SHORT NOTES

GEOGRAPHY

INDIA - WORLD - PHYSICAL

FEATURES
QUICK REVISION BEFORE EXAM
KEYPOINTS HIGHLIGHTED
ORGANISATION OF INFORMATION IN TABLES

SSC UPSC RAILWAY DEFENSE CDS NDA TEACHING STATE PSC & OTHERS

GEOGRAPHY (INDIA)

LOCATION ASPECTS

Location

India is the seventh largest and the second most populous country in the world.

➤ It lies between latitudes 8° 4 ′N and 37° 6 ′N and longitudes 68° 7 ′E and 97°2 5 ′E .

➤ Country is divided into almost equal parts by the Tropic of Cancer.

➤ Tropic of Cancer Passes through 8 states — (From West to East) Gujarat — Rajasthan — Madhya Pradesh — Chattisgarh — Jharkhand — West Bengal — Tripura — Mizoram.

➤ Southernmost point of Indian Territory — Indira Point (6°4 5 ′) Andman and Nicobar

➤ Coastline of mainland India — 6100 km .

➤ Total coastline including Lakshadweep and Andman and Nicobar — 7516.6 km.

➤ India stretches from North to South — 3214 km.

➤ India stretches from East to West — 2933 km.

➤ Total length of mainland — 15,200 km .

➤ Total length of coastline — 7516.6 km

➤ Total boundary — 22716.6 km

➤ No. of Island in Bay of Bengal — 204

➤ No. of Island in Arabian Sea — 43

LAST POINT OF INDIAN BOUNDRY

1. Eastern Point — Kibithu (Arunanchal Pradesh)
2. Western Point — Gour Meta (Gujrat)
3. Northern Point — Indira Col (Jammu and Kashmir)
4. Southern Point — Indira Point
5. Southern most point of mainland — Kanyakumari (Cape Comorin, Tamil Nadu)

THE INDIAN STATES ON INTERNATIONAL BOUNDRIES

1. Bangladesh 4096.7 km. West Bengal > Tripura > Meghalaya > Mizoram > Assam
2. China 3488 km. Jammu and Kashmir > Arunachal Pradesh> Himachal Pradesh > Uttarakhand > Sikkim
3. Pakistan 3323 km. Jammu and Kashmir > Rajasthan > Gujarat > Punjab
4. Nepal 1751 km. Uttar Pradesh > Bihar > Uttarakhand > West Bengal > Sikkim
5. Myanmar 1643 km. Arunachal > Mizoram > Nagaland > Manipur
6. Bhutan 699 km. Assam > West Bengal > Arunachal > Sikkim
7. Afghanistan 106 km. Jammu and Kashmir (POK)

➤ There are seventeen states on International boundries.

North-East States = 07 + Sikkim = 01 + West Bengal = 01 + Uttar Pradesh + Uttarakhand + Himachal Pradesh + Jammu & Kashmir + Bihar = 05 + Punjab + Rajasthan + Gujarat = 03

Total = 17

STATES OF COASTLINE (DESCENDING ORDER)

1. Andman and Nicobar Island 2. Gujarat 3. Andhra Pradesh 4. Tamil Nadu 5. Maharashtra 6. Kerala 7. Odisha 8. Karnataka 9. West Bengal 10. Goa

➤ There are 5 countries in Indian subcontinent —

1. India 2. Pakistan 3. Bangladesh 4. Nepal 5. Bhutan

➤ Puducherry is streches in three states of India —

1 . Mahe (Kerala) 2. Karikal (Tamilnadu) 3. Puducherry (Tamilnadu) 4. Yanam (Andhra Pradesh)

➤ Four North-East States don't share their boundaries with Bangladesh—

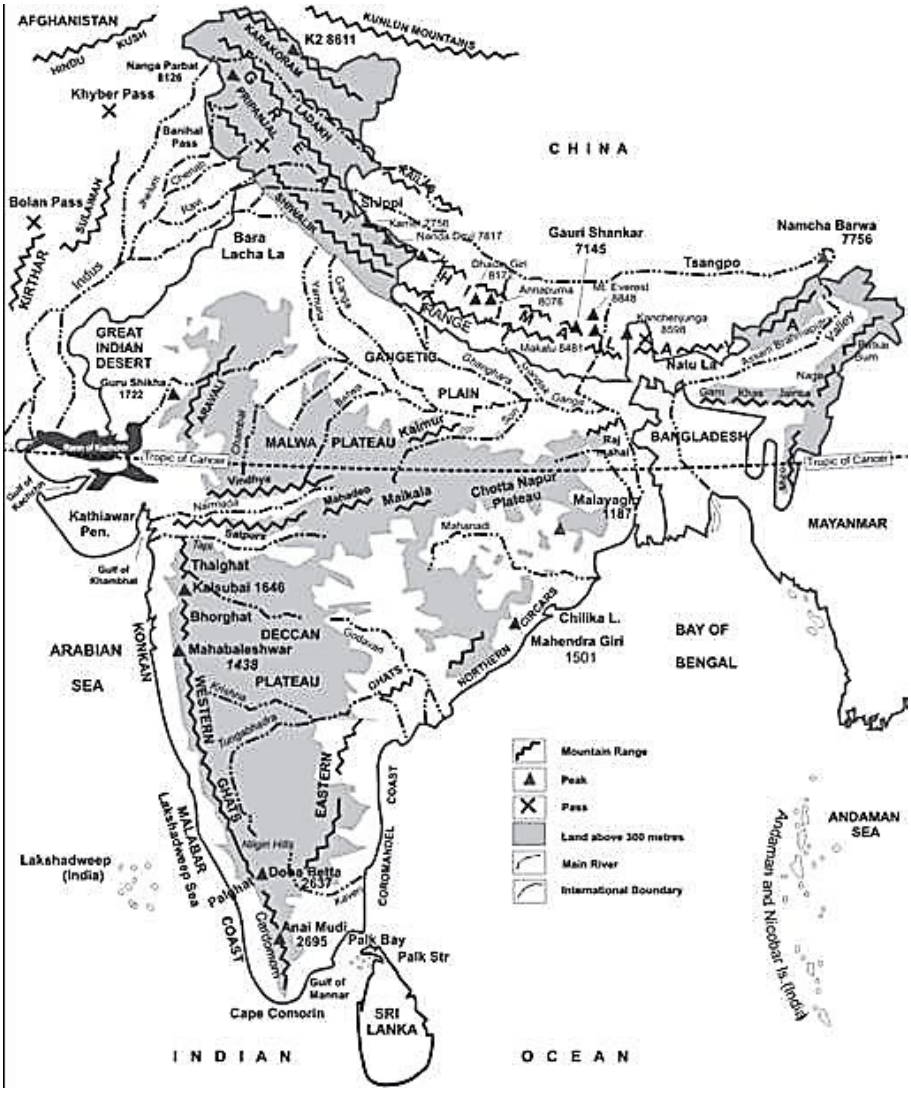
1. Nagaland 2. Manipur 3. Arunachal Pradesh 4. Sikkim

- Mac Mohan line divides India and China in Arunachal Pradesh.
- Indian state sharing its boundary with Nepal, Bhutan and China in Sikkim.
- Andaman and Nicobar is known as Emerald Island.
- There are seventeen states share its boundaries with neighbouring countries.
- Uttar Pradesh borders maximum number of states (8) Uttarakhand, Himanchal Pradesh, Haryana, Rajasthan, Madhya Pradesh, Chhattisgarh, Jharkhand and Bihar.
- 82°30' E longitude is considered as the standard Meridian which passes through Mirzapur in Uttar Pradesh.
- The Indian standard Time (IST) is 5 hours 30 minutes ahead of the Greenwhich Time (GMT).
- Indian Standard Meridian passes through UP, MP, Chhattisgarh, Odisha and Andhra Pradesh.

MAIN CHANNELS

1. Great Channel Indira Point and Indonesia
2. 8° Channel Maldiv and Minicoy
3. 9° Channel Minicoy and Lakshadweep
4. 10° Channel Little Andman and Car Nicobar
5. Palk Strait Gulf of Mannar and Bay of Bengal.

PHYSIOGRAPHY



Himalayas

The Himalayan mountain range and Tibetan plateau have formed as a result of the collision between the Indian Plate and Eurasian Plate (Plate tectonics) which began 50 million years ago and continues today.

MAJOR PHYSIOGRAPHIC REGIONS

1. The Himalayan Mountain Chain
2. The Northern Plains — (a) Great Planes, (b) Thar Desert
3. The Great Peninsula Plateau —(a) Central Highland, (b) Peninsula Plateau (c) Coastal Plains

The Himalayan Mountain Chain

Trans Himalayan :

- Trans Himalayans are the part of Himalayan system. It is also known as Tethis Himalayans.
- Pamir Knot is known as “the roof of the world”.
- Kunlun run into Tibet.
- Karakoram enters into Kashmir.
- Karakoram pass is situated in Karakoram range.
- Baltoro and Siachin are the glaciers of this range.
- Lengthwise glaciers of Karakoram — Siachin — Hispar — Biafo —

➤ Indus river originates from Chamayung dung Glacier near Kailash.
➤ Indus river flows between Ladakh and Zaskar ranges from south east to north west.
➤ Indus river make the deepest gorge in Gilgit.
➤ Trans himalayas are formed by sedimentary rock.
➤ The rocks from Tertiary age to Cambrian age are found here.
➤ Trans himalayas separate itself from great himalayas with Shuture zone.
➤ K 2 (Godwin Austen) is the highest peak of Trans Himalaya (Karakoram Range) with range of 8611 meters.

Greater Himalayas

➤ It is called as Himadri.
➤ Mount Everest is the highest peak of the world.
➤ Mount Everest is located in Nepal. It is called Sagarmatha in Nepal. It's height is 8848 meter.
➤ Tibetians call it Chamlungma.
➤ Kangchenjunga is the second highest peak of greater himalayas.
➤ Kangchenjunga lies in Sikkim.
➤ Namchabarva is an important peak in east overlooking the Bhramaputra where this range takes a sudden change and twist towards south to enter India.
➤ Namchabarva lies in Tibet (China).
➤ Several Passes are lie in this range like Bara Pass, Lapcha, Shipkila, Thangla, Nifila, Nathula.
➤ Hindustan-Tibet way which joins shimla to Gangtok, passes through 'Shipkila Pass' in Satluj Valley.
➤ Great Himalayas separate from middle Himalays with main central thrust.
➤ The great himalayan mountain range boasts of the tallest heads of the world.
➤ Most of the peaks remain under perpetual snow.
➤ In Greater Himalayas, the snow line is at lower elevation of the southern slopes than on the northern slopes because the southern slopes are steeper and received more rainfall.

HIGHEST PEAK OF THE GREATER HIMALAYAS

Peak Country Heights (in mtrs)

1. Mt. Everest — Nepal — 8,848
2. Kangchenjunga — India — 8,598
3. Makalu — Nepal — 8,481
4. Dhaulagiri — Nepal — 8,172
5. Nanga Parvat — India — 8,126
6. Annapurna — Nepal — 8,078
7. Nanda devi — India — 7,817
8. Namchabarwa — Tibet (China) — 7,756
9. Gurla Mandhata — Tibet — 7,728

Middle Himalayas (Lesser Himalayas or the Himachal)

➤ Lie to the south of Great Himalayas.
➤ Mountains and valleys are disposed in all direction.
➤ Its important ranges are ; Dhauladhar, Pirpanjal, Niaga-Tibba, Mussoorie.
➤ Important hill stations are : Dharmshala, Dalhousie, Shimla, Mussoorrie, Nainital, Darjelling, Chakrata, Almora, Chhail, Ranikhet .

Shivaliks :

➤ Southern most ranges of Himalayas are called Shivalik.
➤ Shivaliks are made of unconsolidated deposits of rivers.
➤ Shivaliks are prone to earthquakes and land slides.
➤ This is the outer Himalayas.
➤ This is called the sub Himalayan.

➤ Shivalik is known as Jammu Hills in Jammu and Dafla, Mishimi, Abor, in Arunachal Pradesh.
➤ It is the newest range.

IMPORTANT PEAKS OF INDIA

Highest peak of Himalayas in India : Kangchenjunga
Highest mountain peak in India : K 2 or Godwin Austen
Highest peak of Aravalis : Gurushikhar
Highest peak of Western Ghats : Anaimudi
Highest peak of Nilgiri : Dodabeta
Highest peak of Eastern Ghats : Mahendragiri
Highest peak of Rajmahal hills : Parasnath
Highest peak of Andaman & Nicobar : Saddle peak

Plains

THE NORTH INDIAN PLAINS

➤ The Great North Indian plain lies to the north of the peninsula and to the south of the Himalayas.
➤ The plain extends for 3200 km between the mouths of the Ganga and the Indus, all along the foot of the moutains, with a width varying from 150 to 300 km.
➤ The plain is narrowest in Assam with its width varying between 90 and 100 km.
➤ It is 160 km wide near the Rajmahal hills and 280 km near Allahabad.
➤ The plains were formed as a result of the filling of depression lying between the peninsula and the Himalayas by the depositional work of the Himalayan and peninsular rivers.
➤ It is erroneous to characterise the plains as an area of monotonous relief having little variety in its geomorphological features.
➤ Generally the plain is recognised as consisting of four divisions each characterised by important differences in surface relief. These divisions are : (i) Bhabar (ii) Terai (iii) Bhangar and (iv) Khadar.
➤ The Bhabar is a narrow belt of 8-16 km wide running east-west direction along foothills of Shiwaliks. The Himalyan rivers deposits their sediments creating alluvial fans along the foot hills. The fans consisting of gravel and unsorted sediments merge together to form the Bhabar belt .
➤ The Bhabar zone is studded with pebbles and it consists of porous beds.
The porosity is so high that all streams lose themselves in Bhabar.
➤ The Terai is marshy tract south of the Bhabar marked by reemergence of underground streams of the Bhabar belt. These streams convert large areas along the rivers into marshy lands of excessive dampness.
➤ The Bhangar refers to the upland formed by deposition of older alluvium in river beds. It is alluvial terrace above the flood plains, often impregnated with calcareous concentration known as Kankar .
➤ The **Khadar** is composed of newer alluvium and forms the flood plains along the river banks. It is a lowland formed by deposition of detritus of new alluvium in the river beds during floods every year.

Differences Khadar & Bangar

Khadar	Bangar
khadar is the newer and younger deposits of the flood plains	Bhangar is the older alluvium. It forms the largest part of the Northern plains
This type of alluvial soil found in the lower levels in the plains near the rivers.	Bhangar found in higher up in the plains at river terraces away from rivers
It is loamy and porous soil.	It is clayey and non-porous soil
It is more fertile than Bhangar as new layers are deposited year after year during monsoonal floods	It is less fertile than khadar as it is not renewed.
It is pale brown, sandy clays & loams, more dry & leached less calcareous & carbonaceous	It is generally dark coloured & of a more clayey composition.

➤ The Great Indian Plains of North India can be divided into the following four major regions.

(i) The Rajasthan or Western Plains (ii) The Punjab-Haryana Plains
(iii) The Ganga Plains (iv) The Brahmaputra Plains

➤ **The Rajasthan Plain :** The plain consisting of Thar or Marusthali,& the arid plain of Rajasthan. Luni is the only river flowing through this desert region. North of the Luni basin, there is a large area of inland drainage.

Eastern Thar Desert has several saline lakes such as Sambhar, Didwana, Degana, Sargol, Khatu etc. Sambhar is the largest salt lake in India.

➤ **The Punjab Haryana plain :** This part of the plain is formed as a result of deposits brought by five rivers (Satluj, Ravi, Chenab, Jhelum & Beas) and known as Punjab. It is primarily made up of Doabs (interfluves) - the land between two rivers.

➤ The important Doabs in this plain are :-

1. Bist -Jalandhar Doab between Beas and Satluj.
2. Bari Doab between the Beas and Ravi.
3. Rechna Doab between the Ravi and the Chenab.
4. Chaj Doab between Chenab and the Jhelum.
5. Sindsagar Doab between the Jhelum, Chenab and the Indus.

➤ **Ganga plain :** The plain stretches between Punjab- Haryana plain to the Sundarbans Delta region. The Ganga along with Yamuna, Gomti, Ghaghara, Gandak and Kosi has deposited large quantities of alluvium to build this fertile and densely populated region.

➤ The important doabs in this plain are :

(i) Ganga-Yamuna Doab (ii) Ganga-Ghaghra Doab
(iii) Ghaghra-Gandak (iv) Gandak-Kosi Doab (Mithila Plain)

➤ The Ganga plain is further divided into, Upper Ganga plain, Middle Ganga plain, and the Lower Ganga plain.

➤ **The Brahmaputra plain :** It is an aggradational plain built up by, depositional work of Brahmaputra and its tributaries. It is girdled by Purvanchal hills, Patkai Bum, Naga hills in the east, Garo-Khasi-Jaintia, Mikir hills and Meghalaya plateau in the south. Several islands have Originated because of the deposition of soil in the middle of the Brahmaputra.

'Majuli' is such island which is in Assam. It is the largest riverine island in the world.

The Peninsular Plateau

➤ It is a part of Gondvana land.
➤ Triangular in shape.
➤ Archaean age
➤ It is the oldest plateau not only in India but also in the World.
➤ Average height is 600-900 m.
➤ Its slopes towards north and east side and in southern part from west to east.

ARAVALLI REGION

➤ It is a fold mountain
➤ Its elevation is 800-900 m.
➤ It is a residual mountain range.
➤ It is older than Himalayas.
➤ Broader in South as compared to north.
➤ Elevation goes on decreasing from south to north.
➤ Gurushikhar is the highest peak of Aravalli.
➤ Gurushikhar is near Mount Abu in Rajasthan.
➤ Extends from Delhi Ridge to Ahmedabad.
➤ Aravalli acts as Gangetic water divide.
➤ Nakki lake is located at Mt. Abu.

It is very famous for tourists.

THE MALWA PLATEAU

- Lies between Aravallis and Vindhyan ranges.
- It is very affected by gully erosion.
- Rolling Plains are found on this plateau.
- Gwalior hills are lying to the north of this plateau.
- Chambal and its tributeries have turned the north of this plateau into ravines.

BUNDELKHAND — BAGHELKHAND— VINDHYACHAL

- The north-east side of Malwa Plateau is known as Bundelkhand
- Chambal and Yamuna rivers have made a bad land in Bundelkhand.
- Dhuandhar water falls is in Jabalpur.

MEGHALAYA PLATEAU

- It is an outlier of the Peninsular Plateau.
- Important ranges and peaks:

1. Dafla, Miri Abor and Mishmi — Eastern Himalayas
2. Patkai, Naga, Mizo, Barail, Rengma, Mikir — East side
3. Garo, Khasi, Jaintia — Meghalaya Plateau.

- Lakes — Loktak in Manipur with floating island.
- Mynsynram receives highest rainfall.
- Parks — Namdapha, Keibul Lamjao, Dampa, Norkrek.

SATPURA RANGE

- Satpuras are fold mountains.
- Mahadeo hills forms the highest portion.
- Dhupgarh is the highest peak of Satpura. It is near Panchmarhi in Madhya Pradesh.
- River Tapi rises from Panchmarhi.
- Narmada and Tapi rivers are west flowing rivers.
- Son river is the biggest tributary

WESTERN GHATS

- Form a continuous barrier from north to south almost parallel to the Arabian sea.
- Extended in 1600 km. long.
- General altitude is 900 – 1200 m.and width 50-80 km.
- It is standing as a wall. One can across through the pass.
- It is vertical to the south-west monsoon.
- It is the source of many big rivers.
- It is known as Sahyadri in Maharashtra and Karnataka, Nilgiri in Tamilnadu.
- Nilgiri is the meeting point of Western Ghats and Eastern Ghats.
- Hills of Western Ghats from North to South — Kalsubai — Harishchandra — Mahabaleshwar — Bababudan — Nilgiris — Annamalai— Palani — Cardamom.
- Doda Beta (2637) is the highest peak of Nilgiris.
- Udagamandalam (Ooty) is a hill station located in Nilgiris in Tamil Nadu.
- Anai Mudi is the highest peak of Western Ghats.
- Anai Mudi is located in Annamalai hills.
- It is falls in Kerala.
- Famous hill station Kodaikanal lies in Palani hills in Tamil Nadu.
- Pariyar lake is situated in Palani hills.
- Western Ghats is divided into two parts named — North Sahyadri and South Sahyadri.
- Western Ghats act as a water divide.

EASTERN GHATS

- Eastern Ghats form a discontinuous line of hills Parallel to east coast.
- General altitude is 600 m.
- Width is 190km in north and 75 km is south.

- Its width decreases from north to south because Peninsular Plateau is triangle is shape.
- Mahendragiri is the highest peak is in Odisha.
- It is not a source of any big river.
- It receives less rainfall.
- It is known by different names at different places —

1. Northern circars north of Godavari
2. Palkonda and Nallamala between Godavari and Palar river.
3. Shevaroy and Javadi as Tamil Nadu hills.

- Hills from north to south — Nallamala — Erralmala — Velikonda — Palkonda — Javadi — Shevaroy.

WEST COAST PLAINS

- Extend from Gujarat to Kerala.
- Known by different names at different states —1. Konkan in Gujarat and Goa 2. Kanara in Karnataka.

3. Malabar in Kerala.

- Plains are wider in south and narrower in the north.
- Garsopa falls (Jog falls) on Karnataka coast are highest in India.
- In Kerala, Coast has salt water lakes called lagoons.
- Ashtamudi and Vembanad are important lakes located here.

EAST COAST PLAINS

- Coastal strip along with Bay of Bengal is broader as compared to the Western coast.
- Known as Utkal plains in Odisha.
- Chilka lagoon is located in Odisha.
- Kolleru lake lies in Andhra Pradesh.
- Pulicat lake is located here.
- Coromandal Coast is in Tamil Nadu in south.
- It is formed by alluvium brought by rivers.
- Rivers of this coastal plains are longer and less erosine.
- Rivers form deltas
- This coast is prone to cyclone and floods.
- Ports are lesser than that of Eastern Coast Plains.

Islands

LAKSHADWEEP ISLAND

- Extend from 8°N — 12° N.
- Consists of 30 small islands, only 10 of which are populated.
- Population consists of moppilis from Kerala.
- Some islands are called Attol because of horseshoe shaped.
- Minicoy islands lie to the extreme south, it is the largest island of Lakhadeewp.

ANDAMAN AND NICOBAR ISLAND

- Extend from 6°3 9 ′N to 13°3 4 ′N.
- Consist of two groups — Andman Group and Nicobar Group
- They are submerged part of Arakanyoma (Myanmar). It is a mountain range.
- 10° channel separates Andman from Nicobar.
- Little Andman is separate from Great Andman by Duncan passage.
- Great Nicobar is the largest island in the group.
- Saddle peak is the highest peak of Andaman and Nicobar island located in North Andaman.
- Area is prone to earthquakes and tsunamis.
- Port Blair, the capital of Andaman and Nicobar Islands is situated in South Andaman.
- The barren Island which is India’s only active volcano is situated in the east of Middle Andaman.

➤ Tribes : Onges, Senthelese, Jarawas, Shompens.

CLIMATE

➤ The climate of India can be broadly describe as Tropical Monsoon Climate.
➤ Derived from the Arabic word 'Mausam' monsoon implies a seasonal reversal in the wind direction through the year.
➤ The monsoon regime emphasises the unity of India with the rest of south-east Asia region.
➤ The meteorologists usually recognise the following four seasons:-
(i) Hot weather season,
(iii) South-West Monsoon season, and
(iv) The Season of retreating Monsoon.
➤ Summer is India's hottest season.
Summer season starts in March with day times temperatures exceeding 30° C. Coastal India as well as the southern states of Tamil Nadu and Kerala experience high humidity. By May, most of interior India experience very high temperature (40° C) .
➤ Warm land surface creates large area of low pressure over north western India. This creates an onshore wind bringing the moisture laden maritime air from Indian Ocean to the land.
➤ **Southwest Monsoons:** The southwest monsoons supplies over 80 per cent of India's annual rainfall. It consists of two arms, the *Bay of Bengal* arm, and the *Arabian Sea* arm. Both arms are attracted to the low pressure area over the Thar desert in Rajasthan.
➤ The monsson makes its presence felt by the end of May. It starts around the 29th May , hitting the Andaman and Nicobar Islands in the Bay of Bengal. It strikes the mainland of Kerala on June 1. By 9th June, it hits Mumbai and Delhi by 29th June. By first week of July, the entire country experiences rain. Predictably, Southern India receives more rainfall than Northern India.
➤ The Bay of Bengal branch moves in the northwest direction whereas the Arabian Sea arm moves in the northeast direction.
➤ During this season, cyclones occur, causing widespread devastation to coastal regions.
Cherapunji and Mawsynram in Meghalaya, the world's wettest place, receive rainfall above 300 cms annually.
➤ The monsoons start, withdrawing by the last week of August.
By mid September, it has withdrawn from Mumbai and by October, the southwest monsoons have completely withdrawn from
➤ **Northeast Monsoons:** After the withdrawal of the monsoons, the northeast monsoons begin by November. Supplying 20 per cent of India's rainfall it doesn't cover the entire country but only the States of Tamil Nadu, West Bengal, Arunachal Pradesh, Karnataka, Kerala and Meghalaya.
➤ Cold mountain air travelling along the Brahmaputra river brings rain to the northeast region of India. This picks up moisture over the Bay of Bengal resulting in heavy rain in southern India.

FACTORS RESPONSIBLE FOR INDIAN MONSOON

1. The differential heating and cooling of land water creates low pressure on the landmass of India while the seas around experience comparatively high pressure.
2. The shift of the position of Inter Tropical Convergence Zone
(ITCZ) in summer, over the Ganga plain.
3. The presence of the high-pressure area, east of Madagascar, approximately at 20°S over the Indian ocean.
4. The Tibetan plateau gets intensely heated during summer, which result in strong vertical air currents and the formation of low pressure over the plateau at about 9 km above sea level.
5. 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.

DRAINAGE

- India has been adorned, with hundreds of large and small rivers, by the nature.
- The threefold physiographic division has an important bearing on the drainage of Indian Subcontinent.
- On the basis of their origin the river system of India can be classified into two categories:-

(i) The Himalayan rivers
(ii) The Peninsular rivers.

The Himalayan River System

- It is constituted by the Indus, the Ganga , the Brahmaputra and their tributaries.
- These rivers originate from the lofty Himalayan ranges and are named as the Himalayan rivers.
- These rivers have large basins and catchment areas.
- The total basin area of the Indus, the Ganga and the Brahmaputra is 11.78, 8.61 and 5.8 lakh square kilometres respectively.
- The Himalayan rivers flow through deep I-shaped valleys called gorges. These gorges have been carved out by down cutting carried on side by side with the uplift of the Himalayas . These are examples of antecedent drainage.
- The Himalayan rivers are perennial in nature, i.e., the water flows throughout the year in these rivers.
- These rivers receive water both from the monsoons and snowmelt.

The perennial nature of these rivers makes them useful for irrigation.

- These rivers flow across the young fold mountains and are still in a youthful stage.
- The upper reaches of the Himalayan rivers are highly tortuous.

When they enter the plains, there is a sudden reduction in the speed of flow of water. Under these circumstances these rivers form meanders and often shift their beds.

- The Himalayan rivers form big deltas at their mouths. The Ganga- Brahmaputra delta is the largest in the world.

The Peninsular River System

- The Peninsular rivers have shorter and shallower courses as compared to their Himalayan Counterparts.
- A large number of the Peninsular rivers are seasonal, as their flow is dependent on rainfall.
- The Peninsular drainage system is older than the Himalayan one.
- Most of the major rivers of the Peninsula such as the Mahanadi , the Godavari , the Krishna and the Cauvery flow Eastwards and drain into the Bay of Bengal .
- The Narmada and the Tapi are the only long rivers, which flow west and make estuaries rather than making a delta because of their swift flow and steep slopes.
- The drainage basins of the Peninsular rivers are comparatively smaller in size.
- Estuaries are partially enclosed bodies of water along coastlines where fresh water and salt water meet and mix.

River System of India

THE INDUS RIVER SYSTEM:

SOURCE: The Indus River rises in Tibet near Manas Sarovar Lake. Flowing westwards, it enters India in Ladakh district of Jammu and Kashmir.

COURSE: It flows through the states **of Jammu and Kashmir, Himachal Pradesh andPunjab** in India then enters Pakistan and flowing further south reaches the Arabian Sea, east of Karachi.

TRIBUTARIES: Zaskar, Nubra, Shyok, and Hunza are the tributaries in India. Ravi, Chenab, Sutlej, Jhelum, and Beas are the tributaries in Pakistan.

CHARACTERISTICS: The slope is very gentle **and with 2900 km length,** Indus River is one of the longest rivers in the world.

THE GANGES RIVER SYSTEM:

SOURCE: The Ganges River originates in Gangotri glacier as Bhagirathi and joined by Alaknanda at Devprayag, It turns into Ganga.

COURSE: The Ganga River enters plains in Haridwar and from there it flows eastwards enlarged by the tributaries joining from left and right. The river divides in West Bengal and the distributary Hooghly flows southward to reach the Bay of Bengal. The main river enters into Bangladesh and joins with Brahmaputra river.It covers the **states of Uttarakhand, Uttar Pradesh, Bihar and West Bengal.**

TRIBUTARIES: Yamuna River joins Ganga at Allahabad as a right bank tributary. Ghagra, Gandak and Kosi Rivers arising from Nepal Himalayas join as left bank tributaries. Chambal, Betwa and Son rivers from central Highlands join as right bank tributaries. It covers the states of Uttarakhand, Uttar Pradesh, Bihar

CHARACTERISTICS: The **length is 2500 km** and the slope is almost steep in the Himalayas and gentle in the plains. With more number of tributaries, the basin of the river is very huge.

BRAHMAPUTRA RIVER SYSTEM:

SOURCE: The Brahmaputra River originates in Tibet to the east of Manas Sarovar Lake.

COURSE: The Brahmaputra River mostly flow outside India from the point of its origin and in the middle course, **enters Arunachal Pradesh and later into Assam.** Then, it flows eastwards into Bangladesh. In Bangladesh, Brahmaputra River is called as River Padma.

TRIBUTARIES: In Arunachal Pradesh Dibang, Lohit and Kenula Rivers are its tributaries.

CHARACTERISTICS:The length of the river is 2900 km and is one of the longest rivers of the world.

PENINSULAR RIVER S :

These rivers are confined to the peninsular region **and are dependent on rainfall for water.** Unlike Himalayan Rivers, these rivers are **shorter with small basins.** NARMADA, TAPI, GODAVARI, KRISHNA, CAUVERY and MAHANADI are the main rivers.

NARMADA BASIN:

It originates in Amarkantak hills in Madhya Pradesh and flows towards the west to join the Arabian Sea. It covers the states of Madhya Pradesh and Gujarat.

TAPI BASIN:

It rises in Madhya Pradesh and covering the states of **Madhya Pradesh, Gujarat and Maharashtra** join the Arabian Sea.

GODAVARI BASIN:

It is known as DAKSHIN GANGA due to its area covered (over 1500 km). The Godavari River originates in Nasik in Maharashtra and covers the states of **Madhya Pradesh, Orissa, and Andhra Pradesh.** Flowing eastwards, it joins in the Bay of Bengal.

