

WATER

TOPICAL MULTIPLE CHOICE QUESTIONS

Q.No.1 Encircle the correct option from the given multiple choices.

Properties of water

- (1) Which of the following properties of water is responsible for rising of water in plants?
 (a) Specific heat capacity (b) Surface tension
 (c) Excellent solvent (d) Capillary action
- (2) Specific heat capacity of water is
 (a) 4.2 kJg^{-1} (b) $4.2 \text{ Jg}^{-1} \text{ k}^{-1}$ (c) $4.6 \text{ kJg}^{-1} \text{ k}^{-1}$ (d) $5.4 \text{ Jg}^{-1} \text{ k}^{-1}$
- (3) Water dissolves non ionic compound by
 (a) Ion-ion forces (b) Ion dipole forces
 (c) Hydrogen bonding (d) Dipole dipole forces

Occurrence of water of earth

- (4) The percentage of water fit for drinking on earth is
 (a) 0.2% (b) 0.6% (c) 0.21% (d) 2%
- (5) Which one of the following is insoluble in water?
 (a) CaCO_3 (b) KBr (c) NaCl (d) NH_4NO_3
- (6) The chemical formula of Gypsum is
 (a) CaCO_3 (b) CaSO_4 (c) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ (d) $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$
- (7) Which one of the following is sparingly soluble in H_2O
 (a) CaCl_2 (b) NaCl (c) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ (d) Na_2SO_4
- (8) Which is polar molecule
 (a) Water (b) Benzene (c) Toluene (d) Acetone
- (9) The percentage of NaCl in sea water is
 (a) 0.02% (b) 3.4% (c) 97% (d) 2%
- (10) The density of water is maximum at
 (a) 4°C (b) 2°C (c) 4.6°C (d) 3°C
- (11) The percentage of water found in atmosphere is
 (a) 0.1% (b) 0.6% (c) 0.001% (d) 0.02%
- (12) The percentage of water in the form of Glaciers and ice Cap is
 (a) 0.6% (b) 0.2% (c) 0.001% (d) 2.1%

Hardness of water

- (13) Which salt does not cause the hardness of water?
 (a) Calcium hydrogen carbonate (b) Magnesium hydrogen carbonate
 (c) Magnesium sulphate (d) Sodium chloride

- (14) Temporary hardness in water is caused by
 (a) $\text{Ca}(\text{HCO}_3)_2$ (b) $\text{Mg}(\text{HCO}_3)_2$ (c) CaCl_2 (d) Both A and B
- (15) Which of the following ions causes hardness in water.
 (a) Ca^{+2} (b) Mg^{+2} (c) Na^+ (d) Both A and B

Removal of hardness of water

- (16) Temporary hardness of water is removed by
 (a) Adding lime water (b) Boiling
 (c) By ion exchange method (d) All of these
- (17) Heating calcium hydrogen carbonate produces
 (a) CO_2 (b) H_2O (c) CaCO_3 (d) All of these
- (18) Which of the following method is used to remove permanent hardness from water?
 (a) Ion exchange method (b) Clark's method
 (c) Boiling (d) Distillation
- (19) Which of the following is used as ion exchange resin in ion-exchange method?
 (a) Soda lime (b) Slaked lime (c) Quick lime (d) Na_2 -Zeolite
- (20) Which is used to remove permanent hardness in water
 (a) Slaked lime (b) Washing soda (c) Boiling water (d) All of these
- (21) When white precipitate is formed by the reaction of Ca^{+2} and Mg^{+2} ions present in hard water with soap. This white precipitate is known as
 (a) Gum (b) Resin (c) Scum (d) Wax

Water pollution

- (22) The rapid growth of algae in water bodies is because of detergent having.
 (a) Carbonate salt (b) Sulphonic acid salt
 (c) Phosphate salt (d) Nitrates salt
- (23) Which human activity results in contamination of water bodies
 (a) Like stock waste (b) Pesticides (c) Septic tank (d) All of these
- (24) The chemical used to kill or control pests are called pesticides. They are
 (a) Dangerous organic chemicals (b) Beneficial organic chemicals
 (c) Dangerous inorganic chemical (d) All of these
- (25) The water coming from leather tanneries contains large amount of
 (a) Sulphate salts (b) Nitrate salts
 (c) Chromium (VI) salt (d) Nickel (VI) salts

Interesting information

- (26) The gas used for killing bacteria in water is
 (a) Br_2 (b) CH_4 (c) Cl_2 (d) I_2
- (27) A disease that causes bone and tooth damage is
 (a) Hepatitis (b) Rickets (c) Cholera (d) Fluorosis

Water born disease

- (28) Which of the following is not a water born disease
 (a) Hepatitis (b) Typhoid (c) Dysentery (d) Anemia
- (29) The process in which water is treated with slaked lime and Alum is called
 (a) Sedimentation (b) Coagulation (c) Distillation (d) Crystallization
- (30) Dysentery is caused by
 (a) Virus (b) Bacteria (c) Entamoeba (d) None of these
- (31) Typhoid is characterized by continuous fever between _____ to _____
 and irregular pulse.
 (a) $101^{\circ}\text{F} - 104^{\circ}\text{F}$ (b) $98^{\circ}\text{F} - 103^{\circ}\text{F}$ (c) $102^{\circ}\text{C} - 104^{\circ}\text{C}$ (d) $104^{\circ}\text{F} - 107^{\circ}\text{F}$
- (32) Which of the following diseases causes liver inflammation.
 (a) Hepatitis (b) Typhoid (c) Cholera (d) Nausea
- (33) Which one of the following disease severe diarrhea and can be fatal
 (a) Jaundice (b) Dysentery (c) Cholera (d) Hepatitis

