

# GEOGRAPHY

## Chapter 3: Drainage



## Drainage

An area drained by the streams or tributaries of a single river is known as a **drainage basin**. A river along with its tributary is known as a **river system**. When a mountain or an upland separates two drainage basins, it is known as a **water divide**.

### Drainage System in India

Relief features play an important part in controlling the drainage system in India. Indian rivers are divided into two major groups—the Himalayan rivers and the Peninsular rivers.

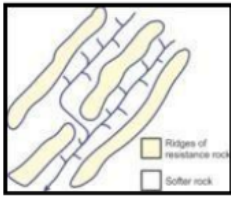
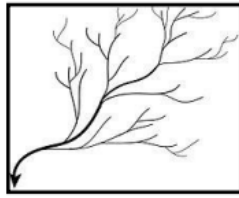
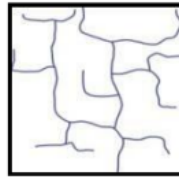
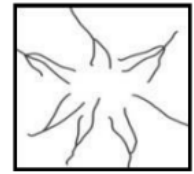
Differences between the Himalayan rivers and the Peninsular rivers are

The Himalayan Rivers	The Peninsular Rivers
<b>Most of the Himalayan rivers are perennial such as the Ganga and the Brahmaputra.</b>	Most of the Peninsular Rivers are not perennial.
<b>The rivers are deep and have large courses.</b>	The rivers have shorter and shallower courses as compared to the Himalayan rivers.
<b>Most of the Himalayan rivers originate in the snow-capped Himalayan mountains.</b>	Most of the Peninsular rivers originate in the Western Ghats.
<b>The Himalayan rivers are long.</b>	The Peninsular rivers are comparatively smaller.

### Drainage Patterns Formed by Rivers

The main drainage patterns formed by rivers are

- Dendritic:** This drainage system is formed when the river channel follows the slope of the terrain. Because many tributaries join the main river, this drainage system appears like the branches of trees.
- Trellis:** The trellis pattern is developed when many tributaries join the main river at right angles and  
the hard and the soft rock exist parallel to each other.
- Rectangular:** It develops on the strongly jointed rocky terrain which are resistant to erosion. Such rocks have joints at right angles which can be eroded. The joints are cracked opened by erosion, and hence, the streams of rivers develop along these joints.
- Radial:** When the streams of a river flow in different directions from a central peak or a dome-like structure, the radial drainage pattern is developed.

**Trellis pattern****Dendritic pattern****Rectangular pattern****Radial pattern**

## The Himalayan Rivers

The main Himalayan Rivers are the Indus, Ganga, and Brahmaputra.

### The Indus River System

- The river Indus originates near Lake Mansarovar in Tibet. It enters India in the Ladakh district of Jammu and Kashmir.
- With a total length of about 2900 km, the river Indus is one of the longest rivers in the world.
- It has many tributaries such as Zaskar, Nubra, Shyok and Hunza which join it in the Kashmir region.
- The Satluj, Beas, Ravi, Chenab and Jhelum join and flow into the River Indus in Pakistan.
- About one-third of the river Indus flows through Kashmir, Himachal Pradesh and Punjab. The rest of the river flows through Pakistan.
- The Indus then flows southwards and drains into the Arabian Sea.

### The Ganga River System

- The river Ganga originates from the Gangotri Glacier in the Himalayas. It is joined by Alaknanda at Devprayag in Uttarakhand. It is at Haridwar that the river Ganga emerges from the mountains on to the plains.
- Some tributaries of the river Ganga are the Yamuna, Ghaghara, Gandak and Kosi.
- Yamuna is a major tributary of Ganga. It originates from the Yamunotri Glacier in the Himalayas and meets the River Ganga at Allahabad.
- Rivers such as the Kosi, Gandak and Ghagra rise in the Himalayas in Nepal. They cause floods in the northern plains almost every year. They enrich the soil and make the region agriculturally very productive during the process.

