Toppersnotes®
Unleash the topper in you

# BPSC

## Assistant Prosecution Officer (APO)

Bihar Public Service Commission (BPSC)

Volume - 5

**General Studies & Science**

SIERRA INNOVATIONS

# INDEX


| S No. | Chapter Title | Page No. |
|---|---|---|
| 1 | India–Size & Location | 1 |
| 2 | Physiographic Divisions of India | 3 |
| 3 | Indian Drainage System | 20 |
| 4 | Climate of India | 34 |
| 5 | Energy Resources in India | 40 |
| 6 | Mineral Resources in India | 48 |
| 7 | Industrial Regions of India | 52 |
| 8 | Transport in India | 55 |
| 9 | Harappan Civilization | 60 |
| 10 | Vedic Age | 62 |
| 11 | Jainism and Buddhism | 65 |
| 12 | Mahajanapadas (600–300 BC) | 69 |
| 13 | Mauryan Empire | 70 |
| 14 | Post–Mauryan Age | 73 |
| 15 | Gupta Era | 75 |
| 16 | Post–Gupta Age | 78 |
| 17 | Sangam Age | 80 |
| 18 | Delhi Sultanate | 81 |
| 19 | Mughal Empire | 87 |
| 20 | Maratha Empire and Other Regional States | 92 |
| 21 | Socio–Religious Reform Movements | 97 |
| 22 | Establishment of British Rule in India | 104 |
| 23 | Revolt of 1857 | 111 |

# INDEX


| S No. | Chapter Title | Page No. |
|---|---|---|
| 24 | Popular Movements Against the British Rule | 113 |
| 25 | Moderate Phase of Indian National Congress | 118 |
| 26 | Extremist Phase (1905–1909) | 120 |
| 27 | The Mass Movement: Gandhian Era (1917–1925) | 123 |
| 28 | The Struggle for Swaraj (1925–1939) | 126 |
| 29 | Towards independence (1940–1947) | 131 |
| 30 | Basics of Indian Constitution | 137 |
| 31 | Constitutional Amendment | 145 |
| 32 | Fundamental Rights | 148 |
| 33 | Directive Principle of State Policy | 153 |
| 34 | Fundamental Duties | 155 |
| 35 | President | 156 |
| 36 | Vice President | 159 |
| 37 | Prime Minister | 160 |
| 38 | Central Council of Ministers | 161 |
| 39 | Parliament | 162 |
| 40 | Panchayati Raj | 169 |
| 41 | Municipalities | 171 |
| 42 | Supreme Court | 173 |
| 43 | High Court | 174 |
| 44 | Subordinate Courts | 175 |
| 45 | Governor | 176 |
| 46 | Chief Minister | 178 |

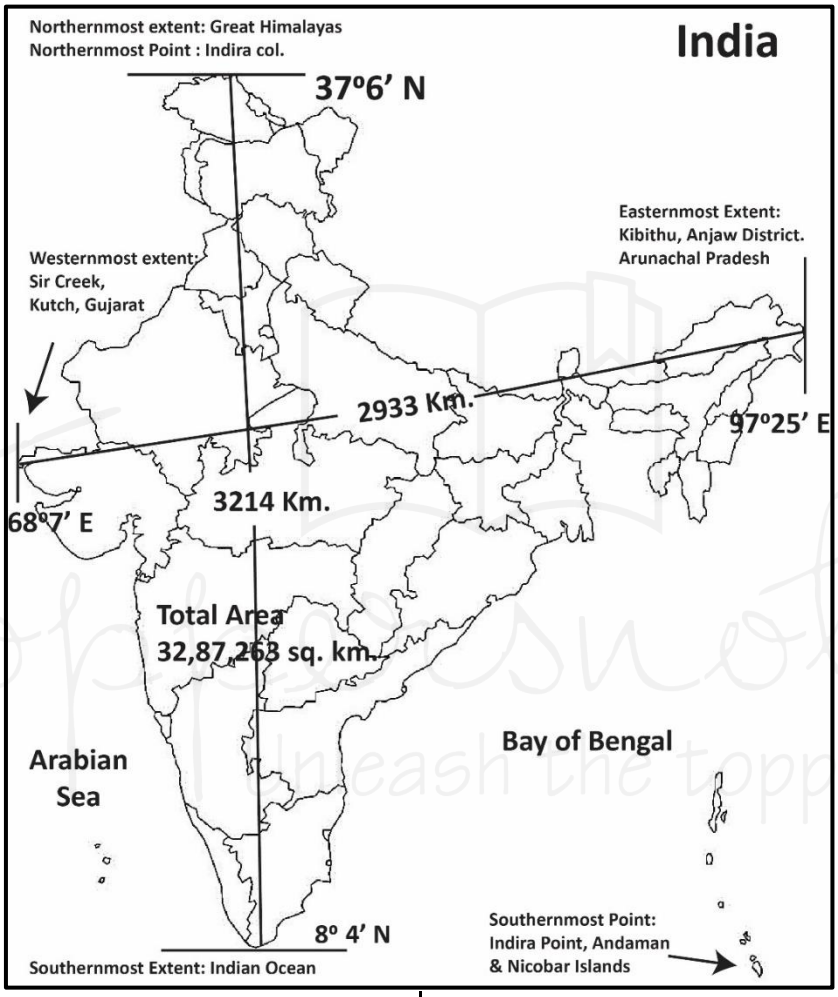
# INDEX


| S No. | Chapter Title | Page No. |
|---|---|---|
| 47 | State Council of Ministers | 179 |
| 48 | State Legislature | 180 |
| 49 | Economic System and National Income | 182 |
| 50 | International Economic institutions | 187 |
| 51 | Economic Reforms | 191 |
| 52 | Five Year Plans in India | 193 |
| 53 | Biology | 195 |
| 54 | Chemistry | 224 |
| 55 | Physics | 243 |

# 1 CHAPTER

# India-Size & Location

- **7th largest country** in the world.
- Situated in the **northern hemisphere** (**8°4'N to 37°6'N and 68°7'E to 97°25'E**)
  - India lies to the north of the equator between **6° 44′ and 37°6'N latitude** and 68° 7′ and 97° 25′ east longitude (including the islands).
- **Area**: 32,87,263 sq. km (**2.42% of the world**)
- 2nd most populated country in the world (**17.5% of the world's population**)
- **Total land boundary** = 15,200 km.
- **Total Sea boundary** = 7516.6 Km
  - Without islands = 6100 Km




**Border Countries:**

| | |
|---|---|
| **North-west** | ● Afghanistan and Pakistan<br>● Indo-Pak border: Radcliffe line<br>● Pak - Afghanistan border: Durand Line |
| **North** | ● China, Bhutan and Nepal<br>● Indo-China border: McMahon line |
| **East** | ● Myanmar, Bangladesh<br>● Longest boundary with Bangladesh |
| **South** | ● Sri Lanka<br>● Separated by Palk Strait & Gulf of Mannar |

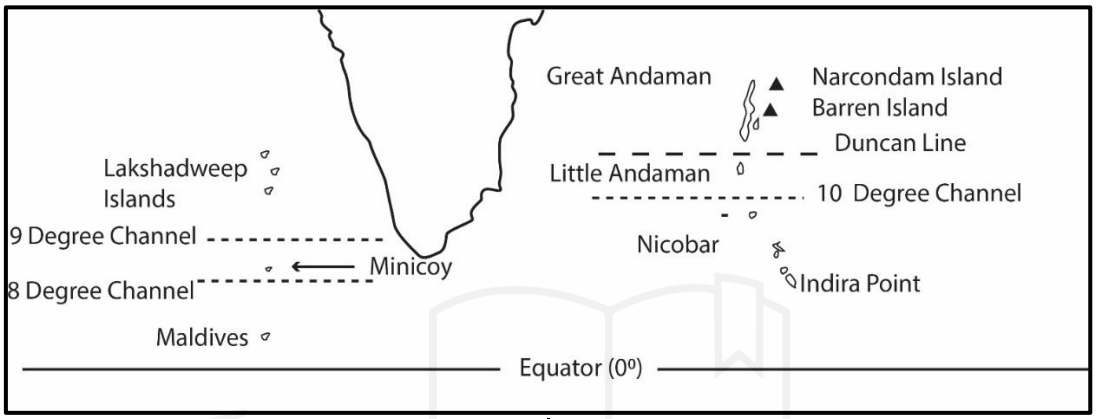
**States sharing International borders:**

| | |
|---|---|
| **Bangladesh** | **5 States:** West Bengal, Mizoram, Meghalaya, Tripura, and Assam (**4096 km)** |
| **China** | **4 States and1 UT:** Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh and Ladakh (**3488 km)** |
| **Pakistan** | **3 States and 2 UTs:** J&K, Punjab, Gujarat, Rajasthan and Ladakh (**3323 km)** |

| | |
|---|---|
| **Nepal** | **5 States:** Uttar Pradesh, Bihar, Uttarakhand, Sikkim, West Bengal **(1751km)** |
| **Myanmar** | **4 States**: Arunachal Pradesh, Manipur, Mizoram, and Nagaland (**1643 km)** |
| **Bhutan** | **4 States**: Arunachal Pradesh, Assam, Sikkim, and West Bengal (**699 km)** |
| **Afghanistan** | **1 UT:** Ladakh (**106 km)** |

