UNIT 14

ENVIRONMENTAL CHEMISTRY

SECTION A (1 MARK QUESTIONS)

1. Which of the following is not a green house gas?

a) CO b) O_3 c) CH_4 d) CO_2

Ans. CO

2. What is of BOD?

Ans. Biochemical oxygen Demand

3. P^H value of acid rain is ……

A) above 7.2 b) below 5.6 c) Between 6 and 7 d) 7

Ans. Below 5.6

4. Clean water would have BOD value ……

a)5ppm b)less than 5ppm c)greater than 5ppm

Ans. Less than 5 ppm

5. …… is used in the dry cleaning of clothes

Ans. liquefied CO_2

SECTION B (Questions with score 2)

6. Classify the following into gaseous and particulate air pollutants:

Dust, hydrocarbons, ozone, smog

Ans. Gaseous air pollutants-hydrocarbons ,smog

Particulate air pollutants-dust,smog

7. Carbonmonoxide is a poisonous gas. why?

Ans. Carbonmonoxide binds to haemoglobin to form carboxyhaemoglobin which reduces the oxygen carrying capacity of blood. This oxygen deficiency results in headache, weak eyesight, nervousness and cardiovascular disorder.

8. What is greenhouse effect?

Ans. It is the phenomenon in which earth's atmosphere traps the heat from sun and prevent it from escaping into outer space resulting in rise of atmospheric temperature.

9. What is acid rain?

Ans. When p^H of the rainwater drops below 5.6,it is called acid rain.SO_2 and NO_2 present in polluted air are the major contributors to acid rain.

10. What is classical smog?

Ans. A mixture of smoke, fog and SO_2 present in the atmosphere is called classical smog. It occurs in cool and humid climate.

11. Suggest two methods for the control of photochemical smog.

Ans. Use of catalytic converters in automobiles and planting certain plants such as pinus, Juniperus etc.

12. Define the terms Biochemical Oxygen Demand and Eutrophication.

Ans. Biochemical Oxygen Demand is the amount of oxygen required by microorganisms to oxidise organic matter present in polluted water.

Eutrophication is the pollution of water by nutrients such as phosphate from detergents and fertilizers which accelerate the growth of algae and other plants in water. This reduces the dissolved oxygen and adversely affects aquatic life.

13. Mention two important applications of green chemistry in day to day life.

Ans.(a) Dry cleaning of clothes: Liquefied CO_2 along with a suitable detergent is used for dry cleaning of clothes. It is less harmful.

(b) Bleaching of paper: H_2O_2 along with a suitable catalyst is used for bleaching of paper.

14. Give any two adverse effects of global warming.

Ans. Increase of temperature due to accumulation of CO_2 in the atmosphere is called Global warming.

(a) Global warming increase infectious diseases such as yellow fever, dengue fever etc.

(b)It may lead to melting of polar ice caps which result in an increase of water level in lakes, oceans etc.

15. Write any 4 international standards for drinking water.

Ans. Fluoride ion <1ppm

Sulphate ion <500ppm

Nitrate ion <50ppm and Lead < 50ppb

SECTION C (Questions with score 3)

16 a) What is mean by the green house effect? (1½)

b) Explain what is mean by green house gases? (1½)

Ans. a) When the concentration of carbon dioxide in the atmosphere is above the normal level (0.03%), it absorbs more infra-red radiation from the solar energy and hence the temperature of the earth's atmosphere increases. This is known as Green house effect.

b)The gases responsible for green house effect are called green house gases. They are CO_2, methane, water -vapour, chlorofluorocarbons (CFC's), nitrous oxide and ozone.

17. The Taj Mahal in India has been affected by 'acid rain'. Explain the causes and harmful effects of acid rain. (3)

Ans. The harmful effects of acid rain are: a) Acid rain is harmful for agriculture, trees and plants. b)It causes respiratory ailments and skin cancer in human beings and animals. c) It affects plants and animal life in aquatic ecosystem. d)It corrodes water pipes resulting in the dissolution of heavy metals into the drinking water. e) Acid rain damages buildings and other structures made of stone or metal.

18. The phenomenon of global warming is due to green house effect. What are the consequences of green house effect? (3)

Ans: **Due to Green house effect (global warming) the average global temperature will increase. This will lead to the melting of polar ice caps and flooding of low lying areas all over the earth. Increase in the global temperature results in the infectious diseases like dengue, malaria, yellow fever, sleeping sickness etc.**

19. Atmospheric pollution increases the global average temperature and the phenomenon is called global warming.

a) What are the major gases which contribute towards global warming? (1)

b) What can we do to reduce global warming? (2)

Ans: a) CO_2, methane, water vapour, chlorofluorocarbons (CFC's), nitrous oxide and ozone.

b) Global warming can be reduced by the following methods: a)Reduce the burning of fossil fuels by minimizing the use of automobiles. b)Plant trees c)Avoid burning of dry leaves, wood etc. d)Aware the public about the bad effects of global warming.

20. a)What is Green Chemistry? (1)

b)Give some applications of Green Chemistry in day-to-day life. (2)

Ans. a)Green chemistry (also called sustainable chemistry) is an area of chemistry focused on the design of products and processes that minimize the use and generation of dangerous substances.

b) (i) Dry Cleaning of Clothes: Liquefied carbondioxide, with a suitable detergent is used for dry cleaning clothes. (ii) Bleaching of Paper: Hydrogen peroxide with suitable catalyst is used for bleaching paper. (iii) Synthesis of Chemicals: Ethanal is now commercially prepared by one step oxidation of ethene in the presence of ionic catalyst in aqueous medium.

