# Class: 10th

# Subject: Chemistry

# Chapter 15: Water

## Important MCQs:

**1. What percentage of the human body consists of water?**

(a) 50%

(b) 60%

(c) 70% ✅

(d) 80%

**2. What is the major threat to groundwater mentioned in the text?**

(a) Rainwater

(b) Chemical waste dumps and landfills ✅

(c) Salts from the sea

(d) Dust particles

**3. Which type of chemicals are mainly responsible for water pollution after World War II?**

(a) Natural minerals

(b) Organic acids

(c) Synthetic chemicals ✅

(d) Metallic salts

**4. What percentage of the Earth's water is suitable for drinking (potable)?**

(a) 1%

(b) 0.2% ✅

(c) 2%

(d) 10%

**5. Why is sea water not fit for drinking and agriculture?**

(a) It is too cold

(b) It is contaminated with bacteria

(c) It contains a high percentage of dissolved salts

✅

(d) It has no minerals

**6. What is the composition of a water molecule?**

(a) One hydrogen and two oxygen atoms

(b) Two oxygen and two hydrogen atoms

(c) One oxygen and two hydrogen atoms ✅

(d) One oxygen and one hydrogen atom

**7. What is the freezing point of pure water at sea level?**

(a) 100°C

(b) 4°C

(c) 0°C ✅

(d) -1°C

**8. What is the maximum density of water?**

(a) 0.98 g/cm³

(b) 1 g/cm³ ✅

(c) 4.2 g/cm³

(d) 2 g/cm³

**9. Water is neutral to litmus, which means it is:**

(a) Basic

(b) Acidic

(c) Neutral ✅

(d) Alkaline

**10. Why is water called a universal solvent?**

(a) It dissolves gases

(b) It dissolves non-polar substances

(c) It dissolves almost all minerals ✅

(d) It dissolves metals only

**11. What is the main reason for water's ability to dissolve ionic compounds?**

(a) High surface tension

(b) Polar nature of water ✅

(c) Large molecules

(d) Density of water

**12. Which of the following compounds is not soluble in water?**

(a) NaCl

(b) Glucose

(c) Ether ✅

(d) KCl

**13. What is the heat capacity of water?**

(a) 2.1 $Jg^{-1}K^{-1}$

(b) 3.5 $Jg^{-1}K^{-1}$

(c) 4.2 $Jg^{-1}K^{-1}$ ✅

(d) 5.0 $Jg^{-1}K^{-1}$

**14. High capillary action of water is due to:**

(a) Polarity

(b) Low boiling point

(c) High surface tension ✅

(d) Specific gravity

**15. How many hydrogen bonds can one water molecule form?**

(a) Two

(b) Three

(c) Four ✅

(d) Five

**16. What is soft water?**

(a) Water that contains minerals

(b) Water that forms scales in boilers

(c) Water that produces good lather with soap ✅

(d) Water that causes stomach disorders

**12. What is the main cause of hardness in water?**

(a) Dissolved oxygen

(b) Salts of calcium and magnesium ✅

(c) Organic matter

(d) Water vapour

**13. Which of the following compounds causes temporary hardness of water?**

(a) $CaCl_2$

(b) $MgSO_4$

(c) $Ca(HCO_3)_2$ ✅

(d) NaCl

**14. What type of hardness is caused by sulphates and chlorides of calcium and magnesium?**

(a) Carbonate hardness

(b) Temporary hardness

(c) Permanent hardness ✅

(d) Soft water hardness

**15. What is the method used to remove temporary hardness of water?**

(a) Freezing

(b) Boiling ✅

(c) Filtration

(d) Chlorination

**16. What chemical is used in Clark's method to remove hardness?**

(a) Sodium carbonate

(b) Calcium chloride

(c) Slaked lime ($Ca(OH)_2$) ✅

(d) Baking soda

17. Which of the following removes permanent hardness of water?

(a) Boiling

(b) Filtration

(c) Sodium carbonate (Washing soda) ✅

(d) Sand filter

18. What is Sodium Zeolite?

(a) A natural soap

(b) A type of acid

(c) A sodium aluminium silicate resin ✅

(d) A form of hard water

19. What is formed when hard water is passed through sodium zeolite?

(a) Magnesium metal

(b) Soft water ✅

(c) Saltwater

(d) Lime water

20. What is one major disadvantage of hard water

**in boilers?**

(a) Increases water level

(b) Reduces water pressure

(c) Forms scales which reduce efficiency ✅

(d) Produces too much steam

**21. What are industrial effluents?**

(a) Pure water from industries

(b) Treated clean water

(c) Waste chemicals and materials discharged from industries ✅

(d) Water used for drinking in factories

**22. Which of the following heavy metals causes kidney damage and destruction of red blood cells?**

(a) Zinc

