Atmosphere Composition and Structure: Composition of Atmosphere, Structure of the Atmosphere

- The air has a special place among all the conditions necessary for life. The air is a mixture of several gases. The air encompasses the earth from all sides. The air surrounding the earth is called the atmosphere. The atmosphere is an integral part of our Earth. It is connected with the earth due to the gravitational force of the earth.
- It helps in stopping the ultraviolet rays harmful for the life and maintains the suitable temperature necessary for life. The air is essential for the survival of all forms of life on the earth. The atmosphere is like a large protective cover. Besides gases, water vapour, and dust particles are also found in the atmosphere. The composition and structure of the atmosphere and the cyclic process of main gases are very crucial to understand.

Objectives

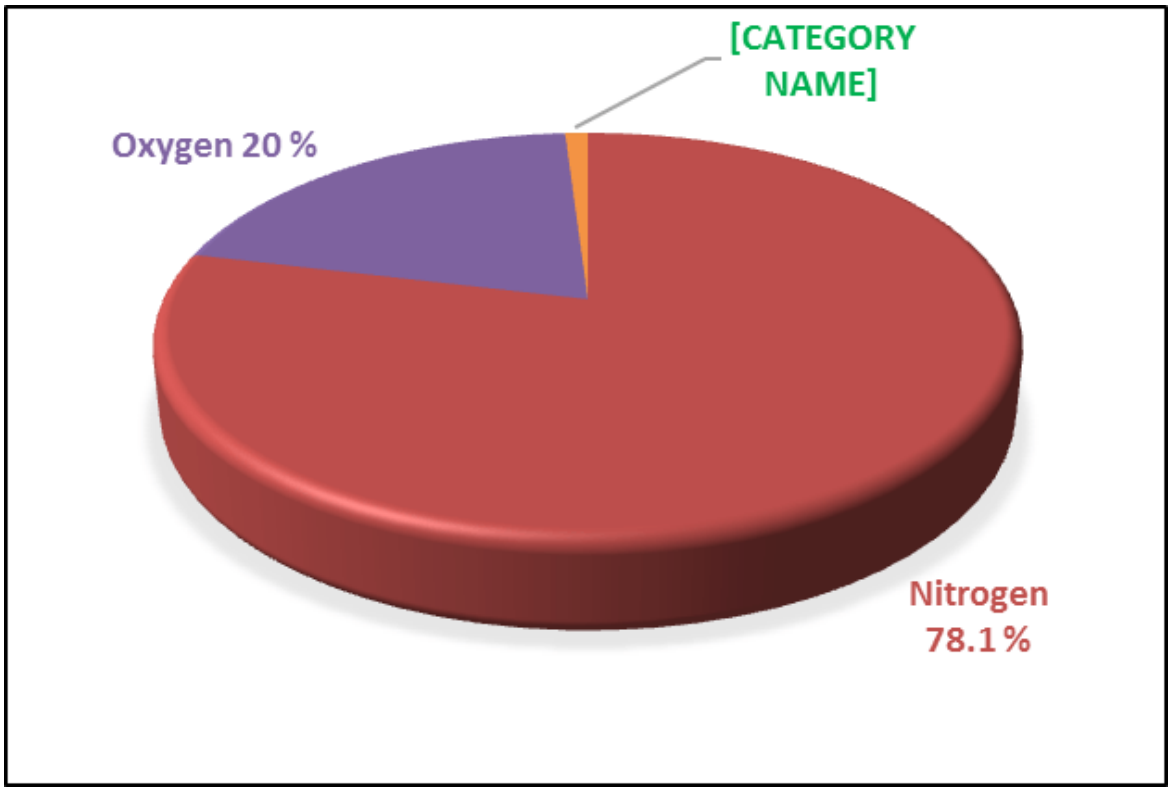
The major objectives of this chapter are:

- To explain the composition of atmosphere
- To explain the characteristics of different layers of the atmosphere
- To explain the importance of atmosphere
- To explain the cyclic processes of main gases of the atmosphere including nitrogen, oxygen and, carbon dioxide
- To describe the importance of cyclic processes of important gases of the atmosphere such as nitrogen, oxygen, and carbon dioxide

Composition of Atmosphere

The atmosphere is made up of different types of gases, water vapour, and dust particles. The composition of the atmosphere is not static, but it changes according to the time and place.

- **Gases of the Atmosphere**: The atmosphere is the mixture of different types of gases, including water vapour and dust particles. Nitrogen and oxygen are the two main gases of the atmosphere. 99% part of the atmosphere is made up of these two gases. Other gases like organ, carbon dioxide, hydrogen, neon, helium etc. form the remaining part of the atmosphere.



Composition of the Atmosphere

- **Ozone Gas**: The amount of ozone gas in the atmosphere is very small. It is limited to the ozone layer, but it is very important for all forms of lives. It protects the living beings by absorbing the ultra-violet rays of the sun. If there was no ozone gas in the atmosphere, there would not have been existence of the living beings and plants on the earth surface.
- **Water Vapour**: Gaseous form of water present in the atmosphere is termed water vapour. The presence of water vapour in the atmosphere has made life possible on the earth. Water vapour is the source of all kinds of precipitation. The maximum amount of water vapour in the atmosphere could be up to 4% . The maximum amount of water vapour is found in hot and wet regions and

least amount is found in the dry regions. Usually, the amount of water vapour goes on decreasing from low latitudes to high latitudes.