ANSWER KEY

Q.	Ans.	Q.	Ans.	Q.	Ans.	Q.	Ans.
1	b	11	c	21	c	31	a
2	a	12	d	22	c	32	a
3	c	13	d	23	d	33	b
4	a	14	d	24	a		
5	a	15	d	25	c		
6	c	16	d	26	c		
7	a	17	d	27	d		
8	a	18	a	28	d		
9	b	19	d	29	b		
10	a	20	b	30	c		

TOPICAL SHORT QUESTIONS

Q.No.2 Answer these questions. Answer to each part should not exceed three to four lines.

Occurrence

Q.1 What is the percentage existence of water on earth?

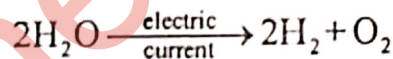
Ans: Water covers almost 71% of the earth crust. Distribution of water on earth crust is given below.

- (i) Oceans = 97%
- (ii) Glaciers and icecaps = 2.1%
- (iii) Ground water = 0.6%
- (iv) River and lakes = 0.2%
- (v) Atmosphere water = 0.001%

Composition of water

Q.2 Discuss the composition of water.

Ans: When electricity is passed through the acidified water in a particular instrument (Electrolytic cell), water decomposes. It gives hydrogen and oxygen. This process is called electrolysis and reaction can be written as.



The splitting of water molecules produces double amount of hydrogen as compared to oxygen. This means hydrogen and oxygen are the components of water in the ratio of 2:1 by volume.

Importance of water

Q.3 What is the importance of water?

Ans: **Importance of water**

- Water is crucial for suturing that keeps us alee. For instance, digestion, distraction of food through blood, removal of waste matter from the body.
- It carols auto in orb bile engine, nuclear power plants, steel mills and parts of heavy machinery in industrial unit.
- It is also used to generator electricity.

Q.4 Water has six times higher heat capacity than Rocks. What is its importance?

Ans: The water has high heat capacity about $4.2 \text{ J g}^{-1} \text{ K}^{-1}$, which is about six times greater than rocks. This specific heat capacity of water is responsible for keeping the earth's temperature within limits. Otherwise day time temperature would have been too high to bear and night time temperature would have been too low to freeze everything.

Q.5 What is capillary action?

Ans: **Capillary Action:**

This is the process by which water rises up from roots of the plants to the leaves in the upper parts of plants through a tube like xylem vessels. This process is vital for the survival of land plants.

Hardness of water

Q.6 Define soft and hard water?

Ans: **Soft Water:**

Water that gives easily lather with soap and does not form scum is called soft water.

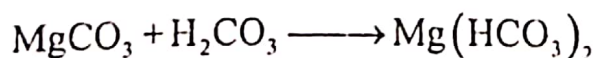
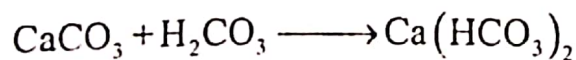
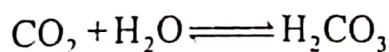
Hard Water:

The water that gives little lather to form scum is called hard water.

Q.7 How hardness is produced in water?

Ans: The rain water absorbs Carbon dioxide as it falls through the atmosphere, Carbon dioxide reacts with water to produce carbonic acid. When this rain water passes over the rocks containing calcium carbonate and MgCO_3 , then the acid present in it attacks these rocks. It slowly dissolves them forming calcium and magnesium hydrogen carbonate which dissolved into the water. In this way hardness is produced in water.

Equations:



Some rocks like CaCl_2 , MgCl_2 , CaSO_4 , MgSO_4 etc. are soluble in water so when rain water passes through them these dissolve into that water and cause hardness in water.

Chapter-15

Q.8 Write the disadvantages of hard water

Ans: Disadvantages of water hardness:

- Hard water wastes a lot of soap, when used for washing.
- The soap forms scum with hard water, which adhere to the clothes being washed. Scum can spoil the finish of some fabrics.
- Cause kettles to fur.
- Can cause hot water pipes, boilers and car radiators to block due to the formation of insoluble calcium and magnesium salts, causing great damage.

Q.9 What is scum?

Ans: It is difficult to make the soap later in hard water. Instead, the water becomes cloudy. This cloudiness is due to the formation of a white precipitate by the reaction of Ca^{+2} or Mg^{+2} ions present in hard water and soap. This white precipitate is known as scum.

Raw water treatment

Q.10 Define (a) Sedimentation (b) Coagulation

Ans: Sedimentation

It is the process in which water is allowed to stand in a reservoir. The suspended matters sink to the bottom and separated out.

Coagulation

It is the process in which water is treated with slaked lime and alum. These materials react to form a gelatinous mass of aluminium hydroxide.

Equation



The aluminium hydroxide carried down dirt particles and bacteria.

