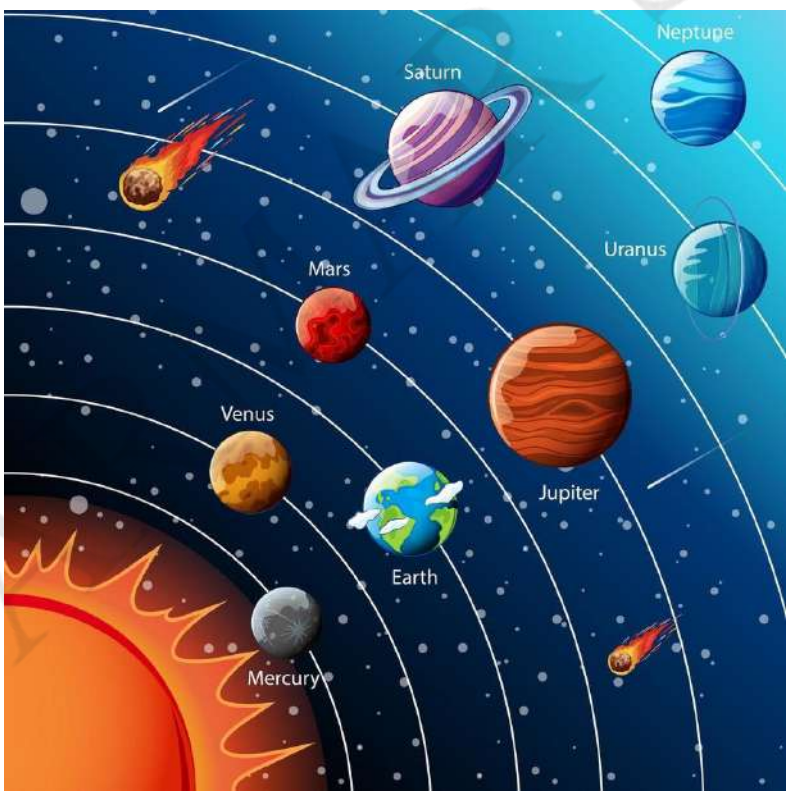
# SOLAR SYSTEM



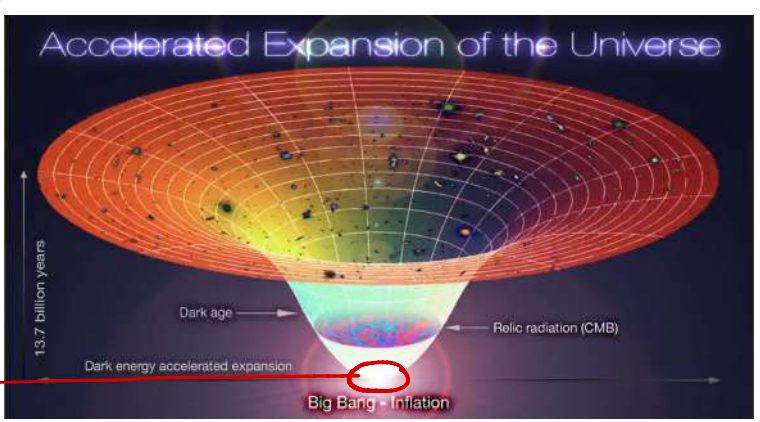

- Nearest galaxy: Andromeda Galaxy
- Study of Universe: Cosmology

Universe
↓
Milky Way Galaxy
↓
Solar System
↓
8 planets

## ORIGIN OF UNIVERSE

Theories given:

- BIG BANG THEORY




Infinitely hot and dense single point ⟶ Exploded

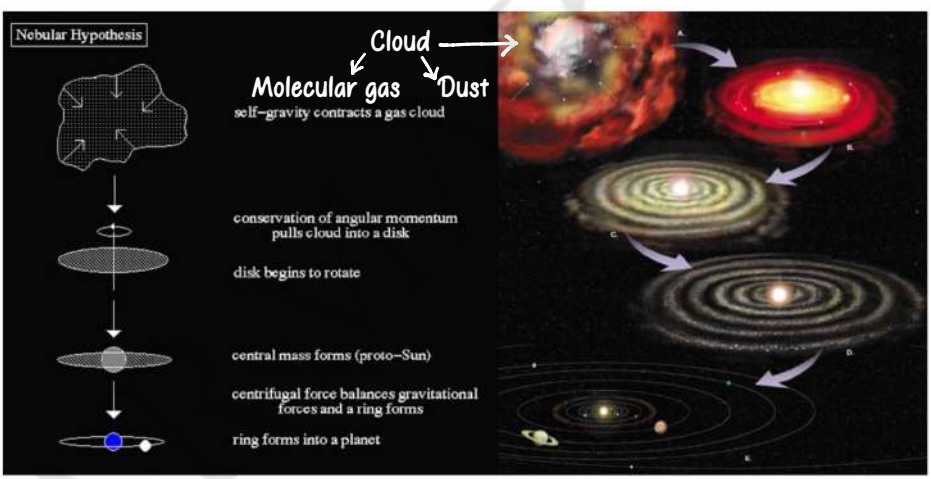
George Lemaitre: 1931
Edwin Hubble → Increase in distance of celestial bodies

Origin of Big Bang Theory. Also, known as Big Bang Explosion → Explosion → 13.6 billion years ago

→ 4.5 billion years ago

## FORMATION OF OUR SOLAR SYSTEM

- Nebular Theory, 1755: by Immanuel Kant
  1796: modified by Laplace
- Nebula: A giant cloud of dust and gas




- $H_2$ + He → Nuclear Fusion
- H + H → He → Formation of Sun (mostly made of $H_2$ and He

  $H_2$ → 70%
- Indian Institute of Astrophysics HQ: Bangalore

# CELESTIAL BODIES

Two types:

- Luminous: Self-glowing, eg: stars
- Non-Luminous: Not self-glowing, but can reflect light from other sources. Eg: Moon

1. Asteroids: they are small, rocky objects that orbit the Sun
2. Meteoroids/Meteors: enters Earth's atmosphere and burn up in Mesosphere (shooting stars)
3. Comet: Small icy dirt balls that orbit the Sun, burn upon reaching Sun
4. Stars

- Stars: luminous bodies
- Colour: Depends on temperature
- Group of stars: Constellation
  - Largest: Hydra
  - Urja Major: Sapta Rishi
- Brightest star in Orion Constellation: Rigel
- Brightest star in night sky (overall): Sirius (Dog Star)
- Closest star to Earth: Sun → Distance from Earth: 150 million km ($1.5 \times 10^8$ km)
  - After Sun, it is Proxima Centuri
- Light Year/Parsec: celestial distances
- 1 LY: $9.46 \times 10^{12}$ km
- 1 Parsec: 3.26 LY

- India's first Solar Mission
  - ADITYA L1 mission ISRO, India

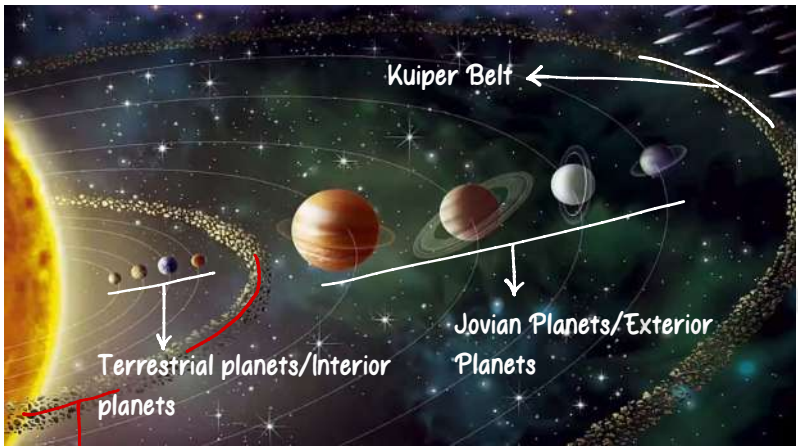
## Sun

- The only star in our solar system and powerhouse of solar system
- Composed of Hydrogen (73%), Helium (25%) and other metals
- Carries 99% mass of our solar system
- Approx 109 times of Earth
- Takes 8 minutes 30 seconds for light at speed of 3 lakh km/sec to reach Earth
- Temperature at surface = 5800 K/5600 C
- Temperature at centre = 15.7 million K
- Outer layer: CORONA

## Moon

- Earth's natural satellite
- Non-Luminous
- Radii: 1.74 x $10^6$ km
- Time of Moon's light, takes to reach Earth: 1.26 secs
- Distance b/w Earth and Moon: 3,84,000 km
- Gravity = $\frac{\text{Earth's gravity}}{6}$
- Rotation = Revolution (same)
  - 27.3 days → Only one side of the Moon is visible (far side)

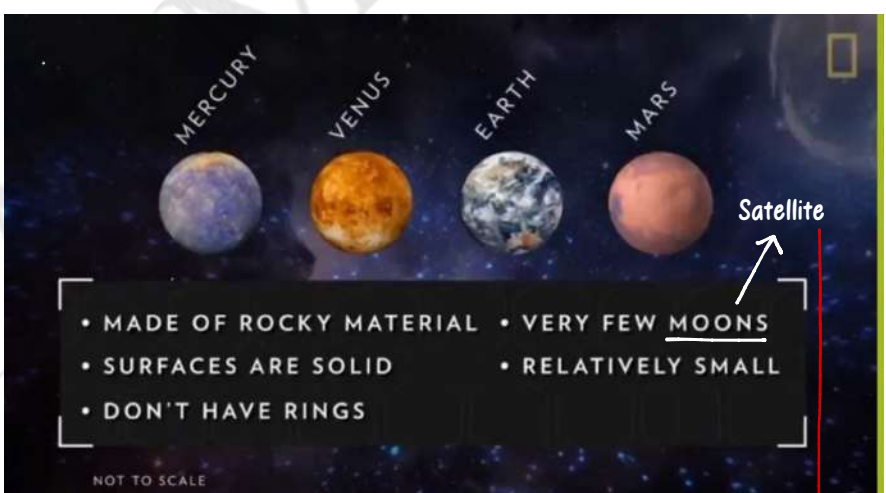
- Rotation: object's spinning motion about its axis
- Revolution: object's orbital motion around another object
- All planets rotates from West to East (anti-clockwise) except Venus and Uranus (clockwise)


Asteroid Belt: b/w Mars and Jupiter

- Pandit Jasraj becomes the first Indian musician to have a minor planet named after him: Panditjasraj (300128) → Derived from his date of birth, 28 Jan 1930

- Characteristics of Terrestrial Planets




Revolves around planets



Jupiter Saturn


Uranus Neptune

1st Planet: Mercury

- Closest planet to Sun
- Smallest planet in solar system
- Diameter: 4900 km
- Fastest planet, takes 88 days to complete revolution around Sun
- Planet with no satellite
- Planet with no water and gases like Nitrogen, Hydrogen, Oxygen, and Carbon Dioxide

## 2nd Planet: Venus

- Hottest planet in solar system: traps the gas easily, has thick clouds of $H_2SO_4$ and $CO_2$
- Brightest planet in Solar System, also known as "Evening Star" and "Morning Star"
- No satellite/Moon
- Also known as "Earth's Twin" due to similar mass and size
- Rotates clockwise

## 3rd Planet: Earth

- the only planet to give support to life
- Also known as "Blue Planet": 70% water
- It has one satellite: Moon
- Densest in the entire solar system

## 4th Planet: Mars

- Known as "Red Planet": rich in Iron oxide (red soil)
- Second smallest planet in solar system
- Two natural moons: Phobos and Deimos
- Largest Volcano and tallest mountain of Mars: Olympus Mons

## 5th Planet: Jupiter

- Largest planet with shortest rotation- 10 hours
- Atmosphere filled with: Hydrogen, Helium, other gases
- Third brightest after Moon and Venus
- At present total moons: 95 moons at present
- Largest satellites: Io, Europa, Ganymede (largest among all), Callisto (all discovered by Galileo)
- Has unclear ring around it

## 6th Planet: Saturn

- Second largest planet
- Has bright and concentric rings made of tiny rocks, gas, dust, ice
- It is the least dense planet
- Has 146 moons at present (the maximum)
- Largest satellite: Titan
- 1655: Huygenes (discover Saturn's rings)
- 1675: Cassini (discovered gap b/w rings)
  - Cassini divisions

## 7th Planet: Uranus

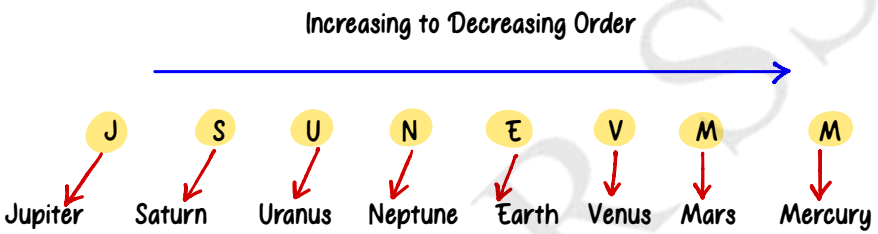
- It is greenish in colour: "Green Planet" due to presence of Methane ($CH_4$)
- Discovered by William Herschel in 1781
- Known as "Ice Giant"
- Atmosphere has: Hydrogen, Helium, Water, Ammonia, Methane
- Rotates clockwise like Venus
- Coldest planet
- Its is tilted to 98° at its axis– Rolling/Lopsided Planet

## 8th Planet: Neptune

- Farthest planet
- It is also "Ice Giant"
- Atmosphere composed of: Hydrogen, Helium
- Bluish in colour due to Methane
- Fourth largest planet and third most massive planet
- Discovered by: Johann Galle and Urbain Le Verrier in 1846 (only planet found by Mathematical Predictions)
- Has 14 satellites, famous moon: Triton

## Pluto

- No more a planet in 2006 by International Astronomical Union (IAU)
- It is known as dwarf planet and is a member of Kuiper Belt
- Kuiper Belt is a spherical boundary outside the orbit of Neptune containing a number of asteroids, rocks and comets



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## Geography

## Latitude – Longitude
## Rotation – Revolution

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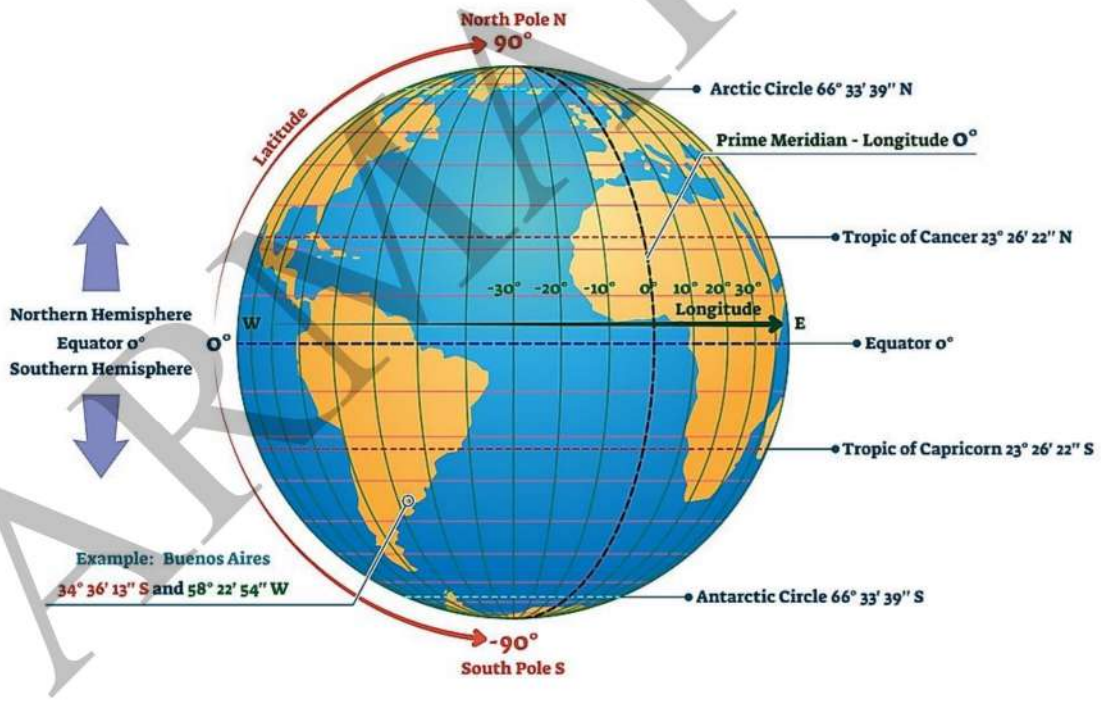
# LONGITUDE AND LATITUDE
# ROTATION AND REVOLUTION



# Fundamentals of Earth


Phase 4: Eclipse

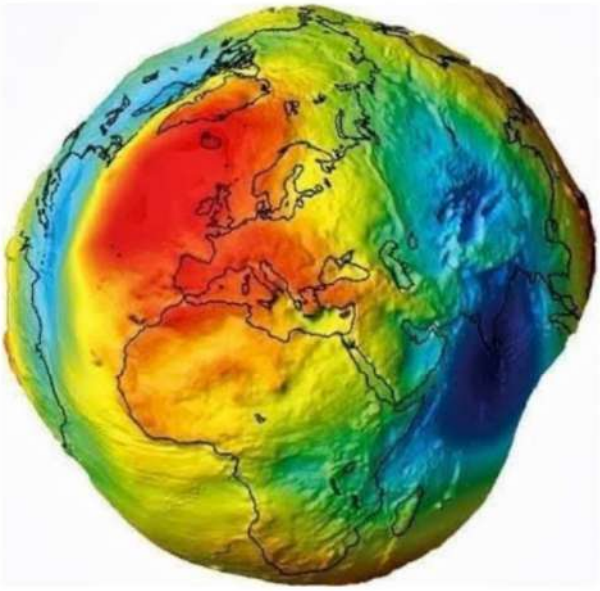
## Age of Earth

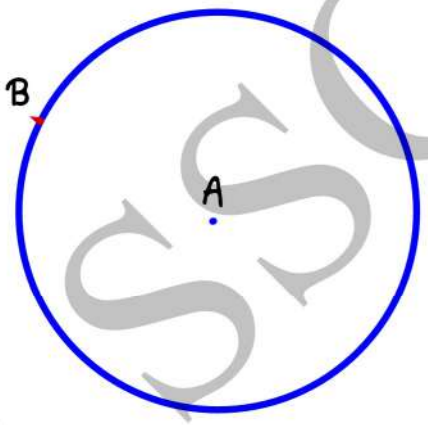
Technique used: Radioactive dating → invented by Ernst Rutherford (1905)

## Types of Dating

1. Uranium-lead dating method (oldest rocks)
2. Potassium-argon method
3. Rubidium-strontium method
4. Radiocarbon dating method
5. Chlorine-36 dating method
6. Carbon-dating ($C^{14}$) (latest rocks)

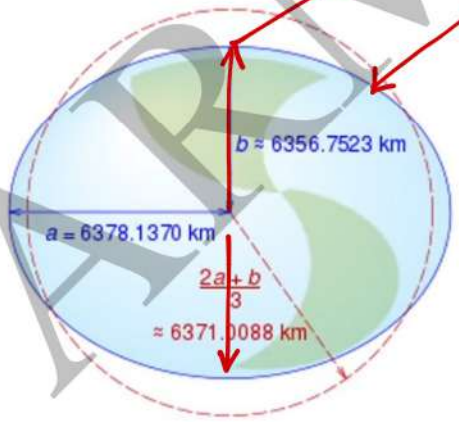
## Shape of Earth

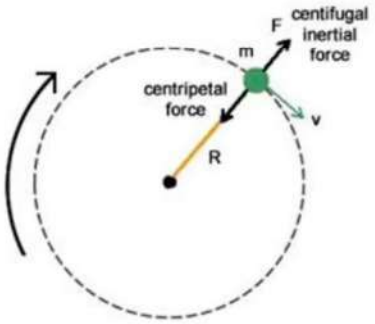





- Shape of Earth is Geoid or Oblate Spheroid (a little flat from top and bottom)
- Reason: more Centrifugal Force at Equator bulges earth at Centre and Gravitation force at poles pushes surface towards centre due gravitational force towards the centre, it flat in top and bottom

Actual shape

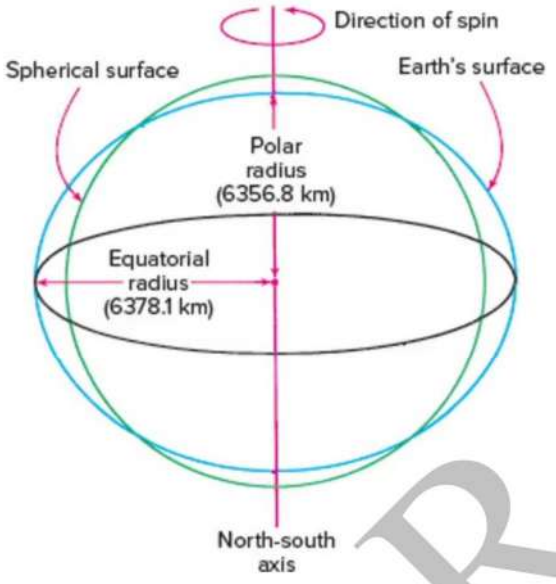


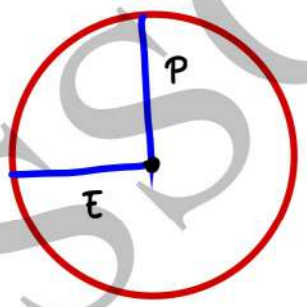




When a body revolves, two types of forces is applicable

- Centripetal Force: towards the axis of rotation or centre of curvature (inside)
- Centrifugal Force: directed away from the centre of the circle

## Radius of Earth



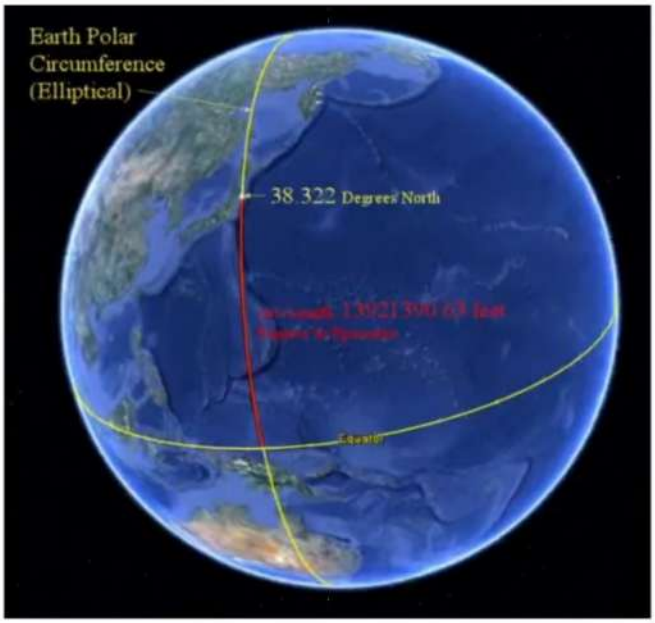




- Equatorial Radius: 6378 km
- Polar Radius: 6357 km
- Mean Radius: 6371

**Why polar radius < Equatorial radius?**

- Ans: Earth is bulged at the equator and flattened at the poles

## Circumference of the Earth

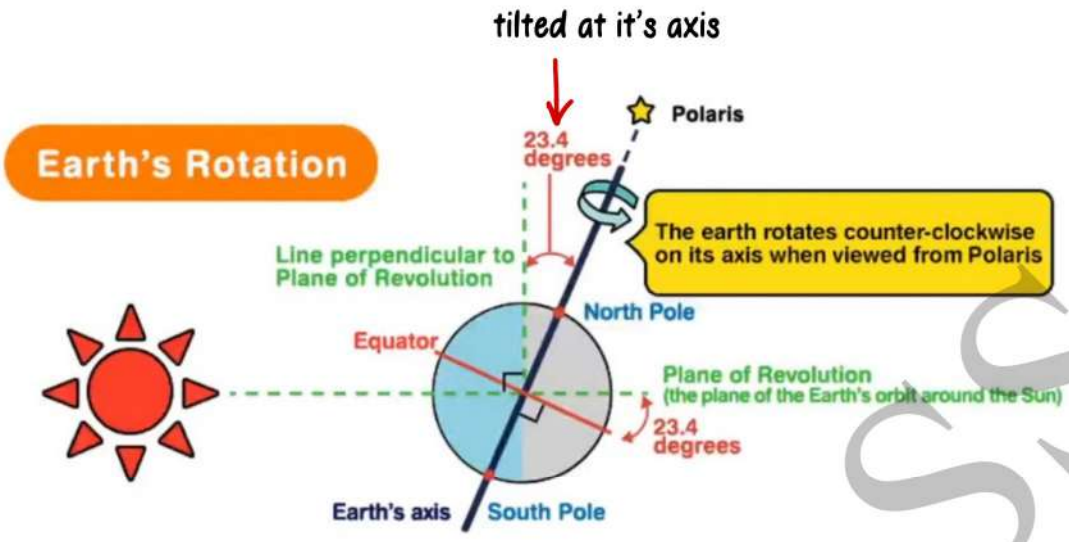



- Polar: 40,007 km
- Equatorial: 40,075 km
- Mean: 40,040 km

**Why poles circumference < Equatorial?**

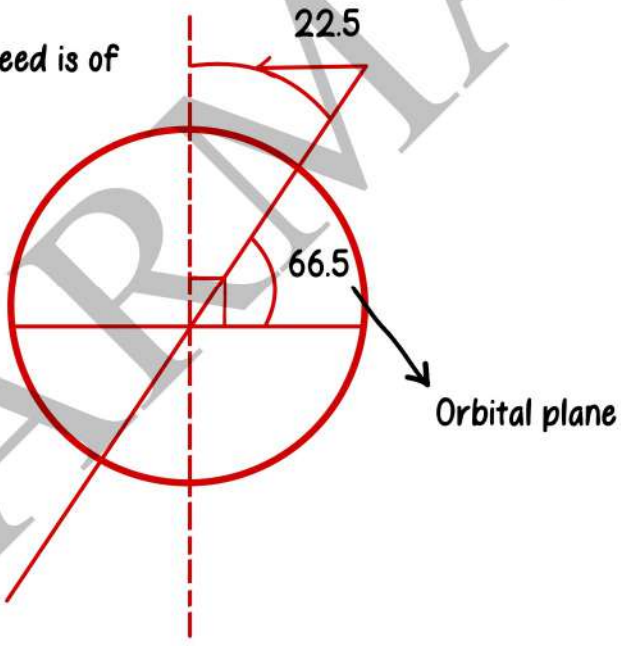
- Earth is bulged at equator and flattened at the poles

## Rotation of Earth

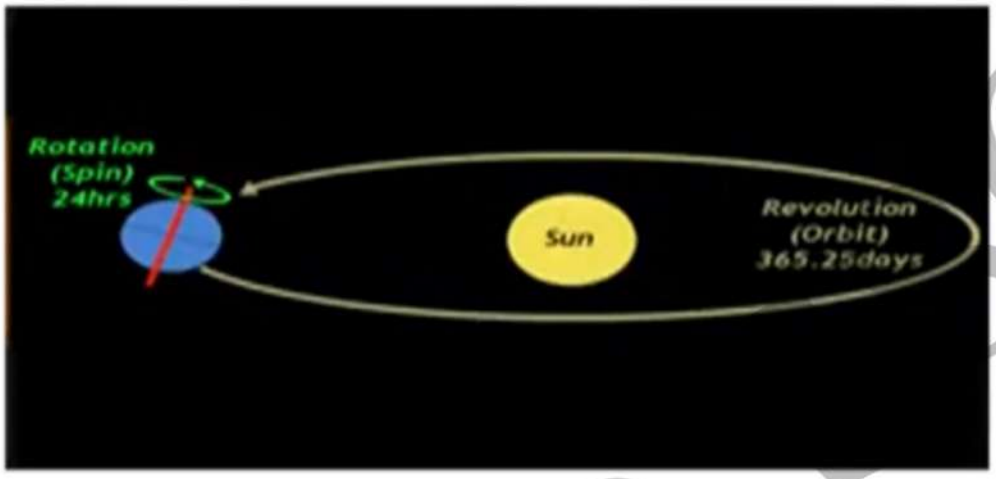



- Rotation: spinning on its own axis
- One rotation of Earth: 23 hour 56 mins 4 sec
- Direction: West to East
- Rotational Speed is maximum at Equator and minimum at Poles

Fastest rotation speed is of Jupiter



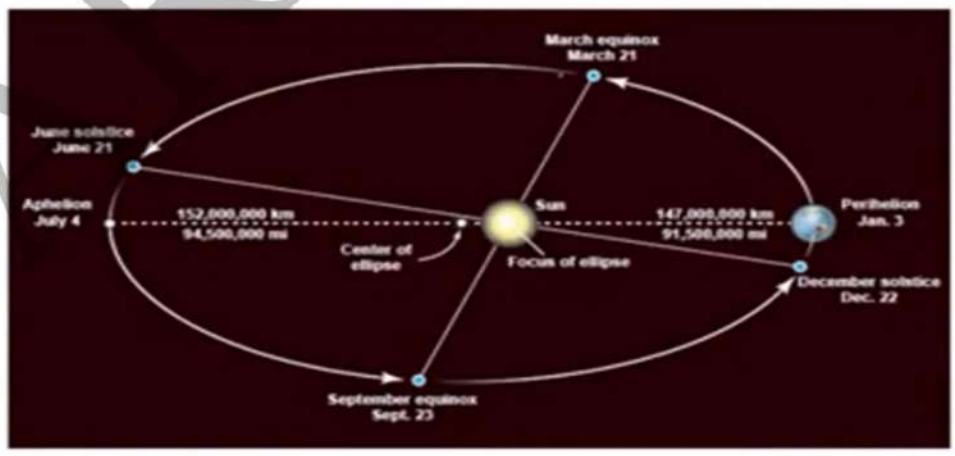
## Revolution of Earth




- Revolving around the Sun in Elliptical orbit
- One revolution: 365 days 6 hours 9 minutes and 9 sec
- Orbital speed: 29.8 km/sec
- Max orbital speed: Mercury
- Min orbital speed: Neptune

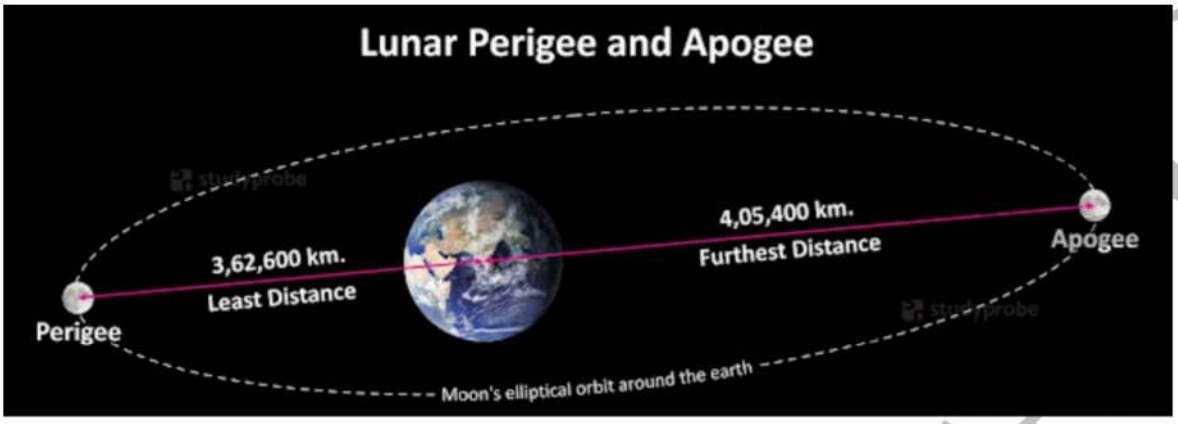
6 x 4 = 24 hrs → Leap year concept (366 days)

## Distance from the Sun

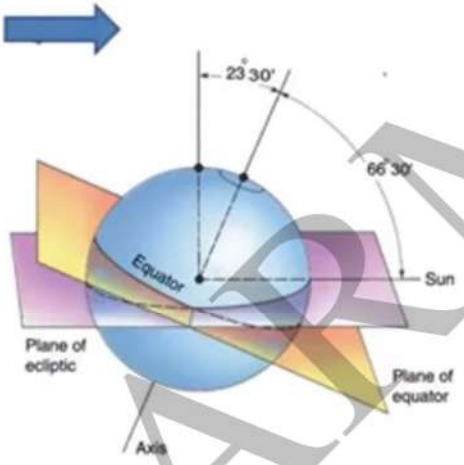



- When nearest to Sun: Perihelion (January 3rd – 14,75,00,000 km)
- When farthest from Sun: Aphelion (July 4 – 15,25,00,000 km)

- **Perigee**: the point of moon's orbit when it is closest to Earth
- **Apogee**: When moon is farthest from Earth




## Inclination of the Earth's axis




- Axial Inclination: Inclination of Earth on its axis = $23\frac{1}{2}^{\circ}$
- Orbital Inclination: Inclination of Earth on its orbital plane = $66\frac{1}{2}^{\circ}$

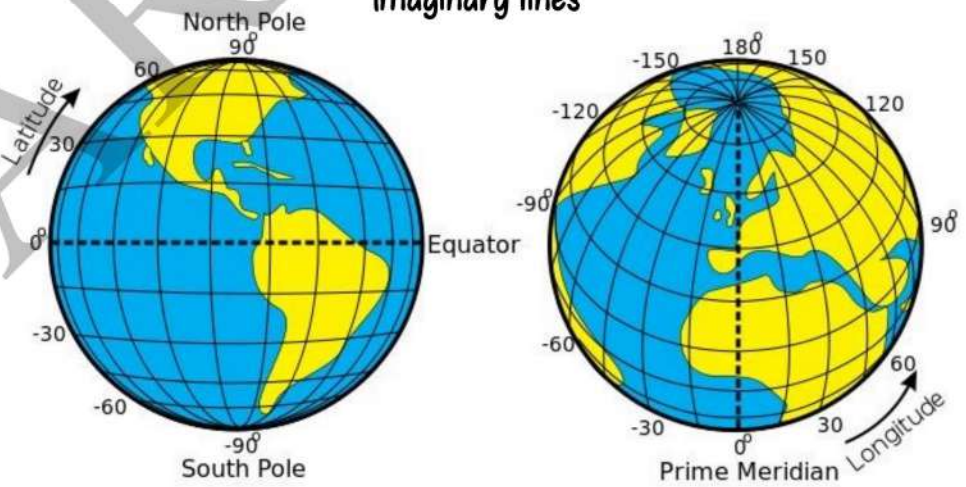
## Hemisphere


- Equal division of Earth in two parts
- Equator: divides the globe horizontally into 2 equal parts – Northern and Southern Hemisphere
- Prime Meridian and International Date Line: divides the globe vertically – Eastern and Western Hemisphere

### Latitude and Longitude

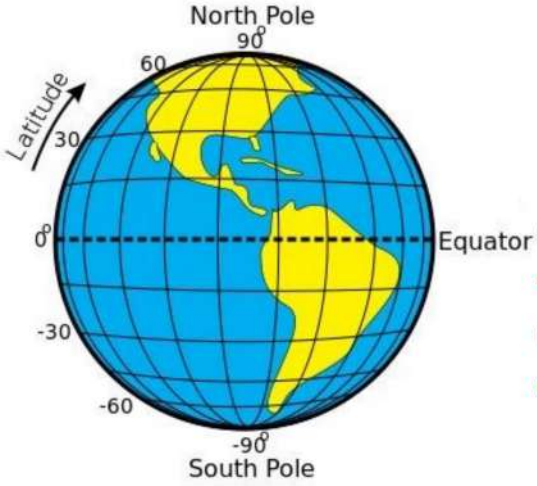
↓

### Imaginary lines



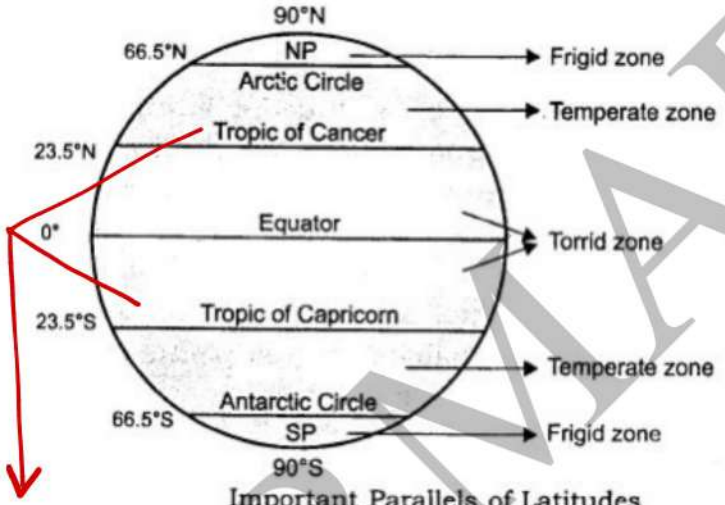

Horizontal lines

Vertical lines




## Latitude

- Imaginary horizontal lines on the globe that run from East to West
- Angular Distance of a place from the equator
- 1 degree of latitude = 111 km (approx)
- Total latitudes: 181
- Distance b/w each latitude is same

