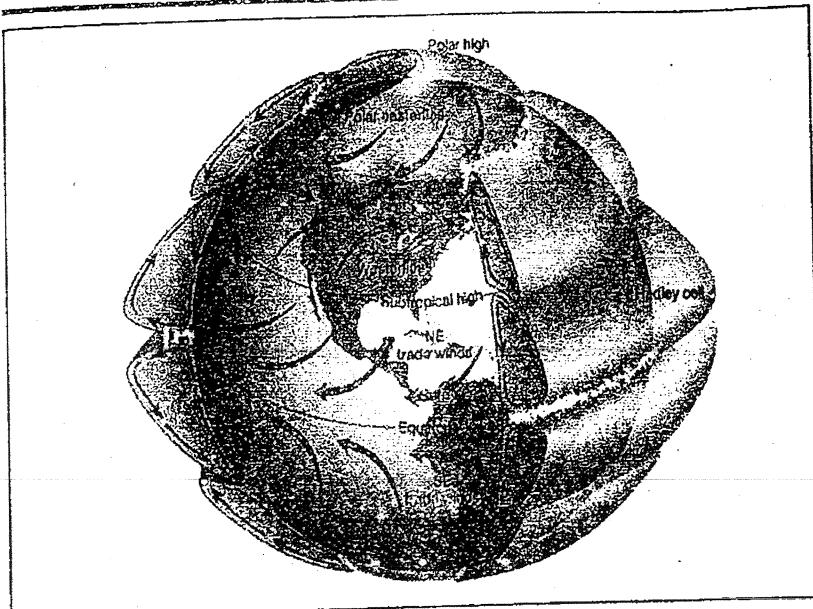


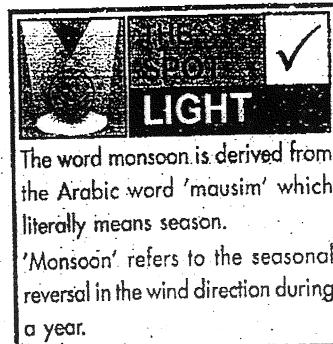
# Climate



"India is home to an extraordinary variety of climatic regions, ranging from tropical in the south to temperate and alpine in the Himalayan north, where elevated regions receive sustained winter snowfall. The nation's climate is strongly influenced by the Himalayas and the Thar Desert."

## 17.1 Weather and Climate

Weather and Climate		
S.N.	Weather	Climate
1	It refers to the atmosphere conditions that exist for a given time in a specific area.	Climate is the aggregate of day to day weather condition over a long period of time.
2	It refers to a small area.	Climate refers to a large area.
3	It may change at a very short interval of time.	Climate remains more or less unchanged year after year
4	It is influenced by any one of its predominant elements i.e. temperature, humidity, wind, precipitation etc.	It is the collective effect of all its elements.



The word monsoon is derived from the Arabic word 'mausim' which literally means season.

'Monsoon' refers to the seasonal reversal in the wind direction during a year.

## 17.2 Climate of India

The climate of India is described as of monsoon type. Derived from an Arabic word 'mausim' monsoon to the seasonal reversal in the wind direction through the year. This type of climate is found mainly in the south east Asia. Despite an overall unity and commonality in the general pattern, there are regional variations in climatic conditions within the country. The temperature touches as high as 50°C in the western desert during the summer season. Whereas it goes down as low as -40°C in Leh during the winter. Similarly, variations are noticeable not only in the precipitation but also in its amount.

### 17.3 Climate Controls

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

- (i) **Latitude** : 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.
- (ii) **Altitude** : As one goes from the surface of the earth to higher altitudes, the atmosphere is less dense and temperature decreases. The hills are therefore cooler during summer.
- (iii) **The Pressure and Winds** : The system of any area depends on the latitude and altitude of the place it influences the temperature and rainfall pattern.
- (iv) **Distance from the sea** : 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).
- (v) **Ocean current** : Ocean current along with on shore 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.
- (vi) **Relief** : It plays a major role in determining the climate of a place. High mountain 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. The leeward side of mountains remains relatively dry.

### 17.4 Factors affecting the climate of India

- (a) **Latitude** : The tropic of cancer passes through the middle of the country from the Rann of Kuchchh in the west to Mizoram in the east. Almost half of the country lying south of the tropic of cancer belongs to the tropical area. All the remaining area, north of the Tropic, lies in the subtropics. Therefore, India has tropical & subtropical Climate.
- (b) **Altitude** : India has mountains to the north and an average height of about 6000 metres. India has a vast coastal area where the maximum elevation is about 30 metres. The Himalayas prevent the cold winds from Central Asia from entering the subcontinent. Because of this subcontinent experiences comparatively milder winter as compared to Central Asia.
- (c) **Pressure and winds** : The climate and associated weather conditions in India are governed by the following atmospheric condition.
  - (i) Pressure and surface winds. (ii) Upper air circulation. (iii) Western cyclonic disturbances and tropical cyclone.

The pressure condition exerted by the surrounding countries like East Africa, Iran, Central Asia also influence the climate condition of India. The fury of monsoons as well as long dry spell in India are mainly due to the pressure conditions in the above mentioned countries.

Winds especially Typhoons, Air current and monsoon also have a great bearing on the climate of India. Typhoons originating in the China sea also have a great bearing on the weather conditions in India.

