ATMOSPHERE

The *atmosphere* is a thin protective blanket that nurtures life on Earth and protects it from the hostile environment of outer space by absorbing energy and damaging ultraviolet radiation from the sun and by moderating the Earth's temperature to within a range conducive to life.

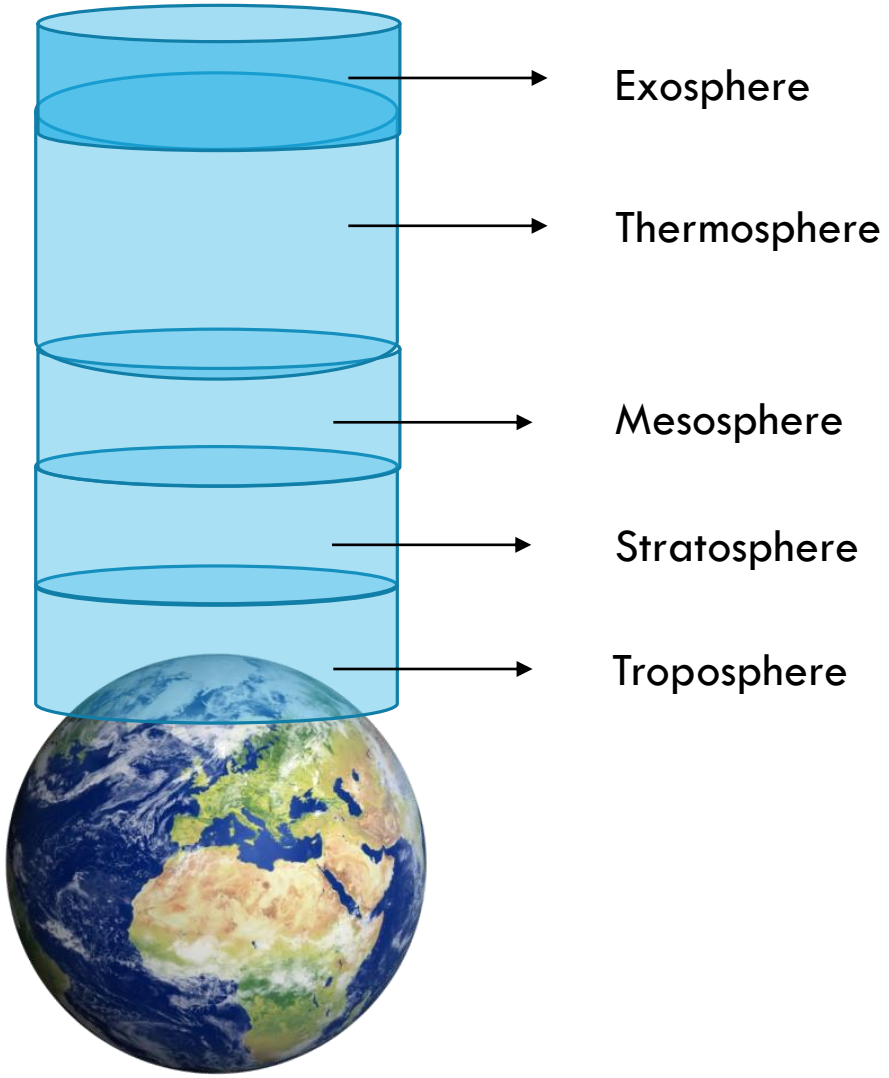
The Atmosphere of Earth is Composed of :

Gas	%
Nitrogen	78.08
Oxygen	20.95
Argon	0.93
Carbon dioxide	0.0365

In addition, air contains trace amounts of neon, helium, methane, krypton, nitrous oxide, hydrogen, xenon, sulfur dioxide, ozone, nitrogen dioxide, ammonia, carbon monoxide as well as water vapor.

Layers of the Atmosphere :

The atmosphere is composed of discrete layers. Atoms and molecules travel rapidly within a layer but only very slowly between layers. The layering results from temperature variations of the gas molecules.



i. Troposphere

- The troposphere is the lowest layer of our atmosphere.
- Starting at ground level, it extends upward to about 10 km above sea level.
- Humans live in the troposphere, and nearly all weather occurs in this lowest layer.
- Most clouds appear here, mainly because 99% of the water vapor in the atmosphere is found in the troposphere.
- Air pressure drops, and temperatures get colder, as you climb

higher in the troposphere.

ii. Stratosphere

- Stratosphere is the second layer of the Earth's atmosphere.
- The stratosphere extends from the top of the troposphere to about 50 km above the ground.
- The infamous ozone layer is found within the stratosphere. Ozone molecules in this layer absorb high-energy ultraviolet (UV) light from the Sun, converting the UV energy into heat.

❖ Unlike the troposphere, the stratosphere actually gets warmer the higher you go! That trend of rising temperatures with altitude means that air in the stratosphere lacks the turbulence and updrafts of the troposphere beneath.