Water born diseases

Q.11 Write down the names of major water born diseases?

Ans: The name of major water born diseases are _____

- Cholera
- Dysentery
- Jaundice
- Hepatitis
- Typhoid
- Hookworm
- Flourosis

Q.12 What is water pollution?

Ans: **Water Pollution:**

Water pollution is the contamination of water bodies like lakes, rivers, streams, oceans and ground water by the human activities such as live stock waste landfill, agricultural pesticides, oil leakage, disposal of industrial effluents on open land, septic tanks, detergent etc. all these substances are responsible for pollution of water.

Q.13 List toxic substances present in Household Waters?

Ans: Household waste contains a wide variety of dissolved and suspended impurities such as food and vegetable waste, garbage, cans, bottles, chemical soaps, detergent and washing powder etc.

Q.14 In what ways, industrial wastes pollute water?

Ans: **Industrial Wastes:**

Manufacturing of industrial products are always accompanied by some by-products and waste effluents. These waste products may be in the form of waste heat, smoke, solid or waste water effluents. These wastes may contain highly toxic compounds and heavy metals such as Pd, Cd, Cr, Hg, As, Sb etc. these toxic substances cause serious health problems, such as nervous disorder, anemia, high blood pressure, kidney diseases, nausea, dizziness and cancer.

Industrial units generally discharge their wastes either to open land or into water bodies, lakes, ponds, rivers or oceans. Water from leather tanneries contains large quantities of chromium (VI) salts. Chromium (VI) ions are highly toxic and known to cause cancer. Industrial wastes cause irreversible degeneration of the environment causing serious health problems for public and marine life.

15.1

List household, industrial and agricultural uses of water

Ans: Household:

We need water for drinking, cooking and cleaning. It is also used to generate electricity.

Industrial:

It cools automobile engines, nuclear power plants, steel mills and parts of heavy machinery in industrial units.

Agricultural:

Farmers need a large amount of water for their fields for growing fruits, vegetables and crops.

15.2

1. List substances that cause hardness in water

Ans:

Hydrogen carbonates, chlorides and sulphates of Ca^{2+} and Mg^{2+} are the substance which causes hardness in water

2. Differentiate between soft and hard water.

Ans:

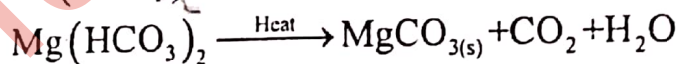
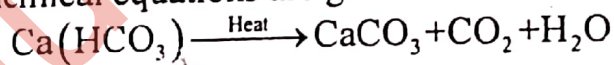
Soft water	Hard water
(i) Water that easily gives good leather and does not form scum with soap is called soft water.	(i) Water that gives little leather or forms scum with soap is called hard water.
(ii) It does not contains hydrogen carbonates, chlorides and sulphates of Ca^{2+} and Mg^{2+}	(ii) It contains hydrogen carbonates, chlorides and sulphates of Ca^{2+} or Mg^{2+}
(iii) It is good for digestive system and does not show digestive disorder.	(iii) It is unfit for drinking and show digestive disorder.

15.3

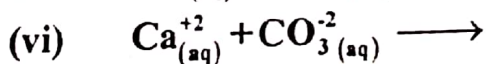
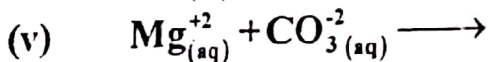
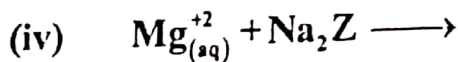
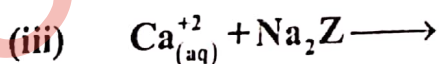
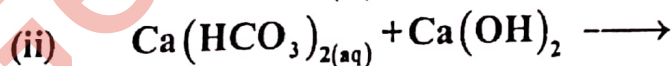
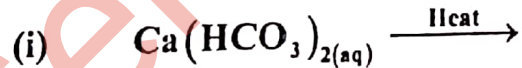
Write chemical equations to show the changes that occur when hard water containing calcium hydrogen carbonate and magnesium hydrogen carbonate is boiled.

Ans:

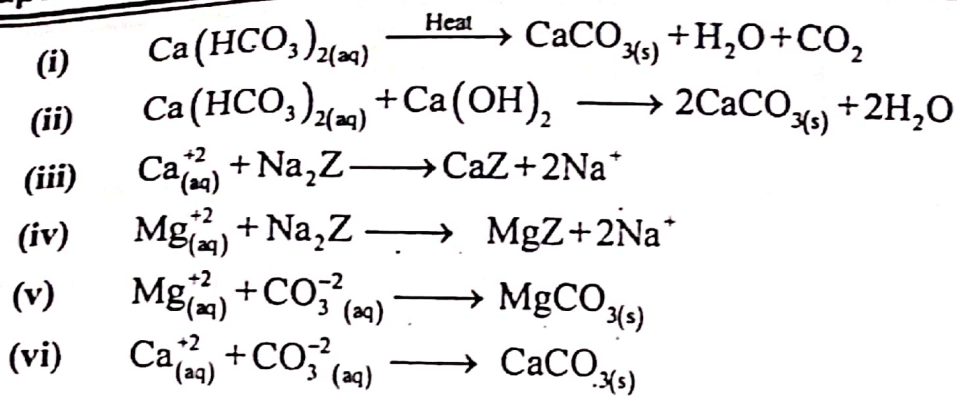
When the hard water containing calcium hydrogen and magnesium hydrogen carbonate is boiled then these hydrogen carbonates converted into corresponding insoluble carbonates. Chemical equations are given below



15.4



Ans:

**15.5**

1. List some water borne diseases,

- Ans: (i) Cholera
(ii) Dysentery
(iii) Jaundice
(iv) Hepatitis
(v) Typhoid

2. List sources of water borne diseases.

Ans: See long question of water born diseases.