KRISHNA BASIN:

It rises near MAHABALESHWAR in Maharashtra and **covering an area of 1300 km** , it flows through **Maharashtra, Karnataka, and Andhra Pradesh and reaches the Bay of Bengal.**

CAUVERY BASIN:

Cauvery River originates in the Western Ghats and **covering an area of 760 km,** it reaches the Bay of Bengal in Tamil Nadu. The states covered are **Karnataka, Kerala and Tamil Nadu.**

Besides the above other rivers include Mahi, Sabarmati, Subarna Rekha and so on.

List of the Projects, State, Location and their Purpose

S. No.	Name of the Project	Location	State	Purpose
1	Nagarjuna Sagar multi-purpose Project	River Krishna	Andhra Pradesh	Irrigation, Hydroelectricity
2	Pochampad Project	River Godavari	Andhra Pradesh	Irrigation
3	Lower Sileru Project	River Sileru (Godavari)	Andhra Pradesh	Hydroelectricity
4	Kakrapar Project	River Tapi	Gujarat	Irrigation
5	Kothagudem Project	Singareni Coalfields	Andhra Pradesh	Thermal power

6	Kosi Project	River Kosi	Bihar	Flood Control, Irrigation, Hydroelectricity
7	Gandak Project	River Gandak	Uttar Pradesh. Bihar	Irrigation, Hydroetectricity
8	Dhuvaran Power Station	Kheda District	Gujarat	Thermal Power
9	Sabarigiri (Pamba Kakki) Project	River Pamba-Kakki	Kerala	Hydroelectricity
10	Idukki Project	Rivers Periyar, Cheruthoni, Idukki	Kerala	Hydroelectricity
11	Chambal Project	River Chambal	Rajasthan, Madhya Pradesh	Irrigation, Hydroelectricity
12	Tawa Project	River Tawa (Narmada)	Madhya Pradesh	Irrigation
13	Korba Project	Near Korba Coalfields	Chhattisgarh	Thermal Power
14	Satpura Power Station	Patharkada Coalfields	Madhya Pradesh	Thermal Power
15	Koyna Project	River Koyna	Maharashtra	Hydroelectricity
16	Nagpur Power Station	Koradi, near Nagpur city	Maharashtra	Thermal Power
17	Tungabhadra Multi-purpose Project	River Tungabhadra	Karnataka, Andhra Pradesh	Irrigation, Hydroelectricity
18	Upper Krishna Project	River Krishna	Karnataka	Irrigation
19	Sharavathi Project	River Sharavathi, Near Jog Falls	Karnataka	Hydroelectricity
20	Hirakund multi-purpose Project	River Mahanadi	Odisha	Irrigation, Hydroelectricity
21	Mahanadi Delta Project	River Mahanadi	Odisha	Irrigation
22	Bhakra Nangal Multi-purpose Project	River Sutlej	Himachal Pradesh, Punjab. Haryana	Irrigation, Hydroelectricity
23	Rajasthan Canal Project	River Sutlej in Punjab	Rajasthan, Headworks in Punjab	Irrigation
24	Kundah Project	River Kundah	Tamil Nadu	Hydroelectricity
25	Ramganga Multipurpose Project	Chuisot Stream near Kalagarh	Uttarakhand	Irrigation, Hydroelectricity
26	Matatila Multipurpose Project	River Betwa	Uttar Pradesh. Madhya Pradesh	Irrigation, Hydroelectricity
27	Rihand Scheme	River Rihand	Uttar Pradesh	Hydroelectricity
28	Damodar Valley Project	River Damodar	Jharkhand, Shared with West Bengal	Flood Control, Irrigation, Hydroelectricity
29	Ukai Project	River Tapi	Gujarat	Irrigation
30	Mahi Project	River Mahi	Gujarat	Irrigation
31	Ghataprabha Project	River Ghataprabha	Andhra Pradesh and Karnataka	Irrigation
32	Bhima Project	River Bhima	Maharashtra	Irrigation
33	Sardar Sarovar Project	River Narmada	Gujarat and Madhya Pradesh	Irrigation and Hydroelectricity

34	Bansagar Project	River Son	Madhya Pradesh, Chhattisgarh	Irrigation
35	Dul Hasti Project	River Chenab	Jammu and Kashmir	Hydroelectricity
36	Salal Project	River Chenab	Jammu and Kashmir	Hydroelectricity
37	Their Dam Project	River Ravi	Punjab	Irrigation, Hydroelectricity
38	Malaprabha Project	River Malaprabha	Karnataka	Irrigation
39	Jayakwadi Project	River Godavari	Maharashtra	Irrigation
40	Beas Project	River Beas	Punjab and Haryana	Hydroelectricity
41	Sharda Sahayak	River Ghaghra	Uttar Pradesh	Irrigation
42	Mayurakshi Project	River Mayurkhsi	West Bengal	Irrigation, Hydroelectricity
43	Rana Pratap Sagar project	River Chambal	Rajasthan	Hydroelectricity
44	Mettur Project	River Cauvery	Tamil Nadu	Hydroelectricity
45	Pallivasal Project	River Munnar Abuja	Kerala	Hydroelectricity
46	Papanasam Project	River Thamirabarani	Tamil Nadu	Hydroelectricity
47	Loktak Project	Lake Loktak	Manipur	Hydroelectricity
48	Tehri Project	River Bhagirathi (Ganga)	Uttarakhand	Hydroelectricity
49	Farakka Project	Ganga	West Bengal	Irrigation
50	Daman Ganga	River Daman Ganga	Gujarat	Irrigation and River Link
51	Gima Project	River Gima (Tributary of Tapi)	Maharashtra	Irrigation and River Link
52	Pamba Project	River Pamba	Kerala	River Conservation and Irrigation
53	Tapovan-Vishnugarh	River Alaknanda	Uttarakhand	Hydroelectricity
54	Omkareshwar	River Narmada	Madhya Pradesh	Hydropower and Irrigation

Rivers and Disputing States

River	Disputing States
Krishna	Maharashtra, Andhra Pradesh, Karnataka
Godavari	Maharashtra, Andhra Pradesh, Madhya Pradesh, Odisha, Karnataka
Cauvery	Kerala, Karnataka, Tamil Nadu, Puducherry
Narmada	Rajasthan, Madhya Pradesh, Gujarat, Maharashtra
Mahadayi/mandovi	Goa and Karnataka
Vansadhara	Andhra Pradesh and Odisha
Ravi and Beas	Punjab and Haryana
Mullaperiyar	Kerala and Tamil Nadu

Important Falls in India

Water Fall	Height in Meters	River	Location
Kunchikal falls	455	Varahi	Karnataka
Langshiang falls	337	Kynshi	Meghalaya
Nohkalikai falls	335	—	Meghalaya
Nohshgithiang	315	—	Meghalaya
Dudhzagar falls	310	Mandovi	Goa
Kynoem falls	305	—	Meghalaya
Meenmutty falls	300	Karimpuzha	Kerala
Thalaiyar falls	297	Majjalar	Tamil Nadu
Barkana falls	259	Sita	Karnataka
Barchipani falls	399	Budhabalanga	Orissa

Lakes of India

Wular Lake Jammu & Kashmir	Bhim Tal Uttarakhand
Lonar Maharashtra	Sambhar Rajasthan
Kolleru Andhra Pradesh	Sukhna Chandigarh
Loktak Manipur	Parashuram Kund Arunachal Pradesh
Dal Lake Jammu & Kashmir	Pongong Tso Jammu & Kashmir
Naini Tal Uttarakhand	Tso Morari Jammu & Kashmir
Salt Lake Kolkata	Nakki Lake Rajasthan
Chilka Odisha	Pushkar Lake Rajasthan
Pulicut Andhra Pradesh	Udaipur Lake Rajasthan
Vembanad Kayal Kerala	Upper & Lower Lake Bhopal, MP
Ashtamudi Kerala	Nizam Sagar Hyderabad

Main Rivers and their Tributaries

Rivers	Left Bank Tributaries	Right Bank Tributaries
Indus	Zaskar, Panjnad, Nubra	Shyok, Gilgit, Kabul
Mahanadi	Ib, Mand, Hasdo, Sheonath	Ong, Jonk, Tel
Godavari	Penganga, Wardha, Wainganga, indravati and Sabari	Manjira
Krishna	Bhima, Doni, Musi, Muneru	Malprabha, Ghatprabha, Tungabhadra
Cauvery	Herangi, Hemavati, Lokpavani, Srimsha and Arkavati	Laksmantirtha, Kabani, Suvarnavati, Bhavani and Amaravati
Narmada	Burhner, Banjar, Sher, Shakkar, Towa and Kundi	Hiran, Barna, Kolar
Tapi	Sipra, Kapra, Khursi, Mona, Girna, Bori, Amaravati	Purna, Betul, Patki, Suki, More, Arunavati, Gomai
Ganga	Gomati, Ghanghara, Gandak, Burhi Gandak and Kosi	Yamuna, Son, Punpun
Yamuna	Tons	Chambal, Sind, Betwa, ken

Difference between the Himalayan & the Peninsular River

S. No.	Aspects	Himalayan River	Peninsular River
1	Place of Origin	Himalayan Mountain covered with glaciers	Peninsular Plateau & Central highland
2	Nature	Perennial	Seasonal
3	Type of Drainage	Antecedent & consequent leading to dendritic pattern in plains	Super imposed, rejuvenated resulting in trellis, radial & rectangular patterns
4	Basins	Very large basins	Relatively smaller basin
5	Depth & Valleys	Rivers form deep vallays & gorges in their source areas	River valleys are often shallow
6	Flow of water	Cause much erosion & have great flow of water	Create much less erosion & also have weaken flow of water.
7	Irrigation	Irrigate the northern plains	Irrigate the Deccan Plateau.
8	Stage	Young & active	Old rivers with graded profile.

Longest Rivers Flowing in India

River Length (km)	River Length (km)
Ganga 2510 Godavari 1465 Sutlej 1440	Krishna 1400 Yamuna 1376 Narmada 1289

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NATURAL VEGETATION AND WILDLIFE

MAJOR INDIAN FOREST TYPES

(1) Tropical Evergreen Forest

➤ **Region :** Areas having 200-300 cm or more annual rainfall such as windward side of Western Ghats, North-Eastern hills of India, Andaman and Nicobar Islands.

➤ **Important trees :** Rosewood, Shisham, Ebony, Mahogany, etc.

(2) Tropical Monsoon Forests

➤ **Region :** Areas having annual rainfall between 100-200 cm (in Orissa, Madhya Pradesh, Chhattisgarh, Jharkhand, Tamil Nadu and Karnataka).

➤ **Important trees :** Sal, Teak, Sandalwood, Myrobalan, Bamboo, Rosewood, Ebony, Shisham, etc.

(3) Tidal or Littoral Forests

➤ **Region :** Areas of West Bengal, Andaman and Nicobar, Orissa and Andhra Pradesh having annual rainfall above 200cm. (deltaic regions).

➤ **Important trees :** Sundari

(4) Montane Forests

➤ **Region :** Eastern and Western Himalayas and Nilgiri, regions of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Kerala and Tamil Nadu.

➤ **Important trees :** The type of trees depends on the height of mountain: Sal (lower Shiwalik range); Chir (higher range); and Pine, Cedar, Fir, Spruce,(1,600-3,300m).

(5) Thorn Forests

➤ **Region:** Areas of Rajashtan, Punjab and Gujarat having annual rainfall between 25 to 80cm.

➤ **Important trees :** Khajuri, Khair, Kikar and Babul.

No.	Vegetation type	Distribution	Characteristic vegetation
1.	Tropical Wet Evergreen	In areas where the annual rainfall is over 250 cm and the average annual	Lofty, very dense, multilayered forest with mesosphytic evergreens, e.g., bamboos,

	Vegetation	humidity exceeds 77 per cent (North-East states, western portions of the Western Ghats and Andaman and Nicobar).	ebony, rose wood, champa, toon, jamun, mesa, white cedar, mahogony.
2.	Tropical Semi-Evergreen Vegetation	Found in regions where the annual rainfall is between 200-250 cm and the humidity approaches 75% (Upper Assam, lower eastern Himalayas, Orissa, the Andaman and Nicobar islands & Western Coast).	Evergreen trees mixed with deciduous ones, less dense but more gregarious e.g., aini, semul, gutel, kadam, irul, thorny bamboo, rosewood, Kusum, hollock bonsum, white cedar, Indian chestnut, champa, mango, bamboos etc.
3.	Tropical Dry Evergreen Vegetation	In areas where the mean rainfall is about 100 cm, mostly from north-east monsoon, the mean annual humidity is 75%, and the mean annual temperature is 28°C (Tamil Nadu coast).	Short statured trees, with complete canopy, coriaceous leaved trees of short boles, no canopy layer differentiation. e.g., khirmi, jamun, kokko, toddy palm, tarrina, ritha, neem etc.
4.	Tropical Moist Deciduous Vegetation (Also known as monsoon forest)	In areas having moderate rainfall of 100- 200 cm, a mean annual temperature of about 27°C, and an average relative humidity of 60 to 75% (Western Ghats, Odisha, eastern coastal plains, and Himalayan foothills).	Trees which shed their leaves during spring & early summer season, very useful forests because they yield valuable timber & several other forest products, heavily buttressed trees, shrubby undergrowth with patches of bamboos, climbers & canes. e.g. sal, teak, sandalwood, siris, palas, mahua, sisam, amla etc.
5.	Tropical Dry Deciduous Vegetation	In areas where rainfall is less than 150 cm and dry period is relatively long (eastern Rajasthan, Kathiawar, rain shadow area of the Deccan plateau, Central India).	Trees which grow relativity shorter then the tropical moist deciduous trees closed & uneven canopy. Examples include teak, sal, bijasal, palas, khair, tendu, rosewood, anjar etc.
6.	Tropical Thorny Vegetation	Mostly prevalent in areas having very low rainfall, i.e., 50 cm to 75 cm, the annual mean temperature between 25°C and 30°C, and the annual humidity less than 50% (Kutchh, Saurashtra, Punjab, Haryana, Rajasthan, Upper Ganga plains and the Deccan plateau).	Open stunted forest breaking down into xerophytic bush, e.g., babul, accasia, senegal, ber, khair, ak, neem, Cactii etc.
7.	Sub-Tropical Vegetation	Found at 1,000-2000 m altitude in eastern and western Himalayas, and drier areas of Kashmir.	Luxurious forests of evergreen species. Eg. – Oak, chestnut, ash, birch, pine, sal, chir pine, oak, wild olives.
8.	Himalayan Dry Temperate Vegetation	In the inner dry ranges of the Himalayas where precipitation is below 10 cm. (Ladakh Lahul, Chamba, Kinnaur, Garhwal, Sikkim).	Predominantly coniferous forests with xerophytic shrubs, e.g., chilgoza, deodar, oak, maple, ash, celtis, etc.
9.	Himalayan or Montane/ Mountain Moist Temperate Vegetation	In the temperate eastern and western Himalayas, between 1,500 m and 3,300 m (Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Darjeeling).	Broad leaved evergreens mixed with dominant coniferous species, generally 30 to 50 m high, open forest with shrubby undergrowth. e.g., deodar, spruce, maple, ash, pine, fir, beach, etc.

10.	Himalayan or Montane/ Mountain Wet Temperate Vegetation	Found between 1,800 m and 3,000 m of altitude (eastern Himalayas, Nilgiris, the Annamalai, Palni hills of South India, Sikkim, Nagaland, hills of West Bengal, Assam, Arunachal Pradesh) where average rainfall is between 150 cm and 300 cm. & humidity is over 80%.	Evergreen forests, short-boleds branchy trees, dense and rounded leaves. Examples include oak, magnolia, chilauni, birch, plum, deodar, laurel and maple.
11.	Sub-Alpine and Alpine Vegetation	Above 2,900 m of altitude in the eastern Himalayas and above 3,500 m of altitude in the western Himalayas and extends up to the snowline.	Dwarf shrubs which degenerate into a low evergreen scrubs and into xerophytic vegetation; examples include fir, juniper, pine birch and *Rhododendron* , *spruce* .
12.	Littoral or Tidal or Delta or Swamp Vegetation	In and around the tidal creeks and along the deltas of the rivers Ganga, Mahanadi, Krishna and Godavari.	Evergreen trees having profuse growth and stiltlike roots, e.g., sundari in the great Sunderban delta, *Rhizophora* , nipa fruiticans (a type of palm), palms, keora, amur etc.

1. Jammu and Kashmir	**8. Uttar Pradesh**	**13. Bihar**	**19. Sikkim**	**29. Kerala**
National Parks	Dudwa	Valmiki	**National Parks**	Eravikulam
Dachigam	**Sanctuaries**	**Sanctuaries**	Khangchendzonga	Periyar
Hemis	Chandra Prabha	Bhimbandh	**Sanctuaries**	Silent Valley
Kishtwar	Chilla	Chandra Prabha	Fambong Lho	**Sanctuaries**
Sanctuaries	Hastinapur	Kabar	Kyongasia Alpine	Aralam
Baltal	Kaimur	Kaimur	Maenam	Chimony
Changthang	Kateraniaghat	Nakti Dam	Shingba Rhododendron	Chinnar
Gulmarg	Kishanpur	Rajgir	**20. Manipur**	Idukki
Hirpora	Maahavir Swamy	Valmikinagar	Keibul Lamjao	Neyyar
Hokarsar	National Chambal	Udaipur	Siroi	Parambikulam
Kanji	Nawabganj	**14. Jharkhand**	**Sanctuary**	Peechi Vazhani
Karakoram	Ranipur	Dalma	Yagoupokpi Lokchao	Peppara
Lachipora	Samaspur	Gautam Buddha	**21. Meghalaya**	Periyar
Limber	Sohagabarwa	Hazaribagh	Balphakram	Shendurney
Nandini	**9.**	Koderma	Nokrek	Thattekkad

	Uttaranchal			Bird
Overa	**National Parks**	Lawalong	**Sanctuary**	Wynad
Overa-Aru	Corbett	Mahuadanr	Bhagmara	**30. Tamil Nadu**
Ramnagar	Gangotri	Palamau	Nongkhyllem	Guindy
Surinsar-Mansar	Govind	Parasnath	Siju	Indira Gandhi
Tongri	Nanda Devi	Topchanchi	**22. Arunachal Pradesh**	or Anamalai
2. Himachal Pradesh	Rajaji	**15. Maharashtra**	Mouling	**Sanctuaries**
National Parks	Valley of flowers	**National Parks**	Namdapha	Kalakad
Great Himalayan	**Sanctuaries**	Gugamal	**Sanctuaries**	Karikili
Pin Valley	Askot	Nawegaon	D’Ering Memorial	Mudumalai
Sanctuaries	Binsar	Sanjay Gandhi	Dibang Valley	Mukurthi
Bandli	Govind Pashu	Tadoba	Eagle nest	Mundanthurai
Chail	Kedarnath	**Sanctuaries**	Itanagar	Point Cali mere
Churdhar	Sonanadi	Andhari	Kamlang	Pulicat
Daranghati	**10. Madhya Pradesh**	Aner Dam	Kane	Srivilliputhur
Darlaghat	**National Parks**	Bhimashankar	Mehao	Vedantangal
Gamgul Siahbehi	Bandhavgarh	Bor	Pakhui	Vettangudi
Gobind Sagar and Naina Devi	Dinosaur Fossils	Chandoli	Sessa Orchid	**31. The Andaman Islands**
Kais	Ghati	Chaprala	**23. Mizoram**	**National Parks**
Kalatop & Khajjiar	Kanha	Dhakna Kolkaz	Murlen	Campbell Bay
Kanawar	Madhav	Gandhari	Phawngpui	Galathea
Khokhan	Panna	Gautala Autramghat	**Sanctuaries**	Wandur
Kugti	Pench	Great Indian Bustard	Dampa	Mount Harriet Island
Lippa Asrang	Sanjay	Jaikwadi	Khawnglung	Saddle Peak

Majathal	Satpura	Kalsubai Harishchandra	Ngengpui	**Sanctuaries**
Manali	Van Vihar	Katepurna	**24. Nagaland**	Barren Island
Naina Devi	**Sanctuaries**	Koyna	Nitangki	Battimalve Island
Nargu	Achanakmar	Malvan Marine	Pulebatze	Benett Island
Pong Dam Sanctuary	Badankhoh	Melghat	Fakim	Bluff Island
Raksham Chitkul	Bagdara	Nagzira	**25. Tripura**	Bondoville Island
Renuka	Barnawapara	Nandur Madmeshwar	Charilam	Buchaan Island
Rupi Bhabha	Bhairamgarh	Painganga	Sepahijala	Cinque Island
Sechu Tuan Nala	Bori	Phansad	Rishna	Crocodile (Lohabrrack)
Shikari Devi	Gandhi Sagar	Radhangiri	Bison	Defence Island
Shilli	Ghatigaon	Sagareshwar	Clouded Leopard	East (Inglis) Island
Simbalbara	Gomardah	Tansa	**26. Assam**	East Island
Talra	Karera	Wainganga	Kaziranga	Flat Island
Tirthan	Ken Gharial	Yawal	Nambiar	Interview Island
Tundah	Kuno-Palpur	**16. Gujarat**	Dibru-Saikhowa	James Island
3. Punjab	Kheoni	Vansda	**Sanctuaries**	Kyd Island
Sanctuaries	Narsingarh	Gir	Dipor Beel	Landfall Island
Abohar	National Chambal	Marine (Gulf of Kutch)	Garampani	Narcondum Island
Harike Lake	Noradehi	Velavadar/Blackbuck	Laokhowa	North Reef Island
Bir Gurdialpura	Pachmarhi	**Sanctuaries**	Manas	Paget Island
Bir Bunnerheri	Palpur	Balaram-Ambaji	Nameri	Pitman Island
Bir Motibagh	Pamed Wild Buffalo	Barda	Orang	Point Island
4. Haryana	Panpatha	Dhumkhal	Pabha	Ranger Island
Sultanpur	Pench	Gir	Pobitara	Fleef Island
Sanctuaries	Fensatallite	Jambughoda	Sonai Rupai	Roper Island

Bir Shikargarh	Ratapani	Jessore	**27. Andhra Pradesh**	Ross Island
Chautala	**Major Wildlife Reserves**	Khijadiya	**National Parks**	Sandy Island
5. Delhi	Sailana Florican	Kutch Desert	Shri Venkataswara	Shearme Island
Indira Priyadarshini	Sanjay (Dubrj)	Marine (Gulf of Kutch)	**Sanctuaries**	Sir Hugh Rose Island
6. Chandigarh	Sardarpur Florican	NalSarovar	Coringa	South Brother Island
Sukhna	Samarsot	Narayan (Chenkars)	Eturnagaram	South Reef Island
7. Rajasthan	Singhori (Sindhari)	Sarovar	Gundlabrahmeswaram	South Sentinel Island
National Parks	Sitanadi	Paniya	Koundinya	Spike Island
Desert	Sone Gharial	Purna	Kawai	Swamp Island
Keoladeo	Tamor Pingla	Rampara	Kinnerasani	Table (Delgarno) Island
Ranthambore	Udanti Wild Buffalo	Ratanmahal	Kolleru	Table (Excelsior) Island
Sariska	**11. Chhattisgarh**	Shoolpaneshwar	Krishna	Talabaicha Island
Sanctuaries	Indravati	Wild Ass	Lanjamadugu	Temple Island
Bandh Bartha	Kanger Ghati	**17. Goa, Daman and**	Manjira	Tillonchang Island
Bassi	**12. Odisha**	**Diu**	Nagarjunasagar-Srisailam	West Island
Bhensrodgarh	**National Parks**	Bhagwan Mahavir	Neelapattu	
Darah	Bhitar Kanika	**Sanctuaries**	Pakhal	
Jaisamand	Simlipal	Bhagwan Mahavir	Papikonda	
Jamwa Ramgarh	**Sanctuaries**	Cotigao	Pocharam	
Jawahar Sagar	Badrama	**18. West Bengal**	Pranahita	
Keladevi	Baisipalli	**National Parks**	Pulicat	

Kumbhalgarh	Balukhand Konark	Neora Valley	Rollapadu	
Mount Abu	Bhitarkanika	Singalila	Srilanka Malleswara	
Nahargarh	Chandaka Dampara	Sundarban	Siwaram	
National Chambal	Chilka Lake (Nalaban)	**Sanctuaries**	**28. Karnataka**	
National Garhial	Debrigarh	Buxa	**National Parks**	
Phulwari	Hadgarh	Bibnutibhushan	Anshi	
Ramgarh Bundi	Karlapat	Betuadahary	Bandipur	
Sawai Mansingh	Khalasuni	Ballavpur	Bannerghatta	
Shergarh	Kotgarh	Chapramari	Kudremukh	
Sita Mata	Kuldiha	Gorumara	Nagarhole	
Sunda Mata	Lakhari Valley	Halliday Island	**Sanctuaries**	
Todgarh Raoli	Satkosia Gorge	Jaldapara	Arabithittu	
TalChapper	Simlipal	Jorpokhri	Dandeli	
Van Vihar	Sunabeda	Lothian Island	Ghataprabha	
	Ushakothi	Mahananda	Biligiri	

	Name	**Location**	**Fauna**
1.	Nilgiri Biosphere Δ	Western Ghat	Nilgiri Tahr,
2.	Reserve, Tamilnadu, Kerala Karnataka	Western Himalyas Coast	Lion talked macaque
3.	Nanda Devi, Utrakhand Δ	East Himalayas	—
4.	Gulf of Mannar, Tamilnadu Δ	Gangatic Delta	Dugong
5.	Nokrek, Meghalya Δ	East Himalayas	Red Panda
6.	Sunderbans, West Bengal Δ	Deccan Peniusula	Royal Bengal Tiger
7.	Manas, Assam	Eastern Himalayas Semi-Arid	Red Panda
8.	Simlipal, Odissa Δ	Maikals Hills	Royal Bengal Tiger,
9.	Dihang - dibang, Arunachal Pradesh	Desert	Ganv, Wild elephant

10.	Panchmarhi Biosphere Δ	Western Himalayas	—
11.	Amerkantak, Madhya Padesh Chhatisgarh Δ	East Himalayas	Flying squirrel
12.	Rann of Kutch, Gujarat	Western Glats	Giant Squirrel
13.	Pin valley national park	Islands	Indian wild ass
14.	(Cold Desert), Himachal Pradesh	East Himalayas	Show Leopased
15.	Khangchendzonga, Sikkim	Eastern Ghats	Red Panda
16.	Agasthyamalai Biosphere resurve, Kerala,	Catchment area of Ken River	Nilgiri Tahr Elephants
17.	Tamilnadu	Western Ghat	Saltwater Crocodile
18.	Nicobar Biosphere Reserve, A & Nicobar,	Western Himalyas Coast	Golden Langur
19.	Islands Δ	East Himalayas	Tiger, Chital, Chinkara,
20.	Dibru-Saikhowa, Assam	Gangatic Delta	Sembhar and Sloth bear
21.	Seshachalam Hills, Andhra Pradesh	East Himalayas	Nilgiri Tahr,
22.	Panna, Madhya Pradesh	Deccan Peniusula	Lion talked macaque

MINERALS

Mineral	**Ore**	**Found in**	**Features**
Iron	Magnetite—the best quality of iron ore and contains 72% pure iron. Haematite-contains 60 to 70% pure iron. Limonite-contains 40 to 60% pure iron. Siderite-contains many impurities and has just 40 to 50% pure iron.	Odisha (Sonai, Mayubhanj, Keonjhar), Jharkhand and Bihar (Singhbhum Hazaribagh, Palamau, Shahbad), Chhattisgarh and Madhya Pradesh (Raipur, Durg, Bastar, Raigarh, Bilaspur, Jabalpur, Balaghat), Andhra Pradesh (Krishna, Kurnool, Chittor, Cuddapha, Warangal, Guntur), Tamil Nadu (Salem, Tiruchirapalli), Karnataka (Ballary, Chitradurg, Chikmagalur),	India has the world's largest reserves, approximately one fourth of world's known reserves; Jharkhand has the largest reserves accounting for about 25% of the total reserves of iron ore in India.

		Maharashtra (Ratnagiri, Chanda), Goa	
Coal (Black Gold)	Anthracite Coal—the best quality of coal and contains 80 to 95% carbon. It is found only in Jammu and Kashmir in small quantity. Bituminous coal—The most widely used coal and contains 40 to 80% carbon. It is found in Jharkhand, Orissa, West Bengal, Chhattisgarh and Madhya Pradesh. Lignite– Also known as brown coal. It is a lower grade coal and contains about 40 to	Bihar-Jharkhand-Bengal belt (Raniganj, Jharia, Giridih, Bokaro, Karanpur), Madhya Pradesh and Chhattisgarh belt (Singrauli, Korba, Raigarh, Sonhat, Sohagpur. Umaria), Odisha (Desgarh, Talcher), Maharashtra (Chand), Andhra Pradesh (Singreni), Assam (Makum, Lakhimpur); in small quantities in Arunachal Pradesh, Meghalaya, Jammu and Kashmir, and Nagaland	"About one-fourth of India's coal reserves lie in the DamodarValley, across Bihar, Jharkhand, and West Bengal. India is the fourth largest coal producing country in the world according to 1992 coal production in the country."
Manganese	India has the second largest manganese ore reserves in the world after Zimbabwe. India is the fifth largest producer in the world after Brazil, Gabon, South Africa and Australia.	Odisha (Keonjhar, Kalahandi, Mayurbhaj, Talcher) Madhya Pradesh (Balaghat, Seoni, Chhindwara, Jabalpur), Maharashtra (Nagpur, Bhandara, Ratnagiri), Gujarat (Panchmahal), Karnataka (Chitradurg, Tumkur, Shimoga, Chikmagalur, Belgaum, North Canara, Dharwar), Jharkhand (Singbhum), Andhra Pradesh (Visakhapatnam), Rajasthan (Udaipur, Bansawara)	Orissa is the leading producer of manganese in the country. India ranks third in world in manganese production.
Mica	The three major types of mica found in India are – Muscovite, Phlogopite and Biotite.	Bihar (Gaya), Jharkhand (Hazaribagh), Rajasthan (Ajmer, Shahpur, Tonk, Bhilwara, Jaipur), Andhra Pradesh (Nellore)	India has largest deposits of mica in world India alone contributes about two-thirds of the world's production
Bauxite (aluminium ore)	Jharkhand (Palamu), Gujarat (Kaira), Madhya Pradesh (Katni, Jabalpur, Balaghat, Bilaspur, Bastar), Tamil Nadu (Salem), Karnataka (Chitradurg, Belgaum), Maharashtra (Kolhapur), Jammu and Kashmir (Kotli)	Third largest producer in the world.	
Copper	India contributes to about 3.5 to 4% of the world's total production of copper.	Jharkhand (Singhbhum, Hazaribagh), Rajasthan (Khetri, Alwar, Bhilwara, Jhunjhunu, Sirohi), Andhra Pradesh (Guntur, Khamman, Agnigundala), Karnataka	Very meager reserves; almost all copper comes from Singbhum and Hazaribagh in Jharkhand and Khetri in Rajasthan.

