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Open Vocational Education Programme

Drinking Water Purifier Technician

NSQF Level 3.5

Practical Manual

National Institute of Open Schooling

Open Vocational Educational Programme

DRINKING WATER PURIFIER TECHNICIAN

PRACTICAL MANUAL

NATIONAL INSTITUTE OF OPEN SCHOOLING

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A Word with You

Dear Learner,

Welcome to the programm **"Drinking Water Purifier Technician".**

I am glad that you have chosen this vocational course.

Today water purifiers have become a day to day necessity thus the demand of water purifier both domestic and commercial is high in India and it is increasing day by day.

Water purifier needs routine services for its smooth functioning and it also requires proper installation and maintenance .Keeping this fact in mind, NIOS has designed this course to develop you as a skilled and professional technician for Installation, Repairing and Maintenance of Domestic and Commercial Drinking Water Purifier Systems.

This qualification has been approved by NCVET and is at NSQF level 3.5. it furthers ensure quality assurance across this vocational sector.

This course will accommodate the knowledge and skills required for assembling, installing and repairing wide variety of drinking water purifier system available in the market. This course has been written progressively and in very simple language giving insight of each and every technology used in water purifier systems.

The course cover all core elements of a water purifier service such as -: **Configuring Water Purifier System, Components of Water Purifier, Working Procedure of a range of Water Purifier System, Inspecting Water Purifier Systems, and Troubleshooting techniques.** In this course these core components are categorized in to 11 lessons and grouped under following **National Occupation Standards (NOS):** NIO/PSC/N0101:**Install water purifier system (Domestic and Commercial),** NIO/PSC/N0102:**Perform service and maintenance of Water purifier system (Domestic and Commercial),NIO/PSC/N0103:Effective Resource Utilization,** NIO/PSC/N0104:**Maintain health and safety at work place and** DGT/VQS/N0102 **Employability skill.**

In this programm our goal is to give learners a fundamental understanding of the Water Purification Industry. Additionally, this course shall make you aware of the employment and business opportunities available in this sector. After completing this course; learner may be able to find work at establishments such as - Water Purifier Service Centers, Water Purifier Retail Chains/Shops, Water Purifier Assembling Plants, Water Purifying Plants etc.

As this is a vocational course which is skill based so master your skills, practical training is must and your success at the place of work will depend on how skillfully you have performed your assigned job.

So, we request you to kindly attend the Personal Contact Programme (PCP) at your alloted Accredited Vocational Institutes (AVIs).

Wishing you good luck and success!

Ms. Priyanka Goyal

Course Coordinator

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Notes

1

WATER QUALITY TESTING

Aim -: To test the quality of the water sample, TDS level, pH (acidity), Hardness metal contaminates physical inspection odour.

Equipment /Tools and Material Required : TDS Meter, pH meter, Filter paper, Funnel (Glass or Plastic) , Small electronic weighing machine.

Theory:

Quality of water can be judged physically for turbidity and with measurement of TDS and pH and hardness of water sample. The procedure of judging and testing water quality is given separately for TDS, pH, hardness odour etc .

TDS Level Chart for Drinking Water

TDS in Water (measured in PPM)	Suitability for Drinking Water
Between 50-150	excellent for drinking
150-250	Good
250-300	Fair
300-500	Poor, not good for drinking
Above 1200	Unacceptable

As per Indian standards, the pH of drinking water should be between 6.5 and 8.5

Practical - 1

Water Quality Testing

Notes

Acceptable range of the calcium ion is 100-300 mg/litre, depending on the associated anion. Hardness levels above 500 mg/ litre are generally considered to be aesthetically (pleasing) unacceptable, although this level is tolerated in some communities.

Pre Procedure:

- Take atleast 3 different sample of drinking water (from different sources like river water,well, tap water etc.) of atleast 50 ml each at STP.
- While taking the sample from a particular source please stirr the water of the source.
- Keep them seperatly in a transparent container (glass or plastic).
- Number them as 1, 2 and 3 (by placing stickers on them).

Procedure:

Step 1: Physical Examination

1. Take samples of water (each at a time) randomly.
2. Physically examine all the three sample and observe for turbidity in them with naked eye.
3. Note the level as high low and medium as per your observation in the Table1.1.
4. Now check the suspended solid impurities of each sample one by one by using standard filter paper (image of filter paper).
5. Measure the weight of the suspended solid impurities of each sample by using weighing machine.
6. Note down all the readings of suspended solid impurities in the observation table and compare the results of each sample.
7. Discuss among yourself which sample is best for drinking

Observation Table 1.1

S. No.	Sample No.	Turbidity level low or high	Weight of suspended solid impurities
1.	1		
2.	2		
3.	3		

Step 2: TDS level testing using TDS meter

1. Take the TDS reading of the samples one by one for all the three samples.
2. Note the TDS reading of the samples in the observation table 1.2
3. Discuss among yourself which type of filteration technique to be used for all three the samples.

Observation table No 1.2

S. No.	Sample No.	TDS level
1.	1	
2.	2	
3.	3	

Step 3: pH level testing using pH meter

1. Take the pH reading of the samples by pH meter.
2. Note the pH reading of all the three samples in the observation table 1.3
3. Discuss among yourself about the quality of water based on pH level and which filter technique can be used to make the water drinkable by adjusting the pH level

Observation Table 1.3

S. No.	Sample No.	pH value
1.	1	
2.	2	
3.	3	

Step 4: Hardness level testing using Hardness kit

1. Determine the hardness level of the samples with the help of hardness kit.
2. Note the hardness level of the water samples.
3. Discuss the hardness of the samples among yourself .

Practical - 1

Water Quality Testing

Notes

Note: Discuss the quality of water based on turbidity level, TDS level, pH level and hardness and suggest the water filteration technique i.e micro filter alone , micro filter with UV, micro filter with RO, alkaline filter and if the sample is too hard formRO then softener may be suggested.

Precautions:

1. Do not take the sample from same source.
2. Before checking the qaulity of water samples do not allow the impurities to settle down.
3. Maintain the sample at room temperature to get real results.
4. TDS meter and pH meter (batterry should not be weak) and Hardness kit used for testing water sample should be in good condition.
5. Handle the testing euipments and the apparatus carefully.
6. Do not use discharge or discarded water.

