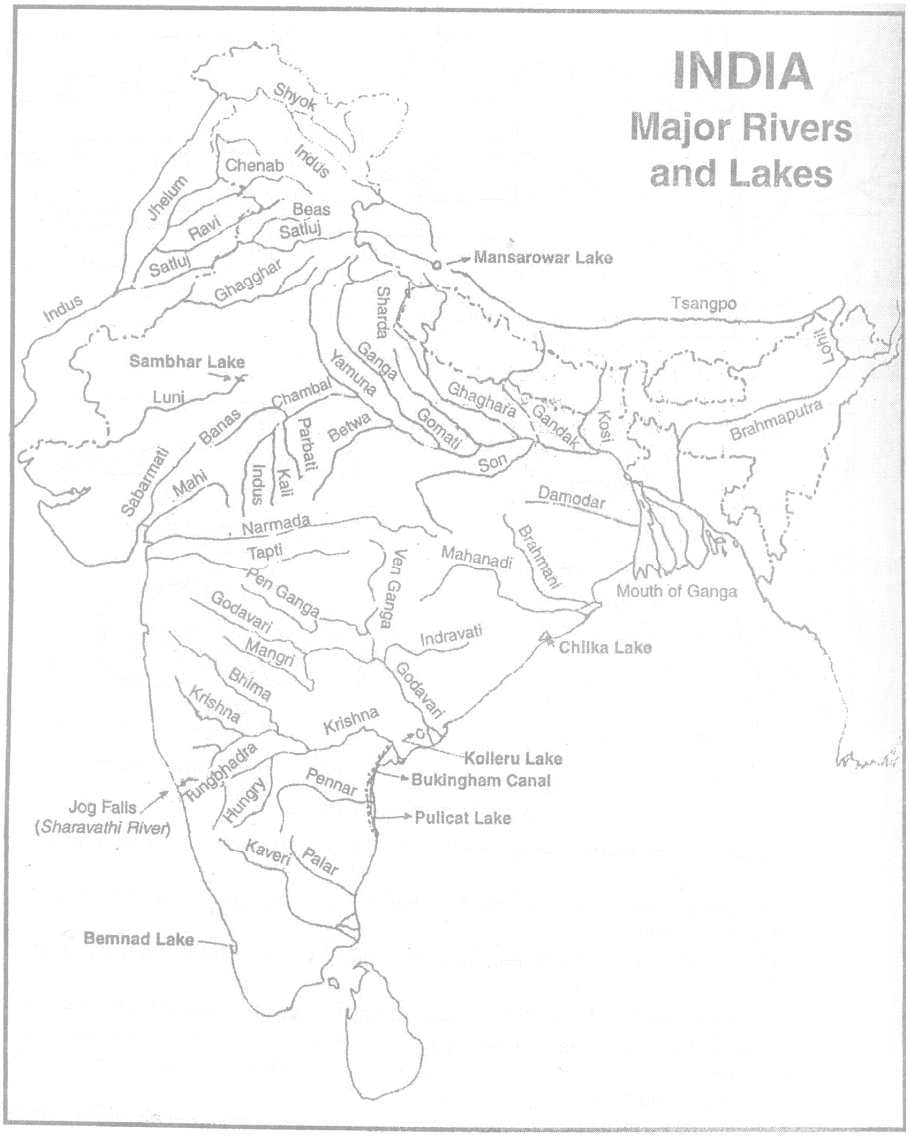
| S.No | The Himalayan Rivers | The Peninsular Rivers |
|---|---|---|
| 1. | These rivers originate from the glaciers. | These rivers originate on the plateau. |
| 2. | Their catchment area is very large. | Their catchment area is very small. |
| 3. | These rivers pass through gorge and carve deep valleys. | These rivers from shallow valleys. |
| 4. | These rivers are young. | These have acquired maturity. |
| 5. | These are engaged in high erosion activity. | These have very little erosional activity. |
| 6. | These are useful for irrigation. | These are of little use for irrigation. |
| 7. | These rivers are perennial, i.e., they flow throughout the year. | These rivers are non-perennial. |
| 8. | Indus, Ganga, Brahmaputra Are The Main Rivers. | Godavari, Krishna, Kaveri, Narmada and Tapti are major rivers. |

