

Class 11 Environmental Chemistry Important Questions with Answers

Short Answer Type Questions

Q1. Greenhouse effect leads to global warming. Which substances are responsible for green house effect?

Answer:

The greenhouse effect is caused by the trapping of heat by greenhouse gases such as carbon dioxide, methane, nitrous oxide (N_2O), ozone, and chlorofluorocarbons (CFCs).

Q2. Acid rain is known to contain some acids. Name these acids and where do they come in rain?

Answer:

Nitric acid, sulphuric acid, and carbonic acid are the most frequent acids found in acid rain. Nitric acid is created when nitric oxide in the air is converted to NO_2 and NO_3 , which dissolve in water in the air. The oxidation of SO_2 to SO_3 in the presence of air produces sulphuric acid, which is then dissolved in water. Carbonic acid is formed when CO_2 in the acid dissolves with water.

Q3. 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?

Answer:

The stratosphere is made up of ozone gas (O_3), which shields us from the sun's harmful UV rays ($\lambda = 225 \text{ nm}$). UV radiation can cause melanoma, cataract formation in the eyes, genetic mutation, and crop destruction in humans. It also has the potential to harm aquatic vegetation and animals. The discharge of chlorofluorocarbons (CFCs) into the atmosphere is the primary cause of ozone depletion.

As a result, we may state that while O_3 is hazardous to us in the troposphere, it protects us from damaging radiation in the stratosphere.

Q4. Dissolved oxygen in water is very important for aquatic life. What processes are responsible for the reduction of dissolved oxygen in water?

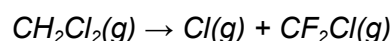
Answer:

Excessive use of phosphatic and nitrate fertilisers, detergents, human sewage discharge, and organic waste from the food, paper, and pulp industries are all factors that contribute to a decrease in dissolved oxygen in the water. Oxidising bacteria utilised oxygen dissolved in water as well. Furthermore, photosynthesis ceases at night, while aquatic plants continue to respire, resulting in dissolved oxygen depletion.

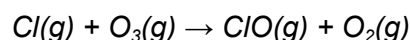
Q5. On the basis of chemical reactions involved, explain how de chlorofluorocarbons cause thinning of the ozone layer in the stratosphere.

Answer:

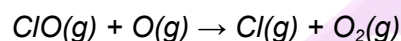
Chlorofluorocarbons are broken down by intense UV radiations in the stratosphere, generating chlorine free radical.



The chlorine radical reacts with ozone in the stratosphere to produce chlorine monoxide radicals and molecular oxygen.



More chlorine radicals are produced when a chlorine monoxide radical reacts with atomic oxygen.



The chlorine radicals are constantly replenished, causing ozone depletion. CFCs are thus transportation agents for the ongoing generation of chlorine radicals in the stratosphere, causing ozone layer damage.

Q6. What could be the harmful effects of improper management of industrial and domestic solid waste in a city?

Answer:

Domestic waste in a city that is not adequately handled could end up in sewers or being eaten by cattle. Non-biodegradable garbage, such as polythene bags and metal refuse, clog drains. If the polythene bags are swallowed by the animals, they will die. Similarly, improper management of industrial waste will result in pollution of the air, land, and water.

Q7. During an educational trip, a botany student 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. After a 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?

Answer:

The destruction of the lake was caused by the improper disposal of domestic garbage created in villagers' homes, as well as the use of organic chemicals such as detergents in the lake. These materials operate as a nutrient, promoting the rapid growth of algae and other aquatic plants, as well as bacteria that produce a terrible odour.

Eutrophication is a process in which the concentration of these nutrients increases over time. The process of eutrophication occurs when the amount of dissolved oxygen in water decreases.

Q8. What are biodegradable and non-biodegradable pollutants?

Answer:

Biodegradable pollutants are those that are degraded by microorganisms, such as leftover vegetables and fruits, sewage, and cow dung.

Mercury, polythene, aluminium DDT, and other non-biodegradable pollutants cannot be digested by microbes.

Q9. What are the sources of dissolved oxygen in water?

Answer:

Photosynthesis, natural aeration, and mechanical aeration are all sources of dissolved oxygen in water. Microscopic algae provide the majority of the oxygen in a pond. These make oxygen through a process known as photosynthesis and thus release oxygen into the pond water.

Q10. What is the importance of measuring the BOD of a water body?

Answer:

The biological oxygen demand, or B.O.D., is a metric for the amount of pollution in water generated by organic biodegradable materials. BOD in water is a measurement of the quantity of organic material present in water in terms of how many oxygen molecules are required to break it down biologically. A BOD value of less than 5 ppm indicates that the water is clean, whereas a BOD value of 17 ppm or above indicates that the water is extremely polluted.

