo.

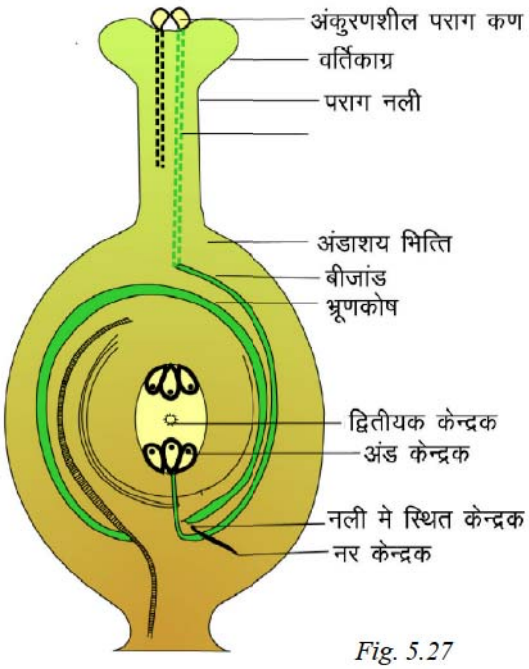


Fig. 5.27

5.6.2 The development of fruit and seed

After fertilization the ovary of the flower developes into fruit and all other parts fade and fall off. The seed is formed from ovule. The seed contains the embryo. This embryo remains inactive in a protective environment. It germinates and gives rise to a new plant in favourable conditions.

5.6.3 Dispersal of seeds

If all the seeds fall and germinate at the same place then what will happen? It will be difficult for all to get food, sunlight water etc in the right quantity. Some plants will not be able germinate and of those, that will germinate will be very weak. Therefore, nature has devised some ways to spread these seeds. The transport of seeds from one place to another is called seed dispersal.

You might have seen peepal plants growing at very high walls and boundry walls where it is difficult for anyone to reach. Then how did the seeds of peepal tree reach there.

Yes air, water, birds, insects and animals do the dispersal of flowers and seeds in nature. Dispersal by air is possible only when the seeds are very light, for example seeds of grass. Some seeds have wing like structure and can fly with their help, example drumstick and maple.

Fig. 5.28 (a)

Fig. 5.28 (b)

Some seeds possess small hair like structures, which help them in flying eg., Sunflower and calotropis.

Fig. 5.29 (a)

Fig. 5.29 (b)

Some seeds and fruits float and reach from one place to another. The skin of such fruits is spongy and fibrous. These fruits easily float in water eg. Coconut. Some seeds and fruits are hook like or spiny in structure. These seeds attach to the animals with their help. Apart from that seeds of fruits and vegetables eaten by man, animals and birds reach far off places with their feaces. Tomato, peepal, Gourd, chick pea are good examples of this.

Fruits of some plants burst forceably. The dispersal of seeds of Castor and balsam takes place by this method.

Fig. 5.30

Chapter Questions 5.5

1. What is the difference between monoecious and dioecious flowers?

   _____

2. Answer in one word :

   (i) What is the name of the process of transfer of pollen from anther to stigma?

   .....

   (ii) What is the term used for transfer of Pollen on its own stigma in the flower?

   .....

   (iii) What is the term used for fusion of male and female gametes?

   .....

   (iv) What is the term used for transportation of seeds from one place to another?

   .....

What you have learned

- Each organism, either plant or animal, reproduces to maintain its own kind.
- There are two types of reproduction in animals 1. Sexual reproduction and 2. Asexual reproduction.

- In animals reproducing by sexual reproduction, reproductive organs in males and females are very different.
- The fusion of male and female gamete is called fertilization.
- Some animals undergo internal fertilization. In these animals fusion of the male sperm and female ova takes place inside the female body.
- In many animals the fertilization takes place outside the female's body. It is called external fertilization.
- A zygote is formed as a result of fertilization. This zygote developes into an embryo.
- Some animals give birth to young ones and some lay eggs. Those animals, which give birth to young ones are called viviparous. Those animals that lay eggs are called egg laying.
- The conversion from young ones to adults is called metamorphosis.
- In man changes take place constantly from childhood to youth. The hormones produce changes in the organs and also affect the mental state. In boys a hormone named testosterone is formed. Two hormones are produced in the girls' body. Estrogen and Progesterone.
- Chromosomes determine weather the child will be boy or a girl. In man there are23 pairs of chromosome. In which 22 pairs are same in males and females. The twenty-third pair is different in both males and females.
- Plants also reproduce by two methods, asexual and sexual.
- In asexual reproduction the plants grow without seeds and by seeds in sexual reproduction.
- Asexual reproduction takes place by many methods like vegetative propagation, budding, and fragmentation and spore formation.
- In vegetative propagation new plants arise from leaves, stems, roots and buds.
- The reproductive organs of the plants are located in the flowers. These reproductive organs are of two types, male reproductive organs androecium and female reproductive organs gynoecium.
- Male gamets are formed in the androecium and female gamets are formed in the gynoecium. The male gamets are formed in the pollen grains and the female gametes are formed in the ovule.
- The transfer of pollen grains from the anther to the stigma is called pollination.
- If the pollen grains fall on the stigma of its own flower then it is called self-pollination.

- If the pollen grains of the flower fall on the stigma of another flower it is called cross-pollination.
- Pollination can take place by air, water, and insects.
- The ovary develops, transforms into a fruit and seeds develop in the ovule.
- The seed remains safe in the ovary. It germinates and gives rise to a new plant in favourable conditions.
- The seeds are spread by air, water, and animals. This spreading of seeds to far off areas is called dispersal.

End of Chapter Questions

1. Mark tick on the most correct answer-

   (a) Mainly how many types of reproduction are found in the organisms?

   (i) One type (ii) Two type

   (iii) Three type (iv) Four type

   (b) Male and female seeds produced in the genetic organs are termed as

   (i) Gametes (ii) Zygote

   (iii) Sperm (iv) Ovum

   (c) What is the term used for reproduction involving male and female.

   (i) Asexual reproduction (ii) Somatic reproduction/generation

   (iii) Fertilization (iv) Sexual reproduction

   (d) What is the term used for production of new plant without seed?

   (i) Division (ii) Zygote formation

   (iii) Sexual reproduction (iv) Asexual reproduction

2. Give answer in one word-

   (a) What is done by the organism to maintain its species?

   .....

(b) What is the term used for the fusion of sperm and egg?

.....

(c) What is formed after fertilization?

.....

(d) What is the term used for the organisms directly giving birth to the young ones?

.....

3. What are the main differences between sexual and asexual reproduction?

_____

_____

_____

4. Write down the names of 4 oviparous and 4 viviparous animals

Sl.	**Viviparous**	**Oviparous**
1	.....	.....
2	.....	.....
3	.....	.....
4	.....	.....

5. What do you understand by metamorphosis?

_____

_____

6. What is external fertilization?

_____

_____

7. Fill in the blanks

(a) Hormone named testosterone is produced in the ..... body.

(b) Girls and women body produces estrogen and ..... Hormones.

(c) It will be a girl or boy is decided by .....

(d) Man have ..... pairs of chromosomes.

5. What do you understand by metamorphosis?

_____

_____

6. What is external fertilization?

_____

_____

7. Fill in the blanks

(a) Hormone named testosterone is produced in the .....body.

(b) Girls and women body produces estrogen and..... Hormones.

(c) It will be a girl or boy is decided by.....

(d) Man have..... pairs of chromosomes.

8. What is dispersion? Explain with the help of 3 types of example.

_____

_____

_____

_____

9. Explain the differences between self-pollination and cross pollination.

_____

_____

_____

_____

Answer Key of Chapter Questions

5.1

1. In animals there are two types of reproduction
   (a) Asexual reproduction
   (b) Sexual reproduction
2. If there is fusion of male and female gametes such reproduction is called as sexual reproduction.
3. True, false, true, true, false
4. (i) In testes (ii) Semen
   (iii) Ovary (iv) One
   (v) Fertilization

5.2

1. During internal fertilization male gamete sperm and female gamete ovum fuses inside the body of female such as human, cow, pigeon.
2. External fertilization takes place outside the body of female animal example frog, fish.

	Animal	**Type of fertilization**
1.	Hen	(i) Internal
2.	Frog	(ii) External
3.	Lizard	(iii) Internal
4.	Fish	(iv) External
5.	Pigeon	(v) Internal

3. Oviparous, babies, embryo, uterus, fetus
4. Viviparous, oviparous, fallopian tubes, 3 weeks.

5.3

1. In some animals the young ones are quite different from the adults in appearance. They undergo drastic changes, only then they will look like the adults. These changes occurred in the young ones to reach the appearance of their adults is called as metamorphosis.

2. Pituitary gland is present in the middle of the brain. Pituitary gland decides how much and when a particular hormone is required by the body.

3. A hormone named testosterone is formed inside the body.

4. In girls body two types of hormones are formed estrogen and progesterone.

5. 23, different, 23rd, boy.

6. Microscopic organism have asexual reproduction.

7. Hydra like organisms have outgrowth in their body, which is called as buds. These buds develop to form new organism. Reproduction with the help of such buds is called as budding.

5.4

1. True, False, False, True, True.

2. Seed, somatic, buds, division.

3. Somatic propagation can be done using any somatic part of the body like root, stem, leaf or bud.

4. Significance of somatic propagation-

   (a) Plants look alike their parent plant.

   (b) Plants can be grown in less time. They have flower and fruits in less time as well.

5.5

1. Monoecious flower have either male or female organs. Dioecious flower have both male and female organs.

2. Pollination, self-pollination, fertilization and dispersion.

6

Different Types of Materials - I

We see a variety of substances around us. All these substances somehow differ from each other. Their colors, features, shape, texture etc. are different. Some objects are made of different materials like paper, plastic, wood, iron, copper, steel etc. while others are made of same material like glass tumbler, pebble, Katori (Bowl), bulb, window pane, glass bangles etc. This means that on one hand some objects are made of different types of materials, on the other hand many items could be made of a single material. It shows that specific material is needed to make a certain object. To make sure which material is suitable for what kind of work,we must study the different properties of material.In this lesson, let's try to know about different materials around us and their properties.

Objectives

After studying this lesson you should be able to

- describe three states of material;
- Categorize materials as soluble and insoluble.
- Define solute, solvent and solution.
- Differentiate between sinking and floating substances.
- Identify soft and hard substance.
- Differentiate between transparent, translucent and opaque objects.
- Define mixture and

- Describe various methods of separating different components of a mixture e.g. hand picking, threshing, winnowing, sieving, sedimentation, decantation, filtration and evaporation.

6.1 States of Material

Activity 6.1

Take a piece of ice in a bowl. After a while you will see that the ice melts and turns into water. Heat this water. The water boils and turns into steam. What do you see?The ice is solid, water is liquid and steam is gas. Therefore water exists in three states. Now observe some other substances at your home and identify objects that are in solid, liquid and gaseous state and whether their state may be changed? If so, how?

Ice

Water

Steam

Fig.: ice, water, vapour

6.2 Different Types of Materials

6.2.1 Soluble and Insoluble material

You know that salt and sugar dissolve in water easily but substances like stone, saw dust and soil do not dissolve in water. Materials that get dissolved in water are called soluble whereas materials that do not get dissolved in water are called insoluble. A large number of substances dissolve in water that is why water is known as solvent. The mixture we get after dissolving a material in water is called solution. Now try yourself and find out which materials around you, get dissolved in water and which do not.

Let us now see whether the liquid substances also dissolve in water. Yes, lemon juice gets completely mixed with water but, if we pour mustard oil in water, then it makes a separate layer on the upper surface of water. This means that some liquids dissolve in water whereas others not. Now try yourself and find out which materials are soluble in water and which are insoluble.

Now you may be curious to know whether gases also dissolve in water or not. Like solids and liquids, some gases are soluble in water whereas others are not. Usually, some gases dissolve in water in a small quantity. For example, oxygen gas dissolved in water is very important for the survival of animals and plants that live in water.

6.2.2 Materials that float or sink in water

You might have experienced in your daily life that some materials sink in water while others float. For example stone, iron nail, needle etc. sink in water whereas dried leaves and paper sheet float in water. Try yourself and find out the materials that float and those that sink in water.

Fig. 6.1 some objects float in water while others sink in it

6.2.3 Transparent, Translucent and Opaque materials

When you look through a glass window while sitting in a bus you are able to see things outside clearly. You might also have seen some materials kept in plastic container in a grocery shop.Those substances or materials, through which things can be seen, are called transparent. Glass, water and plastics are examples of transparent materials. On the other hand, there are some materials through which objects can be seen, but not clearly e.g. tracing paper. If you spread some oil on the sheet of paper and look through it, then you will not be able to see things clearly. The materials through which objects can be seen, but not clearly, are known as translucent. On the contrary there are some materials through which you are not able to see are called opaque. Wood, cardboard and Iron etc. are examples of opaque materials.

Fig. 6.2 Transparent, Translucent and Opaque materials

6.2.4 Hard and Soft materials

You may have some experiences form your daily life that when you press some materials with your hands they cannot be compressed easily, for example key, piece of wood, thali etc. But there are some materials that can be compressed easily. For example, paper, cotton, sponge etc. Materials which can be compressed easily are called soft, while some other materials which are difficult to compress are called hard.

Intext Questions 6.1

1. Fill in the blanks

   (i) We see a variety of ……around us.

   (ii) Materials exist in ……states.

   (iii) Ice is a …….. state of material.

   (iv) Materials which get dissolved in water are called……..

   (v) Some materials ……in water while others……

   (vi) Soft materials can be …… easily.

2. What are transparent materials?

   _____

3. Give two examples each of transparent, translucent and opaque materials.

   Transparent …….. Translucent ……. Opaque……

6.3 Mixtures

When different types of materials are combined together, they are called mixture. For example tea is a mixture of water, sugar and tea leaves. Similarly, Lemonade (shikanjiis) is a mixture of water, lemon juice and sugar. Have you ever seen separating the components of a mixture?

6.3.1 Separation of Materials

Process of removal of different components from their mixture is known as separation. There may be many instances when you might have observed the process of separation around you. For example Tea leaves are separated from the liquid with a strainer, while preparing tea.Milk or curd is churned to separate the butter. Stones are separated out from rice by picking them out with hands. Did you ever think, why do we need to separate different components of a mixture? Moreover, what are the different methods of separation?

We need to separate harmful or non-useful substances that may be mixed with it. Sometimes, useful materials get mixed together. In such a situation we need to separate them also. Components of a mixture. The substances to be separated may be solids, liquids or even gases. So there are different methods to separate them. Let's try to know about some simple methods of separation.

1. Hand Picking

You might have noticed that when we purchase rice, pulses or any other grains form a shop, they may have small pieces of stone and pebble, husks and earthy particles mixed with them. These impurities can be removed easily by picking with hands.The quantity of such impurities is usually not very large. In such situations, we find that removal of these impurities by hand is a convenient method. Thus, the method of separation of impurities from the mixture of solid materials is known as handpicking.

Fig. 6.3: handpicking

2. Threshing

You must have seen that wheat or paddy crops are dried in the sun after harvesting. Stalks of the crop are kept as bundles. Each bundle has hundreds of stalks of grainseeds attached to it. To remove the grain seed stalks are beaten by the farmers. This process is known as threshing. Sometimes threshing is done with the help of bullocks. Now a days machines are also being used for threshing.

Fig. 6.4

3. Winnowing

The method of separating both the components of a mixture by wind is called winnowing. Winnowing is used to separate heavier and lighter components of a mixture by wind or by blowing air. This method is commonly used by farmers to separate husk particles from the seeds of grain.

Fig. 6.5

Activity 6.2

Prepare a mixture of dried sand with powdered dry leaves. Keep this mixture on a plate and see whether they can be separated out easily? Now, take your mixture to an open ground and stand on a raised platform. Now tilt the plate slightly, so that the mixture slides out slowly. What happens? Do both the components fall at the same place? Is there a component that blows away with air?

4. Sieving

You know that we use a sieve to remove the bran that may be present in the flour. Sieving allows the fine flour particles to pass through the holes of the sieve while the bigger impurities remain on the sieve. Similarly you may have also noticed large sized sieves being used at construction sites to separate pebbles and stones from sand. Sieving is used when components of a mixture have different sizes. Now find out some more examples in your surroundings where separation is done by sieving.

Fig. 6.6 Method of sieving

separation of bran from the flour using sieve

5. Sedimentation, Decantation and Filtration

Sometimes, it may not be possible to separate components of a mixture by above mentioned methods. For example, there may be lighter impurities like dust or soil particles in rice, pulses or green leafy vegetables. These impurities are removed by washing with water. By adding water rice grain settle down and dust or soil get mixed with water. When the heavier component in a mixture settles down after water is added to it, the process is called sedimentation. When the water (along with the dust) is removed, the process is called decantation. Now on the basis of your observations find out some other mixtures that can be separated out using this method.

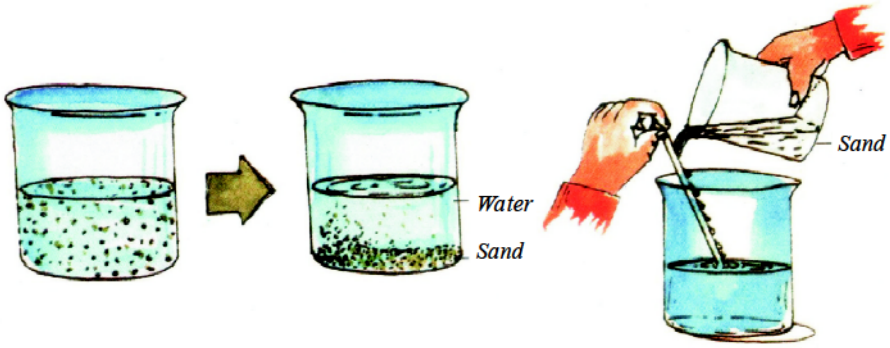


Fig. 6.7: Separation by decantation

The same method is also used for separating a mixture of oil and water. Mixture of two liquids that do not mix with each other is allowed to stand for some time, they form two separate layers. The component that forms the top layer can then be separated by decantation.

Think again, is it possible to separate tea leaves from prepared tea? Try decantation. You will find that some tea leaves still remain in your tea. When we pour the tea through a strainer all the tea leaves remain in the strainer and tea is filtered out? This process is called filtration. Now find a few other activities in your surroundings where filtration is being used. Also find

out from where we get safe water to drink.How can the impurities of water be removed?

A filter paper is used to separate microscopic impurities present in water. A filter paper is one such paper that has very fine pores in it. It allows pure water to pass through it and minute particles present in water remain on the filter paper. Fruit and vegetable juices are also prepared by this method. Similarly, filtration method is also used to separate cheese (paneer) from liquid materials. Think and find out what type of materials dissolved in water can be separated using above mentioned methods?

Fig. 6.8

6. Evaporation

Let's perform an activity to understand this process.

Activity 6.3

Heat a beaker/Katori containing some water. If you continue heating, the water would turn into steam and disappear completely. Now, take some water in the same Beaker/katori and add two spoons of salt to it. Stir it well so that salt could dissolve completely. Now heat the beaker/Katori containing the salt water. Let the water boil away. What is left in the beaker? In this activity, we separated salt from water. Water gets evaporated and salt is left in the beaker. The process of conversion of water into its vapour is called evaporation. The process of evaporation takes place continuously wherever water is present. If we cover the boiling water with a metal plate and observe it after sometime then we would see some water droplets under the plate. Water gets evaporated but again turns to water gradually. The process of conversion of water vapour into its liquid form is called condensation.In nature, the process of evaporation and condensation takes place continuously. The process of obtaining salt from sea water involves evaporation. Sea water is allowed to stand in shallow pits, water gets heated by sunlight and evaporates completely leaving behind the mixture of solid salts. Common salt is then obtained from this

Fig. 6.9

Fig. 6.10

mixture of salts by further purification. Think about some other activities in your surroundings where evaporation and condensation take place.

Intext Questions 6.2

1. What are mixture?

_____

2. Name the various methods of separating different materials from their mixture.

_____

3. Where is the process of winnowing used?

_____

4. How will you separate water from the mixture of sand and water?

_____

5. Which method is used to separate solid component dissolved in a liquid?

_____

What have you learnt

- Materials exist in three states.
- Materials that get dissolved in water are called soluble whereas materials that do not get dissolved in water are called insoluble.
- Some materials sink in water while others float. Some materials are hard whereas some others are soft.
- On the basis of looking through the materials, they are categorised as transparent, translucent and opaque.
- A material that consists of different types of materials is called mixture.
- Handpicking, winnowing, sieving, sedimentation, decantation and filtration are some of the methods of separating substances from their mixtures.
- Large sized particles of a mixture are separated by handpicking.

- Lighter and heavier materials are separated with the help of wind by winnowing.
- Difference in the size of particles in a mixture is utilised to separate them by the process of sieving and filtration.
- On adding water, the heavier particles of mixture settle down at the bottom and they can be separated from water by decantation.
- Filtration can be used to separate components of a mixture of an insoluble solid and a liquid.
- Evaporation is the process in which a liquid gets converted into its vapour on heating. This method can be used to separate a solid dissolved in a liquid.

End of Chapter Questions

1. Fill up the blanks.

   (i) ……., ……. and ……. are three states of material.

   (ii) Materials are ……. on the basis of their properties.

   (iii) Hard materials cannot be …….. easily.

   (iv) Materials, through which things can beseen, are called …….

   (v) Different materials are combined together to form …….

2. In the following statements tick (✓) against correct statement and (✗) against wrong statement.

   (i) Tea leaves can be separated from prepared tea by filtration.

   (ii) Separation of sugar from sugar solution can be done with evaporation.

   (iii) A mixture of milk and water can be separated by the process of decantation.

   (iv) Husk could be separated from grains by winnowing.

   (v) A mixture of oil and water can be separated by sedimentation and decantation.

3. What are the different types of materials on the basis of their properties? Name them.

4. Describe the threshing process of separation.

5. Explain the process of evaporation with examples. Which type of materials are separated using this method?

Answer Key for Chapter Questions

6.1

1. (i) material (ii) Three (iii) Solid (iv) Soluble (v) Sink, Float (vi) compressed
2. Those substances or materials, through which things can be seen, are called transparent.
3. transparent materials: glass, plastics, water, mesh (any two)

   translucent materials: tracing paper, cloth, oily paper (any two)

   Opaque materials: wood, iron, thick paper (any two)

6.2

1. When different types of materials are combined, they are called mixture.
2. Different methods of separating materials from their mixtures are:
   (a) Hand picking
   (b) Threshing
   (c) Winnowing
   (d) sieving
   (e) Sedimentation, Decantation and Filtration
   (f) Evaporation
3. Winnowing is used toseparate heavier and lighter components of a mixture by air.
4. Water can be separated from the mixture of sand and water by filtration.
5. The method of evaporation is used to separate solid component dissolved in a liquid.

7

Different Types of Materials - II

We use a variety of things every day, such as utensils, boxes, tables, chairs, bicycles, mobile phones, books, pencils, shoes. slippers, TVs etc. All these things are an integral part of our life. Without them, we cannot imagine life.These things were not available in ancient time. It took thousands of years for humans to learn to make them. In this long journey, where humans learned to use the available materials around them, he invented many new substances as well. In this lesson, we will learn about different types of substances and their use.

Objectives

After studying this lesson, you should be able to:

- Find naturally occurring minerals;
- Classify materials as metals and non-metals;
- Describe the physical and chemical properties of metals and non-metals;
- Know about the use of metals and non-metals;
- Know about alloys and their use;
- Get information about the materials used in the construction work; And
- Know about Polymer, soap and detergent, fertilizer and pesticides.

7.1 Minerals

Fig. 7.1

Humans use a variety of things to meet their needs, like utensils to prepare food, clothing to wear, home to live, furniture to sit and rest, and bicycles, fridges, mobile, TVs, cars, etc. for leisure and entertainment. All these things are made of some material. Where do all these materials come from? Some materials are found in the earth's rocks naturally as minerals, while others are made by human beings in factories, and industrial units. All of this happened due to our growing needs. As our needs increased, people were inspired for making items from different types of substances.

Naturally occurring minerals can be divided into two groups:

(a) Non-metals

(b) Metals

There are 89 types of minerals found in India. Out of these, 11 are metallic, 52 are non-metallic, 4 are fuel minerals and 22 are other minerals. We get metals from metallic mineral. They are also called **Ore**.

The minerals from which the metals can be extracted profitably and conveniently are known as **ores**. Table 7.1 shows the metallic ores and their location.

Table 7.1 Metallic Minerals: Ores and their location in India

S. No.	Metal	Ore	Places, where they are found
1.	Iron	Haematite (Fe_2O_3) Magnetite (Fe_3O_4)	Madhya Pradesh, Karnataka , Bihar, Orissa, Tamil Nadu
2.	Copper	Pyrite	Rajasthan, Bihar, Madhya Pradesh, Andhra Pradesh
3.	Aluminium	Bauxite	Madhya Pradesh, Orissa, Gujrat, Bihar, Andhra Pradesh, Maharashtra
4.	Manganese	Pyrolusite	Karnataka, Madhya Pradesh, Orissa, Maharashtra, Gujrat
5.	Gold	Exists in free state	Karnataka, Andhra Pradesh

Table 7.2 shows the details of non-metallic ores and their location.

Table 7.2 Non-metallic Minerals and their location in India

S. No.	Minerals	Places, where they are found
1.	Mica	Bihar, Orissa, Tamil Nadu, Rajasthan, Andhra Pradesh , Gujrat
2.	Lime Stone	Madhya Pradesh, Andhra Pradesh, Rajasthan, Gujrat, Karnataka, Bihar, Orissa, Tamil Nadu
3.	Dolomite	Madhya Pradesh, Gujrat, Karnataka, West Bengal Maharashtra, Uttar Pradesh, Orissa
4.	Gypsum	Rajasthan ,Jammu and Kashmir, Uttar Pradesh, Tamil Nadu, Gujrat
5.	Asbestos	Karnataka, Bihar, Rajasthan

7.2 Metals and Non-metals

You are familiar with a number of materials which are metals like iron, copper and gold. You also use them in your daily life. Similarly, you are familiar with many non-metals and their uses, like mica, Sulphur, Coal, Oxygen gas etc.

Activity 7.1

Let's add some common items in the following table. Also write the materials they are made of in the next column.

S. No.	Items/Objects	Materials they are made of
1.	Bucket	Plastic, Iron, Brass, Aluminium
2.		
3.		
4.		
5.		
6.		

We identify metals on the basis of our daily experiences and information. Yes, there are many physical and chemical properties of metals on which they can be distinguished from other substances. Let's learn about the properties of metals and non-metals.

7.2.1 Physical and Chemical Properties of Metals and Non-Metals

1. Metals are lustrous. They have specific metallic lustre.
2. Metals are generally hard, but some metals like sodium, magnesium are so soft that they can be cut with a knife.
3. The metals can be beaten into thin sheets.You might have seen a blacksmith beating an iron piece to make iron articles like a spade, a shovel etc. What will happen if you beat a piece of wood? Thin sheets are made by beating Aluminum. Chocolate, toffee and medicines can be kept safely in Aluminium foils. You might be familiar with silver foil used for decorating sweets. The property of metals by which they can be beaten into thin sheets is called **malleability**. This is a characteristic property of metal.
4. Metal can be drawn into wires. This property is called **ductility.** Wires made of copper and aluminium are used to conduct electricity.
5. Metals are good conductor of electricity. They allow to pass electricity through them easily.
6. Metals get hot quickly because they are good conductors of heat. This is the reason they are used to make cooking utensils.
7. The metals are solid and strong, so they are used for making buildings, trains, machines, bridges, vehicles etc.
8. The things made of metals produce ringing sound when struck against hard surface. Suppose you have two objects similar in appearance, one made of wood and the other of metal. Can you tell which object is made of metal by striking both the objects? Since metals produce ringing sounds, they are said to be **sonorous.**

After considering the above properties we can say that some materials are hard,

lustrous, malleable, ductile, sonorous and good conductors of heat and electricity**.** The materials which generally possess these properties are called metals. The examples of metals are iron, copper, aluminium, calcium, magnesium, etc.

Metals like sodium and potassium are soft and can be cut with a knife.Mercury is the only metal which is found in liquid state at room temperature.These are exceptions.

In contrast, materials like coal and sulphur are soft and dull in appearance. They break down into powdery mass on tapping with hammer.They are not sonorous and are poor conductors of heat and electricity. The materials which possess these properties are called **non-metals.** The examples of non-metals are sulphur, carbon, oxygen, phosphorus, etc.

7.2.2 Chemical Properties of Metals and Non-metals

Chemical properties of metals include reactions with air, water and acids, which means, what are the effects of water, air, acids etc. on metals?

Metals react with oxygen. Rusting of iron is an example of such reaction. You know that iron articles rust, but why do iron articles rust?

Because iron reacts with oxygen and water to form rust.

Activity 7.2

Collect a spoonful of rust and dissolve it in a very little amount of water. You will find that the rust remains suspended in water. Shake the suspension well. Test the solution with red and blue litmus papers. What do you observe? Is the solution acidic or basic?

Similarly, when a copper vessel is exposed to moist air for long, it acquires a dull green coating. The green material is a mixture of copper hydroxide and copper carbonate which is formed due to reaction of copper with oxygen and water.

- Metals react with water. Sodium metal is very reactive. It reacts vigorously with oxygen and water. A lot of heat is generated in the reaction. It is, therefore, stored in kerosene
- Generally, non-metals do not react with water though they may be very reactive in air. For example, phosphorus is a very reactive non-metal. It catches fire if exposed to air. To prevent the contact of phosphorus with air, it is stored in water.
- Non-metals generally do not react with acids but metals react with acids and produce hydrogen gas that burns with a 'pop'sound.

Some metals such as sodium, potassium, aluminum, copper, iron etc. are highly reactive but other metals such as gold, platinum are less reactive. Less reactive metals do not react easily, so they are found in free state in nature. But the more reactive metals, due to their reactivity, are mixed/combined with other minerals. Due to this reason they are found as the compounds of oxide, sulphide and carbonate etc. rather than free state. Pure metal is extracted from compounds present in metal ores by metallurgical processes.

Intext Questions 7.1

1. Mark (✓) against correct statements and (✗) against incorrect statements.
   (i) Metals can be beaten into thin sheets. (correct/incorrect)
   (ii) Metals are good conductor of heat. (correct/incorrect)

(iii) Mercury is a metal. (correct/incorrect)

(iv) Non-Metals are good conductor of electricity. (correct/incorrect)

(v) Metals are highly reactive. (correct/incorrect)

2. Name four metals and four non-metals in the following table.

S. No.	Metals	Non-metals
1.		
2.		
3.		
4.		
5.		

3. What do you mean by ore? Explain.

_____

4. Give reason.

(i) Sodium metal is kept in kerosene.

_____

(ii) Phosphorus is stored in water.

_____

7.3 Uses of Metals and Non-metals

Without metals and non-metals, we cannot imagine convenient life. Humans have been using metals for centuries. The use of metals is so important that ages of civilizations are known as metal civilizations,for instance Iron Age, Bronze Age etc. Even today, metals are equally important. Metals are used in making industrial gadgets, buildings, vehicles such as cars, aircraft, trains, satellites, cooking utensils, furniture, almirah, fridges etc. In almost every item necessary for life, metal is used in some form.

Let's see what the different uses of non-metals are.

- Oxygen is such a non-metal which all living beings inhale during breathing.
- A number of medicines are prepared from non-metals.
- Graphite, mica and diamond are non-metals. Diamond is used to make jewellery and cutting tools.

- Chlorine, a non-metal, is used in water purification process.
- Many non-metals are used as fertilisers.
- Potassium nitrate is used in crackers.
- Graphite is used to make pencil lead.

You may add some more uses of metals and non-metals from your experiences.

7.4 Alloys

Some metals can be mixed together. The new metal formed by combining two or more metals or non-metals is called alloy. Alloys are homogenous mixture of metals. These are made from melting metals. Properties of alloys are different from their constituent metals.

You must have used bronze utensils. Bronze is an alloy. Bronze is made from copper and tin metals. Tin is hard and corrosion resistant and copper is a soft metal.

Similarly, iron is brittle. It easily forms rust. But, if it is mixed with carbon, it becomes steel alloy. When iron is mixed with nickel and chromium, we get stainless steel. These alloys are strong, hard and corrosion-resistant. Some alloys and their uses have been given in table 7.3.

Table 7.3: Alloys and their uses

S. No.	Alloy	Constituent Metals	Uses
1.	Steel	Iron, carbon	Bridge, Buildings, Railway lines, Tanks, Ships, Tools
2.	Stainless steel	Iron, Nickle, chromium	Utensil, Surgical Instruments
3.	Bronze	Copper, Tin	Coins, Utensils, statues, Jewellery
4.	Brass	Copper, Zinc	Utensils, Machines, musical instruments, statues
5.	Nichrome	Iron, Nickle, chromium, manganese	Heating elements
6.	Duralumin	Copper, Aluminium	Parts of aeroplane
7.	AlNiCo	Iron, Nickle, Aluminium, cobalt	Magnets

7.5 Useful substances for construction work

In all types of construction work stone, wood, metal, brick, limestone, cement, concrete, sand, etc. are used. Bricks are made from fired clay. First bricks and stones were joined with clay only. After that, bitumen (resin) and lime for the separation felt. Granite, marble and sandstone used in natural stone for centuries,but in the 19th century Portland cement was invented. Now cement is being used for every type of house, building, bridge etc. Let's know about cement.

7.5.1 Cement

The Portland cement was invented in 1824 by Joseph Aspdin. Modern Portland Cement consists of 60-67% calcium oxide, 17-25% silica, 3-8% aluminum oxide and 6% iron oxide. Ground limestone and clay is mixed in desired ratio. This mixture is heated to 1150 kelvin in rotary furnace. The substance so obtained is called a clinker. Clinker is then ground with a small amount of gypsum to produce cement.

Uses

- Mortar is made by mixing cement with sand and water. This mortar is used for plastering and as a binding material.
- Concrete is made by adding cement, gravel, sand and water. This concrete is used to construct roofs of the house, street tracks, electric poles etc.
- If you put iron rods in concrete, then RCC Cement is obtained. R.C.C. is used in making poles, roofs and slabs. It is also used to make pre-cast product by casting concrete in a reusable mold. These pre-cast parts are used to make bridges etc.
- Concrete can be strengthened by adding ashes of asbestos and coal. Concrete combined with asbestos is used to make drains, pipes, etc. Concrete mixed with ashes is also used in building bridges etc.

Fig 7.2 Uses of cement

7.5.2 Glass

Glass is mainly prepared by melting the silica (SiO_2); Silica is the main component of sand. Silica is heated to 1600 °C to melt it. Silica is cooled to 1600°C to obtain glass.

Ordinary glass: Silica is added to calcium carbonate ($CaCO_3$) and soda ash (Na_2CO_3) to get ordinary glass. This is called soda glass. Soda glass is used to make window pane, utensils, mirrors etc.

While making glass, different substances can be added to it to get glass having desirable properties. like.

- **Coloured glass:** In order to make colourful glass, the metallic salts are mixed in it. For example, adding salts of iron, green glass is obtained.
- **Opaque glass:** Opaque glass can be obtained by adding fluoride and phosphate.
- **Heat resistant glass:** The heat-resistant glass are obtained by mixing boric oxide (B_2O_2). When it is hot, it expands very little and does not break. It is known as Borosilate glass. It is also called Borosil and Pyrex. Utensils made of these glasses are used in factories, labs and houses.
- **Optical glass:** The glass made by mixing potassium oxide (K_2O) is very hard. This is called optical glass. Optical glass is used in eye glasses, contact lenses, cameras, microscopes and other optical instruments.
- **Photochromatic glass:** Silver (silver) salts is added in it. This glass becomes darker in bright light and light colour in dim light. This glass is used in sunglasses or goggles.
- **Lead Crystal Glass:** Many arte facts are made from glass. In such things glass is cut in such a way that the light may get reflected. Thus, objects look very bright and beautiful. To make such a glass, lead oxide (PbO) is added to it. These are called lead crystal glasses.
- **Optical Fibres:** Thin fibres of highly purified glass are used in information transmission, medicine and computer network.

Fig. 7.3: Substances made of glass

Intext questions 7.2

1. Name the constituent metals of the following alloys.

Alloy	Constituent metals
Steel	
Bronze	
Brass	

2. Write answer in one word.

   (i) Name the non-metal, which is essential for each and every organism……..

   (ii) Name the non-metal which is used in fire crackers……

   (iii) A non- metal which is used to make pencil lead……..

   (iv) What is the main constituent of glass? …….

3. Write four uses of metals.

   _____

4. When did cement get invented? Write two uses of cement.

   _____

7.6 Polymer

Polymers are man-made materials. They are obtained from petroleum. Polymers are considered a material due to their different uses. The word 'polymer' comes from two Greekwords; *poly* meaning *many* and *mer*meaning *part/unit. So,* a polymer is a material in which several units are joined together to make bigger unit. The units of polymer are joined together by the chemical substances, just as many bogies make the train together. Cellulose wool and silk are some examples of natural polymers. Cellulose is found in plant cells.

There are many polymers made by human, like polyethylene, polyvinyl chloride, polystyrene,Teflon etc. We use polymer substances every day. These polymers are made of different units. Let's learn about their uses.

- **Polythene:** It is a polymer made of ethylene or ethane units. It is light, strong and flexible. It is used for packing of luggage, making bottles and distributing beverages.
- **Polyvinyl chloride:** They contain vinyl chloride units. Bottles, vinyl flooring, cable, sanitary

pipe, raincoat, toys, sole of shoes etc. are made from polyvinyl chloride.

Fig. 7.4: Substances made of polymers

- **Polystyrene:** It is actually made up of the repeating units of a chemical called styrene. It is used for making packaging material and electrically insulated items.
- **Teflon:** It is a polymer of tetrafluoroethylene. It has very high melting point i.e. more heating is required for melting. Due to its strength and non-sticking property, it is used for making non-stick utensils and electrical insulators.

Fig. 7.5: Substances made of Teflon

Polythene, polyvinyl chloride, polystyrene and Teflon are known as **thermoplastics.** Thermoplastics are those materials which get deformed easily on heating and can be moulded into desirable shapes. On the other hand, there are some plastics which when moulded once, cannot be softened by heating. These arecalled **thermosetting** plastics.Examples of thermosetting plastics are Bakelite and melamine.Bakelite is used for making electrical switches, plugs etc. Melamine is used for making handles of pressure cocker.

Beside these many types of polymers are used to make fibres. You will study about these fibres in detail in class 9.

7.6.1 Soap and Detergents

Soaps are mainly prepared by the chemical reaction of naturally occurring oil or fats with sodium hydroxide. Naturally occurring oil and fats are obtained from animal fats and plant seeds.

Fig 7.6: Different types of soap and detergents

For example, palm oil and olive oil are obtained from plants. Oils contain esters. Esters get hydrolysed when added with sodium hydroxide. This hydrolysis gives sodium salt of acid present in the ester and glycerol. Sodium salt thus obtained is soap.

Fats or Oil + Sodium hydroxide $\rightarrow$ Acid + Glycerol
(Ester) sodium salt of acid(soap)

Acids thus obtained have a long carbon chain. They consist of a long chain having 15 to 18 carbon atoms.

If we use hard water then soap will not make foams. Hard water contains salts of calcium and magnesium. These salts react with soap to form insoluble substance. But detergent can make foams with hard water because they do not form insoluble substance with calcium and magnesium salts.

Like soaps, detergents also consist of a long chain of carbon atom. One end of this chain is polar. Polar end dissolves in water while non-polar end attaches itself with dirt. Thus, the dirt goes to the water by soap or detergent.

Some detergents help to keep us clean but at the same time they pollute our environment. Let us see how it happens?

Some detergents are biodegradable while others are not. Biodegradable means that microorganisms decompose them. Detergents, which do not get decomposed, are washed down into the water bodies along with water. Such polluted water is harmful for plants and animals.

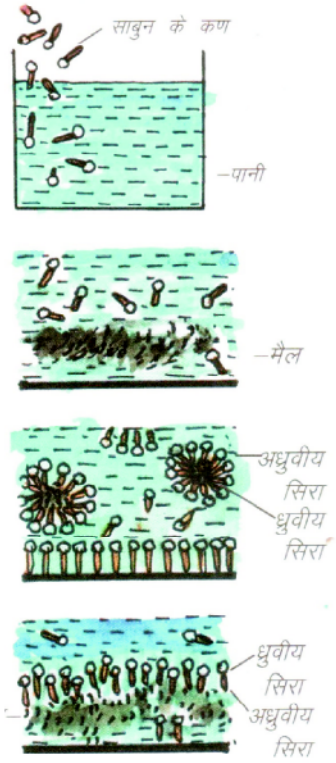


Fig. 7.7: Cleansing action of soap and detergent

7.7 Fertilizers and Pesticides

In order to get high crop yield, fertilizers and pesticides are being used at a large scale. Do you know what is in the fertilizer that provides good yield?

7.7.1 Fertilizers

Fertilizers provide complete nutrients to the plants. They help us to get better yield of crops. Fertilizers contain the following substances.

- **Nitrogen:** Nitrogen is essential for the growth of plants and protein synthesis that takes place in them. Fertilizers contain nitrogen in the form of ammonium nitrate, ammonium phosphate, ammonium sulphate and urea. All these substances are soluble in water. Roots of the plant absorb these substances when they are dissolved in water.
- **Phosphorus:** It is essential for the development of the plant roots.
- **Potassium:** It is important for the flowering in plants. It is used as Potassium sulphate.

7.7.2 Pesticides

Many organisms are harmful to plants. Pesticides either kill such unwanted organisms or help in their prevention. Pesticides protect humans and plants from many diseases and are also beneficial for their health.Pesticides are classified in different groups on the basis of the types of organisms theyhelp to prevent.

Table 7.5: Different types of pesticides

S. No.	Pesticides	Type of organisms they control
1.	Bactericide	Bacteria
2.	Fungicides	Fungus, molds
3.	Insecticides	Different Types of Insects
4.	Rodenticides	Organisms like rats and grasshopper
5.	Herbicides	Unwanted plants (Weeds)

Pesticides have been used for a long time. About 2000 years ago, Arsenic and its compounds were used as insecticides. During second World War some other organic pesticides or insecticides were discovered which proved to be more effective than inorganic insecticides like arsenic. There were

two important qualities in these pesticides.Firstly, they were helpful in the prevention of pests even in a very little amount. Secondly, they were less harmful to humans and other organisms as well as plants.

D.D.T. Was discovered in 1939. It was used to prevent insects and mosquitoes that spread malaria. During World War II, it was used extensively for protecting the soldiers from pests. People were very impressed by it and the use of DDT increased day by day. But gradually,pests and mosquitoes became accustomed to it and the effect of DDT almost disappeared.Secondly, it was also found that DDT persists in the soil for many years and does not get decomposed. Thus, they pose serious danger to other organisms, humans and plants, hence many nations have imposed total ban on DDT. DDT cannot be used in these countries.

Fig. 7.8:

Aldrin, Heptachlor, Parathion, Malathion etc. are less harmful than DDT and get decomposed quickly. That is why they are used in many places. In this way we see that chemical substances that are beneficial for us, may prove harmful to the environment, so we should use them wisely and reduce our needs.

Intext questions 7.3

1. Fill in the blanks.
   (i) Polythene is a ..... made of ethylene units.
   (ii) Soaps are mainly prepared by naturally occurring ..... or .....
   (iii) Nitrogen is essential for the ..... of plants.
   (iv) Pesticides kill unwanted.....
2. What is the difference between thermoplastics and thermosetting plastics?

   _____
3. Why does soap not form lather in hard water?

   _____
4. Name any three substances present in fertilizers.

   _____

What have you learnt

- In order to fulfil their needs, humans begin to use the available materials around them. Men invented many new substances as their needs grew.
- Naturally occurring minerals exist in two forms: metals and non-metals
- There are 89 types of minerals found in India. Minerals from which we get metals, are called **Ores.**
- Metals occur in nature as minerals. Metals are hard, lustrous, malleable, ductile and conductor of heat and electricity.
- Metals like sodium and potassium are soft and can be cut with a knife. Mercury is the only metal which is found in liquid state at room temperature.These are exceptions.
- Non-metals are brittle, non-lustrous, and poor conductors of heat and electricity. Most of the metals are reactive, hence they occur as compounds.
- Metals and non-metals help us to make our lives convenient.
- Alloys exhibit different properties as compared to metals. Several properties of alloys are better than metals.
- Natural substances are used to construct buildings, home, bridges etc., but we invented many materials which are stronger and cheaper like cement, concrete and glass etc.
- Polymer is a man-made material. Polymers are of many types like polythene, polyvinyl chloride, polystyrene, Teflon etc.
- Polymers are made of chemical substances. Many smaller units combine together to form bigger units called polymers.
- Some polymers are thermoplastics while others are thermosetting plastics.
- Soaps are mainly prepared by the chemical reaction of naturally occurring oil or fats with sodium hydroxide. Soaps do not produce lather in hard water.
- Fertilizers provide complete nutrients to the plants; hence we get better yield of crops. Fertilizers contain nitrogen, phosphorous and potassium.
- Pesticides protect humans and plants from many diseases. Pesticides are classified in different groups on the basis of their ability to prevent harm from different organisms.
- Many fertilizers and pesticides are non-biodegradable; hence their use causes environmental pollution.
- Chemical substances are beneficial for us in many ways, but they do not get decomposed for many years, so we should use them wisely and reduce our needs.

End of Chapter Questions

1. Mark (✓) against correct statements and (✖) against incorrect statements.

   (i) We get alloy from ore. (correct/incorrect)

   (ii) Mercury is a non-metal. (correct/incorrect)

   (iii) Oxygen is a non-metal. (correct/incorrect)

   (iv) Polythene is a natural material. (correct/incorrect)

   (v) Glass is made by the fusion of silica. (correct/incorrect)

2. Match column A with column B

Column A		Column B	
(a)	Lead	(i)	Packing
(b)	Gold	(ii)	Fertilizer
(c)	Iron	(iii)	Pencils
(d)	Polythene	(iv)	Jewellery/ornaments
(e)	Nitrogen	(v)	Bridges, Buildings

3. Give four examples each of metals, non-metals and alloys in the table given below.

S. No	Metals	Non-Metals	Alloys

4. Give four physical properties of metals.

5. Some metals occur as compounds while others are in native states. Give reason with examples.

6. Write four uses of cement.

7. Fill in the blanks.

   (i) Soda glass is used to make……

(ii) ……is obtained by mixing copper and lead.

(iii) In order to make coloured glass …….. of metals are added to it.

(iv) Non-metals are poor conductor of heat and ……..

(v) ……and electrical insulators are made from Teflon.

8. What do plants get from fertilizers?

9. Give two examples of pesticides.

10. Give reasons.

(i) Gold exists in free state.

(ii) Food materials are wrapped in Aluminium foils.

Answers to Intext Questions

7.1

1. (i) correct (ii) correct (iii) incorrect (iv) incorrect (v) correct

2. Metals like iron, copper, gold, Aluminium

   Non-metals like lime stone, Sulphur, Mica, Oxygen

3. Metals occur in nature as metallic minerals. Minerals from which we get metals, are called Ores.

4. Sodium metal is very reactive. It reacts vigorously with oxygen and water. A lot of heat is generated in the reaction. It is, therefore, stored in kerosene

   Phosphorus is a very reactive non-metal. It catches fire if exposed to air. To prevent the contact of phosphorus with air, it is stored in water.

7.2

1. Steel: iron, carbon

   Bronze: copper, tin

   Brass: copper, zinc

2. Oxygen, Potassium, Lead, Silica

3. Metals are used to make

   (i) houses and building

(ii) utensils

(iii) jewellery

(iv) vehicles

4. The Portland cement was invented in 1824 by Joseph Aspdin. Two uses of cement are:

   (i) It is used for plastering and as a binding material.

   (ii) R.C.C. is used in making poles, roofs and bridges.

7.3

1. (i) Polymer (ii) oil, fats (iii) growth (iv) organisms

2. Thermoplastics are those materials which get deformed easily on heating and can be moulded into desirable shapes e.g. Teflon, polythene

   These are plastics which when they are moulded once, cannot be softened by heating. These are called **thermosetting** plastics e.g. Bakelite and melamine.

3. Hard water contains salts of calcium and magnesium. These salts react with soap to form insoluble substance. Hence soap does not form lather in hard water.

4. Nitrogen, Phosphorus, Potassium

8

How do Changes Take Place

Many changes are taking place continuously around us. Some of them can be seen easily while some other changes are not visible to us. Some changes occur spontaneously and some take place when humans interfere. Some changes are slow while some fast.Some changes take place at a regular interval and others keep on continuously.In this lesson we will learn about various changes. Also, we would learn why these changes take place and what are the different types of changes.

Objectives

After studying this lesson, you should be able to

- Describe the causes of a change;
- Know about different types of changes like natural change, man made changes and other changes.
- Define physical and chemical change
- describe various chemical reactions–Combination reaction, Decomposition reaction, Displacement reaction, Double displacement reaction and Redox reaction.
- describe the use of acids, bases and salts which are useful in our daily life.

8.1 Changes

Many changes are taking place around us on their own. Our nails and hairs grow themselves. Some

hair fall on their own. Leaves of the tree change colour with season. The flowers bloom and then wither away. Every day the sun rises and it is evening then night and next day comes out. Roti is made from dough. Setting curd from milk. Have you paid your attention towards such changes before?