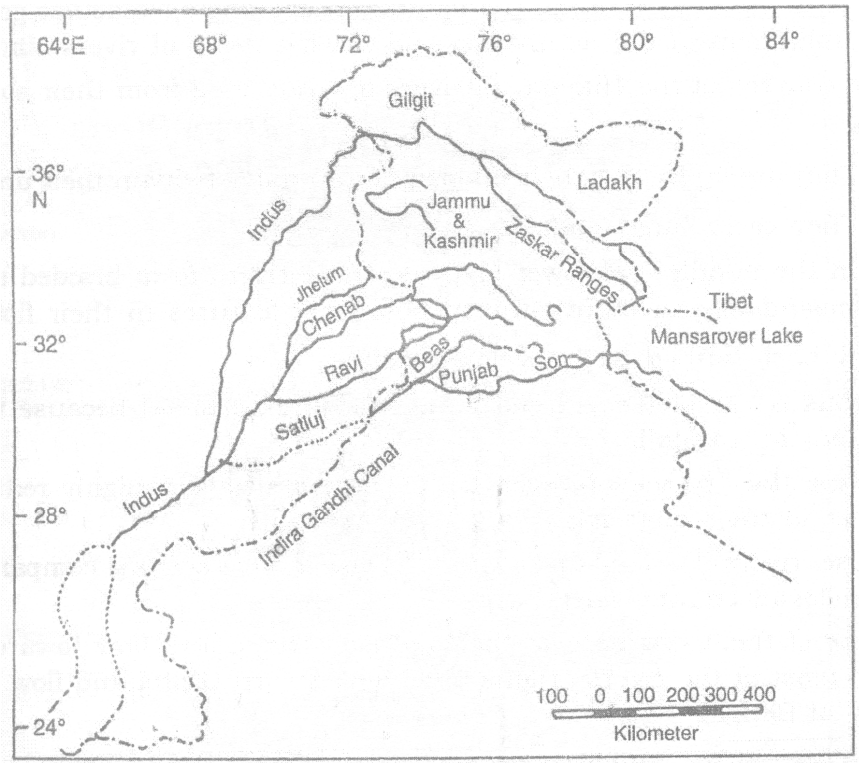


**(a) The Himalayan Rivers :**

The major Himalayan Rivers are the Indus, the Ganga and the Brahmaputra. These rivers are long, and are joined by many large and important tributaries.

**(A) The Indus River system :**

The river Indus rises in Tibet, near Lake **Mansarowar**. Flowing west, it enters India in the Ladakh district of Jammu and Kashmir. Several tributaries, the Zaskar, the Nubra, the Shyok and the Hunza, Join it in the Kashmir region. The Indus flows through Baltistan and Gilgit and emerges from the mountains at Attock. The Satluj, the Beas, the Ravi, the Chenab and the Jhelum join together to enter the Indus near Mithankot in Pakistan. Beyond this, the Indus flows southwards eventually reaching the Arabian Sea, east of Karachi. The Indus plain has a very gentle slope. With a total length of 2900 km, the Indus is one of the longest rivers of the world. a little over a third of the Indus basin is located in India in the states of Jammu and Kashmir, Himachal Pradesh and the Punjab and the rest is in Pakistan.




**Indus River System**.

(i) The Jhelum, an important tributary of the Indus, rises from a spring at Verinag situated at the foot of the Pir Panjal in the south-eastern part of the valley of Kashmir.

(ii) The Chenab is the largest tributary of the Indus. it is formed by two streams, the Chandra and the Bhaga, which join at Tandi near Keylong in Himachal Pradesh. hence, it is also known as Chandrabhaga. The river flows for 1,180 km before entering into Pakistan.

(iii) The Ravi is another important tributary of the Indus. it rises west of the Rohtang pass in the Kullu hills of Himachhal Pradesh and flows through the Chamba valley of the state.

(iv) The Beas is another important tributary of the Indus, originating from the Beas Kund near the Rohtang Pass at an elevation of 4,000 m above the mean sea level.

(v) The Satluj originates in the Rakas Lake near Mansarovar at an altitude of 4,555 mt .In Tibet, where it is know as Langchen Khambad.

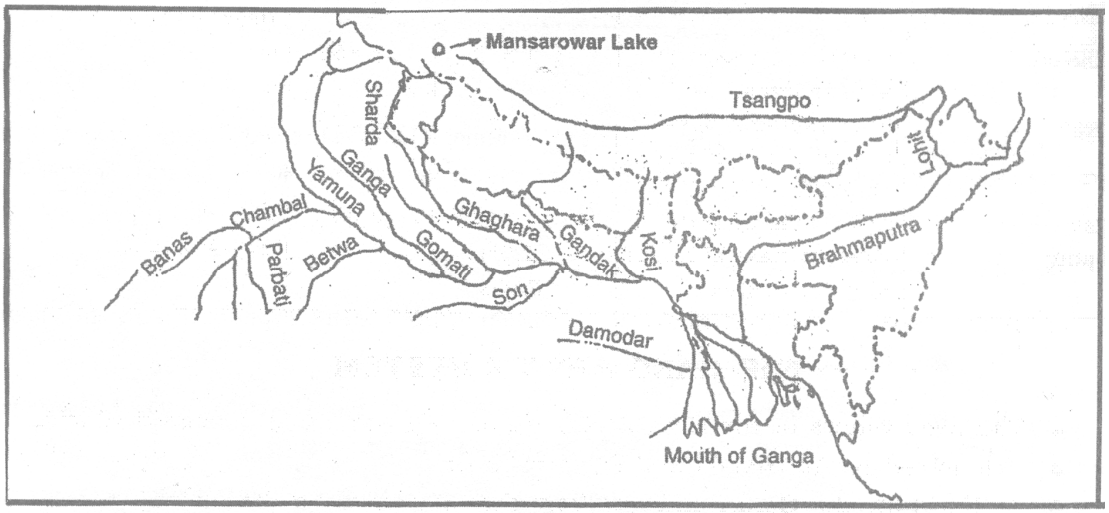
**(B) The Ganga System :**

(i) The headwaters of the Ganga, called the 'Bhagirathi is fed by the Gangotri Glacier and Joined by the Alaknanda at Devprayag in Uttaranchal. At Haridwar the Ganga emerges from the mountains on to the plains.

(ii) The Ganga is joined by the many tributaries from the Himalayas such as the Yamuna, the Ghaghara, the Gandak and the Kosi. The river Yamuna rises from the Yamunotri Glacier in the Himalayas and meets the Ganga at Allahabad. The Ghaghara, the Gandak and the Kosi rise in the Nepal Himalaya.

(iii) The main tributaries from the peninsular uplands are the Chambat, the Betwa and the son.