- In the same way, its amount goes on decreasing with increasing altitude. Water vapour reaches in the atmosphere through evaporation and transpiration. Evaporation takes place in the oceans, seas, rivers, ponds and lakes while transpiration takes place from the plants, trees and living beings.

- **Dust Particles**: Dust particles are mostly found in the lower layers of the atmosphere. These particles are found in the form of sand, smoke or oceanic salt. Sand particles have important place in the atmosphere. These dust particles help in condensation of the water vapour. During the process of condensation, water vapour gets condensed in the form of droplets around these dust particles. Due to this process the clouds are formed, and precipitation is made possible.

Importance of the Atmosphere

- Oxygen is very important for living beings.
- Carbon dioxide is very useful for plants.
- Dust particles present in the atmosphere create suitable conditions for precipitation.
- The amount of water vapour in the atmosphere goes on changing and directly affects plants and living beings.
- Ozone protects all kinds of life on the earth from harmful ultra-violet rays of the sun.

Structure of the Atmosphere

The atmosphere is an integral part of the earth. It surrounds the earth from all sides. Usually, it extends up to about 1600 kilometres from the earth's surface. 97% of the total amount of weight of the atmosphere is limited up to the height of about 30 kilometres. According to the diversity of temperature and density, the atmosphere can be divided into five layers.

Troposphere

- This is the lower most layer of the atmosphere.
- The height of this layer is about 18 km on the equator and 8 km on the poles. The main reason of higher height at the equator is due to the presence of hot convection currents that pushes the gases upward.
- This is the most important layer of the atmosphere because all kinds of weather phenomenon take place only in this layer. Due to these changes, the development of living world take place on the earth. The air never remains static in this layer. Therefore, this layer is termed changing sphere or troposphere.
- The environmental temperature decreases with increasing height of atmosphere. It decreases at the rate of 10C at the height of 165 metre. This is called Normal lapse rate. (v) The upper limit of the troposphere is called tropopause. This is a transitional zone. In this zone characteristics of both the troposphere and ionosphere are found.

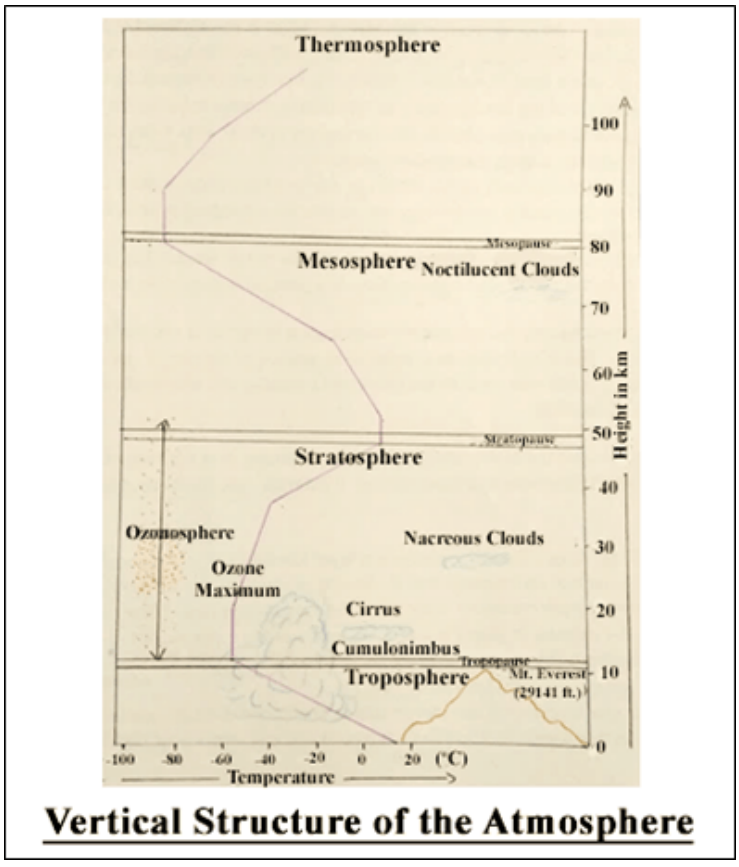
Stratosphere

- This layer is above the troposphere.

- This layer is spread up to the height of 50 km from the earth's surface. Its average extent is 40 km.
- The temperature remains almost the same in the lower part of this layer up to the height of 20 kms. After this, the temperature increases slowly with the increase in the height. The temperature increases due to the presence of ozone gas in the upper part of the layer.
- Weather-related incidents do not take place in this layer. The air blows horizontally. Therefore, this layer is considered ideal for flying of the aircrafts.

Mesosphere

- It is the third layer of the atmosphere spreading over stratosphere.
- It spreads up to the height of 80 km from the earth's surface. Its extent is 30 kms.
- Temperature goes on decreasing and drops up to – 100°C.
- Meteors or falling stars occur in this layer.



Ionosphere

- This is the fourth layer of the atmosphere. It is located above the mesosphere.
- This layer spreads up to the height of 400 km from the earth's surface. The width of this layer is about 300 km.
- The temperature starts increasing again with increasing height in this layer.

- Electrically charged currents flows in the air in this sphere. Radio waves are reflected back on the earth from ionosphere and due to this radio broadcasting has become possible.

Exosphere

- This is the last layer of the atmosphere located above the ionosphere and extends beyond 400 km above the earth.
- Gases are very sparse in this sphere due to lack of gravitational force. Therefore, the density of air is very less.

Both the layers of ionosphere and exosphere are also known as the lower and upper layers of the thermosphere respectively.