



Climate and Adaptations

Prior Knowledge

In the previous classes, I have learnt that

- We can find different organisms living in different parts of the world.
- Some organisms are found only in certain habitats on the Earth.
- Organisms have special adaptations that help them to live in a particular habitat.

Learning Objectives

In this chapter, I will learn about:

- Weather and climate
- The factors that affect the weather and climate at a place
- Adaptations of animals to different climates

Let's Get Going

The Meteorological Department is the government department that studies and reports on weather. Weather forecast for a week in the month of October for New Delhi is given below.

Study the picture and answer the questions that follow.

7 DAY FORECAST

Day, Month, Year

LOCATION

25.5°



Feels like: 26°C

Humidity: 63%

Pressure: 1012.1MB

Wind: 63KM/H

Sunrise: 5:52AM

Sunset: 8:12PM

Sun	Mon	Tue	Wed	Thu	Fri	Sat
18° 29°	16° 25°	17° 27°	18° 29°	16° 25°	17° 27°	17° 27°
Sunny	Showers	Mostly cloudy	Scattered Thunderstorms	Showers	Mostly cloudy	Mostly cloudy

1. Mention the days with the highest temperature.
2. On which day might airplanes leaving from the New Delhi airport get delayed?
3. On which days should we certainly carry umbrellas when leaving for school?
4. Which day do you think would be the best day to go for a picnic?

WEATHER AND CLIMATE

Weather plays an important role in our lives. It influences our choices in food, clothes and activities. For example, when planning a holiday, we pack clothes suited to the weather at our destination. We enjoy warm meals in the winter but prefer cold beverages and ice creams in the summer.

Weather is the current atmospheric condition at a place based on temperature, rainfall, wind, humidity and other factors. Weather is observed over a short period of time and may vary from day-to-day or even from hour to hour. You may have seen how a clear and bright sky can suddenly turn dark and stormy in a very short span of time. We can observe if the weather is rainy, windy, sunny or cloudy by simply observing our surroundings.

Climate is the general pattern of weather conditions that are observed in a region over a long period of time. Unlike weather, climate does not vary over short periods of time but remains relatively unchanged over a longer time span of a few years. The changes in climate at a particular place are detectable only if weather patterns, including the different variations in weather, are observed over long time spans such as hundreds of years.

Weather reports that are collected over a long period of time, such as for 25 years, help us to predict the climate of a place. If a place records high temperatures for most days of the year, we can say that it has a hot climate. If it also receives heavy rainfall on most days, we can say that the climate is hot and wet. For example, the climate of Shimla in the Himalayan region of India is cool or cold for most of the year, which is different from the warm and humid climate of Kochi in the coastal region.

Meteorology is the branch of science that deals with atmospheric processes and events, especially for forecasting weather. A

meteorologist is a scientist who studies weather conditions such as temperature, humidity and rainfall at a place and predicts the weather.

MyDictionary

Forecast: predict or estimate something that might happen in the future

FACTORS AFFECTING THE WEATHER OF A PLACE

The weather at a place is affected by factors such as temperature, humidity and rainfall. These factors are called **elements of weather**.

Temperature

Temperature is a measure of the amount of heat contained in the atmosphere. It is measured using a thermometer. The units used are either degree Celsius ($^{\circ}\text{C}$) or degree Fahrenheit ($^{\circ}\text{F}$).

Generally, as the day progresses after sunrise, the temperature increases because sunlight warms the surroundings. The maximum temperature of the day is usually reached during the afternoon. As the sun descends in the sky, the surroundings slowly begin to cool and the temperature reduces. The minimum temperature of the day is therefore usually measured very early in the morning, long after sunset. Maximum and minimum temperatures are measured using a special instrument called a **maximum-minimum thermometer** (Fig. 7.1).



