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Reducing Environmental Pollution

STD - XI

UNIT 15

Environmental Chemistry



SHANMUGAM S

ST.JOHN'S MHSS PORUR CHENNAI -116

9841945665

Environmental Chemistry

18. Dissolved oxygen in water is responsible for aquatic life. What processes are responsible for the reduction in dissolved oxygen in water?

The which are responsible for the reduction of dissolved oxygen in water are

- i) Use of phosphatic and nitrate fertilizers.
- ii) Detergents, the discharge of human sweage
- iii) organic waste from food, paper and pulp industries.
- iv) The microorganisms which oxidise matter also also utilise oxygen dissolved in water.
- v) Moreover during night, photosynthesis stops but the aquatic plants continue to respire resulting in reduction of dissolved oxygen.

19. What would happen, if the greenhouse gases were totally missing in the earth's atmosphere?

Greenhouse gases : CO_2 , CH_4 , $\text{H}_2\text{O}_{(\text{vap})}$, N_2O , (O_3) and CFCs

Following gases are responsible for green house effect.

- I) They are present near earth's surface. They absorb solar energy radiated back from the earth surface.
- II) Due to this, the atmosphere is heated. Thus, these gases are essential for maintaining the temperature of earth for the sustenance of life.
- III) In the absence of green house gases, there will be significant decrease in the average temperature of earth. Due to this, life will not be possible on earth.

20. Define smog.

Smog is a chemical mixture of gases that forms a brownish yellow haze over urban cities. Smog mainly consists of ground level ozone, oxides of nitrogen, volatile organic compounds, SO_2 , acidic aerosols and gases, and particulate matter.

There are two types of smog.

- i) Classical smog caused by coal smoke and fog ,
- ii) Photo chemical smog caused by photo chemical oxidants.

21. Which is considered to be earth's protective umbrella? Why?

At high altitudes to the atmosphere consists of a layer of ozone (O_3) which acts as an umbrella or shield for harmful UV radiations. It protects us from harmful effect such as skin cancer. UV radiation can convert molecular oxygen into ozone



22. What are degradable and non-degradable pollutants?

The pollutants which can be easily decomposed by the natural biological processes are called bio-degradable pollutants.

Examples: plant wastes, animal wastes etc.

The pollutants which cannot be decomposed by the natural biological processes are called Non bio-degradable pollutants.

Examples: metal wastes (mainly Hg and Pb), D.D.T, plastics, nuclear wastes etc

23. From where does ozone come in the photo chemical smog?

Ground Level Ozone and Photochemical Smog. Ozone is a secondary pollutant that forms from the primary pollutants such as Volatile Organic Compounds (Hydrocarbons) and nitrogen oxides (NO_x) in the presence of sunlight. Its formation is mainly from the automobile emissions

24. A person was using water supplied by corporation. Due to shortage of water he started using underground water. He felt laxative effect. What could be the cause?

A moderate concentration of sulphate ions in water are harmless but excessive concentration, i.e., greater than 500 ppm in water causes laxative effects. Hence, underground water may have consisted excess of sulphates.

25. What is green chemistry?

Efforts to control environmental pollution resulted in development of science for synthesis of chemicals favorable to environment which is called green chemistry

26. Explain how does greenhouse effect cause global warming

i) Thus Greenhouse effect may be defined as the heating up of the earth surface due to trapping of infrared radiations reflected by earth's surface by CO_2 layer in the atmosphere". The heating up of earth through the greenhouse effect is called global warming.

ii) Without the heating caused by the greenhouse effect, Earth's average surface temperature would be only about -18°C (0°F). Although the greenhouse effect is a naturally occurring phenomenon.

iii) If these trends continue, the average global temperature will increase which can lead to melting of polar ice caps and flooding of low lying areas. This will increase incidence of infectious diseases like dengue, malaria etc

27. Mention the standards prescribed by BIS for quality of drinking water

BIS (Bureau of Indian Standards)

Now a days most of us hesitate to use natural water directly for drinking, because biological, physical or chemical impurities from different sources mix with surface water or ground water.