(b) Cadmium ✅

(c) Chromium

(d) Iron

**23. What harmful effect do detergents have on**

**water bodies?**

(a) Increase oxygen level

(b) Help aquatic life

(c) Cause rapid growth of algae ✅

(d) Kill bacteria in water

**24. What is the main pollutant in agricultural effluents that causes algae growth?**

(a) Sodium

(b) Iron

(c) Nitrate and phosphate salts ✅

(d) Carbon dioxide

**25. How does polluted water affect aquatic life?**

(a) Increases reproduction

(b) Provides more food

(c) Causes oxygen depletion and death ✅

(d) Makes them stronger

**26. What are waterborne infectious diseases?**

(a) Diseases spread through air

(b) Diseases caused by excessive food

(c) Diseases caused by polluted water ✅

(d) Diseases spread by animals

**27. Which microorganism causes cholera?**

(a) Escherichia coli

(b) Vibrio cholerae ✅

(c) Giardia

(d) Salmonella

**28. Which disease is caused by excess fluoride in drinking water?**

(a) Typhoid

(b) Fluorosis ✅

(c) Jaundice

(d) Dysentery

**29. What type of organism is Cryptosporidium?**

(a) Virus

(b) Bacterium

(c) Protozoa ✅

(d) Worm

**30. Hookworm infection mainly spreads due to:**

(a) Contaminated food

(b) Mosquito bites

(c) Poor sanitation ✅

(d) Polluted air

**31. Which of the following diseases is a liver infection spread through contaminated water?**

(a) Cholera

(b) Dysentery

(c) Hepatitis A ✅

(d) Typhoid

**32. Which symptom is common in both cholera and dysentery?**

(a) Vomiting

(b) Jaundice

(c) Diarrhea ✅

(d) Bone pain

**33. Which heavy metals are mentioned as toxic pollutants in water?**

(a) Copper and zinc

(b) Sodium and potassium

(c) Lead, cadmium, mercury ✅

(d) Aluminum and iron

**34. What is the preventive method against waterborne diseases?**

(a) Use of antibiotics

(b) Eating fresh vegetables

(c) Drinking safe and purified water ✅

(d) Avoiding exercise

**35. What is the main cause of jaundice?**

(a) Iron deficiency

(b) Parasites in lungs

(c) Excess bile pigments in blood ✅

(d) Bacterial infection in skin

## Exercise Short Questions:

**1. How water rises in plants?**

**Answer:**

Water rises in plants through capillary action, which is caused by the high surface tension of water. This allows water to move upward from the roots to the leaves.

**2. Which forces are responsible for dissolving polar substances in water?**

**Answer:**

The ion-dipole forces and hydrogen bonding are responsible for dissolving polar substances in water. These forces attract water molecules to the charged ends of solutes.

**3. Why are non-polar compounds insoluble in water?**

**Answer:**

Non-polar compounds are insoluble in water because they lack positive or negative poles, so water molecules cannot form attractions or

hydrogen bonds with them.

**4. How does water dissolve sugar and alcohol?**

**Answer:**

Water dissolves sugar and alcohol by forming hydrogen bonds with their –OH (hydroxyl) groups, as both are polar compounds.

**5. How does limestone dissolve in water?**

**Answer:**

Limestone ($CaCO_3$) dissolves in water when carbon dioxide ($CO_2$) dissolves in rainwater forming carbonic acid, which reacts with $CaCO_3$ to form soluble calcium bicarbonate.

**6. Differentiate between soft and hard water.**

**Answer:**

**Soft water:** Produces lather with soap easily.

**Hard water**: Does not produce lather with soap due to the presence of calcium and magnesium salts.

**7. What are the causes of hardness in water?**

**Answer:**

Hardness in water is caused by the presence of dissolved salts of calcium ($Ca^{2+}$) and magnesium ($Mg^{2+}$) such as bicarbonates, chlorides, and sulphates.

**8. What are the effects of temporary hardness in water?**

**Answer:**

Temporary hardness causes excessive soap consumption, and on boiling, it forms scale deposits (insoluble salts) which can damage boilers and heating systems.

**9. Mention the disadvantages of detergents.**

**Answer:**

Detergents are often non-biodegradable, which means they remain in water for a long time, causing water pollution, rapid algae growth, and making water unfit for aquatic life.

