

ENVIRONMENTAL CHEMISTRY

1. What is depolymerization of plastic and where it is used?

The polymerization is a process in which the used plastics are converted back into their original components by a chemical or thermal process so that these can be polymerized again e.g polyethylene terephthalate (PET) can be thermally depolymerized in the presence of a catalyst and change into its original components.

2. Explain purification of water by coagulating agent?

The materials which are present or suspended in the colloidal form in raw water are removed by coagulation process. The coagulation such as aluminum sulphite or alum is added to the raw water, which causes the precipitation of suspended impurities.

For example: aluminum hydroxide is precipitated when alum is added to water in alkaline medium.

3. What is ecosystem and biosphere?

Biosphere: the region of earth capable of supporting life. It includes lower atmosphere, oceans, river, lakes, soil and solid sediments that actively interchange materials with all types of living organisms.

Ecosystem: the smaller unit of biosphere which consists of community of organisms and their interaction with environment i.e animals, plant and microorganisms which lie in definite zone and depend on the physical factors such as soil water and air.

4. Define environmental pollutants?

All those substances which adversely affect the human health, quality of life and natural functioning of the ecosystem are environmental pollutants. There are two types of pollutants.

- i. Primary pollutants like CO, NO, unburnt hydrocarbon etc
- ii. Secondary pollutants like acid rain, smog etc.

5. What do you know about oxidizing smog and reducing smog?

Reducing Smog: The smog containing high concentration of SO₂ is chemically reducing in nature is known as reducing smog. The main cause of reducing smog is combustion of coal.

Oxidizing Smog: Photochemical smog consists of higher concentration of oxidants like ozone and is also termed as oxidizing smog. It is a yellowish brownish grey haze which is formed in the presence of water droplets and chemical reactions of pollutants in the air. It has unpleasant odour because of the gaseous components.

6. What does coagulation means?

The materials which are present or suspended in the colloidal form in raw water are removed by coagulation process. The coagulation such as aluminum sulphite or alum is added to the raw water, which causes the precipitation of suspended impurities.

For example: aluminum hydroxide is precipitated when alum is added to water in alkaline medium.

7. How detergents are threat to aqueous animal life?

Detergents are excessively used in industries and household are cleaning agent. The amount of deposited detergent in waste water is increasing day by day. This waste water when discharge in river or sea, greatly effects the aquatic life. Detergents contents of waste water mobilize the toxic ions of heavy metals such as Pb, Cd and Hg from sediments into water.

8. What is photochemical smog? Give its properties.

Photochemical smog consists of higher concentration of oxidants like ozone and is also termed as oxidizing smog. It is a yellowish brownish grey haze which is formed in the presence of water droplets ad chemical reactions of pollutants in the air. It has unpleasant odour because of the gaseous components.

9. Write a note on hydrosphere?

Hydrosphere: hydrosphere includes all water bodies, mainly oceans, rivers, streams, lakes, ice caps, glaciers and ground water reservoirs. Oceans contains 97% of earth's water but because of high salt contents, this water cannot be used for human consumption. The polar ice caps and glaciers contain 2% of the earth's water supply. Only 1% of earth's water resources are available as fresh water. The fresh water is used for agriculture (69%), industries (23%) and for domestic purpose (8%).

10. What is smog? What are the contents of photochemical smog.

The word smog is combination of smoke and fog. Photochemical smog is combination of higher concentration of oxidants like ozone and is also termed as oxidizing smog. It is a yellowish brownish grey haze which is formed in the presence of water droplets ad chemical reactions of pollutants in the air. It has unpleasant odour because of the gaseous components. The main reactants of the photochemical smog are nitric oxide NO and unburnt hydrocarbons. Nitric oxide is oxidized to nitrogen dioxide within minutes to hours depending upon the concentration of pollutant gases.

11. What are the effects of CO on human health?

Carbon monoxide is highly poisonous gas and causes suffocation if inhaled. It binds blood hemoglobin more strongly than oxygen thus excluding oxygen from normal respiration. The CO poisoning can reverse by giving high pressure oxygen. Exposure to high concentration of CO results in headache, fatigue, unconsciousness and eventually death.

12. How is coal produced from the remains of Trees?

13. What is chemical demand (COD)?

The organic contents of water which consume oxygen during chemical oxidation is evaluated by its chemical oxygen demand. The oxygen demand of water can be determined directly by treating it

with dichromate ions $\text{Cr}_2\text{O}_7^{2-}$ which is a powerful oxidizing agent. The organic matter in water is oxidized, while the remaining dichromate is determined titrimetrically.

The value of COD is directly measure of chemically oxidizable matter in water. Higher value of COD will indicate more pollution.

14. What is smog? Give necessary conditions for the formation of smog/ photochemical smog.

The word smog is combination of smoke and fog. The main cause of smog is combustion of coal.

The other cause is higher concentrations of oxidant like ozone, NO and unburnt hydrocarbons.

The following conditions are necessary for the formation of smog

- There must be sufficient NO, hydrocarbons and volatile organic compounds emitted by vehicular traffic.
- Sunlight, so that some of the chemical reactions may occur at a rapid rate.
- The movement of air must be little so that reactions are not disturbed.

15. What are primary pollutants? Give examples.

The waste products given out from chimneys of industrial units and exhaust of automobiles contain gases such as sulphur dioxide, sulphur trioxide, nitrogen oxides, carbon monoxide, hydrocarbons, ammonia, compounds of fluorine and radioactive materials. These waste products are called primary pollutants.