- **Indian Standard Meridian**
  - **82°30'E**, **Mirzapur(UP)** - India's Standard Meridian.
  - **Ahead of meantime** by **5 hours and 30 minutes.**
  - **States through which IST Passes:** Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Odisha and Andhra Pradesh.
- **Tropic of cancer** (23°30'N) - Gujarat, Rajasthan, MP, Chhattisgarh, Jharkhand, West Bengal, Mizoram, and Tripura.
- **Coastal states of India: 9** (West Bengal, Odisha, Andhra Pradesh, Tamil Nadu, Kerala, Karnataka, Goa, Maharashtra, and Gujarat)

## Various Channels and their Location




- **Ten Degree Channel**
  - **Separates** the **Andaman Islands** from the **Nicobar Islands** in the Bay of Bengal
  - **150 km wide** from north to south and **10 km long** from east to west with a minimum depth of 7.3m.
- **Nine Degree Channel**
  - **Separates Minicoy** island from the **Lakshadweep archipelago**.
  - **200 km wide** with a **depth** of **2597 metres**.
  - **Strategic importance**: Passage of major merchant shipping between Europe, the Middle East and Western Asia with South-East Asia and the far East.
- **Eight Degree Channel**
  - **Maritime boundary** between the **Maldives** and **India**
  - **Separates** the islands of **Minicoy** and **Maldives**.
  - Traditionally known as **Maliku Kandu** and **Māmalē Kandu Divehi**.

**Duncan Passage**

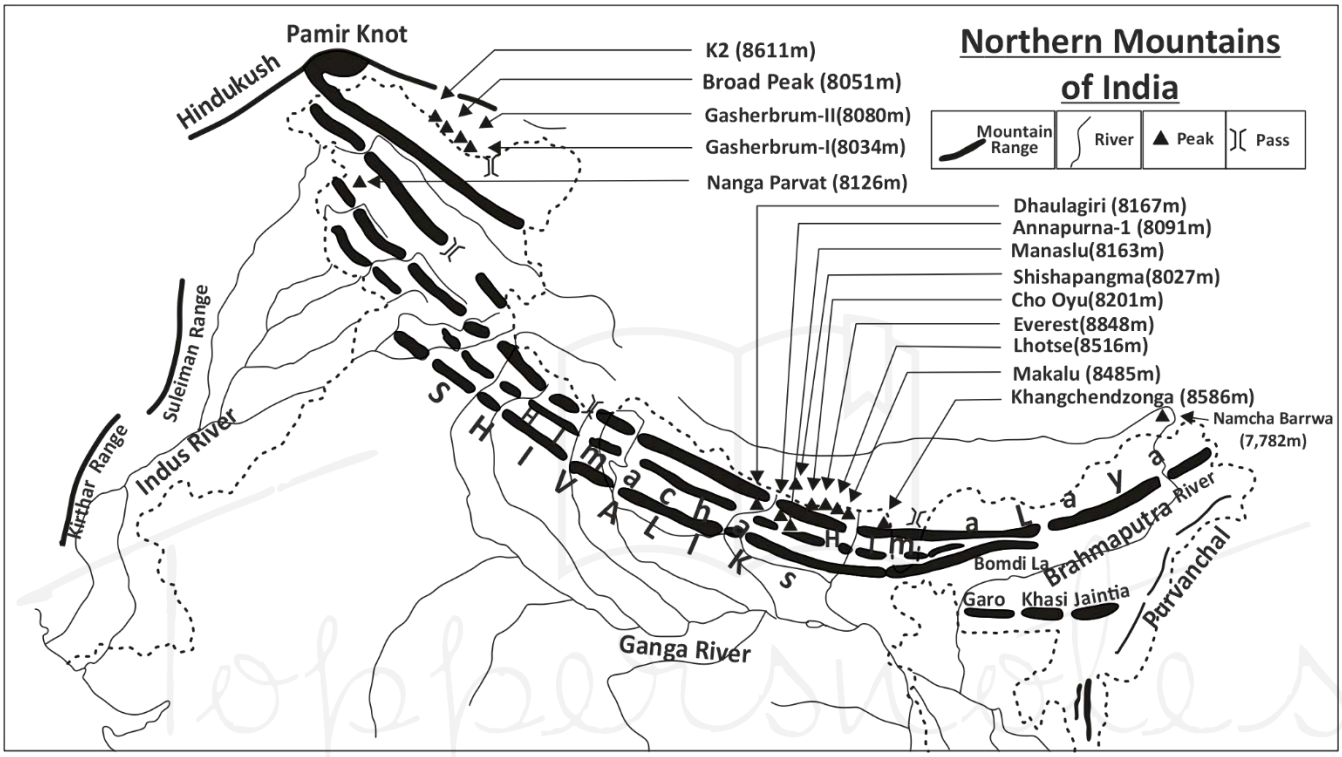
- A strait in the Indian Ocean.
- Located in between South Andaman and Little Andaman.
- Also lies within the EEZ of India, protected by the integrated tri-services Andaman and Nicobar Command of Indian Military.
- **Width**: ~ 48km.

# 2 CHAPTER Physiographic Divisions of India

Based on physical features, India is divided into six physiographic divisions:

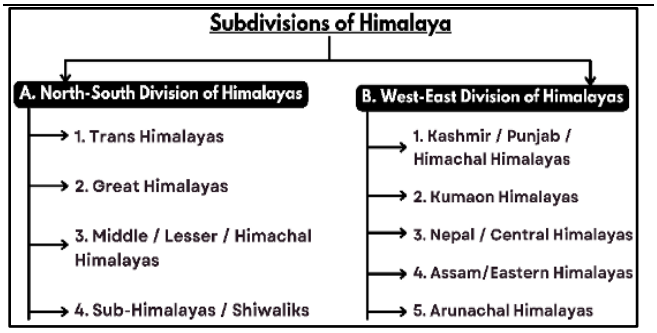
1. Himalayan Mountains
2. Great Plains of India
3. Peninsular Plateau
4. Indian Desert
5. Coastal Plains
6. Islands

## 1. Himalayan Mountains

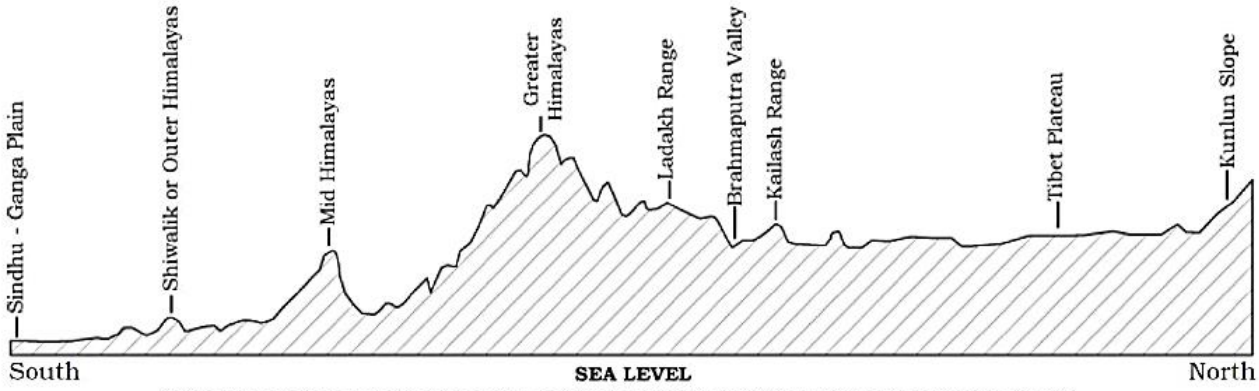



- **Highest and the youngest fold mountain** ranges of the world.
- **One of the highest earthquake-prone regions** of the world.
- **Length:** runs **west-northwest to east-southeast** in an arc **2,500 km long.**
  - **Western anchor**: **Nanga Parbat** (lies just south of the northernmost bend of the Indus River)
  - **Eastern anchor: Namcha Barwa** (lies immediately west of the great bend of the Yarlung Tsangpo River)
- **Width**: 400 km - 150 km (West- East).
- **Soaring heights, steep-sided** jagged peaks, valley and alpine glaciers often of stupendous size
- **Topography** deeply cut by **erosion**, seemingly **unfathomable river gorges**, **complex geologic structure**, and **series of elevational belts** (or zones)
- **Greater part of the Himalayas** lies below the snow line.
- The **mountain-building process** that created the range is still active.
- **Considerable stream erosion** and **gigantic landslides**.

