

4

GEOGRAPHY

Climate

Contemporary India - I
(NCERT Book)



A place's climate affects its residents' economic circumstances, way of life, and surroundings. Extreme climate fluctuations are typical in a nation like India, which has a diversified topography and needs them to sustain its wide range of vegetation. India is situated in a perilous position between the tropics due to its latitudinal extension. Nonetheless, the subtropical zone contains a sizable chunk of its landmass. As a result, the nation experiences a wide range of regional climate differences.

Topic Notes

- Climate
- Climatic Controls
- Factors Affecting India's Climate
- The Seasons
- Distribution of Rainfall
- Monsoon as a Unifying Bond

Climate refers to the sum total of weather conditions and variations over a large area. This chapter throws light on various unique climatic conditions experienced in India and the factors that influence them. India experiences four different seasons and each season has different characteristics. India experiences the monsoon—a seasonal reversal of rain-bearing winds that benefits its agricultural economy. This chapter focuses on the different climatic variations experienced in different regions of the country. The climate is influenced by six climatic controls, which have also been explained in this chapter.

TOPIC 1

CLIMATE

Learning Objectives

- Students will be introduced to concepts like weather, climate, and climatic conditions.
- Students will learn about the elements of weather and climate.
- Students will read about the variations in temperature and precipitation experienced at different places in the country.
- Students will learn about the monsoon type climate experienced in India and South Asia.

Learning Outcomes

- Students will be able to know the difference between weather and climate.
- Students will be able to describe in brief the climate type of India.
- Students will be able to give reasons for various climate related paradoxes experienced in the country.
- Students will be able to enlist the variations in precipitation and temperatures experienced by various regions in the country.

Weather refers to the state of the atmosphere over an area at any given point of time. Climate refers to the sum total of all weather conditions and variations over a large area for a long period of time (more than thirty years). The elements of weather and climate are the same, i.e., temperature, atmospheric pressure, wind, humidity and precipitation.

Weather conditions can fluctuate multiple times a day, but there is a common pattern observed over a few weeks or months. On the basis of monthly atmospheric conditions, a year is divided into seasons such as winter, summer or rainy seasons.

Important

- The world is divided into various climatic regions. This monsoon type of weather is found in south and south-east Asia.

India's climate is described as the monsoon type of climate. The term 'Monsoon' is derived from the Arabic word, Mausim, which means season. Monsoon refers to the seasonal reversal in the wind direction during a year.

India's climatic conditions vary immensely regionally despite an overall unity. Temperature and precipitation vary from one place to another. For example, Rajasthan receives little precipitation and experiences the highest temperature in summer.

Dras in Jammu and Kashmir experiences extremely low temperatures, while Mawsynram is the wettest place in the world.



Frequently Asked

- In certain places, wide differences between day and night temperatures are experienced.
- In the Thar Desert, temperatures may rise to 50°C during the day and drop to near 15°C in the same night.



Important

- However, there is hardly any difference in day and night temperatures in the Andaman and Nicobar islands or in Kerala because of their closeness to the sea.

Precipitation varies in its amount and its seasonal distribution in various regions. Most parts of the country receive rainfall from June to September, but some parts, like the Tamil Nadu coast receive the majority of their rainfall in October and November.

Seasonal contrasts are experienced more in the interior of the country than in the coastal areas. These temperature and precipitation variations affect the lives of people in terms of their culture, religion, food habits and lifestyles.

Example 1. Why are houses in Assam built on stilts? (Understand) [NCERT]

Ans. (1) Assam lies in the north-eastern region of India, which receives plentiful rainfall. This results in frequent floods.

(2) In order to safeguard their houses from flood water, people build them on stilts above ground level.

TOPIC 2

CLIMATIC CONTROLS

Learning Objectives

- Students will learn about the six factors or climatic controls.
- Students will understand the influence of these climatic controls on the regional climate.
- Students will understand the meaning of geographical terms like ocean currents, pressure and wind systems, etc.

Learning Outcomes

- Students will be able to write the definition of climatic controls.
- Students will be able to enlist these factors and describe their individual and collective impact upon the climate.

Climate is controlled by various factors. These factors are called climatic controls.

There are six major factors that control the climate of any place—latitude, altitude, pressure and wind system, distance from the sea (also known as continentality), ocean currents and relief features.

- (1) **Latitude:** Due to the curvature of the earth, the amount of solar energy received at a place varies according to its location/latitude. It is maximum at the equator and decreases as one moves up from the equator. As a consequence, the air temperature generally decreases from the equator towards the poles.
- (2) **Altitude:** At higher altitudes, the atmosphere is less dense. This causes a fall in temperature. Air temperature decreases 6.5°C for every 1 km altitude gain.

Example 2. Which of the following climatic controls affects the amount of sunlight received at a particular location?

- (a) Longitude
 - (b) Distance from the sea
 - (c) Altitude
 - (d) Latitude
- (Remember)*

Ans. (d) Latitude

Explanation: The sunlight received at a place varies greatly based on the latitude of the location. This happens because of the shape of the planet (a geoid). The equator receives the most sunlight and experiences the highest temperatures. The poles receive the least sunlight and experience the lowest temperatures.

Caution

→ It is important that the students understand each factor/climatic control and its multiple implications.

- (3) **Pressure and wind systems:** This factor depends on the latitude and altitude of a given place. Thus it has an impact on the temperature and rainfall pattern of a place.
- (4) **Distance from the sea:** The sea is a moderating influence upon the climate experienced at any place. Near the sea, the temperature is moderate and as one starts moving away from the coast, temperatures start rising.

There is an inverse relationship between the distance of a place from the sea and the moderating effect of the sea. At the place people experience extreme weather conditions in the interiors of a country/continent. They experience extremely hot summers and extremely cold winters. This effect is known as continentality.

Contrary to this, the places located near the coast do not experience wide variations in day and night temperatures or between summers and winters.

- (5) **Ocean currents:** An ocean current is a continuous, directed movement of seawater generated by a number of forces acting upon the water. They are both cold and warm. They affect the climate of the coastal areas coupled with onshore winds. Example: A coastal area with warm or cold currents flowing past it, will experience cold or warm weather depending upon the current received (providing the winds are onshore).

- (6) **Relief:** Geographically, the term 'relief' indicates the unevenness, slope, slant, height of a place, etc. This is a major determinant of the climatic conditions of an area.

For example, high mountains act as barriers for cold, hot or rain-bearing winds. They cause precipitation when located in the path of moisture-bearing winds. The leeward side of the mountains remains relatively dry.

Each feature affects the climate of a region differently.

Example 3. Case Based:

Read the following passage and answer the questions that follow.

As the distance from the sea increases, its moderating influence decreases and the people experience extreme weather conditions. This condition is known as continentality. Ocean currents along with onshore winds affect the climate of 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. Finally, relief too plays a major role in determining the climate of a place. High mountains act as barriers for cold or hot winds. They may also cause precipitation if they are high enough and lie in the path of rain-bearing winds.

- (A) Explain how the climate of the coastal area is affected by ocean currents and onshore winds. (Understand)

- (B) Assertion (A): Higher latitudes mean higher temperatures.

Reason (R): Latitudes affect the temperature experienced at a location due to variations in the amount of sunlight received.

- (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 correct but (R) is wrong.
 (d) (A) is wrong but (R) is correct. (Analyse)
- (C) Which of the following is an example of the role played by relief in determining a location's climate?
 (a) High mountains allow for cold or hot winds to pass through.
 (b) High mountains act as barriers for cold or hot winds.
 (c) Beaches experience heavy rainfall on the eastern coast but not on the western coast.

- (d) Desert are present in the western margins of India. (Understand)

- (D) refers to when the distance from the sea increases, decreasing its moderating influence and the people experience extreme weather.

- (a) Relief (b) Continuity
 (c) Continentality (d) Loo (Remember)

- (E) What do you mean by ocean currents? (Understand)

Ans. (A) Onshore winds, coupled with the presence of cold/warm ocean currents affect the temperature of a region. If approaching currents are cold, the region experiences cooler temperatures.

- (B) (d) (A) is wrong but (R) is correct.

Explanation: Higher latitudes mean lower temperatures. At the equator, or 0° latitude, maximum sunlight is received. Thus, the temperatures are very high. As we move towards the poles and latitudes rise, temperatures decrease because of a fall in the amount of sunlight received.

Caution

Understanding the applications of the concepts taught in the chapter is extremely important for answering such questions. Students must not be confused about which latitudes are higher or lower.

Students must also be very careful about the terms longitudes and latitudes. They sound similar and students often confuse one for the other.

- (C) (b) High mountains act as barriers for cold or hot winds.

Explanation: High mountains act as barriers for cold or hot winds. They may also cause precipitation if they are high enough to form a barrier and lie in the path of rain-bearing winds.

- (D) (c) Continentality

Explanation: When the distance from the sea increases, its moderating influence decreases and people experience extreme weather conditions. This condition is known as continentality.

- (E) Ocean currents are continuous, predictable, directional movements of seawater driven by gravity, wind or/and water density.

Related Theory

→ Ocean water moves in two directions: horizontally and vertically. Horizontal movements are referred to as currents, while vertical changes are called upwellings or downwellings.