Learner's Observation:

S. No.	Sample	Sample Technology recommended for purification
1.	1	
2.	2	
3.	3	

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Check the water quality physically
- Check the TDS level
- Check the hardness of the water sample
- Check the pH value of the water sample
- Discuss the water quality of the water sample based on the tests performed.

Learner's Observations

Record your observation for the above practical

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Invigilator's Sign

Practical - 1

Water Quality Testing

Notes

2

MARKET SURVEY FOR WATER PURIFIER

Aim: To conduct market survey for a range of water purifier.

Places to visit

1. Retailers of Water Purifier in local market.
2. Dealers / Wholesalers of Water purifier in local market.
3. Accessories / spare part retailers in local market.
4. Accessories / spare part dealer in local market.
5. Service Centres of water purifier.

Procedure / Activity

1. The learners have to go to market for locating a range of retailers / whole sellers of WPU and its accessories.
2. Learners should visit the shops to take quotation / information in respect of WPU of different brands.
3. Learner should Note down the technology used, rates of different WPU available in local.
4. Learner should note down the information taken from different sources in observation table 2.1

Market Survey For Water Purifier

Observation Table 2.1

S. No.	Name of WPU (Brand)	Technology used	Rate	Remark
1.				
2.				
3.				
4.				

Conclusion:

Learner should identify the best water purifier unit based on the quality of water samples as in in practical-1 and write in detail in learner's observation.

Precaution:

1. The learner attitude should be polite while interacting with the shop keepers / dealers
2. The learner should collect leaflets of all the WPU and its accessories from the shop keepers /dealers

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Conduct market survey for a range of water purifier.
- Identify appropriate water purifier based on inlet water.

Learner's Observations

Record your observation for the above practical

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Invigilator's Sign

Notes

3

INSTALLATION LOCATION

Aim-: To identify best location for installing the water purifier system (Pre filter and water purifier unit)

Theory :

Finding out proper installation location is very necessary for a domestic as well as Commercial water purifier unit for its succesful and long service time.Various factors such as capacity of water purifier unit, plumbing and electrical connections etc.

Procedure:

The best location for installation of a water purifier unit should be decided on the basis of the observation on the following points.

Plumbing:

1. For a given space observe for proper spacing for cooling and maintenance.
2. Evaluate the plumbing connection,it should be as near as possible for continuous and stable supply of water to the water purifier unit.
3. Check the pressure in the feed water line should be enough for proper flow specially for a RO water purifier. Generally, the water pressure range of municipal tap water is 0.1-0.3 MPa, which can be directly connected to the water purifier.
4. If the space choosen is far from the feeding water supply, the plumbing have to done either concealed or open to bring the supply as near as possible to the water purifier unit.
5. The waste water pipe should be of minimum length, for this the drain should be nearest to the waste water outlet.

Installation Location

6. As all water filters need to be regularly rinsed, disinfected and replaced after a period of use, the installation position of the water purifier should not be too high, too narrow or too hidden, which increases the difficulty of regular maintenance.

Electrical Connection:

1. Electrical connection should be near to the WPU
2. Electrical connection should be proper value as per the rating of water purifier unit i.e., 230 V AC 6 ampere or 16 amperes.

Capacity :

1. The size (Weight) of the water purifier unit depends on the capacity of water purifier unit.
2. Large space is required for high capacity (5L-15L).
3. Generaly all domestic water purifier of capacity of up to 10 L are wall mounted.

Model or design/Usage :

Water purifier are installed according to their design and usage also for example-

- **Undersink RO:** As name suggested some water purifier unit are designed to installed under the kitchen sink.

Figure : 3.1 Undersink RO

- Hot or Cold water dispenser cum water purifier is mounted on floor.

User/Customer requirement:

A technician should take proper care of the customer requirement while deciding the installation location height of family members.

Practical - 3

Installation Location

Notes

Common points for consideration for selecting the location of water purifier unit:

- Obtain sufficient clearance to connect plumbing lines, electrical connections, and access the system for servicing and heat dissipation.
- If the family has installed a whole set of water purification equipment in the whole house, then when the tap water is filtered and purified layer by layer, the water pressure will automatically decrease.

Where you cannot install water purifier?

As there are so many priority locations for installing water purifiers, there are installation places which should be avoided by a technician like:

- Water purifier unit should not be installed near a heat source or in direct sunlight. Because most filter element are made of plastic which can be easily decompose in hot condition, resulting in odour and secondary pollution.
- It should not be exposed to the outdoors for a long time as this may make the plastic parts of the water purifier brittle, reducing the life of the water purifier.
- It is not suitable to install a water filter in a too small space (congested). As in the water purifier unit filter element needs to be clean frequently so If the space is too small, the water filter cannot be removed and also it will be difficult to disassemble the water purifier.
- For the best use of the water filter, choose an installation place with high water pressure and convenient sewage discharge, but also consider the aesthetics (look or view) after installation.

Observation -:

Take a look at where you install your water filter, is it installed correctly?

Precautions :

1. While customizing the installation location for the user also check the amount of accesories provided by manufacturer whether it is sufficient or not, like length of pipe etc.
2. Keep all the points in mind which are to be avoided for the installation location of water purifier unit.

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Identify best location for installing the water purifier system (Pre filter and water purifier unit)
- Decide the location of water purifier unit considering beautification point of view.

Learner or Trainer should contact near by dealer and observe the installation procedure done by the technician team of the dealer. Prepare a report on any 3 places taken for the selection of best location of water purifier installation.

Learner's Observations

Record your observation for the above practical

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Invigilator's Sign

Notes

4

INSTALLATION OF WATER PURIFIER

Aim: To perform installation of a water purifier.

Theory:

It is very important to unpack the water purifier unit very carefully to check for any damage and missing parts. The installation involves the water connection, electrical connection and mounting of the water purifier unit. The training of installation procedure involves rigorous practice of all the steps as given procedure detailed below.

Procedure :

Installation of water purifier involves following steps :

Step 1- Unpacking of this purifier

1. Carefully place water purifier box on the plane surface.
2. Cut the SMPS on packing box with help of knife.
3. Cut the packing tape wrapped on all sides of the box.
4. Carefully take out the top cover of packing box and remove the polythere cover of the water purifier.
5. Take out all the accessorize of Water purifier.
6. Remove the packing.

Installation of Water Purifier

Items in the box-

Water purifier unit	01 No.
S. S ball value	01 No.
3 way connector	01 No.
Food grade while pipe 3"8	3 meters.
Food grate while pipe 1/4" (white and blue)	2 meters each.
Screws & plastic inserts	02 No each.
Hot and cold water dispenser	01 No.
Instruction manual	01 No.
Drilling sticker	01 No.