### Sub Divisions of the Himalayas



**A. North-South Division of Himalayas**




**Himalayan Mountain Complex : Cross Sectional View from South to North**

**1. Trans-Himalayan Ranges:**

- **Location:** North of the Great Himalayas
- Also known as **Tibetan Himalaya** because most of it lies in Tibet.
- **Lifted much before the Himalayas** between Jurassic and Cretaceous
- **Geologically not a part of the Himalayas**.
- **Start** from **Pamir Knot.**
- **Godwin Austen/ K2/ Qogir** (8,611 m) - **second highest** peak in the **world / highest peak in the Indian Union** found in Karakoram Range
- **Length- 1,000 km** in the **east-west** direction.
- **Average elevation - 5000 m** above mean sea level.
- **Average width** - 40 km- 225 km (extremities -central part).
- **Siachen glacier** - highest battlefield.
- **Glacier Baltaro** - largest Mountain glacier from the Karakoram range.
- **Karakoram Pass** - connects the **Aksai Chin,** an erosional plateau of an average height 5000m.
- **Main ranges**:

| | |
|---|---|
| **Karakoram Range** | ● **Northernmost range** of the Trans-Himalayan Ranges in India<br>● Also known as **Krishnagiri range**<br>● Extends eastwards **from Pamir for about 800 km.**<br>● **Average elevation** - 5,500 m and above. |
| **Ladakh Range** | ● **North of the Zaskar** Range<br>● **Highest point** - Rakaposhi<br>● Lies **north of Leh.**<br>● **Merges with the Kailash range** in Tibet.<br>● **Important passes** - Khardung La, and Digar La. |
| **Zaskar Range** | ● A mountain range in the **union territory of Ladakh.**<br>● **Separates Zanskar from Ladakh.** |
| | ● **Average height** - about 6,000 m.<br>● Acts as a **climatic barrier protecting Ladakh and Zanskar from monsoon**<br>● **Major passes**- Marbal Pass, Zojila Pass - extreme northwest.<br>● **Major rivers**- Hanle River, Khurna River, Zanskar River, Suru River (Indus), and Shingo River. |
| **Kailas Range** | ● **Offshoot** of the **Ladakh Range**.<br>● **Highest peak -** Mount Kailash (6714 m).<br>● **River Indus** originates from the **northern slopes of the Kailas range**. |

**Ladakh Plateau**

- **Cold desert**
- Lies to the **northeast of the Karakoram Range**.
- **Dissected into** many plains and mountains - **Soda Plains, Aksai Chin, Lingzi Tang, Depsang Plains and Chang Chenmo**.
- **Northwestern part - Deosai mountains** are the **end of the Trans-Himalayan region**

**2. Great Himalayas:**

- Also known as **Himadri.**
- **Average height** - 6000 m
- **Average width** - 25 km
- **Extension -** Mt. Namcha Barwa to Nanga Parbat (2400 km)- World's one of the longest-running fold mountain ranges
- **Features:** High relief, deep gorges, vertical slopes, symmetrical convexity, and antecedent drainage.
- **Terminates abruptly** at the **syntaxial bends**.
  - **Nanga Parbat** - north-west
  - **Namcha Barwa** - north-east.
- **Composed** of **metamorphic** and **sedimentary** rocks.

- **Core** - **Batholith** representing the intrusion of Magma (Granitic Magma)
- **Have asymmetrical folds** due to high compression, and they **have fractured rocks** in the **eastern part.**
- **14 of the 28 tallest peaks** in the world (> 8000 m) are situated here.
- **Major passes -** Zojila Pass (connects Srinagar with Leh), Shipki La Pass, Burzil Pass, Nathu La Pass etc.
- **Major glaciers** - Rongbuk glacier (largest in the Himadri), Gangotri, Zemu etc.
- **Separated from lesser Himalayas** by longitudinal **valleys** filled with sediments known as **Doons**.
    - **Eg.** Patli Dun, Chaukamba Dun, Dehradun etc.

**3. <u>Middle/ Lesser/ Himachal Himalaya:</u>**

- **Most rugged** mountain system.
- Lies **between** the **Shiwaliks** in the south and the **Greater Himalayas** in the north.
- **Composed** of **highly compressed and altered rocks.**
- **Average altitude** - 3,700 - 4,500 metres.
- **Average width** - 50 to 80 Km.
- **Pir Panjal range - longest**
    - **Extends from Jhelum - upper Beas River** for over 300 km.
    - Rises to 5,000 metres and contains **mostly volcanic rocks**.
- **Passes:**
    - **Pir Panjal Pass** (3,480 m), the Bidil (4,270 m), Gulabgarh Pass (3,812 m) and **Banihal Pass** (2,835 m).
    - **Banihal Pass**- Jammu-Srinagar highway and Jammu-Baramulla railway.
- **Rivers**: Kishanganga, the Jhelum and Chenab.
- **Important Valleys**

| | |
|---|---|
| **Valley of Kashmir** | ● Between the **Pir Panjal** and the **Zaskar Range** (average elevation- 1,585 m)<br>● **Composed** of alluvial, lacustrine [lake deposits], fluvial [river action] and glacial deposits.<br>● **Jhelum River meanders** through these deposits and cuts **a deep gorge** in Pir Panjal. |
| **Kangra Valley** | ● **Extends from** the foot of the **Dhauladhar Range to the south of Beas**. |
| **Kullu Valley** | ● In the **upper course of the Ravi**<br>● A **transverse valley.** |

- **Most important range** - Dhaula Dhar and Mahabharat ranges.
- **Includes** famous valley of Kashmir, the Kangra and Kullu Valley in Himachal Pradesh.
    - Well **known for its hill stations.**
- **Cut across by the Jhelum and Chenab rivers.**
- **Dhauladhar ranges** – an extension of Pir Panjal into Himachal Pradesh - cut across by the river Ravi.
- **Mussoorie ranges** - divide the waters of Sutlej and Ganga
- Have **steep, bare southern slopes** [ prevents soil formation] and gentler**, forest-covered northern slopes.**
- **Uttarakhand**- marked by **Mussoorie and Nag Tibba ranges**.

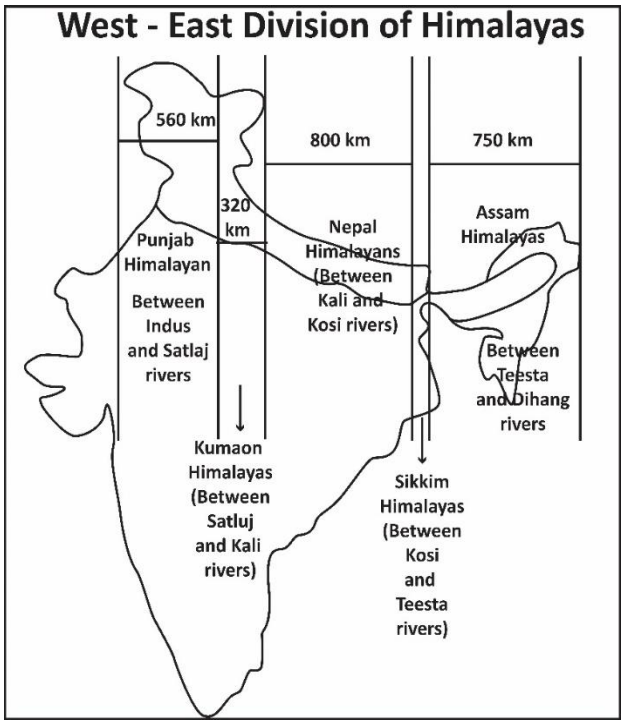
| Important ranges of Lesser Himalayas | Region |
|---|---|
| **Pir Panjal Range** | Jammu and Kashmir (south of Kashmir Valley) |
| **Dhauladhar Range** | Himachal Pradesh |
| **Mussoorie Range and Nag Tibba Range** | Uttarakhand |
| **Mahabharat Range** | Nepal |

**4. <u>Sub-Himalayas/ Shiwaliks:</u>**

- Also known as **Outer Himalayas.**
- **Between Great Plains and Lesser Himalayas**.
- **Altitude**- 600-1500 metres.
- **Length**- 2,400 km - **Potwar Plateau to Brahmaputra valley.**
- **Southern slopes** - steep
- **Northern slopes** - gentle.
- **Width** - 50 km - 15 km (Himachal Pradesh -Arunachal Pradesh).
- **Almost unbroken except** for 80-90 km – **Tista and Raidak River valley**.
- Covered with **thick forests from North-East India up to Nepal**.
- **Southern slopes** in **Punjab** and **Himachal Pradesh**- almost **NO forest cover.**
- **Highly dissected** by **seasonal streams** - **Chos**.
- **Valleys** - part of **synclines** and **hills** - part of **anticlines**
- **Different names:**

| Region | Name of Shiwaliks |
|---|---|
| Jammu Region | Jammu Hills |
| Dafla, Miri, Abor and Mishmi Hills | Arunachal Pradesh |
| The Dhang Range, Dundwa Range | Uttarakhand |
| Churia Ghat Hills | Nepal |

