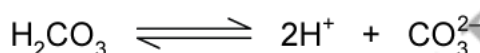
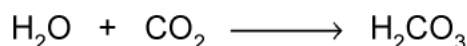
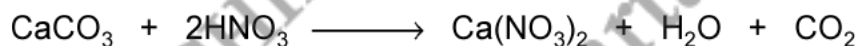
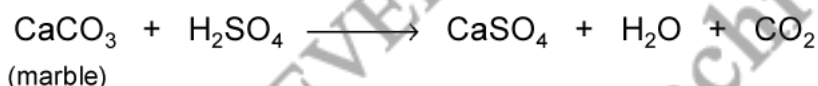
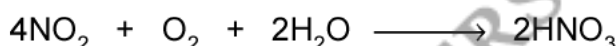
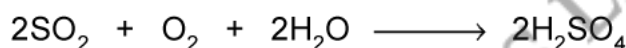


- Q1. Write a short note on photochemical smog.
- Q2. What are PCBs?
- Q3. A person was using water supplied by Municipality. Due to shortage of water he started using underground water. He felt laxative effect. What could be the cause?
- Q4. What do you mean by Biochemical Oxygen Demand (BOD)?
- Q5. Have you ever observed any water pollution in your area? What are the major causes of water pollution? Explain.
- Q6. Which acid is not present in acid rain?
 HNO_3 , H_2SO_3 , H_2SO_4 , CH_3COOH , H_2CO_3 .
- Q7. Statues and monuments in India are affected by acid rain. How?
- Q8. List gases which are responsible for greenhouse effect.
- Q9. Explain tropospheric pollution in 100 words.
- Q10. Write down the reactions involved during the formation of photochemical smog.
- Q11. What is smog? How is classical smog different from photochemical smog.
- Q12. Define environmental chemistry.
- Q13. Carbon monoxide gas is more dangerous than carbon dioxide gas. Why?
- Q14. What are the harmful effects of photochemical smog and how can they be controlled?
- Q15. What are the major causes of water pollution? Explain.
- Q16. What do you mean by ozone hole? What are its consequences?
- Q17. What are pesticides and herbicides? Explain giving examples.
- Q18. Do you observe any soil pollution in your neighbourhood? What efforts will you make for controlling the soil pollution?
- Q19. State briefly the reactions causing ozone layer depletion in the stratosphere.
- Q20. Write short note on Green Chemistry. Explain with the help of example.
- Q21. What do you understand by BOD and COD? How are they determined?
- Q22. Define an environmental pollutant. What do you understand by an environmental pollution model?
- Q23. What is environmental chemistry discuss its social relevance.
- Q24. (a) What is the cause of acid rain? How is it harmful to the environment?
(b) What do you understand by greenhouse effect? What are the major greenhouse gases?

- S1.** PCDDs are Polychlorodiibenzodioxins.
PCDFs are Polychlorodiibenzofurans.
- S2.** PCBs are Polychlorinated biphenyls.
- S3.** Excess of SO_4^{2-} ions *i.e.*, > 500 ppm in underground drinking water could be the cause of laxative effect.
- S4.** **BOD:** It is defined as the amount of oxygen required by bacteria to break down organic materials present in water
- S5.** Yes, there is water pollution. Sewage water should not be mixed with drinking water. Water purifier should be used before drinking water.
- S6.** CH_3COOH (Acetic acid) is not present in acid rain.
- S7.** When pH of the rain drops is below 5.6, it is called acid rain.

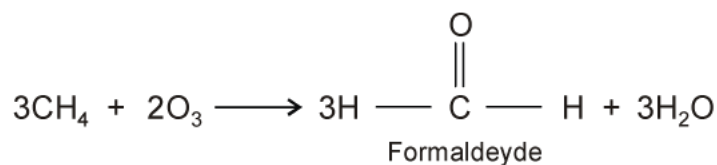
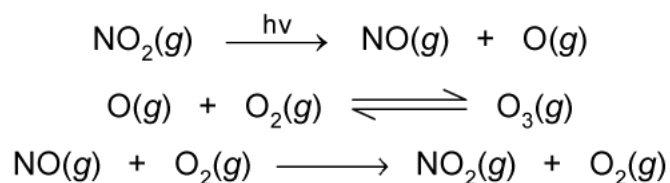


Acid rain affects statues and monuments like Taj Mahal made up of calcium carbonate.