Let's see some more examples of changes that are taking place around us.

Activity 8.1

Take a balloon and blow it. The shape and size of the balloon have changed. Now, let the air escape the balloon.

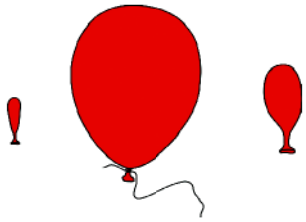


Fig.:

Activity 8.2

Take a piece of paper and fold it to make a toy boat. After some time, unfold the paper again.

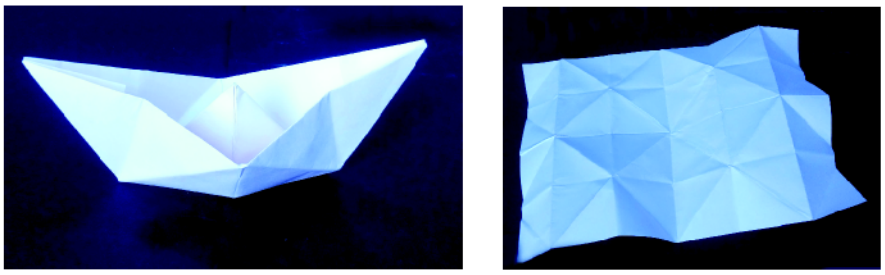


Fig. A boat made of paper

Activity 8.3

Take some dough and make a ball. Try to roll out a roti. Now change it back into a ball of dough again.

You may have observed three changes in these activities. What do they have in common?

Yes, in each of the three activities, it is possible to get back the material with which we started our activity. It means that the changes occurring in these activities

Fig.:

could be brought in their initial position. Such changes are known as **reversible** changes. Let's perform these activities with a difference.

Activity 8.4

Take the same balloon, which you used in Activity 8.1. Blow it to its full size and tie its mouth with a string tightly. Prick it with the needle or pointed tip of your pencil.Oops! It bursts.

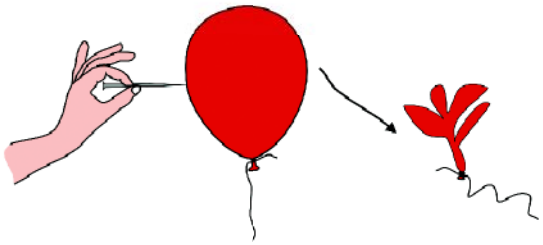


Fig: Blowing up the balloon

Activity 8.5

Take the same piece of paper, which you used in Activity 8.2 to make toy boat. Draw a boat on it and cut along its outline.

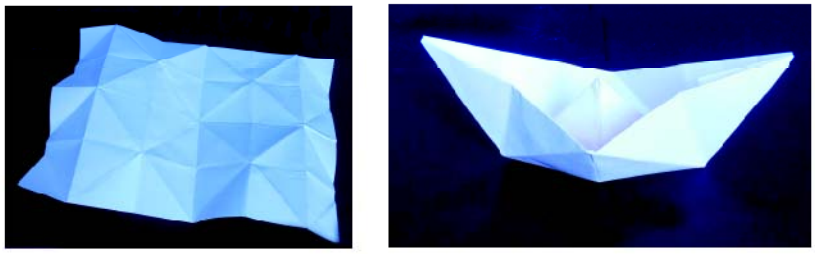


Fig:

Activity 8.6

Roll out a *roti* from the ball of dough again and bake it on a *tawa.*

Can the changes which have occurred in the Activity 8.4, 8.5 and 8.6 be reversed? No, these changes cannot be altered or reversed.

Let's take some more examples of such changes that are taking place around us.

Put the seeds of wheat, coriander or any flower in wet soil, then after some days the plant comes out of it. The little plant gets bigger gradually. It bears flowers and flowers turn to fruits and seeds. After some time the plant dries and dies. It does not survive even if we add fertilizer or water to it.

Fig:

Water when cooled at low temperature, freezes to ice. Ice, when kept in an open it again forms water. If we heat this water strongly then it begins to evaporate. These vapours when allowed to cool, get changed into liquid. Thus, the nature of water, its temperature and state changed.

Ice

Water

Steam

Fig. 8.1:

Take a glass of lukewarm milk. Add a teaspoon of curd to warm milk and stir it well. In a few hours, the milk changes into curd. Milk is liquid and slightly sweet in taste. Curd is thick, semi liquid and sour in taste. Thus, there are two types of changes.

1. Change in taste (sweet to sour) – chemical change
2. Change in state (liquid to semi liquid) – physical change
3. Besides that, the microorganisms present in the curd acted, due to which setting of curd has taken place. That is why it is a biological change too.

Thus,there are innumerable changes that take place around us all the day and night. For example, the position of the sun in the sky and the intensity of light changes every moment. Potter makes pitcher from the clay. In this way the shape of clay changes. He bakes the pitcher in an oven, and the clay becomes strong. Its colour also changes. If baked pitcher is broken down then it could not get the form of clay back. Similarly, if the candle burns, the wax melts slowly. The candle gradually gets smaller and extinguishes after some time. Have you ever thought where does the candle go? The candle has burnt to form carbon dioxide. It is a chemical reaction.

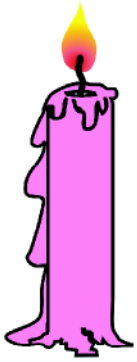


Fig 8.2: Melting of a candle

Intext questions 8.1

1. Fill in the blanks by using suitable word from the following.

   Biological, reversible, changes

   (i) Many …… are taking place continuously around us.

   (ii) Some changes are……

   (iii) Setting curd from milk is a …… change too.

2. Some changes are listed below. For each change, write in the blank space, whether the change can be reversed or not.

	Change	Can be reversed (Yes/No)
1.	Drying of wet clothes	.....
2.	Knitting of sweater from wool	.....
3.	Making flour from grains	.....
4.	Curd from milk	.....
5.	Melting of Ice cream	.....
6.	Dissolving sugar in water	.....

8.2 Different Types of changes

There are innumerable changes taking place around us. As we have seen that, the process of curdling involves many changes. Similarly, other changes could also be grouped in many ways. Scientifically changes may be classified mainly into six groups.

Changes

1. Natural and man-made change
2. Periodic and non-periodic change
3. Reversible and irreversible change
4. Physical and chemical change
5. Biological change
6. Slow and fast changes

8.2.1 Natural and Man-Made Changes

a) Natural Changes

Many changes are taking place around us on their own. There is no interference (contribution) of human or any other organism. Such self-governed changes are called natural changes. You are familiar with some natural changes. For example

(i) Evaporation of water from the rivers, streams, ponds and oceans. Formation of cloud from steam and pouring of clouds as rain.

(ii) The eruption of the volcano, the fire and the lava from it, and solidification of lava after some time.

(iii) Changing phases of the moon.

(iv) Shooting stars in the sky.

(v) Lunar and solar eclipses

(vi) Development of chickens inside the egg.

(vii) Falling of the fruit from the tree.

(viii) Emanating of fragrance from a flower.

(ix) Pulling of your hand as it touches the thorn.

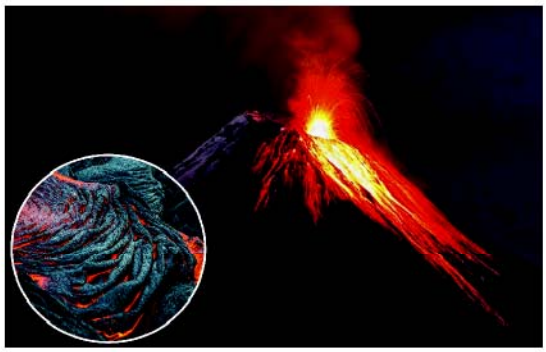


Fig. 8.3:

In all the examples given above, there is a similarity that all these things are happening on their own. We remove our hand very quickly if it touches a thorn unknowingly. The task of removal of hand is not done by human itself. It happens naturally due to the natural tendency of the body. Just like the food that is eaten is digested in the stomach. Digestion of food, beating of heart, growing of the body etc. are natural changes.

b) Man Made Changes

Changes which do not occur on their own but due to human activities are known as man made changes. Examples of such changes are

(i) Shaping a lump of clay into a pot by a potter.

(ii) Construction of houses from bricks, stone, lime, marble and sand.

(iii) Construction of roads by cutting hills.

(iv) Preparation of jaggery and sugar from sugarcane juice.

(v) Preparation of *khoya* from milk and sweets from *khoya*.

(vi) Making roti from dough.

(vii) Blowing up the balloon.

(viii) Making crackers using Sulphur and potash

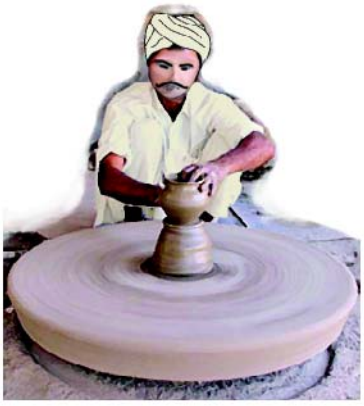


Fig. 8.4: Shaping a lump of clay into a pot by a potter

8.2.2 Periodic and Non-Periodic Changes

(a) Periodic Changes

Changes which occur after a regular interval of time are called periodic changes. Let's try to understand these changes with the help of some examples.

- Amavasya is a natural change which occurs after a fixed interval of time.
- Seasons keep on changing. Rainy season after summer, then autumn, winter season, Hemant Season and after that spring season comes. We all know that,at the end of spring, the summer season comes. This cycle keeps on changing periodically.
- Beating of heart one by one is also an example of periodic change.
- Swinging on trees or to and fro motion of a pendulum of a clock, are other examples of periodic changes.

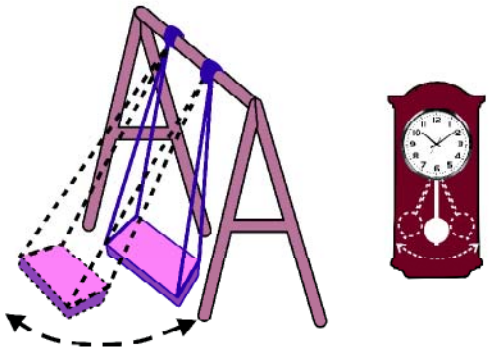


Fig. 8.5: (a) Swing (b) Pendulum of a clock

(b) Non-Periodic Changes

Non periodic changes may occur at any time. For example

(i) Occurrence of earthquake.

(ii) Falling of leaves and flowers from the trees.

(iii) Hailing

(iv) Rusting of Iron

(v) Shooting stars

(vi) Flood

(vii) Drought

8.2.3 Reversible and Irreversible Changes

(a) Reversible Changes

Reversible changes are those changes which can be brought in their initial state by altering the conditions like temperature, volume and pressure. For example

(i) Formation of ice from water and formation of water from ice again.

(ii) Melting of wax to make candles and melting of candle to wax.

(iii) Inflating and deflating of balloon.

Fig. 8.6: Drying of clothes in the sun

(iv) Washing of clothes and then drying.

(b) Irreversible Changes

These changes cannot be brought back into their original form. These changes which cannot be altered are known as irreversible changes. Let's see some examples of such changes.

(i) We cannot turn cheese or curd back into milk

(ii) When you heat a raw egg to make a cooked egg, the fried egg cannot be changed back to a raw egg again.

(iii) We cannot turn wheat flour back into wheat grains.

(iv) Seeds grow into plants, but plants cannot be changed to seeds again.

8.2.4 Physical and Chemical Changes

Broadly changes are of two types– physical and chemical change.

(a) Physical Change

Properties such as shape, size, colour and state of a substance are called its physical properties. A change in which a substance undergoes a change in its physical properties is called a **physical change**. A physical change is generally reversible. In such a change no new substance is formed.

Some examples of physical changes

- Cut a piece of paper into four pieces. You cannot join the pieces back to make the original piece, but there is no change in the property of the paper. The original material is paper. Paper underwent changes in size only.
- Take some ice in a tumbler. Keep the tumbler in the warm place. Ice will melt to form water. Now place the tumbler in a refrigerator. The water becomes solid ice once again. This is the change of state of water.
- Hold a piece of iron with a pair of tongs and keep it on the flame of a gas stove. The colour of the piece of iron changes to red. Remove the piece of iron from the flame. Let it be cooled for some time. It gets back its original colour again. Here, the colour of iron has changed.

(b) Chemical Changes

On the other hand, a change in which one or more new substances are formed is called a **chemical change**. A chemical change is also called a chemical reaction.

A change with which you are quite familiar is the rusting of iron. Rusting is caused by the

presence of moisture and oxygen present in the air. Rust is different from iron. The reaction involved in rusting can be represented by the following equation.

Iron (Fe) + Oxygen (O_2) + Water (H_2O) → Rust (Fe_2O_3)

(i) The burning of wax and release of carbon dioxide gas (CO2)into the air while a candle burns.

(ii) Cut surface of Apples, potatoes and brinjal. When exposed to air for some time they turn to brown or black.

Fig. 8.7 Cut surface of apples and brinjal turns brown

(iii) Take some freshly prepared lime water in a glass tumbler. Now blow gently in glass tumbler through the straw a few times. Lime water turns milky. The air we exhale contains carbon dioxide, which when react with lime water a new substance is formed. This reaction

Carbon dioxide + Lime water → Calcium Carbonate + Water

(CO_2) [$Ca(OH)_2$] ($CaCO_3$) (H_2O)

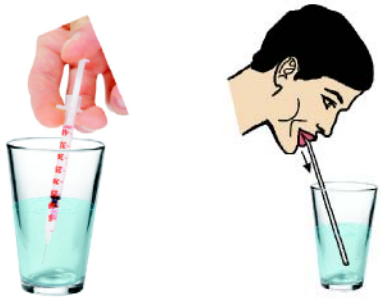


Fig. 8.8 CO_2 in lime water

(iv) Take about a teaspoonful of vinegar in a beaker/katori. Add a pinch of baking soda to it. You would hear a hissing sound and see bubbles of a gas coming out. The change in a beaker/katori is as follows.

Vinegar + Baking Soda → Carbon Dioxide + Sodium Acetate + Water

(CH_3COOH) ($NaHCO_3$) (CO_2) (CH_3COONa) (H_2O)

(v) Chemical changes are very important in our lives. New substances are formed as a result of chemical changes. Metals are extracted from their ores by carrying out a series of chemical changes. A medicine is the end product of chemical reactions. Similarly plastics, soaps and detergents, are also produced by chemical reactions. In addition to new products, the following may accompany a chemicalchange:

- Heat, light or any other radiation may be given off or absorbed.
- Sound may be produced.
- A change in smell may take place or a new smell may be given off.
- A colour change may take place.
- A gas may be formed.

Let's try to understand this.

- Burning of coal, wood, leaves or any substance is also a chemical change. Burning is always accompanied by production of heat.
- Explosion of a firework is a chemical change. Such an explosion produces heat, light, sound and unpleasant gases that pollute the atmosphere.
- When food gets spoiled, it produces a foul smell. This change is also a chemical change.

8.2.5 Biological Change

There are so many changes that can be carried out by a living organism or occur in a living body. Such changes which are possible by means of living organisms are known as biological changes. Biological changes are chemical changes. Some examples of biological changes are:

(i) Development of a plant from seed.

(ii) Development of leaves, flowers and fruits in the plants.

(iii) Preparation of food by the plants using water, minerals (absorbed from the soil) and carbon dioxide (from air).

(iv) Formation of bones, blood etc. from the food in our body.

Fig. 8.9:

8.2.6 Slow and Fast Changes

Slow and fast changes are comparative. The same type of changes may occur with a different pace in different situations. For example, a man, a plane, a train and a horse are running or flying with their full velocity. Can you imagine which of these is changing its place more quickly? Whose speed is less than that? Who will be the third out of these? Who is the slowest?

(i) Similarly, dry a cloth in the sun or in the shade or dry it by shaking hands in the sun. Guess where the cloth will dry quickly?

(ii) Burn a *phuljhari* and a candle of same-length simultaneously. Both will start to burn. Chemical changes also occur in both cases. Compare that in which case the change is taking place more rapidly.

Likewise, you can make a comparison among other activities also.

8.2.7 Desirable (good) and Undesirable (bad) Changes

On the basis of different points of views, a change can be termed as good or bad. For example, when fire crackers burst, they make us to feel good, this change is good, but this change brings smelly smoke and poisonous gases, so it is called bad. Similarly, forests are cut down to get crop fields and to make houses. This change is a good change for humans, but the change made from the destruction of forests is also bad because the habitats of the birds and animals get ruined, the balance of nature gets spoiled etc. So, it is up to you that, what change you consider good or bad.

Can any change be stopped?

- Can you stop the sun from rising up or setting down? No,
- Can milk be prevented from spoiling? Yes, it can be prevented. If we store milk in a cool place or in a refrigerator, it can be prevented from spoiling.
- Can burning wood or candle be prevented from burning? Certainly, we can.
- Similarly, iron can be protected from rusting. Applying paint, oil, grease Vaseline etc. on the surface of iron prevents it from rusting.These objects do not allow oxygen and moisture to reach the iron, hence the rusting does not occur.
- Can ageing be prevented? No, but the changes that occur in old age, can be avoided by taking good food, proper exercise, rest, preventive measures against diseases etc.

8.2.8 Interaction among Changes

- When the bird flies in the air, it pushes air from its wings. Air opposes to fly. The resistance of air helps the bird to fly. Thus the body of the bird and the air interact with each other.
- When you pour water on quick lime, it undergoes a chemical reaction.The reaction between Calcium oxide (lime) and water results in the formation of Calcium hydroxide (Lime water).

Fig. 8.10:

Intext Questions 8.2

1. Give Answer in one or two words.

   (i) Changes which occur after a regular interval of time are called .....

   (ii) Which type of change produces new substance? .....

   (iii) Where do the biological changes take place? .....

   (iv) Is there any interaction existing among changes? .....

2. Identify biological and non-biological changes among the following.

   (i) Fermentation of dough. Biological/non-biological

   (ii) Puffing up of bread on the flame Biological/non-biological

   (iv) Rising of the sun. Biological/non-biological

   (v) Making a flower garland Biological/non-biological

8.3 Types of Chemical Reactions

Different Types if chemical reactions take place between two or more substances. Let's know more about them.

8.3.1 Combination Reaction

Formation of new substances by the combination of two or more substances is known as combination reaction.

Example: When a substance burns in the air it combines with oxygen present in the air.

Activity 8.7

Take a small amount of quick lime in a beaker or any glass tumbler. Slowly add water to this. Feel the outer surface of tumbler by touching it with your hand.

We have learnt that quick lime reacts with water to produce calcium hydroxide. A large amount of heat is also produced during the reaction, which raises the temperature of the reaction mixture. This reaction may be represented by the following equation.

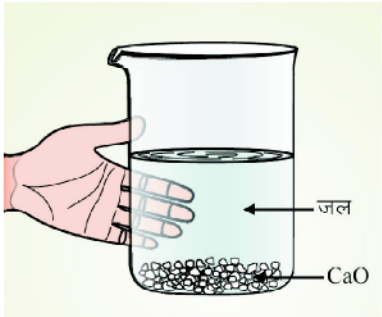


Fig. Reaction between quick lime and water

Quick lime + water → Slaked lime + Heat

CaO H_2O $Ca(OH)_2$

In this reaction quick lime and water interact with each other and produce a new substance, calcium hydroxide (slaked lime).

8.3.2 Decomposition Reaction

You know that quick lime is used for white washing walls. Do you know from where we get quick lime? We get quick lime by heating lime stone in a kiln. Lime stone, when heated in a kiln, produces quick lime and carbon dioxide.

$CaCO_3$ → CaO + CO_2

Limestone Quick lime carbon dioxide

This is an example of decomposition reaction.

Decomposition reaction is that, in which single substance breaks down to give two or more substances.

8.3.3 Displacement Reaction

When an element displaces another element from its compound by a chemical activity, a **displacement reaction** occurs.

8.3.4 Double Displacement Reaction

Such reactions in which there is an exchange of ions between the reactants are called **double displacement** reactions.

8.3.5 Redox Reaction

You have learnt that, if a substance gains oxygen during a reaction, it is said to be oxidised. Similarly, if a substance loses oxygen during a reaction, it is said to be reduced. It means during this reaction one reactant gets oxidised while the other gets reduced. Such reactions are known as redox reactions. In all redox reactions one compound gets oxidised while the other gets reduced. Reduction is not possible without oxidation and oxidation is not possible without reduction. You will learn more about this in higher classes.

8.4 Acid, Base and Salt

Different materials found in nature have different taste. Do you know why? The reason is that, they contain different chemicals.

The nature of these chemical substances is acidic or basic. Let's see what are acids and bases?

8.4.1 Acid, Base

Curd, lemon juice, vinegar and tamarind taste sour. These substances taste sour because they contain acids. The chemical nature of such substances is acidic.

Baking soda is bitter in taste. If you rub its solution between fingers, it feels soapy. Substances like these which are bitter in taste and feel soapy on touching are known as bases. The nature of such substances is said to be basic. But there are some substances which are neither acidic nor basic, hence they are known as neutral substances.

We cannot taste every substance to check whether it is acid or base, then how do we find its nature? Special type of substances are used to test whether a substance is acidic or basic. These substances are known as indicators. The indicators change their colour when added to a solution containing an acidic or a basic substance. Turmeric, litmus, china rose petals (*Gudhal*), etc., are some of the naturally occurring indicators.

Taste the following substances given in the table and enter the results.

Substance	**Taste (sour/bitter/sweet/any other)**
Bitter guard	
Lemon juice	
Tamarind (*imli*)	
Amla	
Curd	
Orange juice	
Grapes	
Unripe mango	
Sugar	
Common salt	
Vinegar	
Baking soda	

1. Litmus – A Natural indicator

The most commonly used natural indicator is litmus. It is extracted from lichens. It has a mauve (purple) colour in distilled water. When added to an acidic solution, it turns red and when added to a basic solution, it turns blue. It is available in the form of a solution, or in the form of strips of paper, known as litmus paper. Generally, it is available as red and blue litmus paper. Acid turns blue litmus to red while base turns red litmus to blue.

Fig. 8.11 (a) Lichen (b) Red and blue litmus paper

Activity 8.7

Mix some water with lemon juice in a plastic cup/tumbler. Add small amount of water to it. Put a drop of this solution on a strip of the red litmus paper. Is there any change in colour? Repeat the same exercise with other substances and write your experiences.

2. Turmeric – A natural indicator

- Take a tablespoonful of turmeric powder. Add a little water and make a paste.
- Make turmeric paper by depositing turmeric paste on blotting paper/filter paper and drying it. Cut thin strips of the yellow paper obtained.
- Put a drop of soap solution on the strip of turmeric paper. What do you observe? Soap solution is basic, hence turmeric strip turns red

Now repeat the same exercise with other solutions and write your experiences.

Table 8.1: Effect of turmeric solution on different substances

Test solution	Effect on turmeric solution	Remarks
Lemon juice		
Orange juice		
Vinegar		
Baking soda		
Sugar		
Common salt		

3. China Rose – A natural indicator

Collect some China rose (*Gudhal*) petals and place them in a beaker. Add some warm water. Keep the mixture for some time till water becomes coloured. Use the coloured water as an indicator. Add five drops of the indicator to any solution and see the effect. China rose indicator turns acidic solutions to dark pink and basic solutions to green.

Activity 8.8

Prepare these natural indicators and try to observe the change in colour in acidic, basic and neutral solutions.

8.4.2 Neutralisation

When an acidic solution is mixed with a basic solution, both the solutions neutralise the effect of each other. When an acid solution and a base solution are mixed in suitable amounts, both the acidic nature of the acid and the basic nature of the base are destroyed. The resulting solution is neither acidic nor basic. In this reaction, heat is always produced. In neutralisation reaction a new substance is formed. This is called salt. Salt may be acidic, basic or neutral in nature.

The reaction between an acid and a base is known as neutralisation. Salt and water are produced in this process with the evolution of heat.

Acid + Base → Salt + Water (Heat is evolved)

The following reaction is an example:

HCl	+	NaOH	→	NaCl	+	H_2O	+	Heat
Hydrochloric Acid		Sodium hydroxide		Sodium chloride		Water		

Some salts are generally used in our homes like baking soda (sodium hydrogen carbonate: $NaHCO_3$), washing soda (Sodium carbonate: Na_2CO_3), bleaching powder (calcium oxychloride: $CaOCl_2$)

8.4.3 Examples of Neutralisation in everyday life

(i) Ant bite

When an ant bites, it injects the acidic liquid (formic acid) into the skin. The effect of the acid can be neutralised by rubbing moist baking soda (sodium hydrogen carbonate) or calamine solution. Calamine solution contains zinc carbonate. This basic substance neutralises the acidic substance of ant.

(ii) Indigestion

Our stomach contains hydrochloric acid. It helps us to digest food. But due to some reason too much of acid in the stomach causes indigestion. To relieve indigestion, we take an antacid such as milk of magnesia. Milk of magnesia contains magnesium hydroxide. It neutralises the effect of excessive acid.

(iii) Soil treatment

Excessive use of chemical fertilisers makes the soil acidic. Plants do not grow well when the soil is either too acidic or too basic. When the soil is too acidic, it is treated with bases like quick lime (calcium oxide) or slakedlime (calcium hydroxide). If the soil is basic, organic matter is added to it. Organic matter releases acids which neutralise the basic nature of the soil.

Intext Questions 8.3

1. What happens when water is added to quick lime? Choose the correct answer from the following.

   (i) Quick lime becomes shiny ( )

   (ii) Carbon dioxide gas is produced ( )

   (iii) A new substance calcium hydroxide is formed. ( )

   (iv) Calcium becomes greenish. ( )

2. Fill in the blanks.

   (i) Acids are ..... in taste while bases are ..... in taste.

   (ii) The reaction between an acid and a base is known as.....

   (iii) Turmeric is a naturally occurring .....

   (iv) ..... is extracted from lichens.

What have you learnt

- Many changes are taking place around us. These changes are of different types.
- These changes can be categorised as natural and man-made changes, periodic and non-periodic change, reversible and irreversible changes, physical and chemical changes, Biological changes, slow and fast changes.

- Natural changes take place on their own. There is no interference (contribution) of human or any other organism. Man made changes are due to human activities.
- Changes which occur after a regular interval of time are called periodic changes. There is no fixed time of non-periodic changes, these changes may occur at any time.
- Reversible changes can be brought in their initial state by altering the conditions like temperature, volume and pressure.
- Irreversible changes cannot be altered. These changes cannot be brought back into their original form even by altering the conditions.
- In a physical change, a substance undergoes a change in its physical properties such as shape, size, colour and state. A physical change is generally reversible. In a chemical change, physical property may not be changed but, in chemical changes one or more new substances are formed. A chemical change is also called a chemical reaction.
- Biological changes can be carried out by a living organism or occur in a living body.
- Slow and fast changes are comparable.
- On the basis of different points of view, a change can be termed as good or bad. It depends on a person that, what change he/she considers good or bad.
- There are many types of chemical reactions. Like
  (a) Combination reaction— formation of new substances by the combination of two or more substances.
  (b) Decomposition reaction — in this reaction a single substance breaks down to give two or more substances.
  (c) Displacement reaction — When an element displaces another element from its compound by a chemical activity
  (d) Double Displacement reaction — in this type of reaction there is an exchange of ions between the reactants.
  (e) Redox reaction — during this reaction one reactant gets oxidised while the other gets reduced.
- Some substances are acidic while some are basic. But there are some substances which are neither acidic nor basic, hence they are known as neutral substances. Indicators are used to test their nature.
- Litmus is extracted from lichens. It is available in the form of a solution, or in the form of strips of paper, known as litmus paper. Acid turns blue litmus to red while base turns red litmus to blue.
- A base turns strip of turmeric paper to red.

- China rose indicator turns acidic solutions to dark pink and basic solutions to green.
- The reaction between an acid and a base is known as neutralisation. Salt and water are produced in this process. Salts may be acidic, basic or neutral.

End of Chapter Questions

1. Choose the correct option.

   (a) What is the nature of lemon juice?

   (i) Acidic (ii) Basic

   (iii) Neutral (iv) Salt

   (b) Reversible changes can be brought in their initial state when

   (i) a chemical reaction takes place

   (ii) the interaction among changes takes place

   (iii) conditions are altered

   (iv) a periodic change takes place

   (c) What happens when redox reaction occurs?

   (i) Compound is decomposed to form two substances

   (ii) New substance is formed

   (iii) Exchange of ions between the reactants takes place

   (iv) One reactant gets oxidised while the other gets reduced

2. Mark (✓) against correct statements and (✗) against incorrect statements.

   (i) Periodic changes occur at a definite time. ( )

   (ii) Acids are sour in taste. ( )

   (iii) indicators show different colour in an acidic medium. ( )

   (iv) Lime and water react together to form nitrogen. ( )

3. Fill in the blanks.

   (i) Rusting is a ..... change.

   (ii) Biological changes occur in a ..... Body.

(iii) If lime stone is heated, it produces ..... and carbon dioxide.

(iv) A base turns red litmus to .....

4. Write two identifications each of acid and base.

5. What is the difference between combination and decomposition reaction.

6. Give reasons.

(i) Baking soda is applied on ant bite.

(ii) To relieve indigestion, we take milk of magnesia.

7. What are salts? Give two examples of salts.

8. Name four categories of changes that occur around us.

9. A tumbler contains freshly prepared lime water. Air is blown into the tumbler using straw. Lime water becomes milky. Which type of change is this?

10. Explain the reaction involved in rusting of iron. Give chemical equation also.

11. You have three liquids – hydrochloric acid, sodium hydroxide and a solution of sugar. How could you identify them using litmus paper.

Answer Key for Chapter Questions

8.1

1. (i) changes (ii) reversible (iii) Biological

2. (i) Yes (ii) Yes (iii) No (iv) No (v) Yes (vi) Yes

8.2

1. (i) Periodic change
   (ii) Chemical change
   (iii) Living body
   (iv) Yes

2. (i) Biological (ii) non-biological
   (iii) Biological (iv) non-biological
   (v) non-biological

8.3

1. (iii) A new substance calcium hydroxide is formed

2. (i) Sour, bitter

   (ii) neutralization

   (iii) indicator

   (iv) litmus

9

Fibres and Fabrics

We use different types of clothes or fabric. These fabrics are made of different materials. If we observe them closely, we find that they are made of fibres. How many types of fibre are there? Where do these fibres come from? What are the specific properties of these fibres? What are the advantages and disadvantages of using these fibres? In this lesson we shall learn about the sources of all these fibres, methods adopted to obtain them and their properties.

Objectives

After studying this lesson you should be able to

- know about the diversity in fabrics and different types of fibres;
- Describe the fibres obtained from plants especially cotton and jute;
- Learn about the cultivation of cotton and jute and how to obtain fibers from them;
- Learn about the source of woollen fibre, sheep rearing, and the ways to get wool from them.
- Know about the source of silk fibers, rearing of silkworm and the process of obtaining silk fibre;
- Describe various types of synthetic fibres and their properties;
- Learn about plastics and their properties;
- Describe the effect of plastics on the environment.

9.1 Diversity in Clothing

We use the variety of clothes. Our dresses like sari–blouse, *salwar–kameez, kurta–pajama, dhoti–bandi* are made of some kind of fabrics. Bed sheets, mattresses, blankets, towels, handkerchiefs, socks, vest, even different types of bags and gunny bags are made of some kind of fibres. Some of these fabrics are cotton, some are silk, some are woollen and some are synthetic i.e. artificial.

Activity 9.1

Take a piece of cloth. Now, try to pull out a yarn gently from it. You will find that a fabric is made up of yarns arranged together. Now observe these yarns carefully. What are these yarns made of?

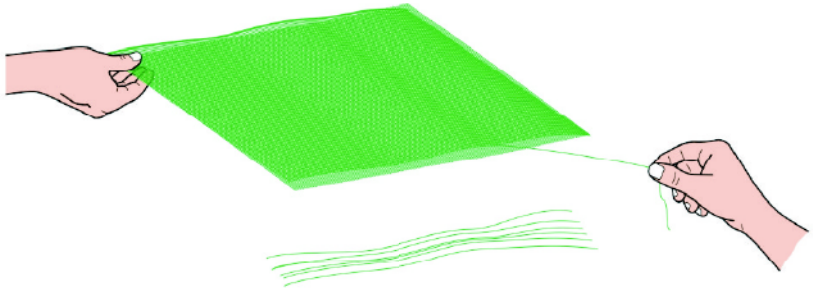


Fig.: Pulling a yarn from a fabric

Activity 9.2

Now, press one end of the yarn you pulled out from the piece of cloth with your thumb. Scratch the other endof the yarn along its length with your nail. You will find that at this end, the yarn splits up intothin strands

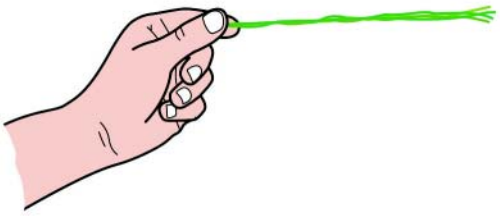


Fig.: Splitting the yarn into thin strands

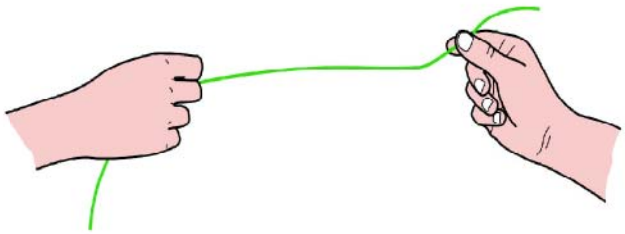


Fig.: Yarn split up into thin strands

Many a time, the end of the thread is separated into a few thin strands, when you try to thread a needle. This makes it difficult to pass the thread through the eye of the needle. Now observe these strands of yarn carefully. The thin strands of thread are made up of still thinner strands called **fibres.**

Every fabric is made up of yarns and yarns are further made up of some kind of fibres.

9.2 Different kinds of Fibres

Fabrics are mainly of four types– cotton, silk, woollen and synthetic. Properties of these fabrics are different from each other. This is because they are made up of different types of fibres. Sources of these fibres are also different, that is why they look quite different from each other.

The fibres of some fabrics such as cotton, jute, silk and wool are obtained from plants and animals. These arecalled **natural fibres.** Cotton and jute fibres are obtained from plants. Wool and silk fibres are obtained

from animals. Woollen fibres are obtained from the fleece of sheep or goat. It is also obtained from the hair of rabbits, yak and camels, while silk fibre is drawn from the cocoon of silkworm.

For thousands of years natural fibres were the only ones available for making fabrics. In the last hundred years or so,fibres are also made from chemical substances. These are called **synthetic fibres**. Some examples of synthetic fibres are polyester, nylon and acrylic.

Intext Questions 9.1

1. Fill in the blanks by choosing correct word.
   (i) Yarn is made up of ..... (Animals/fibres)
   (ii) Cotton fibres are obtained from..... (Plants/Animals)
   (iii) Woollen fibres are obtained from .....(Goat/Fish)
2. State whether the following statements are true or false:
   (i) Polyester is a natural fibre. (True/False)
   (ii) Synthetic fibres are made from chemical substances. (True/False)
   (iii) Natural fibres are obtained from plants and animals. (True/False)
   (iv) Silk fibre is obtained from sheep. (True/False)

9.3 Some Plant Fibres

Fibres, which are obtained from plants are known as plant fibres, e.g. cotton, jute etc.

9.3.1 Cotton

Cotton is obtained from cotton plants. Cotton plants are usually grown at place shaving black soil

and warm climate. Cotton is mainly grown in Maharashtra, Andhra Pradesh and Gujrat? The fruits of the cotton plant (**cotton bolls**) are about the size of a lemon. After maturing, the bollsburst open and the seeds covered with cotton fibres can be seen. Cotton fibres are white, so a cotton field that is ready for picking looks like a field covered with snow.

Fig. 9.1: Cotton seeds and fibres

Fig. 9.2: Ginning of cotton

Cotton is usually picked by hand. Fibres are then separated from the seeds (cotton bolls) by combing.This process is called **ginning** of cotton. Ginning was traditionally done by hand. These days, machines are alsoused for ginning.

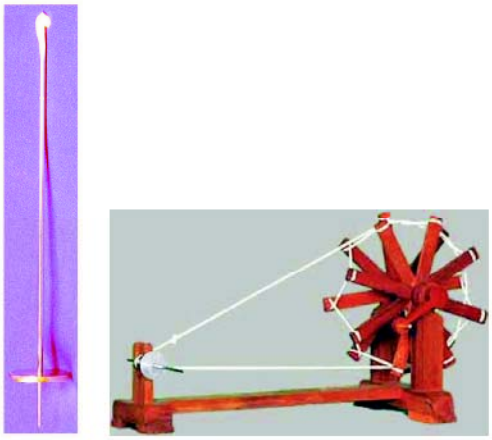
9.3.2 Jute

Jute fibre is obtained from the stem ofthe jute plant. In India it is cultivated during the rainy season. In India, jute is mainly grown in West Bengal, Bihar and Assam. The jute plant is normally harvested when it is at flowering stage.The stems of the harvested plants are immersed in water for a few days. The stems rot and fibres are separated by hands.Yarns are made from these fibres.

Let's see how it is done.

9.3.3 Spinning of Cotton Yarn

The process of making yarn from fibres is called **spinning**.In this process, fibres from a mass of cotton wool are drawn out and twisted. This brings the fibres together to form a yarn. Spinning is done using *takli/ spindle* and *charkha*.Spinning of yarn on a large scale is done with the help of spinning machines.

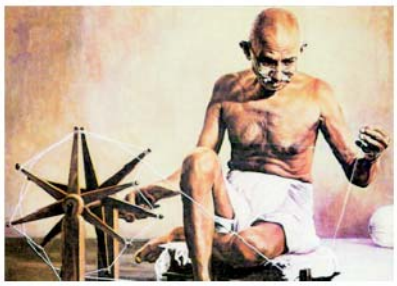


Spinning with *takli* Spinning with *charkha*

Fig. 9.3: Different ways of spinning

Did You Know

Use of *charkha* was popularised by Mahatma Gandhi as part of the Independence movement. He encouraged people to wear clothes made of homespun yarn and shun imported cloth made in the mills of Britain.



9.3.4 Yarn to Fabric

There are many ways by which fabrics are made from yarns. The two main processes are **weaving** and **knitting**.

(a) Weaving

You might have noticed that a fabric is made up of two sets of yarns arranged together. The process of arranging two sets of yarns together to make a fabric is called **weaving**.

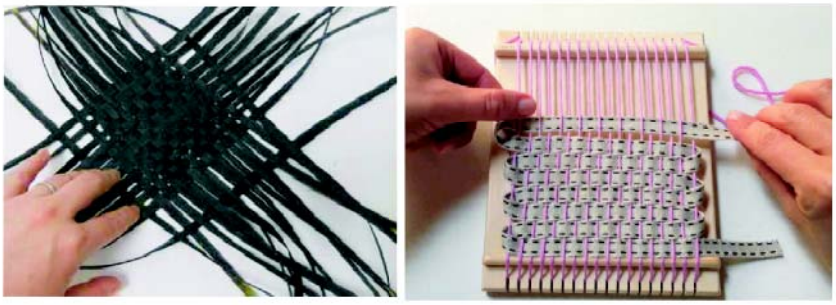


Fig. 9.4: Arrangement of yarn in fabric

Weaving of fabric is done on **looms.** The looms are either hand operated or power operated. Looms which are hand operated are known as handlooms, while power operated looms are called power looms.

Handlooms

Power Looms

Fig. 9.5: Different types of looms

(b) Knitting

Knitting is a special type of weaving? In **knitting**, a single yarn is used to make a piece of fabric similarly a sweater is knitted. Let's pull up the yarn from a torn pair of socks. A single yarn gets pulled out continuously as the fabric gets unravelled. Like socks, many other clothing items are made of knitted fabrics. You must have seen clothes made of hosiery. These clothes are made by knitting.

Did You Know

HISTORY OF CLOTHING MATERIAL

Thousands of years ago man discovered clothing material to protect himself from heat, sun and rain. It appears that in those times people used the bark and big leaves of trees or animal skins and furs to cover themselves.After that, they learnt to weave twigs and grass, vines to weave fabrics. Animal fleece or hair were twisted together into long strands. These were woven into fabrics. They started to make cotton fabric. People used to wear unstitched clothes they simply draped the fabrics around different parts of their body. With the invention of the sewing needle, people started stitching fabrics to make clothes. Let's prepare a list of fabrics which we wear unstitched.

Intext Questions 9.2

1. From which parts of the plant cotton and jute fibres are obtained?

   _____

2. Name any two devices that are used for spinning yarns.

   (i) ……

   (ii) ……..……..

3. Fill in the blanks.

   (i) Cotton fibres are separated from the seeds (cotton bolls) by the process of ……..

   (ii) Cotton fibres are obtained from ……..plants.

   (iii) The process of making yarn from fibres is called ……

   (iv) The two main processes of making fabrics from yarn are……and……

9.4 Wool

Wool is obtained from sheep, goat, yak and some other animals. These wool-yielding animals bear hair on their body. Hair trap a lot of air easily. Air is a poor conductor of heat i.e. air does not allow heat to pass through it, so, heat is maintained and hair keeps these animals warm. Wool is derived from these hairy fibres.

Activity 9.3

Feel the hair on different parts of your body. Do you find any difference? Which one seems coarse and which one is soft.

Like us, the hairy skin of the sheeph as two types of fleece:

(i) The coarse beard hair, and

(ii) The fine soft under-hair close to the skin.

The fine hair provide the fibres for making wool. Some breeds of sheep possess only fine under-hair.

9.4.1 Animals that yield wool

Several breeds of sheep are found in different parts of our country. They provide different types of wool. Wool is also obtained from goat hair. Angora wool is obtained from angora goats. Angora goats are found in hilly regions of Jammu and Kashmir.

(i) Sheep (ii) Goat (iii) Angora Goat

(v) Yak (vi) Camel (vii) Lama (iv) Alpaca

Fig. 9.6: Animals that yield wool

The under fur of Kashmiri goat is soft. It is woven into fine shawls called Pashmina shawls. In Tibet and Ladakh wool is obtained from Yak.The fur(hair) on the body of camels is also used as wool.

Lama and Alpaca, found in South America,also yield wool.

Making Wool from fibres

Wool is obtained from different animals but the wool found usually in markets is obtained from sheep.

9.4.2 Some Indian breeds of sheep

Sheep are reared in many parts of our country for wool.Sheep are mainly reared in Jammu & Kashmir,Himachal Pradesh, Uttarakhand, Arunachal Pradesh, Sikkim, Haryana, Punjab, Rajasthan and Gujarat states.

The following table 9.1 gives the names of some breeds of sheep, the quality and texture of the fibres obtained from them and the states where they are found.

Table 9.1: Some Indian breeds of sheep

Name of breed	Quality of wool	State where found
Lohi	Good quality wool	Rajasthan, Punjab
Rampur bushair	Brown fleece	Uttar Pradesh,Himachal Pradesh
Nali	Carpet wool	Rajasthan, Haryana, Punjab
Bakharwal	For woollen shawls	Jammu and Kashmir
Marwari	Coarse wool	Gujarat
Patanwadi	For hosiery	Gujarat

Certain breeds of sheep have thick coat of hair on their body which yields good quality wool in large quantities.These sheep are raised by selective breeding. Selective breeding is a special process of reproduction. In this method, sheep are chosen specially to give birth to such progeny having soft hair on their body.

9.4.3 Rearing of sheep

Sheep are herbivores. They prefer to eat grass and leaves. Apart from grazing sheep,rearers also feed them on a mixture of pulses, corn, jawar, oil cakes and minerals. In winter, sheep are kept indoors and fed on leaves, grain and dry fodder. Once the reared sheep have developed a thick growth of hair, hair is shaved off for getting wool.

Fig. 9.7:

9.4.4 Processing fibres into wool

Processing fibres into wool is a long process,which involves the following steps:

Step I: Shearing

The fleece of the sheep along with a thin layer of skin is removed from its body. This process is called shearing. Machines similar to those used by barbers are used to shave off hair.The uppermost layer of the skin is dead, so, the shearing does not hurt the sheep. The hair of sheep are removed just as barber shaves off your hair using machine. The hair of sheep grow again.

Fig. 9.8:

Usually, hair are removed during the hot weather. This enables sheep to survive without their protective coat of hair.

These hair provide woollen fibres. Woollen fibres are then processed to obtain woollen yarn.

Step II: scouring

The sheared skin with hair is thoroughly washed in tanks to remove grease, dust and dirt. This is called scouring. Nowadays scouring is done by machines.

Fig. 9.9: Scouring in tanks

Fig. 9.10: Scouring by machines

Step III: Sorting

After scouring, sorting is done, the hairy skin is sent to a factory. Here hair are sorted out. In this process hair of different textures are separated.

Step IV: Drying

In the next step hair are dried. But, before drying, the small fluffy fibres are picked out from the hair. These are called burrs. These are the same burrs which sometimes appear on your sweaters. The fibres are scoured again and dried. This is the wool ready to be spun into fibres.

Step V: Dying

The fibres are dyed in various colours, as the natural fleece of sheep and goats is brown or white.

Step VI: Reeling

The last step is called **reeling**. The fibres are first straightened, combed and then rolled into yarn.

The longer fibres are made into wool for sweaters and the shorter fibres are spun and woven into woollen cloth.

Fig. 9.11: A woollen yarn

Intext Questions 9.3

1. Name any four animals which provide us wool.

   (i) …… (ii) ……..

   (iii) ……..…. (iv) ……..…..

2. State whether the following statements are true or false:

   a) A sheep of good breed is ……. (True/False)

   b) Hair of sheep are removed during the cold weather. (True/False)

   c) Woollen fibres are processed to obtain woollen yarn. (True/False)

   d) Scouring is used to make sweater. (True/False)

   (e) Wool obtained from Angora goat is used to make carpet. (True/False)

3. Fill in the blanks.

   (i) We obtain …….. fibre from sheep.

(ii) The process of removing grease, dust and dirt from sheared skin with hair is called ……

(iii) After scouring, ……is done.

(iv) Angora goat is found in ……

9.5 Silk

Silk fibres are also animal fibres. They are obtained from silk moth. Silk moth are reared for obtaining silk. Rearing of silkworms is called sericulture. Let's learn about life history of the silk moth.

9.5.1 Life history of silk moth

A female silk moth lays hundreds of eggs at a time, from which are hatched larvae which are called caterpillars or silkworms. They grow in size after feeding on plenty of leaves. Caterpillar swings its head from side to side in the form of the figure of eight (8). During these movements, the caterpillar secretes fibre made of protein. This fibre hardens on exposure to air and becomes silk fibre. Soon the caterpillar completely covers itself by silk fibres and turns into pupa. This covering is known as cocoon. The silk yarn (thread) is obtained from the cocoon of the silk moth.

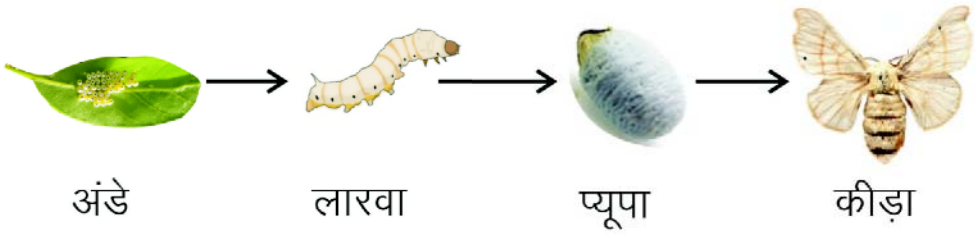


Fig. 9.12: Life history of silk moth

There is a variety of silk moths which look very different from one another and the silkyarn they yield is different in texture (coarse, smooth, shiny, etc.). Thus, *tassar* silk, *mooga* silk, *kosa* silk, etc., are obtained from cocoons of different types of moths. The most common silk moth is the mulberry silk moth. The silk fibre from the cocoon of this moth is soft, lustrous and elastic. It can be dyed in beautiful colours.

Activity 9.4

Collect pieces of silk cloth of various types. You can find them in a tailorshop among the heap of waste cut pieces. Compare the texture, flexibility and softness of these fabrics. Now take a piece of the artificial silk and compare it with the natural silk. Write your observations.

Activity 9.5

Take an artificial (synthetic) silk thread and a pure silk thread. Burn these threads carefully. Did you notice any difference in the smell while burning? Now, burn a woollen fibre carefully. Did it smell like burning of artificial silk or that of pure silk? Can you explain why?

9.5.2 Rearing Silkworms

A female silk moth lays hundreds of eggs at a time. The eggs are stored carefully on strips of cloth or paper and sold to silkworm farmers. The farmers keep eggs under hygienic conditions and under suitable conditions of temperature and humidity.

The eggs are warmed to a suitable temperature for the larvae to hatch from eggs. This is done when mulberry trees bear a fresh crop of leaves.The larvae, called caterpillars, eat day and night and increase enormously in size. The larvae are kept in clean bamboo trays along with freshly chopped mulberry leaves.

After 25 to 30 days,the caterpillars stop eating and move to a tiny chamber of bamboo in the tray to spin cocoons. Small racks or twigs may be provided in the trays to which cocoons get attached. The caterpillar or silkworm spins the cocoon inside which develops the silk moth.

