

Chapter 13. Environmental Chemistry

Question-1

What are the differences between Tropospheric pollution and stratospheric pollution?

Solution:

Tropospheric Pollution	Stratospheric Pollution
1. Pollution in atmosphere up to 10 km from sea level.	Pollution in atmosphere from between 10 - 50 km from sea level.
2. Pollution affects air (80% or total air) and moisture of atmosphere.	Pollution depletes ozone layer.
3. Pollution widespread	Pollution is narrow

Question-2

What are biodegradable and non-biodegradable pollutants?

Solution:

(i) **Biodegradable pollutants** are materials such as domestic sewage, cow dung etc. which are easily decomposed by the micro-organisms either by nature itself or by suitable treatment and thus not harmful but if these are present in excess in the environmental they do not go degradation completely and thus become pollutants.

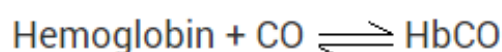
(ii) **Non-biodegradable pollutants:** These are materials such as mercury, aluminium, D.D.T. etc. which do not undergo degradation or degrade very slowly, but their presence even in very small quantity in the environment is very harmful for the humans as well as plants. They may react with other compounds present in the environment and produce even more toxic compounds.

Question-3

How does carbon monoxide acts as a poison for human beings?

Solution:

Carbon monoxide is poisonous because it combines with haemoglobin of the red blood corpuscles (R.B.C) about 300 times more easily than does oxygen to form carboxy haemoglobin reversibly as follows:



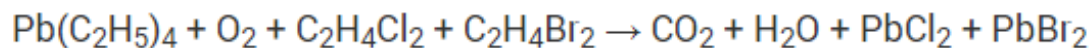
The maximum permissible concentration of CO in the ambient air(Surrounding air) is 40 ppm for an exposure 6-8 hours. At concentration of greater than 100 ppm difficulty in breathing starts and there is headache and dizziness. Concentration of 750 ppm or more lead to acute oxygen starvation(called anoxia or asphyxiation) and lead to coma or death.

Question-4

How do lead halides enter into atmosphere as pollutants?

Solution:

Tetraethyl Lead $\text{Pb}(\text{C}_2\text{H}_5)_4$ is added to gasoline to act as an anti-knocking agent. During combustion in the engine, it is oxidised to PbO which deposits in different parts of the engine and may cause damage. To avoid this damage $\text{Pb}(\text{C}_2\text{H}_5)_4$ is mixed with dichloroethane and dibromoethane which converts PbO into PbCl_2 and PbBr_2 which are volatile and thus come along with the exhaust gases and introduced into the atmosphere.



This engine is protected but air gets polluted.

Question-5

Comment upon the state "Green chemistry is an alternative tools for reducing pollution".

Solution:

Green chemistry focuses on processes and products that reduce or eliminate the use and generation of hazardous substances. This may be achieved by following the aspects.

- 1) The use of starting materials – reagents and solvents that pose less hazards to man and his environment.
- 2) Using raw materials more efficiently generating less waste. This may be achieved by adopting only the reactions are simple additions, which completely converts reactants into products directly, without intermediate.
- 3) Date bases of information on the hazardous and toxic properties of chemicals, should be utilized by scientific commonly.

Development of a new method of synthesizing ibu profen which involves less use of solvents and waste; production of a herbicide by catalytic dehydrogenation of diethalamine without using cyanide and HCHO, using CO₂ instead of chlorofluoro carbon as a boiling agent in the manufacture of polystyrene focus, and use of a easily degradable, 'sea-nine' as a anti bonding compound are the few examples for the achievement in Green Chemistry.

Question-6

How plant nutrients and pesticides act as water pollutants?

Solution:

Plant nutrients (containing N and P) flow into lakes where they support the growth of aquatic plants. These plants on decay produce unpleasant odour. Further the microorganisms in decomposing these plants consume oxygen as a result the amount of dissolved oxygen in the water decreases which proves fatal for the aquatic lives i.e. fish.

Pesticides. These are organic compounds which are used to protect plants from pests. These are also used to stop the growth of weeds. These are mild poisons. These pesticides include insecticides (to kill insects) fungicides (to kill rodents such as fungi or mold), rodenticides (to kill rodents such as rats and mice).

They flow into lakes along with rain water causing problems to aquatic as well as human life.

Question-7

What is the international standards for drinking water.

Solution:

F^- = 1 ppm = To avoid teeth decay. If excess 10 ppm it is harmful to bones & teeth.

Pb^{2+} = 50 ppb ($\mu g\ dm^{-3}$)

pH = pH should be between 5.5 and 9.5

If the pH is lower than 5.5, water may dissolve metals.