- Chambal, Betwa and Son are some tributaries of the river Ganga which rise in the peninsular uplands.
- The river Ganga flows till Farakka in West Bengal and divides here. Its distributary Bhagirathi– Hooghly flows through the deltaic plains into the Bay of Bengal.
- The main River Ganga flows into Bangladesh where it joins the river Brahmaputra. It is also known as Meghna further downstream. These rivers form the Sundarban delta, home to the royal Bengal tiger.

### **The Brahmaputra River System**

- The river Brahmaputra rises east of the Mansarovar Lake in Tibet. Most of its course lies outside India.
- The River Brahmaputra at Namcha Barwa takes a 'U' turn and enters Arunachal Pradesh through a gorge. It is joined by many tributaries such as the Dibang and Lohit to form the River Brahmaputra in Assam, where it is also known as Dihang.
- In India, the river passes through a region of high rainfall, and thus, the volume of water and silt increases.
- The river Brahmaputra makes many riverine islands in Assam. Majuli is the largest riverine island formed by the Brahmaputra. The river shifts its channel frequently.
- During the rainy season every year, the river Brahmaputra floods its bank and causes huge loss of lives and property.

### **The Peninsular Rivers**

The Western Ghats acts as a main water divide in Peninsular India. Some important peninsular rivers are the Godavari, Mahanadi, Krishna and Kaveri. These rivers make deltas at their mouths. While most rivers drain into the Bay of Bengal, the Narmada and the Tapi drain into the Arabian Sea forming estuaries.

### **The Narmada Basin**

- The river Narmada originates in the Amarkantak Hills in Madhya Pradesh.
- The river creates many scenic locations on its way into the Arabian Sea. The 'Marble Rock' and the Dhuandhar Falls are some picturesque locations.

- The Narmada basin covers parts of Gujarat and Madhya Pradesh.
- The tributaries of Narmada are very short.

### **The Tapti Basin**

- It originates in the Satpura ranges in the Betul district of Madhya Pradesh.
- It is much shorter in length compared to River Narmada. It flows through Madhya Pradesh, Gujarat and Maharashtra.

### **The Godavari Basin**

- The River Godavari is the largest of all peninsular rivers. It originates from the slopes of the Western Ghats in the Nasik district of Maharashtra.
- Its length is about 1500 km, and it drains into the Bay of Bengal. Because of its length, it is also known as Dakshin Ganga.
- About half of the river's basin lies in Maharashtra. The river also flows through Madhya Pradesh, Odisha and Andhra Pradesh. Some of its tributaries are the Purna, Wardha, Manjra and Penganga.

### **The Mahanadi Basin**

- It originates in the highlands of Chhattisgarh. The river drains into the Bay of Bengal.
- The river mainly drains Odisha, Chhattisgarh, Maharashtra and Jharkhand.