9.5.3 Processing Silk

Silk fibres are separated out from the cocoons before they turn to adult. The cocoons are kept under the sun or boiled or exposed to steam to get silk fibres. The silk fibres separate out of a pile of cocoons isused for obtaining silk fibres.

The process of taking outthreads from the cocoon for use as silkis called reeling the silk. Reeling is done in special machines. Fibres are drawn from the cocoon by these machines. Silk fibres are then spun into silk threads, which are woven into silk cloth.

Activity 9.6

Observe silk moth rearing apparatus, if possible in your village or around your house. Observe the different stages of silk moth carefully and draw the diagrams of the same.

Intext Questions 9.4

1. Fill in the blanks.

   (i) We obtain …….. fibre from silkmoth.

(ii) Female silk moth lays hundreds of ..... at a time.

(iii) Eggs hatch into .....

(iv) Silk fibre is made up of .....

(v) Caterpillar completely covers itself by silk fibres and turns into .....

2. What does a common silk moth eat?

_____

3. Name any four varieties of silk.

(i) ..... (ii) ..... (iii) ..... (iv) .....

9.6 Synthetic Fibres and Plastics

The synthetic fibres are made by human beings.That is why these are called **synthetic**or **man-made** fibres. Like several beads are roped in a thread to make a garland, a synthetic fibre is a strand in which several small units are joined together. A synthetic fibre is also a chain of small units joined together. Each small unit is actually a chemical substance.

Fig. 9.13:

Many such small units combine to form a large single unit called a **polymer.** Theword 'polymer' comes from two Greekwords; *poly* meaning *many* and *mer*meaning *part/unit. So,* a polymer is made of many repeating units.

9.6.1 Types of Synthetic Fibres

- **Rayon or artificial silk:** Rayon is obtained by chemical treatment of wood pulp. Although rayon is obtained from a natural source,wood pulp, yet it is a man-made fibre. Rayon is cheaper than silk. It is used to make a variety of clothes. Rayon is mixed with cotton to make bed sheets. It is mixed with wool to make carpets.
- **Nylon** is another man-made fibre. It was prepared from coal, water and air. It was the first fully synthetic fibre. Nylon fibre was strong, elastic and light. It was lustrous and easy to wash. So, it became very popular for makingclothes. A Nylon

Fig. 9.14: Some articles made of nylon

thread is actually stronger than a steel wire. Nylon is used for making parachutes and ropes for rock climbing. Nylon is also used to make ropes, tents,socks,toothbrushes, car seat belts, sleeping bags, curtains etc.

Activity 9.7

Insert a hook or iron nail in a wall. Take a cotton thread (whose strength is to be measured) of suitable length. Tie it to the hook or iron nail. Suspend a pan to the free end of the thread so that weights can be placed in it. Add weights one by one till the thread breaks. Note down the total weight required to break the thread. This weight indicates the strength of the fibre. Repeat the same activity with threads of wool, polyester, silk and nylon. Tabulate the data in the following Table 9.2.

Observation Table 9.2

S. No.	Type of thread/fibre	Total weight requiredto break the thread
1.	Silk	
2.	Cotton	
3.	Wool	
4.	Nylon	
5.	Polyester	

Precaution: Note that all threads should be of the same length and almost of the same thickness.

- Polyester is also a synthetic fibre. Fabric made from this fibre does not get wrinkled easily. Terrelene is a popular polyester. It can be drawn into very fine fibres that can be woven like any other yarn. Fabrics made from polyester are very popular. Polycot fabric is made by the mixing of polyester and cotton. Similarly Polywool fabric is made by the mixing of polyester and wool. PET is a very familiar form of polyester. It is used for making bottles,utensils, films, wires and many other useful products.
- **Acrylic fibres** are used to make artificial wool. Sweater, Shawl and clothes made from acrylic are good looking and durable. So, they are more popular than natural fibres.

Activity 9.8

Burn a thread of any synthetic fabric. Now burn a thread of cotton fabric. What difference did you observe?

9.6.2 Characteristics of Synthetic Fibres

- Synthetic fibres are durable, less expensive and readily available in comparison of natural fibres.
- They dry up quickly as they soak less water than natural fibre.
- They are easy to maintain.
- A disadvantage of synthetic fibres is that they melt on heating. The clothes made from such fibres catch fire, melts and stick to the body of the person wearing it. We should, therefore, not wear synthetic clothes while working in the kitchen or near the fire.

Activity 9.9

You like to wear different types of clothes. Some of these are silk, some are cotton, some are woollen and some are synthetic. Which characteristic of which fibre you like most. Write your experiences in the following table.

Table 9.3: Observation

S. No.	Characteristic	Cotton	Silk	Woollen	Synthetic
1.	Washing/drying				
2.	Maintenance				
3.	Comfortable				
4.	Risk of fire				
5.	Durability				

9.7 Plastics

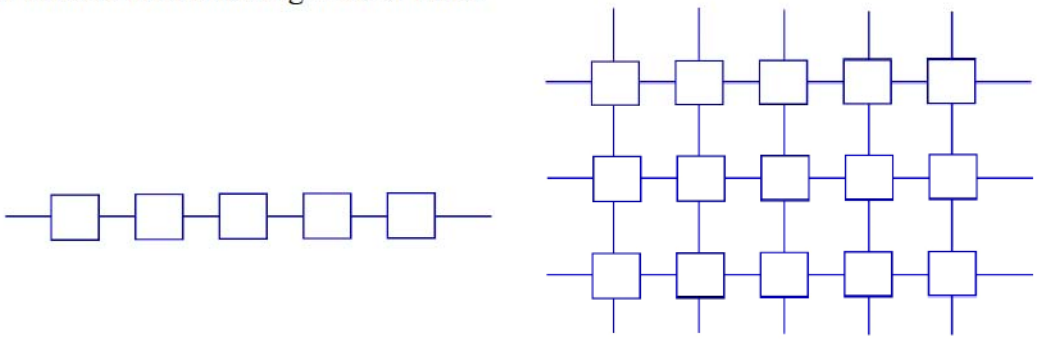
We use so many articles made of plastics in our homes. Make a list ofsuch items and their uses.

Table 9.4: Observation

S. No.	Articles/materials	Uses
1.		
2.		
3.		

Plastic is also a polymer like the synthetic fibre. All plastics do not have the same type of arrangement of units. In some it is linear, whereas in others it is cross-linked.

Plastic is easily mouldable i.e. can be shaped in any form. Plastic can be coloured and melted. They can be rolled into sheets. Plastics can be made into wires. Plastic can be recycled i.e. can be used to make new articles after allowing to melt them.



(a) Linear arrangement (b) Cross-linked arrangement

Fig. 9.15:arrangement ofunits in plastics

9.7.1 Articles Made of Plastics

Try to bend a piece of plastic yourself. Can all the plastic articles be bent easily? You will observe that some plastic articles can bend easily while some break when forced to bend. When we add hot water to a plastic bottle, it gets deformed. Such plastic which gets deformed easily on heating and can be bent easily are known as **thermoplastics.** Polythene and PVCare some of the examples of thermoplastics. These are used for manufacturing toys, combs and various types of containers.

Fig. 9.16:Various articles made of

On the other hand, there are some plastics which when moulded once, cannot be softened by heating. These are called **thermosetting** plastics. Two examples are Bakelite and Melamine. Bakelite is a poor conductor of heat and electricity. It is used for making electrical switches, handles of various utensils, etc.

Melamine is a versatile material. It resists fire and can tolerate heat better than other plastics. It is used for making floor tiles, kitchenware and fabrics which resist fire.

Fig. 9.17: Articles made of thermosetting plastics

9.7.2 Characteristics of Plastics and Utility

1. Being lighter as compared to metals, plastics are use din cars, aircrafts. They are used to make containers for storing a food item,water, milk, pickles, medicine, etc. Articles like slippers, furniture like chairs and tables and decorative items are also made by plastics.
2. Metals like iron, copper get rusted when left exposed to moisture and air. But plastics do not react with water and air. They are not corroded easily. That is why they are used to store various kinds of material, including many chemicals.
3. Plastics are strong and durable.
4. Plastic can be moulded into different shapes and sizes. It is used for various purposes. Make a list of different kind of plastic containers that you use in daily life.
5. Plastics are poor conductors of heat and electricity. That is why electrical wires have plastic covering. Handles of cooking utensils are also made of plastics.

Did You Know

Plastics find extensive use in the health-care industry. A number of medical instruments, syringes, threads used for stitching wounds, bottles for storing medicines are also made of plastics. Teflon is a special plastic on which oil and water do not stick. It is used for non–stick coating on cookware. Although plastic catches fire easily, yet Melamine is a special plastic which is flame resistant. That is why the uniforms of firemen have coating of melamine plastic. This coating makes the uniform flame resistant.

9.7.3 Effects of Plastics on the Environment

Garbage and waste materials around us and in our homes disappear in a few days. The main reason is that waste materials get decomposed by the action of microorganisms. But plastics do not get decomposed easily by natural processes. For example polythene bags remain in the environment for several years. Since plastic takes several years to decompose, it is not environment friendly. It causes environmental pollution. If synthetic materials are burnt, they take a long time to burn. In the process it releases lots of poisonous gases which may pose danger for all living organisms.

The natural process in which material get decomposed by microorganisms is called biodegradation. A material which gets decomposed through microorganisms is called **biodegradable**. A material which is not easily decomposed by natural processes is termed as **non-biodegradable.** Plastic is a non-biodegradable; therefore, avoid the use of plastics as far aspossible. Make use of bags made of cotton or jute. The biodegradable and non–biodegradable wastes should be collected separately and disposed off separately.

Table 9.5 Decomposition of various materials

Type of waste	Time taken to decompose	Nature of material
Peels of vegetable and fruits, leftover foodstuff, etc.	1 to 2 weeks.	Biodegradable
Paper	10–30 days	Biodegradable
Cotton cloth	2 to 5 months	Biodegradable
Wood	10 to15 years	Biodegradable
Woollen clothes	About a year	Biodegradable
Tin, aluminium, and other metal cans	100 to 500 years	Non-biodegradable
Plastic, polythene bags	Several years	Non-biodegradable

Source: http: edugreeten.ri.res.in/explore/solwaste/types.htm

It is better to recycle the plastic waste i.e. unused plastic materials should be made to use again. However, during recycling certain colouring agents are added. This limits its usage especially for storage of food.

If you want to make your environment clean, remember four principles.

- **Reduce**
- **Reuse**
- **Recycle**
- **Recover**

9.7.4 Harmful Effects of Polybags carelessly thrown

1. In the process of eating the food waste animals swallow polythene bags. These plastic material choke the respiratory system of these animals, or forms ulcers in their stomachs and can be the cause of their death.

2. The polybags carelessly thrown here and there are responsible for clogging the drains, too. Sometime people throw the wrappers of chips, biscuits and other eatables on the road or in parks or public places.Is this a good practice? As a responsible citizen what measures do you suggest to keep environments clean and free of plastics?

Intext Questions 9.5

1. State whether the following statements are true or false:

   (i) Synthetic fibres are obtained from animals. (True/False)

   (ii) Rayon is an artificial silk. (True/False)

   (iii) Nylon is a man made fibre. (True/False)

   (iv) Synthetic fibres are costlier than natural fibres. (True/False)

2. Name any three synthetic fibres.

   (i) ..... (ii) ..... (iii) .....

3. Why should we not wear synthetic clothes while working in the kitchen?

   _____

4. Give any three characteristics of plastics.

   (i) ..... (ii) ..... (iii) .....

What have you learnt

- There is a variety of clothing material or fabric, such as, cotton, silk, wool and polyester.
- Fabrics are made from yarns, which in turn are made from fibres. Fibres are either natural or synthetic. Cotton, wool, silk and jute are some natural fibres, while nylon and polyester are some examples of synthetic fibres
- Natural Fibres are obtained from plants and animals.
- Fibres like cotton and jute are obtained from plants and are known as plant fibres.
- The process of making yarn from fibres is called spinning. The two main processes of making fabric from yarn are **weaving** and **knitting**
- Fibres like wool and silk are obtained from animals, hence they are known as animal fibres.
- Sheep hair is sheared off from the body, scoured, sorted, dried, dyed, spun and woven to yield wool.
- Silk fibres are obtained from silk moth. Caterpillar completely covers itself by silk fibres and turns into pupa.

- Silk fibres are separated out from a large pile of cocoons and processed. These fibres are then reeled into silk threads.
- Silk threads are woven into silk cloths.
- Synthetic fibres and plastics, like natural fibres, are made of very large units called polymers. Polymers are made up of many smaller units.
- Synthetic fibres are obtained by chemical processing of petrochemicals. Like natural fibres, these fibres can also be woven into fabrics Rayon, Nylon, Polyester and Acrylic.
- Synthetic fibres are durable, less expensive. They are used in house hold items, aeroplane, spaceship and health services.
- The different types of fibres differ from one another in their strength, water absorbing capacity, nature of burning, cost, durability, etc.
- Today, life without plastics cannot be imagined. But plastics are not environment friendly. Their disposal is very difficult.
- We need to use synthetic fibres and plastics in such a manner that we can enjoy their good qualities and at the same time minimise the environmental hazards for the living communities.

End of Chapter Questions

1. Classify the following fibres as natural and synthetic.

Fibre	Natural	Synthetic
Rayon	✖	✓
Wool		
Jute		
Cotton		
Polyester		
Silk		

2. State whether the following statements are true or false:

   a) Wool is a plant fibre. (True/False)

   b) Cotton is obtained from jute plants. (True/False)

c) Silk moths feed upon neem leaves. (True/False)

d) Separation of fibres from the seeds is called **ginning** of cotton (True/False)

e) Synthetic fibres are prepared from chemical substances. (True/False)

3. Fill in the blanks.

(i) The two main processes of making fabric from yarn are weaving and **.....**

(ii) The under fur of Kashmiri goat is used to make ..... shawls.

(iii) The process of removing grease, dust and dirt from sheared skin is called .....

(iv) Silk yarn are made of .....

(v) Silk fibres are separated out from the ..... before they turn to adult.

4. Arrange the stages involved in the process of wool processing in correct order.

Shearing, Sorting, Reeling, Scouring, Drying, Dyeing

5. Draw two stages of life cycle of silk moth which are related to silk production.

6. Match the words given in column 'A' with correct sentences given in column 'B'.

	Column A		Column B
(1)	Cocoon	(i)	produces wool
(2)	Rayon	(ii)	is heat resistant
(3)	Melamine	(iii)	produces silk fibre
(4)	Yak	(iv)	is an artificial silk

7. Why are the following articles made of thermosetting plastics?

(a) Electrical plugs and switches

(b) Handles of cooking utensils

8. Explain the process of making thread from cotton fibres.

9. Mention three advantagesof using plastic containers for storing food.

10. Which material would you prefer to make an umbrella for rainy season. Give reason.

Answer Key for Chapter Questions

9.1

1. Fibres, Plants, Goat
2. False, True, True, False

9.2

1. Cotton fibres are obtained from cotton fruits and jute fibres are obtained from the stem of jute.
2. Takli/Spindle and Charkha
3. ginning, Cotton, Spinning, Weaving and Knitting

9.3

1. Sheep, Goat, camel, Yak, Lama, Alpaca (any four)
2. True, False, True, False, False
3. Wool, Scouring, Sorting, Kashmir

9.4

1. Silk, Eggs, Caterpillar, Protein, Pupa
2. A common silk moth feeds on mulberry tree leaves.
3. *tassar*silk, *mooga*silk, *kosa*silk, Mulberry silk,

9.5

1. False,True, True, False
2. Rayon, Polyester, Acrylic
3. Synthetic fibres melt on heating. If the clothes made from such fibres catch fire, they melt and stick to the body of the person wearing it.
4. Plastics do not react with water and air. That is why they are used to store various kinds of material, including many chemicals.

   Plastics are strong and durable.

   Plastics can be moulded into different shapes and sizes.

   Plastics are poor conductors of heat and electricity.

10

Heat

In winter we use hot water for bathing and washing our hands and legs and cold water during summer season. We wear woollen clothes during winters. In summer we prefer to wear light coloured cotton clothes. Why? Cotton clothes give us a feeling of coldness.

When we rub our hands together, they become warm. Similarly, an object becomes hot when a hammer strikes on it.

How do we know whether an object is hot or cold? How do we find out how hot or cold an object is? What kind of substances produce heat on combustion? In this chapter we shall try to get answers to some of these questions.

Objectives

After studying this lesson, you should be able to

- know about the heat and its nature;
- Relate heat and temperature as well as its measurement;
- Use clinical thermometer and laboratory thermometer;
- Explain the process of transfer of heat in different materials;
- Explain the phenomenon of land breeze and sea breeze;
- State the properties of clothes wearing in summer and winter;
- Learn about the combustion and the conditions necessary for combustion;
- Describe the fuel and characteristics of an ideal fuel;

- Explain the flame and its structure;
- Describe the fire extinguisher and different ways of using it.

10.1 Heat and Temperature

We experience cold and heat every day. Having less or more heat causes us to feel cold, heat. When heat flows out of our body we feel cold. If the heat flows into our body from the outer environment then we feel hot.

Heat is a type of energy which is related to the motion of the molecules of a substance.

A physical quantity which determines the direction of flow of heat is called its temperature. Higher is the temperature of the substance, faster is the movement of its molecules, thus, more energy exists in the form of heat. Heat always flows from a body at higher temperature to a body at lower temperature, therefore, during the summer when the temperature of environment is more than our body, we feel hot, and in the winter the temperature of outside is less than the temperature of the body, hence we feel cold.

10.1.1 Effect of Heat as an Energy

Heat is a form of energy which is associated with the motion of the molecule of a substance. You might have seen that when water is boiled in a kettle covered with a lid, then its lid moves up frequently due to the pressure of steam. Obviously, steam is formed due to heat which raises lid up.

Our clothes dry up in the sun due to the heat. We obtain salt from the sea water with the help of heat.

Heat, as it has the capacity of doing work, is a form of energy.

If you observe your surroundings carefully, you will find that many other types of energy are transformed into heat. Burning candles causes chemical energy to change into heat. The electric energy in the electric furnace is converted into heat. In an electric heater electric energy is also changed into heat.

10.1.2 Effects of Heat

The higher the speed of the molecules of a substance, the higher its temperature and by providing heat the speed of its molecules increases. When any object is heated, one or more of the following effects may appear.

(i) Change in size – Metals like iron, mercury etc. expand on heating.

(ii) Rise in temperature – When a body is heated, it becomes hot.

(iii) **Change of state –** Solid substances change to liquid and gases. Water in liquid state changes to solid, liquid and gaseous state. For example, liquid water from ice and steam from water.

(iv) **Change in physical and chemical properties of a substance –** Iron when heated, becomes red hot.

(v) **Damage to living cells etc. –** If the leaf is lying in the sun, then it becomes dry. If the person remains in the sun for a long time, then the colour becomes black.

10.2 Measurement of Temperature

The measurement of hotness or coldness of a body is known as its temperature.Generally, we use our sense of touch to decide whether an object is hot or cold. But, can we guess the temperature of an object correctly only by touching it? Let's perform an experiment.

Activity 10.1

Take three tumblers. Label them as 1, 2 and 3. Put ice cold water in tumbler 1, hot water in tumbler 2 and lukewarm water in tumbler 3. Now dip your right hand in tumbler 1 and the left hand in tumbler 2 for some time. After keeping the hands in the two tumblers, put both the hands simultaneously in tumbler 3. What do you feel?

Fig.: Estimation of temperature by touching

The fingers of right hand feel hot and fingers of left hand feel cold. The fingers of the left hand feel hot due to colder than lukewarm water, while the right-hand fingers experience cold due to hotter than lukewarm water. It is clear that we can use our sense of touch to decide whether an object is hot or cold. But, to find out how hot or cold an object really is we use a special device known as thermometer. Let's find out what is a thermometer? And how do we measure the temperature of an object using it.

10.2.1 Thermometer (Clinical Thermometer)

The thermometer that measures our body temperature is called a clinical thermometer. Hold the clinical thermometer in your hand and observe it carefully. You will find that a clinical thermometer consists of along, narrow, uniform glass tube. It has a bulb at one end. This bulb contains mercury.

Outside the bulb, a small shining thread of mercury can be seen.You can see a kink near the bulb. This kink prevents mercury level from falling on its own when thermometer is taken out of mouth and we can read the thermometer easily.

Fig. 10.1: Clinical Thermometer

You will also find a scale on the thermometer. The scale we use is the Celsius scale, indicated by °C. A clinical thermometer reads temperature from 35°C to 42°C only.

In a thermometer another scale is also used to measure temperature which is known as Fahrenheit scale (°F). In Fahrenheit scale thermometer readsfrom 94°F to 108°F only.

The normal temperature of a healthy person is 37°C or 98.6°F.

10.2.2 Reading a Clinical Thermometer

Before the use of thermometer wash the thermometer properly. It is better to use an antiseptic solution rather than ordinary water. Hold it firmly and give it a few jerks. The jerks will bring the level of mercury down.Ensure that it falls below 35°C. Now place the bulb of the thermometer under the tongue. After one minute, take the thermometer out and note the position of mercury on the scale. This is your body temperature.

10.2.3 Laboratory Thermometer

To measure the temperature of other objects, there are other thermometers. One such thermometer is known as the laboratory thermometer.

Laboratory thermometer consists of a long, narrow glass tube. The lower end of this tube is like a bulb. This tube contains mercury or alcohol. Its upper end is sealed. The glass tube is kept in ice cubes. The point in the tube where mercury becomes steady after getting cooled is marked as 0°C. Now the tube is kept in the steam of boiling water. The mercury starts to expand inside the tube. The point in the tube where mercury becomes steady is marked as 100 °C. The intervening space between the two points is divided into 100 equal parts. Thus, the measure of each small division is 1°C. Generally, the range of this thermometer is –10°C to 110°C.

Fig. 10.2: Laboratory Thermometer

Precautions

1. The laboratory thermometer should be kept upright while using.
2. The bulb should be surrounded from all sides by the substance of which thetemperature is to be measured.
3. The bulb should not touch the walls of the container.

Intext Questions 10.1

1. What is heat?

   _____

2. Mark (✔) against correct statement and (✖) against wrong statement.

   (i) Temperature of an object decreases on heating. ( )

   (ii) Heat cannot be converted into energy. ( )

   (iii) We can measure the temperature of an object by touching it. ( )

   (iv) Clinical thermometer contains mercury. ( )

   (v) The glass tube of a clinical thermometer is kinked near the bulb. ( )

   (vi) Laboratory thermometer contains water. ( )

3. Draw a diagram of clinical thermometer.

   _____

10.3 Propagation of Heat

What happens when we pour hot tea in an empty glass of steel? Glass becomes hot. What happens when a metallic rod is heated near its one end? After some time, another end of this metallic rod also becomes hot. Keeping the hot tea filled mug for some time, the tea cools down. The body starts getting warm when standing at a distance in front of the fire.

These actions show that heat flows from one object to another, from one place to another and from one part of the object to the other. The process of transfer or displacement of heat is called propagation of heat.

How does heat propagate? Let's understand.

Activity 10.2

Take two rectangular pieces of iron or any metal of same size. Heat one of the pieces for a while. Now place the second piece above or close to the hotter piece. After some time, find the temperature of both the pieces. You will observe that the temperature of the second piece increases. What does this conclude? The propagation of heat between two objects is due to the temperature difference. The heat always flows from a hotter object to a colder object.

How does heat transfer? Let's explore.

Activity 10.3

Dip one end of the spoon of steel in the boiling water. What happens if you keep holding the other end of the spoon? The other end of the spoon gradually becomes very hot due to heat. How does the heat of boiling water reach from one end of the spoon to the other? Let's know.

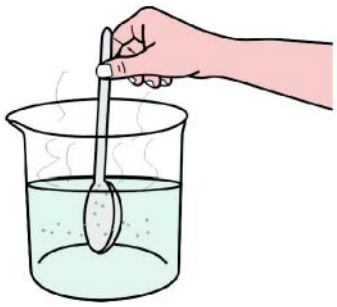


Fig: Conduction of Heat

Each substance is made up of molecules. The temperature of the tip of spoon,which is in boiling water, increases. Hot molecules transfer their heat to neighboring molecule. These molecules transfer their heat to their neighboring molecules. Thus, the heat reaches the end of less temperature from the end of higher temperature, and after some time the other end of the spoon becomes hot. This method of heat transfer is called **conduction**.

Do all substances conduct heat easily? Why the metallic pan for cooking has a plastic or wooden handle?

Activity 10.4

Heat water in a small pan or a beaker. Collect some articles such as a steel spoon, plastic scale, pencil,metallic rod etc... Dip one end of each of these articles in hot water. Wait for a few minutes. Touch the other end. Enter your observation in the following table.

Article	**Material with which the article is made of**	**Does the otherend get hot Yes/No**
Steel spoon	Metal	Yes
Plastic scale		
Pencil		
Metallic rod		

You will find that some materials become hot easily e.g. iron, steel etc. while some other materials like pencil, wood, plastics do not get hot easily.

The materials which allow heat to pass through them easily are conductors of heat. For examples, aluminium, iron and copper. The materials which do not allow heat to pass through them easily are poor conductors or insulators of heat such as plastic and wood.

The water and air are poor conductors of heat. Then, how does the heat transfer take place in these substances? Let us find out.

Fig. Conduction of heat by different material

Activity 10.5

Take a tumbler. Fill it with water. Wait till the water in the flask is still. Place a crystal of potassium permanganate at the bottom of the flask gently. Now, heat the tumbler slowly.

Observe the coloured streams arising from the surface of water. What do you see?

When water is heated, the water near the flame get shot. Hot water rises up.The cold water from the sides comes in to take its place. This water also gets hot and rises and water from the sides moves down. This process continues till the whole water gets heated. This mode of heat transfer is known as convection.

How does the heat transfer in air? The air near the heat source gets hot and rises. The air from the sides comes in to take its place. In this way the air gets heated. This air also gets hot. Thus, the process continues to take place.

Applications of convection in daily life

1. Chimney: Smoke and hot gases from homes and factories rise up due to convection and get out through the chimney.
2. Ventilators:

Activity 10.6

Light a candle. Keep one hand above the flame and one hand on the side of the candle. Do your hands feel equally hot? If not, which hand feels hotter? And why?

Here, the air above the flame gets heated by convection. Therefore, the hand above the flame feels hot. On the sides, however, there is no convection and air does not feel as hot as at the top.

When we come out in the sun, we feel warm. How does the heat from the sun reach us? It cannot reach us by conduction or convection because both of these processes require a medium. There is no medium such as air in most part of the space between the earth and the sun, hence, from the sun the heat comes to us by another process known as **radiation**.The transfer of heat by radiation does not require any medium. When we sit in front of a room heater, we get heat by this process.

Fig.: Transfer of heat by convection in air

Our body too, gives heat to the surroundings and receives heat from it by radiation.

A hot utensil kept away from the flame cools down as it transfers heat to the surroundings by radiation.It means that all hot bodies radiate heat. When this heat falls on some object, a part ofit is absorbed and a part is reflected.

The temperature of the object increases dueto the absorbed part of the heat. Now you have understood that why you are advised to use an umbrella whenyou go out in the sun.

10.4 Land breeze and sea breeze

The people living in the coastal areas experience an interesting phenomenon. During the day, the land gets heated faster than the water. The air over the land becomes hotter and rises up. The cooler air from the sea rushes in towards the land to take its place. The air from the seais called the **sea breeze**.

Fig. 10.3: Land breeze and sea breeze

At night the land cools down more quickly than the sea water. So, the cool air from the land moves towards the sea.This is called the **land breeze**.

10.5 Properties of clothes we wear in summer and winter

In summer we prefer light-coloured clothes and in winter we usually wear dark-coloured clothes. Why is it so? Let us find out.

Activity 10.7

Take two identical tin cans. Paint the outer surface of one black and of the other white. Pour equal amounts of water in each and leave them in the mid-day sun. After some time measure the temperature of water in both the cans. Do you find any difference in the temperatures? You will find that the water in black can is warmer. You can feel the difference even by touching water in the two cans.

Activity 10.8

Fill the two cans used in the above Activity with the same amount of hot water at the same temperature. Leave the cans in a shade. After 10-15 minutes note the temperature of water in each can. Does the temperature of water in both the cans fall by the same amount? Do these activities suggest to you the reason why it is more comfortable to wear white or light-coloured clothes in the summer and dark-coloured clothes in the winter?

Dark surfaces absorb more heat and, therefore, we feel comfortable with dark coloured clothes in the winter. Light coloured clothes reflect most of the heat that falls on them and, therefore, we feel more comfortable wearing light coloured clothes in the summer.

10.5.1 Woollen clothes keep us warm in winter

In the winter, we use woollen clothes. Wool is a poor conductor of heat. Moreover, there is air trapped in between the wool fibres. This air prevents the flow of heat from our body to the cold surroundings. So, we feel warm.

Suppose you are given the choice in winter of using either one thick blanket or two thin blankets joined together. What would you choose and why?

Remember that there would be a layer of air in between the blankets. It is therefore said that in winter one should be dressed in layers instead of single thick cloth.

Intext Questions 10.2

1. Fill in the blanks.

   (a) The process of transfer of heat is called.....

   (b) Plastics and wood are ..... of heat.

(c) In solids, the heat is transferred mostly by.....

(d) Smoke from the chimney is released out by the process of .....

2. Mark (✓) against correct statement and (✖) against wrong statement.

(i) The heat always flows from a hotter object to a colder object. (correct/incorrect)

(ii) Copper and iron are bad conductors of heat. (correct/incorrect)

(iii) Transfer of heat by convection does not require any medium.(correct/incorrect)

(iv) Light colours reflect most of the heat that falls on them. (correct/incorrect)

(v) At night cool air from the sea moves towards the land. (correct/incorrect)

3. Mark (✓) against the most appropriate answer in the following.

A wooden spoon is dipped in a cup of *ice cream*. Its *other end*.

(a) becomes cold by the process of conduction.

(b) becomes cold by the process of convection.

(c) becomes cold by the process of radiation.

(d) *does* not *become* cold.

4. What are the three methods of heat propagation.

(i) ..... (ii) ..... (iii) .....

10.6 Combustion

The process of burning is known as combustion. Combustion is a chemical process. In this process a substance reacts with oxygen to give off heat. The substance that undergoes combustion is called a **fuel**. Some materials burn with flame like a candle while some materials burn without flame like coal.

The substance that undergoes combustion easily and produces heat is said to be combustible. Different substances catch fire at different temperatures. The lowest temperature at which a substance catches fire is called its **ignition temperature.**

Necessary conditions for combustion

1. **Heat —** ignition temperature must be within access.
2. **Fuel —** Fuel should be combustible.
3. **Oxygen —** suitable amount of oxygen must be there.

10.6.1 Flame

The substances which vaporise during burning, give flames. For example, molten wax rises through the wick and vaporised during burning and forms flames.

Coal, on the other hand, does not vaporise and so does not produce a flame. Let's see the composition of flame.

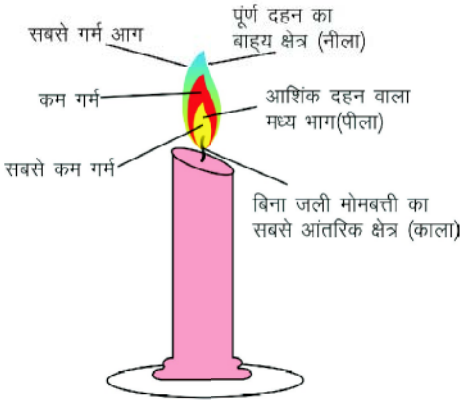


Fig. 10.4: Different zones of a flame

Activity 10.9

Light a candle and observe its flame carefully. Now introduce a clean glass plate/slide into

the flame of the candle. Hold it there with a pair of tongs for about 10 seconds. Then remove it.What do you observe?

A circular blackish ring is formed on the glass plate/slide. It indicates the deposition of unburnt carbon particles present in the luminous zone of theflame.

Activity 10.10

Now introduce a portion of a wire in the uppermost part of the flame. You will observe that this portion of the wire gets red hot. It indicates that the non-luminous zone of the flame has a high temperature. In fact, this part of the flame is the hottest part.

Goldsmiths blow the outermost zone of a flame with a metallic blow-pipe for melting gold and silver. They use the outermost zone of the flame for melting gold and silver.

10.7 Fire Fighting

You must have seen or heard of fire breaking out in homes, shops and factories due to the carelessness and faulty equipment. We have learnt that there are three essential requirements for combustion. These are: fuel, air (oxygen) and heat. Fire can be controlled by removing one or more of these

requirements. It is quite difficult to remove fuel from the site of fire, So, the fire is extinguished by the following two factors.

1. By cuttingoff the supply of air: The supply of air can be stopped by covering the burning solid fuel with soil, sand and blanket.
2. By cooling the combustible material below its ignition temperature: Water is a most common fire extinguisher. Water cools the combustible material below its ignition temperature. This prevents the fire from spreading. Water vapours also surround the combustible material, helping in cutting off the supply of air. But water works only when things like wood and paper are on fire.

Fig. 10.5: Fire extinguisher

If electrical equipment is on fire, water may conduct electricity and harm those trying to douse the fire.

Water is also not suitable for fires involving oil and petrol. Water is heavier than oil. So, it sinks below the oil, and oil keeps burning on top.

For fires involving electrical equipment and inflammable materials like petrol, carbon dioxide is the best extinguisher. Carbon dioxide covers the fire like a blanket. Since the contact between the fuel and oxygen is cut off, the fire is controlled.

You might have seen red cylinder to get the supply of carbon dioxide. Carbon dioxide is stored at high pressure as a liquid in these cylinders. When released from the cylinder, carbon dioxide expands enormously in volume and cools down. So, it brings down thetemperature of the fuel. That is why it is an excellent fire extinguisher.

Fire extinguisher – When the knob of the cylinder is opened soda reacts with acid and pours the mixture of carbon dioxide and water on the fire and fire is extinguished.

10.8 Fuel

The substances which have energy stored in them in different forms and provide energy are known as fuels.A good/ideal fuel is one readily available. It is cheap. It burns easily in air at a moderate rate. It produces a large amount of heat. It doesnot leave behind any undesirable substances.

We obtain energy from different sources. These sources may be natural or artificial.

10.8.1 Natural Sources of Fuel

We get coal, petroleum and natural gas from different natural sources. If we continue to use them with present faster rate the reserves of oil and natural gas present in the earth will exhaust in next 25-30 years. These fuels are also known as **fossil fuels**.It is considered that these were formed from the dead remains of living organisms (fossils).

Coal reserve found as coal mines is limited. In future entire coal will be used up and this natural source of energy will be exhausted in the years to come. Coal is a substance which contains chemical energy and this energy is converted to heat on burning.

Other sources like liquid petroleum were also formed when animals got buried under the soil millions of years ago. They also contain chemical energy which gets converted to heat and light on burning.

All the fuels mentioned above burn in the presence of oxygen and produce different gases like carbon dioxide and sulphur dioxide. All these gases pollute atmosphere and pose threat to our health also. We use liquid petroleum to run buses, trucks, trains, aeroplanes, cars and scooters etc. Kerosene is used for lighting and getting heat energy. The comparative study of all these fuels suggests that different fuels have different thermal efficiency.

10.8.2 Coal and Petroleum

(A) Coal

Millions of years ago big trees, forests, plants and vegetation got buried under the soil and slowly converted to coal. Hence there are so many varieties of coal. Coal is used as a fuel in large furnaces and industries, production of bricks, thermal power stations, making food and other domestic purposes. For obtaining coal large and deep mines are made in the earth crust. Pure coal is obtained from relatively deep and dangerous mines.

Fig.10.6: Coal

Coal is mainly of two types – natural coal and charcoal. Comparative study of the calorific values of natural coal and

charcoal suggests that the calorific value of natural coal is hundred times of charcoal. The most important property of coal is that it radiates energy on burning continuously. Due to this property, it is used in various domestic purposes.

Basically, all types of coal are modified wood. Charcoal is produced from the wood of special trees. It has also the capability of radiating energy continuously.

(B) Petroleum

Liquid Petroleum was formed from large animals and numerous human bodies which are buried in the earth crust. These oily materials are found in seabed as well. Iran, Iraq, Kuwait and other Arab countries are the major petroleum producing countries in the world.These materials are used to get energy. Petrol, kerosene, Diesel and mobile oil are some examples of petroleum products. During the mining of petroleum some natural gases are also produced. The natural gas is used as CNG. LPG is also a gaseous fuel obtained from petroleum. We must use these natural resources wisely. They are present in limited quantity on the earth. If their use continues with present rate, these natural resources will exhaust in next few years.

Intext Questions 10.3

1. What do you mean by combustion?

_____

2. Match the column 'A' with column 'B'.

Column 'A'		Column 'B'	
(a)	The substances which vaporise during burning	(i)	is hottest.
(b)	the uppermost part of the flame	(ii)	the contact between the fuel and oxygen
(c)	Water is a	(iii)	give flames.
(d)	carbon dioxide cut off	(iv)	conductor of electricity.

3. What are the various types of coal?

_____

What have you learnt

- Heat is a type of energy which is related to the motion of the molecules of a substance.
- Thermometer is a device that measures temperature.The thermometer that measures our body temperature is called a clinical thermometer.A ***clinical*** thermometer has a temperature ***range*** of only 35°C to 42°C.To measure the temperature of other objects, laboratory thermometer is used. Generally, the range of this thermometer is –10°C to 110°C.
- The heat always flows from the hotter to the cooler object. There are three modes of *heat transfer*: conduction, convection and radiation.
- In solids, heat is transferred by conduction, while the transfer of heat in liquids and gases is due to convection. But for radiation no media are required.
- The materials which allow heat to pass through them easily are known as conductor of heat. On the other hand,those materials which do not allow heat to move easily through them are called heat insulator or heat resistant.
- Dark coloured objects are good absorber of heat radiation than light coloured objects.
- During the day, the land becomes hotter and air rises up. The cooler air from the sea rushes in towards the land to take its place. This is called the **sea breeze**.
- At night the land cools down more quickly than the sea water. So, the cool air from the land moves towards the sea. This is called the **land breeze.**
- Woollen clothes keep us warm during winter, because **wool** is a poor conductor of heat and it has air trapped in between the fibres.
- The process of burning is known as combustion. Heat and light are produced during combustion. The lowest temperature at which a substance catches fire is called its **ignition temperature**
- A substance which burns in air is known as fuel or combustible substance.
- Easily available, cheap/economical and easy to burn and does not leave any residue on burning. These are the characteristics of an ideal fuel.
- Flame is a zone where combustion of gaseous substance takes place. Flame consists of several zones of different temperature.
- Generally, water is used to douse fire. But water is not suitable for fires involving electrical equipment and inflammable materials like petrol. Carbon dioxide is the best extinguisher in such cases.

End of Chapter Questions

1. Write similarities and differences between laboratory thermometer and clinical thermometer?
2. Give any four examples each of heat conductor and heat insulator.
3. Mark (✓) against the correct statement.
   (a) Transfer of heat by radiation
      (i) require a medium (ii) does not require a medium
      (iii) air is essential. (iv) solid is essential
   (b) Heat is propagated in liquids through
      (i) Conduction (ii) Radiation
      (iii) Convection (iv) None of these
4. Fill in the blanks.
   (a) Temperature of boiling water is…….
   (b) An iron rod is a …… of heat.
   (c) ..... coloured objects are good absorber of heat radiation than light coloured objects.
   (d) Temperature is measured in degree……
   (e) The hotness of a body is measured by……...
   (f) ……...is being used as a fuel to run buses these days.
5. Match the statements given in column (A) with those given in column (B).

Column 'A'	**Column 'B'**
1) All metals are	(i) in winter
2) When the bulb of a thermometer is heated,	(ii) conductor of heat
3) The degree of hotness or coldness of an object	(iii) the mercury starts to expand
4) Dark coloured clothes are preferred	(iv) is measured by thermometer

6. Why is it advisable to wear layers of clothes instead of one thick cloth?

7. What are the three modes of heat transfer?

8. Why do you prefer to wear white clothes during summer?

9. Generally, the bottom of a stainless steel *kadhai* is made of copper. The reason is that

   (a) copper bottom makes the *kadhai* durable.

   (b) the *kadhai* appears attractive.

   (c) copper is better conductor of heat than stainless steel.

   (d) copper is easier to clean than *Stainless steel.*

10. Why is the handle of a metallic kettle covered with strips of cane?

11. Draw a labelled diagram of a candle flame.

12. Write the conditions necessary for combustion.

13. Write the answers of the following questions.

   (a) Why clinical thermometer cannot be used to measure high temperature?

   (b) Why is a clinical thermometer kept under the tongue for taking body temperature?

   (c) Why does the mercury not fall in a clinical thermometer when it is taken out of the mouth?

14. Match the column

	Column 'A'		**Column 'B'**
1)	Wood	(i)	Liquid fuel
2)	Kerosene	(ii)	Gaseous fuel
3)	Coal	(iii)	Obtained from wood
4)	LPG	(iv)	Solid fuel

Answer Key for Chapter Questions

10.1

1. Heat is a form of energy.Having less or more heat causes us to feel cold, heat.

2. (i) incorrect (ii) correct (iii) incorrect

   (iv) correct (v) correct (vi) incorrect

3. Diagram

10.2

1. (a) propagation (b) insulator (c) conduction (d) convection

2. (i) incorrect (ii) incorrect (iii) correct (iv) correct (v) incorrect

3. (d) *does* not *become* cold

4. conduction, convection, radiation

10.3

1. Combustion is a chemical process. In this process a substance burns with oxygen or air to give heat and energy.

2. (a) (iii) (b) (i) (c) (iv) (d) (ii)

3. Coal is mainly of two types : natural coal – formed millions of years ago when big trees, forests, plants and vegetation got buried under the soil and charcoal – which is prepared by the combustion of wood..

11

Nutrition in Living Beings and Plants

Sushila and Ram were playing outside their home. Their mother called them for having food. Children were busy playing. They didn't want to leave the game. Sushila asked her mother,"maa, why do we need to eat food? What is its need? Why can't we always play?" Mother laughed at her words. She said, "do you feel hungry? If yes, then eating food is the solution to stop hunger. Let us eat food, I will tell you about nutrition."

Nutrition means eating healthy foods is very necessary. Both animals and plants take nutrition in one form or another. What is the difference between plants and animals? What are the types of nourishment? What do you mean by digestion process? We will study about these topics in this chapter.

Objectives

After reading this chapter, you will be able to

- Define nourishment
- Understand autotrophic and heterotrophic nourishment
- Explain the process of photosynthesis by which plants prepare their own food
- Learn about host plants and parasitic nourishment
- Differentiate between herbivores, carnivores and omnivores
- Explain the digestive system in humans

11.1 Various types of Nourishment

Food or nutrition is necessary for every living being, both animals and plants. Nourishment items are essential for the physical structure, growth, health and maintenance of non working or weak parts of living beings. Living beings get energy required for the essential movement from food. The process and technique of eating food and the use of its energy is known as nourishment. Nourishment is of two types in living beings which include:

1. Autotrophic – this is that method of nourishment where living beings prepare their own food. These plants prepare their food with the help of water, carbon dioxide and minerals. Thus, these plants are known as autotrophic.
2. Heterotrophic - animals and other living beings make their food with the help of food synthesized by plants. These are known as heterotrophs.

11.2 Process of photosynthesis in plants

Photosynthesis is the process by which plants prepare their foods. Leaves are kitchen of the plants. Plants prepare their food in leaves. The process of preparing food in plants is known as photosynthesis. Therefore, all the raw materials are supplied to the leaves. These raw materials are absorbed by water and minerals by the roots of the plants present in soil. These absorbed water and mineral elements are sent to leaves by means of stem. There are small holes present in the layer of leaves. These holes help leaves in getting carbon dioxide present in air. There holes are covered by epidermis cells. The holes are known as pores.

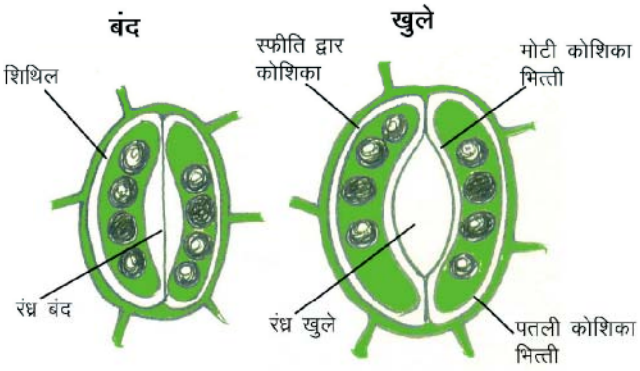


Fig. 11.1: Structure of pores in leaves

Leaves are of green colour. This green pigment present in leaves is known as chlorophyll. Leaves are of green colour due to presence of chlorophyll. Chlorophyll helps leaves in collecting energy from the sunlight. This energy is used for synthesizing the food. By food synthesis we mean the use of stored energy, water and carbon dioxide to prepare food. Since this process is done in the presence of sunlight it is known as photo synthesis.

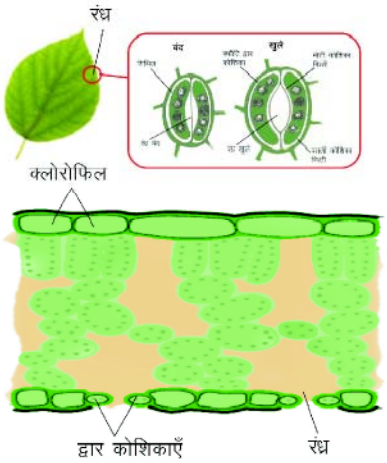


Fig. 11.2: Photo Synthesis

Therefore, in the process of photosynthesis, chlorophyll present in the leaves synthesises water and carbon dioxide to prepare food. This process is presented in the form of following equation:

$$\text{Carbon dioxide + water} \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} \text{carbohydrate (glucose) + oxygen}$$

This process helps in releasing oxygen. Carbohydrates are changed to starch in this process.

For the process of synthesis, we need chlorophyll, sunlight, water and carbon dioxide. Leaves collect sun energy and prepare food for the plants. The life of all the living beings is directly or indirectly dependent on this stored food.

Therefore, sun is the prime source of energy for all the beings.

Oxygen gas which is required for every living being is released in the process of photosynthesis. It is impossible to imagine a life on earth without photosynthesis.

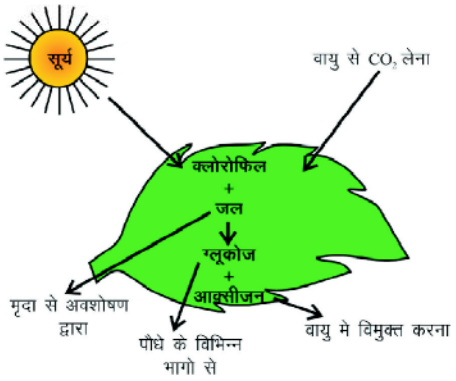


Fig. 11.3: Photosynthesis System

Chlorophyll is present in all colours of leaves. Chlorophyll is found in all types of leaves like green, red, yellow, brown etc. These colours cover the chlorophyll of the leaves, but these leaves are involved in the process of photosynthesis.

Fig. 11.4: Different color leaves

Do you know

Do you know that not only leaves but green parts of plants like branches and stem also help in the process of photosynthesis? Desert plants take the shape of thorns for the objectives of less evaporation. Green stem of these plants prepare food by photosynthesis. Other than these, algae and weeds present on walls and in pond also prepare food by the process of photosynthesis.

Intext Question 1.1

1. (✓) Tick the correct and cross (✖) the wrong statement: -

   a. Plants do not need nourishment (True/False)

   b. The top layer of leaves has small pores. (True/False)

   c. Roots get water and minerals from soil. (True/False)

   d. Oxygen is required for photosynthesis. (True/False)

   e. Chlorophyll is found in leaves. (True/False)

2. Match the following:-

	Column 'A'		Column 'B'
i)	Plant Autotrophic	i)	Due to chlorophyll
ii)	Leaves are plants	ii)	Sunlight require
iii)	For photosynthesis	iii)	Living Beings
iv)	Green colour of leaves	iv)	Kitchen

3. Why do organisms need food or nutrition?

_____

11.3 Other methods of Nourishment

There are many plants and animals who do not have chlorophyll, therefore they are unable to synthesise their own food. They are dependent on the synthesised food of the plants. Many animals eat directly the plants. Some of them eat those animals who consume foods. Some animals eat both plants and animals. All these animals use heterotrophy systems for nourishment. The method of nourishment where living beings are dependent on food prepared by plants is known as heterotrophy. This type of nourishment is of various types like herbivores, carnivores, omnivores, parasites, saprophyte, pitcher etc. let us learn about them in detail.

11.3.1 Herbivores Nourishment

Some beings gain nourishment by eating plants. These are known as herbivores. Some of them are Cow, Buffalo, goat, deer, camel etc. Many people only eat vegetables, fruits etc. These are known as vegetarians. The stomach of animals like cow, buffalo etc have four parts. They grasp grass fast

and store it in a part of their stomach. This part is known as cud. Here some part of food is digested which is known as ruminate. However animals take food back in their mouth to chew it. This is known as ruminating. Grass contains cellulose in maximum quantity. Many animals and human beings are unable to digest cellulose.

Fig. 11.5 Herbivore Animals

11.3.2 Carnivore Nourishment

Those animals which gain energy by eating other animals are known as Carnivores like lion, bear, fox, eagle, python etc.