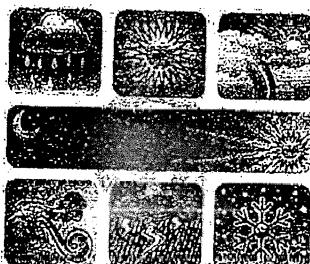
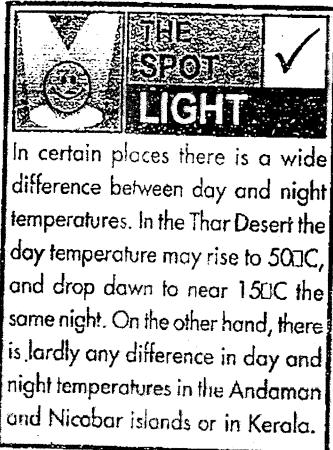
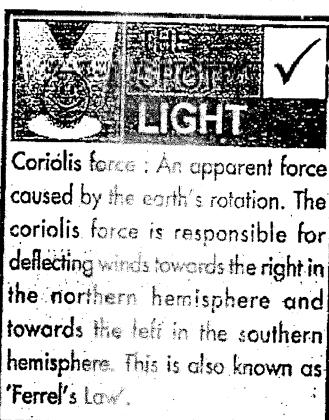


Fig. 1  
Different Types of climates



- (d) **Western cyclonic disturbance** : The western cyclonic disturbances are weather phenomena of the winter months brought in by the westerly flow from the Mediterranean region. They usually influence the weather of the north and north-western regions of India. Tropical cyclones occur during the monsoon as well as in October-November, and are part of the easterly flow. These disturbances affect the coastal regions of the country.
- (e) **Distance from the sea** : The location of seas on the three sides of India has exerted a moderate influence on much of the Indian sub continent. As the distance from the sea increases its moderating influence decreases.
- (f) **Physiography** : It plays an important role in determining the climate of a place. The location of the Himalayas in the north has acted as a great barrier to the cold winds of the north. But for the Himalayas, India would have become a cold country.

## 17.5 The Indian monsoon



Fig.2 : Arrival of Monsoon

- (a) The differential heating and cooling of land and water creates low pressure on the landmass of India while the sea around experiences comparatively high pressure.

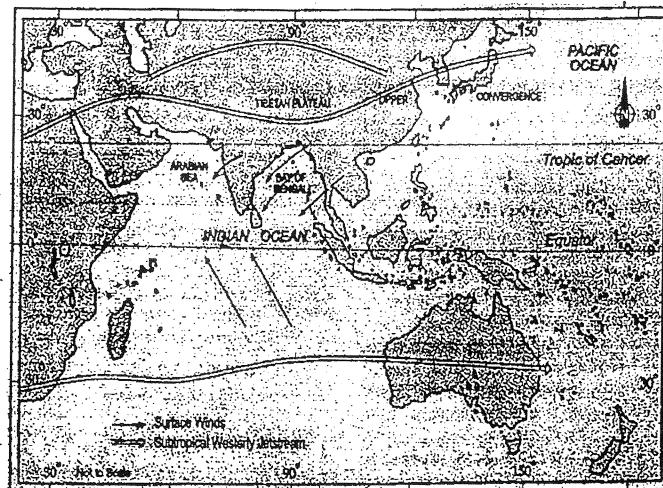


Fig. 4 : Atmospheric conditions over the Indian Subcontinent  
in the month of January


**THE SPOTLIGHT**


Jet stream : These are a narrow belt of high altitude (above 12000 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 are the mid-latitude and the sub tropical jet stream.



Fig.3  
Precipitation and rainfall


**THE SPOTLIGHT**


The formation of the Himalayas during the Early Eocene some 53 million years ago was key in determining India's current climate; global climate and ocean chemistry may have been impacted.

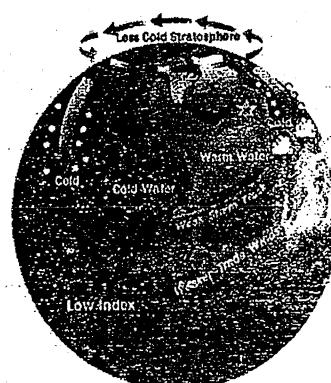
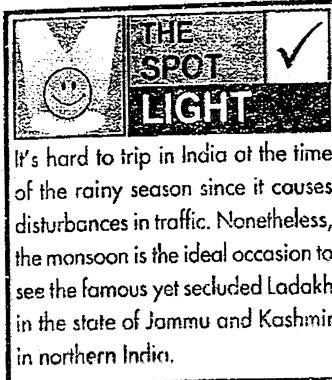


Fig.6  
Movement of winds

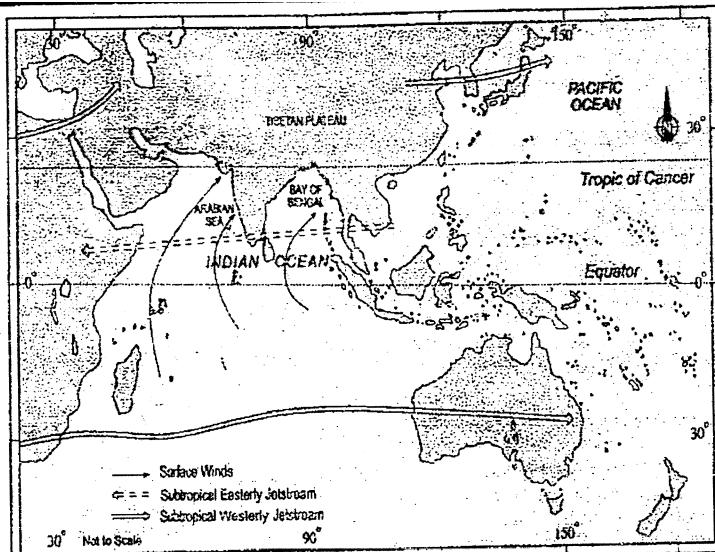
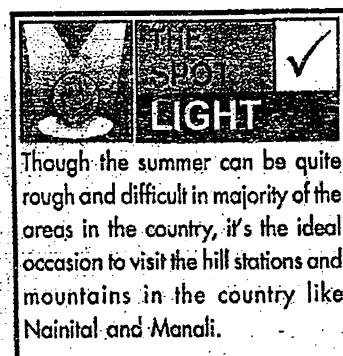


