

LESSON AT A GLANCE

- **Environmental pollution:** It is the effect of undesirable changes in the surroundings that have harmful effects on plants, animals, and human beings.
- **Troposphere:** The lowest region of atmosphere which extends up to the height of ~ 10 km from sea level in which man and other living organism exists.
- **Stratospheric pollution:** It is above troposphere between 10 to 50 km above the sea level.
- **Acid rain:** It is caused by the presence of oxides of sulphur and nitrogen and CO_2 in the atmosphere. The pH of the rain drops below 5.6, and it becomes acidic.
- **Green House Gases:** Some gases like carbon dioxide, methane, ozone, water vapours, CFCs have the capacity to trap some of the heat radiations from the earth or from the sun. This leads to global warming.
- **Eutrophication:** When phosphate ion increases in water it increases the growth of algae which consume the dissolved oxygen in water. Consequently aquatic life is adversely affected. This results in loss of biodiversity and the phenomenon is known as Eutrophication.
- **COD (Chemical Oxygen Demand):** It is calculated as the amount of oxygen required to oxidise the polluting substances. It is measured by treating the given sample of water with an oxidising agent, generally $\text{K}_2\text{Cr}_2\text{O}_7$ in the presence of dil. H_2SO_4 .

TEXTBOOK QUESTIONS SOLVED

Q1. Define environmental chemistry.

Ans. Environmental chemistry is a multi-disciplinary subject and can be defined as the study of sources, transportation,

transformation and effects of chemical pollutants. It also outlines the various abatement and mitigation procedures which may be adopted to save the human environment.

Q2. *Explain tropospheric pollution in 100 words.*

Ans. Tropospheric pollution may be defined as the addition of one or more contaminants into the tropospheric region due to human activities or from some natural sources. Pollutants in this region are mainly gases or particulate matter consisting of finely divided solids or liquids. The gaseous pollutants include oxides of carbon (CO and CO₂), nitrogen (NO_x) and sulphur (SO₂ and SO₃), ammonia, hydrocarbons and ozone, etc. The common particulate pollutants are dust, sand, smoke, pollen grains, fog, fumes and smog.

Q3. *Carbon monoxide gas is more dangerous than carbon dioxide gas. Why?*

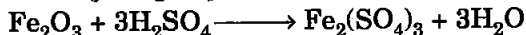
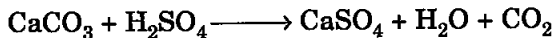
Ans. Carbon monoxide gas is more dangerous than carbon dioxide mainly due to its high affinity for haemoglobin. The normal function of haemoglobin is to carry oxygen to different parts of body and bring the carbon dioxide back. Haemoglobin has about 200 times more affinity for carbon monoxide than for oxygen. When carbon monoxide is present in air then it combines with haemoglobin at a faster rate to form carboxyhaemoglobin, so less oxygen is taken by haemoglobin. Secondly, when some carbon monoxide is present in the blood, it becomes harder for the oxygen to be released from haemoglobin in various parts of the body. The net effect of the two mechanisms is that the oxygen transportation through the body is reduced. Due to this, different parts of the body are not able to function properly and longer exposure to high concentration of carbon monoxide may ultimately lead to death. Carbon dioxide does not combine with haemoglobin and does not show any such effect although it is a greenhouse gas and leads to global warming.

Q4. *List gases which are responsible for greenhouse effect.*

Ans. The gases which cause greenhouse effect are also called greenhouse gases. The chief greenhouse gas is carbon dioxide. However, methane, chlorofluorocarbons, ozone, nitrous oxide and water vapours also contribute to this effect, though to a lesser extent.

Q5. Statues and monuments in India are affected by acid rain. How?

Ans. Acid rain affects the statues and monuments as they are generally made up of marble or sandstone. Marble is calcium carbonate whereas sandstone has a coating of iron oxide. Acids present in acid rain react with both of these and monuments are being destroyed.



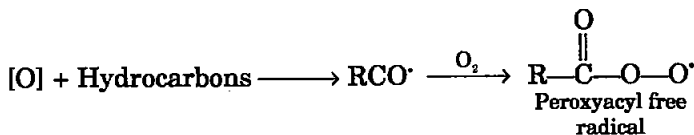
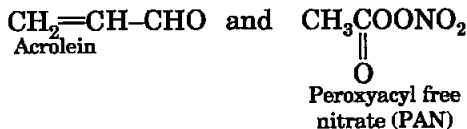
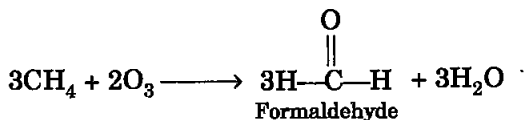
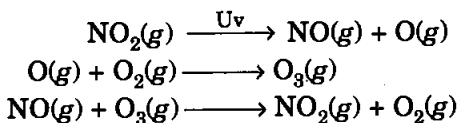
Q6. What is smog? How is classical smog different from photochemical smogs?

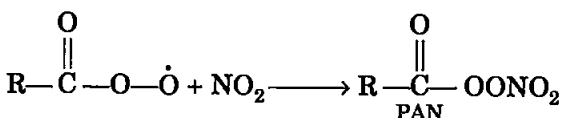
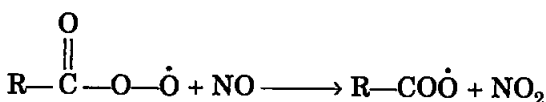
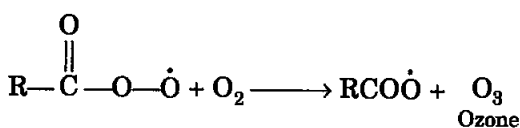
Ans. The word smog is a combination of smoke and fog. It is a type of air pollution that occurs in many cities throughout the world. Classical smog occurs in cool humid climate. It is also called as reducing smog.