16. What is reprocessing of plastic?

The recycling of plastic is done by reprocessing, depolymerization or transformation. In reprocessing, the used plastic are remelted and converted into other material e.g the original use of polystyrene is for manufacturing of foam, packaging cutlery, furniture etc. But after reprocessing it is mostly used for the manufacture of toys, trays etc.

17. Name the components of environment. What are the substances present in atmosphere????

The components of environment are

- Atmosphere
- Hydrosphere
- Lithosphere
- Biosphere

In atmosphere, various gases in different proportion are present.

$\text{N}_2 = 78\%$, $\text{O}_2 = 21\%$, $\text{Ar} = 0.9\%$, $\text{CO}_2 = 0.03\%$ and trace amount of H_2 , O_3 , CH_4 , CO , He , Ne , Kr and Xe . It also contain various amount of water vapors.

18. What is reducing smog?

The word smog is combination of smoke and fog. If it contains high concentration of SO_2 , it is chemically in nature thus known as reducing smog. The main cause of reducing smog is combustion of coal.

19. Explain the term BOD?

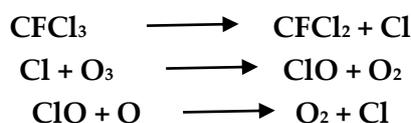
The most important oxidizing agent which is dissolved in water is molecular oxygen. The organic matter is oxidized with the help of this dissolved oxygen in water. It is a parameter to determine the quality of water.

20. What is the role of CFC's on depletion of ozone?

OR

What reactions take place in decomposition of ozone?

Chlorofluorocarbons (CFC's) used as refrigerants in air conditioning and in aerosol sprays are inert in the troposphere but slowly diffuse into stratosphere, where they are subjected to UV rays generating Cl free radicals. CFC's play an effective role in removing O₃ in the stratosphere due to following reactions.



A single chloride radical can destroy upto 100,000 ozone molecules.

21. What is acid rain? How does it affect the building materials?

The rain contains acid is called acid rain. Now days it termed as acid deposition. It produces serious environmental problems. Acid rain is produced due to the presence of CO₂, SO_x and NO_x in atmosphere. CO₂ converts into carbonic acid while SO_x and NO_x react with oxygen and water and produce H₂SO₄ and HNO₃ respectively.

Acid rain damages buildings such as steel, paint, plastic, cement, masonry work and sculptural material especially of marble and lime stone.

22. How is oil spillage affecting the marine life?

Petroleum or crude oil is a complex mixture of many compounds mainly hydrocarbons. The petroleum products are used as fuel, lubricants, for manufacturing petrochemicals, plastic, electrical applications, synthetic rubber and detergents etc. sea water gets polluted by accidental oil spillage and leakage from cargo oil tankers in sea, tanker trucks, pipelines leakage during off shore exploration and leakage of underground storage tanks. Many petroleum products are poisonous and cause serious health problems to humans, animals and aquatic life. Hydrocarbons particularly polycyclic aromatics are known to be carcinogenic even at very low concentrations. The marine organisms are severely affected by soluble aromatic fractions of oil. The spilled oil damages the marine life often causing death.

23. What are secondary pollutants?

The primary pollutants in the atmosphere through various reactions produce some pollutants such as sulphuric acid, nitrogen monoxide, carbonic acid, hydrofluoric acid, peroxyacetyl nitrate (PAN), ozone, aldehyde, ketone and peroxy benzol are called secondary pollutants.

24. What is aeration?

Aeration: the quality of raw water is improved by aeration. In this process, air is passed through water to remove the dissolved gases such as H_2S , organo-sulphur compounds and volatile organic compounds. Water soluble Fe^{+2} is converted into Fe^{+3} (insoluble) and oxygen level of water is also improved.

25. Why chlorination of water has harmful effects?

Chlorination of water containing organic material also form some organic compounds which are toxic.

- Phenol if present in water reacts with chlorine to form chlorinated phenol with bad smell and taste and is toxic as well.
- Hydrochlorous acid reacts with organic matter dissolved in water to form chloroform. This chloroform causes liver cancer and also has negative reproduction and development effects in humans.
- If chlorinated water is used for drinking, it increases the risk of bladder and rectal cancer.

To avoid the harmful effects of chlorination of water, ozone or chlorine dioxide is used as disinfectant of water.

26. What is incineration? Give its advantages.

Incineration: the waste water process in which solid waste is burnt at high temperature ranging from 900 to 1000°C is called incineration.

The burning of solid waste in the incinerator consumes all combustible material leaving behind the non-combustible materials and the ash residues. The volume of waste is reduced by two third. The combustible components of garbage such as paper, plastic and wood provide fuel for fire. In incinerator the heat produced may be used to produce steam which runs the turbine to produce electricity.

CHAPTER 16

LONG QUESTIONS

1. Discuss the term 'acid rain' along with its effects on environment?
2. What is smog? Give conditions for the formation of smog?
3. What is acid rain? How does it affects the environment?
4. Write a note on oil spillage.
5. What is acid rain? And how does it affects our environment?
6. Write a note on smog?
7. What are pesticides? Explain how pesticides are dangerous to human beings?
8. Write a note on water disinfection by chlorine.
9. Describe natural and human activities that cause air pollution due to the following:
 - (i) Carbon monoxide
 - (ii) Hydrocarbons

10. What is smog? Explain the pollutants which are the main cause of photochemical smog?
11. Explain how pesticides are dangerous to human beings?
12. How water is made potable by aeration and coagulation?
13. Describe the process of incineration of industrial waste.



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