Chapter

Weather and Climate

KEY CONCEPTS

- Elements of Weather: Temperature, Atmospheric Pressure, Humidity, Precipitation, Winds, Cloud.
- Difference between Weather and Climate.
- Weather Instruments: Thermometer, Rain Gauge, Barometer, Hygrometer, Anemometer and Wind Vane.
- Isohytes and Isotherms: meaning and diagrams.

It is said that the story of man is also a saga of his struggle against the unpredictability of weather. Over time, man realised that weather phenomena resulted from physical processes in the atmosphere. Today, man has the ability to predict, to some extent, the weather and to make necessary modifications in his day-to-day activities.

Weather and climate are two different concepts. **Weather** is the physical state of the atmosphere at a given time. In simple terms, it refers to the day-to-day conditions of the atmosphere at a definite place and at a fixed time. Weather influences day-to-day activities such as clothing, farming, modes of transportation, etc. The long-term average of weather of an area is called the **Climate.** It determines water potential, natural vegetation, cropping pattern, land use, housing and other infrastructure, industrial location, etc.

ELEMENTS OF WEATHER

The earth's surface is warmed by the sun and cooled by rain and winds. The energy transformations in atmosphere, oceans and land manifest as weather phenomena and culminate in climate in the long run. Various elements such as temperature, pressure, humidity, etc. give rise to atmospheric variations.

Temperature

Temperature refers to the degree of hotness or coldness of the air.

The temperature of the atmosphere varies not only between day and night but also from season to season. For example, summers are hotter than winters. The factors which influence the distribution of temperature across the world are the following:

(i) **Difference in Latitude:** Temperature decreases with increase in latitude on either side of the Equator. This is due to the spherical shape of the earth and its revolution around the sun. Thus, higher the latitude the colder is the place. On this basis, the earth is divided into 5 temperature zones. These are: the **Torrid Zone** between the *Tropics of Cancer* and *Capricorn;* **the North Temperate Zone** and **the South Temperate Zone** and the two **Frigid Zones.**

The sun's rays which fall over the Torrid Zone travel shorter distance and heat up a smaller surface area leading to higher temperature. Beyond the Torrid Zone sun's rays travel longer distance. The sun's rays fall in a slanting position and heat up a larger area. This is because of inclined axis and revolution of the earth on its axis. Most of the heat is absorbed by clouds and water vapour or reflected back by dust particles. Thus, there is a fall in temperature as we move towards the Poles.

(ii) **Altitude:** The height of a place above mean sea level is known as its altitude. The higher the altitude, the lower is the temperature.

(iii) **Distance from the Sea:** The areas close to the sea have lower daily and annual ranges of temperature. So here the people enjoy equable temperature whereas people living away from the sea experience extremes of temperature. For example, the summers are hotter in Delhi than in Mumbai.

(iv) **Ocean Currents:** Ocean currents are large masses of surface water that circulate in regular patterns around the oceans. The warm ocean currents tend to raise the temperature of the places where they flow. For example, the British Isles enjoy a mild climate on account of the warm North Atlantic Drift. Similarly, the Humboldt Current, also called the Peru Current, a cold ocean current, greatly cools the hot climate of Peru.

(v) **Winds:** Winds blowing from warm regions raise the temperature whereas those blowing from the colder regions lower the temperature. For example, in the plains of northern India, very hot and dry winds blow from the hot desert areas of Rajasthan in summer in the afternoons. These winds called *loo* raise the temperature and cause severe heat wave.

(vi) **Natural Vegetation:** A crop covered field absorbs between 60 and 80 per cent of the solar energy while a snow surface absorbs only about 20 per cent. A forest surface absorbs about 90 per cent of the solar energy. So, forested areas bring down the temperature of a place. That is why temperature in cities is much higher than that of villages. Further, the concrete and metals in buildings and the asaphalt of roads get heated during the day. This heat is released during the night. The high rise buildings in the cities also trap the warm air and thus raise the temperature of the cities.

Atmospheric Pressure

Air is a mixture of gases and therefore, has weight. Due to its weight, it exerts pressure on the earth's surface, which varies not only from place to place but also from time to time. The weight of air on a unit area of the earth's surface is called *Air Pressure.*

Atmospheric Pressure is defined as the force per unit area exerted against a surface by the weight of the air above that surface. Air pressure is highest at sea level and decreases with altitude. Low pressure areas have less atmospheric mass above their location, whereas high pressure areas have more atmospheric mass above their location. Similarly, as height increases, there is less overlying atmospheric mass, so that pressure decreases with increasing height.

Atmospheric pressure is also influenced by temperature of air at a given place. In areas where temperature is high the air gets heated and rises up. This creates a low pressure area which is generally associated with cloudy skies and wet weather (e.g., Equatorial regions). High pressure on the other hand, is associated with clear and sunny skies, and lower temperatures.

Wind

Air moves from high pressure areas to low pressure areas. This horizontal movement of air over the earth's surface is called *wind.* It is caused by the unequal heating and cooling of the earth and the atmosphere by the Sun, which produces differences in air pressure. Winds blow from high pressure to low pressure.