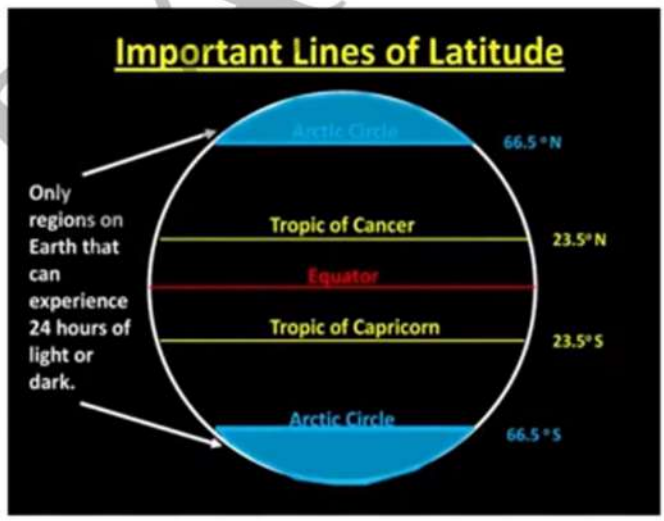


Important Parallels of Latitudes

Sunlight does not falls beyond these tropics

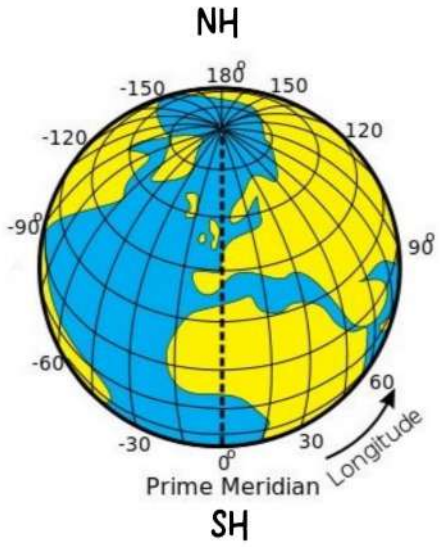
### Important Latitudes:

- 0 : Equator
- $23\frac{1}{2}^{\circ}$N: Tropic of Cancer
- $66\frac{1}{2}^{\circ}$N: Arctic Circle
- $23\frac{1}{2}^{\circ}$S: Tropic of Capricorn
- $66\frac{1}{2}^{\circ}$S: Antarctic Circle
- Largest latitude: Equator
- Smallest latitude: Poles (North and South




### Uses

1. In Climatology:
   - Temperature zones, wind
   - Responsible for Pressure System
   - Planetary Winds System
2. Location of place




## Longitudes

- Imaginary vertical lines over the globe that run North to South
- Angular Distance of a plane from Prime Meridian
- Distance from each longitude varies from poles towards equator
- Least distance at poles and maximum distance at equator: 111.32 km
- Total longitudes: 360

*
- All longitudes divide Earth into 2 equal parts
- All longitudes are Great Circle (circle in case of longitudes)

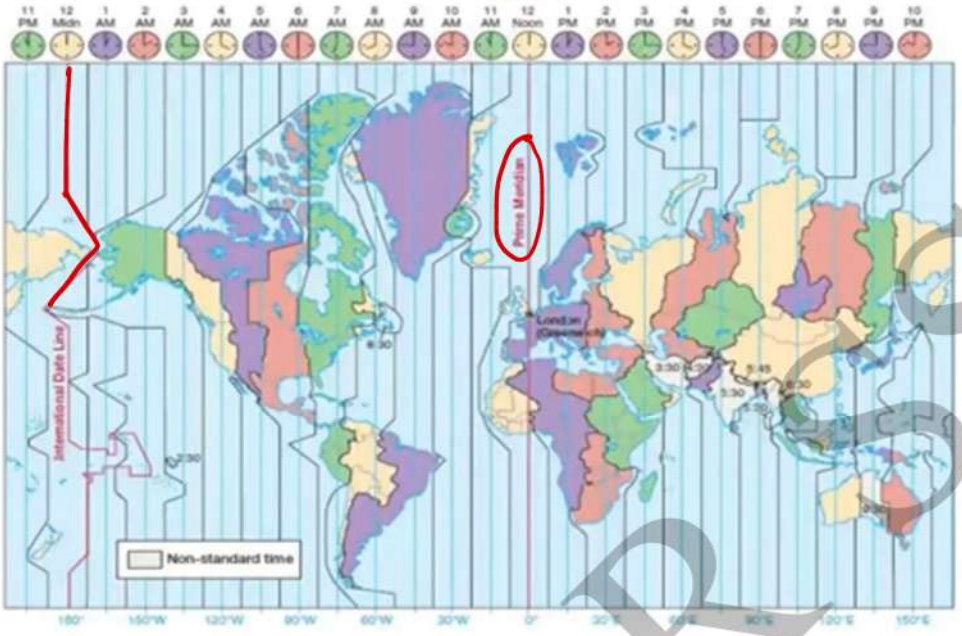

## Important Meridians

- Prime Meridian: 0 degree longitude (passes from Greenwich, London)
- International Date Line: 180 degree Meridian

↓

Zig-Zag lines

## International Date Line




## Prime Meridian


- It passes through Greenwich in London
- Countries: 8
  - UK
  - France
  - Spain
  - Algeria
  - Mali
  - Burkina Faso
  - Togo
  - Ghana

- TRICK: BSF GAMe in TOGO Kingdom

$360^\circ$ = 24 hrs

$\frac{360^\circ}{24}$ = 1 hr

$15^\circ$ = 1 hr

$15^\circ$ = 60 mins

$1^\circ = \frac{60}{15}$ = 4 mins

- Prime Meridian will increase the time by 1 hr
- Moving each $15^\circ$ towards West of Prime
- Meridian will decrease the time by 1 hr

## Solstice and Equinox


- Overhead Rays
- Longest day and Shortest night

- Day and Night: due to Rotation
- Seasons:
  1. Revolution
  2. Tilt

## Solstice

### Summer – June 21

1. Vertical rays on Tropic of Cancer
2. Northern Hemisphere gets more heat
3. Continuous sun rays on North Pole for 6 months, continuous days
4. known as Kark Sankranthi

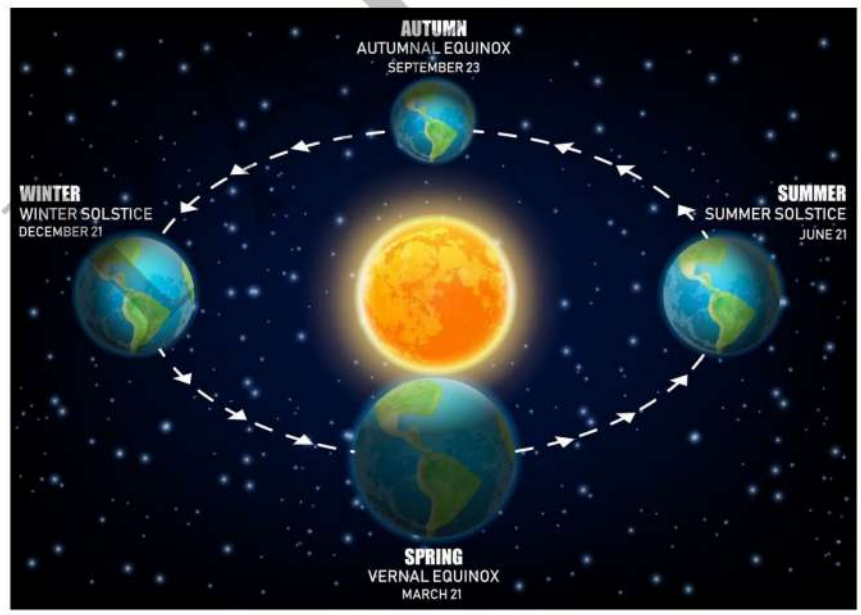
Insolation: incoming solar radiations

### Winter – Dec 22

1. Vertical rays on Tropic of Capricorn
2. Southern Hemisphere gets more heat
3. Continuous Sun rays on South Pole for 6 months, continuous daylight
4. known as Makar Sankranthi

## Equinox

- Direct rays of the Sun fall on the Equator
- At this position neither of the poles is titled towards the Sun
- So, the entire Earth experiences Equal days and nights

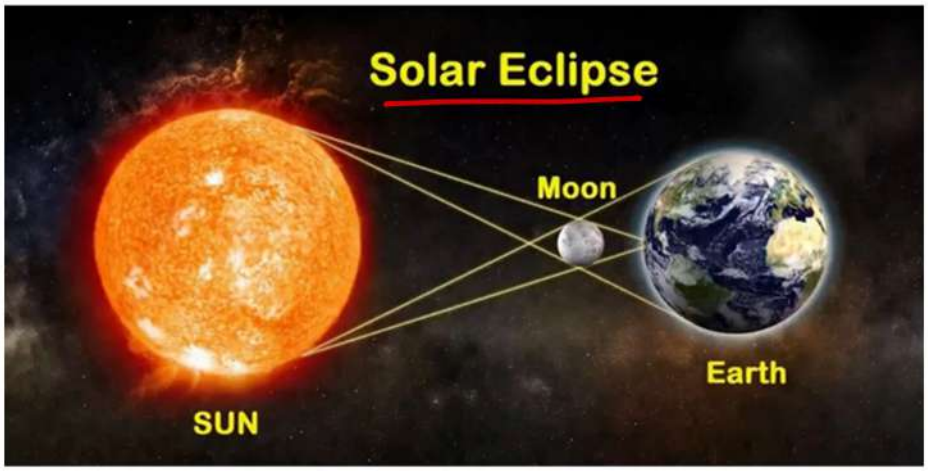



### Vernal Equinox

- March 21: It is spring in the NH and autumn in the SH

### Autumnal Equinox

- Sep 23: it is autumn in NH and spring in SH




- Sun (at its constant position) is obscured by the moon

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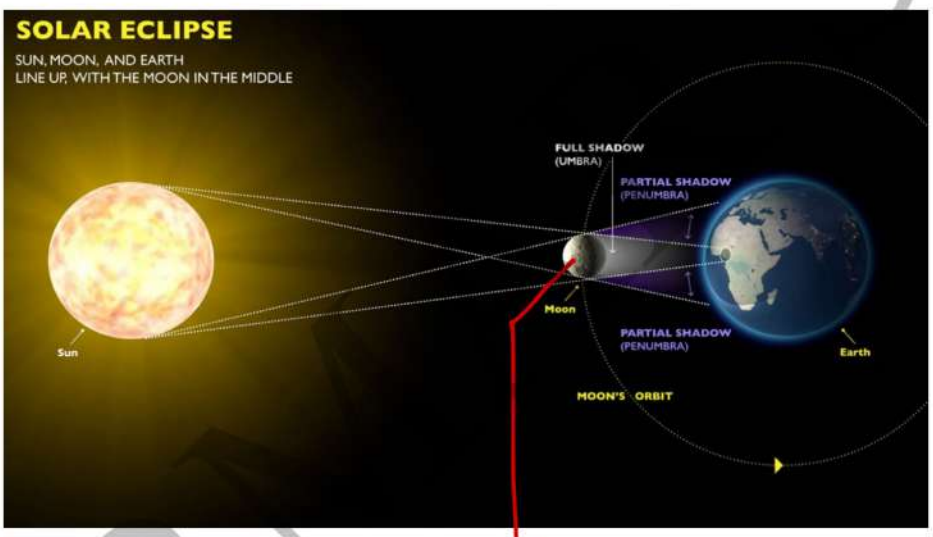
New Moon
- Amavasya

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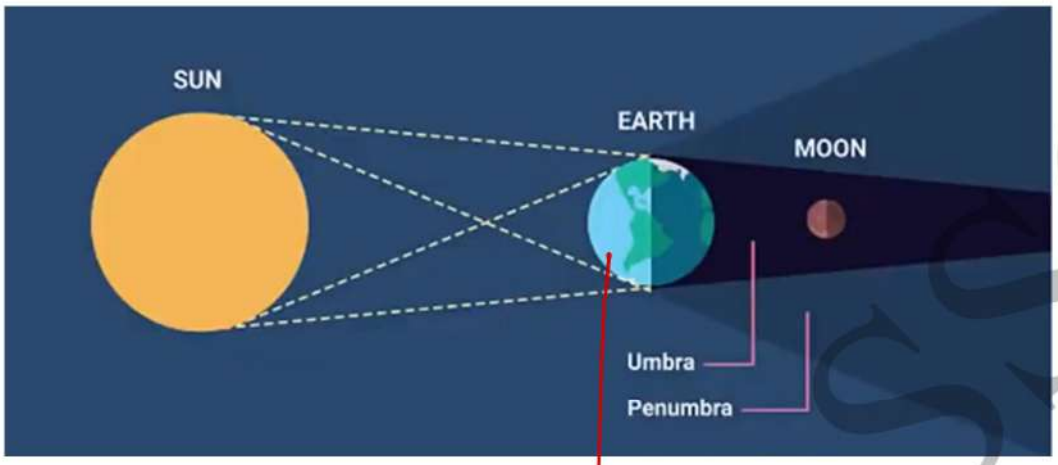
Moon is blocking Sun's light

Total Solar Eclipse  Annular Solar Eclipse  Partial Solar Eclipse

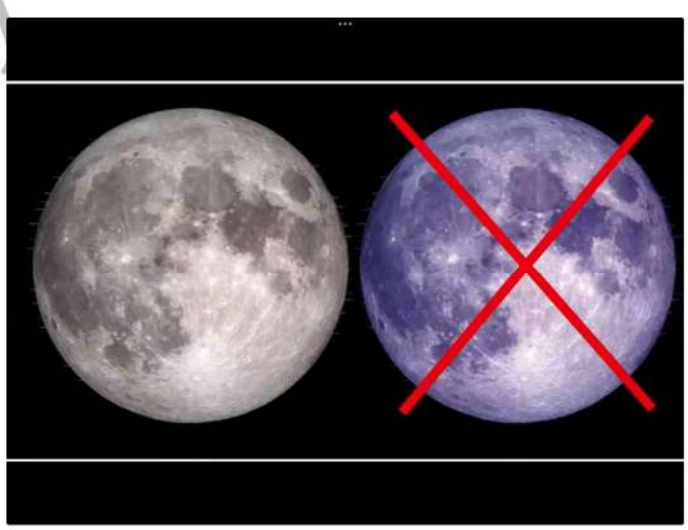
## Lunar Eclipse



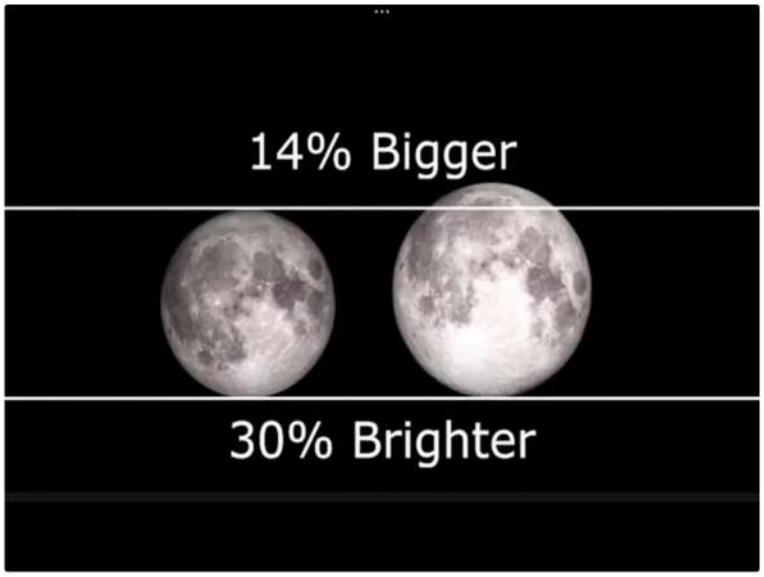

- Full Moon condition- Purnima

Earth blocks Sun's light
(light refraction) → scatters more
causing blue colour
light to vanish and red → scatters less
light to reach moon

Red Moon



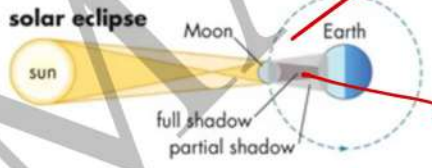
Blue moon
↓
2 full moon in a month




- Lunar Eclipse + Perigee → Moon appears bigger than its normal size

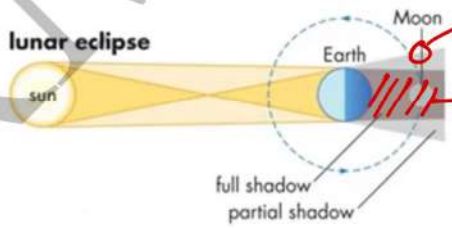
↓

Super Moon condition




Penumbra

Umbra




light shadow (Penumbra)

Dark Shadow (Umbra)

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# Geography

## Earth's Interior and Plate Tectonics

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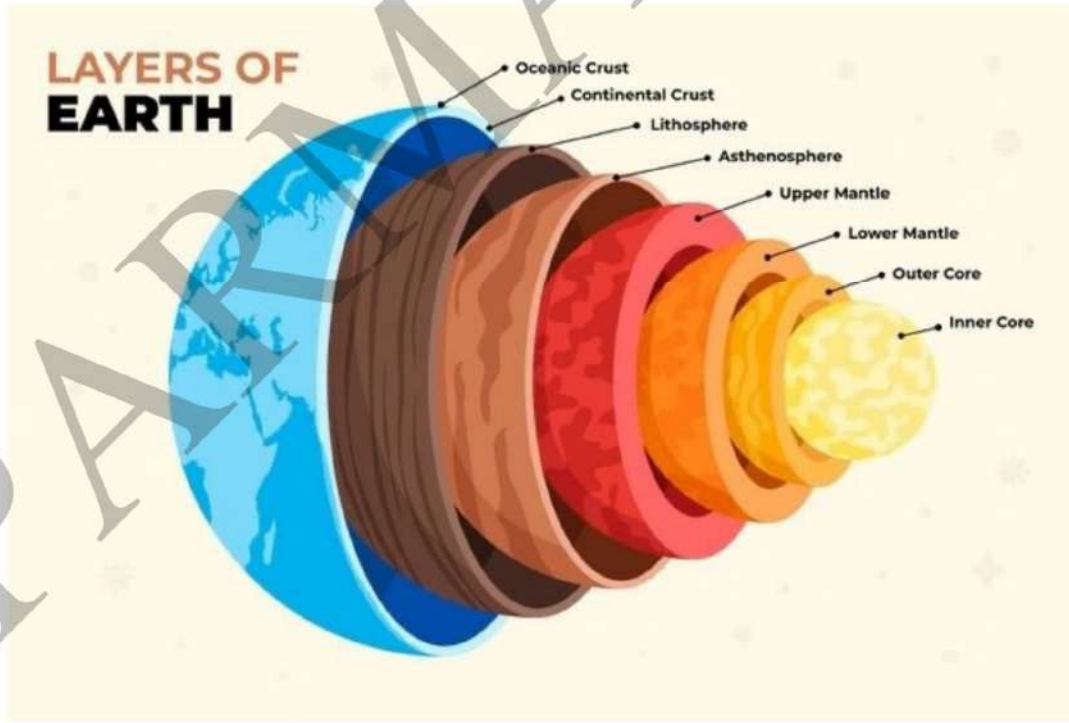
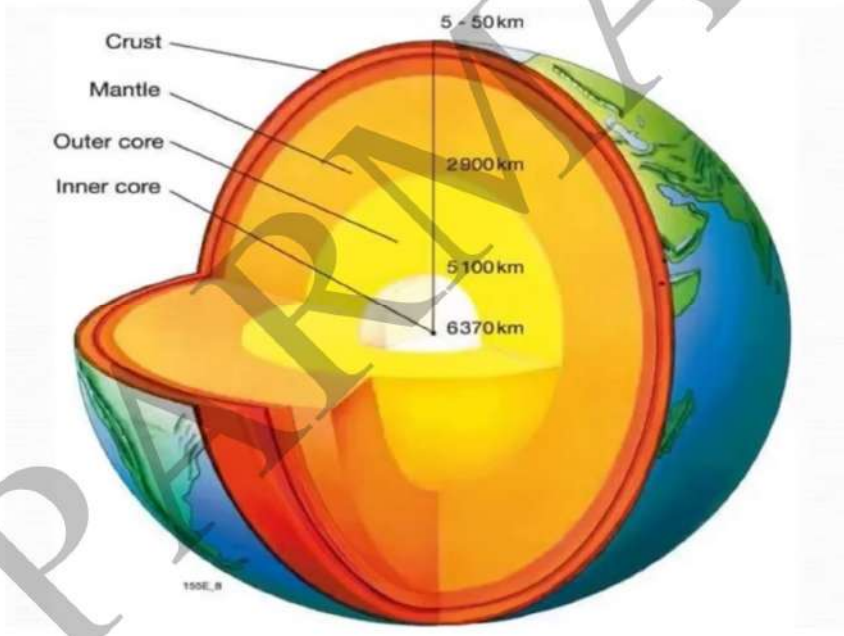
# Earth's Interior
# &
# Plate Tectonic



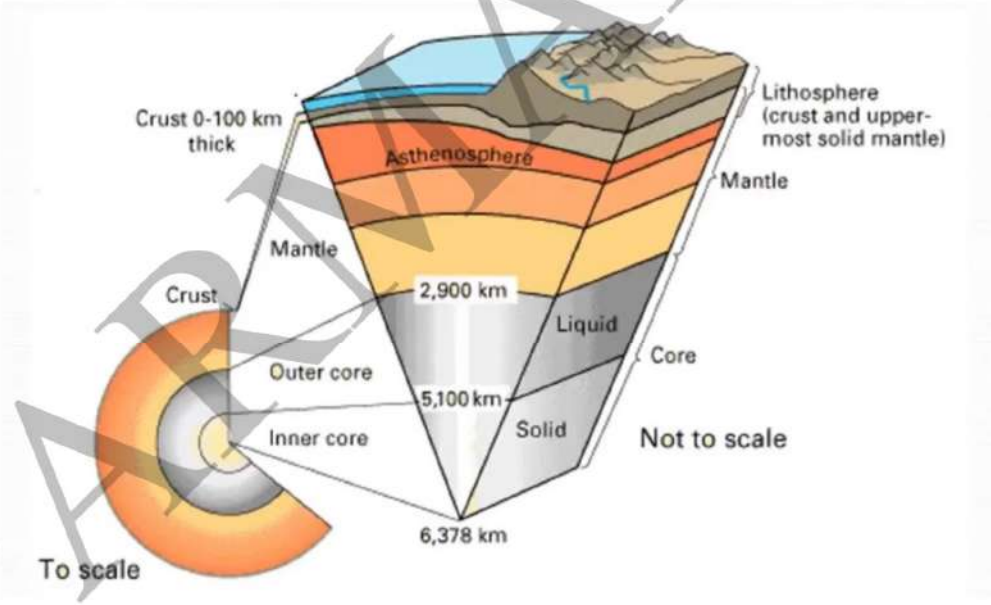

## Earth's Interior

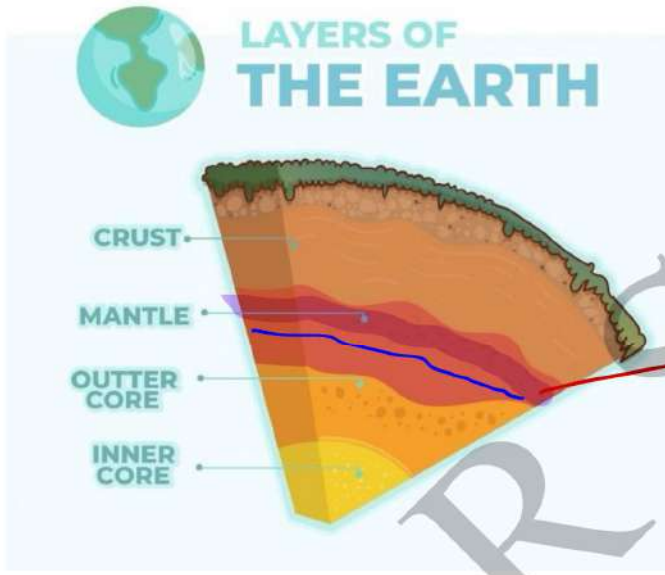



## Four method's to know Earth's interior:

1. Temperature – indirect source
2. Volcanoes and rock – direct source
3. Meteorites – indirect source
4. Earthquakes – indirect source


Temperature
Volcanoes
Meteorites
Earthquakes


Crust 0-100 km thick
Asthenosphere
Lithosphere (crust and upper-most solid mantle)
Mantle
Mantle
Crust
2,900 km
Liquid
Core
Outer core
5,100 km
Inner core
Solid
Not to scale
6,378 km
To scale




Crust: made of Silica and Aluminium layer (SiAl)

- Thickness: 5-70 km

Two divisions:

1. Continental Crust:

- land part of crust
- 30 km (thick/lighter)
- made of Granitic rock

2. Oceanic Crust:

- water part of crust
- 5 km (thick/denser)
- made of Basaltic rock

Composition of Earth's crust:

- O → 46.4%
- Si → 28%
- Al → 8% (most abundant metal in crust)
- Fe → 5% (2nd most abundant)

Mantle: made of Silica and Magnesium (SiMa)

- Thickness: 2900 km
- Top layer: Solid form

Two divisions:

1. Upper Mantle
2. Lower Mantle

- Asthenosphere: semi-molten form (plastic form)

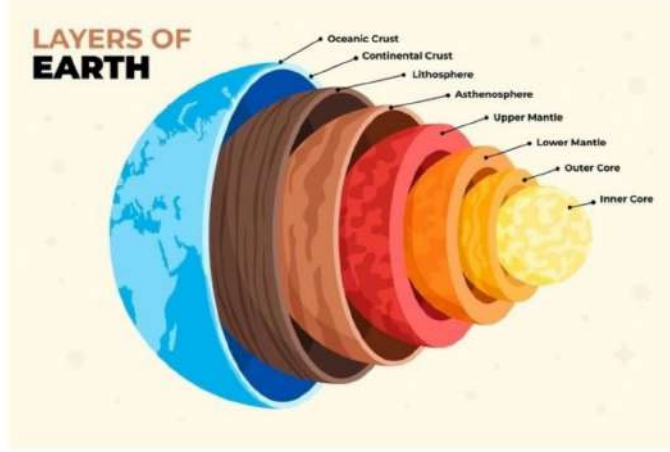
Core: made of Nickel and Iron (NiFe)

Two divisions:

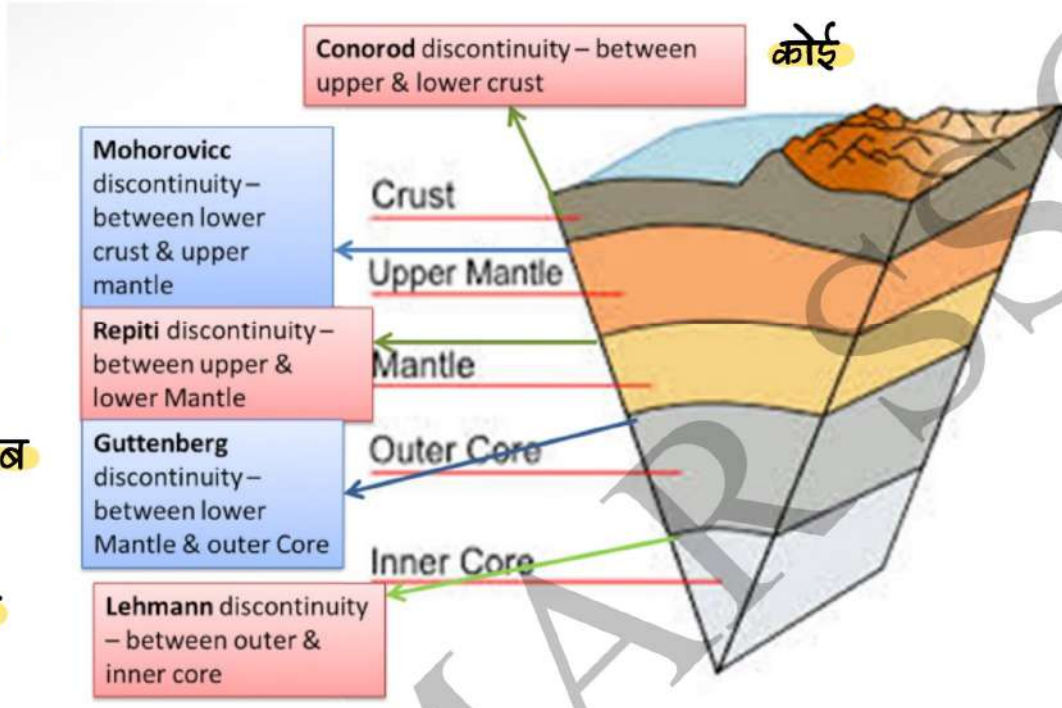
1. Inner Core: Solid form – 2200 km
2. Outer Core: liquid form (shows magnetic properties) – 1300 km

| | Crust | Mantle | Core |
|---|---|---|---|
| By Volume | 1% | 84% | 15% |
| By Mass | 1% | 68% | 31% |

- Lithosphere: Crust + Upper solid part of Mantle – thickness: 10–200 km
- Asthenosphere is not part of Lithosphere



## Earth's Discontinuity

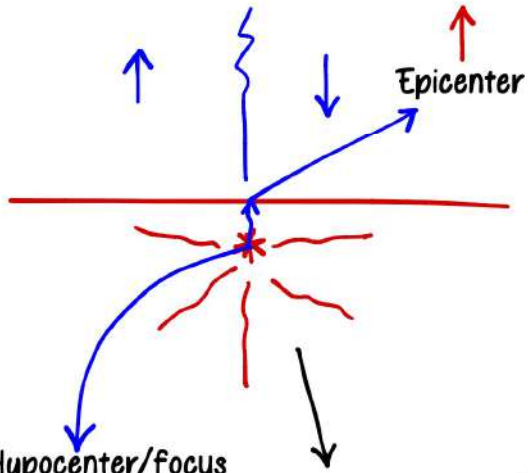



| S. No | Discontinuity | Layers | Depth |
|---|---|---|---|
| 1. | Conrad | Outer and Inner Crust | 45 km |
| 2. | Moho | Crust and Mantle<br>Inner Crust and Outer Mantle<br>Inner Crust and Asthenosphere | 100 km |
| 3. | Repiti | Outer Mantle and Inner Mantle | 700 km |
| 4. | Gutenberg-Weichart | Mantle and Core<br>Inner Mantle and Outer Core | 2900 km |
| 5. | Lehmann | Outer Core and Inner Core | 5200 km |

## Earthquake

- An Earthquake is intense shaking of Earth's surface, which causes shifting of Earth's plate

Distance nearest to Epicenter = more destructruction




Hypocenter/focus (Place from where energy is released first)

Energy released due to movement of plates on the form of waves

Earthquake/Seismic waves

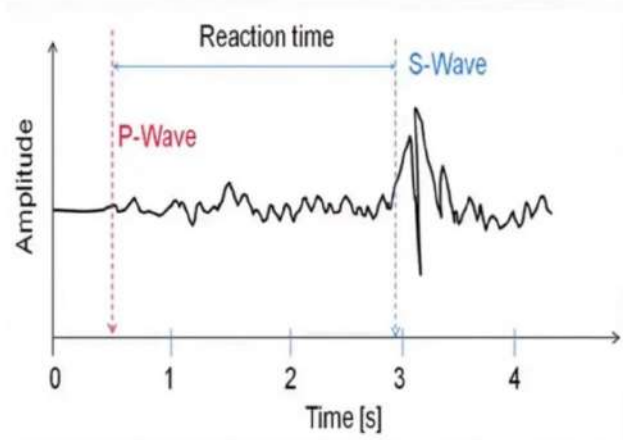
- **Seismograph:** an instrument that records earthquake waves

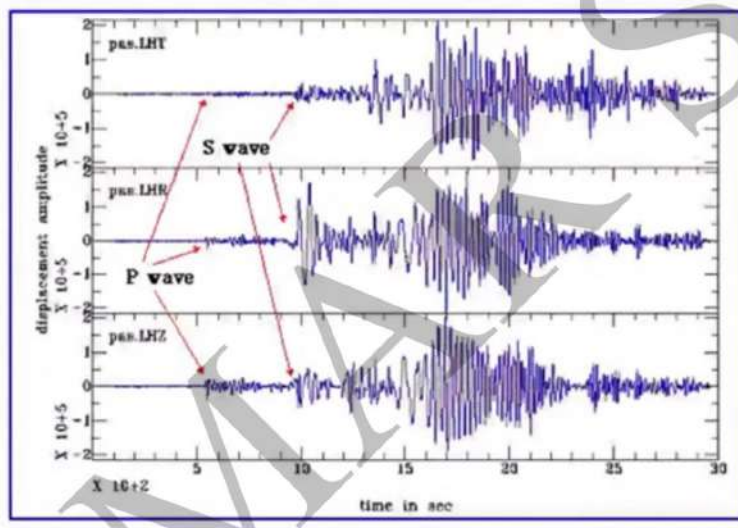
**Waves**

- **Body Waves** (Rocks) → **Surface Waves/Love waves**
  - Surface Waves/Love waves: 4–6 km/sec
  - causes more destruction
- **P waves**
  - First to reach on surface
  - 7–8 km/sec
  - Travels fastest
  - Longitudinal
- **S waves**
  - Transverse
  - Can travel only in Solid medium

Speed ratio:

- Solid > Liquid > Gas (through all mediums)
- They resemble Sound Waves



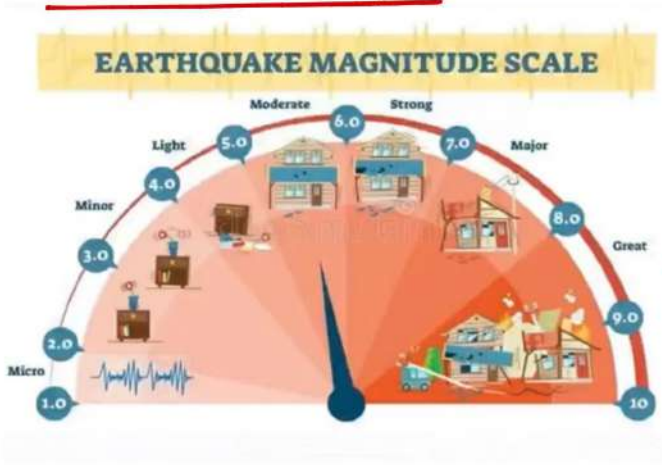

## S waves

- creates Crest and Trough

## P waves

- creates Compression and Rarefaction
- causes stretching and squeezing

## Scales to measure Earthquake



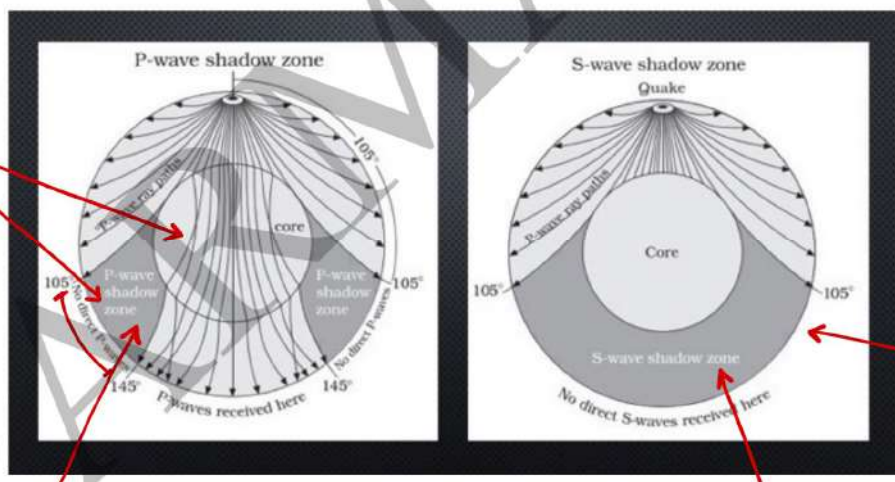

### Richter Scale

- Instrument to measure magnitude of Earthquake
- Magnitude: 0–10
- It is a limitless scale