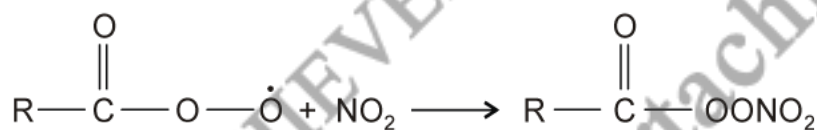
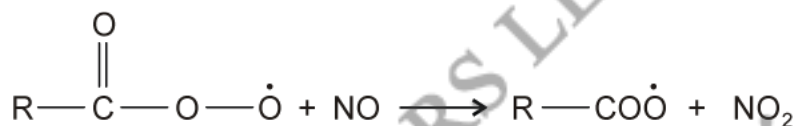
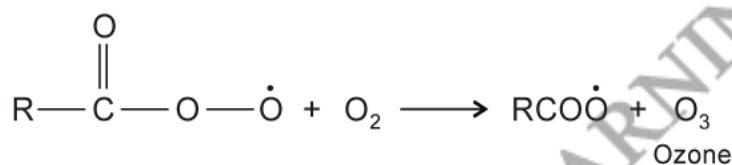
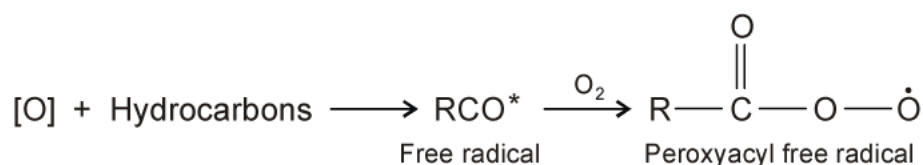


- S8.** Carbon dioxide, methane, ozone, chlorofluorocarbons and water vapours in atmosphere are responsible for greenhouse effect.
- S9. Tropospheric Pollution:** It is due to presence of undesirable solid or gaseous particles in air.
- (a) **Gaseous Air Pollutants:** These are oxides of sulphur, nitrogen and carbon, hydrogen sulphide, hydrocarbons, ozone and other oxidants.
- (b) **Particulate Pollutants:** These are dust, mist, fumes, smoke and smog.

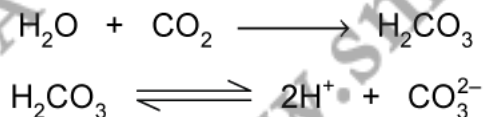
When fossil fuels are burnt, oxides of sulphur are formed. SO_2 is harmful to animals as well as plants. It causes irritation to eyes, resulting in tears and redness. High concentration of SO_2 leads to falling of flowers. SO_3 is more harmful than SO_2 . leads to falling of flowers. Oxides of nitrogen NO and NO_2 are produced in atmosphere by combustion of petrol and diesel. NO depletes ozone layer and is extremely harmful.

S10. Mechanism of formation of Photochemical Smog:

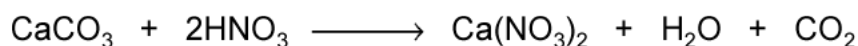
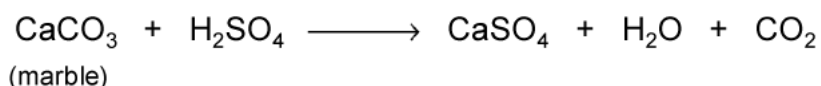
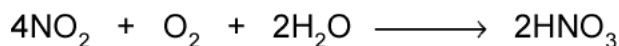
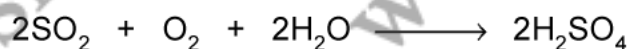
Acrolein ($\text{CH}_2 = \text{CH} - \text{CHO}$) and peroxyacyl nitrate are highly injurious to eyes.



S11. When pH of the rain drops is below 5.6, it is called acid rain.



Acid rain affects statues and monuments like Taj Mahal made up of calcium carbonate.



S12. Environmental chemistry deals with study of the origin, transport, reactions, effects and fates of chemical species in environment.

S13. Carbon monoxide reacts with haemoglobin to form carboxy-haemoglobin which is 300 times more stable than oxy-haemoglobin complex. In blood, when concentration of carboxy-haemoglobin is about 3-4%, the oxygen carrying capacity of blood is greatly reduced. This oxygen deficiency, results into headache, weak eye sight, nervousness and cardiovascular disorder.

S14. Effects:

- (a) Smog causes respiratory problems like asthma attacks, bronchitis, heart related disorder.
- (b) It also causes irritation to eyes, throat and nose.
- (c) It reduces visibility and affects road as well as traffic.
- (d) It damages plants and other materials like electronic and electrical equipment.

Control:

- (a) Efficient catalytic converters in the automobiles will reduce smog formation as it prevents the release of nitrogen oxides and hydrocarbons to the atmosphere.
- (b) It can also be suppressed by certain compounds which act as free radical traps. When these compounds are sprayed in the atmosphere, they generate free radicals which readily combine with free radicals responsible for formation of photochemical smog.

S15. Causes of Water Pollution:

- (a) **Pathogens:** The disease causing agents are called pathogens like bacteria that enter into water from domestic sewage and animal excreta.
- (b) **Organic wastes:** Leaves, grass, trash etc. pollute water. Excessive growth of phytoplankton within water is also source of water pollution.