Winds occur at all levels — global winds (trade winds), upper level winds (jet streams), local winds and winds that develop because of geographical features (like sea breezes). Winds can be divided into three types:

1. **Permanent winds** blow constantly throughout the year in a particular direction. *The Trade Winds, Westerlies* and *Easterlies* are the permanent winds.
2. **Seasonal winds** change their direction in different seasons. For example, *monsoons* in India.
3. **Local winds** blow only during a particular period of the day or year in a small area. For example, land and sea breeze. The hot and dry local winds that blow in the plains of northern India called *loo* is a local wind.

Humidity

Humidity is the amount of water vapour present in the air. It is a measure of the moisture content in the atmosphere. It varies from place to place and from time to time. In common parlance, when we talk about humidity, we refer to *relative humidity.*

Relative humidity is the ratio between the actual amount of water vapour present in the air (absolute humidity) and the total amount the air can hold at a given temperature. It is expressed as a percentage. Warm air can hold more water vapour than cold air.

Relative humidity is an important indicator in forecasting weather. Humidity indicates the likelihood of rainfall, dew or fog. When the relative humidity is hundred per cent, *dew point* is said to occur. When the air cools further, the water vapour condenses to form clouds and rain. Thus, in the Equatorial regions, the air is moist when the relative humidity is high. However, in the desert areas, the air is dry as the relative humidity is low.

Precipitation

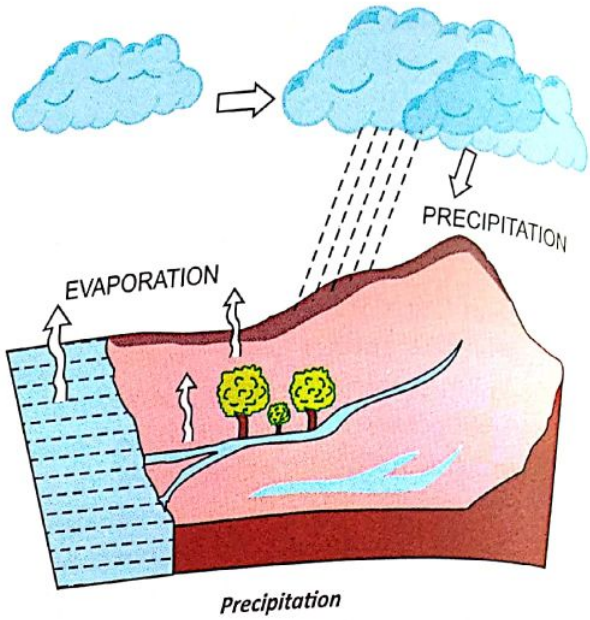
Due to evaporation from the water bodies, the atmosphere gets water in the form of water vapour. As the air cools, the water vapour is transformed into water drops by means of condensation and clouds are formed.

Clouds

The amount of cloud-cover in the sky is estimated in eighths or oktas. In order to estimate the cloud cover, a mirror divided into equal-sized squares numbering eight or its multiples is placed on the ground in an open area to reflect the sky. The number of squares covered by clouds show how many eighths of the sky have cloud cover. Suppose, if the mirror shows that 8 squares out of 16 are covered by cloud, then the cloud cover is

$$\frac{8}{16} \times 8 = 4 \text{ oktas}$$

'Eight oktas' means the sky is completely overcast and 'no oktas' means the sky is cloudless.



Precipitation

When clouds are many thousands of feet thick, these small droplets join together to form larger drops which can no longer remain suspended in the air. These drops then fall down on the earth as **rain, snow** and **hail.**

The process by which products of condensation, i.e., water droplets, ice crystals, sleet, etc., fall to ground is known as **precipitation.** Rainfall, snowfall, drizzle, sleet and hail are the chief forms of precipitation. Precipitation takes place only when tiny particles of water join together to form large sized particles which become too heavy to remain in suspension in the clouds.

1. **Rain:** It is the most common form of precipitation. Raindrops of smaller size and less intensity are known as *drizzle.*
2. **Snow:** Water droplets which rise higher and freeze on account of drop in temperature cause snowfall. Snowfall usually occurs in winter in cold climates or on high mountains.
3. **Hail:** Sometimes, vertical air currents may push water droplets or ice particles higher. They form into solid ice and fall as hail. Hailstones cause great damage to crops.

Clouds

When the earth surface gets heated up, the air gets warm and rises up. As it rises, it expands and gets cooled. After the dew-point temperature is reached cooling leads to condensation of

water vapour in the air. Tiny droplets of water vapour which are too small to fall as rain or snow remain suspended in the air and stick to things like bits of dust, ice or sea salt and float as **clouds.** The exact composition of the clouds is influenced by the temperature. Clouds remain in a state of constant evolution and show a variety of shapes, sizes and forms. Their shapes, height and movements tell us a great deal about weather we are likely to experience. Four main types of clouds and their characteristics are given in the table below.