Fig. 5 : Atmospheric Conditions over the Indian Subcontinent in The Month of June

- (b) **The shift of the position of inter Tropical convergence zone.** 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.
- (c) **The presence of high pressure area, east of Madagascar** approximately at 20°S over the Indian ocean. The intensity and position of this high pressure area affects the Indian monsoon.
- (d) **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 movements 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.

- (e) **Southern oscillation or SO :** When the tropical eastern south pacific ocean experiences high pressure tropical eastern Indian ocean experiences low pressure. But in certain years, there is a reversal in the pressure conditions and the eastern pacific has lower pressure in comparison to the eastern Indian ocean. This period change in pressure condition is known as southern oscillation or SO.
- (f) **El Nino Southern Oscillations :** A warm ocean current that flows past the Peruvian Coast, in place of the cold peruvian current, every 2 to 5 years. The changes in pressure conditions are connected to the El Nino. Hence the phenomenon is referred to as ENSO.
- (g) **InterTropical Convergence Zone :** Inter Tropical Convergence Zone (ITCZ) is a broad trough of low pressure in equatorial latitudes. This is where the northeast and the southeast trade winds converge. This convergence zone lies more or less parallel to the equator but moves north or south with the apparent movement of the sun.

## 17.6 The onset or the monsoon and withdrawal

- (a) **The onset of the monsoon :** The monsoon arrives at the southern tip of the Indian Peninsula generally by the first week of June. Subsequently, it divides into two branches
1. The Arabian Sea Branch.
  2. The Bay of Bengal Branch.
    - The Arabian Sea Branch reaches Mumbai about 10 days later on approximately the 10<sup>th</sup> of June. This is 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 Ganga plains.
    - By mid June the Arabian Sea branch of the monsoon arrives over Saurashtra-Kuchchh and the central part of the country.
    - Both the branches of monsoon merge over the northwestern part of the Ganga plain.
    - Delhi receives the monsoon shower from the Bay of Bengal branch by the end of June.
    - By the first week of July, western, Uttar Pradesh, Punjab, Haryana and Eastern Rajasthan experience monsoon.
    - By mid July the monsoon reaches Himachal Pradesh and rest of the country.

(b) **Withdrawal of the monsoon**

- It is a gradual process. It 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.

### CHECK YOUR LEARNING 17.1

1. Why is monsoon known for its "uncertainties"?
2. Why most of the world's deserts are located in the western margins of continents in the subtropics?

## 17.7 The seasons

(a) **The cold weather season :**

- (i) The cold season begins from mid-November till February. The temperature decreases from south to north.
- (ii) The average temperature of Chennai is between 24°-25°Celsius, while in the northern plains, it is between 10°-15°Celsius. Days are warm, nights are cold. Higher areas of Himalayas experience snowfall.



El Nino : This 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. 'El Nino' is a Spanish word meaning 'the child', and refers to the baby Christ, as this current starts flowing during Christmas.

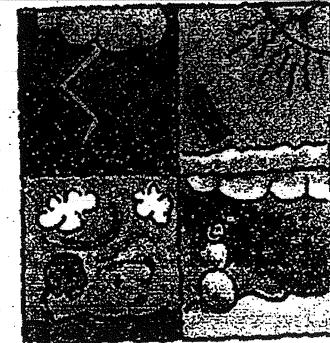


Fig.7  
Different seasons



The presence of the El Nino leads to an increase in sea-surface temperatures and weakening of the trade winds in the region.)



**Continental climate :** It is experienced in the interior of the continent. It is very hot in summer and very cold in winter, e.g., Delhi.

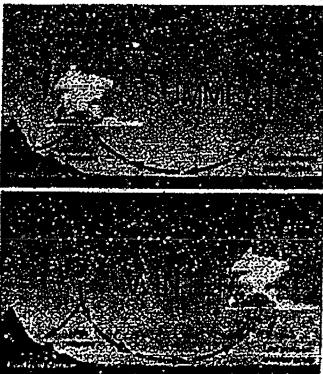
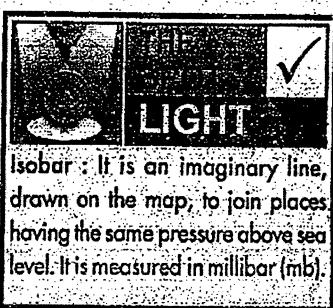


Fig. 8  
Cycle of seasons



**Isobar** : It is an imaginary line, drawn on the map, to join places having the same pressure above sea level. It is measured in millibar (mb).

- (iii) North-east trade winds blow over the country. They blow from land to sea.
- (iv) For most parts of the country, it is dry season. Tamil Nadu gets rain from these winds, here they blow from sea to land.
- (v) Western Disturbances (cyclonic disturbances) move into India from the Mediterranean Sea and blow over northern and North-western parts of India.
- (vi) They cause much needed winter rains over the northern plains and snowfall in the Himalayas.
- (vii) The total amount of rainfall is about 70 cm. They are important for the cultivation of **rabi crops**. Locally these rains are also known as "**Mahawat**".
- (viii) The peninsular region does not have a well-defined cold season. Due to the moderating influence of the sea, there is not much noticeable seasonal changes in temperature pattern in winters.

