Fundamental of Physical Geography
Chapter-8 Composition and Structure of Atmosphere

This unit deals with :

- Atmosphere — compositions and structure; elements of weather and climate
- Insolation — angle of incidence and distribution; heat budget of the earth — heating and cooling of the atmosphere (conduction, convection, terrestrial radiation, advection); temperature — factors controlling temperature; distribution of temperature — horizontal and vertical; inversion of temperature• Pressure — pressure belts; winds-planetary seasonal and local, air masses and fronts; tropical and extra tropical cyclones
- Precipitation — evaporation; condensation — dew, frost, fog, mist and cloud; rainfall — types and world distribution
- World climates — classification (Koeppen), greenhouse effect, global warming and climatic changes

CHAPTER EIGHT

What is the importance of atmosphere?

Air is essential to the survival of all organisms. Some organisms like humans may survive for some time without food and water but can't survive even a few minutes without breathing air. That shows the reason why we should understand the atmosphere in greater detail. The air is an integral part of the earth's mass and 99 per cent of the total mass of the atmosphere is confined to the height of 32 km from the earth's surface

Define the Atmosphere

Atmosphere is a mixture of different gases and it envelopes the earth all round. It contains life- giving gases like oxygen for humans and animals and carbon dioxide for plants.

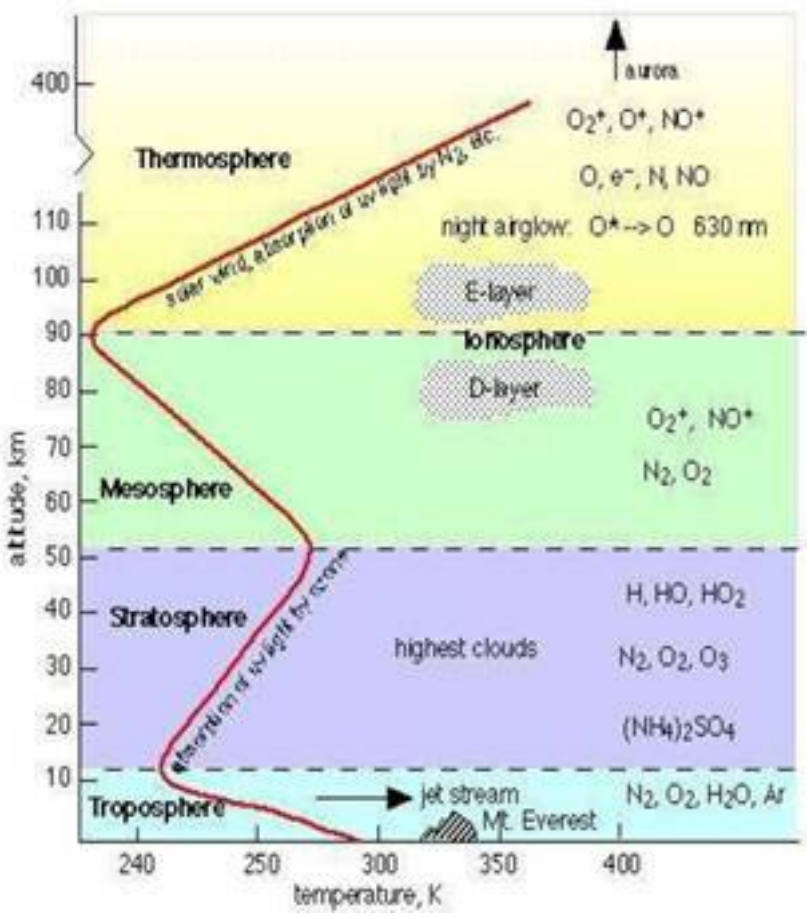
What is the average height of the Atmosphere?

The air is an integral part of the earth's mass and 99 per cent of the total mass of the atmosphere is confined to the height of 32 km from the earth's surface. The air is colourless and odourless and can be felt only when it blows as wind.

Can you imagine what will happen to us in the absence of ozone in the atmosphere?
In the absence of Ozone life is not possible on the earth surface. Ozone layer protects us from harmful UV rays.