(iv) The Ganga flows eastwards till Farakka in West Bengal, the northemmost point of the Ganga delta. The river bifurcates here; the Bhairathi-Hooghly flows southwards through the deltaic plains to the Bay of Bengal. The mainstream, flow southwards into Bangladesh and is joined by the Brahmaputra. Further down stream, it is known as the Meghna and finally flows into the Bay of Bengal. The delta formed by these rivers is known as the Sunderban Delta.




**Ganga River System and Brahmaputra River System.**

**(C) The Brahmaputra System :**

(i) The Brahmaputra rises in Tibet east of Mansarovar Lake. It is slightly longer than the Indus. it flow eastwards parallel to the Himalayas.

(ii) On reaching the Namcha Barwa (7757 m), it takes a 'U' turn and enters India in Arunachal Pradesh through a gorge. Here, it is called the Dihang and it is Joined by the Dibang, the Lohit, the Kenula and many other tributaries to from the Brahmaputra in Assam.

(iii) In India it passes through a region of high rainfall. Here the river carries a large volume of water and considerable amount of silt. The Brahmaputra has a braided channel in its entire length in Assam and forms many riverine islands (Majuli, in the Brahmaputra River is the largest inhabited riverine island in the world).

(iv) During the rainy season, the river overflows its banks, causing widespread devastation due to floods in Assam and Bangladesh. Unlike other north Indian rivers the Brahmaputra is marked by huge deposits of silt on its bed causing the river bed to rise. The river also shifts its channel frequently.

## THE PENINSULAR RIVERS

The Peninsular drainage system is older than the Himalayan one. This is evident from the broad, largely-graded shallow valleys, and the maturity of the rivers. Peninsular rivers are characterized by fixed course, absence of meanders, small drainage basin and non-perennial flow of water. He main water divide in peninsular Indian is formed by the Western Ghats. Most of the major rivers of the Peninsula flow eastwards and drain into the Bay of Bengal. The Narmada and the Tapi which flow through the rift valley are exceptions.

### (a) The Narmada Basin:

**(i)** The Narmada originates on the western flank of the Amarkantak plateau at a height of about 1, 057m. It falls into the Arabian Sea south of Bharuch. The Sardar sarovar project has been constructed on this river.

**(ii)** Flowing in rift valley between the satpura in the south and the vindhyan range in the north the Narmada creates many picturesque locations. the 'Marble rocks', near Jabalpur where the Narmada flows through a deep gorge, and the 'Dhuadhar falls' where the river plunges over steep rocks, are some of the notable ones.

**(iii)** All the tributaries of the Narmada are very short and most of these join the main steam at right angles. The Narmada basin covers parts of Madhya Pradesh and Gujarat.

### (b) The Tapi Basin:

The Tapi originates from Satpura ranges in the Betul district of Madhya Pradesh. nearly 79 per cent of its basin lies in Maharashtra, 15 per cent in Madhya Pradesh and the remaining 6 per cent in Gujarat. The Tapi flows in a rift valley parallel to the Narmada but it is much shorter in length.

### (c) The Godavari Basin :

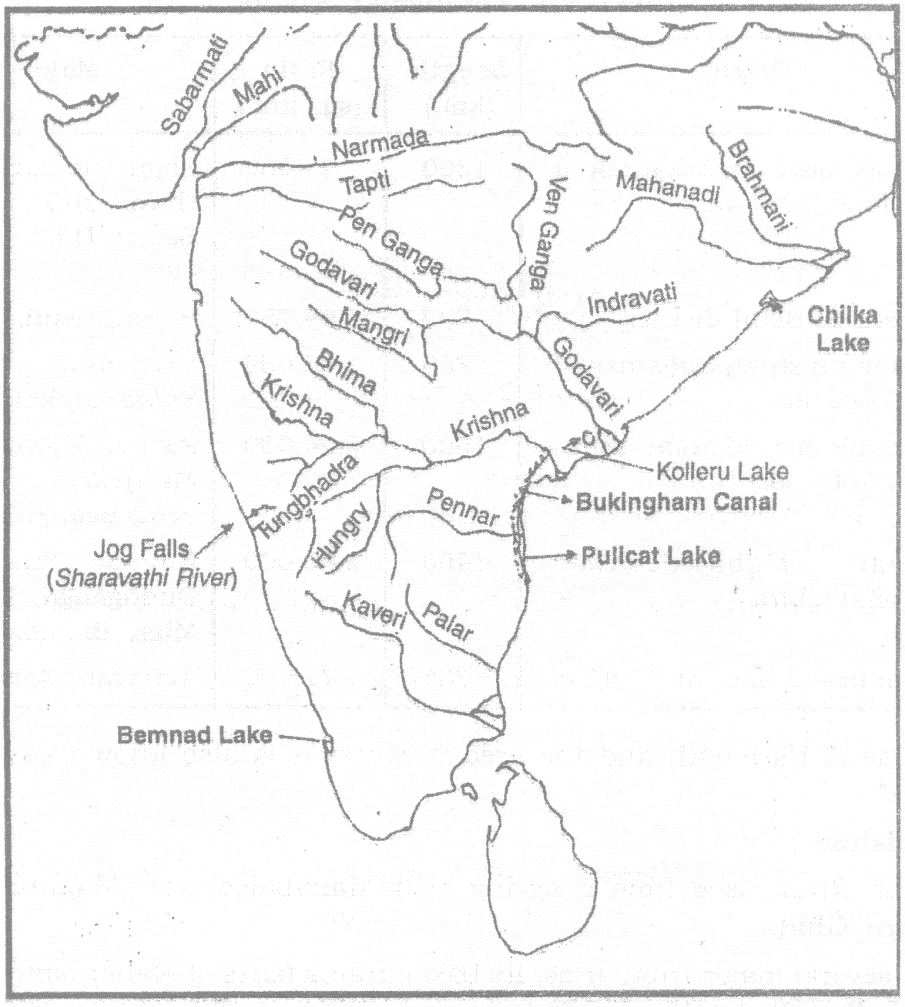
**(i)** The Godavari is the largest peninsular river system. it rises from the slopes of the Western Ghats in the Nashik district of Maharashtra. its length is about 1500 km.