**10. What is the difference between biodegradable and non-biodegradable substances?**

**Answer:**

- **Biodegradable substances**: Can be broken down by microorganisms (e.g., food waste, paper).
- **Non-biodegradable substances**: Cannot be decomposed by microorganisms (e.g., plastics, detergents).

**11. How detergents make the water unfit for aquatic life?**

**Answer:**

Detergents cause rapid growth of algae, which later decays and uses up oxygen in water. This leads to oxygen depletion, causing death of aquatic animals.

**12. Why are pesticides used?**

**Answer:**

Pesticides are used to kill or control pests like weeds, insects, fungi, and viruses which damage crops and spread diseases.

**13. What are the reasons of waterborne diseases?**

**Answer:**

Waterborne diseases spread due to polluted water, lack of sanitation, and the presence of microorganisms (like bacteria, viruses, protozoa) or toxic chemicals in water.

**14. How waterborne diseases can be prevented?**

**Answer:**

- They can be prevented by:
- Using safe and purified drinking water
- Proper disposal of sewage
- Avoiding contamination of water sources
- Controlling use of toxic chemicals

## Important Short Questions:

**1. What is an industrial waste?**

**Answer:**

Industrial waste is the leftover material from factories and industries which includes toxic chemicals, heavy metals, acids, and oils that pollute

water and the environment.

**2. How does water used as a cleaning agent in industries cause pollution?**

**Answer:**

Water used for cleaning carries toxic chemicals like oils, greases, acids, and heavy metals into rivers and lakes, thus causing water pollution.

**3. Why is the use of detergents increasing day by day?**

**Answer:**

Because detergents are easily available, affordable, and more effective in cleaning than traditional soaps, especially in hard water.

**4. How do decaying plants consume oxygen?**

**Answer:**

When aquatic plants die, bacteria decompose them. This decomposition process uses up the dissolved oxygen in water, making it scarce for aquatic animals.

**5. What is the function of fertilizers?**

**Answer:**

Fertilizers supply essential nutrients (like nitrogen, phosphorus, potassium) to the soil, which help in the healthy growth of plants and increase crop yield.

**6. How do the pesticides cause water pollution?**

**Answer:**

Pesticides run off from agricultural fields into water bodies. These toxic chemicals pollute water, harm aquatic life, and can also enter the human food chain.

**7. What are waterborne diseases?**

**Answer:**

Waterborne diseases are the infections that spread due to drinking polluted water or consuming food prepared with such water.

**8. What is dysentery?**

**Answer:**

Dysentery is an intestinal disease usually caused by

bacteria or parasites. It is characterized by severe diarrhea that may include blood or mucus.

**9. Which bacteria causes cholera?**

**Answer:**

Cholera is caused by the bacterium Vibrio cholerae, usually found in water contaminated with human feces.

**10. What do you mean by fluorosis?**

**Answer:**

Fluorosis is a disease caused by the intake of excessive fluoride. It affects bones and teeth, making them weak or discolored.

**11. What is hepatitis?**

**Answer:**

Hepatitis is the inflammation of the liver. Hepatitis A and E can spread through contaminated water.

## Exercise Long Questions:

🌟 **Q1: How does the polarity of water molecules help dissolve substances?**

❖ **Introduction:**

Water is called the universal solvent due to its unique ability to dissolve a wide variety of substances. This property is largely due to the polarity of water molecules.

🔹 **Polarity of Water**

- A water molecule ($H_2O$) consists of two hydrogen atoms and one oxygen atom.
- Oxygen is more electronegative, so it attracts the shared electrons more than hydrogen.
- This causes a partial negative charge ($\delta^-$) on the oxygen side and a partial positive charge ($\delta^+$) on the hydrogen side.

Hence, the molecule becomes polar (has two opposite poles).

🔹 **Role of Polarity in Dissolving Substances**

## ✅ 1. Attraction of Opposite Charges

- Water molecules surround the ions or polar molecules.
- The positive pole (hydrogen) of water attracts negative ions.
- The negative pole (oxygen) attracts positive ions.
- This weakens the ionic bonds in the solute, helping it dissolve.

## ✅ 2. Hydrogen Bonding

- Water can form hydrogen bonds with other polar molecules like sugar, alcohol, etc.
- These bonds pull solute molecules apart, dissolving them into water.

## 🔹 Why Non-Polar Substances Don't Dissolve

- Non-polar substances like oils and fats do not have charged regions.
- Water molecules cannot form interactions with them.

