**18.1 The Atmosphere Supports Life.**

* The small fraction of the Earth’s environment that supports life is called the biosphere.
* The atmosphere consists of a mixture of gases extending about 100 km above the Earth’s surface.
* The atmosphere is divided into several layers, the troposphere being the layer closest to Earth.
* The interactions that occur in the upper atmosphere are mostly influenced by the high-energy radiation from the sun.
* The chemistry of the troposphere is significantly affected by human activity.

**The Atmosphere and Radiation.**

* High energy, ultraviolet radiation from the Sun is damaging to living organisms.
* Ozone (O3) gas can absorb some of the radiation and acts like a protective filter.
* In the stratosphere (10-30km above the Earth) ozone occurs at higher concentrations than the lower regions and is known as the ozone layer.
* Ultraviolet radiation is classified as UV-A, UV-B and UV-C. Ozone absorbs all UV-C, most UV-B, but little of UV-A.

In the ozone layer, high energy ultraviolet radiation causes the strong double bond of diatomic oxygen molecules (O2) to break and form highly reactive oxygen molecules.

Some of the reactive oxygen atoms can then combine with other oxygen molecules to form ozone molecules.

So the overall reaction is:

The second reaction requires the presence of a third molecule, usually nitrogen (N2), to take the energy released. Because the energy released is heat the temperature of the stratosphere increases as the altitude increases.

Ozone molecules can also absorb ultraviolet radiation, decomposing to oxygen molecules and oxygen atoms. The bonds of ozone are slightly weaker than diatomic oxygen and hence ultraviolet radiation of a slightly lower energy is need to break the bonds.

Overall, without the effect of human activity, the rate of formation of ozone is about the same rate of depletion. So the concentration of ozone remains fairly constant.

**The Atmosphere and Climate.**

* Earth’s average temperature is maintained because of a balance between the radiation received from the Sun and that reflected back into space.
* Radiation of shorter wavelength (visible and ultraviolet) passes through the atmosphere from the Sun to the surface.
* The Earth then radiates back lower-energy, longer-wavelength infrared radiation.
* Gases in the troposphere (carbon dioxide, water vapour and methane) absorb some of the reflected radiation and reradiates some of it back towards earth. This process is called the Greenhouse Effect.
* The gases responsible for trapping heat are called greenhouse gases.