**B. West-East Division of Himalayas**




**1. Kashmir /Punjab/ Himachal Himalayas**

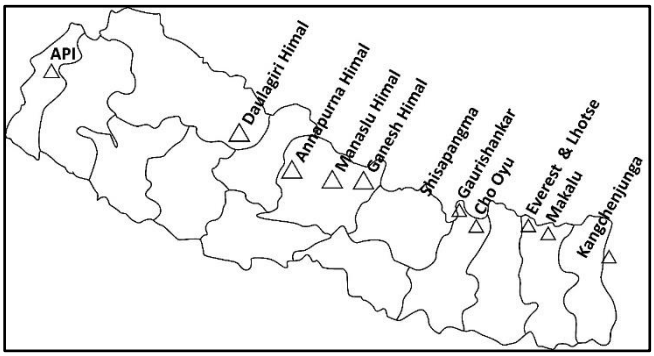
- Located **between Indus and Satluj gorge**
- **Length**- 560 kms
- **Width** - 320 kms
- **Zaskar range -** northern boundary and **Shiwaliks -** Southern boundary
- **Characterized by** ridge and valley topography (Kashmir Valley is the syncline basin) formed by the Lacustrine deposits (**Karewas**- helpful in **growing saffron**- from Pulwama to Pampore) of Jhelum.
- **Major ox-bow lakes** - Wular lake, Dal Lake, etc.
- Also known as "**Vail of Kashmir**"
- **Rainfall** upto 100cm in **summers** and **snow** during **winters**
- **Only gateway to Kashmir - Banihal pass** - Jawahar tunnel (Second Largest in India)
- **Major passes**- Burzil pass, Zozila pass.

**2. Kumaon Himalayas**

- Located between **Satluj and Kali gorges**
- **Length**- 320 kms
- **Major mountain ranges -** Nag Tibba, Dhaula Dhar, Mussoorie, and the Greater Himalayas.
- **Major peaks -** Nandadevi, Kamet, Badrinath, Kedarnath, etc.
- **Major rivers –** Gangotri, Yamunotri, Pindari, etc.
- **Characteristics:**
  - **Snowfall** in winters
  - **Coniferous** forests above **3200m** and **Deodar** Forest between **1600-3200m**.
  - Has **tectonic valleys**- Kullu, Manali, and Kangra.
  - **Rainfall** of about 200cm in summers
  - **More prone to Seismicity** and landslides.

**3. Nepal/ Central Himalaya**

- **Length- 800 km**
- **Between Kali** in the west and **Tista** in the east.
- **Great Himalayas attain a maximum height** in this portion.
- **Major peaks**- Mt. Everest, Kanchenjunga, Makalu, Annapurna, Gosainthan and Dhaulagiri.
- **Lesser Himalaya** is known as **Mahabharat Lekh** here.
- **Major rivers**- Ghaghara, Gandak, Kosi, etc.
- **Major valleys**- Kathmandu and Pokhra lacustrine valleys (previously lakes).




**4. Assam/ Eastern Himalayas**

- **Length-** 750km
- Located between **Tista** in the **west** and **Brahmaputra** (Dihang gorges) in the **east**.
- Occupy **mainly Arunachal Pradesh** and **Bhutan**.
- Narrow longitudinal valleys
- **Rainfall > 200cms.**
- Show a **marked dominance of fluvial erosion** due to heavy rainfall.
- **Landslides** and **earthquakes** are very **common** as rocks are fractured
- **Inhabited by tribes**
- **Important peaks** - Namcha Barwa (7756 m), Kula Kangri (7554 m), ChomoLhari (7327 m).
- **Major hills** - Also known as hills, Dafla hills, Miri hills, Abor hills, Mishmi hills, Namcha Barwa, Patkai bum, Manipur hills, Blue Mountain, Tripura range, and Braille range.
- **Major passes-** Bomdi La, Yong Yap, Diphu, Pangsau, Tse La, Dihang, Debang, Tunga, and Bom La.

**5. Arunachal Himalayas**

- **Form the eastern frontier** of the **Eastern Himalayas.**
- **Namcha Barwa** - **extreme east** of Arunachal Pradesh.
- **Earlier known as Assam Himalayas.**
- **Himalayan range** enters Arunachal Pradesh **from Bhutan** in the West Kameng district.
- **Characteristics**
  - **High ridges** and **low valleys**
  - **Altitude** - 800 m to 7,000 m above sea level.
  - **Extend** from the east of the Bhutan Himalayas - Diphu pass in the east.
  - **Dissected by the Brahmaputra,** which flows through a deep gorge after crossing Namcha Barwa.
- **Major tribes**- Monpa, Abor, Mishmi, Nyishi and the Nagas- practice Jhumming.

## Purvanchal Himalayas

- Geologically considered **part of the Himalayas**
- Has **structural differences**, thus, **separated from the main Himalayan ranges**.
- Lies **south of the Brahmaputra valley.**
- Belong to **Arakan Yoma orogenesis.**
- Have **loose, fragmented sedimentary rocks** like shale, mudstone, sandstone, quartzite
- **Most fractured parts** of the Himalayas.
- **Naga fault line**- earthquakes and landslides
- **Rainfall** - 150-200 cm
- **Densely forested**
- **Elevation** decreases from **north to south.**
- **Convex to the west.**
- **Low hills** where Jhum cultivation is prevalent.
- **Major Hills**:

| | |
|---|---|
| **Dafla Hills** | ● **Location**: north of Tezpur and north Lakhimpur<br>● Bounded on **west** by the **Aka Hills** and on the **east** by the **Abor Range.** |
| **Abor Hills** | ● **Location:** region of Arunachal Pradesh in NE of India, near China border<br>● Bordered by **Mishmi Hills** and **Miri Hills.**<br>● **Drained by the Dibang River**, a tributary of the Brahmaputra. |
| **Mishmi Hills** | ● **Location:** southward extension of the Great Himalayan ranges.<br>● **Northern and eastern parts touch China.** |
| **Patkai Bum Hills** | ● **Location:** India's NE border between Arunachal Pradesh and Myanmar.<br>● **"Patkai" - "to cut chicken"** in Tai-Ahom language.<br>● **Originated by the same tectonic processes** that resulted in the **formation of the Himalayas** in the Mesozoic.<br>● Have **conical peaks, steep slopes** and **deep valleys**<br>● **Not** as **rough** as the **Himalayas**.<br>● Whole region is **surrounded by forests** composed of sandstones. |
| **Naga Hills** | ● **Location:** extending into Myanmar forms a divide between India and Myanmar.<br>● **Highest peak** - Saramati.<br>● Receive a **heavy monsoon rainfall** and densely forested. |
| **Manipur Hills** | ● **Location:** north of Nagaland, Mizoram in the south, upper Myanmar in east and Assam in the west bound Manipur Hills.<br>● **Border** between **Manipur and Myanmar.**<br>● **Loktak Lake** - only floating national park of the world.<br>● **Keibul-Lamjao national park** situated here. |
| **Mizo Hills** | ● **Location-** south-eastern Mizoram state.<br>● **Formerly** known as **Lushai Hills.**<br>● **Highest part**- Blue Mountain.<br>● Part of the **North Arakan Yoma system.**<br>● Also known as **'Molasses basin'** - made up of **soft unconsolidated deposits.**<br>● **Shifting agriculture** and some **terrace cultivation** practised. |
| **Tripura Hills** | ● series of **parallel north-south folds**, **decreasing** in **elevation** to **south**.<br>● Merge into **greater Ganges-Brahmaputra lowlands** (aka Eastern Plains). |
| **Mikir Hills** | ● **Location-** south of the Kaziranga National Park, Assam.<br>● Part of the **Karbi Anglong Plateau.**<br>● **Mikir Hills** - oldest landform in Assam.<br>● **Radial drainage pattern**<br>● **Major rivers**- Dhansiri and Jamuna.<br>● **Highest peak –** Dambuchko. |
| **Garo Hills** | ● **Location:** Meghalaya state.<br>● **Highest peak**: Nokrek Peak. |
| **Khasi Hills** | ● Part of **Garo-Khasi Range** in Meghalaya.<br>● **Cherrapunji** - East Khasi Hills.<br>● **Highest peak**: Lum Shyllong. |
| **Jaintia Hills** | ● **Location:** further to the east of the Khasi Hills. |
| **Barail Hill** | ● **Location:** North Cachar Hill District.<br>● **Southwestern extension** of the **Patkai Range.**<br>● Runs in a **south-westerly direction from southern Nagaland** and parts of **northern Manipur** up to the Jaintia Hills of Meghalaya. |

