

# GEOGRAPHY

## Chapter 4: Climate



## Climate

Weather is the state of the atmosphere over an area at a given point of time. Climate, on the other hand, refers to the total of weather conditions and variations occurring over a large area over a long period of time. Wind, rainfall, temperature, and atmospheric pressure are some important elements of climate and weather. Two main differences between weather and climate:

Weather	Climate
<b>Weather is a day-to-day state of the atmosphere of an area at any given point of time.</b>	Climate is the total of weather conditions of a given place over a longer period of time.
<b>Weather changes on a daily basis.</b>	Climate of a given place remains constant for over 30 to 40 years.

### The Climate of India

India has a 'monsoon' type of climate. It experiences several kinds of regional climatic variations. While there is hardly 20cm of rainfall annually in the western parts of Rajasthan and Gujarat, Assam and Arunachal Pradesh receive more than 250cm of rainfall. During winters, the night temperature may fall below  $-45^{\circ}\text{C}$ , while on the same night, Thiruvananthapuram may experience a temperature of  $45^{\circ}\text{C}$ . These variations have resulted in different lifestyles of the people.

#### Factors Affecting the Climate of India

Factors which affect the climate of India are

##### Latitude

- Tropic of Cancer, a latitude, passes through India at  $23^{\circ}26'\text{N}$  to the north of the equator. It passes through eight Indian states running from the Rann of Kutch of Gujarat to Mizoram in the east.
- The Tropic of Cancer divides the country into two halves. The areas in India which lie to the north of the Tropic of Cancer lie in the sub-tropical regions, while the areas to the south of the tropic lie in the tropical regions.
- The temperature remains high throughout the tropical regions.

**Altitude:** The temperature declines as we travel to places above the sea level. Thus, the temperature decreases with an increase in altitude.

- There is a decrease of  $1^{\circ}\text{C}$  for every 166 m rise in height. This is the reason that hill stations in India are cooler than the plain regions.

### Air Pressure and Surface Winds

- India lies in the region of northeasterly winds. However, as these winds blow over land, they carry very little moisture and cause no rainfall.
- During winters, high pressure areas are created to the north of the Himalayas. Cold winds blow from this region to the low-pressure areas to the south over the oceans.
- During summers, as low-pressure areas develop over Central Asia, there is complete reversal of the direction of the winds. Winds move from a high-pressure area over the Southern Indian Ocean. As these winds blow over the warm ocean, they gather moisture and bring rainfall to the country.
- The climate of India is also influenced by jet streams. The western cyclonic disturbances in the north and northwestern parts of the country are brought about by the sub-tropical westerly jet streams.

**Jet streams** are a narrow belt of high-altitude westerly winds in the troposphere. Their speed varies from about 110 km/h in summers and to about 184 km/h during winters. The cyclonic disturbances which are experienced in the northern and northwestern parts of the country are brought in by the westerly flow.

### The Indian Monsoon

India has a monsoon type of climate as its climate is strongly influenced by the monsoon winds. It is important to keep certain facts in mind before studying the monsoon season in India. These are

- a. The differences in heating and cooling of land and water results in the creation of low pressure on the Indian mainland. The seas at the same time experience high pressure conditions.
- b. **Inter Tropical Convergent Zone (ITCZ)** is a broad trough of low pressure in the equatorial latitudes.

- c. The presence of high-pressure area east of Madagascar over the Indian Ocean affects the Indian monsoon.
- d. The movement of the westerly jet stream to the north of the Himalayas and the tropical easterly jet stream over the Indian Peninsula also affect the rainfall in India.

It has been seen that apart from other factors, the changes in the pressure conditions over the southern oceans also affect the monsoons. Generally, when the tropical eastern South Pacific Ocean experiences high pressure, the tropical eastern Indian Ocean experiences low pressure. However, it has been noticed that there has been a reversal in the pressure conditions. While the eastern South Pacific Ocean has low pressure conditions, the eastern Indian Ocean has relatively high-pressure conditions. This periodic change in pressure conditions is known as the **Southern Oscillation** or **SO**.