#### (b) The hot weather season (summer)

- (i) During this period there is a rapid shifted belt of heat from south to north.
- (ii) In May, the rising temperature leads to a low pressure in a wide area from the Thar desert to Chhota Nagpur.
- (iii) Because of this low pressure, the moisture laden winds from the Arabian Sea are attracted towards this area and consequently there is rainfall.
- (iv) A striking feature of the hot weather season is the '**loo**'. These are strong, gusty, hot, dry winds blowing during the day over the north and northwestern India.
- (v) Sometimes they even continue until late in the evening. Direct exposure to these winds may even prove to be fatal.
- (vi) Dust storms are very common during the month of May in northern India.
- (vii) These storms bring temporary relief as they lower the temperature and may bring light rain and cool breeze.
- (viii) This is also the season for localised thunderstorms, associated with violent winds, torrential downpours, often accompanied by hail. In West Bengal, these storms are known as the '**Kaal Balsakhi**' calamity for the month of Baisakh.
- (ix) Towards the close of the summer season, 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**'.

#### (c) Advancing monsoon season

- (i) This season runs from June to September.
- (ii) During these months the south west monsoon winds blow northwards into two branches from the Arabian sea and the Bay of Bengal. They make rainfall almost in the whole of northern India.
- (iii) These winds blow from the oceanic high pressure area towards the low pressure area of land and make heavy rainfall.

- (iv) The Arabian sea branches causes heavy rainfall in the coastal areas of the Western Ghats but this rainfall decreases as the monsoon goes further. Kutch receives less rainfall.
- (v) The Bay of Bengal causes heavy rainfall in the hills of Meghalaya. Mawsynram receives highest rainfall in the world.
- (vi) As the monsoon winds take a turn from east to west because of Himalayas, the rain goes on decreasing. Due to the uncertainty and uneven distribution of rainfall, floods and droughts are common during this season.
- (vii) Another phenomenon associated with the monsoon is its tendency to have 'breaks' in rainfall. These breaks in monsoon are related to the movement of the monsoon trough.
- (viii) 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.

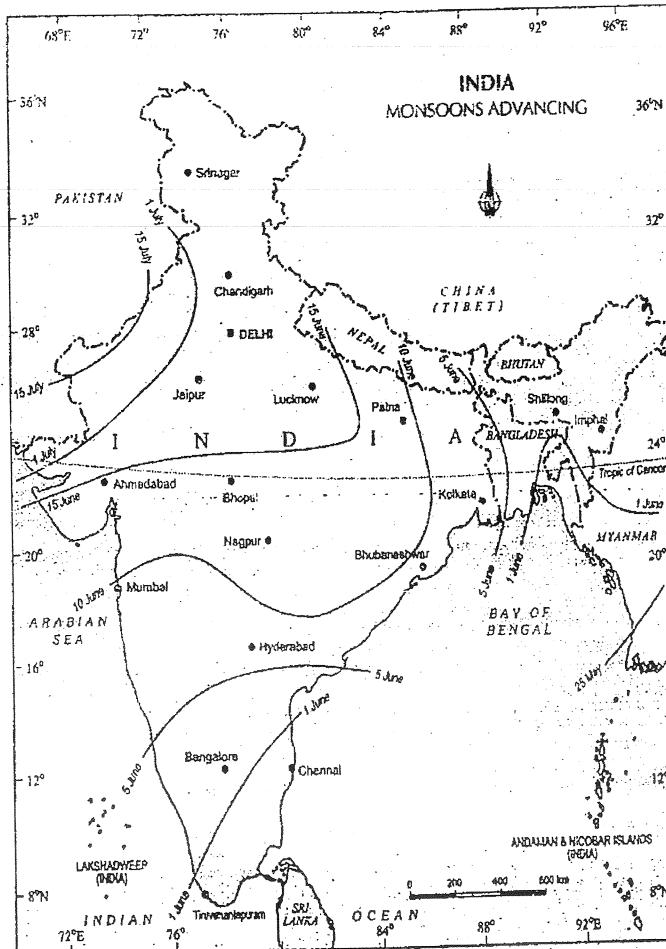
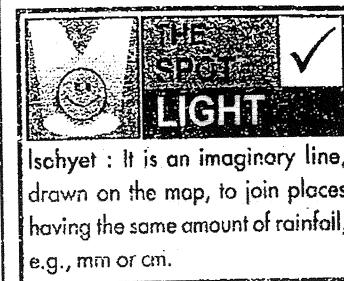


Fig.10 : Advancing Monsoon



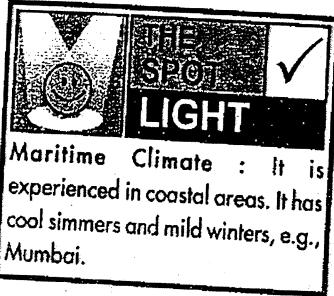
Fig.9  
Thunderstorm & lightning



**Breaking of monsoon :** Sudden approach of the moisture-laden winds is associated with violent thunder and lightning. This is known as "break" or "burst" of the monsoons. The monsoon first "breaks" on the south-west Coast of India around 1st June.

### CHECK YOUR ANSWERS 174

- 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.
- Sometimes the presence of cold coastal water can contribute to the creation of a desert along the adjoining shore. This occurs because cold ocean currents tend to stabilise the air over the coast and inhibit cloud formation. Large western coastal deserts include the Atacama Desert in Chile and the Namib Desert in Namibia.