### Mercalli Scale

- Instrument to measure intensity of Earthquake
- Magnitude: 1–11

## Shadow zone of waves




speed slow

Liquid medium

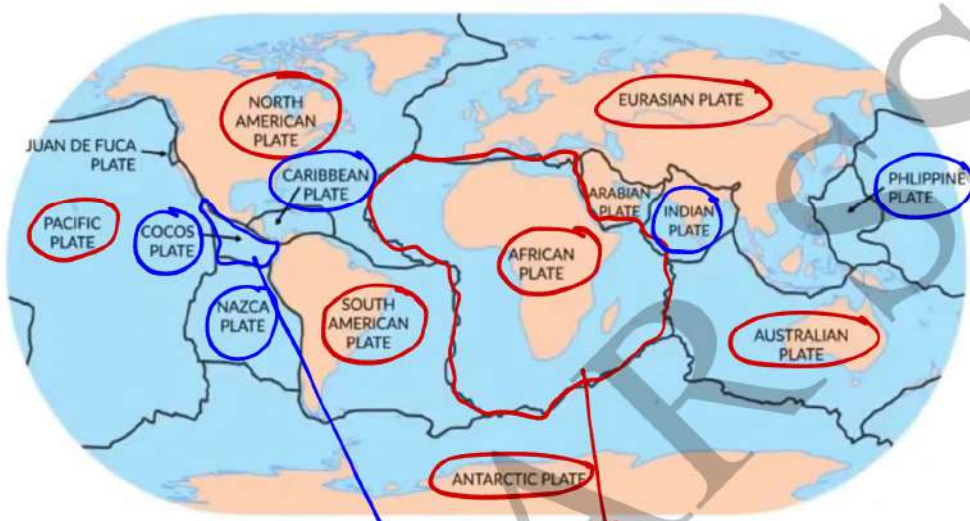
Liquid medium

Large shadow zone

- 40% of Earth's surface (not recorded)

## Tectonic plates

- Lithosphere makes plates comprising Crust and upper solid part of Mantle
- 7 Major + few minor plates



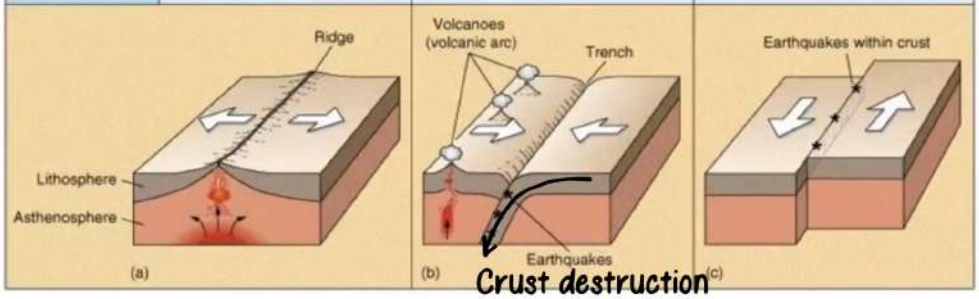

Large boundary: major plate

Minor boundary: minor plate

- Major plates marked in red
- Minor plates marked in blue

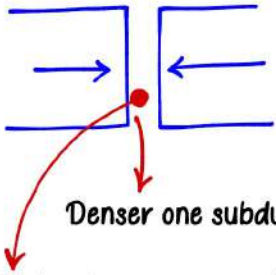
## Different types of plate boundaries

| Type of Margin | Divergent | Convergent | Transform |
|---|---|---|---|
| Motion | Spreading | Subduction | Lateral sliding |
| Effect | Constructive (oceanic lithosphere created) | Destructive (oceanic lithosphere destroyed) | Conservative (lithosphere neither created or destroyed) |
| Topography | Ridge/Rift | Trench | No major effect |
| Volcanic activity? | Yes | Yes | No |




Crust destruction

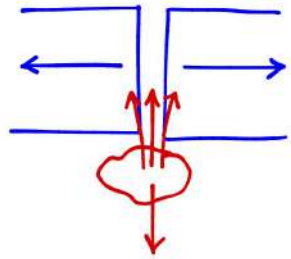
Convergent



Denser one subducts

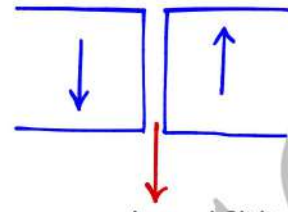
Subduction zone created
Asthenosphere melts
the crust causing crust
destruction

Divergent



distance created, causing lava to
explode
New crust formation –
Constructive boundary

Conservative



Lateral Sliding
Conservative boundary

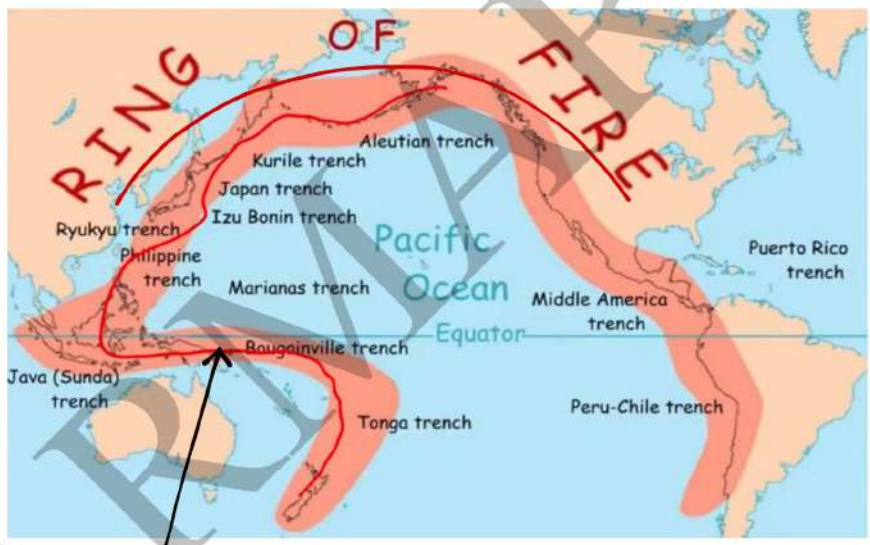



Plate boundary created,
these places are called-
Ring of Fire in Pacific
Ocean

Force behind plate movement:

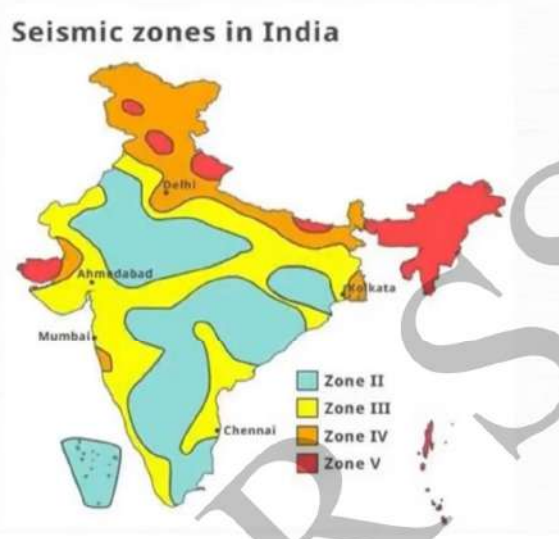
- Heat generated within the Earth due to Radioactive decay and Residual heat

# Seismic Zones in India-

**Seismic Zone Map of India: -2002**

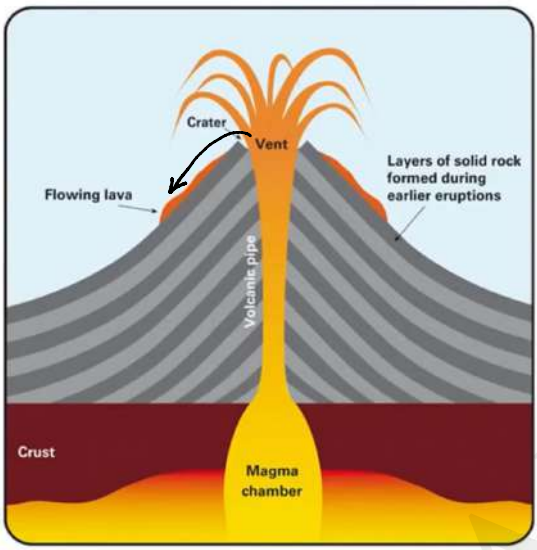
About 59 percent of the land area of India is liable to seismic hazard damage

| Zone | Intensity |
|---|---|
| Zone V | Very High Risk Zone Area liable to shaking Intensity IX (and above) |
| Zone IV | High Risk Zone Intensity VIII |
| Zone III | Moderate Risk Zone Intensity VII |
| Zone II | Low Risk Zone VI (and lower) |



# ROCKS, CONTINENT AND OCEANS

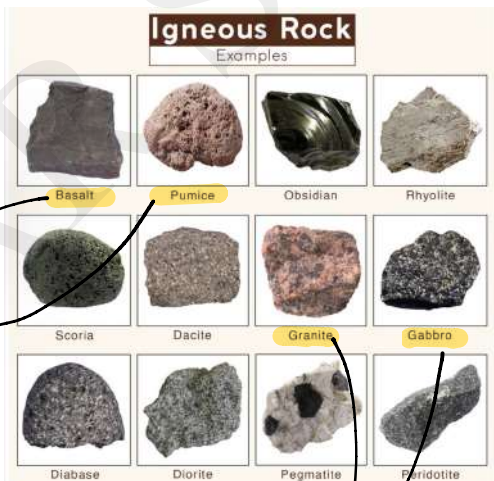
Petrology: Study of rocks




How are rocks formed?

Igneous Rocks: formed when magma cools and solidifies

Types:
1. Intrusive: solidifies inside
2. Extrusive: solidifies outside



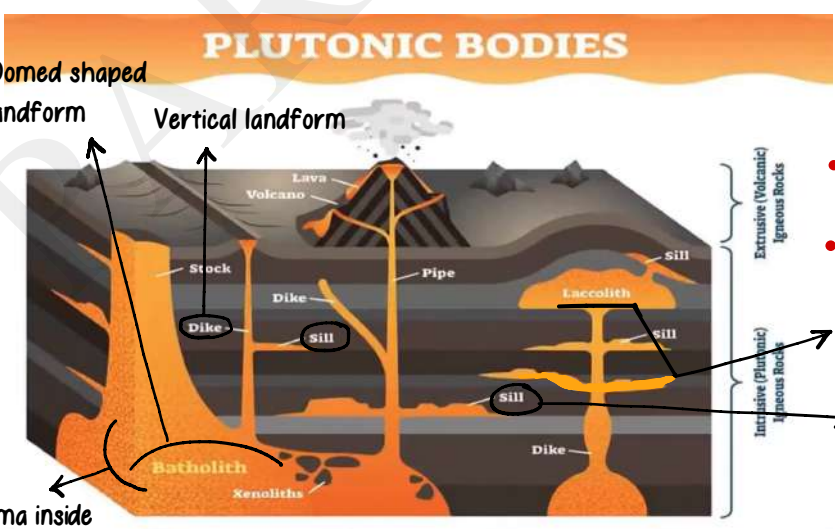

Rock

Exogenous agents act upon
eg: wind, water

Extrusive igneous rock

Intrusive igneous rock/plutonic rocks

- Granite: Continental crust
- Basalt: Oceanic crust




Phacolith

Horizontal Landform

Magma inside

Sedimentary Rock: Sediments are broken, transported, and deposited

- They exists in layers/strata
- In sedimentary compaction takes place – Lithifaction
- Fossils are found in it


Types:

1. Formed mechanically, eg: Sandstone, limestone and shale
2. Formed organically, eg: chalk, limestone, coal
3. Formed chemically, eg: Limestone, halite

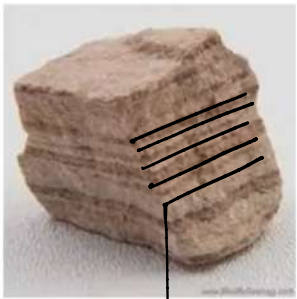
Metamorphic Rock: These rocks are formed by recrystallisation and reorganisation of materials within the original rocks

Igneous + Sedimentray → Metamorphic

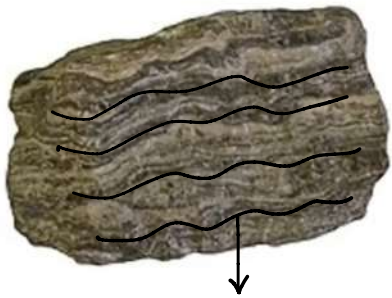
Pressure
Volume
Temperature
} change in forms → Metamorphosis

Types:

1. Thermal Metamorphism: metamorphic rocks formed due to a sudden temperature change
2. Dynamic Metamorphism: metamorphic rocks formed without any chemical change



Alternate dark and light bands called **banding**

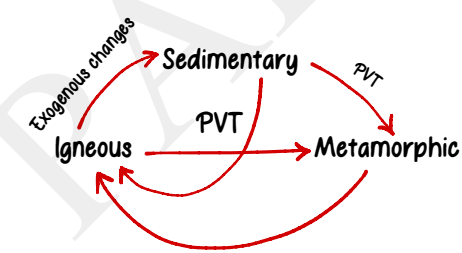


Lines formed called **Lineation**

- Granite → Gneiss → Metamorphic (PVT changes)
- Shale → Slate → Metamorphic
- Sandstone → Quartzite → Metamorphic
- Limestone → Metamorphic

Metamorphic → Marble, Schist, Amphibolite


## Rock Cycle



## Volcano

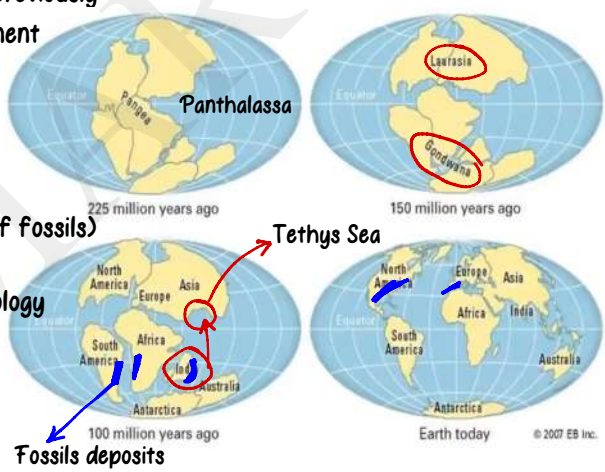
Types:

1. Cinder
2. Composite: most viscous lava
3. Shield: low viscosity lava
4. Caldera: most explosive lava, collapses on itself

## Continents and Oceans

- Alfred Wegener: Gave Continental Drift Theory, 1912

All of the modern-day continents had previously been clumped together in a supercontinent called Pangaea and the water body is called Panthalassa




→ Evidences:

- Jig Saw fit
- Fossils deposits: Palaeontology (study of fossils)
- Placer deposits

Study of rock: Petrology

Types of rocks

Soft — eg: Talc

Hard — eg: Diamond

Convection cells

Due to

Residual heat — Radioactive decay

Two main sources of heat within the Earth

- Continental drift due to (as assumed by Alfred Wegener)
  1. Tidal force
  2. Polar fleeing force

But it occurs due to development of convection cells


- Decreasing order of Continents and Oceans

| Area wise | Population basis |
|---|---|
| Asia | Asia |
| Africa | Africa |
| North America | Europe |
| South America | North America |
| Antarctica | South America |
| Europe | Australia |
| Australia | Antarctica |

Mariana Trench deepest point: Challenger deep

deepest ocean

Oceans Order

P: Pacific Ocean

A: Atlantic Ocean (S-shape )

I: Indian Ocean

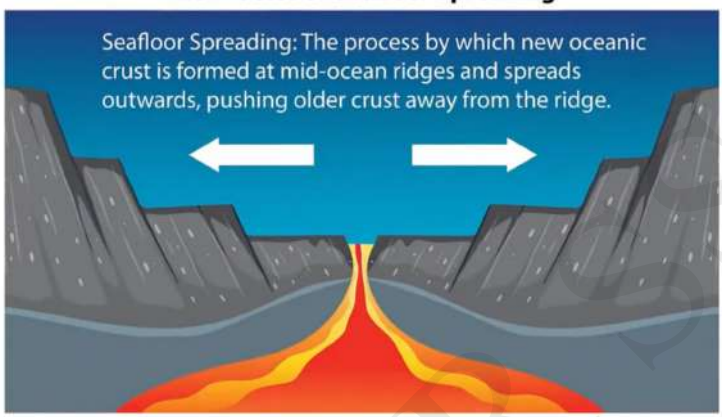
S: Southern (Atlantic)

A: Arctic

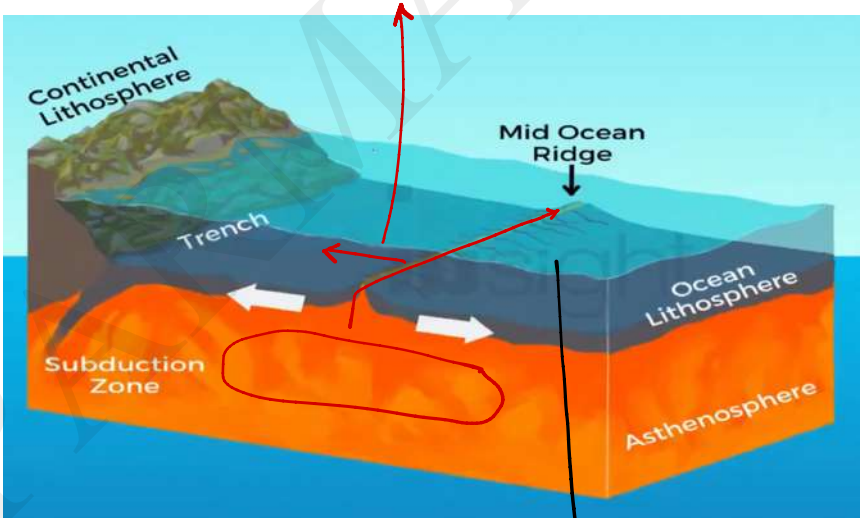
Busiest ocean

Sargasso Sea (brown algae Sargassum is seen here) - borderless sea

**The Process of Seafloor Spreading**




The age of oceanic rocks increases as you move away from the mid-ocean ridge



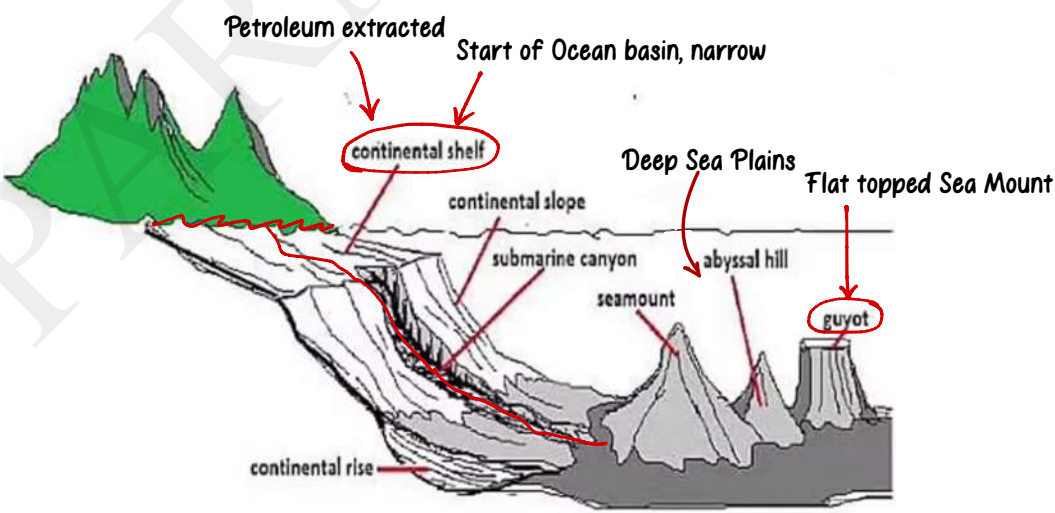

Oceans has more relief features than continents (more diversity)

- Harry H. Hess gave seafloor spreading theory, 1962


created due to divergent plate boundary

Mid-Atlantic Ridge

Longest and largest landform on Earth

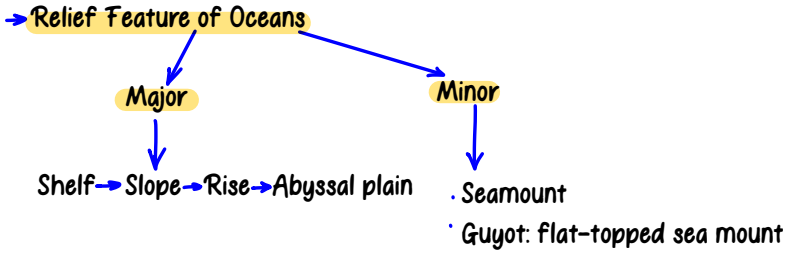


- Minor relief feature: Atoll, sea mount, guyot

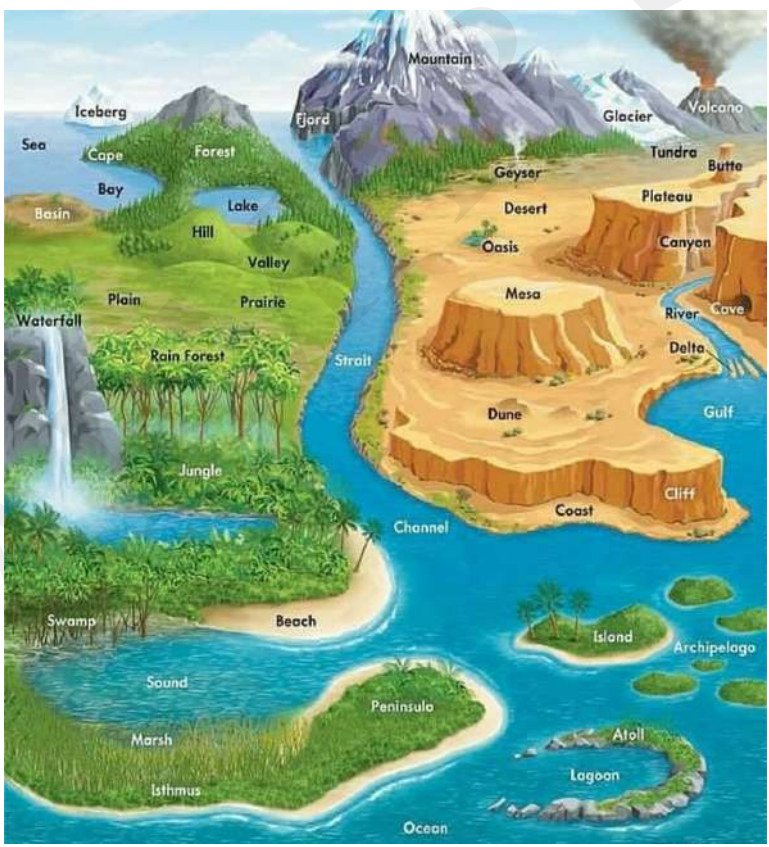
Corals: they are sea organisms, known as Rainforest of Sea

- Exists in symbiotic relationship with Zooxanthellae algae
  - Makes food for corals
  - Secretes $CaCO_3$ that provides protection to Zooxanthellae algae
- Corals exists in colony
- Favourable conditions:
  1. Saline water (cannot survive in fresh water)
  2. Sunlight
  3. Clear water
  4. Temperature: Moderate temperature 30–35°C
- Barrier Reef: Great Barrier Reef in Australia (largest)

- Coral bleaching: when water is too warm, corals will expel the algae (Zooxanthellae) living in their tissues causing the corals to turn completely white
  - due to climate change

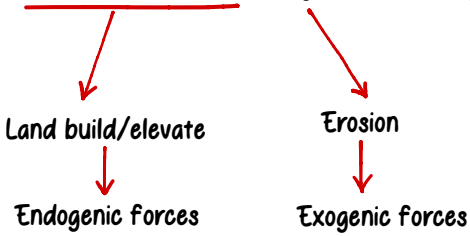

Relief Feature of Oceans
Major
Minor
Shelf
Slope
Rise
Abyssal plain
Seamount
Guyot: flat-topped sea mount

# GEOMORPHOLOGY AND LANDFORMS



# Geomorphology

- Geomorphic process: Changes in the configuration of Earth




- Example:
  Himalayas: continuously increasing → Endogenic > Exogenic
  Aravalis: continuously decreasing → Exogenic > Endogenic

- Endogenic forces: the pressure within the earth, also known as internal forces

  Energy from:
  Radioactive decay
  Primordial heat

  Changes categorised into:
  1. Diastrophism: it is kind of process that move/elevate/build up the process of Earth

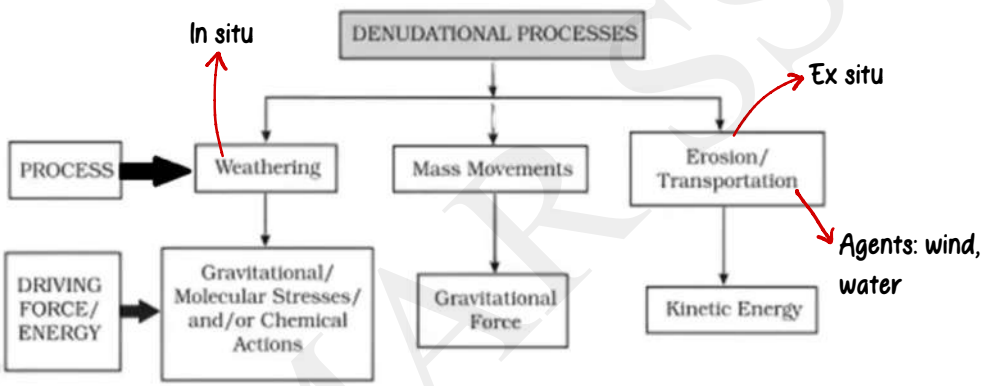
  Endogenic Processes:
  a. Orogenic: process through which mountains are built
  b. Epeirogenic: other changes except mountain build up
  c. Earthquake: shaking of Earth
  d. Plate tectonics

  2. Volcano: openings/vents where lava or magma erupts

- Exogenic Processes: due to Exogenic forces, causes wearing and tearing

- Gradation: wearing down of relief features of Earth

- Collectively Exogenic forces are called Denudation
- Exogenic Agents: running water, wind, waves, ground water
- Ultimately sources of energy for all exogenic forces: Sun




- Weathering: Action of elements of weather and climate over Earth Materials
  It is a in situ process
- Types of weathering:
  1. Chemical weathering: the erosion or disintegration of rocks, building materials, etc. caused by chemical reactions
  2. Physical/Mechanical weathering: disintegration without chemical change
  3. Biological weathering: caused by movement of plants and animals

- Effect of Weathering:
- Exfoliation: process when large, curved plates or slabs of rocks are stripped away from the outer surface of a rock mass

Mass Movement

Fast

Slow

weathering is not a pre-requisite for Mass Movement, it aids the Mass Movement

- Main force involved: Gravity

Types:

- Landslide
- Avalanche
- Earthquake
- Mud flow

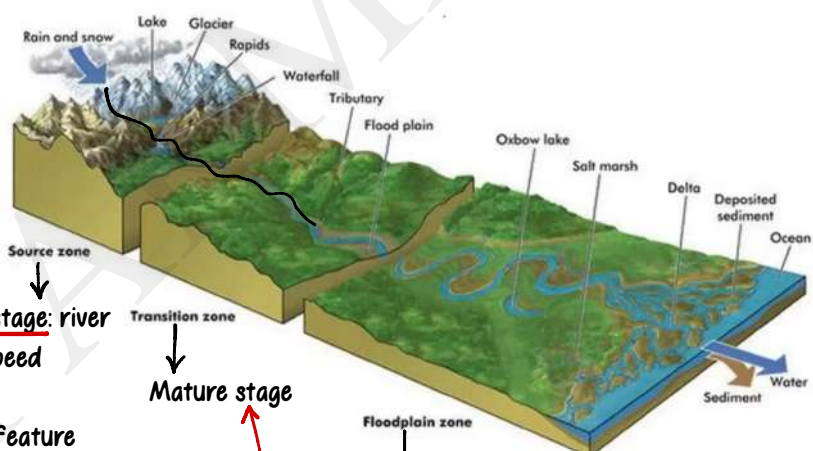
- Creep: slow downslope movement of particles
- Solifluction: slow progressive movement of mass down a slope

- Landforms

Types:

1. Erosional
2. Depositional

- Landforms Created by River




Youthful stage: river flows in speed

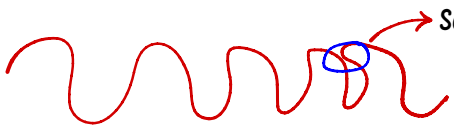
Erosional feature dominates

Mature stage

Old stage

Depositional feature dominates

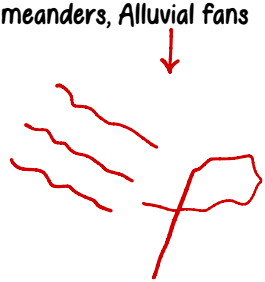
- Youth stage: V-shaped valley, Gorges, Canyon, Waterfalls, Rapids, entrenched meander
- Mature stage: Meanders
- Old: ox-bow lake, delta, levees, flood plain



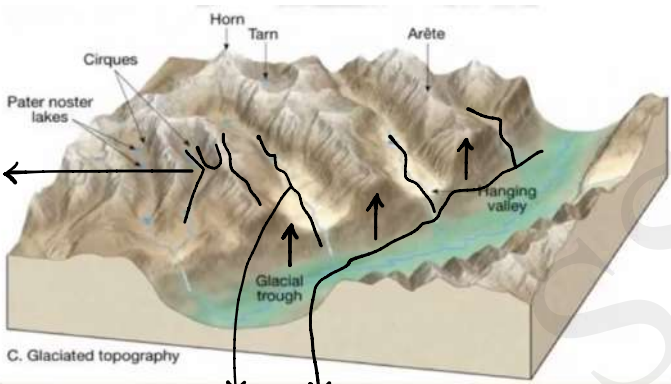

Erosional features:
- V-shaped valley, Gorges, Canyon, Waterfalls, Pothole, Plunge pools, River terraces

Incised Meanders: a meandering river valley that has cut down its bed into the bedrock because of uplift or lowered base level

- Depositional features: flood plains, Delta, ox bow lakes, meanders, Alluvial fans



## Landforms Created by Glacier




Serrated ridges

Valley

Main valley created

**Erosional**

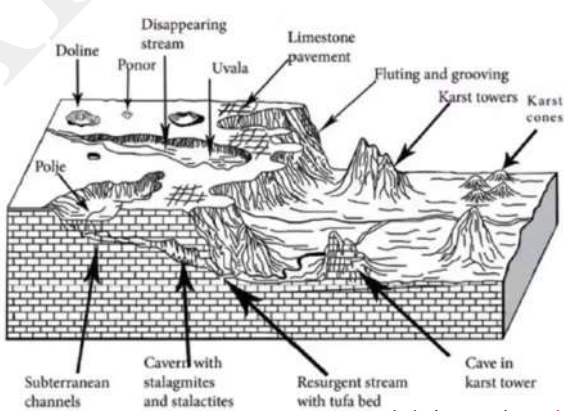
- Cirque: are created in heads of glacial valleys
- Ridges/Arête
- Horn
- Hanging Valley
- Glacial Valley

**Depositional**

- Moraine
- Eskers
- Drumlins
- Outwash plains

- **Landforms Created by Groundwater**: usually seen in places where rock is soft → Dolomite/Limestone → Chemical weathering

Dolines → Uvulas

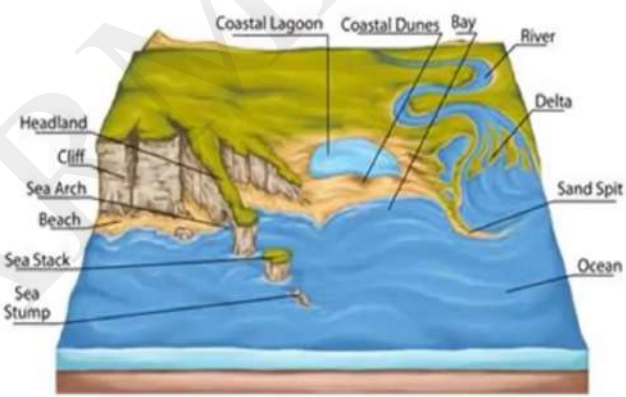



Karst Topography (in groundwater) → Found in Karst region in Mediterranean Sea where rocks are made of Limestone and Dolomite

In India, mainly in South India

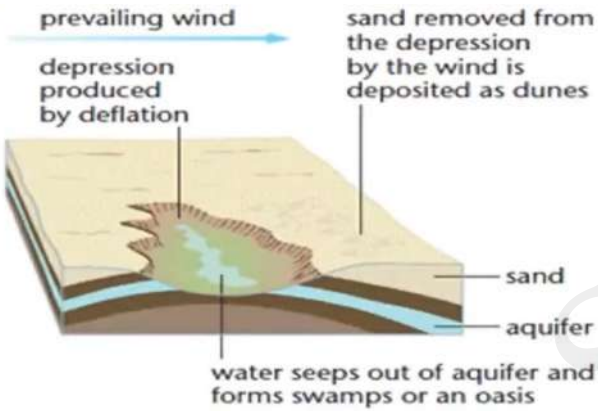
- Erosional: pools, sink holes, dolines, lapies, uvalas, limestones
- Depositional: Stalactite, Pillars, Stalagmite

- Landforms Created by Sea Waves



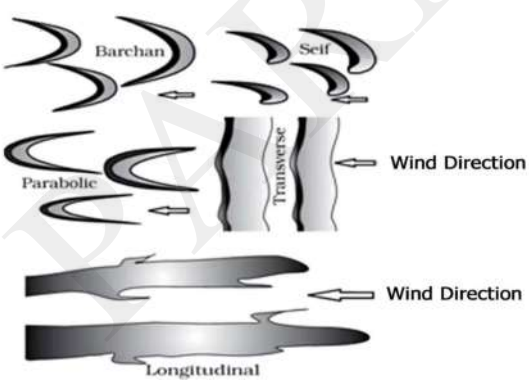

- Erosional: cliff, caves, stack, arch
- Depositional: beaches, dunes, bars, barrier, spits

- Landforms Created by Wind




- Erosional: Pediplain, Playas, Mushroom rock, Pedestal rocks

- Depositional: Sand Dunes
  - Barchan
  - Seif



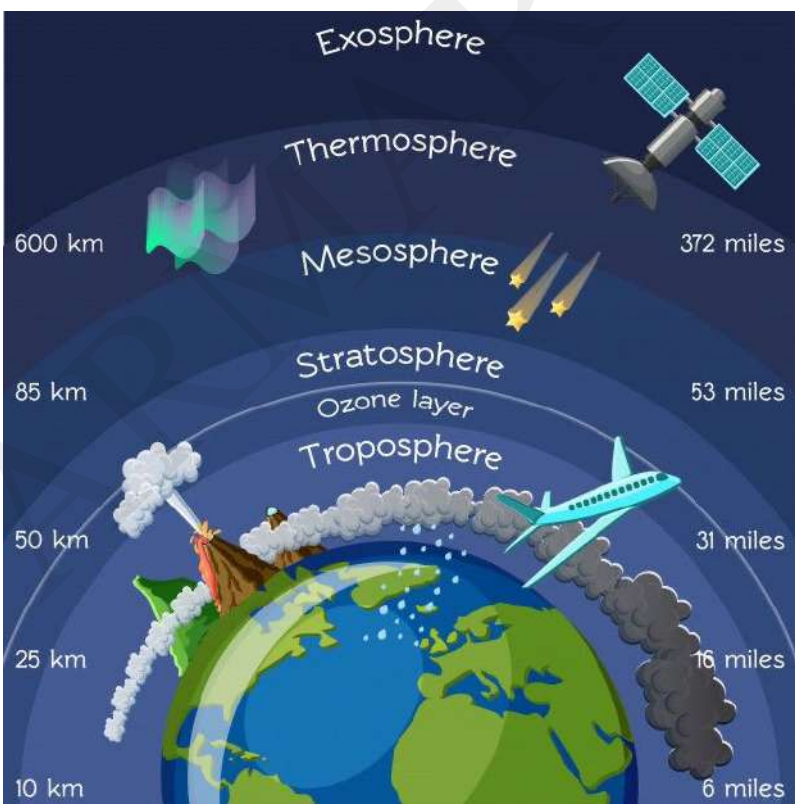

Mushroom Rock

1. Horn: Glacier
2. Lapie: sinkhole, pool, lapies, Dolines → Erosional landform by Groundwater
3. Ox-bow lakes:  River: old stage
4. Stack:  sea waves
5. Stalactite: groundwater

- Drumlins: glaciers
- Alluvial fan: river (youthful to mature stage)
- Barriers/Bar/Spit: sea waves
- Seif/Barchan : wind

- Only river that meanders in youthful stage: Jhelum

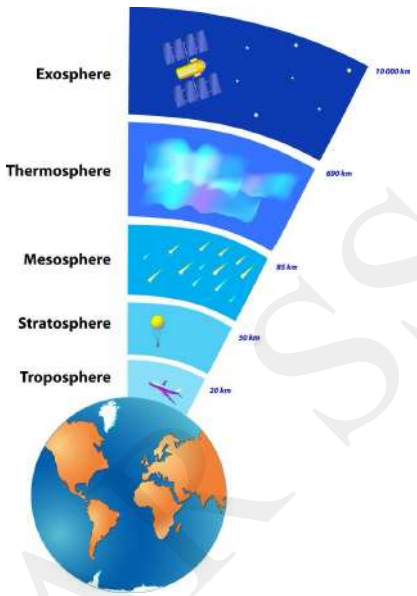
# ATMOSPHERE AND WATER IN THE ATMOSPHERE



- Our atmosphere divided into certain layers

**TRICK to remember layers**

- Thank you: Troposphere
- So: Stratosphere
- Much: Mesosphere
- The: Thermosphere
- Ex: Exosphere




- Our atmosphere is a mixer of gases that surrounds Earth. It is kept in place by the pull of Earth's gravity

Evolution of Atmosphere

Stages:

1. Loss of primordial atmosphere- early atmosphere had more amount of $H_2$, He and due to excessive solar flares it vanished
2. Hot interior of Earth through volcanism
3. Modification by the living world (plants)

## Troposphere

- Weather phenomenon
- Lowest layer of the atmosphere
- Height is variable:

Poles: 8 km
Equator: 18 km
> Average: 13 km

Tropopause: a line that separates Troposphere from Stratosphere

Composition of gases:

- $N_2$: 78%
- $O_2$: 21%
- Ar: 0.9% (second most abundant inert gas)
- $CO_2$: 0.036%
- He

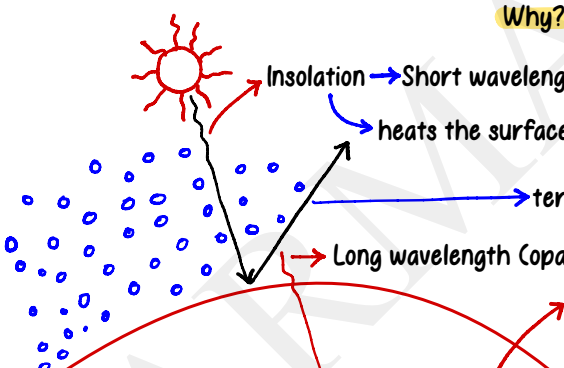
Troposphere generally decreases with altitude

this is called Lapse Rate

165 m 1°C

1 km 6.5°C

Why?



