

Chapter-8

Composition and Structure of Atmosphere

1. Multiple choice questions.

Question 1(i).

Which one of the following gases constitutes the major portion of the atmosphere?

- (a) Oxygen**
- (b) Nitrogen**
- (c) Argon**
- (d) Carbon dioxide.**

Answer:

- (b) Nitrogen**

Question 1(ii).

Atmospheric layer important for human beings is:

- (a) Stratosphere**
- (b) Mesosphere**
- (c) Troposphere**
- (d) Ionosphere.**

Answer:

- (c) Troposphere**

Question 1(iii).

Sea salt, pollen, ash, smoke soot, fine soil these are associated with:

- (a) Gases**
- (b) Dust particles**
- (c) Water vapour**

(d) Meteors.

Answer:

(b) Dust particles

Question 1(iv).

Oxygen gas is in negligible quantity at the height of atmosphere:

(a) 90 km

(b) 120 km

(c) 100 km

(d) 150 km.

Answer:

(b) 120 km

Question 1(v).

Which one of the following gases is transparent to incoming solar radiation and opaque to outgoing terrestrial radiation?

(a) Oxygen

(b) Nitrogen

(c) Helium

(d) Carbon dioxide.

Answer:

(d) Carbon dioxide.

2. Answer the following questions in about 30 words.

Question 2(i).

What do you understand by atmosphere?

Answer:

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.

Question 2(ii).

What are the elements of weather and climate?

Answer:

Weather is conditions of temperature, humidity, pressure, etc at a given point of time while climate is condition of these elements for a longer period of time. Following are the important elements of weather and climate:

1. Temperature: It affects weather as well as climate.
2. Pressure: Pressure keeps on decreasing with increase in height.
3. Wind: The flow of wind also affects weather and climate.
4. Humidity: Clouds and rain are important factors of climate.

Question 2(iii).

Describe the composition of atmosphere.

Answer:

The atmosphere is composed of gases, water vapour and dust particles. Nitrogen constitutes 78.8%, oxygen contributes 20.94% and argon contributes 0.93% in atmosphere. Other gases include carbon dioxide, helium, ozone, methane, hydrogen, krypton, xenon and neon, etc. Nitrogen and oxygen together constitute 99% of the atmosphere. Neon, krypton, xenon are scarce gases. 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.

Question 2(iv).

Why is troposphere the most important of all the layers of the atmosphere?

Answer:

The troposphere is the lowermost layer of the atmosphere. Its average height is 13 km and extends roughly to a height of 8 km near the poles and about 18 km at the equator. It is most important layer of the atmosphere because:

1. Thickness of the troposphere is greatest at the equator because heat is transported to great heights by strong convectional currents.
2. This layer contains dust particles and water vapour.
3. All changes in climate and weather take place in this layer.
4. The temperature in this layer decreases at the rate of 1°C for every 165m of height.

5. All biological activities take place in this layer.

3. Answer the following questions in about 150 words.

Question 3(i).

Describe the composition of the atmosphere.

Answer:

The composition of the atmosphere can be understood by considering following table.

Gases of the Atmosphere

Constituent	Formulae	% 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
Krypton	Kr	0.001
Xenon	Xe	0.00009
Hydrogen	H ₂	0.00005

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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 absorbs a part of terrestrial radiation and reflects back some part of it towards the earth's surface. It is largely responsible for the green house effect. Ozone is another important component of the atmosphere. It is found between 10 and 50 km above the earth's surface and acts as a filter. It absorbs the ultra-violet rays radiating from the sun. It prevents them from reaching the surface of the earth.

Water vapour is such a variable gas in the atmosphere, which decreases with altitude. 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. Atmosphere has a sufficient capacity to keep small solid particles, which may originate from, different sources and include sea salts, fine soil, smoke-soot, ash, pollen, dust and disintegrated particles of meteors.

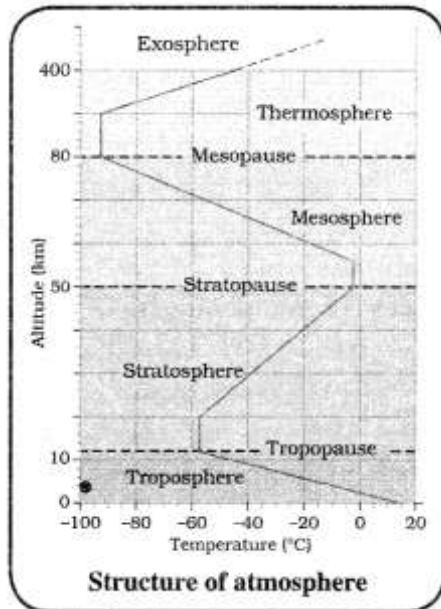
Question 3(ii).

Draw a suitable diagram for the structure of the atmosphere and label it and describe it.

Answer:

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

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



1. Troposphere: The troposphere is the lowermost layer of the atmosphere. Its average height is 13 km and extends roughly to a height of 8 km near the poles and about 18 km at the equator. Thickness of the troposphere is greatest at the equator because heat is transported to great heights by strong convectional currents. This layer contains dust particles and water vapour. All changes in climate and weather take place in this layer. The temperature in this layer decreases at the rate of 1°C for every 165m of height.

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

3. Mesosphere: The mesosphere lies above the stratosphere, which extends up to a height of 80 km. In this layer, temperature starts decreasing with the increase in altitude and reaches up to minus 100°C at the height of 80 km.

4. Ionosphere; The ionosphere is located between 80 and 400 km above the mesopause. It contains electrically charged particles known as ions, and hence, it is known as ionosphere. Radio waves transmitted from the earth are reflected back to the earth by this layer.

Temperature here starts increasing with height.

5. Exosphere: The uppermost layer of the atmosphere above the thermosphere is known as the exosphere. This is the highest layer but very little is known about it.