TOPIC 3

FACTORS AFFECTING INDIA'S CLIMATE

Learning Objectives

- Students will learn about how different climatic controls affect India's climate.
- Students will understand why India's climate is tropical and subtropical.
- Students will understand the mechanism of monsoon winds which cause rainfall in India, in brief.

Learning Outcomes

- Students will be able to understand the impact of three major determining factors or climatic controls upon the Indian climate.
- Students will be able to enlist the reasons that how India experience mild winter than Central Asia.
- Students will be able to describe the mechanism and impact of rain-bearing winds that rise in the southern oceans and cross the equator to enter India as south-west monsoon winds.

Three major determinants that influence the climate of India are:

- (1) Latitude
- (2) Altitude
- (3) Pressure and winds

Latitude

India is divided into two parts by the Tropic of Cancer, from the Rann of Kuchchh in the west to Mizoram in the east. The area located in the south of the Tropic of Cancer is tropical. The area to the north of the Tropic of Cancer is subtropical.

As a consequence of its location, India experiences climatic characteristics of both tropical and subtropical areas.

Altitude

India has the Himalayan mountain ranges surrounding its Northern boundaries. These peaks are about 600 metres. They block the cold winds originating from the central Asia from entering the subcontinent. These mountains enable India to experience milder winters as compared to the Central Asia.

The Indian mainland has vast coastal areas and northern plains, which have an average elevation of 30 metres.

Pressure and Winds

The atmospheric conditions which affect the climate in India are:

- (1) Pressure and surface winds
- (2) Upper air circulation
- (3) Western cyclonic disturbances and tropical cyclones

India lies in the region of the north-easterly wind system. They originate from the subtropical high-pressure belt of the northern hemisphere. They blow

southwards and get deflected to the right due to the Coriolis force. Thereafter, they move towards the equatorial low-pressure area. These winds generally carry very little moisture as they originate and blow over land. These winds bring little or no rain.

If this was the case, India would have been arid. However, this is not the reality.

The pressure and wind conditions over India are unique.

- (1) During winter, a high-pressure zone is formed in the north of the Himalayas. Cold dry winds blow from this region to the low-pressure areas over the oceans to the south.
- (2) In summer, a low-pressure area develops over interior Asia and northwestern India.
- (3) A complete reversal of the direction of winds is experienced during the summer.
- (4) Winds move from high-pressure areas (present over the southern Indian Ocean) in a south-easterly direction, towards the low-pressure areas over the Indian subcontinent. They are deflected right after they cross the equator. These are known as the south-west monsoon winds.

These winds blow over the warm oceans, gather moisture and bring widespread rainfall over the mainland of India.

Example 4. Mention two characteristics of the south-west monsoon winds. (Understand)

Ans. Two characteristics of the south-west monsoon winds are:

- (1) They are moisture-bearing winds which blow over warm oceans and cross the equator and are deflected towards the right.
- (2) They bring rainfall over most of mainland India.

TOPIC 4

THE SEASONS

Learning Objectives

- Students will learn about the four seasons experienced in India—winters, summers, advancing and retreating monsoon.
- Students will learn about the peculiar weather conditions associated with each season.
- Students will read and learn various new terms like monsoon trough, break in monsoon, global heat belts, etc.

Learning Outcomes

- Students will be able to understand the four seasons experienced in India round the year.
- Students will be able to describe in brief, the climatic conditions associated with each season.
- Students will be able to define various new geographical terms introduced in the topic.
- Students will be able to classify peculiar weather conditions according to their respective seasons.

One of the most significant features of the monsoon type of climate is that it is accompanied by distinct seasonal patterns. The weather conditions change drastically from one season to the other. The coastal regions experience a stark difference in the rainfall pattern.

Important

→ Weather changes among the four seasons are more prominently observed in the interior of the continents than on the coastal regions.

There are four main seasons in India—the cold weather season (winter), the hot weather season (summer), the advancing monsoon and the retreating monsoon with some regional variations.

The Cold Weather Season: Winter

The winter season begins from mid-November stays till February in northern India. December and January are the coldest months in the northern part of India. The temperature decreases from south to north.

The average temperature of Chennai and the rest of the eastern coast remains around 24°-25° Celsius while the northern Plains faces harsh winters with 10°-15° Celsius. The days are warm and the nights are cold. Major regions in the plains experience frost conditions.

The region comprising Himalayas and the mountains experience snowfall, hail and frost.

The north east trade winds prevail over the country during this season. They blow from land to sea and cause winters to be dry.

Important

→ The coast Tamil Nadu is among the only few regions in the country which receives rainfall in the winter season. Here, the winds blow from sea to land. These moisture-bearing winds cause the Tamil Nadu coast to receive rainfall during the winters.

In north India, a weak high-pressure region develops. Light winds begin moving outwards from this region. These winds move towards the Ganga valley from the west and the northwest due to the relief. The weather is marked by clear skies, low temperatures and low humidity and gentle winds.

A characteristic feature of the cold weather season over the northern plains is the inflow of cyclonic disturbances from the western and north-western direction which form a low pressure system. Western disturbances originate over the Mediterranean Sea and Western Asia and move towards India along with the westerly flow.

The western region of India witnesses mild showers in winter due to western disturbances. Snowfall is experienced in the mountains. The winter rainfall is locally known as Mahawat. It is extremely important for the Rabi crops.

However, the peninsular India does not witness any noticeable change in temperature pattern during the winters due to the influence of the sea.

The Hot Weather Season: Summer

As the sun moves towards the north, the global heat belt shifts northward too. As a consequence, from March to May, India witnesses the hot weather season i.e., summer.

Temperatures are extremely high in the northern half of the country. Air pressures witness a steep dip.

A low pressure zone develops at the region from the Thar Desert to Patna in the east and the Chhota Nagpur plateau in the south-east. From here, the circulation of air around this trough begins.

The hot weather season is characterised by extremely hot winds called 'loo'. These are strong, hot, dry winds and they blow during the day over the north and northwestern India. Direct exposure to these winds may even prove to be fatal.

Dust storms are common during May. They bring light rain and cool breeze. Localised thunderstorms are often experienced along with violent winds, torrential downpours and hail.



Frequently Asked

- In West Bengal, such localised storms are known as the *Kaal Baisakhi*.
- Pre-monsoon showers are common in Kerala and Karnataka during the end of the summer season.
- These showers help in the early ripening of mangoes. Because of this, they are called 'mango showers'.

Example 5. Mention any three benefits of the localised thunderstorms experienced during the hot weather season in northern India. (Understand)

Ans. Three benefits of the localised thunderstorms experienced during the hot weather season are:

- (1) They regulate the temperature and provide temporary relief from hot winds called Loo.
- (2) These thunderstorms are known as mango showers because they help in the growth of the crop of Mango.
- (3) These showers bring light rain. They help prevent the conditions of droughts in dry regions.

Advancing Monsoon: The Rainy Season

By early June, the low pressure conditions over the northern plains attract the trade winds from the southern hemisphere. These winds rise over the warm subtropical areas of the southern oceans and as they cross the equator, they are deflected and begin to blow from the south western direction. They finally enter the Indian peninsula as the south-west monsoon winds.

They travel over warm oceans and carry with them, an abundant amount of moisture. These are strong winds and they blow at the speed of approximately 30 kmph. The monsoon winds cover the country except the extreme north-western part in about a month.

The onset of monsoon begins with the Western Ghats. The windward side of the Western Ghats receives very heavy rainfall (more than 250 cm). The Deccan Plateau and parts of Madhya Pradesh also receive some amount of rainfall despite being in the rain shadow area.

The maximum rainfall in this area is received by the north-eastern part of the country.



Frequently Asked

- Mawsynram receives the highest amount of rainfall in the world. It is located in the southern ranges of the Khasi Hills. It is also reputed for its stalagmite and stalactite caves.

Important

→ In the Ganga valley, the amount of precipitation received decreases from the east to the west. Rajasthan and parts of Gujarat get scanty rainfall.

Monsoons experience various 'breaks' in rainfall. It undergoes both wet and dry spells. The monsoon rains fall, interspersed with rainless intervals.

These breaks are caused due to the movement of the monsoon trough (the low pressure belt). The trough and its axis move either northward or southward continuously. This movement determines the spatial distribution of rainfall. When the axis of the monsoon trough lies over the plains, abundant rainfall is received in the region. When the axis shifts closer to the Himalayas, long dry spells are experienced in the plains, and abundant rain occurs in the mountainous catchment areas of the Himalayan rivers. These heavy rains cause devastating floods and damage to life and property in the plains.