21. Organic matters such as leaves, grass, trash etc. are major pollutants in water.

a) How do organic pollutants affect aquatic life? (2)

b) What is Biochemical Oxygen Demand (BOD)? (1)

Ans: a) As the amount of organic matter in water increases, more oxygen is required to decompose them by bacteria. So the amount of dissolved oxygen in water decreases. This causes oxygen dependent aquatic life to die.

b) The amount of oxygen required by bacteria to break down the organic matter present in a certain volume of a sample of water, is called Biochemical Oxygen Demand (BOD)..

SECTION D (Questions with score 4)

22.a) What are the adverse effects of photochemical smog? (2)

b) Write any two methods to control photochemical smog. (2)

Ans.a) Adverse effects of photochemical smog:

- **Eye irritants**
- **Nose irritation**
- **Head ache**
- **Chest pain**

• Dryness of throat

• Cough

• Difficulty in breathing

b) 1) Use catalytic converters in automobiles.

2) Plant certain plants (e.g. Pinus) which can metabolise nitrogen oxide.

23. a)Carbon monoxide gas is more dangerous than carbon dioxide gas. Why? (2)

b)Write two major consequences of air pollution. (2)

Ans. a) CO combines with haemoglobin to forms a complex entity, carboxyhaemoglobin which is about 300 times more stable than oxy-haemoglobin. In blood, when the concentration of carboxyhaemoglobin reaches 3 -4%, the oxygen-carrying capacity of the blood is significantly reduced. In other words, the body becomes oxygen-starved. This results into headache, nervousness, cardiovascular disorder, weak eyesight etc.

b)Air pollution causes global warming.

It leads to acid rain.

24. a)Name the chemicals responsible for acid rain. (2)

b) Statues and monuments in India such as Taj Mahal are affected by acid rain. How? (2)

Ans.a)Oxides of nitrogen and sulphur mist of hydrochloric acid and phosphoric acid etc.

b) The air in the vicinity of Taj Mahal contains very high levels of oxides of sulphur and nitrogen. This results in acid rain which reacts with marble of Taj Mahal causing pitting.

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

$$CaCO_3 + 2HNO_3 \rightarrow Ca(NO_3)_2 + H_2O + CO_3.$$

As a result, the monument is being slowly eaten away and the marble is getting decolourised and lustreless. Thus, acid rain is considered as a threat to Taj Mahal.

25. a)What are the major pollutants of water? (2)

b) What is meant by eutrophication? (2)

Ans. a)Micro-organism present in domestic sewages, organic wastes, plant nutrients, toxic metals, sediments, pesticides and radioactive substances,

b) Eutrophication is the pollution of water by nutrients such as phosphate from detergents and fertilizers which accelerate the growth of algae and other plants in water. This reduces the dissolved oxygen and adversely affects aquatic life.

26. a) Why usage of chlorofluorocarbons being discouraged? (1)

b).How is ozone formed in the atmosphere? (2)

c) Super sonic jet planes can contribute to ozone depletion by introduction of the gas straight to the stratosphere (1)

Answer

a) The decomposition of CFC's destroying ozone.

$$CF_2Cl_2(g) + hv \rightarrow Cl(g) + CF_2Cl(g)$$

The reactive Cl atom reacts with O_3 to form ClO radical.

$$Cl(g) + O_3 \rightarrow ClO(g) + O_2(g)$$

Thus each Cl atom produced, can destroy many O_3 molecules. This leads to ozone depletion.

27. a) What do you mean by greenhouse effect? write any consequence of it. (2)

b)Which gases are responsible for greenhouse effect? (2)

Answer -

a) Greenhouse effect is a process by which solar radiation is absorbed by greenhouse gases and the temperature of Earth's atmosphere is increased.

This leads to melting of ice. So the sea level rises.

b) The main gas responsible for greenhouse effect is CO_2. Other greenhouse gases are methane, nitrous oxide, water vapours, chlorofluorocarbons (CFC's) and ozone.

28. a) Briefly explain Global Warming ? (2)

b)Write the mechanism of formation of photochemical smog. (2)

Answer

a) As more and more infrared radiations are trapped, the atmosphere becomes hotter and the global temperature rises up. This is known as global warming.

b) At high temp, the petrol and diesel engines, N_2 & O_2 combine to form NO which is emitted into atmosphere. NO is then oxidised in air to form NO_2 which absorbs sunlight and form NO and free O atom.

The O atoms being reactive and combine with O_2 to form O_3.

$$O_2(g) + O(g) \rightarrow O_3(g)$$

The O_3 react with NO formed by the photochemical decomposition of NO_2.

$$NO(g) + O_3(g) \rightarrow NO_2(g) + O_2(g)$$

NO_2 and O_3 are good oxidising agents and they react with unburnt hydrocarbons in the polluted air to form substances such as acrolein and formaldehyde. These are the main substances of photochemical smog.

29. a)Why is green chemistry getting so much attention? (2)

b)Give two examples in which green chemistry has been applied. (2)

Answer:

a)Green chemistry is the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances. Reduces the negative impacts of chemical products and processes on human health and the environment. Lessens and sometimes eliminates hazard from existing products and processes.

b) 1) Dry-Cleaning of clothes and laundry: Replacement of halogenated solvent like (CCl_4) by liquid CO_2 which is less harmful to groundwater.

2) Bleaching of Paper: In place of chlorine H_2O_2 is used for the bleaching of paper.

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