DIFFERENCE BETWEEN WEATHER AND CLIMATE

Weather and climate are two separate entities and should not be confused with one another. Everyday we experience changes in the atmospheric conditions such as in temperature, humidity, cloudiness, precipitation and visibility. These changes in the day-to-day conditions of atmosphere at a definite place and at a fixed time is known as **Weather.**

The atmospheric conditions are never static and keep on changing. Temperature, humidity,

Types of Clouds with Characteristics

Clouds	Characteristics	Appearance	Weight
Cirrus 	They are composed mainly of ice crystals. They indicate fair weather.	Wispy or feathery commonly known as 'Mare's tails'	High-level clouds, found at more than 6km above the ground
Stratus 	They are composed of rain drops. They are uniformly grey and thick. They bring dull weather with light drizzle. They reduce the visibility of aircrafts and are dangerous.	Flat clouds, spread like sheets over wide areas.	Low-level clouds, less than 3km above the ground.
Cumulus 	Cumulus clouds are either white or grey. White fluffy clouds mean no rain but dark grey clouds bring rain.	They look like heaped cotton or cauliflowers with flat bases.	At less than 3km above the ground they are called *cumulus.* Between 3km and 6km, they are called *altocumulus;* they look like the scales of mackerel fish and are also known as 'mackerel skies' and above 6km they are called *cirrocumulus.*
Nimbus 	Nimbus means 'rain-bearing'. Nimbostratus clouds bring continuous rain, snow or sleet. *Cumulonimbus* clouds are frequently seen in tropical areas in the afternoon. They bring convectional rain along with lightning and thunder. They are also called thunderclouds	Nimbostratus is a dark, dull cloud, appearing in layers. Cumulus clouds develop into Cumulonimbus clouds when the top grows above the freezing level. Ice crystals form at the top and spread out in the shape of an anvil and appear fibrous	They extend from low and middle layers to the top. They display features of two or more types of clouds. They combine with stratus to form Nimbostratus and with cumulus to form Cumulonimbus.

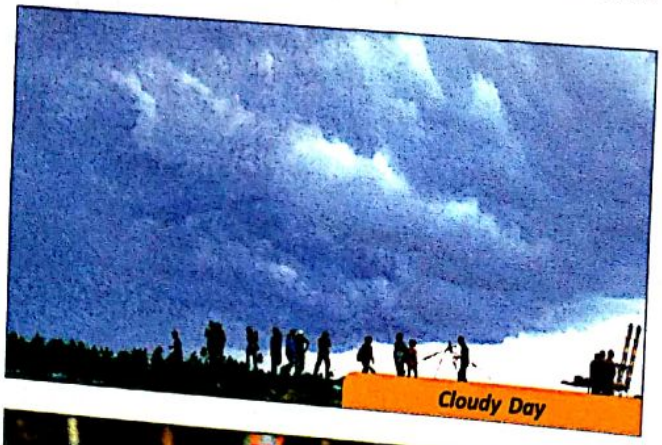
Difference between Weather and Climate

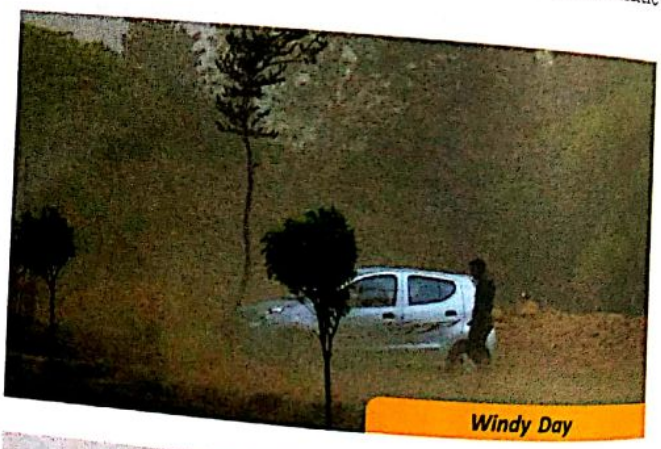
Weather	Climate
1. Weather is the condition of atmosphere at a definite place and at a fixed time.	1. Climate is the sum total of weather conditions of an area over a considerably long period of time.
2. The elements of weather change constantly.	2. The elements of climate do not change much with time.
3. Weather refers to the short term state, i.e., a day or a week or an hour.	3. Climate refers to the long term state. For climate averages, a minimum period of 35 years is desirable.
4. Weather relates to a small area.	4. Climate relates to a large area.

cloudiness, atmospheric pressure, precipitation, wind speed and direction are known as the **elements of weather.** It is on the basis of the changes in these elements of weather that we describe the weather as rainy, cloudy, windy, sunny, pleasant or sultry. Even in a small area, the weather conditions may vary a lot. For example, it may be raining heavily in one part of city, but may be quite sunny in another part of the city.

Climate, on the other hand, refers to the sum total of weather conditions of an area over a long period of time. A place that does not get much rain over many years would have a dry climate. Similarly, a place which remains cold for most of the year would have a cold climate. The elements of climate are the same as that of weather. But, the elements of climate do not change much with time. For calculating climatic averages, a minimum period of 35 years is desirable.