Standard characteristics prescribed for deciding the quality of drinking water by BIS, in 1991 are shown

Standard characteristics of drinking water

S.No	Characteristics	Desirable limit
I	Physico-chemical Characteristics	
i)	pH	6.5 to 8.5
ii)	Total Dissolved Solids (TDS)	500 ppm
iii)	Total Hardness (as CaCO_3)	300 ppm
iv)	Nitrate	45 ppm
v)	Chloride	250 ppm
vi)	Sulphate	200 ppm
vii)	Fluoride	1 ppm
II	Biological Characteristics	
i)	Escherichia Coli (E.Coli)	Not at all
ii)	Coliforms	Not to exceed 10 (In 100 ml water sample)

28. How does classical smog differ from photochemical smog?

Classical smog	Photochemical smog
1) It is formed when there is high concentration of SO_2 and particulate matter produced due to combustion of fuels.	1) It is formed when sunlight acts on the oxides of nitrogen and hydrocarbons produced from factories or by automobiles.
2) It occurs in cold and humid climate.	2) It occurs in warm and dry climate.
3) It is reducing in nature	3) It is oxidizing in nature
4) It also causes bronchial irritation.	4) Photochemical smog causes irritation to eyes, skin and lungs, increase in chances of asthma

29. What are particulate pollutants? Explain any three.

Particulate pollutants are small solid particles and liquid droplets suspended in air. Many of particulate pollutants are hazardous.

Examples: dust, pollen, smoke, soot and liquid droplets (aerosols) etc.,

Types of Particulates

- a. Viable particulates - **bacteria, fungi, moulds, algae, etc**
- b. Non-viable particulates - **dust, smoke, Mists and Fumes**

i) Smoke:

Smoke particulate consists of solid particles (or) mixture of solid and liquid particles formed by combustion of organic matter.

For example, cigarette smoke, oil smoke, smokes from burning of fossil fuel, garbage and dry leaves.

(ii) Dust:

Dust composed of fine solid particles produced during crushing and grinding of solid materials.

For example, sand from sand blasting, saw dust from wood works, cement dust from cement factories and fly ash from power generating units.

(iii) Mists

They are formed by particles of spray liquids and condensation of vapours in air.

For example, sulphuric acid mist, herbicides and insecticides sprays can form mists.

30. Even though the use of pesticides increases the crop production, they adversely affect the living organisms. Explain the function and the adverse effects of the pesticides.

Pesticides can contaminate soil, water, turf, and other vegetation. In addition to killing insects or weeds, pesticides can be toxic to a host of other organisms including birds, fish, beneficial insects, and non-target plants.

Pesticides and human health: Pesticides can cause short-term adverse health effects, called acute effects, as well as chronic adverse effects that can occur months or years after exposure. Examples of acute health effects include stinging eyes, rashes, blisters, blindness, nausea, dizziness, diarrhea and death.

31. Ethane burns completely in air to give CO_2 , while in a limited supply of air gives CO. The same gases are found in automobile exhaust. Both CO and CO_2 are atmospheric pollutants**i) What is the danger associated with these gases**

Carbon dioxide is released into the atmosphere mainly by the process of respiration, burning of fossil fuels, forest fire, decomposition of limestone in cement industry etc.

Carbon monoxide is a poisonous gas produced as a result of incomplete combustion of coal are firewood.

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ii) How do the pollutants affect the human body?

Carbon- di- oxide:

The increased CO₂ level in the atmosphere is responsible for global warming.

It causes headache and nausea.

Carbon Monoxide :

It is released into the air mainly by automobile exhaust. It binds with haemoglobin and form carboxy haemoglobin which impairs normal oxygen transport by blood and hence the oxygen carrying capacity of blood is reduced. This oxygen deficiency results in headache, dizziness, tension, Loss of consciousness, blurring of eye sight and cardiac arrest.

