# Question Bank
## Chapter-3 (Air Pressure)

Q. Explain the pressure belts of the earth with proper diagram.

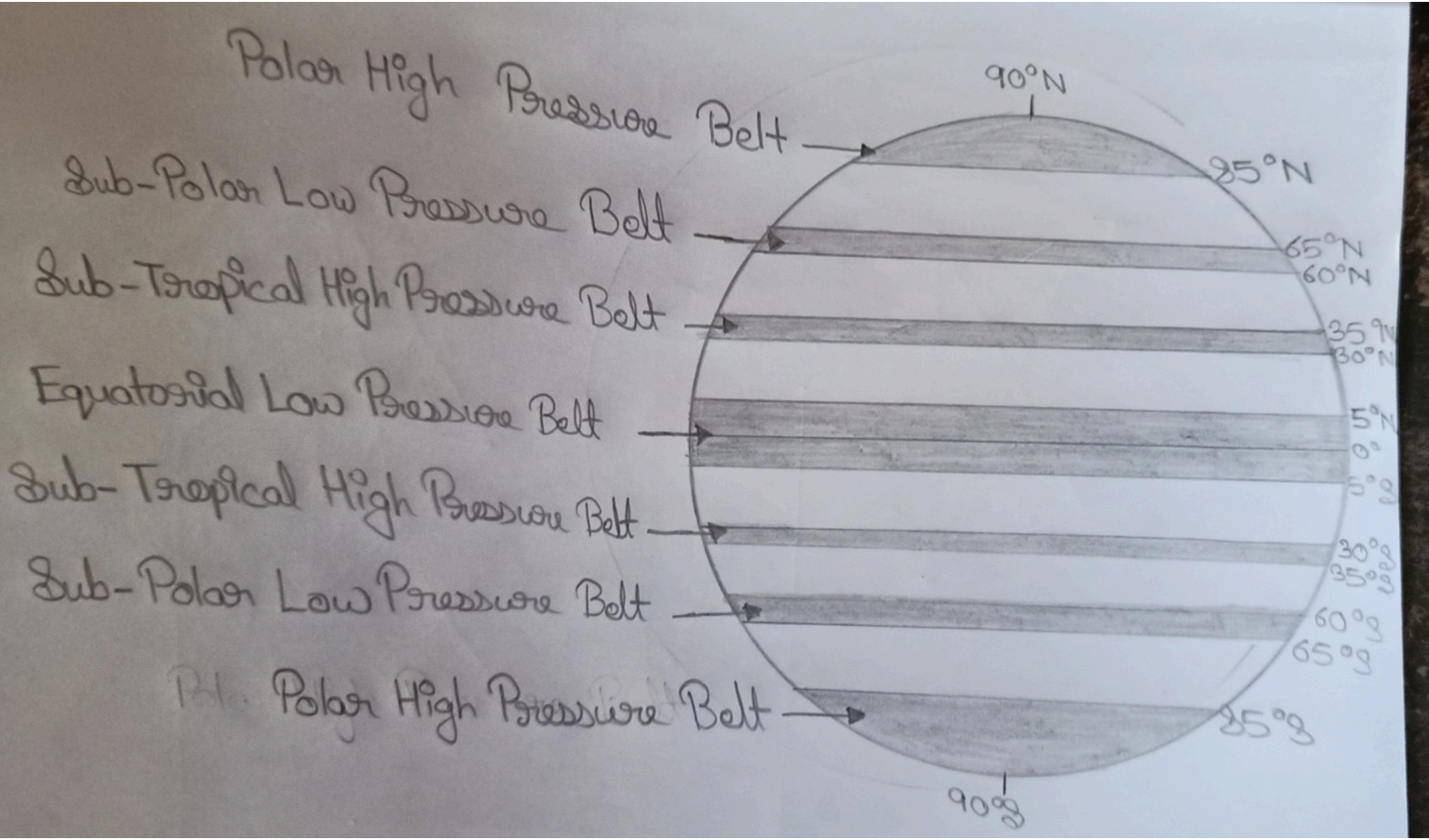
Ans There are seven pressure belts on the globe. Out of these four are high pressure belts and three are low pressure belts:
(1) The equatorial low pressure belt.
(2) & (3) The sub-tropical high pressure belts (North and South).
(4) & (5) The sub-polar low pressure belts (North and South).
(6) & (7) Polar High pressure belts (North and South).