Step 2 - Setting up of water connections.

1. Keep all the plumbing tools and accessories ready before turning off the main supply line of water (for minimum interruption in the supply line).
2. Turn off the main water supply line, Always install purifier on normal water supply line and not on Hot water.
3. Take out the tap from water supply line carefully by using pipe wrench.
4. Use a Teflon tape to create tight joint on the three way connector having external thread and wrapped it tightly on the connector thread in clock wise direction only to prevent it from loosening in water supply line, cut the excess tape.
5. Insert external thread end of the 3 way connector in to the water supply line.
6. Use teflon tape on the tap to create a leak free joint.
7. Insert the tap on the hex end of the 3 way connector and tighten using pipe wrench.
8. Use teflon tape on S.S ball valve and insert it in to ¼" Port of the 3 way connector.
9. Take the white pipe and broaden its mouth by inserting, screw driver with edge in to it.

Notes

Practical - 4

Installation of Water Purifier

Notes

10. Remove hex nut form S.S ball valve and insert the hex nut into white pipe from non-broadened end put the broaden end of the pipe in to the S.S ball value make sure pipe completely slips over the nipple of the S.S ball and secure the connections by tightening the hex nut on the S.S ball.

11. Water supply remains ON when lever is parallel to S.S ball valve body and water supply is off when lever is perpendicular to S.S ball valve body.

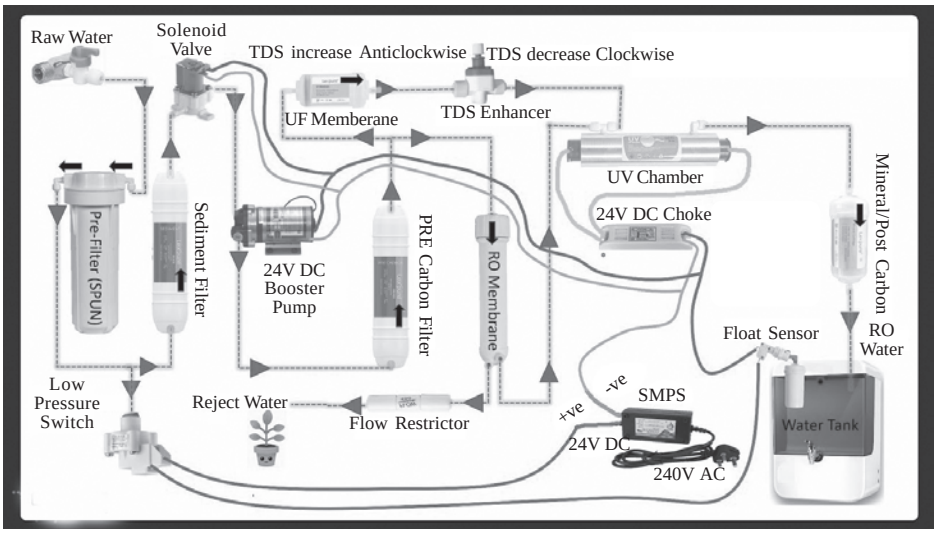

Figure 4.1 : Water purifier connection diagram

Step 3 - Making preparation for mounting the purifier (for choosing the mounting surface)

1. Check for the proper horizontal level which should be a plain even surface.
2. Every purifier comes with the drilling sticker with measured marking.
3. Stick the drilling sticker on the mounting in a proper horizontal straight line.
4. Drill two hole into the sticker markings using 8mm drill bit (holes depth should be such that plastic inserts could go completely inside the hole).

Step-4 Installation of water purifier

1. Place the Purifier on flat surface.
2. Cut the tie wires holding the UF member and RO member housing on place.
3. These components are so tied as to save them from getting damaged.
4. Position during transportation Hang the purifier on plain even surface.

Notes

5. Remove dead plug from raw water in let by pressing elbow collect with one hand and puling dead plug with the other.

6. Take white pipe with the end not fixed to SS ball valve.

7. Measure its distance from the water inlet of the water purifier and cut of the extra length.

Raw water inlet

- Fix the end not fixed to SS ball valve of white pipe into the water inlet of water purifier.
- Remove dead plug from the Flow Restrictor tube outlet by pressing the elbow collect with and hand puling deal plug with the other.

Reject water output: -

- Fix one end of the blue pipe into the Flow Restrictor outlet of water purifier.
- Push pipe into the elbow to avoid any leakage.
- Put the other end of the blue pipe in the drain.
- Clamp both white and blue pipes make sure that rejected water pipe in not place at a level higher than the purifier, otherwise the rejected water may Flow backward into the purifier Avoid Sharp bends in the pipe fitting do not bend or block the rejected water pipe.

H P S (High Pressure Switch)outlet : -

- Remove deal plug from the high pressure switch outlet.
- Connect the white pipe to the tips.
- Insert the power plug into the three-pin socket turn on the water supply with the help of SS ball valve later.

Water Supply "off"-

The water supply remains off when the lever is perpendicular to the SS ball valve body.

Water Supply on

- The water supply remains on when the lever is parallel to SS ball valve body. Wait for 2 to 3 minutes after turning on the water supply to pre-soaks the filter.

Practical - 4

Installation of Water Purifier

Notes

- Unlock all the filter housing one by one to remove the air gaps from the filter, lock the filter housing once the air gap is removed.

For installing cold dispenser and water cooler-:

All the above steps should be followed an additionally the steps related to red switch

Red switch

- Air Gap can be removed by pressing the red switch mounted on the filter housing.
- Switch on the Electrical supply The purifier will start operating data in same water from the purifiers output before connecting it to the water cooler as water is not fit for drinking.
- Check and rectify leakage in the purifier, if any.
- Switch off the purifier.
- Insert Union connector 1/4" on the white pipe end not connected to the HPS
- Wrap Teflon tape on water inlet of the water cooler.
- Fix the cooler fitting on the water cooler inlet.
- Tighten union connector to water cooler Fitting.
- Switch on the purifier
- Let the purifier till the water cooler fills up and the purifier shuts off automatically.
- This show whether the HPS is working properly or not.
- Switch off the purifier.
- Completely drain the water from water cooler and throw away the water because first few liters of water purified by the RO membrane may not be fit for drinking, recheck the TDS level of Raw water supply.
- Take out the white pipe from the water cooler.
- Check TDS of purified water coming out from the purifier output.
- Switch of the machine the purifier water TDS level reduce by approximately 90% of raw water TDS and should not be less than 50 PPM.
- The recommended TDS level is 55-75 PPM; however, it can be adjusted to the customer's choice or the value of raw water TDS.