Insolation → Short wavelength (transparent)

heats the surface of Earth

terrestrial radiation → Heats the atmosphere

Long wavelength (opaque)

Greenhouse effect

Green House Gases:

- Water vapour
- $CO_2$
- $CH_4$
- $SO_2$
- $O_3$ → Ozone

- $NO_2$ is not greenhouse gas

- Tropospheric Ozone is bad for our environment

Atmosphere heats up due to:

1. Conduction: layer that's near to Earth will heat through conduction (also vertical)
2. Convection: Vertically transfer of heat after conduction
3. Advection: Horizontal transfer of heat eg: loo is a result of advection

- Insolation

- Aphelion: the point when Earth is very far away from Sun (4th July)- Insolation less
- Perihelion: when Earth is closest to the Sun (3rd Jan)
  → Insolation is more

- Equator: Insolation is less here, due to presence of clouds
- Tropics: Insolation is high here as no good amount of clouds
  ↓
  max. at desert

Factors affecting Insolation:

1. Transparency of atmosphere
2. Length of the day
3. Tilt of the Earth
4. Rotation

- Heat Budget: When Earth's surface maintains its normal temperature, neither cools nor heat up

* Albedo: percentage of light reflected by an object
  - Highest albedo: Ice caps/glaciers

- Temperature inversion: a layer in the atmosphere in which air temperature increases with height
- Conditions favourable:
  1. Long winter night
  2. Still air
  3. Clear cloudless sky

Stratosphere

- Ozone layer is seen here: protects from harmful UV rays → reaction is highly exothermic
- Ozone layer seen b/w 30–35 km
- Temperature increases with altitude/moving upwards
- Jet planes fly in this layer

- Ozone day: 16th Sept → 16 Sept 1987
  - Montreal, Canada → Montreal Protocol
    - Kigali Amendment made to phase out HFCs
    - Phase out CFCs (makes ozone layer thin) → Ozone hole
      - Ozone layer thickness measured by: Dobson unit

- Stratopause: divides stratosphere and mesosphere

## Mesosphere

- Coldest layer atmosphere
- Meteorites end here
- Temperature decrease with altitude

## Thermosphere

- Hottest layer
- Temperature increases with altitude
- Ions are seen here hence known as Ionosphere layer

↓

Reflects radiowaves

- Karman line: boundary b/w the Earth's atmosphere and Exosphere

↓

100 km

- Isotherm: lines connecting the points having same temperature

- Water in the Atmosphere

97.2% → Saline water

2.8% → Fresh water

↓

All out of 2.8%

- Ice caps/glaciers → 2%
- Ground water → 0.68%
- Lakes → 0.4%
- Atmosphere
- Rivers

order of freshwater

As a whole (Freshwater)

- Ice caps/glaciers: 68.7%
- Groundwater: 30.1%

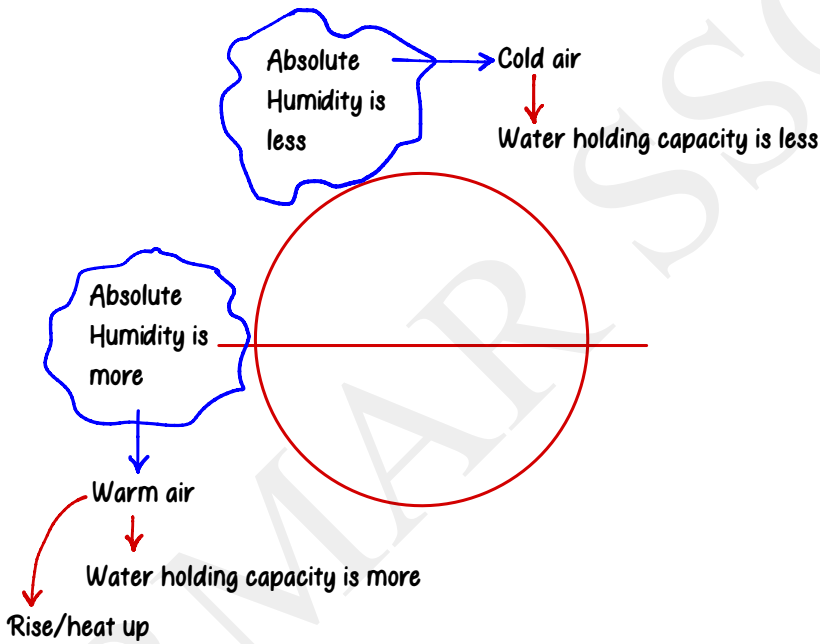
## Water Cycle

Processes:

- Evaporation: water (liquid) → water vapour (gas)
- Condensation: water vapour → water
- Precipitation: rain, snow, hail → any kind of weather condition where something falling from sky

- **Humidity**: water vapour present in atmosphere

- **Types**:
  1. **Absolute Humidity**: actual amount of water vapour present in atmosphere
  2. **Relative Humidity**: % of moisture present in atmosphere compared to its full capacity




- **Dew Point**: temperature at which saturation occurs

- **Condensation**

  **Different forms**:
  - Dew: moisture that forms as a result of condensation
  - Fog } no solid surface needed, water vapour
  - Mist } condenses around hygroscopic particles
  - Frost: deposition of white crystals
  - Clouds

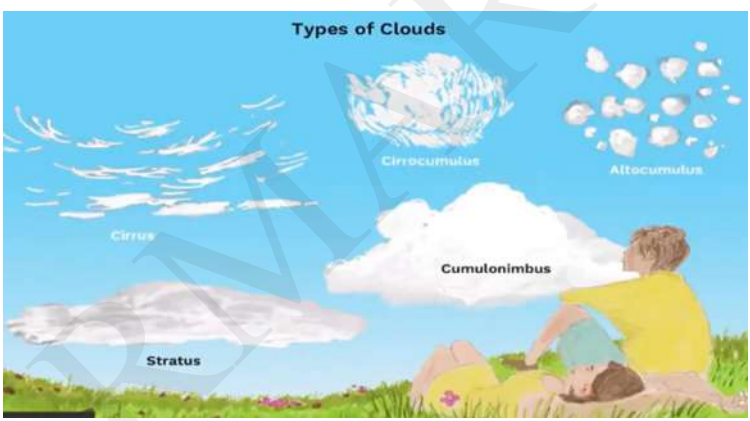
  **Fog**: Big particles
  **Mist**: Small particles

कोहरा
कुहासा

- in winter air cools down due to which dew point reduces: water vapour → water

## Different Types of Clouds

- **Low level clouds**
  - **Nimbus** → rain bearing; black/dark grey coloured; opaque to sunlight
  - **Stratus** → layered clouds
- **High level clouds**
  - **Cumulus** → Flat base, Wool shaped; does not rain; cotton wool; flat base; 4000–7000 m
  - **Cirrus** → High altitude; Feathery appearance; does not cause rain

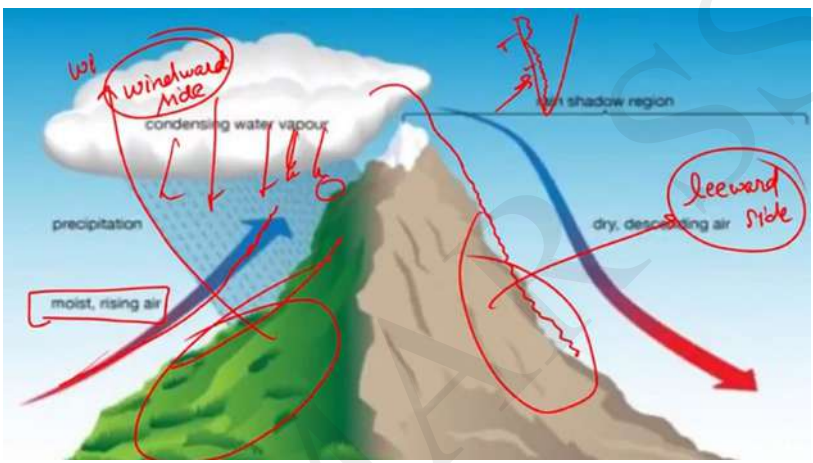



## Types of Rainfall

- Rainfall is a precipitation
  - **Hail** — Size: big
  - **Sleet** — Frozen and refrozen drops; Size: small

3 types of rainfall:

1. **Convectional:** occurs when surface of the Earth is heated up by the Sun
2. **Orographic:** rainfall caused due to mountain
3. **Cyclonic:** due to cyclone




**1.** How much percentage of oxygen is present in the atmosphere?
(SSC CGL 02/12/2022 First Shift)
वायुमंडल में ऑक्सीजन का कितना प्रतिशत मौजूद है?

(a) 39%
(b) 79%
(c) 10%
(d) 21%

**2.** Which layer of atmosphere helps in radio transmission?
(SSC CGL 02/12/2022 Third Shift)
वायुमंडल की कौन सी परत रेडियो प्रसारण में सहायता करती है?

(a) Exosphere
(b) Thermosphere
(c) Mesosphere
(d) Stratosphere

a) बहिर्मंडल
b) बाह्य वायुमंडल
c) मीसोस्फीयर
d) स्ट्रैटोस्फियर

**3.** At what height do the Jet Streams blow in India during winter months? (SSC CPO 11/11/2022 Forth Shift)

सर्दियों के महीनों के दौरान भारत में जेट स्ट्रीम कितनी ऊँचाई पर बहती हैं?

(a) 9-15km
(b) 9-17km
(c) 9-16km
(d) 9-13km

**4.** Which of the following gases shields the surface of earth from ultraviolet (UV) radiation from the sun? (SSC MTS 14/07/2022 Morning Shift)

निम्नलिखित में से कौन सी गैस पृथ्वी की सतह को सूर्य से पराबैंगनी (यूवी) विकिरण से बचाती है?

a) Carbon monoxide
b) Ozone
c) Oxygen
d) Carbon Dioxide

a) कार्बन मोनोआक्साइड
b) ओजोन
c) ऑक्सीजन
d) कार्बन डाईऑक्साइड

**5.** Which two gases are having the highest percentage of the earth's atmosphere?. (SSC CHSL 06/06/2022 Afternoon)

पृथ्वी के वायुमंडल में सर्वाधिक प्रतिशतता किन दो गैसों की है?

(a) Nitrogen and hydrogen
(b) Nitrogen and Oxygen
(c) Oxygen and Carbon Monoxide
(d) Carbon dioxide and nitrogen

Poisonous gas

a) नाइट्रोजन और हाइड्रोजन
b) नाइट्रोजन और ऑक्सीजन
c) ऑक्सीजन और कार्बन मोनोऑक्साइड
d) कार्बन डाइऑक्साइड और नाइट्रोजन

**6.** The ____ lies above the mesosphere and is a region in which temperature increases with height. (SSC CGL 20/04/2022 Afternoon)

____ मध्यमंडल के ऊपर स्थित है और यह एक ऐसा क्षेत्र है जिसमें ऊंचाई के साथ तापमान बढ़ता है।

(a) Stratosphere
(b) Exosphere
(c) Thermosphere
(d) Troposphere

a) स्ट्रैटोस्फियर
b) बहिर्मंडल
c) बाह्य वायुमंडल
d) क्षोभ मंडल

**7.** What is the approximate percentage contribution of argon in Earth's atmosphere? (SSC MTS 14/10/2021 Morning Shift)

पृथ्वी के वायुमंडल में आर्गन का लगभग प्रतिशत योगदान कितना है?

(a) 1%
(b) 2%
(c) 3%
(d) 4%

**8.** Which layer of atmosphere can experience the burning up of meteorites? (SSC MTS 27/10/2021 Evening)

वायुमंडल की कौन सी परत उल्कापिंडों के जलने का अनुभव कर सकती है?

(a) Mesosphere
(b) Exosphere
(c) Thermosphere
(d) stratosphere

a) मीसोस्फीयर
b) बहिर्मंडल
c) बाह्य वायुमंडल
d) समताप मंडल

**9.** Which of the following is NOT a greenhouse gas?. (SSC CGL 17/08/2021 Morning)

निम्नलिखित में से कौन सी ग्रीनहाउस गैस नहीं है?

(a) Helium
(b) Water vapour
(c) Surface-level ozone
(d) Nitrous oxide

a) हीलियम
b) जल वाष्प
c) सतह-स्तर-ओजोन
d) नाइट्रस ऑक्साइड

**10.** ___ is a naturally occurring phenomenon that is responsible for the heating of the Earth's surface and atmosphere. (SSC CPO 25/11/2020 Evening)

___ एक प्राकृतिक रूप से घटित होने वाली घटना है जो पृथ्वी की सतह और वायुमंडल के गर्म होने के लिए जिम्मेदार है

(a) Radiation
(b) Global warming
(c) Green house effect
(d) Global heating

a) विकिरण
b) ग्लोबल वार्मिंग
c) ग्रीनहाउस प्रभाव
d) वैश्विक तापन

**11.** The _____ layer is the upper limit of our atmosphere. It extends from the top of the atmosphere up to 10,000km (6200miles). (SSC CHSL 14/10/2020 Morning)

_____ परत हमारे वायुमंडल की ऊपरी सीमा है। यह वायुमंडल के शीर्ष से 10,000 किमी (6200 मील) तक फैला हुआ है।

(a) Ionosphere
(b) Exosphere
(c) Troposphere
(d) Mesosphere

a) योण क्षेत्र
b) बहिर्मंडल
c) क्षोभ मंडल
d) मीसोस्फीयर

**12.** Which is the second most abundant gas in Earth's atmosphere? (SSC CHSL 16/10/2020 Morning Shift)

पृथ्वी के वायुमंडल में दूसरी सबसे प्रचुर गैस कौन सी है?

(a) Oxygen
(b) Nitrogen
(c) Hydrogen
(d) Carbon monoxide

a) ऑक्सीजन
b) नाइट्रोजन
c) हाइड्रोजन
d) कार्बन मोनोआक्साइड

**13.** Which environmental phenomenon has been linked to synthetic chemicals like chlorofluorocarbons (CFC's)? (SSC CHSL 19/10/2020 Afternoon)

क्लोरोफ्लोरोकार्बन (सीएफसी) जैसे सिंथेटिक रसायनों से कौन सी पर्यावरणीय घटना जुड़ी हुई है?

(a) Electromagnetic interference
(b) Tidal Flow
(c) Ozone depletion
(d) Wave propagation

a) विद्युतचुबकीय व्यवधान
b) ज्वारीय प्रवाह
c) ओज़ोन रिक्तीकरण
d) लहर प्रसार

**14.** Above which layer of the atmosphere does the exosphere lie? (SSC CHSL 19/10/2020 Afternoon)

बाह्यमंडल वायुमंडल की किस परत के ऊपर स्थित है?

(a) Stratosphere
(b) Thermosphere
(c) Mesosphere
(d) Troposphere

a) स्ट्रैटोस्फियर
b) बाह्य वायुमंडल
c) मीसोस्फीयर
d) क्षोभ मंडल

**15.** Which of the following is the lowermost layer of the atmosphere? (SSC CGL 09/03/2020 Afternoon)

निम्नलिखित में से कौन सा वायुमंडल की सबसे निचली परत है?

(a) Troposphere
(b) Thermosphere
(c) Exosphere
(d) Mesosphere

a) क्षोभ मंडल
b) बाह्य वायुमंडल
c) बहिर्मंडल
d) मीसोस्फीयर

**16.** Which of the following statements about the ionosphere is NOT correct? (SSC CPO 12/12/2019 Evening)

आयनमंडल के बारे में निम्नलिखित में से कौन सा कथन सही नहीं है?

(a) Radio wave transmitted from the earth are reflected back to the earth by this layer
(b) It contains charged particles
(c) It is ionized by solar and cosmic radiation
(d) It is located immediately above the stratopause.

a) पृथ्वी से प्रसारित रेडियो तरंगें इसी परत द्वारा वापस पृथ्वी पर परावर्तित होती हैं

**17.** A natural process of mechanical disintegration and or chemical decomposition of rocks of the crust of the Earth by certain physical and chemical agencies of the atmosphere is known as ? (SSC CGL 27/01/2023 First Shift)

वायुमंडल की कुछ भौतिक और रासायनिक एजेंसियों द्वारा पृथ्वी की परत की चट्टानों के यांत्रिक विघटन और या रासायनिक अपघटन की एक प्राकृतिक प्रक्रिया को क्या कहा जाता है?

(a) New rock formation
(b) Weathering
(c) Solidification of rock
(d) Watering of rock

a) न्याऊ चट्टान का निर्माण
b) अपक्षय
c) चट्टान का जमना
d) चट्टान को पानी देना

**41.** Nephology is the science of

नेफोलॉजी का विज्ञान है

(a) Wind
(b) Clouds
(c) Rain
(d) weather

a) हवा
b) बादलों
c) बारिश
d) मौसम

**42.** Clouds are formed by :

बादलों का निर्माण होता है

(a) Condensation of water vapour in the atmosphere
(b) evaporation of water from the oceans
(c) Rising currents of the air
(d) Descending currents of the air

**43.** Which cycle shows the movement of water?
(SSC CHSL 02/06/2022 Afternoon)
कौन सा चक्र जल की गति को दर्शाता है?

(a) Carbon Cycle
(b) Nitrogen Cycle
(c) Geological Cycle
(d) Hydrological Cycle

a) कार्बन चक्र
b) नाइट्रोजन चक्र
c) भूवैज्ञानिक चक्र
d) जल विज्ञान चक्र

**44.** Clouds are basically made up of_____.
बादल मूल रूप से _____ से बने होते हैं।

(a) Droplets of water
(b) Dust
(c) Light
(d) White Colour

a) पानी की बूंदें
b) धूल
c) रोशनी
d) सफेद रंग

**45.** Humidity is measured by an instrument called
आर्द्रता किस उपकरण से मापी जाती है?

(a) Hygrometer
(b) Rain Gauge
(c) Nanometer
(d) Lactometer

a) आर्द्रतामापी
b) वर्षा नापने का यंत्र
c) नैनोमीटर
d) लाक्टोमिटेर

**46.** Which rainfall is caused by the lifting of an air mass because of the pressure difference?
दाब अंतर के कारण वायुराशि के ऊपर उठने से कौन सी वर्षा होती है?

(a) Orographic Rainfall
(b) Convectional Rainfall
(c) Cyclonic Rainfall
(d) All of the above

a) ओरोग्राफिक वर्षा
b) संवहनीय वर्षा
c) चक्रवाती वर्षा
d) ऊपर के सभी

**47.** Which of the following are rain bearing cloud?
निम्नलिखित में से कौन वर्षा लाने वाले बादल हैं?

(a) Cumulus
(b) Alto
(c) Nimbus
(d) Stratus

a) क्यूम्यलस
b) अल्टो
c) चमक
d) फैला हुआ बादल

**48.** Which clouds are indicator of near future weather changes and are Often called Mares' tails?
कौन से बादल निकट भविष्य में मौसम परिवर्तन का सूचक होते हैं और जिन्हें अक्सर मारे टेल कहा जाता है?

(a) Cirrus Clouds
(b) Cirrocumulus Clouds
(c) Cirrostratus Clouds
(d) None of the above

a) सिरस बादल
b) सिरोक्यूम्यलस बादल
c) सिरोस्ट्रेटस बादल
d) इनमें से कोई भी नहीं

**49.** Which clouds is also known as thunderstrom clouds?
किस बादल को थंडरस्ट्रॉम बादल के नाम से भी जाना जाता है?

(a) Cirrus Clouds
(b) Cumulus Clouds
(c) Cumulonimbus Clouds
(d) Cirrostratus Clouds

a) सिरस बादल
b) बहुत सारे बादल
c) क्यूम्यलोनिम्बस बादल
d) सिरोस्ट्रेटस बादल

**50.** The conversion of gaseous form of water into liquid form is known as?
जल के गैसीय रूप का द्रव रूप में परिवर्तन को क्या कहा जाता है?

(a) Condensation
(b) Solidification
(c) Evaporation
(d) Deposition

a) वाष्पीकरण
b) जमाना
c) वाष्पीकरण
d) निक्षेप

**51.** Precipitation take place in the form of?
वर्षा किस रूप में होती है?

(a) Solid
(b) Liquid
(c) Solid and also in liquid
(d) None of the above

a) ठोस
b) तरल
c) ठोस भी और तरल भी
d) इनमे से कोई भी नहीं

**52.** Moisture is deposited in the form of water droplets on cooler surfaces of solid objects is known as?
नमी पानी के रूप में जमा होती है
ठोस वस्तुओं की ठंडी सतहों पर बूंदों को क्या कहा जाता है?

(a) Frost
(b) Dew
(c) Smog
(d) Fog

a) ठंढ
b) ओस
c) धुंध
d) कोहरा

Hygroscopic particle released from vehicles as pollution particles

Visibility is low

**53.** Which refers to the amount of water vapour present in the air?
जो जलवाष्प की मात्रा को दर्शाता है
हवा में मौजूद?

(a) Smog
(b) Humidity
(c) Fog
(d) Frost

a) धुंध
b) नमी
c) कोहरा
d) ठंड

**54.** The two ingredients needed to form clouds aloft are
ऊपर बादलों को बनाने के लिए आवश्यक दो सामग्रिया हैं

(a) Instability and lifting
(b) Lifting and saturated air
(c) Wind shear and lifting
(d) Air with high dewpoint and instability

a) अस्थिरता और उठाव
b) उठाने और संतृप्त हवा
c) पवन कतरनी और उठाना
d) उच्च ओसांक और अस्थिरता वाली वायु

**55.** A visibility of less than 1 km is the internationally recognized definition of?
अंतरराष्ट्रीय स्तर पर दृश्यता 1 किमी से भी कम है की मान्यता प्राप्त परिभाषा?

(a) Haze
(b) Fog
(c) Frost
(d) Smog

a) धुंध
b) कोहरा
c) ठंढ
d) धुंध

**56.** Clouds burst is associated with?

बादल फटना किससे सम्बंधित है?

(a) Altostratus
(b) Cumulonimbus
(c) Cirrocumulus
(d) None of these

a) आल्टोस्ट्रेटस
b) क्यूम्यलोनिम्बस
c) पक्षोभ कपासी बादल
d) इनमें से कोई नहीं

**57.** Where is Orographic rainfall found in India?

भारत में पर्वतीय वर्षा कहाँ पाई जाती है?

(a) Eastern ghats
(b) Western ghats
(c) Malwa Plateau
(d) Northern eastern States

a) पूर्वी घाट
b) पश्चिमी घाट
c) मालवा पलटुआ
d) उत्तरी पूर्वी राज्य

**58.** The Cirrus and Cumulus are types of _____.
(SSC CHSL 19/10/2020 Morning)

सिरस और क्यूम्यलस _____ के प्रकार हैं।

(a) Mountains
(b) Waves
(c) Clouds
(d) Soil

a) पहाड़ों
b) लहर की
c) बादलों
d) मिट्टी

**60.** The capacity of an air of certain volume at certain temperature to retain maximum amount of moisture content is known as

किसी निश्चित तापमान पर निश्चित आयतन वाली वायु की अधिकतम मात्रा में नमी बनाए रखने की क्षमता को क्या कहा जाता है?

(a) Relative humidity
(b) Specific humidity
(c) Absolute humidity
(d) Humidity capacity

a) सापेक्षिक आर्द्रता
b) विशिष्ट आर्द्रता
c) पूर्ण आर्द्रता
d) आर्द्रता क्षमता

**61.** Which term is used to express the ratio of weight of water vapour to the total weight of moist air ?

जलवाष्प के भार और नम वायु के कुल भार के अनुपात को व्यक्त करने के लिए किस शब्द का प्रयोग किया जाता है?

(a) Relative humidity
(b) Absolute humidity
(c) Specific humidity
(d) None of the above

a) सापेक्षिक आर्द्रता
b) पूर्ण आर्द्रता
c) विशिष्ट आर्द्रता
d) इनमें से कोई भी नही

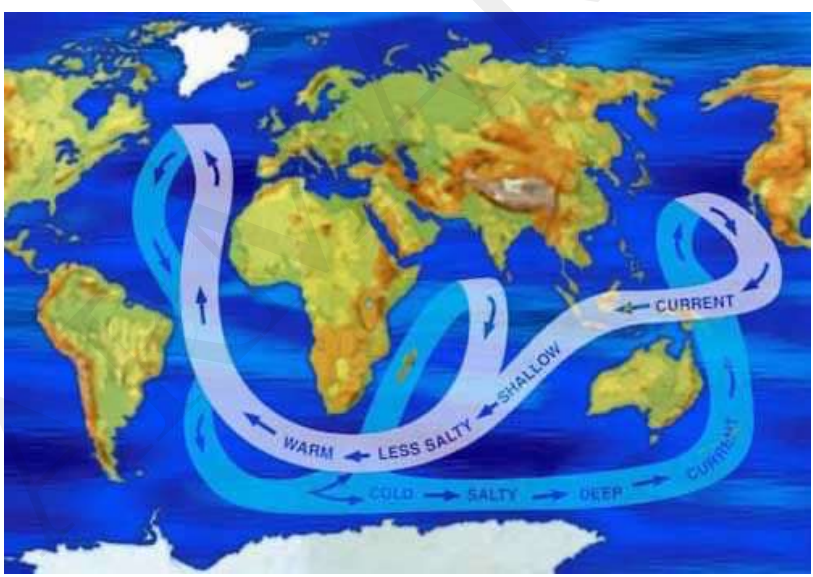
**64.** Mawsynram in the southern ranges of the ____receives the highest average rainfall in the world? (SSC CGL 17/07/2023 Third Shift)

की दक्षिणी श्रृंखला में मासिनराम में दुनिया में सबसे अधिक औसत वर्षा होती है?

(a) Aravali
(b) Shivalik
(c) Nilgiri
(d) Khasi Hills

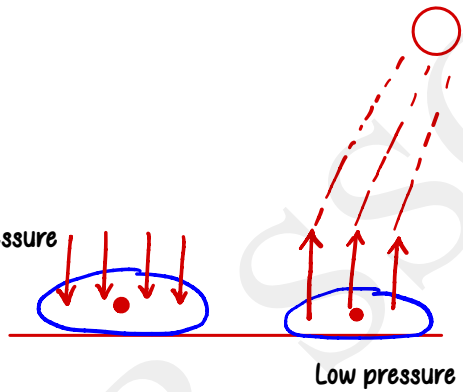
a) अरावली
b) शिवालिक
c) नीलगिरि
d) खासी पहाड़ियाँ

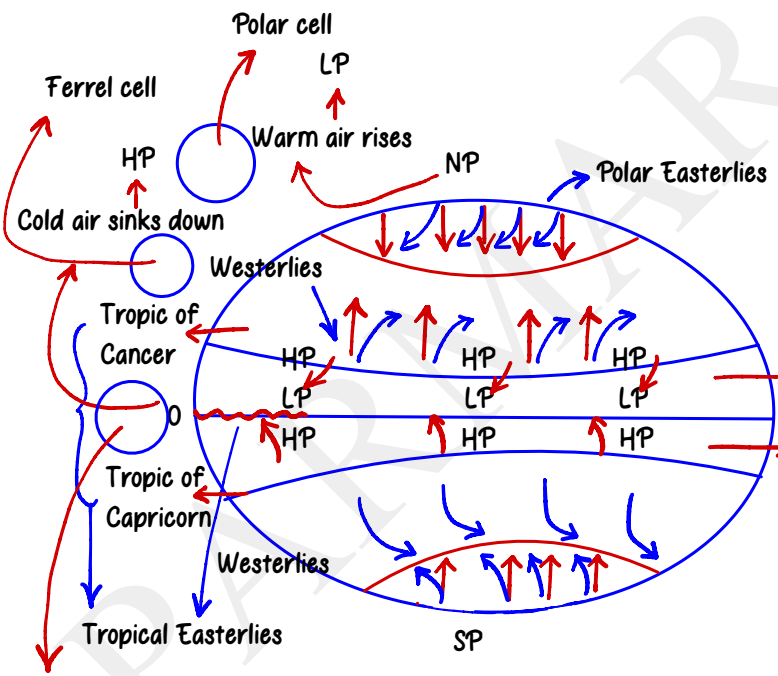
# WINDS, CLIMATE, OCEAN CURRENTS



- Pressure difference causes wind because
  Warm air → Rises → Low pressure
  Cold air → Sink → High pressure

- Wind: High pressure → Low pressure




- Forces: Coriolis Force
  - Due to rotation
    - NH → Right
    - SH → Left

North East Easterlies

South East Easterlies

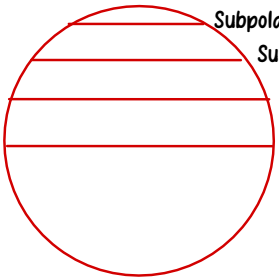
- Wind name: Due to direction of origin

Meeting point of these two zones is known as ITCZ Zone (Inter Tropical Convergence Zone) (NE + SE)

Shifts upward to Tropic of Cancer in summer and shifts to Tropic of Capricorn during winter

Doldrum Zone is seen here

Here:
- Coriolis force is zero
- Winds relatively calm




Trade winds: Permanent winds

- Easterlies (East direction)
  - Tropical
  - Polar
- Westerlies (West direction)

- Horse latitude: seen in 30°N/30°S

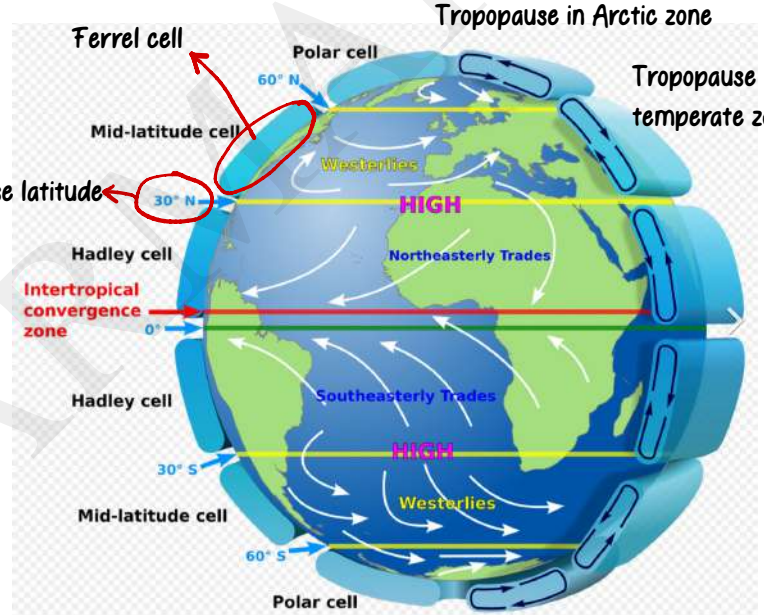
Coriolis force → Max at poles

Zero at equator

when at higher latitude, wind rotates a lot and blows parallel to isobar

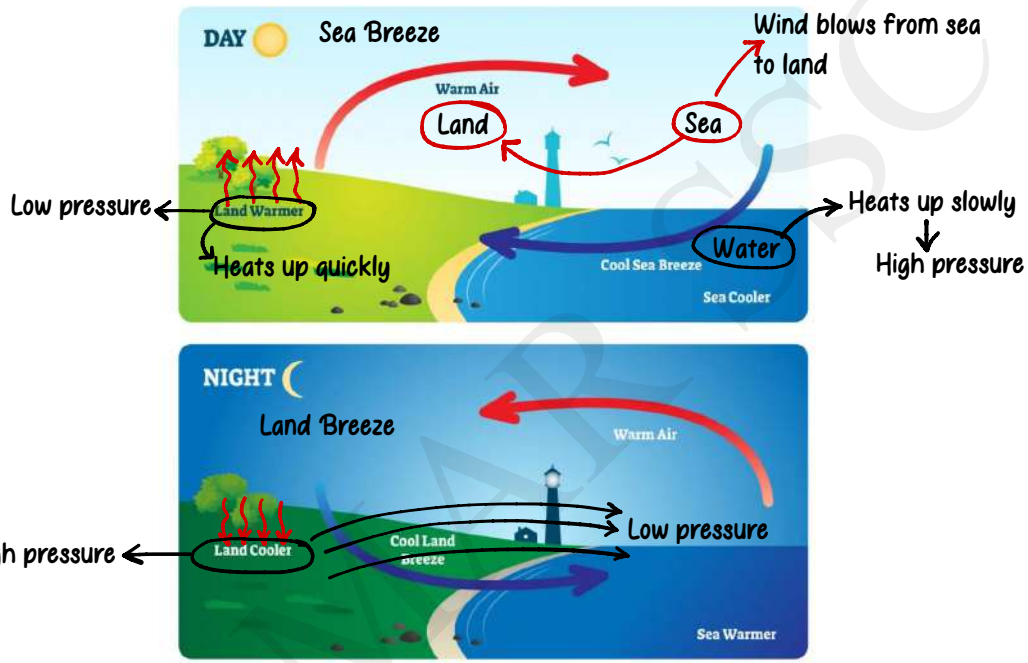
Tropopause in Arctic zone

Tropopause in temperate zone



- **Geostrophic winds**: winds that blow parallel to isobars
- **Isobars**: line connecting the points having same pressure

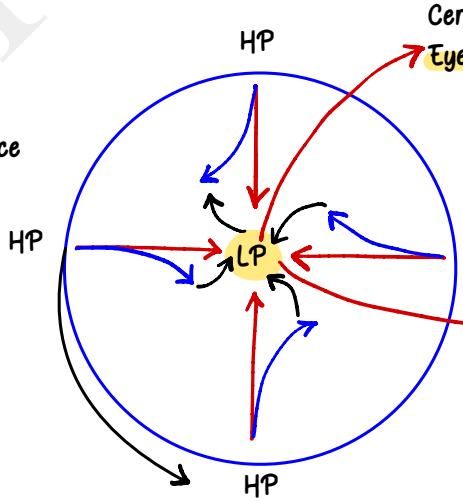
# LAND VS SEA BREEZE




- Land: heats up and cools down quickly
- Water: heats up and cool down slowly

## Cyclones

- At Equator, the Coriolis force is zero → No cyclone




Centre where wind meet is called Eye of Cyclone

- In NH, the wind will rotate anticlockwise

no clouds, calm area, no rainfall

Conditions favourable:

1. Large Sea Surface temperature
2. Coriolis force
3. Small variation in vertical wind speed
4. Pre-existing weak LP area

- During cyclone, Cumulonimbus clouds are formed → Causes heavy rain and thunderstorms

Cyclone at High Latitudes are caused due to Frontogenesis

↓

Fronts

↓

Two different air masses are formed/meet

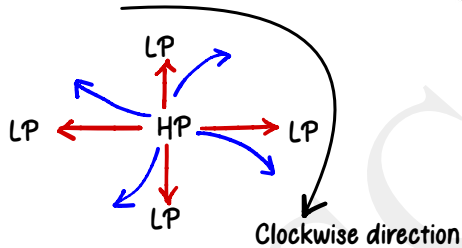
↓

Causes Extratropical/Temperate Cyclone

- Difference in Tropical and Temperate cyclone

| Tropical | Temperate |
|---|---|
| • Only in Sea | • In land/sea |
| • More destructible | • Less destructible |
| • Not frequent | • More frequent |
| • Flows East to West | • Flows from West to East |

Anticyclone: forms around high pressure




| | Cyclone | Anticlockwise |
|---|---|---|
| NH → | Anticlockwise | Clockwise |
| SH → | Clockwise | Anticlockwise |

Different names of cyclones:

1. Atlantic Ocean: Hurricane
2. Australia: Willy-Willy
3. Western Pacific/South China Sea: Typhoon
4. Indian Ocean: Cyclone

Koeppen Climatic Classification

- Weather: short term
- Climate: long term → Roughly 30 years data is taken

- Mediterranean Sea: Cs

Koeppen in 1918 → Empirical Climatic Classification

- Used capital and small letters
- Climatic groups represented with different codes

A B C D E

5 major climatic groups

On precipitation basis

Steppe

S

W

Desert

## Koeppen's Classification

A: Tropical

B: Dry Climate

C: Warm Temperate

D: Cold Snow Forest

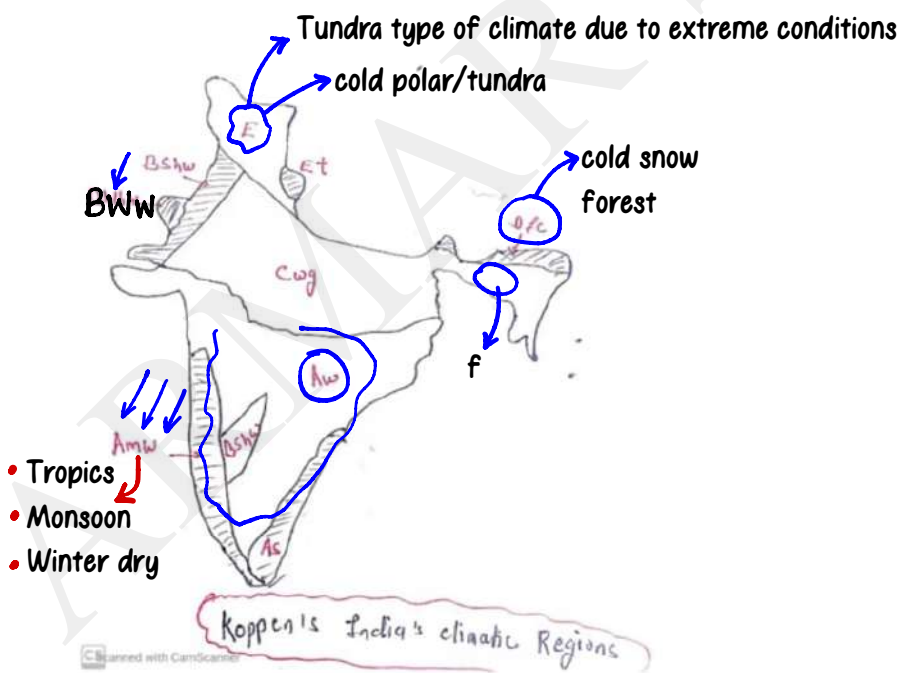
E: Polar type (cold)

w: winter dry

s: summer dry

m: monsoon

f: full baarish



## Ocean Currents


TRICK

B → Benguela
P → Peru
company
G → Greenland
O → Oyashio
L → Labrador
F → Falkland
W → West Australian Drift
C → Canary
California → California

Cold Ocean Current

### Reasons of origination:

1. Heating by Sun
2. Wind
3. Density different
4. Coriolis force
5. Coastline of continents

- **Cold air**: water holding capacity **less**
- **Warm air**: water holding capacity **high**

**Types of Ocean Currents**

- **Surface**: 10%
- **Deep Sea**: 90%

Effects:

1. Warm ocean current + cold ocean current → Best fishing zones

↓

Creates foggy conditions: worst for Harbouring

2. Cold ocean current: creates desert

↓

Max. desert seen on Western side of the continent


- Grasslands: areas where there is not much precipitation (Rainfall)

**1.** In early 1900's, which German Climatologist divided the world's climate into different category based on temperature, amount of rainfall and the time of year when rainfall occurs ?
(SSC CHSL 07/06/2022 Afternoon)
1900 के दशक की शुरुआत में, किस जर्मन जलवायु विज्ञानी ने विश्व की जलवायु को तापमान, वर्षा की मात्रा और वर्ष के उस समय जब वर्षा होती है, के आधार पर विभिन्न श्रेणियों में विभाजित किया था?