**(ii)** Because of its length and the area it covers, it is also known as the Dakshin Ganga. its basin cover parts of Maharashtra, Madhya Pradesh, Orissa and Andhra Pradesh.

**(iii)** The Godavari is joined by a number of tributaries such as the Penganga, the Preheat, the Manjira, the Wainganga and the Wardha. It finally drains into the Bay of Bengal.
(d) The Mahanadi rises near Sihawa in Raipur district of Chattisgarh and runs through Orissa to discharge its water into Bay of Bengal. fifty three per cent of the drainage basin of this river lies in Madhya Pradesh and Chattisgarh, while 47 per cent lies in Orissa.

**(e)** The Krishna is the second largest east-flowing peninsular river which rises near Mahabaleshwar in Sahyadri. Its total length is 1,401 km. the Koyna, the Tungbhadra and the Bhima are its major tributaries.

**(f)** The Kaveri rises in Brahmagiri hills (3,341m) of Kogadu district in Karnataka. Since the upper catchment area receives rainfall during the southwest monsoon season (summer) and the lower part during the northeast monsoon season (winter), the river carries water throughout the year with comparatively less fluctuation than the other Peninsular rivers. Its important tributaries are the Kabini, the Bhavani and the Amravati.




**Peninsular River System.**

| | East flowing Rivers of Peninsular | West flowing Rivers of Peninsular |
|---|---|---|
| 1 | Rivers – Mahanadi, Godavari, Krishna and Kaveri flow from west to east into the Bay of Bengal. | Rivers – Narmada and Tapi flow from East to West into the Arabian Sea. |
| 2 | These rivers form fertile deltas along the eastem coast. | These form estuaries on the westem coast. |
| 3 | These rivers are longer and drain bigger areas. Their main course is flat area. | These two rivers are shorter as compared to east flowing rivers. They flow through trough and from gorges. |
| 4 | They are rain-fed and depend on rainfall and are seasonal. | They are also rain-fed and are seasonal rivers. |

## LAKES

**(i)** sambhar Lake is the largest inland salt take of India situated in Rajasthan. Other salt lakes in Rajasthan are Didwana, Degana, Pachadra, Kucha man, Lunkaransar.

**(ii)** Lunar Lake situated in Maharashtra is a crater lake.

(iii) chilka Lake situated in Puri district of Orissa & south of the Mahanadi delth is the biggest lake of the country.
(iv) Kolleru Lake is deltaic Lake of Andhra Pradesh situated between the Krishna & Godavari delth.
(v) Pulicat Lake situated in the north of Chennai is a shallow lagoon. it has been barred by a long sandpit which is actually Sri Harikota lsland.
(vi) Loktak Lake situated in Manipur is the largest fresh water lake in the North East India. Keibul lamjao, the only floating National Park of the country is situated here.
(vii) Vembanad Lake is a lagoon in Kerala and is an important tourist spot. coconut islands are located in it.
(viii) Gohna Lake situated near Devprayag in Garhwal has been formed by a huge landslide across a tributary of the Ganga.
(ix) Wular Lake & Dal Lake are tectonic lakes formed by faulting activities.

**(a) Importance of Lakes:**

(i) Lakes are very important to man.
(ii) A lake helps to regulate the flow of a river.
(iii) During heavy rainfall they prevent flooding and during the dry season, they help maintain an even flow of water.
(iv) Lakes are also used for developing hydel power.
(iv) Lakes are a valuable source of water.
(v) They moderate the climate of the surrounding areas.
(vi) They maintain the aquatic ecosystem.
(vii) They enhance natural beauty, helps in developing tourism.
(viii) They provide recreation through boating and swimming.

## ROLE OF RIVERS

(i) Rivers have formed fertile northem plains and deltas containing alluvial soils which are the most productive agricultural lands of India.
(ii) Water from rivers is a basic natural resource essential for survival of humans, plants and animals, for agricultural and industrial activities.
(iii) The banks of rivers have been cradles of civilization all over the world. For example Indus civilization in India.
(iv) Rivers have provided cultural and economic progress since ancient time.
(v) Rivers provide inland transportation system. They also dilute and transport wastes from settlements.
(vi) Industrial; development has flourished along rivers. Most of industrial processes depend on water as a raw material, as a coolant and for generating of hydroelectricity.

## RIVER POLLUTION

Rapidly growing domestic, Municipal, industrial and agricultural demand for water from rivers naturally affects the quality of water. Today more and more water is drained out of the rivers. It has resulted in reducing their volume. A heavy load of untreated sewage and industrial effluents is emptied into the rivers.

