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Secondary Level

SCIENCE AND TECHNOLOGY (212)

Practical Examination

1. Objectives:

Science and Technology is a subject which can be learnt better by doing. The experiments inside or outside the laboratory give the learner an opportunity to understand the laws and principles of science. In fact, the experiments form an integral part of science learning. These help in developing a scientific attitude and certain well-defined skills. While doing the experiments in a science laboratory, you will get a chance to handle scientific equipment and apparatus, chemicals, etc. The learner will have to plan their work, make observations and draw conclusions. This process will help in developing a scientific attitude, the habit of systematic work and logical thinking. The purpose of introducing Formative and Summative Assessments in Practical PCP is to ensure learners' involvement and active participation in PCP classes as well as continuous assessment which leads to learning.

2. Implementation:

There are 30 activities listed in the Practical Manual of Secondary Course in Science and Technology (212). These activities are to be conducted in 5 PCP sessions as given below, at the study centre. These will be assessed through Formative (Continuous) Assessment. The Sixth PCP is reserved for the final examination that will be assessed through Summative (Final) Assessment at the Study Centre. The dates for the practical examination (Final) will be notified by NIOS in the examination date sheet. 50% weightage is for each of Formative (Continuous) and Summative (Final) Assessments. The maximum mark for Practical in Science and Technology is 15. The *distribution of* activities in 05 PCPs is as follows:

First PCP Practical:

i. Orientation of the learners about distribution of activities to be performed and allocation of Marks for both the Formative (Continuous) and Summative (Final) Assessment

ii. Orientation of learners about the handling of scientific equipment and apparatus, chemicals, etc.

iii. Learners have to choose **any two activities** to be performed from following experiments (S. No. 1, 12 and 21 of Practical Manual) as:

- Separation of Mixtures
- To determine the Density of the Material of a given Solid using a Spring Balance and a Measuring Cylinder
- To Prepare a Temporary Stained Mount of (i) Onion Peel: observe under the Microscope and Record Observations

Or

- To Prepare a Temporary Stained Mount of Human Cheek Cells: observe under the Microscope and Record Observations

Second PCP Practical:

i. Orientation of learners about Mounting of slides and Scientific principles

ii. Learners have to choose **any two activities** to be performed out of the following activities. (S. No. 3, 13 and 22 of Practical Manual) as:

- To Differentiate between a Chemical and a Physical Change in a given process
- To Observe and Compare the Pressure Exerted by a Solid Iron Cuboid placed on Fine Sand/Wheat Flour while resting on its three different Faces and calculate the Pressure Exerted in the three different cases
- To Study and Draw Different Types of Plant and Animal Tissues with the help of Permanent Slides : Plant tissues: Parenchyma and Sclerenchyma; Animal tissues: Blood, Striped muscle fibres and Nerve cells

Third PCP Practical:

(i) Orientation of learners about the interpretation of the data and conclusions of experiments

(ii) Learners have to choose **any two activities** to be performed. (S. No. 4, 5, 14, 15, 16, 23 and 24 of Practical Manual) as:

- To Test the Presence of Water Vapours in Air
- To Test the Presence of Carbon Dioxide (CO_2) in Air
- To find out the Approximate Percentage of Oxygen in Air
- To Verify the Third Law of Motion using Two Spring Balances
- To Determine the Melting Point of Ice
- To Study the Process of Osmosis through a Semi-permeable Membrane
- To Test the Presence of Starch in Green Leaves exposed to Sunlight

Fourth PCP Practical:

i. Orientation of learners about the concept of laws of Motion, photosynthesis and Respiration

ii. Learners have to choose **any two activities** to be performed from the following experiments (S. No. 17, 7 and 25, 26, 27 of Practical Manual) as:

- To Test the acidic/basic nature of a solution with the help of pH paper.
- To Study the Change in the Size and Position of Image formed by a Convex Lens by hanging an Object (Candle)Placed in front of it
- To Observe that Oxygen is released during the Process of Photosynthesis
- To Show that CO_2 is given out during Respiration
- To Test the Presence of Starch and Fat in given Food Samples

