Humidity and Rainfall

Chapter 7 • Exercise Answers

I. Fill in the blanks

1. Condensation occurs around **dust** particles in the atmosphere.
2. Piled up snow creates **snow drifts**.
3. Relief rainfall is also known as **orographic** rainfall.
4. A **depression** is a region of low air pressure.

II. Write T for true or F for false

1. **T** – Hot air can hold more moisture than cold air at the same pressure.
2. **F** – Correct statement: When the temperature is **below** the dew point, condensation takes place.
3. **T** – Most groundwater comes from rain.
4. **T** – Hailstones are ice pellets formed by the repeated freezing of ice crystals.

III. Multiple Choice Questions

1. **c. both the temperature and the humidity are very high**
2. **b. relative humidity**
3. **c. Temperatures here never fall below 0°C**
4. **a. snow and rain**
5. **a. A is true but R is false**
6. **a. front**

IV. Answer the following questions in brief

1. Explain how dew point influences condensation.

Dew point is the temperature at which the amount of water vapour in the air is at its maximum limit.

- If the temperature of the air falls **below** the dew point, the water vapour starts condensing.
- If the temperature stays **above** the dew point, condensation does not take place.

2. In which of these glasses will you notice water droplets outside the surface? Why?

Water droplets will be noticed outside the glass containing ice cubes. The surface of this glass becomes cold. When the warm, moisture-laden air around it touches the cold surface, the water vapour in the air condenses into water droplets.

3. Distinguish between absolute humidity and relative humidity. In what units are they expressed?

Absolute Humidity	Relative Humidity
The amount of water vapour present in a unit volume of air.	The ratio of the amount of water vapour in the air to the total amount of water vapour the air can carry at that temperature and pressure.
Expressed in kilograms per cubic metre (kg/m^3).	Expressed as a percentage (%).

4. How does temperature affect humidity?

Option 1

- If the temperature of the air **rises**, it can hold more water vapour.
- If the temperature of the air **falls**, it can hold less water vapour.

Option 2

Temperature decides how much water vapour air can hold. Hot air can hold more moisture than cold air. As air becomes colder, it can hold less water vapour.

5. What are cirrus clouds?

Cirrus clouds are thin, wispy clouds made up of ice crystals that streak across the sky high up in the atmosphere.

6. How does snow form?

Snow forms when temperatures are so low that water vapour condenses around an ice crystal and turns directly into ice, which falls to the Earth as snowflakes.

V. Answer the following questions in detail

1. Evaporation and condensation are both essential for rainfall. Explain the validity of this statement.

The statement is valid.

- **Evaporation:** When water is heated, it changes into water vapour. This process is called evaporation. Without evaporation, there would be no water vapour in the

atmosphere.

- **Condensation:** When the air cools below the dew point, the water vapour condenses around dust particles and forms clouds. Without condensation, no clouds would form.
- **Rainfall:** When the water droplets in the clouds become too heavy, they fall to the Earth as rain.

So rainfall needs evaporation to put water vapour into the air and condensation to turn it into clouds and rain.

2. What is precipitation? Explain how hailstone is a form of precipitation.

Precipitation is the falling of condensed cloud droplets to the Earth when the amount of water vapour in the air becomes more than the air can hold. It takes the form of snow, hail and rain.

Hailstones are ice pellets, and they form like this:

- Ice crystals form high up within cumulus clouds.
- As they fall towards the Earth, they start melting.
- Strong updrafts of air carry these ice crystals back up. They freeze again and begin to fall.
- This is repeated several times, until the hailstones become too large and heavy to be held in the cloud.
- They then fall to the Earth.

Since hailstones come down from the clouds to the Earth, they are a form of precipitation.

3. What is the difference between relief rainfall and convectional rainfall? Explain with the help of diagrams.

Relief (Orographic) Rainfall	Convectional Rainfall
Caused by the relief (mountains or hills) of the land.	Caused by intense heating of the Earth's surface during the day.
Moisture-laden winds meet mountains and are forced to rise along the slope.	The air above the heated land becomes less dense and rises.
The rising air cools, and the water vapour condenses and forms clouds.	The rising air cools, and thunderstorm clouds (cumulonimbus) are formed.
Heavy rain falls on the windward side. The leeward side is a rain shadow region.	The clouds become too heavy and the water comes down as a huge downpour.
Example: the Western Ghats and the Himalayan foothills.	Common in places with equatorial and tropical climates.