(a) Michael Wille — a) माइकल विले
(b) Wladimir Koppen — b) व्लादिमीर कोपेन
(c) Rudolf Geiger — c) रुडोल्फ गीगर
(d) Alfred Wegener — d) अल्फ्रेड वेगेनर

## Topic - 7
## Climate (जलवायु)

CGL CHSL MTS Steno

**2.** _____ is concerned with constructing records of past climates and climatic events by analysis of tree growth characteristics, especially growth rings? (SSC CGL 12/04/2022 Afternoon Shift)
_____ वृक्ष विकास विशेषताओं, विशेष रूप से विकास वलय के विश्लेषण द्वारा पिछली जलवायु और जलवायु घटनाओं के रिकॉर्ड बनाने से संबंधित है

(a) Bioclimatology — a) जैवजलवायुविज्ञान
(b) Historical – Climatology — b) ऐतिहासिक - जलवायु विज्ञान
(c) Geo Climatology — c) भू जलवायु विज्ञान
(d) Dendroclimatology — d) डेंड्रोक्लाइमेटोलॉजी

Topic - 7
Climate (जलवायु)
CGL CHSL MTS Steno

**3.** The climate of India is described as which of the following types?
(SSC MTS 26/07/2022 Morning)
भारत की जलवायु को निम्नलिखित में से किस प्रकार के रूप में वर्णित किया गया है?

(a) Mediterranean — a) आभ्यंतरिक
(b) Temperate — b) शीतोष्ण
(c) Monsoon — c) मानसून
(d) Polar — d) ध्रुवीय

**5.** The minimum period of time taken up to which the weather variations are considered to predict the climate of a place is ____ years? (SSC CGL 03/12/2022 Third Shift)

किसी स्थान की जलवायु की भविष्यवाणी करने के लिए मौसम की विविधताओं पर विचार करने में लगने वाली न्यूनतम अवधि ___ वर्ष है?

(a) 20
(b) 25
(c) 10
(d) 30

Topic - 7

## Climate (जलवायु)

CGL CHSL MTS Steno

**6.** Which of the following is local wind? (SSC CGL 05/12/2022 Third Shift)

निम्नलिखित में से कौन सी स्थानीय पवन है?

(a) Loo
(b) Westerlies
(c) Monsoon
(d) Easterlies

a) अस्तर
b) पच्छमी हवा
c) मानसून
d) ईस्टरलीज़

Topic - 7

## Climate (जलवायु)

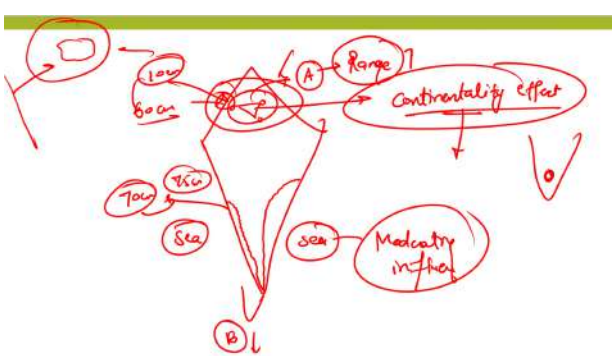
CGL CHSL MTS Steno

**7.** Low annual range of temperature and high annual rainfall are characteristics of a_____? (SSC CGL 07/12/2022 Third Shift)

तापमान की कम वार्षिक सीमा और उच्च वार्षिक वर्षा एक_____ की विशेषताएँ हैं?

(a) Mediterranean Climate
(b) Temperate climate
(c) Tropical Humid Climate
(d) Cold Climate

a) भूमध्य जलवायु
b) समशीतोष्ण जलवायु
c) उष्णकटिबंधीय आर्द्र जलवायु
d) ठंडी जलवायु



**8.** Which of the following climate type found under the cold climates?
(SSC CGL 08/12/2022 Fourth Shift)

निम्नलिखित में से कौन सा जलवायु प्रकार ठंडी जलवायु के अंतर्गत पाया जाता है

(a) Humid subtropical
(b) Highland
(c) Humid Continental
(d) Tundra

a) नम सबट्रॉपिकल
b) अधित्यका
c) महाद्वीपीय नमी
d) टुंड्रा

Taiga

## Topic - 7
## Climate (जलवायु)

CGL CHSL MTS Steno

**9.** Polar easterlies are which kind of winds?
(SSC CGL 09/12/2022 Third Shift)

ध्रुवीय पूर्वी हवाएँ किस प्रकार की हवाएँ हैं?

a) Seasonal winds
b) Permanent winds
c) Sea storm
d) Local winds

a) मौसमी हवाएँ
b) स्थायी हवाएँ
c) समुद्री तूफान
d) स्थानीय हवाएँ

## Topic - 7
## Climate (जलवायु)

CGL CHSL MTS Steno

**10.** Which of the following codes signify the Cold Climate with Dry Winters according to Koeppen ? (SSC CPO 09/11/2022 Morning)

कोप्पेन के अनुसार निम्नलिखित में से कौन सा कोड शुष्क सर्दियों के साथ ठंडी जलवायु को दर्शाता है?

(a) Ef
(b) Df
(c) ET
(d) Dw

a) एफई
b) डी.एफ
c) एट
d) डव

**11.** Which group of the Koppen climate classification system represented by letter code Aw sometimes called the "savannah" Climate, is located just outside the ITZC near the equator ?
(SSC CPO 09/11/2022 Evening)

कोपेन जलवायु वर्गीकरण प्रणाली का कौन सा समूह अक्षर कोड Aw द्वारा दर्शाया जाता है, जिसे कभी-कभी "सवाना" जलवायु भी कहा जाता है, भूमध्य रेखा के पास ITCZ के ठीक बाहर स्थित है?

(a) Mediterranean Climate
(b) Marine West coast climate
(c) Tropical wet and dry climate
(d) Humid subtropical climates

a) भूमध्य जलवायु
b) समुद्री पश्चिमी तट की जलवायु
c) उष्णकटिबंधीय आर्द्र एवं शुष्क जलवायु
d) आर्द्र उपोष्णकटिबंधीय जलवायु

Topic - 7

## Climate (जलवायु)

CGL CHSL MTS Steno

**12.** Which of the following is a temperate marine climate with substantial rainfall in all seasons? (SSC CPO 10/11/2022 Morning)

निम्नलिखित में से कौन सी समशीतोष्ण समुद्री जलवायु है जिसमें सभी मौसमों में पर्याप्त वर्षा होती है?

(a) Am
(b) Bsh
(c) BSk
(d) Cfb

a) पूर्वाहन
b) बीएसएच
c) बी.एस.के
d) सीएफबी

Topic - 7

## Climate (जलवायु)

CGL CHSL MTS Steno

**13.** Which of the following pairs of type of climate – area is NOT correct?
I. Semi-arid steppe climate – Punjab
II. Monsoon with dry summer – Corromandel coast of Tamil Nadu
(SSC CPO 10/11/2022 Evening)

जलवायु-क्षेत्र के प्रकार का निम्नलिखित में से कौन-सा युग्म सही नहीं है?
I. अर्ध-शुष्क मैदानी जलवायु - पंजाब
II. शुष्क गर्मी के साथ मानसून - तमिलनाडु का कोरोमंडल तट

(a) Only I
(b) Neither I nor II
(c) Only II
(d) Both I and II

a) केवल मैं
b) न तो मैं और न ही द्वितीय
c) केवल द्वितीय
d) I और II दोनों

**14.** The cold snow forest climate is found largely in the continental region in the Northern Hemisphere between ____ northern latitudes in Europe, Asia and North America?
(SSC CPO 11/11/2022 Morning)

ठंडी बर्फीली वन जलवायु बड़े पैमाने पर यूरोप, एशिया और उत्तरी अमेरिका में ____ उत्तरी अक्षांशों के बीच उत्तरी गोलार्ध में महाद्वीपीय क्षेत्र में पाई जाती है?

(a) 40° - 70°
(b) 30° - 50°
(c) 80° - 110°
(d) 15° - 20°

Topic - 7

## Climate (जलवायु)

CGL CHSL MTS Steno

**15.** Which of the following regions have long, cold winters with high winds and average temperatures below freezing for six to ten months of the year? (SSC CPO 11/11/2022 Evening)

निम्नलिखित में से किस क्षेत्र में तेज़ हवाओं के साथ लंबी, ठंडी सर्दियाँ होती हैं और वर्ष के छह से दस महीनों तक औसत तापमान शून्य से नीचे रहता है?

(a) Mediterranean Region
(b) Southern Australian Region
(c) Tundra Region
(d) Tropical Region

a) मेडिटरेनियन क्षेत्र
b) दक्षिणी ऑस्ट्रेलियाई क्षेत्र
c) टुंड्रा क्षेत्र
d) उष्णकटिबंधीय क्षेत्र

**16.** The minimum temperature of the day occur generally _____.
(SSC MTS 07/07/2022 Evening)
दिन का न्यूनतम तापमान सामान्यतः _____ होता है।

(a) In the evening
(b) At night
(c) In the afternoon
(d) In the early morning

a) शाम के समय
b) रात में
c) दोपहर को
d) सुबह में

**17.** According to Koeppan's Scheme, which type of climate is denoted by 'Cwg' in India. (SSC CGL 18/07/2023 Second Shift)
कोप्पन की योजना के अनुसार, भारत में 'Cwg' द्वारा किस प्रकार की जलवायु को दर्शाया जाता है?

(a) Semi-arid steppe climate
(b) Monsoon with dry summer
(c) Polar Type
(d) Monsoon with dryer winter

a) अर्धशुष्क मैदानी जलवायु
b) शुष्क गर्मी के साथ मानसून
c) ध्रुवीय प्रकार
d) शुष्क शीत ऋतु के साथ मानसून

Topic - 7
## Climate (जलवायु)
CGL CHSL MTS Steno

**18.** In how many agro-climatic zones has Tamil Nadu been Classified?
(SSC CGL 25/07/2023 Third Shift)
तमिलनाडु को कितने कृषि-जलवायु क्षेत्रों में वर्गीकृत किया गया है?

(a) 5
(b) 7
(c) 3
(d) 9

Topic - 7
## Climate (जलवायु)
CGL CHSL MTS Steno

**19.** Which climate zone has an average temperature of over 64°F(18° C) throughout the year and more than 59 inches rainfall each year?
(SSC CHSL 02/06/2022 Afternoon)
किस जलवायु क्षेत्र में पूरे वर्ष औसत तापमान 64°F(18°C) से अधिक होता है और प्रत्येक वर्ष 59 इंच से अधिक वर्षा होती है?

(a) Tropical Zone
(b) Temperate Zone
(c) Dry Zone
(d) Continental Zone

a) उष्णकटिबंधीय क्षेत्र
b) शीतोष्ण क्षेत्र
c) शुष्क क्षेत्र
d) महाद्वीपीय क्षेत्र

**20.** Which type of climate do the two island regions of India, Lakshadweep and Andaman and Nicobar Islands experience?
(SSC CHSL 06/06/2022 Morning)
भारत के दो द्वीप क्षेत्र, लक्षद्वीप और अंडमान और निकोबार द्वीप समूह किस प्रकार की जलवायु का अनुभव करते हैं?

(a) Humid subtropical climate — a) आर्द्र उपोष्णकटिबंधीय जलवायु
(b) Hot semi-arid climate — b) गर्म-अर्धशुष्क जलवायु
(c) Tropical Warm Climate — c) उष्णकटिबंधीय गर्म जलवायु
(d) Subtropical highland Climate — d) उपोष्णकटिबंधीय उच्चभूमि जलवायु

Topic - 7
## Climate (जलवायु)
CGL CHSL MTS Steno

**21.** What is the name of zone where trade winds converge?
(SSC CHSL 09/06/2022 Afternnon Shift)
उस क्षेत्र का क्या नाम है जहाँ व्यापारिक पवनें एकत्रित होती हैं?

(a) Forest zone — a) वन क्षेत्र
(b) Intra-terrestrial zone — b) अंतर-स्थलीय क्षेत्र
(c) Intra-continental convergence zone — c) अंतरमहाद्वीपीय अभिसरण क्षेत्र
(d) Intertropical convergence zone — d) अंतरउष्णकटिबंधीय अभिसरण क्षेत्र

Topic - 7
## Climate (जलवायु)
CGL CHSL MTS Steno

**22.** According to Kopann's climate classification scheme, dry climates are subdivided using the capital letter S for semi-arid regions or steppe and W for ____ region ? (SSC CHSL 09/06/2022 Evening Shift)
कोपन्न की जलवायु वर्गीकरण योजना के अनुसार, शुष्क जलवायु को अर्ध-शुष्क क्षेत्रों या स्टेपी के लिए बड़े अक्षर S और ____ क्षेत्र के लिए W का उपयोग करके उप-विभाजित किया जाता है?

(a) Highland — a) अधित्यका
(b) Desert — b) रेगिस्तान
(c) Wind dry — c) शुष्क हवा
(d) Wet — d) गीला

**23.** Which of the following is INCORRECTLY matched?
(SSC CGL 18/07/2023 fourth Shift)
निम्नलिखित में से कौन सा गलत सुमेलित है?
(a) Montane Climate – Uttar Pradesh, Bihar and Jharkhand
(b) Hot desserts, arid Climate – Rajasthan and Some parts of Gujarat
(c) Tropical Monsoon Climate – The Western Ghats, the Malabar Coast and Southern Assam
(d) Tropical Semi-arid (Steppe) climate – Karnataka, Central Maharashtra, some parts of Tamil Nadu and Andhra Pradesh
a) पर्वतीय जलवायु - उत्तर प्रदेश, बिहार और झारखंड
b) गर्म मिठाइयाँ, शुष्क जलवायु - राजस्थान और गुजरात के कुछ हिस्से
c) उष्णकटिबंधीय मानसून जलवायु - पश्चिमी घाट, मालाबार तट और दक्षिणी असम
d) उष्णकटिबंधीय अर्ध-शुष्क (स्टेपी) जलवायु - कर्नाटक, मध्य महाराष्ट्र, तमिलनाडु और आंध्र प्रदेश के कुछ हिस्से

**24.** A storm that occur due to difference in temperature and pressure of air is called _____.

तापमान और हवा के दबाव में अंतर के कारण आने वाले तूफान को _____ कहा जाता है।

(a) Tsunami
(b) Cyclone
(c) Earthquake
(d) None of the above

a) सुनामी
b) चक्रवात
c) भूकंप
d) इनमें से कोई भी नहीं

**25.** The western cyclone disturbance originates over? (SSC CGL 26/07/2023 Third Shift)

पश्चिमी चक्रवात विक्षोभ कहाँ से उत्पन्न होता है?

(a) Arabian Sea
(b) Pacific Ocean
(c) Bay of Bengal
(d) The Mediterranean

a) अरब सागर
b) प्रशांत महासागर
c) बंगाल की खाड़ी
d) भूमध्यसागर

Topic - 7

## Cyclone (चक्रवात)

CGL CHSL MTS Steno

**26.** The centre of cyclone is a calm area. It is called the ____ of the storm ? (SSC CGL 24/07/2023 Fourth Shift)

चक्रवात का केंद्र एक शांत क्षेत्र है. इसे तूफान का ____ कहा जाता है?

(a) Base
(b) Focal point
(c) Eye
(d) Trigger point

a) आधार
b) केंद्र बिंदु
c) आँख
d) सतर्कता बिन्दु

Topic - 7

## Cyclone (चक्रवात)

CGL CHSL MTS Steno

**27.** Which of the following cyclone did NOT hit India during the years 2021-2022? (SSC CGL 20/07/2023 First Shift)

वर्ष 2021-2022 के दौरान निम्नलिखित में से कौन सा चक्रवात भारत में नहीं आया?

(a) Gulab
(b) Julia
(c) Yaas
(d) Tauktae

a) गुलाब
b) जूलिया
c) हाँ
d) ताउते

**28.** In the context of India, Tropical Cyclones originate over the _____?
(SSC CGL 05/12/2022 Third Shift)
भारत के संदर्भ में, उष्णकटिबंधीय चक्रवात _____ पर उत्पन्न होते हैं?

(a) Arabian Sea
(b) Pacific Ocean
(c) Bay of Bengal
(d) Mediterranean Sea

a) अरब सागर
b) प्रशांत महासागर
c) बंगाल की खाड़ी
d) भूमध्य - सागर

## Topic - 7
## Cyclone (चक्रवात)

CGL CHSL MTS Steno

**29.** A cyclone is known by different names in different parts of the world. In Philippines it is called_____.
(SSC CGL 13/12/2022 Third Shift)
दुनिया के अलग-अलग हिस्सों में चक्रवात को अलग-अलग नामों से जाना जाता है। फिलीपींस में इसे_____ कहा जाता है।

(a) Willy-willy
(b) Hurricane
(c) Typhoon
(d) Mango-shower

a) विली-विली
b) चक्रवात
c) आंधी
d) आम की बौछार

## Topic - 7
## Cyclone (चक्रवात)

CGL CHSL MTS Steno

**30.** In early November, the low pressure condition shifts over the Bay of Bengal. The transfer is related to cyclonic low pressure, which originates over _____? (SSC MTS 13/07/2022 Morning Shift)
नवंबर की शुरुआत में, निम्न दबाव की स्थिति बंगाल की खाड़ी पर स्थानांतरित हो जाती है। स्थानांतरण चक्रवाती निम्न दबाव से संबंधित है, जो _____ पर उत्पन्न होता है?

(a) Andaman Sea
(b) Sea of Japan
(c) Caspian Sea
(d) Pacific Ocean

a) अंडमान सागर
b) जापान का सागर
c) कैस्पियन सागर
d) प्रशांत महासागर

**31.** In India from where do the tropical cyclones, which enter the Indian subcontinent from the west and the northwest during the winter months, originate? (SSC CHSL 08/06/2022 Morning Shift)
भारत में उष्णकटिबंधीय चक्रवात, जो सर्दियों के महीनों के दौरान पश्चिम और उत्तर-पश्चिम से भारतीय उपमहाद्वीप में प्रवेश करते हैं, कहाँ से उत्पन्न होते हैं?

(a) Over the Gulf of Khambhat
(b) Over the Arabian Sea
(c) Over the Gulf of Mannar
(d) Over the Mediterranean Sea

a) खंभात की खाड़ी के ऊपर
b) अरब सागर के ऊपर
c) मन्नार की खाड़ी के ऊपर
d) भूमध्य सागर के ऊपर

**32.** The cyclone storm of China Sea is known as_____

चीन सागर के चक्रवाती तूफान को _____ के नाम से जाना जाता है

(a) Cyclone
(b) Hurricane
(c) Tornado
(d) Typhoon

a) चक्रवात
b) चक्रवात
c) बवंडर
d) आंधी

Topic - 7

## Cyclone (चक्रवात)

CGL CHSL MTS Steno

**33.** It is a ..... when the maximum sustained wind speed is more than 63 km/h.

यह एक ..... है जब अधिकतम निरंतर हवा की गति 63 किमी/घंटा से अधिक होती है।

(a) Tropical depression
(b) Tropical Storm
(c) Typhoon
(d) Hurricane

a) उष्णकटिबंधीय अवसाद
b) उष्णकटिबंधीय तूफान
c) आंधी
d) चक्रवात

**34.** Temperate cyclones are also termed as.....

शीतोष्ण चक्रवातों को..... भी कहा जाता है।

(a) Extra Tropical Cyclones
(b) Wave Cyclones
(c) Depressions
(d) All of the above

a) अतिरिक्त उष्णकटिबंधीय चक्रवात
b) तरंग चक्रवात
c) गड्ढों
d) ऊपर के सभी

Topic - 7

## Cyclone (चक्रवात)

CGL CHSL MTS Steno

**35.** What causes tropical cyclone to rotate?

उष्णकटिबंधीय चक्रवात के घूमने का क्या कारण है?

(a) Tension force
(b) Gravitational force
(c) Frictional Force
(d) Coriolis force

a) तनाव बल
b) गुरुत्वाकर्षण बल
c) घर्षण बल
d) कोरिओलिस बल

**36.** Identify the correct statement about cyclones.

चक्रवातों के बारे में सही कथन पहचानें।

(a) High speed winds circulate around a high pressure region
(b) The coastline of India is not vulnerable to cyclones
(c) The wind direction is clockwise in southern hemisphere and anticlockwise in northern hemisphere
(d) The wind direction is clockwise in both hemispheres

a) उच्च दबाव वाले क्षेत्र के चारों ओर तेज़ गति वाली हवाएँ घूमती हैं
b) भारत की तटरेखा चक्रवात के प्रति संवेदनशील नहीं है
c) हवा की दिशा दक्षिणी गोलार्ध में दक्षिणावर्त और उत्तरी गोलार्ध में वामावर्त होती है
d) दोनों गोलार्धों में हवा की दिशा दक्षिणावर्त है

**37.** Which of the following is warm current?
(SSC MTS 12/07/2022 Afternoon Shift)

निम्नलिखित में से कौन गर्म धारा है?

(a) Labrador Current
(b) Falkland Current
(c) Canary Current
(d) Gulf Stream

a) लैब्राडोर धारा
b) फ़ॉकलैंड धारा
c) कैनरी धारा
d) गल्फ स्ट्रीम

## Topic - 7
## Ocean Current (सागर की लहरें)

CGL CHSL MTS Steno

**38.** Which of the following is warm ocean current of the Pacific Ocean?

निम्नलिखित में से कौन प्रशांत महासागर की गर्म महासागरीय धारा है?

(a) Kuroshio Current
(b) Humboldt Current
(c) Canaries Current
(d) Labrador Current

a) कुरोशियो वर्तमान
b) हम्बोल्ट धारा
c) कैनरीज़ करंट
d) लैब्राडोर धारा

Topic - 7
Ocean Current (सागर की लहरें)
CGL CHSL MTS Steno

**39.** Gulf stream is which type of current?

गल्फ स्ट्रीम किस प्रकार की धारा है?

(a) Warm Current
(b) Cold Current
(c) Warm and Cold Current
(d) None of the above

a) गर्म धारा
b) ठंडी धारा
c) गर्म और ठंडी धारा
d) इनमें से कोई भी नहीं

**40.** Labrador Current is which type of current?

लैब्राडोर धारा किस प्रकार की धारा है?

(a) Canary Current
(b) Cold Current
(c) Warm Current
(d) None of the Above

a) कैनरी की धारा
b) ठंडी धारा
c) गर्म धारा
d) इनमें से कोई भी नहीं

## Topic - 7

## Ocean Current (सागर की लहरें)

CGL CHSL MTS Steno

**41.** Which one of the given ocean currents is the largest and most powerful surface current on the earth?

दी गई महासागरीय धाराओं में से कौन सी पृथ्वी पर सबसे बड़ी और सबसे शक्तिशाली सतही धारा है?

(a) California Current
(b) Antarctic Circumpolar Current
(c) Florida Current
(d) None of these

a) कैलिफोर्निया वर्तमान
b) अंटार्कटिक सर्कपोलर धारा
c) फ्लोरिडा वर्तमान
d) इनमें से कोई नहीं

**42.** Which of the following currents is a Cold ocean Current ?

निम्नलिखित में से कौन सी धारा ठंडी महासागरीय धारा है?

(a) Florida Current
(b) Norwegian Current
(c) Labrador Current
(d) California Current

a) फ्लोरिडा वर्तमान
b) नॉर्वेजियन करंट
c) इमिंगर धारा
d) कैलिफोर्निया वर्तमान

**43.** Where do warm ocean currents move?

गर्म महासागरीय धाराएँ कहाँ चलती हैं?

(a) Indonesia to Philippines
(b) Sri Lanka to Indonesia
(c) Away from equator toward the poles
(d) None of these

a) इंडोनेशिया से फिलीपींस तक
b) श्रीलंका से इंडोनेशिया तक
c) भूमध्य रेखा से दूर ध्रुवों की ओर
d) इनमें से कोई नहीं

## Topic - 3

## Ocean Current (सागर की लहरें)

CGL CHSL MTS Steno

**44.** The rhythmic rise and fall of ocean water twice in a day called a _____. (SSC MTS 2020/2022 Afternoon)

एक दिन में दो बार समुद्र के जल के लयबद्ध उत्थान और पतन को _____ कहा जाता है।

(a) Fall
(b) Tide
(c) Wave
(d) Current

a) गिरना
b) ज्वार-भाटा
c) लहर
d) मौजूदा

# INDIA AND IT'S BOUNDARY

- India was a part of Gondwanaland

- India in terms of area is in the 7th position
- 1st: Russia
- 2nd: Canada
- 3rd: China
- 4th: USA
- 5th: Brazil
- 6th: Australia
- 8th: Argentina

- Smallest: Vatican City

- India occupies 2.4% of total world's land area

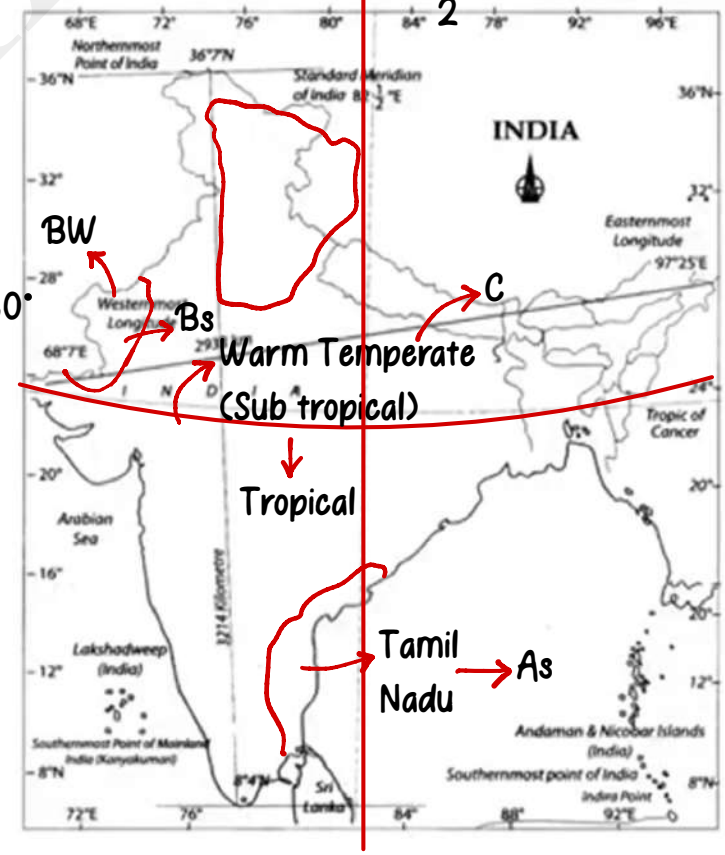
- Population is 17% world's total population

Time Zones

- Russia: 11
- USA: 4
- Max. in France: 12 (because of many territories)

India's common time zone

$82\frac{1}{2}°E$




- India has total state: 28
- Total UTs: 8
- North-South extent: 3214 km
- West-East: 2933 km
- Latitudinal extent: 8°4'-37°6' → Difference: ~30°
- Longitudinal extent: 68°7'-97°25' → Difference: ~30°

- Difference b/w every latitude is same: 111 km
- Difference b/w every longitude is varying

↓

Max. at the equator
Zero at the poles

Time difference between Gujarat and Arunachal: 30°

= 30 x 4

= 120 mins = 2 hrs

1° = 4 mins
15° = 1 hr

| Extremes | State | Point |
|---|---|---|
| Northernmost: | Himachal Pradesh | Indira Col |
| Southernmost: | Tamil Nadu | Kanyakumari/Cape Camorin/ Indira Point |
| Easternmost: | Arunachal Pradesh | Kibithu |
| Westernmost: | Gujarat | Guhar Moti/Sir Creek |


23 1/2° N

Indira Point

- 15° = 1 hr
- 7.5°= 30 mins
- Total time: 24 hrs
- Indian Standard Time (IST): 82.5° E
- IST passes through: 5 states

M: Madhya Pradesh
O: Odisha
U: Uttar Pradesh (Naini, Mirzapur)
C: Chattisgarh
A: Andhra Pradesh

- India's important latitude: Tropic of Cancer → 23 1/2° N

Pass through 8 states

TRICK

Gujarati Raja Made Chief Justice Win The Meeting

Gujarat Rajasthan Madhya Pradesh Chattisgarh Jharkhand West Bengal Tripura Mizoram

- How many capital cities of these 8 States are above (in North) Tropic of Cancer?