Fifth PCP Practical:

iii. Orientation of learners about the concept of Chemical reaction, Chemical equations, estimation of the levels of Pollution and Food Chains and their Trophic levels.

iv. Learners have to choose **any two activities** to be performed from the given experiments.(S. No. 8, 20 and 28 to 30 of Practical Manual) as:

- ❖ To Carry out Chemical Reactions of Different Types
- ❖ To Study the Change in Current through a Resistor by Changing Potential Difference across it. Determine the Resistance of the Resistor by Plotting a Graph between Potential Difference and Current
- ❖ To Estimate the Level of Pollution in Terms of Particulate Matter by Comparing Leaf Samples Collected from Different Areas
- ❖ To Observe Organisms from Given Pictures or Specimens or in the Surroundings (e.g. Crop Field, a Garden, or A Nearby Pond). Classify them as Producers and Consumers, and Construct their Food Chains and Indicate their Trophic Levels
- ❖ To Study External Structural Adaptations in any Two Organisms out of Cockroach, Fish, Frog, Lizard and Pigeon

3. Scheme of Practical Examination:

The following scheme of practical examinations to be followed is as per the details given below:

- The conduct of practical examinations is mainly linked with practical PCP. There are 06 practical sessions which are compulsory.
- The initial five (05) PCP practicals have to be assessed through Formative (Continuous) Assessment and will be utilized for learning.
- The final (6th PCP) practical will be for Summative (Final) Assessment for practical examination.
- A weightage of 50% of the marks will be awarded for Formative (05 practical classes) Assessment and 50% marks for the 6th practical classes for Summative Assessment.

III. Marks Distribution in Formative Assessment (05 PCP Sessions):

S. No.	Criteria for Assessment	Marks	Remarks
1.	Regular Participation in 05 PCP Classes	1½	The five boxes under formative assessment in the award list will be filled up based on these 05 criteria.
2.	Activities Performed in 05 PCP Classes	1½	
3.	Practical Record maintained in 05 PCP Classes	1½	
4.	Use of practical instruments/ equipments	1½	
5.	Participation with Peer-Group and Tutor	1½	
Total		**7½**	

IV. Marks Distribution in Summative Assessment (6th Final PCP Class):

S. No.	Criteria for Assessment	Marks	Remarks
1.	Assessment of activity performed (Two activities out of given three activities)	2 x 2½ = 5	Time of 2½ hours will be allowed for the final examination.
2.	Viva-Voce based on the activities	2½	
Total		**7½**	

Note: The total (Formative and Summative Assessments) weightage is 15 marks. In award list, the marks obtained by the learner, both in Formative and Summative Assessments are to be mentioned clearly and the final figure is the sum of the marks of Formative and Summative Assessments.

4. Preparations for PCP Practical Sessions:

(i) The Centre Superintendent and Tutor must read the instructions mentioned in the Guidelines for practical PCPs.

(ii) Check and arrange the materials, tools, equipments etc. that will be needed in the Practical PCP sessions in advance.

(iii) Learners are informed about the schedule of Practical PCP sessions. Practicals may be arranged in groups of learners.

(iv) The attendance sheet must be properly maintained in each Practical PCP class.

(v) The award list must be filled up, as per the given assessment criteria.

(vi) The techniques of group work may be followed in Practical PCP sessions.

(vii) Learners shall be asked to bring the practical record book in each class. Each learner is expected to maintain it, as per the instructions given in the practical manual.

5. Precautions (DOs and DON'Ts)

Discuss the following points with learners regarding preparing the practical record book:

(i) Throughout the practical note book, the learner should follow the same style. Ask them to use a good fountain pen and a sharp black pencil. It is recommended that the right hand page should be written in blue ink and the left hand page with a black pencil.