		(Chitradurg, Hassan, Chikmagalur, Raichur), Madhya Pradesh (Balaghat), Gujarat (Banaskantha); some quantities also found in Sikkim, Uttar Pradesh, and Tamil Nadu.	
Crude oil	51.08 crore tones	Assam, Tripura, Manipur, West Bengal, Ganga Valley, Himachal Pradesh, Kutch of West Bengal coast, Orissa, Andhra Pradesh, Maharashtra, and Gujarat.	
Lignite	429 crore tones	Tamil Nadu (Neyveli fields) Some deposits also found in Gujarat, Punducherry, Rajasthan (Palana fields), Jammu and Kashmir (Riasi fields).	Maximum deposits of about 383 crore tones, are found in Tamil Nadu.
Gold	India's contribution to gold production across the world is less than one percent (0.75%).	Karnataka (Kolar gold fields, Hutti Mines), in small quantities in Andhra Pradesh (Ramgiri gold fields and Anantpur).	Karnataka was the leading producer of gold accounting for 99% of the total production. The remaining production came from Jharkhand.
Magnesite	23.91 crore tones	Tamil Nadu (Salem), Uttranchal (Almora, Chamoli, Pithoragarh), Karnataka (Mysore, Hassan)	

Petroleum

- It is of Organic Compounds (Material).
- It is found in sedimentary basins.
- Assam is the oldest oil producer of India.
- Oil was first discovered at Makum in 1867 in Assam.

Oil fields

- **Bombay High :** ONGC has discovered oil in 1974
- 2/3 oil is produced here.
- It is the largest petroleum production oil field in India.
- Basin deposits of oil and natural gas.
- Gujarat coast : 3rd largest oil producing of the country.

Ankleshwar : Gujarat Lune : Gujarat Mehsana : Gujarat Kalol : Gujarat Kosamba : Gujarat

The Brahmaputra Valley

- Crude oil was first discovered in the Brahmaputra valley.
- The oil bearing rocks are spread from the Dehang Basin up to the Swime
- **The Nahorkatia oil field :** This oil field lies the south west of Digboi.
- **Arunachal Pradesh :** Manabhum, Kharasang and Charali.
- **Rajasthan :** In Rajasthan, oil discoveries were made by British Agency cairn in Burmen district.

Power Resources in India

➤ There are three major means of electrical energy production in India thermal energy, hydro-electrical energy and atomic energy . Also Renewable Energy is emerging as the major source of electricity which contribute about 10% energy production of India .

Use of Resources for Electricity production in India.

1. Thermal (total) 64.98 %
(a) Coal 54.09%
(b) Gas (Natural Gas) 10.20%
(c) Oil 0.69%
2. Hydro-electricity (Renewable) 21.64%
3. Nuclear 2.75%
4. Renewable Energy Sources 10.63%

Note : Renewable Energy sources, includes, Solar energy, Wind energy, Tidal energy, Geothermal energy, Small Hydro project, Biomass Gasifier, etc.

Sectorwise Consumption of Electricity (%) in India

1. Industrial 43.83%
2. Domestic 22.46 %
3. Agriculture 18.03%
4. Commercial 8.72%
5. Railways 1.72%
6. Others 5.23%

Atomic Power Stations in India

1. Tarapur Palghar district, Maharashtra
2. Rawatbhata Kota district, Rajasthan
3. Kalpakkam Kanchipuram district, Tamil Nadu.
4. Narora Bulandshahar district, U.P.
5. Kakrapara Surat District, Gujarat
6. Kaiga North Kanara district, Karnataka
7. Kudankulam Tirunelveli, Tamil Nadu

Major Power Plants Thermal Power Plant

Power Station	Operator	Year of Establishment	Location	District	State
Talcher Super Thermal Power Station	NTPC	1995	Kaniha	Angul	Odisha
Sipat Thermal Power Plant	NTPC	2008	Sipat	Bilaspur	Chhattisgarh
Vindhyachal Super Thermal Power Station	NTPC	2013	Singrauli	Vindhya Nagar	Madhya Pradesh
Mundra Ultra Mega Power Project	Tata Power	2009	Mundra	Kutch	Gujarat
Korba Super Thermal Power Plant	NTPC	1983	Jamani Palli	Korba	Chhattisgarh
Bhusawal Thermal Power Station	MAHAGENCO	1968	Deepnagar Jalgaon	Jalgao	Maharashtra
Satpura Thermal Power Station	MPPGCL	1967	Sarni	Betul	Madhya Pradesh
Sterlite Jharsuguda Power Station	Vedanta	2006	Jharsuguda	Jharsuguda	Odisha
Durgapur Thermal Power Station	DVC	1996	Durgapur	Bardhaman	West Bengal

Nuclear Power Plant

Power Station	Operator	Establishment Year of	Location	District	State
Tarapur Atomic Power Station	NPCIL	1969	Tarapur	Thane	Maharashtra
Rajasthan Atomic Power Station	NPCIL	1973	Rawatbhata	Chittorgarh	Rajasthan
Kakrapar Atomic Power Station	NPCIL	1993	Kakrapar	Surat	Gujarat
Kudankulam Nuclear Power Plant	NPCIL	2013	Kudankulam	Tirunelveli	Tamil Nadu
Kaiga Nuclear Power Plant	NPCIL	2000	Kaiga	Uttara Kannada	Karnataka
Madras Atomic Power Station	NPCIL	1984	Kalpakkam	Kancheepuram	Tamil Nadu
Narora Atomic Power Station	NPCIL	1991	Narora	Bulandshahar	Uttar Pradesh
Gorakhpur Atomic Power Station	NPCIL	Fatehabad	Fatehabad	Haryana	

Hydro Power Plant

Power Station	Operator	Establishment Year of	Location	State
Bhakra Dam	BBMB	1963	Bilaspur	Himachal Pradesh,
Tehri Dam	THDC India Limited	2006	Tehri	Uttarakhand
Machkund	APGENCO	1955	Jeypore	Andhra Pradesh
Hirakund – I	OHPC	1957	Burla	Odisha
Saradar Sarovar-RBPH	SSNNL	2006	Navagam	Gujrat

Wind Power Plant

Power Station	Operator	Year of Establishment	Location	State
Muppandal Wind Farm	Muppandal Winds	1985	Kanyakumri	Tamil Nadu
Jaisalmer Wind Farm	Suzlon Energy	2001	Jaisalmer	Rajasthan
Brahmanvel Wind Farm	Parakh Agro Industry	2006	Dhule	Maharashtra
Dhalgaon	Grade Mission Export	2008	Sangli	Maharashtra
Damanjodi wind Plant	Suzlon Energy	2014	Koraput	Odisha

India’s Major Photovoltaic (PV) Solar Power Plants

Power Station	Operator	Year of Establishment	Location	State
Charanka Solar Power Plant	GMR group	2012	Patan	Gujarat
Neemuch Solar Power Plant	Welspun Solar.	2014	Neemuch	Madhya Pradesh
Sakri Power Plant	Maharashtra state power generation company	2013	Dhule	Maharashtra

GEDCOL Solar Power Plant	Green Energy Development Corporation Ltd.	2014	Boudh district	Odisha
Dhirubhai Ambani Solar Plant	Reliance Industries	2012	Jaisalmer	Rajasthan

Major Hydro Projects

Multipurpose Projects

No.	**Project**	**River**	**Purpose**	**Beneficiary States**
1.	Bhakra-Nangal Project The project consists of: (i) Bhakra dam (second highest in the world) - 518 m long, 226 high (ii) Nangal dam (iii) Nangal hydel channels (iv) 4 power houses (Biggest in Asia)	Sutlej (Hoshiarpur district in Punjab)	Power and irrigation	Punjab, Himachal Pradesh, Haryana, and Rajasthan
2.	Damodar Valley Corporation Project The project consists of: (i) Tilaiya dam (ii) Konar dam (iii) Maithon dam (iv) Panchet Hill dam (v) Power houses at Bokaro, Durgapur, and Chandrapur	Damodar	Power, irrigation, flood control	Bihar and West Bengal, shared by Madhya Pradesh
3.	Hirakund This is a dam project. The main dam is 4,800 m long, 28.9 m high (World’s largest mainstream dam)	Mahanadi	Power and irrigation	Odisha
4.	Tungabhadra Project	Tungabhadra (tributary of river Krishna)	Power and irrigation	Andhra Pradesh and Karnataka
5.	Mayurakshi Project	Murali	Power and irrigation	West Bengal
6.	Nagarjunasagar Project	Krishna	Power and irrigation	Andhra Pradesh
7.	Gandak River Project	Gandak (tributary of Ganga)	Power and irrigation	Bihar, Uttar Pradesh, Nepal (Joint venture of India and Nepal)
8.	Kosi Project	Kosi	Flood control, power and irrigation	Bihar
9.	Farakka Project	Ganga, Bhagirathi	Power, irrigation, avoid accumulation of silt to improve navigation	West Bengal
10.	Beas Project Units : Beas-Sutlej link Beas dam at Pong Beas transmission system	Beas	Irrigation and power	Rajasthan, Haryana, Punjab, and Himachal Pradesh

11.	Rajasthan Canal Project	Sutlej in Punjab, Beas, and Ravi	Irrigation	Rajasthan, Punjab and Haryana
12.	Chambal Project Units (a) Gandhisagar dam (b) Rana Pratap Sagar dam (c) Jawahar Sagar dam	Chambal	Power and irrigation	Madhya Pradesh and Rajasthan
13.	Kakrapara Project	Tapti	Irrigation	Gujarat
14.	Nagpur Power Station	Koradi	Thermal power Maharashtra	
15.	Ukai Project	Tapti	Power and irrigation	Gujarat
16.	Tawa Project	Tawa (Narmada)	Irrigation	Madhya Pradesh
17.	Poochampad Project	Godavari	Irrigation	Andhra Pradesh
18.	Malaprabha Project	Malaprabha	Irrigation	Karnataka
19.	Durgapur Barrage	Damodar	Irrigation, Navigation, between Kolkata and Raniganj	West Bengal and Bihar
20.	Mahi	Mahi	Irrigation	Gujarat
21.	Mahanadi Delta Project	Mahanadi	Irrigation	Orissa
22.	Idukki Project	Periyar	Hydroelectricity	Kerala
23.	Koyna Project	Koyna	Hydroelectricity	Maharashtra
24.	Upper Krishna Project	Krishna	Irrigation	Karnataka
25.	Ramaganga Multipurpose Project	Chisot stream near kala	Power and irrigation	Uttar Pradesh
26.	Matatilla project	Betwa	Multipurpose power and irrigation	Uttar Pradesh and Madhya Pradesh
27.	Tehri Dam Project	Bhilangana, Bhagirath	Hydroelectricity	Uttar Pradesh
28.	Narmada Sagar Valley Project	Narmada	–	Madhya Pradesh, Gujarat, Rajasthan, and Maharashtra
29.	Obra Power Station	Obra	Thermal power	Uttar Pradesh
30.	Rihand Scheme	Rihand	Hydroelectricity	Uttar Pradesh
31.	Kundah Project	Kundah	Hydroelectricity and irrigation	Tamil Nadu

SOILS IN INDIA

➤ Soil is a mixture of many solid, liquid and gaseous substances . It forms the top most layer of earth's crust.

➤ In India there is a vast variety in the soil cover due to differences in terrain and climatic conditions.

➤ The densely-populated deltaic tract of West Bengal and the coastal plain of Kerala have rich alluvial soils and support flourishing agriculture.

➤ The shallow and coarse grained soils of Telangana and the dry regions of Rajasthan do not provide a base for developed agriculture.

➤ The process of soil formation is known as Pedogenesis.

➤ The process of soil formation depends upon factors like Parent material, Relief, Climate and Natural Vegetation.

MAJOR SOIL TYPES OF INDIA

➤ All India Soil Survey Committee has divided the Indian soils into eight major groups. They are (1) Alluvial soils, (2) Black soils, (3) Red soils, (4) Laterite and Lateritic soils, (5) Forest and Mountain soils, (6) Arid and Desert soils, (7) Saline and Alkaline soils and, (8) Peaty and Marshysoils.

SOME IMPORTANT SOIL TYPES

(1) Alluvial Soils

➤ These soils are generally confined to the river basins and coastal plains.

➤ These soils contribute significantly to the development of agriculture in India.

➤ The alluvial soils are fine-grained both in the areas of new alluvium (Khadar) as well as the old alluvium (Bangar).

➤ These soils vary from sandy loam to clay in texture.

➤ They are generally rich in potash but poor in phosphorus, nitrogen and humus.

➤ The soils of North India are the examples of alluvial soils.

➤ These soils cover about 22% parts of the total geographical area of the country.These are azonal soils.

(2) Black Soils

➤ The black soils are concentrated over the Deccan lava tract.

➤ These are also known as the ‘black cotton soils’ or ‘Regur’ soils. These soils are famous for the cultivation of cotton.

➤ The black soils are generally clayey, deep and impermeable.

➤ Chemically the black soils consist of lime, iron, magnesium and alumina.

➤ The black soil lack in phosphorus, nitrogen and organic matter.

➤ Black soil is very retentive of moisture. It swells greatly and becomes sticky when wet in rainy season.

➤ Black soils of uplands are of low fertility but they are darker, deeper and richer in the valleys.

➤ Some of the major crops grown on the black soils are cotton, wheat, jowar, linseed, virginia tobacco, castor, sunflower and millets.

➤ These soils are mainly found in Maharashtra, Western Madhya Pradesh, parts of Karnataka, Andhra Pradesh, Gujarat and Tamil Nadu.

(3) Red Soils

➤ The reddish colour of the soil is due to the presence of iron in crystalline and metamorphic rocks.

➤ The physical properties of these soils vary from region to region.

➤ Red soils are generally shallow and their pH value ranges from 6.6 to 8.0.

➤ Red soils are poorer in quality as compared to Alluvial soils .

➤ These soils are spread on almost the whole of Tamil Nadu, parts of Karnataka, south-east of Maharashtra, eastern parts of Andhra Pradesh, Madhya Pradesh, Odisha and Chhotanagpur.

➤ By and large, the red soils are poor in lime, magnesia, phosphates, nitrogen and humus, but are fairly rich in potash.

➤ In their chemical composition they are mainly siliceous and luminous, with free quartz as sand, the alkali content is fair, some parts being quite rich in potassium.

➤ On the uplands, the red soils are thin, poor and gravelly, sandy or stony and porous, but in the lower areas they are rich, deep dark and fertile.

➤ These soils are zonal.

(4) Laterite Soils

➤ The laterite soils are formed due to the alternations of wet and dry season which leads to the leaching away of the siliceous matter of the rocks.

➤ The soils in the higher areas are generally more acidic than in low lying areas.

➤ The main development of laterite soil has taken place in the higher areas of the plateau.

➤ The laterite soils are commonly found in Karnataka, Kerala, Tamil Nadu, Maharashtra and Madhya Pradesh.

➤ The laterite soils are poor in lime and magnesia and deficient in Nitrogen.

(5) Mountain or Forest soils

➤ These soils are rich in fossils but they are undecomposed so, humic acid is formed and the soils became acidic.

➤ These soils contain thin layers because of their development on mountain slopes.

➤ These soils poor in potash, phosphours and lime. They are less fertile .

➤ Plantations are done in these soils because of their being on the mountain slopes. Plantations of tea, coffee, spices and fruits are done in these soils in India.

➤ These soils are affected by the problem of erosion.

(6) Desert or Arid Soils

➤ These are infertile soils which are alkaline in nature.

➤ These are sandy soils in which iron and phosphorous are enough but there is a deficiency of nitrogen and humus.

➤ Coarse cereals such as jowar, bajra, ragi etc and oilseeds are produced in these soils.

(7) Saline and Alkaline Soils

➤ The development of these soils has happened in those areas where dry climate is found and there is lack of proper drainage.

➤ These soils are also called 'reh', 'usar' or 'Kollar' .

➤ These soils are rich in sodium, calcium and magnesium.

➤ These soils are deficient in nitrogen and lime.

➤ In coastal areas the coconut trees are found in plenty in these soils.

(8) Peaty or Organic Soils

➤ These soils are dark, heavy and too much acidic .

➤ These soils are formed by deposition of too much organic matter in marshy areas.

➤ These soils are found mainly in Alleppey district of Kerala, Almora in Uttarakhand , the Sunderbans delta and other lower deltaic regions.

Areawise classification of Indian soils into the following order as per the USDA soil taxonomy.

1. Inceptisols 39.74% > 2. Entisols 28.08 % > 3. Alfisols 55% > 4. Vertisols 8.52% > 5. Aridisols 4.28% > 6. Ultisols 2.51% > 7. Mollisols 0.40% > 8. Others 2.92%

Soils of India: Types and Regional Distribution

Alluvial Soil	Ganga and Brahmaputra river valleys; deltas of Godavari and Krishna; Plains of Uttar Pradesh, Uttarakhand, Punjab, Haryana, West Bengal and Bihar; Coastal strip of peninsular India	Rice, wheat, sugarcane, oilseeds, Jute, maize, vegetables & fruits.
Desert Soil	Rajasthan, northern Gujarat and southern Punjab	Wheat, grams, melon, bajra (with irrigation), barley, cotton, maize, pulses.
Black Soil	Maharashtra and Malwa plateaus, Kathiawar peninsula, Telengana and Rayalasema region of Andhra and northern part of Karnataka, some parts of Tamil Nadu.	Cotton, millets, tobacco, sugarcane (Millets include jowar, bajra and ragi), castor, sunflower.
Red & yellow Soil	Scattered in peninsular India, Eastern parts of Deccan plateau, southern states of Kerala, Tamil Nadu and Karnataka, and Chhota Nagpur plateau (Jharkhand), Semi-arid tract of Rajasthan.	Millets, wheat, tobacco, rice, cotton, sugarcane, pulses, groundnut, potatoes, fruits, Oilseeds.
Laterite Soil	Assam hills, Tamil Nadu, Madhya Pradesh, Kerala, Karnataka, and Eastern Ghat region of Orissa.	Coffee, rubber, cashewnut, tapioca
Mountain Soil (It includes	Coniferous forest belt of Jammu and Kashmir, Himachal Pradesh, Uttarakhand and Sikkim.	Fruits, tea, coffee, wheat, maize, barley.

peat, forest and hill soils)		
Saline Soils	Western Gujarat, deltas of Eastern Coast & in Sunderban areas of West Bengal	
Peaty & Marshy Soils	Northern part of Bihar, Southern part of Uttaranchal & the coastal areas of West Bengal, Orissa & Tamil Nadu	

AGRICULTURE IN INDIA

Crop Classification : Indian crops can be divided into following categories :

1. Food Crops : Rice, Wheat, Maize, Millets-Jowar, Bajra, Ragi, Pulses-Gram, Tur (Arhar).

2. Cash Crops : Cotton, Jute, Sugarcane, Tobacco, Oilseeds, Groundnut, Linseed, Sesame, Castorseed, Rapeseed, Mustard etc.

3. Plantation Crops : Tea, Coffee, Spices, Cardamom, Chillies, Ginger, Turmeric, Coconut, Arecanut and Rubber.

4. Horticulture : Fruits-Apple, Peach, Pear, Aprecot, Almond, Strawberry, Walnut, Mangao, Banana, Citrus Fruits and Vegetables.

CROPPING SEASON

1. Kharif Crops

➤ These are sown (in June or early July) with the commencement of south-west monsoon and are harvested by the end of monsoon or autumn (September/October).

➤ The major kharif crops are rice, jowar, maize, cotton, groundnut, jute, hemp, tobacco, bajra, sugarcane, pulses, forage grasses, green vegetables, chillies, gourd, lady finger etc.

2. Rabi Crops

➤ These crops, grown in winter, require relatively cool climate during growth and warm climate during germination of their seeds and maturation. Therefore, sowing is done in November and crops are harvested in April-May.

➤ The major rabi corps are wheat, gram, and oilseeds like mustard and rape seed.

3. Zaid Crops

➤ Besides these two dominant crops, a brief cropping season has been lately introduced in India mainly in irrigated areas where early-maturing crops, called zaid crops, are grown between March and June.

➤ The chief zaid crops are urad, moong, melons, water melons, cucumber, tuber vegetables etc.

LARGEST PRODUCERS OF MAJOR CROPS/AGRICULTURAL PRODUCTS

IMPORTANT CROPS AND THEIR PRODUCING AREAS

➤ **Rice :** W. Bengal, Assam, Bihar, Odisha, Tamil Nadu, A.P., U.P., Maharashtra, Karnataka, Chhattisgarh and Punjab.

➤ **Wheat :** Uttar Pradesh, Punjab, Haryana, Bihar, Madhya Pradesh, Rajasthan, Maharashtra, Gujarat.

➤ **Bajra :** Tamil Nadu, Karnataka, Rajasthan, Madhya Pradesh, U.P., Haryana, and Andhra Pradesh.

➤ **Jowar :** Tamil Nadu, Karnataka, Madhya Pradesh, Gujarat, Rajasthan, U.P., Andhra Pradesh, Haryana, and Maharashtra.

➤ **Millets :** Maharashtra, Karnataka, Madhya Pradesh, Tamil Nadu, Gujarat, Haryana and the dry areas of Andhra Pradesh.

➤ **Maize :** Bihar, U.P., Punjab, Rajasthan, Maharashtra and Gujarat.

➤ **Pulses :** Punjab, Haryana, Rajashtan, Andhra Pradesh, M.P., U.P., Odisha, Maharashtra and Karnataka.

➤ **Sugarcane :** U.P., Punjab, Haryana, Tamil Nadu, Bihar, Bengal, Rajasthan and A.P.

➤ **Oilseeds :** Bihar, Odisha, U.P., Madhya Pradesh, Maharashtra, Gujarat, Andhra Pradesh and Punjab.

➤ **Cotton :** Maharashtra, Gujarat, Madhya Pradesh, Punjab, Tamil Nadu, Uttar Pradesh, W. Bengal, Andhra Pradesh and Karnataka.

➤ **Jute :** Assam, West Bengal, Bihar and Odisha.
➤ **Tobacco :** Andhra Pradesh, Gujarat, Tamil Nadu, Bihar, Karnataka, West Bengal, U.P. and Haryana.
➤ **Tea :** Assam, W. Bengal, Meghalaya, Arunachal Pradesh, U.P., Himachal Pradesh, Tamil Nadu.
➤ **Coffee :** Karnataka, Tamil Nadu and Kerala.
➤ **Coconut :** Kerala, Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, Gujarat, Odisha and West Bengal.
➤ **Rubber :** Kerala, Tamil Nadu and Karnataka. 95 per cent of the total output of rubber is produced in Kerala.
➤ **Spices (Pepper) :** Kerala, Tamil Nadu and Karnataka.

Major Crops

Crops	Temp. (0°C)	Rainfall (cm)	Soil	Distribution
Cash Crops				
Cotton (Gossypium)	21-30	50-75	Black soil	Gujarat, M.P., Kernataka, Maharashta, Punjab
Jute (Corchorus Capsularis)	24-35	125-200	Sandy or clayed loams, deep rich	West Bengal Odisha Bihar Assam Meghalaya
Sugarcane (saccnarum officinarum)	20-26	75-150	Loamy soil	Uttar Pradesh Maharashtra, Tamil nadu, Karnataka
Tobacco (Nicotiana)	15-38	50-100	Friable sandy soil	Uttar Pradesh, Andhra Pradesh, Gujarat, Karnataka
Food Crops				
Rice (oryza sativa)	24-27	150	Clayed and loamy soil	West Bengal, Karnataka, Andhara Pradesh, Assam Odisha, Uttar Punjab, Pradesh Telangana, Chhattisgarh
Wheat (triticum)	10-15	75	Light, sandy, clayed loamy soil	Uttar Pradesh Punjab, Haryana, Rajasthan
Jowar (Sorghum)	27-32	30-65	Black clayed loamy soil	Maharashtra, Karnataka, Madhya Pradesh, Andhra Pradesh
Bajra (Penisetu Typhoidum)	25-35	40-50	Loamy soil	Rajasthan, Uttar Pradesh, Haryana, Maharashtra, Gujarat
Plantation Crops				
Tea (Camellia Thea)	24-30	150-250	Loamy forest soil	Kerala, Tamil Nadu, West Bengal, Assam
Coffee (coffea)	16-28	150-250	Friable forest loamy soils	Karnataka, Kerala, Tamil Nadu
Rubber (Hevea Brasiliensis)	25-35	300	Loamy soils	Kerala, Karnataka, Tamil Nadu

Major Fruit Crops

Fruit Crops	Favorable Climate	Distribution	Relevant Information
Apple	Temperate fruit crop- It requires average temperature from 21 °C to	Kullu and Shimla in Himachal Pradesh,	Loamy soil, rich in organic matter, free from water

	4 C during the active growing season, 100-125 cm rainfall well distributed throughout the growing season. These conditions are found on the hill slopes at altitudes arranging from 1500-2700 m above sea level.	Kashmir valley and hilly areas of Uttarakhand.	logging are suitable for apple cultivation.
Banana	Primarily a tropical and sub-tropical crop requiring average temperature of 20°C to 30°C throughout the growing period and rainfall fairly above 150 cm.	Tamil Nadu and Maharashtra are the two main producers	India is the largest producer of banana in the world.
Mango	It is native of monsoon land and is grown in areas with temperature 20°C to 30°C and rainfall 75 cm to 250 cm.	Uttar Pradesh. Bihar, Andhra Pradesh, West Bengal, Odisha, Kerala, Tamil Nadu are the major producers.	India is the largest producer of mango and contributes 54% of the world production of mango.
Grapes	It requires long summer, short winter and moderately fertile well drained soil.	The major producing States are Uttarakhand, Himachal Pradesh. Jammu and Kashmir.	In Northern India, the plant gives only one crop during summer, but in South India, the plant grows throughout the year, one in March, April and the other in August and September.
Strawberry	It requires above 16°C temperature during its growing season and lots of water because its fields are sub-merges under 10 cm of fresh and slowly moving water for atleast three months.	The main producers are the hilly areas of Jammu and Kashmir, Himachal Pradesh, Uttarakhand.	Water retaining fertile soil is most suitable.

MISC

Tribes

Tribal Group	**Found in**	**Tribal Group**	**Found in**
Abhor	Arunachal Pradesh	Khond	Jharkhand
Adivasi	AP, Bihar, Odisha, Jharkhand, Madhya Pradesh, Maharashtra, Rajasthan, Tamilnadu, Some Northeastern States, West Bangal, Andaman and Nicobar	Khasi	Meghalaya
Ahgani	Manipur	Kharia	Jharkhand, Odisha
Apatani	Arunachal Pradesh	Kol	Madhya Pradesh
Baiga	Madhya Pradesh	Kolam	Maharashtra, Andhra Pradesh, Telengana, MP
Bakarwal	Jammu and Kashmir	Kota	Karnataka
Bhil	M.P and Rajasthan	Kuki	Mizoram
Birhor	M.P and Bihar	Lahaula	Himachal Pradesh

Chang	Nagaland	Lepcha	Sikkim
Chenchuas	Telengana, Karnataka	Lushai	Mizoram, Manipur
Sutiya	Assam	Muria	Chhattisgarh
Gaddis	Himachal Pradesh	Miha	Rajasthan
Gallong	Arunachal Pradesh	Moplah	Malabar
Garo	Meghalaya	Munda	West Bengal, Jharkhand, Odisha, Chhattishgarh
Gond	M.P and Bihar	Nishi	Assam
Gujjar	Rajasthan	Naga	Nagaland
Irula	Tamil Nadu	Oraon	MP, Bihar and Odisha, Chhotanagpur, WB,
Jaintia	Meghalaya	Onges	Andaman & Nicobar
Jarawa	Andamans	Singpho	Assam, Arunachal Pradesh
Kanikar	Tamil Nadu and Kerala	Santhal	WB, Odisha & Bihar, Jharkhand, Assam
Kalkari	Maharashtra	Sangtam	Nagaland
Kharia	Maharashtra	Sema	Nagaland
Sentinelese	Andaman & Nicobar	Wancho	Arunachal Pradesh
Shompen	Andaman & Nicobar	Warli	Maharashtra, Daman and Diu, Bihar, Madhaya Pradesh, West Bengal Dadra, Nagar Haveli
Toda	Tamil Nadu		
Uralis	Kerala		

Major Industries And Its Centres

➤ **Cotton Textiles :** Mumbai, Sholapur, Nagpur, in Maharashtra; Ahmedabad, Surat, Vadodara in Gujarat and Indore in M.P.; Chennai, Madurai and Coimbatore in Tamil Nadu; Kanpur in U.P. and Kolkata in West Bengal.

➤ **Jute Textiles :** West Bengal, Bihar, Andhra Pradesh, U.P. and M.P.

➤ **Silk Textiles :** Assam, Karnataka, Jharkhand, Jammu & Kashmir, Odisha, U.P., M.P., W. Bengal, Bihar, Maharashtra and Punjab.

➤ **Woollen Textiles :** The chief centres of woollen textiles are Punjab, U.P., Maharashtra, Madhya Pradesh, Karnataka, West Bengal.

➤ **Sugar Industry :** U.P., Bihar and some centres are there in Maharashtra, Andhra Pradesh, Karnataka, Tamil Nadu, West Bengal and Punjab.

➤ **Cement Industry :** M.P., Rajasthan, Jharkhand, Karnataka, Andhra Pradesh, Tamil Nadu, Gujarat, U.P. and Odisha have some factories also.

➤ **Paper Industry :** West Bengal, Maharashtra, U.P., Bihar, Odisha, Punjab, Karnataka, Kerala, Andhra Pradesh and Gujarat.

➤ **Iron and Steel Industry :** Jamshedpur, Bokaro (Jharkhand), Bhilai (Chhattisgarh), Durgapur, Hirapur, Kulti, Burnpur (West Bengal), Rourkela (Orissa), Bhadrawati (Karnataka) and Neyveli (Tamil Nadu).

➤ **Leather Industry :** Chennai, Agra, Kolkata, Delhi, Kanpur, Mumbai.

➤ **Aluminium :** Alwaye (Kerala), Hirakund (Odisha), Muri (Jharkhand), Renukoot (U.P.), Bailur (W. Bengal), Koyna Mettur (Tamil Nadu) and Odisha.

➤ **Matches :** Bareilly, Kolkata, Chennai, Gwalior and Hyderabad.

➤ **Photo Film Industry :** Octacamund (Tamil Nadu).

➤ **Glass :** Ferozabad, Shikohabad, Naini, Howrah, Bangalore, Bahjoi, and Belgaon.
➤ **Chemical Industry :** Delhi, Pimpri, Pune, Kolkata, Mumbai, Chennai, Rishikesh, Bangalore and Amritsar.
➤ **Rubber-Goods Industry :** Kolkata, Chennai, Delhi, Bangalore, Mumbai, Hyderabad, Ballabhgarh.
➤ **Locomotive Industry :** Chittaranjan (West Bengal), Varanasi in U.P., Perambur (Tamil Nadu).
➤ **Automobile Industry :** Mumbai, Kolkata, Chennai, and Jamshedpur.
➤ **Antibiotic Industry :** Rishikesh, Pimpri and Delhi.
➤ **Aircraft Manufacturing Industry :** Bangalore, Kanpur, Nasik, Koraput and Hyderabad.
➤ **Fertilisers Industry :** Durgapur, Kanpur, Foolpur (Uttar Pradesh), Haldia, Namrup, Rourkela, Vadodara, Barauni, Vishakhapatnam, Gorakhpur, etc.
➤ **Plastic Industry :** Mumbai, Kolkata, Amritsar, Kanpur, Hyderabad and Coimbatore.
➤ **Petro-Chemical Industry :** Vadodara and Mumbai Bongaigoan, Assam.

