SL Paper 3

Stratospheric ozone is in dynamic equilibrium with oxygen. Give the equations that describe the formation of ozone from oxygen and its depletion in the stratosphere in the presence of ultraviolet light.

Formation:

Depletion:

Ozone prevents UV radiation emitted from the Sun reaching the surface of the Earth.

Describe, using chemical equations, the two-step mechanism of photochemical decomposition of ozone in the Earth's stratosphere.

Step 1:

Step 2:

The ozone layer protects living organisms from dangerous UV radiation. In the Earth's stratosphere, ozone is photochemically formed from oxygen by the following two-step process.

(a) Ozone decomposition can proceed photochemically. Describe, using chemical equations, the two-step mechanism of photochemical decomposition of ozone in the Earth's stratosphere.

Step 1:

Step 2:

(b) Ozone decomposition can also be catalysed by ozone-depleting substances such as chlorofluorocarbons, CFCs. State **two** alternatives to CFCs.

Emissions of ozone-depleting substances such as CFCs have decreased extensively as a result of the Montreal Protocol. In the most recent assessment of ozone depletion by the United Nations Environmental Programme, scientists predict a substantial recovery of the ozone layer by 2050.

b.i. Although the use of harmful CFCs is being phased out, suggest why these compounds are expected to remain in the atmosphere for the next 80–100 years. [1]

b.ii. Discuss **one** advantage and **two** disadvantages of using hydrocarbons as alternatives to CFCs. [3]

Advantage:

Disadvantages:

Increasing concentrations of greenhouse gases are considered to cause global warming. Ozone depletion is another environmental concern.

Identify a gas that is both a greenhouse gas and a cause of ozone depletion.

The ozone layer protects us by absorbing ultraviolet (UV) radiation from the Sun during its natural formation and depletion.

Describe, using equations, the formation and depletion of ozone in the stratosphere by natural processes.

Formation:

Depletion:
