

CHAPTER

ENVIRONMENTAL CHEMISTRY – II WATER

15

MULTIPLE CHOICE QUESTIONS

- Human body consists of _____ % water:
(a) 70 (b) 60 (c) 40 (d) 30
- The ocean contains about _____ % of world water:
(a) 97 (b) 98 (c) 90 (d) 97.1
- water also present in the atmosphere in form of :
(a) rain drops (b) Dew (c) Water vapors (d) rivers
- Only _____ % of the total water on the earth is potable :
(a) 0.6 (b) 0.9 (c) 0.2 (d) 2
- Water is composed of:
(a) Oxygen, hydrogen (b) Nitrogen, Hydrogen
(c) Nitrogen, Oxygen (d) Oxygen, Hydrogen, Carbon
- The freezing point of water is:
(a) 0°C (b) 20°C (c) 100°C (d) 1°C
- The boiling point of water is _____ at sea level :
(a) 100 °C (b) 0 °C (c) 50 °C (d) 101
- The maximum density of water is _____ at 4°C :
(a) 3 g/cm³ (b) 1 gm³ (c) 1 g/cm² (d) 1 gcm⁻³
- Water is excellent solvent for:
(a) ionic compounds (b) Molecular compounds
(c) Both a and b (d) None
- Water has _____ surface tension:
(a) high (b) low (c) moderate (d) comparable
- Water is a universal:
(a) solvent (b) solute (c) Both a and b (d) donor
- Water molecule has _____ structure:
(a) polar (b) non-polar (c) Both a and b (d) diatomic
- Soft water is that which produces _____ lather with soap:
(a) good (b) bad (c) rough (d) fine
- $\text{CaCO}_2 + \text{CO}_2 + \text{H}_2\text{O} \longrightarrow :$
(a) $\text{Ca}(\text{HCO}_3)_2$ (b) $\text{Ca}(\text{HCO}_3)$ (c) $\text{Ca}_2(\text{HCO}_3)_2$ (d) Ca_2CO_3
- $\text{MgCO}_3 + \text{CO}_2 + \text{H}_2\text{O} \longrightarrow :$
(a) $\text{Mg}(\text{HCO}_3)_2$ (b) $\text{Mg}(\text{HCO})_2$ (c) $\text{Mg}(\text{HCO}_3)$ (d) MgCl
- Gypsum is strongly _____ in water:
(a) soluble (b) Insoluble (c) None of these (d) Both a and b
- HCO_3 makes the water:
(a) hard (b) soft (c) clean (d) waxy

18. **Specific heat capacity of water is:**
 (a) $4.2 \text{ jkg}^{-1}\text{K}^{-1}$ (b) $2.4 \text{ jkg}^{-1}\text{K}^{-1}$ (c) $3.4 \text{ jkg}^{-1}\text{K}^{-1}$ (d) $4.2 \text{ Jg}^{-1} \text{ K}^{-1}$
19. **Water dissolves non-ionic compound by:**
 (a) ion-ion forces (b) ion-dipole forces (c) hydrogen bonding (d) covalent bonds
20. **Temporary hardness is because of presences of bicarbonates of _____ and magnesium.**
 (a) calcium (b) potassium (c) gypsum (d) copper
21. **The removal of _____ and Ca^{2+} ions which are responsible for the hardness is called water softening.**
 (a) Mg^{2+} (b) k (c) $\text{SO}^2 4$ (d) Cu^{2+}
22. **Temporary hardness is because of:**
 (a) $\text{Ca}(\text{HCO}_3)$ (b) MgCO_3 (c) CaCO_3 (d) NaCl .
23. **Temporary hardness is removed by adding:**
 (a) lime stone (b) slaked lime (c) lime water (d) Na_2CO_3
24. **Permanent hardness can only be removed by using:**
 (a) lime stone (b) slaked lime (c) lime water (d) chemicals
25. **Hard water consumes large amount of _____ in washing purposes:**
 (a) soap (b) power (c) slaked lime (d) detergents
26. **Drinking hard water causes disorders:**
 (a) blood (b) Heart (c) stomach (d) kidney
27. **It is sodium salt of a long carboxylic acid:**
 (a) acid (b) soap (c) lime (d) sodium chloride
28. **Hard water contains salts of**
 (a) Magnesium, calcium (b) Magnesium, potassium
 (c) Calcium, potassium (d) Ca, Cu
29. **Water pollution is contamination of water:**
 (a) Bodies (b) Molecules (c) Compounds (d) prices
30. **Vibrios cholera may be found in water contaminated by:**
 (a) Human feaces (b) Animal feaces (c) Both a and b (d) human urine
31. **Fluorosis is a disease caused by the consumption of excess :**
 (a) Chlorine (b) Bromine (c) Fluoride (d) Astatine
32. **Which of the following disease cause liver inflammation?**
 (a) Typhoid (b) Cholera (c) Hepatitis (d) Jaundice
33. **Hepatitis _____ and _____ can be transmitted by contaminated water:**
 (a) B, C (b) A, E (c) A, D (d) B, A
34. **Hookworm infects the:**
 (a) Small intestine (b) Large intestine (c) Stomach (d) Liver
35. **Hookworm infects about _____ billion people worldwide per annum:**
 (a) 1 (b) 2 (c) 4 (d) 5
36. **Water pollution causes rapid growth of:**
 (a) Bacteria (b) Algae (c) Chemicals (d) Pollutants
37. **Water pollution is unfit for _____ purposes:**
 (a) Cleaning (b) Washing (c) Both a and b (d) drinking