(i) This affects not only the quality of water but also the self cleansing capacity of the river. For example, if there is an adequate stream flow, the Ganga water is able to dilute and assimilate pollution loads of large cities within 20 kms.
(ii) The result is that pollution level of many rivers is rising.
(iii) Concern over rising pollution of our rivers has launching of various action plants to clean the rivers.

**NATIONAL RIVER SONSERVATION PLAN (NRCP)**

(i) The activates of Ganga Action Plan (GAP) phase-l were started in 1985.

(ii) They declared closed on 31st March, 2000.

(iii) The steering Committee of the National River Conservation Authority reviewed the progress of the GAP and necessary corrections were made on the basis of lamed and experiences gained from GAP phase l.

(iv) They have been applied to the major polluted rivers of their country under the NRCP.

(v) The Ganga Action Plan (GAP) Phase-ll has been merged with the NRCP. The expanded NRCP now covers 152 towns located along 27 interstate rivers in 16 states. Under this action plan, pollution abatement work are being taken up in 57 towns. a total of 215 schemes of pollution abatement have been sanctioned. so far, 69 schemes have been completed under this action plan. A million litre of sewage is targeted to be intercepted, diverted and treated.

**SOME INTERESTING KNOWLEDGE**

(i) The world's largest drainage basin is of the Nile River in Egypt.

(ii) According to the regulation of the Indus Water Treaty (1960), India can use only 20 per cent of the total water carried by Indus river system. This water is used for irrigation in the Punjab, Haryana and the southern and western parts of Rajasthan.

(iii) The Sundarban Delth derived its name from the Sundari tree which grows well in marshland. it is the would's largest and fastest growing delta. it is also the home of Royal Bengal Tiger.

(iv) Brahmaputra is known as the Tsang Po in Tibet and Jamuna in Bangladesh.

(v) The river Kaveri makes the second biggest waterfall in India. it is known as Sivasmudram. the fall supplies hydroelectric power to Mysore, Bangalore and the Kolar Gold Field.

(vi) 71 percent of the world's surface is covered with water, but 97 percent of that is salt water. of the 3 percent that is available as freshwater, three quarters of it is trapped as ice.

(iv) Lakes of large extent are called the seas, like the Caspian, the Dead and the Aral seas.

# EXERCISE

## OBJECTIVE DPP – 3.1

1. Which one of the following describes the drainage patterns resembling the branches of a tree ?
   (A) Radial (B) Dendritic (C) Centrifugal (D) Trellis
2. In which of the following states in\s the Wular lake located?
   (A) Rajasthan (B) Uttar Pradesh (C) Punjab (D) Jammu & Kashmir
3. The river Narmada has its sources at:
   (A) Satpura (B) Brahmagiri (C) Amarkantak (D) Slopes of the Western ghats
4. Which one of the following lakes is a salt water lake?
   (A) Sambhar (B) Dal (C) Wular (D) Govind Sager
5. Which one of the following is the largest river of the Peninsular India?
   (A) Narmada (B) Krishna (C) Godavari (D) Mahanadi
6. Which one of the following rivers flows through a rift valley?
   (A) Damodar (B) Tungbhadra (C) Krishna (D) Tapti
7. Which one of the following rivers have Nagarjun Sagar Dam, a river valley project?
   (A) Kaveri (B) Krishna (C) Damodar (D) Mahi
8. What is the name of the river, which rises at Yamunotri glacier?
   (A) The Gangas (B) The Brahmaputra (C) The Yamuna (D) The Kosi
9. Which of the following rivers rises in Nasik?
   (A) Mahanadi (B) Godavari (C) Krishna (D) Kaveri

10. The area drained by a single river system is called a –
(A) Water shed (B) Drainage basin (C) Water divide (D) Drainage Line
11. The plains from Ambala to the Sunderban stretch over nearly is –
(A) Nearly 1800 km (B) Over 2000 km (C) Over 1500 km (D) Over 3000 km
12. Kosi river is the tributary of –
(A) Yamuna (B) Ganga (C) Brahmaputra (D) Sutlej
13. The Kaveri river rises in the –
(A) Brahmagiri range (B) Naga Hills (C) Satpura (D) Aravallis
14. Tungbhadra and Bhima rivers are the tributaries _____ River.
(A) Krishna (B) Kaveri (C) Mahanadi (D) Narmada
15. What is the Ganga called when it joins the Brahmaputra?
(A) Meghna (B) Padma (C) Brahmaputra (D) Son

## SUBJECTIVE DPP – 3.2

### Very short answer type question:

**1.** What do you mean by the term drainage'?
**2.** What is 'drainage pattern'? Explain the major drainage patterns in India.
**3.** Describe the main rivers of Himalayan river system?
**4.** Name the two main groups into which the river systems of India are classified.
**5.** Name the tributaries of river Indus.
**6.** Which is the largest river of the peninsular India?
**7.** Which is the main watershed in peninsular India?
**8.** Which two large rivers of India flow into Arabian Sea**?**
**9.** Where are most of the fresh water lakes locates?
**10.** Write three causes responsible for the increase in demand of water.

### Short answer type question:

**11.** Explain the different drainage patterns formed by the steams.
**12.** Name the three main Himalayan river systems. Give two tributaries of each.
**13.** Why does Brahmaputra in its Tibetan part have less silt, despite a longer course?
**14.** Why are the Himalayan river perennial while the peninsular rivers seasonal?
**15.** Compare the east flowing and west flowing rivers of the peninsular India?
**16.** State some economic benefits of rivers and lakes.