### **The Onset of the Monsoons and their Withdrawal**

- In India, the duration of the monsoon is generally from the months of June to mid-September. When the monsoon arrives, the intensity of the rainfall increases which continues for several days; this is known as the '**burst**' of the monsoon.
- By the first week of June, the monsoon arrives in Kerala. It is then divided into two branches—the Bay of Bengal branch and the Arabian Sea branch.
- The Arabian Sea branch reaches Mumbai in the second week of June. The Bay of Bengal branch also arrives in Assam in the first week of June. The mountains in the region lead to the deflection of the monsoon winds over the North Indian Plains.
- By mid-June, the monsoon strikes the central parts of the country and the Saurashtra and Kutch regions.
- Uttar Pradesh, Punjab, Haryana and eastern Rajasthan receive rainfall by the first week of July.
- The monsoon winds begin to withdraw from the northwestern parts of India by early September. It withdraws from the peninsular region by mid-October, and it completely withdraws from the country by the first week of December.

### **The Seasons**

A country with a monsoon type of climate experiences distinct seasons. India experiences the following seasons:

### **The Cold Weather Season**

- The cold weather season in India begins during mid-November in Northern India and stays till February. December and January are the coldest months.
- During the cold season, the days are warm, and the nights are cold. When temperature decreases, frost is commonly experienced in Northern India.
- The cold season in most parts of the country is the dry season as northeast trade winds blow from land to sea.
- Many cyclonic disturbances occur over northern India during this time. These result in rainfall during winters and snowfall in the Himalayan regions. This winter rainfall helps in the cultivation of rabi crops.

### **The Hot Weather Season**

- The hot weather season in India begins from March and continues till May. In May, the temperature rises to 45°C in the northwestern parts of the country.
- Because of high temperature, low air pressure is created in the northern parts of the country.
- One of the striking features of the hot weather season in India is the blowing of local winds known as 'loo'. It is a hot wind which may blow even during the evenings. Direct exposure to these winds may cause fever and anxieties.
- Sometimes, northern India experiences dust storms accompanied by light rainfall during May. This brings down the temperature.
- During this time, torrential downpours are accompanied by hail in West Bengal. These storms are known as Kaal Baisakhi.
- Towards the end of the summer season, rain showers are common in Kerala and Karnataka. They help in the early ripening of mangoes and thus are sometimes also referred to as 'mango showers'.

### **Advancing Monsoon**

- By the first week of June, low pressure conditions get intensified over the North Indian Plains. These conditions attract the southeast trade winds which originate from the Southern oceans.

- These winds blow over the warm oceans and thus bring moisture and rainfall to the country.
- During the early monsoon season, the places located on the windward side of the Western Ghats receive heavy rainfall up to 250 cm.
- The northeastern parts of the country receive heavy rainfall. Mawsynram in Meghalaya receives the highest amount of rainfall in the world.
- As we go from the east to the west, the rainfall decreases. Rajasthan and Gujarat receive scanty rainfall.
- Rain does not fall continuously during the monsoon season. Thus, there are dry spells and wet spells. Monsoons are uncertain and irregular.

### **Retreating Monsoon**

- During October and November, the southwest monsoon winds become weaker and start retreating from the Northern Plains by the beginning of October.
- The retreat is indicated by clear skies and an increase in the temperature in the northern plains. This increase in temperature is termed 'October heat'.
- At this time, the low-pressure conditions shift to the Bay of Bengal, giving rise to cyclonic depressions. These cyclonic depressions often result in the destruction of life and property, generally on the eastern coast and the southern coast.
- Most of the rainfall in the Coromandel Coast is derived from depressions and cyclones.

### **Distribution of Rainfall**

- Rainfall distribution is not the same for every part of the country. While northeastern India and the parts of the western coast receive about 400 cm of rainfall annually, western Rajasthan and the western parts of Gujarat, Punjab and Haryana receive less than 60 cm of rainfall.
- The winds which rise from the Arabian Sea are full of moisture. These winds strike the mountains on the western side resulting in heavy rainfall. By the time these winds reach the Eastern Ghats, they are already dry as they already shed their moisture. Hence, the Western Ghats receive more rainfall than the Eastern Ghats.
- Rainfall is also low in the Eastern Ghats, interior parts of the Deccan Plateau and the Leh

region of Jammu and Kashmir.

- The other parts of the country receive moderate rainfall.
- Such a distribution of rainfall causes great climatic variations. While the eastern parts of the country almost get flooded every year, the western parts of the country experience drought like situations.