32. On the basis of chemical reactions involved, explain how do CFC's cause depletion of ozone layer in stratosphere?

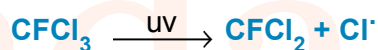
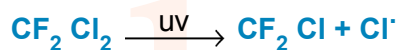
The CFC's derivatives of CH₄ and C₂H₆ are referred by trade name Freons.

These CFC's are stable, non-toxic, non corrosive and non-inflammable,

Easily liquefiable and are used in refrigerators, air- conditioners and in the production of plastic foams. CFC's are the exhaust of supersonic air craft's and jumbo jets flying in the upper atmosphere.

They slowly pass from troposphere to stratosphere.

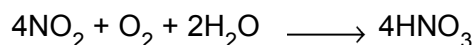
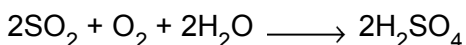
They stay for very longer period of 50 - 100 years. In the presence of uv radiation, CFC's break up into chlorine free radical



Due to this continuous attack of Cl[°] thinning of ozone layer takes place which leads to formation of ozone hole

33. How is acid rain formed? Explain its effect

Oxides of sulphur and nitrogen in the atmosphere may be absorbed by droplets of water that make up clouds and get chemically converted into sulphuric acid and nitric acid respectively as a results of pH of rain water drops to the level 5.6, hence it is called acid rain.



Some harmful effects are discussed below

(i) Acid rain causes extensive damage to buildings and structural materials of marbles. This attack on marble is termed as Stone leprosy.

(ii) Acid rain affects plants and animal life in aquatic ecosystem

(iii) It is harmful for agriculture, trees and plants as it dissolves and removes the nutrients needed for their growth.

(iv) It corrodes water pipes resulting in the leaching of heavy metals such as iron, lead and copper into the drinking water which have toxic effects.

(v) It causes respiratory ailment in humans and animals

34. Differentiate the following**(i) BOD and COD****a) Biochemical oxygen demand(BOD)**

The total amount of oxygen in milligrams consumed by microorganisms in decomposing the waste in one litre of water at 20°C for a period of 5 days is called biochemical oxygen demand (BOD)

b) BOD is used as a measure of degree of water pollution. Clean water would have BOD value less than 5 ppm whereas highly polluted water has BOD value of 17 ppm or more.

c) measure Bio-degradable pollutants

Chemical Oxygen Demand (COD)

a) BOD measurement takes 5 days so another parameter called the Chemical Oxygen Demand (COD) is measured.

b) Chemical oxygen demand (COD) is defined as the amount of oxygen required by the organic matter in a sample of water for its oxidation by a strong oxidising agent like $K_2Cr_2O_7$ in acid medium for a period of 2 hrs.

c) It is measure Bio-degradable pollutants and Non bio-degradable pollutants :

(ii) Viable and non-viable particulate pollutants**ii) a. Viable particulates**

The viable particulates are the small size living organisms such as bacteria, fungi, moulds, algae, etc. which are dispersed in air. Some of the fungi cause allergy in human beings and diseases in plants.

b. Non-viable particulates The non- viable particulates are small solid particles and liquid droplets suspended in air. They help in the transportation of viable particles. There are four types of non-viable particulates in the atmosphere.

35. Explain how oxygen deficiency is caused by carbon monoxide in our blood? Give its effect

Carbon monoxide primarily causes adverse effects by combining with hemoglobin to form carboxy hemoglobin (HbCO) preventing the blood from carrying oxygen. Additionally, myoglobin and mitochondrial cytochrome oxidase are affected

36. What are the various methods you suggest to protect our environment from pollution?

1. Waste management: Environmental pollution can be controlled by proper disposal of wastes.
2. Recycling: a large amount of disposed waste material can be reused by recycling the waste, thus it reduces the land fill and converts waste into useful forms.
3. Substitution of less toxic solvents for highly toxic ones used in certain industrial processes.
4. Use of fuels with lower sulphur content (e.g., washed coal)
5. Growing more trees.
6. Control measures in vehicle emissions are adequate.