### Long answer type question:

**17.** Discuss the main features of the Indus river system.
**18.** Discuss the main features of the Ganga river basin.
**19.** Differentiate between Himalayan River and the Peninsular River.
**20.** Which river is often termed as 'Dakshin Ganga'? Describe the main features of this river system.
**21.** Discuss the causes of river pollution. Suggest a few remedies for it.

## ANSWER KEY

*(Objective DPP 3.1)*

| Que. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ans | B | D | C | A | C | D | B | C | B | B | A | B | A | A | A |

# CLIMATE

## SL-04(G)

**WEATHER AND CLIMATE**

| Weather | Cllmate |
|---|---|
| **(i) Weather is the state atmosphere at any point of time and space, it changes every moment.** | **(i) Climate refers to the sum total of weather conditions and variations over a large areas for a long period of time. it is the sum total of average weather conditions of 30 years.** |
| **(ii) Elements of weather are temperature, atmospheric pressure, wind, humidity and precipitation.** | **(ii) Elements of climate are the same as those of water.** |
| **(iii) Example: Cloudy, windy, dry, wet weather.** | **(iii) Example : Monsoon, equatorial desert, cold climate etc.** |

### (a) India has Diverse Climatic Conditions:

We can take two important elements-temperature and precipitation, and examine how they vary from place to place and season to season.

### Temperature –

(i) 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, temperature at Drass in Jammu and Kashmir may be as low minus 45° C. Tiruvananthpuram, on the other hand, may have a temperature of 20° C.

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

### Precipitation –

There are variations not only in the form and types of precipitation but also in its amount and the seasonal distribution.

(i) While precipitation is mostly in the form of snowfall in the upper parts of Himalayas, it rains over the rest of the country.

(ii) The annual precipitation varies fro over 400 cm in Meghalaya to less than 10 cm in Ladakh and western Rajasthan.

(iii) Most parts of the country receive rainfall from June to September. But some parts like the Tamil Nadu coast get most of its rain during October and November.Coastal areas experience less contrast in temperature conditions, seasonal contrast are more in the interior of the country.

## CLIMATIC CONTROLS

The climate of a place is determined by the interplay of various factors such as location, altitude, distance from the sea, pressure and winds and upper air circulation.

(i) Due to the curvature of the earth, the amount of solar energy received varies according to latitude. As a result, air temperature decreases from the equator towards the poles.
(ii) As one goes from the surface of the earth to higher to higher altitudes, the atmosphere becomes less dense and temperature decreases. The hills are therefore cooler during summers.
(iii) The pressure and wind system any area depend on the latitude and altitude of the place. Thus it influences the temperature and rainfall pattern.
(iv) The sea exerts a moderating influences on climate: As the distance form the sea increases, its moderating influence decreases and the people experience extreme weather conditions. This condition is known as continentality.
(v) Ocean currents along with onshore winds affect the climate of the coastal areas.
(vi) Relief too plays a major role in determining the climate of a place. High mountains act as barriers for cold or not 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 dry.

## FACTORS AFFECTING INDIA'S CLIMATE

**(a) Latitude:**
Indian is situated roughly between $8^o$ N and $37^o$ N latitudes. India is divided in almost two equal parts by the tropic of cancer. The southern half lies in the tropical zone and the western half in the subtropical zone. Therefore, India's climate has characteristics of tropical as well as subtropical climates.

**(b) Altitude:**
India has mountains to the north, which have an average height of about 6000 meters. The Himalayas prevent the cold winds from Central Asia from entering the subcontinent. It is because of these mountains that this subcontinent experiences comparatively milder winters as compared to Central Asia.

**(c) Pressure and Winds:**
India lies in the subtropical high pressure belt, thus, the winds originate from the land and move outwards towards the equatorial low pressure belt. These winds are known as northeast trade winds and are devoid of any moisture. But due to unequal heating of land and water in the summer, a low pressure develops over the interior of land masses. This low pressure attracts the winds from south of the equator. After crossing the equator the southeast trade winds get deflected and are known as southwest monsoons. The climate of India is also affected by jet streams. This is a fast flowing wind blowing in a narrow zone in the upper atmosphere. The jet streams are responsible for sudden outbreak of monsoons in Northern India. a subtropical westerly jet stream bring in the western disturbances in winter. These disturbances cause heavy snowfall on the mountains and light rains on the northwestern part of India.

## THE INDIAN MONSOON

The climate of India is strongly influenced by monsoon winds. the Arabs, who had come to India as traders benefited from the reversal of the wind system as they came by sailing ships at the mercy of winds, they named this seasonal reversal of the wind system 'monsoon'.
The monsoons are experienced in the tropical area roughly between $20^o$ N $20^o$ S. to understand the mechanism of the monsoons, the following facts are important.

