CHAPTER

19 Environmental Chemistry

1. The recommended concentration of fluoride ion in drinking water is upto 1 ppm as fluoride ion is required to make teeth enamel harder by converting $[3Ca_3(PO_4)_2 \cdot Ca(OH)_2]$ to
(a) $[CaF_2]$ (b) $[3(CaF_2) \cdot Ca(OH)_2]$
(c) $[3(Ca_3(PO_4)_2 \cdot CaF_2]$ (d) $[3(Ca(OH)_2 \cdot CaF_2]$
(2018)

2. Biochemical Oxygen Demand (BOD) value can be a measure of water pollution caused by the organic matter. Which of the following statements is correct?
(a) Anaerobic bacteria increase the BOD value.
(b) Aerobic bacteria decrease the BOD value.
(c) Polluted water has BOD value higher than 10 ppm.
(d) Clean water has BOD value higher than 10 ppm.
(Online 2018)

3. A water sample has ppm level concentration of following anions, $F^- = 10$; $SO_4^{2-} = 100$; $NO_3^- = 50$. The anion/anions that make/makes the water sample unsuitable for drinking is/are
(a) only F^- (b) only SO_4^{2-}
(c) only NO_3^- (d) both SO_4^{2-} and NO_3^-
(2017)

4. Identify the pollutant gases largely responsible for the discoloured and lustreless nature of marble of the Taj Mahal.
(a) SO_2 and NO_2 (b) SO_2 and O_3
(c) CO_2 and NO_2 (d) O_3 and CO_2 *(Online 2017)*

5. Which of the following is a set of greenhouse gases?
(a) CO_2, CH_4, N_2O, O_3 (b) O_3, NO_2, SO_2, Cl_2
(c) CH_4, O_3, N_2, SO_2 (d) O_3, N_2, CO_2, NO_2
(Online 2017)

6. The concentration of fluoride, lead, nitrate and iron in a water sample from an underground lake was found to be 1000 ppb, 40 ppb, 100 ppm and 0.2 ppm, respectively. This water is unsuitable for drinking due to high concentration of
(a) fluoride (b) lead
(c) nitrate (d) iron. *(2016)*

7. BOD stands for
(a) Biochemical Oxidation Demand
(b) Biological Oxygen Demand
(c) Biochemical Oxygen Demand
(d) Bacterial Oxidation Demand. *(Online 2016)*

8. Which one of the following substances used in dry cleaning is a better strategy to control environmental pollution?
(a) Sulphur dioxide
(b) Carbon dioxide
(c) Nitrogen dioxide
(d) Tetrachloroethylene *(Online 2016)*

9. Photochemical smog consists of excessive amount of *X*, in addition to aldehydes, ketones, peroxyacetyl nitrates (PAN) and so forth. *X* is
(a) CH_4 (b) CO
(c) CO_2 (d) O_3 *(Online 2015)*

10. Addition of phosphate fertilisers to water bodies causes
(a) enhanced growth of algae
(b) increase in amount of dissolved oxygen in water
(c) deposition of calcium phosphate
(d) increase in fish population. *(Online 2015)*

11. The gas leaked from a storage tank of the Union Carbide plant in Bhopal gas tragedy was
(a) phosgene (b) methylisocyanate
(c) methylamine (d) ammonia. *(2013)*

12. Identify the wrong statement in the following.
(a) Acid rain is mostly because of oxides of nitrogen and sulphur.
(b) Chlorofluorocarbons are responsible for ozone layer depletion.
(c) Greenhouse effect is responsible for global warming.
(d) Ozone layer does not permit infrared radiation from the sun to reach the earth.
(2008)

13. The smog is essentially caused by the presence of
(a) O_2 and O_3
(b) O_2 and N_2
(c) oxides of sulphur and nitrogen
(d) O_3 and N_2. *(2004)*

ANSWER KEY

1. (c) **2.** (c) **3.** (a) **4.** (a) **5.** (a) **6.** (c) **7.** (c) **8.** (b) **9.** (d) **10.** (a) **11.** (b) **12.** (d) **13.** (c)

Explanations

1. (c) : Tooth enamel is mostly hydroxy apatite. F^- converts this into the much harder fluorapatite.

$$[3Ca_3(PO_4)_2 \cdot Ca(OH)_2] \xrightarrow{F^-} [3Ca_3(PO_4)_2 \cdot CaF_2]$$

2. (c) : Anaerobic bacteria decrease the BOD value and aerobic bacteria increase the BOD value. Clean water has BOD less than 5 ppm.

3. (a) : Above 500 ppm of SO_4^{2-} ions in drinking water, can cause laxative effect otherwise lesser ppm value is permissible for drinking.
Maximum limit of NO_3^- ions in drinking water is 50 ppm, above this limit it can cause the disease like methemoglobinemia.
More than 1 ppm F^- ions in drinking water are not fit for drinking, it can cause decay of bones and teeth.

4. (a) : Industries present nearby Taj Mahal produce a lot of NO_2 and SO_2 gases which react with water, oxygen and other chemicals to form sulphuric acid and nitric acid. These then mix with water and make the rain acidic which then react with marble to decolourise it.

$$CaCO_3 + H_2SO_4 \longrightarrow CaSO_4 + CO_2 + H_2O$$

5. (a)

6. (c) : Fluoride, lead and iron are present within their permissible limits but nitrate ion which has permissible value of 50 ppm, is present in much higher amount *i.e.*, 100 ppm which makes the water unfit for drinking.

7. (c) : BOD stands for Biochemical Oxygen Demand.

8. (b) : Liquid carbon dioxide is better to replace conventional halogenated solvents (potentially carcinogenic). These detergents are developed in a way that one end of the molecule is soluble in non-polar substances like grease, oil stains and the other end dissolves in liquid carbon dioxide.

9. (d) : Chemical pollutants in photochemical smog are nitrogen oxides (NO and NO_2), volatile organic compounds, ozone (O_3), peroxyacetyl nitrates.
In the presence of sunlight the following reactions take palce :

$$NO_2 \xrightarrow{h\upsilon} NO + O$$

$$O + O_2 \longrightarrow O_3$$

Hence it consists of excessive amount of ozone molecules.

10. (a)

12. (d) : The thick layer of ozone called ozoneplanket which is effective in absorbing harmful ultraviolet rays given out by the sun acts as a protective shield. It does not permit the ultra violet rays from sun to reach the earth.

13. (c) : Photochemical smog is caused by oxides of sulphur and nitrogen.