The degree of change in the climate also differs from place to place. For example, the climate of Britain is so changeable that it is often said that 'Britain has no climate, but only weather'. On the other hand, the climate of Egypt is so unchangeable that it is said that 'Egypt has no weather, but only climate'. Climate relates to a large area whereas weather relates to a small area. Therefore, geographers have divided the whole world into different zones based on the climatic


Cloudy Day


Windy Day


Sunny Day


Rainy Day

Different kinds of Weather

conditions in these zones. These zones are known as **Climatic Zones.**

Thus, climate is what we know and expect, like tropical monsoon climate and weather is unexpected, like a hot day with thunderstorms. Its dynamic and ever changing.

IMPACT OF CLIMATE

Climate has a profound influence over man's activities:

- The type of food we eat depends on climate as different crops require different climatic conditions for their growth. For example, in India, the kharif crops like jowar, bajra, rice, maize, etc. are grown at the beginning of south-west monsoon (May to July) as these require high temperature and heavy rainfall. The Rabi crops, like wheat, barley, oats on the other hand, need low temperature and less rainfall, and are, therefore, grown in winters.
- The clothes we wear depend on the weather conditions. During summer season, we wear light cotton clothes and during winter we wear heavy woollen clothes.
- The kind of houses we live in are influenced by the climate. In the mountains and the areas which get heavy rainfall, the houses have sloping roofs to allow the rainwater or snow to slide off easily.
- The way we live and work depend on climate and weather. People living in cooler areas as in the mountains and hills undertake terrace cultivation and animal rearing, whereas people living in the hot tropical places have agriculture as their main occupation. Fishermen follow weather broadcasts before they sail out for fishing.
- Climatic conditions influence the longevity of human life. It is usually seen that death rates are high in tropical countries than in the deserts. This is because in areas of high temperature and low humidity germs are not readily transmitted.
- Air communications depend on accurate and timely meteorological reports from ground stations.
- Climate also influences the presence of plants and animals in a particular area. For example, mango and palm trees grow in warm areas whereas pine and fir grow in cold areas and dates and cacti in hot deserts. Similarly, animals like polar bears are found in cold areas, whereas elephants and lions are found in warm areas and camels in deserts.

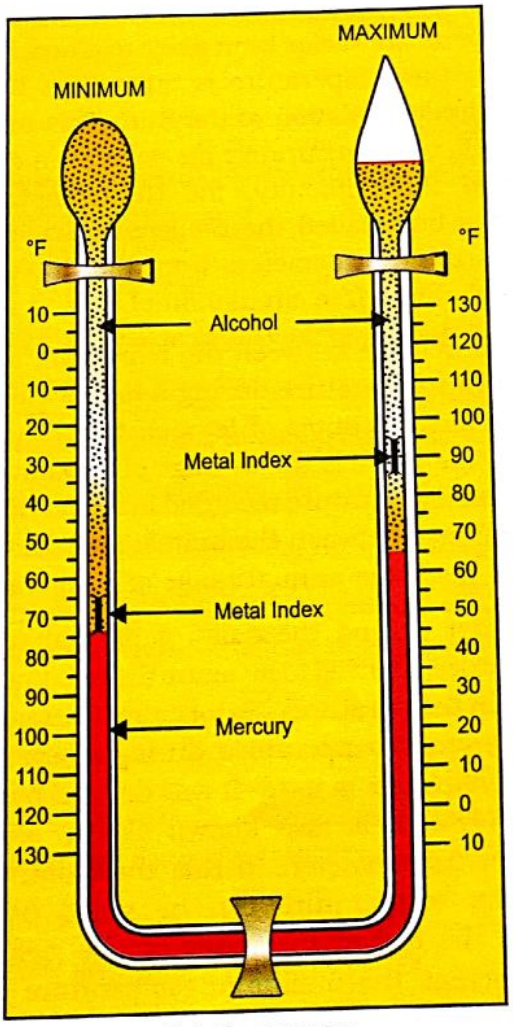
WEATHER INSTRUMENTS

The meteorologists usually make use of a variety of instruments to measure elements of weather like temperature, atmospheric pressure, humidity, rainfall and direction and speed of wind.

Thermometer

The instrument used for measuring temperature is called the **thermometer.** A thermometer is a narrow glass tube filled with mercury which expands on heating and contracts on cooling.

For measuring temperature, two types of scales are used — the *Celsius* or *Centigrade* (°C) scale



Six's Thermometer

Stevenson Screen

and the *Fahrenheit* (°F) scale. In °C scale, the boiling point is 100°C and the freezing point is 0°C. In °F scale, the boiling point is 212°C and the freezing point is 32°F. However, for most scientific purposes the centigrade scale is the preferred scale. One scale can be converted into the other scale using the formula: °F = (°C × 9/5) + 32.

Temperature varies from place to place. In open daylight, the temperature is quite high because of the direct insolation of the Sun. This makes it quite difficult to accurately measure temperature. To avoid this difficulty, the thermometers are kept in a box, called the *Stevenson Screen.* This protects the thermometers from the Sun's direct heat and allows free circulation of air.