(1) **The Equatorial Low Pressure Belt:** The equatorial belt of low pressure extends from the Equator to 5°N and 5°S latitudes. This belt has been formed due to (a) Vertical sun rays fall on this region through out the year as such, air is warm and light all the year round. The air extends and becomes lighter, rises upwards as convection currents and finally ascends to form this low pressure belt. (b) Presence of water vapour is more in this region. So water vapour further helps in lowering the air pressure ther. (c) Due to the rotation of the earth bulk of the air above this region swings towards thin and formed low pressure.

(2) & (3) **Sub-tropical High Pressure Belts:** Two sub-tropical high pressure belts are formed near the tropics and extend between 30°-35° North and South latitudes. The causes behind the formation of these two high pressure belts are: (a) The warm and moist air over the Equator rises, cools and spread towards the north pole and the South pole. On reaching latitudes 30°N and 30°S the air becomes cool, dense and heavy. Consequently, it descends to form these high pressure belts. These are regions of calm with light winds and quiet, stable weather condition. (b) Due to the rotation of the earth, cold air from the polar region swings towards this region.

(4) & (5) **Sub-Polar Low Pressure Belts:** Two sub-polar low pressure belts are located between 60°-65° North and South latitudes. In these belts low-pressure develops because — (a) the earth's rotation swings bulk of the air from these areas towards the Equator; (b) cold winds of the polar highs expand when they reach these two regions. (c) warm and light westerlies blow above cold and heavy polar winds. So, in the sub-polar region, density of air is less ∴ pressure is also low.

(6) & (7) Polar High Pressure Belts : Two high pressure belts are found around North pole and South pole because — (a) This is a region of permanently low temperature, as such, the pressure of the air is high, (b) Evaporation is less, so water vapour is almost absent and (c) The air that rises above the sub-polar regions swings and descends over these areas.


Polar High Pressure Belt
Sub-Polar Low Pressure Belt
Sub-Tropical High Pressure Belt
Equatorial Low Pressure Belt
Sub-Tropical High Pressure Belt
Sub-Polar Low Pressure Belt
Polar High Pressure Belt
90°N
65°N
60°N
35°N
30°N
5°N
0°
5°S
30°S
35°S
60°S
65°S
90°S

2) What is Air Pressure?

A) Atmospheric pressure is the pressure at any point on the surface of the Earth due to the weight of the column of air above that point. Simply air pressure is the weight of air molecules pressing down on the Earth. The pressure of the air molecules changes as we move upwards from sea level into the atmosphere. The highest pressure is at sea level where the density of the air molecules is the greatest. Atmospheric pressure is also called aerometric pressure.

3) Why do we not feel the air pressure?

A) There are huge amount of air in our body. Our body pressure and atmospheric air pressure is equal, so that you can not realise the pressure.

4) Why air exerts pressure?

A) Air exerts pressure in all directions. Air exerts pressure because its molecules are in constant motion, they impact against objects they encounter and exert a pushing force against them. The force of multiple impacts over an area is air pressure. The molecules of the gaseous body moves on wandering separately and sometimes they collide each other. When air molecules collide with any body, this collision exerts pressure, which is commonly known as air pressure.

5) Why is air pressure maximum at sea level?

A) Atmospheric pressure is not same at all places. Pressure varies from place to place according to changes in temperature. Air pressure is maximum on sea surface of the earth because the gravitational pull is maximum in the sea surface and due to the weight of the upper atmospheric layers on it. For this cause air molecules come close to each other and increase the air pressure. On the other hand, in the upper atmospheric layer pressure is low which help to spread the molecules. So the density of air is low as a result, with the increase of height the air pressure is reduce in every 270 m or 900 feet altitude at a rate of 1 or 34

mb. At the sea level air pressure is equivalent to the height of 76 cm mercury level. At sea level, air pressure is 1013.25 mb. With the increase of altitude the density and pressure of wind decreases. The rate of decrease per 110 m is equivalent to 1 cm on mercury level. For this reason, the boiling point in high altitude is less than 100°C.