Fig. 11.6: Carnivores animals

Pitcher Plant

There are many plants who catch hold of insects and digest them. Such plants can be of green or any other colour. 'Nepenthes' is one such plant. Such kind of plants are known as pitcher plants. The leaves of these plants transform themselves in the shapes of a pitcher. The top part of leaves works as the cap of pitcher. This plant has thin hairs. These hairs are numerous and have pores which are tilted downwards.

Whenever any insect enters the plant, these pores catch hold of it. The digestive juice present in pitcher helps in the digestion of insects. **Venus Flytrap** and **Sundue** are other pitcher plants. These plants are low in nitrogen content. They end this deficit by digesting insects. These plants are found in those places where nitrogen content flows away from the soil due to heavy rains.

Fig. 11.7: Pitcher Plant

11.3.3 Omnivores Nourishment

Some beings take nourishment from both herbivores and carnivores. Such beings are known as omnivores. These include humans, crow, cockroach, dog, cat etc.

Fig. 11.8: Omnivore Animals

11.3.4 Parasitic Nourishment

When a living being gets nourishment from other living being (by staying either inside and outside) is known as parasitic Nourishment. These beings that get food from the body of other beings are known as parasitic. The life from where parasite gets food is known as heterotroph.

Cuscuta Reflexa is a yellow coloured rope. This plant grows by covering other plants. This plant does not have chlorophyll. Therefore it could not produce its own food. By the help of its special roots its gets nourishment from heterogeneous plants.

Lice, Bedbugs, louse, mosquito etc are those parasites which suck blood from heterogeneous body to get their nourishment from parasitic body. Eskeris is also an example, which live in human intestine to gain nourishment.

Fig. 11.9: Eagle, Vulture, Fox

Some plants are also saprogenous like mushroom. Mushroom grows in the rainy season on leaves and stem. This is a kind of fungi. These spread some juice on the layer of dead and decomposed plants and organisms.

Then theses beings are transformed into decomposed form which is absorbed by them in the form of food. Other types of fungi like fungi on mushroom, pickle, leather, clothes, bread etc. also get their nourishment in the same way. Such organisms are known as decomposition.

11.3.5 Symbiotic Relationship

Many organisms live with each other. They have their shelter and nourishment with each other. Such relationships are known as symbiotic relationship. Some fungi live in the roots of plants and trees. Fungi gets food from plants. In return to this the plant gets water and nutrition substance as help in the absorption of organisms i.e. Lykane has two helpers. One of them is weeds and second, fungi. Weeds have chlorophyll whereas fungi do not have chlorophyll. Fungi gives shelter, water and nutrition substance to weeds, whereas weeds give synthesized food by process of photosynthesis to fungi.

Fig. 11.10 (a): Lykane

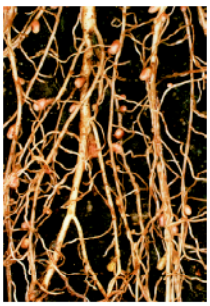


Fig. 11.10 (b): Symbiotic Relationship

Another example of symbiotic relationship is Rizobium bacteria. These are found in roots of plants. These plants change the element of nitrogen in the air. This airy change helps in the easy absorption by plants. In return to this Rizobium provides shelter and food to plants. This plant is very important for farmers. There is no need to give nitrogen fertilizer to the crop of pulses. Also, there is no need for fertilizers to take the next crop of the land.

11.3.6 Nutrition in Amoeba

Amoeba is a single cell being which is found in water bodies. Amoeba can change its shape continuously. Join (artificial legs) are found in Amoeba which have the shape of finger. These give motion to the Amoeba and help them in collecting the food.

Amoeba is a single cell which has one cell membrane, central and other food vessels. Amoeba takes small food by join. These get stuck to its stomach. This secretes digestive juice. This digestive juice changes the food items to smaller and simple food items. Also this juice helps in the absorption of food items in the cell.

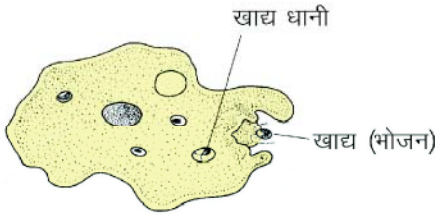


Fig.11.11: Amoeba

This substance gives energy to Amoeba to do many works.

The non-digestive food is excreted. The basic structure of digestive system is same in all the living beings. This helps in simplifying the food items and releases energy.

Intext Questions 11.2

1. Fill in the blanks: -

   A) Heterotrophs get food synthesized by _____.

   B) Leaves are transformed into the shape of _____ in pitcher plants.

   C) Omnivores take both types of food, carnivores and _____

   D) Louse is a _____ organism.

   E) Amoeba has join which helps him in catching _____.

2. Write any two examples of following : -

S. No.	Methods of nutrition	Example
1.	Herbivores	_____
2.	Pitcher	_____
3.	Omnivores	_____
4.	Parasite	_____
5.	saprogenous	_____
6.	Symbiotic	_____

3. Write the answers of the following: -

a. From where is digestive juice secreted in Amoeba?

_____

b. What is the characteristic of symbiotic relationship?

_____

11.4 Human Digestion

All living beings whether single cell or multi cell have the digestion of food as the common factor. The digestion of food is divided into five categories: -

1. Intake
2. Digestion
3. Absorption
4. Utility
5. Excretion

Let us see what is human digestion is ?

The food eaten or taken by human mouth is passed through a continuous pipe. This pipe starts from mouth and ends on anal. There are following areas of this pipe which are: -

1. mouth
2. Food Pipe
3. stomach
4. Small intestine
5. Big intestine joined with
6. anal

All these parts together form the digestive system of humans. As food goes inside, various processes start in the sequential form of digestion.

Let us learn, what happened to the food in various parts of human digestive system.

i) Mouth and mouth intake

Mouth is used for taking food inside in humans. The process of taking food inside human body is known as intake.

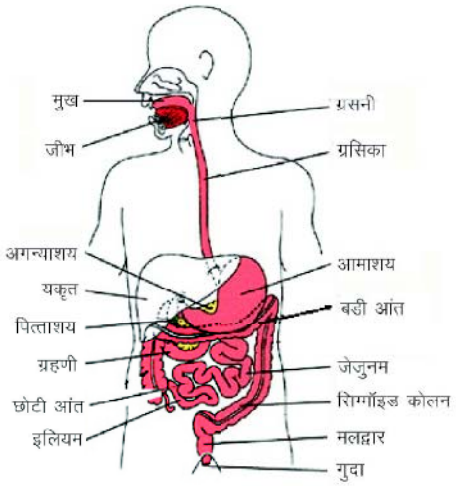


Fig. 11.12

ii) Teeth

There are 32 teeth inside the mouth. Food is chewed with the help of teeth. The mechanical process of chewing makes small pieces of food. Every teeth and gum has a separate socket. There are 16 teeth in Upper Jaw and 16 in lower jaw.

The shape of teeth are different. Their functions are also different.

1. **Canine** - Two teeth in the front of human mouth are known as canine. These are helpful in cutting of food.
2. **Incisors** - On both sides of canine. There are pairs of 2 teeth on each side known as incisors. Their function is to tear apart the food.
3. **Pre molars** - On both sides of incisors, there are two premolars. Their work is chewing and grinding the food.
4. **Molars** - The next three teeth to premolars are known as molars. These are also used to chew and grind the food.

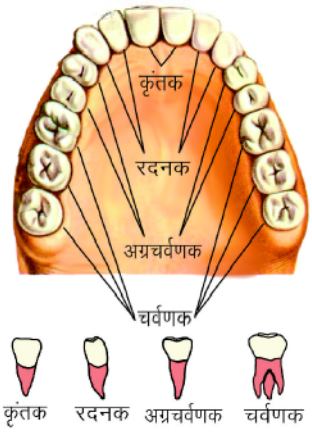


Fig. 11.13: Jaw and Teeth

Saliva Glands

Apart from teeth, mouth has tongue and saliva glands. These glands secrete saliva and it helps food to change to sugar. This makes food soft.

iii) Tongue

Tongue is a muscle organ. This is linked towards the back side of mouth. The other part of

tongue is free. This front portion can move in any direction. Tongue does a lot of functions. Tongue is mostly used to speak. Tongue also helps in mixing saliva in the food. Tongue also helps in pushing food to the pipe. This food softens by mixing of saliva.

There is another function of tongue with which you are familiar. Tongue helps us in tasting various types of food. Tongue has taste cells on various parts to identify the taste.

Following activity will help you in understanding the various areas of tongue.

Fig. 11.14

Activity 11.1

Make different solution of following items and pour them in different points like-

1. Mixing Sugar
2. Salty water
3. Lime Juice
4. Neem or bitter gourd juice

Close your friend's eyes with a cloth. Ask your friend to keep his tongue in the front.

Now keep two drops of these items as per the indication of taste cells in the above picture. Repeat these with other items. Use dropper or stick to drop the solution.

Ask him in which part he is experiencing sweet, salty, saline and bitter.

You can repeat this activity with more people.

iv) Food Pipe

The food taken by mouth is transferred to food pipe. This food with the food pipe goes to chest. The contraction and expansion of food pipe walls helps the food to reach slowly.

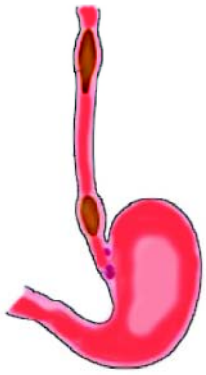


Fig. 11.15: Food in food pipe

v) Stomach

Stomach is a thick walled polythene shaped organ. This is flat and U shaped. This is the widest part of food pipe. It connects food pipe on one end and connects small intestine on the other side. When food reaches stomach, then it secretes a type of digestive juice from internal walls which include mucus and hydrochloric acid. Mucus provides security to the internal surface of stomach. Acid destroys those bacteria which reach stomach with food. It also makes food acidic. Acidic foods help digestive juices in doing their activity. Digestive juice breaks protein present in the food into simple substances.

vi) Small Intestine

Stomach sends food to small intestine. Small intestine is about 7.5 metres in length, narrow and has spiral pipe. The walls of small intestine secrete digestive juices. These digestive juices help in the digestion of protein, carbohydrate, maltose sucrose and fat.

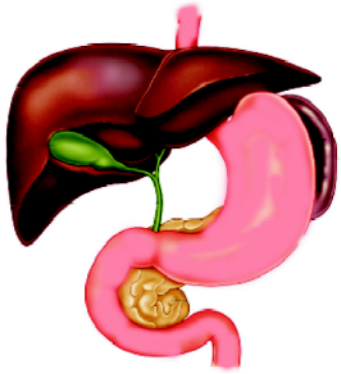


Fig. 11.16: Liver and Bladder

Liver is a gland of deep red colour. This is the biggest gland in human body. This is found in upper part of stomach and is on left side of stomach. This makes genic juices which are stored in one part of liver. This part is known as gall bladder. During digestion process genic juice is sent from bladder to small intestine. Genic juice plays an important role in the digestion of fat.

Pancreas is also a big gland of light yellow colour.

This is situated just below stomach. Pancreatic juice does effect carbohydrate and protein. Due to this protein gets transformed into simple form. Food is digested partially by means of these digestive juices. Rest of the digestion takes place in the above part of small intestine. When food reaches the lower part of small intestine it gets digested fully. Carbohydrate is changed to simple sugar like glucose. Fat is changed to fat acid and glycerol. Protein gets changed to Amino Acid.

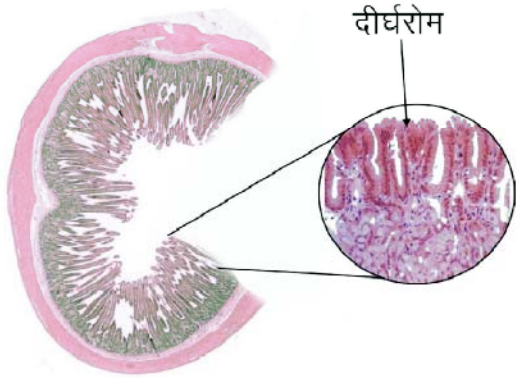


Fig. 11.17: Doudenum

Absorption in small intestine

Digested food is absorbed by Blood vessels on the walls of small intestine. This process is known as absorption. Small intestine has the structures of curved fingers in the internal walls.

These are known as plumule. These blood vessels enlarge the base area for the absorption of digested food.

Absorbed food from plumule goes to vessels. Blood vessels take absorbed elements to heart by the way to liver. From there, these food materials are sent to various parts of human body. There these are used to make complex elements. This process is known as assimilation. In this process glucose is broken in the internal part of cell with the help of oxygen. This activity forms carbon dioxide and water. This also releases energy.

Glucose $\xrightarrow{\text{Oxygen}}$ + Water + Carbon dioxide + Energy

vii) Big intestine

That part of food which does not get digested or absorbed goes to big intestine. Big intestine is smaller but wider in comparison to small intestine. This big intestine is about 1.5 meter length. The main work of big intestine is the absorption of water and some salts. The undigested part of food is sent to anal. This gets out of human body by anal. This is known as excretion.

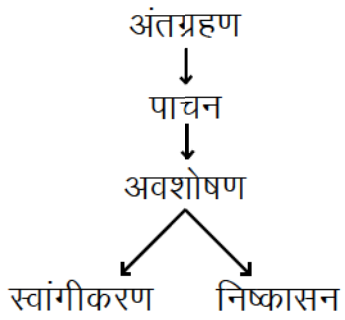


Fig. 11.18: Nutrients in Organisms

Intext Question 11.3

1. Write the names of types of teeth present in humans?

   _____

2. Fill in the blanks:

   a. Food reaches _____ moving from food pipe.

   b. _____ acid is produced by the internal part of the stomach.

   c. _____ is the biggest gland of humans.

   d. Pancreas juice gets stored in _____.

e. Digestive juices produced by small intestine digest food _____.

3. Tick (✓) and Cross (✖) the wrong statement:

a. Digested food is absorbed in big intestine (True/False)

b. Absorbed food from blood vessels is sent to blood vessels. (True/False)

c. Small intestine connects fats to protein (True/False)

d. Big intestine absorbs water (True/False)

What have you learnt

- Every organism needs food. These nutrients are helpful in the physical or bodily growth and maintenance of living beings.
- On the basis of nutrients, organisms are in two categories, Autotrophs who prepare their food themselves and heterotrophs who are dependent on others for nutrition.
- Plants prepare their own food with the help of sunlight, chlorophyll, water and carbon dioxide. This process releases glucose and oxygen.
- Heterotrophs are dependent on the foods prepared by plants. These include herbivores, carnivores, omnivores, parasites, pitcher plants etc.
- Some organisms get nutrition from plants and trees known as herbivores. Those who eat flesh of other animals are known as carnivores. Some organisms consume both kinds of nutrition as herbivores and carnivores. This is known as omnivores.
- Some organisms get nutrients from the body of other organism by living inside or outside. This is known as parasitic substance.
- Those organisms that depend on dead organisms for substances are known as dead saprophytes.
- Sometimes organisms share shelter and nutrition with each other which is known as symbiotic relationship.
- Amoeba gets food by its structure like join.
- Amoebas to humans have the same activities related to digestive system.
- The digestion of food has five steps: - 1) intake 2) digestion 3) absorption 4) utility 5) excretion
- Human digestive system is composed of mouth, food pipe, stomach, small intestine and big intestine.

- Liver and pancreas are the two main glands related to digestive system. These help in the digestion by secreting various digestive juices.
- Undigested food is collected at colon in big intestine and is then excreted by anal.

End of Chapter Questions

1) Define nutrition and narrate its types?
2) What are the categories of heterotrophs on the basic of nutrition ?
3) What is the difference between parasites and saprophytes nutrition ?
4) Where is saliva gland situated? What are its main functions?
5) Write any three functions of tongue?
6) Write any one similarity and one difference between nutrition method of humans and Amoeba?
7) There are 32 teeth in human mouth. Categorize them on the basis of their functions?
8) Draw a diagram of food pipe in humans?
9) Write the equation of the process of photosynthesis in plants?
10) How food is digested by small intestine? Explain

Answer Key for Chapter Questions

11.1

1. a. False b. True c. True d. False e. False

2 a) iii b) iv c) ii d) i

3. Nutrition is required by the organisms for their bodily structure, its growth, health and maintenance of damaged organs and correct maintenance. Energy is provided by nutrition for activities.

11.2

1. a) Plants b) pitcher c) Herbivores d) Parasite e) Food

2. a. Cow, Goat b. Nethenes, Venus flytrap
   c. Human, cockroach d. Cuscuta Reflexa, Bed Bugs
   e. Mushroom, Fungi f. Lycane, Rizobium

3. i) Food items

ii) Two organisms live together in a way that they both help each other. They share their shelter and nutrition with each other.

11.3

1. There are four types of teeth, canine, incisors, premolars and molars

2. i) Stomach ii) Hydrochloric

iii) Liver iv) pancreas

v) Completely

3. a) False b) True c) False d) True

Self - Evaluation Test - 2

1. What is the frequency of listening of human ear?
   (a) 20 Hz to 20000 Hz
   (b) 200 Hz to 2000 Hz
   (c) 120 Hz to 2000 Hz
   (d) 20 Hz to 200 Hz
2. Tick the correct statement
   (a) Sodium is more active than magnesium.
   (b) All metals are solid at room temperature.
   (c) All non-metals are not in liquid form.
   (d) Portland cement was discovered in 1824.
   (e) Silk is an example of artificial fibre.
3. Why is aluminium foil used to cover food items?
4. What is Rayon? Give two examples.
5. Why clothes prepared from synthesized material are used?
6. Draw a diagram of human digestive system?
7. What are the effects of boiling an item?
8. What precautions are taken for using thermometer in a lab?
9. Why light coloured clothes and dark coloured clothes are worn in summer and winter?
10. Which states have jute crop in India?
11. Which type of wool is found in lohi (type) sheep? Where these sheep are found?
12. Write down various steps of preparing wool from fibre?
13. Write down life cycle of silk worm?
14. Write the characteristics of synthetic fibre?
15. Write down names of any four plastic items?
16. Why synthetic clothes are not worn in preparing food?

12

Micro Organisms

We make curd out of milk. Vinegar is prepared from sugarcane juice. If fruits and vegetables are held for a few days, they start getting rotten. Yeast is formed in wheat flour. Have you ever thought why, and how it happens? What makes us ill? It is said that we should place handkerchief on our face at the time of sneezing and coughing why? Because all this happens due to some micro organisms which we could not see with our naked eyes. We will learn about some of these organisms in this chapter.

Objective

After reading this chapter you will be able to

- Define micro organism
- Categorize the various types of micro organisms
- Tell the living environment of micro organisms
- Explain the good and bad micro organisms
- Define the relationship between micro organisms and techniques of food storage.

12.1 Micro Organism

If chapati is kept in a moisturized area, then we will see black and white spots in some days on its

surface. These patches are known as fungi. These spots when seen with magnifying glass are seen black in color. Many small micro round structures are seen with the help of magnifying glass. These round structures are small organisms which cannot be seen with naked eyes.

Magnifying Lens

This is a type of lens which are easily available in market. Seeing things through a magnifying glass shows them bigger. However some of these micro organisms are very small to be seen with the help of magnifying glass. Therefore, we need microscope to see these micro organisms. Such small organisms are known as micro organisms.

Fig.12.1: Microscope

12.2 Where do micro organisms live?

Micro organisms live in air, water, soil, organisms and plants or trees. They can live in different situations. These organisms live in cold weather and stiff summer also.

Some of micro organisms live in the body of humans and other organisms. These are amoeba, bacteria etc. These create constipation disease in human body. Some micro organisms live independently whereas some micro organisms are dependent on other organisms. Some live alone and some in group. Micro organisms like amoeba lives alone whereas fungi bacteria live in a collective manner.

12.3 Various types of Micro Organisms

Micro organisms are of many types. These are divided into four categories namely bacteria, fungi, protozoa and algae.

The structure, colour, shape, form, place, food etc of these micro organisms are different from each other. Some of them are single cell but some are multi cell. Every category has many types of micro organism. Let us, learn about each category.

A. Bacteria

Bacteria are single cell organisms. Generally these live in a collective group. Some bacteria are straight and some are spiral. These bacteria spread diseases like typhoid and T.B (tuberculosis).

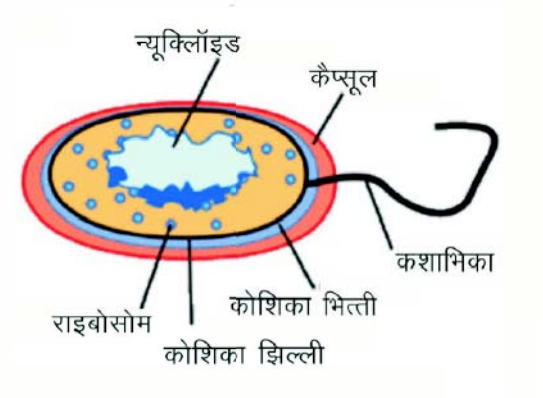


Fig. 12.2: Bacteria

B. Algae

Some algae are single cell and some are multi cell organisms. Claimydomonas is single cell algae and spairogira is a multi cell algae deposited in corners of drainage and pond. It is also a type of weed.

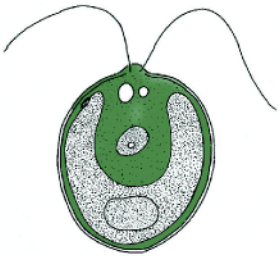


Fig. 12.3: Algae

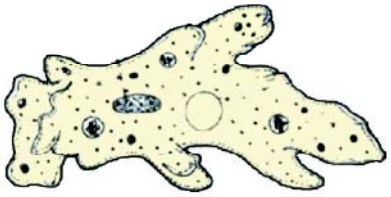


Fig. 12.4: Protozoa

C. Protozoa

These are single cell organisms Diseases like Diarrhea and Malaria are cause by Protozoa.

D. Fungi

Mostly fungi is a multi cell organism. One of the common examples is the fungi present on chapatti. Medicine Penicillin is made up of fungi named penicilium.

Fig. 12.5: Fungi

12.3.1 Virus

Virus is also a type of micro organisms. These are different from other micro organisms. Virus multiply when they live inside any other organism or plants. Virus causes common cold, cough, flu, polio and measles etc. These come out from the body of the patient through his cough, sneeze, urine and breath. Therefore, one should keep cloth on one's mouth. We should wash our hands with soap before eating and after toilet. This is the safe measure to stop virus and other micro organisms from entering body.

Intext Questions 12.1

1. Fill in the blanks by choosing the correct word:-

   1. _____ is used to see micro organisms. (spex/Microscope).
   2. Micro organisms are divided into ____ categories. (five/four).
   3. Virus is a type of _____. (Microorganism/insect)
   4. Bacteria are _____ organism. (single cell/Multi cell).

2. Match the following columns.

	Micro organisms		Category
(a)	Spaorogara	(1)	Bacteria.
(b)	T.B	(2)	Fungi.
(c)	Bread Mould	(3)	Protozoa.
(d)	Amoeba	(4)	Algae

3. Where do microorganisms live?

   _____

12.4 Beneficiary and harmful Micro Organisms

Micro organisms have deep relation with our day to day life. Some of these microorganisms (whether we see or not) are our friends and some are our enemy. Some benefit us by living in our body and some are enemy and they make us ill.

12.4.1 Beneficiary Micro organisms

Micro organisms benefit us in a number of ways. These are needed from our home to business. Many medicines and injections are prepared with the help of micro organisms. Some micro organisms help in fertilizing the land and clean our environment. let us let how it happens.

(a) Utility of micro organisms in food items

Various food items are prepared with the help of microorganisms. Food items like curd, bread, cake, .. etc. are prepared by means of micro organisms.

Curd has many microorganisms. One of them is Lactobacillus. Bacteria named lactobacillus transforms milk into curd. Therefore, a little amount of curd is added to lukewarm milk for making curd. Lactobacillus bacteria is present in curd and it multiplies fast in lukewarm milk and changes milk to curd.

Ferment is prepared in making idli, dosa, naan, bhature, yeast roti, jalebi etc. Yeast is formed with the presence of micro organisms. Ferment is formed by a fungi name yeast. This yeast works is dough of flour. yeast starts multiplying fast if this dough is kept in a hot place for a longer time. Due to breathing of yeast carbon-dioxide gas is built, small bubbles of gas are formed in flour which help in making plump size of flour.

Bacteria also change sugarcane juice to vinegar.

Activity 12.1

Place some flour in a utensil. Add some sugar and salt to it. Dough with hot water and leave it in kitchen. Check it after 4 to 6 hours. Do you find any difference in flour? Did you find flour plump?

Fig. Dough

(b) Use of Micro Organisms in business

Yeast is used in baking industry on a large level. This is used in preparations of bread, pastry, cake, biscuits, etc. Yeast is used for making dough.

Microbes are also used for the production of Alcohol, Vinegar, Acetic Acid and wine. Sugar is always found in barley, wheat, rice, fruit juice etc. Yeast is mixed with them to prepare Alcohol and wine. The transformation of sugar into alcohol is known as fermentation.

Fermentation was discovered by a scientist Louis Pasteur in 1837.

Fig.: Louis Pasteur

(c) Medicinal use of Micro Organisms.

Some bacteria destroy other bacteria which becomes the cause of illness. They stop the growth of bad bacteria. Good bacteria are used in medicines.

Various diseases are treated by antibiotic medicines. Penicillin injections are used in some

diseases. Medicines like Antibiotic and Penicillin are prepared by such bacteria which destroy bacteria causing illness.

Today various kinds of Antibiotic medicines are prepared by fungi and bacteria. Tetracycline and Erythromycin are general purpose antibiotics. They are used which are themselves made up of bacteria and fungi.

A scientist named Alexander Fleming was researching on bacteria in 1929. He discovered that one type of fungi was penicillin. Because of this, fungi was named 'Penicillin'.

Fig. Alexander Fleming

Antibiotics are used to save birds from diseases. Antibiotics are used in their food, so that they are saved from diseases.

In the same way plants and trees are also given antibiotics to stop diseases.

(d) Injection

We know that injection saves us from many diseases. Let us now learn what an injection is and how it works ?

Some micro organisms are born diseases. These are known as microbes. when these microbes enter body, then body offers some resistance. This resistance fights microbes to save body. If resistance wins, then we don't fall ill. Moreover, body remembers how it fought the microbe. if it entered human body again.

In the same way, injection also saves human body. If dead or non active microbes enter human body, then these are destroyed by resistance power of body.

In the same way, injections also save human body from microbes. Dead microbes are injected in human body through injection. Body gets resistance power to secure body from diseases. Diseases like Cholera, dehydration, small pox, T.B, Typhoid, etc can be stopped by injection.

Various injections are given to children since birth. These injections save them from various dangerous diseases like Polio, tetanus, measles etc. Therefore, it is necessary to get injection in children at proper time.

Fig. 12.6: Vaccination

Activity 12.2

Note down from health centre or Asha behn ji which injections or vaccines are given to children.

Small pox is eradicated from the world by means of injections. Polio is now also eradicated by the campaign. Government organizes program for polio drops given to the child is form of oral drops and injection.

A scientist Named Edward Jenner discovered the injection of small pox in 1798.

Fig. Edward Jenner

(e) Utility of micro organisms in agriculture

Some bacteria and weeds help in checking the amount of nitrogen in atmosphere. These bacteria and weeds are of green blue colour and are found in soil. These change dead plants and organisms to nitrogen compounds. Some bacteria change these nitrogen compounds to nitrogen gas. This nitrogen gas is released in environment. This corrects the amount of nitrogen in atmosphere.

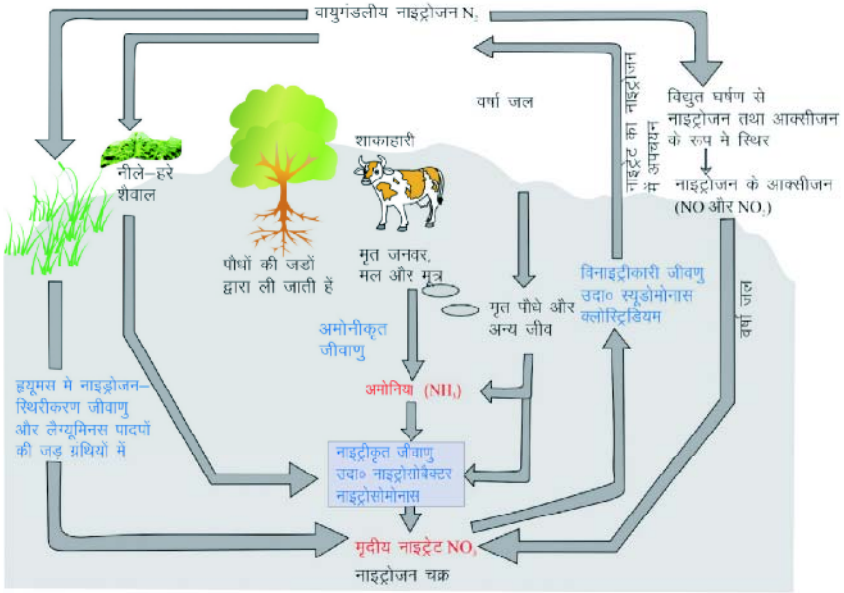


Fig. 12.7: Nitrogen Cycle

In this way, micro organisms decompose leaves, fruits vegetables etc into compost. This helps in making environment pure and increase the fertility of the soil.

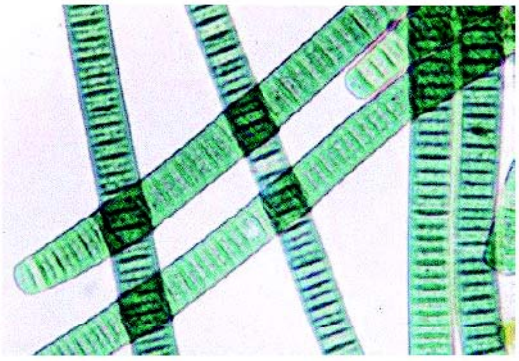


Fig. 12.8: Blue Green algae make Nitrogen static

(f) Purity of environment

You must have seen the dead bodies of organisms in a few days. The reason behind this is that micro organisms decompose them into a simple item. These items are used by other plants and organisms.

In this way micro organisms finish off harming items and make environment pure.

12.4.2 Harmful Micro Organisms

Many micro organisms harm us in many ways. They give birth to various diseases in humans, organisms and plants. Some micro organisms pollute food, water and environment. Let us learn a lot about them in detail.

(a) Micro organisms that produce diseases in humans

Microbes enter human body through breathing, water and food. By contacting an ill person, we get diseases. The diseases which communicate through polluted water, air or in contact with person are known as communicable diseases. Some of the communicable diseases include Plague, cholera, common cold, Polio etc.

A Healthy Person gets microbes through breathing. Therefore, one should always keep clothes on one's nose while coughing. Every precaution should be taken by healthy person while going near an ill person.

Some insects and organisms work as carriers like flies. One such carrier is fly. Flies sit on garbage. They stick microbes to their legs; when these flies sit on the food items then microbes are transferred to things. Therefore, all food items should be covered.

Mosquito is also a disease carrier insect. This is the carrier of virus carrying Malaria and Dengue Virus. Female Adis Mosquito is the carrier of Dengue and female anopheles mosquitos is the carrier of malaria virus.

Fig. 12.9: Mosquito

Fig. 12.10: Fly on garbage

Plasmodium Protozoa is found in the body of mosquito. Whenever mosquito is bites any healthy person, then protozoa gets inserted in that man's body. Therefore, we should save ourself from mosquito bites.

Mosquitoes breed in stagnant water. Therefore water should not be logged in tyres, flower pots, garbage, holes etc.

Activity 12.3

Observe your nearby areas and find out where Mosquitoes and flies take birth. Make a list of those precautions that help in stopping the growth of mosquitoes and flies. Prepare a list of those steps that help us from mosquito.

12.5 Diseases and its various resources

Micro organisms can cause many kinds of diseases not only to humans, but to organisms and plants also.

Following is a table of some common diseases in humans, how they of spread and steps of prevention.

Table 12.1: Some diseases in human beings by Micro organism

Disease	Micro organism	Spreading ways of	Prevention
T.B.	Bacteria	Air	Keep patient separate
Measles	Virus	Air	Proper disposal of items used by patients
Smallpox	Virus	Air or Direct contact	Injection on time
Polio	Virus	Air or water	Proper disposal of patient's waste
Cholera	Bacteria	Water or food	Vaccination and Personal hygiene

Typhoid	Bacteria	Water	Use pure water and clean food
Hepatitis A	Virus	Water	Vaccination and drinking boiled water
Malaria	Protozoa	Mosquito	Stopping mosquito multiplication and using precautions against mosquito
Dengue	Virus	Mosquito	Using chemicals to keep mosquito away

(b) Micro organisms that spread disease in plants

Various micro organisms harm our crops. The major plants for micro organism attack include wheat, rice, sugarcane, orange. apple, ladyfinger, cabbage etc. Some chemicals are used to stop these diseases.

Table 12.2: Some diseases of plants that are caused by micro organisms

Disease	Micro organisms	Ways of spreading
Lemon cancer	Bacteria	Air
Wheat rust disease	fungi	Air and seeds
Lady finger yellowness Disease	virus	insects

(c) Food Poisoning

We generally hear that people get hospitalized after eating poisonous food. They get diseases like vomiting and loose motion. Why does it happen ? If food is not properly stored, then it becomes prone to micro organisms. They make food poisonous.

If we eat such food we grow prone to serious diseases. They may lead to death. The disease which happens by consuming poisonous food is known as food poisoning.

Intext Questions 12.2

1. Tick (✓) the correct statement and cross (✖) the wrong ones :-

   (a) Micro organisms are both our friends and foes. (True/False)

   (b) Curd has lactobacillus bacteria. (True/False)

   (c) Micro organisms aren't used in baking industry. (True/False)

   (d) Antibiotics medicines are made up of fungi and bacteria. (True/False)

2. Fill in the blanks.

(a) Micro organisms borne diseases are known as _____.

(b) Chicken pox is stopped by _____ in the world.

(c) Yeast _____ fast in wet flour.

(d) Female _____ dengue and female _____ malaria are the carriers of diseases.

(e) If food is not stored properly, then it gets ____ in it.

3. Write three benefits and three harms of virus in the following table:

S. No.	Benefits	Harm
1.		
2.		
3.		

12.6 Food Storage

When mango is kept for a few days, it gets rotten but mango pickle does not get rotten soon. In the same way, green chili gets damaged but dry red chili powder is stored for months.

Why this happens ?

Food items get rotten because micro organisms start increasing then. There are some ways to stop their multiplication so that items are stored safe for longer duration.

Activity 12.4

Make a list of those ways by which food items can be secured for a longer time.

Let us see what are the ways of storage that are generally used in homes.

(a) Drying

This is the oldest way to secure food items. Drying up is the cheapest way to secure grains, fruits, spices and vegetables.

Micro organisms multiply in moisture. There are fewer chances of microorganism to multiply in dried grains. These are dried up to end all the moisture in these items.

Papad and *badiyaan* are protected by drying them in sunlight.

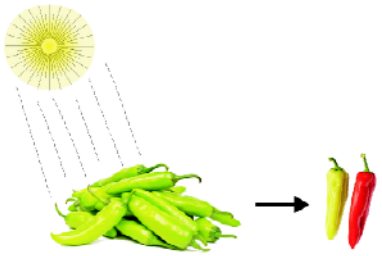


Fig.:

(b) Using Chemical products

The growth of micro organisms is stopped by salt and oil. Therefore this is known as preservation. Salt and Oil are used in pickle in the form of preservatives. The general preservatives are sodium betabisulphate and sodium benzoate. These are used in jam, jelly and juices etc.

Salt as used as preservative in meat and fish since a long time. To stop its growth of micro organisms meat and fish are covered with dried salt. Salt is also used us preservative in mango, gooseberry, tamarind etc.

Sugar is also used as preservative. Sugar is used in sauce, jelly etc.

Microorganisms don't develop in vinegar. Therefore, vinegar is used in many items.

(c) By boiling or cooling

If milk is boiled then it does not decay. Many microorganisms present in milk are killed in the process of boiling. Therefore food is prepared at high temperature to stop the growth of micro organisms.

Low temperature (chilled environment) does not lead fungi and bacteria to grow. Therefore food items are kept in fridge and ice box. Some of them are fruits, vegetables, fish, milk etc.

Pasteurized milk can be used directly without boiling. This is because for pasteurization of milk is boiled at 70 degree for 15-30 seconds. Then this boiled milk is chilled for storage. By this, the growth of micro organisms is stopped.

(d) Seal packed packing

Food items are boiled and seal- packed in such a way that air and moisture do not reach them. In this way, the micro organisms present in these items cannot breathe easily. Their growth is stopped.

Intext Questions 12.3

(1) If mango is kept for a few days, it gets rotten whereas pickle does not decay for years. Why?

_____

(2) Write names of any two preservatives which are easily available in houses?

_____

(3) Write names of two household ways of storing food items ?

_____

What you have learnt

- Micro organisms are very small to be seen through naked eye. They can't be seen without the help of special equipment.
- Microbes are either single cell or multi cell. These are categorized into four categories.

  (1) Bacteria (2) Algae (3) Protozoa (4) Fungi
- Virus are different from other micro organisms. These get multiplied when they live in the body of other organisms.
- Micro organisms live in air, water, soil, organism and plants. Micro organisms can live in difficult condition like high temperature or chilled, cold etc.
- Some micro organisms are harmful and some are beneficial.
- Beneficiary Micro organisms are used in food items, business, making medicines, agriculture, environment purification etc. Blue green algae present in soil maintain the proper quantity of nitrogen in atmosphere.
- Many Microorganisms produce diseases in humans, organisms and plants
- If the multiplication and growth of micro organisms is stopped, then food can be preserved for a long time.
- Some Micro organisms poison the food.
- By using techniques of food storage, multiplication and growth of microorganisms can be stopped.
- There are many methods used in house for preserving food items. These include drying food items, by keeping them in salt, sugar, oil, vinegar etc., by cooling or heating them or by sealed packing.

End of Chapter Questions

1. Tick the correct options.

   (A) Which tool is used to see the micro organisms.

   (1) Spex (2) Mirror

   (3) Microscope (4) Water

(B) Female ades mosquito causes which disease.

(1) Cholera (2) Tuberclosis

(3) Diarohea (4) Dengue

(C) Why is yeast used in food products for making pickle?

(1) For making pickle (2) For fermentation

(3) For making curd (4) For planting trees

(D) Which of the following is used as a preservative ?

(1) Salt (2) Chilly

(3) Coriandner (4) Cumin

2. Tick (✓) the correct statement and (✖) the wrong statement.

(1) There is no difference between virus and algae. (True/False)

(2) Nitrogen is kept static by red black weeds in environment. (True/False)

(3) Protozoa is a simple cell organism. (True/False)

(4) Lactobacillus bacteria helps in making yeast. (True/False)

(5) Protozoa named plazamodium are found in mosquitoes body. (True/False)

3. Fill in the blanks:

(1) The process of changing alcohol to sugar is known as _____.

(2) Medicine like antibiotic and penicillin are prepared by _____.

(3) Antibiotics are used to stop _____ in plants.

(4) Fly is a _____ insect.

(5) There are less chances of _____ taking birth on dried items.

4. How many categories of Micro organisms are there ? Write the names of their categories?

5. Write the name of two diseases caused by virus ?

6. Which gas gives pressure for fermentation of dough?

7. Which Micro organisms are used to prepare Alcohol and Wine ?

8. What is the importance of beneficiary micro organisms in our life ? Write in six sentences.

9. How do microorganisms harm us ?

10. Write two household names of food preservation ?

Answer Key for Chapter Questions

12.1

1. (1) Microscope (2) Four (3) Micro organisms (4) Single Cell

2. (a) - iv (b) - i (c) - ii (d) - iii

3. Micro organisms live inside air, water, soil, organisms, and plants.

12.2

1. 1. True 2. False 3. False 4. True

2. (i) bacteria (ii) Injection (iii) multiplication (iv) ades, anopheles (v) Micro organisms

3.

Benefit	Harm
1. Making Vinegar, curd	1. Diseases in humans yeast
2. Making medicines.	2. Diseases in plants
3. Cleaning environment.	3. Poisonous material in stale food

12.3

1. If mangoes are kept for a few days, then microorganisms start building. They decompose mangoes. This makes mangoes rotten. Salt and oil are used in mangoes pickle to preserve them from micro organisms. Salt and oil stop the growth of micro organisms.

2. Like Salt, sugar, oil, vinegar

3. Like drying up, using chemical products, by boiling and cooling.

13

Crop Production

Food is one of the most important things in our life. Food is required to live and sustain life. Various elements from which we gain energy or prepare food are known as grain. The main problem of our country is to fullfil the demands of our increasing population. To solve this problem, we need the following information.

a) Regular production of crops.

b) Proper storage and distribution of grains.

We will study about the process of crop production in this chapter.

Objective

After reading this chapter you will be able to

- categorise various types of crops.
- define the various steps in the process of crop production.
- understand the process of storage and distribution of grain.
- tell the preventive measures to secure grains and crops.

13.1 Types of Crops

When a single plant is planted at a place in large numbers, it is known as crop, like wheat crop, rice crop, barley crop, mustard crop etc.

As you know that crops are of various kinds like grain, vegetables and fruits. India is the chief producer of many crops. There are mainly four types of crop planted and grown in India.

a) Grain crops like rice, wheat, barley, pulses etc.

b) Commercial crops like cotton, jute, sugarcane, tobacco, oil seeds etc.

c) Plantation crops like tea, coffee, coconut, rubber etc.

d) Horticulture crops like many types of fruits and vegetables.

Different crops are planted in our country. These different crops are planted in different weather areas, temperature, moisture and rain. Therefore, many types of crops are produced in different areas of our country. According to climate, crops are divided into three categories:

1. Kharif crops or monsoon crops
2. Rabi crops or winter crops
3. Zaid crops or season crops

1. **Monsoon Crops:** These crops are sown in rainy season, like maize, soyabean, cotton, groundnut, money crop etc. The rainy season starts from June to September in our country.
2. **Winter Crops:** These crops are sown in winter season. These include wheat, gram, peas, mustard etc. This season lasts from November to February.
3. **Season Crops:** There are some parts in our country where such farming is done. The season is from March to June. The main crops are watermelon, melon, gourd, pumpkin, bitter gourd etc.

   Pulses and vegetables are sown in different areas in summer season. Their season lasts from March to May.

13.2 Planting Crops

A lot of things need to be done by a farmer in producing a crop. These functions are known as farming techniques. These include preparing the soil, sowing the seeds, making compost, splitting fertilizers, irrigation, weeding, lodging etc.

13.2.1 Preparing the Soil

Soil should be checked first for preparing it for farming. This checking can be done at the checking centre of village or blocks by giving the sample of the soil. This lets us know the type of soil and which type of crops suits the soil.

After checking up of soil, one starts working in preparing the soil for farming. The top level of soil

is dug about 6" deep. This soil is known as 'humus'. This humus includes decomposed organic items; made up of plants and animals. These decomposed items are changed to compost, known as 'humus'. This is enriched in minerals which are beneficial for plants.

Activity 13.1

Get soil from the nearest garden and place it in a glass. Add some water and mix it with spoon. Keep glass for sometime. What do you see? Some mud is seen on the top level of glass. This is humus.

Fig. Humus

Now you know very well the need for soil preparation. Let us know, how soil is prepared.

First of all, soil is made hollow. Now the question is why the soil is made hollow? There are two main causes of it.

First, hollow mud keeps nutrients going deep into the roots of plants. Many minerals, water, air, micro organisms and earthworms are found in soil. Micro organisms and earthworms grow fast in hollow mud because they get air and water in full quantity. These micro organisms and earthworms make land fertile. Traces of dead plants and other organisms are also found in soil. These elements are broken down by micro organisms in soil. Thus, this decomposition mixes many nutrients in soil. These nutrients are absorbed by the roots of the plants.

Secondly, roots are deeply inserted in hollow mud. Roots can easily breathe. This helps in the growth of plants. Therefore, making void or space in mud is very important in agriculture. This helps in bringing the nutrients on the top layer of the soil. This helps plants in absorbing nutrients at a fast pace. This is done by plough and tractor.

This is known as cultivation. Tractors are used now a days for cultivation. After cultivation many loose big balls of mud are left as residue. This is levelled by hoeing. This is done because the equal and uniform soil is required for irrigation and sowing. Sometimes fertilizers are mixed in soil before cultivation. This helps in better mixing of nutrients in soil. The major tools used are plough, pick, etc.

Fig. 13.1: Tools of irrigation

13.2.2 Souring

After the preparation of soil, the next important step is the sowing of seeds. It is necessary to choose healthy and clean seeds of good quality before sowing.

(a) Choosing of seeds

Activity 13.2

Take some seeds of wheat in a utensil full of water. You will see that some of the seeds will start floating on water. These floating seeds are hollow because of decay. This is one of the techniques to differentiate between good and bad quality of seeds.

Many tools are used for sowing of seeds. Let us learn about them -

Traditional Tool: These tools are in shape of keep. The lower part of the keep is connected to a three sided pointed pipe. At the time of souring, these pointed points cut the soil and place seeds in them.

Different kinds of crop use different kinds of tools.

Fig. 13.2 (a): Traditional way of sowing seeds

Fig. 13.2 (b): Seed drill

13.2.3 Scattering Seeds

Seed drill is used to sow seeds at an equal distance. This machine is attached to a tractor. This covers the seeds after sowing them. Thus, the further damage to the seeds is stopped. Seed drill takes less time and less labour in sowing the seeds.

Seeds are sown at an equal distance so that they get proper sunlight, nutrients and water. If the distance is less between plants, then some of the plants are removed from their place.

13.2.4 Mixing compost and fertilizer

You must have seen farmers adding something like soil to their land. This is known as compost and fertilizers. Soil provides mineral for the better growth of the plants. These mineral elements are known as nutrients. Compost and fertilizers add nutrients to the soil.

Due to regular production of crops, nutrient levels get decreased in land. To make up this deficiency compost and fertilizers are added to the soil. Let us know what compost and fertilizers mean?

Compost:

This is made up of decay of plants and organisms. All the decay is decomposed in a hole dug by the farmer. This hole is left open. Micro organisms decompose the materials in the hole. This is now known as compost. Thus, compost comprises of organic items. The water level of land is increased by compost. Organisms and bacteria grow and multiply easily in compost. This hollow mud works as green compost for sorghum, beans etc.

Fertilizers:

These are chemical items which have special nutrients. These are produced in factories. Some of the fertilizers are urea, super phosphate, amonium sulphate, potash. These fertilizers are used to make soil more fertile. However, the more use of fertilizers stops the growth of fertility of land. Plants decay to make soil fertile and organic compost. Sometimes, time gap is given in sowing these crops. Thus, crops are planted by changing it. After sowing one crop, a different crop is planted. This is known as rotation of crops or crop rotation. Pulses are generally sown after wheat.

Table 3.1: Difference between fertilizer and compost

Fertilizer	Compost
These are made from inorganic items.	These are prepared from organic items.
This is made in factories.	These are prepared in farm.
These do not give humus to soil.	Humus is given to soil by compost.
This has high quantity of minerals.	how quantity of minerals is found in compost.
Over use of fertilizers hampers soil.	These do not hamper soil.

13.2.5 Irrigation

We need water to live and sustain. In the same way, water is essential for plants to live, grow, flower, fruit and seeds to live healthy. Plants are composed of about 90% of water. Water is required

for sprouting of seeds. The roots of plants transfer nutrients to plants. Roots absorb minerals and fertilizers present in soil. These elements are mixed with water to reach every part of plant. Water saves plant from chill weather and hot air.

Water is given to plants from time to time for better crop and to retain moisture in soil. This activity is known as irrigation. What is the time of irrigation? How many times irrigation should be done? It is dependent on the quality of crop, soil and weather. Irrigation is required more in summer than winter. You must have seen many methods used by former for irrigation. Let us see, which are those methods. Now a days, new techniques are also used with traditional techniques of irrigation.

1. **Traditional methods of irrigation:** Water is sent to land by means of well, canals, etc. Other methods include, moth, ghitni, chain pump etc.

   These methods use pump to pull water from the land. Disel, bio gas, electricity and solar energy are used to drive the pump.

Fig. 13.3: Traditional methods of irrigation

2. **Modern methods of irrigation:** Various new methods are used for irrigation. These help in better irrigation with less water and in a proper way.

   Some of these techniques are:

   (i) Sprinklers: Vertical pipes are used in this technique which have nozzles on the top of the pipe which moves in a circular motion. These pipes are joined to the main pipe at a particular distance. When water is sent from main pipe with the help of pump, it comes from the nozzle moving in a circular way. This water is sprinkled in a way as if it is raining. It is more useful in desert soil and imbalanced land.

Fig. 13.4: (a) Sprinkler

(ii) **Drip system:** By this method, water is dropped on the roots of plants with the help of a nozzle. This does not waste water. This is useful for places with less water. This is the best way to give water to fruit plants, garden and plants.

Fig. 13.4: (b) Drip System

13.2.6 Seprating weeds (weeding and lodging)

With the growth of crops, many unwanted crops also crop up. These are known as weeds. These weeds stop the growth of crops. Some weeds are poisnous for humans and plants. These weeds create difficulty in cutting of plants. Therefore, before preparing crops, weeds need to be removed. This process of removing weeds is known as weeding. The best time to remove weeds is before the blossming of plants and making of seeds. These weeds can be removed by the use of chemicals or labour.