## Himalayan Passes

### 1. Passes of Jammu and Kashmir and Ladakh

| | |
|---|---|
| **Banihal Pass (Jawahar Tunnel)** | ● A famous pass in Jammu and Kashmir.<br>● Situated in **Pir- Panjal Range**.<br>● Connects **Banihal with Qazigund**. |
| **Zoji La** | ● Connects **Srinagar with Kargil and Leh.**<br>● **Border Road Organization**- clears and **maintains** the road, especially during winter. |
| **Burzil Pass** | ● **Srinagar- Kishan Ganga Valley**<br>● Joins the Valley of **Kashmir with** the **Deosai Plains of Ladakh**. |
| **Pir-Panjal Pass** | ● A traditional pass **from Jammu to Srinagar**.<br>● **Closed after the partition**.<br>● **Shortest roadway access to Kashmir** valley from Jammu. |
| **Qara Tagh Pass** | ● Located in the **Karakoram Mountains**.<br>● A **subsidiary of the ancient silk route.** |
| **Khardung La** | ● **Highest motorable pass** in the country (5602 m).<br>● **Connects Leh and Siachen** glaciers.<br>● **Closed** during the **winter**. |
| **Thang La** | ● Located in **Ladakh**.<br>● **Second highest motorable** mountain **pass** in **India**. |
| **Aghil Pass** | ● **North of Mount Godwin-Austen** in Karakoram.<br>● Connects **Ladakh with Xinjiang province** of China. |
| **Chang-La** | ● Connects **Ladakh with Tibet.** |
| **Lanak La** | ● **Aksai Chin** in Ladakh region.<br>● Connects **Ladakh and Lhasa**.<br>● **Chinese** authorities have built a **road to join Xinjiang with Tibet**. |
| **Khunjerab Pass** | ● **Kashmir** and **China**<br>● On the **Indo-China border** |
| **Mintaka Pass** | ● **Kashmir and China**<br>● **Tri Junction** of **India-China** and **Afghanistan border** |

### 2. Passes of Himachal Pradesh

| | |
|---|---|
| **Shipki La Pass** | ● Passes **through Sutlej Gorge.**<br>● **Connects Himachal Pradesh with Tibet.**<br>● **India's 3rd border post** for **trade with China** (Lipu Lekh and Nathula Pass) |
| **Bara-Lacha Pass** | ● **Himachal Pradesh- Leh-Ladakh**<br>● Situated **on the National Highway** in Jammu and Kashmir.<br>● Connects **Manali and Leh**. |
| **Debsa Pass** | ● Joins **Spiti and Parvati Valley.**<br>● **Between the Kullu and Spiti** of Himachal Pradesh.<br>● **Bypass** route of **Pin-Parvati Pass.** |
| **Rohtang Pass** | ● **High road transportation**- high jams<br>● Connects **Kullu, Spiti, and Lahaul.** |

### 3. Passes of Uttarakhand

| | |
|---|---|
| **Lipu Lekh** | ● Connects **Uttarakhand with Tibet.**<br>● **Important border post** for trade with China.<br>● The **pilgrims for Kailash-Manasarovar travel** through this pass. |
| **Mana Pass** | ● Located in the **Greater Himalayas**.<br>● Connects **Tibet with Uttarakhand.**<br>● **Remains under snow for six months** during winter. |
| **Mangsha Dhura Pass** | ● Connects **Uttarakhand-Tibet**.<br>● **Known for landslides**.<br>● **Pilgrims for Manasarovar** cross this route. |
| **Muling La** | ● **Seasonal pass**<br>● Connects **Uttarakhand with Tibet**<br>● Snow covered during the winter season |
| **Niti Pass** | ● **Joins Uttarakhand with Tibet.**<br>● Remains **snow-covered during the winter** season. |
| **Traill's Pass** | ● Situated at the **end of the Pindari glacier**.<br>● Connects the **Pindari valley to Milam valley**.<br>● **Steep** and rugged. |

### 4. Passes of Sikkim

| | |
|---|---|
| **Nathu La Pass** | ● Located on the **India- China border.**<br>● Forms a part of an **offshoot of the ancient silk route.**<br>● One of the **trading borders posts between India and China.** |
| **Jelep La Pass** | ● Passes **through the Chumbi valley.**<br>● Connects **Sikkim with Lhasa**, the capital of Tibet. |

### 5. Passes of Arunachal Pradesh

| | |
|---|---|
| **Bomdi-La** | ● Connects **Arunachal Pradesh-Lhasa**, the capital city of Tibet.<br>● Located in the **east of Bhutan.** |
| **Dihang pass** | ● **Located** in the **Northeastern states of Arunachal Pradesh.**<br>● **Connects Arunachal Pradesh with Myanmar** (Mandalay) |
| **Diphu pass** | ● An alternate route to **Myanmar.**<br>● **Remains open throughout the year** for transportation and trade. |
| **Lekhapani** | ● **Remains open throughout** a year for transport and trade.<br>● Connects **Arunachal Pradesh with Myanmar**. |
| **Pangsan Pass** | Connects **Arunachal Pradesh and Myanmar**. |

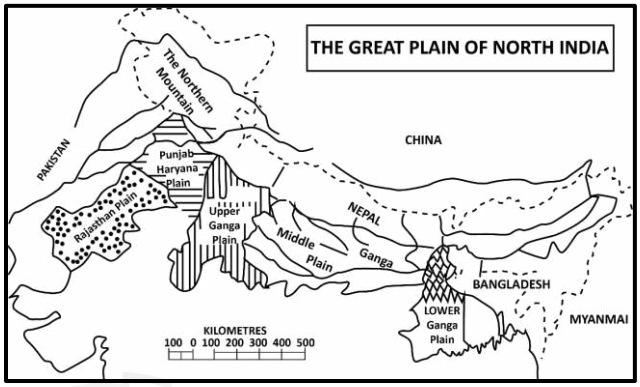
| | |
|---|---|
| **Yonggyap Pass** | Connects **Arunachal Pradesh with Tibet** |
| **Kumjawng Pass** | Connects **Arunachal Pradesh with Myanmar** |
| **Hpungan Pass** | Connects **Arunachal Pradesh with Myanmar** |
| **Chankan Pass** | Connects **Arunachal Pradesh with Myanmar** |

**Tuju Pass:**

- **Manipur.**
- Connects **Imphal to Myanmar**.

## 2. Great Plains of India

- Lie to the **south of Shiwalik** separated by the Himalayan Front Fault (HFF).
- A **transitional zone between the Himalayas** and **Peninsular India**.
- **Aggradation plain** formed by **alluvial deposits of the Indus, Ganga, Brahmaputra** and their tributaries.
- Stretches for about **2400 km from west to east.**
- **Width**- 90-100 in Assam, 160 km near Rajmahal (Jharkhand), 200 km in Bihar, 280 km near Allahabad and 500 km in Punjab. (Increases from east to west.)
- **Consists largely of alluvial deposits** brought down by rivers of the Himalayan and the Peninsular region.
  - **Maximum depth > 8000 metres** - Ambala, Yamunanager and Jagadhri (Haryana).
- Merges into the **Thar Desert** in the **southwest**.
- A **low watershed of the Delhi ridge** (278 m) + **Yamuna** River **separates** the **Satluj plains** (a part of the Indus plain) from the **Ganga plains**.




### Divisions of the Great Plains

**A. <u>North-South Division of Great Plains of India</u>**

| | |
|---|---|
| **1. Bhabar** | ● Along the **foot of Siwaliks** with remarkable continuity **from Indus to Tista.**<br>● **8-16 km wide belt** consisting of **gravel and unassorted sediments**<br>● **Deposited** by **Himalayan rivers** in the foreland zone **due to sudden slope break**.<br>● **Himalayan rivers deposit** their loads along the **foothills** in the form of **alluvial fans.**<br>○ **Coarser sediments** merged to build up piedmont plain/ Bhabar.<br>● Most **unique feature** - **porosity**.<br>○ Porous due to the **deposition of a huge number of pebbles** and **rock debris** across the alluvial fans.<br>○ **Not suitable for agriculture**<br>● **Comparatively narrow** in the **east** |
| **2. Tarai** | ● **10-20 km wide marshy region** in the **south of Bhabar** and runs parallel to it.<br>● **Wider in eastern parts** of the Great Plains - Brahmaputra valley due to heavy rainfall.<br>● **Re-emergence of underground streams** of the Bhabar belt<br>● Most of Terai land (especially in Punjab, Uttar Pradesh and Uttarakhand) has been **reclaimed and turned into agricultural land** over some time.<br>● Receives **high rainfall** and has **excessive humidity**.<br>● Has **underground streams** $\rightarrow$ ground **marshy**.<br>● **Suitable for** wheat, maize, rice, rice, sugarcane, etc. |
| **3. Khadar** | ● **Younger alluvium** of flood plains of numerous rivers<br>● Also known as **Bet/betlands** (in Punjab).<br>● **Contains new alluvial deposits** along the course of the river.<br>● **Alluvium** – light-coloured and poor calcareous matter consisting of sand, silt, mud and clay deposits.<br>● Suitable for **extensive cultivation**.<br>● **Rivers in the Punjab-Haryana** plains have **broad floodplains** of Khadar **flanked by bluffs** known as Dhayas. |
| **4. Bangar or Bhangar Plains** | ● **Uplands** (alluvial terrace) formed by **deposition of older alluvium.**<br>● **Lies above the flood limit** of the plains.<br>● **Main constituent: clay.**<br>● **Rich in humus - high yield.** |

| | |
|---|---|
| | ● **Contains** Calcium Carbonate nodules known as **'Kankars'** - impure and found in doabs<br>● **Regional variations**:<br>○ **Barind plains**- the deltaic region of Bengal<br>○ **Bhur formations** - middle Ganga and Yamuna doab.<br>○ **'Reh', 'Kollar' or 'Bhur'** - Drier areas- exhibit small tracts of saline and alkaline efflorescence. |