The difference between the maximum and the minimum temperature during a day is called the daily or diurnal range of temperature. The *mean daily temperature* is the average of maximum and minimum temperature recorded in a day. However, the difference between the hottest and the coldest months, gives the annual range of temperature.

In order to find the daily or annual range of temperature, we need to measure the maximum and minimum temperatures. To measure the maximum and minimum temperature during a given time, *Six's thermometer* is used. It was devised by James Six in 1782. It is also known as the *Maximum minimum* thermometer. In this thermometer, the maximum temperature can be noted from the scale at the end of the index on the right hand limb whereas the minimum temperature can be noted from the left hand limb. This thermometer preserves the readings of the day's highest as well as the lowest temperature till it is reset by moving the markers using a magnet. It is still in common use wherever a simple way is needed to measure the extremes of temperatures at a location.

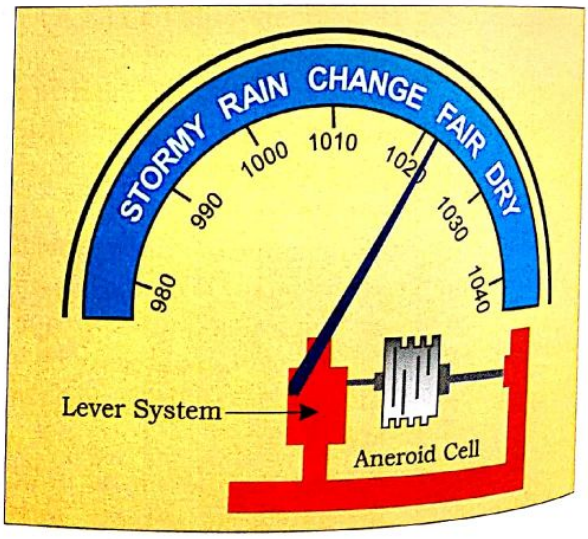
- Daily range of temperature = Maximum temp. – Minimum temp.
- Average or Mean temperature = $\frac{\text{Maximum temp + Minimum temp}}{2}$
- Annual range of temperature = Mean temp of the hottest month – Mean temp of the coldest month

Nowadays, an automatic thermometer, called the **thermograph,** is used at weather stations. It gives a continuous record of temperature over a period of twenty four hours. This makes it possible to study the maximum and minimum temperature during the whole day.

On a map, temperature is shown by the lines joining points having same temperature, called the *isotherms.* Isotherm maps are the most common method of showing temperature change on a climate scale.

Barometer

The instrument used for measuring air pressure is called a *barometer.* It was invented by Torricelli in 1643. It consists of a long glass tube, sealed at one end and open at the lower end. This tube is immersed



Aneroid Barometer

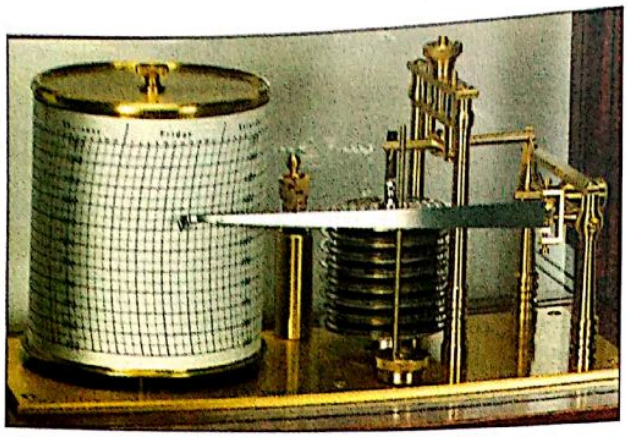
into a container of mercury. Atmospheric pressure then forces the mercury up into the tube to a level that is considerably higher than the mercury in the container. This gives the pressure of the air which can be read from the scale on the glass tube. The pressure of atmosphere is approximately 30 inches or 76 centimetres (one centimetre of mercury is equal to 13.3 millibars). A barometer, however, has certain limitations in recording pressure:

- The readings differ in mountainous regions and at sea-level. This is because as we ascend there is less air above and so the weight or pressure is less.
- The height of mercury varies with changes in outside weather conditions. It expands with an increase in temperature.
- The readings also vary at different latitudes since the barometer is sensitive to gravitational forces at different latitudes.

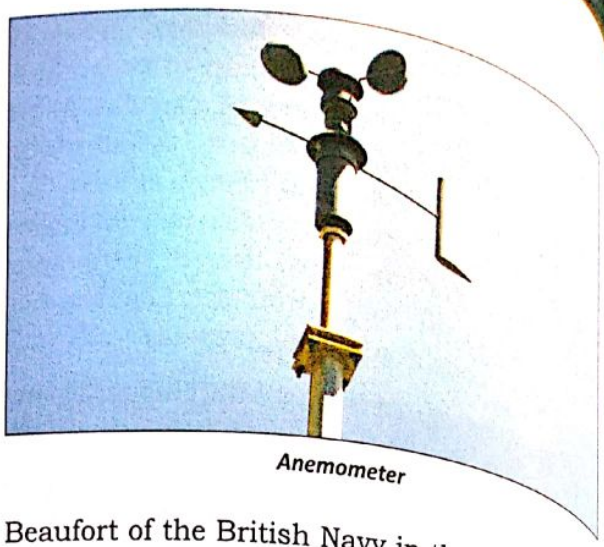
Therefore, for taking accurate readings on a barometer corrections have to be made in terms of altitude, latitude and temperature.