6. What are the factors responsible for different types of pressure?

Ans The atmospheric pressure varies from place to place, region to region and from time to time due to the following factors.

(i) Temperature: Air pressure has an inverse relation with temperature, the higher is the temperature, the lower is the pressure. As air is heated, it expands and rises upwards. It becomes less dense and exerts less pressure. Conversely, cold air contracts; it becomes heavier and descends. This descending cold air exert high pressure. Higher temperatures are, therefore, associate with low pressure an upward current of air and inflowing winds. On the other hand lower temperatures are associated with high pressure, a downward current of air and outflowing winds.

(ii) Altitude: Altitude variation causes variations in air pressure. The lower layers of air are denser than the upper layers. Moreover, the lower layers are compressed under the weight of the upper layers of air and that is why the lower layers exert high pressure. As we go higher up the atmospheric pressure decreases. Air pressure decreases at the rate of 10 mm per 110 metres rise in altitude.

(iii) Water Vapour: Air containing water vapour is lighter than dry air. The more water vapour there is the lighter the air. The humid air contains comparatively less nitrogen and oxygen but the dry air contains more of them. This makes the humid air lighter than the dry air. For this reason land winds are heavier than sea winds which are laden with water vapour.

(iv) Rotation of the earth: The rotation of the earth and the centrifugal force resulting in swing of air in different areas, exerts some influence on air pressure. The sub-polar low pressure belts between 60° and 65° north and south are due to the rotation of the earth.

Q. What are the effects of air pressure?

Ans. Atmospheric pressure is an important element of weather and climate. It controls the weather condition of a place to a great extent as well as other elements or condition of weather and climate.

(i) Winds are caused due to differences in air pressure: Air pressure has an inverse relation with temperature. The higher the temperature, the lower is the pressure. As air is heated, it expands and rises upwards. It becomes less dense and exerts less pressure. Conversely, cold air contracts it becomes heavier and descends. This descending cold air exert high pressure. Thus wind blows from high pressure to the low pressure. This movement of air is known as wind.

(ii) Atmospheric pressure influences weather: Upward and downward movement of air creates cloudy and clear skies. As air rises and creates an area of low pressure, water vapour in the air condenses and forms clouds. Conversely, sinking air generally means that condensation cannot take place. Low pressure is, therefore, associates with cloudy skies and wet weather. High pressure is normally associated with clear and sunny skies.

(iii) Weather Forecasting: Fluctations in air pressure indicate weather changes. For example, rapidly falling pressure indicates that a low pressure system is approaching, which may bring rain.

Q. What is Isobar?

Ans. An isobar is an imaginary line drawn on a map joining all places with equal or same atmospheric conditions at the same time. The rate of change of atmospheric pressure per unit horizontal distance is called 'pressure gradient'. When the isobars appear close together, they reveal a 'strong pressure gradient' and it is associated with strong winds.

Q. What are the types of pressure? Explain.

Ans. Atmospheric pressure is generally classified into two types, namely :- (i) High Pressure and (ii) Low Pressure.

(i) High Pressure: A high pressure system is a conditions where the pressure in the atmosphere is higher than the surrounding area. The term high pressure denotes the state of the atmosphere when the barometer reads about 1013 mb or more. The terms 'High' (H) is used to indicate high pressure.

(ii) Low Pressure: A low pressure system is a condition in which the pressure in the atmosphere lower than the pressure on the surface of the earth. The term 'low pressure' denotes the state of the atmosphere when the barometer reads about 996 mb or less. The term 'depression', 'trough' or 'low' (L) are used to indicate low pressure.

10) What are the differences between HP and LP?