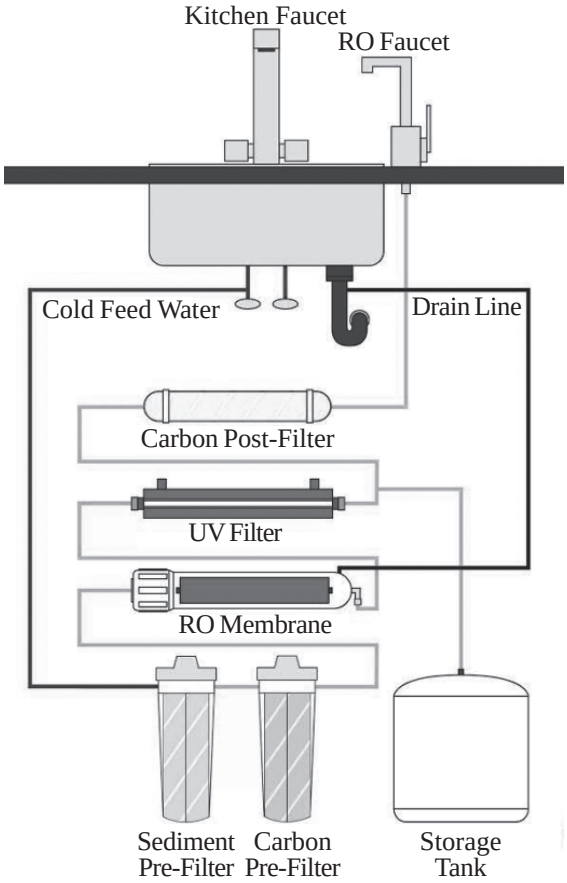

Figure 4.2 : Connection Diagram of undersink RO

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Install the water purifier as per standard guidelines

Learner's Observations

Record your observation for the above practical

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Invigilator's Sign

5

TOOLS USED IN ELECTRICAL INSTALLATION

Aim-: To demonstrate various tools required in Electrical Connection of water purifier system

Theory: Tools plays an important role in electrical installation, routine maintenance and repairing of the water purifier unit. Few of the tools which are generally used are as under.

Tape Measure

To measure the space required to install your water filter, you need to get underneath the sink. Measure up, and make sure you allow 30 millimetres underneath the system.

Shifter, Crescent, or Adjustable Spanner

You'll need this when you install the T-piece for the under-sink installation kit. Simply use the crescent to take the chrome flexible hose off and install the T-piece.

Tools Used In Electrical Installation

Electrical Tape

It is used for electrical insulation of bare electrical wire / electrical parts

Nail Punch/Sharp Object/Hammer

To mark a little hole on the electrical tape, and drill a pilot hole for the faucet.

Drill And Drill bits

Used to drill the hole in the sink.

Pen or Marker

To mark the holes where you are going to drill.

Practical - 5

Tools Used In Electrical Installation

Notes

Screws And Screwdriver

To screw the electrical board and electrical socket and switch.

Wire cutter

To remove the insulating sleeve of a wire and to cut the wire

Tester

To test the phase or live wire,it may also be used as a screw driver

Test Lamp

To test the supply and to test the continuity of electrical wiring.

Tools Used In Electrical Installation

Procedure:

1. Display the tools on a working bench
2. Identify the specific purpose of each tool as described above.
3. To use and handle the tools.
4. Clean and store the tools after their use.

Precautions:

1. Never touch bare wire with naked hands
2. Use related relevant tools
3. Handle sharp knife/ cutter care fully
4. Handle drill very carefully
5. Use electric tap when ever bare wire is seen.

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Identify different kinds of electrical tools .
- Handle and use tools for relevant purposes.

Learner's Observations

Record your observation for the above practical

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Notes

6

SELECTION OF WIRING FOR ELECTRICAL CONNECTIONS

Aim: - To make electrical connection of WPU with proper selection of wring system and material

Equipment /Tools and Material Required:

Wire cutter, Neon Tester 0-500 V, Hammer ball pin 1/2 Kg, Screw driver 9"

Material required:

1.5 mm^2 multistrand wires 6, amp switch cum socket combine, (3"x4"), earth, wire, concealed pipe 1/2" (if required) and Insulation tape or roll.

Theory:

The voltage in India for single phase connection is 230 V Usually all domestic water purifier are operated on 230 V 6 amp supply. The connection for commercial water purifiers units are to be taken from 230 V 16 amp supply. The connection must also have proper earthing for electrical safety.

Procedure

1. Observe the space near by the water purifier unit location.
2. If already existing 6 amp electrical outlet is found, fix a 3 pin socket and switch board near the electrical outlet.
3. Make wiring connections of the board and connect it to the wiring out let (Fig 6.1)
4. Test for proper voltage and earthing with the help of volt meter. The voltage between phase and neutral, phase and earth should be nearly the same. If not make the earthing proper.

5. If the electrical connection is too far from WPU location, bring electrical connection outlet near to it by either concealed or open conduit wiring system Fig 6.2

6. Make a 3 point socket switch connection along with a MCB to provide electrical point to a water purifier using standard electrical installation procedure as given in Fig 6.2

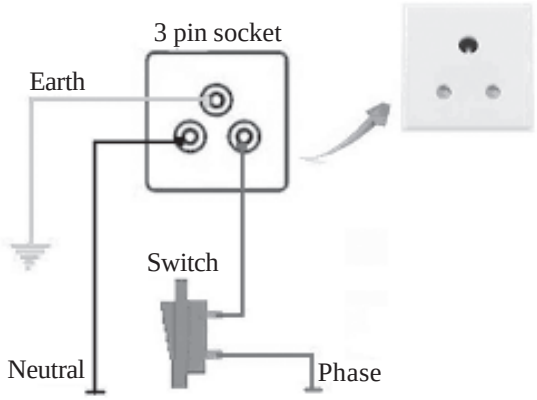

Figure 6.1 : 3 pin socket switch connection for a water purifier if electrical power outlet is near WPU