3. List steps used in sewage water treatment.

Ans: Sewage water treatment involves following steps,

- (i) Primary sewage treatment
(ii) Secondary sewage treatment
(iii) Activated sludge treatment
(iv) Chlorination

4. List steps used in raw water treatment.

Ans: Following steps involved in raw water treatment

- (i) Sedimentation
(ii) Coagulation
(iii) Filtration
(iv) Chlorination

5. Write effects produced by industrial wastes.

Ans: Disadvantages of water hardness

- Hard water wastes a lot of soap, when used for washing.
- The soap forms scum with hard water, which adhere to the clothes being washed. Scum can spoil the finish of some fabrics.
- Cause kettles to fur.
- Can cause hot water pipes, boilers and car radiators to block due to the formation of insoluble calcium and magnesium salts, causing great damage.

6. Write names of six household wastes.

Ans: Name of six house hold wastes are

- (i) Human wastes
(ii) Live stock wastes
(iii) Soaps and detergents
(iv) Paints and oils
(v) Vegetable wastes
(vi) Garbage

LONG QUESTIONS

Q.1 Explain the properties of H_2O .

Ans: Properties of water

- Water is the only substance that exists in three different states on Earth. Can you name these states?
- Pure water is transparent, colourless, odourless and tasteless. It boils at $100^\circ C$ and freezes at $0^\circ C$ at the sea level.
- Density of most of the solids and liquids, generally increases on heating and decreases on cooling. Water, however, shows strange behaviour in this regard. On cooling it contracts up to $4^\circ C$. At this temperature its density becomes maximum. On further cooling water expands, hence its density decreases. So water expands when it freezes. Because of this ice floats on the top of water. The consequences of this strange behaviour are immense for life on earth. Ice forms on the surfaces of lakes only and insulates the lower layers of water. This enables fish and other aquatic organisms to survive in winter.
- Water has a high **heat capacity**. So much heat is required to raise the temperature of 1.0g of water by $1^\circ C$. Conversely, much heat is given off by water for even a small drop in temperature. The vast amount of water on the surface of Earth thus acts as a giant heat reservoir to moderate daily temperature variations. For this reason water is an excellent cooler in industries.
- Water has a high **heat of vaporization**. So a large amount of heat is required to evaporate a small amount of water. This is of enormous importance for us. How large an amount of body heat can be dissipated by the evaporation of a small amount of water (perspiration) from the skin. This property also accounts for the climate-modifying property of lakes and oceans. Thus in summer it is cooler near a large body of water (lakes, rivers and seas) than in interior land areas.

Q.2 What is a universal solvent? Explain this statement.

Ans: Water as solvent

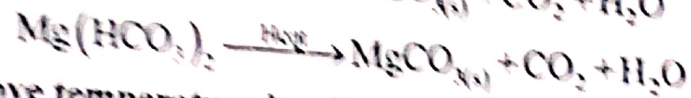
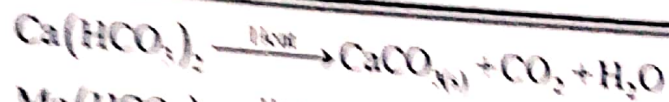
Water is very good at dissolving substances. For this reason natural water such as rainwater and groundwater are not pure water. As water falls through the atmosphere, it dissolves a little oxygen, nitrogen, carbon dioxide, and dust particles. During thunderstorms, it also dissolves nitric acid. Groundwater dissolves minerals from rocks and soils as it moves along on or beneath Earth's surface. Groundwater also dissolves many substances from decaying plants and animals.

The ability of water to dissolve a wide variety of substances is due to its two properties: the polarity of water molecules and the ability of water molecules to form hydrogen bonds. Water molecules are strongly attracted to ions, polar molecules with which water can form hydrogen bonds. If these attractions are strong enough, they overcome the attractions between the molecules or ions of the other substance and in this way the substance dissolves. Thus water-soluble substances include a wide range of substances. They may be ionic solids, polar substances and hydrogen-bonded compounds.

Q.3 How do we remove the hardness of water?

Ans: Methods of removing hardness

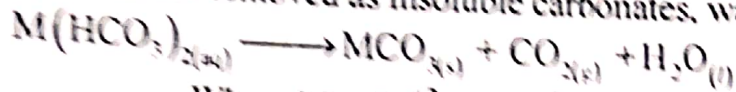
When hard water containing calcium hydrogen carbonates and magnesium hydrogen carbonates is boiled, these hydrogen carbonates are converted into corresponding insoluble carbonates. Chemical equations are given below



Methods to remove temporary hardness

(i) By Boiling

Hardness of water can be removed simply by boiling. During boiling the soluble calcium and magnesium hydrogen carbonates are decomposed forming insoluble carbonates. Since Ca^{+2} and Mg^{+2} ions are removed as insoluble carbonates, water becomes soft.