**Maritime Climate :** It is experienced in coastal areas. It has cool summers and mild winters, e.g., Mumbai.

- (d) **The retreating monsoon**
- The months of October-November form a period of transition from hot rainy season to dry winter conditions.
  - The retreat of the monsoon is marked by clear skies and rise in temperature. 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.
  - At this time the monsoon starts retreating. The lower temperatures on the plains give rise to gradual increase in pressure and as such the monsoons, retreat from most parts of North India.
  - Depressions originate in the southern part of the Bay of Bengal and start moving towards the east coast of India.
  - Tamil Nadu receives high rainfall from these winds during this season.
  - The distribution and the range of rainfall is not certain even during this season also.

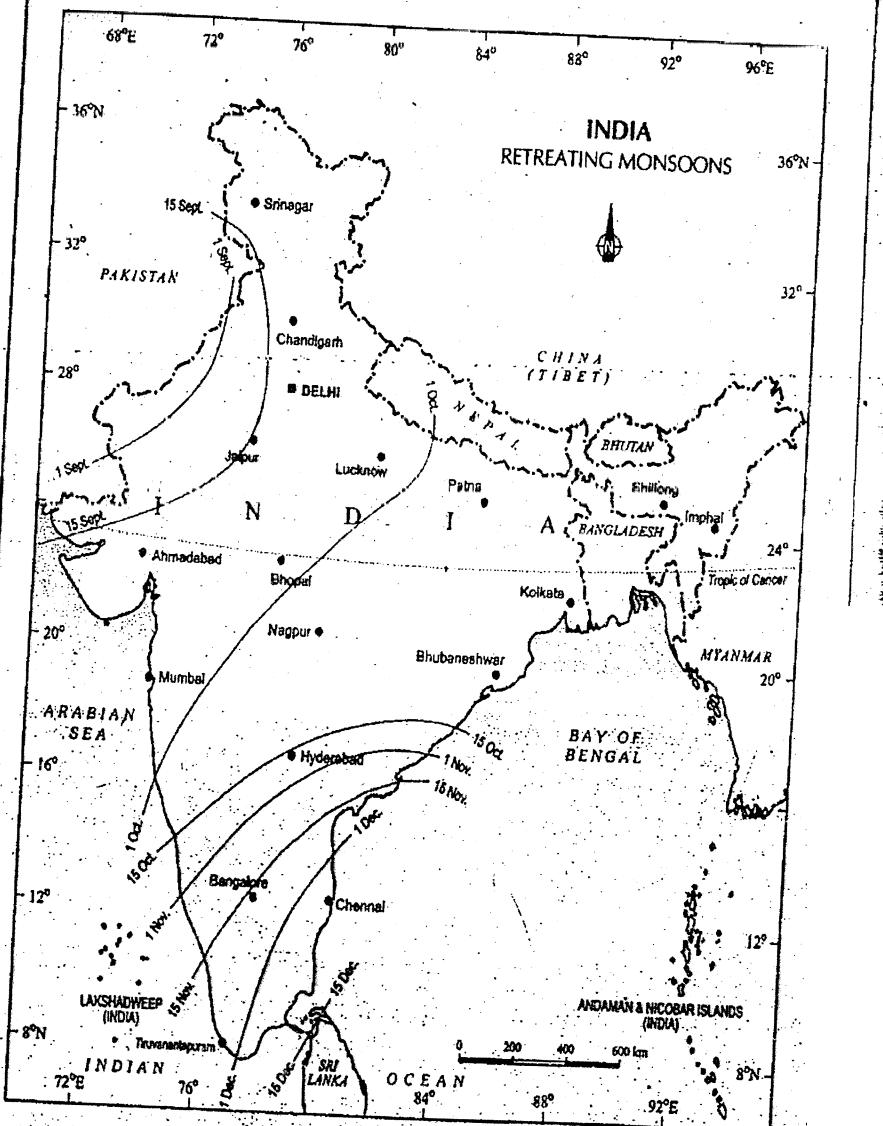


Fig.11 : Retreating Monsoon

**Monsoon trough :** It refers to the intense low pressure area, which develops over north-western parts of the country extending from Thar Desert to Chota Nagpur Plateau.

## 17.8 Distribution of Rainfall

- (i) The Western Coast and North Eastern India receive over about 400 cm of rainfall annually.
- (ii) Western Rajasthan and adjoining parts of Gujarat receive less than 60 cm.
- (iii) Rainfall is equally low in the interior of the Deccan plateau and east of the Sahyadris.
- (iv) A third area of low precipitation is around Leh in Jammu and Kashmir.
- (v) The rest of the country receives 'moderate rainfall'.
- (vi) Snow fall is restricted to the Himalayan region.