**B. Regional Classification of Great Plains**

**1. Sindh Plain**

- Lies **in Pakistan**
- Mainly **formed of** the **Bhangar Plains.**
- **Dhors: Long narrow depressions** - **remnants of** the course of **former rivers.**
- **Dhand: Alkaline lakes on some Dhors.**

**2. Rajasthan Plains**

- **Occupied by Thar Desert.**
- An **undulating plain** (average elevation - 325 m above mean sea level).
- **Desert region known as Marusthali** forms a greater **part of the Marwar plain.**
- Has a few outcrops of **gneisses, schists** and **granites**
  - Proof that it is **geologically a part of the Peninsular Plateau.**
- **Eastern part is rocky,** while the **western part** has **shifting sand dunes**.
- **Eastern part of Thar Desert** till **Aravalli Range** - **Rajasthan Bangar**- semi-arid plain.
- **Drained by** several **short seasonal streams** from the Aravali and **supports agriculture** in some patches of fertile tracts.
- **Luni –** a significant **seasonal stream** which **flows into Rann of Kutch.**
- **Tract north of Luni** - **thali** or sandy plain.

**3. Punjab Plain**

- Form the **western part of northern plain.**
- Majorly **in Pakistan.**
- **Divided into many Doabs**. Formed by **5 important rivers** of the Indus system.
- **Literally means** "(**The Land of Five Waters**" referring to: **Jhelum, Chenab, Ravi, Sutlej,** and **Beas.**

| | |
|---|---|
| **Sindh Sagar Doab** | between the **Indus** and **Jhelum** rivers. |
| **Jech Doabs/ Chaj Doab** | between the **Jhelum** and **Chenab** rivers. |
| **Rechna Doab** | between the **Chenab** and **Ravi** rivers. |
| **Bari Doabs** | between the **Ravi** and **Beas** rivers. |
| **Bist Doab** | between the **Beas** and **Sutlej** rivers. |

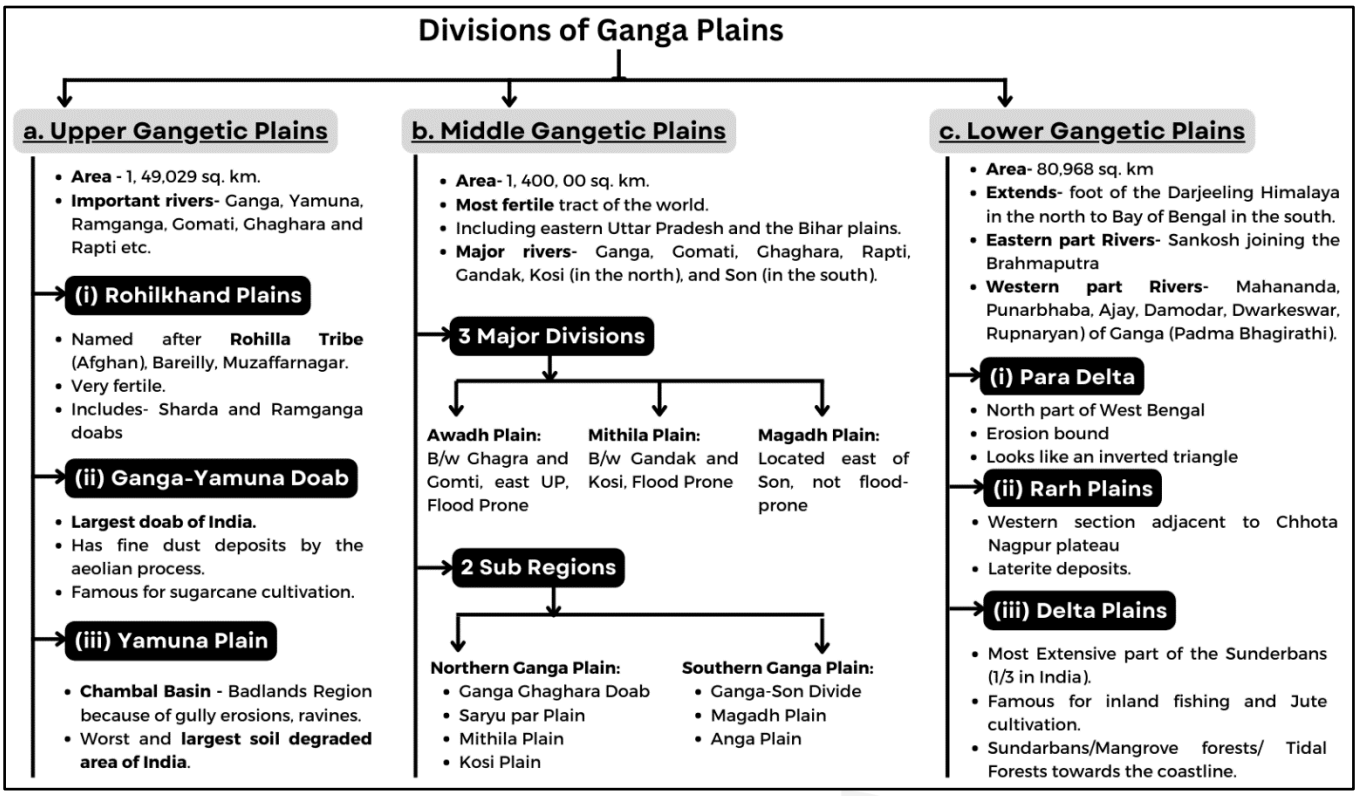
- **Total area** - 1.75 lakh sq km.
- **Average elevation** - 250 m above mean sea level.
- **Eastern boundary** - Delhi-Aravali ridge.
- **Northern part** [Shivalik hills] is **intensively eroded** by numerous **streams** called **Chaos**.
  - Resulted in **enormous gullying**.
- **South of Satluj river** - **Malwa plain** of Punjab.
- **Area** between the **Ghaggar and Yamuna rivers - 'Haryana Tract'**.
  - **Water divide** b/w **Yamuna and Satluj** rivers.

**Other Doabs of India:**

- **Malwa Doab:** Covers Madhya Pradesh and parts of north-eastern Rajasthan.
- **Raichur Doab:** A triangular region of Andhra Pradesh and Karnataka lying between Krishna and its tributary Tungabhadra River.

**4. Ganga Plain**

- **Extend from Yamuna River** in west **to western borders of Bangladesh** (~ 1,400 km).
- **Average width** - 300 km.
- **Maximum height** - Saharanpur (276m) - decreases towards Sagar Islands (3 m).
- **Largest unit of Great Plain** of India - from **Delhi to Kolkata** (about 3.75 lakh sq km).
- **Major Himalayan river**- Ganga.
- **Peninsular rivers** - Chambal, Betwa, Ken, Son, etc. (join Ganga river system - contribute to formation of this plain).
- **Slope -** east and south east.
- **Rivers flow sluggishly in lower sections of Ganges** resulting in levees**, bluffs, oxbow lakes, marshes, ravines,** etc.
- **Rivers keep shifting their courses** making this area **prone to frequent floods**.
  - **Kosi** river- 'Sorrow of Bihar'.




**5. Brahmaputra/Assam Plains**

- **Area-** 56,274 sq. km
- **Easternmost part** of Great Plains
- Aggradation plain built up by the **Brahmaputra and its tributaries**.
- **Extend** from Sadiya (in the east) to Dhubri (near the Bangladesh border in the west).
- **Majuli** (area 929 km²)- **largest river island in** the world.
- **Large marshy tracts** → formation of **terai or semi-terai conditions**.
- **2 sub-regions:**
  - Upper Assam Valley
  - Lower Assam Valley

## 3. Indian Desert

**A. Sandy Thar Desert**

- **India- ~ 85%** of Thar Desert
- **Rest-** in Pakistan.
- **4.56%** of the **total geographical area** of India.
- **Geographical characteristics:**
  - **Location**: partly in **Rajasthan** and partly in **Punjab and Sindh**.
  - **Area:** > 2,00,000 sq km.
  - **Rainfall< 150 mm** per year- arid climate with **low vegetation cover.**
  - Forms a **natural boundary** along the **border** Between **India** and **Pakistan**.
  - Came into **existence** in the **Pleistocene age.**
  - Believed to be **submerged in sea** during the **Mesozoic era**.
    - **Evidence** - wood fossils park at Aakal and marine deposits around Brahmsar, near Jaisalmer.
  - **Underlying rock structure** of desert – the **extension** of the **Peninsular plateau**.
  - **Major desert land features** - mushroom rocks, shifting dunes and oasis (mostly in its southern part).
  - Also known as **Marustali** (the dead land) and **Bagar**.
  - Comprises of **aeolian wind deposits**
  - **Dry climate** and **alluvial deposits**
  - **2 parts:**
    - **Northern part** - sloping towards Sindh.
    - **Southern part** - towards Rann of Kutch.
  - **Most rivers** in this region are **ephemeral**.
  - **Sand dunes** - elevation 150 m
  - **Metamorphic Rocks**
  - **Short seasonal streams** originating from Aravallis
  - **Oasis** in its **southern** part
  - **High** and **low dunes** separated by sandy plains and low barren hills, or bhakars, rise abruptly from the surrounding plains.
    - **Dunes** - continual motion and varying shapes and sizes.
    - **Barchan/Barkhan**- crescent-shaped sand dune produced by the action of wind
- **Climate**:
  - **Subtropical desert climate** - persistent **high pressure** and **subsidence**.
  - **Southwest Monsoon rainfall** in the summer seasons.
  - **Low annual rainfall** (4-20 inches) as compared to the other parts of India.
  - **Coldest month** - January
  - **Hottest month -** May and June.