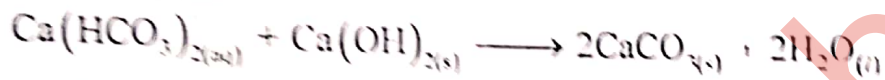


Where $\text{M} = \text{Ca}^{+2}$ or Mg^{+2}

Unfortunately, this method is too expensive to remove temporary hardness of water on the large scale.

(ii) By adding slaked lime (Clark's method)

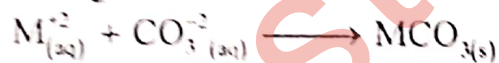
Temporary hardness in water on the large scale can be removed by adding a estimated amount of slaked lime in it. The slaked lime reacts with the hydrogen carbonates to form insoluble carbonates.



Methods to remove permanent hardness

(i) By adding washing soda

On the large scale permanent hardness in water can be removed by adding washing soda ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$). Ca^{+2} and Mg^{+2} ions are removed as their insoluble carbonates.



Where $\text{M}^{+2} = \text{Ca}^{+2}, \text{Mg}^{+2}$

(ii) By ion exchange resins

The hard water is passed through a container filled with a suitable resin containing sodium ions. Zeolite is one of the natural ion exchanger. Chemically it is sodium aluminium silicate. It is usually written as Na_2Z . The Ca^{+2} or Mg^{+2} ions causing the hardness are exchanged with Na^+ ions in the resin.



Where $\text{M}^{+2} = \text{Ca}^{+2}, \text{Mg}^{+2}$

The used up Zeolite can be regenerated by heating with concentrated solution of NaCl . This makes the process economical.



4. Write a detail note on water pollution.

Ans: Water pollution

Water is very good at dissolving substances. This is due to the polarity of the water molecules and the ability of its molecules to form hydrogen bonds. As water from rain and snow flows over rocks and through soil, it dissolves minerals. The fresh water we drink or use for our daily life processes is sufficient concentration water becomes unfit for human use. Many human activities also result in the contamination of the surface and ground water. Several forms of pollutants affect water bodies. The human activities such

as house hold wastes, agricultural wastes, livestock wastes, pesticides, oil leaks, detergents, septic tanks, petroleum; natural gas production may result in contamination of water bodies. We discuss about household wastes and industrial wastes.

Household wastes

Household wastes include, human wastes, livestock wastes, soaps and detergents, paints and oil, food and vegetable wastes, garbage etc. although detergents have strong cleansing action than soap, but they remain in water for a long time and make water unfit for aquatic life. Bacteria cannot decompose detergents. When household water containing detergents is discharged in lakes, ponds, rivers etc. it causes death of aquatic life. Chemical and bacterial contents in household water can contaminate surface and underground water. Bacterial contents may cause infectious disease such as cholera, jaundice, hepatitis, typhoid, dysentery etc.

Industrial Wastes

Manufacturing of industrial products are always accompanied by some by-products and waste effluents. These waste products may be in the form of waste heat, smoke, solid or waste water effluents. These wastes may contain highly toxic compounds and heavy metals such as Pd, Cd, Cr, Hg, As, Sb etc. these toxic substances cause serious health problems, such as nervous disorder, anaemia, high blood pressure, kidney diseases, nausea, dizziness and cancer.

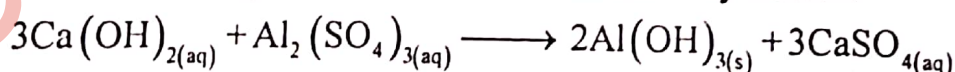
Industrial units generally discharge their wastes either to open land or into water bodies, lakes, ponds, rivers or oceans. Water from leather tanneries contains large quantities of chromium (VI) salts. Chromium (VI) ions are highly toxic and known to cause cancer. Industrial wastes cause irreversible degeneration of the environment causing serious health problems for public and marine life.

Q.5 How we purify water for drinking and domestic use?

Ans: Raw water treatment

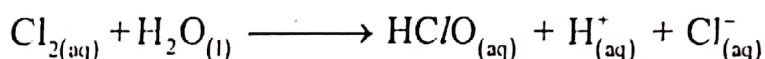
The raw water is treated in a municipal water purification plant, to make it fit for drinking and domestic purposes (see figure 15.3). Various stages in this treatment are