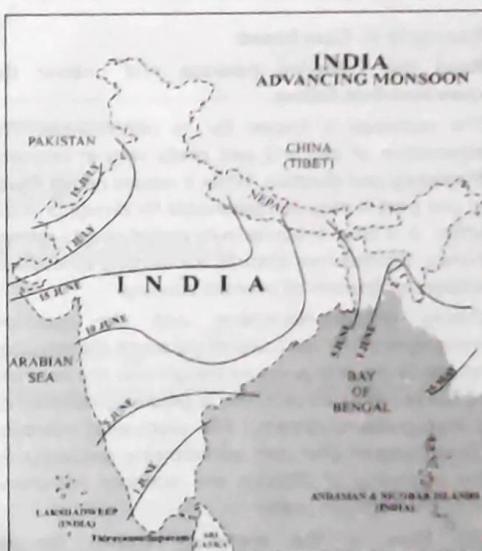
Important

→ The frequency and intensity of tropical depressions determine the amount and duration of monsoon rains. These depressions form at the head of the Bay of Bengal and cross over to the mainland.

The depressions follow the route of monsoon's trough of low pressure.

Monsoons bring in a lot of uncertainties.

- (1) The alternation of dry and wet spells vary in intensity, frequency and duration.
- (2) It is often irregular in its arrival and its retreat.
- (3) It causes drought in one part of the country and floods in another.
- (4) This variation disturbs the farming schedule of millions of farmers all over the country.



Advancing Monsoon in India



Retreating/Post Monsoons (The Transition Season)

The monsoon in India starts to retreat from October, and continues the same till December. With the apparent movement of Sun towards the south, the monsoon trough becomes weaker and is replaced by a high pressure system gradually.

The south-west monsoon winds begin withdrawing gradually. By the beginning of October, the monsoon withdraws from the Northern Plains.

The retreating monsoon marks a season of transition from hot rainy season to dry winters. This season is marked by a clear sky and a significant rise in temperature. Days are warm, nights are cool and pleasant. The land is still moist after the rainfall.



Frequently Asked

→ Conditions of high temperature and humidity are experienced in major areas in India. This phenomenon is commonly known as 'October heat'.

In the second half of October, temperatures begin to fall drastically in northern India. The low-pressure conditions over northwestern India shift towards the Bay of Bengal in early November. This shift leads to the formation of cyclonic depressions over the Andaman Sea, which causes destructive storms.

Peninsular rivers such as the Godavari, the Krishna and the Kaveri are often struck by these storms. This causes great damage to life and property.

Odisha, West Bengal and Bangladesh also experience such storms. Most of its rainfall received by the Coromandel Coast is derived from these depressions and cyclones.

Example 6. Case Based:

Read the following passage and answer the questions that follow.

The monsoon is known for its uncertainties. The alternation of dry and wet spells vary in intensity, frequency and duration. While it causes heavy floods in one part, it may be responsible for droughts in the other. It is often irregular in its arrival and its retreat. Hence, it sometimes disturbs the farming schedule of millions of farmers all over the country.

During October-November, with the apparent movement of the sun towards the south, the monsoon trough or the low-pressure trough over the northern plains becomes weaker. This is gradually replaced by a high-pressure system. The south-west monsoon winds weaken and start withdrawing gradually. By the beginning of October, the monsoon withdraws from the northern plains.

(A) How is the monsoon known for its uncertainties? (Understand)

- (B) Which of the following statements is true?
- Monsoons are experienced in the north-eastern part of India during October.
 - Monsoons are responsible for floods as well as droughts.
 - Monsoons are characterised by one regular spell of precipitation.
 - Monsoons are harmful for the production of crops.

(C) What is the phenomenon of October heat? (Understand)

- (D) Which of the following climatic conditions are usually experienced in October along the Tamil Nadu coast?
- High temperatures during the night, no rainfall and cold nights
 - Low temperatures during the days, cold nights and dry spells
 - High temperatures during the day, heavy rainfall
 - Low temperatures and spells of heavy rainfall

(E) Assertion (A): The monsoon withdraws from the northern plains by the beginning of October.

Reason (R): The monsoon trough shifts over the north.

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

Ans. (A) Monsoon is known for its uncertainties because they are characterised by dry spells and wet phases of heavy rainfall.

- They cause droughts in some regions and floods in other places because of their uncertain precipitation.
- The monsoon might arrive early or with delay based on the apparent formation of the monsoon trough.

(B) (b) Monsoons are responsible for floods as well as droughts.

Explanation: Monsoons are uncertain and irregular. They might cause floods in some regions and droughts in other areas because of their irregular pattern of rainfall.

Related Theory

→ Monsoon is received with breaks of dry spells and wet phases. They might impact the schedule of cultivation and harvest but they don't harm the crops grown with their onset.

(C) In October, day temperatures are high and nights are cool and pleasant. Owing to these conditions accompanied by high humidity, the weather becomes unbearably hot. This phenomenon is commonly known as 'October heat'.

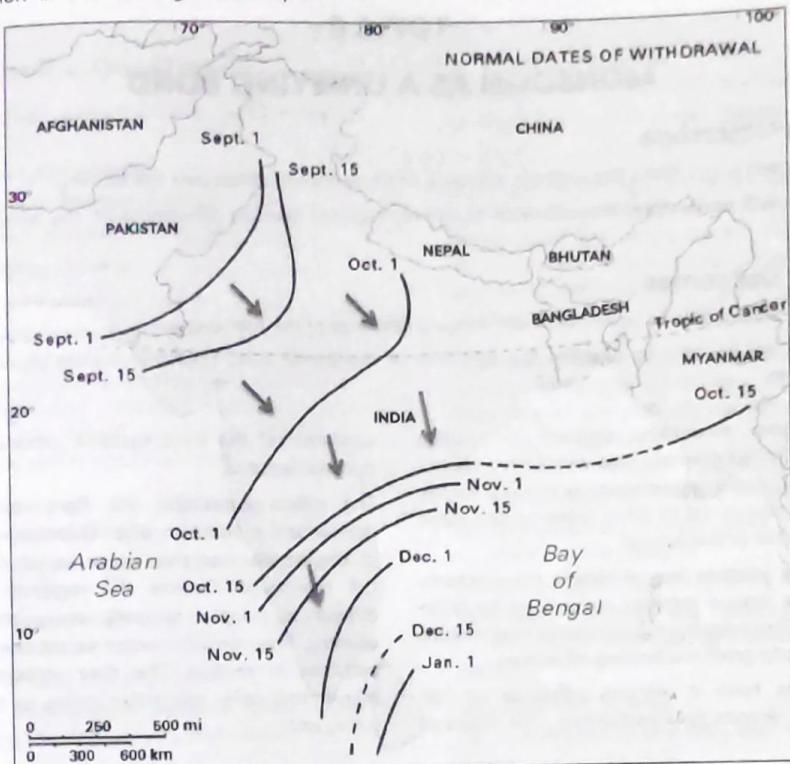
(D) (d) Low temperatures and spells of heavy rainfall

Explanation: Tamil Nadu coast is the only region in the country that experiences

heavy rainfall because of the retreating monsoon winds. Thus, the climatic conditions are characterised by heavy rainfall and low temperatures.

(E) (c) (A) is correct but (R) is wrong.

Explanation: The monsoon trough shifts to the south and becomes weaker over the northern plains. This is why, monsoon withdraws from the northern plains.



The Map of Retreating Monsoon

TOPIC 5 DISTRIBUTION OF RAINFALL

Learning Objectives

- Students will learn about the distribution of rainfall in the country.
- Students will understand about the variations experienced in the rainfall in different regions based on their locations.

Learning Outcomes

- Students will be able to describe the pattern of rainfall experienced in the country.
- Students will be able to identify the regions which receive low rainfall.
- Students will also be able to mark the regions which receive high rainfall.

The annual amount of rainfall received in the country is highly variable. Variability is high in the regions of low rainfall like Rajasthan, Gujarat and the leeward side of the Western Ghats.

Parts of western coast and north-eastern India receive about 400 cm of rainfall annually.

However, western Rajasthan and adjoining regions of Gujarat, Haryana and Punjab receive less than 60 cm of rainfall.

Rainfall is also scantily received in the interior of the Deccan plateau, Leh and Kashmir and the eastern region of the Sahyadris. Snowfall is experienced in Kashmir. The rest of the country receives normal rainfall.

Important

→ Areas of high rainfall are liable to be affected by floods, areas of low rainfall are drought-prone.

TOPIC 6 MONSOON AS A UNIFYING BOND

Learning Objectives

- Students will learn about the unifying influence of the monsoon winds over the country.
- Students will understand the influence of various regional climatic differences on the residents of the country.

Learning Outcomes

- Students will be able to write about the unifying influence of the monsoons.
- Students will be able to describe this influence of monsoons using their own words, experiences and arguments.

The Himalayan mountains protect the Indian subcontinent from extremely cold winds from central Asia. Northern India experiences uniformly higher temperatures compared to other areas on the same latitudes because of this barrier.

The Peninsular plateau has moderate temperatures because of its unique location surrounded by three water bodies. These regions still experience temperature variations despite great moderating influences.

The monsoons have a unifying influence on the entire country despite its uncertainties. The seasonal

alteration of the wind systems provide a rhythmic cycle of seasons.

The Indian landscape, the flora and fauna, its agricultural production and calendar, the lifestyles of the people and their customs, all depend upon the monsoons. Despite the regional and spatial differences, monsoons unify every citizen of the country. They provide water to set the agricultural activities in motion. The river valleys which are rejuvenated using this water unites as a single river valley unit.