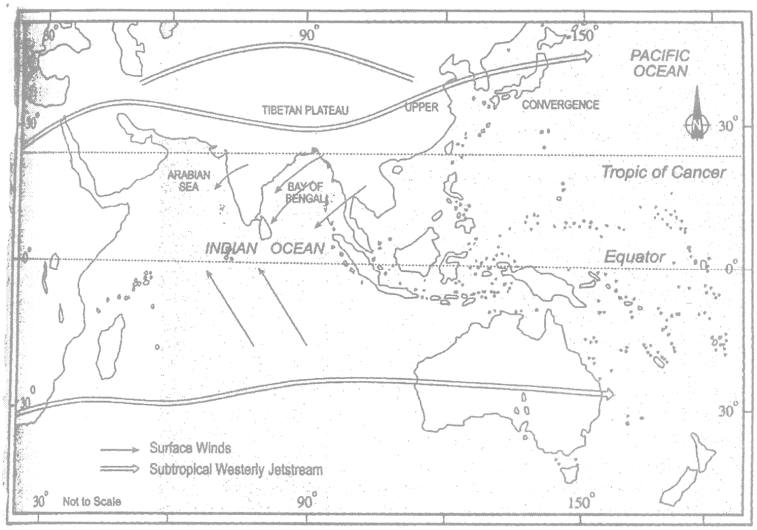
(i) The differential heating and cooling of land and water creates low pressure on the landmass of India while the seas around experience comparatively high pressure.
(ii) The shift of the position of inter Tropical Convergence Zone (ITCZ) in summer, over the Ganga plain (this is the equatorial trough normally positioned about $5^o$ N of the equator – also known as the monsoon-trough during the monsoon season).

(iii) The presence of the high-pressure area, east of Madagascar, approximately at 20o S over the Indian Ocean. The intensity and position of this high-pressure area affects the Indian Monsoon.

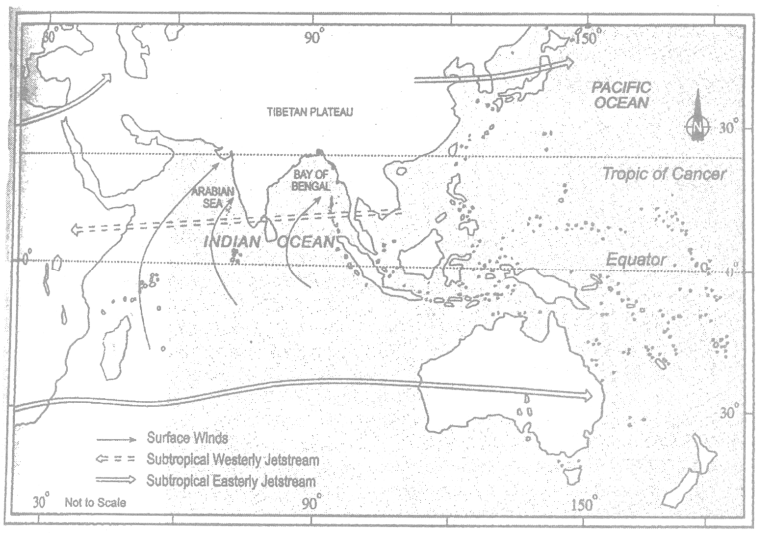
(iv) The Tibetan plateau gets intensely heated during summer, which results in strong vertical air currents and the formation of high pressure over. The plateau at about 9 km above sea-level.

(v) 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.

Changes in the pressure conditions over the southern oceans also affect the monsoons. Normally when the tropical eastern south Pacific Ocean experiences high pressure, the tropical eastern Indian Ocean experiences low pressure. The difference in pressure over Tahiti (Pacific Ocean, 18° S/149° W) and Darwin in northern Australia (Indian Ocean, 12° 30'S/ 131°E) is computed to predict the intensity of the monsoons. if the pressure differences are negative, it means below average and late monsoons.




Atmospheric Conditions over the Indian Subcontinent in the Month of January




Atmospheric Conditions over the Indian Subcontinent in the Month of January

## THE MONSET OF THE MONSODN AND WITHDRAWAL

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. The monsoon arrives at the southern tip of the Indian peninsula generally by the first week of June. Subsequently, it divides in to 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. The Bay of Bengal branch arrives is Assam in the first week of June. The lofty mountain s 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. 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 SEASONS

Four main seasons can be identified in India –

| | | | |
|---|---|---|---|
| (i) | Cold weather season | -- | December to February |
| (ii) | Hot weather season | -- | March to May |
| (iii) | Advancing monsoon season | -- | June to September |
| (iv) | Retreating monsoon season | -- | October and November |

### (A) The Cold Weather Season (Winter):

(i) The cold weather season begins from mid-November in India and stays till February.

(ii) December and January are the coldest months in the northem part of India. The temperature decreases as one moves from south to the north.

(iii) Days are warm and the 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. They blow from land to sea and hence, for most part of the country, it is a dry season.

(v) In the northern part of the country, a feeble high-pressure region develops, with light winds moving outwards from this area.

(vi) The weather is normally marked by clear sky, low temperatures and low humidity and feeble variable winds.

(vii) 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. Locally known as 'mahawat' are of immense importance for the cultivation of 'rabi' crops.

(viii) The northeast trade winds cause fair amount of rainfall in Chennai or the Coromandel Cast in winter.

### (b) Hot weather season (Summer):

(i) Due to the apparent movement of the sun, the global heat belt shifts northward. as such, from March to May, it is not weather season in India.

(ii) Temperature increases from south to north. In peninsular India, temperatures remain lower

(iii) High temperature between 38° C and 48° C in the plains.