### Monsoon as a Unifying Bond

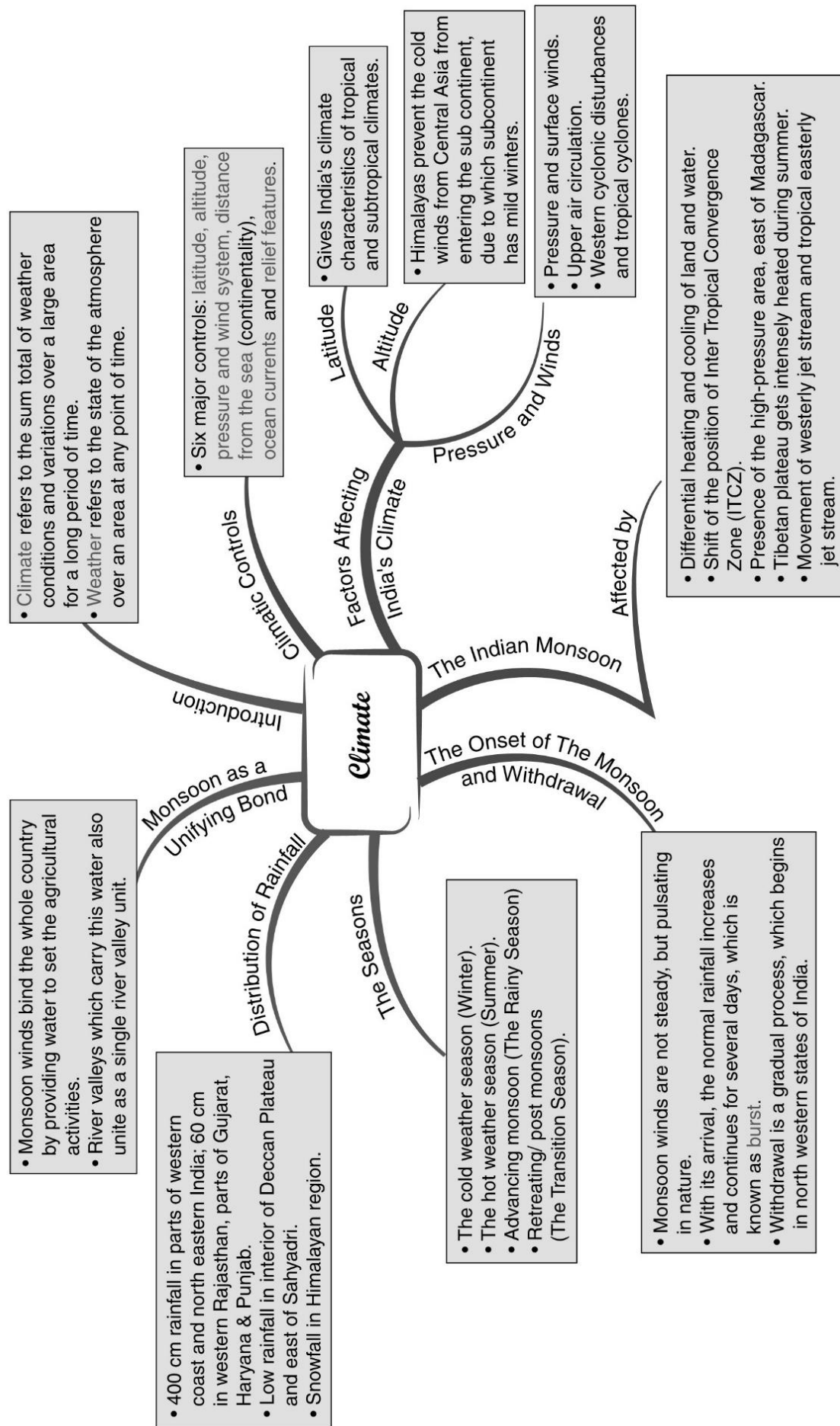
Although the monsoon winds are irregular and uncertain, they unify the entire country. The farmers eagerly wait for the arrival of rainfall. Rainfall provides the water required to set agricultural activities in motion. Its arrival is welcomed with the celebration of festivals, singing and dancing.