Fig. 13.5: Spraying weed removing chemicals or fertilizers

Many methods are used by farmers to remove and stop the growth of weeds. Cultivating land and its prepration also help in removing weeds. Due to these procedures, weed plants die out of dryness and mix in the soil. Weeds are removed by pulling them out or cutting them from time to time. Hero (khurpi) is used here. Weed removing chemicals are also used to remove weeds. Some of the common examples of weed removal chemicals are -2, 4D Napthender, Aestic acid, strazen etc. These are sprinkled in the farm but they do not harm the crop. These chemicals are mixed with water as per requirement and are sprayed. This spray might harm the health of farmer. Therefore, these should be used cautiously. Mouth and nose should be covered with cloth at the time of spray.

Intext Questions 13.1

1. Fill in the blanks:
   (a) When one type of plant is planted in one place, it is called .....
   (b) On the basis of weather, crops are divided into ....., ... and ..... in India.
   (c) The first step in the process of crop planting is ..... the soil.

(d) The procedure of cultivating a plant is known as .....

(e) Soil is made ..... during the cultivation of farm.

2. Why is compost and fertilizer added in the soil for cultivation?

_____

3. What precautions are taken during the sowing of seed?

_____

4. Give any two examples of following:

a. Rabi crop 1. ..... 2. .....

b. Kharif crop 1. ..... 2. .....

5. Match the following column 'A' with column 'B':

	Column A		Column B
(a)	Tools of cultivation	(i)	tools of sowing
(b)	Compost	(ii)	Plough
(c)	Seed drill	(iii)	decay of plant and organism
(d)	Traditional methods of irrigation	(iv)	fertilizer
(e)	Chemical material	(v)	chain pump, ghitni
(f)	separating weeds	(vi)	modern techniques of irrigation
(g)	Drip system, sprinkler system	(vii)	weeding

13.3 Cutting Plants

Crop is cut when it is ripe. This is known as cutting of plants & almost takes 3-4 months for a crop to ripen. Cutting of plants is done by putting them or cutting near the roots. Sickle is the tool used for cutting in the country. Machines, (now called harvester) are also used for cutting.

Thrashing is the process of differentiating between grains and its cover. The machine used for thrashing is known as comberia. This machine is the mixed form of harvester and thrasher. This helps in cutting of plants fast. Farmers also differentiate on separate grains by droping them it in air. This is known as winnowing.

Fig. 13.6: Tools used in cutting

Festival celebration in crop cutting

Farmers are very happy to see the ripe crop after their hard work. This is their time of harvesting. Many festivals are celebrated in India at this time. These are - Pongal, Biasakhi, Holi, Deepawli and Bihu etc.

13.4 Storage

It is necessary to store crop after cutting the grains of crop. It should be safe from moisture, micro organisms, insects and mice. Fresh crop has more amount of moisture in it. If it is not dried up, then it gets rotten. This may have less sprouting power. Therefore, it is necessary to dry it up in sunlight. This secures grains from insects and perts. If the amount of moisture is about 10% then, these are stored in jute bags. These grains are also stored in mud utensils and steel items. Before storage, these utensils are cleaned. Chemicals are also sprinkled if needed. Aluminium phosphate is used to save grains from insects and mice. These seeds are stored in sylo and storage houses on a large area.

Fig. 13.7: (a) Sylo

Fig. 13.7: (b) Storage house

Neem leaves are used for storage of grains in homes.

Distribution: The safe grains in storage house is distributed by government. Government only decides the value of these grains.

13.5 Insects and Insecticides

Following measures are taken to stop insects and their bad effect on grains.

Many insects are found in the crop in the process of crop production. These insects are controlled by chemicals known as insecticides. Major insects and insecticides for stopping them are as follows:-

S. No.	Insect	Insecticide
1.	Termites- tunnel making in land and eating roots of plants	Aldrin
2.	Grasshopper - eating the leaves of plants	VAC
3.	Paddy - he eats leaves and no grains are grown	VAC
4.	Caterpillar - It is about 4 cm and eats leaves	Indosulfar
5.	Mites - These eat grains after the of grains are ripe	Celphes

Intext Questions 13.2

1. Tick (✓) the correct statement and cross (✖) the wrong statement:

   (i) It takes six months to ripen a fruit. ( )

   (ii) Harvester is used for cutting the crop. ( )

   (iii) Combine machine is used for cutting the crop and for separating straw and grains from crop. ( )

   (iv) Thrashing is the process of separating grains from crops. ( )

   (v) Storage grains should not contain moisture. ( )

   (vi) There is no requirement of storing grains in large quantity. ( )

   (vii) The stored grain in storage area is distributed by government. ( )

   (viii) Government does not decide the value of storage grains. ( )

   (ix) Insects are found in the process of crop cultivation. ( )

   (x) There are no methods to control insects in a crop. ( )

What you have learnt

- Proper and continuous production of crop are required to provide food in the growing population of the country.
- The process in the production of crop is known as farming technique.
- By crop, we mean one type of plant being planted in one place. There are three categories of crops based on weather in India-Rabi, Kharif or zaid.
- The first step of crop production is cultivation and levelling of land. Plough is used in this process.
- Before sowing, choosing the right seed is necessary. Good quality and healthy seeds are required. To get good quality crop, seeds should be planted at proper depth and distance. Seed drill is used for sowing seeds.
- To enhance the fertility and nutrients in soil by using compost and fertilizers.
- Correct time and gap in watering the plants is known as irrigation.
- Unwanted plants growing near the crop are known as weeds. Removing weeds is known as weeding.
- Crop is cut by machine or hand. This is known as cutting. Separating grains from rest of crop is known as thrashing.
- Storing grains and saving them from insect and micro organism is known as storage. Before it is necessary to dry up the grains. These grains are stored in big utensils of soil and steel.
- A large amount of grains are stored in sylo and storage houses.
- The price of stored grain in storage areas is fixed by the government.
- Many insects destroy crop.
- Many types of chemicals are used to control insects in crops. This is known as insecticides.

Terminal Exercies

1. Fill in the blanks:

   (a) Crop means the plantation of one plant in one .....

   (b) There are three kinds of crops in India - Rabi, ... and .....

   (c) Roots of leaves easily ..... in hollow soil.

(d) It is necessary to ..... good quality of seeds and healthy seeds before souring.

(e) ..... is used for sowing of seeds.

2. Write any two examples of following:

(a) Tools of cultivation

1. ..... 2. .....

(b) Modern techniques of irrigation

1. ..... 2. .....

(c) Tools of cutting

1. ..... 2. .....

(d) Means of storing crop on a large level

1. ..... 2. .....

(e) Tools of weed separation

1. ..... 2. .....

3. Write any four differences between compost and fertilizer?

_____

_____

_____

_____

4. What is the effect of regular cropping on farm?

_____

_____

5. What is weed? How can it be controlled?

_____

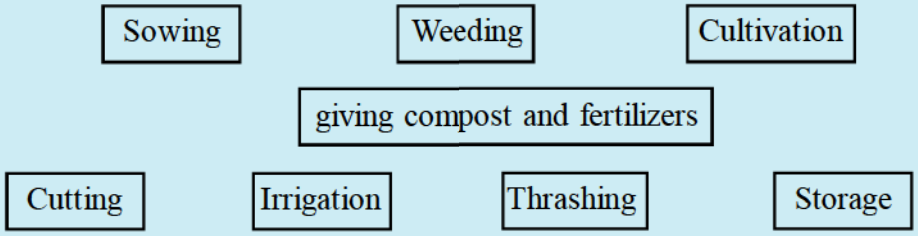
_____

6. Write short notes of about 20-40 words on the following:

1. Cultivation

2. Sowing
3. Irrigation
4. Weeding
5. Cutting
6. Storage

7. Prepare a diagram and mention the sequence of following activities:



Answer key to Intext Questions

13.1

1. (a) Crop
   (b) Rabi, Kharif, Zaid
   (c) Ready
   (d) Farming technique
   (e) Hollow
2. to increase fertility of land
3. (i) quality of seeds
   (ii) healthy seeds
4. (i) Kharif crop - Gram, Peas
   (ii) Rabi crop - Paddy, Maize
5. (a) - (ii)
   (b) - (iii)
   (c) - (i)

(d) - (v)

(e) - (iv)

(f) - (vii)

(g) - (vi)

13.2

1. (i) ✖ (ii) ✓ (iii) ✓ (iv) ✓

(v) ✓ (vi) ✖ (vii) ✓ (viii) ✖

(ix) ✓ (x) ✖

14

Magnet and Electric Current

You will be quite familiar with these two names - magnet and electric current. You must have seen magnet in the shop of steel utensils. This is done to check that the utensils are made up of full steel and do not have iron in them. Magnet is used in our day to day life many times. Magnets are used in the almirah doors, fridge doors and wooden boxes etc. These are helpful in closing them easily. Magnets are also found in toys and speakers. There is a deep relation between magnets and electric current. Magnets are also used in some electronic items. We will learn about magnets and electric current in this chapter.

Objectives

After reading this chapter, you will be able to

- know what magnet is
- differentiate between magnetic and non-magnetic items
- know the chief characteristic of magnet
- know the various uses of electric current
- differentiate between good and bad conductors of electricity
- understand the structure of electric circuit
- know the various effects (heat, magnetic and chemical) of electric current

14.1 Magnet

Magnet is one such item that attracts things made up of iron. The other metals that magnet attracts are nickel and cobalt.

The items that get attracted towards magnets are known as magnetic items. Those which do not get attracted are called non-magnetic items.

There are many mountains in nature having magnetic properties. These are known as natural magnet. It is said that a place named Magnesia was in Eastern Greece country around 2800 years back. One person was grazing his sheep in the mountains. He had a stick with iron cap on the top. This cap attracted mountain. He took some pieces of rock with him and concluded that they attracted iron. He discovered that if these pieces are freely moved, then they stop in one direction. This was known as 'loadstone' meaning mountain telling direction. This rock was made up of minerals known as magnetite. Hence, the name magnet.

Activity 14.1

Get a magnet from near by area. You can also get magnet from an old speaker or toy. Prepare a list of items from your environment having magnetic and non-magnetic properties. Observe them in the following table:

S. No.	Name of item	Magnetic/Non-magnetic
1.	.....	.....
2.	.....	.....
3.	.....	.....
4.	.....	.....
5.	.....	.....
6.	.....	.....
7.	.....	.....
8.	.....	.....
9.	.....	.....
10.	.....	.....

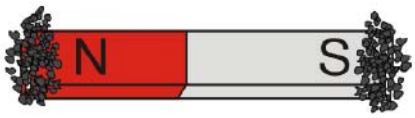
14.2 Shape and size of Magnet

Magnet is found in many shapes like circular magnet, bar magnet, horse shoe magnet etc. There are two poles of every magnet, north pole and south pole. The magnetic power of magnets are stored on these two poles. North pole is symbolized (N) and south pole as (S).

Fig. 14.1: Different types of Magnet

Activity 14.2

Take a bar magnet. Put some iron powder on a clean paper. Keep magnet above it. You will find that maximum iron powder sticks on the corners of magnet. There are no iron traces on the center of magnet.



Intext Questions 14.1

1. Fill in the blanks:

   (a) There are two poles of a magnet, ... pole and ..... pole.

   (b) The items that get attracted to magnets are ..... items.

   (c) Magnet is named by mineral called .....

   (d) Iron, ... and ..... have magnetic properties.

   (e) The magnetic properties are found on its .....

2. Categorise the following items into magnetic and non-magnetic table:

   Pin, nail, pencil, rubber, stitching, plastic bowl

Magnetic	Non-magnetic
.....	.....
.....	.....

14.3 Reaction of magnetic poles

Bring two magnets closer. Do they get attracted? Now bring two different poles of magnets together.

Do they get attracted to each other?

The same poles of magnet repel each other and different poles get attracted to each other.

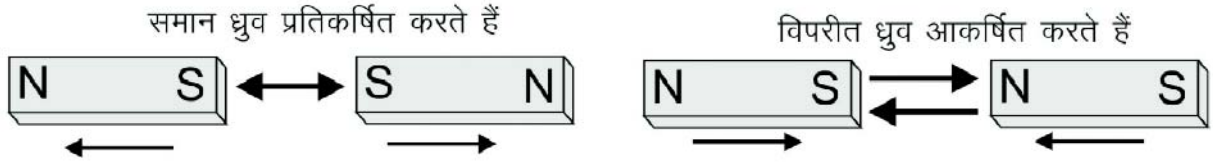


Fig. 14.2: Reaction of magnetic poles with each other

When magnet moves independently, it stops in one direction. The pole pointing north direction is north pole. The pole pointing south direction is south pole.

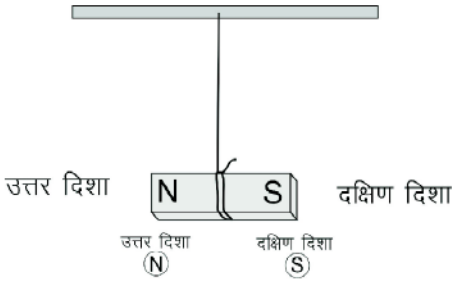


Fig. 14.3: Poles of Magnet

This property makes magnet usable in compass. By compass we mean a round dial having or showing many sides. A magnetic needle in the center is always pointing north direction. We know our distance from north-south direction.

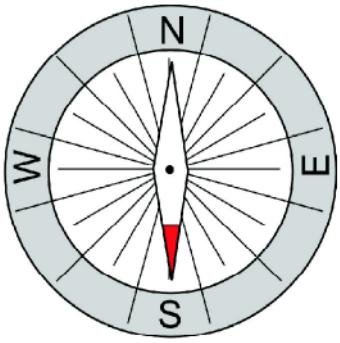


Fig. 14.4: Compass

Compass is used in aeroplanes, ships and forest offices to know the correct direction.

Magnets are also used to select iron items from garbage dump. Magnets are used to carry heavy items of iron with the help of crane.

Fig. 14.5: Crane pulling car with help of magnets

Intext Questions 14.2

1. Fill in the blanks:

   (a) A free hanging magnet always stops in ..... direction.

(b) Same poles ..... and different poles of magnet .....

(c) ..... is the name of magnets to tell correct direction.

(d) Compass is used in ....., ... and ..... to know correct direction.

2. Write any three uses of magnet?

_____

14.4 Electric Current

After pressing the switch; bulb gets lighted, fans start working, iron gets heated. What are the elements that make these items working when we press the switch on and they stop when switch is off? Yes, this is known as electric current. Let us understand electric current with the help of some experiments. We need following items for experiment: 4 electric cells (1.5 volts each), joining wire, torch bulb, titch button, thread and a piece of cardboard.

Note: Do not use any household circuit for experiment (where you work lamp, press etc). This could be dangerous. House electricity comes on 220 volts whereas the cells only have 1.5 volt. This current is not dangerous.

Activity 14.3

Structure of cell

Take an old cell. You will see two ends there. One is curvical and one is flat. The curvical area is known as positive terminal (symbol + ve). The flat surface is negative terminal (symbol -ve). Now remove paper from the outer body of the cell. You will find a clynderical shape of white metal known as zinc. Cut this metal with precaution. You will find a carbon rod inside covered by a sticky black coloured chemical.

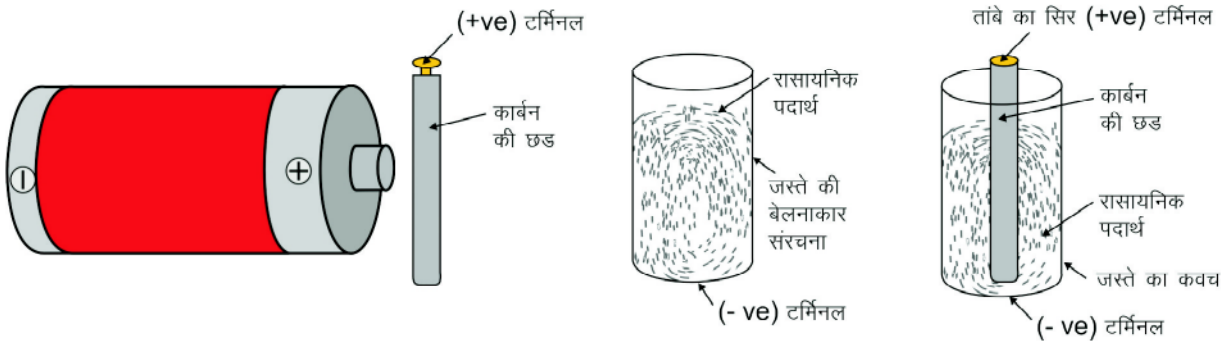


Fig. 14.6: Structure of cell

The chemical reactions of this chemical prepare electric current. This electric current is a moving charge. Electric current in a cell passes from +ve terminal to -ve terminal. If these are joined correctly bulb lights up.

Sometimes we need extra electric current. This is prepared by joining two or more cells. We should check +ve terminal of one battery is connected to -ve terminal of other battery. Battery is the joining of two or more cells.

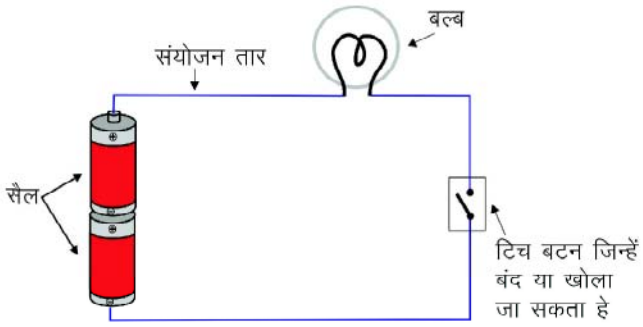


Fig. 14.7: Battery of two cells

Intext Questions 14.3

1. Fill in the blanks:
   (a) A simple electric cell is of ..... volts.
   (b) House hold circuit has ..... volts.
   (c) Carbon stick in cell works as ..... terminals.
   (d) Electric current is a moving .....
   (e) ..... is made up of two or more cells.
2. Write the names of parts of cells?

   _____
3. Draw a picture of two cell battery?

   _____

Activity 14.4

Making electric circuit

Take a piece of cardboard. Bind it with one or two cells (by making battery) with the help of thread. Now keep the +ve terminal stick to joining wire with the help of cello tape. Now this is bound with card board. Now add torch bulb to this wire and add titch button in a way that all wires are closed. No wire is open. You can also used LED (Light Emitting Diode) bulb in place of torch bulb. These bulbs can be lighted with the help of single cell only. The longer side of LED is touched with +ve terminal and the smaller side with -ve terminal. (The end point of wire is on -ve side). Titch button works as a switch. When titch button works as a switch. When titch button joins then bulb lights up and if these are separated the bulb stops emitting light.

If titch button is closed the bulb gets lighted up and vice versa. Why does it happen?

This happens because to complete an electronic circuit, we need the closed wire connecting to +ve terminal joining -ve terminal without any obstacle. This circuit is known as close circuit. If this circuit is broken somewhere, then it is open circuit.

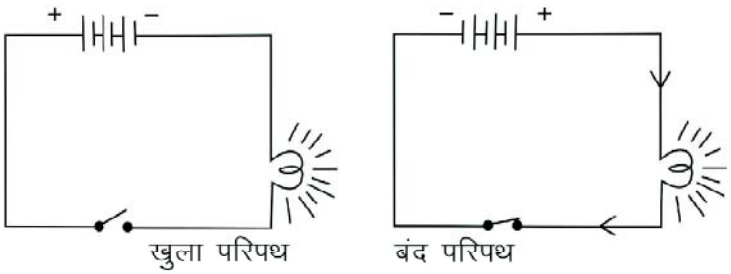
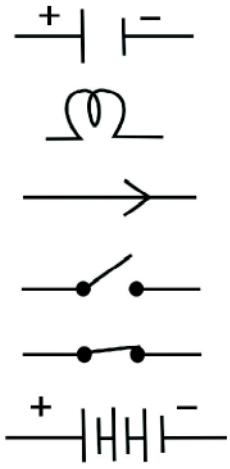


Fig. 14.8: On and off switch

To show items in a circuit various symbols are used as:

1. Electric cell
2. Electric bulb
3. Joining wire
4. Switch on
5. Switch off
6. Battery



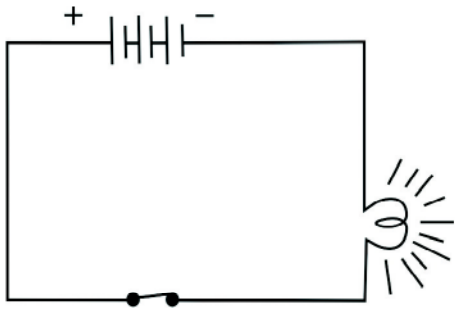


Fig. 14.9: Electronic Circuit

Activity 14.5

Replace titch button with various things (like pen, rubber, spoon, safety pin, wooden piece etc.) in the electronic circuit made by you. Now find out which items have current flouring and which are not flowing the current. Those items through which current passes are known as good conductors of electricity.

Those through which current does not pass are known as bad conductors of electricity. You must have seen that people working on electrical wire wear rubber gloves in hands and rubber shoes in legs. So that they do not get electric current in their body.

14.4.1 Heating effect of electric current

When electric current passes through carrier or joining wire, it gets heated up. Therefore, heat is generated in electric current. If you touch any lighted bulb, you will feel its heat. Electric current flows in iron, making it heated.

Electric current characteristics are also found in gyser or rod to heat up water or in heater to prepare food etc. The effect of carriers get heated up by electric current is known as heating effect. This effect is found in different objects and in different quantity. Heating effect is dependent on the length and thickness of carriers etc. Long and thin wire gets heated more whereas small and thick wire gets less heated.

14.4.2 How does bulb light up?

A spiral of thin wire is prepared by tungsten material inside the bulb. Another sprial is made to wind up wire in a small place. Thungster is a thin wire and gets more heat. However, thungsten does not melt easily. Therefore, it is a proper material for bulb. When it gets heated with electric current it starts shinning. This is the light emitting of bulb.

Electric bulb gets heated in large quantity to emit light in bulb. This energy is extra and waste to us. Therefore, tube lgiht, C.F.L or L.E.D bulbs are used in place of big bulbs. These work on less electric supply and save energy.

14.4.3 Fuse and its uses

A weak link is made in our homes to supply electric current. This melts the wire in small amount of heat. The circuit breaks down. This is known as fuse. Short circuit happens when more electric supply is passed accidentaly. This may lead to fire. To stop this danger, fuse is used.

Intext Questions 14.4

1. Write the symbols of following items in electric circuit:
   a. electric cell
   b. electric bulb
   c. carrier wire
   d. battery
   e. switch on
   d. switch off
2. Write any three names of good and bad conductors of electrcity?
3. Why does a lighted bulb, heat up?
4. Write any two instruments used for electric current heating?

14.4.4 Magnetic effect of electric current

Activity 14.6

Take an iron nail of about 6-10 cm and cover it up with a flexible wire of about 75 cm. Join them with a battery of four cells. Keep some all pins nearby to the tip of nail. Does the iron nail attract all pins?

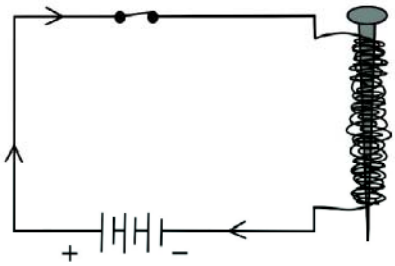


Fig. 14.10: Magnetic activity

How does nail convert to magnet?

Electric current passes through spiral wire which puts magnetic effect on nail. Due to this the nail starts showing magnetic properties. With the help of these magnetic properties, electronic magnets are prepared. These are used in electronic bells, pulling iron out of garbage by crane, in toys and some tests on humans by doctors etc.

14.4.5 Chemical effect of electric current

Activity 14.7

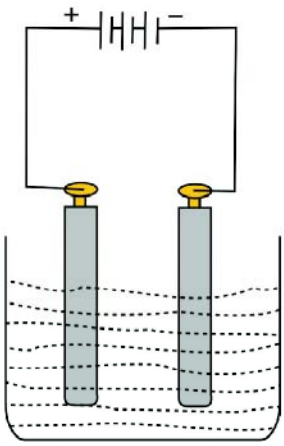
Put salt solution on the two ends of electric circuit prepared in activity 14.4. Does the bulb get emitted? Lighting of bulb means that electronic circuit is not broken. This means it keeps on passing with salt solution. This tells us that salt solution is the good conductor of electric current. Those liquid by which the bulb does not get emitted are weak conductors of electricity. Now put following liquids in place of salt solution and fill the following table:

S. No.	Liquid	Bulb lighted or not	Good/weak conductor
1.	Lime juice	lighted	good conductor
2.	Vinegar		
3.	Tap water		
.	oil		
10.	Milk		

Activity 14.8

Take out the carbon rods of any two disposed off or waste cells. Make their top ends clean by using emery (rake) paper. Now join them with a battery made up of two cells. Carbon rods will do the

work of electrodes. +ve terminal rod is known as positive electrode or anode. The negative terminal joined rod is known as negative electrode or cathode. Electrode can be made up of copper metal or any other metal.



Put both electrodes in a glass box which is full of water. You will find few gas bubbles in both the electrodes. Actually these are bubbles of oxygen and hydrogen gas which have built by the breaking of water molecules due to electric current. The chemical reaction is seen when oxygen gets collected on anode and hydrogen gets collected on cathode. If we add copper sulphate in this water, then copper molecules will start collecting on cathode. This will build a thin layer on electrode. This characteristic is used in electroplating.

14.5 Electroplating

The use of chemical reaction of electric current is known as electroplation.

This is a procedure where a layer of a metal is built on other metal, like the iron handle of a cycle has a layer of nickel, silver ornaments have a layer of gold etc.

The metal or item on which layer is supposed to be made is added with -ve terminal and the metal which is used for thin layer solution is added with electrode to produce electric current.

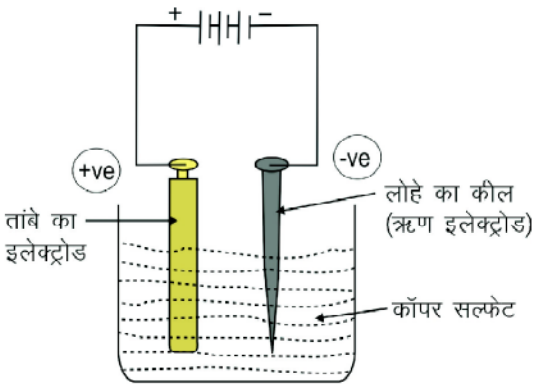


Fig. 14.10: Electroplating on iron nail

Intext Questions 14.5

1. How will you make magnet out of an iron nail?

_____

2. Write any two names of electric magnets used in our homes?

_____

3. What are the uses of electric current in electroplating?

_____

4. What is the name of electrode joining positive terminal?

_____

5. Which two gas molecules are formed by breaking of water molecules?

_____

What have you learnt

- Magnetite is a natural magnet. Magnet attracts elements like nickel, iron, cobalt etc. Such items are known as magnetic items and some that do not get attracted to magnets are called non-magnetic items.
- There are two poles of magnet-north pole and south pole. If magnet is independently freely moved, it stops in north-south direction.
- Same poles of magnet repel each other and different poles of magnet attract each other.
- Electric cell is an important resource of electric current. It has two terminals where big line shows +ve terminal and small line shows -ve terminal.
- In a close electric circuit, electric current flows from +ve terminal to -ve terminal in an electric cell.
- These items which help in flow of electric current are known as good conductors of electricity and those that do not help in flowing electric current are called bad conductors of electricity.
- The elements of electric circuit are shown by symbols.
- When an electric current is passed in a wire, it gets heated, known as the heating effect of electric current. Some special metals break the heat of electric circuits. These special metals are used in making electronic fuse.
- When electric current is passed in a wire, it behaves like a magnet. This is known as magnetic effect of electric current.
- When a piece of iron is covered by an electric wire (good conductor) in spiral way, it is known as electronic magnet. This electronic magnet is used in many equipments.
- When a good conductor liquid passes through electric current many chemical reactions take place. These reactions are known as the chemical effect of electric current.
- When any material is covered with a required metal by means of electric current it is known as electroplating.

Terminal Exercises

1. Choose the correct option:

   (a) Magnet attracts

   (i) Wood powder (ii) Glass powder

   (iii) Iron powder (iv) Copper powder

   (b) Non magnetic items are

   (i) Nickel (ii) Cobalt

   (iii) Gold (iv) Iron

2. Tick (✓) the correct statement and cross (✖) the wrong one:

   (a) Magnet is not used to check the utensils of stainless steel. ( )

   (b) The magnetic power is on the centre of magnets. ( )

   (c) There is attraction in the same poles of magnets. ( )

   (d) Copper is a good conductor of electricity. ( )

3. What is electric magnet? How is it used?

4. Which tools are used as an effect of heating effect of electric current?

5. What are the uses of fuse in electric current?

6. Write four examples of electroplating from your environment?

7. Why are C.F.L or L.E.D bulbs used in place of simple electric bulbs?

8. Prepare an electric circuit of a battery of two cells, a bulb and a switch.

9. Why rubber gloves are used in hands while working on electricity?

10. What are the uses of compass?

Answer key to Intext Questions

14.1

1. (a) North, South (b) Magnetic (c) Magnetite

   (d) Nickel, Cobalt (e) Poles

2. Magnetic - pin, nail, stitching

Non-magnetic - pencil, rubber, plastic bowl

14.2

1. (a) North, South (b) Repel - attract

(c) Loadstone (d) Aeroplane, ships

2. (a) Choosing objects of iron from garbage

(b) To find out direction by forest officers

(c) To close doors of almirah

14.3

1. (a) 1.5 volt (b) 220 volt (c) +ve

(d) charge (e) battery

2. Parts of cell

(a) Carbon rod (b) Chemical items (c) Clynderical zinc

3.

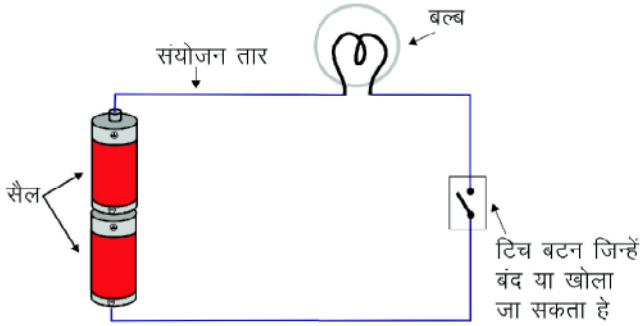
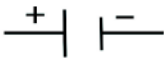
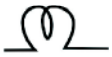
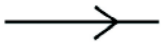


Fig. 14.7

14.4

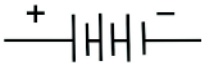
1. (a) 

(b) 

(c) 

(d) 

(e) 

(f) 

2. Good conductors - copper, iron goods, coins

   Bad conductors - rubber, wood, leather

3. The heating effect of passing electric current in bulb heats it.

4. (a) heater

   (b) gyser

14.5

1. Iron nail in spiral wire passes electric current. This makes magnet.

2. Electric bell, toys

3. Electroplating creates electricity by chemical reaction

4. Positive electrode or anode

5. Oxygen and hydrogen

15

Movable Objects, Force, Friction and Motion

When you look at the environment around yourself you will find a lot of things moving like birds flying in the sky, children running in the park, water flowing in a canal, pendulum moving in a watch, fan rotating on the roof etc. So what is this movement?

We say that some things are static like tree on the side of road, stone in the park and building of the school etc. By static we mean that there are not moving. Why do we say like that?

Movement is motion which is important for life. If all these movements stop and things become static, what will happen?

When we put a weight on own head directly or if we use turban or cloth on our own head, we are comfortable in the second position.

Let us study about motion, its type and causes with effect of force and anti-motion force or friction and pressure in this chapter.

Objectives

After reading this chapter you will be able to

- Define motion with examples
- The methods of measuring distance and length
- Explain force with examples
- Define the factors making an effect on friction and frictional force.

- Able to explain the utility and limitations of frictional force with example
- Know the need of making more and less frictional force
- Make a list of things relating to low and high frictional force in them
- Define pressure and atmospheric pressure with examples
- Know the various means of pressure

15.1 Interval (static) and motion

When you go to some other place from your home, you move. This makes change in your position which changes with time. This change of position of a thing from time to time is known as motion.

Think about a tree planted on the lower end of the road. It is there where it was yesterday. There is no change of position from time to time. This is known as static position i.e. permanent. Therefore, the item where position does not get changed, is known as fixed position.

15.1.1 Types of Motion

Think about motion in the following pictures. Are all of these some kinds of motion?

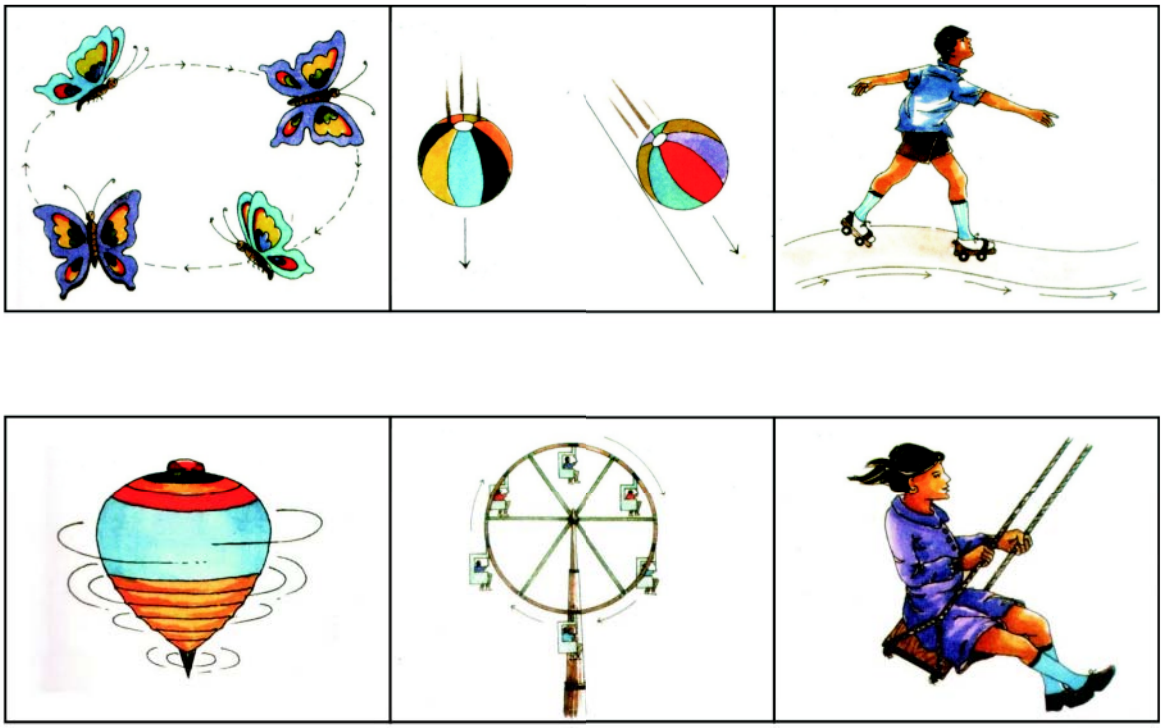


Fig. 15.1: Moving objects

Let us analyse all these motions and categorize them.

Flying butterfly goes on a non-fixed path and then its motion changes. This is known as irregular motion.

A falling ball has a linear path. This is known as motion, linear motion. The same is the motion of a child slipping on a flat track.

A top revolves on a rotation path. The top revolves on its axis in a rotational or cylindrical motion.

In a mary go round children in a circular path on its axis. Such kind of motion is known as circular motion.

A child on swing goes around a central point, in to and fro motion. Such motion is called oscillatory motion.

Some time many things have different types of motion. For example a tyre of a vehicle revolves on its axis and moves forward. This shows that it has linear motion and rotating motion too.

Activity 15.1

To study different types of motion.

Take one small stone, thread, copy and pen.

Do the following activity and note it down in a notebook.

i) Drop stones from different heights about three four times.

ii) Rotate stone in circular stone by binding it with thread.

iii) Bind stone with thread and put it on a nail and leave it, Now see its motion.

iv) Observe the tip of pen while writing all the details.

You will find:-

i) The first state of stone is linear motion.

ii) The second stage of the stone's movements is circular motion. Therefore it is circular motion.

iii) The third stage has clyinderical motion.

iv) The nib of pen moves in a non fixed way. Therefore, it is irregular motion.

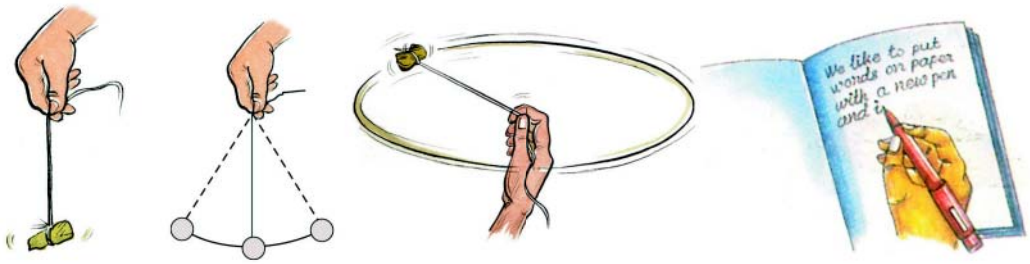


Fig. : Various types of motion

Intext Questions 15.1

1) Identify which of the following are dynamic and which are static: -

   a) Kicking a football

   b) Moving needles of watches

   c) Tree planted on the side of road

   d) Planet of solar system

2) What type of motion is found in the following

   a) players playing hockey in a ground

   b) Motion of a child on a swing

   c) Motion of a person climbing stairs

   d) Motion of earth moving around the sun.

15.2 Length, Measurement of Distance or length

Whenever we see a dynamic thing we say it changes its position with time. When an object moves on a path from one place to another then the length covered by that object is called its distance. How would you know what is the distance covered by you? We need measurement taken of that distance.

Measuring length or distance

A tailor measures the length of a cloth to know whether it is sufficient for a Kurta or not. A carpenter measures the length and width of an almirah to know how much wood is required for it

In older time, the tools of measurement were length of foot, width of finger, one step ahead etc. Hand (from finger tip to elbow) was used as a measurement tool in ancient Egypt.

Foot is used as a unit of measurement of distance or length in various corners of the world. 3 feet is equal to one yard. People measure 1 yard by measure of cloth from chin to open hand. Romans measured length by their steps,

But every human being has different body structure. How can it be used to measure the length? Everybody has different length of legs, steps etc.

There must be some problems in measurement. Due to this problem French started measurement in 1790. Their standardized tool is known as meter system.

For uniformity measurement, various scientists of world prepared a standard system of measurement.

This is known as international system. (S.I. Standard)

The S.I. standard of length and distance is meter.

To measure a bigger length 10 times, 100 times and 1000 times of meter measurement is used.

To measure a smaller unit one-tenth, 100^{th} and 1000^{th} part of meter is used.

Let us understand the correct method of length measurement.

Activity 15.2

According to the picture keep a point zero on the length of book.

Keep your eyes on the second end of the book and see the number on the meter.

Note it. It will tell you the length of the book.

For correct length keep your eyes on 90° angle neither right nor left, but straight

Why is it necessary? Think about it if the number zero on meter scales is changed to one, then what would be its length?

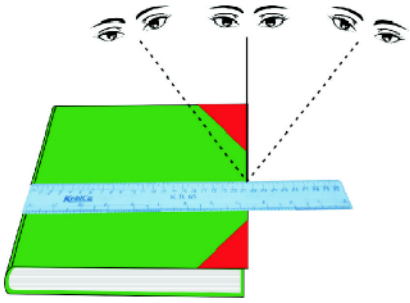


Fig.

Activity 15.3

Note down the correct measurement of following items in the table: -

Sl. No.	Name of Item	Meter or Centimeter
1.	Length of Bench	.....
2.	Height of Wall	.....
3.	Length of table	.....

In our day to day life, we use various methods for measurement. Meter is used as length measurement, tailor measurement and cloth measurement. Therefore, the distance covered by an object is fixed. The same is called motion.

$$\text{Motion} = \frac{\text{Distance}}{\text{Time}} = \frac{\text{Meter}}{\text{Second}}$$

S.I technique makes meter as the qualifier of distance and second as standard units of time. Therefore, the standard unit of motion is meter per second.

Intext Questions 15.2

1. Fill in the blanks
   a) There are _____ centimeters in one meter.
   b) There are _____ meters in one kilometer.
2. Why steps are not used as the standard measure of length?
3. Write in increasing order:-
   a) Meter
   b) Centimeter
   c) Kilometer
   d) Milimeter

15.3 Force Pushing

There are a few words that are used to explain some activities like pulling, pushing, kick, attack etc. These activities create a difference in the motion or create a difference in the motion of the object. Can we use one or more words to express these activities? Every work described above can be called as pulling or pushing. Can we conclude that to bring things in motion we can push it or pull it.

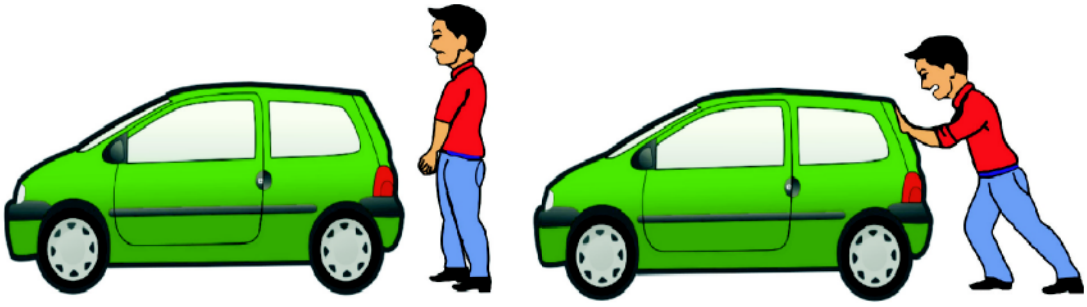


Fig. 15.2: A person standing behind car and pushing the car

The pushing or pulling of an item in science is known as force. Assume that a person is standing behind the car (Fig 15.2)

Does his presence have an effect on the motion of car or pushing the car or is it force? Car starts moving in the direction of movement. The person stops pushing the car. The movement of the car stops. Take some heavy item like a table or box. Push it making it in motion.

Push a heavy item (like table or box) to move put it in motion. Make your friend pushing it on the other side. (Fig 15.3)

Fig. 15.3: Pushing table in the same direction and opposite direction

Note down the motion of a table. Can you easily stop a person that is pushing table by more force? Have you seen the game of rope pulling where two teams pull each other in opposite directions?

Both items pull each other in their direction. Sometimes the rope does not move. The team which pulls more or exerts more pressure wins the game. If two forces are exerted in different directions then the total force is equal to the difference between both the forces.

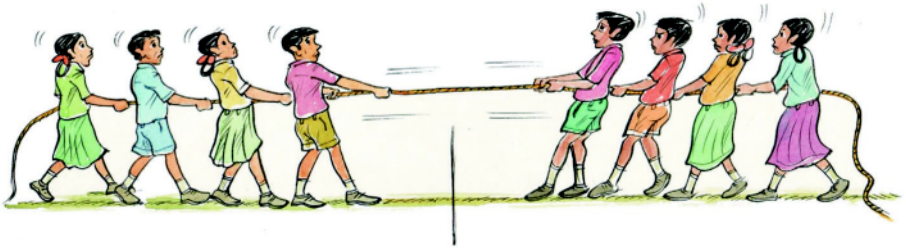


Fig. 15.4: Game of rope pulling; two teams pulling each other

When both teams exert same pressure, then the rope does not move. Now we have learnt that one force may be bigger or smaller than the other force. Force is measured by its mass. It is necessary to observe direction and measurement of force. This force acts as work. To measure force Newton (N) is used. If the direction and mass of force are changed, then effects are also changed. Force changes the stage of motion.

What happens when a force is exerted on things?

Activity 15.4

Take a rubber ball and place it on a flat surface like table or concrete floor. Now push the ball on the surface. Do you find a motion in the ball.

Now push the ball again. Do you find any change in its motion? This increases or slows down. Now put your palm in front of the moving ball. When ball touches your palm, remove your hand. Does your palm exert some pressure on the ball? Does it have an effect on the speed of the ball? Does it increase or decrease? If you stop the moving ball with your hand, what will happen? Think

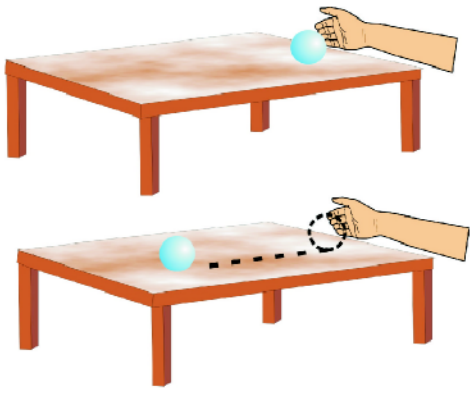


Fig.: Rubber Ball and pushing rubber ball on a flat surface

about such positions. For example: A football player exerts pressure on football during penalty kick. Before kick, ball was in rest mode. Therefore, it had a zero motion. The exerted force make ball moving towards goal. Goal keeper stops ball or pushes it to save the goal. The goal keeper exerts force on the moving ball. His force stops or redirects the ball. It also stops the goal. If goal keeper succeeds in stopping the ball then the motion of ball is zero. This means that the force exerted on an object can change its path. If the pressure exerted by goal keeper is in the direction of motion of ball, then speed increases. If the pressure exerted by goal keeper is in opposite direction than speed decreases.

Does speed get changed only by the exertion of force?

Activity 15.5

Take a ball and place it on a flat surface. Push the ball. Keep a scale on its way which will exert force on the ball. Does ball move in the same direction after hitting scale. Repeat this activity. Make sure that scale makes different angles with the moving ball. Note down the direction of ball in every situation.

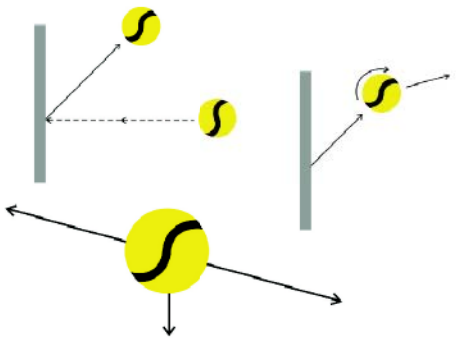


Fig. : Ball hitting scale and different angles made by it

15.4 Stages of Motion

The stage of motion is decided in every object by its speed and direction of movement. Static movement is called zero motion stage. Every object can be static or in motion. Both are the stages of motion. This means that force will change the stage of motion of objects. This is our general experience that some things do not move even by exerting pressure. For example, a heavy box does not move by exerting maximum pressure. In the same way, force has no effect on the way. Force can change the shape of objects (when an air balloon is pressed between both the hands).

All these activities make us understand that force can make objects static, can change the speed of moving objects, can change the direction of moving objects, and can change the shape of moving objects. Force can do some or all effects on a objects. Although force does show one or more effects yet none can be shown without exerting force. This means that no objects, can move in it or change its direction or shape without force.

Intext Question 15.3

Tick the correct option:-

1. Force is

   a) Can move a thing

   b) Can stop a thing

   c) Can change the shape of a thing

   d) All of above

2. Does force change the shape of an object? If so, give example?

   _____

15.5 Friction

You slow down your cycle or other vehicles by pressing brake. Have you ever thought why cycle or other vehicle slow down by pressing brake? This ia applicable to not only cycle or other vehicles but to every other object which is moving on surface of other items. It slows down when no other external force is exerted. It stops down. Have you seen moving ball stopping after sometime? Why do we slip on a banana?

15.5.1 Friction Force

To stop a motion or going in its opposite direction, there must a be force which is exerted. This is known as friction force. Push any book placed on the table. You will find it stops after some distance. Repeat this activity from opposite direction. (Fig 15.5)

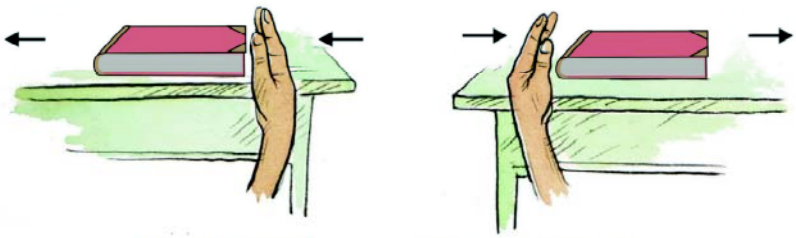


Fig. 15.5 : Pushing a book placed on the table

Does book stop this time too? Can we say that a force must be exerted in the opposite direction of movement to stop motion? This is known as friction force.

You must have seen that if you exert force on left side, then friction works in right direction. If force is exerted on right side, then the book moves in left direction due to friction. Friction force is always against the above activity. Does it depend on the sticking of its surfaces?