Ans

| High Air Pressure | Low Air Pressure |
|---|---|
| (i) A region in the atmosphere where the air is sinking is known as high pressure system. | (i) A region in the atmosphere when the air is rising is known as low pressure system. |
| (ii) These systems are also called highs or anticyclones. | (ii) These systems are also called lows, depressions or cyclones. |
| (iii) Anti-cyclones are descending air after getting cooled in the upper atmosphere. | (iii) A low pressure system is developed when the air gets hot and moist compared to the surrounding air. |
| (iv) Sinking air | (iv) Rising air |
| (v) Air moves clockwise | (v) Air moves anti-clockwise. |

11) What is wind and air current?

Ans Horizontal movement of air is called wind while vertical movement is known as an air current.

12) What is Coriolis force?

Ans The force which causes a change in the direction of wind owing to the Earth's rotation is called the Coriolis force. The coriolis force is absent at the equator and increases to a maximum at the poles.

13) What is Ferrel's law?

Ans According to Ferrel's law, winds and all objects moving over the earth's surface get deflected to the right of their path in the Northern Hemisphere. In the Southern Hemisphere, they get deflected to the left of their path of motion.

14) What are the units of measurement of atmospheric pressure?

Ans Atmospheric pressure is measured in terms of the height of a column of mercury in Barometer. There systems of unit are used - (a) Inches (b) Centimetres (c) Millibars. The normal pressure is about 29.92 inches. The common unit of measuring pressure is millibars. One millibar is a force equal to 1000 dynes per sq cm. Normal pressure

is equal to 1013 mb.

$\therefore$ 30 inches = 76 cm = 1013 mb

$\therefore$ 1 inch = 34 mb nearly

1 cm = 13 mb nearly.

The common unit of measuring air pressure in CGS unit is millibar which is equivalent of 100 pascals.

15) What is the relation between pressure and temperature?

A) The atmospheric pressure has an inverse relation with temperature. As the air is heated, it expands and rises upwards. The higher the temperature, the lower is the pressure. On the other hand, cold air contracts and becomes heavy. It results in high pressure. The general rule is that a rising thermometer shows a falling barometer, whereas a falling thermometer shows a rising barometer.

16) Explain the relation between altitude and pressure?

A) There is an inverse relation between pressure and altitude. There is a rapid decrease of pressure with increasing height. The pressure decreases at the rate of 12 mb for every 300 metres. The lower layers are denser than upper layers. The lower layers are compressed under the weight of the upper layers of the atmosphere. It is estimated that about one-half of the atmospheric pressure lies upto a height of 5 km.

17) What is atmospheric disturbances?

A) There exists a planetary system of pressure belts and winds. This general patern is disturbed due to irregularities produced by local conditions. Variable whirlwinds are produced just as eddies are formed in a river current. These variable winds are known as atmospheric disturbances.

18) Name the areas of tropical cyclones.

A) There are different kinds of tropical cyclones. These are known by different names in different oceans such as:

(a) Depressions in Bay of Bengal.

(b) Hurricanes in West Indies.

(c) Typhoons in China Sea.

(d) Tornadoes in Atlantic Ocean.

(e) Willy-Willy in Australia.

19) What is Pressure Gradient?

A) Atmospheric pressure is shown by isobars. The spacing between isobars shows pressure gradient. Close spacing represent a steep gradient while wide spacing shows a gentle gradient. Thus, the pressure gradiant is rate at which the horizontal pressure changes. It is always measured at right angles to the isobars. When the pressure gradiant is steep, strong winds blow. When the pressure gradient is weak, gentle winds blow. Thus, the pressure gradient is defined as the change in pressure per unit distance.

20) How winds are related to pressure?

A) Wind is simply air in motion in a horizontal direction. Vertical air movements are known as currents. The following fundamental rules control the relationship between pressure and wind:

(a) Winds blow from high to low pressure.

(b) The planetary winds follow the pattern of pressure belts.

(c) Descending winds develop high pressure while ascending winds develop low pressure on the surface.


High
Polar winds
Westerlies
High
Trade winds
High
Westerlies
Polar winds
High
Low
Low
Low
S
N
90°
60°
30°
0°
30°
60°
90°