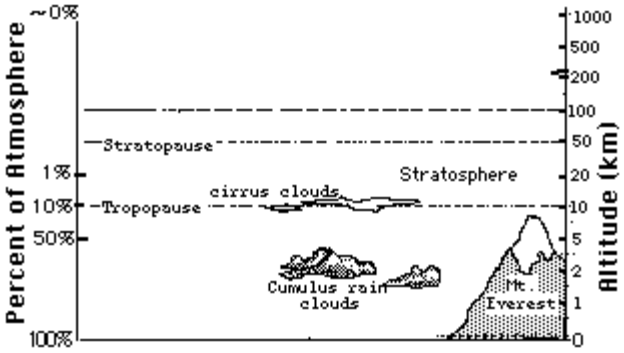
# OZONE LAYER - INTRODUCTION

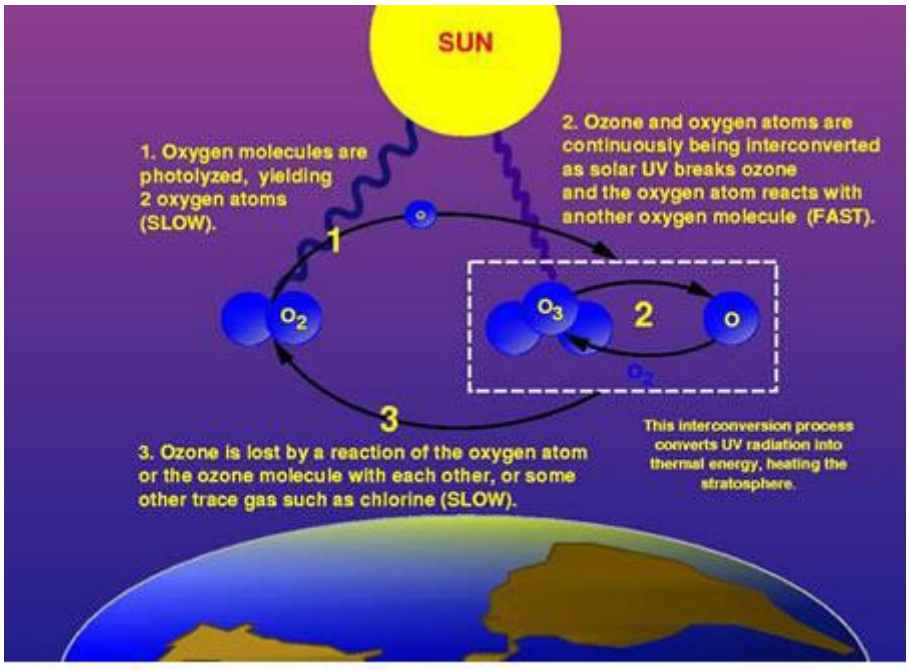
"The ozone layer" refers to the ozone within stratosphere, where over 90% of the earth's ozone resides. Ozone is an irritating, corrosive, colorless gas with a smell something like burning electrical wiring. In fact, ozone is easily produced by any high-voltage electrical arc (spark plugs, Van de Graaff generators, Tesla coils, arc welders). Ozone is a tri-atomic form of oxygen, i.e., each molecule of ozone has three oxygen atoms and is produced when oxygen molecules (O2) are broken up by energetic electrons or high energy radiation. Thus, it is formed naturally in the upper levels of the Earth's atmosphere by high-energy ultraviolet radiation from the Sun. As, the radiation breaks down oxygen molecules, releasing free atoms, some of which bond with other oxygen molecules to form ozone. About 90 per cent of all ozone formed in this way lies between 15 and 55 kilometres above the Earth's surface – the part of the atmosphere called the stratosphere. Hence, this is known as the 'ozone layer'. Even in the ozone layer, ozone is present in very small quantities; its maximum concentration, at a height of about 20-25 kilometres, is only ten parts per million.

Ozone is an unstable molecule. High-energy radiation from the Sun not only creates it, but also breaks it down again, recreating molecular oxygen and free oxygen atoms. The concentration of ozone in the atmosphere depends on a dynamic balance between how fast it is created and how fast it is destroyed.