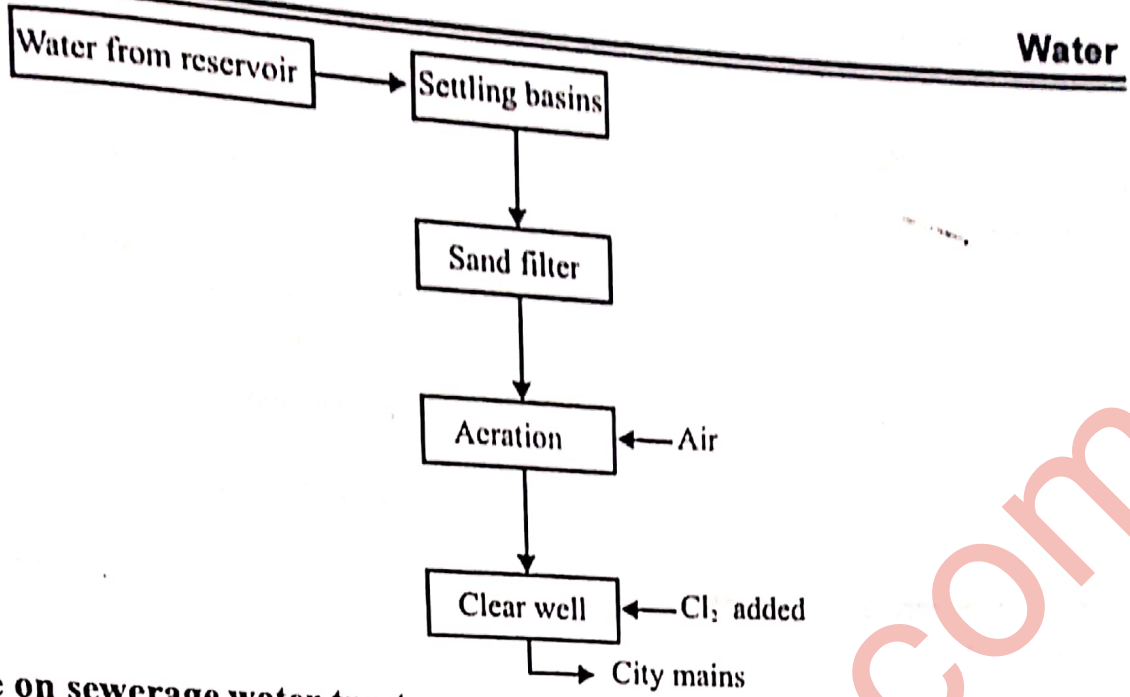
- (i) **Sedimentation:** It is the process in which water is allowed to stand in a reservoir. The suspended matter sinks to the bottom.
- (ii) **Coagulation:** It is the process in which water is treated with slaked lime and alum. These materials react to form a gelatinous mass of aluminium hydroxide.



The aluminium hydroxide carries down dirt particles and bacteria.

- (iii) **Filtration:** The water is then filtered through sand gravel. Sometimes it is filtered through charcoal to remove coloured and odorous compounds.
- (iv) **Chlorination:** In the final step, chlorine is added to kill any remaining bacteria. Chlorine reacts with water to form hypochlorous acid HClO which kills bacteria.





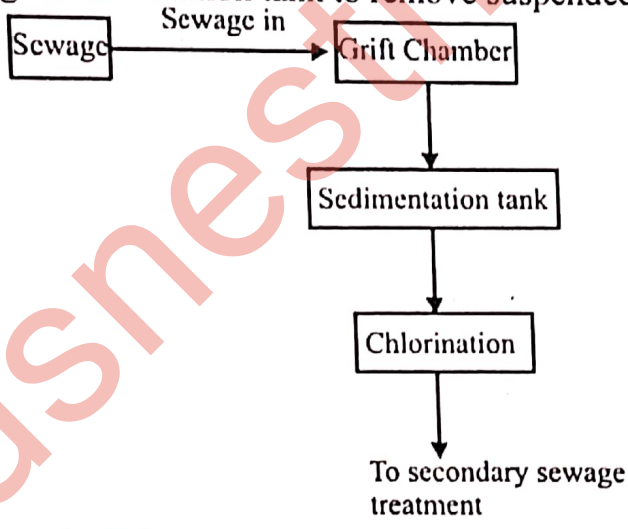
Q.6 Write a note on sewerage water treatment.

Ans: Sewerage water treatment

In many countries, sewerage water is passed through certain treatment stages before it is discharged into a lake, stream river or ocean. This treatment involves following steps.

(i) **Primary sewerage treatment**

Primary treatment removes some of the solids as sludge. For this purpose waste water is allowed to stand in a large sedimentation tank to remove suspended particles.



(ii) **Secondary sewerage treatment**

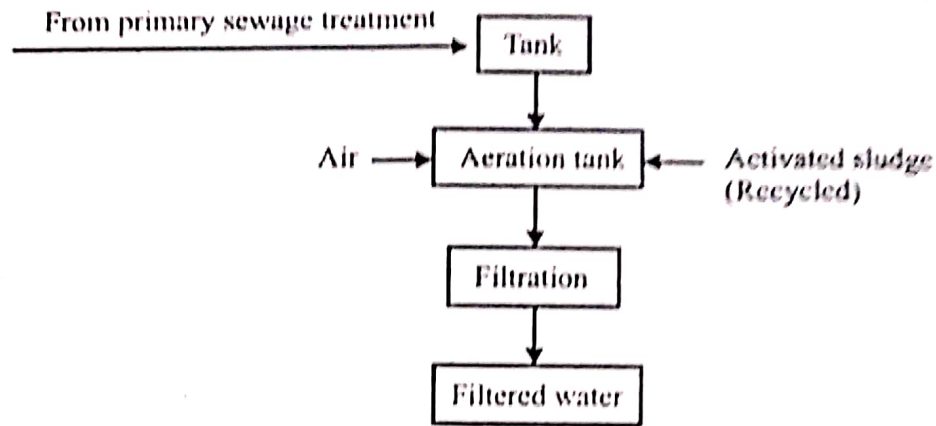
Effluent from the primary treatment is passed through sand and gravel filters. There is some aeration in this step, and aerobic bacteria convert most of the organic matter to stable inorganic materials.

