

## Long Answer Type Question

**Q. 1. (a) What do you mean by Greenhouse effect? What is the role of CO<sub>2</sub> in greenhouse effect?**

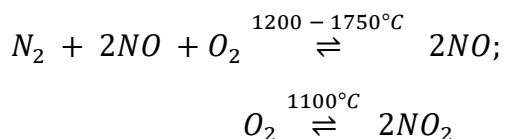
**(b) A factory was started near a village. Suddenly villagers started feeling the presence of irritating vapours in the village and cases of headache, chest pain, cough, dryness of throat and breathing problems increased. Villagers blamed the emissions from the chimney of the factory for such problems. Explain what could have happened. Give chemical reactions for the support of your explanation.**

**Ans. (a)** Greenhouse effect: It is the phenomenon in which earth's atmosphere traps the heat from the sun and prevents it from escaping into the outer space.

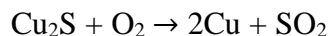
Greenhouse gases such as CO<sub>2</sub>, methane, ozone, chlorofluorocarbon (CFC) compounds and water vapour in the atmosphere result in climatic changes.

Heat from sun is absorbed by the earth and this heat is reemitted by the earth which is absorbed by CO<sub>2</sub> and then radiated back to earth which results in global warming.

**(b)** The symptoms observed in the villagers show that oxides of nitrogen and sulphur must be coming out of the chimney. This is due to combustion of fossil fuels like coal, oil, natural gas, gasoline, etc. to produce high temperatures at which oxidation of atmospheric nitrogen takes place forming NO and NO<sub>2</sub>.



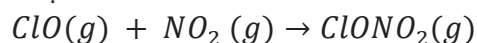
SO<sub>2</sub> is produced due to combustion of sulphur containing coal and fuel oil or roasting of sulphide ores like iron pyrites (FeS), copper pyrites (CuFeS<sub>2</sub>), etc.

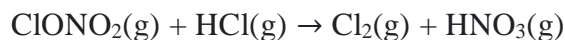
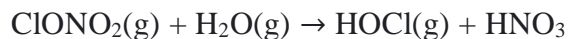
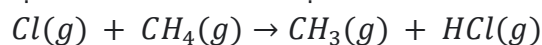


**Q. 2. (a) Sometime ago the formation of polar stratospheric clouds was reported over Antarctica. Why were these formed? What happens when such clouds break up by warmth of sunlight?**

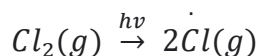
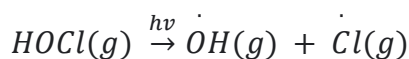
**(b) Ozone is a gas heavier than air. Why does ozone layer not settle down near the earth?**

**Ans. (a)** In summer season, nitrogen dioxide and methane react with chlorine monoxide and chlorine atoms forming chlorine sinks, preventing much ozone depletion, whereas in winter, special type of clouds called polar stratospheric clouds are formed over Antarctica. These polar stratospheric clouds provide surface on which chlorine nitrate gets hydrolysed to form hypochlorous acid. It also reacts with hydrogen chloride to give molecular chlorine.



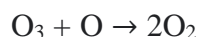


When sunlight returns to the Antarctica in spring, the sun's warmth breaks up the clouds and HOCl, Cl are photolysed by sunlight.



(b) In stratosphere, the formation of O<sub>3</sub> gas goes on continuously, but O<sub>2</sub> is also decomposed by UV radiation between 240-360 nm.

The O-atom reacts with second O<sub>3</sub> molecule.



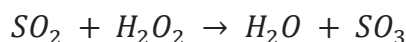
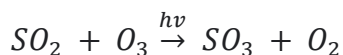
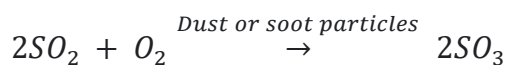
Thus, the reaction forms a delicate balance in which the rate of O<sub>3</sub> decomposition matches the rate of O<sub>3</sub> formation, i.e., a dynamic equilibrium exists and maintains a constant concentration of O<sub>3</sub>.

**Q. 3. (a) Oxidation of 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 SO<sub>2</sub> into SO<sub>3</sub>.**

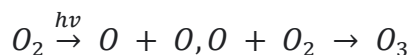
**(b) How is ozone produced in stratosphere?**

**(c) What is the compound formed when CO combines with blood?**

**Ans. (a)** The presence of particulate matter in polluted air catalyses the oxidation of SO<sub>2</sub> to SO<sub>3</sub>. The reaction is also promoted by ozone and hydrogen peroxide.



**(b)** The formation of ozone in the stratosphere takes place in two steps. In the first step, ultraviolet radiation coming from the sun has sufficient energy to split dioxygen into two oxygen atoms. In the second step, the oxygen atoms react with more of dioxygen to form ozone.



**(c)** Carboxyhaemoglobin (COHb).

**Q. 4. (a) What is the importance of measuring BOD of a water body?**

**(b) What is Green Chemistry? What are the achievements of Green Chemistry?**

**Ans. (a)** BOD is the measure of level of pollution caused by organic biodegradable material in terms of how much oxygen will be required to break down the organic material biologically. Clean water would have BOD values less than 5 ppm while highly polluted water could have a BOD value of 17 ppm or more.

**(b)** Green Chemistry involves processes and products that reduce or eliminate use and generation of harmful substance.

**Achievements of Green Chemistry are as follows:**

**(i)** New method of synthesizing ibuprofen in 99% yield, avoiding large quantities of solvents and wastes associated with traditional methods.

**(ii)** Catalytic hydrogenation of diethanol amine in which environmental friendly herbicide is produced in less dangerous way

**(iii)** Designing of a safer, marine antifouling compound 'Sea-nine' that degrades far more rapidly than organotin compounds which persist in marine environment and cause pollution problems.