Map showing direction of Southwest monsoon winds in India



# CHAPTER- 4 CLIMATE





## Important Questions

### Multiple Choice questions-

Question 1. What factors affect the climate of a place in India?

(i) Location (ii) Surface winds (iii) Relief features (iv) Upper air circulation

(a) (i) and (iv)

(b) (i) and (iii)

(c) (i) and (ii)

(d) (i), (ii), (iii) and (iv)

Question 2. The word 'Monsoon' has been derived from the Arabic word 'Mausam' which means:

(a) Climatic changes

(b) Seasons

(c) Weather condition

(d) Climatic variation

Question 3. What is the average temperature of Chennai during winter?

(a) Between 24° – 25°C

(b) Between 10° – 15°C

(c) Between 20° – 25°C

(d) Between 25° – 30°C

Question 4. Which of the following state affected by Kal-Baisakhi:

(i) Assam (ii) West Bengal (iii) Chennai (iv) Orissa

(a) (i) and (iii)

(b) (i) and (iv)

(c) (i) and (ii)

(d) All states (i), (ii), (iii) and (iv)

Question 5. Which of the following seasons are recognised in India.

(i) Cold Weather Season (ii) Hot Weather Season (iii) Advancing Monsoon Season (iv) Retreating Monsoon Season

(a) Only (iv)

(b) Only (iii)

(c) Expect (iv), (i), (ii) and (iii)

(d) All season mention in option (i), (ii), (iii) & (iv)

Question 6. What is climate?

- (a) Sum of total weather conditions and variation over a large area of a long time.
- (b) Sum of total weather condition over a particular area.
- (c) Temperature condition of a particular region.
- (d) None of these

Question 7. Which of the following place receive highest rainfall in India as well as in the world?

- (a) Silchar
- (b) Cherrapunji
- (c) Mawsynram
- (d) Guwahati

Question 8. The wind blowing in the northern plains in summer is called .....

- (a) Loo
- (b) Trade winds
- (c) Kaal Baisakhi
- (d) All a, b and c.

Question 9. Which of the following causes rainfall during winter in the north-western part of India.

- (a) Cyclonic depression
- (b) Western disturbance
- (c) Retreating monsoon
- (d) South west monsoon

Question 10. Monsoon arrives in India approximately in ..... :

- (a) Early May
- (b) Early June
- (c) Early July
- (d) Early August

Question 11. The most important characteristics of cold weather season in India is:

- (a) Warm days and warm nights
- (b) Warm days and Cold nights
- (c) Cold days and cold nights
- (d) Cold days and warm nights

Question 12. From which of the following pressure belts do the north-easterly trade winds originate?

- (a) Equatorial low-pressure belt
- (b) Subtropical high-pressure belt of the Northern Hemisphere
- (c) Subtropical high-pressure belt of the Southern Hemisphere
- (d) Temperate low-pressure belt of the Northern Hemisphere

Question 13. The Indian subcontinent experiences comparatively milder winters as compared to Central Asia due to which of the following factors?

- (a) The Tropic of Cancer
- (b) The surrounding seas
- (c) The Himalayas
- (d) Ocean currents

Question 14. Which one of the following is not one of the six major controls of the climate of any place?

- (a) Latitude
- (b) Temperature
- (c) Pressure and wind system
- (d) Distance from the sea

Question 15. Latitude and altitude of a place determine which of the following climatic elements of a place?

- (a) Pressure and wind system
- (b) Temperature
- (c) Rainfall pattern
- (d) All the above

### Very Short Questions:

1. What is climate?
2. Distinguish between climate and weather.
3. Name the elements of climate and weather.
4. What is the climate of India?
5. What does the word 'Monsoon' mean?
6. What is the variation of temperature in summer in India?
7. What is the variation of temperature in winter in India?
8. What is the variation of annual precipitation in India?

9. In which months is the season of rainfall experienced in India?
10. Why do the coastal areas of India experience less contrast in temperature?

### Short Questions:

1. How do the variations in temperature affect the lives of the people in India?
2. What is the jet stream?
3. What is the ITCZ?
4. Explain the Southern Oscillation.
5. How is the El Nino phenomenon connected with the Southern Oscillation?
6. What do you understand by the 'Retreating of the Monsoon'? When does it occur?
7. Describe the main features of the Retreating Monsoon season in India.

