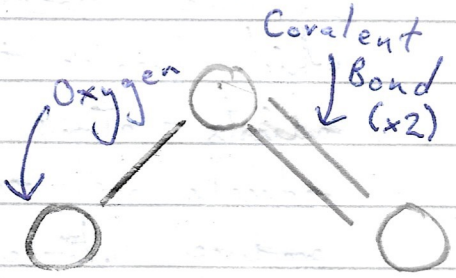
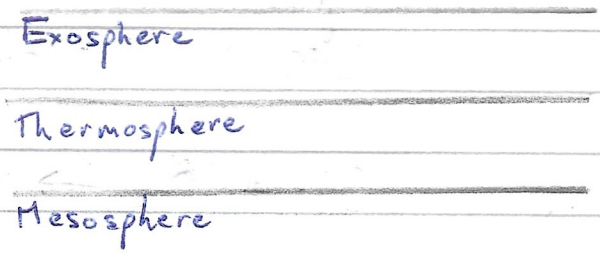
3.

The Ozone Layer

The ozone layer is an atmospheric layer with the highest concentration of ozone gas (O_3) found in the atmosphere. Although this is 90% of atmospheric ozone, it only accounts to 0.0008% of the layers gas composition (max, avg 2-8 ppm) with carbon dioxide (CO_2) still the most concentrated.



Ozone is a useful greenhouse gas consisting of 3 oxygen atoms.



The Role

The layer is responsible for the absorption of 98% of the Sun's UV-B rays that enters the Earth's atmosphere (97-99% of 200-315 nm). This reduces the risk of developing skin cancers and sunburn on Earth by reducing the concentration of UV light.

The ozone layer is part of the Earth's stratosphere and lies between 15 and 35 km above the Earth's surface.

The Hole

In 1985, a hole in the ozone layer was discovered over Antarctica. This was caused by refrigerants called CFCs (chlorofluorocarbons) which react with ozone to produce oxygen (O_2) and the chain-reaction inducing chlorine monoxide (ClO).

CFCs have recently threatened this layer.

PTO

In the atmosphere, CFCs are exposed to sunlight which breaks them down to produce free chlorine radicals - atoms with unpaired valence electrons. These radicals are very reactive and react with ozone to produce chlorine monoxide and oxygen (molecular). The chlorine oxide triggers a chain reaction, further reacting with additional ozone to break down more molecules.

$$CFCl_3 (+ \text{electromagnetic radiation}) \rightarrow Cl\cdot + \cdot CFCl_2$$

↑ CFC — ↑ sunlight — Cl· radical (symbol)

$$Cl\cdot + O_3 \rightarrow ClO + O_2$$

↙ Chain reaction begins

$$ClO + O_3 \rightarrow Cl\cdot + 2O_2$$

The chemical chain reaction equation. The last two equations are repeated to liberate more molecular oxygen whilst the chlorine radical acts as a catalyst.