

ENVIRONMENTAL CHEMISTRY

1. Given below are two statements :

Statement I: The value of the parameter "Biochemical Oxygen Demand (BOD)" is important for survival of aquatic life.

Statement II: The optimum value of BOD is 6.5 ppm.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (1) Statement I is false but Statement II is true
- (2) Both Statement I and Statement II are true
- (3) Statement I is true but Statement II is false
- (4) Both Statement I and Statement II are false

2. Given below are two statements:

Statement I : An allotrope of oxygen is an important intermediate in the formation of reducing smog.

Statement II : Gases such as oxides of nitrogen and sulphur present in troposphere contribute to the formation of photochemical smog.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Both statement I and Statement II are false
- (2) Statement I is true but Statement II is false
- (3) Both Statement I and Statement II are true
- (4) Statement I is false but Statement II is true

3. Water does not produce CO on reacting with:

- (1) CO_2
- (2) C
- (3) CH_4
- (4) C_3H_8

4. Given below are two statements :

Statement I :

The pH of rain water is normally ~5.6.

Statement II :

If the pH of rain water drops below 5.6, it is called acid rain.

In the light of the above statements, choose the correct answer from the options given below:

- (1) Statement I is true but Statement II is false.
- (2) Both Statement I and Statement II are false.
- (3) Statement I is false but Statement II is true.
- (4) Both Statement I and Statement II are true.

5. The presence of ozone in troposphere
- (1) Protects us from the UV radiation
 - (2) Protects us from the X-ray radiation
 - (3) Protects us from greenhouse effect
 - (4) generates photochemical smog

6. The type of pollution that gets increased during the day time and in the presence of O_3 is :

- (1) Reducing smog
- (2) Oxidising smog
- (3) Global warming
- (4) Acid rain

7. The green house gas/es is (are) :

- (A) Carbon dioxide
- (B) Oxygen
- (C) Water vapour
- (D) Methane

Choose the most appropriate answer from the options given below :

- (1) (A) and (C) only
- (2) (A) only
- (3) (A), (C) and (D) only
- (4) (A) and (B) only

8. Reducing smog is a mixture of:

- (1) Smoke, fog and O_3
- (2) Smoke, fog and SO_2
- (3) Smoke, fog and $\text{CH}_2=\text{CH}-\text{CHO}$
- (4) Smoke, fog and N_2O_3

9. Which of the following statement(s) is (are) incorrect reason for eutrophication ?

- (A) excess usage of fertilisers
- (B) excess usage of detergents
- (C) dense plant population in water bodies
- (D) lack of nutrients in water bodies that prevent plant growth

Choose the most appropriate answer from the options given below :

- (1) (A) only
- (2) (C) only
- (3) (B) and (D) only
- (4) (D) only

10. The statements that are TRUE :
- (A) Methane leads to both global warming and photochemical smog
- (B) Methane is generated from paddy fields
- (C) Methane is a stronger global warming gas than CO_2
- (D) Methane is a part of reducing smog.

Choose the most appropriate answer from the options given below :

- (1) (A), (B), (C) only (2) (A) and (B) only
- (3) (B), (C), (D) only (4) (A), (B), (D) only

11. Given below are two statements :

Statement I : Non-biodegradable wastes are generated by the thermal power plants.

Statement II : Bio-degradable detergents leads to eutrophication.

In the light of the above statements, choose the most appropriate answer from the option given below :

- (1) Both statement I and statement II are false
- (2) Statement I is true but statement II is false
- (3) Statement I is false but statement II is true
- (4) Both statement I and statement II are true.

12. Green chemistry in day-to-day life is in the use of:

- (1) Chlorine for bleaching of paper
- (2) Large amount of water alone for washing clothes
- (3) Tetrachloroethene for laundry
- (4) Liquified CO_2 for dry cleaning of clothes

13. Which one of the following gases is reported to retard photosynthesis ?

- (1) CO (2) CFCs (3) CO_2 (4) NO_2

14. The water having more dissolved O_2 is :

- (1) boiling water (2) water at 80°C
- (3) polluted water (4) water at 4°C

15. Given below are two statements :

Statement I : Chlorofluoro carbons breakdown by radiation in the visible energy region and release chlorine gas in the atmosphere which then reacts with stratospheric ozone.

Statement II : Atmospheric ozone reacts with nitric oxide to give nitrogen and oxygen gases, which add to the atmosphere.

For the above statements choose the correct answer from the options given below :

- (1) **Statement I** is incorrect but **statement II** is true
- (2) Both **statement I** and **II** are false
- (3) **Statement I** is correct but **statement II** is false
- (4) Both **statement I** and **II** are correct

16. Which one of the following statements is NOT correct ?

- (1) Eutrophication indicates that water body is polluted ?
- (2) The dissolved oxygen concentration below 6 ppm inhibits fish growth
- (3) Eutrophication leads to increase in the oxygen level in water
- (4) Eutrophication leads to anaerobic conditions

17. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

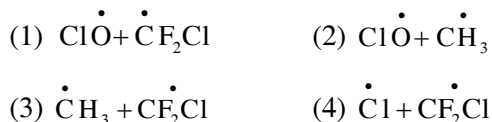
Assertion (A) : Photochemical smog causes cracking of rubber.

Reason (R) : Presence of ozone, nitric oxide, acrolein, formaldehyde and peroxyacetyl nitrate in photochemical smog makes it oxidizing.

Choose the **most appropriate** answer from the options given below :

- (1) Both **(A)** and **(R)** are true but **(R)** is not the true explanation of **(A)**
- (2) **(A)** is false but **(R)** is true.
- (3) **(A)** is true but **(R)** is false
- (4) Both **(A)** and **(R)** are true and **(R)** is the true explanation of **(A)**

18. The gas 'A' is having very low reactivity reaches to stratosphere. It is non-toxic and non-flammable but dissociated by UV—radiations in stratosphere. The intermediates formed initially from the gas 'A' are :



19. In stratosphere most of the ozone formation is assisted by :

- (1) cosmic rays
 (2) γ -rays.
 (3) ultraviolet radiation
 (4) visible radiations

20. Which one of the following is used to remove most of plutonium from spent nuclear fuel?

- (1) ClF_3 (2) O_2F_2
 (3) I_2O_5 (4) BrO_3

21. BOD values (in ppm) for clean water (A) and polluted water (B) are expected respectively :

- (1) $A > 50, B < 27$
 (2) $A > 25, B < 17$
 (3) $A < 5, B > 17$
 (4) $A > 15, B > 47$

22. Water sample is called cleanest on the basis of which one of the BOD values given below

- (1) 11 ppm (2) 15 ppm
 (3) 3 ppm (4) 21 ppm

SOLUTION**1. Official Ans. by NTA (3)**

Sol. Clean water would have BOD value of less than 5 ppm whereas highly polluted water could have a BOD value of 17 ppm or more.

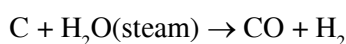
2. Official Ans. by NTA (1)

Sol. Reducing smog is a mixture of smoke, fog and sulphur dioxide.

Tropospheric pollutants such as hydrocarbon and nitrogen oxide contribute to the formation of photochemical smog.

3. Official Ans. by NTA (1)

Sol. $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$



$\left. \begin{array}{l} \text{CH}_4 + \text{H}_2\text{O} \rightarrow \text{CO} + 3\text{H}_2 \\ \text{C}_3\text{H}_8 + \text{H}_2\text{O} \rightarrow 3\text{CO} + \text{H}_2 \end{array} \right\}$ both reactions are carried out at 1270K temp. with Ni catalyst

Thus CO_2 does not produce CO.

4. Official Ans. by NTA (4)

Sol. Both statements are correct.

Normally rain water has pH of 5.6 due to the presence of H^+ ions formed by the reaction of rain water with carbon dioxide present in the atmosphere.

5. Official Ans. by NTA (4)

Sol. The presence of ozone in troposphere generates photochemical smog.

6. Official Ans. by NTA (2)

Sol. In presence of ozone(O_3), oxidising smog gets increased during the day time because automobiles and factories produce main components of the photochemical smog (oxidising smog) results from the action of sunlight on unsaturated hydrocarbon and nitrogen oxide.

Ozone is strong oxidising agent and can react with the unburnt hydrocarbons in the polluted air to produce chemicals.