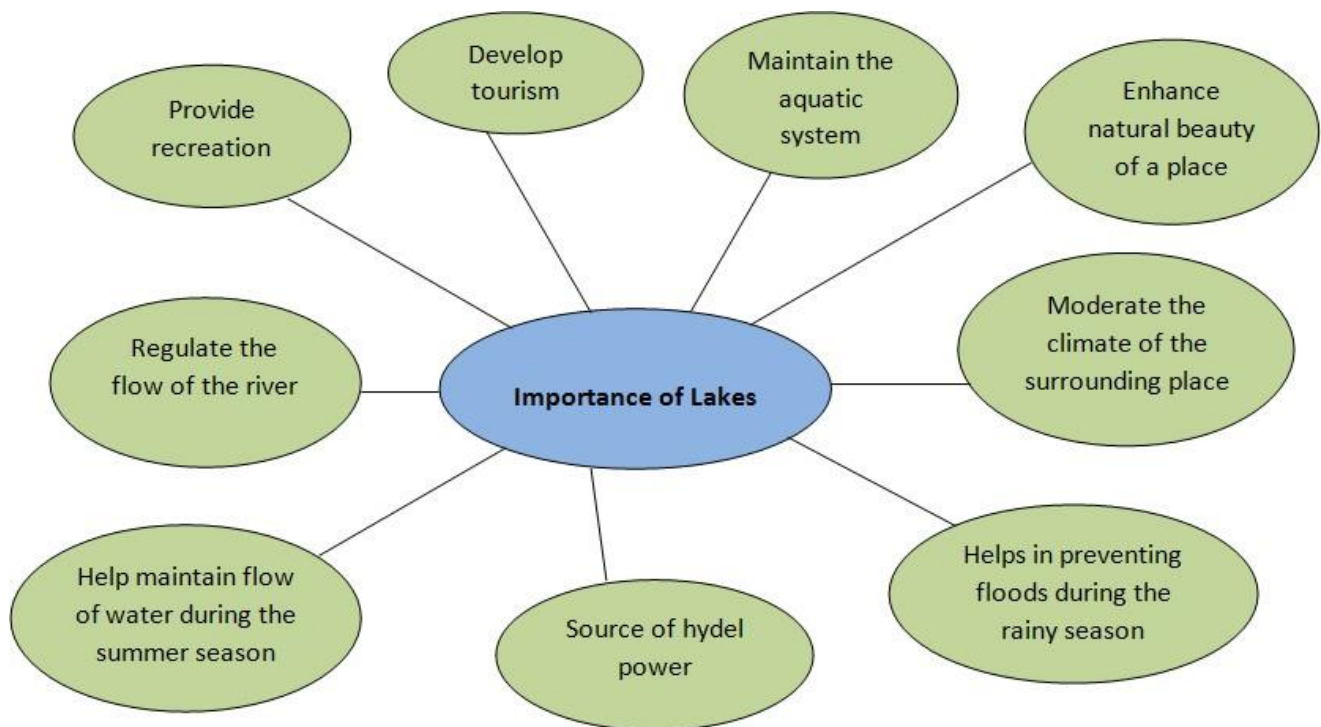
### **The Krishna Basin**

- It rises from a spring near Mahabaleshwar and drains into the Bay of Bengal.
- Some of its tributaries are the Musi, Koyana, Bhima and Ghatprabha.
- It drains Maharashtra, Karnataka and Andhra Pradesh.

## **Lakes**

- The Dal Lake is a famous lake in Kashmir.
- Lakes originate
- During the rainy season

- As a result of the action of glaciers and ice sheets
- As a result of the action of winds and rivers, and human activities
- An oxbow lake is produced when water forms a large meander from the mainstream creating a free- standing body of water.
- Lake Sambhar in Rajasthan is a saltwater lake. Its waters are used to manufacture salt.
- Many freshwater lakes found in the Himalayan region are of glacial origin.
- The Wular Lake in Jammu and Kashmir is the largest freshwater lake in India. The Dal, Bhimtal, Nainital and Loktak are some important freshwater lakes in India.
- Guru Gobind Sagar Lake in Punjab has been formed as a result of the damming of a river.



### Role of Rivers in the Economy

- Rivers have been of extreme importance throughout human history. Many civilisations developed on the banks of rivers.
- River water is used for domestic and industrial consumption.

- River water is used for irrigation and navigation.
- River water is used for the generation of electricity.

**River Pollution**

- Domestic, municipal, and industrial wastes pollute river waters.
- Untreated sewage wastes and industrial effluents also pollute river water. This not only reduces the quality of water but also the self-cleansing mechanism of river water.
- Increasing urbanisation has also polluted river water.