Therefore, non-polar substances remain undissolved.

🌟 **Q2: Explain the methods of removing permanent hardness in water.**

❖ **Introduction:**

Permanent hardness in water is caused by the presence of sulphates and chlorides of calcium and magnesium. It cannot be removed by boiling. Special methods are used to remove this type of hardness.

🔹 **Methods of Removing Permanent Hardness**

✅ **1. Using Washing Soda (Sodium Carbonate)**

**Chemical Formula**: $Na_2CO_3$

- It reacts with calcium and magnesium salts to form insoluble carbonates.
- These precipitates can be filtered out.

**Example Reaction:**

> $CaSO_4 + Na_2CO_3 \Rightarrow CaCO_3\,' + Na_2SO_4$

➡ This removes calcium ions and softens the water.

## ✅ 2. Using Sodium Zeolite (Ion Exchange Method)

- Zeolites are special chemicals that exchange sodium ions ($Na^+$) with $Ca^{2+}$ and $Mg^{2+}$ ions in hard water.
- The hard ions are trapped in the zeolite, and sodium ions remain in water.

**Example Reaction:**

> $Ca^{2+}$ (in water) + Na-zeolite ⇒ Ca-zeolite + $Na^+$ (in water)

➡ This method is widely used in water softeners and industrial water treatment.

### 📘 Summary:

Permanent hardness makes water unsuitable for household and industrial uses. Using washing soda or sodium zeolite are effective chemical methods to remove hardness and make water fit for use.

### 🌟 Q3: Explain the water pollution caused by industrial waste.

❖ **Introduction:**

Water pollution occurs when harmful substances are added to water bodies, making it unfit for use. Industrial waste is one of the major contributors to water pollution.

## What is Industrial Waste?

Industrial waste refers to toxic chemicals, sludge, oils, heavy metals, and non-biodegradable substances released by factories into water sources.

## How Industrial Waste Causes Water Pollution

### 1. Discharge of Chemicals

Factories often release toxic chemicals like mercury, lead, arsenic, and acids into rivers and lakes.

➡ These chemicals harm aquatic life and contaminate drinking water.

### 2. Thermal Pollution

Some industries release hot water used in cooling processes into rivers.

➡ This increases water temperature and reduces dissolved oxygen, which kills fish and aquatic plants.

### 3. Oil Spillage

Oil industries may spill oil and grease into nearby water bodies.

➡ Oil forms a layer on the surface, blocking oxygen supply to aquatic organisms.

### 4. Plastic and Non-Biodegradable Waste

Industries also dump plastics and synthetic materials into water.

➡ These materials do not decompose and stay in the environment for years.

📘 **Summary:**

Industrial waste seriously pollutes water, causing harm to the environment, aquatic life, and human health. Proper waste treatment and strict pollution laws are essential to protect water resources.

🌟 **Q4: Justify the statement: Household water is the reason of water pollution.**

❖ **Introduction:**

Although industries are major polluters, household

activities also play a significant role in water pollution. Wastewater from homes contains harmful substances that pollute water bodies.

## 🔹 Ways Household Water Causes Pollution

### 1. Use of Detergents and Soaps

Detergents contain chemicals like phosphates that cause algal bloom in water bodies.

➡ This depletes oxygen and kills aquatic life.

### 2. Kitchen and Sewage Waste

Daily kitchen water, leftover food, and sewage are released into drains.

➡ These waste materials contain bacteria, organic matter, and sometimes toxic substances.

### 3. Medicines and Chemicals

People often throw expired medicines, hair dyes, and cosmetics into toilets or drains.

➡ These chemicals accumulate and pollute groundwater and rivers.

### 4. Plastic and Garbage Disposal

Plastic wrappers, bottles, and other solid waste from households clog drains and rivers.

➡ These materials are non-biodegradable and stay for years.

### 🔹 Why It Is a Problem

- Polluted household water reaches lakes and rivers without treatment.
- It spreads waterborne diseases.
- It damages aquatic ecosystems.

📘 **Summary:**

Household water waste is a major cause of water pollution. People must be aware of safe disposal, reduce the use of harmful chemicals, and practice eco-friendly habits to protect clean water.

## 🌟 Q5: Explain that agricultural effluents are fatal for aquatic life.

### ❖ Introduction:

Agricultural activities produce effluents (waste water) that include fertilizers, pesticides, and

herbicides. When these substances enter water bodies through rain or irrigation runoff, they cause serious pollution and harm aquatic ecosystems.