Other metals

Zn – 5 ppm;

Cd - 0.005 ppm

Mn – 0.05 ppm

Fe - 0.2 ppm

Cu - 3 ppm

Se - 0.2 ppm

SO_4^{2-} 500 ppm - produces a laxative effect

NO_3^- 50 ppm; excess nitrate leads to 'blue – baby' syndrome.

Question-8

Explain the processes involved in the safe disposal wastes?

Solution:

Recycling

When materials are recycled, cost of raw materials as well as waste disposal are also reduced. (ex: a) use of break bottles in glass industry, b) use of scrap metal in steel manufacturing, c) burning of combustible waste to get energy. Recycling convert waste into wealth.

Sewage treatment

- 1) The removal of large solids by filtering the waste water through screens and disposal of in land fill sites.
- 2) Settlement in tanks to allow the removal of solids that settle (sludge)
- 3) The degradation of the organic content of waste water by microbial oxidation
- 4) Removal of phosphates, coagulating filtration and disinfection using chlorine and used to improve quality of waste water. Sludge is dried and the may be incinerated, digested or dumped.

Question-9

Briefly explain 'electrostatic precipitation' method for controlling particulate pollution.

Solution:

The air containing the particulates is allowed to enter a tall chamber in which the electrode in the centre is subjected to a negative potential of 30,000 – 40,000 volts, whereas peripheral electrode is earthed. The air inside get ionized into positive ions and electrons. The electrons are absorbed on the particulates thereby giving them a negative charge. They are then attracted towards the positive peripheral electrode on which they accumulated and are removed by vibrating the electrode.

Question-10

What are the effects of oil pollution in sea water?

Solution:

Effects of oil pollution in sea water

- (i) Oil spills causes heavy damage to fishes. Oil coating makes them unable to respire and close their gill slits. Aromatic compounds present in them are a poison for the fishes.
- (ii) Emulsified oil goes deep down into the sea damaging aquatic animals and plants.
- (iii) Oil spills results in reduction of dissolved oxygen (P. O.)
- (iv) The most affected by oil pollution are the sea-birds. Natural insulating oil and waxes which shield the birds from water are broken down by the spilled oil. As a result due to loss of insulation, they start shivering and are frozen to death, especially in winter.

Environmental Chemistry

Short Answer Type Questions

1. Green house effect leads to global warming. Which substances are responsible for green house effect?
2. Acid rain is known to contain some acids. Name these acids and where from they come in rain?
3. Ozone is a toxic gas and is a strong oxidising agent even then its presence in the stratosphere is very important. Explain what would happen if ozone from this region is completely removed?
4. Dissolved oxygen in water is very important for aquatic life. What processes are responsible for the reduction of dissolved oxygen in water?
5. On the basis of chemical reactions involved, explain how do chlorofluorocarbons cause thinning of ozone layer in stratosphere.
6. What could be the harmful effects of improper management of industrial and domestic solid waste in a city?
7. During an educational trip, a student of botany saw a beautiful lake in a village. She collected many plants from that area. She noticed that villagers were washing clothes around the lake and at some places waste material from houses was destroying its beauty.
8. After few years, she visited the same lake again. She was surprised to find that the lake was covered with algae, stinking smell was coming out and its water had become unusable. Can you explain the reason for this condition of the lake?
9. What are biodegradable and non-biodegradable pollutants?
10. What are the sources of dissolved oxygen in water?
11. What is the importance of measuring BOD of a water body?
12. Why does water covered with excessive algal growth become polluted?
13. A factory was started near a village. Suddenly villagers started feeling the presence of irritating vapours in the village and cases of headache, chest pain, cough, dryness of throat and breathing problems increased. Villagers blamed the emissions from the chimney of the factory for such problems.

14. Explain what could have happened. Give chemical reactions for the support of your explanation.
15. Oxidation of sulphur dioxide into sulphur trioxide in the absence of a catalyst is a slow process but this oxidation occurs easily in the atmosphere.
16. Explain how does this happen. Give chemical reactions for the conversion of SO_2 into SO_3 .
17. From where does ozone come in the photochemical smog?
18. How is ozone produced in stratosphere?
19. Ozone is a gas heavier than air. Why does ozone layer not settle down near the earth?
20. Some time ago formation of polar stratospheric clouds was reported over Antarctica. Why were these formed? What happens when such clouds break up by warmth of sunlight?
21. A person was using water supplied by Municipality. Due to shortage of water he started using underground water. He felt laxative effect. What could be the cause?