Towns Associated With Industries

➤ **Agra :** Stoneware, leather, carpets and marbles.
➤ **Ahmedabad :** Cotton-textiles.
➤ **Aligarh :** Cutlery, locks and dairy-industries.
➤ **Ambala :** Scientific goods.
➤ **Amritsar :** Cloth-printing, carpets, woollen goods, shawls.
➤ **Bangalore :** Watches, telephone, aircraft industry.
➤ **Bareilly :** Rubber factory, match factory, wood work.
➤ **Chennai :** Integral coach factory, leather, cigarette, cotton.
➤ **Mumbai :** Chemicals, oil refineries, fertilisers, film industry, woollen goods, cotton manufacturing.
➤ **Chittaranjan :** Electrical locomotives.
➤ **Churk :** Cement.
➤ **Cochin :** Coffee, coconut, oil, ship-building.
➤ **Dalmianagar :** Cement.
➤ **Delhi :** Textiles, chemicals, electronics, sewing machines.
➤ **Dhariwal :** Woollen goods.
➤ **Ferozabad :** Glass-bangles.
➤ **Hardwar :** Heavy electricals.
➤ **Jamshedpur :** Iron and steel works, train coaches locomotives.
➤ **Jalandhar :** Sports articles and surgical goods.
➤ **Jaipur :** Ivory work, brass work, jewellery, pottery, cloth painting.
➤ **Kolkata :** Iron and steel, jute, paper, pottery.
➤ **Kanpur :** Leather, cotton, aircraft factories, woollen mills, soap, iron, flour mills.
➤ **Kolar :** Gold-fields.
➤ **Lucknow :** Embroidery, gold, silver, lac work.
➤ **Ludhiana :** Hosiery, cycle.
➤ **Mirzapur :** Carpet, pottery, stoneware and brass.
➤ **Moradabad :** Brassware, cutlery, enamel industry.
➤ **Karnataka :** Sandalwood oil, ivory work, silk goods.
➤ **Renukoot :** Hindustan Aluminium Works.
➤ **Saharanpur :** Paper mill.
➤ **Srinagar :** H.M.T. factory, woodwork, embroidery, paper machine, woolen shawls.
➤ **Surat :** Cotton textiles.
➤ **Tarapur :** Atomic power plant.
➤ **Titagarh :** Paper and jute.
➤ **Trombay :** Oil refineries, atomicreactors.

- **Varanasi :** Diesel-locomotives, brass-wares, lac bangles.
- **Vishakhapatnam :** Ship-bulding.

Lakes Of India

State/UT Lakes

Andhra Pradesh Kolleru Lake, Pulicat Lake
Arunachal Pradesh Sela Lake, Gango Lake
Assam Chandubi Lake, Deepor Beel, Son Beel
Bihar Kanwar Lake Bird Sanctuary
Chandigarh Sukhna Lake
Gujarat Hamirsar Lake, Kankaria, Nal Sarovar, Narayan Sarovar, Sardar Sarovar, Thol lake, Vastrapur lake.
Haryana Badkhala Lake, Blue Bird Lake, Brahma Sarovar, Damdama Lake, Karna Lake, Sannihit Sarovar, Surajkund, Tilgar Lake.
Himachal Pradesh Maharana Pratap Sagar, Pandoh Lake, Gobind Sagar, Renuka Lake, Macchial Lake, Khajjar Lake, Kumarwah Lake, Prashar Lake, Dehnasar Lake, Nako Lake, Chandra Tal, Suraj Tal, Dhankar Lake, Dashair, Bringhu Lake, Manimahesh Lake, Ghadhasaru Lake, Mahakali Lake, Lama Dal, Chander Naun, Kareri Lake, Rewalsar
Jammu and Kashmir Anchar Lake, Dal Lake, Manasbal Lake, Mansar Lake, Pangong Tso Sheshnag Lake, Tso Moriri, Wular Lake
Karnataka Hebbal Lake, Ulsoor Lake, Bellandur Lake, Agara Lake, Shanti Sagar, Karanji, Honnamana Kere, Pampa Sarovar.
Kerala Ashtamudi Lake, Kuttanand Lake, Manaanchira, Padinjarechira, Paravcirkayal, Punnamada Lake, Shasthamkotta Lake, Vadakkechira, Vanchikulam, Vellayani Lake.
Madhya Pradesh Bhojtal, Lower Lake, Upper Lake, Tawa Reservoir
Maharashtra Gorewada Lake, Khindsi Lake, Lonar Lake, Pashan, Powai Lake, Rankala, Salim Ali Lake, Shivasagar Lake, Tolao Poli, Upvan Lake, Venna Lake
Manipur Loktak Lake (Keibul Lamjao National Park)
Meghalaya Umiam Lake
Mizoram Palak dil, Tam dil
Odisha Anshupa Lake, Chilka Lake, Kanjia Lake
Puducherry Bahour Lake
Punjab Harike Wetland, Kanjili Wetland, Ropar Wetland
Rajasthan Ana Sagar, Balsamand Lake, Dhebar Lake, Jaisamand Lake, Jal Mahal Lake, Kalyana Lake, Lake Foy Sagar, Loonkaransar, Nakki Lake, Pachpadra Lake, Pushkar Lake, Rajsamand Lake, Ramgarh Lake, Sambhar Lake, Talwara Lake, Ummed Sagar.
Sikkim Gurudongmar Lake, Khecheopalri Lake, Lake Cholamu, Lake Tsongmo
Tamil Nadu Berijam Lake, Chembaram bakkam Lake, Kaliveli Lake, Kodaikanal Lake, Ooty lake, Perumal Eri, Red Hills Lake, Sholavaram Lake, Singanallur Lake, Veeranam Lake
Telangana Durgam cheruvu, Himayat Sagar, Hussain Sagar, Mir Alam Tank, Osmar Sagar, Shamirpet Lake
Uttar Pradesh Barua Sagar Tal, Belasagar Lake, Amakhera Lake, Keetham Lake, Ramgarh Tal Lake, Bhadital Lake, Sheikha Lake, Nachan Tal
Uttarakhand Skeleton Lake, Sattal, Bhimatal, Nainital, Naukuchiatal, Dodital
West Bengal Debar Lake, East Calcutta Wetlands, Jore Pokhri, Mirik Lake, Rabindra Sarobar, Rasikbil, Santragacchi Lake, Senchal Lake.

Waterfalls

Vantang Water falls : Mizoram
Nohkalikai Water falls : Shilong
Sadthum Water falls : Meghalaya

Karansuri Water falls : Meghalaya
Tyarchi Water falls : Meghalaya
Munri Water falls : Meghalaya
Elephant Water falls : Meghalaya
Akashiganga Water falls : Assam
Champawati Water falls : Assam
Shivakundra Water falls : Assam
Arvalam Falls : Goa
Dudhsagar Falls : Goa
Karnataka Apsarakonda Falls, Abbey Falls, Barkana Falls, Bennehole Falls, Burude Falls, Chunchana katte Falls, Chelavaram Falls, Dabbe Falls, Dondole Falls, Gokak Falls, Godchinamalaki Falls, Hebbe Falls, Irupa Falls, Jog Falls, Lalguli Falls, Mallali Falls, Nisargadhana Falls, Shanti Falls
Kerala Ananthoni Falls, Kaalakkayam Falls, Meenmutty Falls, Nyayanad Falls, Soochipare Falls
Tamil Nadu Aintharuvi Falls, Catherine Falls, Elk Falls, Fairy Falls, Fairy Falls, Hogenakal Falls, Kolakambai Falls, Palar Falls, Perriyar Falls, Suruli Falls, Vattaparai Falls,
Maharashtra Amboli Ghat Falls, Dudhsar Falls, Dhobi Falls, Lingamala Falls, Mandakini Falls, Ramtirtha Falls
Madhya Pradesh Dhuandhar Falls, Dugdhadhara Falls, Kabildhar Falls, Pandav Falls, Pawa Falls, Keoti Falls
Jharkhand Dassam Falls, Dharagiri Falls, Gur Falls, Hirni Falls, Lodh Falls, Sits Falls, Hundru Falls
Himachal Pradesh Budla Waterfalls, Bhagsu Waterfalls, Badri Waterfalls, Chadwick Waterfalls, Rahla Waterfalls, Sissu Waterfalls, Machhrial Waterfalls
Bihar Kakolat Falls, Madhuvdhandam Falls, North Tank Falls
Chhattisgarh Chitrakoot Falls, Teerathgarh Falls

Tribes And Racial Groups

➤ The present day population of the Indian Sub-continent is supposed to have affinity to the following racial groups :
1. The Negrito
2. The Proto-Australoids
3. The Mongoloids
4. The Mediterraneans
5. The Brachycephalic
6. The Nordics

Top Ten Longest National Highways Of India

1 NH-7(44) 2,369 Varanasi- Kanyakumari Varanasi Jabalpur Nagpur Hyderabad Bengalur u Madurai Kanyakumari
2. NH-6 1,949 Hajira - Kolkata Hajir a Surat Dhule Nagpu r Raipu r Sambalpur Kolkata
3. NH-5 1,533 Cuttak-Chennai Bhubaneswar Vishakhapatnam Vijayawada Nellore Chennai

Road Transport

➤ India has one of the largest road networks in the world. The total length of the roads is approximately 46.9 lakh km.

National Highways

➤ National Highways is the responsibility of the central Government. These have about 96,214 km length, according to the survey of India 2014-15 and comprise only 2% of the total traffic.
➤ The longest NH in India is 375 km long NH–44(Srinagar – Kanyakumari).
➤ The new NH-44 is the combination of NH - 1A, 1, 2, 3, 7, 26 and NH - 75.

➤ It passes through 12 states J & K, HP, Punjab, Haryana, Delhi, UP, MP, Maharashtra, Telangana, Andhra Pradesh, Karnataka and Tamil Nadu.
➤ Earlier NH-7 was the largest highway of India. (Varanasi-Kanya Kumari : 2369 km).
➤ NH-7 passes through UP (120 km), MP (504 km), Maharashtra (232 km), Telangana (504 km.), Andhra Pradesh (250 km.), Karnataka (125 km) Tamil Nadu (627 km).

Transport System In India

➤ NH 1 & 2 is called G.T. Road .
➤ Jawahar Tunnel is located in NH1A.
➤ 47A is the smallest highway of India. Its length is only 6 km. This is in Kerala.
➤ NH-15 passes through the desert of Rajasthan.
➤ Recently NH-7 renamed as NH-44.
➤ Golden Quadrilateral (5846 km) : High quality road joining the four megacities of the country (Delhi, Kolkata, Chennai and Mumbai) is called as Golden Quadrilateral Connecting National Highways.
(1) Delhi-Kolkata : NH-2
(2) Mumbai -Delhi : NH-8
(3) Mumbai -Chennai : NH-4
(4) Chennai-Kolkata : NH -5

North South and East-West corridor

➤ Under National Highways Development Project (NGDP) North- South corridor will join from Srinagar to Kanyakumari and East-west corridor from Silchar to Porbandar composing and laning of 7522 km of National Highway.
Length of North-South corridor and East-West corridor is 4,000 km and 3,500 km respectively.
➤ Jhansi is the junction of North- South and East-West Corridors.

Rank National Length In Between Major cities on Route Highway *km.*

4. NH-5 - Pathankot-Samakhioli Pathankot Amritsar Bhatinda Bikaner Jaisalme r Samakhioli
5. NH-2 - Delhi-Dankuni (Kolkata) Faridabad Mathura Agra Allahabad Varanasi Aurangabad Dhanba d Durgapur Kolkata
6. NH-8 - Delhi-Mumbai Delhi Gurgao n Jaipur Udaipu r Gandhinaga r Ahmedabad Vadodar a Surat Silvassa Mumbai
7. NH-17 - Panvel-Kochi Panvel Panaj i Ankola Manglore Kozhikode Kochi
8. NH-4 - Mumbai - Chennai Mumbai Pun e Kolhapur Bangalore Vellore Chennai
9. NH-3 - Agra - Mumbai Agra Gwalio r Indore Mumbai
10. NH-31 - Barhi-Guwahati Barhi Begusara i Dalkhola Siligur i Kokrajhar Guwahati

State Highway

➤ State Highway is the responsibilty of State Government.
➤ At Present, the total length of State Highways is 1,42,687 km.
➤ State having maximum roads (length wise) Maharashtra > Uttar Pradesh > Odisha
➤ State having maximum road density is Kerela.
➤ State having minimum road density is Jammu and Kashmir.
➤ In UTs Delhi has maximum road density.
➤ Manali-Leh passes through Bara Lacha La is world's highest motorable road.
➤ Asia's biggest rop road way is in Gharahwal (Uttrakhand) this joins Joshmath and Auli. Its total length is 500 m .

Border Road Organisation (BRO)

➤ It is istablished in 1960.
➤ It is under Home Ministry, Central Government.
➤ It is established for the development of roads of strategic importance in the northern and north eastern borders of the country.

➤ At present this organisation is constructing bridge, airfield and flats.
➤ BRO made roads in naxalite areas of Maharashtra under ‘Project Hirak’.
➤ Road were made by BRO in Bhutan under ‘Project Dantak’.

International Highways

➤ These highways are formed under the agreement of the Economic and Social Commission on Asia and Pacific (ESCAP).
➤ These highways are financed by the World Bank.
➤ It connects India with its neighbouring countries .
➤ They are of two types :

1. The main arterial routes linking the capitals of neighbouring countries like _____.
(i) The Lahore - Mandalay (Myannar) route passing through Amritsar- Delhi-Agra-Kolkata-Golaghat-Imphal.
(ii) The Agra-Gwalior-Hyderabad-Bangalore-Dhanushkodi road.
(iii) The Barhi-Kathmandu road.
2. Route linking major cities—
(i) Agra-Mumbai road (ii) Delhi-Multan road
(iii) Bangalore-Chennai road (iv) Golaghat-Ledo road.

Super National Highway Project

➤ Connecting major ports and cities in the country.
➤ To increase the traffic flow and accelerate the means of transport. These are —
(i) **Super National Highway No.1 (Maharaja Agrasen marg) :** Delhi- Kanyakumari via Jaipur-Udaipur-Ahmedabad-Mumbai-Pune- Bangaluru-Kochi and Thiruvananthapuram.
(ii) **Super National Highway No. 2 (Guru Gobind Singh Marg) :** Amritsar to Chennai via Chandigarh-Delhi-Kanpur-Patna-Dhanbad-Kolkata- Bhubaneshwar-Channai.
(iii) **Super National Highway No. 3 (Sant Ravi Das Marg) :** Pathankot to Jalandhar.
(iv) **Super National Highway No. 4 (Ravindra Nath Tagore Marg) :** Patna to Guwahati
(v) **Super National Highway No. 5 (Bhagwan Mahavir Marg) :** Delhi to Bengaluru via Agra-Nagpur-Hyderabad
(vi) **Super National Highway No. 6 (Bhagwan Parshuram Marg) :**
Mumbai to Dhanbad via Nagpur-Rourkela
(vii) **Super National Highway No. 7 (Swami Dayanand Marg) :** Bengaluru to Chennai

Airways

➤ The ministry of civil Aviation is responsible for the formulation of national policies and programmes for the development and regulation of civil aviation.
➤ There are 33 international and 450 airports in India (2016)
➤ In the Public sector there are Air India, Indian Airlines, Air India Charters Ltd., and Alliance Air.
➤ The Air India was constitued in 1947 .
➤ In 1952 ; the Planning Commission recommended the nationalization of Air Transport Industry which was effected in 1953 with the creation of nationalized corporations.
➤ Indian Airlines was setup under the Air Corporation Act, 1953 with its Head Quarters at Delhi.
➤ Director General of Civil Aviation is the regulatory body for civil aviation in India.
➤ Rajiv Gandhi International Airport, Hyderabad is the first green Airport in Asia.
➤ Airport Authority of India was formed in 1995 .
➤ AAI in responsible for providing safe and efficient Air Traffic Services; communication and navigational aids at all the airports.

Greenfield Airport and Brownfiled

Airport : Greenfield Airport is a new airport built from scratch in a new location because the existing airport is unable to meet the projected requirement of traffic.
The project which are modified or upgraded from existing facilities are called ‘brown field projects’.

Water Transport

➤ Waterways are the cheapest means of transport.
➤ They provide 1% of total transport
➤ Central Inland water ways Authority was set up in 1986 .
➤ The head office of the authority is located at Noida.
➤ There are two types of water ways— (1) Inland Water Ways, (2) Maritime Transport

Inland Water Ways : Navigated by river, canals and lakes

➤ Waterway from Haldia to Allahabad, was declared as NW1 by the central government in 22 October, 1986 .

Major Ports

Ports

➤ There are 13 major and 185 medium and small airports in India.
➤ Major ports are under the jurisdiction of the central government while the minor and intermediate ports are managed and maintained by the respective state governments
➤ Minor ports are maximum in Maharashtra.
➤ Vishakhapattanam is the deepest land lock port in India.
➤ Chennai is the oldest artificial harbour.
➤ Ennore is India's first corporate port.

1. Mumbai

➤ Natural port on west coast
➤ It is the biggest port of India in terms of cargo handling.
➤ It makes Mumbai the gatway of India.
➤ It handles 1/5th of India's foreign trade.

2. Kandla

➤ It is a tidal port
➤ Developed to release pressure on the Mumbai port.
➤ It is located on eastern end of Gulf of Kachchh .

3. Marmagao

➤ It is located in Goa.
➤ It has a naval base.
➤ It is India's leading iron-ore port.

4. New Mangalore

➤ Called the 'Gateway of Karnataka' .
➤ Located at southern tip of Karnataka coast.
➤ Handles the export of iron-ore from Kundremukh.

5. Kochi

➤ It is a natural harbour.
➤ It is located on Kerala coast.
➤ It is a ship building centre
➤ Handles tea, coffee and spices.

6. Tuticorin

➤ It come into existence during the region of Pandya kings.
➤ It is located in Tamilnadu.
➤ Artificial deep sea harbour.

7. Ennore

➤ Developed to reduce pressure of traffic on Chennai Port.
➤ It is the latest port.
➤ It is country's first corporate port.

8. Chennai
➤ Oldest artificial harbour.
➤ Handles petroleum products, fertilizers and iron-ore.
9. Vishakhapatnam
➤ Deepest land lock port
➤ Export iron ore.
➤ Located in Andhra pradesh.
10. Paradip
➤ Located on Odisha coast along the Bay of Bengal.
➤ Handles iron ore and coal.
➤ It is deep water sea port.
11. Kolkata
➤ It is a riverine port.
➤ Located on the bank of river Hooghly in West Bengal.
12. Haldia
➤ This port located in West Bengal.
➤ This port has made for reducing pressure on Kolkata port.
➤ It is the harbour for those largesized ship which do not reach Kolkata.
➤ Handles petroleum products, coal, iron and steel.
13. Jawaharlal Nehru Port
➤ Located in Maharashtra
➤ Occupies the 5th position in the world's fastest growing ports.
14. Port Blair
➤ Added in the list of major ports in June, 2010.
➤ It is the 13th major port.
➤ The port is of stratagic importance to India.
➤ It is closer to two international shipping lines— Saudi Arabia — Singapore and US — Singapore.

Railways

➤ The rail transport in India began in 1853 when the first train was run between Mumbai and Thane (34 km) .
➤ The first section of the East India Railway, from Howrah to Hooghly was inaugurated on 15 August 1854 .
➤ Indian railways is world's second largest rail network under the single management. (USA is the largest one) .
➤ It is the largest public sector undertaking of the country.
➤ Of the two main segments -freight and passenger-the freight segment accounts for roughly two - third of revenues.
➤ Three types of rail gauges — Broad gauge – 1.676 m. — Metre gauge – 1.00 m —Narrow gauge – 0.762 m

Important PASSES

1. Karakoram Pass Karakoram Range, J&K India's highest pass
2. Zozila Pass Zaskar Range , J&K Srinagar to Leh
3. Baramula Pass Pirpanjal Rage, J&K Srinagar to Mujaffarabad
4. Pir Panjal Pass Pirpanjal Range, J&K Pahalgaon to Koshi
5. Banihal pass Pirpanjal Range, J&K Jammu to Srinagar, NH1A, Jawahar Tunnel
6. Baralacha La (J&K) Himachal Pradesh Mandi (H.P.) to Leh
7. Rohtang Pass Himachal Pradesh Manali to Leh
8. Shipkila Pass Himachal Pradesh Shimla to Tibet

9. Thangla Pass Himachal Pradesh —
10. Niti La Pass Uttarakhand, Kumaun Uttarakhand to Tibet Range and Mansarovar
11. Mana La Pass Uttarakhand, Kumaun Uttarakhand to Tibet Range and Mansarovar
12. Lipu Lekh Pass Uttarakhand, Kumaun Uttarakhand to Tibet Range and Mansarovar
13. Muling La Pass Uttarakhand, Kumaun Uttarakhand to Tibet Range and Mansarovar
15. Diphuk Pass Arunachal Pradesh Arunachal Pradesh to Myanmar
16. Likha Pani pass Arunachal Pradesh Arunachal Pradesh to Myanmar
17. Chaukan Pass Arunachal Pradesh Arunachal Pradesh to Myanmar
18. Pangsad Pass Arunachal Pradesh Arunachal Pradesh to Myanmar
19. Tuzu Pass Manipur Imphal to Myanmar
20. Nathu La Pass Sikkim Sikkim to Tibet
21. Jelep La Pass Sikkim Chumbi valley to Tibet
22. Palaghat Pass Kerala Palakkad to Coimbatore
23. Bhorghat Pass Maharashtra Mumbai to Pune
24. Thalaghat Maharashtra Mumbai to Nasik
25. Shenkotta Pass Kerala and T.N. Kollam to Madurai

Valleys Of India

- Nubra Valley — Leh (Jammu and Kashmir)
- Araku Valley — Andhra Pradesh
- Murkha Valley — Ladakh (Jammu and Kashmir)
- Chumbi Valley — Sikkim
- Zuku Valley — Nagaland
- Sangla Valley — Himachal Pradesh
- Yuthang Valley — Sikkim (Valley of Flower)
- Kullu Valley — Himachal Pradesh
- Pangi Valley — Chamba, Himachal Pradesh
- Tons Valley — Himachal pradesh
- Dibang Valley — Arunachal Pradesh
- Neora Valley — West Bengal
- Ketti Valley — Tamil Nadu
- Charavati Valley — Karnataka
- Kangra Valley — Himachal Pradesh
- Duke Valley — Manipur
- Milam Valley — Uttarakhand

Major Cities Of India

- **Agra :** A Cultural, historical and industrial city of Uttar Pradesh located on the banks of the Yamuna river. The most popular tourist attraction and UNESCO World Heritage sites - Taj Mahal and Agra Fort are located here.
- **Ahmedabad :** Situated in the cotton belt of the Gujarat plains, it is the largest city of Gujarat and is known as the “Manchester of the East”. Located on the banks of river Sabarmati it is an important industrial, cultural and educational town.
- **Ajmer :** Situated in Taragarh hills in Aravallis, important railway junction & trade and a pilgrim centre. Famous for Pushkar Lake and Dargah of Moinuddin Chishti.
- **Amritsar:** Home to Harmandir Sahib (Golden Temple), spiritual and cultural centre of Sikh religion, commercial activities includes tourism, carpets manufacturing, farm produce
- **Asansol :** Located in the Bardhaman district of West Bengal, Important railway junction and famous for IISCO
(Indian Iron and Steel Company). Asbestos Industry & Automobile Industries located here.

➤ **Bengaluru :** Capital of Karnataka state, Bengaluru is a clean, spacious and well planned city of beautiful parks and is known as 'Garden city of India'. One of the fastest growing city, this 'city of the future' is famous for BHEL, HAL, HMT, Indian Telephone industry and IT Industry and is known as 'Silicon valley of India'.
➤ **Baroda/Vadodra :** Third most populated city of Gujarat. On Vishwamitri river, cultural capital of Gujarat and administrative headquarters of Vadodra district, Petrochemical, engineering, pharmaceuticals, plastic industries are located here. Gujarat refinery of IOC, Gujarat state fertilizers and chemicals IPCL. Gujarat Alkaline Chemicals Ltd. etc are also present here.
➤ **Bhubaneswar :** Capital of Odisha, popularly known as the 'Temple city fo India'. It is a planned city, cultural and educational town, famous for its Khandagiri and Udayagiri cave and Dhaulagiri rock edict.
➤ **Chennai :** Capital of Tamil Nadu, centre of Dravidian culture, ancient city and the oldest artificial harbour on the east coast of India. India's largest sea beach Marina beach is on its Bay of Bengal coast.
➤ **Coimbatore :** In Tamil Nadu, also called Koval, second largest city of Tamil Nadu, located at the foothills of Nilgiris. It is important for cotton textile, electric motors, pumps, automobile, iron and steel and aluminum castings. It is known as the Manchester of South India.
➤ **Dalhousie :** A hill station located on a spur of the Dhauladhar range of the Himalaya in Himachal Pradesh. It is famous for handicrafts industry and is a military base. It has spectacular scenic beauty and is the gateway to Chamba district.
➤ **Darjeeling :** A major hill resort of West Bengal and has strategic importance as a possible access to Nepal and Tibet. The Himalayan mountaineering institute is located on it. It is also famous for tea estates and handicrafts. Darjeeling Himalayan railways is UNESCO world heritage site.
➤ **Dhanbad :** Located near river Damodar in Jharkhand, it has coal mining centre and Indian Institute of Mining.
➤ **Ghatshila/Ghatsila :** It is a copper mining centre in the Singhbhum region of Chhottanagpur plateau. Located on the bank of river Subarnrekha near Jamshedpur.
➤ **Guwahati :** Oil refinery gateway to North Eastern States, biggest city of Assam on the bank of Brahmaputra river. Largest commercial, industrial and educational centre of Assam.
➤ **Gwalior :** A historical and cultural city with an expanding industrial base located in the agricultural heartland of Madhya Pradesh. Famous for palaces, forts, temples, tombs and handicrafts.
➤ **Haldia :** It is a port town recently been developed on the river Hooghly about 105 km downstream from Kolkata. Its main purpose is to release congestion at Kolkata. Haldia has an oil refinery. It receives larger vessels which otherwise would have gone to Kolkata.
➤ **Hyderabad :** Capital of Andhra Pradesh and Telangana located on the Bank of river Musi. It is the largest town leading industrial and trade centre, twin city is Secunderabad. Major industries are engineering goods, power generation, Indian drugs and pharmaceuticals factory and electronic industry.
➤ **Imphal :** Capital of Manipur, cultural and administrative centre, fertile plains of Manipur, cotton textile, handicraft, bamboo made goods, central university, NH-39.
➤ **Jaipur :** Surrounded on three sides by the rugged Aravalli hills, Jaipur is the picturesque capital of Rajasthan. It is a planned city, known as the gateway to Rajasthan and 'Pink City' . It is famous for forts, palaces, ancient observatory, handicrafts and jewellery.
➤ **Jaisalmer :** The desert town founded on an oasis, palaces, fort, jain temple and camel and sheep's fair, handicrafts made this city as the most important tourist destination. Every year 'Desert Festival' celebrated in January. It is the district headquarters of the largest district of Rajasthan.
➤ **Jammu :** Gateway to Kashmir, Jammu is also the winter capital of the state. Situated on the banks of the river Tawi, this busy, prosperous town is surrounded by lakes, hills, temples and fortresses. It is a cultural, commercial and a major tourist centre.
➤ **Jharia :** Located in Jharkhand, second in India in terms of coal reserves. The best in metallurgical store of India. Base for a number of Iron-steel industries and other metallurgical centres.
➤ **Jodhpur :** Situated close to the edge of the Thar desert, Jodhpur is a historical and cultural city. It is an important tourist destination due to beautiful forts, museum and handicraft industries.

➤ **Kakinada :** A deep water port with Special Economic Zone status, also known as fertilizer city of Andhra Pradesh. Hinterland have a great economic value due to the natural gas deposit in Krishna-Godavari basin.
➤ **Kalol :** Famous for oil refinery, crude-oil and natural gas reserve, crude-oil transported through pipeline to Koyali for refining.
➤ **Kanyakumari :** India's southernmost mainland town. Important for Tourism. It is the meeting point of three great seas - the Indian ocean, the Arabian sea and the Bay of Bengal.
➤ **Kochi :** It is another natural harbour located on the coast of Kerala. Kochi has sheltered backwater bay. It handles the export of tea, coffee and spices and imports of mineral oil and chemical fertilisers. The Kochi Oil Refinery receives crude oil through this port.
➤ **Kodaikanal :** A quiet, charming hill station situated in the scenic Palni hills of Tamil Nadu. It has the solar physics observatory and orchidarium. It is famous for the Kurinji flower which blooms once in 12 years.
➤ **Kolkata :** India's second largest city and capital of West Bengal.
Located in the jute producing centre of India, it is a major port city called the 'Gateway to Eastern India'.
➤ **Korba :** Power hub of Chhattisgarh. land of black diamond, Kosa silk and Thermal power, a major mineral source of Chattisgarh. Half of total mineral income of state, one of largest treasure of coal in India. Other limestone, fireclay, etc. 'Gavra project' largest opencast mine of India is located here. Major industrial hub, Aluminium coal and power industries are located here.
➤ **Kullu :** Kullu town is situated on the banks of the winding river Beas, is famous for its orchards, temples, scenery and handloom shawls.
➤ **Ladakh :** A dry, mountainous land of the passes, sandwiched between the Karakoram range and Zaskar range, most often referred to as the "little Tibet".
Ladakh is the highest altitude plateau region in India. Leh is the largest town in Ladakh.
➤ **Leh :** The ancient capital of Ladakh, lies in a fertile valley near the Indus river. It has many Buddhist monasteries, mosque and highest airport and golf course in the world. It is a quiet little township and tourist centre, overlooked by a hilltop palace and monastery.
➤ **Madurai :** One of the most pleasant cities, Madurai has a charming situation on the river Vaigai , fringed by lush paddy fields and coconut groves. It is famous for handloom, handicrafts the Meenakshi temple.
➤ **Mahabaleshwar :** One of the most popular hill station of western India, and at 1372 mt the highest of the region. Situated in the Sahyadri range of the Western Ghats in Satara district of Maharashtra. Mahabaleshwar is also blessed with spectacular views of the Krishna and Koyna valleys and also known as a holy place.
➤ **Mahabalipuram :** UNESCO world heritage site. Famous for Shore temple (Pancha temples) and is a port city.
➤ **Manali :** Situated in northern end of Kullu valley, a hill resort, good scenic beauty, tourist spot, famous for Yak Skiing.
➤ **Marmagao :** It is an important port of Goa and occupies fifth position in handling the traffic. For a long period, it handled the export of iron ore from Goa.
➤ **Mathura :** Ancient holy city, Iargest oil refinery of India, silver polishing industry and is famous for Eari printing and water-tap factories.
➤ **Mount Abu :** Rajasthan's only hill station, located on the Aravalli hill, it is an important pilgrim centre.
Gurushikhar, the highest peak of Aravalli is near this town. Nakki lake and Dilwara temple are most important tourist attraction.
➤ **Mumbai :** It is the Gateway of India from the west, largest city, biggest port and commercial capital. Originally located on the salsette island, it is the state capital of Maharashtra and Hollywood of India.
➤ **Murshidabad :** Located in the left bank of Bhagirathi river in West Bengal, this city is famous for manufacturing utensil, handloom, weaving and silk industry.