(iii) **Activated sludge treatment**

The sewerage is then placed in tanks and aerated with large blowers. This result in the formation of large, porous clumps, which absorbs contaminants. The aerobic bacteria further convert the organic material to sludge. This sludge is stored on land or sometimes used as fertilizer.

(iv) **Chlorination**

The effluent from sewerage plant is treated with chlorine to kill any remaining pathogenic micro organisms.



Q.7 Write a note on water borne diseases.

Ans: Waterborne disease

Human wastes are dumped on the ground or into the nearest stream. Human waste contains pathogenic micro-organism. These organisms are transmitted through food, water and direct contact. These micro-organisms may cause typhoid fever, dysentery and hepatitis. Chemical and bacterial contents in livestock waste can pollute surface and ground water causing above mentioned diseases. Hepatitis a viral disease occasionally spread through drinking water.

Unclean water supplies, poor sanitation and poor hygiene kill 2.668.000 people worldwide each year.

Water in swimming pools is purified from pathogenic organisms by aeration and chlorination.

Some waterborne diseases are given below.

Cholera

Cholera is an intestinal disease. It is caused by bacteria such as vibrio cholera, E.coli etc. which may be present in water contaminated with human wastes. It is characterized by vomiting and purging.

Dysentery

Dysentery is also an intestinal diseases. It is caused by parasite, Endamoeba. This infection is transmitted by faecal contamination of water or food by encysted organism. Patients have mild to severe abdominal cramps, diarrhea, chocolate coloured stool with mucous and sometimes with blood.

Jaundice

This diseases proceeds from obstruction of liver. Excess of bile from the liver enters in the blood and causes yellowness of skin and eyes. It leads to loss of appetite, weakness and fatigue.

Hepatitis

Hepatitis is scale inflammation of liver. It is caused by viruses, and classified as Hepatitis A, B, C, D and E. Hepatitis A and E spreads through polluted water.

Typhoid

Typhoid is a dangerous intestinal disease. It spreads by polluted water containing bacteria such as salmonella typhi, salmonella paratyphi, and salmonella enteritidis. It is characterized by continuous fever between 101°F to 104°F and irregular pulse.

REVIEW QUESTIONS FROM TEXT BOOK

- Q.1 Select the correct answer**
- (i) **Percentage of sodium in sea water is**
 (a) 0.02 (b) 34
 (c) 97 (d) 2
- (ii) **The density of water is maximum at**
 (a) 0°C (b) 4°C
 (c) 100°C (d) -4°C
- (iii) **Which salt does not cause the water to become hard?**
 (a) calcium hydrogen carbonate (b) magnesium hydrogen carbonate
 (c) magnesium sulphate (d) sodium chloride
- (iv) **Which salt causes temporary hardness in water?**
 (a) magnesium sulphate
 (b) calcium sulphate
 (c) calcium sulphate and magnesium sulphate
 (d) magnesium hydrogen carbonate
- (v) **Heatin calcium hydrogen carbonate produces**
 (a) CO₂ (b) H₂O
 (c) CaCO₃ (d) all of these
- (vi) **Which of the followings is not a water born disease?**
 (a) hepatitis (b) typhoid
 (c) dysentery (d) anemia
- (vii) **Which human activity results in contamination of water bodies?**
 (a) livestock waste (b) pesticides
 (c) septic tanks (d) all of these
- (viii) **Which is used to remove permanent hardness in water?**
 (a) slaked lime (b) washing soda
 (c) boiling water (d) all of these

ANSWER KEY

Q.	Ans.	Q.	Ans.	Q.	Ans.
1	b	4	d	7	d
2	b	5	d	8	b
3	d	6	d		

SHORT QUESTIONS

Q.2 Give short answers.

(i) List the impurities present in rain water

Ans: Rain water contain

(a) H_2CO_3 (carbonic acid) (b) Soil (c) Some dissolve minerals

(ii) List toxic substances present in household wastes

Ans: Toxic substance in house held wastes

(a) Human waste (b) Livestock wastes (c) Soaps & detergents
(d) Point and oils (e) Food and vegetable wastes (f) garbage etc.

(iii) In what ways, industrial wastes pollute water?

Ans: See short question answers

(iv) What is water pollution?

Ans: See short question answers

(v) List some waterborne diseases

Ans: See short question answers

(vi) What are pathogenic microorganisms?

Ans: Pathogenic micrograms are those microscopic organisms which causes diseases when enter into the body of human being or animal. E.g. endamoeba, E.coli etc

Q.3 What is hard water? Why is it sometime undesirable?

Ans: See short question answers

Q.4 List two ways in which lakes and streams become polluted.

Ans: (i) Addition of household waste in streams and rivers pollute their water.

(ii) Addition of agricultural waste in streams and rivers pollute their water.

Q.5 Give chemical equations for the

(a) Reaction of slaked lime with alum.

Ans: $3Ca(OH)_2 + Al_2(SO_4)_3 \longrightarrow 2Al(OH)_3 + 3CaCO_4$

(b) Carbonated rain water with lime stone.