### Long Questions:

1. Describe the main features of the Retreating Monsoon season in India
2. Describe the path of the monsoon winds, after it strikes the West Bengal coast.
3. Explain the distribution of rain caused by the Monsoons
4. Explain the four features of the Monsoon rains.
5. Describe the regional variations in the climatic conditions of India with the help of suitable examples.

### Assertion Reason Questions:

1. In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

**Assertion (A) :** 'Western Disturbances' disturb the calm and quite weather of North and Northwestern India by causing cyclonic rains over the plains and snowfall in the mountains.

**Reason (R) :** Winter rainfall caused by them locally known as 'Mahawat' is of immense importance for the cultivation of Rabi crops.

A) Both (A) and (R) are true, and (R) is the correct explanation of (A).

B) Both (A) and (R) are true, but (R) is not the correct explanation of (A).

C) (A) is true, but (R) is false.

D) (A) is false, but (R) is true.

2. In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

**Assertion (A) :** Arabian Sea branch of South West Monsoons is responsible for good rainfall in the Northern Plains of India.

**Reason(R) :** The part of South West Monsoons which blows over the Arabian Sea is

responsible for high rainfall on the western coast of India.

A) Both (A) and (R) are true, and (R) is the correct explanation of (A).

B) Both (A) and (R) are true, but (R) is not the correct explanation of (A).

C) (A) is true, but (R) is false.

D) (A) is false, but (R) is true.

### Case Study Based Question:

1. Read the source given below and answer the questions that follow:

The cold weather season begins from mid November in northern India and stays till February. December and January are the coldest months in the northern part of India. The temperature decreases from south to the north. The average temperature of Chennai on the eastern coast, is between 24°C - 25° Celsius, while in the northern plains, it ranges between 10°C and 15° Celsius. Days are warm and nights are cold. Frost is common in these winds blow through the Ganga valley from the west and the northwest. The weather is normally marked by clear sky, low temperatures and low humidity and feeble, variable winds.

A characteristic feature of the cold weather season over the northern plains is the inflow of cyclonic disturbances from the west and the northwest. These low- pressure systems, originate over the Mediterranean Sea and western Asia and move into India, along with the westerly flow. They cause the much-needed winter rains over the plains and snowfall in the mountains. Although the total amount of winter rainfall locally known as 'Mahawat' is small, they are of immense importance for the cultivation of 'Rabi' crops.

(1) In cold weather season of winter, the temperature decreases from \_\_\_\_\_.

A) South to the North

B) East to the West

C) North to the West

D) South to the East

(2) Which one of the following characterizes the cold weather season in India?

A) Warm days and warm nights

B) Warm days and cold nights

C) Cold days and cold nights

D) Cold days and warm nights

(3) Some amount of rainfall occurs on the \_\_\_\_\_ coast from these winds, as they blow sea to land.

A) Coromandel

B) Malabar

C) Kerala

D) Tamil Nadu

(4) Winter rainfall called is of immense importance for the cultivation of \_\_\_\_\_ crops.

A) Monsoon Showers, Rabi Crops

B) Mango Showers, Kharif Crops

C) Mahawat, Rabi Crops

D) Kaal Baisakhi, Kharif Crops

2. Read the source given below and answer the questions that follow:

There are six major controls of the climate of any place. They are: Latitude, Altitude, Pressure and Wind system, Distance from the sea (continentality), Ocean currents and Relief features.

Due to the curvature of the Earth, the amount of solar energy received varies according to Latitude. As a result, air temperature generally decreases from the equator towards the poles. As one goes from the surface of the earth to higher altitudes, the atmosphere becomes less dense and temperature decreases. The hills are therefore cooler during summers. The pressure and wind system of any area depend on the latitude and altitude of the place. Thus, it influences the temperature and rainfall pattern. The sea exerts a moderating influence on climate: As the distance from the sea increases, its moderating influence decreases and the people experience extreme weather conditions. This condition is known as continentality (i.e., very hot during summers and very cold during winters). Ocean currents along with onshore winds affect the climate of the coastal areas. For example, any coastal area with warm or cold currents flowing past it, will be warmed or cooled if the winds are onshore.

(1) Due to the \_\_\_\_\_ of the Earth, the amount of Solar energy received varies according to Latitude.