➤ **Mysuru :** A cultural and industrial city, known for its palaces, garden, silk factory, and handicraft. It is also known as the 'Sandalwood city' and the 'city of palaces'. It is the second largest city of Karnataka.
➤ **Nainital :** Town in Uttarakhand in Kumaon hills, present in a valley containing pear-shaped lake, famous tourist spot. India's oldest national park. Corbett national park is located here.
➤ **New Mangalore :** It is situated on the coast of Karnataka and handles export of iron ore from Kudremukh. It also handles import of fertilizers, petroleum products, edible oils and other cargo.
➤ **Neyveli :** Thermal power centre in Tamil Nadu, famous for lignite coal, helped in development of industries.
➤ **Ootacamund (Udhagamandalam)/ Ooty :** Former summer capital of the Madras presidency (now Tamil Nadu), Ooty is popularly known as the 'Queen of Hill Station.' It nestles in the Nilgiris (Blue mountain) near the junction of Karnataka, Tamil Nadu and Kerala. Also famous for its Botanical garden and plantations.
➤ **Paradip :** A cultural, industrial and port city of Odisha, Paradeep is located on the Bay of Bengal coast. It handles iron ore and coal along with some other dry cargo.
➤ **Porbandar :** Located in Porbandar district of Gujarat, a coastal city on the extreme west coast of Arabian Sea, birthplace of Mahatma Gandhi, all weather port with direct berthing facilities.
➤ **Pune :** A cultural, military and an administrative town famous for palaces, temples, film and television institute and museum.
It is the birth place and one of the main estates of the Maratha hero Chhatrapati Shivaji.
➤ **Puri :** A minor seaport of Odisha, world famous for the Jagannath Temple. It is a cultural city and pilgrimage. Located on the continental shelf of Bay of Bengal, it has a beautiful natural sea-beach and chemicals, drugs & pharmaceutical industries.
➤ **Ramchandrapuram :** Located in Andhra Pradesh near Godavari delta. The central power distribution company of Andhra Pradesh is located here. It is famous for rice, betel and coconut cultivation.
➤ **Ranchi :** Capital of Jharkhand state. Industrial and cultural town famous for machine tools, spare parts and alumina. Dassam falls located nearby. River Subarnarekha flows near this city.
➤ **Raniganj :** One of the largest and most important coalfields of India situated in upper Damodar valley in West Bengal.
➤ **Shimla :** Former summer capital of British India, Shimla is the largest hill station in the world and capital of the state of Himachal Pradesh. This hill resort is famous for its meadows and forest and handicraft industry.
➤ **Srinagar :** Capital of Jammu & Kashmir, located on river Jhelum.
Cultural and industrial centre, famous for wood work, woolen, silk clothing, carpet manufacturing and handicrafts.
➤ **Surat :** Situated on river Tapi. (left bank). Climate is tropical and rain is abundant, industrial hub for production of synthetic, manmade fibers and diamond cutting industry.
➤ **Talcher :** Industrial town in Angul district (The industrial hubs of Odisha), rich in black diamond, NTPL power plant uses coal from Talcher coalfields and water from a small barrage reservoir on river Brahmani.
➤ **Trivandrum :** It is a busy seaside city built seven hills overlooking the peaceful valleys. It derives its name from Thiru-Anantha-Puram
(Home of the Serpent) and is also known as the city of the Sacred Geese.
➤ **Tuticorin :** A port city developed in the coast of Tamil Nadu which handles traffic of coal, foodgrains, edible oils, sugar and petroleum products.
➤ **Varanasi (Benaras) :** The centre of Hinduism and most important pilgrimage place in India. Located on the Bank of Ganga it is an important seat of learning. It is famous for temples, metal handicrafts and sarees.
➤ **Visakhapatnam :** It has the deepest landlocked and protected port. An important industrial, educational, medical and port city.
It has iron & steel, fertilizer, petroleum refinery and the shipbuilding and ship repair industry.

POPULATION : 2011 CENSUS

The study of population is called Demography.

Population Trend in India

- 1891-1921 Period of stagnant population
- 1921-1951 Period of steady growth
- 1951-1981 Period of high growth
- 1981-2011 Period of declining rate
- The year, 1921 is known as the year of Great Divide.

National Population Policy 2000

This policy outlined the following objectives to be achieved

- To lower down the Total Fertility Rate (TFR) to achieve replacement level by 2010 .
- Population stabilisation by 2045 .
- Reduce MMR (Maternal Mortality Rate) to below 100 per 100000 births .
- Reduce IMR (Infant Mortality Rate) to below 30 per thousand live births.
- Making school education compulsory.
- Promote delayed marriage of girls.
- Promote and control communicable diseases.

Demographics

- First synochronized census in India took place in 1881. Since 1901, it has been taking place after every decade.
- Census 2011 is the 15th Census , and 7th after Independence.
- The slogan of census 2011 is "Our Census, Our Future" .
- India was the first country to adopt family planning in world.
- According to the census 2011 , there are 50 million plus cities in India as compared to 35 in census 2001 .
- 'Cafeteria approach' to family planning was adopted during Janta Party Government Rule in 1978 .

CENSUS 2011

- Total Population of India — 1,21,08,54,977
- Sex Ratio (females per thousand males) — 943
- Crude Birth Rate (2009) — 22.5
- Crude Death Rate (2009) — 7.3
- Infant Mortality Rate (2006) — 57 per thousand live births
- Maternal Morality Rate — 407 per lakh live births
- Literacy rate of the country — 73 per cent. (Male — 80.9 per cent, Female — 64.6 per cent)
- State with highest literacy — Kerala (94.0%)
- State with lowest literacy — Bihar (61.8%)
- State with highest female literacy — Kerala (92.1%)
- State with lowest female literacy — Bihar (51.5%)
- State having highest decadal growth — Meghalaya (27.9%)
- State having highest Population — Uttar Pradesh 19,98,12,341
- State having lowest Population — Sikkim 6,10,577
- State with highest Population Density — Bihar (1106)
- State with lowest Population Density — Arunachal Pradesh (17)
- State having highest Sex Ratio — Kerala (1,084)
- State having lowest Sex Ratio — Haryana (879)
- India accounts for a meagre 2.4 per cent of the world surface area of 135.79 million sq km.
- India supports 17.5 per cent of the World Population.
- Life Expectancy at Birth — 63.5 years, Male — 62.6 years, Female —64.2 years

Physical Geography

UNIVERSE AND SOLAR SYSTEM

Universe

➤ The vast surrounding space is called Universe. It incorporates everything that exists, the stars, planets, satellite as well as our earth and all the objects on it.
➤ Light year and Parsec are the units of measuring distances in the Universe.
➤ One Light year is the distance travelled by light in one year. 1 Light Year = 9.46×10^{12} kilometers .
➤ The nearest star to the earth 'Alpha Centuari' is about 4.3 light years away from the earth.
➤ Parsec is an astronomical unit of distance which is equal to 3.26 light years. 1 Parsec = 3.26 light years .
➤ The science dealing with the nature and origin of the Universe is known as Cosmology .

Galaxy

➤ A galaxy is a vast collection of billion of stars, dust and hydrogen gas, isolated in space from similar system.
➤ The two most important galaxies in the Universe are Milky Way Galaxy and Andromeda Galaxy.
➤ Our own Sun and its family of planets belong to the Milky Way Galaxy.
➤ Three basic shapes of galaxies are :
(i) Spiral Galaxy, (ii) Elliptical Galaxy, (iii) Regular Galaxy
➤ Milky Way galaxy is spiral type of galaxy.
➤ Indian name of Milky Way galaxy is 'Akash Ganga' .
➤ Some of the brightest galaxies are elliptical galaxies.

Constellations

➤ The stars which appear in the form of closed groups and form recognizable shapes are known as constellations.
➤ The Indian name for constellation is 'Nakshatras' . About 80 constellations are known.
➤ Some of the important constellations are : Ursa Major : 'Saptarishi' Ursa Minor : 'Laghu Saptarishi' Orion : 'Mirga' Scorpio : 'Vrischika' Pleides : Kruttika Cassiopeia : 'Sarmistha' **Stars**
➤ Stars are the heavenly bodies like the Sun that are extremely hot and have light of their own.
➤ Stars are made up of vast clouds of hydrogen gas, helium and dust.
➤ The star which lies immediately above the earth's North Pole and around which all other stars seem to revolve is called Pole Star.

Life of Stars : Stars pass through a definite evolutionary sequence. The first step in the formation of a star from gases is the Protostar.
(a) A Protostar : It is formed by the gravitational contraction of gases present in the Galaxy. A Protostar is a highly condensed cloud of gases mainly hydrogen and helium .
(b) Red Giants : The continued Nuclear fusion upset the overall equilibrium of the star and to readjust it star's outer region expands while the core shrinks. Due to the large expansion of the outer shell, the star becomes very big, and its colour changes to red .
(c) Novae and Supernovae : A giant star phase may end in a Novae/ Supernovae stage. These are stars whose brightness increase suddenly by ten to twenty magnitudes or more due to a partial or outright explosion in the star. When brightness increases to 20 magnitudes or more , it is called a Supernovae .
(d) White dwarfs : A Novae/Supernovae explosion in a small star like our Sun (stars lighter than 1.2 solar mass) may leave behind a very dense core of that state. A star of this size cools and contracts to become a White Dwarf.
(e) Neutron star : A supernovae explosion in a star bigger than the Sun but not more than twice as big, may leave behind an extremely dense, residual core of that star, reaching a density of 10^{14} grams/ cm^3 ,

known as Neutron Star .
(f) Pulsar : A spinning neutron star emits radio waves and is called a
(g) Black Holes : A black hole is an object with such a strong gravitational field that even light cannot escape from its surface. Black holes are formed from neutron stars after the Supernoval explosions of big stars . Protostar Red Giants Black Holes Pulsar Neutron Star White dwarf Novae/ Supernovae

Big Bang Theory

➤ The Big Bang Theory formed in 1972 , according to this theory every thing in the universe emerged from a point known as singularity, 15 billion years ago.
➤ This theory explains the origin of universe and every thing in it including ourselves on the premise that the universe contained many million of galaxies each one having thousand of millions of stars and each star having numerous planets around them.
➤ The galaxies moved apart from one another as the empty space between them expanded.
➤ In the beginning the universe was much smaller as there was less space between the galaxies.
➤ All the matter in the universe was created in one instant a fixed moment in time.
➤ "As universe expanded for 15 billion years, the hot radiation in the original fireball also expanded with it, and cooled as a result".

Goldilocks Zone

➤ It is an area of space in which a planet is just the right distance from its home star so that its surface is neither too hot nor too cold. The conditions in the Goldilocks zone are just right so that liquid water remains on the surface of the planet without freezing or evaporating out into space.
Terrestrial planet are more likely to lie in the Goldilocks zone. It is also called as habitable zone or life Zone.

The Solar System

➤ The solar system consists of the Sun, the eight planets and their satellites and various other smaller heavenly bodies such as asteroids, comets and meteors.

The Sun

➤ The sun is a star . It is the star around which the earth and other planets revolve. It is the nearest star to the earth.
➤ Light travelling at a speed of 300,000 km. per second, takes about 8 minutes to reach us from the Sun.
➤ The next nearest star to earth is "Alpha Centuari" .
➤ The Sun is mainly composed of hydrogen. The glowing surface of the Sun which we see is called 'Photosphere'.
➤ Above the photospheres is the red cloud 'Chromosphere'. Beyond the chromospheres is the 'Corona', which is visible during eclipses.
➤ The temperature of the photospheres is about 6000°C, that of the chromosphere about 32400°C, and that of the corona about 2,700,000°C.
➤ The core of the Sun has a temperature about 15 million degrees C.
➤ The dark lines in the corona are called 'Fraunhofer lines'. The emission of hydrogen in all directions is called 'Prominences ' .
➤ Sometimes they roll out of the atmosphere to be seen as 'Solar flares'.
➤ The outward stream of protons flowing out from the corona are called 'Solar winds', which is made up of plasma.
➤ The earth's Magnetosphere or Van Allen belts, as they were earlier called, acts as a shield and deflects the Solar winds.
➤ 'Sun spots' are dark patches notched on the surface of the Sun. They appear dark because they are cooler i.e. they have a temperature of about 1500°C .

The Moon

➤ The Moon's diameter is onefourth of Earth diameter.
➤ Circumference : 11000 km. approximately.

➤ Gravitational Pull in 1/6th of the Earth.
➤ Its orbit around the earth in elliptical orbit.
➤ Distance between the Earth and the Moon is 3,82500 km. approx. (According to NASA)
➤ The distance varies because it revolves around the Earth is an elliptical orbit.
➤ At Perigee the point at which the moon is closest to the Earth, the distance is approximately 3,60000 km .
➤ At Epogee the point at which the moon is farthest to the earth, the distance is approximately 4,05,000 km . (According to NASA).
➤ The Moon is 1/4th size of the Earth.
➤ The Moon take 27 day, 7 hrs, 43 min. and 11.47 sec. to complete one revolution around the Earth.
➤ The Moon in the only satellite of the Earth.
➤ The Moon rotates on its axis in exactly the same time as that of its revolution. That's why we see only one part of the moon.
➤ We can see only 59% of its surface.
➤ There is no atmosphere on the moon.
➤ The moon has no light of its own. It reflects sun light.
➤ The reflected light by the moon reaches on the Earth in 1.3 seconds .
➤ It has a low albedo (reflection).
➤ It reflects only 7% and the rest is absorbed by venus.
➤ Neil Armstrong and Aldrin reached the moon on 21, July 1969 . Through Apollo × 1.
➤ Landing spot is called ‘sea of tranquility’
➤ The black spot on the moon is called 'sea of tranquility.'

The Earth

➤ It is our planet.
➤ As per order in distance from the sun. It is at third position.
➤ It is at 5th position according to size.
➤ It takes 365 days and 6 hrs. for one rotation around the sun.
➤ It is similiar to venus in shape and size.
➤ It is the only planet where life exists.
➤ It is also called ‘Blue Planet’ .
➤ It is the densest of all Planet.
➤ Perihelian is the nearest position of the Earth to the Sun.
➤ The Earth reaches its perihelion on January 3 every year at a distance of about 147 million km.
➤ Aphelian is the farthest position of the Earth from the Sun.
➤ The Earth reaches its aphelian on july 4, when the earth is at a distance of 152 million km.
➤ It is also called ‘Green Planet’ because of ecology.
➤ Venus is the nearest planet to the Earth.
➤ The Earth revolves around the sun at a speed of 29.8 km/second .

Eclipse

➤ An eclipse is an astronomical event that occurs when an astronomical object is temporarily obscured, either by passing into the shadow of another body or by having another body pass between it and the viewer.

Solar Eclipse

➤ As observed from the Earth, a solar eclipse occurs when the Moon passes in front of the Sun.
➤ The type of solar eclipse event depends on the distance of the Moon from the Earth during the event.
➤ A total solar eclipse occurs when the Earth intersects the umbra portion of the Moon’s shadow.
➤ When the umbra does not reach the surface of the Earth, the Sun is only partially occulted, resulting in an annular eclipse.
➤ Partial solar eclipses occur when the viewer is inside the penumbra.

➤ When observed at points in space other than from the Earth's surface, the Sun can be eclipsed by bodies other than the Moon.
➤ Two examples are when the crew of Apollo 12 observed the Earth to eclipse the Sun in 1969 and when the Cassini probe observed Saturn to eclipse the Sun in 2006 .

Lunar Eclipse

➤ Lunar eclipses occur when the Moon passes through the Earth's shadow.
➤ Since this occurs only when the Moon is on the far side of the Earth from the Sun, lunar eclipses only occur when there is a full moon.
➤ There are three types of lunar eclipses : • Penumbral, when the Moon crosses only the Earth's penumbra; • Partial, when the Moon crosses partially into the Earth's umbra; • Total, when the Moon crosses entirely into the Earth's umbra.

Tides

➤ Tides are the rise and fall of sea levels caused by the combined effects of the gravitational forces exerted by the Moon and the Sun and the rotation of the Earth .
➤ Two almost equal high tides and two low tides each day, is called a semi-diurnal tide .
➤ Only one high and one low tide each day, called a diurnal tide .
➤ Two uneven tides a day, or sometimes one high and one low each day; this is called a mixed tide .
➤ The time and amplitude of the tides at a location are influenced by the alignment of the Sun and Moon, by the pattern of tides in the deep ocean , by the amphidromic systems of the oceans, and by the shape of the coastline and near-shore bathymetry .
➤ Tide changes proceed via the following stages : • Sea level rises over several hours, covering the intertidal zone; flood tide .
• The water rises to its highest level, reaching high tide.
• Sea level falls over several hours, revealing the intertidal zone; ebb tide.
• The water stops falling, reaching low tide, a tides produce oscillating currents known as tidal streams .
➤ The moment that the tidal current ceases is called slack water or slack tide. The tide then reverses direction and is said to be turning.

The Types of Tides : Springs and Neaps

➤ The semi-diurnal range (the difference in height between high and low waters over about half a day) varies in a two-week cycle.
➤ Approximately twice a month, around new moon and full moon when the Sun, Moon and Earth form a line the tidal force due to the sun reinforces that due to the Moon.
➤ The tide's range is then at its maximum : this is called the spring tide, or just spring s .
➤ When the Moon is at first quarter or third quarter, the sun and Moon are separated by 90° when viewed from the Earth, and the solar tidal force partially cancels the Moon's.
➤ At these points in the lunar cycle, the tide's range is at its minimum: this is called the neap tid e ,

Planets

➤ Planets are solid heavenly bodies which revolve around the Sun in closed
➤ A Planet is made up of rock and metal.
➤ The Planets move around the Sun from west to east.
➤ There are eight major Planets including earth.

The Eight Planets (Grahas)

(1) Mercury (Budha)
(2) Venus (Shukra)
(3) Earth (Prithvi)
(4) Mars (Mangal)
(5) Jupiter (Brihaspati)
(6) Saturn (Shani)
(7) Uranus (Indra)
(8) Neptune (Varun)

Pluto (Yama) is not a planet now, Pluto is considered as Dwarf planet : Pluto was discovered by Clyde Tombaugh in 1930 . The redefinition of planet by the International Astronomical Union (IAU) on August 24, 2006 states that, in the Solar System, a planet is a celestial body that

➤ orbit around the Sun.
➤ has sufficient mass so that it assumes a hydrostatic equilibrium (nearly round) shape.
➤ has cleared the neighbourhood around its orbit.
➤ A non-satellite body fulfilling the first two rule is classified as a Dwarf planet. So, Pluto is considered as Dwarf planet.
➤ A non-satellite body fulfilling the first rule is termed as Small Solar System Body (SSSB) .
➤ According to the definition, there are currently eight planets and five Dwarf planets known in the Solar System. The 5 Dwarf planets are Pluto, Ceres, Eris, Makemake and Haumea .
➤ Pluto has been given the number 134340 .

Asteroids : Asteroids are very small planets of rock and metal which revolve around the Sun mainly between the orbits of Mars and Jupiter .

Comets : A comet is a collection of gas and dust which appears as a bright ball of light in the sky with a long glowing tail .

Meteors : Meteors are the heavenly bodies from the sky which are seen as a bright streak of light in the sky . The meteors are also called as shooting stars .

Meteorite : A meteor which does not burn completely on entering the earth's atmosphere and lands on earth surface is known as Meteorite.

➤ Increasing order of planet of distance from the sun.

Mercury Venus Earth Mars Jupiter Saturn Uranus Neptune

➤ Decreasing order of diameter of planet.

Jupiter Saturn Uranus Neptune Earth Venus Mars Mercury

FACTS TO REMEMBER

Planet	Points
Venus	Brightest Planet, Evening Star, Morning Star, Hottest Planet, Nearest Planet to Earth, Earth's twin, Slowest rotation in solar system, same period of rotation as revolution, rotates from East to West
Earth	Blue Planet, Densest Planet
Mars	Red Planet, length of the day is nearly same as that of the Earth
Mercury	Smallest Planet, Fastest revolution in Solar System, nearest planet to Sun, shortest year, maximum diurnal range of temperature
Neptune	Slowest revolution in Solar System, Coldest Planet
Pluto	slowest revolving dwarf planet, coldest and smallest dwarf planet, Biplanet, longest year
Jupiter	fastest rotating planet, Biggest Planet
Uranus	Green Planet, rotates from North to South
Titan	Only satellite with an atmosphere like Earth
Saturn	Least dense Planet, has maximum number of satellites
Proxima centauri	Closest star to the Sun
Mars	Red Planet
Gannymede	Biggest Satellite

Deimos	Smallest satellite

- The length of the day is nearly same on the planet Mars as that of the Earth.
- **Jupite r , Satur n , Uranus** and **Neptune** are the Jovian planets.
- The angle of inclination of **Mars** is nearly same as that of Earth.
- **Jupite r , Satur n , Uranus** and **Neptune** are the outer planets.
- **Mercur y , Venu s , Earth** and **Mars are inner planets.**

Geological Time Scale

Eons	Era	Period	Epoch	Year	Age/years Before Present
	Cainozoic (From 65 million years to the present times)	Quaternary	Holocene Pleistocene	0 - 10,000 10,000 - 2 million	Modern Man Homo Sapiens
		Tertiary	Pliocene Miocene Oligocene Eocene Palaeocene	2 - 5 million 5 - 24 million 24-37 Million 37 - 58 Million 57 - 65 Million	Early Human Ancestor Ape : Flowering Plants and Treees Anthropoid Ape Rabbits and Hare Small Mannals : Rats - Mice
	Mesozoic 65 - 245 Million Mammals	Cretaceous Jurassic Trjassic	No Epoch	65 - 144 Million 144 - 208 Million 208 - 245 Million	Extinction of Dinosaurs Age of Dinosaurs Frogs and turtles
	Palaeozolc 245-570 Million	Permian Carboniferous Devonian Silurian Ordovician Cambrian	No Epoch	245-286 Million 286-360 Million 360-408 Million 408-438 Million 438-505 Million 505-570 Million	Reptile dominate-replace amphibians First Reptiles: Vertebrates : Coal beds Amphibians First trace of life on land: plants First Fish No terrestrial Life: Marine Invertebrate
Proterozolc Archean Hadean	Pre-Cambrian 570 Million 4,800 Million		No Epoch	570-2,500 Million 2,500-3,800 Million 3,800 - 4,800 Million	Soft-bodied arthropods Blue green Algae; Unicellular Bacteria Oceans and Continents form - Ocean and Atmosphere are rich in Carbon dioxide
Origin of Stars Supernova Big Bang	5,000-13,700 Million		No Epoch	5,000 Million 12,000 Million 13,700 Million	Origin of the sun Origin of the universe

THE EARTH

International Date Line (IDL)

- The International Date Line (IDL) is an imaginary line on the surface of the Earth, that runs from the north to the south pole and demarcates one calendar day from the next.
- It passes through the middle of the Pacific Ocean, roughly following the 180° longitude but it deviates at Aleutian Islands, Fiji, Samoa and Gilbert Islands.
- The International Date line is on the opposite side of the Earth Prime Meridian.

➤ The Prime Meridian helps to define Universal Time and is the meridian from which all other time zones are calculated.
➤ A traveler crossing the International Date Line eastbound (i.e., from Japan to USA) subtracts one day, or 24 hours, so that the calendar date to the west of the line is repeated after the following midnight.
➤ Crossing the IDL westbound results in 24 hours being added, advancing the calendar date by one day.

Prime Meridian :

➤ It is the mean solar time at the Royal ob in Greenwich London.
➤ GMT is formally used as the international civil time standard now superseded in that function by coordinated universal time.
➤ The modern form of mean solar time at 0° longitude.
➤ Prime meridian passes through these countries :
1. U.K 2. Spain 3. France, 4. Algeria 5. Burkino Faso 6. Ghana, 7. Togo 8. Mali 9. Antarctica (South Pole)

Tropic of Cance r

The line beyond which sunrays never incident directly at 90 ^{0} on earth in northern hemisphere. It is a line at 23 ½ in northern hemisphere. It is thus the southernmost latitude where the Sun can be directly overhead (90 ^{0}). ➤ Tropic of cancer passes through these countries :
1. USA 2. Mexico 3. Bahamas, 4. Mali 5. Mauritania 6. Niger, 7. Algeria 8. Chad 9. Libya, 10. Saudi Arabia 11. Egypt 12. UAE, 13. India 14. Bangladesh 15. Myanmar, 16. China 17. Oman

Tropic of Capricorn

➤ The line beyond which sunrays never incident directly at 90 ^{0} on earth in southern hemisphere. It is a line at 23 ½ in southern hemisphere. It is thus the southernmost latitude where the Sun can be directly overhead (90 ^{0}). It passes through these countries — 1. Chile 2. Argentina 3. Paraguay, 4. Brazil 5. Namibia 6. Botswana, 7. South Africa 8. Medagascar 9. Mozambique, 10. Australia

Equator

➤ It passes through these countries —, 1. Ecuador 2. Colombia 3. Brazil, 4. Gabon 5. Congo 6. Zaire, 7. Somalia 8. Uganda 9. Kenya, 10. Indonesia 11. Kiribati 12. Maldives, 13. Sao Tome and Principe

EARTH'S MOVEMENTS

(i) Rotation : Earth rotates on its own axis that is tilted at an angle of 23½° to the vertical .
➤ It spins from west to east once in every 23 hours, 56 minutes and 4.9 seconds .
➤ The linear velocity of rotation varies, achieving a maximum of 1690 km/hr at the equator, reducing gradually to zero at the poles.

Effects of Earth's Rotation

➤ We have day and night.
➤ A difference of 1 hour between two meridians which are 15° apart.
➤ Deflection of ocean currents and winds.
➤ Rise and fall of tides every day.

(ii) Revolution : Earth revolves round the Sun once in every 365¼ days .
➤ Earth revolves on an elliptical orbit at a speed of 106,560 km/hr. As it is not possible to show a quarter of a day in the calendar, a normal year is taken to be 365 days, and an extra day is added every four years in a leap year.

Effects of Revolution

➤ Change of seasons.
➤ Variation in the lengths of day and night at different times of the year.
➤ Shifting of wind belts.
➤ Determination of latitudes.

TILT OF EARTH'S AXIS

➤ The axis of Earth is inclined to the plane of ecliptic at an angle of 66½° .
➤ It gives rise to different seasons and varying lengths of day and night.

➤ The Sun is vertically overhead at the equator on two days each year i.e. on March 21st and September 23rd .
➤ These days are called equinoxes meaning 'equal nights' .
➤ After the March equinox, the Sun appears to move northwards and is vertically at the Tropic of Cancer on June 21st. This is known as the Summer Solstice.
➤ During summer solstice, the Northern hemisphere will have its longest day and the shortest night.
➤ By December 22nd, the Sun is overhead at the Tropic of Capricorn.
➤ This is the Winter Solstice.
➤ In the Winter Solstice the Southern hemisphere will have its longest day and shortest the night.

LATITUDES AND LONGITUDES

➤ **Latitude :** Latitude is the angular distance of a point on the earth's surface, measured in degrees from the centre of the places of same latitude are called parallels of latitude since they are parallel to a line, the Equator, which lies midway between the poles. These parallels of latitude are actually circles on the globe, becoming smaller poleward.
➤ Some important parallels are :
(i) 0° latitude : Equator
(ii) 23½°N : Tropic of Cancer
(iii) 23½°S : Tropic of Capricorn
(iv) 66½°N : Arctic Circle
(v) 66½°S : Antarctic Circle
➤ The parallel of 60° is half of the Equator in length and 75° is ¼th of the Equator.
➤ **Longitude :** Longitude is the angular distance measured in degrees along the equator east or west of the Prime Meridian.
➤ On the globe the lines of longitude are drawn as a series of semi-circles that extend from the North Pole to the South Pole through the Equator.
➤ They are also called meridians.
The Prime Meridian (0°) is that meridian which passes through the **Greenwich,** near London and from which all other meridians radiate eastwards and westwards up to 180°.
➤ 1° of latitude or longitude represents 111 km approx .
➤ This distance is true for the longitudes along the equator only since the distance between the longitudes gradually decreases towards the poles to 0 km.

THEORIES RELATED TO ORIGIN OF THE EARTH

THEORIES RELATED TO ORIGIN OF THE EARTH	
Hypothesis	Propounder
Nebular Hypothesis	— Laplace
Tidal Hypothesis	— James Jeans
Supernova Hypothesis	— F. Hoyle
Gaseous Hypothesis	— Immanuel Kant
Planetesimal Hypothesis	— Chamberlin
Binary Star Hypothesis	— H.N. Russell

COMPOSITION OF THE EARTH

1. Iron 35%
2. Oxygen 30%
3. Silicon 15%
4. Magnesium 13%
5. Nickel 2.4%
6. Sulfur 1.9 %

SOURCE OF KNOWLEDGE OF INTERIORS

Direct sources	Indirect Sources
The surface rocks or rocks we get from mining	Meteors as they are made up of same materials as, or similar to our planet.
Molten material (magma) from volcanic eruptions Observations from scientific projects such as : "Deep ocean Drilling Project" and "Integrated	Other important sources include: 1. Gravitation 2. Magnetic field 3. Seismic activity

STRUCTURE OF THE EARTH

➤ The structure of Earth can be defined in two ways : by mechanical properties such as rheology , or chemically. Mechanically, it can be divided into lithosphere , asthenosphere , mesospheric mantle , outer core , and the inner core .

➤ The interior of Earth is divided into 5 important layers. Chemically, Earth can be divided into the crust, upper mantle, lower mantle, outer core, and inner core.

➤ The geologic component layers of Earth are at the following depths below the surface :

Core

➤ The inner most layer of the Earth is called the core.

➤ The core is divided into two parts, a solid inner core with a radius of~ 1,220 km and a liquid outer core extending beyond it to a radius of ~ 3,400 km .

➤ The solid inner core was discovered in 1936 by Inge Lehmann and is generally believed to be composed primarily of iron and some nickel.

➤ The core is thus believed to largely be composed of iron (80%), along with nickel and one or more light elements, whereas other dense elements, such as lead and uranium , either are too rare to be significant or tend to bind to lighter elements and thus remain in the crust.

➤ The liquid outer core surrounds the inner core and is believed to be composed of iron mixed with nickel and trace amounts of lighter elements.

Mantle

➤ Earth's mantle extends to a depth of 2,890 km, making it the thickest layer of Earth.

➤ The mantle is composed of silicate rocks that are rich in iron and magnesium relative to the overlying crust.