38. In some parts of the world, the water supply contains small amount of _____ compounds:
 (a) Chlorine (b) Bromine (c) Fluorine (d) iodine
39. Lack of proper sanitation facilities is the main cause of rapidly spreading _____ diseases:
 (a) Water borne (b) Water pollution (c) hepatitis (d) heart
40. Diarrhea may be caused by viruses:
 (a) Bacteria (b) Parasites (c) Both a and b (d) fungal infections
41. Dysentery is a disease of:
 (a) Intestine (b) Stomach (c) Heart (d) liver
42. Cholera is an acute infection caused by _____ bacteria:
 (a) Cholerae (b) Vibrious cholerae (c) Both a and b (d) None of these
43. A large number of soap is wasted in _____ formation:
 (a) Scum (b) Detergents (c) Soda (d) None of these
44. Water pollution due to agriculture waste is because of use of the:
 (a) Fertilizers (b) Pesticide (c) Both a and b (d) insecticide
45. Fertilizers are used to make up deficiency of:
 (a) Nitrogen (b) Phosphorus (c) Both a and b (d) calcium
46. Aquatic animals feel suffocation and ultimately die due to insufficient supply of:
 (a) Oxygen (b) Hydrogen (c) Carbon dioxide (d) None of these
47. Water borne diseases:
 (a) Dysentery (b) Cholera (c) Both a and b (d) pneumonia
48. Heavy metals like Cadmium, Lead and Mercury are toxic and health hazards for:
 (a) Humans (b) Animals (c) Both a and b (d) plants
49. Use of detergents is increasing day by day for cleaning purposes in:
 (a) Houses (b) Industries (c) Both a and b (d) classes
50. Detergents can work even in _____ solutions:
 (a) Acidic (b) Basic (c) Both a and b (d) Alkaline
51. The _____ salt is present in detergents cause rapid growth of algae in water:
 (a) nitrate (b) Phosphate (c) Magnesium (d) Both a and b
52. Jaundice is caused by an excess of _____ in blood:
 (a) Bile pigments (b) RBC's (c) WBC's (d) thrombocytes
53. Patient feels weakness and fatigue in:
 (a) Jaundice (b) Hepatitis (c) Cryptosporidium (d) Cholera
54. Typhoid is a dangerous _____ disease:
 (a) Intestinal (b) Bacteria (c) Infections (d) fungal
55. Chlorine kills:
 (a) Bacteria (b) Micro-organisms (c) Both a and b (d) germs
56. Swimming pools are cleaned by:
 (a) Chlorination (b) Fluorination (c) Bromination (d) Both b and c
57. Hardness is of _____ types:
 (a) Four (b) Two (c) Three (d) Five