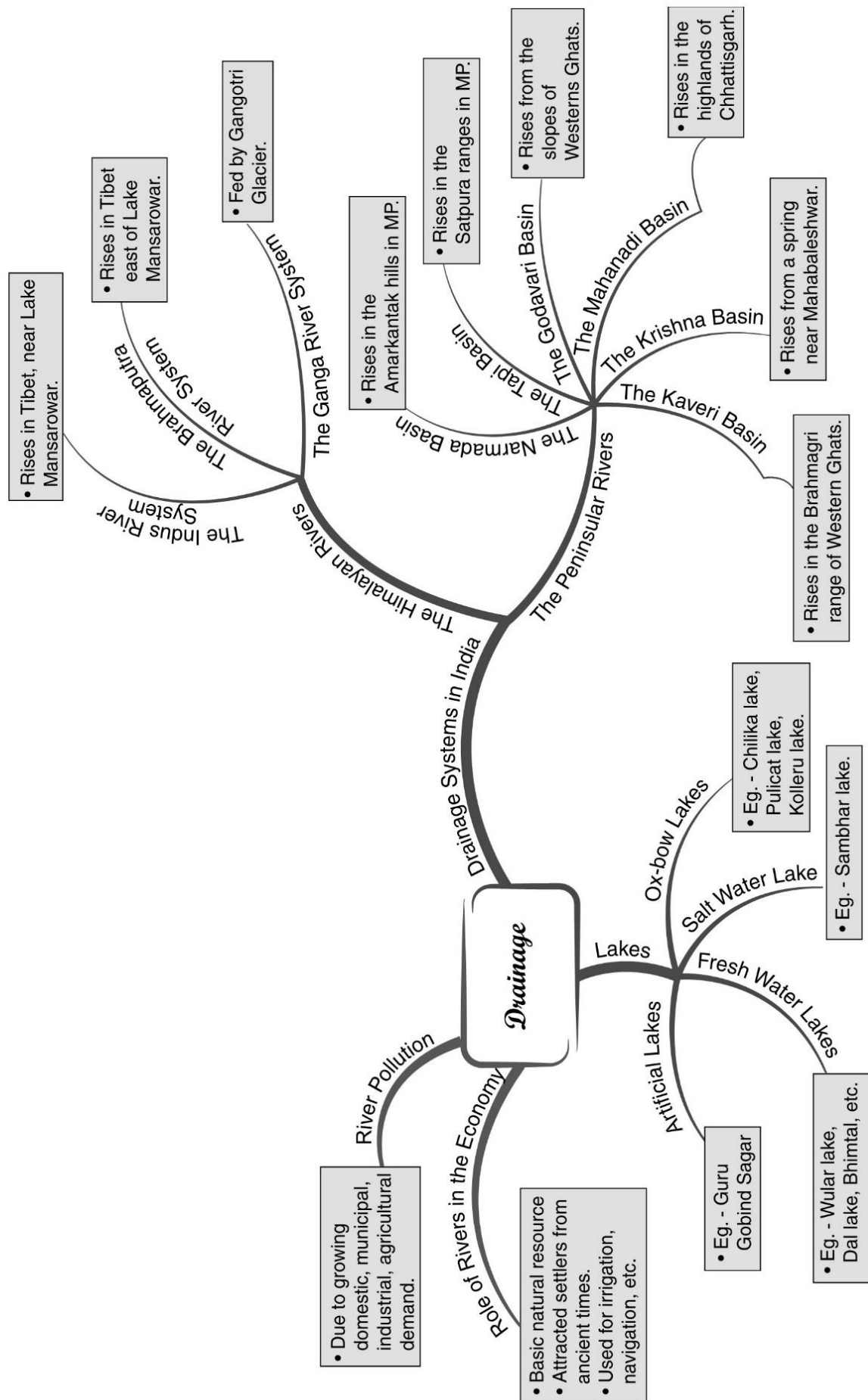


## Map of Major Rivers in India





# CHAPTER- 3 DRAINAGE



## Important Questions

### Multiple Choice questions-

Question 1. Which of the following state is not drained by River Ganga:

- (a) Bihar
- (b) West Bengal
- (c) Uttar Pradesh
- (d) Punjab

Question 2. What are the characteristics of a river?