Glossary

- (1) **Climate:** It refers to the sum total of weather conditions and variations over a large area for a long period of time.
- (2) **Weather:** The climate at a certain place and time, how much wind, rain, sun, etc., it experiences.
- (3) **Monsoon:** The Indian climate system is called monsoon climate. Monsoon is marked by the reversal of winds.
- (4) **Precipitation:** The amount of waterfall in any form such as rain, hail, snow, etc., is called precipitation.
- (5) **Continentiality:** Continentality is a climatic condition in which less energy is taken to heat a location, the moderating effect of water bodies do not influence the temperature much at all.
- (6) **Relief:** Relief can be defined as the topography of a particular area.
- (7) **Rabi crops:** The crops sown in the winter season are called Rabi crops. For example: wheat, barley, mustard, sesame and peas.
- (8) **Loo:** The local summer winds in the Indian subtropics are called loo.
- (9) **Mango showers:** The pre-monsoon showers in the states of Karnataka and Kerala. They are usually experienced at the end of summer.

- (10) **Windward:** The windward side is called the side of the mountain where air from sea can fall and cause orographic rains.
- (11) **Leeward:** The leeward side of a mountain is the rain shadow region, the air reaches here when it has lost the moisture, hence, it results in dry weather.
- (12) **October Heat:** It can be defined as the post monsoon and pre winter season, when there is a rise in temperature.

OBJECTIVE Type Questions

[1 mark]

Multiple Choice Questions

1. India receives majority of its rainfall from

- (a) Western disturbances
- (b) North-east monsoon winds
- (c) South-west monsoon winds
- (d) Retreating monsoon

Ans. (c) South-west monsoon winds

Explanation: India is a subtropical country and receives its share of precipitation from various sources like western disturbances, south-west trade winds and retreating monsoons, etc. However, the highest amount of rainfall is received by south-west monsoons.

2. Which among the following is a characteristic of October Heat?

- (a) Day temperatures are low, while nights are hot.
- (b) Day temperatures are high, nights are cool and pleasant.
- (c) Humid days and dry nights.
- (d) The temperature reaches very high during the day as well as at night.

Ans. (b) Day temperatures are high, nights are cool and pleasant.

Explanation: October heat is a climatic phenomenon experienced during the season of retreating monsoons (October-November). It is when a low pressure region is formed over the northern plains and Monsoon winds begin retreating. Conditions of high temperature and humidity are experienced in major areas in India. During the day, temperatures are high while the nights are cool.

3. During a visit to his grandfather's farm in Punjab, Aman noticed that farmers were busy plowing their fields. Curious, he asked his grandfather why they were planting crops during this season instead of waiting for the monsoon. His grandfather explained that rabi crops, like wheat and mustard, grow best when sown in this season.

In which season did he visit his grandfather?

- (a) Winter
- (b) Summer
- (c) Autumn
- (d) Spring

Ans. (a) Winter

Explanation: The Rabi crops are sown around mid-November, preferably after the monsoon is over, and harvesting begins in April/May. The crops are grown either using rainwater that has percolated into the ground or using artificial irrigation.

4. There are various factors which control the climatic conditions of regions. Which of the following statements are correct in creating an impact on climate:

- (I) Latitude affects the amount of precipitation a region receives.
- (II) Distance from the sea gives moderating effect on the climate.
- (III) Temperature falls with rising altitude.
- (IV) Ocean currents are affected by the amount of solar energy received.

Options:

- (a) Statement (I) Only
- (b) Statements (II) and (III) Only
- (c) Statement (III) Only
- (d) Statements (I), (II), (III) and (IV)

Ans. (c) Statement (III) Only

Explanation: Temperatures fall as one climbs up higher. With an increase in altitudes, the atmosphere becomes more refined and scarce, thereby causing a fall in temperatures. Latitude affects the amount of sunlight received. Regions with higher latitudes away from equator receive less amount of sunlight, hence have low temperature in the region.

Related Theory

→ Distance from the sea has an intensifying effect on the climate. As the distance from a place increases, climate variations intensify.

Ocean currents affect the climate of a coastal area. They have a warming or chilling effect on the climate of a coastal area depending upon their nature.



Caution

→ The given question matches the climate controls with their climatic implications. Students must try to learn these by making a table or creating a concept map to avoid confusion. They must clearly know the difference between the terms, longitude, latitude and altitude.

5. Read the data given below and answer the question.

Region	Climate
Mawsynram	Extremely heavy rainfall
Drass	Extremely cold weather conditions

As per given data in the table why the mentioned region receives extremely heavy rainfall?

- (a) Due to south-west monsoon
- (b) Due to retreating monsoon
- (c) Due to western disturbances
- (d) Due to October heat

Ans. (a) Due to south-west monsoon

Explanation: This table displays certain cities/places and the most likely weather conditions associated with the mentioned city. Dras in Jammu and Kashmir is the coldest place in the country where temperatures plunge to as low as -45°C during the night. Mawsynram is known for receiving the highest amount of rainfall on Earth.



Caution

→ Other options might also seem correct and likely. Students must focus upon figuring out a logical relationship between the other facts given in the question to be able to guess the correct alternative.

6. When does the Indian Union Territory of Lakshadweep not witness monsoon?

- (a) Mid-October
- (b) Last week of April
- (c) First week of May
- (d) Starting of June

Ans. (b) Last week of April

Explanation: The Lakshadweep islands experience the very first monsoon showers, which progresses from South to North from June to October.



Related Theory

→ India has two sets of Islands. One is situated in the eastern part of the country in the Bay of Bengal called the Andaman and Nicobar Islands, while the Lakshadweep (group of islands) is situated in the western part of the country in the Arabian Sea.

7. Arjun, a weather analyst, was studying the impact of winter cyclones on India's climate. He noticed that these disturbances bring rainfall to northwestern India, especially during the winter months. While researching their origin, he found that these cyclonic systems form over a specific sea before moving towards India and western Asia. Can you help Arjun identify where these cyclonic disturbances originate?

- (a) Pacific Ocean
- (b) Red Sea
- (c) Mediterranean Sea
- (d) Indian Ocean

Ans. (c) Mediterranean sea

Explanation: The western disturbances originate in the Mediterranean region, other parts of Europe and the Atlantic Ocean. The winds are within a low pressure area and enter India from the west. They are named western disturbances.

8. India's climatic conditions like temperature and pressure vary immensely regionally despite an overall unity. Identify the region which experiences the maximum difference in its day and night temperatures.

- (I) Silchar, Assam
- (II) Vidarbha, Maharashtra
- (III) Thar, Rajasthan
- (IV) Mahabalipuram, Tamil Nadu

Options:

- (a) (I) Only
- (b) (II) and (III) Only
- (c) (I), (II) and (IV) Only
- (d) (III) Only

Ans. (d) (III) Only

Explanation: In the western margin of India, there is no moderating effect of sea. Also, the relief features of sand elevates the temperature quickly leading to quick heating and the vast difference in day and night temperatures.

9. Consider the statements given below and choose the correct answer.

Statement (I): A strong gutsy hot wind, which blows during the summers is called Loo.

Statement (II): Thunderstorms, with violent winds, torrential downpours, and hail are called Kaal Baisakhi.

- (a) Statement (I) is correct and (II) is incorrect.
- (b) Statement (I) is incorrect and (II) is correct.

- (c) Both (I) and (II) are incorrect.
- (d) Both (I) and (II) are correct.

Ans. (d) Both (I) and (II) are correct.

Explanation: Loo is a local wind, which blows during the summer season in North and Northwestern India. They are almost like heat waves. Kaal Baisakhi often found in West Bengal.

Related Theory

→ Local winds blow in a small region or are localised to a certain area. They are the result of the movement of air between low and high pressure systems within small regions. Some examples are: Foehn, Loo, Chinook, Sirocco, etc.

10. Why does India experience milder winters as compared to central Asia?

- (I) The Himalayas form a barrier for these winds.
- (II) India's peninsular region has a low elevation.
- (III) The highest mountain range located in China and Afghanistan forms a barrier against these winds from central Asia.
- (IV) Winds which blow in Central Asia cannot reach India because they are weak and local.

Options:

- (a) Statements (III) and (IV)
- (b) Statements (II), (III) and (IV)
- (c) Statements (I), (III) and (IV)
- (d) Statement (I) only

Ans. (d) Statement (I) only

Explanation: The mighty Himalayas act as a barrier between mainland India and the cold winds which originate in Central Asia. These winds are powerful enough to compel the Indian mainland to experience very cold winters. They are not localised or weak but they are unable to cross the barrier of the Himalayan mountains.

11. Identify the correct option that describe the climate of region given below:

- (I) The mercury occasionally touches 50°C in summer in day.
 - (II) The temperature drop down to near 15°C in night.
 - (III) There is a big difference in day and night.
 - (a) Tamil Nadu (b) Maharashtra
 - (c) Rajasthan (d) Madhya Pradesh
- [Delhi Gov. QB 2024]

Ans. (c) Rajasthan

Explanation: Climate is controlled by many factors such as latitude, altitude, air and pressure system, relief features, etc.