Long Answer Type Questions

1. How can you apply green chemistry for the following :
 - (i) to control photochemical smog.
 - (ii) to avoid use of halogenated solvents in drycleaning and that of chlorine in bleaching.
 - (iii) to reduce use of synthetic detergents.
 - (iv) to reduce the consumption of petrol and diesel.
2. Green plants use carbon dioxide for photosynthesis and return oxygen to the atmosphere, even then carbon dioxide is considered to be responsible for green house effect. Explain why?
3. Explain how does green house effect cause global warming.
4. A farmer was using pesticides on his farm. He used the produce of his farm as food for rearing fishes. He was told that fishes were not fit for human consumption because large amount of pesticides had accumulated in the tissues of fishes. Explain how did this happen?
5. For dry cleaning, in the place of tetrachloroethane, liquefied carbon dioxide with suitable detergent is an alternative solvent. What type of harm to the environment will be prevented by stopping use of tetrachloroethane? Will use of liquefied carbon dioxide with detergent be completely safe from the point of view of pollution? Explain.

CBSE Class 11 Chemistry
Important Questions
Chapter 14
Environmental Chemistry

1 Marks Questions

1. What is troposphere?

Ans: The lowest region atmosphere in which the human beings along with other organisms live is called troposphere. It extends upto the height of ~ 10 km from sea level.

2. Name some gaseous air pollutants.

Ans: Gaseous air pollutants are oxides of sulphur, nitrogen and carbon, hydrogen sulphide, hydrocarbons, ozone and other oxidants.

3. What are the diseases caused by sulphur dioxide?

Ans: Sulphur dioxide causes respiratory diseases eg. asthma, bronchitis, emphysema in human beings, sulphur dioxide causes irritation to the eyes, resulting in tears and redness.

4. List gases which are responsible for green house effect?

Ans: Carbon dioxide, methane, water vapors, nitrous oxide, CFC's and ozone are responsible for green house effect.

5. What is the effect of CFC's on ozone layer?

Ans: Chlorofluorocarbon (CFC's) damage the ozone layer and creates holes in ozone layer.

6. What is greenhouse effect?

Ans: Atmosphere traps the Sun's heat near the Earth's surface and keeps it warm. This is Greenhouse effect.

7. Which disease is caused due to ozone layer depletion?

Ans: Ultraviolet rays reaching the earth passing through the ozone hole cause skin cancer.

8. What is smog?

Ans: When smoke with fog, it is called smog.

9. The London smog is caused in which season and time of the day?

Ans: The London smog is caused during summer season and in the afternoon part of the day when it is very hot.

10. Name two gases which form acid rain.

Ans: SO_2 and NO_2 .

11. Which acid is present in the acid rain?

Ans: The acids present in the acid rain are

H_2SO_4 , HNO_3 and HCl .

12. What is PAN?

Ans: PAN is Peroxy acetyl nitrate.

13. When does rain water become acid rain?

Ans: When pH of rain water becomes as low as 2 to 3.5. It forms acid rain.

14. What is BOD?

Ans: BOD stands for Biochemical Oxygen Demand.

15. Define green chemistry.

Ans: The branch of chemistry that emphasizes on the processes and products that reduce or eliminate the use and generation of toxic / hazardous substances is called green chemistry.

16. What are pesticides?

Ans: Pesticides are those chemicals which are used to destroy pests, rats, parasites and fungi.

17. What should be the pH of drinking water?

Ans: The pH of drinking water should be between 5.5 and 9.5.

18. What is the desirable concentration of fluoride ion (F⁻) in drinking water?

Ans: 1 ppm or 1 mg dm⁻³ is desirable concentration of F⁻ ions in drinking water.

19. What is an insecticide?

Ans: Insecticides are used to control insects and curv disease (for eg. malaria and yellow fever) and protect crops. Eg. DDT.

20. Name two air pollutants which forms photochemical smog.

Ans: PAN and O₃

21. What is the effect of excess of SO₄²⁻ ion in drinking water

Ans: Excess of SO₄²⁻ in drinking water (> 500 ppm) may cause a laxative effect.

CBSE Class 12 Chemistry
Important Questions
Chapter 14
Environmental Chemistry

2 Marks Questions

1. What is the role of ozone layer in the stratosphere?

Ans. The presence of ozone in the stratosphere prevents about 99.5% of the sun's harmful ultraviolet (uv) radiations from reaching the earth's surface and thereby protecting humans and other animals from its effect.

2. What includes stratospheric pollutants? Give examples.

Ans Depletion of ozone layer in stratospheres leading to reach harmful uv radiation on earth is the result of stratospheric pollution. The presence of chloro fluoro carbon compounds in the atmosphere is responsible for this depletion.

3. Why is carbon monoxide considered to be poisonous?

Ans. Carbon monoxide binds to hemoglobin to form carboxyl – haemoglobin, which is about 300 times more stable than the oxygen – haemoglobin complex. In blood when the concentration of carboxyl hemoglobin is greatly reduced. This oxygen deficiency, results into headache, weak eyesight, nervousness and cardiovascular disorder.