Fig. 7.1 Maximum-minimum thermometer

Humidity

*Humidity is the amount of water vapour in the air. Air can hold only a specific amount of water vapour at a particular temperature. The air holding the maximum amount of water vapour at a particular temperature is called **saturated air**. Warm air can hold more water vapour than cool air. This is why the air is cooler and drier in winter while it is warmer and humid in summer.*

Humidity is usually expressed as relative humidity. *Relative humidity is the amount of water vapour in air when compared to the amount present in saturated air at a particular temperature.* The instrument used to measure relative humidity is called **hygrometer** (Fig. 7.2).

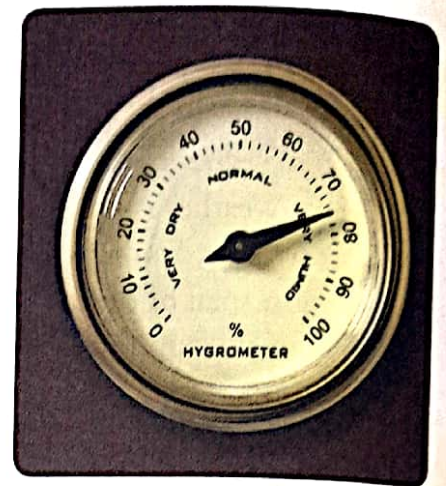


Fig. 7.2 Hygrometer

Rainfall

The sun's heat evaporates the water in waterbodies to form water vapour. Water vapour rises into the atmosphere, cools and condenses to form tiny water droplet in clouds. These droplets eventually fall back to the Earth as rain. The amount of rainfall a place receives is usually expressed in millimetres (mm). The instrument used to measure rainfall is called **rain gauge** (Fig. 7.3).

Real World

Raindrops are not tear-shaped. As raindrops fall from clouds, they have a round shape. But as they fall, their shape changes due to different factors. Small raindrops may combine to form larger drops giving it the shape that looks like a bun (flattened base with a rounded dome at the top) or even like a parachute.

Let's Investigate

Extreme weather events such as blizzards, dust storms, floods and droughts can cause a lot of destruction and loss of life. Form groups of four with your classmates. Let each group make a presentation on a specific extreme weather event, listing its causes and effects.

Also, list measures that are taken to prepare for such an event.

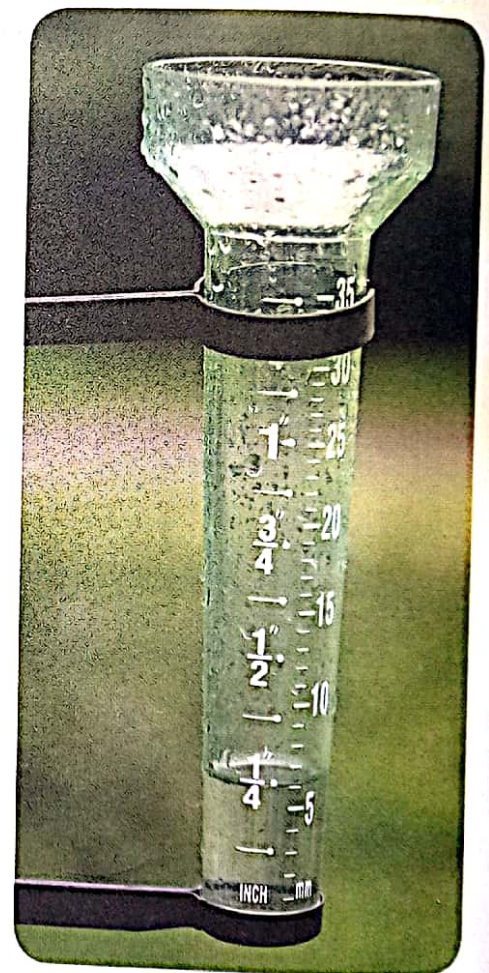


Fig. 7.3 Rain gauge

Water vapour returns to the ground in other forms as well. When rain freezes into ice as it falls, it forms **sleet**. When water droplets in the clouds turn into ice crystals, they fall as **snow**. When the ice crystals form in large clumps, they fall as **hail stones**. *The different forms in which water in the atmosphere falls back to the Earth are referred to as **precipitation**.*

FACTORS AFFECTING THE CLIMATE OF A PLACE

Some of the factors that affect the climate of a place on Earth are discussed below.