Caution

→ It is important for the students to understand the definition and associated implications of each factor of climatic control clearly to be able to answer such questions.

12.decreases with increase in height:

- (a) Precipitation (b) Wind
- (c) Rainfall (d) Temperature

[DIKSHA]

Ans. (d) Temperature

Explanation: There is an inverse relationship between temperature and height.

13. Every year, Riya's family eagerly waits for the arrival of the monsoon, as it brings much-needed rainfall for their crops in Maharashtra. Meanwhile, her cousin in Kerala experiences the monsoon first, and her friend in Rajasthan sees much less rainfall. Despite these differences, the entire country depends on the monsoon for agriculture, water supply, and overall climate balance.

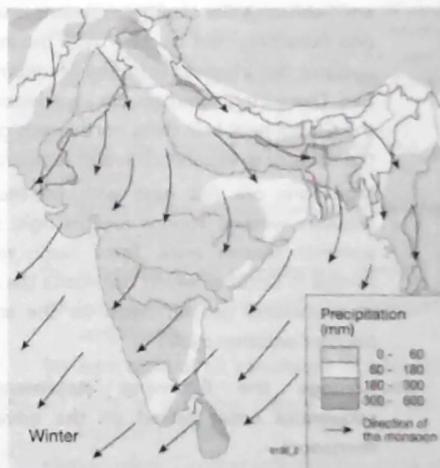
Based on this, what influence does monsoon have on India?

- (a) Divisive (b) Unifying
- (c) Diversifying (d) Destructing

Ans. (b) Unifying

Explanation: Despite the temperature and vegetation variations in the country, monsoons unify the entire country into one single climatic condition or pattern.

14. Observe the given image carefully and find out the direction.



- (a) North-east Monsoon
- (b) South-west Monsoon
- (c) North-west Monsoon
- (d) South-east Monsoon

Ans. (a) North-east Monsoon

Explanation: The North-east Monsoon occurs during the winter months when the wind direction changes due to the shifting pressure systems. A high-pressure system over the Indian subcontinent is created. Meanwhile, the Indian Ocean remains relatively warm, forming a low-pressure system. As a result, dry, cold winds from the northeast blow towards the warmer ocean, bringing some rainfall, particularly to the southeastern coast of India, including Tamil Nadu, Andhra Pradesh, and parts of Kerala.

15. Arrange in chronological order.

- (I) Global heat belt shifts northwards.
- (II) Inflow of cyclonic disturbances from the west and the northwest.
- (III) Tamil Nadu receives rainfall.
- (IV) Pre-monsoon showers are experienced in Kerala.

Options:

- (a) (III), (I), (IV), (II)
- (b) (II), (III), (I), (IV)
- (c) (III), (II), (I), (IV)
- (d) (II), (I), (IV), (III)

Ans. (d) (II), (I), (IV), (III)

Explanation: These statements are the weather conditions experienced by the country in a year. In the beginning of a year (January and February), the country experiences winters and extremely cold weather with the influx of cyclonic disturbances from the Mediterranean Sea. Thereafter, summers are experienced and the Global heat belt shifts northwards causing the country to experience warm temperatures. Monsoons are felt next with pre-monsoon showers wetting various regions right as the summer season ends. Tamil Nadu receives rainfall in October which kick-starts the arrival of the winter season again (or the start of another weather cycle).

16. Arrange the following statements in sequential order based on the advancing monsoon:

- (I) Monsoon reaches Patna
- (II) Monsoon reaches Lucknow
- (III) Monsoon reaches Jaipur
- (IV) Monsoon reaches Thiruvananthapuram

Options:

- (a) (II), (I), (IV), (III)
- (b) (IV), (I), (II), (III)
- (c) (II), (I), (III), (IV)
- (d) (I), (II), (IV), (III)

Ans. (b) (IV), (I), (II), (III)

17. It is a well-known fact that there are breaks in monsoon. These breaks are caused because of:

- (I) Western disturbances
- (II) Spatial distribution of rainfall
- (III) Monsoon trough
- (IV) October heat

Options:

- (a) (I) and (II)
- (b) (I) and (III)
- (c) (I) and (IV)
- (d) (III) only

Ans. (d) (III) only

Explanation: Monsoon rains are interspersed with rainless intervals. These breaks in monsoon are related to the movement of the monsoon trough. With the movement of the trough and its axis, the spatial distribution of rainfall at a place is determined.

18. Read the data given below and answer the question:

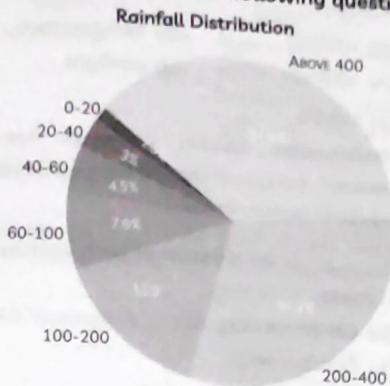
Region	Jan.	Apr.	Jul.	Oct.	Dec.
Temperature (°C) Delhi	14.4	30.0	30.0	25.6	15.6
Temperature (°C) Thiruvananthapuram	26.7	28.7	26.2	26.7	26.5

As per the data, what do you observe from the difference in the temperature variation between these states?

- (a) Coastal areas experience less variations in temperature conditions.
- (b) Interior areas experience less variations in temperature conditions.
- (c) Coastal areas experience more variations in temperature conditions.
- (d) Interior areas experience no variations in temperature conditions.

Ans. (a) Coastal areas experience less variations in temperature conditions.

19. Interpret the following pie diagram of rainfall distribution and choose the correct option for the following question.



Identify the region which comes under the category of 0-20 cm.

- (a) Ladakh
- (b) Madhya Pradesh
- (c) Meghalaya
- (d) Tamil Nadu

Ans. (a) Ladakh

Explanation: Some parts of Ladakh and Rajasthan receives only 0-20 cms of annual rainfall.

20. Which wind accounts for rainfall along the Malabar Coast?

- (a) South-west monsoon wind
- (b) South-east trade wind
- (c) Western cyclonic disturbances
- (d) North-east trade wind

[DIKSHA]

Ans. (a) South-west monsoon wind

Explanation: South-west monsoon winds are responsible for the rainfall received along the Malabar Coast (along the coastline of Kerala and Karnataka). As they enter India, these moisture bearing winds strike the Western Ghats and shed their moisture along the coast. Other winds either do not carry moisture or do not blow in the Malabar region.

Western cyclonic disturbances are mostly experienced in the northern half of the country.

Caution

Students must not be confused between Malabar and Coromandel Coast in this question. It is important to learn these names by heart and refer to the map of India multiple times to learn their location.

21. Why is it that the houses in the Terai region and in Goa and Mangalore have sloping roofs?

- (a) Due to high rainfall
- (b) Due to low rainfall
- (c) Due to low temperature
- (d) Due to high temperature

[DIKSHA]

Ans. (a) Due to high rainfall

Explanation: Due to high rainfall, these regions have houses with sloping roofs to prevent accumulation of water and incidence of associated implications. Sloping roofs also allow the water to be collected in a rainwater collection system which could be further utilised for other purposes.

Related Theory

Such modifications are adopted in regions with severe climatic conditions which affect the lifestyles of people living in the area.

22. Column A Column B

Cyclonic disturbances	Cause tropical cyclones along the eastern coast
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Western disturbances	-----
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- (a) Help the growth of Kharif crops
- (b) Cause cyclones in Kashmir
- (c) Help the growth of Rabi crops
- (d) Bring pre-monsoon showers

Ans. (c) Help the growth of Rabi crops

Explanation: They cause the much-needed winter rains over the plains and snowfall in the mountains. They are of immense importance for the cultivation of 'rabi' crops.

Related Theory

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.

23. Choose the correct definition of the term weather.

- (a) State of the atmosphere over an area at any point of time
- (b) Envelope of air surrounding earth
- (c) Generalised monthly atmospheric conditions
- (d) Sum total of all conditions at a location

Ans. (a) State of the atmosphere over an area at any point of time

Explanation: Weather refers to the state of the atmosphere over an area at any given point of time. The sum total of all weather conditions and variations over a large area for a long period of time (more than thirty years) is called climate.

24. Identify the correct option(s) regarding advancing monsoon based on the given hints:

- (I) In this season, by early June, the low-pressure condition over the northern plains intensifies.
- (II) Winds blow over the warm ocean and bring abundant moisture in this season.
- (III) The windward side of Western Ghats receives heavy rainfall.
- (IV) These storms bring light rain.

Options:

- (a) Statements (I) and (II) are correct.
- (b) Statements (I), (II), and (III) are correct.
- (c) Statement (IV) is correct.
- (d) Statements (II), (III) and (IV) are correct.

Ans. (b) Statements (I), (II) and (III) are correct.

Explanation: This season begins in June and is characterised by heavy rainfall throughout the country excluding certain areas depending upon their location on the windward side or the leeward side of the Western Ghats.



Related Theory

→ Loo bring temporary relief as they lower the temperature and may bring light rain and cool breeze. These are common during peak of summer season.

25. Consider the statements given below and choose the correct answer.

Statement (I): Pre-monsoon showers bring temporary relief from the hot, gusty winds which blow in summers.