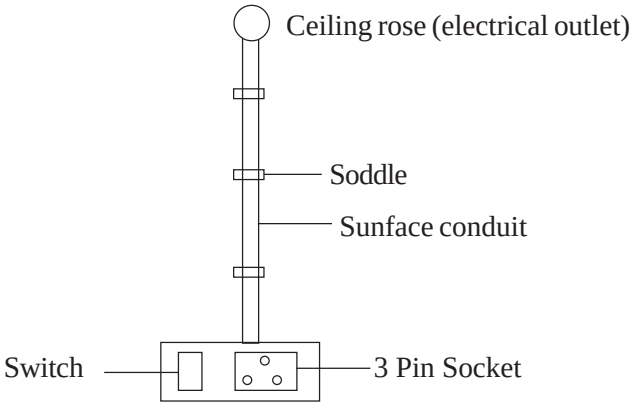

Figure 6.2 : Open conduit wiring

Precautions:

1. Electrical connection should be tight.

2. Earthing should be properly fixed.

3. Accessories such as switch and socket should be selected according to the rating of purifier.

Practical - 6

Selection of Wiring for Electrical Connections

Notes

4. Proper cutting of wall should be done in order to avoid breaking of water pipe line if any inside the wall.

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Make electrical connection of water purifier unit with proper selection of wiring system and material.

Learner's Observations

Record your observation for the above practical

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7

INTERNAL ELECTRICAL CONNECTIONS

Aim : To make internal electrical connections of water purifier system.

Equipment /Tools and Material Required:

Insulated plier, Wire cutter, Tester, Screw driver, Multi meter, Cripping tool and copper lugs. (If required), Wire stripper, Insulation sleeves and Insulation tape 1 Roll

Theory:

The electrical connection of WPU depends upon the parts which are electrically operated. The power supply is connected to AC 230V supply the out power of SMPS is connected to UV lamp booster pump solenoid switch etc. i.e. all the parts where electricity is required.

Procedure:

1. After mounting SMPS on the place allocated for it, check the wires coming out from the SMPS.
2. Put copper lugs in the wire and with the help of crimping tools if required.
3. Test the i/p and o/p voltage of the SMPS
4. Make internal electrical connections of a water purifier unit as given in the service / installation manual as given in (also refer to Figure 7.1)
5. Most of the electrical connections are plug in type with male-female connectors already comes with the components. Learner should identify and make connections according to the diagram provided in the installation manual.
6. In few water purifier unit soldering is required.

Practical - 7

Internal Electrical Connections

Notes

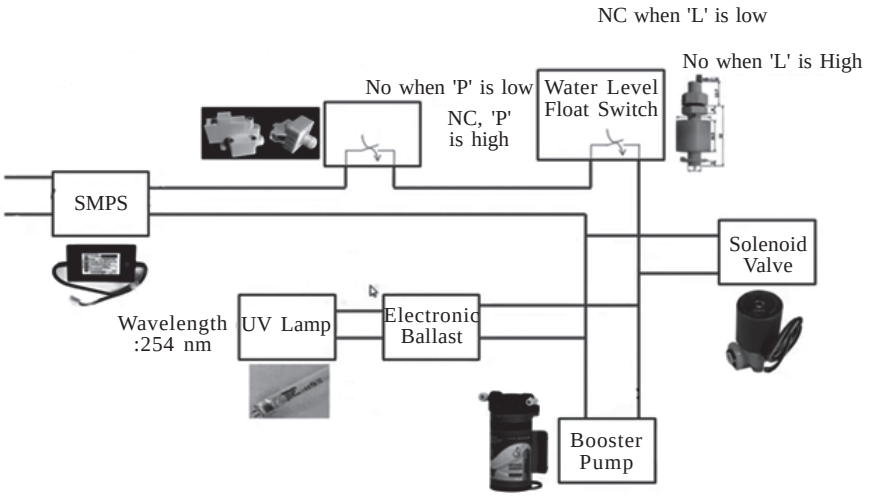

Figure 7.1 : Internal electrical diagram of a water purifier

Precautions

1. Wire end should be stripped with the help of wire strippers.
2. Stranded wires should be crimpped into copper lugs by crimping tools
3. Make sure that proper required output voltage is had at SMPS o/p.

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Make internal electrical connection of water purifier.

Learner's Observations

Record your observation for the above practical

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Invigilator's Sign

8

PRE AND POST FILTERS

Aim: To perform installation of pre and post filters of water purifier system.

Equipment /Tools and Material Required:

3 in one spanner, Plier, Carbon granule, Carbon filter, RO membrane, alkaline filter and Drill machine

Procedure :

1. Installation of pre filter

1. Mark the position of pre filter.
2. Make holes in the wall.
3. Fix frame of pre filter on the wall.
4. Remove outer casing of the WPU with the help of 3 in one spanner.
5. Put new filter in the filter housing.
6. Tight the outer of housing and fix pipe in the inlet and outlet of the pre filter.
7. Remove pre carbon filter outer casing with the help 3 in 1 spanner.
8. Fill the pre filter with carbon granuals.
9. Fix the cap of pre filter with the help of 3 in 1 spanner.