S16. Ozone Hole: There is depletion of ozone layer over Antarctica region commonly known as ozone hole. Its consequences are that UV light can reach the Earth which can lead to ageing of skin, cataract, sunburn, skin cancer, killing of many phytoplanktons, damage to fish productivity etc. It has also been observed that plant proteins get easily affected by UV radiations which lead to the harmful mutation of cells.

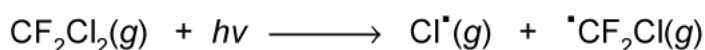
S17. Pesticides: Those chemicals which are used to kill pests and insects which are harmful for the crops, e.g., Aldrin, Dieldrin, B.H.C. etc.

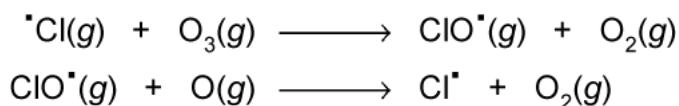
Herbicides: Those chemicals which are used to destroy weeds, *i.e.*, unwanted plants, are called herbicides, e.g., sodium chlorate, sodium arsenite etc.

S18. Yes, there is soil pollution. We can prevent soil pollution by using less pesticides, insecticides, fungicides, weedicides. DDT which has been banned should not be used.

Organo-phosphates and carbamates should be used instead of Aldrin and Dieldrin. Sodium chlorate and sodium arsenic are also not environment friendly. Fields should be weeded manually.

S19. The decomposition products of CFCs destroy ozone as it is shown in the following reaction:





S20. Green Chemistry: It involves designing and development of green chemical products and processes which do not create pollution.

- Use of CNG has reduced air pollution in Delhi.
- Development of a new method to produce ibuprofen in 99% yield, avoiding the usage of large quantity of solvents and wastes associated with the traditional methods.
- Using CO_2 as blowing agent for manufacture of polystyrene foam sheet packaging material has eliminated the use of CFCs which cause ozone depletion.
- Designing of a safer marine antifouling compound 'Sea-nine' that degrades far more rapidly than organotins which persist in the marine environment and cause pollution problems.

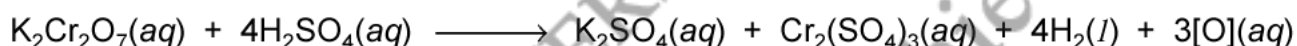
S21. BOD (Biochemical Oxygen Demand) is measure of dissolved oxygen that would be needed by micro-organisms to oxidise organic and inorganic compounds.

The water sample is saturated with oxygen and then heated at 20°C for five days. This allows time for micro-organisms the water sample to oxidise pollutants. The remaining amount of dissolved oxygen is determined and BOD is obtained by subtraction.

COD (Chemical Oxygen Demand is determined as follows:

The water sample is treated with known quantity of oxidising agent such as $\text{K}_2\text{Cr}_2\text{O}_7$ in acidic medium. The reagent oxidises most of the polluting substance, including those which are resistant to microbial oxidation.

The remaining $\text{K}_2\text{Cr}_2\text{O}_7$ is determined by back titration with a suitable reducing agent like Mohr's salt. From the concentration of $\text{K}_2\text{Cr}_2\text{O}_7$ consumed, the amount of oxygen used in the oxidation may be calculated using the following chemical equations:



The results are expressed in terms of amount of oxygen, in ppm, that would be required to oxidise the contaminants. This is called COD.

S22. The substances which cause adverse effect on the environment are called environmental pollutants.

In an environmental pollution process, a pollutant originates from a source and gets transported by air or water or is dumped on land by man. Some of the pollutants may be absorbed (assimilated) or chemically changed by the environment. The rest build-up to concentrations which are harmful to environment.

S23. Environmental chemistry deals with study of the origin, transport, reactions, effects and fates of chemical species in the environment.

Mankind is faced with several types of pollution such as air pollution, water pollution, soil pollution, thermal pollution, noise pollution, metals pollution, etc.

It is most essential to control various types of pollution so as to save mankind and living organisms.

- S24.** (a) When rain falls through polluted air, it comes across chemicals such as gaseous oxides of sulphur, oxides of nitrogen, mists of hydrochloric acid and phosphoric acid etc. pH lowers down from 5.6 to 3.5. Sometimes, it becomes as low as 2.
- (i) It is harmful for aquatic animals which cannot survive at pH below 4.
 - (ii) It is harmful for plants. Leaf pigments are decolourised and acid rain affects chlorophyll of plants.
 - (iii) It damages textiles, paper, leather products. Buildings made-up of limestone, marble, dolomite, mortar and slate are damaged by acid rain.
- (b) Greenhouse effect is the phenomenon in which Earth's atmosphere traps the heat from the sun and prevents it from escaping into outer space. Carbon dioxide, methane, ozone, chlorofluorocarbons and water vapours are green house gases.

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