A) Circumference

B) Radius

C) Curvature

D) Diameter

(2) As one goes from the surface of the Earth to higher altitudes, the \_\_\_\_\_ becomes less dense and temperature decreases.

A) Atmosphere

C) Hydrosphere

B) Biosphere

D) Lithosphere

(3) The condition known as \_\_\_\_\_ when it is very hot during summers and very cold



during winters.

- A) Continuity of Climate
- B) Climatic Condition
- C) Continentality Climate
- D) Changing Climate

(4) Relief feature plays a major role in determining \_\_\_\_\_.

- A) The temperature of a place
- B) The weather of a place
- C) The season of a place
- D) The climate of a place

### **Answer Key:**

#### **MCQ**

1. (d) (i), (ii), (iii) and (iv)
2. (b) Seasons
3. (a) Between 24° – 25°C
4. (c) (i) and (ii)
5. (d) All season mention in option (i), (ii), (iii) & (iv)
6. (a) Sum of total weather conditions and variation over a large area of a long time.
7. (c) Mawsynram
8. (a) Loo
9. (b) Western disturbance
- 10.(b) Early June
- 11.(c) Cold days and cold nights
- 12.(b) Subtropical high pressure belt of the Northern Hemisphere
- 13.(c) The Himalayas
- 14.(b) Temperature
- 15.(d) All the above

#### **Very Short Answer:**

1. Climate refers to sum total of weather conditions over a large area for a long period of time (30 – 40 years).

2. Climate refers to the sum total of weather conditions and variations over a large area for a long period of time (thirty years).

Weather refers to the state of the atmosphere over an area at any point of time.

3. Elements of weather and climate are temperature, atmospheric pressure, wind, humidity and precipitation.

4. India's climate is described as "Tropical Monsoon Type of Climate".

5. The word Monsoon is derived from the Arabic word 'mausim' which literally means season. It refers to the seasonal reversal in the wind direction during a year.

6. In summer, the mercury occasionally touches 50°C in some parts of Rajasthan desert, whereas it may be around 20°C in Pahalgam in Jammu and Kashmir.

7. In winter, the temperature in Drass in Jammu and Kashmir is as low as – 45°C and Thiruvananthapuram may have 22°C.

8. The annual precipitation is over 400 cms in Meghalaya and less than 10 cms in Ladakh and western Rajasthan.

9. Most parts of India receive rainfall from June to September.

10. The coastal areas experience less contrast in temperature because of the influence of the sea, e.g. Mumbai experiences an equable climate.

### Short Answer:

**Ans: 1.** (a) They affect the food the people eat.

(b) The clothes the people wear

(c) The kind of houses they live in.

**Ans: 2.** (a) These are a narrow belt of high altitude westerly winds in the troposphere.

(b) Their speed varies from about 110 km/h in summer to about 184 km/h in winter.

(c) Of the jet streams that have been identified, the most constant are the mid-latitude and the sub-tropical jet stream.

**Ans: 3.** (a) The Inter Tropical Convergence Zone is a low pressure trough lying 5° North and South of the Equator.

(b) The North East and the South East Trade winds meet here.

(c) The ITCZ moves north or south of the Equator with the apparent movement of the sun

**Ans: 4.** (a) Normally when the tropical eastern South Pacific Ocean experiences high pressure, the tropical . eastern Indian Ocean experiences low pressure.

(b) Sometimes there is a reversal in the pressure conditions.

(c) This periodic change in pressure conditions is known as the Southern Oscillation or S.O. If the pressure differences are negative it would mean late monsoons.

**Ans: 5.** (a) Normally a cold current flows along the Peruvian Coast.

(b) Every two to five years a warm ocean current takes the place of the cold Peruvian current.

(c) The changes in the pressure conditions are connected to the El Nino, so this phenomenon is referred to as ENSO (El Nino Southern Oscillations).

**Ans: 6.**

(a) Withdrawal of the monsoon from the country is known as the retreating of the monsoon.

(b) The withdrawal is a gradual process. In September the monsoon withdraws from the north western states and by October from the northern half of the peninsular.

(c) The monsoon finally withdraws from the country by early December.