Wind Speed and its effects on Environment

Symbol	Beaufort Code	Description	Speed Km/hr	Effects on the Environment
	0	calm	< 1	smoke rises vertically
	1	light air	1–5	smoke drifts slowly
	2	light breeze	6–11	leaves rustle, wind can be felt, wind vanes move
	3	gentle breeze	12–19	leaves and twigs on trees move
	4	moderate breeze	20–29	small tree branches move, dust is picked up from the ground surface
	5	fresh breeze	30–38	small trees move
	6	strong breeze	39–51	large branches move, difficult to walk in the wind
	7	near gale	51–61	trees move, difficult to walk in the wind
	8	gale	62–74	twigs break off from trees
	9	strong gale	75–86	branches break off from trees, shingles blown off roofs
	10	whole gale	87–101	trees become uprooted, structural damage on buildings
	11	storm	102–120	widespread damage to buildings and trees
	12	hurricane	> 120	severe damage to buildings and trees



Barograph



Anemometer

To overcome the above said difficulties, an *aneroid barometer* is used. Inside this instrument is a small, flexible metal capsule called an *aneroid cell*. In the construction of the device, a vacuum is created inside the capsule so that small changes in outside air pressure cause the capsule to expand or contract. Any change in the volume of air is transmitted by springs and levers to an indicating arm that points to the corresponding atmospheric pressure.

For keeping a continuous record of pressure changes, an automatic barometer, called *barograph* is used. It records the atmospheric pressure on a graph paper.

On maps places of equal pressure are joined by lines called *isobars*.

Anemometer and Wind Vane

Unlike the other elements of climate, winds have both the speed and the direction. Wind speed is the velocity attained by a mass of air moving horizontally through the atmosphere. Wind speed is often measured with an *anemometer*, in kilometres per hour (kmph), miles per hour (mph), knots, or metres per second (mps).

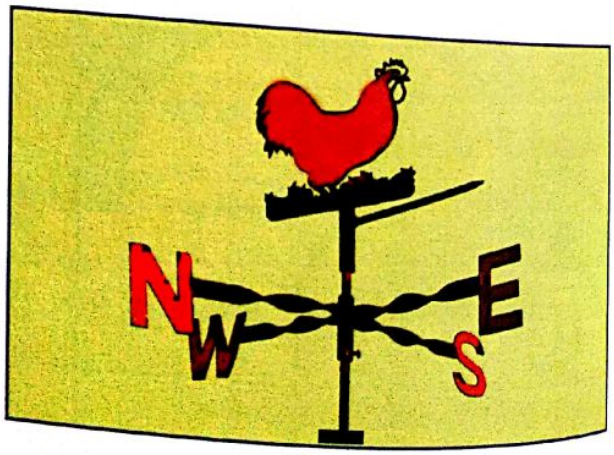
An *anemometer* consists of semi-circular cups attached to the ends of horizontal spokes placed on a high vertical spindle. When the winds blow, the horizontal spokes rotate which further make the central rod to move and transfer the velocity of the wind to an electrically operated dial.

Wind speed can also be measured without the aid of instruments using the *Beaufort wind scale*. This descriptive scale was developed by Admiral Beaufort of the British Navy in the first decade of the 17th century. The purpose of this system was to allow mariners to determine wind speed from simple observations. The Beaufort system has undergone several modifications to standardise its measurement scale and to allow for its use on land.

Wind direction refers to the direction from where a wind comes. For example, a southerly wind comes from the south and blows to the north. *Wind Vane* or *Weather Cock* is used to measure the direction of the wind. It consists of two parts — one is an arrow or vane on the top which rotates freely with the wind and the other is a stationary four compass point which shows the direction of the wind. From the direction on the compass the winds are named. For instance, the wind blowing from north-east direction is called the north-easterly wind.

Hygrometer

There are various devices used to measure humidity. A device used to measure humidity is called a *hygrometer*.



Wind Vane

Hygrometer

A simple hygrometer consists of wet and dry bulb thermometers which are placed side by side in the Stevenson screen. The dry-bulb thermometer measures the temperature of the air or the shade temperature. In the wet-bulb thermometer, the thermometer bulb is wrapped in muslin and is kept wet by a wick which is dipped into a reservoir containing distilled water. The evaporation of water has a cooling effect and the temperature indicated by the wet-bulb thermometer is less than the dry-bulb thermometer. Thus, the difference in the temperatures indicated by the two thermometers gives a measure of Relative Humidity. When the difference in the readings of the two thermometers is large, it refers to low relative humidity and when the difference is small, it indicates high relative humidity. In case, both the thermometers show the same reading, relative humidity is 100 per cent and the air is saturated.