Whereas photochemical smog occurs in warm and dry sunny climate. It has high concentration of oxidising agents and therefore, it is also called as oxidising smog.

Q7. Write down the reactions involved during the formation of photochemical smog.

Ans. Mechanism of formation of photochemical smog:





Q8. What are the harmful effects of photochemical smog and how can they be controlled?

Ans. Harmful effects of photochemical smog:

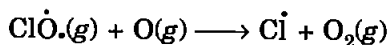
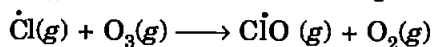
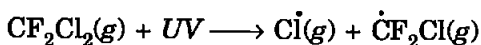
- (i) Their high concentration causes headache, chest pain and dryness of the throat.
- (ii) Ozone and PAN act as powerful eye irritants.
- (iii) Photochemical smog leads to cracking of rubber and extensive damage to plant life.
- (iv) It causes corrosion of metals, stones, building materials, and painted surface etc.

Control:

- (i) Use of catalytic converter in automobiles prevents the release of nitrogen dioxide and hydrocarbons to the atmosphere.
- (ii) Pinus, juniparus, quercus, pyrus etc can metabolise nitrogen dioxide. Thus their plantation could help to some extent.

Q9. What are the reactions involved for ozone layer depletion in the stratosphere?

Ans. The reaction can be shown as follows:



Q10. *What do you mean by ozone hole? What are its consequences?*

Ans. Depletion of ozone layer creates some sort of holes in the blanket of ozone which surround us. This is known as ozone hole.

- (i) With the depletion of the ozone layer UV radiation filters into the troposphere which leads to aging of skin, cataract, sunburn, skin cancer etc.
- (ii) By killing many of the phytoplanktons it can damage the fish productivity.
- (iii) Evaporation rate increases through the surface and stomata of leaves which can decrease the moisture content of the soil.

Q11. *What are the major causes of water pollution? Explain.*

Ans. **Causes of water pollution:**

- (i) **Pathogens:** Pathogens include bacteria and other microorganism that enter water from domestic sewage and animal excreta.

Human excreta contains bacteria such as *Escherichia coli* and *streptococcus faecalis* which cause gastrointestinal diseases.

- (ii) **Organic wastes:** Organic wastes when added to water, as these are biodegradable, bacteria decomposes organic matter and consumes dissolved oxygen in water. When the concentration of dissolved oxygen of water is below 6 ppw, the growth of fish gets inhibited. Breakdown of the organic wastes by anaerobic bacteria produces chemicals that have a foul smell and are harmful to human health.

- (iii) **Chemical pollutants:** Some inorganic chemicals as an industrial wastes dissolve in water like cadmium, mercury nickel etc. These metals are dangerous to humans and other animals. These metals can damage kidneys and central nervous system, liver etc. Petroleum products pollute many sources of water.

Q12. *Have you ever observed any water pollution in your area? What measures would you suggest to control it?*

Ans. Do yourself.

Q13. *What do you mean by Biochemical Oxygen Demand (BOD)?*

Ans. The amount of oxygen required by bacteria to breakdown the organic matter present in a certain volume of a sample of water is called Biochemical oxygen demand (BOD).

Q14. *Do you observe any soil pollution in your neighbourhood? What efforts will you make for controlling the soil pollution?*

Ans. Do yourself.

Q15. *What are pesticides and herbicides? Explain giving examples.*

Ans. Pesticides are the chemical compounds used in agriculture to control the damages caused by insects, rodents, weeds and various crop diseases.

Example: Aldrin, Dilldrin, B.H.C etc.

Herbicides: These are the chemicals used to control weeds.

Example: Triazines.

Q16. *What do you mean by green chemistry? How will it help decrease environmental pollution?*

Ans. Green chemistry is a way of thinking and is about utilising the existing knowledge and principles of chemistry and other sciences to reduce the adverse effect of pollution.

For example:

(i) Automobile engines have been fitted with catalytic converters which prevent the release of the vapours of hydrocarbons and oxides of nitrogen into acrolein and peroxyacetyl nitrate.

(ii) CO_2 has replaced CFCs as blowing agents in the manufacture of polystyrene foam sheets.

Q17. *What would have happened if the greenhouse gases were totally missing in the earth's atmosphere? Discuss.*

Ans. The main greenhouse gases present in earth's atmosphere are CO_2 , CH_4 , O_3 and water vapours. They absorb part of the heat received from sun and keep the atmosphere warm near the earth surface. Due to this warm temperature, life sustains on earth. If there were no greenhouse gases, probably there would have been no life on earth.

Q18. *A large number of fish are suddenly found floating dead on a lake. There is no evidence of toxic dumping but you find an abundance of phytoplankton. Suggest a reason for the fish kill.*

Ans. Fishes can die either due to the presence of some poisonous substances or due to lack of oxygen. Since in this case there is no evidence of toxic dumping, so it can be only scarcity of oxygen. It can be due to phytoplankton present in water. Aerobic bacteria decompose this organic

matter and use up a large amount of oxygen. If the level of dissolved oxygen falls below 6 ppm, fishes die.

Q19. *How can domestic waste be used as manure?*

Ans. Domestic waste consists of biodegradable waste which can be connected into manure by suitable method.

Q20. *For your agricultural field or garden you have developed a compost producing pit. Discuss the process in the light of bad odour, flies and recycling of wastes for a good produce.*

Ans. The compost producing pit should be kept covered so that flies cannot make entry into it and bad odour is minimised. The waste materials which are non-biodegradable like glasses, plastic bags, papers must be handed over to the vendors who can send them to the recycling plants.

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