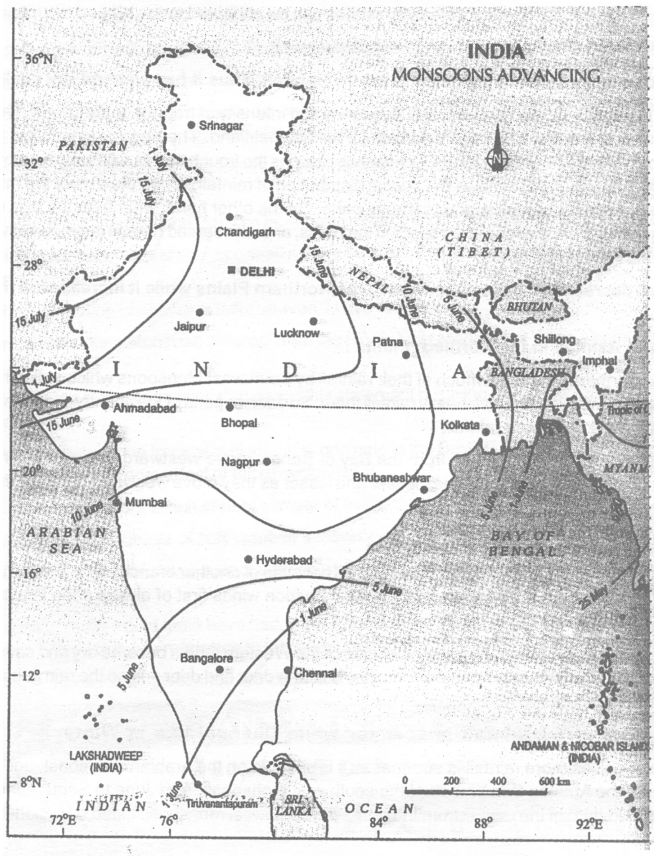
(iv) Local dust storms accompanied with light rains.

(v) Hot dry winds, 'loo'is common in May and June.
(vi) Kerala and Kamataka coast receivers pre-monsoon showers. (Mango showers)
(vii) West Bengal and Assam are affected by northwesterly winds. (Kalbaisakhi).

**(c) Advancing Monsoon (The Rainy Season):**

- Monsoon
  - Advancing Monsoon(South Western monsoon)
    - Arabian Sea Branch
      - Entering from Weatern ghats
      - Entering from Rann of Kuchchh
    - Bay of Bengal Branch
      - Entering into the N.E. regions
      - Entering into the Ganga Valley
  - Retreating (N.E. Monsoons)

**The climate of India is described as of monsoon type. Derived from an Arabic word 'mausim', monsoons refer to the seasonal reversal in the wind direction through the year.**



## Mechanism of the Monsoon:

The word monsoon denotes a season in which the wind regime is completely reversed. The southeast winds, after crossing the equator in the Indian Ocean, take a southwesterly direction. The dry and hot land bearing trades are thus completely replaced by sea bearing winds full of moisture. This phenomenon of complete reversal of winds is confined to tropical lands lying between $20^o$ N and $20^o$ S. this phenomenon account for 75 to 90 percent of the annual rainfall just from June to September

## Characteristics of the Monsoon:

(i) Almost all over the country, the rains occur from June to September.
(ii) 75% to 90% of the total annual rainfall is concentrated over this period.
(iii) There is great variation in the advance and withdrawal dates of the monsoons.
(iv) The monsoons occur in wet spell, interspersed by dry spells.
(v) The amount of rainfall also varies, causing floods and drought conditions.

**"Distribution of rainfall received from the southwest monsoons is governed mainly by the relief of the country."**
(i) The windward side of the Western Ghats receives a rainfall of over 250 cm. On other hand, the leeward side of the Western Ghats receives less than 50cm.
(ii) The heavy rainfall in the northeastern states can be attributed to the hill and mountain ranges.
(iii) Rainfall in the Northern Plains decreases westward.

**"Monsoon has a tendency to have breaks in rainfall. Thus it has wet and dry spells".**

Breaks in monsoons are related to the frequency and intensity of tropical depressions. They are formed at the head of the Bay of Bengal and cross over the mainland. The depressions follow the axis of the monsoon trough of the low pressure. 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 rains in the mountainous catchment area of the Himalayan Rivers.

**"Rainfall decreases from east to west in the Northern Plains while it increases in the Peninsular India".**

## Pattern of Rainfall in the Northern Plains:

(i) The Northern Plains get much of their rainfall by Southwest Monsoons which strike the eastern part of the country first and give heavy rainfall there. so eastern parts of the country like Assam, Meghalaya, Bengal etc. get much rainfall.

(ii) Then the monsoons arising from the Bay of Bengal move westwards along the Himalayas. their capacity to cause rain become lesser and lesser as they move westward because they continue to become drier and drier.

## Pattern of Rainfall in Peninsular India:

(i) The Peninsular India also gets much rainfall because of another branch of the South-West Monsoons which rises from the Arabian Sea. These monsoon winds first of all strike the Western Ghats and cause mu8ch rain there.

(ii) These winds while reaching the other side of the Western Ghats become dry and cause less rain. As they go on moving to the eastern side they become drier and drier and so the rain goes decreasing from west to east.

## Mumbai receives rainfall in summer while Chennai has in Winter :

Mumbai receives more rainfall in summer as it is situated on the Arabian Sea coast, and receives all its rains from the Arabian Sea branch of the southwest monsoons from June to September only. Chennai receives two-third of the rainfall from the retreating southwest monsoons aided by cyclones on October to December.

**Western Rajasthan has desert type of climate:**

(i) Western Rajasthan lies in the rain shadow areas of the Aravalli Mountains. (Leeward side).

(ii) Arabian sea branch of S.W. monsoons blows parallel to the Aravalli range; hence the Aravallis fail to check it.

(ii) By the time the Bay Bengal branch reaches here it is almost dry, moreover it lies on the leeward side of the Aravallis.

(iii) Monsoon winds become warmer and increase their capacity to hold moisture instead of causing rain.

## (D) Retreating Monsoons: