

## Chapter 4 Climate

### Question-1

What are the controls affecting the climate of India?

#### **Solution:**

There are six major controls of the climate of any place. They are:

1. Latitude
2. Altitude
3. Pressure and wind system
4. Distance from the sea (continentality)
5. Ocean currents
6. Relief features

### Question-2

Why does India have a monsoon type of climate?

#### **Solution:**

The monsoon type of climate is characterised by a distinct seasonal pattern. The weather conditions greatly change from one season to the other. These changes are particularly noticeable in the interior parts of the country. The coastal areas do not experience much variation in temperature though there is variation in rainfall patterns. Four main seasons can be identified in India – the cold-weather season, the hot weather season, the advancing monsoon, and the retreating monsoon with some regional variations.

### Question-3

Which winds account for rainfall along the Malabar Coast?

#### **Solution:**

Surface winds account for rainfall along the Malabar coast.

### Question-4

What are Jet streams and how do they affect the climate of India?

#### **Solution:**

Jet streams are a narrow belt of high altitude (above 12,000 m) westerly winds in the troposphere. Their speed varies from about 110 km/h in summer to about 184 km/h in winter. A number of separate jet streams have been identified. The most constant is the mid-latitude and the subtropical jet stream.

Over India, these jet streams blow south of the Himalayas, all through the year except in summer. The western cyclonic disturbances experienced in the north and northwestern parts of the country are brought in by this westerly flow. In summer, the subtropical westerly jet stream moves north of the Himalayas with the apparent movement of the sun. An easterly jet stream, called the tropical easterly jet stream blows over peninsular India, approximately over 14°N during the summer months.

### Question-5

Define monsoons. What do you understand by “breaks” in monsoon?

#### **Solution:**

The seasonal reversal in wind direction during a year is called the monsoon. Monsoon tends to have ‘breaks’ in rainfall; which means that there are wet and dry spells in between. The monsoon rains take place only for a few days at a time and then come to the rainless intervals.

### Question-6

Why is the monsoon considered a unifying bond?

#### **Solution:**

Despite great moderating influences on the climate of India, 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.

### Question-7

Why does the rainfall decrease from the east to the west in Northern India?

#### **Solution:**

The western coast and northeastern India receive over about 400 cm of rainfall annually. However, it is less than 60 cm in western Rajasthan and adjoining parts of Gujarat, Haryana, and Punjab. Rainfall is equally low in the interior of the Deccan plateau, and east of the Sahyadris. The third area of low precipitation is around Leh in Jammu and Kashmir. The rest of the country receives moderate rainfall.

Snowfall is restricted to the Himalayan region. Owing to the nature of monsoons, the annual rainfall is highly variable from year to year. Variability is high in the regions of low rainfall such as parts of Rajasthan, Gujarat and the leeward side of the Western Ghats. As such, while areas of high rainfall are liable to be affected by floods, areas of low rainfall are drought-prone.

### Question-8

Give reasons as to why.

- (i) The bulk of rainfall in India is concentrated over a few months.
- (ii) The Tamil Nadu coast receives winter rainfall.
- (iii) The delta region of the eastern coast is frequently struck by cyclones.
- (iv) Parts of Rajasthan, Gujarat, and the leeward side of the Western Ghats are drought-prone.

#### **Solution:**

(i) The bulk of rainfall in India is concentrated over a few months

The inflow of the south-west monsoon into India brings about a total change in the weather. Early in the season, 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 rain in spite of lying in the rain shadow area. The maximum rainfall of this season is received in the north-eastern part of the country. Mawsynram in the southern ranges of the Khasi Hills

*receives the highest average rainfall in the world. Rainfall in the Ganga valley decreases from the east to the west. Rajasthan and parts of Gujarat get scanty rainfall.*

*(ii) The Tamil Nadu coast receives winter rainfall*

*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. The peninsular region does not have a well-defined cold season. There is hardly any noticeable seasonal change in temperature patterns during winters due to the moderating influence of the sea.*

*(iii) The delta region of the eastern coast is frequently struck by cyclones*

*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. The thickly populated deltas of the Godavari, the Krishna and the Kaveri are frequently struck by cyclones, which cause great damage to life and property. Sometimes, these cyclones arrive at the coasts of Orissa, West Bengal and Bangladesh.*

*(iv) Parts of Rajasthan, Gujarat and the leeward side of the Western Ghats are drought-prone*