Q11. Why does water covered with excessive algal growth become polluted?

Answer:

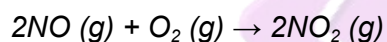
The presence of high algal development indicates that the water contains a lot of phosphate due to fertiliser influx from the surroundings. The decomposition of algae produces a foul odour and an unappealing appearance, making it unsuitable for swimming, boating, and other activities, as well as a fall in dissolved oxygen content, which may be detrimental to aquatic life.

Q12. 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. Explain what could have happened. Give chemical reactions for the support of your explanation.

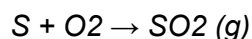
Answer:

Nitrogen oxide and sulphur oxide are discharged from the manufacturing chimney, according to symptoms noted in a village. These are made by burning fossil fuels such as gasoline, coal, natural gas, and so on.

As illustrated below, dinitrogen and dioxygen combine to form a large amount of NO and NO₂:



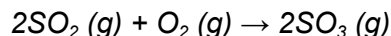
Sulphur dioxide (SO₂) is created by burning sulphur-containing fossil fuels or roasting sulphide ores such as iron pyrites, copper pyrites, and other sulphide ores.



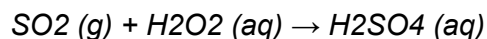
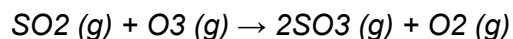
Q13. Oxidation of sulphur dioxide into sulphur trioxide in the absence of a catalyst is a slow process but this oxidation occurs easily in the atmosphere. Explain how does this happen. Give chemical reactions for the conversion of SO₂ into SO₃.

Answer:

Sulphur dioxide oxidation without a catalyst is weak. The oxidation of Sulphur dioxide to Sulphur trioxide is catalysed by the presence of particulate matter in contaminated air.



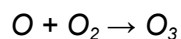
Ozone or hydrogen peroxide can speed up the reaction,



Q14. From where does ozone come in the photochemical smog?

Answer:

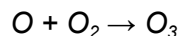
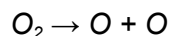
When nitrogen oxides from automobile engines are discharged into the atmosphere, they combine with sunlight to form single oxygen atoms. Ozone is created when these atoms interact with molecular oxygen.



Q15. How is ozone produced in stratosphere?

Answer:

There are two processes in the creation of ozone in the stratosphere. The sun's UV radiation has enough energy to break dioxygen into two oxygen atoms in the first phase. The oxygen atoms react with additional dioxygen to generate ozone in the second phase.



Q16. Ozone is a gas heavier than air. Why does ozone layer not settle down near the earth?

Answer:

At a height of 25 to 30 kilometres above the earth's surface, an ozone layer forms in the stratosphere. The force of gravity is insignificant at this altitude, thus the ozone layer does not settle.

Ozone is also thermodynamically unstable, decomposing into molecular oxygen. As a result, there is a dynamic equilibrium between ozone generation and breakdown.

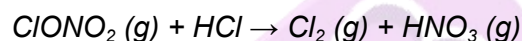
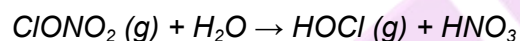
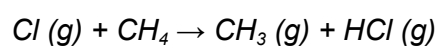
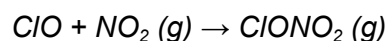
Q17. Some time ago formation of polar stratospheric clouds was reported over Antarctica. Why were these formed? What happens when such clouds break up by warmth of sunlight?

Answer:

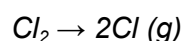
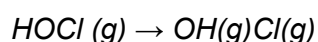
Scientists operating in Antarctica have observed ozone layer depletion, or the presence of an ozone hole, over the Antarctic region's South Pole. Based on the seasons, it was discovered that a unique set of factors was responsible for the ozone hole.

In the summer, nitrogen dioxide and methane react with chlorine monoxide and chlorine atoms to generate chlorine sinks, which prevent ozone depletion, whereas in the winter, polar stratospheric clouds accumulate over Antarctica.

Polar stratospheric clouds occur over Antarctica during the winter season, providing a surface on which chlorine nitrate is hydrolyzed and hypochlorous acid is produced. It also forms molecular chlorine when it interacts with HCl.



When the sun comes again in the spring, the warmth of the sun breaks through the cloud, photolyzing HOCl and Cl₂,



The chlorine radicals that result start the ozone depletion chain reaction.

Q18. 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?

