Class 11 Geography Notes Chapter 11 Water in the Atmosphere

The air contains water vapour. It varies from zero to four per cent by volume of the atmosphere and plays an important role in the weather phenomena.

Water is present in the atmosphere in three forms namely—gaseous, liquid and solid.

The moisture in the atmosphere is derived from water bodies through evaporation and from plants through transpiration. Thus, there is a continuous exchange of water between the atmosphere, the oceans and the continents through the processes of evaporation, transpiration, condensation and precipitation.

The air containing moisture to its full capacity at a given temperature is said to be saturated. It means that the air at the given temperature is incapable of holding any additional amount of moisture at that stage. The temperature at which saturation occurs in a given sample of air is known as dew point.

The ability of the air to hold water vapour depends entirely on its temperature. The absolute humidity differs from place to place on the surface of the earth. The percentage of moisture present in the atmosphere as compared to its full capacity at a given temperature is known as the relative humidity.

With the change of air temperature, the capacity to retain moisture increases or decreases and the relative humidity is also affected. It is greater over the oceans and least over the continents.

Movement of air replaces the saturated layer with the unsaturated layer. Hence, the greater the movement of air, the greater is the evaporation.

The transformation of water vapour into water is called condensation. Condensation is caused by the loss of heat. When moist air is cooled, it may reach a level when its capacity to hold water vapour ceases.

Condensation also takes place when the moist air comes in contact with some colder object and it may also take place when the temperature is close to the dew point.

After condensation the moisture of atmosphere or humidity gets converted into dew, fog, mist, frost and clouds.

The ideal conditions for formation of dew are clear sky, calm air, high relative humidity, and cold and long nights.

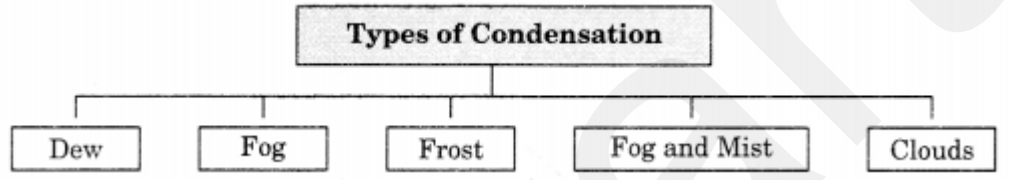
Frost forms on cold surfaces when condensation takes place below freezing point (0°C), i.e. the dew point is at or below the freezing point.

The only difference between the mist and fog is that mist contains more moisture than the fog. In mist each nuclei contains a thicker layer of moisture.

Fogs are drier than mist and they are prevalent where warm currents of air come in contact with cold currents. Fogs are mini clouds in which condensation takes place around nuclei provided by the dust, smoke, and the salt particles.

Cloud is a mass of minute water droplets or tiny crystals of ice formed by the condensation of the water vapour in free air at considerable elevations. According to their height, expanse, density and transparency or opaqueness clouds are grouped under four types :

- cirrus
- cumulus
- stratus
- nimbus.



Cirrus clouds are formed at high altitudes (8,000-12,000m). They are thin and detatched clouds having a feathery appearance. They are always white in colour.

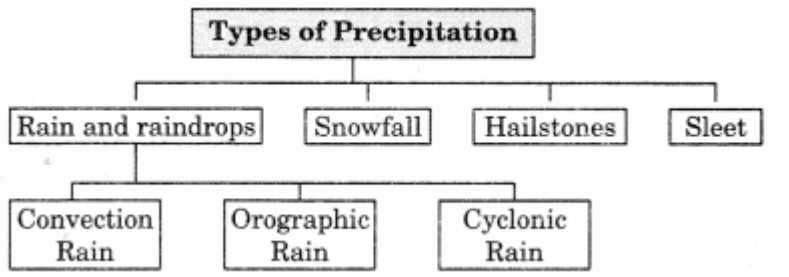
Cumulus clouds look like cotton wool. They are generally formed at a height of4,000-7,000 m. They exist in patches and can be seen scattered here and there. They have a flat base.

Stratus are layered clouds covering large portions of the sky. These clouds are generally formed either due to loss of heat or the mixing of air masses with different temperatures.

Nimbus clouds are black or dark gray. They form at middle levels or very near to the surface of the earth.

On the basis of origin, rainfall may be classified into three main types — the convectional, orographic or relief and the cyclonic or frontal.

Convectional rain takes place when the air on being heated, becomes light and rises up in convection currents. As it rises, it expands and loses neat and consequently, condensation takes place and cumulous clouds are formed. With thunder and lightening, heavy rainfall takes place but this does not last long.



Orographic rain occurs when the saturated air mass comes across a mountain, it is forced to ascend and as it rises, it expands; the temperature falls, and the moisture is condensed. The chief characteristic of this sort of rain is that the windward slopes receive greater rainfall.

Different places on the earth's surface receive different amounts of rainfall in a year and that too in different seasons. In general, as we proceed from the equator towards the poles, rainfall goes on decreasing steadily. The coastal areas of the world receive greater amounts of rainfall than the interior of the continents. The rainfall is more over the oceans than on the landmasses of the world.

Between the latitudes 35° and 40° N and S of the equator, the rain is heavier on the eastern coasts and goes on decreasing towards the west. But, between 45° and 65° N and S of equator, the rainfall is first received on the western margins of the continents and it goes on decreasing towards the east.

In some regions rainfall is distributed evenly throughout the year such as in the equatorial belt and in the western parts of cool temperate regions.

Distribution Of Clouds:

Classification of clouds on the basis of average height	Sub-categories or types of clouds	Features or characteristics
High Clouds 5 km to 14 km	Cirrus	Cirrus clouds are formed at high altitudes. They are soft and silk like shaped.
	Cirrostratus	They are thin and detatched clouds having a feathery appearance. They are always white in colour.
	Corrocumulus	These clouds look like small white circular shaped. They do not have any shadow
Medium Clouds	Altostratu	They are blue or brown in colour. They have fibres like look.
	Altocumulus	These are flattened circles like clouds which are organised like waves.

Low Clouds	Stratocumulus	Soft and brownish clouds in a group which have a shining.
	Nimobostratus	They are low and same layer clouds which look like fog but they are not stable on surface of the earth.
Clouds with extensive vertical development	Cumulus	Cumulus clouds look like cotton wool. They are generally formed at a height of 4,000-7,000 m. They exist in patches and can be seen scattered here and there. They have a flat base.
	Cumulonimbus	They are formed on mountains and cause rainfall.

Class 11 Geography Notes Chapter 11 Important Terms:

- Humidity: Water vapour present in the air is known as humidity.
- Evaporation: It is a process by which water is transformed from liquid to gaseous state. Heat is the main cause for evaporation.
- Latent heat of vaporisation: The temperature at which the water starts evaporating is referred to as the latent heat of vaporisation.
- Absolute humidity: The actual amount of the water vapour present in the atmosphere is known as the absolute humidity. It is the weight of water vapour per unit volume of air and is expressed in terms of grams per cubic metre.
- Relative humidity: The percentage of moisture present in the atmosphere as compared to its full capacity at a given temperature is known as the relative humidity.
- Dew points: The temperature at which saturation occurs in a given sample of air is known as dew point.
- Dew: When the moisture is deposited in the form of water droplets on cooler surfaces of solid objects (rather than nuclei in air above the surface) such as stones, grass blades and plant leaves, it is known as dew.
- Condensation: The transformation of water vapour into water is called condensation. Condensation is caused by the loss of heat.
- Sublimation: When moist air is cooled, it may reach a level when its capacity to hold water vapour ceases. Then, the excess water vapour condenses into liquid form. If it directly condenses into solid form, it is known as sublimation.
- Precipitation: After the condensation of water vapour, the release of moisture is known as precipitation. This may take place in liquid or solid form.
- Rainfall: The precipitation in the form of water is called rainfall.
- Snowfall: When the temperature is lower than the 0°C, precipitation takes place in the form of fine flakes of snow and is called snowfall.
- Orographic rain: When the saturated air mass comes across a mountain, it is forced to ascend and as it rises, it expands; the temperature falls, and the moisture is condensed. It is also known as the relief rain.
- Rain shadow area: The area situated on the leeward side, which gets less rainfall is known as the rain-shadow area.
- Cyclonic rain: Rain caused by a cyclone is called cyclonic rain.

- Hailstones: Sometimes, drops of rain after being released by the clouds become solidified into small rounded solid pieces of ice and which reach the surface of the earth are called hailstones.
- Convectional rain: The air on being heated, becomes light and rises up in convection currents. As it rises, it expands and loses heat and consequently, condensation takes place and cumulous clouds are formed. With thunder and lightening, heavy rainfall takes place but this does not last for long.
- Frost: Frost forms on cold surfaces when condensation takes place below freezing point (0°C), i.e. the dew point is at or below the freezing point.
- Fog and Mist: When the temperature of an air mass containing a large quantity of water vapour falls all of a sudden, condensation takes place within itself on fine dust particles. So, the fog is a cloud with its base at or very near to the ground.
- Smog: A condition when fog is mixed with smoke, is described as smog.
- Clouds: Cloud is a mass of minute water droplets or tiny crystals of ice formed by the condensation of the water vapour in free air at considerable elevations. As the clouds are formed at some height over the surface of the earth, they take various shapes.