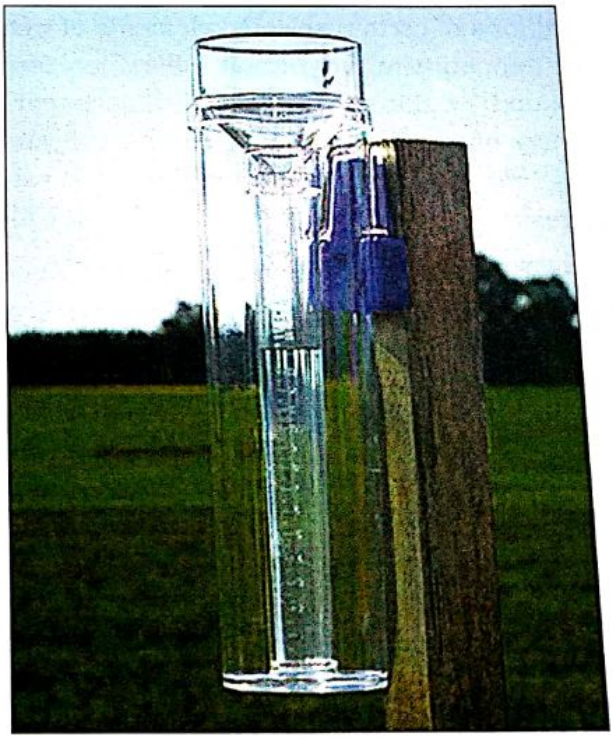
Humidity is measured on a global scale using remotely placed satellites. These satellites are able to detect the concentration of water in the atmosphere, send various water vapour images, which play an important role in monitoring climatic conditions like the formation of thunderstorms and in weather forecasts.

Rain Gauge

Rainfall is measured in inches or millimetres. One inch of rain is defined as the amount of rain required to cover a uniformly flat surface with water to the depth of one inch, provided the water does not evaporate or flow or seep away. The snowfall is carefully melted by warming the funnel and then measured. Usually 10 to 12 inches of snow is considered as equivalent to one inch of rain.

Rainfall is measured by means of a *rain gauge*. A rain gauge comprises a copper cylinder with a metal funnel, which leads into smaller copper container or a glass bottle. The hole in the funnel is very small so as to minimise evaporation. The container is placed one foot above the ground and fastened firmly to prevent splashing. It is kept in an open position, not sheltered by walls, houses, trees, etc. The rainfall is measured by removing the funnel and emptying the rain water in the container into a measuring jar. A period of 24 hours with at least 0.01 inch or more of rain is recognised as a rainy-day.

The daily records of rainfall are added for the month to measure the total rainfall during that particular month. The total for each month is then



Rain Gauge

added to obtain the annual rainfall. The average of annual rainfall over a long period of time, say 35 years gives the *mean annual rainfall.* On a map, the lines joining all places having the same mean annual rainfall are called *isohytes.*

Weather Forecast and its Significance

Man's dependence on climate and weather has led him to undertake a systematic study of the various elements of weather. This involves keen observation, accurate recording and correct processing of the elements of climate such as rainfall, temperature humidity, air pressure, winds, clouds, etc. The scientific study of the processes and physical phenomena operating in the earth's atmosphere for predicting weather is known as **meteorology** and the scientists who study it are called **meteorologists.**

A *forecast* is a statement of weather conditions expected over a place or an area during a specified period of time in future. *Short range forecasts* are valid up to forty-eight hours and give details of different weather elements and their variations expected during that period. *Medium range forecasts* are valid from two to seven days, whereas *long range forecasts* pertains to weeks, months or a season ahead and indicate the expected mean conditions of certain selected elements of weather like temperature or rainfall. Weather forecast is issued by the meteorological department of a country on the basis of information collected by using various instruments as well as satellite images.

Weather stations or meteorological stations are the places where weather conditions are studied using various instruments. Weather stations are located all over the world, including the oceans where weather ships gather a wide range of data for making weather predictions. Weather satellites encircling the earth provide useful information through pictures of clouds, storms and other weather phenomena. All this help the meteorologists to forecast the weather fairly accurately.

Weather forecasts provide valuable guidance for future planning, economic benefit as well as safety of life and property in the following ways:

- Every mode of **transportation** whether on land, over water or in the air is sensitive to changes in weather. Sailing, shipping, fishing, off-shore drilling and deep sea mining operations are highly dependent on weather. Similarly, aeroplanes which fly in the air, are dependent on weather phenomena. So, accurate forecast of weather is essential for ocean navigation, fishing activity and aviation schedules.
- **Agriculture,** especially in India, is dependent on weather conditions. Rainfall, temperature and humidity guide the cropping pattern and cropping seasons of a place. Weather forecasts help the farmers to prepare themselves and their land for any changes caused by weather conditions.
- Weather forecast plays an important role in saving men and materials by predicting the occurrence of **natural calamities** like cyclonic storms, tsunami, hurricanes and heavy rainfall.
- Many **important events** like military operations, geographical expeditions, social events and important sports events are organised on the basis of weather forecasts.

Isotherms and Isohyets

Isotherms and Isohyets are used to show the distribution of temperature and rainfall, respectively on maps.