Depletion of stratospheric ozone (O3), as commonly known as 'the hole in the ozone layer', is an issue of international concern. Most ozone is found in the stratosphere (upper part of the atmosphere), more than 10 to 16 kms from the surface of the Earth. The natural distribution of ozone around the Earth is not uniform, as seasonal winds and formation patterns contribute to lower concentrations at the equator and higher concentrations at the poles. Ozone in the stratosphere protects life on Earth as it limits penetration of ultraviolet radiation through the atmosphere, but it is considered a pollutant in the troposphere (close to the ground). The amount of ozone in the atmosphere is measured in Dobson units (DU). One DU is about twenty-seven million molecules per square centimeter. The average thickness of the atmospheric ozone layer at any place varies from month to month, but is generally between 260 and 330 DU.



The Earth's atmosphere is divided into several layers. The lowest region, the troposphere, extends from the Earth's surface up to about 10 kilometers (km) in altitude. Virtually all human activities occur in the troposphere. Mt. Everest, the tallest mountain on the planet, is only about 9 km high. The next layer, the stratosphere, continues from 10 km to about 50 km. Most commercial airline traffic occurs in the lower part of the stratosphere. For nearly a billion years, ozone molecules in the atmosphere have protected life on Earth from the effects of ultraviolet rays. It is a form of oxygen (O2). We all know that, oxygen we need to live and breathe. Normal oxygen consists of two oxygen atoms. Ozone, however, consists of three oxygen atoms and has the chemical formula O3. Ozone is formed when an electric spark is passed through oxygen. Over millions of years the action of sunlight and specifically the action of ultra violet light or UV on oxygen has created a layer of ozone high up in the atmosphere. This ozone layer resides in the stratosphere and surrounds the entire Earth. The action of UV light on this layer both destroys and creates ozone, a constant process going on silently. Thus, this process of absorbing portion of UV light, protecting us from the harmful exposure. In fact, UV-B radiation (280- to 315- nanometer (nm) wavelength) from the Sun is partially absorbed in this ozone layer. As a result, the amount of UV-B reaching Earth's surface is greatly reduced. UV-A (315- to 400-nm wavelength) and other solar radiation are not strongly absorbed by the ozone layer. Human exposure to UV-B increases the risk of skin cancer, cataracts, and a suppressed immune system. UV-B exposure can also damage terrestrial plant life, single cell organisms, and aquatic ecosystems. In the past 60 years or so human activities have contributed to the deterioration of the ozone layer to a great extent.




Ozone process

Sunshine and ozone – As discussed, ozone (a form of oxygen containing three atoms instead of the usual two) is formed and destroyed by a complicated series of chemical reactions between atmospheric

oxygen, sunlight and other trace substances in the stratosphere. Absorbtion of solar UV radiation by the ozone layer has the effect of removing much of the more harmful parts of the UV radiation spectrum as they pass through the stratosphere (the upper atmosphere 10 to 50 km above ground). By the time UV radiation has passed through the stratosphere, virtually all of the shortest wavelengths and most (70-90%) of the intermediate wavelengths (UV-B) have been absorbed, leaving the least damaging UV-A.

The amount of ozone depends on its rate of formation and destruction, and varies naturally as per the following factors:

* Regional factors - Most ozone is produced over the tropics (where levels of UV radiation are highest), but then carried away by stratospheric winds to higher latitudes, so that the ozone layer is thickest towards the poles and thinnest around the tropics.

* Seasonal factors - The thickness of the ozone layer remains relatively constant throughout the year in the tropics, but varies considerably at higher latitudes (both north and south), with peak levels occurring in the spring and minimum levels in the autumn.

* Other factors - ozone levels correlate with the 11 year solar sunspot cycle, and may also be influenced by volcanic eruptions.

Research also revealed that the Arctic is similarly affected during winter/spring – as in Antarctica, the greatest loss is near the Pole, but depletion is spreading to lower latitudes.

Source : http://saferenvironment.wordpress.com/2008/12/03/ozone-layer-%E2%80%93-effective-checking-of-its-thinning-would-reduce-global-warming-and-enhance-standard-of-environment/