→3 states

| Rajasthan | Mizoram | Tripura |
|---|---|---|
| Jaipur | Aizawl | Agartala |

- Tropic of Cancer meets IST at: Korea, Chattisgarh (Baikunthpur)

- Countries that share boundary with India:
  - B: Bangladesh → 4,096.7 km (longest)
  - C: China → 3,488 km
  - P: Pakistan → 3,323 km
  - N: Nepal → 1,751 km
  - M: Myanmar → 1,643 km
  - B: Bhutan → 699 km
  - A: Afghanistan → 106 km (least)

total: 15,106.7 km


Bangladesh: India and Bangladesh → Radcliffe Line

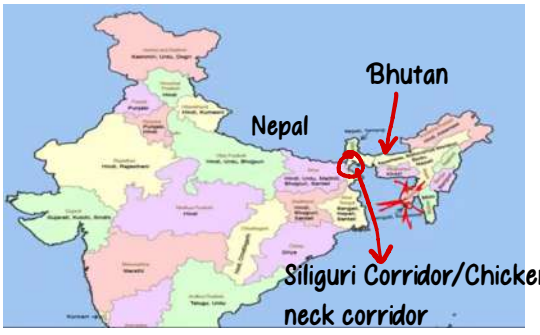
M → Meghalaya
A → Assam
M → Mizoram
Take → Tripura
Water → West Bengal

It is surrounded by Bangladesh from three sides

Train b/w Bangladesh to India
- Bandhan Express
- Mitali Express

Nepal

S → Sikkim
U → Uttar Pradesh
B → Bihar
B → West Bengal
U → Uttarakhand



## Bhutan

B → West Bengal
A → Assam
S → Sikkim
A → Arunachal Pradesh

Pakistan: Pakistan and India → Line of Control (LOC) + Radcliffe Line → Agreed

G → Gujarat
R → Rajasthan
P → Punjab
J & K
Ladakh

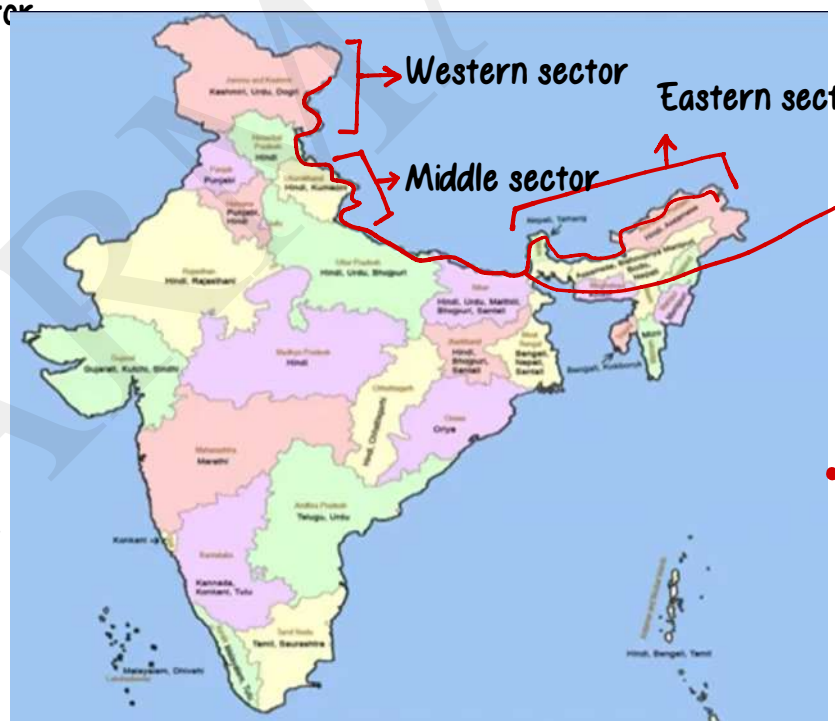
Train b/w India and Pakistan:
- Samjhauta Express
- Thar Express

Train to Pakistan (book): Khushwant Singh

## China

Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh

- India-China Border divided into 3 sectors:
  1. Western sector
  2. Middle sector
  3. Eastern sector




India-China Border divided into 3 sectors

- Vibrant Village Programme for development: India-China border

- Line b/w India and China: Line of Actual Control (LAC) → Not agreed
  - McMohan Line
  - Johnson Line

- Border Road Organisation (BRO) → 1960

- Border Area Development Programme: 7th Five Year Plan

↓

1985-90

- Nepal and Bhutan: SSB (under Ministry of Home Affairs)
- Pakistan and Bangladesh: BSF
- India and China: ITBP (under Ministry of Home Affairs)
- Naxalite affected areas: Red Corridor

- Airforce/Navy/Army: Ministry of Defence
- Assam Riffles: Under Home Affairs but operation control under Ministry of Defence
- CRPF: Largest force of India

Myanmar

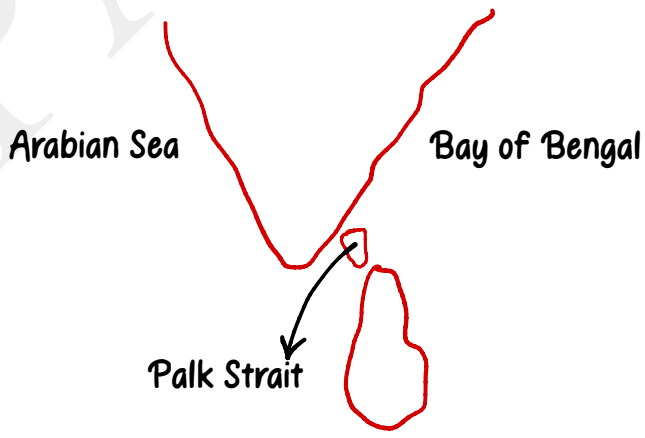
Aru ↓ Arunachal
Na ↓ Nagaland
Ma ↓ Manipur
Mi ↓ Mizoram

Afghanistan
Ladakh

Sri Lanka and India separated by Palk Strait

↓

a narrow passage of water connecting two seas or two other large areas of water




- Largest Gulf in the world: Gulf of Mexico
- Largest Bay in the world: Bay of Bengal

- State sharing boundary with maximum no. of state: Uttar Pradesh
  - 8 states + 1 UT (Delhi)

- State sharing boundary with least no. of states: Sikkim, Meghalaya
  - West Bengal
  - Assam

- States sharing boundary with 3 countries:
  1. Sikkim (Nepal, Bhutan, China)
  2. Arunachal (Bhutan, China, Myanmar)
  3. West Bengal (Nepal, Bhutan, Bangladesh

- 1 UT that shares boundary with 3 countries: Ladakh (Pakistan, China, Afghanistan)

## Coastal Boundary of India

- Total: 7516.6 km
- Mainland: 6100 km
- States: 9
  - Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Andhra Pradesh, Odisha, West Bengal
- UTs: 4
  - Andaman and Nicobar Island, Lakshadweep, Daman and Diu, Puducherry

- longest coastal boundary of the world: Canada
- India is in 13th position

Longest coastline in India: Andaman and Nicobar (1912 km)

- State: Gujarat (1214 km)
- UT: Andaman and Nicobar (1912 km)

- Shortest coastline: Goa

Territorial Limit of India

- 12 nm = 22 km
- Contiguous zone = 24 nm
- Exclusive Economic Zone: 200 nm

To measure coastline

Nautical miles

- 1 nautical mile = 1.852 km

- India is lying entirely in: Northern Hemisphere

- India can be divided into 6 physiographic regions:
  1. Himalaya
  2. Peninsular Plateau
  3. Northern Plain
  4. Desert
  5. Island
  6. Coastal Plains

- India is 7th largest in the world

- India is bounded by the young fold mountains in the northwest: Himalayas

- Andaman and Nicobar is located on the Eastern Coast of India

- Gulf of Mannar (b/w India and Sri Lanka): Indian Ocean

- Languages of countries
  - Sri Lanka: Sinhala/Tamil
  - Maldives: Dhivehi
  - China: Mandarin
  - Bhutan: Dzongkha

- The place situated on three seas: Kanyakumari

- Sites located on the hills near the Brahmaputra valley on the way to China and Myanmar: Hading → Jadeite stone is found here

- Line that separates Pakistan and Afghanistan/India and Afghanistan: Durand Line

- Afghanistan capital: Kabul
  Official languages: Pashto and Dari

- Two neighbouring islands of India: Sri Lanka and Maldives

- Water Treaty signed b/w India and Pakistan in year 1960: Indus Water Treaty

- Hill pass located between India and China: Karakoram Pass

- Havelock Island: Andaman and Nicobar Islands

- State capital located 530 meters above the sea level b/w 93 East longitude and 27 North latitude: Itanagar

- City situated along the Coromandel Coast: Tuticorin

- Bordered by Bhutan and Arunachal in the North, Nagaland and Manipur to the East, Meghalaya, Tripura, Mizoram and Bangladesh to the South, West Bengal to the west: Assam

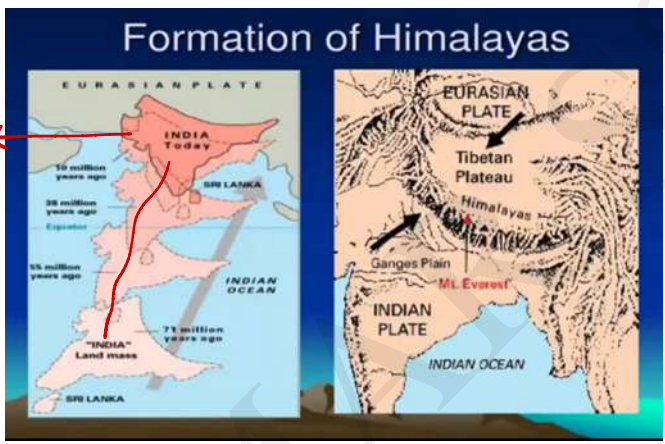
- Total area of the state Goa: 3702 $km^2$

# HIMALAYAS

India: 6 Physiographic Divisions

1. The Himalayas
2. Northern Plains
3. Peninsular Plateau
4. The Great Indian Desert
5. Coastal Plains
6. Group of Islands

Tethys




Northern Mountains

Himalayas ← Plate convergence

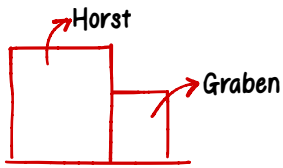
- Young fold mountains (formation: million of years ago)

Eg:

- Andes Mt. Range (South America)
- Alps Mt. Range (Europe)
- Rockies Mt. Range (North America)

- Old fold mountains: formed billion years ago
- Ural Mt. Range (separates Europe and Asia)
- Appalachians (North America)
- Aravalli (India)

## Block Mountains




Eg:

- Vosges Mountain (France)
- Caucasus Mountains

## Volcanic Mountains

Eg:

- Mount Kilimanjaro (Africa)
- Mount Stromboli (light house of Mediterranean)
- Mount Fujiyama(Japan) → Highest volcanic mountain
- Mount Ojas del Salado (Chile–Argentina border)
- Mount Cotopaxi (Ecuador)

- Himalayas: core is made up of granitic rocks
  - Trans Himalayas → series of mountains
  - Himalayan Range
    - Great Himalayas → Known as Himadri
    - Middle Himalayas → known as Himachal
    - Shiwalik → Churiya Hills

- Trans Himalayas: 3 mountain ranges (Mt. Kailash is a part)
  1. Karakoram Range: highest peak of this range is K2/Godwin Austin (8611 m, world's s… highest peak)
  2. Ladakh: high slope
  3. Zanskar

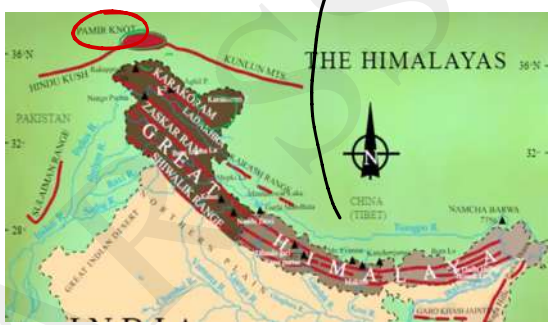
Shyok river flows b/w Karakoram and Ladakh → Tributary of Indus

Indus flow b/w Ladakh and Zanskar

Tibet Plateau: known as Roof of the World

Glaciers of Karakoram Range:

1. Siachen → Operation Meghdoot (1984)
2. Baltoro
   Hisper
   Diafo




1. Great Himalayas/Himadri/Inner Himalayas

- Western most point: Nanga Parvat
- Eastern most point: Namcha Barwa
- Avg. height: 6000 m

Highest Peaks:

1. Mt. Everest (8848 m, highest in the world)
   local names → Sagarmatha (Nepal), Chomolungma (Tibet)
2. Mt. Kanchenjunga (Sikkim): Highest in India (8598 m)
3. Nanda Devi: highest peak in Uttarakhand (7816 m)
   - Mt. Kamet: Uttarakhand

Nepal:

1. Annapurna (8091 m)
2. Dhaulagiri (8167 m)
3. Mount Makalu

2. Lesser Himalayas/Middle Himalayas/Himachal Himalayas

Avg. Height: 4000 m

Names:

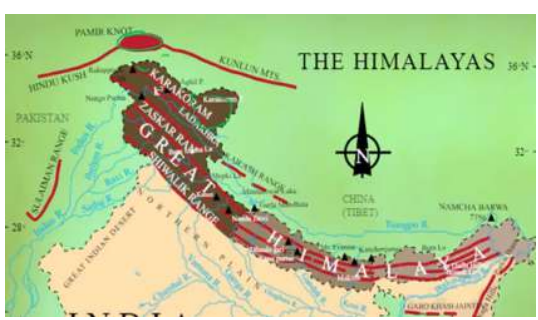
- J & K: Pir Panjal Range
- Himachal Pradesh: Dhauladhar
- Uttarakhand: Nagtibba
- Nepal: Mahabharat Range

- Valley: घाटी

- Kashmir Valley: b/w Great Himalayas and Lesser Himalayas

3. Shiwalik

- Avg. height: 1000 m
- In the Eastern Himalayas gets replaced by Duars
  - Good for tea cultivation
- B/w Lesser Himalayas and Shiwaliks: longitudinal valleys known a Duns
- Largest dun: Dehradun

## Regional divisions of Himalayas

- Punjab Himalayas: b/w Indus river and Sutlej river
- Kumaon Himalayas: b/w Sutlej and Kali river
- Nepal Himalayas: b/w Kali and Teesta river
- Assam Himalayas: Dihang and Teesta river

**Kashmir Himalayas:** Karewas formation (glacial deposits) → Zaffron (A local variety of saffron)

**Lakes:**

- Dal Lake, Wular Lake → fresh water lakes
- Pangong Tso, Tso Moriri → salt water lakes

- Jhelum River: Meanders in its youth stage → Srinagar

**Himachal/Uttarakhand Himalayas**

- Tribe: Bhotia
- Summer grasslands: Bugyal

**Darjeeling and Sikkim Himachal**

- Mt. Kanchenjunga
- Tribe: Lepcha/Bhutia tribe
- Absence of Shiwalik → Duars → jhumming cultivation practiced

**Arunachal Himalayas**

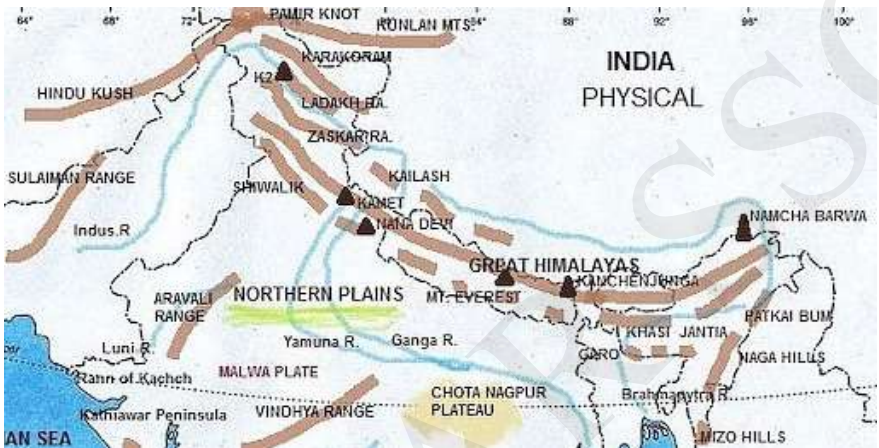
- Important peaks: Kangtu and Namcha Barwa
- Important rivers: Kameng, Subansiri, Dibang
- Tribes:

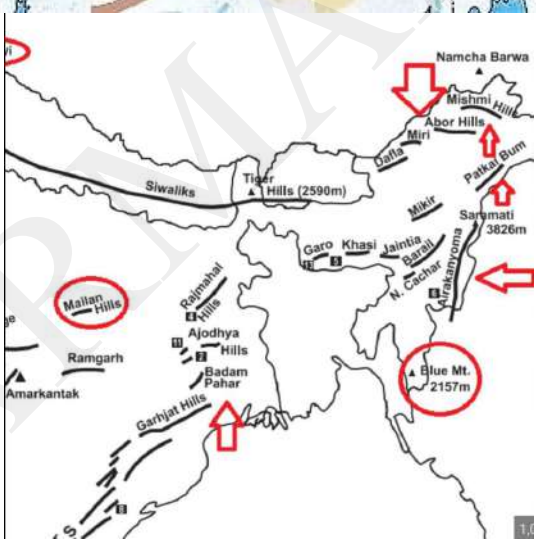
West → East

Monpa, Abor, Mishimi, Nyishi, Naga

## Eastern/Purvanchal Hills

- Patkai bum
- Naga Hills
- Manipur Hills
- Mizo/Lushai Hills




- Barak River

↓

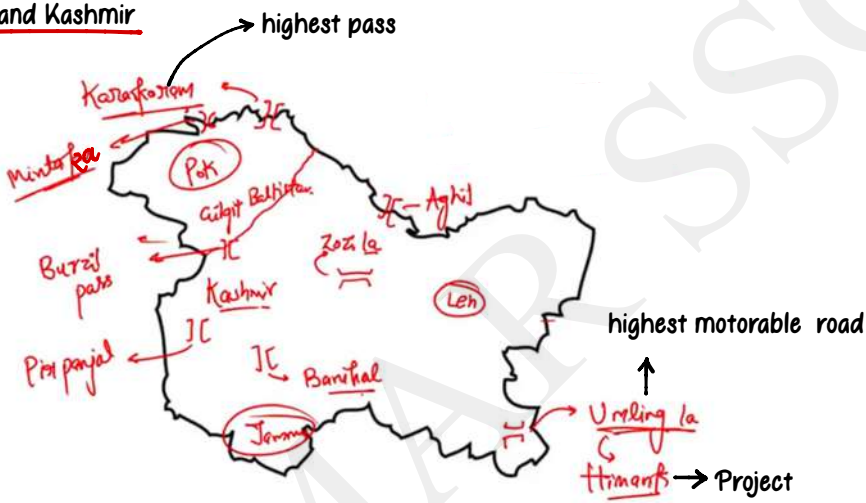
Mizoram: Molasses Basin (soft unconsolidated deposits)

Manipur: Loktak Lake → Keibul Lamjao National Park

- Floating National Park
- State Animal: Shanghai Deer

## Passes

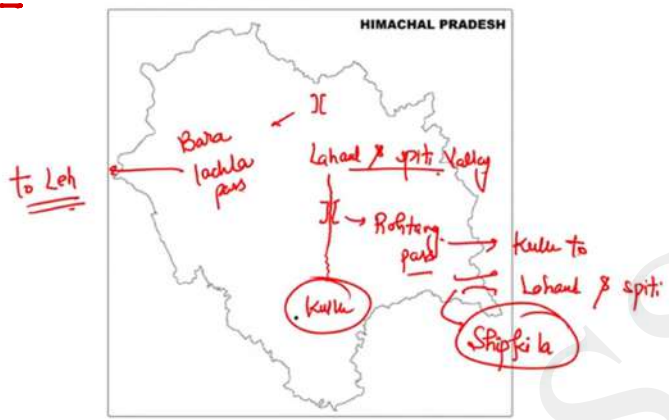
### Jammu and Kashmir




- Jammu to Kashmir/Srinagar: Banihal and Pir Panjal

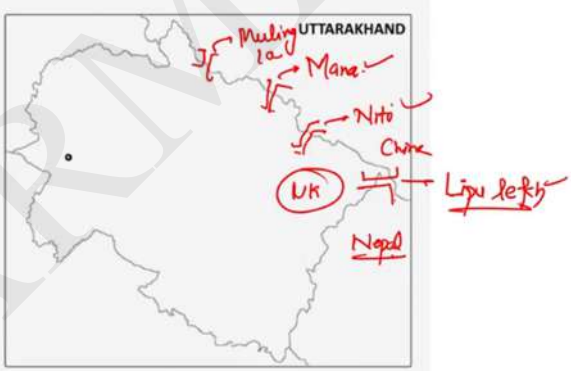
- Kashmir to Gilgit: Burzil
- Kashmir to Leh: Zoji La

## Himachal Pradesh



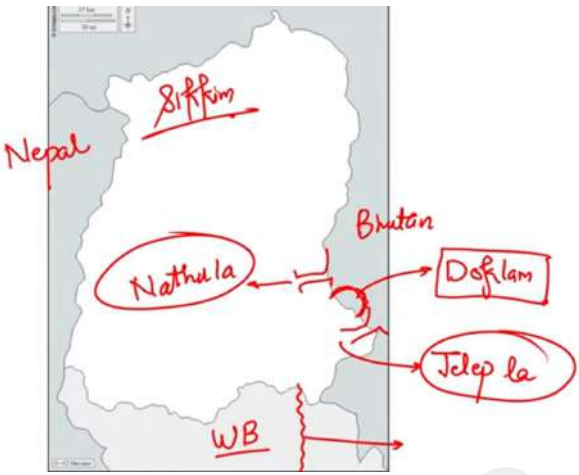

- Rohtang pass connects: Kullu to Lahaul and Spiti Valley
- Baralacha La Pass: Lahaul and Spiti to Leh
- Atal Tunnel in Rohtang Pass

## Uttarakhand

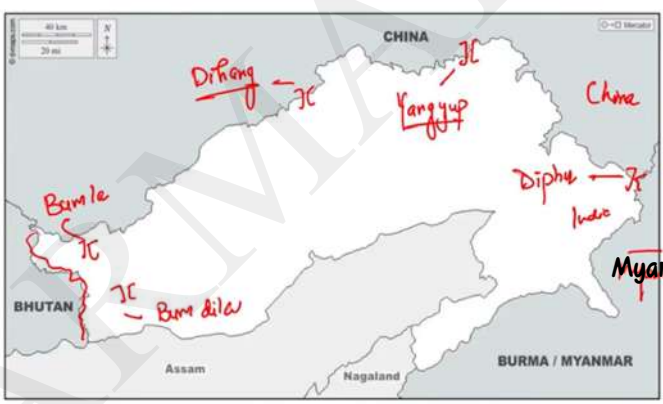



- Lipu Lekh located at Trijunction

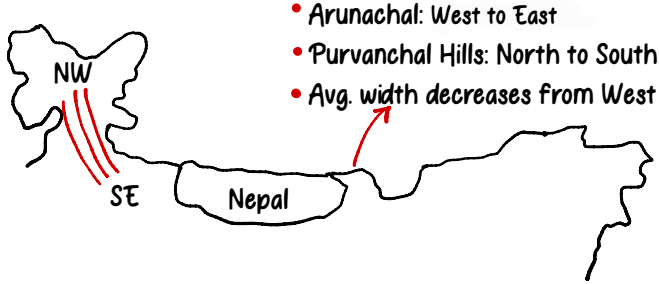
## Sikkim




## Arunachal Pradesh




## General Orientation of Himalayas




- NW Himalayas: NW to SE
- Arunachal: West to East
- Purvanchal Hills: North to South
- Avg. width decreases from West to East

- Appalachians: North America Cold mountains
- Aravalli (old)
- Ural (old)

- Harz Mountains (Germany) → Block mountains

- Terai: Belt
  ↓
  Low land region in Northern India and Southern Nepal

- Mount Krakatoa: Indonesia

- Kotli Dun and Patli Dun located b/w: lesser Himalayas and Shiwaliks

- Highest peak in Peninsular India: Anaimudi

- White Mountain: Dhaulagiri (Nepal), covered with white snow

- Deomali, highest peak of: Odisha

- Mount Tiyi: Nagaland

- Mountain near Dhauliganga: Nanda Devi

- Gorichen peak: Arunachal Pradesh

- Mountain b/w India and Nepal: Kanchenjunga

# PENINSULAR PLATEAUS

triangular shaped

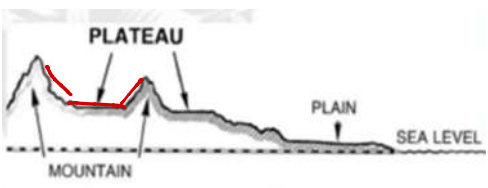
**Peninsular Plateaus:** Largest physiographic division

**What is Peninsular?**

- A land mass which is covered by water from three sides

**What is a Plateau?**

- A plateau is a flat, elevated landform that rises sharply above surrounding area on at least one side




**The Peninsular Plateau**

- A table land composed of the old crystalline, igneous, and metamorphic rocks

**Formation:**

- Due to breaking and drifting of Gondwana land Peninsular Plateau is made up of black soil (volcanic origin)
- It has broad and shallow valleys and rounded hills

**Divisions**

- Central Highlands
- Deccan Plateau

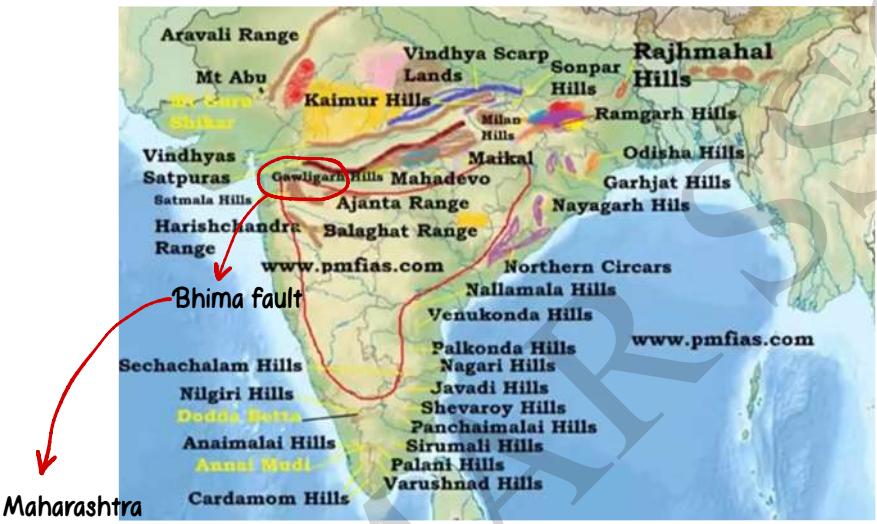
- Peninsular Plateau general elevation: 600–900 m


**Satpura**

- Block mountains
- **3 hills:**
  Rajpeepla
  Mahadeo
  Maikal
- **Highest Peak:** Dhupgarh (Madhya Pradesh) located on Mahadeo Hills
- **Hill station:** Panchmarhi Hills → Queen of Satpura
- Amarkantak Plateau
  - Makes radial drainage pattern
  - **Rivers that flow:** Narmada and Son
  - abundant deposits of Bauxite

## Vindhya

- Panna (Madhya Pradesh) → Famous for diamond
- Highest peak: Sadbhavna Shikhar (Peak of Goodwill)

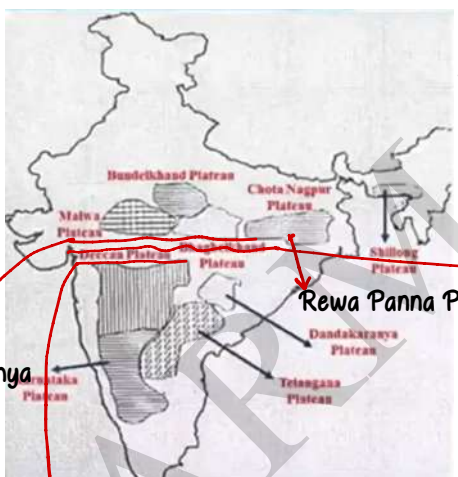




Rift valley

## Central Highlands

- Part lying to the North of Narmada River
- Covered by Vindhya, bounded by Satpura at South and Aravalis on the Northwest




### Main plateaus

- Malwa Plateau (largest) – Western side
- Chota Nagpur Plateau – Eastern side

- Central Highlands are wider in West but narrower in the East
- (Bundelkhand and Baghelkhand)

Narmada river

Rewa Panna Plateau

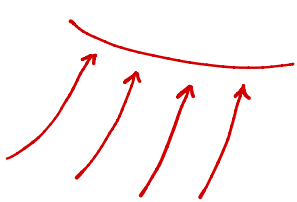
Vindhya

Satpura

- Topmost producer of Cotton: Maharashtra/Gujarat

## Malwa Plateau

- In Gujarat, Rajasthan, and Madhya Pradesh
- Made of lava (Basaltic rock)
  - Black soil originates
- Rivers that flow: Chambal, Betwa, Sindh, Ken
  - From Southwest to Northeast
  - Tributaries of Yamuna



Aravalis: North West extension of Central Highlands

- Spread across 860 km
- Old fold mountains
- They are residual mountains
- Spread across: Gujarat, Rajasthan, Delhi, Haryana
  - Raisina Hills
- Highest peak: Guru Shikhar (1722 m)
  - situated in Mt. Abu Hills
    - Temple located: Dilawara Jain Temple

Chota Nagpur Plateau

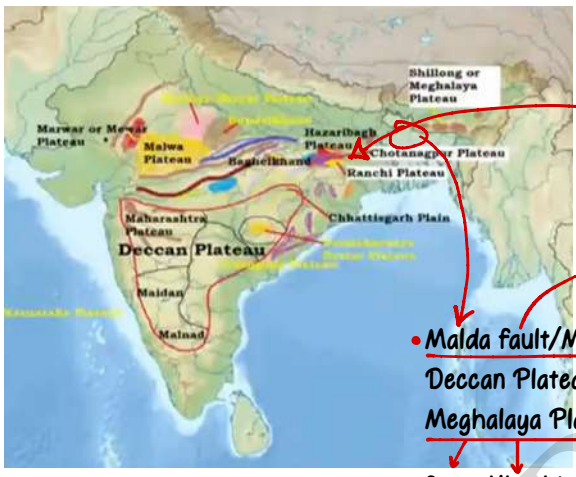
- Spread across Jharkhand, Chattisgarh, Odisha, West Bengal
- Also known as Ruhr State (famous for minerals)
- 3 important plateaus:
  - Ranchi Plateau
  - Hazaribagh Plateau
  - Koderma Plateau
- Highest peak: Parsavnath (also, name of 23rd Tirthankar)
- River that flows in rift valley: Damodar River (eastern side)
- Jadugada Mines: famous for Uranium

Deccan Plateau

- It is a triangular landmass lying South of river Narmada

Borders

- Satpura: Northern borders
- Mahadev, Kaimur hills, and Maikal range: Eastern borders
- Tilted towards East
  - The Deccan Plateau is higher in the west and slopes gently eastwards
- An extension of these plateaus is found in North East
  - Meghalaya plateau (Garo, Khasi and Jaintia Hills), Karbi Anglong plateau and North Cachar hills
    - Assam



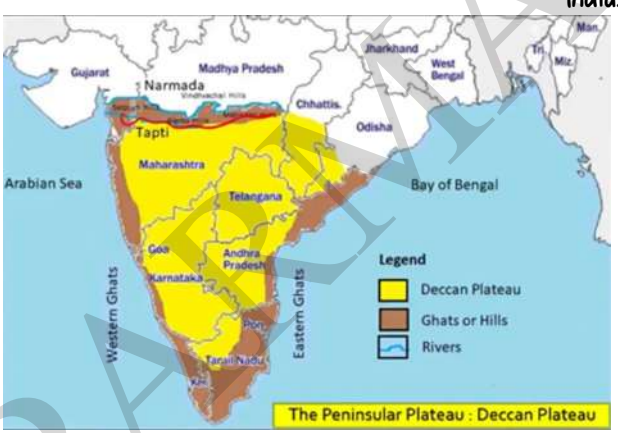

Rajmahal Hills: makes North Eastern boundary of Deccan Plateau

West Bengal

- Malda fault/Malda gap: Separates entire part of Deccan Plateau from Karbi Anglong Plateau/ Meghalaya Plateau/North Cachar Plateau

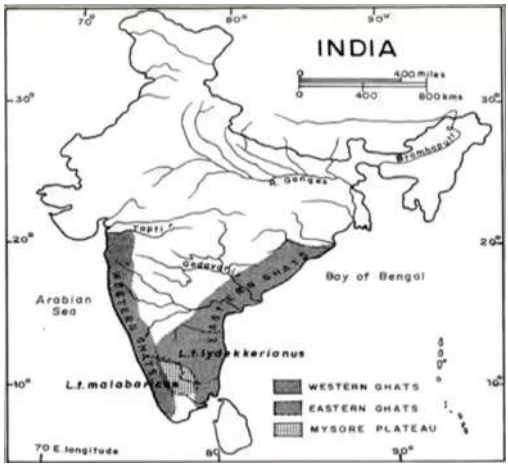
Garo Khashi Jayantia (Hills) Mikir Hills Rengma Hills

Cherrapunji, Mawsynram (highest rainfall in India), Shillong




## Western Ghats and Eastern Ghats

- Both Western Ghats and Eastern Ghats lies west and east of the Deccan Plateau respectively
- Both the ghats have some distinctive features and differentiating points
- These are block mountains

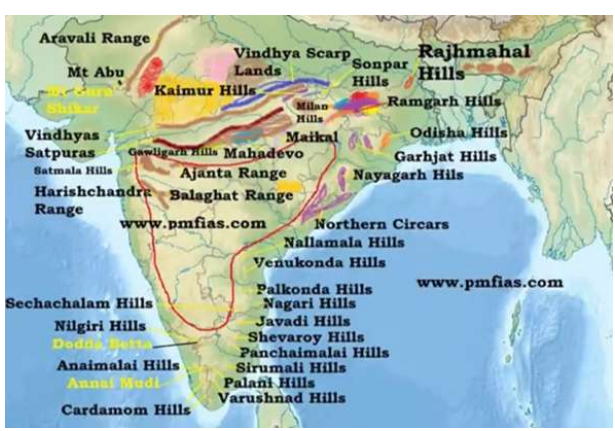



## Western Ghats

- Continous and can be crossed through passes only
- Higher than eastern: 900–1600 m
- Stretch from Tapi to South of Nilgiri Hills
- Spread across: Gujarat, Maharashtra, Karnataka, Kerala, Tamil Nadu, Goa
- Cause Orographic rainfall
- Height increase from North to South
- Highest peak: Anaimudi (Anaimalai Hills)– 2695 m → Kerala
- 2nd highest peak: Doddabetta (2637 m) → on Nilgiri Hills; Ooty is here (Hill station); Tamil Nadu
- Southernmost Hills: Cardamom Hills

## Eastern Ghats

- Discontinuous, irregular, and Dissected by rivers
- Stretched from Mahanadi Valley to the Nilgiri → Connects Western Ghats to Eastern Ghats
- Highest peak: Mahendragiri (1501 m)/ Jindhagada (1690 m)
- Shevaroy Hills and Javadi Hills are located to the southeast to it



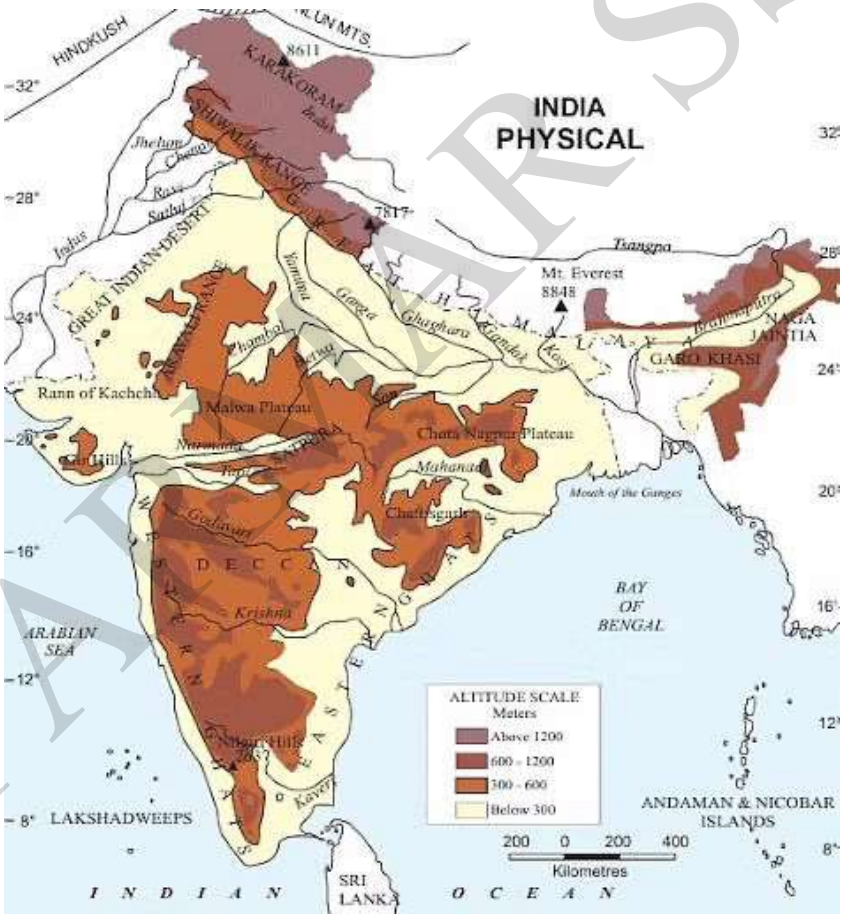
Passes

- Bhorghat: Mumbai to Pune
- Thalghat: Mumbai to Nasik
- Pal Ghat: Annamalai to Nilgiri

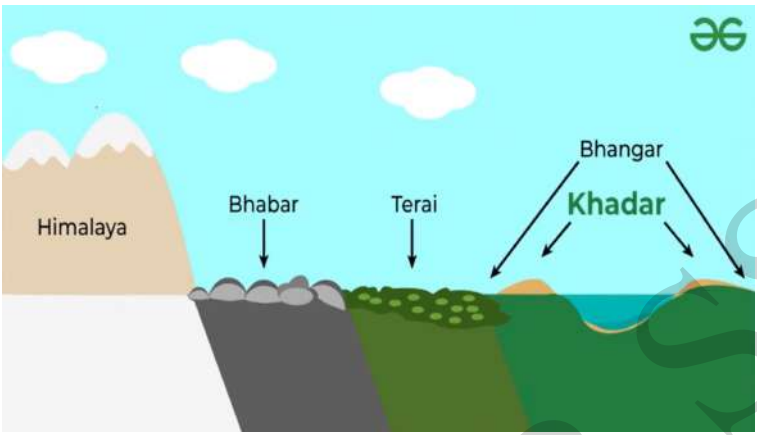
- Mountain Peak at the mountainous border of Indian state of Nagaland and the Sagaing region of Myanmar: Mount Saramati
- Mountains in the northwest, north, and northeast bind India: Young fold mountains
- Mount Jopuno: Sikkim
- Kumaon Himalayas is between Sutlej and Kali
- Oldest mountain/hills range in India: Aravali Hills
- Lipu Lekh pass: Uttarakhand
  ↓
  Located at tri-junction
  India, Nepal, and China
- Mountain that looks like a giant pyramid and has a flat summit area and two peaks: Kamet
- Core of Great Himalayas is composed of: Granite (igneous rock)
  ↓
  continental crust
- Oceanic Crust: made of Basaltic rock, is denser and is thin
- Rohtang pass cuts through Pir Panjal range and links Manali and Leh by road
- Ladakh range extends from northern side of Leh to the Tibetan Border and comprises Digar La Pass and Khardung La Pass

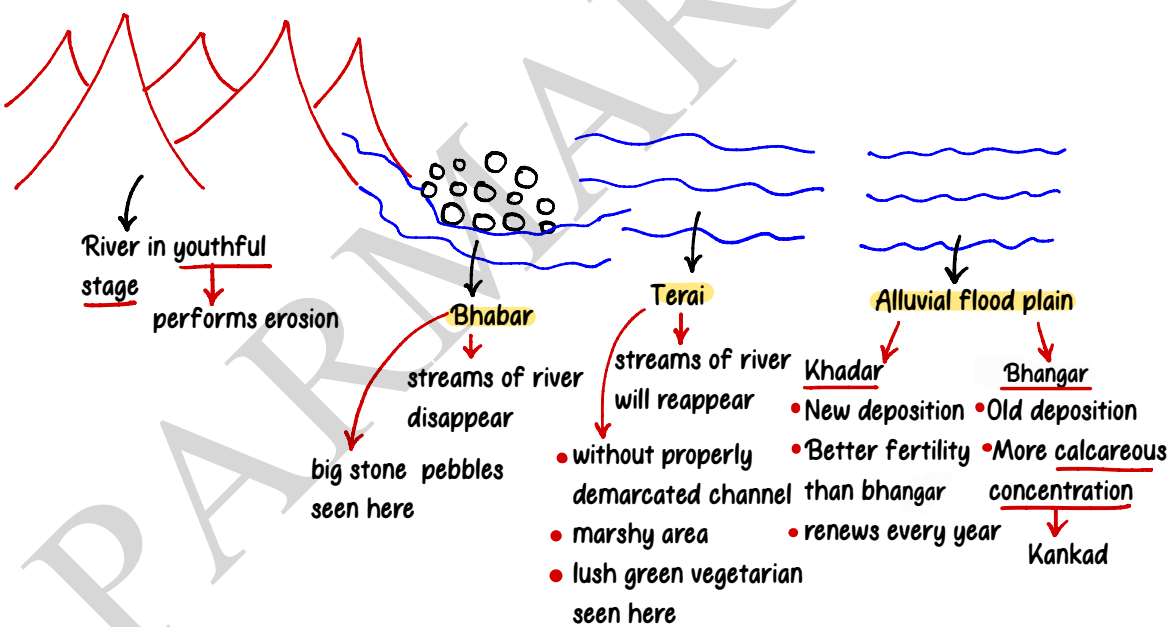
- K2 mountain is situated near Siachen region of Ladakh in India
- Jawahar Tunnel: Banihal Pass (J&K and Srinagar)
- Land route to Kailash and Mansarovar passes through: Mana Pass
- Javadi: Eastern Ghats peak
- Nilachal Hills: Guwahati
  - Kamakhya Temple is situated here
- Fotu La (4108 m) is highest point of Ladakh under Zanskar mountain range
- Highest hill station: Leh
- Hills in Andhra Pradesh: Nagari Hills
- Borra Caves in Andhra Pradesh is situated on the East Coast of India in: Ananthagiri Hills
- Patkai bum: Eastern part of India
- Shatrunjaya Hills located in Gujarat
- Maikal is a range not a plateau
- Deccan Plateau spread across: Telangana, Maharashtra, Karnataka, Kerala, Andhra Pradesh , Madhya Pradesh, Chattisgarh, Tamil Nadu

# NORTHERN PLAINS AND ISLANDS



# Northern Indian Plains



## Coasts of India

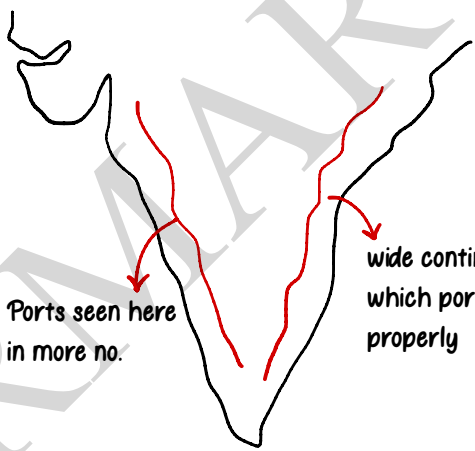
- 9 coastal states + 4 UTs

### Western Coastal Plains

- Narrow in middle and wider in the ends
- Submerging
- Rivers do not form delta
- Formation of Kayals (Backwaters) → Punnamada Kayal: Nehru Trophy (Boat race)
- Port development is easy

### Eastern Coastal Plains

- Wider
- Emerging
- Form Delta




- World's largest continental shelf: Siberian Shelf
  - In Arctic Ocean


Western Ghats is known as Sahyadri in Maharashtra

## Ports of India

- Major
  - 13 ports
    - 12
      - Govt. Owned
      - Ownership and management by Central Govt.
    - 1
      - Pvt.
      - Ennore (Kamrajkar Port)
- Minor
  - 200
  - Owned by State Govt.