## 🔹 Major Components of Agricultural Effluents

### ✅ 1. Fertilizers

- Fertilizers contain nitrate and phosphate ions.
- These ions promote the overgrowth of algae and aquatic plants (a process called eutrophication).
- When plants die and decay, bacteria use oxygen ($O_2$) to decompose them.

**Result**: Decrease in dissolved oxygen, which kills fish and other aquatic organisms.

### ✅ 2. Pesticides

- Pesticides are toxic chemicals used to kill insects and pests.
- These chemicals accumulate in water bodies and are harmful to aquatic organisms.
- They also enter the food chain, affecting birds,

fish, and even humans.

### ✅ 3. Animal Waste

- Waste from animals (manure) may contain pathogens that pollute water.
- It also increases biological oxygen demand (BOD), reducing oxygen for aquatic life.

### 🔹 Effects on Aquatic Life

- Death of fish and aquatic animals due to oxygen shortage.
- Disruption of natural food chains.
- Loss of biodiversity in rivers, lakes, and ponds.
- Contaminated water unsafe for human consumption.

### 🌟 Q6: Explain five important waterborne diseases. How can these be prevented?

❖ **Introduction:**

Waterborne diseases are caused by drinking polluted water or consuming food prepared with contaminated water. These diseases spread rapidly

in areas with poor sanitation.

## 🔹 Five Important Waterborne Diseases

### 1. Cholera

- **Caused by:** Vibrio cholerae (bacteria)
- **Spread by:** Drinking water contaminated with human feces
- **Symptoms**: Severe diarrhea, dehydration, vomiting
- **Danger**: Can be fatal without treatment

### 2. Dysentery

- **Caused by**: Bacteria or parasites (e.g., Shigella)
- **Spread by**: Contaminated water or food
- **Symptoms**: Diarrhea with blood or mucus, fever, abdominal pain

### 3. Hepatitis A and E

**Caused by**: Hepatitis viruses (A and E)

**Spread by:** Contaminated water

**Symptoms**: Yellowing of eyes (jaundice), fatigue,

liver inflammation

### 4. Cryptosporidiosis

- **Caused by:** Protozoa (Cryptosporidium)
- **Spread by:** Drinking untreated surface water
- **Symptoms**: Diarrhea, nausea, vomiting, stomach cramps

### 5. Fluorosis

- **Caused by:** Drinking water with excess fluoride
- **Symptoms**: Damage to teeth and bones
- Long-term exposure can cause permanent disability

## 🔹 Prevention of Waterborne Diseases

### 1. Safe Drinking Water

- Use boiled, filtered, or treated water for drinking and cooking

### 2. Proper Sanitation

- Ensure hygienic disposal of sewage and human waste

Avoid open defecation near water sources

### 3. Clean Food Practices

- Wash fruits and vegetables with clean water
- Use clean utensils and cooking water

### 4. Personal Hygiene

- Wash hands before eating and after using the toilet

### 5. Public Awareness

- Educate communities about water safety and sanitation

### 📘 Summary:

Waterborne diseases are dangerous but preventable. Good hygiene, proper water treatment, and improved sanitation can help control their spread and protect human health.

## 🌟 Q7: Give some disadvantages of hard water.

### ❖ Introduction:

Hard water contains dissolved salts of calcium ($Ca^{2+}$) and magnesium ($Mg^{2+}$). It is not harmful to

health but causes several problems in daily life, especially in cleaning, washing, and industrial use.

## 🔹 Disadvantages of Hard Water

### 1. Does Not Form Lather with Soap

Hard water reacts with soap to form insoluble scum.

Extra soap is required, which increases cost and wastage.

### 2. Damages Clothes

Repeated washing with hard water can fade colors and harden fabrics.

### 3. Reduces Efficiency of Heating Systems

- Hard water causes lime scale or calcium deposits in geysers, boilers, and kettles.
- This reduces heat efficiency and increases energy bills.

### 4. Clogs Pipes

- Minerals in hard water deposit inside pipes, leading to blockage or corrosion.
- It causes plumbing problems and repair costs.

### 5. Unsuitable for Industrial Use

- Many industries require soft water for chemical reactions.
- Hard water can interfere with production processes.

### 6. Affects Taste of Food

- Cooking with hard water can alter the taste of food and beverages like tea.

🌟 **Q8: What is water pollution? Describe the effects of using polluted water.**

❖ **Definition:**

Water pollution is the contamination of natural water bodies (rivers, lakes, groundwater) due to the addition of harmful substances like chemicals, waste, and toxins. It affects both humans and the environment.