Statement (II): Pre-monsoon showers are localised thunderstorms.

- (a) Statement (I) is correct and (II) is incorrect.
- (b) Statement (I) is incorrect and (II) is correct.
- (c) Both (I) and (II) are incorrect.
- (d) Both (I) and (II) are correct.

Ans. (c) Both (I) and (II) are incorrect.

Explanation: These storms are known by various regional names like Kaal Baisakhi, Mango showers, etc. These storms may bring light rain and cool breezes. These localised thunderstorms are associated with violent winds, torrential downpours and are accompanied by hail.

26. There is a fall experienced in _____ generally from east to west in the Northern Plains.

- (a) rainfall
- (b) temperature
- (c) latitude
- (d) sunlight

Ans. (a) rainfall

Explanation: Rainfall decreases from the eastern parts of the country towards the western regions in India.

27. is an element of both weather and climate.

- (a) Continentality
- (b) October heat
- (c) Atmospheric pressure
- (d) Monsoon trough

Ans. (c) Atmospheric pressure

Explanation: The elements of weather and climate are the same, i.e. temperature, atmospheric pressure, wind, humidity and precipitation. They are both influenced by these factors.

28. Match the items given in Column A with those in Column B.

Column A	Column B
(A) Summers	(I) June-September
(B) Winters	(II) March-May
(C) Advancing Monsoon	(III) October-November
(D) Retreating Monsoon	(IV) November-February

Options:

- (a) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)
- (b) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)
- (c) (A)-(II), (B)-(IV), (C)-(I), (D)-(III)
- (d) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

Ans. (c) (A)-(II), (B)-(IV), (C)-(I), (D)-(III)

Explanation: The items in Column A are seasons which extend during the months given in Column B.

Caution

→ It is important that the students clearly remember the time period and extent of the seasons mentioned in the chapter. They must not be confused between advancing and retreating monsoons.

29. Match the items given in Column A with those in Column B.

Column A	Column B
(A) Climate	(I) Permanent winds which blow from tropical high pressure belts to equatorial low pressure belt
(B) Trade winds	(II) Natural growth of plants and trees
(C) Winter disturbances	(III) Sum of all weather conditions for a fixed period of time
(D) Vegetation	(IV) Cyclones which develop over the Mediterranean Sea which blow towards northern India

Options:

- (a) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)
- (b) (A)-(II), (B)-(I), (C)-(IV), (D)-(III)
- (c) (A)-(II), (B)-(IV), (C)-(I), (D)-(III)
- (d) (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

Ans. (a) (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

Assertion-Reason (A-R)

In the following questions, two statements in the form of an Assertion (A) and a Reason (R) have been put forward. Read both statements carefully and choose the most appropriate option:

- (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 correct but (R) is wrong.
- (d) (A) is wrong but (R) is correct.

30. Assertion (A): India experiences monsoon type of climate.

Reason (R): India is located in South Asia.

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

Explanation: South and south-east Asia experiences monsoon type of climate.

31. Assertion (A): During October, with the apparent movement of the sun towards the south, the monsoon trough or the low-pressure trough over the northern plains becomes weaker.

Reason (R): This is gradually replaced by a low-pressure system.

Ans. (c) (A) is correct but (R) is wrong.

Explanation: The replacement of this low pressure trough is with a high pressure system.

32. Assertion (A): A striking feature of the hot weather season is the Loo.

Reason: (R) These are strong, gusty, hot, dry winds blowing during the day over the north and northwestern India.

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

33. Assertion (A): Pressure impacts temperature and rainfall pattern of a place.

Reason (R): It depends on the latitude and altitude of a given place.

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

34. Assertion (A): In the Thar Desert, the day temperature may rise to 50°C, and drop down to near 15°C the same night. On the other hand, there is hardly any difference in day and night temperatures in the Andaman and Nicobar Islands or in Kerala.

Reason (R): There is uniform climatic conditions within a country.

Ans. (c) (A) is correct but (R) is wrong.

35. Assertion (A): The lowest temperature in the world is found in the North Pole.

Reason (R): The North Pole is surrounded by the Arctic Ocean.

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

Explanation: Higher latitudes experience lower temperatures due to the limited amount of sunlight received because of the curvature of the Earth. Equator (0° N/S) experiences the highest temperatures and the maximum amount of sunlight.

36. Assertion (A): Bulk of the rainfall of the Coromandel Coast is derived from depressions and cyclones.

Reason (R): The low pressure conditions which once prevailed over north-western India get

transferred to the centre of Bay of Bengal by early November.

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

Explanation: The Coromandel Coast receives rainfall during the winter season from the retreating monsoon.

CASE BASED Questions (CBQs)

[4 marks]

Read the following passages and answer the questions that follow.

37. 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 north. The average temperature of Chennai, on the eastern coast, is between 24° - 25° Celsius, while in the northern plains, it ranges between 10°C and 15°C Celsius. Days are warm and nights are cold. Frost is common in the north and the higher slopes of the Himalayas experience snowfall. During this season, the northeast trade winds prevail over the country. They blow from land to sea and hence, for most parts of the country, it is a dry season. Some amount of rainfall occurs on the Tamil Nadu coast from these winds as, here they blow from sea to land. In the northern part of the country, a feeble high-pressure region develops, with light winds moving outwards from this area. Influenced by the relief, 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) Mention two characteristics of the cold weather season as mentioned in the passage.

(B) Why the source explains that winter season is characterised by dry spells?

(C) Name the two coldest months of this season.

Ans. (A) Two characteristics of the cold weather season are:

(1) During this season, skies are clear, temperatures and humidity is low.

(2) Various regions in the northern half of the country experience frosty conditions.

(B) The winter season is characterised by dry spells because the northeast trade winds prevail over the country in this season. These winds are moisture less. They blow from land towards the sea.

(C) The two coldest months of the winter season are:

- (1) December
- (2) January

38. Another phenomenon associated with the monsoon is its tendency to have 'breaks' in rainfall. Thus, it has wet and dry spells. In other words, the monsoon rains take place only for a few days at a time. They are interspersed with rainless intervals. These breaks in monsoon are related to the movement of the monsoon trough. For various reasons, the trough and its axis keep on moving northward or southward, which determines the spatial distribution of rainfall. When the axis of the monsoon trough lies over the plains, rainfall is good in these parts. On the other hand, whenever the axis shifts closer to the Himalayas, there are longer dry spells in the plains, and widespread rain occurs in the mountainous catchment areas of the Himalayan rivers. These heavy rains bring in their wake, devastating floods causing damage to life and property in the plains. The frequency and intensity of tropical depressions too, determine the amount and duration of monsoon rains. These depressions form at the head of the Bay of Bengal and cross over to the mainland.

(A) Which of the following is the correct definition of a monsoon break?

- (a) Short wet spells interspersed by short dry spells
- (b) A long wet spell (6 month long) followed by a long dry spell
- (c) Hail followed by sleet followed by droughts
- (d) Short dry spells followed by periods of no rain

- (B) Which of the following is true about the monsoon trough?
- It remains stationary throughout its life.
 - It moves northwards every year.
 - It is formed in the southern hemisphere only.
 - It keeps moving northwards and southward based on the movement of the sun and other features.
- (C) How does the presence of monsoon trough affect the precipitation in a region?
- In areas where the trough is present, abundant rainfall is received.
 - In areas where the trough is present, little to no rainfall is received.
 - Monsoon trough's position does not impact the amount of precipitation received by a region.
 - Monsoon trough's presence in a region causes floods.
- (D) Identify one consequence of the tropical depression.
- Volcanic eruptions
 - Droughts
 - Earthquakes
 - Floods

[Mod. DIKSHA]

Ans. (A) (a) Short wet spells interspersed by short dry spells

Explanation: Monsoons arrive with various uncertainties. There are variations in the amount, patterns and other implications. Monsoons appear with breaks- this means they are not continuous. Short spells of dry spells are interspersed with wet spells.

(B) (d) It keeps moving northwards and southward based on the movement of the sun and other features.

Explanation: A monsoon trough never remains stationary at a place. It keeps moving northwards and southwards based on various factors.

(C) (a) In areas where the trough is present, abundant rainfall is received.

Explanation: The presence of monsoon trough in a region causes abundant rainfall.

Related Theory

When the axis of the monsoon trough lies over the plains, rainfall is good in these parts. On the other hand, whenever the axis shifts closer to the Himalayas, there are longer dry spells in the plains.

(D) (d) Floods

Explanation: Cyclonic depressions cause excessive rainfall which leads to tsunami and floods.

39. The Himalayas protect the subcontinent from extremely cold winds from central Asia. This enables northern India to have uniformly higher temperatures compared to other areas on the same latitudes. Similarly, the Peninsular plateau, under the influence of the sea from three sides, has moderate temperatures. Despite such moderating influences, there are great variations in the temperature conditions. Nevertheless, the unifying influence of the monsoon on the Indian subcontinent is quite perceptible. The seasonal alteration of the wind systems and the associated weather conditions provide a rhythmic cycle of seasons.