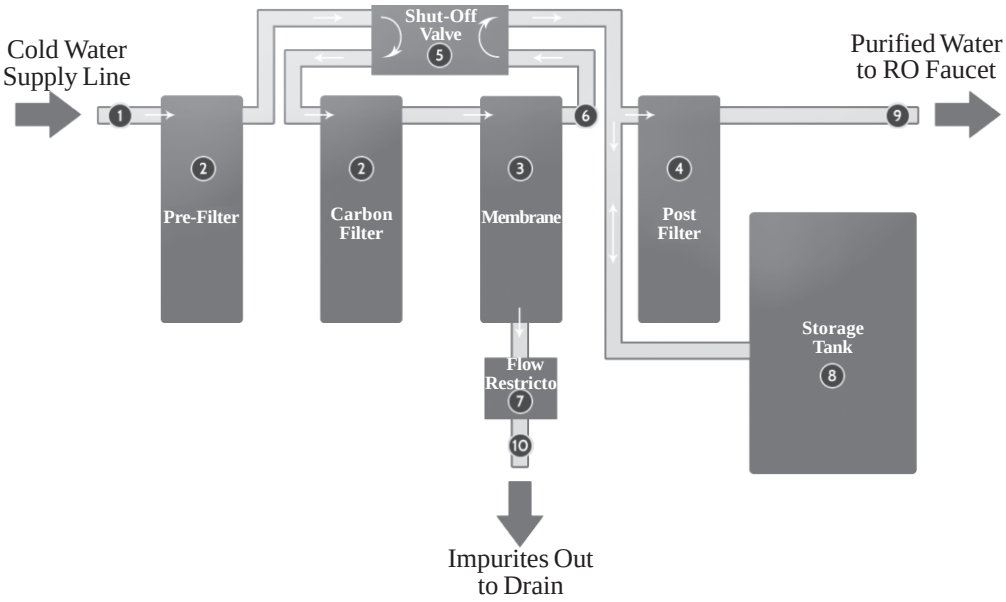

Figure 8.2 : Installation of pre filter

2. Installation of post filters

1. Remove the cap of RO membranes with the help of 3 in 1 spanner.
2. Replace the RO membrane of suitable value.
3. Put back the cap of RO membrane casing.
4. Place flexible pipe on the outlet and inlet of RO membrane nozzle.
5. Replace alkaline membrane by removing flexible pipe and again fix flexible pipe in new alkaline filter.

Precautions

1. Unscrew the outer and caps of filters very carefully to avoid breakage.
2. Check for broken pipes and leakages

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Analyz the need of replacement of filters in a water purifier.
- Carry out replacement of pre and post filters.

Learner's Observations

Record your observation for the above practical

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Invigilator's Sign

Practical - 8

Pre and Post Filters

Notes

Notes

9

ROUTINE MAINTENANCE

Aim: To carry out routine maintenance of a typical water purifier unit.

Equipment/ Tools and Material required:

3 in one spanner, Pliers, Carbon granule, Carbon filter, RO membrane, Alkaline filter, Solenoid valve and float switch

Theory:

The filters in water purifiers can clog up quickly since they filter out many types of contaminants in the water. The product's function and durability are harmed by improper maintenance and upkeep. This is why cleaning all of the filters in a water purifier requires professional assistance. With regular maintenance and care, a high-quality water purifier can last up to 5 to 8 years.

Routine maintenance of the water purifier system is the process of inspecting and repairing and replacing of filters and other components of water purifier system periodically for the smooth functioning of the water purifier system.

The important factor in the maintenance of a water purifier is to service, replace and clean the filters and membrane every 6-8 months. Impurities formed on the filter surface may eventually be transmitted to the purified water if the filters are not replaced on time. When it takes a long time for your filter to fill up the storage tank, it's time for a replacement.

Choked filters and membranes waste electricity because they lower purification capacity, requiring the purifier to run for longer periods of time to purify the same amount of water.

Systematic filter change is important

Sediment filter - A sediment filter present in a water purifier should be replaced every 4-6 months. The pre-filter is designed to strain out sediment and dirt, and it is critical because the sediment filter protects the RO membrane from dirt.

Carbon filter - A carbon filter removes chlorine and other pollutants that impact the RO membrane's performance and longevity, as well as the taste and odour of the water. Every 12 months, the carbon filter should be replaced as well.

RO membrane servicing - The RO purifier has a semi-permeable membrane that allows water to pass through while filtering out any other impurities. The RO membrane should be replaced every 1.5 to 2 years, depending on the TDS level in your water.

In simple words you can say that you can maintain filtration system by regularly changing the filter, which, if left for too long, can become clogged. Note down the date you last changed the filter cartridge and follow the guidelines provided for that particular cartridge type and your individual system regarding how long this should last. All entries should be made in log book / job card.

All entries should be made in logbook/job cards.

In commercial water purifier system the chemicals to be added periodically and the electrical motor performance including its propeller should be checked for better efficiency along with the periodic change of filters and RO membrane.

Apart from periodic maintenance if any malfunctioning of water purifier system is reported by customer, you should attend the complaint to rectify the fault in water purifier system.

Procedure :

Physical Inspection

1. Physically inspect water purifier for any damage.
2. Run the water purifier to find any malfunction of the components.
3. Check the flow of water, low output indicates the need for replacement of filter / RO membrane
5. Foul smell from the filtered water indicated the need of replacemnt of carbon filter

Notes

6. Ask for existing AMC, from the customer or give the estimate before starting routine maintenance.

7. Start routine maintenance after getting the approval from the customer.

Routine Maintenance of water purifier

1. Remove outer casing with the help of 3 in one spanner.

2. Remove the cap of RO membranes with the help of 3 in 1 spanner

3. Replace the suitable RO membrane. Put new filter in the filter housing

4. Tight the outer of housing and fix pipe in the inlet and outlet of the pre filter.

5. Remove pre carbon filter outer casing with the help 3 in 1 spanner.

6. Fill the pre filter with carbon granules.

7. Fix the cap of pre filter with the help of 3 in 1 spanner

8. Put back the cap of RO membrane casing.

9. Fix back flexible pipe on the outlet and inlet of RO membrane nozzle.

10. Replace alkaline membrane by removing flexible pipe and again fix flexible pipe in new alkaline filter (optional).

11. Check for any leakage in the white and blue pipes, replace pipe and or connectors responsible for leakage.

12. Check electrical connection, remove carbon depositions if any with the help of sand paper and insulate the open connections with insulating tap.

13. Run the water purifier unit check for smooth function.

14. Drain out the water completly from WPS tank after filling the tank full. Repeat the process till the o/p of water is clear and free from any odour.

15. Check TDS level and show to the customer.

16. Take signature of the customer on the Job / AMC card.

17. Take feedback report from the customer and ask them to report if any problem occurs in near furure the complaint will be attended at the earliest.

Precautions

1. Unscrew the outer and caps of filters very carefully to avoid breakage

2. Check for broken pipes, crack pipes and leakages

3. Switch of the power supply and water supply before starting the maintenance of water purifier system

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Carry out routine maintenance of a range of water purifier.

Learner's Observations

Record your observation for the above practical

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Invigilator's Sign

Notes

10

FAULT DIAGNOSIS

Aim: To carry out the fault diagnosis of a typical Water Purifier

Theory: Fault diagnosis of a typical water purifier is a systematic process of finding fault in a WPU its cause and remedies.

Fault diagnosis includes both physical and testing of components of a WPU. There are plenty of probable fault for malfunctioning of WPU, you as a technician soul also the customer about the problem he is facing with WPU, then only fault diagnosis should be start. (Refer Table 7.3 : Troubleshooting of Water Purifier System).