7. Official Ans. by NTA (3)

Sol. The green house gases are CO_2 , $\text{H}_2\text{O}_{(\text{vapour})}$ & CH_4 .

8. Official Ans. by NTA (2)

Sol. Reducing or classical smog is the combination of smoke, fog and SO_2 .

9. Official Ans. by NTA (4)

Sol. The process in which nutrient enriched water bodies support a dense plant population which kills animal life by depriving it of oxygen and results in subsequent loss of biodiversity is known as eutrophication.

10. Official Ans. by NTA (1)

Sol. Methane leads to both global warming & photochemical smog.

Methane is generated in large amounts from paddy fields.

CO_2 can be absorbed by photosynthesis, or by formation of acid rain etc., while no such activities are there for methane.

Hence methane is stronger global warming gas than CH_4 .

Methane is not a part of reducing smog.

11. Official Ans. by NTA (4)

Sol. Non-biodegradable wastes are generated by the thermal power plants which produces fly ash.

Detergents which are biodegradable causes problem called eutrophication which kills animal life by depriving it of oxygen.

12. Official Ans. by NTA (4)

Sol. Chlorine gas was used earlier for bleaching paper. These days, hydrogen peroxide (H_2O_2) with suitable catalyst.

Tetra chloroethene ($\text{Cl}_2\text{C}=\text{CCl}_2$) was earlier used as solvent for dry cleaning. The compound contaminates the ground water and is also a suspected carcinogen. Replacement of halogenated solvent by liquid CO_2 will result in less harm to groundwater.

Hence given statement (4) is correct.

13. Official Ans. by NTA (4)

Sol. According to NCERT only NO_2 from the given options can retard the photosynthesis process in plants.

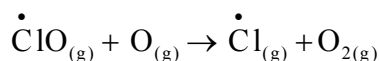
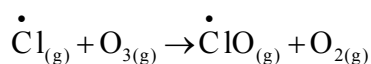
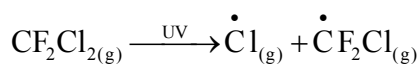
14. Official Ans. by NTA (4)

Sol. On heating concentration of O_2 in water decreases. So boiling water and water at $80^\circ C$ having less O_2 concentration. Polluted water also having less O_2 concentration. So water at $4^\circ C$ having maximum O_2 concentration.

15. Official Ans. by NTA (2)

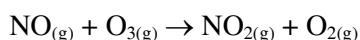
Sol. Statement (1)

CFCs are broken down by powerful UV radiation and releases chlorine free radical which reacts with ozone and start chain reaction.



Statement (2)

Atmosphere ozone reacts with nitric oxide to produce nitrogen dioxide and oxygen.



16. Official Ans. by NTA (3)

Sol. Eutrophication leads to decrease in oxygen level of water.

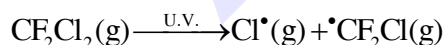
3rd statement is incorrect

17. Official Ans. by NTA (4)

Sol. Photochemical smog causes cracking of rubber, the common component of photochemical smog are ozone, nitric oxide, acrolein, formaldehyde and peroxyacetyl nitrate (PAN).

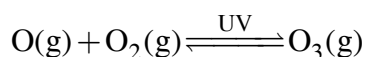
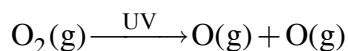
18. Official Ans. by NTA (4)

Sol. In stratosphere CFCs get broken down by powerful UV radiations releasing Cl^\bullet



19. Official Ans. by NTA (3)

Sol. Ozone in the stratosphere is a product of UV radiations acting on dioxygen (O_2) molecules.



20. Official Ans. by NTA (2)

Sol. O_2F_2 oxidises plutonium to PuF_6 and the reaction is used in removing plutonium as PuF_6 from spent nuclear fuel.

21. Official Ans. by NTA (3)

Sol. BOD values of clean water (A) is less than 5 ppm

So $A < 5$

BOD values of polluted water (B) is greater than 17 ppm

So $B > 17$

So Ans. is 3

22. Official Ans. by NTA (3)

Sol. Clean water could have BOD value of less than 5 ppm whereas highly polluted water could have a BOD value of 17 ppm or more.