- What enables Northern India to have uniformly higher temperatures compared to surrounding areas?
- Which geographical phenomenon comprises seasonal alteration of the rain-bearing winds in India?
- Mention two ways in which monsoons unify the country.

Ans. (A) The presence of the Himalayan ranges enable Northern India to have uniformly higher temperatures compared to surrounding areas.

- Monsoons include the seasonal alteration of the rain-bearing winds.
- Two ways in which monsoons unify the country are:

- They alter the cultivation and agricultural schedule of the entire country, affecting the lifestyles of all the farmers in the country.
- Because of them, similar weather conditions are experienced in far and wide corners of the country, with some variations.

40. 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.

(A) Which region on Earth experiences the hottest summers?

- (a) Equator
- (b) Poles
- (c) Northern Hemisphere
- (d) Southern Hemisphere

(B) Which factor is responsible for the rise in temperatures as one moves away from Mumbai towards Mathura?

- (a) Altitude
- (b) Latitude
- (c) Ocean currents
- (d) Distance from the sea

(C) Which of the following is another important climatic control but has not been mentioned in the given source?

- (a) Soil texture
- (b) Relief
- (c) Distance from deserts
- (d) Amount of snowfall received in a year

(D) The pressure and wind system of any area depend on the and altitude of the place.

- (a) longitude
- (b) ocean currents
- (c) relief
- (d) latitude

Ans. (A) (a) Equator

Explanation: Maximum sunlight is received in the regions around the equator. This is why, equator experiences the highest temperatures on the planet.

(B) (d) Distance from the sea

Explanation: Continental causes the interior parts of the country to experience extremely high temperatures. As one moves away from the sea, the moderating influence of the sea decreases. Extreme variations are experienced in Mathura but not in Mumbai because it is a coastal area.

(C) (b) Relief

Caution

→ Students must not get confused between relief and other factors. Soil textures, distance from the desert and amount of snowfall experienced in a country does not impact its temperature. It is not a climatic control.

(D) (d) latitude

SHORT ANSWER Type-I Questions (SA-I)

[2 marks]

41. 'The Indian Subcontinent has unique characteristic features of climate.' Justify this statement with valid points.

Ans. (1) India's climate is of monsoon type.

- (2) Regarding its unifying nature in the whole country it gives predictable regional variations.

42. 'Mahawat is of immense importance for the cultivation of crops.' Justify the statement.

Ans. Mahawat is the rainfall which is experienced in the winter. It is helpful in the sowing of rabi crops.

43. 'On first week of June India receives its first monsoon showers every year.' Substantiate the statement with illustrations.

- Ans. (1) In early June, the low-pressure condition over the northern plains intensifies.
- (2) It attracts the southwest trade winds of the southern hemisphere.

Related Theory

→ These southeast trade winds originate over the warm subtropical areas of the southern oceans.

44. 'The peninsular region does not have a well defined cold season.' Provide evidence to support this statement.

Ans. Peninsular relief of India, under the influence of sea from three sides always have moderate temperature, so there is hardly any noticeable change in this region.

45. 'During winter India is surrounded by a dominant northeast wind trade system which brings the dry season.' Justify your answer with example.

Ans. (1) During winter northeast trade blow from land to sea marked by clear sky, low temperatures and low humidity and feeble, variable winds.

- (2) These winds do not carry moisture, resulting in dry conditions across most parts of India, except for some regions like Tamil Nadu, which receives winter rainfall due to the northeast monsoon.

46. Climate of India has an overall unity in the general pattern, but there are perceptible regional variations in climatic conditions within the country. Identify two reasons for this variation.

Ans. (1) As the latitude increases, the reach of sunlight to the region decreases which results in decrease of temperature.

(2) Region away from sea is less influenced by it due to continental effect.

47. Namit, a farmer from Rajasthan, noticed that by late September, the sky was becoming clearer, and the humid monsoon winds had started to weaken. His grandfather told him that this was the time when the rains began to withdraw from India, marking a shift in the season. Namit wondered, when does the monsoon start retreating from the Indian subcontinent?

Ans. The monsoon starts retreating from India in the beginning of October. The whole transition period is from October to November when the sun moves towards the south and low pressure trough moves from north region.

48. Which winds account for rainfall along the Malabar Coast? [DIKSHA]

Ans. Malabar Coast comes under the region of western ghats. Western ghats receive most of their rainfall from the south-west monsoon winds during the month of June. The heavy rainfall in this region supports dense tropical rainforests and rich biodiversity.

49. 'Distance from the sea influences the climate of India.' Explain the statement by giving suitable examples.

Ans. The distance from sea influences the climate of a location. This influence can be described as:

(1) The distance from the sea intensifies the climatic/temperature variations in an area. As the distance increases, the moderating influence of the sea decreases.

(2) Coastal regions experience moderate temperatures with little to no variations in their seasonal temperatures while the interior parts of the country experience harsh winters and extremely warm summers.

50. 'Tamil Nadu coast receives bulk of its rainfall in the winter season.' Justify this statement with valid points.

Ans. The Tamil Nadu coast receives most of its rainfall in winters. This is because:

(1) It is located on the east coast and receives its rainfall from the retreating south-west monsoon winds. For the rest of the country, these winds blow from land to sea, carrying no moisture and bringing no rainfall.

(2) As they cross the Bay of Bengal, they pick up moisture and bring rain to parts of southeast India, especially the Tamil Nadu coast.

51. Aarav, a farmer in Maharashtra, eagerly waits for the rains every year to irrigate his fields. He knows that the monsoon is crucial for agriculture, but he often wonders why India experiences monsoons in the first place. Help Aarav to understand why India experiences monsoons.

Ans. The monsoon is better defined as the seasonal reversal of winds. It is the climate type of Indian subcontinent.

(1) It takes place due to the pressure differences in the region. A high pressure is formed at the Arabian Sea and a low pressure is formed at the Tibetan Plateau.

(2) Relief and other phenomenon of wind systems also help bring monsoon to the country. Mountain located in India become a barrier to moisture-laden monsoon winds blowing from the south-west. These winds cause heavy rainfall in most of India.

52. Monsoon have a unique feature which is known as 'Break of Monsoon'. Explain this feature.

Ans. There is no continuity in the monsoon rains. They are interspersed with rainless intervals. This phenomenon is known as the break of monsoon.

53. Indian peninsula receives rainfall throughout the year in many forms. Mention different sources of rainfall in India.

Ans. The Indian subcontinent receives rainfall throughout the year. Some of these sources are:

- (1) The south-west monsoon
- (2) The north-west or the retreating monsoon
- (3) Western disturbances (Any two points)

54. What is Loo? Define the season in which it appears.

Ans. Loo is a local wind. These are hot, gusty winds which blow in the northern part of India during the summer season.

- (1) The summer season is characterised by high temperatures and a dry atmosphere.
- (2) There is a low pressure in the region following the summer season.

55. Which region of India does not have a well-defined cold season and why?

[Delhi Gov. QB 2022]

Ans. The peninsular region of India does not have a well-defined cold season because it is surrounded by three large waterbodies.

These water bodies regulate the temperature of this region and no defined seasonal temperature variations are experienced in the region.

SHORT ANSWER Type-II Questions (SA-II)

[3 marks]

56. What are the reasons behind the variety in lives of people—in terms of the food, clothes and houses? [Delhi Gov. QB 2022]

Ans. The reasons behind the variety in the lives of people in terms of food, clothes and houses are as follows:

(1) **Variation in temperature:** Different regions have different temperatures which causes the people to wear clothes made out of different fabrics, etc. People in Leh wear covered snow suits while people living in Tamil Nadu wear Lungis.

(2) **Variation in humidity:** Mawsynram is the wettest place on Earth while Thar Desert has a huge scarcity of water resources. Differences in humidity percentage of the place affects the schedule of people directly.

(3) **Variation in precipitation:** Differences in precipitation affects the cultivation schedules of farmers in regions across the country.

57. "Monsoon in India goes through regional variations". Identify three reasons for this variation.

Ans. The Indian landmass has various geographical divisions which causes monsoons to experience regional variations.

The variance can be described using the following points:

(1) Areas in the windward side like the Western Ghats receive heavy rainfall, while the leeward side faces drought-like conditions, like Vidarbha or Saurashtra.

(2) The coastal region has a moderating effect of sea, hence the summer and winters are mild in the area.

(3) Places like Ladakh and Kashmir are very cold due to its high altitude, while the Thar Desert located on the western margin of India, remains hot and dry.

58. Aarav and his grandmother were sitting on their balcony in Delhi. Aarav noticed that it was raining in the morning, but by noon, the sun was shining brightly. Astonished, he asked his grandmother if Delhi always had such unpredictable weather. His grandmother smiled and explained that while today's rain and sunshine were part of the weather, the overall pattern of hot summers and cold winters in Delhi over many years defined its climate.

Based on this conversation, can you differentiate between weather and climate?

Ans.

Climate	Weather
(1) Climate can be defined as an average weather conditions of a place, it is defined for a long term.	Weather is same as climate but for shorter period of time and place.
(2) It is stable for long periods and follows a pattern of change.	It is measured over a short period of time and is reported as forecast.
(3) The climate of India can be defined as a Monsoon type of Climate.	In India, we have different weather conditions due to changes in air and wind pressure systems, namely summer, winter and rainy.