58. **Used water is called:**
 (a) Waste water (b) Sewage (c) Both a and b (d) none of these
59. **Good quality Water is colorless and:**
 (a) odorless (b) Tasteless (c) Both a and b (d) softly
60. **Pure water has _____ conductivity:**
 (a) High (b) Very low (c) Both a and b (d) None of these
61. **A disease that causes bone and tooth damage:**
 (a) Jaundice (b) Fluorosis (c) Hepatitis (d) Asthma
62. **Sea water is unfit for _____ purposes:**
 (a) Drinking (b) Agriculture (c) Both a and b (d) Washing
63. **Water is a universal solvent because of its:**
 (a) Polarity (b) Hydrogen bonding ability
 (c) Both a and b (d) Covalent bonding
64. **Which one of the following properties of water is responsible for rising of water in plants?**
 (a) Surface tension (b) Capillary action (c) Heat capacity (d) Specific heat
65. **Permanent hardness because of Mg^{2+} and Ca^{2+} :**
 (a) SO_4^{2-} (b) Cl^- (c) Both a and b (d) Phosphates

ANSWER KEY

1	a	14	a	27	b	40	c	53	a
2	a	15	a	28	a	41	a	54	b
3	c	16	a	29	a	42	b	55	c
4	c	17	a	30	a	43	a	56	a
5	a	18	d	31	c	44	c	57	b
6	a	19	c	32	c	45	c	58	c
7	a	20	a	33	b	46	a	59	c
8	d	21	a	34	a	47	c	60	b
9	c	22	a	35	a	48	a	61	b
10	a	23	b	36	b	49	c	62	c
11	a	24	d	37	c	50	a	63	c
12	a	25	a	38	c	51	d	64	b
13	a	26	c	39	a	52	a	65	c

SHORT QUESTION

PROPERTIES OF WATER

Q.1 What is capillary action?

Ans. **Definition:** Capillary action is the process by which water rises up from the roots of plants to leaves.

Importance: It is vital for the survival of land plants.

Q.2 Point out two properties of water that make it an excellent solvent.

Ans. The ability of water to dissolve substances is because of two unique properties which are given below:

- (i) Polarity of water molecule
- (ii) Exceptional hydrogen bonding ability

Q.3 Why the water molecule is polar?

Ans. **Polar Nature of Water:** Water molecule has a polar structure i.e., one end of the molecule is partially positive while the other end is partially negative because of electro negativity difference between oxygen and hydrogen atoms.

Q.4 Explain why non-ionic polar compounds are soluble in water?

Ans. Water can even dissolve non-polar (un-ionizable) gases like oxygen, hydrogen and nitrogen etc. through dipole-induced dipole forces.

SOFT AND HARD WATER

Q.1 Which salts are responsible for hardness of water?

Ans. **Causes of Hardness:** Rain water dissolves many salts of divalent cations like Mg^{+2} , Ca^{2+} and anions like Cl^{-} , SO_4^{-2} , HCO_3^{-} , and CO_3^{-2} .

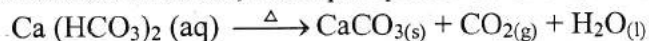
Example:

- Gypsum ($CaSO_4, 2H_2O$)
- Lime stone ($CaCO_3$).

These salts make the water hard.

Q.2 Explain the chemistry of removing the temporary hardness by boiling water.

Ans. **Removal of temporary Hardness:** On boiling, calcium bicarbonate $Ca(HCO_3)_2$ decomposes to produce insoluble calcium carbonate, which precipitates out of the solution.

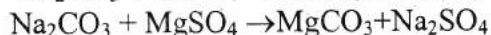
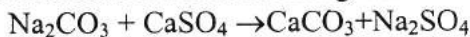


Q.3 What is the principle of removing permanent hardness of water?

Ans. **Removal of permanent Hardness:** the permanent hardness can only be removed by using chemicals calcium (Ca^{+2}) and magnesium (Mg^{+2}) are removed as "Insoluble salts" by adding washing soda (Na_2CO_3) or sodium zeolite.

Q.4 How addition of Na_2CO_3 removes permanent hardness of water?

Ans. **By using washing soda:** The addition of washing soda removes the calcium and magnesium ions as the insoluble calcium and magnesium carbonates respectively.



Q.5 How sodium zeolite softens water?

Ans. **Water softening process:** Sodium zeolite is a naturally occurring resin of sodium aluminium silicate $NaAl(SiO_3)_2$, which can also be prepared artificially. When water is passed through resin sodium ions of the resin are exchanged with the unwanted calcium and magnesium ions of the hard water.