➤ The high temperatures within the mantle cause the silicate material to be sufficiently ductile that it can flow on very long timescales.

➤ Convection of the mantle is expressed at the surface through the motions of tectonic plates .

➤ The melting point and viscosity of a substance depends on the pressure it is under.

Crust

➤ The crust ranges from 5-70 km in depth and is the outermost

➤ The thin parts are the oceanic crust , which underlie the ocean basins (5-10 km) and are composed of dense (mafic) iron magnesium silicate igneous rocks , like basalt .

➤ The thicker crust is continental crust , which is less dense and composed of (felsic) sodium potassium aluminium silicate rocks, like granite .

➤ The rocks of the crust fall into two major categories -Sial (Silicate + Aluminium) and Sima (Silicate + Magnesium).

➤ It is estimated that sima starts about 11 km below the Conrad discontinuity (a second order discontinuity).

➤ The uppermost mantle together with the crust constitutes the lithosphere .

➤ The crust-mantle boundary occurs as two physically different events.

➤ First, there is a discontinuity in the seismic velocity, which is known as the Mohorovicic discontinuity or Moho. The cause of the Moho is thought to be a change in rock composition from rocks containing plagioclase feldspar (above) to rocks that contain no feldspars (below).
➤ Second, in oceanic crust, there is a chemical discontinuity between ultramafic cumulates and tectonized harzburgites , which has been observed from deep parts of the oceanic crust that have been obducted onto the continental crust and preserved as ophi-olite sequences .
➤ Many rocks now making up Earth's crust formed less than 100 million (1×10^{8}) years ago; however, the oldest known mineral grains are 4.4 billion (4.4×10^{9}) years old, indicating that Earth had a solid crust for at

COMPOSITION OF EARTH CRUST

1. Oxygen 46.60%
2. Silicon 27.7%
3. Aluminium 8.1%
4. Iron 5.0%
5. Calcium 3.6%
6. Sodium 2.8%
7. Potassium 2.5%
8. Magnesium 2.09%
9. Others 1.41%

MAJOR DISCONTINUITY

Moho Discontinuity : Between Crust and Mantle
Conrad Discontinuity : Between outer and Inner Crust
Weichert-Gutenberg Discontinuity : Between Mantle and Core
Repetti Discontinuity : Outer and Inner Mantle
Transition Discontinuity : Outer and Inner Core.

Earthquakes

➤ When the Lithosphere plates move, the surface of the Earth vibrates .
➤ The vibrations are travelled all round the Earth, these vibrations are called earthquakes .
➤ The point of origin of earthquake is called ' Focus' .
➤ The point on the Earth's surface vertically above the focus is called 'Epicentre' .
➤ The waves are recorded by seismograph .
➤ The magnitude of waves is measured on Richter's scale .
➤ The number on this scale ranges from 0 to 9 . Each increase of one unit on the Richter scale represents a tenfold increase in earthquake strength.
➤ No earthquake has been measured above 9 on scale.
➤ The region around the Pacific Ocean is prone to earthquakes.
➤ In India, Himalayan region and Ganga-Brahmaputra valley are prone to earthquakes.
➤ Although earthquakes can't be predicated, the impact can certainly be minimised if we are prepared before hand.
➤ Around 21% of earthquakes occur in the mid-world mountain belt extending parallel to the

Types of earthquake waves :

There are three types of earthquake waves — **Primary waves (P waves) :**

➤ These waves are longitudinal waves.
➤ Travel from the point of happening by the displacement of surrounding particles.
➤ They are transmitted through solids, liquids and gases.
➤ These wave travel fastest.

Secondary waves (S waves) :

➤ These waves are transverse waves.
➤ These waves travel through solids only.

➤ Can't pass through core.

Long waves (L waves) :

➤ These waves are also called surface waves.
➤ Travel on Earth's surface.
➤ These waves cause maximum destruction.

Effects of Earthquake

➤ Ground shaking
➤ Differential ground settlements
➤ Mud slides
➤ Soil liquefaction
➤ Ground Lunching
➤ Avalanches
➤ Fires
➤ Tsunami

The Earthquake Zones in India

On the basis of intensity of the earthquakes a map of India has been published by the Meteorological Department in collaboration of the Indian Standard Institution. The map shows the five seismic zones based on modified Mercalli scale.

Zone I - Intensity V or below (feeble, slight, moderate rather strong)
Zone II - Intensity VI (strong)
Zone III - Intensity VII (very strong)
Zone IV - Intensity VIII (Destructive Zone)
Zone V - Intensity more than VIII (Disastrous, Catastrophic)

Zone I - No area of India is currently classed. in zone I

Zone II - Includes Southern Punjab and Haryana, certain parts of Plains of Uttar Pradesh, Eastern Rajasthan, Coastal areas of Odisha and Tamilnadu. This is the low damage rests zone.

Zone III: Covers Southern and South Eastern parts of Rajasthan, larger parts of Madhya Pradesh, Maharashtra, Karnataka, Jharkhand and Northern and North-Western parts of Orissa.

Zone IV: Covers Jammu and Kashmir, Himachal Pradesh, Northern parts of Punjab, Haryana, Delhi, Eastern Uttar Pradesh, Tasai and Bhabhat regions, the Himalayan areas of Uttaranchal, Bihar and Sikkim

Zone V: Covers certain parts of Jammu and Kashmir, Himachal Pradesh, Uttranchal, Monghy, and Darbhanga districts of Bihar, Northern part of India and Kutchh region of Gujarat. Some specific areas where the waves are not reported, such zone is called the 'shadow zone'.

Volcanoes

➤ A volcano is an opening in the Earth's crust.
➤ Crust allows magma to reach the Earth's surface.
➤ The magma that reaches the Earth's surface is called lava .
➤ Sometimes magma rises slowly to the surface and spread over a vast area.
➤ Some plateaus and plains have been formed in this way.
➤ The top of cone is usually marked by a funnel shaped depression, which is called crator.

Types of volcanoes : There are three types of volcanoes — **Shield volcanoes :**

➤ The shield volcanoes are the largest of all the volcanoes on the Earth .
➤ These volcanoes are mostly made up of Basalt .
➤ They become explosive if water gets into the vent.
➤ These are formed by quiet eruption of lava with low silica content.

Active Volcanoes Dormant Volcanoes Extinct Volcanoes

Active Volcanoes	Dormant Volcanoes	Extinct Volcanoes
Mount Etna-Sicily island Stromboli-Lepari island Cotapaxi-	Fujiyama-Japan Visuvious-Italy Krakatao- Indonesia	Kohsultan-Iran Popa-Myanmar Chimborajo-

Ecuador Mauna loa-Hawaii island Ojos de Salado-Argentina - Chile boundary		Ecuador Aconcagua-Argentina

Composite Volcanoes

➤ These volcanoes are characterised by eruptions of cooler and more viscous lava than basalt .

➤ These are made of lava and ash.

➤ On the basis of frequency of eruption, volcanoes are classified into active, dormant and extinct volcanoes .

➤ **Active Volcanoes :** The volcanoes which continues to erupt periodically are called active volcanoes.

➤ **Dormant Volcanoes :** The volcanoes which are devoid of any activities for a long time but in which there is a possibility of eruption are called dormant volcanoes .

➤ **Extinct volcanoes :** The volcanoes in which the eruption has completely stopped and is not likely to occur are called extinct volcanoes.

➤ The atmosphere is an insulating blanket protecting the Earth.

➤ It softens the intense light and heat of the Sun.

➤ It's Ozone layer absorb most of the harmful ultraviolet rays from the Sun .

Composition

➤ The atmosphere is composed of various gases and water vapour, and in its uppermost reaches, it is charged with subatomic particles.

➤ Of the many constituents, carbon dioxide, dust particles, water vapour and Ozone are of great importance for the earth's climatic conditions.

➤ Nitrogen serves mainly as a diluents and its main function is to regulate combustion by diluting oxygen.

➤ Carbondioxide, just 0.03 per cent of the dry air, even though it has great climatic significance. This gas emits about half of the absorbed heat back to the earth and hence a very important function in the heat energy budget.

➤ Ozone, less than 0.0005 per cent by volume, is not uniformly distributed in the atmosphere.

➤ It's greatest concentration is found between the altitude of 20 and 25 km. It absorbs the ultraviolet solar radiation.

➤ Water vapour content in the air may vary from 0.02 per cent by volume in the cold dry climate to nearly 4 percent in humid tropics.

➤ It absorbs not only the long wave terrestrial radiation, but also a part of incoming solar radiation , thus regulating the energy transfer through the atmosphere.

➤ About 90 per cent of water vapour lies below 6 km of the atmosphere.

Only less than 1 per cent of the total atmospheric moisture in the atmosphere is found above 10 km.

➤ Dust particle include all the solid particles present in the air excepting the gases and water vapour.

➤ They absorb a part of the incoming short-wave solar energy.

➤ A certain percentage of solar radiation energy is reflected back

Rocks And Soils

Rocks

➤ Rocks are made up of individual substances, which are called minerals found mostly in a solid state.

➤ Each mineral usually contains two or more simple substances called elements of which the whole earth is made.

➤ Out of about 2000 minerals , only twelve are common all over the earth. These twelve minerals are called the rock-formers.

➤ As many as 87 per cent of the minerals in earth's crust are silicates.

➤ The metal compounds of rocks is known as 'ores'.

CLASSIFICATION OF ROCKS

On the basis of the mode of formation, rocks are usually classified into three major types :

(1) Igneous Rocks

➤ Igneous rocks are found mostly in the Earth.

➤ Two-third of the earth's crust is made of these rocks.

➤ These rocks are called the basic rocks.

➤ These rocks are ancestors of all other rocks and make up 85 per cent or more of the earth's crust.

➤ Igneous rocks are formed by the cooling, solidification and crystallization of molten earth materials, known as magma and lava.

➤ Igneous rocks are also called as Primary rocks or parent rocks because these were originated first during the formation of crust through the process of cooling of the earth surface.

➤ The igneous rocks are made of silicates (SiO_2) and often combine with other oxides of aluminum, iron, magnesium etc. some of the important igneous rocks are granites, rhyolite, pegmatite, syetite, diorite, andestite gabbro, basalt, dolerite and peridotite .

➤ Igneous rocks are generally hard and water percolates through them with great difficulty along the joints.

➤ Since water does not percolate easily, these rocks are less affected by chemical weathering.

➤ These rocks are more prone to mechanical weathering due to their granular structure.

➤ These rocks are non-fossiliferous.

On the basis of mode of occurrence, Igneous rocks are classified into two major groups :

(i) Intrusive Igneous Rocks :

When the rising magma is cooled and solidified below the surface of the earth, they are known as Intrusive Igneous Rocks . These are further sub-divided into :

(a) Plutonic Igneous Rocks :

They result from the cooling of magma very deep inside the earth.

Due to very slow cooling at that great depth, large grains are developed, e.g.- Granite

(b) Hypabyssal Igneous Rocks :

They are formed when magma cools and solidify just beneath the earth surface. They take different shapes and forms depending upon the hollow places in which they solidify.

(ii) Extrusive Igneous Rocks :

These igneous rocks are formed by the cooling and solidification of molten lava on the earth's surface. Basalt is the most important example of extrusive igneous rocks, others being Gabbro and Obridian . These are generally fine grained or glassy because of quick rate of cooling of lava. The extrusive igneous rocks are divided into two sub-groups :

(a) Explosive Type : Volcanic materials of violent volcanic eruptions include 'bombs' (big fragments of rocks), lapilli (pea-sized fragments) and volcanic dusts and ashes.

(b) Quiet Type : In this, lava appear on the surface through cracks and fissures and their continous flow form extensive lava plateaus, e.g., Deccan Plateau, Columbia Plateau .

(2) Sedimentary Rocks

➤ Sedimentary rocks are constituted of sediments, a material from wind or running water that settle down.

➤ About 75% of the surface area of the globe is covered by the sedimentary rocks while rest 25% area is occupied by the igneous and metamorphic rocks.

➤ Though sedimentary rocks cover largest area of the earth's surface, they constitute only 5% of the composition of the crust while 95% of the crust is composed of igneous and metamorphic rocks.

➤ **The fossils** are found in the layers of sedimentary rocks. A fossil refers to any part of the once living things preserved in the rock. It may be entire body, a singe bone or a set of foot-prints.

It tells up about the life in past and they help us to date environment.

Fossils also show what kind of animals lived in the past.

➤ The layers of sedimentary rocks hold all reserve of coal, oil and natural gas.

➤ The mechanically formed sedimentary rock contain pieces of other rocks.

➤ Agents like running water, wind and moving ice break them into smaller pieces and deposits them at new sites where they form new sedimentary rocks.
➤ Organically formed sedimentary animals and plants. Limestone , chalk and corals are the most common of this type of sedimentary rocks.
➤ Chemically formed rocks are formed by the direct precipitation of mineral matter from solution. Rock-salt is an example of such rocks. Gypsum is also formed in a similar manner.
➤ **'Sandston e '** is a common sedimentary rock, is formed mainly of quartz particles cemented together by silica, lime or iron oxide.
➤ 'Shale' is most abundant of all sedimentary rocks.
➤ It is compacted silt and clay. Kaolin and clay minerals are abundant in it.
➤ **Rock gypsum** is a white to reddish in colour. Gypsum and rock salt are formed by the evaporation of sea water and salt lakes.
➤ 'Chalk' is a calcareous rock made up of microscopic skeletal elements from a varieties of limes secreting organism.
➤ It is composed of almost pure calcium carbonate .
➤ Most of the sedimentary rocks are permeable and porous but a few of them are also non-porous such as clay.

(3) Metamorphic Rocks

➤ In Greek language the word metamorphic means 'change of form' .
➤ When the original character of the rocks i.e. their colour, texture and mineral composition is partly or wholly changed, it gives rise to metamorphic rocks, under favourable conditions of heat and pressure.
➤ The formation of metamorphic rock refers that in course of time shale may get changed to slate and schist, limestones to marble, sandstone to quartzite
➤ The metamorphic rocks may be classified into two categories :
(i) The **Foliated** and
(ii) **Non-Foliate d** .
➤ The foliated rock is characterised by parallel arrangement of slaty minerals such as mica.
➤ In the non-foliated metamorphic rocks, the minerals grains are equi-diamensional e.g. quartzite and marble.
➤ Uranium is found in metamorphic rocks.
➤ Example of metamorphic rocks formed from different rocks— **Metamorphic rock Made from** Marble — limestone, chalk, dolomite Quartzite — Sandstone Slate — Shale Graphite and Diamond — Bituminus coal Gneiss — Granite

Mountains

Mountains

➤ An uplifted portion of the earth's surface is called a mountain.
➤ On the basis of their origin or mode of formation, the mountains are classified as structural, residual or dissected and volcanic .

Structural Mountains

➤ Such systems are hundreds of kilometers wide and thousands of kilometer long.
➤ Many of them lie near or parallel to continental coastlines.
➤ Both the fold and the block mountains are included in this type.
➤ **Fold Mountains :** These mountains have originated due to compressional tectonic forces and have been thrown up to form fold mountains e.g. Himalayas, Andes, Alps etc.
➤ On the basis of age the fold mountains can be grouped into.

(i) New or Young Fold Mountains :

Example **:** The Alps , the Himalayas , the Circum-Pacific Oceanic Mountains , etc.
➤ The main features of these mountains are the complex folding of the rocks, faulting, volcanic weathering caused by running water, ice, winds, etc.

(ii) Old Fold Mountains : *Example* : The Caledonion and Hercynian mountains of Central Europe, the Pennines , the Highland of Scotland , etc.

➤ These mountains were folded in very ancient times, then subjected to denudation and uplift; many faults were formed and the layers of the rock were wrapped.

➤ Many mountains exist as relics due to erosion.

➤ **Block Mountains :** These mountains are formed when great blocks of the earth's crust may be raised or lowered during the late stages of mountain–building.

➤ When the earth's crust cracks due to tension or compression, faulting takes place.

➤ A section of the landform may subside or rise above the surrounding level giving rise to Block Mountains or Horst or Rift valley or Graben.

➤ The Block Mountains have a steep slope towards the rift valley but the slope on the other side is long and gentle.

➤ An old fold mountain may also be left as block mountains due to continuous denudation.

➤ The Vosges in France, Black Forest (Rhine valley) in Germany and Salt Range in Pakistan are cited as typical examples of block mountains.

Volcanic Mountains

➤ These mountains are formed by the accumulation of volcanic material.

➤ The slope of the mountains becomes steep and the height increases due to the development of the cones of various types like Cinder cones, Composite cones, Acidic lava cones, Basic lava cones, etc.

➤ Well-known examples of this type are Popocatepetle of Mexico , Mount Raineer of Washington, Lessen Peak of California, the Visuvious of Italy, the Fujiyama in Japan, the Aconcagna in Chile, Kilimanjaro in Africa, Mt. Mayon in Philippines, Mt. Merapi in Sumatra etc.

Residual or Dissected Mountains

➤ They owe their present form due to erosion by different agencies.

➤ They have been worn down from previously existing elevated regions.

➤ This type of Mountains includes, Vindhyachal ranges, Aravallis , Satpura, Eastern and Western Ghats, Nilgiris, Parasnath, Girnar, Rajmahal .

Fold Block Volcanic Residnal

Fold Mountains	**Block Mountains**	**Volcanic Mountains**	**Residnal Mountains**
Himalayas	Vosges-France	Mauna Loa-USA	Vindhyachal
Alps	Vindhya-India	Hawaii Island (USA) Fujiyama-Japan	Aravalli
Rockies	Satpura-India	Popa-Myanmar	Satpura
Andes	Harge-Germany	Rainier-USA	Mahadev
Ural	Salt Range-Pakistan	Kilimanjaro-Tanzania	Western Ghat
Appalachians	—	—	Eastern Ghat
Tian Shan	—	—	Parasnath
Atlas	—	—	—

Main Plateaus of the World

Arabian Plateau — South-West Asia Deccan Plateau — South India Iran Plateau — Iran Brazil Plateau — Brazil Mexico Plateau — Mexico Alaska Plateau — USA Bolivia Plateau — Bolivia Great Basin Plateau — USA Colorado Plateau — USA Ozark Plateau — USA Pamir Plateau — China Guiana Plateau — Venezuela and Guyana Mongolian Plateau — Mangolia and China Meghalaya Plateau — India Peninsula Plateau — India Plateau

Soils

The Soil Profile

➤ The soil profile consists of the weathered material derived from the rock. But the bedrock itself does not form a part of it.

➤ A soil profile generally has three main horizons in it-true soil at the top , subsoil and the bedrock apart from it.

➤ Each horizon is quite distinct from the others by its own physical and chemical composition, and organic contents produced the long process of soil formation.

➤ Each soil type has physical properties like its colour, texture and the structure.

➤ They largely depend upon the nature of the bedrock from which they are derived.

➤ There are five soil forming factors- bedrock, local climate, plant and animal organisms, elevation and the relief .

Soil Classification

➤ The two main zonal groups of soil are the Pedalfers and the Pedocals.

➤ These are further subdivided into twelve major soil types all over the Globe .

➤ Pedalfers are found in humid climates extending from high-latitude coniferous forests, mid-latitude deciduous forest lands to low-latitude tropical forests and grasslands.

➤ Pedocals group of soils are found in the arid, semi-arid and the sub-humid ones in the world.

➤ Pedocals are rich in calcium and mineral salts.

➤ The black earths or chernozomes are one of the richest soils of this group.

Other Important Classification of Soil

Inceptisols : Soil with weakly developed horizons, having minerals capable of further alteration by weathering processes.

Andisols : Soils with weakly developed horizons, having a high proportion of glassy volcanic parent material produced by erupting volcanoes.

Entisols : Soils lacking horizons, usually because their parent material has accumulated only recently.

Oxisols : Very old highly weathered soils of low lattitudes, with a subsurface horizon of accumulation of mineral oxides and very **Ultisols :** Soils of equatorial, tropical and subtropical latitudinal, zones, with a subsurface horizon of clay accumulation and low base status.

Vertisols : This soil contains high clay content. Vertisols develop deep, wide cracks when dry and the soil blocks formed by cracking move with respect to each other.

Alfisols : Soils of humid and subhumid climates with subsurface horizon of clay accumulation and high base status.

Spodosols : Soils of cold, moist climates, with a well developed B horizon of illuviation and low base status.

Mollisols : Soils of semiarid and subhumid mild midlatitude grasslands, with a dark, humus rich epipedon and very high base status.

Aridisols : Soils of dry climates, low in organic matter, and often having subsurface horizons of accumulation of carbonate minerals or soluble salts.

Histosols : Soils with a thick upper layer very rich in organic matter.

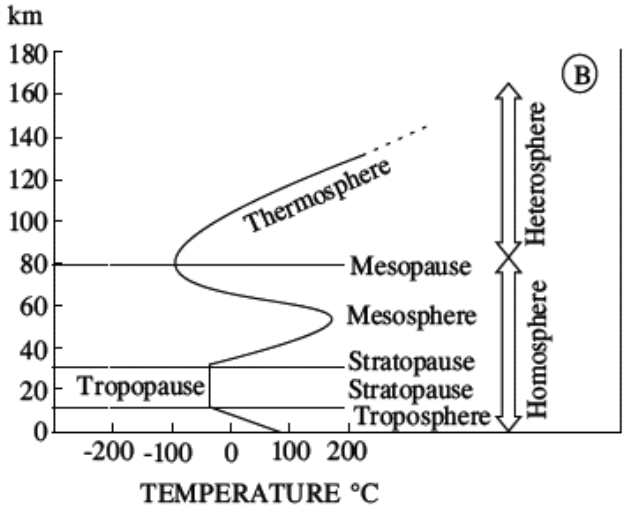
ATMOSPHERE

Composition

Nitrogen (N_2) 78.084 %
Neon 00.0018 %
Oxygen (O_2) 20.947 %
Helium 00.0005 %
Argon (Ar) 00.934 %
Methane 00.0002 %
Carbon Dioxide (CO_2) 0.0314 %

Krypton 00.0001 %
Hydrogen (H_2) 00.00005 %

Structure Of Atmosphere



➤ The atmosphere has a layered structure.
➤ This is because of density stratification as a result of this lighter gases move up and denser one settles down.
➤ The atmosphere can broadly be divided into 5 layers , there are :

(1) Troposphere

➤ The troposphere is the lowest layer of the atmosphere.
➤ It extends roughly to a height of 8 km . near the Poles and about 18km. at the equator.
➤ Temperature decreases with height, roughly at the rate of 1°C for 165 meters of ascent. This is known as normal lapse rate.
➤ This layer contains dust particles and over 90 per cent of the earth's water vapour.
➤ All vital atmospheric processes leading to various climate and weather conditions take place in this layer.

(2) Stratosphere

➤ It lies beyond the Troposphere.
The zone separating the two layers is known as the tropopause .
➤ The stratosphere extends upto a height of 50 km .
➤ In the lower part of this layer
(upto 20 km) temperature remains constant. Afterwards it gradually increases upto a height of 50 km because of the presence of Ozone layer .
➤ Clouds are almost absent and there is very little dust or watervapour.

(3) Mesosphere

➤ It extends upto a height of 80 km.
➤ Temperature decreases with height again and reaches upto –100°C at the height of 80 km .
➤ Bulk of the meteors are destroyed in this region.
➤ It is also called **'Chemosphere'.**
➤ In upper part of the Mesosphere (60-80 km) oxygen exists in its atomic form.

(4) Thermosphere

➤ It is located between 80 to 400 kms .
➤ In its lower part, there is an electrically charged layer called the **Ionosphere.**
➤ Radio waves transmitted from the earth are reflected back to the earth by this layer.

➤ Temperature again starts increasing with height because of radiation from the Sun.
➤ The aurora borealis and aurora australis sometimes occur in the upper part of thermosphere and lower part of the exosphere, where they overlap into the thermosphere.
➤ Thermosphere is a region of the atmosphere that is ionized by solar radiation.
➤ It is responsible for auroras.
➤ During daytime hours, it stretches from 50 to 1000 km and includes the mesosphere, thermosphere and part of the xosphere.
➤ Ionization in the mesosphere largely ceases during the night, so auroras are normally seen only in the thermosphere and lower exosphere.
➤ The ionosphere forms the inner edge of the magnetosphere.

(5) Exosphere

➤ It is the uppermost layer of the atmosphere extending beyond the Thermosphere above a height of 400 kms .
➤ Here the atmospheric gases are very thin.
➤ This part is extremely rarefied and gradually merges with the outer space.
➤ Here the temperature may reach to astonishing high value of more than 5000°C .

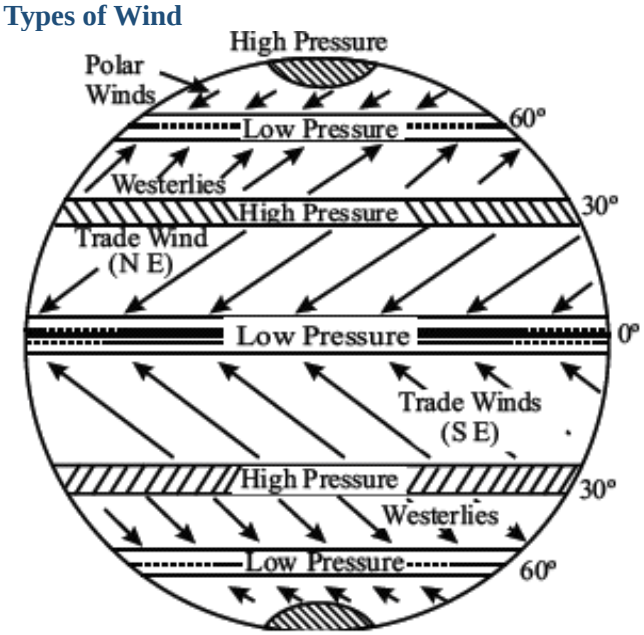
Atmospheric Pressure

➤ Atmospheric Pressure is the weight of the column of air at any given place and time.
➤ It is measured by means of an instrument called a **Barometer.**
➤ It is measured as a force per unit area. The units used by meteorologists for this purpose are called Millibars (mb).
➤ The distribution of atmospheric pressure is shown on a map by Isobars.
➤ An Isobar is an imaginary line drawn through places having equal atmospheric pressure reduced

Wind

➤ Horizontal movement of the air is called as wind. Due to horizontal difference in air pressure , air flows from areas of high pressure to areas of low pressure .
➤ The vertical or nearly vertical movement of air is referred to as air current.
➤ Winds and air currents together comprise a system of circulation in the atmosphere.

Types of Wind



(1) Planetary winds : These winds blow throughout the year from one latitude to the other in response to the latitudinal differences in air pressure, for example, the trade winds and the westerly winds .

➤ **Trade Winds :** The winds which blow from the sub-tropical high pressure towards the equatorial region of low pressure regularly throughout the year in many areas especially the oceans and the hot deserts from north-east in the northern hemisphere . It brings little rain except on the line of convergence of the two trade wind systems.
➤ **Westerlies :** The Westerly winds are those which blow with great frequency from the Horse Latitudes towards the polar region throughout the year with varying intensity and cause rain near the polar regions. Westerlies are stronger in the Southern Hemisphere because of the vast expanse of ocean water. Owing to their ferocious nature, they are also described as **"Roaring Forties". "Furious Fifties"** and **"Shrieking Sixties"**
which were dreaded terms for navigation.
➤ **Doldrums :** Also known as inter-tropical convergence Zone (ITCZ) . It is the equatorial belt of low atmospheric pressure where the north-east and south east Trade winds converge , it is a region of calmness. The calmness periodically broken by storms, accompanied by heavy rains.
➤ **Horse Latitude :** They are the sub-tropical belts of high atmospheric pressure over the oceans (near 30° latitude) between the regions of Trade winds and Westerlies. They are regions of calm, light variable winds and
Coriolis Force : The phenomena of deflection of all winds to the right, anti-clockwise in the northern hemisphere, while they deflects to the left, clockwise in the Southern hemisphere with respect to the rotating Earth is called Coriolis Force. The Coriolis force is zero at the equator and maximum at the poles as it depends on the sine of latitude. With the increasing wind velocity, coriolis force also increases. Since, this phenomenon was firstly proved by a French Scientist Ferrel , it is called Ferrel's Law .
(2) Periodic winds : The Winds changing their direction periodically with change in season are called periodic winds. Monsoons are the best examples of large scale modification of the planetary wind system.
➤ **Monsoon :** The word monsoon has been derived from the Arabic word "Mausam" which means season. The monsoon winds thus refers to the wind systems that have a pronounced seasonal reversal of direction.
➤ The monsoon winds blow over India, Pakistan, Bangladesh, Myanmar, Sri Lanka, Arabian Sea , Bay of Bengal, South-Eastern Asia, Northern Australia, China and Japan.
(3) Local Winds : Local winds develop as a result of local differences in temperature and pressure. They affect small areas and are restricted to the lowest levels of the troposphere.
➤ **Loo :** A very hot and dry wind
(hot wave) in the North Western India and Pakistan which blows from the west in afternoon of May and June and may cause sunstroke.
➤ **Mistral :** The cold wind which originates over the snow-covered mountains of Alps and blows towards the Mediterranean Sea .
➤ **Chinook and Foehn :** Warm and dry local winds blowing on the leeward sides of the mountains are called Chinook in the USA and Foehn in Switzerland.
➤ **Tornado :** An extremely violent whirl-wind, covering a small area, sometimes wind velocity exceeds 300 km per hour. It occurs frequently in the Mississippi basin of the U.S.A. and Sahara .
➤ **Harmattan :** The warm and dry winds blowing from north-east and east to west in the eastern parts of Sahara Desert are called "Harmattan" . Similar winds are called 'brickfielder' in Australia, 'blackroller' in USA, 'Shamal' in Mesopotamia and Persian Gulf and 'Norwester' in New Zealand.
➤ **Sirrocco :** It is a warm, dry and dusty wind which blows in northerly direction from Sahara desert and after crossing Mediterranean Sea reaches Italy, Spain etc. Similar winds are known as 'Khamsin in Egypt, 'Gibli' in Libya, 'Chilli' in Tunisia,

Airmasses

An air mass is defined as a large part of atmosphere, having similar physical properties (especially temperature and humidity) spreading over hundreds of kilometers. In order to acquire the similar physical

properties air mass must be stationary for a longer period of time on the source regions. The notable centre for the development is anticyclone area which is characterised by high pressure and low pressure regions.
Classification of Air mass Generally the air mass is classified into 4 types:
(1) Polar Air mass (P) - It originates in polar region between 60° N and S. Polar air mass is cold.
(2) Tropical Air mass (T) - It originates between 25°N and S upto equator. Tropical air mass is warm.
(3) Continental Air mass (C) - It originates over continents (land mass) and is dry in nature.
(4) Marine Air mass (M) - It originates over the oceans and in moist in nature.
These four air masses are combined with one other to form four principal air masses such as:
(1) Continental polar mass air (CP) - Cold, air and stable.
(2) Maritime polar mass air (MP) - Cold, air and unstable.
(3) Continental Tropical air mass air (CT) - hot, dry, stable (at height) and at surface Instable.
(4) Maritime Tropical air mass air (MT) - warm, moist and unstable.