Procedure:

1. Practice fault diagnosis on a mal functioning water purifier unit provided by the training centre.
2. Start fault diagnosis considering the check points at various stages of WPU both mechanical and electrical. Such as filter replacement, cleaning, and sanitization.
3. Observe the functioning of the water purifier unit and write down the observations in the observation table.
4. Take necessary safety precautions when working with water purification systems, including electrical safety, handling of chemicals, and proper disposal of waste materials.

Fault Diagnosis

Prepare a detailed report of trouble shooting of a water purifier unit in the following table:

S. No.	Problem	Probable cause	Remedy	Remark

Precautions:

1. Use insulated working tools.
2. Tight the water pipes carefully to avoid damage of threads.
3. Use Teflon top to avoid leakage.

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Perform the fault diagnosis of a range of water purifier.

Learner's Observations

Record your observation for the above practical

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Invigilator's Sign

11

CUSTOMIZATION OF WATER PURIFIER UNIT

Aim : Demonstrate how to customize the Water Purifier Unit by selecting appropriate combination of filteration techniques and filters to achieve the desired water quality.

Tools or Equipments or Material required:

3 in 1 spanner, Wrench, Plier, Screw Driver, Filters, O-ring and Teflon tape

Theory:

Depending upon the quality of raw water available in the area, the type of filters to be used and the maintenance schedule is identified . For example if water is not hard and TDS level of raw water is 90, then only water purifier with pre and post filter will purify the water, you don't need to use RO membrane containing water purifier. If TDS level is high i.e more than 200 then you can go for RO water purifier. The water quality should be checked for three parameters i.e. **hardness,salinity and TDS.**

The technician should be able to suggest the type of water purifier suitable for a particular customer. Effectively communicate with customers and address their concerns, and offer recommendations based on their specific needs.

Procedure:

Before suggesting the suitable water purifier system perform the following:

Collect at least three samples of raw water from three different places or three different water supplies for analysis.

1. Physically examine the raw water and note the turbidity level and suspended impurities

2. Measure the TDS level of Raw water.

3. Measure hardness of raw water with the help of hardness kit.

4. Taste the water for salinity

5. Smell the raw water for unpleasant odour (smell)

6. Note all the five observations and suggest the suitable water purifier

Suggest the suitable water purifier by considering the following points:

a. **RO Technology:** RO membrane technology is widely used water purification process known as reverse osmosis. It is used to purge the water of pollutants, bacteria, and dissolved salts.

When water is passed through the semi permeable RO membrane; hazardous compounds, dissolved salts, and microorganisms that are floating in water are left behind and only purify water comes out of the membrane. The taste of water is also made sweeter by a RO water filter, which is appropriate for hard water with a high TDS level.

b. **UF Technology:** The ultra filtration method of purification also uses membrane technology, but it does so with a membrane that has larger pores. It cleans the water of all minor impurities. However, it can't get rid of dissolved salts and solids.

The UF purification method has a very low TDS and is suited for water that isn't very hard.

c. **UV Technology:** It is possible to remove 99.99% of dangerous organisms from water using the ultra violet purification method, which uses ultraviolet light to eliminate germs, bacteria, cysts, and other unwanted species. It makes use of a tiny mercury lamp to produce short-wave UV radiation that cleans water and penetrates bacterial and viral cells, stopping them from reproducing and eventually killing them.

The size of domestic and commercial water purifier also depends upon the output water in liter per hour

Domestic water purifier available for 5 LPH 10LPH and 15 LPH

Commercial water purifier available in 350 LPH, 500 LPH, 1000LPH and 2000LPH

Practical - 11

Customization of Water Purifier Unit

Notes

Some custom made commercial water purifier for industrial use may have output beyond 2000 LPH.

Case study 1 : If the water sample has no hardness, its TDS is low, no bacterial growth in raw water and is free from dissolved salts an ultra-filtration water purifier may be suggested.

Case study 2 : If the water sample has no hardness its TDS is high ,micro bacterial growth and dissolved salts is also present in raw water an ultra-filtration water plus RO plus UV type water purifier can be suggested.

Case Study 3 : If the water sample has high hardness, its TDS is high, micro bacterial growth and dissolved salts in raw water ultra-filtration water plus RO plus UV type water purifier along with softener can be suggested.

Type of filters and capacity of filters depends upon the above points and its size depends upon the requirement of output in LPH (liter per hour). In domestic water purifiers the size of filters are smaller then the filters used in commercial water purifiers.

Precautions:

1. Don't taste the water if foul smell is coming from raw water.
2. Carefully handle the TDS meter.
3. Try to collect water samples from three different water supply or three locations far apart from one another as sample.
4. Clean hardness kit and TDS meter after their use.
5. Handle the filters with care.

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Demonstrate how to customize the water purifier unit by selecting appropriate combination of filteration techniques and filters to achieve the desired water quality.

Practical - 11

Customization of Water Purifier Unit

Notes

Learner's Observations

Record your observation for the above practical

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Invigilator's Sign

12

WASTE WATER UTILIZATION

Aim : To perform waste water utilization by using various technology of Waste Water utilization.

Tools or Equipments and Materials required:

1. Waste water pipe (blue colour)
2. Connectors
3. Standard tool kit
4. Water tank for storing rejected water

Theory :

The technician should tell the customers about the uses of rejected water from RO otherwise the same would have gone waste. It is very important to utilize the rejected water as the scaricity of water is now a global problem and the amount of rejected water is appreciably large.

The proper utilization of rejected water from RO water purifier can be done very efficiently in the following ways :

1. **Plant Watering:**

   Use the discarded water to water indoor or outdoor plants. This is one of the most common and practical ways to reuse the water.

2. **Cleaning and Household Chores:**

   Utilize the reject water for cleaning tasks like mopping floors, washing cars, or flushing toilets. This reduces the demand on your main water supply.

Figure 12.1 : Dishwashing

3. Pets' Water Bowl:

Give the rejected water to your pets, such as dogs or cats, as drinking water. Ensure that the water is safe for them to consume.

4. Cooking and Boiling:

Use the reject water for cooking, especially for boiling vegetables. It's safe for this purpose as long as the water quality is suitable.