Isotherms are lines joining places having equal temperature. These lines are drawn on maps by using the temperature recorded at different meteorological stations to show the distribution of temperature at the earth's surface. They are also used to show the time variation of temperature with height in the atmosphere.

Isohyets are lines joining places having equal amount of precipitation in a given period. It helps to analyse average rainfall across a particular area.

Key Points

- Weather refers to the day-to-day conditions of atmosphere at a definite place and at a fixed time.
- Climate refers to the average atmospheric conditions of an area over a considerably long period of time.
- The elements of weather and climate are *temperature, humidity, atmospheric pressure, rainfall, wind speed and direction and cloudiness.*
- Temperature is the degree of hotness or coldness of the air. It is measured by a thermometer which is a narrow glass tube filled with mercury. To measure the maximum and minimum temperature during a given time, *Six's thermometer* is used.
- Atmospheric Pressure refers to the pressure at any given point in the earth's atmosphere. Pressure decreases with height. A *Barometer* is used for measuring pressure.
- Humidity is the amount of water vapour in the air. Relative humidity is the ratio between the actual amount of water vapour in the air (absolute humidity) and the total amount of water vapour the air can hold at a given temperature. *Hygrometer* is used to measure humidity.
- Rainfall is measured by a *rain gauge.*
- Wind is the horizontal movement of air. Wind speed is the velocity attained by a mass of air moving horizontally through the atmosphere. It is measured by an *anemometer.* It can also be measured without using any instrument with the help of a *Beaufort Wind Scale.*
- Wind direction is the direction from where a wind comes. It is measured by an instrument called a *wind vane.*
- The scientific study of the processes and physical phenomena operating in the earth's atmosphere for predicting weather is known as *meteorology.*
- Weather Stations or meteorological stations are the places where weather conditions are studied using various instruments.

Exercises

I. Fill in the blanks:

1. _____ is never static and keeps on changing.
2. Air has _____ and it exerts _____.
3. _____ air can hold more water vapour than _____ air.
4. In the equatorial regions the humidity is _____ and in the deserts it is _____.
5. On a centigrade scale, the boiling point of water is _____ and on a Fahrenheit scale, it is _____.

II. Match the following:

Column A: Elements of Weather	Column B: Measuring Instrument
1. Humidity	(a) Anemometer
2. Atmospheric Pressure	(b) Wind Vane
3. Wind Speed	(c) Hygrometer
4. Temperature	(d) Barometer
5. Wind Direction	(e) Thermometer

III. Distinguish between the following terms:

1. Climate and Weather.
2. Celsius and Fahrenheit scales.
3. Relative and Absolute Humidity.
4. Annual Rainfall and Mean Annual Rainfall.

IV. Answer the following questions briefly:

1. What is meant by weather? What are its main elements?
2. In what ways climate and weather affect human activities?
3. How is temperature measured using Six's thermometer?
4. What is atmospheric pressure?
5. How does temperature of air influence atmospheric pressure?
6. How is humidity in the air measured?
7. How is rainfall measured?
8. What is a wind? Explain with examples, three types of winds.

V. Structured Question

(a) How is atmospheric pressure measured? What are the limitations of recording pressure with a barometer?

(b) What is wind speed? How can it be measured without using any instrument?

(c) Define temperature. State the factors that influence the temperature of a place.

(d) Give geographical reasons:

(i) Summers are hotter in Delhi than in Mumbai.

(ii) Plains in northern India are very hot in summers.

(iii) Temperature in cities are higher than that of villages.

VI. Things To Do

1. Study the readings on the given Six's Maximum, Minimum thermometer and answer the following questions:

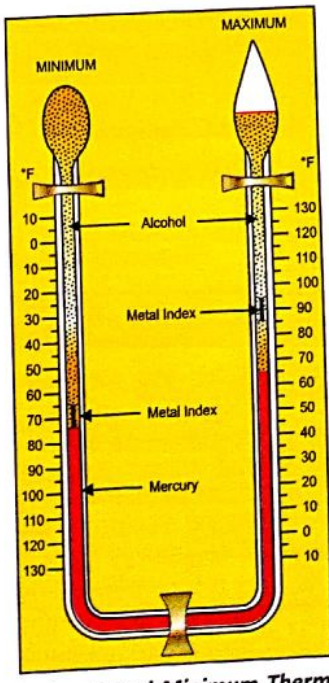
(a) What is the temperature scale on each limb?

(b) What is the maximum temperature?

(c) What is the minimum temperature?

(d) What is the daily range of temperature?

(e) What is the Average or Mean temperature?



Six's Maximum and Minimum Thermometer

Home work :

Q. 1. What is Weather ?

Q. 2. Name the elements of Weather.

Q. 3. What is climate ?

Q. 4. State two differences between weather and climate.

Q. 5. Name different Heat zones.

Q. 6. Name different types of clouds according to the height.

7. Name the instruments use to measure
   i) Temperature.
   ii) Rainfall,
   iii) Atmospheric Pressure
   iv) Humidity.
   v) Direction of Wind.