Weather Front

➤ A weather front is a boundary separating two masses of air of different densities and is the principal cause of meteorological phenomenon.
➤ The air masses separated by a front usually differ in temperature and humidity.
➤ Cold fronts may feature now bonds of thunders forms and severe weather and may on occasion be preceded by squall lines or drylines.
➤ Warm fronts are usually preceded by stratiform preciptiation and fog.
➤ The weather clears quickly after a front's passage.
➤ Some fronts produce no precipitation and little cloudiness, although there is invariability in a wind shift.
➤ Cold fronts and occluded fronts generally move from the west to east while warm fronts move poleward.
➤ **Types of Front :** There are four types of Fronts —
1. Cold Fronts
2. Warm Fronts
3. Occluded Fronts
4. Stationary Fronts

1. Cold Fronts : A cold front is located at the leading edge of the temperature drop off which in an isotherm analysis shows up as the leading edge of the isotherm gradient and it normally lies within a sharp surface trough.
➤ Cold fronts often bring heavy thunder forms rain and hail.
➤ Cold fronts can produce sharper changes in weather and move up to twice as quickly as warm fronts since cold air is denser than warm air.
2. Warm Fronts : Warm fronts are the leading edge of a homogeneous warm air mass , which is located on the equatorward edge of the gradient in isotherms.
➤ These fronts lie within broader trough of low pressure than cold fronts.
➤ A warm front moves slowly than the cold front which usually follows because cold air is denser and lander to remove from the earth's surface.
➤ Clouds ahead of the warm front are mostly stratiform and rain form gradually increases as the front approaches.
➤ Fog can also occur preceding a warm frontal passage.
3. Occluded Front : The overtaking of a warm front by a cold front in an atmospheric depression. Which ultimately lifts the warm sector off the surface of the Earth, is called an Occluded front . This front shows the characteristics of both cold and warm front.
4. Stationary Front : This front is formed when two contrasting air masses converge in such a way that they become parallel to each other and there is no ascent of air .
Cyclone

Cyclone in centre of low pressure surrounded by elliptical arrangement isobars. The pressure increases outward and the air move inward as the centre has low pressure. In the northern hemisphere it has anticlockwise movement and clockwise in the southern hemisphere. It can be circular, elliptical or 'V' shape.

It is of two types

– Extratropical/Temperature cyclone

– Tropical cyclon e

➤ An extratropical cyclone is a synoptic scale low pressure weather system that does not have tropical characteristics, being connected with fronts and horizontal gradient in temperature

(1) Extratropical/Temperate cyclone

It is a simple depression or atmospheric disturbance having low pressure in the centre and pressure increases outward. It is found in the middle latitude (35°-65°) in both opposing air masses (warm, moist and light tropical air mass, front is created where these two air masses converge and lead to the development of temperate cyclone. The size of cyclones varies from 150 km to 3000 km. On an average vertical extent is 10-12 km. Its average summers velocity is 32 km per hours for winter it is 48 km per hour.

(2) Tropical Cyclone The development of the cyclone over the tropical region lying between tropic of cancer to capricorn are called as Tropical Cyclones. Generally the tropical cyclones are formed along the zone of confluence of south-east and north-east trade winds. The confluence zone of these two winds is also known as the Inter Tropical Convergence Zone (ITCZ). • • Its average diameter varies between 80 km to 300 km. At times it is restricted to 50 km or even less in diameter. • • Velocity varies between 32 km/hr to 180 km/hr or more when it is coverted into a hurricane. • • Tropical cyclone becomes more vigorous and move with high velocity over ocean but over land it becomes feeble as it reaches interior portion of the continents. • • There are less number of isobars and are more or less in circular shape. This results in rapid rush of wind towards the centre. • • Every year it occurs at a particular period of a year, mainly during summer season. • • It is not generated near equator as the coriolis force is negligible at equator.

Tropical Cyclones are known by different names :

Hurricanes - Carbbean and Pacific coast of Mexico.

Typhoons - Sea of China and Japan

Cyclones - India / Australia

Willy-Willies - North Australia

Tornado - South and Eastern USA.

Bagguio - Philippines

Comparison Between Temperature And Tropical .

Tropical Cyclone	**Extra-tropical cyclone**
The tropical cyclone have a thermal origin, exclusively over the tropical seas.	Formed in middle or high latitudes, due to the development of front (35°-65° N and S)
The size of the tropical cyclone is 1/3 of temperate cyclone	It is much extensive size.
Strongest winds of tropical cyclones take place at surface.	Strongest winds of mid-latitude cyclones are higher up in atmosphere.
It is associated with single eye	There is more than one place where wind and rain is active.
Wind velocity is very high	It is low in comparison to tropical cyclone.
Its relation with upper level air is not clear	It has a distinct relation with of air.

CLIMATE

Weather Elements

Evaporation and Condensation

➤ Evaporation is the process by which water is transformed from liquid to gaseous form.
➤ It takes approximately 600 calories of energy to convert one gram of water to water vapour.
➤ One calorie is the amount of heat required to raise the temperature of one gram of water to 1°C .
➤ Condensation is the process of change of state from gaseous to liquid or solid state.
➤ Dew, white frost, fog, mist and clouds are various forms of condensation.
➤ When the moisture is deposited in the form of water droplets on cooler surface of solid objects such as stones, grass backs and plant leaves, it is known as dew .
➤ The ideal conditions for dew formation are : a clear sky, little or no wind, high relative humidity and cold and long nights.
➤ When condensation takes place at a dew point which is at or below freezing point, excess moisture is deposited in the form of minute ice crystals. It is called as white frost .
➤ Fog is defined as a cloud with its base at or very near the ground.
Fogs are of different kinds depending upon the nature of the cooling process.
➤ Mist is also a kind of fog in which the visibility is more than one km but less then 2 km .
➤ Cloud is a mass of minute droplets of water or tiny crystals of ice formed by the condensation of the water-vapour in free air at considerable elevations.
➤ Generally there are ten major types of clouds which are grouped under three main categories arranged according to their height.

Humidity

➤ Humidity is the general term which describes the invisible amount of water vapour present in the air.
➤ Absolute Humidity is the weight of actual amount of water vapour present in a unit volume of air. It is expressed as grams per cubic meter of air.
➤ Specific Humidity is the weight of water vapour per unit weight of air. It is expressed as grams per kilogram of air.
➤ Relative Humidity is the ratio of the air's actual water vapour content to its water vapour capacity at a given temperature. It is expressed in percentage.
➤ Dew point is the temperature at which saturation occurs.

Three main categories of clouds :

1. Cirrus clouds - Forms around 12 km altitude.
2. Altostratus clouds – forms around 6 km altitude.
3. Stratocumulus clouds – forms at low altitude around 2.1 km.

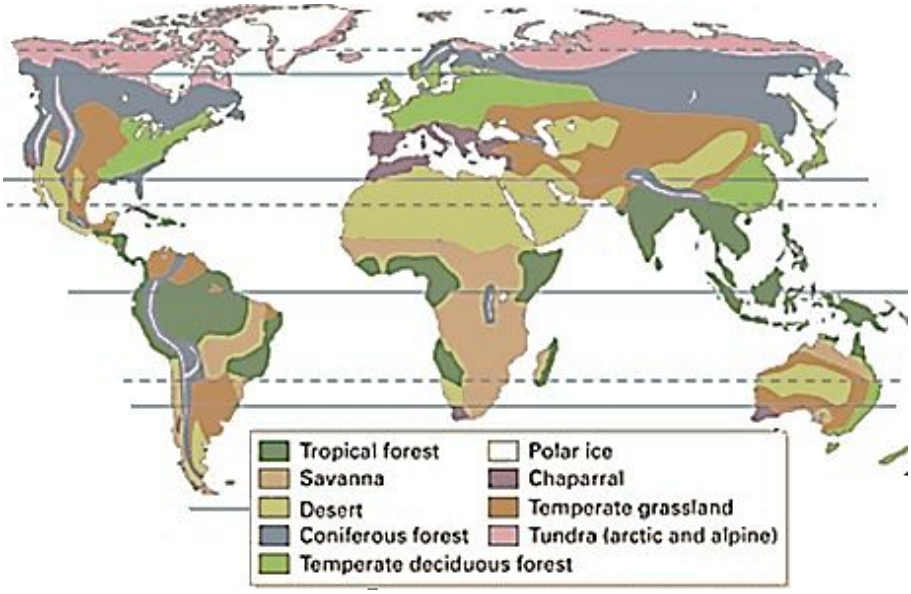
Precipitation

➤ Condensation of water vapour in the air in the form of water droplets and ice and their falling on the ground is called precipitation .
➤ The precipitation in the form of drops of water is called rainfall.
➤ When the temperature is less than O°C precipitation takes place in the form of fine flakes of snow and is called snow-fall.
➤ Sleet is frozen raindrops and refrozen
➤ Precipitation in the form of hard rounded pellets is known as hail.
➤ On the basis of its origin precipitation may be classified into three main types :

(i) Convectional Precipitation :

It is caused when moist winds are drawn into the convection currents of a hot region. It generally occurs in equatorial region. The thundery rain of a summer afternoon is a typical example.

(ii) Orographic Precipitation :
It is caused by the surface relief of the land, mainly, by the presence of mountain range. There is heavy rain on the wind-ward side.
(iii) Cyclonic Precipitation : It is associated with the passage of a cyclone or depression.
Forest in the World
- ➤ According to a recent global assement forests cover 31% of the total land area of the World.
- ➤ The average land area per capita is 0.6 hectare.
- ➤ The total forest areas in 2016 was around 4 billion hectares.



World Climatic Zones

1. Equatorial Climate Or Tropical Rain Forest

- ➤ It is found between 5°N to 10°N and South of equator.

Climate Location: South America : Largest area is in the Amazon lowlands. It also occurs along the coast of Guianas. **Africa :** Part of the Congo basin and Guinea coast Africa. **Southern Asia :** Malaysia, Indonesia, New Guinea and parts of Philippines.
Characteristics
- ➤ It is warm round the year as the sun's rays are always fall vertically. Annual average temperature is uniform at 27°C. The daily range of temperature is in between 10°C and 25°C. The annual range temperature is less than 5°C.
- ➤ This region has no dry season. Average annual rainfall is 200 cm to 250 cm.
- ➤ Thermally included low pressure belt due to the uniform high temperature throughout the year.
- ➤ Convection current is formed and results in rainfall in this zone.
- ➤ The convergence of trade winds coming from sub-tropical high pressure belt forms intertropical convergence (ITC). ITC is associated with atmospheric distribution (cyclone).

Vegetation High temperature and rain throughout the year produce most luxuriant vegetation in the region which are tropical rainforest or Selvas in South America.

2. Savanna Or Sudan Type

This transitional type of climate is bounded between equatorial rainforest and semi-arid and subtropical humid climate. This lies between 5° to 20° north and south of equator.
South America : Columbia and Venezuela. **Africa :** Sudan, parts of Senegal, Mali, Guinea, Niger, Chad, Ghana, Togo, Kenya, Zimbabwe, Tanzania, Angola and Uganda. **Australia :** Queensland.

Characteristics

➤ This zone has distinct wet and dry season.

➤ Annual precipitation of 100 cm to 150 cm is received.

➤ 80% to 90% of the rain occurs in rainy season only.

Vegetation

➤ Seasonal rains allow grass to grow. These are natural grasslands. Rainfall is not sufficient to support tall trees but grass grows well. Elephant grass grows up to 4.5 metres. As we move towards the equator, trees with broad leaf and umbrella shaped grow along the banks of the streams.

➤ **Fauna:** Elephants, giraffe, zebra, rhinoceros along with varieties of carnivores animals (lion, leopards, tiger, cheeta, hyena etc.) are found.

3. Hot Desert

Arid deserts lie close to the tropic of cancer and tropic of capricorn in the western margins of continents, between 15°-30° in both the hemispheres.

➤ Sahara, Arabia, Thar, Mohave and Sonoran (U.S.A.), Kalahari and Namib (Africa), Simpson, Gibson, Great Sandy (Australia). These lie in western part of the continents.

Characteristics

➤ Climate is dominated by subsidence of air masses and sub tropical anti cyclones.

➤ These areas are nearly rainless or receive lowest annual rainfall (Less than 12 cm).

Vegetation

➤ Normal vegetation is cactus, thorny plants, shrubs and herbs.

4. Steppe (Temperate Continental) Climate

These are also called **mid-latitude grasslands.** They are far away from any influence of the sea as they are in the heart of the continents. **Examples:** • Prairies (North America), Pampas (South America), Velds (South Africa), Canterbury (Newzeland), Downs (Australia) and Steppes (Russia).

Climate

➤ Their climate is continental with extremes of temperature. Summers are very warm and winters are very cold. In northern hemisphere where as in southern hemisphere the temperature variation is mild.

➤ These are dry lands as they are located in the deep interiors of large land masses away from the oceans.

Rain fall occurs in spring and early summer and varies between 25 cm. and 75 cm. Rain in this region is of convectional type and light.

Vegetation Short grass grows everywhere. Trees are found only on mountain slopes.

5. Mediterranean

➤ The zone lies between 30°-40°N and Southern latitudes on the western edge of the continents. Mediterranean type of climate is found near the Mediterranean sea in the northern hemisphere (Portugal to Turkey, Morocco, Northern Algeria, Tunisia and Libya) alongwith southern California coast.

➤ In the southern hemisphere central Chile, Capetown area of South America, South and Southwest coast of Australia.

➤ The zone experiences season shift of pressure belt

➤ Winter rainfall is received through cyclonic storms.

➤ Summer winds are generally dry and hot.

Vegetation

➤ Woodland, dwarf forest and scrubs are found in this region.

➤ The leaves are thick and shiny resisting moisture loss.

➤ The trees like pine, oak, cedar, madrone, walnut and chestnuts grows here.

➤ Citrus fruits are grown in this zone.

6. Sub-Tropical Humid Climate/China Type Location

➤ It is found in the eastern boundary of the all continents between 25°C to 40° N and Southern latitude.

➤ It is found in south-east China, PO Basin, Danube Basin, South-east USA; south-east Brazil, Paraguay, Uraguay and north-eastern Argentina and Africa alongwith the east coast of Africa.

Climate

➤ Mean annual summer temperature lies between 24°C to 26° and during winter it is 6.6°C to 10°C.

➤ The temperature do not varies spatially.

➤ Tropical cyclone is found and results in rainfall. Even winter cyclones are found here as it is associated with Westerlies.

Vegetation

➤ Dense evergreen forests are found alongwith decid

➤ us sparse forest and grassland. They have broad leaves.

7. West European Type

➤ The zone lies between 40° and 65° latitude in both the hemispheres along the west coast of the continents. North-Western Europe, British Columbia of Canada, Washington and Oregon states of the USA, south-west coast of Chile, south-east coast of Australia and Tasmania and New Zealand.

Climate

➤ Polar front causes the development of temperate cyclone in this region under the influence of westerlies.

Vegetation

➤ Broad-leaf deciduous forests (oak, birch, walnut, maple, elm, chestnut, etc).

➤ Needle-leaf (coniferous) forests like pine, fir etc are found.

➤ Mixed forest is also found here.

8. Monsoon

➤Monso o n region includes the eastern margins of continents which lies between 5° to 30° N and Southern latitude of equator.

➤ Eastern Brazil (S. America), Central American countries, Natal coast (S. Africa), Indian subcontinent, South East Asia, Myanmar, Thailand, Vietnam, Philippines, etc. Parts of East Africa including Malagasy and North Australia.

Climate

➤ Temperature variation results in season formation.

➤ During the months of summer (March to June) the average temperature is ranging between 27°C to 32°C.

➤ During the months of winter the average temperature recorded is 10° to 27°C.

➤ The temperature in this zone is controlled by nearness or remotness of the sea, latitudinal and altitudinal also influence it.

➤ The region receives cyclonic rainfall mostly alongwith orographic rain.

➤ 80% of the rainfall is received within 3 months (July, August and September).

➤ Monsoon rainfall is basically cyclonic in character.

➤ Generally, dry season is found here

Vegetation • Trees are mostly deciduous. The forests are open and less luxuriant. Most of the forests yield valuable timber like teak and other kinds of timber are sal, acacia and eucalyptus.

9. Taiga /Boreal/ Sub-Arctic

This climate type is named after the coniferous forest cover found in the region.

➤ This region lies between 55° and 70° in northern hemisphere. It forms a continuous belt across southern Canada, northern Europe and Russia.

➤ South Alaska, southern Canada, parts of Norway, Sweden, Finland, Northern Russia, Northern Siberia, and Sakhalin Island.

Climate

➤ Winters are very cold and severe lasting for 6 to 7 months .

➤ Most of the rain comes from cyclonic weather. It falls throughout the year but maximum in summer as frequent showers.

➤ In winter it is in the form of snow which remains on the ground for 5 to 7 months.

Vegetation

➤ Vegetation in this climate type is softwood coniferous forests (Spruce, fir, pine).

➤ Fauna like reindeer, deer, elk, moose and wild cat are found here.

10. Tundra

➤ The northern most parts of Asia, Europe and North America (include Alaska and Canadian Islands).

Climate

➤ Long, bitterly cold and severe winter are experienced. Summers are short but cool. Precipitation is below 40 cm and as snowfall.

Vegetation

➤ Very short growing season. Dwarf willows and birches grow here. Fauna like reindeer, polar bear, fox, musk, ox and arctic hare are commonly found here.

VEGETATION

Major Forest types

(1) Tropical Hardwood Forestc :

These are found in the regions of high temperature and high rainfall.

Forests are divided into two types.

(a) Equatorial Forest : These forests extend between 5° North and 5° South of the equator. They are found in Zaire basin of Africa, the Amazon basin of South America and with some modifications in Malaysia and Indonesia.

➤ The equatorial forests in the Amazon basin are also known as Selvas.

➤ These forests are very dense due to high temperature and rainfall throughout the year.

➤ They present a layered structure.

Numerous creepers like liana climb the trees. Due to high humidity throughout the year epiphytes growing on trees could be seen commonly.

➤ These are evergreen forests.

➤ Most of the trees in these forests have hard wood.

➤ Mohogany, Rosewood, Ebony etc.are the hard wood trees.

(b) Monsoon Forests :

➤ These forest are found in central and north-east India, Myanmar, Vietnam, Thailand, Laos, Cambodia and northeast Australia.

➤ Monsoon forests are not very dense. Sal, teak and Sisam are important trees of the region.

➤ Besides, in the areas of high rainfall bamboos , rubber, cinchona , mahogany etc. are found.

(2) Temperate Deciduous Hardwood Forests

➤ Temperate regions of moderate temperature and rainfall like central and western Europe, northeastern USA, Southern Russia, Central America, eastern Asia.

Korea, Japan, China etc. have the hardwood deciduous forests.

➤ Trees of these forests shed their leaves at the onset of the winter and remain without leaves throughout the winter.

➤ They are found between 30° to 50° North and South of the equator.

➤ Wood of these trees are lighter and easier to work on. Important trees of this forests are Oak , Birch, Chestnut, Maple, Walnut and Elm .

(3) Temperate Coniferous Softwood Forests or Taiga

➤ Except for a few hill-slopes, most of the coniferous forests are confined to the northern latitudes.

➤ These are located between 50° N

➤ In the southern hemisphere , the extent of these forests is limited.

➤ They are found in an extensive belt in the northern hemisphere running through Canada, Norway, Swedan, Finland, Latavia, Lithuania, Estonia and Central and Eastern Siberia .

➤ In Siberia they are known as Taiga forests . They are found on the mountain slopes, between altitudes of 1500 and 2000 meters.

➤ Coniferous trees are tall, straight with narrow, needle like leaves.

Most of these are evergreen but some trees like larch are deciduous.

➤ These forests are commercially valuable as one species of tree is found over extensive areas.

➤ Pine, Cedar, Spruce, Fir, Red wood and Walsum are some of the important trees of these forests.

DRAINAGE

➤ The Drainage refers to a body of flowing water, ranging in scale from a rill to river.

➤ The evolution of drainage system in a particular region is determined by the nature of the original surface and the Geological structures.

➤ There are broadly two categories of drainage – Sequent Drainage System and Insequent Drainage System .

(1) Sequent Drainage System

(a) Consequent Stream : In the region of flooded structure, stream formed in the synclinical troughs is called synclinical consequent stream .

Consequent stream follows the direction of the slope. Most of the stream draining the coastal plains of India are of this type.

(b) Subsequent Stream : When the master consequent stream is joined by its tribuatary at right angles it is called subsequent stream . For of Yamuna and river "Son" a tributary of the Ganga are the subsequent streams.

(c) Obsequent Stream : It is the stream which flows following the direction of the slope opposite to master consequent stream. For example : the Mahabharat Range of lesser Himalayas, Ganga, Yamuna etc.

(d) Resequent Stream : Such stream follows the direction of master consequent stream that meets the subsequent stream at right angles.

(2) Insequent Drainage System

The streams which do not follow the regional slopes and drain across the geological structure are called insequent or inconsequent streams.

(a) Antecedent Drainage : The stream which originated before the upliftment of the surface on which they flow. For example, Indus, Sutlej and Brahmaputra are antecedent rivers as they originated before the upliftment of Himalayan Range and hence create deep Gorge , along the Mountain Range.

(b) Superimposed Drainage : It is formed when the nature and characteristics of the valley and flow direction of a consequent stream develop on the upper geological formulation and structure are superimposed on the lower geological formation of the entirely different characteristics.

For example , river Subarnarekha is superimposed on Dalma hills on the west of Chandil in the Chhotanagpur plateau region of Jharkhand.

HYDROSPHERE

➤ Hydrosphere is the water surface which includes the oceans, lakes and rivers.

➤ It is estimated that the hydrosphere contains about 1,460,000 cubic km of water.

➤ Of this 97.3% is in the oceans and inland seas. The rest 2.7% is found as glaciers and ice caps, fresh water lakes, rivers and underground

WATER ON THE EARTH'S SURFACE

Reservoir	Volume (Million Km ^{3})	Percentage of the Total
Oceans	1,370	97.25%
Ice Caps and Glaciers	29	2.05%
Ground Water	9.5	0.68%
Lakes	0.125	0.01%
Soil Moisture	0.065	0.005%
Atmosphere	0.013	0.001%
Streams and Rivers	0.0017	0.0001%
Biosphere	0.0006	0.0004%

OCEANOGRAPHY

Oceans and Seas

- The oceans comprise more than 70.1% of the earth's surface.
- They exert a great influence upon the global and regional climates.
- They help to modify the distribution of temperature along the coastal areas.
- They help to sustain the hydro logical cycle .
- Oceans are the repositiories of a large number of useful metallic and non-metallic minerals such as petroleum, gas, common salt, gold, diamond etc.
- The sea, as a biological environment is, the easiest available and an inexhaustible source of food and other products of value to man.
- Of all the marine resources, fish is the most abundant and important.

COMPOSITION OF SEA WATER :

Sodium Chloride (Nacl) – 77.8%
Magnesium Chloride – 10.9 % ($MgCl_2$)
Magnesium Sulphate ($MgSO_4$) – 4.7%
Calcium Sulphate – 3.6% ($CaSO_4$)
Potossium Sulphate – 2.5% (K_2SO_4)

DISSOLVED ELEMENTS IN SEA/OCEAN WATER

Chlorine 18.97 > Sodium 10.47 > Sulphate 2.65 > Magnesium 1.28 > Calcium 0.41 > Potassium 0.38 > Bicarbonate 0.14 > Bromine 0.06 > Borate 0.02

Ocean Relief

- **Continental Shelf :** It is the seaward extension of the continent from the shoreline to the continental edge.
- The continental shelves provide the richest fishing ground in the world e.g. the Grand Banks off Newfound land , the North sea and the Sunda shelf.
- The shelves are also potential mining sites for minerals.
- A significant proportion of the world production of petroleum and natural gas comes from them.
- The average width of shelves is about 70 km and the mean slope is less 1.

Continental slope

- It lies at the edge of the continental shelf, generally up to the depth of 2000 fathoms (3660 mt.) from the mean sea level.
- It has a steep slope with the angle of slope varying from 2° to 5° .
- It covers about 8.5% of the total oceanic area and individually about 12.4% of the Atlantic Ocean, 7.1% of the Pacific ocean and 6.5% of the Indian ocean.
- The continental blocks are supposed to end at the site of continental slope.

➤ The continental slope along the many coasts of the world is furrowed by deep canyons like trenches terminating as fanshaped deposits at the base.
➤ There are five types of continental slopes-(a) fairly steep with elongated hills and basins, (b) gentle slope with elongated hills and basins,
(c) faulted slope, (d) slope with terraces & (e) slopes with seamounts.

Continental Rise

➤ The place where the continental slopes end, the gentle sloping continental rise begins.
➤ The average slope is between 0.5° and 1° & its general relief is low.
➤ With increasing depth the Continental Rise becomes virtually flat and it merges with abyssal plain.

Abyssal Plains

➤ Beyond the Continental Rise it is found at the depth of 3000 to 6000 mt .
➤ They cover about 40% of the total ocean floor and generally are bounded by hills on the seaward side.
➤ They are almost flat with a gradient less than 1:100 .
➤ They are covered by sediments both of terrigenus and shallow water origins. The irregular topography of the abyssal plain are burried forming relatively flat areas due to large supply of sediments.

Submarine Ridges

➤ These are the mountain ranges in the ocean.
➤ A large number of submarine ridges are placed centrally in the oceans.
➤ At some places their summits may rise above the sea level forming islands.

Abyssal Hills

➤ A deep sea floor also contains numerous isolated abyssal hills, sea-mounts and guyots.
➤ A submarine mountain peak rising more than 1000 mt. above ocean floor are known as “seamount”.
➤ Flat topped seamounts are known as “Guyots” .
➤ All the above features are volcanic in origin.

Submarine Trenches or Deeps

➤ A long narrow and steep sided depression on the ocean floor is called trench . These are the deepest part of the ocean.
➤ They are usually 5500 mt . in depth and lie along the fringes of the deep sea plains and usually run parallel to the bordering fold mountains or the island chains.
➤ They are believed to have resulted from faulting or down folds of the earth crust and so tectonic in origin.
➤ They are most common in the Pacific ocean like “Mariana Trench” , off the Guam Island Chain which is deepest (11022 mt.) in the world.

Submarine Canyons

➤ These are the deep gorges on the ocean floor and are restricted to the continental shelves, slopes and rises.
➤ Some canyons begin at the edge of the continental shelf and extend down the continental slope.
For example- “Oceanographer Canyon” near New-England.
➤ Some canyons have dendritic appearance like off the east coast of Southern California.
➤ Some begins at the river mouth and extends over the continental shelf as “Zaire”, Mississipi” and “Indus” canyons.

Bank, Shoal and Reef

➤ These are the marine features which are formed through the processes of erosion, deposition and biological activity .
➤ Banks are almost flat topped elevation located in the continental margin.
➤ The depth of water is relatively small but adequate for navigation and are sites of rich fishing e.g. “Dogger Bank” (North Sea), “Grand Bank” (off Newfoundland) .
➤ Shoales are detached elevation with shallow depth.
➤ They are dangerous for navigation as they only 18-20 mt. below the sea level.
➤ Reefs are the mound or rocky elevation like ridges made of organic

➤ ‘Great Barrier Reef’ (off Queensland, Australia) is the largest reef in the world.
➤ **Coral Reefs :** In tropical seas many kinds of coral animals and marine organisms such as coral polyps, calcareous algae , shellforming creatures and lime-secreting plants live in large colonies.
➤ Though they are very tiny creatures, their ability to secrete calcium carbonate within their tiny cells has given rise to peculiar type of marine land form.
➤ They exist in numerous species of many forms, colours and shapes Under favourable conditions, they grow in great profusion just below the water level.
➤ Taking coral animals as a whole, the polyps are most abundant and also the most important.
➤ Each polyp resides in tiny cup of coral and helps to form coral reefs.
➤ When they die, their lime skeletons are cemented into coralline limestone .
➤ There are also non-reef building species such as the ‘precious corals’ of the pacific oecan and the ‘red coral’ of the Mediterranean which may survive in the colder and even the deeper waters.
➤ As a rule they thrive well only in the warmer tropical seas.
➤ **Coral Bleaching :** The loss of algae from the corals resulting into the white colour which indicates the death of corals is considered as coral Bleaching.
➤ The coral bleaching during 1997 -98 , has been recorded as the most catastrophic event.
➤ Global warming has been reported as the major factor of coral bleaching.
➤ Large scale coral bleaching accounting for 70% death of the corals of the coasts of Maldives, Andamans and Lakshadweep Islands in Indian ocean and Kenya .

Salinity

➤ Salinity is expressed as the number of grams of dissolved salts in 1000 grams of sea water.
➤ The average salinity of oceans is about 35 per thousand or 35%° .
➤ The amount of salinity determines the composition and movements of the sea water and the distribution of various marine lives.
➤ Salinity varies both horizontally and vertically.
➤ The average salinity of N-Hemisphere is 34%o while for S-Hemisphere it is 35%o .
➤ The greatest proportion of salt is found in two areas which lie about the Tropic of Cancer and the Tropic of Capricorn . From these regions the salinity decrease both towards equator and the poles.
➤ In general there is low salinity in equatorial zone, high in tropical belt, low in temperate zone and minimum in sub-polar zone.

Worlds Highest Saline bodies

Van Lake 330
Dead Sea 238
Great Salt lake 220
Sambhar Lake 205
Red Sea 40

Ocean Movements

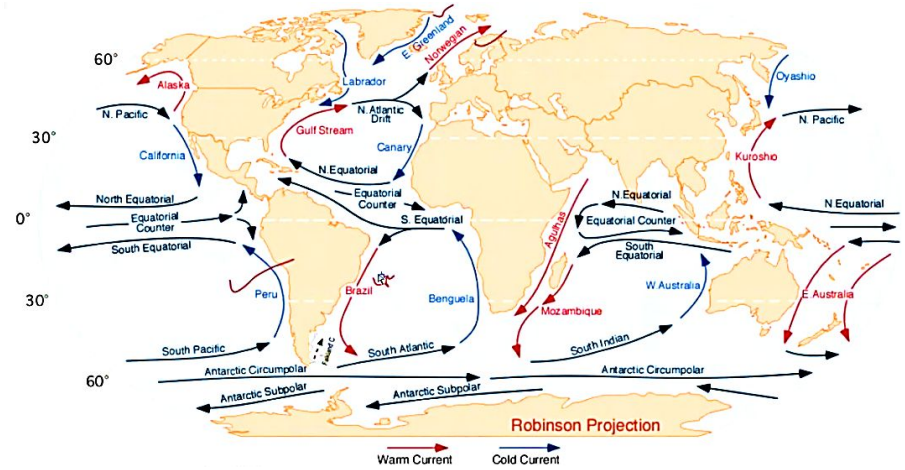
➤ Ocean currents are swift moving, large masses of surface water that move in a fairly defined direction.
➤ Ocean currents are of two typesthe warm currents and the cold currents.
➤ In the Northern Hemisphere , the current move to their right and in
➤ In Northern Indian Ocean the currents change their direction in response to the reversal of the monsoon winds.
➤ The periodic phenomenon of alternate rise and fall in the sea levels is known as Tide .
➤ Tides are produced due to gravitational interaction of Earth, Moon and Sun.
➤ Moon exerts the strongest influence on tides because of its closeness to Earth.
➤ On the full moon and the new moon tides are the highest (Spring Tides) .
➤ On the Ist and 3rd quarters, tides are lower than the usual (Neap tides) .
➤ Waves are oscillatory movements in water mainly produced by winds.