15.5.2 Factors affecting friction

Activity 15.5

Make a flat surface on slippery floor and a table. For this you can use a wooden piece on a brick stand. At any point 'A' make any symbol on flat surface. Now slip a pencil cell down from this point and observe the distance of the stopping point of pencil from table. Now place a cloth on table. Cloth should not have a single wrinkle. Repeat the above activity. Repeat by placing a thin layer of sand on table. Take the same slope in every activity. Observe the least distance covered by pencil cell in which activity? Why is this that the distance covered by pencil cell changes? Try to find the cause of difference of this distance. Does it depend on the nature of surface on which this distance pencil cell is placed. Does the slippery nature of surface also affect the distance covered by pencil cell?

Friction is caused because of the irregularities of two surfaces. These surfaces are very slippery. They have many micro irregularities on the surface. Due to the irregularities of two surfaces, they dig into each other. When we try to give motion to an object on a different surface then an interrelation of surfaces takes place. To cross this interrelation of surfaces, force is applied. If the surface is irregular, then there is more friction force. We have learnt that the interrelation of irregularities of two surfaces causes friction.

It is clear that if two surfaces are pressed forcefully then friction increases. You can experience it by pulling a mat. When nobody is sitting on the mat and when somebody is sitting on the mat. Remember your experience.

15.6 Friction – Harmful but compulsory

Remember some of your experience

1. Which is easy to hold, a glass or a pot ? Now think that the outer surface of glass is slippery or there is a coat of oil present on its surface. Do you think it will be easy to hold the glass? Now think if there is no friction, then how would you hold the glass?
2. Think about walking on the wet floor of marble or muddy way or a slippery mud way. It will be difficult to walk on it. Can you imagine walking without friction?
3. It will be impossible to write with a pen or pencil without friction

4. When your teacher writes on blackboard with a chalk, then the irregular surface of blackboard reduces chalk powder and rest of chalk is on the blackboard with the help of alphabets. Therefore, you can see the writing on blackboard.
5. If there is no friction between road and tyres of vehicles, then there would be no motion in vehicles; they can't be stopped nor direction be changed.
6. If an object starts in motion, it cannot be stopped, if there is no friction.
7. You can't even fix a nail or tie a knot in thread without friction.
8. building can't be built without friction.

However, friction is harmful, because

1. Due to friction objects depreciate. Like nails, valve, bearing or the shoe sole.

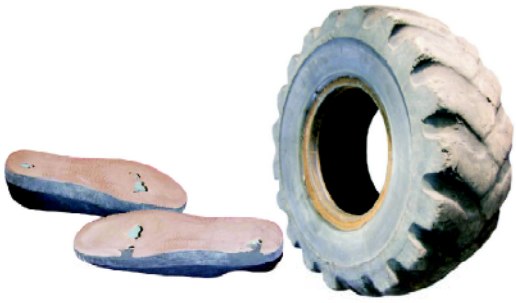


Fig. 15.6 (a): — of shoe sole

2. You must have seen bridges and stairs. Friction also creates heat when you light a match stick with a match box, then it catches fire. Fig 15.6 (b)

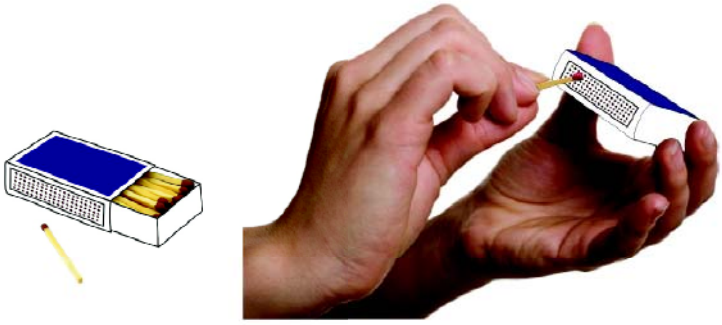


Fig. 15.6 (b): Lighting of match stick

You must have seen that after running for a few minutes the jar of electrical mixer also heats up. You can see many examples where friction creates heat energy. When you use a machine, then energy created by friction destroys extra energy. We will now study how to increase or decrease friction.

15.7 Increasing and decreasing friction

Have you ever thought why the sole of our shoes is irregular in design. Fig. 15.7 (a)

Irregular design of shoes help in catching the floor, so that you are safe while walking. In the same way, the tyre of car, trucks and bulldozers also stick, so that they have a good hold of the road. Brake pad is used in automatic vehicles and cycles to increase friction. When you ride a cycle and your brake presses the liver, this pressing friction stops the motion of rim and it stops working.

Fig. 15.7: (a) Sole of shoes

You must have seen that

a) Kabbadi players rub mud on their hands so that they can hold their opponent. Gymnast also place any greasy material on their hands. This increases friction and their hold. In some situations friction is not required. Therefore, we need to lesson it.

b) Why delicate powder is spread on carom board? So that the friction between striker and carom board will be lessened? Fig 15.7 (b)

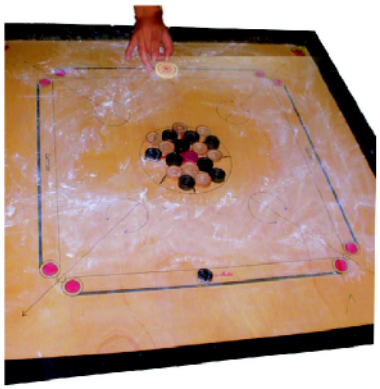


Fig. 15.7 (b): Carom Board and delicate powder

You must have noted that we drop a few oil drops in our door gate so that it starts moving freely. Cycle and motor mechanic uses grease in the moving parts of these machines. All these situations increase skill of the machine and reduce friction. When grease on graphite is used between the moving parts of any machine then a thin layer is formed and the moving parts do not get stuck with each other.

The item used to reduce friction is known as oil but it is not used in some machines as lubricant. Such machines use seat between moving parts to reduce friction. Friction cannot end completely. A surface cannot be completely slippery, there are some irregularities in it. Fig 15.7 (c)

Fig. 15.7 (c) : Bearing and wheel reduce friction rollers on

You must have seen toys and other heavy items. Such items are easily taken by small kids. Fig 15.7 (d).

Fig. 15.7 (d): Rollers in Suitcase and other heavy items

Why this happens? Let us understand

Activity 15.6

Take some pencils of cylindrical shape. Keep them parallel on the table. Put a heavy book above it. Now push this book. You will find that pencils start falling due to motion of the book. Such type of motions of pencil is known as aviator or roller motion.

Have you experienced that instead of pushing, moving a book in this manner has made less friction? Have you seen people transporting heavy machines by keeping them over logs of wood.

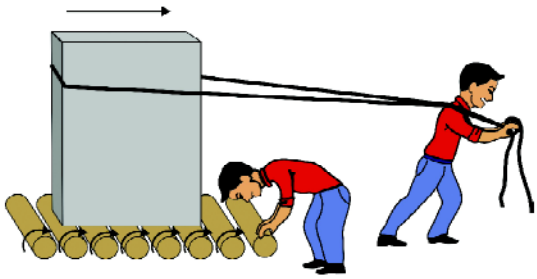


Fig : Moving an object over log of wood

When an object moves on the surface of another object then the resistance of motion is called roller motion or friction. This reduces friction. Rolling is like pushing an object. Therefore, pushing an item on roller is easy.

15.8 Liquid Friction

You know that air is very light and moving. However, the things moving in the air have Air friction force. In the same way, motion of things in liquid and gas also has friction force. Gas and liquid have been given the name 'liquid' in science. Thus, we can say that things moving in liquid have friction force. The friction force exerted by liquid is known as fluid friction. The friction force in liquid depends upon the relative motion of its liquid. Friction force also depends on the shape of item and nature of liquid; when an object gives motion in liquid, it has to go above the friction force of that item. Therefore, many things are done to reduce the friction. Therefore, objects are given various shapes. These shapes are received by codes given to them. You will think who gives them these codes? The answer is nature. Birds and fishes move in liquid. Their body is built in such a way that their energy helps them in reducing the friction force in the liquid. You have read about

these shapes before. Think about the shape of airplane. Every vehicle is designed in such a way to reduce liquid friction.

Intext Question 15.4

1) The force exerted against the motion of an object is known as: -

   a) Friction b) Communication force

   c) Gravity force d) Magnetic Force

2) Fill in the blanks: -

   a) To _____ the friction force, designs are made in tyres.

   b) Resistance of air is an example of _____ friction.

   c) Oiling is done in machine to reduce _____.

3) Write any two methods to reduce frictions?

   _____

15.9 Pressure

Try to fix a nail in a wooden piece with head and tail. Now try to cut vegetable both with a blunt and sharp knife. Which is easy?

Do you feel that the area on which force is exerted (for example on the tail part of nail), makes work easy. Let us do an activity to understand the effect of force in the change of area.

Activity 15.7

- Take a wide utensil. Place a thick layer of sand of about 6 cm.
- Take a brick
- First place it vertical and then horizontal? What do you find?

The vertical shape of bricks makes it go in depth why?

The reason is the 'less' area which makes brick taking less contact to sand. The weight of brick

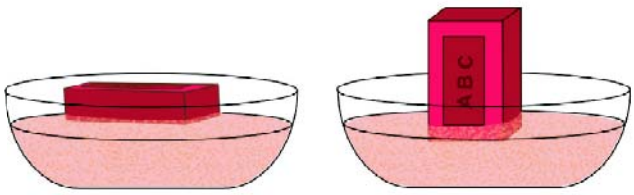


Fig.

and effect of pressure increases in the second situation. The contact area of brick and sand is bigger. What do you conclude?

> If equal force is exerted, then area is less and effect of force is in height and more communicating area more leads to reduction of force.

Let us understand the exertion of force in effect of communicating area.

Activity 15.8

- Take a wide utensil full of sand.
- Place a horizontal brick in it.
- Place a horizontal brick as per picture
- Now place one more brick on it.
- Let us see what happens

We find that the bowl having two bricks inserted is more deep than the bowl having one brick.

Which stage has more pressure on vertical bricks?

The one having two bricks has more pressure.

What do you conclude?

The increased force on same base has increased the effect of this force.

If the area of contact is same and the area is changed of the applied force then the effect of force changes.

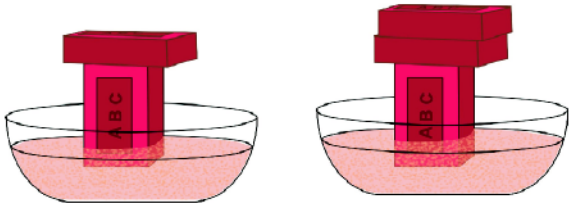


Fig.

All the above activities prove that the effect of force on contact area is proportional (ratio) to the area of force and non proportional (heterogeneous ratio) to the area of contact. This effect of force is known as pressure. Let us understand what is pressure?

Pressure is the effect of change by force exerted on the base of an object. Pressure on any base is dependent on the area of base and the length of force exerted on it.

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}} = \frac{\text{N}}{\text{m}^2} = \frac{\text{Newton}}{\text{m}^2}$$

Vertical force on surface area of an object is known as pressure.

Pressure is increased when

1) Area of applied force is increased

2) Area of the object is decreased

Pressure is decreased when: -

1) Area of applied force is decreased

2) Area of the object is increased

The unit used for measure pressure N/m^2 or Pascal

15.9.1 Effect of pressure in real life

1) Fruits and vegetables are cut easily with sharp knife.

2) Schools and carry bags have a wide surface to carry more items.

3) Labour and coolie wrap cloth on their head to make their work easy.

15.10 Atmospheric Pressure

Imagine you have cotton in your hand and you make a small round of it. The quantity of cotton is same but it has now shrunk.

In the same way the air around you gets pressurized from the air above it. This pressure of air is known as air pressure. Let us understand the effect of air pressure.

Activity 15.9

- Take a box of them tin. Fill it with some water.
- Boil it in such a way that both air and steam get out of it.
- Now close the box and put cold water above it. What happens?
- Box get stick from all sides. Why?

The hot air inside the box comes out of the box and is replace by water steam. This is changed to water at the time of cooling and reducing air pressure. The air outside exerts more pressure on the box from all sides. This makes box stick .

Fig.

15.11 Pressure by Liquids (Liquid and Gas)

When you immerse yourself in water then the pressure exerted by water is heard by the ears. This force is pressure. It is found in all liquid and gases. Gases and liquid together are called liquids. These liquid items exerted pressure in all directions up-below and equal but this pressure is directly proportional to the depth of liquid substances. Let us understand this with the following activities.

Activity 15.10

Take a pipe of transparent glass or plastic pipe of around 15 cm length. Take a sheet of good and thin rubber sheet. You can also use the rubber of balloon. Now cover one end of pipe with rubber sheet. Hold the pipe from center in vertical shape.

Ask your friend to insert some water in the pipe. Does the rubber sheet bloom in the outer corner. Note down the height of water in the pipe. Now put some more water in the pipe. Note down the rise in rubber sheet and the height of water in pipe. Repeat this height procedure. Do you find any relation between blooming of rubber sheet and height of water.

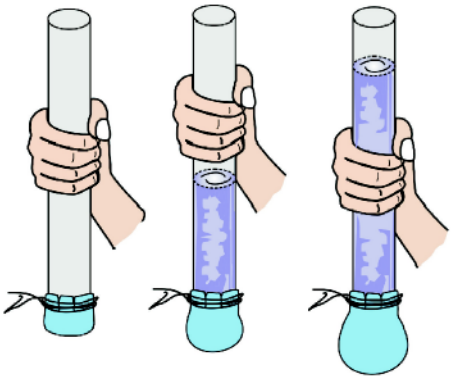


Fig: Bend the corner of pipe with rubber sheet

Activity 15.11

Take a plastic bottle. You can also use used water or cold drink bottle. Heat an end of 5.6 cm long glass pipe and place it in the bottom of bottle. Check that water should not leak from the ends. If this happens insert wax at the leak point. Close the mouth of glass pipe with a thin rubber sheet. Now fill half bottle with water what do you find? You will find that the rubber sheet on the mouth of glass pipe blooms.

Now put some more water in bottle. Do you find difference in the blooming of rubber sheet. Observe that the rubber sheet is placed in the walls of bottle not in the bottom of bottle. Does the blooming of rubber show that water exerts pressure on the walls of utensils.

Activity 15.12

Take an empty bottle or cylindrical utensil. You can also use empty box of talcum powder or a used plastic bottle of cold drink. Make four holes in four directions near the bottom of bottle. Make sure that the holes are at equal height.

Fill the bottle with water. What do you see? You find that water coming out from the bottle falls at an equal distance. What does this show? This shows that liquid exerts pressure on the walls of

utensils. Does gas exert pressure on the walls of utensils in which they are kept? When you have blown a balloon, why its mouth is closed in order to see that the air does not get away. If this mouth opens, what will happens? Imagine you have a balloon having a hole. Can you blow it? If not, why? It is because air pressurizes every direction.

If there is puncture in cycle what happens to the air inside it. These examples show that air pressurizes the walls of tubes of tyres in a cycle or balloon. Thus, we can say that gas exerts pressure on the walls of utensils in which it is kept.

Fig.

Intext Question 15.5

1) Tick (✓) the correct statement and cross (✖) the wrong one: -

   a) There is different pressure in different directions at a particular depth in water ( )

   b) Pressure increases with depth in liquid ( )

   c) Liquid exerts pressure on the walls of utensils ( )

2) Water tanks are kept a little above the ground.

   _____

3) As you go up from earth, what are the changes in atmospheric pressure?

   _____

What have you learnt

- The changing position of an object with limit is known as motion.
- Motion following a simple line is known as linear motion.
- In circular bath of motion the distance from the centre is equal from the centre.
- The motion which gets repeated at intervals is known as — motion.
- This equal measurement system has meter as S.I. measurement of length.
- If an object is pushed it is known as force.
- Force changes the motion or static position of an object, its direction and transforms its shapes.

- Friction force presents relative against motion of two surfaces.
- Friction force depends on force exerted on the nature of two surfaces. Friction has its own benefit and demerits.
- Liquid motion items give shape and also reduce friction force.
- Force exerted on single unit area is known as pressure. Liquid and gas pressurize the walls of the utensils.
- The pressure exerted by air around us is known as atmospheric pressure.

End of Chapter Questions

1. Match Column 'A' with column 'B'

	Column 'A'		**Column 'B'**
A)	Linear Motion	i)	Technique of less friction force
B)	Circular Motion	ii)	clock
C)	Cylindrical Motion	iii)	Rail Motion
D)	Ball bearing	iv)	rotation of sun by earth
E)	Items kept on table	v)	stage of motion
F)	Moving Car	vi)	static position

2. Fill in the blanks: -

   a) _____ makes changes in the shape of objects.

   b) The force exerted on top level between surfaces is known as _____.

   c) To _____ friction force design are made in tyres.

   d) The ratio between _____ and _____ is known as pressure.

3. Tick (✓) the correct statement and cross (✖) the wrong statement: -

   a) Item exerting pressure on horizontal in various stages is known as pressure. ( )

   b) By sharpening knife decreases the area of its surface. ( )

   c) Pressure exerted on any base is in ratio to length and also has heterogeneous ratio its area. ( )

d) The pressure on base of utensils depends on the heights of liquid filled in it. ( )

4. What is the importance of friction force in your day to day life? Explain with examples

5. Tick the correct option: -

a) S.I measurementof length is

i) Kilogram ii) Meter

iii) Foot iv) Yard

b) Force

i) Makes things in motion

ii) Stops things in motion

iii) Changes shape of things in motion

iv) All of above

c) The force opposing the motion of an item is known as: -

i) Friction force ii) Communication force

iii) Gravitational force iv) Magnetic force

6. Show how pressure is equal in all directions.

7. When a dropper nozzle is pressed after keeping in water; many water bubbles are spotted. If pressure is removed from valve of dropper nozzle, water gets filled. The reason of water moving in dropper is: -

a) Pressure of water b) Gravity of earth

c) Shape of rubber valve d) Atmospheric Pressure

Answer Key for Chapter Questions

15.1

1. a) Moving / Motion b) Moving / Motion

c) Static position d) Moving/Motion

2. a) Random/irregular motion b) Cylindrical motion

c) Linear motion d) Circular motion

15.2

1. i) 100 ii) 4000
2. Steps are not used to measure length because every individual has different sizes.
3. 1 millimeters, 1 Centimeter, Meter and 1 Kilometer

15.3

1. iv) all of above
2. the shape of an item can be changed as wet soil transforms itself by pressure

15.4

1. i) friction
2. i) increase friction force
   ii) Liquid Friction
   iii) Friction force
3. i) used in valve bearing and roller bearing
   ii) slippery level and polishing them

15.5

1. i) False ii) True iii) False
2. To increase pressure of liquid (Water)
3. Is less

16

Sound

We hear various types of voices in the environment. The sculling of leaves and whisper of rains give us the idea about the weather outside. We talk to each other to express our feelings. A child explains all his needs by sounds. Therefore, sound was a great effect on our life. How a sound is produce? How is it transferred from one place to other? Is there any difference between various types sound? How can we hear a sound? We will learn about all this in this chapter.

Objectives

After reading this chapter you will be able to

- Define Sound
- Explain the nature and characteristics of sound
- Explain the process of sound travel in various means
- Get knowledge about the listening process in human
- Explain the production of sound in humans
- Difference between music and noise, audible and non audible sound
- Understand the harmful effects of noise pollution
- Elaborate the measures to save oneself from noise pollution

16.1 Sound

Sound is an important form of energy. It connects us to environment and lets us know the changes in environment. We learn what is happening around us by sound by listening door bell or thumping on door, and we know that someone has come to meet us. We hear the sound of footsteps and we understand and that somebody is walking.

Think, how do you know that air is blowing outside or it is heavily raining without seeing? By the sounds of an instrument, you identify if it is a flute or a drum or bell. Prepare a list of sound around you and you will know the major changes around you.

How a sound is produced?

Activity 16.1

Take a metal utensil. Hang it in such a way that it does not touch a wall. Now hit it by a stick. Touch your finger after hitting. Do you experience any vibration?

Again hit the plate by stick and now tightly hold it by using both your hands. Did you listen any sound now? When plate stops producing sound, touch it again. Do you experience any vibration now?

Fig. : Hitting a utensil

Fig. : Waves produced by the vibration of water

Activity 16.2

Take a metal plate. Put some water in it. Now hit it with a spoon from a corner. Do you listen any sound? Now hit the plate again and touch it. Do you feel any vibration?

Again hit the plate. See on the water level. Do you find any waves? Now hold plate tightly by your hands. Does this show any change in waves?

You must have understood that the items producing vibration produce sound. This is seen in some situations. It is difficult to see this vibration in most of the situations. The reason behind this is that we cannot see vibration by our eyes. We experience the sound. In reality, every source of sound is a vibration doing thing or an item.

16.2 What is Vibration?

When an item moves to and from the centre it is known as pendulum or Oscillation.

Let us understand vibration in more detail.

Activity 16.3

Take a strong thread. Attach a stone at one corner of the thread. Put a nail on the wall. Now hang the stone by using the other end of the thread. Observe its motion.

You will find that the stone moves from point 'B' and comes to point 'C' crossing the midpoint

This motion is repeated and in the end the stone stops moving and stays at point 'A'.

The stone attached to thread moves to both the ends equally. This is known pendulum motion or oscillation.

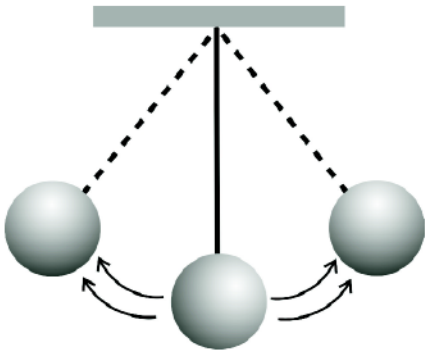


Fig. : Pendulum Motion

It is important to understand that: -

1. Stone moving from 'A' to 'B' then 'B' to 'A', then 'A' to 'C' and finally 'C' to 'A' is a full circle of one pendulum.
2. The time taken by stone to complete one pendulum is known as oscillation time.
3. The number of pendulums completed by the stone in a second is known as frequency of pendulum. This is measured in Hertz (Symbolize Hz). Frequency is always equal to one pendulum per second.
4. The maximum displacement of stone from middle point 'A' (A, B or A, C) is known as dimensions of pendulum.

Intext Question 16.1

1. Fill in the blanks: -
   a. Sound is a form of _____.
   b. Sound helps us to know _____ in the environment.
   c. Vibrating items produce _____.
   d. Frequency is measured in _____.

2. What do you mean by vibration or pendulum?

_____

16.3 Sound produced by humans

You know that humans produce sound with the help of their throat. keep your hand on your throat. you will find a hard bump. When you eat or drink something this body part moves. This is known as vocal cords. These vocal cords are on the upper end of breathing pipe. Vocal cords have two voice boxes which have a narrow passage to the air.

Muscles related to vocal cords can make cords tight and loose. When lungs forcefully push the air out then vocal cords get vibrated and produce sound. Sound is different in both loose and tight cords.

Fig.: Vocal Cords in Humans

Do you know that the length of vocal cords in males is around 20 mm and females have 15 mm vocal cords. The difference of female and male vocal cords is 5 mm. Children have smaller vocal cords. Therefore, the sound of women, men and children are different from each other.

16.4 Sound Travel

When sound source starts vibration then the molecules of air also vibrate. These make other elements present in them also vibrate. In this way the process goes on. The sound then reaches from one place to another by means of air. Therefore, we know that sound needs a medium to move. Sound moves in all three medium solid, liquid and gas.

16.5 Listening Sound

You already know that sound is produced by vibrating objects and they can be sent in any direction and any medium. Let us know how a sound is listened.

We know that we hear by ears. The outer shape of ear is like a keep; sound then moves in a pipe after entering outer ear. This pipe has a thin layer known as ear drum. Ear drum is an important part. What are the functions of an ear drum? Let us do an activity to know more about ear drum.

Activity 16.5

Take a plastic or tin box. Cut both the ends of the box. Place a balloon on one end and bind it with the help of an elastic rubber; place rice or wheat grains or thermocol above it. Now speak Hurray Hurray on the other end and see what happens to grains.

Ear drum is just like a stretched rubber sheet. Sound gets vibrated just like in the above activity. These vibrations are sent to internal ear. Afterwards these codes are used as symbols by human mind. In this way, humans can listen sound.

Fig. : Making ear drum from box

Do you know that

We should not put any pointed object in our ears. This may damage the internal part of ear and we may have difficulty in listening.

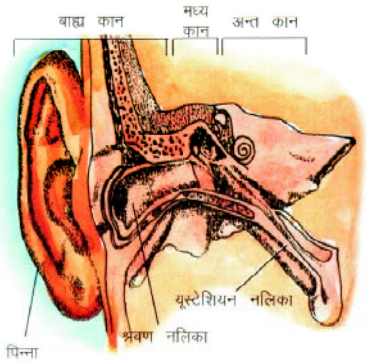


Fig. : Structure of human ear

16.5.1 Identifying various types of sounds

We identify sound easily without seeing them. We identify the object. However, this is possible when there is difference in all the sounds. Dimension and frequency are two important characteristics of sound. Sound is differentiated on this basis.

Hit a drum slowly and then beat it fast. Do you realize when dimension is maximum? When sound is loudest? This means when here is maximum dimension of vibration then sound is the maximum of dimensions. When they are small, then sound is less.

Sound is measured in decibel. The symbol of decibel is db following table shows the frequency of various types of sounds: -

Normal Breathing - 10db

Whispering	- 30 db
Normal conversation/talking	- 60 db
Busy traffic	- 70 db
Average factory	- 80 db

Sound over 80 db is very painful and is considered noise.

Compare the voice of a child and adult. Do you find any difference? Do you find both of them equal or different? Let us see how these are different from each other.

Put a rubber band on the head of the nail. Keep the other end in your left hand. Make it vibrate by right hand; listen to the sound created

Pull rubber band and make it straight; make it vibrate and listen to its sound. Which stage has maximum sound? By stress increasing in rubber, the frequency of vibration also increases. It has a more loud sound. This characteristic of sound is loudness.

Fig. : Identifying loudness by rubber band

The voice of girls has more loudness than voice of boys.

The characteristic of sound which helps us in identifying voices is known as timbre.

The three characteristics of loudness, frequency and timbre help us in identifying various sounds.

16.5.2 Audible and non audible sounds

Every vibrating object produces sound but can we hear all the sounds? No, not at all. The sounds which can be heard by humans are called audible. Humans cannot listen to a frequency less than 20Hz sounds; which cannot be heard by humans are called non audible sounds. Human ear can listen to a sound from 20Hz to 20,000Hz.

> Do you know that some organisms like dog can hear sound more than 20,000Hz. You must have seen police dogs. Police uses a very high frequency sound whistle for them. Such whistle can be listened by dog but not by humans.

16.5.3 Music and Noise

A sequence of sounds which seens pleasant to ears is called music. Non sequential sounds which create stress and tensions are called noise.

Intext Question 16.2

1. Tick (✓) the correct statement and cross (✖) the wrong one: -

   a) --- is present in ear (True/False)

   b) For sound --- medium is needed (True/False)

   c) Sound --- in vacuum. (True/False)

   d) Ear drum is like --- rubber sheet (True/False)

   e) Sound --- is measured by decibel. (True/False)

2. Write answers to following questions: -

   a) Where are --- situated? What are their functions?

   _____

   b) Up to what frequency can human ear listen?

   _____

   c) What is timbre?

   _____

   d) What is music? Can music be changed to noise?

   _____

16.6 Noise Pollution

Much more or unwanted sounds are called noise pollution or sound pollution. The main reasons for noise pollution are sound by vehicles, industrial machines, television running on high volume, radio noise etc. The other causes of noise pollution are the use of loud speaker in marriages, election campaign, religions and other festivals. Bursting crackers also increase noise pollution. Observe in your surrounding and make a list of source of noise pollution.

16.6.1 Harmful Effects of Noise Pollution

Noise pollution is harmful to us like air pollution and water pollution. Noise pollution is the cause of many health problems. Noise pollution causes insomnia, stress, high blood pressure, anxiety and other diseases. Listening to high volume for a longer time leads to deafness or temporary loss of listening power.

The effect of noise pollution is mostly seen in patients, old people, children and students. This creates difficulty in the sleep and rest and increases stress and tension. This has a bad effect on their health.

16.6.2 Measures to save from noise pollution

Noise pollution should be controlled from our home. We should try to make less noise. If possible, motivate people around you to create less noise.

1. Sources of noise pollution should be controlled. T.V., Radio and other musical instruments should be played in less volume.
2. Proper maintenance of electronic items like fan, cooler etc should be done. This helps in reducing their sound.
3. Loudspeakers should be used minimum. If required then it should have less volume so that sound does not become noise.
4. Use less horn while driving, maintaining the silencer of vehicle properly.
5. Plant trees on the sides of road or near to houses. This will stop the noise of vehicles in reaching home. If it comes, it will be in lower volume.
6. Don't burst crackers. This produces harmful gas. Explosive crackers produce double pollution.
7. The activities producing noise should be far away from residential area.
8. Industries producing noise should be far away from residential areas.
9. Silencer should be placed in traffic vehicles, industrial machines, home appliances, aircraft etc.

Intext Question 16.3

1. Fill in the blanks:
   a. Much and unwanted sounds are called _____.
   b. The main reason of noise pollution is _____ crackers.
   c. There should be a control on the sources of _____ to get saved from noise pollution.
   d. Noise pollution causes high _____.
   e. There is a decrease in _____ power by listening high sound.

f. _____ should be used less while driving.

2. Write any two measures to make less noise pollution?

_____

_____

What have you learnt

- Sound is a form of energy. It links us to our environment
- Objects doing vibration create sound.
- When an object moves from center point in a to and fro motion it is called --- or ---.
- The time taken to complete an oscillation is called oscillation time.
- The number of times an objects completes pendulum in one second it is known as frequency of pendulum.
- Sound frequency is measured in Hertz (Hz)
- The maximum displacement of an object from its centre point is called its dimension.
- Humans create sound by their throat which is on the top end of breathing pipe.
- A medium or a channel is needed by the sound to travel. Sound can travel in every medium through solid, air and gases.
- Sound can be identified without seeing the source of noise productivity.
- Sound frequency is measured in decibel (db).
- The stress of a noise source increasing the frequency of vibration is called loudness.
- The characteristic of identifying many voices is called timbre.
- Sounds which are pleasing to ears are called music and unpleasing sounds creating stress and tension (These unpleasant sounds) are called noise.
- Much more or unwanted sounds are called noise pollution or sound pollution.
- Noise pollution creates many health problems in humans.
- We should try our best to stop or lessen noise pollution.

Terminal Exercises

1) What is sound? Explain

2) What do you mean by vibration? Explain by the activity of thread.

3) Define the following: -

   a. Pendulum

   b. oscillation motion

   c. Frequency

   d. Pendulum time

   e. dimension

4) Prepare a diagram of human throat?

5) What is sound travel? Which medium are required for it?

6) Explain with example, if sound moves in vaccum or not?

7) Tick the correct option: -

   a. Only solid

   b. Only liquid

   c. Only gas

   d. All the above

8) What are the functions of ear drum?

9) Write one difference between noise and music?

10) What is sound pollution? Write its two harmful effects? Mention any three measures to stop sound pollution?

Answer to Intext Questions

16.1

1. a) Energy b) Changes

   c) Sound d) Hertz

2. The movement of any object from its centre point is called vibration or pendulum motion.

16.2

1. a) ✖ b) ✓ c) ✖ d) ✓ e) ✓

2. a) Throat has transparent vocal cords. There is a narrow passage to pass the air. When air flows, these vocal cords get vibrated and produce sound.

   b) Human ear can listen to sounds from 20Hz to 20,000Hz

   c) The characteristic of sound which helps us in identifying the voices of many persons is called Timbre.

   d) pleasant and melodious sounds care called music. If music gets loud, irritates ears and creates tension, it is called noise.

16.3

1. a) Noise/Sound b) Bursting

   c) Noise d) Blood Pressure

   e) Listening f) Horn

2. i) Controlling sources of noise

   ii) Establishing noise producing industries far from residential areas.

Self - Evaluation Test - 3

1. Which force is used to stop a car by brake?

   (i) Gravity Force (ii) Nagnetic Force

   (iii) Electric Force (iv) Friction Force

2. Which of the following is a good electricity conductor?

   (i) Chalk (ii) Rubber

   (iii) Ory Air (iv) Lemon Juice

3. Fill in the blanks with appropriate words

   (i) ..... should be established far away from residential areas.

   (ii) Some liquids are good conductors and some are .....

   (iii) ..... is used on a large scale in baking industry to make bread, cake, pastry etc.

   (iv) ..... is the process of maintaining moisture in land and to provide water from time to time.

4. What is an electronic magnet? What are its uses?

5. What are weeds? What is the name of process of removing weeds from crops?

6. What are the benefits of using 6 tyres in place of 4 tyres in a truck?

7. Why is noise pollution dangerous to human being?

8. What is the utility of storing grains? How is it done?

9. What are the categories of micro organisums? Explain every category with one example?

10. Write any three examples of pressure from day to day life?

11. Rohan and Ramesh did an experement by bioling wheat in a beaker. Rohan placed beaker near the yellow part of flame and Ramesh placed it near the outer part of flame. Which beaker will boil faster and in less time? Why?

12. When a switch is put 'on' for current flows in wire, then magnetic needle points towards north-south direction. Why?

13. What is food poisoning? Explain.

14. Write the names of machines and tools used in agriculture?

15. Describe various types of motion with examples.

17

Light

We see every object in this world with our eye. But we cannot see anything in dark even using our eye. Therefore, to see in dark we need both light and eyes. What is light? How is light produced? What is the role of an object's transparency, opaqueness and translucency in emission of light? How is light helpful in forming an image in mirror? What is the structure of eyes? If somebody has myopia (short sightedness) then what is the latest technique of overcoming it? We will learn about all this in this chapter?

Objectives

After reading this chapter you will be able to

- Explain light and its travel through various means
- Give examples of various items having transparency, translucency and opaque characteristics.
- Define various types of images.
- Explain the rules of light reflection.
- Tell the characteristics of image or reflection formed by mirrors and lens
- Know the structure of human eyes, sight problems and their modern solution techniques.
- Know the importance of nutritions food to be safe from night blindness.

17.1 Light

We use torch, candle or electric bulb to see in a dark room. We also use lantern, lamp, petromax, mercury rod to see in dark. All these are man made light emission tools. The natural sources of light are sun and stars.

The light emitted by all these resources first falls on objects. These object reflect light on our eyes. Then we can see these objects. Light is also an energy like heat. We see things by light.

17.2 Sources of Light

The objects which emit light are called light sources. These include sun, star, candle, lamp, electric bulb etc. Sun is the natural source of light in nature. Stars are also a source of light. Stars are more distant from earth in comparison to sun. Therefore, they look small and less shining. Fireflies and some fishes in ocean also emit light. All these items emit light. All these objects are called luminous objects. Objects like table, chair, books, utensils etc do not have their own light. These are called non-luminous objects. Luminous objects are a source of light. We can see non-luminous objects in the light of luminous objects.

17.2.1 Natural and artificial sources of light

Moon emits light in moon lit night. This gives an illusion that moon is a luminous object. But it is not so. Moon emits light received from sun. The only natural source of light are sun and stars. All planets, satellites and other objects in universe shine by the light of stars.

Humans have made some artificial sources of light like gas lamp, candle, kerosene lamp, petromax, electric bulb, fluorescent tube etc.

17.2.2 Sources of hot and cold light

Sun, electric bulb, kerosene lamp etc. are the sources of hot light. This emits heat with light. Some sources of light emit energy in form of light like firefly, fluorescent tube etc. These are known cold sources of light.

17.2.3 Difference between the frequency of light sources

We know that all sources of light do not give equal light. Some have more shine and some have less shine. You must have observed that if source of light is far away from us, we see less shine in it.

17.3 Categories of Non-luminous Objects

There are three categories of non-luminous objects on the basis of travelling of light.

1. Transparent. We can see through transparent objects. Light travels easily in these objects. These are the channels of light. Examples are mirror, air, water etc.
2. Translucent. We can see through these objects. But it is unclear and dim. Only some part of light can pass through it. Examples - Paper with oil spots, tracing paper etc.
3. Opaque. We cannot see through these objects. They stop the path of light; even a single ray of light cannot go through them. Examples - stone, wood, iron, aluminum etc.

Intext Question 17.1

1. Fill in the blanks: -
   a) Objects which have their own light are called _____ objects.
   b) Sun is the _____ source of light
   c) Light can travel easily through _____ objects.
   d) Planets and satellite shine by the light of _____.
   e) Maximum light sources emit heat with _____.

17.4 Travelling of Light

Light travels in fast speed from one place to other. It travels at varied speeds in various mediums. Light travels in water with the speed of 2.25 lakh kilometer per second. This speed is 2 lakh kilometer per second in glass.

Light can travel in vacuum also (vacuum means where there is no channel). There are around many hundred kilometers of vacuum between sun and earth. Still run rays reach earth. The speed of light in vacuum is around 3 lakh kilometer per second. You will be surprised to know that an item can move more far in the entire universe.

Light travels in a single line in anyone medium.

Let us understand this with an activity

Activity 17.1

Keep a lighted candle on a table. Try to see the flame with a twisted rubber pipe. Now make the

rubber straight and see the flame. Which mode helps in seeing the flame?

The flame of light is seen when rubber pipe is straight. Slight twist in pipe does not help us in seeing the flame. This tells us that light travels in a straight line.

Many natural events takes place with light moving in a straight line like making of images, lunar eclipse, solar eclipse etc.

If an opaque object is placed in the way of light emitted by light sources then the other side of object has a black shaped structure which is its shadow. This shadow is prepared by the linear motion of the light.

Fig.: Light travels in a straight line

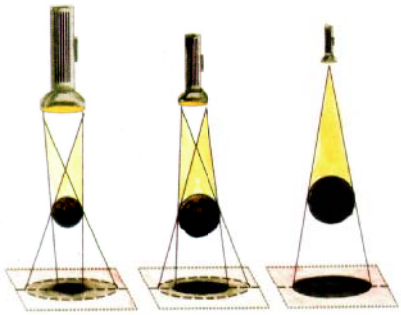


Fig.: Making of Shadow

17.5 Reflection of Light

You have already read that light travels in a straight line in a medium. This chapter has used a straight line as a symbol of travelling light. This light has been made in the shape of an arrow. A single line with an arrow in the end is called a ray. A group of many rays are called beam. It is of three types:

1. Parallel beam - Here all rays travel parallel to each other
2. Convergent beam - this comes from many directions which focus it on middle point.
3. Divergent beam - this is that collection of light rays which originates from one point and then moves in many directions.

When light travelling in a medium collides with any object then the speed of light, according to the nature of that object, can be-

1. Light collides with an object. If it is opaque object then some light is expanded and some is absorbed.

2. Transparent objects absorb some light, some goes back and some goes through it. Sometimes we can see our face in the window pane. This happens because of window mirror where some light is absorbed and some light passes through the object. Glass pane also absorbs some light.

3. If the object is greasy and shining and it cannot absorb light. Then maximum light goes back after collision. This process of light going back after collision with the layer of an object is called regression.

Due to light regression, we can see own images and images of other objects in mirror, steel utensils and other objects of shining surface.

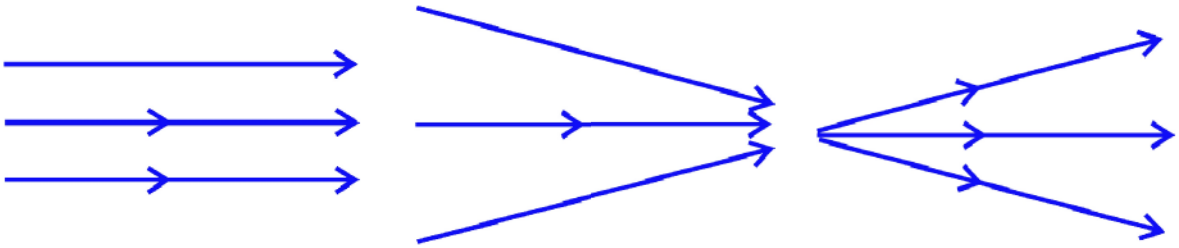


Fig: Various light beams

17.5.1 Rules of Regression

1. Light rays get formed in other direction after collision with mirror. The light ray falling on the surface is called incident ray. Light rays coming after regression from surface are called non incident rays. This means that the light rays telling the direction of coming rays are called reflect rays and the rays telling the direction of going back rays after colliding with changed surface like mirror are called reflect rays.

   Make a 90° angle line in the point where incident rays collide with the surface. This line is called perpendicular from the point of reflecting surface. The angle between incident ray and reflection ray is called incident angle. All these are parallel.

2. Regression angle is formed between perpendicular and regression rays. It is always equal to incidence angle which is formed between perpendicular and ray.

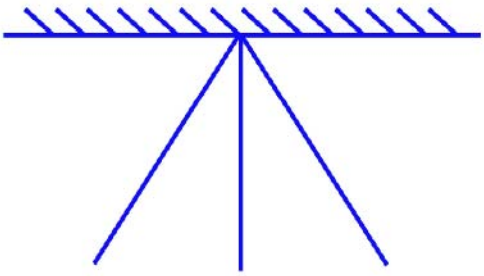


Fig:

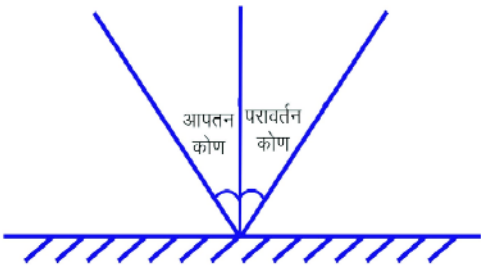


Fig:

17.5.2 Real and virtual image

Activity 17.2

Place a lighted candle in front of parallel mirror. Try to see the flame in the mirror. You will find it as if candle is kept behind the mirror. This is the image of candle formed by the mirror.

Fig.:

Now change the position of candle in front of mirror. Observe the image in every situation. Is it straight in every situation? Is the image of flame seen only in the upper end of candle? Such kind of image is called straight image which is seen straight and is of equal size of object.

Straight of flat Mirror

Now keep a vertical curtain behind mirror tray to form an image of candle on curtain. You will be enabled to get image on curtain. Such kind of image is known as virtual image .

There is also one more interesting difference in the image formed on flat mirror. You know that right side is seen left and left side is seen right on the image. If we wear a straight saree; it is seen as an opposite side direction in mirror.

Write your name in paper and see it in mirror. How is it seen in mirror? This is the reason why AMBULANCE is written opposite in patient vehicles. When the vehicles in front of ambulance see it in rear view then see AMBULANCE in correct direction and they provide way for it.

Activity 17.3

See your image on the back side of steel spoon? Does this image seem just like parallel mirror? What is its size? Is it equal to image, small or big?

Now see your face on the internal side of spoon. You will see image -straight and big. Now increase the distance between spoon and your face; this distance has an effect on image?

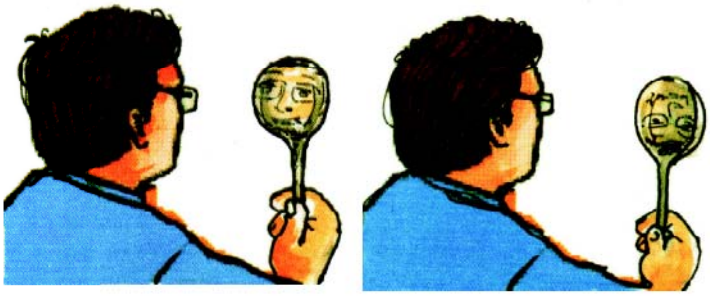


Fig . (a)

The shiny surface of spoon works like a mirror. In the same way some mirrors are of round surface.

If the circular mirror has reflective side

in internal side it is known as concave mirror. If reflection side is outside, it is called convex mirror.

The internal side of spoon works as is concave mirror and outer side of spoon works as convex mirror

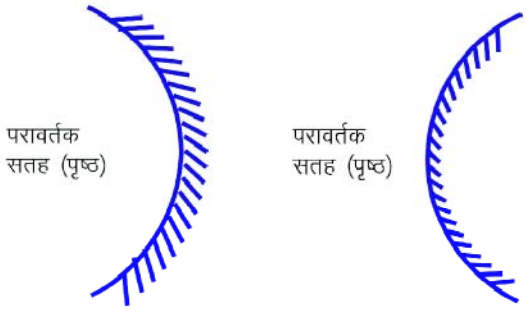


Fig. : Surface of mirror

Activity 17.4

Take a concave mirror. Hold its reflective surface in front of sun. Try to spot the light reflected from mirror on a paper; change the position of paper till you get a shining point. Make a fixed position of mirror and paper you will find that paper starts burning.

Getting a real image from sun.

The shining point put on paper is actually the image of sun. you must have seen that this image is formed on curtain or paper. The images formed on curtain are called real images.

Try to find the image of a flame of candle on the surface using concave mirror.

Fig - 17.7 : Doctor checking the teeth of

1. images formed by concave mirror may be small or big in size of the object. image can be real or virtual.
2. Concave mirror is used for many works doctors see eye, nose, teeth and throat with its help.
3. Torch, car, scooter have reflective lens on its surface.

Convex lens are used in side of car and scooters. Convex mirror can make large area seen. Driver can see the vehicle of bigger area in it.

17.5.3 Characteristic of image formed by a flat mirror

Following are the characteristics of images formed by parallel or flat mirror

1. The distance of reflection from mirror is equal to the distance of the object. Reflection is

formed in the shape of the object.

2. If object moves towards mirror, then its image also moves more towards mirror. If the object goes away from mirror then the reflection also gets away from mirror.

3. Reflection formed in mirror is virtual. It cannot be taken as real.

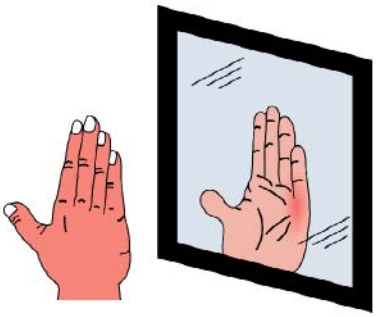


Fig : Left hand seen right in image

4. image is always straight

5. Things on right side is on left side in image. Thus change is called the background change of image

17.5.4 Uses of Mirror

There are many uses of mirror like

1) mirror is used in tools like periscope, claiziscope, camera to see the face.

2) mirror is used in shaving, E.N.T (ear, nose, throat)doctors and dentists examining the patient with headlight, searchlight etc.

3) mirror is used to see the vehicle coming form behind like car, bus, truck, scooter etc.

Intext Questions 17.2

1. State True or False

   a) The speed of light in vacuum is 3 lakh kilometer per second. (True/False)

   b) Shadow is formed due to travelling of light in simple straight time. (True/False)

   c) Parallel beam has rays coming from various directions. (True/False).

   f) Mirrors are used as side mirrors in scooter. (True/False)

   g) Absorption of light is called reflection. (True/False).

2. Write answers

   a) Who has the highest speed in universe?

   _____

   b) If an open object is presented on the path of light, what will happen ?

   _____

c) What is the process of light going back after hitting the surface of an object called?

_____

3. How many types of light beams are there? Write their names?

_____

4. What happens in reflection?

_____

5. Write down any two characteristics of the image formed by a flat mirror ?

_____

17.6 Refraction of Light

Light stands in a medium in straight time. But when it enters another medium from one medium then it diverges from its straight time in both. This diversion happens on the layer differentiating both the medium. Their diversions of light is called reflection or refraction.

Refraction happens with some fixed rules.

17.6.1 Rules of Refraction

i) Incident ray, non incident ray and present all should be on one flat.

ii) When light goes from medium to dense medium it inclines towards perpendicular axis and when it goes to a dense medium from spacious mediums it goes far away from perpendicular.

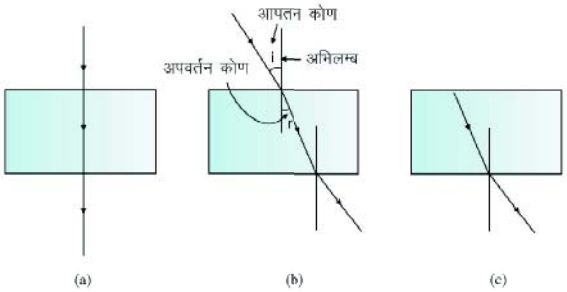


Fig. : Refraction of Light

17.7 Lens

You must have seen spectacles. The glass or plastic which is present in the fame of spectacle is called lens. People having improved watches use lens to see the small - 2 parts of transparent item, which has at least one layer circular and is known as lens. Two types of lens are used commonly

1) convex lens - both layers are It has thick central part and thin

2) concave lens - both layers are. It has central part and their.

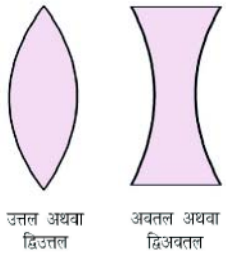


Fig. 17.10: Lens

It is dangerous to see sun on other shinning objects from lens. New focus on any body organ from sunlight using convex lens, can burn.

Activity 17.5

Take a convex lens. Place it in the path of sunrays and keep a piece of paper beneath it. Place it at a where a shining point is obtained on paper. Keep lens and paper at the same place for sometime. You will see paper starts burning.

Now take concave lens. Again place it on the shining point.