# 53 Chapter

# Biology

## The Cell

- **Simplest and most basic unit** of life.
- **Discovered:** Robert Hooke (1665)
- All living things made up of cells- **structural, functional, and biological unit of life**.
- Has the **ability to duplicate itself** on its own.
- aka **"building blocks of life.**"

### Cell Structure and its components

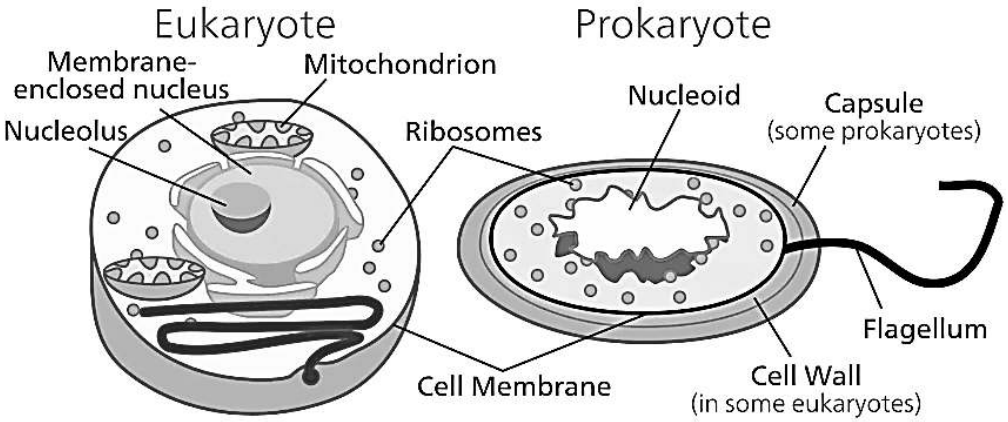
**Cell Organelles**

- Present within a cell & **perform certain specific functions to carry out life's processes.**

| | |
|---|---|
| **Plasma / Cell Membrane** | ● **Outermost covering** of the cell<br>● **Separates contents of cell** from its **external environment.**<br>● **A selectively permeable membrane** as it allows entry and exit of some materials in and out of the cell. |
| **Cell Wall** | ● **ONLY** in **plants**<br>● **Outside** the **plasma membrane.**<br>● Mainly **composed of cellulose.**<br>○ **Cellulose:** A complex substance - provides structural strength to plants. |
| **Cytoplasm** | ● **Jelly-like substance** present between **cell membrane & nucleus.**<br>● **Fluid content inside plasma membrane.**<br>● **Contains** many specialised **cell organelles** (mitochondria, golgi bodies, ribosomes, etc) |
| **Nucleus** | ● **Contains chromosomes** that contain **information** for **inheritance** of features from parents to next generation in form of DNA<br>● Plays a **central role** in **cellular reproduction**.<br>● **Nuclear membrane**- a **double-layered** covering on nucleus.<br>○ **Allows transfer** of **material** from **inside** nucleus **to its outside**, i.e., to cytoplasm. |
| **Nucleolus** | ● **Ribosome synthesis site regulating cellular activity** and **reproduction**. |
| **Gene** | ● **Unit of inheritance** in living organisms. |
| **Protoplasm** | ● **Entire content of a living cell** [cytoplasm + nucleus].<br>● aka **living substance of the cell.** |
| **Chromosomes** | ● **Rod-shaped structures**<br>● Visible **only when** the **cell is about to divide**.<br>● Contain **information for inheritance of features** from parents to next generation in the form of DNA (deoxyribo nucleic acid)<br>● **Composed** of **DNA** and **Protein**. |
| **DNA molecules** | ● Contains **information necessary for constructing and organising cells**.<br>● Functional segments of DNA - **genes.** |

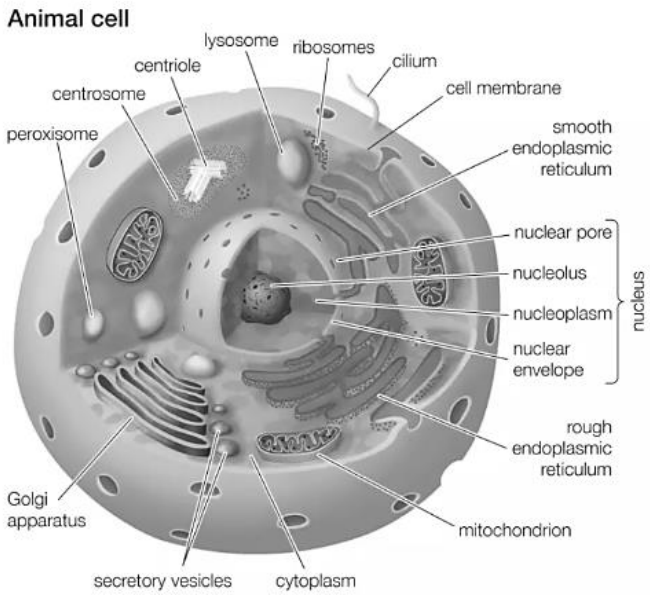
| | |
|---|---|
| **Vacuoles** | ● **Empty structure in cytoplasm**<br>● Act as storage sacs for solid or liquid contents.<br>● **Common in plant cells.**<br>● **Smaller in animal cells**.<br>● **Substances stored**- amino acids, sugars, various organic acids and some proteins. |
| **Endoplasmic Reticulum** | ● A **large network of membrane-bound tubes and sheets**.<br>● **2 types :**<br>**1. Rough endoplasmic reticulum [RER]**<br>o **Has ribosomes** attached to its surface.<br>o **Ribosomes** - sites of **protein manufacture**.<br>**2. Smooth endoplasmic reticulum**<br>o Helps in the **manufacture of fat molecules**, or lipids, important for cell function.<br>o Some of these proteins and lipids **help in building the cell membrane k/a membrane biogenesis.**<br>● Serve as **channels for transport of materials** between various regions of cytoplasm or between the cytoplasm and the nucleus.<br>● Also functions as **a cytoplasmic framework** providing a **surface for some biochemical activities of cells.** |
| **Golgi Apparatus/ Complex** | ● A **system of membrane-bound vesicles** arranged **parallel** to each other in **stacks** called **cisterns**.<br>● **Packages** and **dispatches material synthesised near ER** to **various targets** inside and outside the cell.<br>● **Stores**, **modifies** and **packages products** in vesicles.<br>● Involved in the **formation** of **lysosomes**.<br>o **Membrane-bound sacs** filled with digestive enzymes.<br>o Kind of **waste disposal system** of the cell.<br>o **Help** to **keep** the **cell clean** by **digesting** any **foreign material** as well as **worn-out cell organelles**. |
| **Mitochondria** | ● Aka **powerhouse of the cell.**<br>● **Energy required** for various chemical activities **is released** by mitochondria in the form of **ATP** (Adenosine Triphosphate) molecules.<br>● 2 **membranes:**<br>o **Outer membrane- porous**<br>o **Inner membrane - deeply folded.**<br>■ **Folds** create a **large surface area** for **ATP-generating chemical reactions**. |
| **ATP** | ● aka **energy currency of the cell.**<br>● **Body uses energy** stored in **ATP** for **making new chemical compounds** and for mechanical work. |
| **Ribosomes** | ● **Site of protein synthesis.**<br>● **Polyribosomes or Polysomes:** Several **ribosomes may attach to a single mRNA and form a chain.**<br>● **Prokaryotes- ribosomes are associated with the plasma membrane of the cell.** |
| **Cilia and Flagella Cilia** | ● **Hair-like outgrowths of the cell membrane.**<br>● **Cilia** - **small structures which work like oars**, **causing** the **movement of either the cell or the surrounding fluid.**<br>● **Flagella** - comparatively **longer** and responsible for cell movement.<br>● **Prokaryotic bacteria have flagella but structurally different from eukaryotic flagella.** |
| **Centrosome and Centrioles** | ● Centrosome- **an organelle** usually containing 2 **cylindrical structures called centrioles.**<br>● **Surrounded by amorphous pericentriolar materials**.<br>● **Both** the **centrioles** in a centrosome **lie perpendicular** to each other |