(i) Rivers are fast moving water bodies (ii) River originate from glacier, springs, lake etc. (iii) Rivers are slow moving mass of the ice and slow. (iv) Rivers are used for irrigation, navigation, generation of hydropower etc.

- (a) (i), (ii) and (iii)
- (b) (i), (ii) and (iv)
- (c) All (i), (ii), (iii) and (iv)
- (d) Only (iii)

Question 3. The river Narmada originate from:

- (a) Amarkantak
- (b) Satpura
- (c) Ice slope of Western Ghats
- (d) Brahamagir

Question 4. Which one of the following describes the drainage patterns resembling the branches of a tree:

- (a) Radial
- (b) Dendritic
- (c) Centrifugal
- (d) Trellis

Question 5. In which of the following states is the Wular lake located:

- (a) Rajasthan
- (b) Uttar Pradesh
- (c) Punjab
- (d) Jammu and Kashmir

Question 6. Which one of the following lakes is a salt water lake?

- (a) Sambhar
- (b) Wular
- (c) Dal
- (d) Gobind Sagar

Question 7. Which one of the following is the longest river of the Peninsular India:

- (a) Narmada
- (b) Godavari
- (c) Krishna
- (d) Mahanadi

Question 8. Name the place where river Indus emerges:

- (a) Peshawar
- (b) Amarkantak
- (c) Attock
- (d) Mansarowar

Question 9. Ganga enters Bangladesh at:

- (a) Farakka
- (b) Meghalaya
- (c) Assam
- (d) All are incorrect

Question 10. The length of river Ganga is:

- (a) 2525km
- (b) 2500km
- (c) 2575km
- (d) 2615km

Question 11. The largest river of peninsular India is:

- (a) Tapi
- (b) Mahanadi
- (c) Godavari
- (d) Krishna

Question 12. Largest fresh water lake found in India at:

- (a) Jammu & Kashmir
- (b) Malwa Plateau

- (c) Plain areas
- (d) Near oceans

Question 13. Which of the following two rivers form estuaries:

- (a) Krishna and Kaveri
- (b) Godavari and Tapi
- (c) Narmada and Tapi
- (d) Godavari and Tapi

Question 14. What is the meaning of drainage?

- (a) The river system of a particular area
- (b) The topography of a particular area
- (c) Both A and B
- (d) None of these

Question 15. What is the area drained by a single river system called?

- (a) Drainage
- (b) Drainage basin
- (c) Water divide
- (d) None of these

### Very Short Questions:

1. What is a river/ drainage basin?
2. What is a watershed?
3. Which river has the largest basin in India?
4. In which two major groups Indian rivers are divided into?
5. What is a perennial river?
6. What is a gorge?
7. What do Himalayan rivers do in their upper course?
8. List the factors on which the drainage patterns depend. [HOTS]
9. How is the dendritic pattern formed by the river?
10. How does a rectangular pattern of drainage develop?

### Short Questions:

1. Explain any three features of Peninsular rivers.
2. Why are Peninsular rivers seasonal in nature? State any three reasons.

3. Which two rivers form the largest delta? Write any two features of this delta
4. Explain the concept of water divide with special reference for Ganga and Indus river systems. Name the major distributary of river Ganga
5. Why are most of the Peninsular river draining into the Bay of Bengal? Give two reasons. Name two rivers draining into the Arabian Sea.
6. Describe three important features of the Tapi basin.
7. Why are the rivers of Western Coast very short?

### Long Questions:

1. What is a river pattern? Name any four patterns formed by the rivers..
2. Write main features of River Indus under the following headings:
3. Give main characteristic features of the Ganga river system
4. Give characteristic features of the Ganga-Brahmaputra delta
5. Give the main characteristic features of mighty Brahmaputra river.

### Assertion Reason Questions:

1. In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

**Assertion (A) :** The Ganga is joined by many tributaries from the Himalayas, a few of them being major rivers, such as the Yamuna, the Ghaghara, the Gandak and the Kosi.

