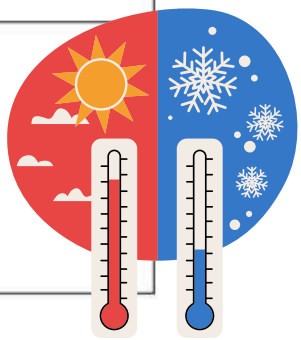
CHAPTER- 4
CLIMATE

POINTS TO REMEMBER:

- The **atmospheric conditions, landforms and drainage** are the **three basic elements** of the any natural environment.
- **Weather** refers to the state of the atmosphere over an area at any point of time
- **Climate** refers to the sum total of 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.***
- The weather conditions fluctuate very often even within a day. But there is some common pattern over a few weeks or months, i.e. days are cool or hot, windy or calm, cloudy or bright, and wet or dry.
- On the basis of the generalized monthly atmospheric conditions, the year is divided into seasons such as winter, summer or rainy seasons.
- **Factors affecting Climate of India**

Sl no.	Factors affecting climate of India	How do they affect climate	Reason
1.	Latitude	The more we move away from equator, colder will be the climate.	Due to curvature of earth the amount of solar energy decreases as we move from equator to poles
2.	Altitude	As we move up in height colder will be the climate	As atmosphere become less dence and temperature decrases with increasing height
3.	Distance from sea	The more a place is at distance from sea the more extreme climatic condition it will have.	The moderating influence of sea (sea breeze) decreases with distance.

4.	Ocean current	The climatic condition of a coastal place is affected by the warm and cold current flowing past by	As cold or warm current accordingly modify the nature of onshore winds and affects the climate.
5.	Relief features or landscape or surface of earth.	Landscape like high mountain acts as barrier for cold or hot winds, they also cause precipitation or rain shadow on leeward.	Due to their size and height they can restrict the flow of winds and alter the climate of a place.
6.	Pressure and Wind system	They are dependent on the latitude and altitude of a place hence has effect on climate accordingly.	



- The **Tropic of Cancer passes through the middle of the country** from the Rann of Kuchchh (Gujarat) in the west to Mizoram in the east.
- Thus India's climate has characteristics of both **tropical as well as subtropical climates.**
- The **Himalayas prevent** the **cold winds from Central Asia** from entering the subcontinent. Therefore, we experiences comparatively milder winters as compared to central Asia.
- The **climate and associated weather conditions** in India are governed by the following atmospheric conditions:
  I. Pressure and surface winds
  II. Upper air circulation
  III. Western cyclonic disturbances and tropical cyclones
- India lies in the region of north easterly winds. These winds originate from the subtropical high-pressure belt of the northern hemisphere.
- Due to the rotation of earth winds deflects towards the right in the northern hemisphere and towards the left in the southern hemisphere by a force called **Coriolis force. This is also known as Ferrell's law.**
- **Jet stream** are a narrow belt of high altitude (above 12,000 m) westerly winds in the troposphere.

I. Their speed varies from about 110 km/h in summer to about 184 km/h in winter.
II. These jet streams are located approximately over 27°-30° north latitude,
III. They are also known as subtropical westerly jet streams.
IV. Over India, jet streams blow south of the Himalayas, all through the year except in summer.
V. In summer, the subtropical westerly jet stream moves north of the Himalayas with the apparent movement of the sun.
VI. An easterly jet stream, called the sub- tropical easterly jet stream blows over peninsular India, approximately over 14°N during the summer months.

- **The western cyclonic disturbances** experienced in the north and north-western parts of the country are brought in by this westerly flow.
    I. The western cyclonic disturbances are weather phenomena of the winter months brought in by the westerly flow from the Mediterranean region.
    II. They usually influence the weather of the north and north-western regions of India.
- Al Nino is a name given to the periodic development of a warm ocean current along the coast of Peru as a temporary replacement of the cold Peruvian current.
    I. It is a Spanish word meaning "The child" and refers to baby Christ, as this starts flowing during Christmas.
    II. The presence of Al Nino leads to an increase in sea surface temperature and weakning of the trade winds in the region.
- There are following important facts to understand the **Mechanism of the monsoons**:
    I. The differential heating and cooling of land and water
    II. The shift of the position of Inter Tropical Convergence Zone (ITCZ) in summer
    III. The presence of the high-pressure area, in east of Madagascar due to low temperature.
    IV. The Tibetan plateau gets intensely heated during summer,
    V. The movement of the westerly jet stream to the north of the Himalayas
    VI. The presence of the tropical easterly jet stream over the Indian peninsula in summer.