➤ Tsunamis

OCEAN CURRENTS

The movement of a mass of oceanic water parallel to the coast is called as ocean current.
Currents are of two types on the basis of temperature.
(i) Warm current
(ii) Cold current

Ocean	Currents	Nature
Pacific	Kuroshio	Warm
	Oyashio	Cold
	Okhotsk	Cold
	Alaskan	Warm
	California	Cold
	East Australian Peruvian/	Warm
	Humboldt	Cold
Atlantic	Antilles	Warm
	Florida North Atlantic	Warm
	Drift	Warm
	Gulf Stream	Warm
	Labrador	Cold
	Canaries	Cold
	Brazil	Warm
	Falkland	Cold
	Benguela	Cold
	Guinea	Warm
Indian	Mozambique	Warm
	Agulhas	Warm
	West Australian	Cold



IMPACT OF CURRENTS

➤ Warm and Cold currents maintain the temperature of the place as per its temperature.

➤ Because of warm current, ports are open in Polar region .
➤ Winds that are in contact with the warm current are full of humidity and thus rainfall occurs in coastal areas.
➤ Due to cold current, deserts develop.
➤ A dense fog is created where two different currents meet.
➤ Warm current melts the iceberg .

Miscellaneous

ZONES OF JURISDICTION

(i) Territorial waters : over which a state has full sovereignty.
They are recognised as extending for 12 nautical miles from the coastline.
(ii) Contiguous Zone or pursuit zone : extends for further 12 nautical miles in which the coastal state can take action against those who break the law within the true territorial waters.
(iii) Exclusive Economic Zone
(EEZ) : extends for 200 nautical miles, starting from the same base line as the territorial waters. Within the EEZ , the coastal state has the right to exploit all economic resources.
(iv) High Seas lie beyond all these zones, and are free to navigation by vessels of all nations.

World geography

Racial Groups and Their Distribution Pattern

Continents	Major Ethnic Group/Race	Distribution	Remarks
Asia	Arabian (Middle East)	Bahrain, State of Palestine, Lebanon, Comoros, Kuwait, Qatar, Syria, United Arab Emirates, Morocco, Egypt, Jordan, Iraq, Tunisia, Yemen, Djibouti, Sudan, Algeria, Somalia, Saudi Arabia, Oman, Libya, Mauritania	This is a major Pan ethnic Group which is primarily habited in Western Asia. The primary language spoken by Arabian group is *Arabic.* Besides 15 other languages are spoken among Arabians in different parts of the World
	Indian (Indo-aryan & Dravidian)	Most part of Indian Sub continents (India, Pakistan and Bangladesh)	On the basis of ethno linguistic composition the group is highly diversified, still the majority of population is restricted within two major linguistic groups such as *Indo-Aryan and Dravidian* .
	Mongoloids	This group is primarily concentrated in Inner Mongolia Autonomous Region and gradually spreading towards Liaoning, Jilin, Heilongjiang, Xinjiang, Qinghai, Gansu, Ningxia, Hebei, Henan, Sichuan, Yunnan and Beijing	They speak mainly the dialect of *Atlantic Language* family. The major three of them are Inner *Mongolian, Barag-Buryat and Uirad* Largest populated race of the world.
Africa	Pygmies	Rwanda, Burundi, Uganda, the Democratic Republic of the Congo (DRC), the	A short height tribal group who lives on hunting, gathering fruits, nuts and

		Republic of Congo (ROC), the Central African Republic, Cameroon, the Equatorial Guinea, Gabon, Angola, Botswana, Namibia, Madagascar, and Zambia are populated by these group	honey from dense jungles and they are primarily confined to rain forests only. Most primitive Tribe of Africa
	Bushmen	They are the huge inhabitant of Kalahari desert. Other than this they spread along Botswana, Namibia, South Africa, Zambia, Zimbabwe and Angola, with loosely related groups in Tanzania.	They are basically yellow-skinned nomads whose primary food intake in plant products collected from jungles which accounts for 70% of their diet and for the rest 20%-30% they depend on hunting.
	Zulus	They are mainly concentrated in KwaZulu-Natal Province of South Africa. Some are also scattered throughout the other provinces. KwaZulu-Natal borders on Mozambique in the north, Eastern Cape in the south, the Indian Ocean in the east, and Lesotho in the west. They are highly concentrated in South Africa.	They are the descendants of *Nguni-speaking* people and best known African tribes who were exploited by Britishers during the late 1800s. The most spoken languages are Zulu and English.
	Massai	They are the semi nomadic tribes who originated from the lower Nile valley north of Lake Turkana (Northwest Kenya) and began migrating south around the 15th century, and finally settled in Kenya around 17th and 18th Century	They commonly use Kenya and Tanzania, Swahili and English language for communication as well as education.
	Bantus	The Bantus are primarily found in Rwanda, Angola, Burundi, Zimbabwe, and South Africa, with some among other nations in the Southern part of Africa.	As these tribes are highly resourceful and adaptable their occupancy in the total continent is also the highest. They mainly speak bantu language which gave them their nomenclature. They live on agriculture and metal working which give opportunity to adopt colonization.
North America	Groups of Indigenous peoples	They mostly confined to Canada and some part of U.S.A.	The indigenous peoples of the Americas are the descendants of the pre-Columbian inhabitants of North and South America.

	Native Hawaiians	Most Native Hawaiians reside in State of Hawaii and the American Southwest	Native Hawaiians are the indigenous Polynesian people of the Hawaiian Islands or their descendants.
South America	Mestijo	Mainly concentrated in Latin America. (Mexico, central America and No. of Island)	They emerged due to extensive intermixing between Europeans and Native Americans early in the colonial period
	Mullatto	Brazil is home to Latin America's largest mulatto population. Other than Brazil they spread in Dominican Republic, Cuba, Panama, Costa Rica, Colombia, Puerto Rico, and Ecuador.	Mulattoes are people of mixture of European and African.
	Zambol	Zambos are the small minorities in the northwestern South American countries such as Colombia, Venezuela, Guyana and Ecuador.	This is a small yet noticeable group resulting from unions of Amerindian women to Afro-Ecuadorian men are not uncommon in major coastal cities of Ecuador.
Europe	Nordic	The Nordics are inhabited in the countries around North and Baltic Seas.	As a sub group of Caucasian race this group is a set of people having distinct physical characteristics such as concurrence of fair, colour, somewhat wavy hair, light eyes, reddish skin, tall stature and a dolichocephalic skull

Major Trenches

Name Location

Mariana Trench Pacific Ocean Kurile Trench Pacific Ocean Java Trench Indian Ocean Kermadec Trench Pacific Ocean Japanese Trench Pacific Ocean Aleutian Trench Pacific Ocean Tonga Trench Pacific Ocean Mindanao Trench Pacific Ocean Peru-Chile Trench Pacific Ocean Puerto Rico Trench Atllantic Ocean Nares Trench Atlantic Ocean

STRAITS OF THE WORLD

Bab-al- Mandeb	**— Red sea of Arabian Sea**
Bering	— Arctic Ocean and Bering Sea
Bosphorus	— Black Sea and Marmara Sea
Dover	— North sea and Atlantic Ocean
Florida	— Gulf of Mexico and Atlantic Ocean
Gibralter	— Mediterranean Sea and Atlantic Ocean
Malacca	— Java Sea and Bay of Bengal
Palk	— Bay of Bengal and Indian Ocean

Magellan	— South Pacific Sea and South Atlantic Ocean
Sunda	— Java sea and Indian Ocean
Yucatan	— Gulf of Mexico and Caribbean Sea.
Hudson	— Canada and Bafin Island
Denmark	— Greenland and Iceland
Bass	— Tasmania and Australia
Luzon	— Philippines and Taiwan
Mozambique	— Mozambique and Madagascar
Cook	— North Island and Southern Alps of Newzeland
Bonifacio	— Ajaccio and Sardinia (Italy)
English Channel	— Bay of Biscay and North Sea
Makassar	— Borneo and Celebes
Malacca	— Singapore and Sumatra

World Highways

➤ **Pan American highways :** It is extended from Alaska of North America to Southern Parts of Chile of South America.

➤ **Trans-Canadian highways :** It joins the Eastern corner of Canada with the western borders of Canada. This highway goes from Saint John to Vancouver via Quebec, Montreal, Ottawa, Sudbury, Thunder Bay, Winnipeg and Calgary.

➤ **Alaska highways :** This highways joins Admont Town with Alaska.

Inter continental highways

➤ **Trans-Siberian highways :** Russian Federation has constructed the Trans-Siberian highways which joins the Eastern Parts of the country with Western Parts of the country.

➤ **Indian Sher Shah Suri Marg :**

This highway was joining Kolkata with Peshawar earlier, but now it goes up to Amritsar, after the partition of country.

This road in India is known as ‘Grand Trunk Road’ (G.T. Road) .

Railways

➤ Railways are the greatest contribution to the humanity of modern times.

➤ The railways came into existence in 1785 as small route in Europe and United States of America.

➤ In India the first railway line was laid in 1854 from Mumbai to Thane by Lord Dalhousi during the British time.

Pattern Of Railways Network

1. Intensive Railways : When many railways tracks are constructed in an area, that type of railways are called intensive railways.

REGIONAL GEOGRAPHY

➤ This type of railway was first constructed in 1825 from Stockton to Darlington in England.

2. Trans-Continental Railways :

This type of railways joins the distant places of thin population.

Trans-Siberian railways, Trans- Caspian railways, Canadian- Pacific railways, Chile-Argentina railways are the examples of such railways.

3. Intragressive Railways :

Intragressive railways start from the centre of the continent and goes up to the coastal areas.

➤ Such railways are found in hot deserts and cold regions.

Major Railways of the World

➤ **Trans-Siberian Railways :** Trans- Siberian railways are the longest and the most important railway line of the world.

➤ Its length is approximately 9232 km.

➤ This railway is extended from Leningrad, Moscow to Vladivostok.

➤ This railway joins Western Part of Russian Federation with the Eastern Part of Russian Federation.

➤ The Construction of Trans- Siberian railways was started in 1891 and was completed in 1905 for traffic.

➤ **Canadian-Pacific Railways :** The Canadian-Pacific railways start from Halifax and St. John on Atlantic Ocean and reaches Vancouver located on the coasts of Pacific Ocean via Quebec, Montreal, Ottawa, Fort William and Winnipeg.

➤ Its length is 5600 km .

➤ It is called the backbone of Canada .

Chile-Argentina Railways : This railway route joins Valparaiso Port of Chile with Buenos Aires of Argentina .

➤ This railway line is only 1600 km. long.

➤ It was for transportation in 1910.

Trans-Australian Railway :

Trans-Australian railways move along the eastern coasts of Australia in a North-South direction in Australia.

➤ This railways starts from Chairs in the North and reaches Canberra in the south.

➤ This railway route passes through Sydney Broken hills, Port Augusta and Kalgoorli centres .

Cape to Cairo Railway : This railway track join Cape Town of South Africa to Cairo the capital of Egypt.

➤ This railway track is about 14,400 km. long.

➤ The whole railway track is divided into three parts —

1. Cape Town to Alabo
2. Makbar to Wadi Haffa
3. Swan to Cairo

Union Pacific Railway : This is a well known railway route of USA .

➤ This route joins SanFrancisco and New York.

Waterways :

Waterways are divided into two types —

1. Inland Waterways
2. Oceanic Waterways.

1. Inland Waterways : There are following Inland waterways.

Rhine River : Rhine river is the major waterways of Europe.

➤ This river is known as the 'Life Line'of European trade.

➤ This is the world's busiest river.

➤ Mainly coal is transported from ‘Ruhr Valley’ through the Rhine river.

➤ Due to coal transportation, this river is also called ‘coal river’.

➤ This river falls into the North Sea.

Denube River : This is the longest river of the European

➤ This river flows through eight countries of Europe.

St. Lawrence River : This is the famous river of Canada.

➤ This river joins North America with Atlantic Ocean.

➤ This river is approximately 1400 km.

Mississippi River : This is the major river of USA.

➤ It has many branches.

➤ Total length is about 3200 km.

Volga River : Volga river is mainly Russian river.

➤ This river contributes about 80% to the total trade of the country.

➤ This river falls into Caspian sea.

Nile River : This river is called the 'life line of Egypt' .

➤ This river flows in the continent of Africa .

➤ The mouth of this river lies in Mediterranean sea.

2. Oceanic water ways :

North Atlantic Oceanic routes :

These routes are much more important than any other waterways.

➤ This waterways joins the region of western Europe with the region of North America.

➤ Glasgow, Manchester, South Haiyxton, London, Rotterdam, Breman, Bordio, Lisben, Ouebec, Montreal, New York, Havana are the important Ports of the world on this oceanic route.

➤ The maximum goods are transported through these waterways.

South Atlantic Oceanic routes :

This routes join North America and Europe with South America.

➤ Goods are transported through this route from North America to South America and Europe.

North Pacific Oceanic routes :

These water ways join East Asia and North America with each other.

South Pacific Oceanic routes : This route joins Australia, New Zealand, North America and Western Europe with each other.

Routes of Indian Ocean : Indian oceanic waterways are used by the countries which fall in the vicinity of Indian Ocean.

➤ Countries of Indian Ocean exports jute, tea, mineral ores etc.

Routes of Mediterranean Sea : This water way joins Asia and Australia continents with North Atlantic Oceanic routes.

➤ Through this waterways the raw material of Eastern countries are being transported to western countries.

Cape of Good Hope Sea route :

Cape of Good Hope Sea route joins Eastern Asia and Europe to Southern parts of Africa.

Canals

Suez Canal : This is the world's biggest canal constructed in the Senai peninsula of Egypt .

➤ This is the most important waterway.

➤ This canal is constructed by cutting the Isthmus of Suez .

➤ This canal joins Red sea with Mediterranean sea.

➤ The Northern bank of Suez canal is known as 'Port Said' of Mediterranean sea and Southern bank of Red sea is known as Port Suez.

➤ The distance between Port Said and Port Suez is 193 km.

➤ Due to construction of this canal, the distance between Europe and Asia has decreased.

Soo Canal : This canal joins the Lake Superior and Huran lakes of USA.

➤ There is a **Saint Mary** waterfall between both the lakes.

Welland Canal : This canal joins the lake Erie and Ontario .

➤ There is a famous Niagra water fall between both the lakes.

➤ Its lengths is 43 km.

Eric Canal : This canal joins Erie lake and Michigan lake . Its length is 584 km.

Panama Canal : This canal is between Pacific ocean and Carribean ocean.

➤ Gatun lake is situated near this canal.

➤ This canal is constructed in Panama , a country of central America.

➤ This canal joins Atlantic Ocean with Pacific Ocean.

➤ The length of Panama is about 80 km.

Kiel Canal : This canal falls in Germany.

- ➤ This canal joins Baltic sea with North sea .
- ➤ This canal is about 98 km in length.

Major Industrial Cities

USA

Boston — Shipbuilding Pittsburgh — 'Iron and steel' Buffalo — Chemicals, metal goods and flour mills Akron — Synthetic rubber Ciatel — Aeroplane Kansas — Seal packing meat Chicago — Seal packing meat Baltimore — Shipbuilding Plymouth — Shipbuilding Los Angeles — Aeroplane, film Detroit — Automobiles Birmingham — Cotton textiles, chemical and metal work

Canada

Hamilton — Iron and steel, cars, porcelain Toronto — Automobiles, chemicals, textiles Windsor — Automobiles and tyre making industries Sarnia — oil refineries

South America

Buenos Aires — Meat packing, flour milling Brasilia — Steel mills, chemicals Montevideo — Packing industry Rio-de Janeiro — Shipbuilding, aircraft engineering, Cotton , coffee Sao Paulo — Coffee industry

UNITED KINGDOM

The Midland

Birmingham — Steel industry Conventry — Automobile industry Derby — Textile and engineering Leicestershire — Coal field Nottingham — Hosiery, cigarettes, tobacco, pharmaceuticals

North East England

Bellingham — Chemicals Darlington — Locomotives Gateshead — Engineering Middlesbrough — Iron and steel New Castle — Shipbuilding South Shield — Port industry

The Lancashire Region

Manchester — Major textile centres Port sunlight — Soap factory St. Helens — Glass industry Bolton and Bury — Spinning Blackburn — Weaving

Yorkshire, Derbyshire and Nottinghamshire

Bradford — Worsted textile Huddersfield — Woolen textile Leeds — Garments industries Sheffield — Cutlery

Central Scotland

Dumbartion — Engineering Glasgow — Iron and steel industry Port Glasgow — Ship building Great London — Industrial region, Cement and oil refineries.

South wales — Coal mining

Belgium

Antwerp — Diamond cutting Liege — Iron and steel industry Mons — Textiles Namur — Agriculture engineering

France

Clermont-Ferrand — Michelin tyres Greater Paris — Wide range of goods Lorraine — Iron and steel production Limoges — Pottery Lyons — Silk textiles Marseilles — Oil refineries **Germany**

Essen — Iron and steel centre Dortmund — Iron and steel centre Krefeld — Textiles Rulr-westaphila — Industrial region Wappertal — Textiles Frankurt — Railway engineering Hamburg — Shipbuilding Hannover — Metal and chemical industries Jena — Photographic equipment Dresden — China clay Munich — Shipbuilding Leipzig — Optical instrument

Italy

Milan — Textiles Turin — Automobiles, aircraft industries

Russia

Gorki — Heavy engineering steel mills Tula — Steel industries Moscow — Textiles, machines, chemicals Ivanovo — Cotton industries Leningrad — Shipbuilding Vladivostok — Shipbuilding Chelyabinsk — Steel industries, machine tools

Japan

Tokyo — Electrical engineering Kawasaki — Glass work, cement, marine engineering Kobe — Shipbuilding Kyoto — Porcelaine toys and Handicrafts work Nagoya — Textiles Osaka — Textiles Yokohama — Shipbuilding Nagasaki — Shipbuilding

China

Manchuria — Heavy industry Shanghai — Cotton textile mills Wuchang — Iron and steel industry Hayang — Iron and steel industry Hankou — Iron and steel industry Sichuan — Automobiles, machine tools Changchung — Automobiles, machine tools Wuhan — Cotton, shipbuilding, steel industry

Australia

Adelaide — Agriculture industries Melbourne — Chemicals, shipbuilding, aircraft engineering New Castle — Iron and steel, locomotive, aircraft, chemicals Port Kembla — Iron and steel, locomotive, aircraft, chemicals

Chile

Valparaiso — Oil refineries, wine industries Santiago — Wine industries

South Africa

Johannesburg — Gold mining

Ukrain

Kharkov — Machinery, engineering Kiev — Engineering Krevagrog — Iron and steel, ship building

Netherland

Rotterdam — Marine engineering, shipbuilding Amsterdam — Diamond polish

Important Cities on River Banks (City - River)

London — Thames New York — Hudson Budapest — Danube Delhi — Yamuna Rome — Tiber Baghdad — Tigris Washington — Potamac Alexandria — Nile Montreal — Ottawa Paris — Seine Shanghai — Chang Jiang Vienna — Danube Bangkok — Menam Belgrade — Danube Bonn — Rhine Cairo — Nile Lahore — Ravi Linz — Danube Calcutta — Hooghly Moscow — Moskava Karachi — Indus Quebec — St. Lawrence Tokyo — Sumida Yangoon — Irrawady

IMPORTANT ISOPLETHS

Type Line (representing) Connects points of Equal.

Isobath equal depth
Isobar equal atmospheric pressure
Isobathy Therm depth of water with equal temperature
Isocheim equal mean winter temperature
Isodose equal intensity of radiation
Isohel equal amounts of sunshine
Isohyet equal precipitation
Isoplat equal acidity in precipitation
Isostere equal atmospheric density
Isothere equal mean summer temperature
Isodrosotherm equal dew point
Isogonal equal magnetic declination
Isohaline equal salinity
Isohume equal humidity
Isoneph equal amaunt of cloud cover
Isophene biological events occurs at the same time.
Isotach equal wind speed.
Isotherm equal temperature
Isogloss Separating linguistic features.

Major Crops, Geographical Conditions

Crop	Climatic Conditions	Soils	Leading Producer	Production in India
Wheat	Cool and moderately moist during growing period and warm diy and shiny during harvesting period. T: mild 13 to 19. R: moderate 25 to 75; with irrigation in areas having R less than 25.	—Sandy loams, alluvial and black —Requires manuring every alternate year.	—Cool Temperate Grassland Region is the world's greatest producing region Reasons —Fertile soil —Sparsely populated and. therefore, large and abundant holdings —Suitable climate —Former USSR. U.S.A. China. India. Canada. Australia. Argentina —Wheat most important crop in Australia in terms of area, production and exports	—The alluvial plains of Sutlej— Ganga basin comprising Punjab, ffaryana and Western Uttar Pradesh —Black soil region of Gujarat. Maharashtra. Madhya Pradesh and Andhra Pradesh —Varieties: Kalyana. Shera. Moti. sonalika. Lerma. Sonara- 64
Rice	—Hot and moist —Flooding in early period of growth T: average 27. R: 100-150	—Loams with high silt and clay content as these prevent rain water from seeping to under ground. —Constant use of fertilisers and manure. Well-drained deep loam	Tropical Monsoon Region is the principal producing region along with Equatorial Lowland Region —China. India. Indonesia. Japan. Thailand —In Japan, principal crop	—India second largest producer but still an importer. —West Bengal largest producer. Bihar. Orissa. Assam. Coastal plains. Punjab. Haiyana. U.P. Production low because —crop dependent upon rainfall. Varieties: Ratna. Padma. Jaya. etc..
Maize	Humid subtropical T: 20 to 24 in summer. 8 to 14 in autumn	Rich fertile	U.S.A. China. In U.S.A. maize is used as an animal feed.	U.P. Bihar. Punjab. M.P.. Karnataka. A.P.. Varieties-sartaz. Deccan- 103. Arun
Barley	—Similar to wheat T: mild 13 to 19 R: moderate 75 to 100 —Grows in wide range of climate: hot. temperate, cold.	Can grow in poor sandy soils	Former USSR. U.S.A. Canada. China. West European countries	U.P. Bihar. Rajasthan. M.P. Maharashtra.
Pulses	Moderate Climate	Varieties of Soils	India. China. U.S.A	M.P.. Maharashtra. U.P.. Rajasthan
Millets	Hot and semi-arid climate T: 24 to 29 R: 50 to 75	Can grow in poor sandy soils	China. India. Former USSR	Tamil Nadu. Maharashtra. Rajasthan. Gujarat. Uttar Pradesh
Cotton	Warm moderately moist dry summer days in the later part. T: 21 (average) R: 60-110 (moderate)	Grown on variety of soils; light sandy, loams, heavy clay, bottom sands, yield increasing in that order	U.S.A. Former USSR. China. India. Egypt. Also these countries are largest producer of cotton seeds	—India has largest acreage under cotton cultivation in the world, but she is fourth largest producer. —Important growing areas: Black Cotton belt of Deccan consisting of Plateau of Malwa. Southern and north eastern Gujarat, almost whole of Maharashtra, northern Andhra Pradesh, north eastern and south

				eastern Karnataka. Central Tamil Nadu Sujata II is best quality cotton grown. India exports short staple cotton and imports long staple Cotton.
Tobacco	Temp. -15-38° C Rainfall. - 50 (avg.)	— regularly fertilized soil	China. Brazil. India. U.S.A.	A.P.. Karnataka. Gujarat
Jute	Hot and moist T: 24-27 R: 200 well distributed over	—Well-drained loamy and clayee —Delta and flood plains are best	India and Bangladesh hold virtual monopoly.	—West Bengal (50 per cent of total output); Assam. Bihar. Orissa
	the growing period	since soil fertility is recouped every year by natural process	Mymensingh area in Bangladesh alone produces 70 per cent of raw jute production of the countiy.	'Mesta' is a variety of Jute
Rubber	—Hot and humid T: 25-35°C R: 175-250; well distributed throughout the year	Deep well- drained loamy	Wild rubber: Brazil and some other S. American countries Plantation rubber: SE Asian countries. Sri Lanka. India. Myanmar. SE Asian region possesss virtual monopoly Malaysia Indonesia. Thailand	Southern States: Kerala (90 per cent of total production). Tamil Nadu. Karnataka
Sugarcane	Tropical climate. 20-27°C. 75-120 cm	Alluvial soil	India. Brazil. Uganda. Cuba	U.P.. Maharashtra. Tamil Nadu
Coconut Palm	—Hot wet T: 24-28 R: over 200	Flourishes in coastal belts of tropical Countries	Philippines. Indonesia. Singapore	Lakshdweep. Kerala
Groundnut	—High Temperature —Moderate rainfall	clayey soil	India. China. USA	Maharashtra. Gujarat. AP.. Karnataka Tamil Nadu. Madhya Pradesh Uttar Pradesh
Tea	—Warm and humid throughout the year T: 27 (average) R: ffeayy. about 200 cm coming in frequent sh-owers	Fertile well drained soil rich in organic matter and iron	—Virtual monopoly of Monsoon Region —India. China. Sri Lanka	NE India and S. India NE India: Assam Valley Surma Valley. Darjeeling. Terai. Tripura S. India: Tamil Nadu. Kerala.
Coffee	—Warm to hot and moist T: 21 to 27 R: 125 to 250. well distributed throughout the growing period	—Fertile, well drained soil, rich in iron and potash —Terra Roxa soil is ideal	Brazil. Colombia (S. America); Ivory Coast (Africa)	Darjeeling produces the best quality tea. —Karnataka. on Nilgiri Hills in Tamil Nadu, on Cardamom Hills in Kerala
Spices	Varying climatic conditions		India. China.	Largest producer black pepper-Kerala. red chilli-Andhra Pradesh. Turmeric - Tamil Nadu. Ginger- Kerala. Cardamom -Kerala. Safforn - Jammu & Kashmir

Important Tables

PRINCIPAL MOUNTAIN PEAKS

Name	Country	Range
Mt. Everest	Nepal-Tibet	Himalayas
K2 (Godwin Austin)	India	Karakoram
Kanchenjunga	Nepal-India	Himalayas
Lhotse	Nepal-China	Himalayas
Makalu	Tibet-Nepal	Himalayas
Dhaulagiri	Nepal	Himalayas
Nanga Parvat	India	Himalayas
Nanda Devi	India	Himalayas
McKinley (Denali)	Alaska (U.S.A.)	Rockies
Mt Logan	Canada	Rockies
Mt Whitney	USA	Rockies
Mt Elbruz	Russia	Caucasus
Mont Blanc	France	Alps
Toubkal	Morocco	Atlas
Mt Kosciusko	Australia	Australian Alps

LOCAL WINDS

Names	Nature	Region
Fohn	Warm	Alps
Chinook	Warm	Rockies
(Snow eater) Kalbaisakhi	Warm	North India
Berg	Warm	S Africa
Zonda	Warm	Andes
Loo	Warm	Indian sub-
Santa Ana	Warm	continent Coastal
Southerly	Cold	Southern California New South
Burster Khamsin	Warm	Egypt
Harmattan	Warm	Guinea Coast
Mistral	Cold	S E France
Puna	Cold	Andes
Pampero	Cold	S. America
Simoon	Warm	Arabian Peninsula
Haboob	Warm	Sudan
Norwester	Warm	New Zealand

Bora	Cold	North Italy
Blizzard	Cold	Canada/USA
Sirocco	Warm	Sahara to Mediterranean Sea

PRINCIPAL LAKES OF THE WORLD

Name	Length (sq. km.)	Country
1. Caspian Sea (Largest)	3,71,800	Russia-Iran
2. Superior	82,350	USA-Canada
3. Victoria	69,500	Kenya-Uganda
4. Aral	64,500	Russia
5. Hudson	59,600	USA-Canada
6. Michigan	58,000	USA
7. Tanganyika	32,900	Tanzania-Zambia
8. Baikal	30,500	Russia
9. Erie	25,700	USA-Canada
10. Winnipeg	24,500	Canada
11. Malawi	23,310	Malawi Mozambique
12. Ontario	19,500	USA-Canada
13. Chad	16,300	Nigeria-Chad
14. Eyre (Salt)	9,580	Australia
15. Rudolf	9,065	Kenya
16. Titica	8,300	Peru-Bolivia
17. Athabasca	8,100	Canada
18. Nicaragua	8,000	Nicaragua
19. Reindeer	6,389	Canada
20. Kuko	5,957	China
21. Torrens	5,775	Australia
22. Victoria Nyanza	26,640	East Africa
23. Nyasa	30,044	Africa

OCEANS

Ocean	Water area (%)	Deepest point	Depth (m)
Pacific	46	Mariana Trench	11,034
Atlantic	23	Puerto Rico Trench	9,200
Indian	20	Java Trench	7,450
Southern Ocean	7	South Sandwich Trench	7,236

GRASS LANDS

Temperate Grassland		Tropical Grassland	
Prairie	USA	Savanna	Africa

Steppe	Russia	Lanos	Venzuela
Pampas	Argentina	Campos	Brazil
Downs	Australia	Selvas	Amazon Basin
Veld	South Africa	Kagon	Philippines
Cantebury	New Zealand		
Taiga	Polar region		

SHIFTING-CULTIVATION

Country	**Name of shifting cultivation**	**Country**	**Name of shifting cultivation**
Mexico	Milpa	Laos	Ray
Congo/Zaire	Masole	Sumatra	Djuma
Ghana	Proka	Malaysia	Ladang
India	Jhum	Thailand	Tamrai
Myanmar	Taungya	Philippines	Caingin
Sri Lanka	Chena	Brazil	Roca
Indonesia	Humah	Madagascar	Tavy
Venenzuela	Conuco		

MAJOR TRIBES OF THE WORLD

Acta	**Philippine**	**Dayak**	**Borneo**
Kafir	S. Africa	Be j a	Sudan
Fellah	Egypt	Kurd	Iran, Iraq
Bora	South East	Fullani	Nigeria
	Colombia	Han	Nigeria
Yugeer	North East Asia	Buryats	Central Aisa
Inuit	N. America	Yuit :	Siberia
Aborigines	Australia	Afikpo	Nigeria
Ainu :	Japan	Alacaluf	Chile
Andmanese	India		Papua New Guinea

Bantu	**South Africa**	**Basques**	**Spain and France**
Basseri	Iran	Bedouins	Africa
Bushmen	Kalahari desert in Africa, Botswana		
Delaware	USA	Eskimos	Canada & Greenland
Giriama	Tanzania	Gurumba	Papua Newguines
Haida	Canada	Hopi	USA
Kirghiz	Kirghizir, Kazakhstan		
Maori	New zealand	Masai	Kenya

Mongols	Mongolia	Nambicuara	Brazil
Nayar	Kerela, India	Ona	Argentina
Papuans	New Guinea	Pygmies	Zaire Basin
Red Indian	North America	Samoans :	Samoa Island
Tartars	Siberia	Tutsi	Zaire, Rwanda, Burundi
Veddas	Sri Lanka	Washo	USA
Yana	USA	Zulu	South Africa