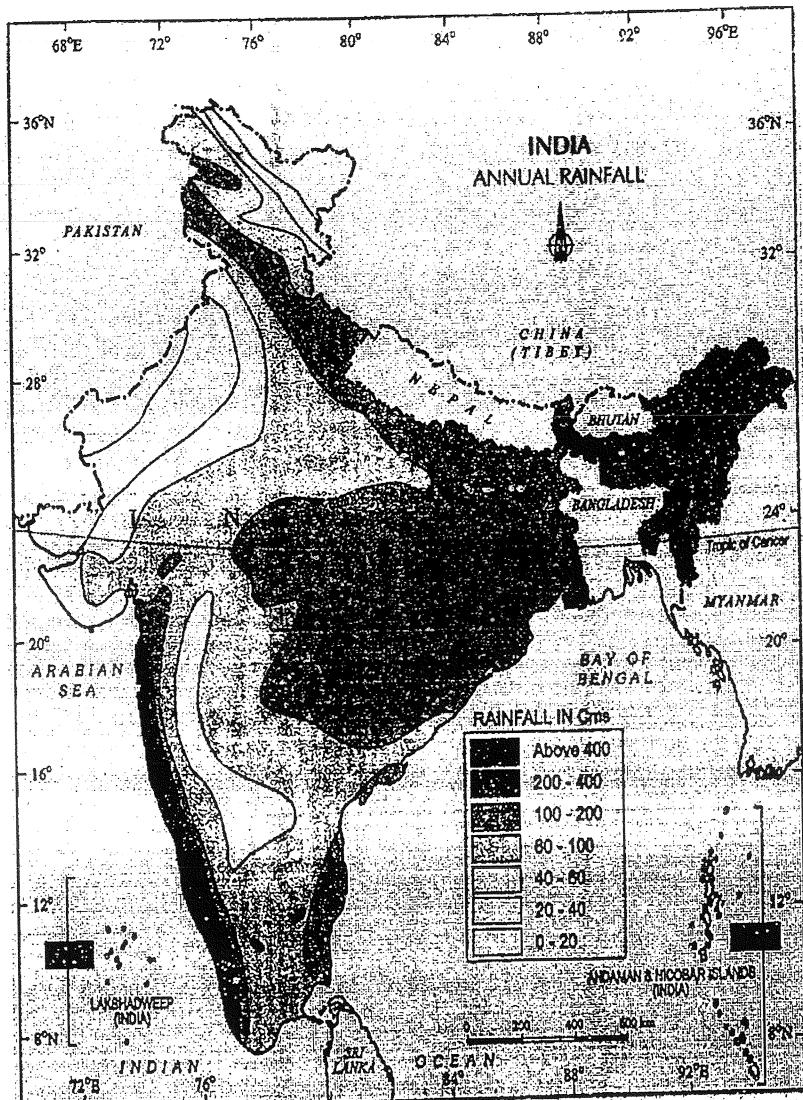
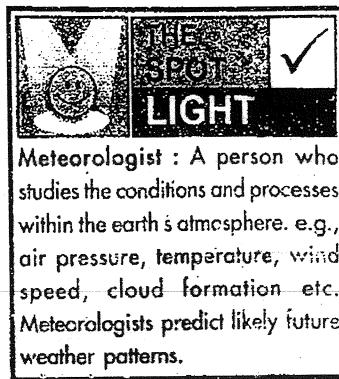
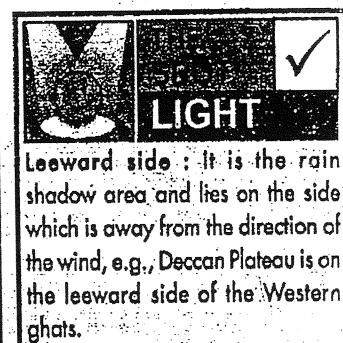


Fig. 12 : Annual Rainfall

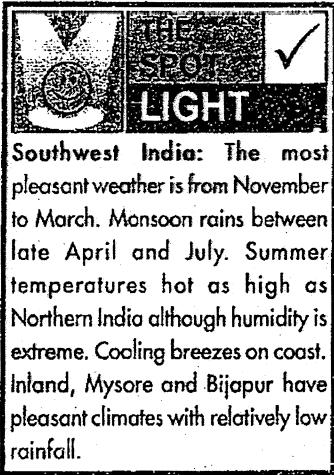


**Meteorologist :** A person who studies the conditions and processes within the earth's atmosphere. e.g., air pressure, temperature, wind speed, cloud formation etc. Meteorologists predict likely future weather patterns.



### 16.7 Monsoon as a unifying bond

- (a) **Effect of the Himalayas :** The Himalayas extending from north west to north east act as a great meteoreological barrier. These high mountains lend the entire country, a some what tropical touch. For example the temperature is almost uniformly high throughout India during most of the year, specially during the summer months. The Himalaya act as a closed base with, which the monsoon winds blow and show their unique performances.
- (b) **Effects of the monsoon :** Moreover, the all pervading effects of the monsoons on the Indian subcontinent have also lent unity to India. With few exceptions here and there. India gets most of its rainfall due to these common winds and that to, in the summer season. The concentration of rainfall over few months in a year keeps the whole land water-thirst for a greater part of the year. This thirst for water is universal throughout India. Hence, the need for developing the different means of irrigation (such as canals, wells, tube-well, etc.) is felt all over India. Thus the vagaries (uncertainties) of monsoons is felt all over the country.



South-west Monsoons	North-east Monsoons
(a) They blow in summer from June to September.	They blow in winter from December to February.
(b) They blow from high pressure sea to low pressure land. They are moisture bearing.	They blow from high pressure land to low pressure sea.
(c) They blow in two branches and give bulk of rainfall to India from 75% to 90%.	These are dry. While crossing the Bay of Bengal, they pick up moisture and give rainfall to the Coromandel coast/Tamil Nadu.
(d) High temperature, low pressure and high humidity.	Low temperature, high pressure, low humidity.

## **EXERCISE # 1**

## **FORMATIVE ASSESSMENT**

## **Multiple choice questions**

20. Which area is not an area of low precipitation ?

- (1) Western Rajasthan and Gujarat
- (2) Leh in Jammu & Kashmir
- (3) Deccan plateau
- (4) Assam

#### True or false

1. Loo are strong dusty, hot dry winds blowing during the day over desert area.
2. Pre monsoon showers occur in Kerala and Karnataka.
3. Centripetal force is an apparent force caused by the earth's rotation.
4. In West Bengal, the storms are known as jet streams.
5. In early June monsoon arrives in India.
6. The Thar desert experiences the highest range of temperature in a day.