**Reason(R) :** The Ghaghara, the Gandak and the Kosi rise in the Nepal Himalaya.

- A) Both (A) and (R) are true, and (R) is the correct explanation of (A).
- B) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
- C) (A) is true, but (R) is false.
- D) (A) is false, but (R) is true.

2. In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as:

**Assertion (A) :** Most of the Himalayan rivers are perennial.

**Reason (R) :** They have water throughout the year. These rivers receive water from rain as well as from melted snow from the lofty mountains.

- A) Both (A) and (R) are true, and (R) is the correct explanation of (A).
- B) Both (A) and (R) are true, but (R) is not the correct explanation of (A).
- C) (A) is true, but (R) is false.
- D) (A) is false, but (R) is true.

### Case Study Based Question:

1. Read the source given below and answer the questions that follow:

The Indus River System The river Indus rises in Tibet, near Lake Mansarovar. Flowing west, it enters India in the Ladakh. It forms a picturesque gorge in this part. 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 kms, the Indus is one of the longest rivers of the world. A little over a third of the Indus basin is located in India: Ladakh, Jammu and Kashmir, Himachal Pradesh and Punjab and the rest is in Pakistan.

- (1) Where does the river Indus rise?

- A) Bangladesh
- B) Nepal
- C) Tibet
- D) China

- (2) Where does it form a picturesque gorge?

- A) Ladakh
- B) Jammu & Kashmir
- C) Nepal
- D) Karachi

- (3) The Indus plain has a very \_\_\_\_\_ slope.

- A) Smooth
- B) Gentle
- C) Rough
- D) Harsh

- (4) Indus is \_\_\_\_\_ long in length.

- A) 2,400 km
- B) 2,900 km
- C) 2,500 km
- (D) 2,700 km

2. Read the source given below and answer the questions that follow:

The main water divide in Peninsular India is formed by the Western Ghats, which runs from north to south close to the western coast. Most of the major rivers of the Peninsula,

such as the Mahanadi, the Godavari, the Krishna and the Kaveri flow eastwards and drain into the Bay of Bengal. These rivers make deltas at their mouths. There are numerous small streams flowing west of the Western Ghats. The Narmada and the Tapi are the only long rivers, which flow west and make estuaries. The drainage basins of the peninsular rivers are comparatively smaller in size.

(1) The main water divide in Peninsular India is formed by the Western Ghats, which runs from \_\_\_\_\_ close to the Western Coast.

- A) South to East
- B) North to South
- C) East to West
- D) North to West

(2) The major rivers of the peninsula flow:

- A) Westwards
- B) Southwards
- C) Eastwards
- D) Northwards

(3) These rivers make deltas at their \_\_\_\_\_.

- A) Source
- B) Mouth
- C) Banks
- D) None of the above

(4) The \_\_\_\_\_ are the only long rivers, which flow West and make estuaries.

- A) Narmada and Tapi
- B) Krishna and Kaveri
- C) Ganga and Yamuna
- D) Mahanadi and Kaveri

### Answer Key:

#### MCQ

1. (d) Punjab
2. (b) (i), (ii) and (iv)
3. (a) Amarkantak
4. (d) Trellis



5. (d) Jammu and Kashmir
6. (a) Sambhar
7. (b) Godavari
8. (c) Attock
9. (a) Farakka
- 10.(a) 2525 km
- 11.(c) Godavari
- 12.(a) Jammu & Kashmir
- 13.(c) Narmada and Tapi
- 14.(a) The river system of a particular area
- 15.(b) Drainage basin

### Very Short Answer:

1. A river/drainage basin is an area drained by a single river system.
2. An upland/highland area that separates two drainage basin systems.
3. River Ganga has the largest basin in India.
4. The Indian rivers are divided into:
  - (a) The Himalayan rivers
  - (b) The Peninsular rivers
5. Perennial rivers have water throughout the year. These rivers get water from rain and snow e.g. River Ganga.
6. A gorge is a deep narrow channel created by a flowing river.
7. The Himalayan rivers perform intensive erosional activity in their upper course and carry huge loads of silt and sand.
8. The slope of the land, the rock structure as well as the climatic conditions of the area are some factors on which the drainage pattern depends.
9. The dendritic pattern is formed by the river channel, when the river follows the slope of the land. The stream with its tributaries develops a pattern that resembles the branches of a tree so named as dendritic.
10. Rectangular pattern of drainage develops on a strongly jointed rocky' terrain.