Solar Radiation

Solar radiation (heat from the sun) warms the Earth. However, the amount of sunlight received is not uniform on all parts of the Earth at all times of the year due to the following reasons.

Tilt in the Earth's axis

The Earth's axis is tilted, which causes the different seasons. As the Earth revolves around the sun, one hemisphere is tilted towards the sun. This hemisphere is warmer as the sun rays fall directly on it. This hemisphere therefore has summer. The other hemisphere that is tilted away from the sun, receives slanting rays and therefore has winter. Thus, when the northern hemisphere has summer, the southern hemisphere has winter. The situation is reversed as the Earth revolves around the sun (Fig. 7.4).

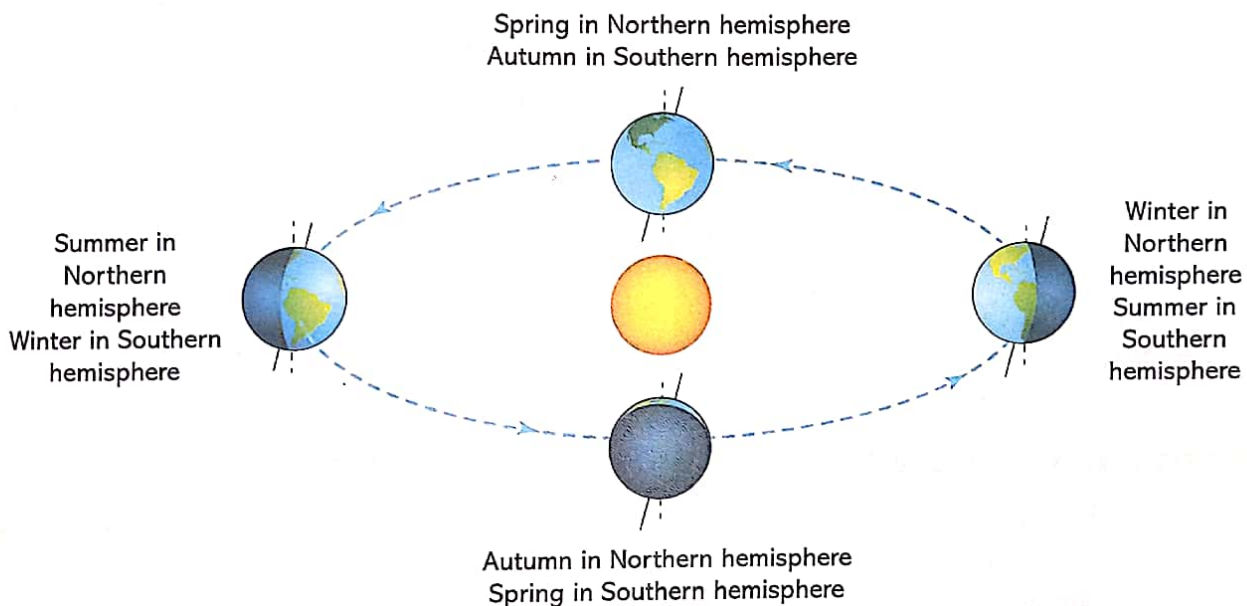


Fig. 7.4 Tilt of the Earth's axis and its movement around the sun cause seasonal changes

Elliptical orbit of the Earth

The Earth's orbit is elliptical. So, at some points on its orbit, the Earth is closer to the sun and receives more heat than when it is farther away (Fig. 7.5).