4. What are the ill-effects of hydrocarbons?

Ans. Hydrocarbons are carcinogenic i. e; they cause cancer. They harm plants by causing ageing, breakdown of tissues and shedding of leaves flowers and trigs.

5. Give one main reason of ozone depletion?

Ans. The main reason of ozone depletion is the release of chlorofluoro compounds (CFC's) in

the atmosphere also known as Freon.

6. Which zone is called ozonosphere?

Ans Stratosphere zone is called ozonosphere.

7. What is 'greenhouse effect'? How does it affect the global climate?

Ans The warming of the earth or global warming due to re-emission of sun's energy absorbed by the earth followed by its absorption by CO₂ molecules and H₂O vapours present in the atmosphere, near the earth's surface and then its radiation back to the earth is called greenhouse effect.

Greenhouse affects the climate. If the rate at which solar radiation are arriving the earth continues, then the entire global climate is going to change drastically.

8. How can photochemical smog be controlled?

Ans If we control the primary precursors of photochemical smog such as NO₂ and hydrocarbons, the secondary precursors such as ozone and PAN, the photochemical smog will automatically be reduced. Usually catalytic converters are used in the automobiles which prevent the release of nitrogen oxide and hydrocarbon to the atmosphere. Certain plants eg. Pines, Juniperus, Quercus, Pyrus and Vitis can metabolise nitrogen oxide and their plantation could help in this matter.

9. What is the composition of photochemical smog?

Ans Photochemical smog is formed as a result of photochemical reaction (i. e; in the presence of sunlight) between oxides of nitrogen and hydrocarbons.

10. What does the amount of BOD signify?

Ans The amount of BOD in water is a measure of the amount of organic material in the water, in terms of how much oxygen will be required to break it down biologically. Clean

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

11.What is pneumoconiosis?

Ans The smaller particulate pollutants are more likely to penetrate into the lungs. These five particles are carcinogens Inhalation of small particles irritates the lung and exposure to such particles for long period of time causes fibrosis of the lung lining. These type of disease is termed as pneumoconiosis.

CBSE Class 12 Chemistry
Important Questions
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3 Marks Questions

1. What are the harmful effects of oxides of nitrogen in atmosphere?

Ans (i) High concentration of NO_2 in atmosphere is harmful to plants resulting in leaf spotting, retardation of photosynthetic activity and also suppression the vegetation growth.

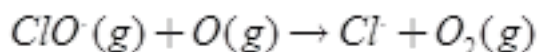
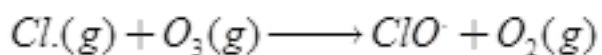
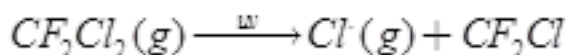
(ii) Nitrogen dioxide (NO_2) results in respiratory problems in human beings and leads to bronchitis. It causes acid rain. Produce photochemical smog.

(iii) Oxides of nitrogen have harmful effects on the nylon, rayon and cotton yarns and also cause cracks in rubber.

(iv) They also react with react with ozone (O_3) present in the atmosphere, and, their decrease the density of ozone.

2. What are the reactions involved for ozone layer depletion in the atmosphere?

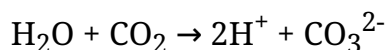
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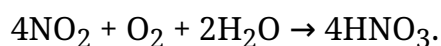
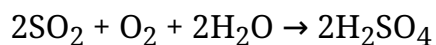
3. Why does rain water normally have a pH of about 5.6? When does it become acid rain,

Ans . Rain water normally has a pH of 5.6 due to the formation of H^+ ions from the reaction

of rain water with CO₂ present in the atmosphere.



When the value of pH drops below 5.6, it becomes acidic. Acid rain is also formed due to the presence of oxides of sulphur and nitrogen in the atmosphere.



4. Discuss the water pollution caused by industrial water?

Ans. The compounds of lead, mercury, Cd, Ni, Co, Zn etc which are the products of chemical reactions, carried in the industrial units, pollute water to a large extent and are responsible for many disease. Mercury leads to Minamata disease, lead poisoning leads to many deformities. In addition, these substances add to the soil and harmfully affect the plant growth and the whole soil biotic system. Both ground water and water bodies are polluted due to chemical reactions known as leaching.

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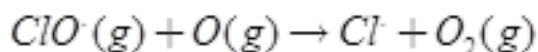
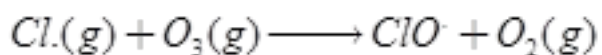
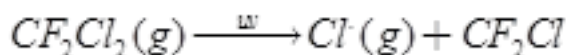
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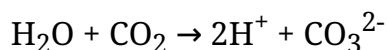
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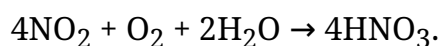
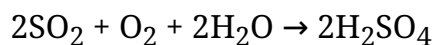
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