VII. Changes in the pressure conditions over the southern oceans.

- The **climate of India** is strongly **influenced by monsoon winds**.
    I. The word **monsoon** is derived from the **Arabic word 'mausim'** which literally **means season**.
    II. 'Monsoon' **refers** to the **seasonal reversal in the wind direction** during a year.
    III. The sailors who came to India in historic times were one of the first to have noticed the phenomenon of the monsoon.
    IV. The Arabs, who had also come to India as traders named this seasonal reversal of the wind system 'monsoon'.
    V. The monsoons are experienced in the tropical area roughly between 20° N and 20°S.
- 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 splits into **two branches– the Arabian Sea branch and the Bay of Bengal branch**.
    I. The Arabian Sea branch reaches Mumbai about ten days later on approximately the 10th of June. This is a fairly rapid advance. By mid-June the Arabian Sea branch of the monsoon arrives over Saurashtra-Kuchchh and the central part of the country.
    II. 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. 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 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 last 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.
- **Four main seasons** can be identified in India –
    I. **The cold weather season,**
    II. **The hot weather season,**
    III. **The advancing monsoon and**
    IV. **The retreating monsoon** with some regional variations.
- **The cold weather season (Winter Season)**:
    I. It begins from mid November in northern India and stays till February.
    II. The temperature decreases from south to the north.
    III. Days are warm and nights are cold. Frost is common in the north and the higher slopes of the Himalayas experience snowfall.
    IV. The northeast trade winds prevail over the country.
    V. In the northern India, a feeble high-pressure region develops, with light winds moving outwards from this area.
- **The Hot Weather Season (The Summer Season)**:
    I. It begins from **March to May**.
    II. The summer months experience **rising temperature and falling air pressure** in the northern part of the country.
    III. A striking feature of the hot weather season is the **'Loo'**. 'Loo' is strong, gusty, hot, dry winds blowing during the day over the north and northwestern India.
    IV. **Dust storms** are common and sometime may bring light rain and cool breeze.
    V. During summer Sometime **localized thunderstorm** along with violent wind, torrential downpours accompanied by hail occurs which is called **'Kaal Baisakhi'** in west Bengal.
    VI. Pre-monsoon showers are common especially, in Kerala and Karnataka. They help in the early ripening of mangoes, and are often referred to as '**mango showers'**.

- **Advancing Monsoon(The Rainy Season):**
  I. The duration of the monsoon is between 100- 120 days from early June to mid-September.
  II. By early June the **low pressure condition over northern plains** intensified.
  III. **It attracts the trade winds** of southern hemisphere.
  IV. These **trade winds originate over** warm subtropical area of **Southern Ocean** and enters India as South- west Monsoon.
  V. As these winds blow over Warm Ocean, they **bring abundant moisture** to the sub continent and do precipitation.
  VI. 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.
  VII. When the axis of the monsoon trough lies over the plains, rainfall is good in these parts.
  VIII. 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.
  IX. These heavy rains bring in their wake, devastating floods causing damage to life and property in the plains.
  X. 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.
  XI. Parts of 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. Owing to the nature of monsoons, the annual rainfall is highly variable from year to year.
- **Retreating Monsoon (The Autumn Season):**
  I. During October-November the low pressure over northern plains(due to heat) become gradually weak and replaced by high pressure system (due to cooling effect of rain during monsoon).
  II. The south west monsoon winds weaken and gradually withdraw from northern plain.
  III. This retreat marked by clear skies and rise in temperature with moist land.

IV. Owing to this condition of high temperature and humidity the weather became oppressive during day. This is commonly known as 'October Heat'.
V. Now low pressure condition transferred to Bay of Bengal and hence causes Cyclones to Eastern Coast of India.

- Monsoon is called the unifying bond of Indian Sub-Continent.
- In fact India's fate rests on Monsoon.

QUESTIONS

Very Short Answer Type Questions(1 Marks each)

1. What type of climate India has?
2. What is climate?
3. Which type of climate is found mainly in the south and the South-East Asia?
4. In which places, there is a wide difference between day and night temperatures?
5. In which places, there is hardly any difference in day and night temperatures?
6. In Which months, most parts of the India received rainfall?
7. Which type of areas experience less contrasts in temperature conditions.
8. What is the originating point of North Easterly wind?
9. What is meant by Coriolis force?
10. What do you mean by Jet stream?
11. What is Inter Tropical Convergence Zone?
12. What is meant by 'pressure differences were negative'?
13. What is El-Nino?
14. Which region of India does not have a well defined cold season?
15. What is a a striking feature of the hot weather season?.
16. Which area receives the highest average rainfall in the world?
17. What is the most important factor in thunderstorms development?
18. What is the highest wind velocity?
19. What is tool to measure the wind speed?
20. What is temperature?

Short/Long Answer Type Questions(3/5 marks)

1. What are the reasons behind the variety in lives of people – in terms of the food, clothes and houses?
2. Describe the major controls of the climate?