#### Fill in the blanks

1. The climate of India may be described as \_\_\_\_\_.
2. The amount of \_\_\_\_\_ present in the atmosphere is humidity.
3. \_\_\_\_\_ is experienced in coastal areas.
4. The word 'mausam' is derived from \_\_\_\_\_ word.

5. Winter rains in Tamil Nadu are caused by \_\_\_\_\_.

6. \_\_\_\_\_ main seasons can be identified in India.

7. \_\_\_\_\_ and \_\_\_\_\_ system of any area depend on the latitude and altitude of the place.

8. The Tropic of Cancer passes through the middle of the country from the \_\_\_\_\_ to \_\_\_\_\_.

#### Match the column

	Column-I	Column-II
(1)	Monsoon	(a) The sum of total weather condition and variation over a large area.
(2)	Climate	(b) It is the difference between maximum and minimum temperature.
(3)	Temperature range	(c) The seasonal reversal in the wind direction during a year.
(4)	Jetstream	(d) The wettest place on the Earth.
(5)	Mawsynram	(e) The Inter-tropical convergence zone.
(6)	ITCZ	(f) Narrow belt of high altitude above 12,000m.

#### EXERCISE # 1

#### ANSWER KEY FORMATIVE ASSESSMENT

#### Multiple choice questions

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	3	1	4	1	4	3	4	4	2	4	3	2	4	2	2	1	4	1	4	4

#### True or false

1. True
2. True
3. True
4. False
5. True
6. True

#### Fill in the blanks

1. Tropical monsoon
2. Water vapour
3. Maritime climate
4. Arabic
5. North-East monsoon
6. 4/Four
7. Pressure, wind
8. Rann of Kuchchh to Mizoram

#### Match the column

1. (1) → c ; (2) → a ; (3) → b ; (4) → f ; (5) → d ; (6) → e

## **EXERCISE # 2**

## **SUMMATIVE ASSESSMENT**

### **Short answer type questions**

1. Give three reasons for the uneven distribution of rainfall in India?
2. Distinguish between weather and climate?
3. What are jet streams and how do they affect the climate of India?
4. Define monsoon. What do you understand by break monsoon.
5. What is inter tropical convergence zone?
6. What do you mean by October heat?
7. Explain - (1) loo (2) dust storms
8. What is southern oscillation? State an important feature of it.

### **Long answer type questions**

1. Explain how does monsoon act as a unifying bond in India. Give examples

2. Describe the regional variations in the climatic conditions of India with the help of examples?
3. Describe how location and relief are important factors in determining the climate of India?
4. Discuss the mechanism of monsoon.
5. Give the characteristics and effects of the monsoon rainfall in India?
6. Explain four factors controlling the Indian weather.
7. The bulk of rainfall in India is concentrated over a few months. Why?
8. What are the major controls of the climate of a place? Explain them
9. What are the features of advancing monsoons?

# **NCERT QUESTIONS WITH ANSWERS**

- 1.** Choose the right answer from the four alternatives given below :

OR



**Ans.** Mawsynram

- (ii) The wind blowing in the northern plains in summers is known as :  
(a) Kaalbaikash      (b) Loo      (c) Trade winds      (d) None of the above

Ans. Loo

OR

Where does the 'loo' flow in summer ?



**Ans.** North and Northwestern India

- (iii) Which one of the following causes rainfall during winters in northwestern part of India ?  
 (a) Cyclonic depression (b) Retreating monsoon (c) Western disturbances (d) Southwest monsoon

**Ans.** Cyclonic depression

- (iv) Monsoon arrives in India approximately in :

(a) Early may              (b) Early July              (c) Early june              (d) Early august

**Ans.** Early June



Ans. Cool days and cold nights

- 2.** Answer the following questions briefly :

- (i) What are the elements affecting the climate of India ?

**Ans.** The elements affecting the climate are temperature, atmospheric pressure, wind, humidity, etc.

- (iii) Why does India have a monsoon type of climate? 3

**Ans.** India is defined as a climatic region with monsoon climate. It is a type of tropical wet and dry monsoon type of climate.

- (iii) Which part of India experiences the highest rainfall?

**Ans.** The Thar Desert had a wide difference between day and night temperatures. There is no sea around to moderate the range of variation of temperature.

- (iv) Which winds account for a fall in temperature?

**Ans.** Malabar coast - gate way of India

- (ii) What are jet streams?

**Q.** What are jet streams and how do they affect the climate of India ?

**Ans.** Jet stream are high velocity westerly winds blowing through a narrow zone in the upper troposphere. The westerly winds blowing through a narrow zone in the upper troposphere. The westerly flows are responsible for the western disturbances experienced in the north and north-western parts of the country. The easterly jet streams cause tropical depressions during the monsoon as well as October-November months.

- (vi) Define monsoons. What do you understand by "break" in monsoon?

**Ans.** Monsoon 'break' refers to the happening of wet and dry spells during the rainy season. The monsoon rains take place only for a few days at a time. They are interspread with rainless intervals.

(vii) Why is the monsoon considered a unifying bond ?