Generally, convex lens converges the light, it is also called convergent lens. In contrast to it, concave lens diverges the light falling on it. Therefore it is called divergent lens

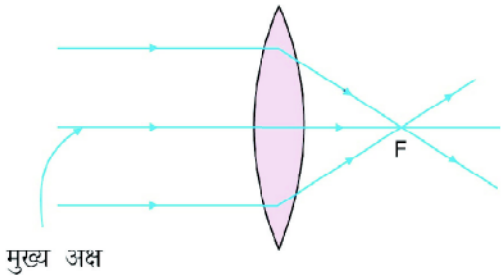


Fig. (a): convergence of light by convex lens

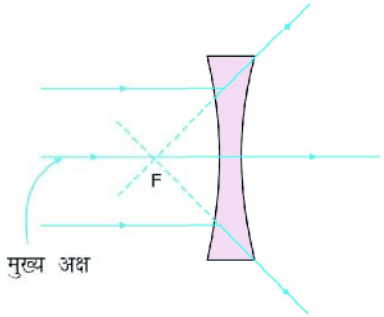


Fig. (b): divergence of light by concave lens

Activity 17.6

Keep a convex lens on table. Convex lens should be placed on a stand. Keep a lit candle at a distance 50 cm from lens. Try to see the image of the flame on paper sheet on the other side of lens.

Now observe the image formed by both the lenses. You will find that concave lens are always in straight and have small image than convex lens.

Uses of lenses You must have seen lenses in microscope, telescopes, spectacles, camera and projector. Many types of light machines are developed on the basis of adjustment of mirrors and lens. Convex lens is also used as microscopic lens.

17.8 Sunlight

You must have seen rainbow in the sky. Rainbow is often seen after rain. It is formed when sum is near to horizon.

Rainbow is seen as a bow of multicolor. Rainbow has seven colors - red, orange, indigo, yellow, green, blue and violet.

You must have seen coloured bubble on soap. See a CD in a sunlight; when light is reflected from CD then many colours are seen in it.

By all these experiences one can say that single light is a mixture of various colours.

Activity 17.7

Take a prism. Prism is made up of hard glass. It is triangular from top and rectangular from bottom.

Place prism in a dark room. Place a sun ray on one surface of prism. This ray should come from a small hole in window of the room. The light emitted by the other surface either should fall on paper or wall. You will find colour like rainbow here.

This proves that sunlight has several colours. This light is called white light.

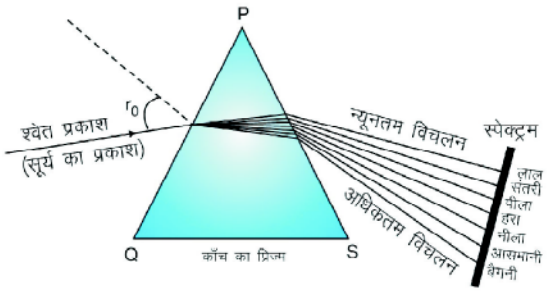


Fig. 17.12 : Prism

The question arises: can we get white light by mixing all these seven colours?

This can be proved by the following action. This activity proves that all seven colours can produce white light by coming together.

Activity 17.8

Take a compact disc of about 10 cm radius. Divide the upper layer of CD into 7 sections. Colour these discs by seven sections. Make a small hole in the centre of CD. Place the tip of ball present reflect on CD by using hole. Now independently move the disc. Make this disc move fast in sunlight and you will find that when together the disc is seen in white colour. This disc is called Newton disc.

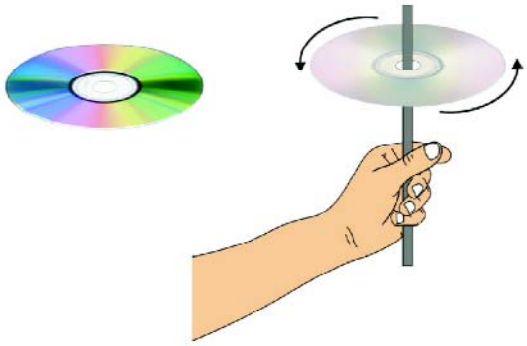


Fig. : Newton disc. (a) : Seven coloured disc (b) : Disc moving fast

Intext Questions 17.3

1. Fill in the blanks

   a) The central part of convex lens is _____

   b) concave lens _____ the light fell on it.

   c) concave lens always from _____ images.

   d) Sunlight is a mixture of many _____.

   e) The base and top of prism is _____.

2. Write any two differences between concave and convex lens?

   _____

3. Write any two uses of lens ?

   _____

17.9 Structure of Human Eyes

Eyes are an important organ of human body. We see objects with eyes. Therefore, it is important to understand the structure and functions of eye.

Human eye is circular in shape. The outer shell of eye (which is white in colour) is tough. This

saves internal part of eyes. The transparent part in front of eyes is called cornea. There are dark coloured muscles behind cornea known as Iris.

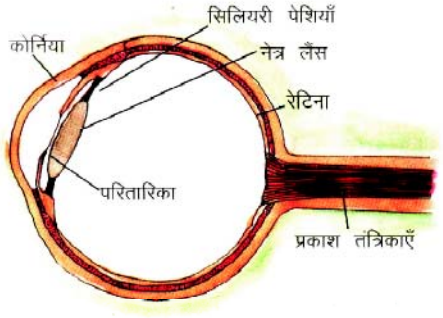


Fig. 17.3 : Human Eyes

There a small hole in Iris is known as pupil. Iris controls the size of pupil. Iris shrinks and expands the size of pupil in dark and expand in light which shrinks the pupil.

Behind pupil there are eye lens which are fiber like transparent items made up of eye lens. This is a convex lens. Eye lens controls the optic muscles. To see an object in far off places eye muscles lessen the thickness of eye lens and expands the focus. To see an object nearby they pressurize lens and increase its thickness. This lessens the focus. This lens focuses light on the back side layer behind the eyes. This layer is called Retina. The balance between eye muscles and focus distance of lens creates an image on retina even if the object is at far off places. Retina is made up of many nerve muscles. Sensitivity experienced by nerves muscles are sent to brain by light cells or nerves.

The image made on retina do not end instantly (when the object is removed). It stays on retina around 1/16 second. The minimum distance to see a thing clear in a healthy eyes is around 2.5 cm.

17.9.1 Sight Diseases

If the thickness of eye lens increases permanent due to any reason, then the rays emitted by the object do not focus on retina but on any point between lens and retina. Thus, the object is not seen clearly. This issue of sight is called myopia (near sightedness). To remove this defect concave lens is used which is of focus distance and power in glass.

With age eye muscles cannot put pressure on lens. Then the image of nearby objects is not formed on retina but on any point behind retina. We cannot see objects clearly. This is called hyperopia (farsightedness). This defect is removed by convex lens of focus distance and power in glass.

Sometimes there is blurness in eye sight in old age. This happens because of weak eye lens. This is known as (cataract) in common language. This weakness in eye sight sometimes takes severe form. It can be cured by treatment. Natural eye lens is removed and artificial eye lens in placed in its place. Modern technology has made treatment safe and easy.

17.9.2 Importance of Nutritious Foods

Deficiency of Vitamins 'A' causes many eye diseases. The most common is night blindness.

One should eat nutritious foods. We should take Vitamin 'A' in our food, yellow green fruits and vegetables are source of Vitamin 'A' other items that are sources of Vitamin 'A' are raw carrot,

cabbage, green vegetables like spinach and cod liver oil. Eggs, milk and milk products like curd, butter, paneer etc. are full of Vitamin 'A'.

Do you know that

Organisms have different shapes of eyes. The eyes of crabs are very small but a crab can see on all four sides through his eyes. He also knows if any enemy is coming from behind. Butterfly has big eyes. The eyes of butterfly seem to be made from thousands of small eyes. These eyes not only see front or side but behind too. Owl can see in night but he cannot see in day. Other animals like eagle, vulture are active in day time but cannot see in night. Owl has big cornea and big pupil so that more light can enter his eyes. There are many nerves in retina in huge number and some are conical. In contrast, day birds have more cones and less nerves in their eyes.

Intext Questions 17.4

1. Match Column 'A' with Column 'B'

	Column 'A'		Column 'B'
a)	---	i)	forms images
b)	On retina	ii)	25 cm
c)	--- muscles	iii)	small hole in Iris
d)	Eye lens	iv)	Controls eye lens
e)	Minimum Distance to see objects clearly	v)	Behind the ---

2. Write answers:

i) What are the causes of night blindness?

_____

ii) What are the measures to remove sight diseases?

_____

iii) What is a cataract?

_____

What have you learnt

- Light is a kind of energy. We see objects with the help of light
- Objects that have their own light are called luminous objects like sun, stars etc.
- Objects that do not produce light are called non-luminous objects. Non-luminous objects are divided into three categories - transparent, translucent and opaque.
- We see non-luminous objects by the light emitted by luminous objects.
- Light travels very fast. It has different speeds in different mediums. Light travels in a straight line in one medium.
- When light comes travelling from medium and gets collided with other then its speed changes on the basis of nature of the object.
- If the object has greasy and shiny layer and if light does not travel then maximum light goes back by collision with the layer. The process of going back of light by collision with layer of an object is called reflection.
- Images are formed of these objects by reflection. There are two important laws of reflection -
  (i) Incident rays, non incident rays, perpendicular and incident angle are on same level in reflection.
  (ii) Reflection angle is always equal to incident angle.
- Some images are not formed on curtain. These are called real images. Images formed on curtain are called real images.
- There are two kinds of round mirrors - concave mirror and convex mirror. Real images are given by concave mirrors. Images formed on flat surfaces are virtual.
- When light enters into another medium then a linear simple path is formed as a layer to differentiate two mediums. This dispersion of light is called light dispersion.
- A piece of transparent object which is round (at least from one side) is called a lens. Lens are of two types - concave lens and convex lens. Light is converged by convex lens. In contrast concave lens diverges light.
- Virtual, straight and smaller than objects images are always formed by concave lens.
- Sunlight is a mixture of various colours.
- Rays of light fall on eyes lens through pupil. These lens rays focus on retina to build an image of the object. The sensitivity of image built on retina is sent to brain by the transformation of light nerves into electric waves.

- Increase in thickness of lens makes the image in eyes blur. This is known as near far sightedness. When nearby images are not cleat it is called far sightedness. The above focus is corrected by the use of convex lens.
- The deficiency of Vitamin 'A' causes night blindness. Vitamin 'A' is found in yellow and green vegetables and fruits.

Terminal Exercises

1. a. How will you prove that light moves in a straight line?
   b. What are the types of light beams? write their names?
2. Explain the laws of reflection of light? Prepare a diagram also.
3. The image formed by flat mirror
   a) Big and behind mirror.
   b) Behind virtual mirror and equal to the size of image.
   c) Behind real mirror and equal to the size of image
   d) Big and behind real mirror
4. Prepare a diagram of human eye
5. Fill in the blanks: -
   a) An image which is not formed is called_____.
   b) Sun and stars are the _____ sources of light.
   c) Lighted candle and electronic bulb light are _____ sources of light.
   d) _____ items produce their own light whereas _____ objects do not have their own light.
   e) The image that is received on curtain is called _____ image.
   f) _____ is caused by the deficiency of Vitamin 'A'
6. Match Column 'A' with Column 'B'

A		B	
a)	Moon	i)	Reflecting Layer
b)	Sun	ii)	Opaque
c)	Brick	iii)	Non-luminous

d) Mirror iv) Transparent

e) Tracing Paper v) Luminous

f) Clean Glass vi) Dim transparent

7. Write difference between

   i) Real and virtual image

   ii) Concave and convex lens

8. There are four items in each question. Three items are connected to each other and one item is odd one out. Identify it.

9. Reflective ray forms 20° angle with perpendicular or reflective ray forms 70° angle with mirror relative.

Answer to Intext Question

17.1

1. a) Luminous b) Natural c) Transparent

   d) Stars e) Light

2. Light passes easily in some objects. These are known as medium of light like - air, water and glass

17.2

1. a) True b) True c) False

   d) True e) False

2. a) Light

   b) Will become shadow of that item

   c) reflection

3. There are three kinds of light beams

   a) parallel rays b) convergent rays c) divergent rays

4. Forms of images

5. a) Distance of image is equal to the distance of object from mirror

   b) Size of image is equal to the size of object

17.3

1. a) Thick b) Convergent / folded towards c) virtual
   d) Colours e) Triangular
2. i) convex lens has central part thick and corners are thin whereas concave lens has thin central part and thick corners
   ii) Light falling on convex lens gets convergent whereas light falling on concave lens is divergent
   iii) Lens are used in microscopic cameras.
3. convex lens is used as microscopic lens

17.4

1. a) (iii) b) (i) c) (iv)
   d (v) e (ii)
2. i) Deficiency of Vitamin 'A' in food
   ii) convex lens is used for proper focus distance
   iii) sight gets blur due to blur of eye lens

18

Natural Calamities and Disaster Management

You must have heard about flood in Uttarakhand, earthquake in Gujrat and Maharastra, cyclone in Andhra Pradesh. You can also have an idea about the damage done by these floods, earthquakes and cyclone. Have you ever throught how these floods, earthquakes and cyclones come? WHat are the reasons of lightning in sky, coming of rains and blowing of air? We will read about all this in this chapter?

Objectives

After reading this chapter, you will be able to

- define air
- explain the process of how pressure is built by the flow of air
- elaborate the process of making air current
- understand the process of monsoon air
- explain the process of rain
- categorise the bad effects of flood and drought
- tell the procedure of thunderstorm and cyclone and its preventive measures
- explain the process of making cyclones from thunderstorm
- Know the security or preventive measures to save from bad effects of cyclone
- categories of earthquake and its preventive measures

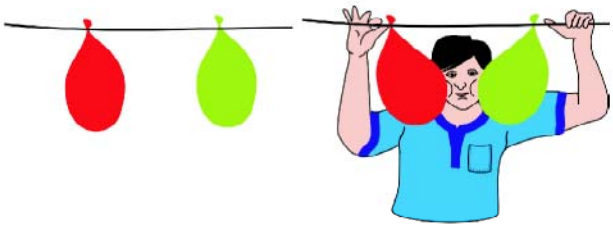
18.1 Air

The sorrounding of air around us is called atmosphere. Many things in our environment are caused due to the hot or cold air, shrinking or expansion of air, or low or high pressure of air. The earth gets hot with the sunlight. This makes air hotter which comes in contact with the hot land; hot air becomes higher and moves upwards; cooler air comes to fill the space vacated by the hot air. This air now becomes wind.

The blowing of wind makes low pressure.

Activity 8.1

Bind two blown balloons with a thread. Pull them together and then blow air from your mouth. This air from your mouth should be between the gap of balloon. You will find that both balloons come closer to each other. This happens because of low air pressure between them.



The maximum difference of air pressure between two places, the more the speed of wind. You must have seen that fast flowing wind takes a lot of things with it. The more high speed wind may take the form of cyclone.

18.2 Air Currents

Hot air is formed in equatorial regions and polar regions. This happens because of non uniform temperature on earth. Sunlight falls more in equator regions and less in polar regions. This makes polar regions cool and equatorial regions hot. In between them is the temperate region or tropical region.

The air from equatorial regions rises up due to hotness. Cold air from tropical region takes its place. This is the reason why temperate or tropical regions are more hot than polar regions. When hot air rises, the cool air from polar regions takes its place. Air currents are produced by movement of air from one place to another

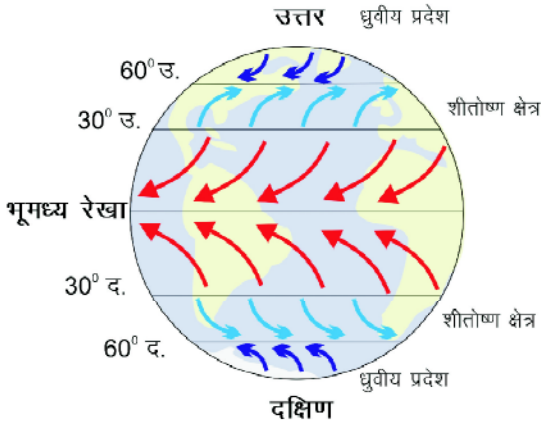


Fig. 18.1: Air Currents

Air current moves from north to south from north-south directions and also from south to north again in north - south direction. The change in direction happens because of the rotation of earth.

18.2.1 Land and ocean breeze are formed because of the hot temperature of earth

Land breeze is more hot than ocean breeze in equatorial areas is summar. Land breeze rises above and the ocean breeze comes to takes its place. This makes monsoon air take evaporated water with itself. This falls down as air in land areas.

Ocean breeze rises up in winter and land breeze comes to take its place.

18.3 Water Cycle and Rain

Water evaporates from ocean. This conversion of water into steam is known as evaporation. These vapours convert into water drops in sky and form clouds.

Water falls from clouds in the form of rain and ice in cold regions. Rain fills rivers, lakes, ponds etc with water on earth, This water is provided to organisms living on land.

This water further flows into ocean. In this way, water cycle keeps on going continuously.

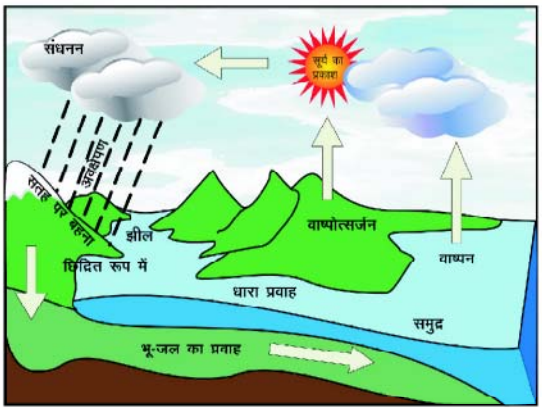


Fig. 18.2: Water Cycle

18.4 Bad effects of Flood and Drought

Rain does not fall regularly on earth. Some times there is excess rain and sometimes deficient rain. Rain falling for a long time fills all rivers and places with water. Sometimes water starts spreading on land taking the form of flood. Sometimes there is less rain in an area. Crops get dried and organisms did not get a drop to drink. Such a situation is called famine or drought. Both flood and drought cause great damage to life on earth.

Fig. 18.3: Flood Scene

Fig. 18.4: Drought Scene

Intext Questions 18.1

1. Fill in the blanks:

   (a) The air surrounding us is called .....

   (b) Hot air rises up due to its .....

   (c) If speed of wind increases, then ..... lessens.

   (d) There is not a uniform ..... in all areas of earth.

   (e) Temperate or tropical region is hot as compared to .....

   (f) Monsoon air takes ..... with itself. These make ..... in land areas.

2. How winds are formed?

   _____

3. How does rain fall in land area?

   _____

4. What are the causes of drought?

   _____

5. How wind currents are formed?

   _____

18.5 Thunderstorm and Cyclone

Sometimes natural events take form of disasters.

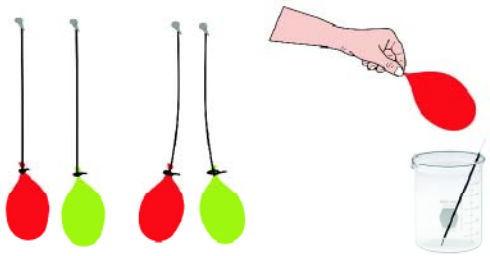
Thunderstorm and cyclone are two such disasters. These emerge in tropical conditions. India also comes in tropical areas.

Air rises above due to heat. Few drops of water also rise with air. Due to less temperature in the sky, these drops stick and form clouds. Clouds and air merge together to form charges (Positive and negative).

Activity 18.2

Making Charge

Tie balloons with two threads. Hand them at some distance as shown in the picture. Rub woollen cloth on balloons. Leave them and you will find them moving away from each other. It happens because some charge is generated in both balloons by rubbing objects having some charge repel or more far away from each other. Therefore, balloons also moved away from each other.



Now take an empty refill of a pen and rub it with polythene. Keep it in a glass. Now bring a charged balloon near the charged refill. They attract each other. This happens because they have opposite charges.

In the same way charges are formed in air and on earth. When a charged item comes near the earth, then all charge is transferred to earth. This process is called conduction.

You must have understood the charges present in cloud. When a charged cloud or air comes close to opposite charged cloud or air or a high tree, then they both attract each other. Friction and spark come out. These sparks are known as lightning. Sound or thunder is also produced. This event is known as thunder storm. It burns anything on which it falls. We should save life and property from thunderstorm.

18.5.1 Preventive measures in thunder storm

An open place is not safe in thunderstorm. If you are in open place or forest during thunderstorm, then take shelter below a small tree. Never take shelter below a large tree.

Do not use a metal stick umbrella in thunderstorm.

House or building is more safe than open air. Open Garage, Storage house and places with metal sheet shades are not safe in thunderstorm. Do not touch telephone wire, electricity wire or metal pipes in thunderstorm.

If you are travelling in thunderstorm, then close the doors and windows of car or Bus.

18.5.2 Process of converting thunderstorm to cyclone

Heat is required to change liquid water to steam or vapour. When steam is converted to water, this heat gets restored in atmosphere. It makes its nearby air warm. This air rises up creating now air pressures.

This air moves fast towards the center of thunderstorm. This gets repeated creating a very low pressure area. Here, air moves in spiral way at a fast pace. This is known as cyclone. Air moves at a fast pace in cyclone and destroys life and property in nearby areas. This cracks homes, trees, electric wires and telephone wires. Animals coming in its way are also killed.

18.5.3 Preventive measures to lessen the harmful effect of cyclone

Government declares warming of cyclone by analysing weather conditions. This warning is given to common people, costal areas, fishermen and ships to make them alert. They are also kept away from ocean. This information is broadcast on doordarshan, Radio and newspapers by meterological department. We should pay attention to these warnings. This information should not be ignored.

Necessary household items, pet animals and vehicles should be sent to safer places. We should not drive vehicles in places which are submerged in water.

Intext Questions 18.2

1. Complete the following sentences:-

   (a) There are two types of charges, ... and .....

   (b) Items of same charge ..... each other.

   (c) Open area in thunderstorm is not .....

   (d) To safe guard from thunderstorm and rain, we should not use ..... of metal slick.

   (e) Fast ..... air moves with thunderstorm which damages ..... and ..... in nearby areas.

2. How is charge produced?

   _____

3. Write any three measures for safety in thunderstorm?

   _____

4. What is conduction?

   _____

5. Write any two effective measures to stop the bad effects of cyclone?

_____

6. How information related to cyclone is given to people?

_____

18.6 Earthquake and its causes

Trembling shocks in any area of earth are called earthquakes. We must see earth's structure to know the causes of earthquake. If we see earth, we find four layers of earth - inner core, outer core, monthle and crust. Outer layer has many plates joined together. The movement of internal areas of earth makes these plates move with each other. Due to these changes, earth shakes and trembles causing leave. There are more chances of earthquake in some areas of earth. These areas are called earthquake region or earthquake prone area.

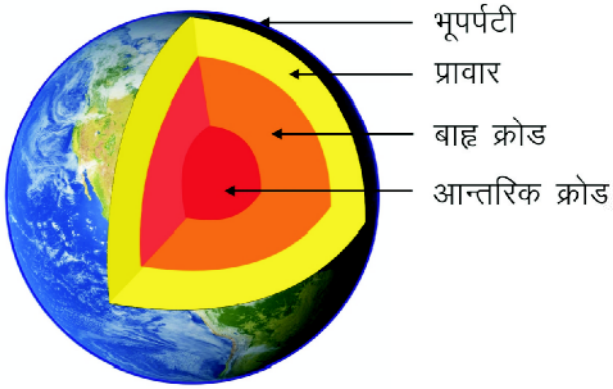


Fig. 18.5 (a): Internal structure of earth

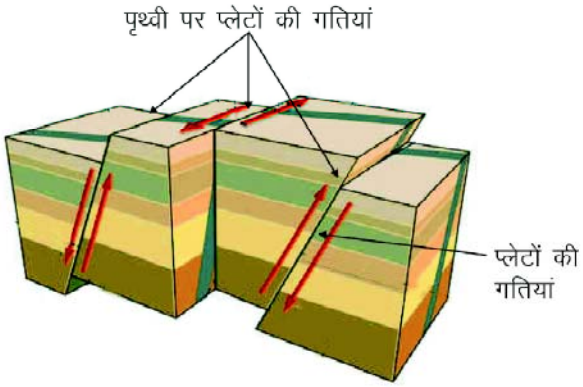


Fig. 18.5 (b): Movements of plates

Sometimes earthquakes happen because of volcanoes, atom bomb testing or clashing of any meteorite that causes damage to life on earth.

18.6.1 Safety measures for Earthquakes

Earthquakes are very dangerous but they cannot be predicted. People living in earthquake prone area should be ready to face this calamity. They should live in homes which can handle trembles. People live in homes made up of mud and woods to decrease the loss. Fire extinguishers should be placed in such buildings in case of any fire breaking out.

If you are in home at the time of earthquake hide yourself below a table. This will save you from falling of heavy items. You should stay away from heavy items at the time of earthquake.

If you are outside your home, stay away from high houses, trees and poles. If you are in a vehicle, do not come out.

Move slowly in an open area till trembling stops.

If you are lying on your bed, hide your head with a pillow.

Intex Questions 18.3

1. Fill in the blanks:-

   (a) Trembling of any part of earth, it is called .....

   (b) There are many causes of earthquakes like movement of ..... in earth, explosion of ....., with ..... test and collision of ..... with earth.

   (c) Earthquake cannot be ..... People make houses of mud and wood in .....

   (d) .....should be placed in high buildings.

What have you learnt

- The cover of air that surrounds us is called atmosphere.
- Many activities in our environment happen due to hot, warm or cool air, shrinking and expansion of air and low and high pressure.
- Wind is formed by flow of air. With increase in speed of wind, air pressure decreases.
- The maximum difference between air pressure of two areas is due to the more flow of wind. Very high flow of wind takes the form of cyclone.
- Air currents are formed due to abnormal heating of polar and equatorial regions. Air currents move from north to south or south to north in North-South direction. The change of direction takes place due to the rotation of earth.
- Land breeze gets warmer than ocean breeze in eqatorial regions in summer. Land Breeze rises up by warming and ocean breeze comes to take its place.
- There is no pattern of continous rain on earth. Excess rain takes the form of flood. Drought or famine happens due to deficient rain. Both flood and droughts cause damage do life and property.

- Thunderstorm and cyclones are mostly formed in tropical areas.
- By contact of charged item, all the charges are taken by earth. This is known as conduction.
- When charged cloud or charged air comes in contact with opposite charged cloud or charged air, they attract each other.
- By coming closer, they produce lightning and thunder around. Whatever comes under this flash lightning, gets burnt.
- House or building is more safe than open area in thunderstorm.
- It is better to take shelter under smaller trees in open area.
- We should not touch telephone or electric wire or metal pipes or poles. If you are travelling, close the doors and windows of vehicles.
- Air moves in a spiral way near lower pressure area in many layers. This is called cyclone. These fast moving wind currents damage life and property.
- Government gives warming by predicting cyclone. This is done to lower the harmful effect of cyclone.
- Earth trembles and shakes with the movements in inner plates of earth. This is known as earthquake. Some places on earth have maximum chances of earthquake. There are known as earthquake regions.
- People living in earthquake regions should be prepared to face this danger.
- High building should have fire extinguisher in case of emergency.

Terminal Exercises

1. Match column 'A' with column 'B' :-

	Column A		Column B
(a)	air surrounding us	(i)	safety from cyclone
(b)	Rain in land areas	(ii)	Tropical area
(c)	Warning by government	(iii)	Cyclone
(d)	Thunderstorm and Cyclone	(iv)	Monsoon air
(e)	Wind with high speed	(v)	Atmosphere

2. How many layers of earth are there? Write their names?

3. What are the three causes of earthquake?

4. What are earthquake regions?

5. Write three preventive measures for thunderstorm?

6. What will you do in earthquake if you are

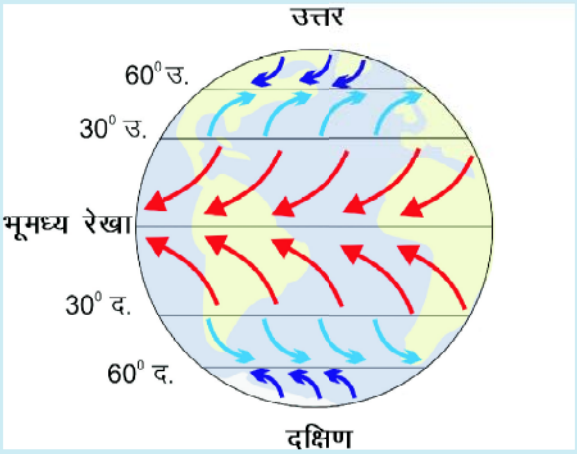
   (a) in your home _____

   (b) on your bed _____

   (c) outside your house _____

   (d) on a vehicle _____

7. Write the names of pointed areas.



8. Explain the process of water cycle with diagram.

9. Observe the natural events near your home. Get more information regarding them and make people aware about it.

Answer key to Intext Questions

18.1

1. (a) atmoshpere (b) light
   (c) air pressure (d) tempreature
   (e) polor region (f) water vapour, rainfall

2. Hot air gets lighter and moves upwards. Cooler air comes to fill the gap made by hot air. Wind is formed with this flow of air.

3. Land breeze gets warm and rises up and ocean breeze takes its place. It also brings water vapours with it. This makes rainfall in land areas.

4. Less rainfall leads to reduction of water. This is known as drought or famine.

5. Wind current or wind streams are produced by the displacement of hot and cold air from one place to another.

18.2

1. (a) positive, negative (b) repel

   (c) safe (d) items

   (e) speed, life, property

2. Charge is produced with the meeting of clouds and air (moving fast).

3. (a) Find shelter below shorter trees than bigger trees

   (b) do not use umbrella with metal sticks

   (c) do not hide in any house or building

   (d) do not touch telephone or electric wire. (any three)

4. When the charge of any charged items is transferred to earth, it is called conduction.

5. (i) Pay attention to warning of weather forecast by metrological department.

   (ii) Send household items, animals, vehicles to safer places.

6. Doordarshan, Radio, Newspaper

18.3

1. (a) earthquake

   (b) movement of inner layers, volcano atom bomb test, collision with meteorite

   (c) prediction, earthquake affected areas

   (d) fire extinguishes

19

Natural Resource - I (Physical)

We see many things around us like plants, animals, birds, trees, mountains, soil, rivers, ponds, runnels or channels, sun, moon and many other objects. All these items are received by nature. These are known as natural resources. These resources are of two types - one which have life like humans, animals, birds etc. These are called biological resources; secondly, non-living things which do not have life like air, water, soil, wood etc. These are known as physical resources. We will read about physical resource in this chapter. Biological resources are discussed in next chapter.

Objectives

After reading this chapter you will be able to: -

- Define natural resources and their utility
- Understand the importance of air, water and soil
- Tell the causes, effect and measurement of air, water and soil pollution
- Explain the sources and uses of main minerals
- Tell the availability and usefulness of fossil fuels

19.1 What are Natural Resources?

Our nature has two types of resources. Physical resources like air, water, soil, sun, wood, mountain, etc. Biological resources like humans, birds, animals, insects, micro organisms, plants, trees etc.

Both these resources together are called natural resources. These are useful to us in one form or other like air and water are required for life, plants and trees for making food, sum for light and energy, birds, animals and other micro organisms are useful in production of food. In this way other organisms and physical objects are needed for many important things. Let us learn about them in detail.

19.2 Air

19.2.1 Air is present everywhere

Although we cannot see air but it sorrunds us. Let us understand this by an activity

Activity 19.1

Take a glass (made up of glass pane). Now place a folded paper (by twisting(in a glass. Now place this glass in a tub full of water upside and then down. What do you see? You will find that water has not gone inside the glass and this is the cause why paper is not wet. (Fig A)

Fig. (a) : Water does not went inside the glass

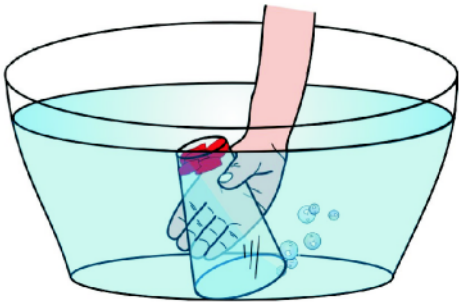


Fig. (b) : Water does not went inside the glass

Now place this glass in water tub in a slanted position. What do you see? You will find bubbles coming out of glass and water is going inside the class. (Fig B)

What are these bubbles made up of ? These bubbles are made by the air present in the glass. When we slanted or tilted the glass to fill water, air came out in form of air bubbles and then empty glass got filled with water. Observe that the paper inside the glass is also wet. What do we understand from this activity?

We find that even if we do not see air yet it is present around us. Every object even if seen empty, has air in it.

19.2.2 Elements of air (What is the composition of air?)

Air is a mixture of many gases. The chief gases present in air are-oxygen, nitrogen and carbondioxide. Other then these, air has water vapours, traces of dust and smoke and other gases. (Fig. 19.1)

Oxygen present in air is the life sustaining gas. Animals or organisms living in water also use oxygen for breathing. All organisms and plants use oxygen present in air for breathing and leave carbondioxide. So, Carbondioxide should be the largest air in air but it is not so. Why? Because plants use. Carbondioxide from air and water and minerals from land in presence of sunlight to prepare food. This process is known as photo synthesis. This process releases oxygen which mixes in air.

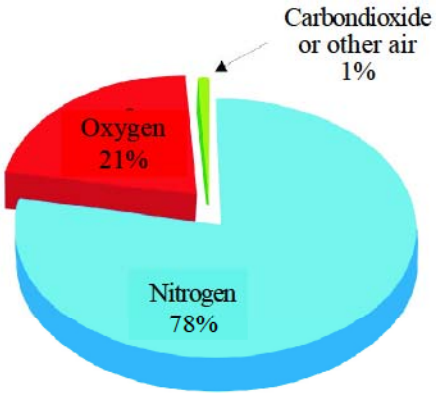


Fig. 19.1 : Gases present in Air

Due to this activity by plants, gas balance is maintained in air. We should plant more trees to keep oxygen in required quantity.

Intext Questions 19.1

1. Fill in the blanks :-

   (a) We cannot breathe without .....

   (b) ..... is present in an empty utensil.

   (c) Air is a ..... of gases.

   (d) ..... present in air is a life giving gas.

   (e) ..... help in maintaining the balance of gases in air.

19.2.3 Utility of oxygen and carbondioxide present in air

You must have seen igniting a stoke or when coals are burnt in iron. When air is blown or fan is used, wood and coal start burning fast.

This happens because oxygen present in air helps in burning of fuel. The more the oxygen is supplied, the more fast the fuel gets burnt. Other gases present in air like carbon dioxide or other gases do not help in burning, but they extinguish the fire. Let us understand this with an experiement.

Fig. 19.2: Oxygen is helpful in burning

Fill a bottle with one cup of vinegar. Put some baking

powder in a balloon and tie it on its mouth. As baking soda falls in vinegar, an activity takes place. Ballon starts blowing. Carbondioxide is produced by baking soda and vinegar. Now remove this blown balloon from bottle and leave the filled gas on a lighted candle. What happend? Candle stopped burning. This explains that carbondioxide in helpful in extinguishing the fire. (Fig. 19.3)

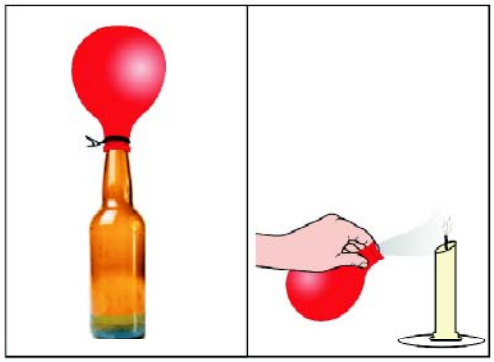


Fig. 19.3: Uses of carbondioxide

Fire extinguishers use this activity to stop fire. Whenever a fire starts, then the handle is pressed or placed upside down on floor. This breaks the bottom of acid insides the fire extinguisher. This activity releases cabondioxide by baking powder. This air blows out the fire.

Think if there was only oxygen in air, what would happen? This would burn the fuel but to stop it would have been impossible

19.2.4 Air Pollution

We know that plants help in maintaining the balance of various gases in air. We do a lot of things to pollute the air. This polluted air harms the balance of gases. Air gets polluted by smoke released by factories and disel pumps, bursting crackers in diwali, smoke released by car, bus and truck and preying of insecticides.

We have a problem in breathing in polluted air. The polluted particles in air give many breathing diseases. Chloro fluro carbon used in air conditioners and refrigerators and fragrant spray pollute the air. Due to these reasons, the quantity of carbondioxide and carbon monoxide increases in air. This further increases the tempreature of earth. If this tempreature keeps on rising, we may face dangerous consequences.

Fig. 19.4: An overview of Air pollution

It is difficult to bring back the lost imbalance of gases present in air. It is better not to pollute the air. We can stop the pollution of air in the following ways:-

(i) by planting more trees

(ii) by using low polluting fuel like C.N.G.

(iii) by establishing factories far from city and residential areas.

(iv) by using filter in chimney in factories.

(v) by minimum spray of insecticides

(vi) by using fragrant spray as per requirement

(vii) using chloro fluro carbon cautiously in air conditioners and refrigerations.

If we do not stop air pollutions now, then the bad effects will be seen by our coming generation. This is our responsibility to get alert and plant more and more trees with other measures to stop air pollution.

Intext Questions 19.2

1. State Yes or No :-

   (i) Oxygen present in air does not help in burning. (yes/no)

   (ii) Fire extinguishers use carbondioxide gas to stop fire. (yes/no)

   (iii) Air gets polluted by bursting crackers. (yes/no)

   (iv) There can be many breathing diseases by polluted air. (yes/no)

   (v) We should not plant trees to stop air pollution. (yes/no)

19.3 Water

Water is necessary for survival of life just like air. 70% of water is present in our body. 71% of earth is covered by water. This water is present in river, ponds and oceans. But humans do not use this water fully. If we consider all the water of the world as a bucket, then humans use only a small teaspoon of water.

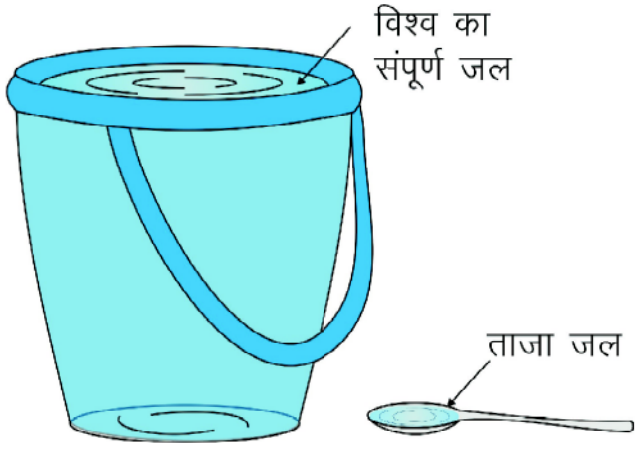


Fig. 19.5: Total fresh water present on earth

19.3.1 Uderground Water

When rain falls on earth, it absorbs rain water. This water is called underground water. This water gets callected below mountains on earth. This is known as water collection. This water is pumbed by taps, tubewells and handpumps for use. This water is restored again by rainfall.

Other sources of Water

Water is also obtained from glaciers, ocean, lakes, ponds and rivers.

19.3.2 Water Cycle

You have learnt in last chapter that due to heat produced by sun water present in pondsand ocean changes into vapour. This vapour condenses at a height and changes into water droplets. These droplets take the shape of clouds and it starts raining. Some rain water is absorbed by land and rest or rain water goes into river, runnels, lakes and ocean. This cycle goes on continously in nature.

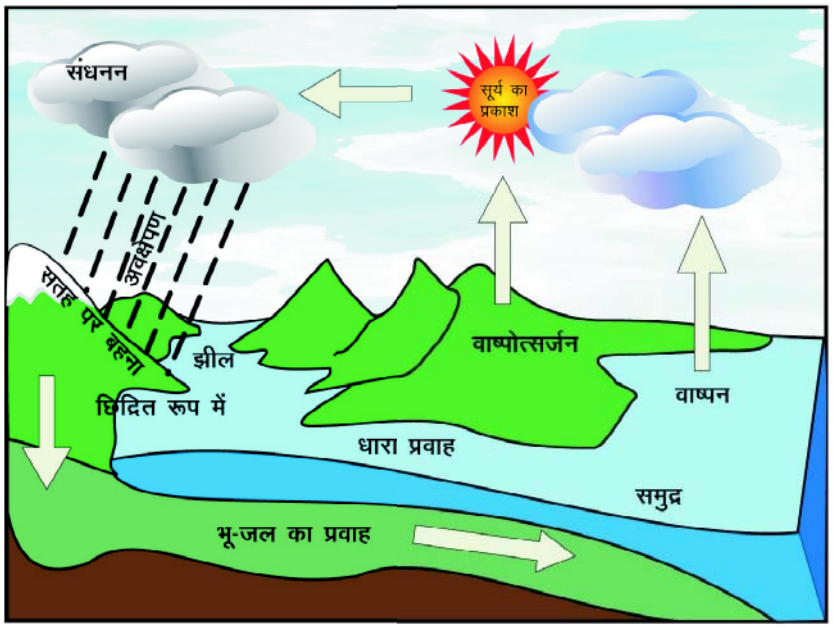


Fig. 19.6 : Water Cycle

19.3.3 Uses of Water

(i) Some organisms live in water like fishes and hydrila live in water.

(ii) Blood transports food, minerals and gases from one organ to other in living beings.

(iii) The flowing water in rivers takes many types of seeds, fruits and other microorganisms from one place to another. These seeds settle down and become plant later on. In this way water helps in the expansion of plants on earth.

19.3.4 How to make water fit for drinking

All the water present on earth is not suited for drinking. It contains many impurities and microorganisms. Therefore, pure water should be used for drinking. There are many methods of water purification. There are some practical methods which can be used in our homes. Some of them are:-

1. **Boiling** - If water is clean on seeing from eye, it should be boiled for 10 minutes before drinking or other use.
2. **Chlorinisation** - If you cannot boil water then drop 2 tablets of chlorine in a bucket of 20 litre water. This water can now be used for drinking. Chlorine tablets can be purchased from medical shop.
3. **Using potash alum** - Potash alum is hung (in muddy water) by binding it with thread. Now move this thread thrice in water and take it out. Mud will settle in bottom. Now save water. It can be used for drinking
4. **Using filter** - Various machines are available to clean water in the market. They also make water suitable for drinking.

19.3.5 Water Pollution

Water gets polluted by mixing with poisnous chemicals, excreted waste etc. These are mixed in clean water present in rivers, ponds and other water bodies. Many fertilizers and insecticides used in farm also mix with water and pollute it.

Water pollution can be stopped in following ways:-

1. Do not put poisnous chemicals produced by factories directly in water.
2. Use fertilizers and insecticides coutiosly in farm.
3. Save water on personal level; keep three things in mind:-
   (a) Reduce
   (b) Reuse
   (c) Recycle

Use waste water from kitchen for irrigation. This water gets wasted by cleaning vegetable and fruits.

Water is very important for our life. Do not pollute it. Do not waste it. Use it as per requirement. To make people aware about juidicious use of water, water conservation day is celebrated on 22 March every year.

19.3.6 Water Conservation

Most of the water droplets coming from rain get wasted. Therefore, it is necessary to collect water for future use. Due to concrete houses and roads, rain water gets wasted. We get a very little portion of rain water for future use. This can be collected in two ways:-

1. Rain water is sent to storage tanks by pipes on the roofs of houses. This stored water is sent to underground holes by pipe system.
2. The rain water is collected from runnels in the same way. This stored water can be used as underground water.

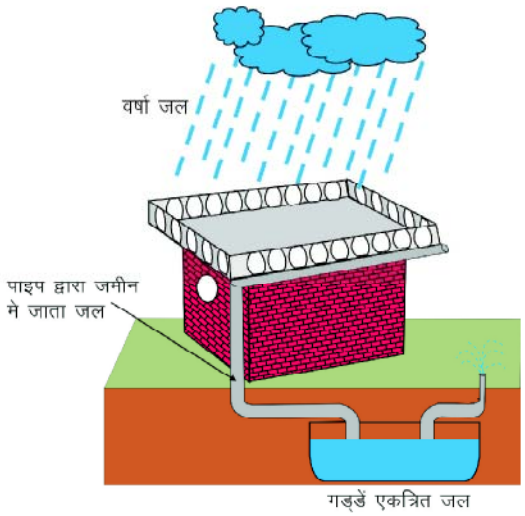


Fig. 19.7: Water Conservation

Write down names of any five sources of fresh water other than underground water:-

1. ..... 2. ..... 3. .....

4. ..... 5. .....

Intext Questions 19.3

1. State yes or no:-
   - (a) Water is neccessary for us. (yes/no)
   - (b) Water is a never-ending resource. (yes/no)
   - (c) Drinking water should not be boiled. (yes/no)
   - (d) polluted water spreads diseases. (yes/no)
   - (e) life of living beings is not possible without water. (yes/no)
2. Explain water cycle with diagram?

   _____
3. When and why is water conservation day celebrated in world?

   _____

19.4 Soil

Soil is an important natural resource. This is required for agriculture. Every plant gets water and nutrients from soil. Soil is a home for many organisms. Soil has many layers. To know more about the layers of soil, let us do an activity.

Take some soil from land and mix it. This soil powder is poured into a glass full of water. Mix it and then keep the glass from some time.

1. Do you see dried leaves on the top level of water?
2. Do you find some layers in the glass:-
   (a) Humus (decomposed organic items)
   (b) Water
   (c) Soil or Creamic
   (d) Sand
   (e) Gravel

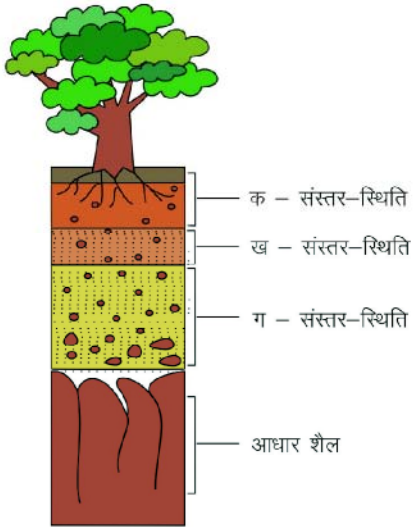


Fig. 19.9: Levels or layers of soil

Soil is formed due to the effect of air and water on mountains. This process is called soil erosion. Many layers of mountain forms the levels of soil. We can only see the top level of soil. This has humns and is used as a fertilizer. Small plants also originate here. This layer has the power to hold more water. This is known as top layer. The next layer to top layer is called middle layer. This is stronger and denser layer. The third layer below middle layer consists of stones.

19.4.1 Types of Soil

The ratio of sand and ceramic in the soil is determined by its basic mountain. The particles and size of soil are based on its type.

(i) Sand Grave Soil

The soil has big particles. The soil connot hold water. Cactus etc. grow in this soil.

(ii) Loam Soil

This soil has more small particles. This soil has both small and big particles. These help in controlling air and water in soil wheat, nuslard etc grow in such soil.

(iii) Clay Soil

This has very small micro particles. This stroes less air and more water. This soil is used to make idols, pitchers etc.

19.4.2 Moisture in Soil

Soil has the capacity of absorbing water. Let us do an activity to know it.

Take and collect soil from three areas, tar road, near pond and near farm. Mix them in powder form. Take three keeps funnel. Add filter paper as shown in the diagram below. Keep it in a beaker. Pour 50gm (exact) of soil on filter paer from three mixtures, one road, two pond and three farm soil.

Fill a bottle with 100 mililitre of water and pour it on every type of soil to see its water absorption capacity. Pour this water with the help of a dropper slowly and slowly. Observe which beaker collects water faster. This is known as internal distillation. Tell us which soil has the most absorbing capacity.

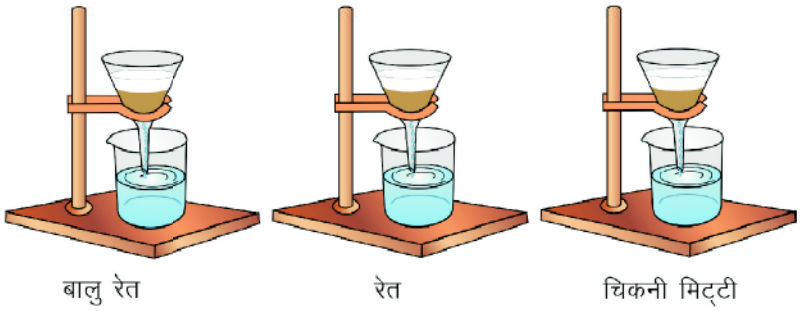


Fig. 19.10: Moisture and water absorption of soil

19.4.3 Relation between soil and crop

The elements of soil affect the growth of crop. Laom soil or gravel soil is good for the growth of wheat and gram. But rice or paddy grows in the soil which is full of humus. Pulse like Red lentils (masoor) grows in loam soil. This soil drainage water easily.

Cotton grows in loam or grand soil. This soil is better as it has proper air and water escape.

Activity 19.2

Identify soil in your area. Note down the crops grown in your area.

19.4.4 Soil Erosion

You must have seen soil particles going high with the fast movement of air. These particles sometime come into our eyes. You must have experienced dust storms in summer.

Do you know what is dust? Dust are small particles of soil. You must have seen dust flowing with water in rainy season. This cleans sky and land. With heavy flow of air, soil moves from one place to another. This is known as soil erosion.