Tidal port

Also known as Deendayal Port Trust

- Also, Nhava Sheva Port
- Largest container port

In Zuary river's estuary

Queen of Arabian Sea

Only state to have max. major ports

oldest port developed by British in 1870s

Haldia Port (West Bengal)

- Riverine port
- Also known as Shyama Prasad Mookerjee Port

India's deepest landlocked port

## Great Indian Dessert

- Seen in North Western of Aravali
- Low rainfall: < 150 mm/year
- Also known as Marusthali
- Most rivers are ephemeral

Features:

- Barchans, Seif
- Mushroom rocks
- Pedestrial rocks

- Oasis is seen here
  - green part in desert

Rajasthan

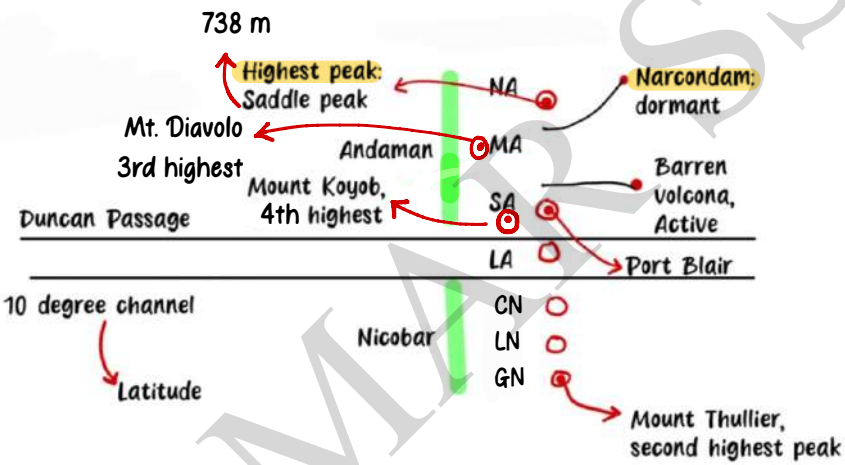
made of coral deposits

Islands: Part of land surrounded by water from all four sides

**Arabian Sea**
- Lakshadweep
- Total: 36 islands
- Largest: Andrott

**Bay of Bengal**
- Andaman and Nicobar group of islands
- Total: 572 islands
- Largest: Great Nicobar

extension of Arakan Yoma ( in Myanmar)

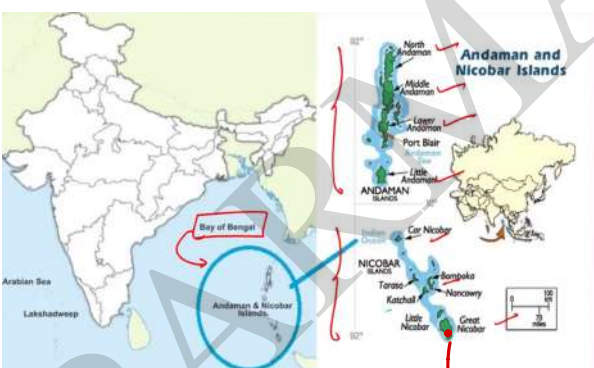



**10°channel**
- separates Andaman group of Islands and Nicobar group of Islands
- separates Little Andaman and Car Nicobar

**Duncan Passage**: Separates South Andaman and Little Andaman

**Tribes**
- Andaman: Negrito group
  - North Andamanese
  - Jarawa
  - Onge
  - Senthelese
- Nicobar
  - Shompen
  - Nicobarese

## National Parks in Andaman and Nicobar


**Islands renamed:**

- Ross Islands → Netaji S. C. Bose Island
- Neil Island → Shaheed Dweep
- Havelock Island → Swaraj Dweep

- Unnamed islands were renamed on 21 Paramveer Chakra Awardees name


11°channel: separates Aminidivi and Cannanore

8°channel

- Minicoy from Maldives
- Lakshadweep from Maldives

Nine Degree Channel → Entire group of Lakshadweep from Minicoy

Minicoy

Sir Creek
Disputed territory between India and Pak

Alia Bet Island

New Moore Island
b/w India and Bangladesh

Chandipur, Odisha

APJ Abdul Kalam Island

Integrated Test Range (missile testing)

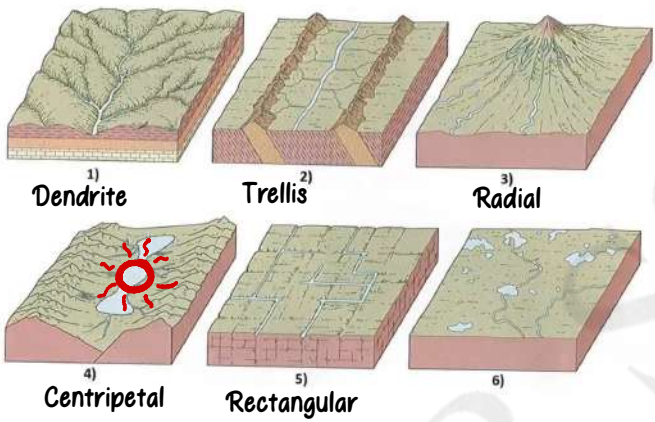
Pamban Island

Kachchatheevu Islands

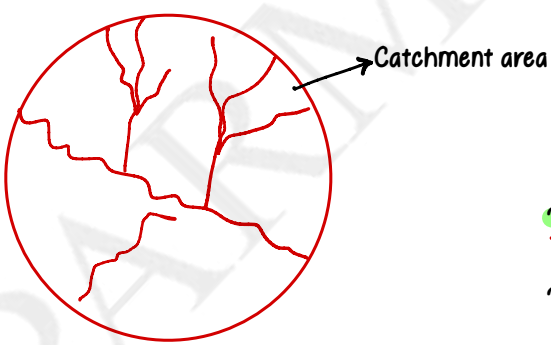
b/w India and Sri Lanka

# DRAINAGE SYSTEM

# Different Drainage Patterns




1. **Dendritic:** resemble the branch of a tree
2. **Trellis:** tributaries join the river at right angle
3. **Radial:** rivers originating from a central dome/peak
4. **Centripetal:** rivers draining their water into a central lake/depression




**River System**

River + Tributaries

Basin/Catchment area

**Indian River System**

1. Himalayan River System
2. Peninsular River System

- **Origin**: source
- **Mouth**: Drains water

## The Himalayan Rivers

1. They are perennial
2. Water throughout the year (Origin/ Source: Glaciers)
3. They have long courses from their source to the sea
4. 3 major rivers: the Indus, Brahmaputra, and Ganga originating from the North of the mountain ranges
5. Ex: the Indus, the Brahmaputra, the Ganga
6. Some Himalayan rivers are antecedent (following their original course), eg: Satluj, Kosi, Indus

## The Peninsular River

1. They are ephemeral
2. During dry season, large rivers have reduced flow of water in their channels
3. They have shorter and shallower course
4. Most of the rivers here originate in the Western Ghats and flow towards Bay of Bengal
5. Ex: Narmada, Tapi, Godavari


Tributaries of Indus

↓

Jhelum+Chenab+ Beas+Ravi+Sutlej = Panchnad

↓

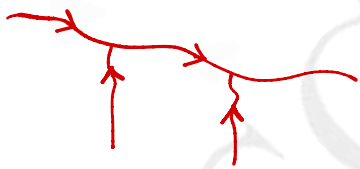
Punjab

- Panj + Doab → Area between two rivers

## Classification of Tributaries

1. Left Bank Tributary
2. Right Bank Tributary

Left bank tributary



Right bank tributary

- **Indus+Jhelum:** Sindh Sagar Doab
- **Jhelum+Chenab:** Jech Doab
- **Chenab+Ravi:** Rechna Doab
- **Ravi+Beas:** Bari Doab
- **Beas+Sutlej:** Bist Doab

### Indus

- **Length:** 2880 km/1114 km in India
- **Flows in:** China → India → Pakistan
- National river of Pakistan
- Indus Water Treaty, 1960
  - Signed in Karachi
  - B/w J L Nehru and Ayub Khan
  - **Mediator:** World Bank
  - One of the most successful treaty around the world

| | |
|---|---|
| Indus, Jhelum, Chenab | 80% water used by Pakistan, 20% water used by India |
| Ravi, Beas, Sutlej | 80% water used by India, 20% water used by Pakistan |

- **Indus origin:** Bokhar Chu Glacier near Lake Mansarovar
- **Drains:** into Arabian Sea
- **Demchok:** enters into India
- **Leh:** located on the banks of Indus River
- Indus in Tibet is known as **Singi Khamban** (Lion's mouth)

## Tributaries of Indus

1. Jhelum: meanders in its youthful stage

- Ancient name: Vitasta
- Origin: Verinag (J & K)
- Flows in the border of India and Pakistan
- Srinagar is located on banks of Jhelum
- Wular Lake gets its water from Jhelum

2. Chenab → Chandra, Bhaga

- Ancient name: Askini
- Origin: Baralacha La pass
- Largest tributary of Indus

3. Ravi

- Ancient name: Purushni
- Origin: Rohtang pass

4. Beas

- Ancient name: Bipasha
- Origin: Rohtang pass
- Only tributary of Indus that does not pass or enter Pakistan

5. Sutlej

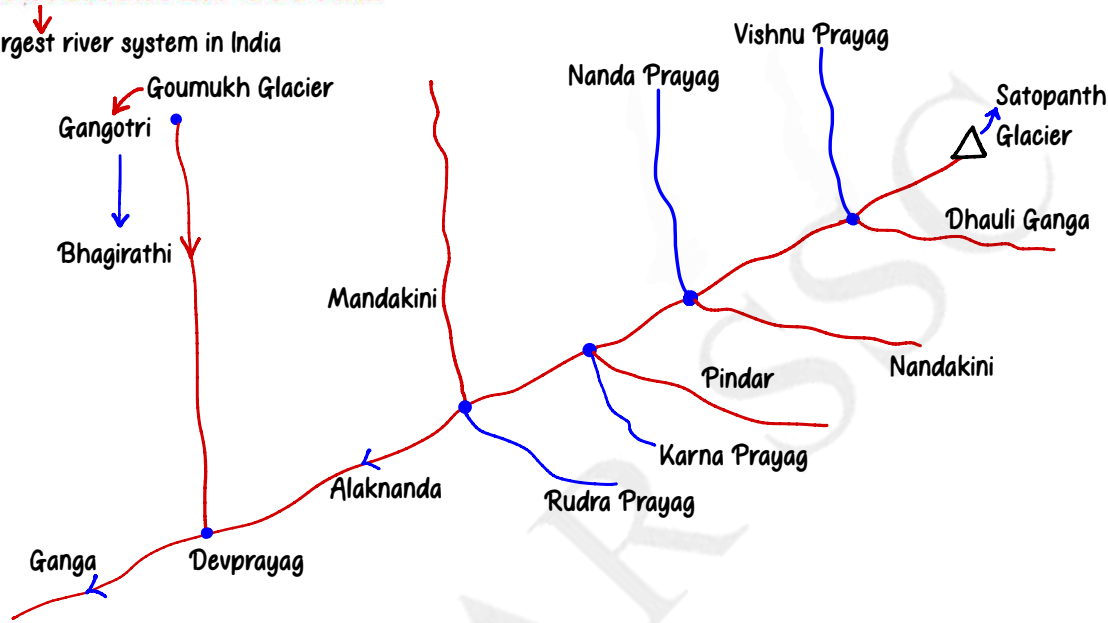
- Ancient name: Shutudri
- Origin: Rakas lake (Lake Mansarovar)
- It enters India through Shipkila pass

- Panchnad meet Indus at Mithankot, Pakistan

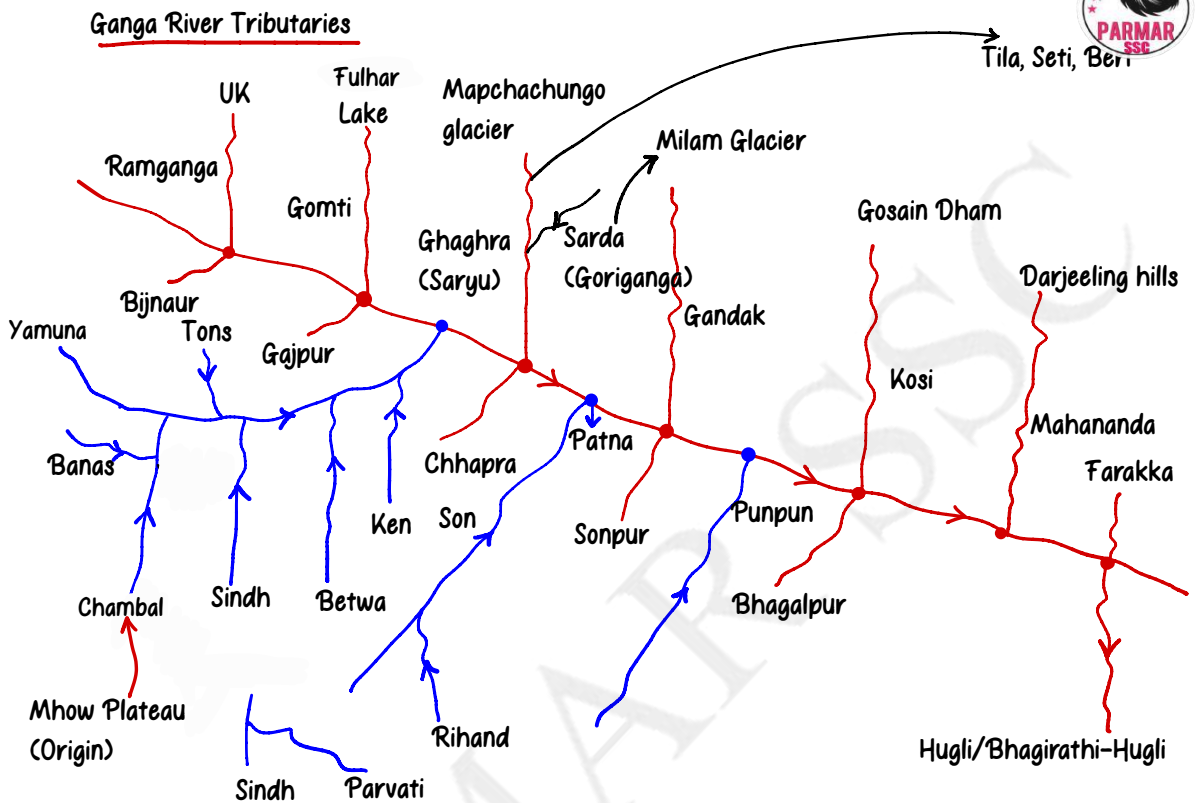
- Right Bank Tributaries: Shyok, Gilgit, Hunza

# GANGA RIVER SYSTEM

Largest river system in India




- **Prayag:** Confluence of two rivers


**Yamuna:** 1370 km

- It is the longest tributary of Ganga
- **Tributaries:** Chambal, Sindh, Betwa, Ken, Tons

**Origin:** Mhow Plateau

Badland Topography due to Ravines (gully erosion)

**Tributaries:**

- Parbati
- Kalisindh
- Shipra

**Son**

- **Origin:** Amarkantak Plateau (Radial Drainage Pattern)
- **Tributaries:** Koel, Rihand
- **Punpun:** joins Ganga at Fatuha near Patna

- Ganga then flows in Bangladesh where it known as Padma
- Water from Ganga stored in bottle remains fresh due to presence Bacteriophage viruses
- Total length: 2525 km
- National River of India, declared in 2008
- Longest River of India
- Passes through 5 states: Uttarakhand, Uttar Pradesh (longest), Bihar, J&K (shortest), West Bengal

- Kosi: Sorrow of Bihar (causes flood in Bihar)

Cities located on banks of Ganga:

- Prayagraj
- Kanpur (largest)
- Varanasi
- Patna

West to East order

## BRAHMAPUTRA RIVER SYSTEM


- Brahmaputra: 2900 km
- Length in India: 916 km

Different names:

- Tibet: Yarlung Tsangpo (origin)
- Siang and Dihang: Arunachal Pradesh
- Assam: Brahmaputra
- Jamuna: Bangladesh

- Takes U-turn in Namcha Barwa
- South turn in Dhubri (Assam)
- World largest Riverine Island: Majuli Island
- Origin: Chemayungdung Glacier/Angsi Glacier
- Padma + Jamuna = Meghna

Mansarovar Lake

Manipur hills ← Barak

- World's largest Delta: Sundarbans Delta (Sundari tree)

Tributaries of Brahmaputra

- Left Bank Tributaries: Lohit, Dhansiri
- Right Bank Tributary: Dibang, Kameng, Manas, Testa, Subansiri

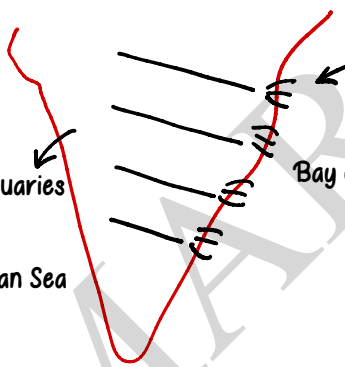
- Drainage pattern that forms central spire or dome-like structure: Radial Pattern
- Drainage pattern forms when rivers discharge their waters from all directions in lake or depression: Centripetal
- Peninsular drainage system: Mahanadi and Godavari
- When river originates from a hill and flows in all directions, the drainage pattern formed: Radial
- River that marks easternmost boundary of Himalayas: Brahmaputra
- Snow-fed river: Yamuna (origin: Bandarpuch)
- River that is also called Vyath: Jhelum
- The river Indus was also called Hindos by the the Iranians and the Greeks
- The river Ganga divides the state Bihar into two parts
- The region of Ganga lies in: 10°N to 30°N latitude
- Yamuna rises in Indian Himalayas
- Source of river Ghaggar: Himachal Pradesh
- The headwater of Ganga: Bhagirathi
- Kolkata is in banks of Hooghly river

# PENINSULAR RIVERS

## Peninsular Rivers

Categories:

1. East flowing rivers
   - Bay of Bengal (Delta)
   - flows in East due to the tilt of Deccan Plateau
     - tilt is towards East
     - East to West
2. West flowing rivers
   - Arabian Sea/Estuary

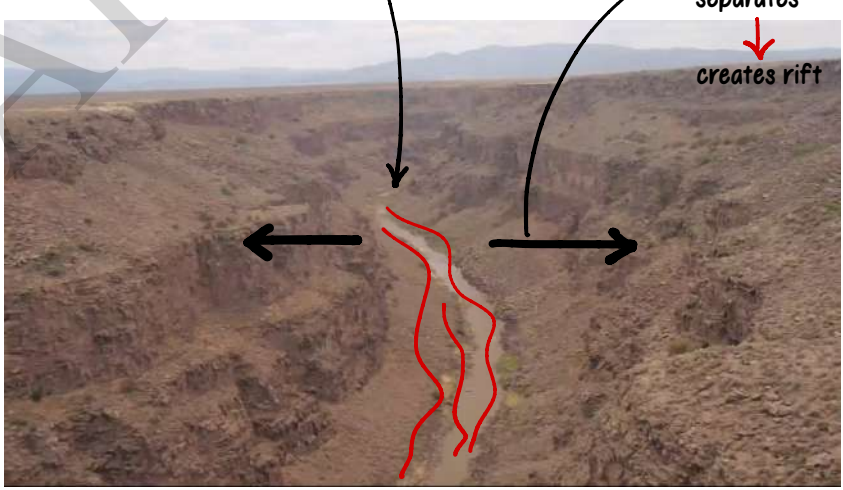


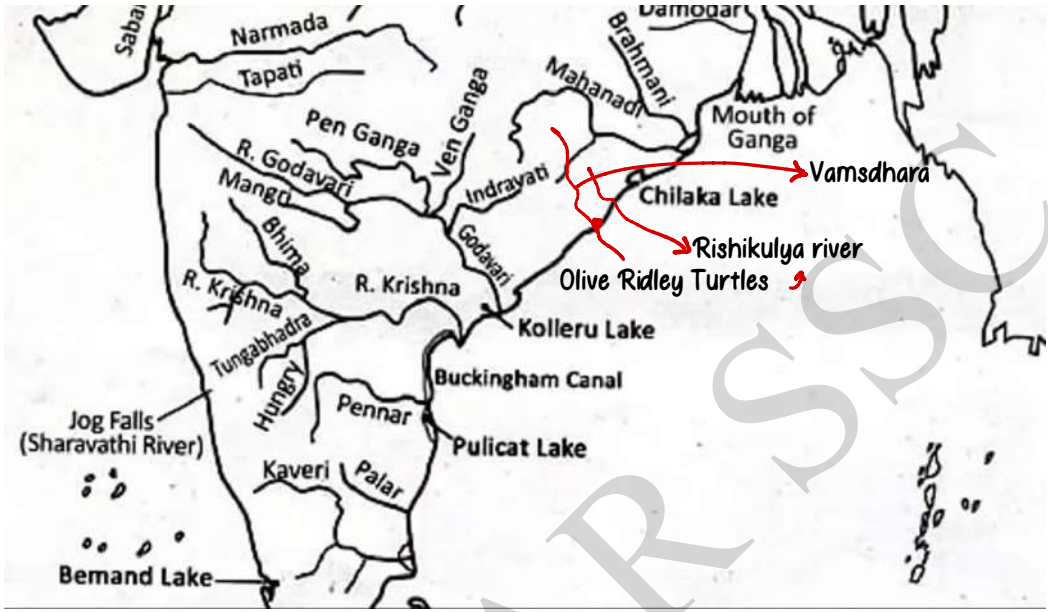

Why?

- Narrow lanes
- Hard rocks, rivers with fresh water directly meets sea water

Rivers flow in rift valley

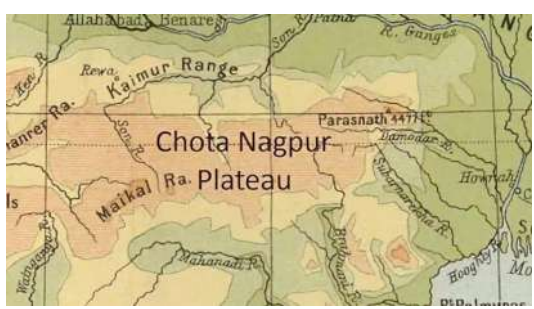
parts of land separates → creates rift






East Flowing Rivers

1. Damodar
- Chota Nagpur Plateau
- Flows in rift valley
- Tributary of Hugli → Distributary of Ganga
- Sorrow of Bengal
- Tributaries: Bokaro, Barakar, Konar




2. Subarnrekha: gold particles are seen in river
- Chota Nagpur Plateau (Randri Plateau)

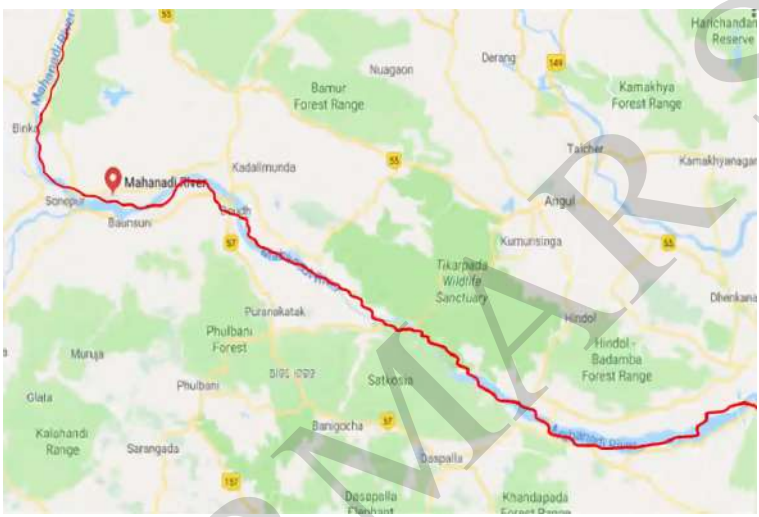
3. Baitarani

4. Brahmani → Sankha + South Koel (tributaries)

5. Vamsdhara: nesting ground for Olive Ridley Turtles

6. Mahanadi

- Length: 850 km
- Sorrow of Odisha
- Sihawa Hills (Rampur, Chhattisgarh)
- Flows mainly in Chhattisgarh + Odisha (River basin spread across Jharkhand, Maharashtra , Madhya Pradesh)
- Dam built on this river: Hirakud Dam
- Tributaries: Tel, Jonk, Ong, Hasdeo, and Mand




from Sahyadri, Western Ghats

7. Godavari

- Length: 1450 km
- Origin: Trimbakeshwar Plateau (Nasik, Maharashtra)
- Maharashtra → Telangana → Andhra Pradesh → Forms delta
- Rivers basin spread across: Chhattisgarh, Odisha, Madhya Pradesh, Karnataka
- Largest river of South India, Called as Dakshin Ganga
- Tributaries: Penganga, Wainganga, Wardha, Purna, Manjra, Indravati, Purna, Pranhita , Sabri


8. Krishna

- Length: 1400 Km → Source: Sahyadri range
- Origin: Mahabaleshwar
- Maharashtra → Karnataka → Telangana → Andhra Pradesh → Delta
- Second longest river of South India
- Tributaries: Bhima, Tungabhadra, Ghataprabha, Malaprabha, Musi, Konya, Dhoodhganga

→ TRICK

भीम तू मौसी को घाट धूध की माला

9. Pennar

- Independent flowing rivers of Andhra Pradesh

10. Kaveri

- Length: 800 km
- Origin: Brahamgiri Hills (Karnataka, Kodagu district)
- Karnataka → Tamil Nadu → Delta (Kerala)
- Only river of south India which flows throughout the year → Perennial river

Flow is like Ganga and tributaries resembles Ganga

- It is called Ganga of South India
- Tributaries: Hemvati, Kabini, Bhavani, Shimsha
- Delta: known as Garden of South India


10. Vaigai: Southern-most river of India


→ West Flowing River
Flows into Arabian Sea

1. Luni River
2. Sabarmati
3. Mahi
4. Narmada
5. Tapti

1. Luni River

- Origin: Nag Hills, Rajasthan
- Flows through: Rajasthan → Gujarat
- Only river that contains saline water
- They don't reach up to oceans and ends in Rann of Katchh

2. Sabarmati

- Origin: Aravalli mountains (Udaipur, Rajasthan)
- Flows through: Rajasthan → Gujarat
- Gandhinagar and Ahmedabad are located on its bank

3. Mahi

- Origin: Vindhya mountains
- Flows through: Madhya Pradesh → Rajasthan → Gujarat → Gulf of Khambhat
- This crosses Tropic of Cancer two times

4. Narmada

- Length: 1310 km
- Longest Western River flowing into Arabian Sea
- Origin: Amarkantak Plateau, Madhya Pradesh
- Flows through: Madhya Pradesh → Gujarat → Gulf of Khambhat
- Flows in rift valley, flows b/w Vindhya and Satpura
- Jabalpur is located on its bank
- Tributaries: Banjar, Tawa, Shakkar, Halon

5. Tapti

- Length: 724 km
- Origin: Betul Plateau, near Amarkantak Plateau (Madhya Pradesh)
- Surat is located on its bank
- Tributaries: Aner, Gomai, Girna, Purna

→ Goa

Rivers:

- Zuari
- Mandovi known as Lifeline of Goa, Panaji is located on its bank

→ Kerala

Rivers:

- Bharatphuza
- Periyar known as life line of Kerala, Longest river of Kerala
- Pamba drains into Vembanad lake

→ Karnataka

Rivers:

- Kalinadi and Sharavati

  ↓

  Jog falls

- Source of river of Ghaggar: Himachal Pradesh
- Kaveri is known as "Pooni" in Tamil, fourth largest river flowing in Southeast direction through Karnataka and Tamil Nadu
- Does not drain into Bay of Bengal: Indus
- Headwater of river Ganga: Bhagirathi
- Allahabad: located on the confluence of river Yamuna and Ganga
- Decommissioned Havelock bridge built over: Godavari
- State that has largest catchment area of Godavari Basin: Maharashtra
- River that cover an area of 65,145 $km^2$ of which 80% lies in Maharashtra: Godavari

- Mahanadi basin doesn't extend to: Uttar Pradesh
- Second longest river of India that covers 10% of the country's area: Godavari
- River basin in Odisha: Mahanadi
- Sundarban Delta is created by Ganga–Brahmaputra rivers
- Tapti empties in Gulf of Cambay of the Arabian Sea, in state of Gujarat
- City not located on banks of river Ganga: Hazaribagh
- Cities that does not lie on the path of river Ganga: Lucknow
- Gandak river comprises of two rivers: Kaligandak and Trishulganga
- Wang Chu river is tributary of Brahmaputra and flows through Bhutan
- Branch of Godavari that joins Bay of Bengal flowing through Yanam enclave of the Union territory of Pondicherry: Gautami
- Mouth of Indus River lies to the north of the Tropic of Cancer
- Only large river in the Indian Desert: Luni River
- Ghagra rises in Nepal Himalayas
- The largest Amazon river, is the 2nd longest river in the world, with a length of 6,400 km is located in the northern part of South America

Flows through Venezuela, Brazil, Peru, Bolivia, Ecuador, Guyana, Suriname

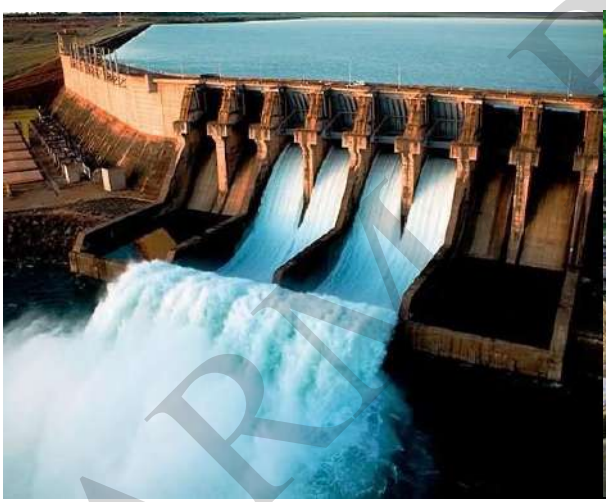
- Longest river of the world: Nile called as Boon of Egypt
- The city of Sanghai is located at the mouth of the Yangtze River

Only river that flows through one country

World's 3rd longest river

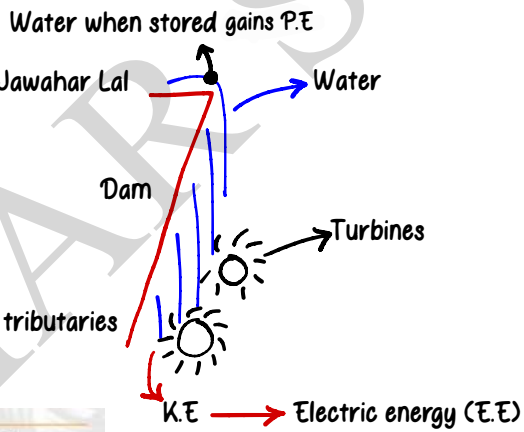
- River that cuts Tropic of Capricorn twice: Limpopo river
- River that cuts Equator twice: Congo river
- Gharials are seen in Chambal River
- Rank on the basis of Basin/Water discharge:
  1. Amazon
  2. Congo
  3. Ganga → Dolphins are found here
- Great rift valley is in Africa

# DAMS, LAKES, WATERFALLS



## Hydroelectric Power Projects

- **Multipurpose Project**
  **Purpose**: Flood control, hydropower generation, irrigation, tourism
- M.E = P.E + K.E
- **Potential Energy (P.E)**: P.E is the energy that is stored in an object in an object due to its position relative to some zero position
- **Kinetic Energy (K.E)**: form of energy that shows an object or a particle has by reasoning of its motion




- Mentioned as "Temple of Modern India" by Jawahar Lal Nehru

### 1. Damodar Valley Project

- India's first river valley project (1948)
- It is based on the Tennessee River of USA
- There are 8 dams built on Damodar and its tributaries

| | | |
|---|---|---|
| Maithon | Jharkhand | Borakar River |
| Tilaiyah | Jharkhand | Borakar River |
| Panchet | Jharkhand | Damodar |
| Konar | Jharkahnd | Konar |

- Another type of Dam: Earthen Dam

### 2. Bhakra Nangal Project

- Constructed during First Five Year Plan
- Built on Sutlej river
- Made of two dams:
- Bhakra: Himachal Pradesh (Govind Sagar Lake from Bhakra Nangal Dam)
- Nangal: Punjab
- Highest Gravity Dam → bears forces on its own
- Largest Dam of India in terms of area
- Nathpa Jhakri Dam is also built on Sutlej in Himachal Pradesh

## Dams

### 1. Rihand Dam

- Built on Rihand river (Tributary of Son)
- Govind Ballabh Pant Sagar Lake created from this dam
- Largest Artificial Lake of India

### 2. Hirakud Dam

- In Odisha, Sambalpur district
- Built on Mahanadi river
- Longest dam of world/India (4.8 km/25 km)

### 3. Tehri Dam

- In Uttarakhand
- Built on Bhagirathi river
- Highest Dam of India (261 m)

- Sunderlal Bahuguna
  - Chipko Movement: against deforestation
  - Anti-Tehri Movement

### 4. Farakka Dam

- In West Bengal, built on Ganga river
- This dam was built to provide water to the Hooghly river

### 3. Vyas River Project

- Harike Dam was built through this project in Punjab (Kapurthala)
- Sutlej and Vyas meets here
- An Indira Gandhi Canal was constructed from it
  - Has the largest irrigation facility