**Ans.** Monsoons are uncertain but all the same they act as unifying force on the climatic unity of India. July and August are wet almost all over the country. In spite of their vagaries, the monsoons have a very important place in the cultural life of the people. The

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

**Ans.** June onwards, there is continued low pressure over the north-west region. This attracts trade winds from the Indian ocean. The winds are trapped by air circulation over India. These winds are loaded with abundant water vapours. The winds blow at a very fast speed. The hilly ranges of the northeast account for heavy rainfall in the region. As these winds travel westwards the amount of moisture contained goes on depleting. There is as such a decrease in rainfall from east to west in northern India.

4. Give reasons as to why:

(i) Seasonal reversal of wind direction takes place over the Indian subcontinent.

**Ans.** With the reversal in the direction of the surface winds, the monsoons withdraw from the Northern Plains. This reversal occurs as the monsoon trough becomes weaker with the approach of winter months.

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

**Ans.** The bulk of rainfall is concentrated over the months of June-September. As winter approaches, there is a reversal in the direction of surface winds and monsoons withdraw from the northern plains.

(iii) The Tamil Nadu coast receives winter rainfall.

**Ans.** Winter rains in Tamil Nadu are caused by north-east trade winds (also known as north east monsoons). That is the only part of India that gets rains during the winter months.

(iv) The delta region of the eastern coast is frequently struck by cyclones.

**Ans.** With the onset of winter season, there is a shift in low pressure conditions from the northwestern plains to the Bay of Bengal. During the middle of November, this shift results in the occurrence of cyclones. The deltas of Krishna and Kaveri rivers (and also Bangladesh) have to bear the fury of these cyclones year after year.

(v) Parts of Rajasthan, Gujarat and the leeward side of the Western ghats are drought-prone.

**Ans.** Rainfall in India is influenced by location as well as relief features. Areas situated in the direction of the monsoon winds receive more rainfall. The rainfall goes on decreasing from east to west. The moisture content of the monsoons goes on decreasing as they move westward. Areas situated in extreme west and devoid of hilly ranges that intercept the monsoon remain drought prone.

5. Describe the regional variations in the climatic conditions of India with the help of suitable example.

**Ans.** There are wide variations in climatic conditions over different parts of country. Most parts of the country. Most parts of the country have dry winters. The Coromandel coastal areas are an exception. Winters are sever in the north. The temperature increases from north to south. As the Northern plains shiver with 10-15 degrees Celsius temperature. Chennai has temperature around 25 degrees Celsius. Higher slopes of the Himalayas experience snowfall. The peninsular region does not have a well defined cold season. Nearness to the sea ensures that there are no wide variations due to seasonal changes.

Rainfall may go up to 1080 mm in the Khasi hills. Rajasthan and parts of Gujarat remain prone to droughts. During the summer seasons temperatures go up to 48°C in the western parts of India. May is the season of loo. These hot and dry winds cause intense heat. Temperature variations (June-December) are minimal at places like Leh. Places in the Northern plains experience severe heat in the summers and extreme cold weather during the winter months.

**6. Discuss the mechanism of monsoons.**

**Ans.** The north-east trade winds that blow during the winter months get replaced as the summer season sets in. There is continued low pressure over the north-west region. This attracts trade winds from the Southern Hemisphere. Coming from the Indian Ocean, these winds cross over the Bay of Bengal and the Arabian sea. They are then trapped by air circulation taking place over India. These winds are loaded with moisture and blow at a very fast speed. The rain caused by south-west monsoon is not uniform. The areas of western Ghats situated in the direction of the winds get more rainfall than the other side.

The cyclonic depressions formed at the head of the Bay of Bengal cause uneven and uncertain distribution of rainfall. These depressions move towards the low pressure monsoon trough which is not steadily placed. For a variety of reasons, they move northwards or southwards. When the axis of the trough moves close to the Himalayas, there are heavy rains in the Himalayan regions. Plains get dry spells. With the approach of winter, the monsoon trough becomes weaker. There is reversal in the direction of surface winds with the approach of winter. The monsoons now withdraw from the Northern plains. The shift in the low pressure conditions from north-western plains to the Bay of Bengal causes cyclones and rains in the Coromandel coast.

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

**Ans.** The winter season lasts from the month of December to February. The season is mostly dry. Cold is severe in the northern parts of the country. The southern parts have only mild cold. In the northern plains the days may be generally warm but the nights are cold. Places situated at high altitudes have snowfall. Light rainfall may occur during the winter months caused by western disturbances. These disturbances are caused by shallow cyclonic depressions originating over the East Mediterranean Sea. Travelling eastward, these depressions reach the north-western parts of India. On their way these get loaded with moisture from the Caspian Sea and the Persian Gulf. The western disturbances are responsible for snowfall in the western Himalayan regions apart from light rains over north-western parts of the country.

Winter rains are often followed by cold waves. Tamil Nadu gets rains in winter by the northeast trade winds.

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

**Ans.** The monsoon rainfall in India is not evenly distributed. Rainy season has a longer spell in the eastern parts of the country. The northwest gets rains for barely two months. The duration of the rainy season is longer in the south than in the north. The southwest monsoon pours more water over areas of Western Ghats that are situated in the direction of the winds. The quantity of rainfall is heavy in the hilly regions of the north-east. It keeps declining as the winds move westwards. Patna gets more rain than Allahabad. Similarly, Delhi gets much less rain than Kolkata. Monsoons are not steady. Rainy days are interspersed with rainless days. When the rains are heavy, the rivers get flooded causing heavy damage in the plains year after year. A dry spell would cause as much misery as the river floods. The arrival and departure of monsoons is uncertain. So is the extent of rainfall in any given rainy season. These characteristics of monsoon have a very destabilising effect on Indian economy that continues to be predominantly agricultural and severely dependent on rainfed irrigation.