COMPOSITION OF THE ATMOSPHERE
The atmosphere is composed of gases, water vapour and dust particles. The proportion of gases changes in the higher layers of the atmosphere in such a way that oxygen will be almost in negligible quantity at the height of 120 km. Similarly, carbon dioxide and water vapour are found only up to 90 km from the surface of the earth.

COMPOSITION AND STRUCTURE OF ATMOSPHERE



Constituent	Formula	Percentage by Volume
Nitrogen	N_2	78.08
Oxygen	O_2	20.95
Argon	Ar	0.93
Carbon dioxide	CO_2	0.036

Neon	Ne	0.002
Helium	He	0.0005
Krypto	Kr	0.001
Xenon	Xe	0.00009
Hydrogen	H_2	0.00005

Study the above table showing the composition of the atmosphere and answer the following questions.

1. Which gas constitutes the highest % of atmosphere?
2. Name the gas which constitutes least % of atmosphere

Gases

Carbon dioxide is meteorologically a very important gas as it is transparent to the Incoming solar radiation but opaque to the outgoing terrestrial radiation. It is largely responsible for the green house effect.The volume of carbon dioxide has been rising in the past few decades mainly because of the burning of fossil fuels. This has increased the air temperature . Ozone is another important component of the atmosphere found between 10 and 50 km above the earth's surface. and its filter and absorbs the ultra-violet rays radiating from the sun and prevents them from reaching the surface of the earth.

Water Vapour

Water vapour is also a variable gas in the atmosphere. In the warm and wet tropics, it may account for four per cent of the air by volume, while in the dry and cold areas of desert and polar regions, it may be less than one per cent of the air. Water vapour also decreases from the equator towards the poles. It also absorbs parts of the insolation from the sun and preserves the earth's radiated heat.

Dust Particles

Dust particles are generally concentrated in the lower layers of the atmosphere; yet, convectional air currents may transport them to great heights. The higher concentration of dust particles is found in subtropical and temperate regions due to dry winds in comparison to equatorial and polar regions. Dust and salt particles act as hygroscopic nuclei around which water vapour condenses to produce clouds.

STRUCTURE OF THE ATMOSPHERE

1. The atmosphere consists of different layers with varying density and temperature.
2. Density is highest near the surface of the earth and decreases with increasing altitude.
3. The column of atmosphere is divided into five different layers depending upon the temperature condition.

Name the layers of atmosphere

They are: troposphere, stratosphere, mesosphere, thermosphere and exosphere.

The troposphere

1. It is the lowermost layer of the atmosphere.
2. Thickness of the troposphere is greatest at the equator because heat is transported to great heights by strong convectional currents.
3. Extends roughly to a height of 8 km near the poles and about 18 km at the equator.
4. This layer contains dust particles and water vapour.
5. All changes in climate and weather take place in this layer.
6. Its average height is 13 km
7. The temperature in this layer decreases at the rate of 1 °C for every 165 m of height.
8. The zone separating the troposphere from stratosphere is known as the tropopause.
9. This is the most important layer for all biological activity.

The stratosphere

1. It is found above the tropopause and extends up to a height of 50 km.
2. One important feature of the stratosphere is that it contains the ozone layer.
3. This layer absorbs ultra-violet radiation and shields life on the earth from intense, harmful form of energy.

The mesosphere

1. It lies above the stratosphere,
2. which extends up to a height of 80 km.
3. The upper limit of mesosphere is known as the mesopause.
4. In this layer, once again, temperature starts decreasing with the increase in altitude and Up to minus 100°C at the height of 80 km.

The ionosphere

1. It is located between 80 and 400 km above the mesopause.
2. It contains electrically charged particles known as ions, and hence, it is known as ionosphere.
3. Radio waves transmitted from the earth are reflected back to the earth by this layer.
4. Temperature here starts increasing with height.
5. The uppermost layer of the atmosphere above reaches up to minus 100

Exosphere

1. the thermosphere is known as the exosphere.
2. This is the highest layer but very little is known about it.
3. Whatever contents are there, these are extremely rarefied in this layer, and it gradually merges with the outer space.

Elements of Weather and Climate temperature,

The main elements of atmosphere which are subject to change and which influence human life on earth are temperature, pressure, winds, humidity, clouds and precipitation.