🔹 **Sources of Water Pollution**

- Industrial waste (chemicals, dyes, heavy metals)
- Agricultural runoff (fertilizers, pesticides)

- Sewage and domestic waste
- Oil spills
- Plastic and non-biodegradable waste

## 🔹 Effects of Using Polluted Water

### 1. Causes Waterborne Diseases

- Polluted water spreads diseases like cholera, dysentery, typhoid, and hepatitis.

### 2. Harms Aquatic Life

- Toxic chemicals and oxygen shortage kill fish and aquatic animals.
- Leads to loss of biodiversity in water ecosystems.

### 3. Makes Water Undrinkable

- Polluted water has bad taste, odor, and color.

Unsafe for drinking and cooking without purification.

### 4. Affects Agriculture

- Using polluted water for irrigation harms soil fertility and contaminates crops.

### 5. Bioaccumulation in Food Chain

- Toxic chemicals can enter the food chain through fish and water plants.
- Long-term consumption leads to serious health issues in humans.

### 6. Reduces Tourism and Aesthetic Value

Polluted rivers and beaches become unattractive and smelly, reducing tourism.

📘 **Summary:**

Water pollution is a serious environmental threat. Its effects are harmful to health, aquatic life, agriculture, and economy. Proper waste disposal, water treatment, and public awareness are essential to control this problem.

🌟 **Q9: Explain the reasons why water is considered a universal solvent.**

❖ **Introduction:**

Water is called a universal solvent because it can dissolve more substances than any other liquid. This unique ability is due to its chemical structure

and physical properties.

## 🔹 Reasons for Being a Universal Solvent

### 1. Polarity of Water Molecule

- Water ($H_2O$) is a polar molecule.
- One end (oxygen) is partially negative ($\delta^-$) and the other end (hydrogen) is partially positive ($\delta^+$).
- This allows water to attract both positive and negative ions of solutes and dissolve them easily.

### 2. Hydrogen Bonding Ability

- Water can form hydrogen bonds with other polar molecules (like sugar, alcohol).
- This helps water to dissolve many organic compounds.

### 3. Ion-Dipole Attraction

When ionic compounds (e.g., NaCl) are placed in water:

- Positive ions ($Na^+$) are surrounded by water's

negative ends (O)

- Negative ions ($Cl^-$) are surrounded by water's positive ends (H)
- This separates the ions and keeps them in solution.

**4. Dissolves a Wide Range of Substances**

- **Ionic compounds**: like NaCl, $KNO_3$ dissolve easily.
- **Polar covalent compounds:** like glucose, ammonia also dissolve.

However, non-polar compounds like oil or benzene do not dissolve well.

📘 **Summary:**

Because of its polarity and strong hydrogen bonding, water can dissolve a huge variety of substances, making it essential in biological, chemical, and environmental processes. This is why water is rightly called the universal solvent.

🌟 **Q10: Write a note on the treatment of sewage water.**

## ❖ Introduction:

Sewage water is the wastewater from homes, industries, and businesses. It contains harmful substances like bacteria, organic waste, detergents, and chemicals. Before releasing into rivers or seas, sewage water must be treated to remove pollutants.

### 🔹 Steps in Sewage Water Treatment

**1. Preliminary Treatment (Filtration)**

- Large solids like plastic, cloth, leaves are removed using screens and grit chambers.
- This protects machinery in later stages.

**2. Primary Treatment (Sedimentation)**

- Water is left in sedimentation tanks where heavy solids settle down.
- The settled material is called sludge.

**3. Secondary Treatment (Biological Treatment)**

- Uses bacteria and microorganisms to break down organic matter.
- This is done in aeration tanks where oxygen is

supplied.

- The clean water is separated from activated sludge.

**4. Tertiary Treatment (Chemical Treatment)**

**Removes nutrients, bacteria, and toxins using:**

- Chlorination (kills pathogens)
- UV treatment or ozonation (advanced disinfection)
- Filtration through sand or activated carbon.

**5. Disposal or Reuse**

The treated water is released into water bodies or recycled for:

- Irrigation
- Cooling in industries
- Flushing toilets

📘 **Summary:**

Sewage water treatment is essential to protect public health and the environment. Proper treatment removes harmful substances and

ensures that the water returned to nature is safe and pollution-free.

## Note:

This chapter is designed to provide a solid foundation of knowledge, with the goal of deepening understanding and encouraging further exploration of the subject. The content has been carefully selected to support effective learning and inspire students to engage with the topic more deeply.

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