❖ Commercial passenger jets fly in the lower stratosphere, partly because this less-turbulent layer provides a smoother ride. The jet stream flows near the border between the troposphere and the stratosphere.

iii. Mesosphere

- It extends upward to a height of about 85 km above our planet.
- Most meteors burn up in the mesosphere.
- Unlike the stratosphere, temperature is once again grow colder as you rise up through the mesosphere. The coldest temperatures in Earth's atmosphere, about -90 °C, are found near the top of this layer.
- The air in the mesosphere is far too thin to breathe; air pressure at the bottom of the layer is well below 1% of the pressure at sea level, and continues dropping as you go higher.

iv. Thermosphere

- High-energy X-rays and UV radiation from the Sun are absorbed in the thermosphere, raising its temperature to hundreds or at times thousands of degrees.
- However, the air in this layer is so thin that it would feel freezing cold to us!
- In many ways, the thermosphere is more like outer space than a part of the atmosphere. Many satellites actually orbit Earth within the thermosphere.
- Variations in the amount of energy coming from the Sun exert a powerful influence on both the height of the top of this layer and the temperature within it.
- The aurora, the Northern Lights and Southern Lights, occur in the thermosphere.

v. Exosphere

- As you might imagine, the "air" in the exosphere is very, very, very thin, making this layer even more space-like than the thermosphere.
- In fact, air in the exosphere is constantly - though very gradually - "leaking" out of Earth's atmosphere into outer space.
- There is no clear-cut upper boundary where the exosphere finally fades away into space.
- The latter value is about halfway to the Moon!

Physical Characteristics of the Atmosphere

- The density of the atmosphere decreases sharply with increasing altitude as a consequence of the gas laws and gravity.

- The fact that atmospheric pressure decreases as an approximately exponential function of altitude largely determines the characteristics of the atmosphere.

What is Air Pollution?

Air pollution occurs, when harmful and toxic gases, dust and smoke, etc, enter the atmosphere. These make the survival of humans, plants and animals difficult and also disfigure the buildings and lead to deterioration of assets.

According to Brimblecombe (1996), air pollution occurs when the substances are released into the air by human activities in such concentrations as are sufficient to cause detrimental effect on human health, vegetation, animals and property or interfere with the enjoyment of the property by the mankind. So the contamination of air whether inside or outside the house is the cause of air pollution. These cause physical, biological or chemical changes in air, which if harmful, cause air pollution.

Pollutants in the Atmosphere

Substances that tend to be transported to the atmosphere are those that are relatively volatile. Such substances include those that are gases under normal ambient conditions, including compounds such as nitric oxide (NO) or carbon monoxide (CO). A number of organic compounds including those in gasoline or chlorofluorocarbons are called volatile organic compounds (VOC). Organic compounds that are less volatile nevertheless get into air are classifed as semivolatile organic compounds.

ATMOSPHERIC POLLUTANTS	
Carbon Monoxide	Carbon Dioxide
Nitrogen Oxides	Sulfur Dioxide
Ammonia	VOCs
Ozone	POPs
Particulate Matter	Heavy Metals

Acid Rain

- Acid rain, or acid deposition, is a broad term that includes any form of precipitation with acidic components, such as sulfuric or nitric acid that fall to the ground from the atmosphere in wet or dry forms. This can include rain, snow, fog, hail or even dust that is acidic.
- Acid rain results when sulfur dioxide (SO_2) and nitrogen oxides (NO_X) are emitted into the atmosphere and transported by wind and air currents. The SO_2 and NO_X react with water, oxygen and other chemicals to form sulfuric and nitric acids. These then mix with water and other materials before falling to the ground.
- While a small portion of the SO_2 and NO_X that cause acid rain is from natural sources such as volcanoes, most of it comes from the burning of fossil fuels.

Photochemical Smog

- *Photochemical smog* or *photochemical pollution* is a type of air pollution formed through solar radiation reacting with airborne pollutants, like nitrogen oxides and volatile organic compounds.
- The largest contributor is automobiles, while coal-fired power plants and some other power plants also produce the necessary pollutants to facilitate its production. Due to its abundance in areas of warmer temperatures, photochemical smog is most common in the summer.
- It forms in the morning when a tremendous number people are driving their vehicles to work.
- Smog can happen both during the day and at night, but photochemical smog only happens in the presence of sunlight.

Pollutant	Effects
Nitrogen oxides	• can contribute to problems with heart and lungs • links to decreased resistance to infection
Volatile organic compounds (VOCs)	• eye irritation • respiratory problems • some compounds are carcinogens
Ozone	• coughing and wheezing • eye irritation • respiratory problems (particularly for conditions such as asthma)
Peroxyacetyl nitrate (PAN)	• eye irritation • respiratory problems