The recommended style of writing is shown below:

Left hand page	Right hand page
Scale, Projections, Calculations. Graph, Diagram, Figures	Title of the exercise, Date, Exercise No, Interpretation and conclusion

(ii) Each experiment should start from a new page.

(iii) A neat and proportionate Scale, Projections, Graphs and Diagrams should be used.

(iv) Mistakes should be crossed out with a single line so that it can still be read, the correct statement rewritten in its place.

(v) No page should be torn-off from the practical record book.

(vi) Before going to take Practical Examination, get all the exercises of Practical Record Book signed by the tutors.

6. List of Activities:

There are 30 activities in the Science and Technology Practical Manual. These 30 activities are distributed under three sections as:

Physical Sciences

1. To Determine the Density of the Material of a given solid using a Spring Balance and a Measuring Cylinder
2. To Find the Average Speed of an individual, as one walks/runs, to and fro between two points

3. To Observe and Compare the Pressure Exerted by a Solid Iron Cuboid placed on Fine Sand/Wheat Flour while resting on its three different Faces and Calculate the Pressure Exerted in the three different Cases
4. To Verify the Third Law of Motion Using Two Spring Balances
5. To Determine the Melting Point of Ice
6. To Study the Laws of Reflection of Light Using a Plane Mirror
7. To Study the Change in the Size, and Position of Image formed by a Convex Lens by hanging the Position of an Object (Candle) placed in front of it
8. To Study the Change in Current through a Resistor by Changing Potential Difference across it. Determine the Resistance of the Resistor by Plotting a Graph between Potential Difference and Current
9. To Assemble a Household Circuit Comprising Two Bulbs (3 Volt each), Two Turn On-Off Switches, a Fuse and Two Dry Cells as Source of Power
10. To Determine the Speed of a Pulse Propagated through a Stretched String

Chemical Sciences

1. To Prepare an Aqueous Solution of Common Salt of a given Composition
2. Separation of Mixtures
3. To Differentiate between a Chemical and Physical Change in a given Process
4. To Test the Presence of Water Vapours in Air
5. To Test the Presence of Carbon Dioxide (CO_2) in Air
6. To find out the Approximate Percentage of Oxygen in Air
7. To Test the Acidic/Basic Nature of a Solution with the help of pH Paper
8. To find the pH of Fruit/Vegetables Juices with the help of pH Paper
9. To Identify Washing Soda and Baking Soda out of the Samples of two White Powders
10. To Carry out Chemical Reactions of Different Types

Biological Sciences

1) (i) To Prepare a Temporary Stained Mount of an Onion Peel; Observe it Under the Microscope and Record Observations

   (ii) To Prepare a Temporary Stained Mount of Human Cheek Cells; Observe it under the microscope and Record Observations

2) To Study and Draw Different Types of Plant and Animal Tissues with the Help of Permanent Slides : Plant tissues: Parenchyma and Sclerenchyma; Animal tissues: Blood, Striped muscle fibers and Nerve cells

3) To Study the Process of Osmosis through a Semi-permeable Membrane

4) To Test the Presence of Starch in Green Leaves Exposed to Sunlight

5) To Observe that Oxygen is Released during the Process of Photosynthesis

6) To Show that CO_2 is given out during Respiration.

7) (i) To Test the Presence of Starch and Fat in Given Food Samples.

   (ii) To Test the Presence of Adulterants in (a) Milk and (b) Metanil Yellow in Pulse.

8) To Estimate the Level of Pollution in Terms of Particulate Matter by Comparing Leaf Samples Collected from Different Areas.

9) To Observe Organisms from Given Pictures or Specimens or in the Surroundings (e.g. Crop Field, a Garden, or a nearby Pond) Classify Them as Producers and Consumers, and Construct Their Food Chains and Indicate their Trophic Levels.

10) To Study External Structural Adaptations in any two Organisms out of Cockroach, Fish, Frog, Lizard and Pigeon.