*Owing to the nature of monsoons, the annual rainfall is highly variable from year to year. Variability is high in the regions of low rainfall such as parts of Rajasthan, Gujarat and the leeward side of the Western Ghats. As such, while areas of high rainfall are liable to be affected by floods, areas of low rainfall are drought-prone.*

### **Question-9**

*Describe the regional variations in the climatic conditions of India with the help of suitable examples.*

#### **Solution:**

*Despite an overall unity in the general pattern, there are perceptible regional variations in climatic conditions within the country. The two important elements, which cause these variations, are – temperature and precipitation.*

*For example, 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. On a winter night, the temperature at Drass in Jammu and Kashmir may be as low as minus 45°C.*

*Tiruvananthapuram, on the other hand, may have a temperature of 20°C.*

### **Question-10**

*Discuss the mechanism of monsoons.*

#### **Solution:**

*To understand the mechanism of the monsoons, the following facts are important.*

- *The differential heating and cooling of land and water create a low pressure on the landmass of India while the seas around experience comparatively high pressure.*
- *The shift of the position of Inter-Tropical Convergence Zone (ITCZ) in summer, over the Ganga plain (this is the equatorial trough normally positioned about 5°N of the equator – also known as the monsoon trough during the monsoon season).*
- *The presence of the high-pressure area, east of Madagascar, approximately 20°S over the Indian Ocean. The intensity and position of this high-pressure area affect the Indian Monsoon.*
- *The Tibetan plateau gets intensely heated during summer, which results in strong vertical air currents and the formation of high pressure over the plateau at about 9 km above sea level.*
- *The movement of the westerly jet stream to the north of the Himalayas and the presence of the tropical easterly jet stream over the Indian peninsula during summer.*

### **Question-11**

*Give an account of weather conditions and characteristics of the cold season.*

#### **Solution:**

*The weather conditions greatly change from one season to the other. These changes are particularly noticeable in the interior parts of the country. The coastal areas do not experience much variation in temperature though there is variation in rainfall patterns. 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 the south to the north. The average temperature of Chennai, on the eastern coast, is between 24° – 25° Celsius, while in the northern plains, it ranges between 10° – 15° Celsius. Days are warm and nights are cold. Frost is common in the north and the higher slopes of the Himalayas experience snowfall.*

### **Question-12**

*Give the characteristics and effects of the monsoon rainfall in India.*

#### **Solution:**

*The Monsoon, unlike the trades, are not steady winds but are pulsating in nature, affected by different atmospheric conditions encountered by it, on its way over the warm tropical seas. The duration of the monsoon is between 100- 120 days from early June to mid-September. Around the time of its arrival, the normal rainfall increases suddenly and continues constantly for several days. This is known as the ‘burst’ of the monsoon and can be distinguished from the pre-monsoon showers.*

*The monsoon arrives at the southern tip of the Indian peninsula generally by the first week of June. Subsequently, it divides into two – the Arabian Sea branch and the Bay of Bengal branch. The Arabian Sea branch reaches Mumbai about ten days later on approximately the 10th of June. This is a fairly rapid advance.*

*The Bay of Bengal branch also advances rapidly and arrives in Assam in the first week of June. The lofty mountains cause the monsoon winds to deflect towards the west over the Ganga*

*plains. By mid-June, the Arabian Sea branch of the monsoon arrives over Saurashtra-Kuchchh and the central part of the country.*

*The Arabian Sea and the Bay of Bengal branches of the monsoon merge over the northwestern part of the Ganga plains. Delhi generally receives the monsoon showers from the Bay of Bengal branch by the end of June (tentative date is 29th of June). By the first week of July, western Uttar Pradesh, Punjab, Haryana and eastern Rajasthan experience the monsoon.*

*By mid-July, the monsoon reaches Himachal Pradesh and the rest of the country. Withdrawal or the retreat of the monsoon is a more gradual process. The withdrawal of the monsoon begins in the northwestern states of India by early September. By mid-October, it withdraws completely from the northern half of the peninsula. The withdrawal from the southern half of the peninsula is fairly rapid. By early December, the monsoon has withdrawn from the rest of the country.*

*The islands receive the very first monsoon showers, progressively from south to north, from the first week of April to the first week of May. The withdrawal takes place progressively from north to south from the first week of December to the first week of January. By this time the rest of the country is already under the influence of the winter monsoon.*