This decreases the fertility of soil and also decreases the production of crops. Soil erosion is caused by rain, air, cutting of forest, over grazing of animals and bad methods of farming.

19.4.5 Soil Pollution

We know land and soil are useful to us. Soil forms the basis of life. Due to some activities, soil is getting poisnous. It also decreases its production capacity. This is soil pollution. Any element that mixes and decreases the production capacity makes it polluted. This is soil pollution because it reduces capacity of soil and makes it poisnous. The causes of soil pollution are:-

1. Use os insecticides
2. Mixing waste materials of industries in soil
3. Mixing dirty water and garbage from our homes in soil
4. Open toilet
5. Coal and petroleum
6. Coal

Many states have banned polythene bengs. Meausres should be taken to free soil from chemicals. Regular plantation should be encouraged to stop the process of soil erosion and secure the layers of soil.

Intext Question 19.4

1. Match Column 'A' with Column 'B' :-

	Column A		**Column B**
(a)	Dark Colour	(i)	Sand Soil
(b)	Dense and Small Particles	(ii)	Loam Soil
(c)	Toy making soil	(iii)	Ceramic Soil
(d)	Big soil particles	(iv)	Top Layer

19.5 Mineral Elements

Some physical resources like iron, manganese, lime, stone, zinc etc are also found in our nature. These elements are useful in our life. These are called mineral elements. Some mineral elements are formed by the decomposition of animals and plants for lakhs of years. These are called fossil fuels. For example, coal and petroleum. You have learnt about them as fuel in chapter 10, 'Heat'. We will study about coal and petroleum in this chapter.

19.5.1 Uses of Coal

Coal is used as a fuel in prepation of food in our homes. This is also used as a fuel to produce electricity. Coal is also used in industries. Coal tar and coal gas are formed from coal.

1. **Coke** - This is the purest form of carbon. Other forms of carbon are known to you like diamond, graphite etc. Coal is tight, strong and is of black colour. This is used for extracting metals specially in steel industries.
2. **Coal Gas** - Coal gas is formed as a by product of purifying coal. This is used as a fuel in nearby established industries.
3. **Coal Tar** - This is a thick black coloured and bad odoured (smell) liquid. This was earlier used to make roads. This is also used in many industries like plastic, explosive, paint, photographic material and napthelene balls (used to keep insects and worms away).

19.5.2 Uses of Petroleum

We get many useful products in petrol refining like petroleum gases, Diesel, Petrol, Kerosene, Paraffin, wax etc. These are used in many industries. This oil is found in India in the basins of Godavari and Krishan River, Bombay High, Mumbai, Gujrat and Assam.

Fig. 19.11 (a) : Petroleum Reserves

Fig. 19.11 (b): Natural Gas Reserves

19.5.3 Natural Gas

Natural gas is found in between many layers of coal and petroleum. This is stored as C.N.G. under high pressure. This is an important source of energy and is taken from one place to another with the help of pipes. C.N.G. is used in vehicles also. This is a less polluting fuel. This means CNG produces less pollution. There are many sources of natural gas in our country. Natural gas is found in Rajasthan, Tripura, Maharashtra and Godavari-Krishna Delta.

19.6 Conservation of limited resources

Natural resources like coal, petroleum and natural gas are available in a fixed amount in nature. It can end by our use.

These fossil fuels are formed after lakhs of years. Therefore, it is neccessary to use them juidiciously. Burning of coal and petroleum as fuel causes air pollution. These are limited resources which can only last for 100 years. Burning of fossil fuel produces carbon dioxide which increases the tempreature of earth.

Intext Questions 19.5

1. Fill in the blanks:-

   a) ..... is used as fuel in vehicles for less pollution.

   b) Coal and petroleum are ..... fuels.

   c) Many useful by products are formed by petroleum .....

   d) Coal tar is used in making .....

2. State yes or no:-

   a) CNG produces more pollution than petroleum (yes/no)

   b) Coke is the purset form of Carbon.

   c) Fossil fuels can be prepared in laboratories (yes/no)

   d) More carbondioxide can make the world hot. (yes/no)

   e) There are reserves of natural gas in India in Rajasthan and Maharashtra. (yes/no)

What have you learnt

- There are two types of natural resources- Physical and biological. Air, Water, Soil, Minerals etc are physical resources. Humans, organisms, plants and micro organisms are boilogical resources.
- Air is present everywhere - We cannot see air. Air has oxygen, nitrogen, carbon dioxide, water Vapours and dust particles with small amount of other gases.

- Oxygen present in air is required for breathing and burning of objects. Carbon dioxide present in air extinguishes the fire.
- Many poisnous gases like smoke mix in air and make it polluted. This harms the balance of gases in air which harms our health and environment.
- We should plant more trees and use smoke free fuel to save air from getting polluted.
- Water is essential for everyone. Although water cycle fulfils the demands of area yet there are places in the world facing drought.
- The main reasons for water deficiency are increasing population, industrializtion and the need of more water for irigation and mismanagement of water.
- We should boil water, chlorinate it, use potash alum or filter to make it suitable for drinking.
- Water gets polluted by dirty water from industries, human waste and poisnous chemicals. Polluted water is dangerous for our crops and organisms living in water.
- To make people aware about water conservation, water day is celebrated on 22 March.
- Note three things for water conservation, reduce, reuse and recycle.
- Soil is formed by the effect of water and air on mountains. Soil has layers of humus, gravel, sand and ceramic.
- The top layer of soil is very fertile. Soil is of three types - Sand, loam and Ceramic. These soils are suited for many types of crops.
- The upper layer of soil moves from one place to another by air, rain or ice. This is known as soil erosion.
- Chemicals and waste materials should be separated from soil to stop erosion. More trees should be palnted for stopping erosion.
- Coal and petroleum are fossil fuels which are used as fuel in many places.
- Coke, Coal gas and coal tar are formed from coal. These are used in many industries.
- Petroleum gases, diesel, petrol, kerosene, paraffin, wax etc are the by products of petroleum refinning. These are used in many industries.
- CNG is fuel producing less pollution. CNG is used in houses and factories as a fuel.
- Coal, petroleum and natural gas are limited resources. They should be used juidiciously.

Terminal Exercises

1. What are the types of our natural resources? Explain with example.
2. What are the elements of air? Prepare a diagram?
3. Why is air necessary?
4. How can we stop air pollution?
5. Take a bucket full of water. Close its mouth from thumb. Insert it in water and then remove thumb. See what happens. What do you understand by this activity?
6. Explain how underground water is stored and recyled?
7. Which of the following is not the cause of water deficiency:-
   (i) Increasing Population
   (ii) Mismanagement of water resources
   (iii) Heavy Rain
   (iv) Using more water for agriculture
8. Write the difference between sandy soil and gravel soil?
9. Explain how soil pollution and soil erosion can be stopped?
10. Write the following soil in decreasing order of water absorption:-
    (a) Sandy Soil (b) Loan Soil
    (c) Gravel Soil (d) Mixture of sand and loam
11. Explain how fossil fuels can come to an end?
12. Write the uses of coke?
13. What are the benefits of using CNG as fuel?

Answers to Intext Question

19.1

1. (a) Air (b) Air (c) Mixture
   (d) Oxygen (e) Plants

19.2

1. (a) No (b) Yes (c) Yes

   (d) Yes (e) No

19.3

1. (a) Yes (b) Yes (c) No

   (d) Yes (e) No

2. Make yourself. (See Fig.19.6)

3. 22 March - to make people aware about the importance of water and its conservation.

19.4

1. (i) - (d)

   (ii) - (c)

   (iii) - (b)

   (iv) - (a)

19.5

1. (a) CNG (b) Fossil Fuels

   (c) Refinery (d) Roads

2. (a) No (b) Yes (c) No

   (d) Yes (e) Yes

20

Natural Resources - II (Biological Resources)

We have already read about physical resources in last chapter. We will read about various types of biological resources and their relations in this chapter. The most important biological resource is our forest. Our forest includes trees and other plants with organisms, microorganisms, food chain and the processes of ecological balance. When humans cut forest for their own use, then they harm the shelter and food of many forest beings. This harms life sustainability on earth. We will discuss how forests can be saved in this chapter. We will also learn how to conserve our biological resources.

Objectives

After reading this chapter, you will be able to

- define biological resources.
- tell the importance of forests in our life.
- explain the structure of forests.
- give examples of food chain found in forests.
- explain the effect of forests on water, air and weather.
- explain the cutting of forests and its harmful effects.
- give suggestions regarding the conservation of forests.

20.1 What are Biological Resources?

Our biological resources include all plants, organisms, microorganisms etc. found on earth. Earth is the only planet where life is possible. You will find some species or life in all places like earth, sky, rivers, ocean etc. The variety of biological resources are found on the basis of various physical regions, climate, land and food on earth. Around 87 lakh organisms and species are found on earth which include polar bear in polar regions, penguin, camel in desert areas with cactus, fishes, tortoise, crocodile, ocean plants in ocean and its costal areas with crabs, magrene forests, leopard etc. All these organisms are connected to each other with food chain. If one species is lost then the balance of many food chains is also lost.

As you have already read in chapter 11 that on the basis of food organisms are divided into two categories - Autotrophs (green plants) and heterotrophs (those plants which do not have chlorophyll and organisms). These heterotrophs are further categorized into herbivores (cow, horse etc.). Carnivores (lion, leopard), ominvores (humans, dogs), parasites (lice, cuscuta reflexa (amarbel)), scavengers (eagle, wolf) and decomposers (bacteria, fungi etc.). Let us see how this natural balance is formed.

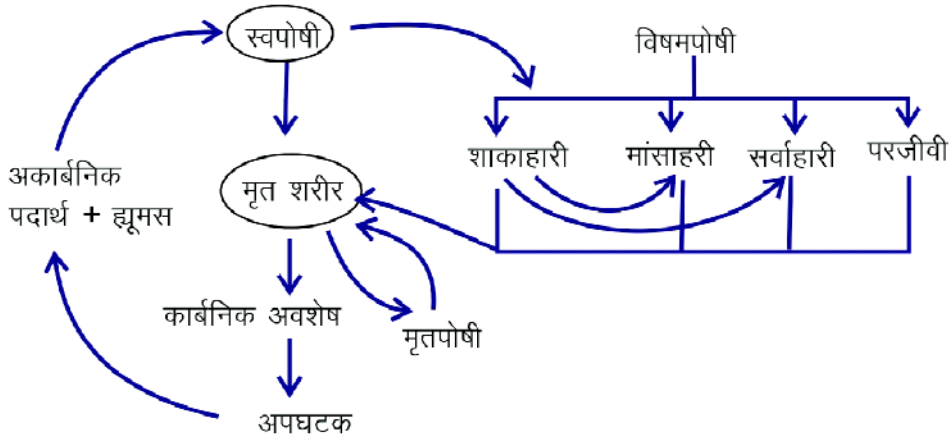


Fig. 20.1: Natural Balance

20.2 Main Biological resources: forest and its importance

The whole life on earth is based on plants. Only green plants are capable of preparing carbonic food from non-carbonic items using solar energy. Plants also release oxygen by the process of photosynthesis and use carbon dioxide released by humans in preparing food.

If we talk about land biological resources, then maximum number of plants are found in forests. Forests are those land areas which are full of dense forest, vines and shrubs. Forests give shelter to many forest living organisms, birds and small organisms. These organisms meet their food and

multiplication needs from forest. Many kinds of forest and organisms are found in colder.areas, hot areas and coastal areas of earth. These are reservoir of our valuable biological resources. Humans also fullfil their needs by forests. People visit forest for touring and adventure games. Forests also help in the production if food, wood, gum, oil, spices, honey, medicines etc. Many tribes live in forest today.

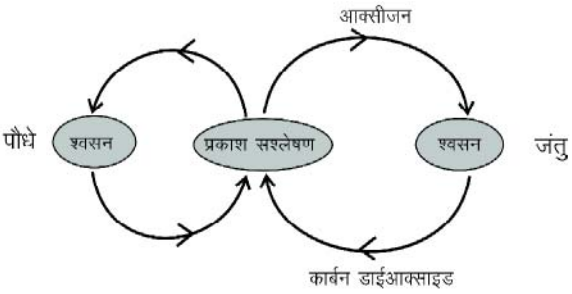


Fig. 20.2: Gas Balance in Nature

Intext Questions 20.1

1. What are biological resources?

   _____

   _____

2. Write one example of each category -

   (i) Autotrophs .....

   (ii) Herbivores .....

   (iii) Carnivores .....

   (iv) Scavengers .....

   (v) Decomposers .....

3. Fill in the blanks:

   (a) All living beings use ..... gas in breathing.

   (b) Plants use ..... gas to prepare food by photosynthesis.

   (c) We get ....., ... and ..... from forests.

   (d) Cuscuta reflexa is a ..... plant.

20.2.1 Structure of Forests

Tall trees are at a height in forests. Their branches cover smaller trees and plants. Such trees are known as conifer cone.

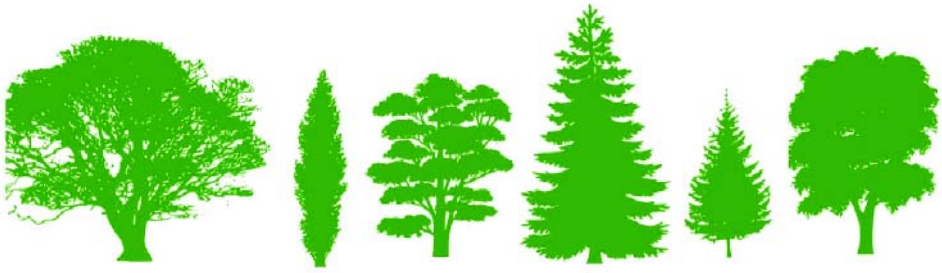


Fig. 20.3: Types of trees in a forest

Since forest has trees of various heights, many upper layers or top layers are formed. The upper layer is called the topmost layer.

Fig. 20.4: Structure of forests

20.2.2 Organisms and plant species found in forest

Many animals or organisms like birds, snake, squirrel, monkey, baboon etc. are found in the branch of trees. On land live lion, tiger, bear, elephant, deer, peacock etc. according to their own needs. Some organisms make their homes inside the earth by digging hole (rats, rabbit) or by making line or colony (ants, snake). The upper layer of soil is the home of earthworms and some insects. Some microorganisms or decomposers are found in soil which decompose dead organisms, leaves etc. In short, they clean the environment.

Common plants and organisms found in Indian forests

The common trees found in Indian forest include - Neem, peepal, bargad, sall, teak, sagon, selum, shisham, palash, amla, bamboo, kachnar, anjir, khair etc.

Scientific name:

Neem	-	Azadirachta Indica
Peepal	-	Sacred fig
Bargad	-	Bunyan
Sall	-	Shorea robusta

Teak	-	Tectona grandis
Sagon	-	Sayawan
Selum	-	Cannonball tree
Shisham	-	Dalbergia sissoo
Palash	-	Butea monosperma
Amla	-	Indian gooseberry
Baans	-	Bamboo
Kachnar	-	Bauhinia variegata
Anjir	-	Common fig
Khair	-	Senegalia Catechu

Animals found in forest include deer, elephant, pig, byson, monkey, baboon, tiger, leopard, cobra, snakes, peacock, hedgehog, jackal etc.

20.2.3 Food chain in forests

Every living being needs food. Every plant uses carbondioxide present in sunlight and water to prepare its own food. These plants are called autotrophs. All plants and organisms don't have chlorophyll, they eat food prepared by autotrophs. Herbivores eat plants and carnivores eat herbivores. This prepares a chain of organisms. This is known as food chain.

Autotrophs → herbivores → carnivores → omnivores

for example, plants → insects → frog → snake → eagle/vulture

grass → deer → leopard

fruits of plants/trees → monkey → python

Many food chains come together to make a food chain.

Vulture peacock → snake → deer → lion → tiger → leopard → frog → mouse → python → insect → grain → plants → rabbit

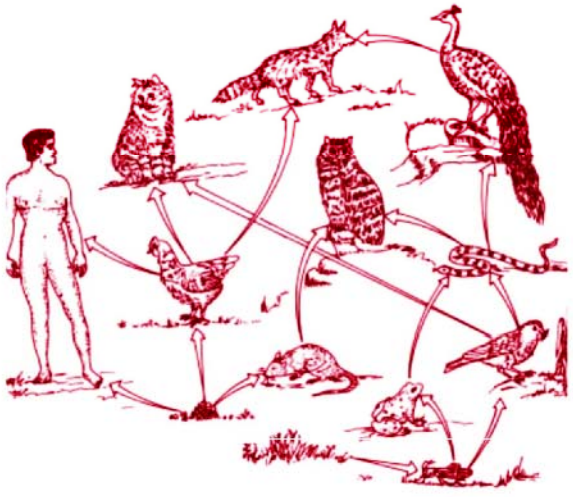


Fig. 20.5: Food Web

If leaves of plants, fruits, seeds and dead organisms are placed in forest, then it may give bad smell. Therefore, eagle, crow, fox, jackal etc. Such organisms are called saprophyte. Rest of the part of dead organism's body and plants are decomposed by fungi and various organisms. These change these into humus and non-carbonic items.

Intext Questions 20.2

1. Write two examples of each:

   (a) Animals found on tree branches ....., ...

   (b) Animals living by making colony in soil, ..., ...

   (c) Animals that decompose dead animals and leaves ....., ...

   (d) Those who eat herbivores, ..., ...

2. Writes name of five trees which are found in Indian forests.

   ....., ..., ..., ..., ...

20.3 Effect of weather and climate on forests

Forests stop the fast flow of air and water. The fast flow of rains comes down slowly because of leaves of trees. This water then flows to rivers and drainage. This water flows for a long time and stops the danger of flood or drought.

In the same way, the fast flowing air hits the leaves and gets slowed down. The moisture in the air increases with evaporation of water present on the leaves of trees. The air present near forest is high in oxygen. Therefore, the area near forest are cooler and give freshness. The tempreature near forest is around 34-35°C in summer. This temprature in our home reaches 47-48°C. Forest also helps in less noise pollution. In this way, forests control the flow of air and water. This control saves us from flood, drought, cyclone and windstorm. They control temprature and make a lovely and better weather.

Forests help in making soil fertile and do not help in flow of soil.

20.4 Cutting of forests and its harmful effects

Humans started cutting trees for land. This land used by increasing poplution, industrialization and urbanisation. Forest are cut due to agriculture, home, factories and wood of trees.

The problems that come up with the injudicious cutting of trees include:

(i) This decreases oxygen in atmosphere and increases carbon di oxide. This increasing carbon dioxide heats up the earth and melts glaciers and ice on mountains. This further increases the danger of flood.

(ii) This increases danger of drought and flood.

(iii) Soil erosion takes place in absence of trees and other plants.

(iv) This snatches food and shelter of many forest animals. Many species get extinct by cutting of forests.

(v) Many tribes are dependent on forests. Their life gets difficult. They take wood for burning, food items, gum for sale, spices, medicines, honey etc. from forests.

For development and secure future, around 30% area of the country should be carved out for forests. Our country has only 21% area covered by forests.

20.5 Conservation of forests and other forest animals

We should control the cutting of forests. There are many forest areas in which cutting trees is legally prohibited. We can do the following to save forests.

1. If trees are cut at a place, then we should plant trees there for greenery.
2. Plant trees as much as possible in colonies or residential areas.
3. Plantation of crops should be organised for making people aware about conservation of trees.

Intext Questions 20.3

1. Fill in the blanks with appropriate words:

   (a) The air in forest has more .....

   (b) Soil ..... takes place due to cutting of trees.

   (c) Many ..... are dependent on forests.

   (d) For better future of any country, around ..... of area should be covered by forest.

What have you learnt

- All plants, organisms and micro organisms found on earth are our biological resources.
- Many types of living organisms are found in different areas of earth.
- All living organisms are connected to each other by many food chains.
- These food chain make a cycle of carbonic and non-carbonic items to make a natural balance.
- Maximum plants are a part of forests on earth.
- Forest are those areas which are filled with dense forests, shrubs, wine and small plants.
- Forests are places of many animals who fullfil their needs of food and multiplication from forests. Humans also fullfil their needs from forests.
- Many tribes still live in forests. They provide wood, food items, gums, spices, oil, honey medicines etc., items of utility.
- Many kinds of trees like high, small, thick, thin etc. are found in forests. High trees spread their branches and make a roof. This roof is called canopy. The top of different trees is of different shapes.
- The chief trees found in Indian forests include teak, semal, bunyan, pipal, saal, shisham etc.
- Common animals found in Indian forest include tiger, leopard, elephant, deer, pig, monkey etc.
- Forests are a balanced unit. They maintain natural balance in various food chains. Many food chains make food web.
- Forests affect our climate and weather. They help us in getting pure air and water. These control temperature and stop noise pollution. These do not let soil erosion take place in fertile or humus soil.
- Forests are being cut down because of increasing population, industralization and urbanisation. The life of forest animals is in danger and people dependent on forest are also in trouble.
- Around 30% area of a country should be covered by forests for a better future. We should take proper steps to conserve forests. Legal ban is imposed on some areas for hunting and cutting of trees. We should plant more trees in our area.

Terminal Exercises

1. Fill in the blanks:
   (a) All living beings are connected by .....
   (b) The parts above the stem of plants are called .....
   (c) ..... and ..... live by making holes or digging holes in soil.
2. Why organisms in different areas are different from each other?
3. Who cleans the dead organisms and falling leaves and fruits of trees?
4. What is a food web?
5. What will happen if eagle and crows disappear?
6. All organisms on earth are dependent on autotrophs. How?
7. What will happen if we cut forests injudiciously?
8. Write any four methods of forest conservation?
9. Why carnivores are needed in a food chain?
10. How cutting of forests can be controlled?

Answers to Intext Questions

20.1

1. Resources found on earth which are living beings are called biological resources. These include trees, plants, micro organisms, animals etc.
2. (a) green plants (b) cow
   (c) lion (d) vulture, eagle
   (e) Micro organisms, fungi
3. (a) oxygen
   (b) carbon dioxide
   (c) wood, food items, gums, spices
   (d) parasites

20.2

1. (a) monkey, squirrel, baboon (b) mouse and rabbit
   (c) decomposers (d) lion, tiger, leopard
2. Bunyan, neem, pipal, shisham, semul, palash etc.

20.3

1. (a) oxygen (b) erosion
   (c) tribes (d) 30%

21

Disposal of garbage waste and Swach Bharat Abhiyan

We see a lot of garbage waste around us. This garbage is produced by houses, schools, shops, hospitals, factories etc. Our day to day work also produces waste like paper, polythene bags, food residue etc. We also put unused items and objects in waste. Other waste produced includes dirty water and waste materials from toilets, bathrooms, kitchen etc. In this way, a lot of waste is produced per day. If this waste is not disposed of properly, then think what would be our environment and life. We will learn about waste disposal in this chapter.

Objectives

After reading this chapter, you will be able to:

- define waste
- categorise various kinds of waste
- know the harmful effects of waste collection
- know the measures of disposing waste
- tell the methods of disposing severage
- understand the objectives of swach bharat abhiyan

21.1 Waste

Whenever you travel in a bus or train, you find that some people throw groundnut peel, empty packets of chips and biscuits, paper and newspaper pieces, empty water bottles inside or outside the

bus or trains. We also throw unused or waste things like vegetable or fruit peel, stale food, paper, plastic bottles, toys etc. outside our home. Shopkeepers also throw items like empty packets, bottles, tin, sacks etc. Hospitals throw used medicine packets, plasters, cotton, clothes, syringe etc. outside everyday. Factories collect waste materials in an open area. We also throw waste materials from our homes everyday. Dirty water is produced by our toilets, bathrooms and kitchen etc. through drainage pipes. All materials which are not useful to us and we throw them out are called garbage or waste. Imagine what will happen if this waste is not properly disposed?

21.2 Harmful effects of garbage collection

If waste is not properly disposed then there can be following results-

(i) Waste will start decomposing and may release bad smell with poisonous gases. This will pollute air.

(ii) Worms take birth in decay waste and may produce diseases in humans and organisms.

(iii) Waste will increase if not properly disposed. This will spread dirt in environment. We will not find pure air for breathing. This will increase diseases. It will create difficulty in living.

Therefore, it is necessary to dispose of waste. Think if this waste gets converted into a useful material. Is this possible? Let us know the types of waste?

21.3 Various types of garbage

You must have seen two dustbins in various cities. One is of blue colour and other is green. Why is it?

1. This is done because one dustbin has those elements which can be used again like plastic, mirror and broken utensils. These are known as non-biodegradable waste. This kind of waste does not decay even after being collected and stored for a long time in land. This means that this waste cannot get decomposed. These cannot be broken into small pieces. This is also known as non-decay waste. Such waste is collected in blue coloured dustbin.

2. Second dustbin is of green colour. This collects those waste items which decompose easily. These waste materials are thrown everyday.

   These include peel of vegetables and fruits, stale food, dried leaves, paper and torn clothes etc. These items decay easily. This is known as biodegradable or biological waste.

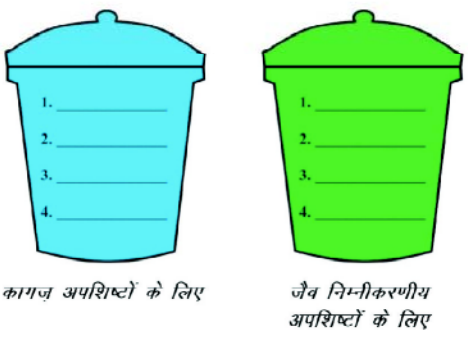


Fig. 21.1: Dustbin

Intext Questions 21.1

1. Fill in the blanks:

   (a) Various non used items thrown by us outside are called .....

   (b) If waste is kept at a single place, then environment gets .....

   (c) Waste is of two types, ... and .....

   (d) Biodegradable waste gets ..... fast.

   (e) Non-biodegradable waste never gets .....

21.4 Disposing Garbage

You must have seen people throwing waste outside after cleaning their homes. When more people throw waste in this way, then garbage gets collected. You must have seen that many people throw waste in rivers, ponds, well or channel or runnel. Garbage is collected near roadside or trees. Think if this garbage gets collected what will happen. The harmful effects of garbage dump is discussed in this chapter under section 21.2.

What happens to waste or what can we do with it? There are many methods to dispose of waste material. The process of disposing of waste material is called garbage disposal.

21.4.1 Dumping Yard

For proper disposal of waste, we need to place biological and non-biological waste separately. Garbage is collected from our houses and is sent to a far off place for collection. Afterwards non-biodegradable waste is spread on ground and is covered by soil. Afterwards this place is used for park or playing ground. This land is left barren for 20 years. Nothing is built on this land for 20 years. This place is known as dumping yard.

Fig. 21.2: Dumping Yard

21.4.2 Making Compost Manure

Decomposed items are collected in a hole and it is then covered by mud. Water is sprinkled on it from time to time. Manure is prepared from waste. This is known as compost manure. This manure is useful for plants. We can make compost from our own biological waste. Think if some waste

items can be used again by modifying or breaking them. Let us learn the four measures of waste disposal.

21.5 Four measures of garbage disposal (4Rs)

21.5.1 Reduce - producing less waste

You must have noticed that we use paper, polythene bags, glass, packets etc. more. We can change our behavriour to produce less garbage. If our work can be done in half page, then we should not use full page. Do not use plastic bottles or polythenes. Take a cloth bag for shopping in market.

21.5.2 Reuse - using again

Check out if some items can be used again like the blank side of calendar can be used as rough paper or making notes. Old boxes and plastic bottles can be used to keep small things. Such things can be used or reused again.

21.5.3 Recycle - Transforming waste

Non-biodegradable waste has some items which can be used again by transformation. This procedure is known as recycling. Like small jars can be made by recycling plastic jars. Old steel can be changed to new steel. New paper can be made by recycling old paper.

21.5.4 Recover - finding again

Many new resources can be prepared from waste like preparing compost manure from organic waste, making biogas from biomass etc. Biomass includes waste of animals, dried leaves etc. This is used to produce electricity and can be used as fuel.

Fig. 21.3: Biogas Plant

The disposal of waste can be understood by the above picture. We should change our behaviour to produce less waste.

We should check which item can be used again from waste collected. Some waste can be recycled by using machines. Many new resources can be made from waste. Then the left waste which is not useful can be placed in an open dumping yard.

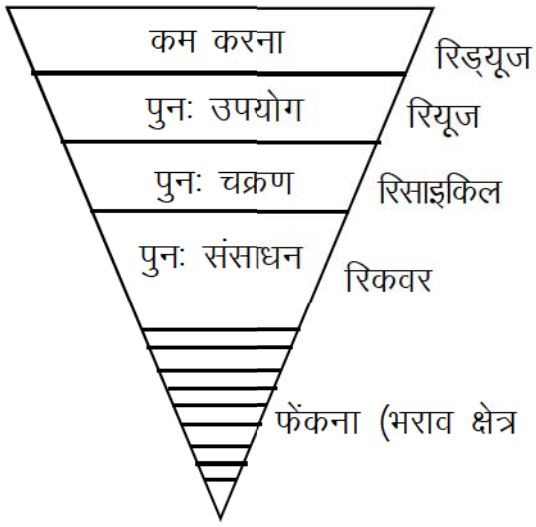


Fig. 21.4: Four chief measures of garbage disposal

Intext Questions 21.2

1. Why is garbage disposal necesary?

   _____

2. What is dumping yard?

   _____

3. How compost manure is made from waste?

   _____

4. What are the four measures of garbage disposal?

   (i) ..... (ii) .....

   (iii) ..... (iv) .....

21.6 Sewerage Disposal

We have learnt about garbage disposal. Now think where dirty water from our toilets, bathrooms, cleaning of utensils and clothes goes? Where does the waste water or liquid from industries, hospitals, offices and other places goes? This waste water is known as sewerage. This waste water also mixes with rain. Some harmful materials are also mixed in water from roads and roofs of houses. In this way, sewerage has maximum water. This water has impurities in a suspended form. Some of the

example are - human waste, oil, urea, dead birds and animals, waste of vegetables and fruits, items containing nitrogen and phosphorus with micro organisms. What happens with waste water? Can this water be reused? Let us learn about it.

21.6.1 Sewerage treatment plant (measuring machines)

Drinking water is supplied to our homes and other places by big and small pipes. In the same way, a web of pipes is made to take disposed water. This pipe web is called sewerage. By these pipes dirty water is taken to sewerage. To dispose sewerage a machine is made which is known as treatment plant.

Dirty water is cleaned by treatment plant in many processes like physical, chemical and biological processes. This helps in separating these three items. Let us understand the working of sewerage treatment plant.

1. First dirty water goes from bar screen. This differentiates big size items like boxes, napkin, packets etc.

Fig. 21.5: Bar Screen

2. Now this sewerage is taken to a tank and is sent at low speed. This settles the mud, pebbles and stones present in it.

Fig. 21.6: Tank

3. Now this is taken to a big tank with a sloppy bottom. Here it is kept for a long time. Here, dirt settles down at the central part of bottom. This is known as sludge. This waste is taken out by rubbing. Skimmer is used to remove the oil surface. Now we get clean water. Sludge is collected in a separate tank. Biogas is produced by organisms using sledge. Biogas is used as a fuel and as an element in producing electricity.

Fig. 21.7: Skimmer

4. This clean water is passed from a pump and air to increase microorganisms. These organisms eat human residue, food decay and other unwanted items. These suspended microorganisms settle down in the bottom in form of sludge after a few hours. Now water is released from the upper part of tank. Rest of the sludge is removed by machines. Dry sludge is used as a fertilizer. This fertilizer helps in retaining minerals and carbonic items back in soil. Water is released in ocean, river and land after treatment. Sometimes chemicals are also used to remove bacteria from water.

Fig. 21.8: Filters

Do you know that

Eucalyptus are planted on all sides of sewerage treatment plant. These trees absorb dirty water and give pure water vapours to atmosphere.

Fig. 21.9: Sewerage treatment plant

21.6.2 Alternative system for sewerage disposal

Sewerage treatment plant are very costly. Therefore, small alternative system disposal are now increasing. Some of the examples are - septic tank, composting pit and chemical toilet etc. Septic tank is safe where there is no proper system of sewerage. Many organisations provide facilities like biogas plant for disposal of sewerage. Excreted waste is sent to biogas plants by closed drainage pipes. Energy produced by biogas plants is used for many purposes.

Intext Questions 21.3

1. Fill in the blanks:

   (i) ..... is used water.

   (ii) Sewerage is a liquid form of ..... items.

   (iii) Sewerage is treated by putting it in .....

   (iv) ..... and ..... are produced by sewerage treatment.

   (v) ..... is used at those places where there is no sewerage system available.

21.7 Swach Bharat Abhiyan (Clean India Campaign)

This is a national mission. This movement was started by prime minister Narendra Modi on 2 October 2014 on 145th birth anniversary of the father of nation, Mahatma Gandhi.

Gandhiji saw the dream of clean India. He believed that cleanliness, purity and peace are a part of healthy life. Indian government is trying to make his dream real. This mission will be completed in 2019 (150th birth anniversary of Bapu).

This mission is implemented in rural and urban areas under ministry of urban development and drinking water and cleanliness.

21.7.1 Goal of Swach Bharat Mission

The major purpose of this mission is to make toilets available to people living below poverty line. It also includes changing unhealthy toilets, providing hand pump, maintaining drainage pipes, proper disposal of liquid and solid waste, better cleaning system of house-hold and family etc.

21.7.2 Swach Bharat Abhiyan

The goal of this mission in urban areas is managing solid waste. This mission has a purpose to provide toilets to 1.04 crore houses, 2.6 lac public toilets and 2.5 lakh community toilets.

21.7.3 Swach Bharat Abhiyan in rural areas

Indian government had started Nirmal Bharat Abhiyan (full cleanliness program) in 1999 to clean rural areas. This program has been reorganised into Swach Bharat Abhiyan (Rural). The main motive is to end the practice of open toilet. Government has made a plan of making "crores" of toilets in this mission. Another plan is to change dirt into organic manure and usable energy fuel. Partnership of Gram Panchayat, Zila Parishad and Panchayat Samiti has also been fixed.

The main objectives of Swach Bharat Abhiyan (Rural) are

(i) to improve the living standard of rural people.

(ii) to motivate them for cleanliness.

(iii) to ensure responsibility of Panchayti Raj institutions and community for cleanliness.

(iv) to maintain solid and liquid waste management.

(v) making environment clean by community co-operation.

(vi) to motivate community for regular cleaning.

All the members of all the communities are needed to make the mission successful. Government has requested everyone to give minimum 100 hours to clean near by environment.

You can write your work or experience related to this mission in your areas.

Intext Questions 21.4

1. Fill in the blanks:

   (a) Swach Bharat India is a ..... mission.

   (b) ..... had a dream about clean India.

   (c) This mission is implemented in urban and ..... areas.

   (d) The main purpose of Swach Bharat Abhiyan is to end the practice of .....

2. What programs are made by government to stop the practice of open toilets?

   _____

   _____

What have you learnt

- Many types of items which are non usable and are thrown by us are called garbage.
- If proper disposal of waste is not done, then environment gets polluted. We will fall ill. For good health, proper disposal of waste is needed.
- There are two kinds of waste-organic and non-organic.
- Reusable and waste objects can be separated from garbage. These useful items are re-made to be used again. Left waste is dumped in dumping ground.
- There are four measures of garbage disposal - reduce, reuse, recycle and recover.
- Dirty water produced by homes, offices, factories etc. has many impurities. Water released by cleaning and other activities is also dirty. Such water is known as sewerage water.
- Sewerage treatment plant separates clean water and impurities sludge and biogas is produced in this treatment.
- Swach Bharat Mission is a national mission; it was started on 2 October 2014.
- The main purpose is to give provide toilets to people living below poverty level. Other goals are providing handpump, maintaining drainage pipes, proper disposal of solid and liquid waste, cleaning home and environment etc.
- The members of all communities and their support is needed to make Swach Bharat Abhiyan successful.
- This mission is implemented in rural and urban areas by ministry of rural and urban development and drinking water and cleanliness.

Terminal Exercises

1. Match the following:

(a)	waste	(i)	degradable
(b)	organic waste	(ii)	organic and non-organic
(c)	non-organic waste	(iii)	clean environment
(d)	disposing waste	(iv)	non-biodegradable

2. Fill in the blanks:

(i) Non useful waste is thrown in ..... area.

(ii) ..... is made from organic waste.

(iii) Non-biodegradable waste can be .....

(iv) Garbage disposal can be done by ..... use.

(v) We should make our habit of producing ..... waste.

(vi) ..... of all is needed for the success of Swach Bharat Mission.

3. Answer the following:

(a) Explain two methods of garbage disposal?

(b) What is sewerage?

(c) How compost manure is prepared?

(d) Name any two items produced by sewerage treatment?

(e) Where and why is the water of sewerage plant sent?

(f) What is the purpose of Swach Bharat Mission? What are its measures?

Answers to Intext Questions

21.1

1. (a) waste

(b) pollute

(c) organic, non-organic

(d) decay

(e) decompose

21.2

1. will pollute our environment and spread diseases
2. left over or residue of waste is put in dumping yard
3. organic waste
4. reduce, reuse, recycle, recover

21.3

1. (a) dirty water

   (b) waste

   (c) sewerage treatment plant

   (d) sludge, biogas

   (e) local cleanliness/septic tank

21.4

1. (a) National

   (b) Gandhi ji

   (c) Rural

   (d) Toilets

2. Government has proposed to make "crores" of toilets to stop the practice of open toilet.

Self Evaluation Test - 4

1. Fill in the blanks:
   (a) The sorrunding of air around is called .....
   (b) There is no uniform ..... on various parts of earth.
2. What is charging of earth?
3. What is light lumination? Explain with diagram?
4. What is the mixture of various gases called?
5. How does alum clean dirty water?
6. What is the effect of forest on weather and climate?
7. Which dustbin is used for organic garbage?
8. Coke, coal and coaltar are used with gases as fuel of coal. What are these? Explain.
9. Explain water cycle with diagram?
10. Explain the rules of light changes with diagram.
11. What is thunder storm? What measures can save us from it?
12. Write a note on alternative system of sewarage disposal.
13. What is Swach Bharat Abhiyan (Clean India Movement)? What are its objectives?
14. Write any four methods of garbage disposal?
15. Note down the preventive measures of air pollution?

Examination Paper Blueprint

Subject - Science

OBE Level 'C'

Total Marks: 100 **Time: 3 hrs**

1. Distribution of marks on the basis of objectives

Objective	Marks	% of Marks (round)
Knowledge	30	30%
Understanding	50	50%
Application and Skill	20	20%

2. Distribution on the basis of type of questions

Type	Number of questions	Time to solve the question by examinee
Long answer question	6x5 = 30	50
Short answer question	4x10 = 40	48
Very short answer question	2x10 = 20	50
Multiple choice questions	1x10 = 10	20

3. Module based marks distribution

S. No.	Module	Marks
1.	World of living being	20
2.	Elements	25
3.	Food	15
4.	How things work	05
5.	Dynamic objects	10
6.	Environment surroundings	10
7.	Natural resources	15
	Total	**100**

Sample Question Paper

Science

(C-105)

Total Marks: 100 **Time: 3 hrs**

Instructions:

This question paper has 26 questions. These questions are divided into four sections 1, 2, 3 and 4.

Section 1 has 1 question of 10 multiple choice questions. Each correct answer carries 1 mark. Four options (i), (ii), (iii) and (iv) are given. You have to select the correct option and write it in your notebook.

Section 2 has questions number 2 to 11 which are very short answers carrying 2 marks each.

Section 3 has questions number 12 to 21. These are short answer questions carrying 4 marks each.

Section 4 has question number 22 to 26. These are long answer questions carrying 6 marks each.

All questions are compulsory.

Section 1: Multiple choice questions (10 Marks)

1. Choose the correct answer:

(a) Which of the following is a characteristic of living beings? (1)

(i) they eat food (ii) they move

(iii) they die (iv) they breathe

(b) Which category is grape plant? (1)

(i) vegetation (ii) increasing vine

(iii) shrub (iv) tree

(c) How many sections of heart are there? (1)

(i) 2 (ii) 3

(iii) 4 (iv) 5

(d) Which of the following will not sink in water? (1)

(i) stone (ii) needle

(iii) nail in wood (iv) nail

(e) Which of the following is not found in metal? (1)

(i) shinning (ii) softness

(iii) good conductors of heat (iv) flexibility

(f) Which of the following is a physical change? (1)

(i) lighting a candle (ii) turning milk into curd

(iii) blowing a balloon (iv) rust on iron

(g) Which of the following fibres is found in plants? (1)

(i) polyster (ii) wool

(iii) cotton (iv) silk

(h) How does solar heat reach us? (1)

(i) by moving (ii) by dispersion

(iii) by radiation (iv) by evaporation

(i) Which of the following food chains is correct? (1)

(i) insect → frog → plants → eagle → snake

(ii) frog → insect → eagle → plants → snake

(iii) plants → insect → snake → frog → eagle

(iv) plants → insect → frog → snake → eagle

(j) Which of the following does not show scientific attitude? (1)

(i) being non-biased and truthful

(ii) keep trying, not accepting defeat

(iii) listening to views of maximum people

(iv) not believing anything without proof

Section 2: Very small questions (2 marks each)

2. Write names of any two single cell organisms with their diagram. (2)

3. What are the main functions of roots? (2)

4. What is dialysis? Why is it needed? (2)

5. Why one way mirrors are placed in windows in homes? (2)

6. What will happen if - (2)

   (i) non-dehydrated lime is mixed in water

   (ii) blue litmus is put in vinegar

7. How does microorganisms benefit us? Write any two examples? (2)

8. How does weed harm crops? Write any name of weedicides? (2)

9. What is difference between music and noise? (2)

10. How is compost prepared? (2)

11. What is external fertilization? Write any one name of organism doing external fertilization? (2)

Section 3: Short answer questions (4 marks each)

12. (i) What is animal environment? Write one example. (4)

    (ii) Write any two names of organisms living in water environment?

13. Prepare a diagram of excretion system in humans. (4)

14. Why do plants need fertilizers? Write the names of any two nitrogen fertilizers? (4)

15. Explain any two methods of food preservation? (4)

16. How are ocean breeze and air breeze formed? (4)

17. What is oscillation motion? Write two examples. Prepare a diagram. (4)

18. What is the difference between biodegradable and non-biodegradable waste? Write two examples of each? (4)

19. How a cyclone is formed by lightning and thunderstorm? Write any two safety measures to lessen its effects? (4)

20. Write any one example of following changes: (4)

    (i) frequency changes

    (ii) reversible changes

    (iii) physical changes

    (iv) biological changes

21. Which, when and where are gases exchanged in our breathing procedure. (4)

Section 4: Long answer questions (6 marks each)

22. Which method will you use to separate the following mixtures: (6)

    (i) sand in salt

    (ii) straw in wheat

    (iii) nails in wood powder

23. (i) What are the five stages of food digestion in heterotrophs? (6)

    (ii) Which elements are secreted in stomach? How does it affect food?

24. Explain various farming techniques of cropping? (6)

25. Write the difference between:- (6)

    (i) Real and virtual images

    (ii) Concave and convex mirrors

    (iii) Myopia and hypermetropia

26. Explain major joints in human body? Write the names of body parts where these joints are found? (6)

Answer Key

Section 1: Multiple Choice Questions			
S. No.	**Correct Answer**	**Marks Distribution**	**Total Marks**
1.	(a) They die	1	1
	(b) increasing wine	1	1
	(c) 4	1	1
	(d) nail in wood	1	1
	(e) softness	1	1
	(f) blowing balloon	1	1
	(g) cotton	1	1
	(h) dispersion	1	1
	(i) plants → insect → frog → snake → eagle	1	1
	(j) listening to views of maximum people	1	1
Section 2: Very small answer questions (2 marks)			
2.	Amoeba Paramesium	½x4	2
3.	Two function of roots:- (i) Making tree erect (ii) Absorbing water and minerals from land	1+1	2
4.	Dialysis is the process of blood purification, when a person's kidney (both) stop working, then extra elements mix in blood. If dialysis is not done, then the person may die. Therefore, dialysis is needed.	1+1	2

5.	One way mirrors are used in windows so that light comes inside the home. However, this mirror has less transparency.	2	2
6.	(i) Non-dehydrated lime reacts with water. This reaction produces calcium hydroxide and high energy. (ii) Blue litmus turns red in vinegar. This shows vinegar is acidic in nature.	1+1 1+1	2 2
7.	(i) Microorganisms are used to produce yeasts and prepare (lactobacillus) curd. (ii) Micro organisms are used in bread, cake, biscuit, alcohol etc. Leather business also uses microorganisms. (iii) These are used in preparing antibiotics. (any two)	1+1 1+1 1+1	2 2 2
8.	Weeds stop the growth of crops. Some of them are poisnous and create difficulty in cutting the crop. weedicides: 2, 4D	1+1	2
9.	Pleasant and soothing voice to ears is music and the sound which is irritating is noise.	1+1	2
10.	Organic compounds are put in a whole. Water is sprinkled from time to time. This makes compost	1+1	2
11.	When female lays eggs outside the body and male spread sperms on it, it is known as external fertilization. Example - frog, fish	1+½x2	2
Section 3: Small answer question (4 marks)			
12.	(i) When many types of organisms live together, it is known as animal environment like - land environment, water environment. (ii) Water environment includes organisms like crocodile, fish, crab, octopus (any two)	2+1+1	4
13.	Diagram of excretion system in humans	2+2	4

14.	Fertilizers are used in soil to enhance its nutrient level. For example - urea, super phosphate.	2+2	4
15.	Two methods of food preservation: (i) by drying (ii) by using chemicals	2+2	4
16.	Making ocean breeze - the land near ocean gets heated up fast. The air rises from land. Cool air moves towards land from ocean. These moving air form ocean breeze.	2+2	4
17.	Oscillation motion - when an object moves in to and fro motion, it is known as oscillation motion. example - swinging on a swing, pendulum of watch	1+2+1	4
18.	Waste which decomposes faster is known as biodegradable composition. Example - paper and peel of vegetables and fruits. Waste which does not decompose for a long time, it is known as non-biodegradable waste. Example - plastic, mirror pieces.	2+2	4

19.	Cyclone by lightning and thunderstrom - water transforms energy to evaporation steam which is changed to water again in atmosphere. This energy makes air hot and it rises. It lessens the pressure of air. Now air starts moving towards the center of thunderstorm. This repetition lessens the pressure of air. Air moves in many spiral layers known as cyclone.	2+2	4
20.	(i) Frequency changes - making day-night or seasons (ii) Reversible changes - making ice to water and water to ice (iii) Physical changes - blowing a balloon (iv) Biological changes - making a plant from seeds	1x4	4
21.	Gas exchange in breathing process - there are round keeps in the end of breathing muscles present in lungs. These are covered by blood. This is gas exchange. These blood keeps absorb oxygen from air and leaves carbon di oxide in the vessels.		
Section 4: Long answer questions (6 marks)			
22.	(i) Mix sand and salt in water. Salt will mix in water. By evaporation water will dry out and salt is left. Sand is seieved to seperate it from salt solution. (ii) Straw can be separated from grains by winnowing. Wheat will fall near and straw (being lighter) will fall far off. (iii) Magnet is used to separate nails from wood powder.	2x3	6
23.	1. Five stages of heterotrophs in human digestion: (i) Intake (ii) Digestion (iii) Absorption	2+3+1	6

	(iv) Assimilation (v) Excretion 2. The items secreted by stomach: (i) Mucus in stomach provides security to internal layer of stomach. (ii) Hydrochloric acid destroys organisms and makes food acidic. (iii) Digestive juice decomposes protein into simple items.		
24.	Farming techniques in crop: (i) Cultivation - making soil hollow by plough or tractor and then levelling it. (ii) Sowing - sowing proper seeds by sprinkling or spreading or using seed drill. (iii) Mixing fertilizers and compost - according to requirement. (iv) Irrigation - giving water to plants by using traditional and modern techniques (v) Weeding - removing weeds by mechanical and complex chemical solutions. (vi) Cutting the crop - using sickle or harvester or combine to cut crop. Thrasher is used to remove or separate grains from crop. Winnowing is used to separate grains and straw. (vii) Storage - grains are dried in the sun and placed in jute sacks. These sacks are stored in sylo and storage houses.	1x6	6
25.	Difference between - (i) Real images are found on a ground whereas virtual images are an illusion. (ii) Concave and convex mirror - convex mirror has	2x3	6

	its corners pointing out from the centre, whereas concave mirror has corners moved towards inside. (iii) Myopia and hypermetropia - if the dens of eyes are thick, then the image of an object does not build on retina but on any other point. These objects are not seen clearly. This is myopia. with age, muscles do not pressurize lens and then image is formed behind lens. Again the object is not seen clearly. This is hypermetropia.		
26.	Following are the main joints found in human body and their places - (i) Bell socket joint - this joint fits both the boxes in a circular motion. This joint is found near the shoulder joint and thigh joints. (ii) Hinge joint - this is equal to hinge applied to doors. This is found in elbow, knee, writst, and ankle. (iii) Pivot or saddle joint - this is a cylendrical shape joint to move organs up down and right left. This joint is found in the joint of neck and head in human body. (iv) Fixed joint - these joint fix many bones and make a structure. These does not let bones in between them move. Such are known as fixed joints. These joints are found in the bones of head, upper jaw and neck joints.	4+2	6