59. Why does Meghalaya receive 400 cm of rainfall while Ladakh receives only 10 cm of rainfall? [DIKSHA]

Ans. Meghalaya receives 400 cms of rainfall because of the geographical location of Khasi Hills.

- (1) The Bay of Bengal monsoon branch gets trapped between the ranges, causing heavy rain.
- (2) The Khasi Hills lie in the path of monsoon winds which strike against the hills and shed their moisture.
- (3) Ladakh lies in the rain shadow area due to which it receives very little rainfall as the winds have already shed their moisture before they reach Ladakh.

60. Monsoon are very important for life in the subtropics. Write its features with reference to India.

Ans. Monsoons are a very important part of Indian culture. They affect the overall living conditions of different communities in the society. Some of the features of monsoons are:

- (1) The monsoon winds are pulsating in nature.
- (2) The monsoons are affected by the change in air pressure and winds.
- (3) The duration of the monsoon season is approximately 100 to 120 days, starting from June to September.

61. Discuss the role of Earth's curvature in influencing the climatic condition of a place. [Delhi Gov. QB 2022]

Ans. The role of Earth's curvature in influencing the climatic condition of a place can be described as follows:

- (1) The amount of solar energy received varies according to latitude.
- (2) Air temperature generally decreases from the equator towards the poles.
- (3) Atmosphere becomes less dense and the temperature decreases.

LONG ANSWER Type Questions (LA)

[5 marks]

62. Analyse the impact of climatic controls that determine the climate of India.

[Delhi Gov. QB 2024]

Ans. Climatic controls can be defined as factors which affect the environment of a geographical area. The climatic controls are as follows:

- (1) **Latitude:** India is divided by the Tropic of Cancer into two equal parts. The temperature generally decreases from Equator towards the Pole.
- (2) **Altitude:** As altitude increases, the temperature of a region starts to fall, hence the climate in a higher altitude is colder as compared to valleys. The atmosphere in mountains is less dense which in turn results in lower temperature.
- (3) **Pressure and Wind System:** In order to maintain equilibrium, wind moves from higher pressure system to lower pressure system. This pressure system of a place keeps on changing due to its latitude and altitude.
- (4) **The Distance of the Sea:** The sea has a moderating effect on the climate of a place. As the distance from sea to land increases this moderating influence decreases. This phenomenon is also called continentality.

- (5) **Ocean Currents:** These currents affect the temperature of coastal areas located in their path.

(6) Relief: The relief system plays a major role in determining the climate of a place.

(Any five points)

63. Naman and his family planned a winter vacation to North India in December. As they reached their destination, they experienced chilly winds, clear skies, and a drop in temperature, especially during the night. In some places, frost was visible on the fields, and the weather felt dry. Naman's father explained that this was due to a specific weather pattern that occurs in India during this time of the year. Identify which season Naman's father was referring to and describe its characteristics.

Ans. Naman's father was referring to cold weather season. The cold weather season begins from mid-November in northern India and stays till February.

- (1) December and January are the coldest months in the northern part of India. The temperature decreases from south to north.
- (2) During this season, the north-east trade winds prevail over the country. They blow from land to sea and hence, for most parts of the country, it is a dry season.
- (3) Some amount of rainfall is experienced on Tamil Nadu coast from these winds as, here they blow from sea to land.



(4) A characteristic feature of the cold weather season over the Northern Plains is the inflow of cyclonic disturbances from the west and the northwest.

(5) They cause the much needed winter rains over the plains and snowfall in the mountains.

64. 'India is called a country of climate contrast'. Explain with help of examples. [DIKSHA]

Ans. (1) In summer, the mercury occasionally touches 50°C in some parts of the Rajasthan desert, whereas it may be around 20°C in Pahalgam in Jammu and Kashmir.

(2) On a winter night, temperature at Drass in Jammu and Kashmir may be as low as minus 45°C.

(3) In certain places there is a wide difference between day and night temperatures. In the Thar Desert, the day temperature may rise to 50°C and drop down to near 15°C the same night.

(4) On the other hand, there is hardly any difference in day and night temperatures in Andaman and Nicobar Islands in Kerala.

(5) While precipitation is mostly in the form of snowfall in the upper Himalayas, the rest of the country experiences heavy rainfall. The annual precipitation varies from over 400cm in Meghalaya to less than 10 cm in Ladakh and western Rajasthan.

65. How does Indian monsoon unifies India in a single bond? Explain the statement with example.

Ans. The climate of a region plays an important part in its social and cultural fabric. The weather conditions impact all the major aspects of a society, from the clothing of people to the food habits, in order to maintain a balance.

(1) The Indian subcontinent with its varying weather conditions and unique climate along with the monsoon has a unique outlook to the climatic factors.

(2) The seasonal reversal of winds joins the whole country in an invisible bond.

We can understand the idiom with examples such as:

(1) In the summer season, northern India faces a local wind called Loo. Dust storms are common during the month of May. This season is known for localised thunderstorms, experienced with torrential downpours and hail, in West Bengal these storms are known as 'Kaal Baisakhi'. The clothing system is almost the same for the whole country.

(2) Kerala and Karnataka experiences pre monsoon showers also called Mango Showers, which help in early ripening of the Mangoes.

(3) The southwest trade winds enter the Indian landmass and travel from south to north laden with moisture and providing rainfall.

(4) It is one of the prime sources of drinking water in majority of India, our farming and agriculture deeply depends on the monsoons and hence, our festivals. There are many local festivals which are celebrated on the arrival of monsoon such as Onam, Teej, Ganga Dussehra, etc.

(5) The advancing monsoon strings India together in a unifying bond, because it causes the farmers of the entire country to practise similar agricultural activities, celebrate similar festivals, wear similar clothes despite some regional variations. Hence, Indian monsoon unifies India in a single bond.

(Any three points)

SELF ASSESSMENT

Multiple Choice Questions

- Which of the following is not a climatic condition experienced in the summer season?
 - High temperatures
 - Rising air pressure in the northern part of the country
 - Hot loo blowing during the day
 - Heat belt shifts northwards (Evaluate) 1
- Identify the winds from the given image which cross the equator and bring rainfall to the Indian mainland.



- Trade winds from north-west
- South-west winds
- Western cyclonic disturbances
- North-easterly winds (Understand) 1
- Choose the incorrect pair.
 - Altitude - Refined temperature
 - Ocean currents - Onshore winds
 - Frost - Winters
 - Mahawat - Kharif crops (Analyse) 1
- Namit lives in Delhi and notices that during December, people start wearing woolen clothes and prefer hot beverages. However, in May, same people switch to summer clothing and enjoy ice creams and cold smoothies to beat the heat. He wonders what factor influences these seasonal lifestyle changes.

What is the main reason behind this variation in people's clothing and food habits?

- Climate
- Altitude
- Ocean currents
- Air (Understand) 1

Assertion-Reason (A-R)

In the following questions, two statements in the form of an Assertion (A) and a Reason (R) have been put forward. Read both statements carefully and choose the most appropriate option:

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

5. Assertion (A): Year after year, people of India from north to south and from east to west, eagerly await the arrival of the monsoon.

Reason (R): The monsoon season affects India's animal and plant life, and the life of the people. (Analyse) 1

6. Assertion (A): The monsoon is known for its uncertainties.

Reason (R): There is little rain experienced in Meghalaya during the monsoons. (Analyse) 1

Case Based Question

- Read the following passage and answer the questions that follow.

While day temperatures are high, nights are cool and pleasant. The land is still moist. Owing to the conditions of high temperature and humidity, the weather becomes rather oppressive during the day. This is commonly known as 'October heat'. In the second half of October, the mercury begins to fall rapidly in northern India. The low-pressure conditions, over northwestern India, get transferred to the Bay of Bengal by early November. This shift is associated with the occurrence of cyclonic depressions, which originate over the Andaman Sea. These cyclones generally cross the eastern coasts of India cause heavy and widespread rain. These tropical cyclones are often very destructive.

(A) Identify the season from the given hint about the weather conditions prevalent in India at the time. While day temperatures are high, nights are cool and pleasant. (Understand) 1

(B) Define a cyclonic depression. (Understand) 1

(C) Highlight two effects of the tropical cyclones on Indian mainland. (Understand) 2

Short Answer Type-I Questions

8. On which factors do the pressure and wind systems of a place depend? (Remember) 2

9. Mention the extreme boundaries of the low pressure belt that develops upon the northern plains during the summer season. (Understand) 2

Short Answer Type-II Questions

10. Determine the influence of relief upon the climatic conditions in a place. (Understand) 3

11. 'The inflow of the south-west monsoon into India brings about a total change in the weather.' Provide evidence to support this statement. (Evaluate) 3

Long Answer Type Question

12. Kanak and her family planned a trip to North India in January. As soon as they arrived, they noticed a sudden drop in temperature, chilly winds, and dense fog covering the streets. Based on Kanak's experience, can you describe the climatic conditions during the winter season in different parts of India? (Understand) 5



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