**Ans: 7.** The main features of the Retreating Monsoon season in India are:

(a) During October-November the monsoon trough becomes weaker. It is gradually replaced by a high pressure system. The south-west monsoon winds starts withdrawing gradually. By beginning of October the monsoon withdraws completely from northern plains.

(b) The months of October and November are a period of change from hot rainy season to dry winter conditions. The land is moist, the sky is clear and the temperature rises. Nights are cool and pleasant. Owing to high temperature and humidity, the heat becomes oppressive during daytime and it is called 'October heat'.

(c) The low pressure conditions get transferred over the Bay of Bengal by the beginning of November. This shift is associated with the occurrence of cyclonic depression, which develops over the Andaman Sea. These cyclones cross the eastern coast and cause heavy rainfall. They are destructive and the deltas of the Godavari, Krishna and Kaveri are often struck by them.

### Long Answer:

**Ans: 1.** (a) **Pressure:** In winter the pressure is high over the land and low over the sea. Therefore cold winds blow from land to the sea. In summer the winds blow from sea to land where the pressure is low.

(b) **Distance from the Sea:** Places near the sea have a moderate climate due to the influence of land and sea breezes. Places far away in the interior have a continental or extreme climate.

(c) **Ocean Currents:** Ocean currents affect the coastal regions. Cold currents reduce the temperature of the regions they blow along. Warm currents increase the temperature of coastal regions.

(d) **Relief:** Mountains lying at right angles to the winds cause heavy rainfall whereas mountains lying parallel to the winds do not cause rain. Windward slopes of mountains cause heavier rain than the leeward slope or the rain shadow area.

(e) **Latitude:** Due to the spherical shape of the earth the amount of solar energy received by the earth varies according to the latitude. Temperature decreases from the Equator to the poles.

**Ans: 2.** (a) The Bay of Bengal Branch first strikes the coast of Bangladesh and then proceeds towards Assam in the first week of June.

(b) The high mountains cause the monsoon winds to deflect towards the west over the Ganga plains.

(c) The rainfall keeps on decreasing as the winds move up the Ganga Valley.

(d) By mid-June, the Arabian Sea Branch meets the Bay of Bengal Branch.

(e) The monsoon reaches Delhi by 29th June. Uttar Pradesh, Punjab, Haryana and eastern Rajasthan receives rain by the 1st week of July and Himachal Pradesh by mid-July.

**Ans: 3.** (a) Heavy rainfall (over 250 cm) is caused on the windward slopes of the Western Ghats.

(b) The Deccan plateau and parts of Madhya Pradesh lie in the rain shadow area of the Ghats and get less rain.

(c) The north eastern part of the country receives very heavy rain (Mawsynram receives the highest rainfall in the world).

(d) Rain in the Ganga plain decreases from the east to the west.

(e) Rajasthan and parts of Gujarat get scanty rainfall.

**Ans: 4.** (a) The Monsoon is often irregular in its arrival and retreat.

(b) The rainfall is unevenly distributed. Certain regions lying on the windward slopes of the mountains receive heavy rain while those in the rain shadow area receives less.

(c) The amount of rain varies annually.

(d) The rainfall is concentrated within the three months of the year.

(e) The alternation of dry and wet spells vary in intensity. At one place the rainfall is very heavy

causing floods while at another place it might have famines.

**Ans: 5.** There are great variations in the climate of India.

(a) Certain regions receive very heavy rainfall like the North-east and the Western Coastal plains while others like the Thar Desert receive scanty rainfall.

(b) Places like Ladakh and Kashmir are very cold while others like Rajasthan are very hot.

(c) Coastal regions have an equable climate while places in the interior have an extreme climate.

(d) Areas on the windward slopes of the mountains receive heavy rainfall, while leeward and rain shadow areas receives less rain.

(e) Coastal areas with warm currents flowing past it, will be warmer than those areas which have the cold currents flowing close to it.

### Assertion Reason Answer:

1. B) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
2. A) Both (A) and (R) are true, and (R) is the correct explanation of (A).

### Case Study Answer:

#### 1. Answer:

- (1) A) South to the North
- (2) B) Warm days and cold nights
- (3) D) Tamil Nadu
- (4) (C) Mahawat, Rabi Crops

#### 2. Answer:

- (1) C) Curvature
- (2) A) Atmosphere
- (3) C) Continentality Climate
- (4) D) The climate of a place