### Short Answer:

**Ans: 1.** The three features of the Peninsular rivers are:

- (a) A large number of peninsular rivers are seasonal as they are dependent on rainfall.

(b) They have short and shallow courses.

(c) Most of the peninsular rivers originate from the Western Ghats and flow into the Bay of Bengal.

(d) The drainage basin of Peninsular rivers are small in size.

**Ans: 2.** The three reasons are as follows:

(a) The Peninsular rivers are dependent on rainfall unlike the Himalayan rivers are snowfed.

(b) The hills of the peninsular plateau are not snow-bound unlike Himalayas.

(c) These rivers follow smaller course and have small basins which influence water volume.

(d) The catchment areas (the area where the river gets maximum water either by rain/snow) of peninsular rivers are small in comparison to Himalayan rivers.

**Ans: 3.** River Ganga and River Brahmaputra form the largest delta i.e. the Sundarban delta.

The two features of this delta are:

(a) It is the largest and fastest growing delta in the world.

(b) It gets its name as Sundarban from the Sundari tree. It is the home of the Royal Bengal tiger.

**Ans: 4.** (a) A water divide is a highland area/an upland/mountain which separates two drainage basins.

(b) Ambala is located on the water divide between the Indus and the Ganga river system.

(c) The distributaries of River Ganga are Hooghly.

**Ans: 5.** I. Most of the Peninsular rivers drain into the Bay of Bengal because of the following reasons:

(a) The Eastern Ghats are lower than the Western Ghats and are also discontinuous thus making it easier for the rivers to reach the Bay of Bengal.

(b) The Deccan Plateau has a gentle slope towards the east, thus the rivers drain towards the east.

II. Two rivers draining into the Arabian Sea are the Narmada and the Tapi.

**Ans: 6.** The important features of Tapi basin are:

(a) The Tapi river rises in the Satpura ranges in the Betul district of Madhya Pradesh.

(b) It also flows through a rift valley parallel to the Narmada but much shorter in length.

(c) Its basin covers parts of Madhya Pradesh, Gujarat and Maharashtra.

**Ans: 7.** The rivers of West Coast of India are very short because:

(a) The coastal plains between Western Ghats and the Arabian Sea are very narrow.

(b) The course of these rivers are short as they do not have much water and drain small area of the states.

(c) These rivers are seasonal in nature.

Examples of these rivers are Sabarmati that drains parts of Rajasthan and Gujarat; Mahi –

Madhya Pradesh, Rajasthan, Gujarat; Periyar – Kerala, Bharathpuzha – Kerala.

### Long Answer:

**Ans: 1.** The streams within the drainage basin form certain patterns depending on

- (a) the slope of the land
- (b) underlying rock structure of the area
- (c) the climate of the area.

The different drainage patterns are:

- (a) Dendritic Pattern: It develops where the river channel follows the slope of the land. When the stream and its tributaries drainage pattern resembles the branches of a tree, so it is called dendritic.
- (b) Trellis Pattern: This pattern develops when a river is joined by its tributaries at approximately right angles. It also develops when the hard and soft rocks exist parallel to each other.
- (c) Rectangular Pattern: This drainage pattern develops on a strongly jointed rocks terrain.
- (d) Radial Pattern: The drainage pattern develops when streams flow in different directions from a central peak or dome-like structure.