Ans: $H_2CO_{3(aq)} + CaCO_3 \longrightarrow Ca(HCO_3)_2$

(c) Reaction that occurs when temporary hard water is boiled

Ans: $M(HCO_3)_2 + \longrightarrow MCO_3 + H_2O + CO_2$

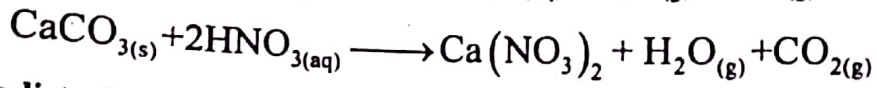
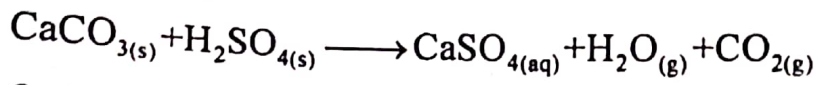
M is the metal (CA or Mg)

(d) Ca^{+2} ions interact with sodium zeolite.

Ans: $Ca^{2+} + Na_2Z \longrightarrow CaZ + 2Na^+$

Q.6 How can buildings made of limestone be affected by acid rain?

Ans: Acid rain corrodes buildings and statues made of lime stone to form water soluble salts water and carbon dioxide. Disintegration of marble buildings and statues are proceeded through these processes



Q.7 Make a list of main methods of softening hard water. In each case write a chemical equation to summarize the chemical reactions involved.

Ans: See question answers of this chapter

Q.8 List some disadvantages of water hardness.

Ans: See question answers of this chapter

Q.9 What are the Earth's four main water sources?

Ans: See question answers of this chapter

Q.10 How does hard water differ from soft water?

Ans: See question answers of this chapter

Q.11 What is the purpose of coagulation in water treatment?

Ans: See question answers of this chapter

Q.12 Explain how hard water hampers the cleansing action of soap.

Ans: See question answers of this chapter

Q.13 Why are municipal water supplies treated with aluminium sulphate and slaked lime?

Ans: See question answers of this chapter

Q.14 What are some health effects of biological contamination of water?

Ans: See question answers of this chapter

Q.15 Write a word and balanced chemical equation to show the effect of heat on magnesium hydrogen carbonate in an aqueous solution.

Ans: See question answers of this chapter

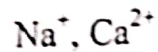
THINK-TANK

Q.16 Why is it cooler near a lake than inland during summer?

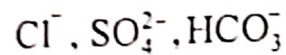
Ans: Water has very high heat of vaporization so very large amount of heat is required to evaporate small amount of water. Due to this important property of water we feel cooling near lake than in land during summer. Because heat of surrounding environment absorbed by water of lake for evaporation and temperature of that region decreases

Q.17 List two cations and three anions present in lake or surface water.

Ans: (i) Cation:



(ii) Anions:

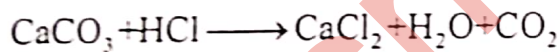


Q.18 Why is wastewater chlorinated before it is returned to a water body?

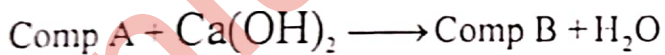
Ans: Waste water chlorinated before it is returned to a water body because during chlorination chlorine kill any remaining pathogenic micro-organisms

Q.19 Hard water causes kettles to fur. This fur can be removed by

Ans: Kettles fur can removed by using an acid because this fur is a layer of carbonates of calcium and magnesium and acid reacts with these carbonate to soluble salts which can remove through washing with water. Reactions of conversion of fur into soluble salts or given below



Q.20 The following chemical equation is about a calcium compound.



(a) Name and give the formula of

(i) Compound A

(ii) Compound C

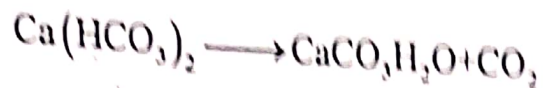
Ans:

(i) Calcium carbonate (CaCO_3)

(ii) Calcium hydrogen carbonate [$\text{Ca}(\text{HCO}_3)_2$]

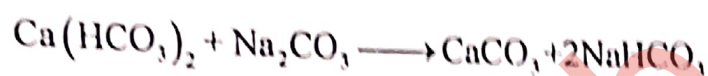
(b) Describe with the aid of a balanced chemical equation. What happens when compound C is heated?

Ans: When compound C is heated which is $\text{Ca}(\text{HCO}_3)_2$ it is converted into calcium hydrogen carbonate water and CO_2 is liberated



c) Compound C is soluble in water. Write a balanced chemical equation to show what happens when its aqueous solution is treated with washing soda.

Ans:



Q.21 How chemistry helps maintain a clean swimming pool? Explain.

Ans: Swimming is an important recreational activity. Biological contamination has also lessened the recreational value of water. However, aeration and chlorination treatment of swimming pool water has lessened the threat of biological contamination.

Q.22 Why it is advisable to wash hands well with soap after using bathrooms?

Ans: It is advisable to wash hands well with soap after using bathrooms because human waste contains pathogenic micro-organisms which cause dangerous diseases. So through wash hands well with soap we remove them from our hands.