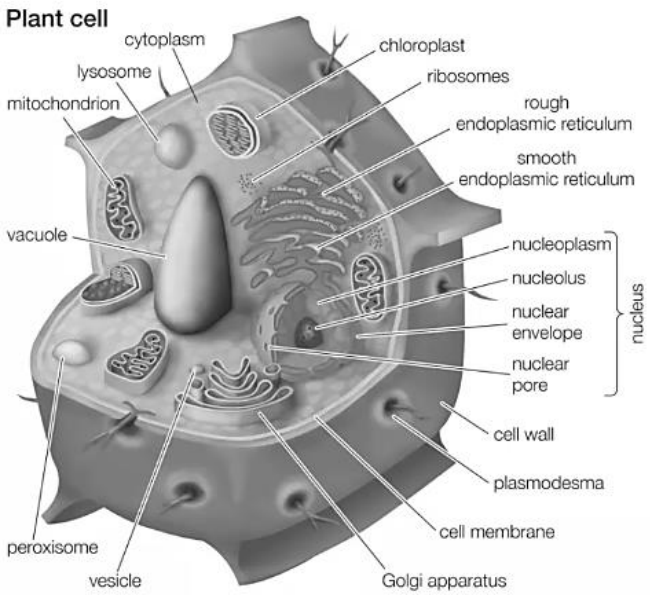
## Types of Cells




| Prokaryotic Cell | Eukaryotic Cell |
|---|---|
| ● **Primitive/undeveloped nucleus.** | ● Has **true or developed nucleus** |
| ● **Size** - 0.2 - 2.0 micrometers | ● **Size**- 10- 100 micrometers. |
| ● **Simpler** in **structure** | ● **More complex** |
| ● **Organelles not membrane-bound** | ● **Organelles membrane bound** & specific in function. |
| ● **DNA** arranged in **circular** shape | ● **DNA linear** in shape |
| ● **Cytoplasm present**, but **lacks** in most **cell organelles**. | ● Consists of **both cytoplasm** and **organelles** |
| ● **Cell wall present**.<br>● Made of mucopeptide or peptidoglycan | ● Usually, **absence of cell** wall here.<br>● Made of cellulose |
| ● **Cell division** - binary fission, transduction, conjugation, and transformation | ● **Cell division** - mitosis |
| ● **Mitochondria absent** | ● Mitochondria **present**. |
| ● **Endoplasmic reticulum not present**. | ● Endoplasmic reticulum **present**. |
| ● **Ribosome present** | ● Ribosome **present** |
| ● **Plasmids** commonly **found**.<br>○ A **small, circular, double-stranded DNA** molecule **distinct** from a **cell's chromosomal DNA**.<br>○ **Naturally exist in bacterial cells.** | ● **Plasmids** very **rarely found** |
| ● **Only asexual reproduction**. | ● **Both sexual** and **asexual** reproduction. |
| ● Have a **single origin** of **replication** | ● Have **multiple origins** of **replication** |
| ● Only 1 **chromosome**. | ● **Many chromosomes** present |
| ● **Eg.** Bacteria and Archaea. | ● **Eg**. Plant and animal cells. |

## Plant and Animal Cells




| | Animal Cell | Plant Cell |
|---|---|---|
| **Nucleus** | Present | Present |
| **Cilia** | Present | Very rare |
| **Shape** | Round (irregular shape) | Rectangular (fixed shape) |
| **Chloroplast** | NO chloroplasts | Chloroplasts present |
| **Cytoplasm** | Present | Present |
| **Endoplasmic Reticulum** | Present | Present |
| **Ribosomes** | Present | Present |
| **Mitochondria** | Present | Present |
| **Vacuole** | One or more small vacuoles (much smaller than plant cells). | One large central vacuole taking up 90% of cell volume. |

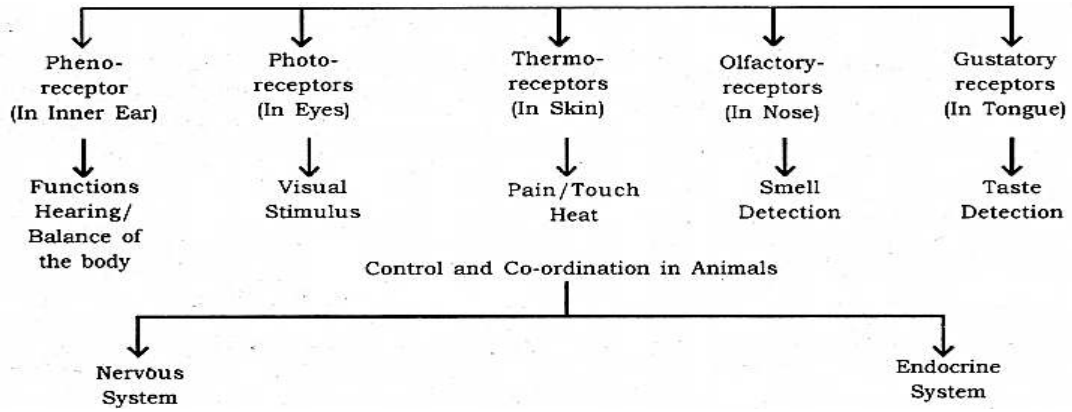
# Control and Coordination

## In animals

**Nervous system and hormonal system** are **responsible** for **control** and **coordination**.

**Receptors:**

- **Specialized tips of nerve fibres** that **collect information** to be **conducted by nerves**.
- **In** the **sense organs** of the animals.



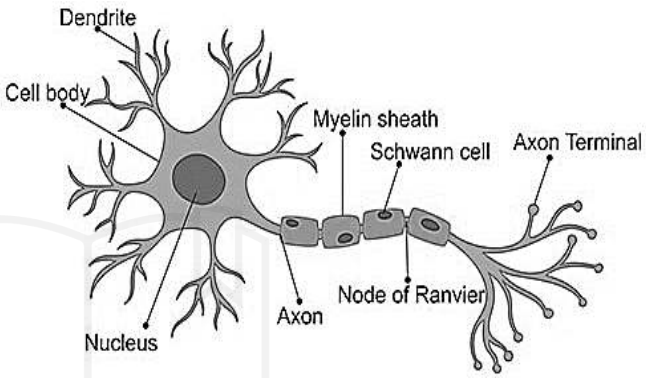
- **Types**:

1. **Nervous System**

- A **highly complex regulatory system** in animals.
- **Coordinates actions** & **transmits sensory information** and **signals** to/from the different parts of body.
- **Neuron** - **structural** and **functional unit** of entire system.
- **Functions:**
  - **Receives information** from the **environment**.
  - Receive the information from the **various body parts**.
  - **Act accordingly** through muscles and glands.
- **Movement**- **ability** of an organism **to move** a **particular body part**.
- **Locomotion** - **ability** of an organism **to move** its **whole body** from one place to another.

## Neuron

- **Structural and functional unit of the nervous system**
- **Coordinates and controls the complex actions** in animals.
- **Specialized cells** responsible for **transmission** of **nerve** impulses.
- **3 parts-**
  1. **Axon-**
     - **Tail** of the **neuron**.
     - **Ends** in **fine hair-like structures** k/a **axon terminals** which rely on nerve impulses
     - **Axons** - **myelinated** or **unmyelinated**.
     - **Impulse transmission is** faster in **myelinated neurons**.
  2. **Cyton/soma/cell body-**
     - **Star-shaped** having various **hair-like structures** k/a **dendrites** which **receive** the **nerve impulses**
  3. **Myelin Sheath-**
     - An **insulating sheath** on **axon**.
     - **Insulates axon against nerve impulse** from its **surroundings**.
     - **Dendrites receive** the **impulse** from other neurons.
     - **Cyton** or Soma cells **process** the **impulse**- **transmitted** to the **Axon**. Gets transmitted either to other neurons or to muscles for taking necessary action.




- **Types :**
  1. **Sensory** neurons- Receive the signals from a sense organ
  2. **Motor** neurons- Send the signals to a gland or muscle
  3. **Relay** or association neuron- Relay signals between a motor neuron and sensory neuron.
- **Synapse**
  - A **microscopic gap** between **two adjacent neurons**.
  - A **point contact between terminal branches** of **axon** of one neuron and with the dendrite of another neuron.
  - **Convert electric signals** into **chemicals** that can cross over gap between axon and dendrite.
  - **Chemical message** is **passed** to **next neuron** and **converted back** to the **electrical signal** for **interpretation**.
- **Neuromuscular Junction:**
  - **Point where** a **muscle fibre comes** in **contact with** a **motor neuron** carrying nerve impulse from the control nervous system.