Answer:

Only when the sulphate concentration in water exceeds 500 ppm does the laxative action appear. At moderate concentrations, sulphate is safe, but at 500 ppm, it causes laxative effects and hypertension.

Long Answer Type Questions

Q1. How can you apply green chemistry for the following:

- (i) to control photochemical smog.
- (ii) to avoid the use of halogenated solvents in drycleaning and that of chlorine in bleaching.
- (iii) to reduce the use of synthetic detergents.
- (iv) to reduce the consumption of petrol and diesel.

Answer:

i) Minimizing the release of nitrogen oxides and hydrocarbons into the atmosphere is the most straightforward strategy to limit or prevent the production of photochemical smog. The following methods can be used to reduce nitrogen oxides and hydrocarbons:

- (a) The hazardous gases are catalytically transformed into harmless gases by installing efficient catalytic converters in autos.
- (b) Spraying some compounds into the atmosphere produces free radicals that readily mix with the free radicals that start the reactions, generating deadly photochemical smog compounds. Smog-inhibiting properties have been discovered in the chemical diethyl hydroxylamine.
- (c) Plants like pinus, juniperus, pyrus, vitis, and others may metabolise nitrogen oxides.

ii) Dry cleaning solvents are typically chlorinated chemicals, which are carcinogenic. To replace the chlorinated chemicals, suitable detergents that function in liquid carbon dioxide have been developed. H_2O_2 is used instead of Cl_2 to bleach garments in the laundry, which produces superior results and is not toxic. Previously, Cl_2 gas was employed to bleach paper. Chlorine is an extremely harmful substance found in nature. In the presence of a sufficient catalyst, it has been replaced by H_2O_2 .

iii) To limit the usage of synthetic detergents as a cleaning agent, the use of soaps manufactured from vegetable oils should be prioritized. Vegetable oils degrade naturally, whereas detergents do not.

iv) CNG (Condensed Natural Gas) and LNG (Liquefied Natural Gas) have been favoured to petrol and diesel since they are pollution-free fuels. Other fuels, such as hydrogen, ethyl alcohol, and so on, can be used instead of gasoline and diesel.

Q2. 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?

Answer:

Carbon dioxide is a naturally occurring component of the atmosphere that is essential for all plant life. It makes up around 0.033 per cent of the atmosphere's volume. It aids in maintaining the earth's temperature, which is necessary for living beings. CO_2 balance is maintained in the atmosphere because CO_2 is created by respiration, fossil fuel combustion, and limestone disintegration, but it is also consumed by plants during photosynthesis.

However, human activities have disrupted this equilibrium, and CO_2 levels in the atmosphere are rising. This is because deforestation has increased by around 25% in the last century. The average temperature of the earth has risen by 0.4°C to 0.8°C over the last approximately 120 years. According to current estimates, a doubling CO_2 concentration will result in a temperature increase of between 1.0°C and 3.5°C . The contribution of CO_2 to the greenhouse effect is 50%, and the contribution of other trace gases is similarly about 50%.

Q3. Explain how does green house effect cause global warming.

Answer:

The greenhouse effect is defined as the trapping of the sun's heat in the lower atmosphere as a result of increased pollution-causing chemicals such as carbon dioxide. Water vapour, carbon dioxide (CO_2), methane, nitrous oxides, and chlorofluorocarbons are some of the gases that contribute to the greenhouse effect (CFCs).

The sun's radiation is partially absorbed by the earth, with the remainder being reflected back into the atmosphere and escaping. However, greenhouse gases form a blanket in the atmosphere, trapping radiation and preventing it from leaving. As a result, the earth's temperature rises, resulting in global warming.

Q4. 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 amounts of pesticides had accumulated in the tissues of fishes. Explain how did this happen?

Answer:

Pesticides are poisonous man made substances that have negative environmental consequences. Organic poisons are mostly non-biodegradable and insoluble in water. Because they are highly persistent, they are transported from the lower trophic level to the higher trophic level. Toxin concentrations in higher animals rise over time, causing major metabolic and physiological problems. They infiltrate the food chain and, as a result, pose a risk to human consumption.

Q5. 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.

Answer:

Previously, tetrachloroethene ($\text{Cl}_2\text{C} = \text{CCl}_2$) was employed as a dry cleaning solvent. The chemical is a suspected carcinogen that contaminates groundwater.

This substance is now being replaced by a technique that uses liquid carbon dioxide in conjunction with a suitable detergent. Groundwater will be less harmed if halogenated solvents are replaced with liquid CO_2 .

Nowadays, hydrogen peroxide (H_2O_2) is utilised to bleach textiles in the laundry process, which produces better outcomes while using less water.