**Ans: 2.** The main features of River Indus as an important river of the Himalayas are:

- (a) Source: Indus river rises in Tibet, near lake Mansarowar. While flowing towards west it enters India in the Ladakh district of Jammu and Kashmir by forming a picturesque gorge.
- (b) Tributaries: Several tributaries like the Zaskar, the Nubra, the Shyok and the Hunza join it in the Kashmir region. Other major tributaries are the Satluj, the Beas, the Ravi, the Chenab and the Jhelum join together and form Indus at Mithankot in Pakistan.
- (c) Areas drained by river Indus: The Indus flows southwards eventually reaching the Arabian Sea east of Karachi areas. This is where Indus river end but not the total area drained.
- (d) Extent of the Indus Plain: The Indus plain has a gentle slope. It covers the states of Jammu and Kashmir, Himachal Pradesh and Punjab.
- (e) Indus Water Treaty (1960): According to the regulations of this treaty, India can use only 20% of the total water carried by Indus river system. The water is used for irrigation in Punjab, Haryana and southern and western parts of Rajasthan.

**Ans: 3.** The main characteristic features of the Ganga river system are:

- (a) The Ganga rises in Gangotri Glacier in Uttarakhand. Its headstream Bhagirathi joined by the Alaknanda at Devaprayag in Uttarakhand.
- (b) At Haridwar, the river Ganga comes out from the mountains to the plains.
- (c) Its tributaries like the Yamuna, the Gandak, the Ghaghara, the Kosi flood parts of northern plains every year, causing widespread damage to life and property but the flood enriches

the soil naturally. The soil is most suitable for intensive cultivation.

- (d) The main tributaries that join Ganga river from peninsular India are the Chambal, the Betwa and the Son.
- (e) The Ganga continues to flow eastwards after addition of water by its tributaries till Farakka in West Bengal. It then enters Bangladesh and joined Brahmaputra and known as stream Meghna which flows into the Bay of Bengal. Here, it forms the Sundarban delta, which is the largest delta of the world.

**Ans: 4.** The characteristic features of the Ganga-Brahmaputra delta are:

- (a) The Ganga-Brahmaputra delta is also known as Ganga delta or Sundarban delta.
- (b) It is situated in Bangladesh (southern parts) and in the state of West Bengal (India).
- (c) It is the world's largest and fastest growing delta.
- (d) The mainstream of Ganga river flows southwards into Bangladesh and is joined by the Brahmaputra river resulting in the formation of a delta.
- (e) Sundarban delta derived its name from Sundari trees which does not rot in stagnant water.
- (f) It is also the home of Royal Bengal tigers.

**Ans: 5.** The main characteristics features of Brahmaputra river are:

- (a) Its source lies in Tibet, east of Mansarowar lake very close to the sources of the Indus and the Satluj. It is slightly longer than the Indus and most of its course lies outside India.
- (b) The river carries less silt and smaller volume of water in Tibet as it is a cold and dry area,
- (c) Brahmaputra river passes through a region of high rainfall in India. Hence, the river carries large volume of water and considerable amount of silt.
- (d) The Brahmaputra has a braided channel in its entire length in Assam and forms many riverine islands. For example, Majuli island is the largest inhabited riverine island in the world.
- (e) Unlike other rivers of north India, river Brahmaputra is marked by huge deposits of silt on its bed causing the river bed to rise. The river also shifts its channel frequently. Every year during the rainy season the river overflows its banks causing widespread devastation due to floods in Assam and Bangladesh.

### Assertion Reason Answer:

1. A) Both (A) and (R) are true, and (R) is the correct explanation of (A).
2. A) Both (A) and (R) are true, and (R) is the correct explanation of (A).

### Case Study Answer:

**1. Answer:**

- (1) C) Tibet

(2) A) Ladakh

(3) B) Gentle

(4) B) 2,900 km

**2. Answer:**

(1) B) North to South

(2) C) Eastwards

(3) B) Mouth

(4) A) Narmada and Tapi