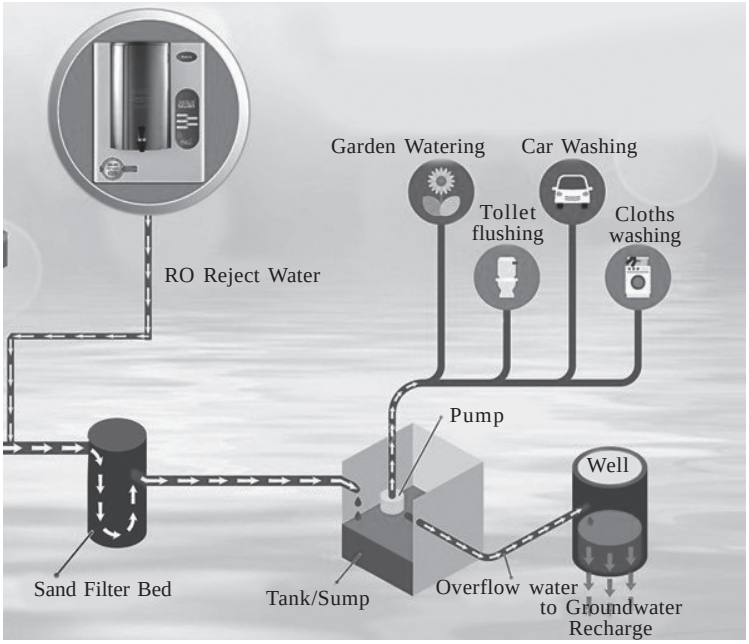

Figure 12.2 : Waste water utilization

5. Dishwashing:

Use the waste water to pre-rinse dishes before loading them into the dishwasher. This can save a significant amount of water.

6. Irrigation System:

Install a drip irrigation system in your garden and use the discarded water to irrigate your plants. This method is more water-efficient than traditional hose watering.

7. Reserve for Emergency Use:

Store the rejected water in clean containers for emergency purposes, like for flushing toilets during water shortages.

Procedure:

1. Locate the nearby garden and if possible take the rejection blue pipe to the garden and connect it into the tank.
2. Store the rejected water in a water tank and mark on it rejected water from water purifier.
3. Connect the rejection pipe in a tank kept near the washing area so that the rejected water may be used for washing utencils.
4. Clean the Filters so that the output of drinkable water increase and consequently the amount of rejected water is reduced .

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Demonstrate a range of techniques appropriate for the waste water utilization .

Learner's Observations

Record your observation for the above practical

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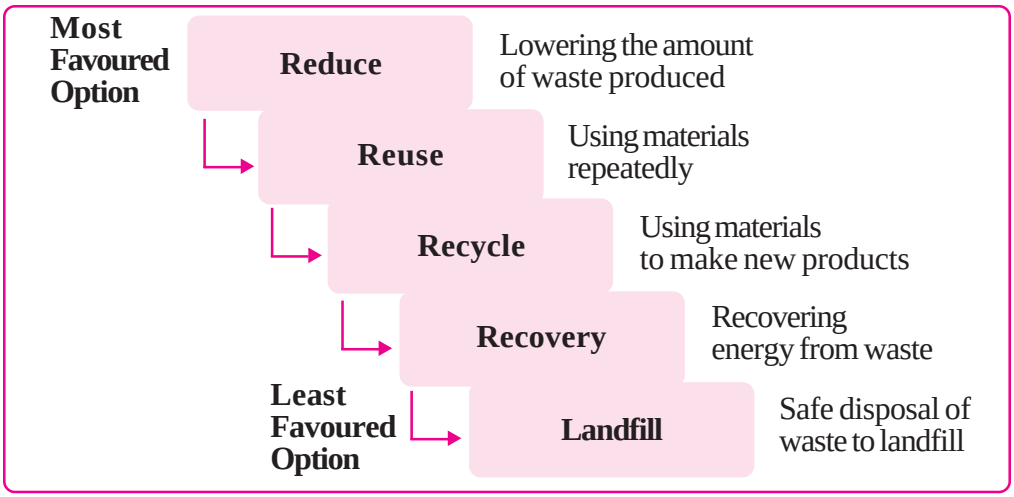
13

WASTE MANAGEMENT

Aim : Demonstrate the waste management for waste disposal as per industry standards.

Theory:

Waste disposal as a Industry standards is of utmost importance as it not only reduces the probable pollution but also recycles the recyclable parts of waste of water purifier unit such so biodegradable waste. Filters, SMPS (electronic part), UV lamp-etc.



Procedure:

1. Identify the waste parts of the given water purifier unit and prepare a list.
2. Prepare a chart for suitable disposal technique for all the waste.
3. Buy back schemes prevailing in market is also a better option for waste disposal, perform market survey to find different buy back schemes.

4. Dispose OFF the plastic in the designated dust bins.

5. Observe the waste material and note down the methods of waste disposal in the below table :

Table 13.1 : Methods of waste disposal

S.No.	List of waste items from a WPU	Methods of waste disposal	Remarks
1.			
2.			
3.			
4.			

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Apply waste management techniques at work place.

Learner's Observations

Record your observation for the above practical

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14

SAFETY EQUIPMENTS

Aim: To Demonstrate the range of safety equipment.

Theory:

Personal protective equipment, commonly referred to as "PPE", is equipment used to minimize exposure to hazards that cause serious workplace injuries and illnesses. These injuries and illnesses may result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. PPEs includesgloves, gowns, shoe covers, head covers, masks, respirators, eye protection, face shields, and goggles.

Mandatory charts are displayed in which pictorial view of dipection of the safety equipments and safety practices.

Procedure:

Instructions for instructor:

1. Arrange all-safety equipments for demonstration.
2. Explain the importance of these equipments in the work place.
3. Explain how to use and handle each safety equipment.
4. Explain how to make the working environment safe for self and others

Table 14.1: Safety Equipments

S.No.	Name of Safety Equipments	Image	Use
1.	Protective gloves		To insulate the naked hands from electric shocks
2.	Helmet		To avoid head injury
3.	Safety Shoe		To protect feet injury
4.	Safety googles		To protect eyes during drilling work or chemical handling in commercial WPU
5.	Face Mask		To protect face from dust and harmful gases

Practical - 14

Safety Equipments

Notes

Note: The trainer should demonstrate the trainee all the safety equipments and should train them to use these safety equipments.

The trainer should conduct activities and mock drills that the trainee become well experienced to identify and use the safety equipments according to use while performing installation and maintenance of water purifier unit.

LEARNING OUTCOMES

After performing this practical learner will be able to:

- Identify different kinds of safety equipment and tools.
- Use proper safety equipments wherever required.
- Keep the working environment safe for all.

Learner's Observations

Record your observation for the above practical

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