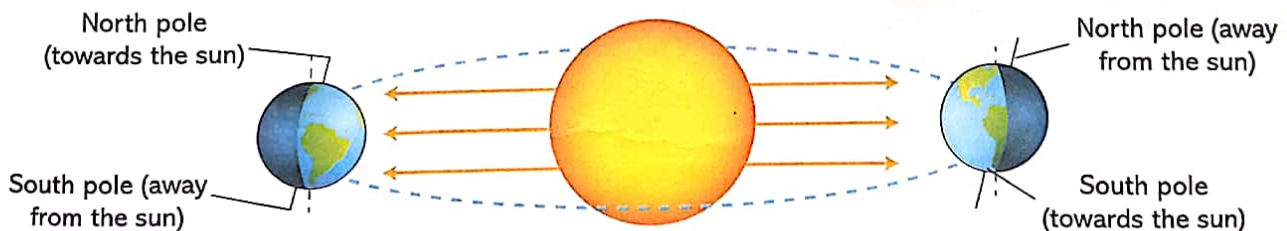


Fig. 7.5 Due to elliptical orbit, distance of Earth from sun keeps changing

Latitude or Distance from the Equator

The amount of sunlight a place receives varies with latitude. Rays of sunlight fall directly on places near the equator. Due to the shape of the Earth, the rays fall in a slanting manner away from the equator and so are spread over a larger area. Therefore, places near the equator are warmer than places that are away from the equator (Fig. 7.6).

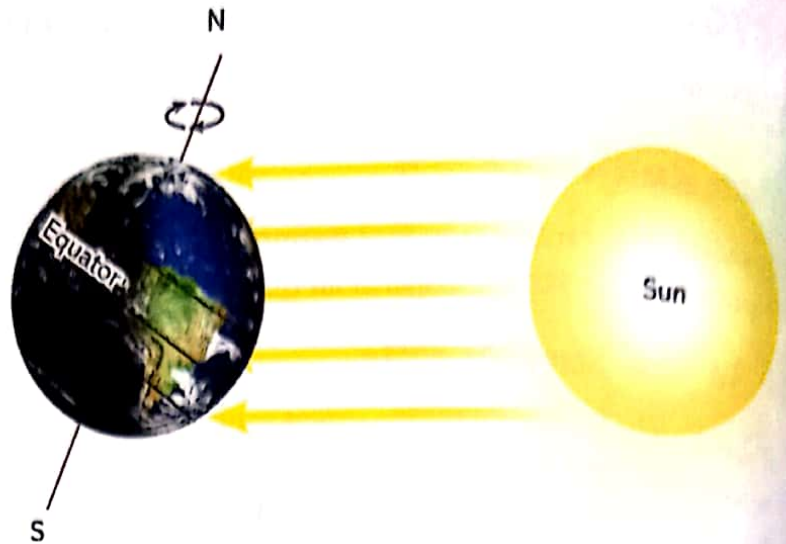


Fig. 7.6 Effect of distance from the equator



Fig. 7.7 Mountains

Altitude or Height above the Sea Level

Climate also varies with altitude. The lower layers of the atmosphere are denser (thicker) than the upper layers. The lower layers also have dust particles and water vapour which help to retain heat. Therefore, the higher above sea level we go, the cooler it gets. Therefore, places in hilly or mountain regions are cooler than places in the plains and at the coasts (Fig. 7.7).

Distance from the Sea and Other Waterbodies

Places such as Chennai and Visakhapatnam, which are near the sea, have a moderate climate. This means that they are neither too hot nor too cold for most days in the year. Water in large waterbodies, including lakes, heats and cools more slowly than land. Therefore, waterbodies tend to regulate the climate by maintaining moderate temperature.

Your Task

Using Internet or newspapers, collect data regarding the average maximum and minimum temperatures and the average precipitation recorded for every month of the year in any two Indian cities—one inland city and one coastal city. Write a report on your findings.

Knowledge Check

- State whether the given statements are true or false. Correct the false statements.
1. Climate may change daily while weather remains unchanged over years.
 2. A hygrometer is used to measure relative humidity.
 3. Rain, sleet and snow are forms of precipitation.
 4. Places near the equator receive more heat from the sun than places near the poles.
 5. The climate of a place does not vary with temperature.