## State-wise

### Jammu and Kashmir

- Dulhasti Hydroelectric Project
- Salal Hydroelectric Power Station

All on Chenab river

- Chenab Rail Bridge
  - highest railway bridge is constructed on Chenab river near Salal hydroelectric project

- Baglihar Hydroelectric Project → On Chenab river

- Kishan Ganga
- Tulbul
- Uri

All on Jhelum river

## Himachal Pradesh

- Pong Dam (Maharana Pratap Sagar): Beas river
- Chamera Dam: Ravi river

## Uttar Pradesh

- Matatila Dam
- Lakshmibai Dam

Betwa river

- Rihand Dam: Rihand river (Govind Ballabh Pant Sagar Reservoir)

## Gujarat

- Ukai Dam: Tapi river
- Kakrapar Dam: Tapi river
- Sardar Sarovar Dam: Narmada river

## Madhya Pradesh

- Tawa Dam: Tawa river (tributary of Narmada)
- Ban Sagar Dam: Son river
- Omkareshwar Dam: Narmada river
- Indira Sagar Dam: Narmada river
- Gandhi Sagar Dam: Chambal river

## Rajasthan

- Mahi Bajaj Sagar Dam: Mahi river
- Bilaspur Dam: Banas river
- Rana Pratap Sagar Dam: Chambal river
- Jawahar Sagar Dam (on Chenab river)

## Maharashtra

- Jayakwadi Dam: Godavari river
- Dhom Dam: Krishna
- Koyna Dam (largest dam of Maharashtra): Koyna river
- Panchet Dam: Damodar river

## Chhattisgarh

- Indravati Dam: Godavari river

## Karnataka

- Jog/Mahatma Gandhi Dam: Sharavati river
- Linganamakki Dam: Sharavati river
- Shivsamudram Dam: Kaveri river
- Almatti Dam: Krishna river

## Kerala

- Periyar/Mullaperiyar/Idukki Dam: Periyar (life line of Kerala) → Many dams are constructed on it

## Telangana

- Pochampad/Sriram Sagar/Kaleshwaram Lift Irrigation Project : Godavari river

## Tamil Nadu

- Pykara Dam: Pykara river
- Mettur Dam: Kaveri river

## Andhra Pradesh

- Srisailam Dam
- Nagarjuna Sagar Dam

| Krishna river

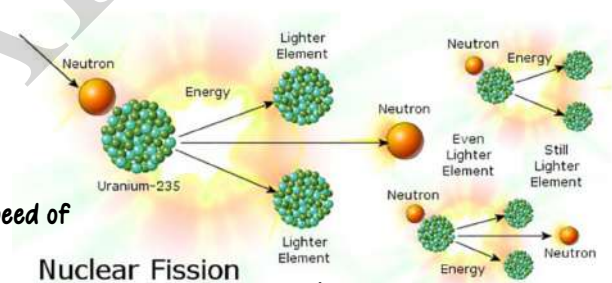
## Waterfalls in India

### Some Important Waterfalls of India
### भारत के कुछ महत्वपूर्ण जलप्रपात :-

| Name (नाम) | River (नदी) | State (राज्य) |
|---|---|---|
| Kunchikal (Highest waterfall 455 ~~km~~ m) | Varahi | Karnataka |
| Jog / Gersoppa / Mahtma Gandhi /2nd highest waterfall in India | Sharavati | Karnataka |
| Shivsamundram | Kaveri | Karnataka |
| Chulia | Chambal | Rajasthan |
| • Dhuandhar<br>• Kapildhara | Narmada | Madhya Pradesh |
| Hundru | Swarnrekha | Jharkhand |
| Dudh Sagar | Mandvi | Goa |

- Highest waterfall in the world: Angel waterfall in Venezuela
- 2nd highest in the world: Niagara Falls (in USA-Canada border)
- Niagara of India: Chitrakote waterfall in Chhattisgarh

- Nuclear Power Plants: where energy is generated through Nuclear Fission, in which Uranium and Thorium atoms are used, during nuclear fission, a neutron collides with such atoms and splits it, releasing a large amount of energy in the form of heat and radiation



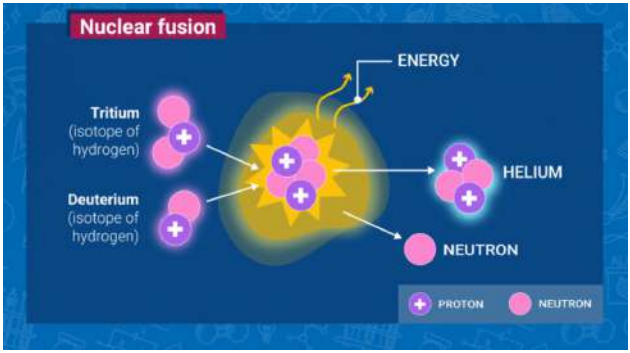

→ becomes self-sustaining

or to reduce the speed of neutrons

Heavy water

→ chain reaction

- Moderators later used to control chain reactions: $D_2O$, Graphite
- Coolant: typically liquid to reduce or regulate the temperature of a system, for example: $H_2O$, $D_2O$, liquid Sodium




- Concept used in making Hydrogen Bombs
- Homi J. Bhabha is known as the "Father of Indian Nuclear Programme"/"Father of Atomic Energy"
- India's first nuclear power reactor: Apsara (Trombay, Mumbai, 1956)
- 1st completely indigenously built nuclear power plant: Kalpakkam

$^{232}_{92}U$ (Uranium + Thorium)

## Nuclear Power Plants of India
## भारत के परमाणु ऊर्जा संयंत्र :-

| Name | Location | Capacity |
|---|---|---|
| Tarapur Atomic Power Station – 1969 | Maharashtra | 1,400 |
| (Rwatbhata)Rajasthan Atomic Power Station – 1973 | Rajasthan | 1180 |
| (Kalpakkam) Madras Atomic Power Station – 1984 | Tamil Nadu | 440 |
| Narora Atomic Power Station- 1991 | Uttar Pradesh | 440 |
| Kakrapar Atomic Power Station – 1993 | Gujarat | 440 |
| Kaiga Nuclear Power Plant -2000 | Karnataka | 880 |
| Kudankulam Nuclear Power Plant – 2013 | Tamil Nadu | 2000 |

1st

1st indigenously built

- Chernobyl Disaster: 26 April 1986

## Lakes of India

- An artificial lake named Govind Sagar was created in 1976 by a huge hydroelectric power dam in Bhakra on the Sutlej river
- Pushkar Lake is situated in Ajmer, Rajasthan
- Lake that is the result of Asteroid impact: Lonar Lake in Maharashtra
  - → Crater lake
- Wular Lake: largest freshwater lake in India, also the result of tectonic activity
- Barapani Lake: Also known as Umiam Lake, in Shillong, Meghalaya
- Tsomgo lake is a glacial lake located in Sikkim
- Bhushi lake is in Maharashtra
- Bhojtal, formerly known as Upper lake is situated in Madhya Pradesh
  - constructed by Raja Bhoj (Parmar Dynasty's most famous and powerful ruler) → Also established Bhopal city
- Anchar lake is in Jammu and Kashmir
- Kolleru lake is located in Andhra Pradesh, situated delta that is formed between Godavari and Krishna
- Pulicat lake: b/w Andhra Pradesh and Tamil Nadu, India's 2nd largest Brackish water lake
- Largest Brackish water lake: Chilika Lake
  - → 1st Ramsar site
  - fresh water+salt water
  - → largest saline water lake
- Largest Inland Salt water lake: Sambhar lake, Rajasthan
  - salinity more than Chilika but area less than Chilika
    - Odisha
- Renuka lake located in Himachal Pradesh
- Loktak lake: world's only floating lake in Manipur

- Suryadhar lake is located in Uttarakhand
- Pangong Tso, Tso kar, Tso Moriri: Salt water lake
  - in Aksai Chin border
- Sur Sarovar, also known as Keetham lake, is a man-made reservoir added to list of Ramsar
- Site in the year 2020
- Kanwar Tal in Bihar: Ramsar Site, 2022
  - largest Ox bow lake
- Thol lake, Gujarat: Ramsar Site, 2021
- Wadhwana wetland, Gujarat: Ramsar Site, 2021
- Nizam Sagar Dam located in Telangana on Manjira river
  - by Hyderabad Nizam
- Nagarjuna Sagar Dam is on Krishna river
- Barrage/Dam closest to India-Bangladesh border: Farakka Barrage
- Maithon Dam in Jharkhand constructed over Barakar river
- Diamer Basha Dam is constructed by Pakistan on Indus River
- Tawa Dam: Madhya Pradesh
- Ujjani Dam: Maharashtra
- Isapur Dam is in Maharashtra on Penganga river
- Tehri Dam is multi-purpose rock and earth-fill embankment dam on the Bhagirathi river

- Ramsar, Iran Convention in 1971 on wetlands
- Schemes launched for Wetland and Mangrove Conservation on World Environment Day:
  1. Amrit Dharohar Yojana
  2. MISHTI (Mangrove initiative for Shoreline Habitats and Tangible Incomes)

- Thein Dam is on Ravi river, also called as Ranjit Sagar Dam
- Hundru waterfall in Subarnarekha river
- Kunchikal waterfall, highest waterfall in India is on Varahi river
- Dudhsagar waterfall is in Goa
- Bhambavli Vajrai Waterfall is located in Maharashtra, Satara district
- Khandadhar waterfall: Odisha
- Chulia waterfall is situated on Chambal river in Rajasthan
- Duduma waterfall is in Odisha
- Gokak waterfall is in Ghatprabha river (tributary of Krishna) in Karnataka

# MONSOON/FORESTS

- Factors affecting climate of India
  1. Latitude
  2. Altitude
  3. Pressure and wind system
  4. Relief features
  5. Ocean Currents
  6. Distance from Sea

- Climate: the average weather in a given area over a longer period of time. Data taken of 30 years

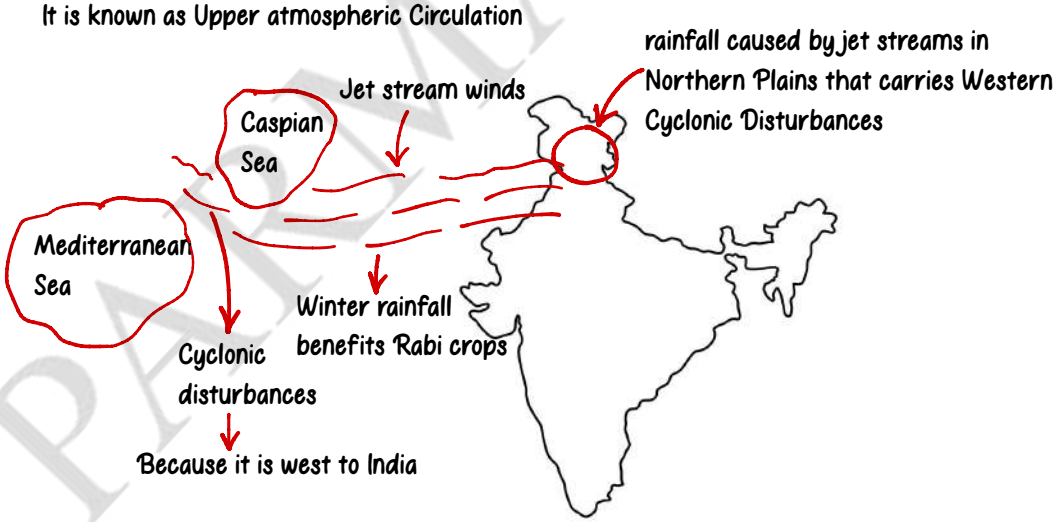
- Weather: the term refers to temporary conditions of the atmosphere, including temperature, atmospheric pressure, wind, humidity, precipitation, and cloud cover

Winter Season

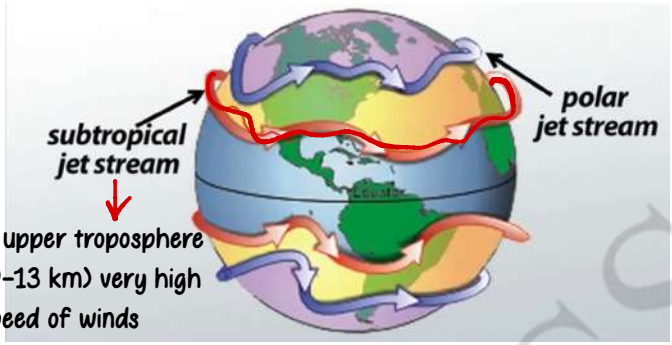
Chilling winds from Arctic/Central Asia affects winter season

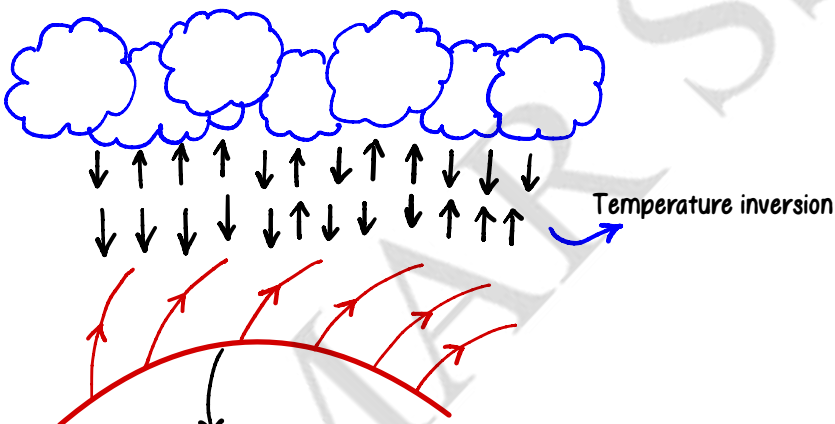
Winter Rainfall

It is known as Upper atmospheric Circulation




Inward of Western Disturbances through jet streams is marked by increase in prevailing night temperature

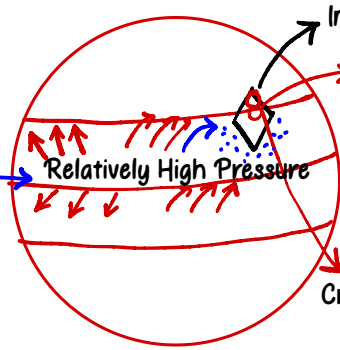



## Summer Season

ITCZ now shifts in upper region

- Trade winds meet and air ascends
- During July: 20°–25°N




India

Summer rays over Tibetan Plateau

Also in Indian Peninsula

Intense heating

Creates low pressure

## Pre-Monsoon Showers

### Nor-Westers

- **Kal Baisakhi**
  - Calamity in the month of Baisakh in West Bengal
  - helpful for growth of jute, tea
- **Bardoli Chheerha**
  - In Assam

### Blossom Showers

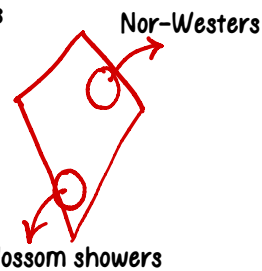
Seen in Kerala/ Karnataka

Helps in growth/cultivation of coffee

### Mango Showers

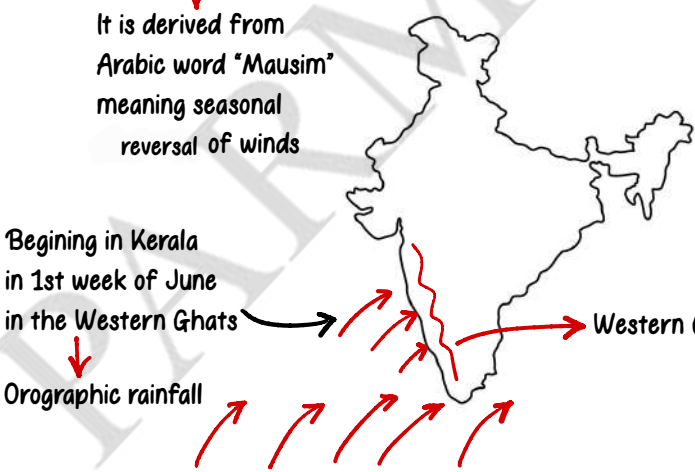
Seen in Kerala

Helps in early ripening of mangoes




## On Set of Monsoon

It is derived from Arabic word "Mausim" meaning seasonal reversal of winds

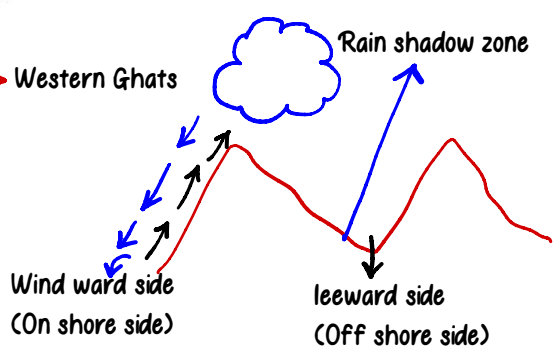


Begining in Kerala in 1st week of June in the Western Ghats

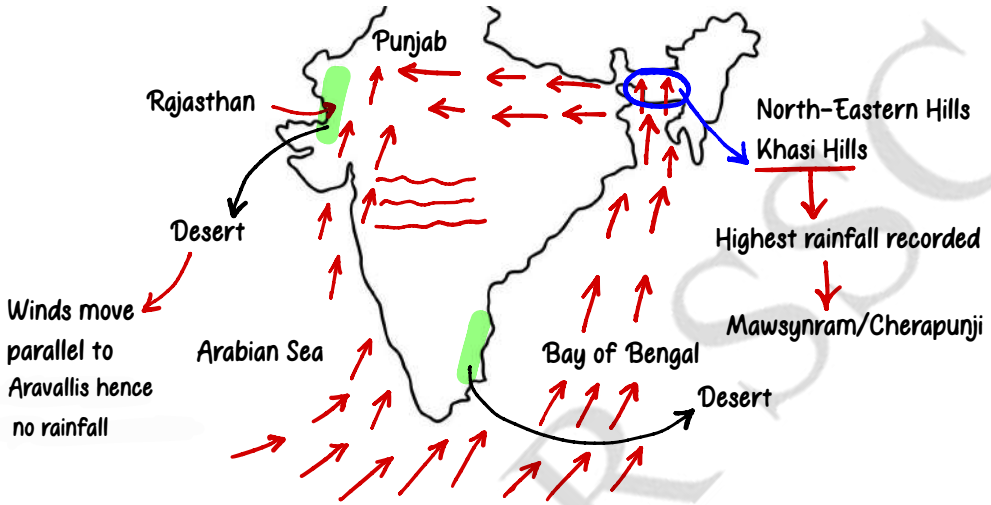
Orographic rainfall

Winds from South West direction

Western Ghats



## Rain Bearing System




- Bay of Bengal branch and Arabian Sea branch of South West Monsoon meet at Punjab

**Break in Monsoon**

↓

Sudden decrease in rainfall after the onset of monsoon

**Retreating monsoon**

↓

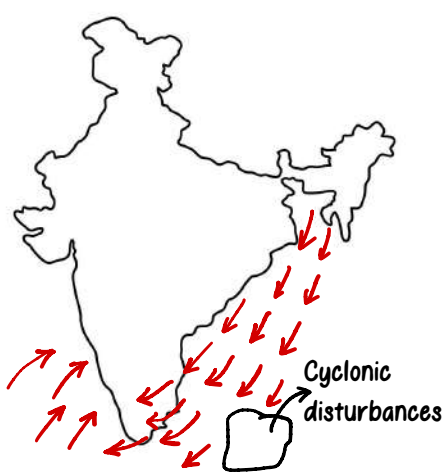
Also known as North-East Monsoon and it causes rainfall over Coromandel coast (Tamil Nadu/Andhra)

↓

Flood in Chennai

**In North India**

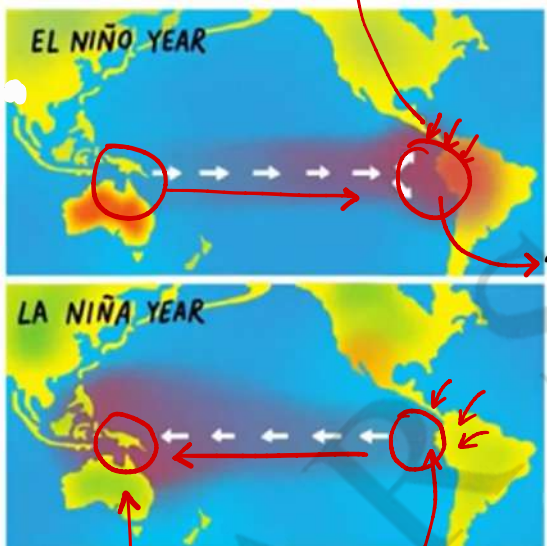
- Clear skies
- October heat: oppressing heat



Effect of El-Nino in Monsoon

- Seen in 3-7 yrs
- Adversely affects the monsoon

North East winds weakens thus water returns




Rainfall

Warm current

Ocean Water

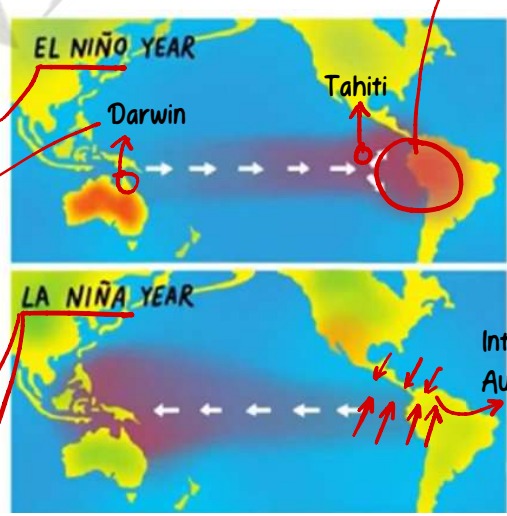
Surface water

Deep water

Fishing Industry won't flourish

No rain in Australia and India

Meaning: Child Christ/Small boy




- They measure the pressure difference b/w Tahiti and Darwin
- If the pressure difference is negative then El Niño will happen

Intense rainfall in Australia and India

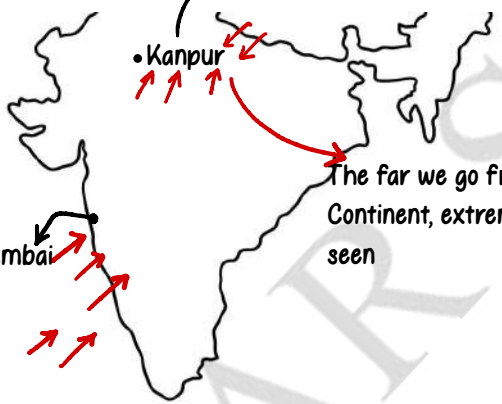
Meaning: Small girl

Opposite to that of El Nino

Variation in Temperature/Rainfall

1. Diurnal Range of Temperature
2. Annual Range of Temperature
3. Annual Range of Rainfall

More in the interior of Continents and less in the the coastal cities




Extremities of Climate not seen

Because it is a coastal city.

Why?

1. Continentality effect
2. Moderating influence of Sea

Seasons and Months

| *Seasons* | *Months (According to the Indian Calendar)* | *Months (According to the Indian Calendar)* |
|---|---|---|
| Vasanta | Chaitra-Vaisakha | March-April |
| Grishma | Jyaistha-Asadha | May-June |
| Varsha | Sravana-Bhadra | July-August |
| Sharada | Asvina-Kartika | September-October |
| Hemanta | Margashirsa-Pausa | November-December |
| Shishira | Magha-Phalguna | January-February |

Forests

1. Evergreen Forests → Eastern Himalayas

- These are layered forests (shed there leaves not all together)
- They are seen in places of high temperature and high rainfall

30°C ↑ 200 cm ↑

- In India, seen in Western side of Western Ghats, Andaman and Nicobar Islands, North-East
- Highest biodiversity seen here
- Eg: Amazon Rainforests (known as "Lungs of the World ")

- Vegetation seen: Rosewood, Ebony, Mahogany, Cinchona, Aini, Epihytes
- Also known as Desert covered by forest

2. Tropical Deciduous Forest

- Rainfall: 70 cm-200 cm
  - 70-150 cm: Dry Deciduous
  - 150-200 cm: Moist Deciduos

- Also known as Monsoon Forests
- These are the most predominant forests in India
- They are seen in: Peninsular Plateaus, North Indian Plains
- Trees:

  Moist Deciduous: Shisham, Sagon, Sandalwood, Teak, Sal

  Dry Deciduous: Tendu, Khair, Palas

  ↓

  Leaves are used to make Bidi

- Guttation: Hydathodes

3. Tropical Thorn Forests

- Rainfall: less than 50 cm
- Thorns are modified form of leaves (to avoid water loss)
- Trees: Babul, Khejri, Cactus
- Special type of grass seen here: Tussocky grass
- In India: seen in Rajasthan, Punjab, Gujarat

4. Coniferous Forest

- Shape: Cone
- Seen in areas of high snowfall
- In India: seen in Upper Himalayas
- Trees:

Softwood trees: Chir, Pine, Cedar, Deodar, Spruce → Gymnosperms

target: 33% (India)

- National Forest Policy: 1952 → 1988
- Chipko Movement: 1978, led by Sundarlal Bahuguna
- Forest Day: 21st March
- Indian Forest Research Institute located in Dehradun, Uttarakhand

5. Montane Forests

- In mountain region
- Categories:

1. North India: seen in Himalayas → Bugyal Grassland seen

a. Upper part: Alpine/Coniferous m, eg: Rhododendron

b. Lower part: Deciduous forests

2. South India

Evergreen forests seen here due to rainfall

Sholas seen here → Grassland/Forests of Western Ghats

India State Forest Report: tells about the total Forest cover in India

- Biennial Report
- Forest Cover: 21.71%
- Tree Cover: 2.9%
- Forest and Trees: 24.62%

→ 2021 report

- Highest Forest cover (area): Madhya Pradesh (1st), Arunachal Pradesh (2nd)
- Highest Forest cover (%): Mizoram (1st), Arunachal (2nd)
- Lowest Forest cover: Haryana
- Highest increase: Andhra Pradesh
- Highest decrease: Arunachal > Manipur

6. Mangrove Forests

- Known as Littoral/Swamp forests
- Seen in coastal areas
- More in Sundarban Deltas → Sundari Trees
- Region: West Bengal
- They are called living roots
- Trees are viviparous

Elephant grass but not nutritious

**Grasslands**

Small grass but nutritious

Tropical grasslands

1. Savannah: in Africa
2. Campos grassland: Brazil
3. Llanos grassland: Venezuela

Known as Big Game country due to extreme poaching of animals

Temperate grasslands

1. Prairies: North America
2. Steppes: Asia/Europe
3. Velds: South Africa
4. Downs: Australia
5. Pustaz: Hungary
6. Canterbury: New Zealand
7. Pampas: Argentina

- Prairies: Known as wheat granaries of the world
- Pampas: grass seen "Alpha alpha grass" → nutrient rich grass

## Shifting Cultivation

- It is known as Slash and Burn Agriculture
- Not good for environment, causes deforestation and soil loses it's productivity

## Across the world known by different names:

1. Indonesia: Ladang
2. Mexico: Milpa
3. Sri Lanka: Chena
4. Vietnam: Ray
5. Brazil: Roca
6. Venezuela: Konuko

## Across the India

1. Jhum: North East
2. Kumari: Western Ghats
3. Pama Dabi/Bringa: Odisha
4. Penda/Podu: Andhra Pradesh
5. Dipa: Chhattisgarh (Bastar district)
6. Waltre: Rajasthan
7. Kuruwa: Jharkhand
8. Bewar/Dahiya: Madhya Pradesh

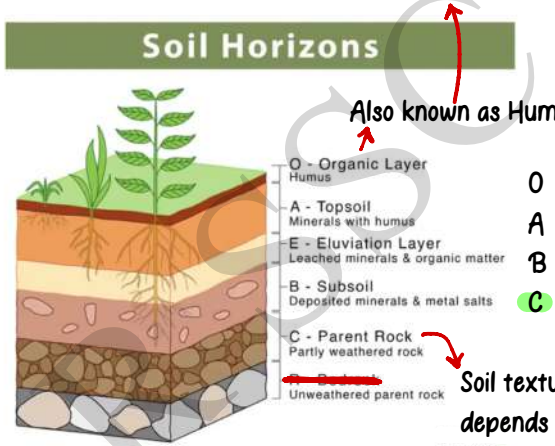
# SOIL AND NATIONAL PARKS/ BIOSPHERE RESERVES

# Soil

## Factors for the formation of soil:

1. Parent Rock
2. Climate
3. Time
4. Topography

a. 1 & 2
b. 1, 2, 3
c. All
d. 1, 3, 4




Weathering is an in situ process

- Study of Soil: Pedology

- ICAR: Indian Council of Agricultural Research
- HQ: New Delhi
- This institute has categorised soil into 8 categories
- Indian Soils lack: $N_2$, P, Humus (organic matter)

## Categories:

1. Alluvial soil: 40%
2. Red soil: 18%
3. Black soil: 15%
4. Laterite soil: 4.3%
5. Desert soil
6. Montane soil
7. Marshy/Peaty soil
8. Alkaline soil

more imp**

### 1. Alluvial Soil

Uttar Pradesh, Bihar, West Bengal, Assam

- Covers 40% area of India (In India, most fertile type of soil)
- Found in Northern Plains + Deltas of Peninsular rivers
- Rich in Potash and poor in Phosphorus

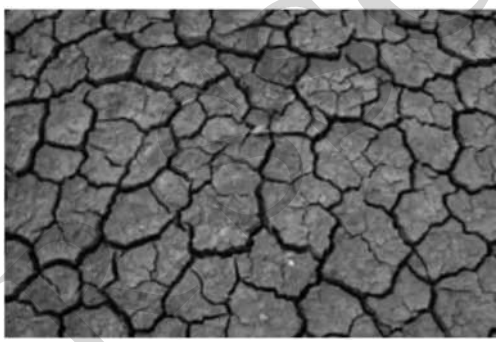
- Formed due to sediments deposited by rivers

They are of two types:

1. Khadar: New Alluvium, more fertile
2. Bhangar: Old Alluvium, less fertile

2. Black Soil (15%)

- It is formed due to eruption of lava
- Found in North Western part of Peninsular Plateau
  - Maharashtra, Gujarat
- Also known as Regur
- Clayey in nature
- It is impermeable soil (high water holding capacity)
- It develops cracks when dry and sticky when moist
  - ↓
  - Self-ploughing characteristics
- Most suitable soil for cotton cultivation
  - ↓
  - requires 210 frost free days
- They are rich in Iron, lime, Alumina



- Loamy Soil: sand content is more

3. Red Soil (18%)

- Formed by the weathering of the metamorphic rock
- It is red due to presence of Iron Oxide
- Changes colour to yellow on hydration
- It is found in water deficit region: Karnataka, Tamil Nadu, Maharashtra, Piedmont Zone of Western Ghats
- In low rainfall areas

4. Laterite Soil (4.3%)

- It is formed by leaching process (where important minerals such as Silica washes away with the soil)
- Found in regions of high temperature and high rainfall
- It is known as Brick Soil

- Good for Cashew growth and cultivation
- Found in Tamil Nadu, Andhra Pradesh, Kerala

5. Marshy/Peaty Soil

- Seen in coastal areas
- Has organic matter/humus
- It is seen in regions of high humidity and high rainfall

6. Desert Soil

- Seen in extremely low rainfall areas (<50 cm): Western Rajasthan, Gujarat, Haryana

7. Montane/Forest Soil

- High humus is seen

| National Parks | Biosphere Reserves |
| --- | --- |
| • Fixed boundary | • Fixed boundary |
| • Limited human activity allowed | • Human activity is allowed to a certain level |
| • Protects flora, fauna, landscape | • It has three zones:<br>  - Core<br>  - Buffer<br>  - Manipulation |

## National Parks

### Assam

Manas → Manas NP

Na Meri → Nameri NP

Kazi → Kaziranga NP

करवादी मेरी शादी → Dihang NP

Aurang → Orang NP

Sheikh → Dibru Saikhowa NP

के साथ → Famous for One-horned Rhino

- Raimona National Park (notified in 2021)
- Dihing Patkai National Park (notified in 2021)

### West Bengal

WB की

Jalpari → Jaldapara NP

Nora → Neora Valley NP

Single → Singalila NP

है और

बड़ी सुंदर → Sunderban NP

और

गोरी → Gorumara NP

है लेकिन

Boxer → Buxa NP

है

### Madhya Pradesh

MP के

Sanjay → Sanjay Gandhi NP

और

माधव → Madhav NP

अपने

Bandhu → Bandhavgarh NP

कान्हा → Kanha NP

से मिलने

Paanch → Pench NP

पैसे लेकर

Paan → Panna NP

रवाकर

Monday → Mandla Plant Fossil NP

को

Saat → Satpura NP

वजे

Van → Van Vihar NP

से पहुंचे

## Rajasthan

Raja → Mukundra Hills NP

Mukund

is

Running → Ranthambore NP

in

Saree → Sariska NP

in

Desert → Desert NP → Great Indian Bustard (state animal)

लेकिन क्यो ? → Keoladeo NP

## Uttar Pradesh

UP के Pilibhit → Pilibhit Tiger Reserve

के Nawab → Nawab gang Bird Sanctuary

को बेटी Chandraprabha → Chandra Prabha WS

को Chambal → Chambal WS

के किनारे Dudh → Dhudhwa NP

से

# नहाते हुए देखा गया

## Uttarakhand

1. Jim Corbett NP: India's first NP, estd. in 1936, Project Tiger 1973 started from here
   - Old names: Hailey's National Park → Ramganga NP
2. Rajaji NP
3. Nanda Devi NP
4. Valley of Flower NP
5. Gangotri NP

- Project Elephant: 1992

## Gujarat

Gujarat मे Meri → Marine NP  Black → Blackbuck NP  Van → Vansda NP  Beach पर

Gir माई → Gir NP → Famous for Asiatic Lions

## Himachal Pradesh

1. Pin Valley NP
2. Simbalbara NP
3. Great Himalayan NP
4. Khirganga NP
5. Inderkila NP

**Jammu and Kashmir, Ladakh** — State animal: Snow Leopard

1. Hemis NP: largest National Park
2. Salim Ali NP
3. Dachigam NP
4. Kishtwar NP

- Salim Ali Bird Sanctuary: Goa

**Kerala**

1. Eravikulam NP
2. Periyar NP
3. Silent Valley NP

**Tamil Nadu**

1. Annaimudi NP
2. Mudumalai NP
3. Guindy NP
4. Indira Gandhi NP
5. Gulf of Mannar NP
6. Palani NP

**Karnataka**

1. Rajiv Gandhi NP (Nagarhole NP) → राजीव नगर के कूड़े का एक अंश भी बैंन है।
2. Kudremukh NP
3. Anshi NP
4. Bannerghatta NP

**Sikkim**

1. Kanchenjunga NP

**Bihar**

1. Valmiki Tiger Reserve

**Odisha**

1. Bhitarkanika NP
2. Simplipal NP

**Jharkhand**

1. Palamu NP
2. Betla NP

**Chhattisgarh**

1. Indravati NP
2. Kanger Valley NP
3. Guru Ghasidas NP

**Manipur**

famous for Sanghai Deer

1. Keibul Lamjao NP (World's only floating NP on Loktak Lake)

## Biosphere Reserves

- Total: 18
- 12 UNESCO Biosphere Reserves: Man and Biosphere programme (MAB), 1971


- Nilgiri Biosphere Reserves: 1st Biosphere Reserve to be included under MAB
- Largest: Great Rann of Kutch

- Under UNESCO, MAB:
  1. Nilgiri – Extended to 3 states → Kerala, Tamil Nadu, Karnataka
  2. Gulf of Mannar
  3. Sundarban
  4. Nanda Devi
  5. Nokrek
  6. Panchmarhi
  7. Simplipal
  8. Achanakmar-Amarkantak (Chattisgarh-Madhya Pradesh border
  9. Great Nicobar
  10. Agasthyamalai → Added under MAB in 2018
  11. Kangchenjunga – Highest mixed first World Heritage
  12. Panna (latest added)

- National Commission on Agriculture (1976) of India has classified forestry into 3 categories:
  1. Urban Forestry
  2. Rural Forestry
  3. Farm Forestry

- In 1972, West Bengal Forest Department recognised its failures in reviving Sal forests in South Western districts of the State

- Coringa is a beautiful Mangrove forests where the Godavari joins the backwaters of Bay of Bengal (Godavari and in backwaters of Bay of Bengal)

- Littoral forests (Mangrove forests): Sundari trees

- Nallamala range of Forests: Andhra Pradesh–Telangana

- Moist Tropical Forests: Bamboo, epiphytes, Aini, semul, gutel and mundane

- Mid latitudinal coastal region: Temperate Evergreen Forest

- Hubbardia heptaneuron: a species grass which is on the verge of extinction due to its insensitivity towards the environment

- Temperate grasslands: ideal for wheat

- Roaring forties: other names — Shrieking sixties, furious fifties
  It's in Southern Hemisphere because of less landmass
  Westerlies in SH

- Largest tropical rainforest in the world: Amazon

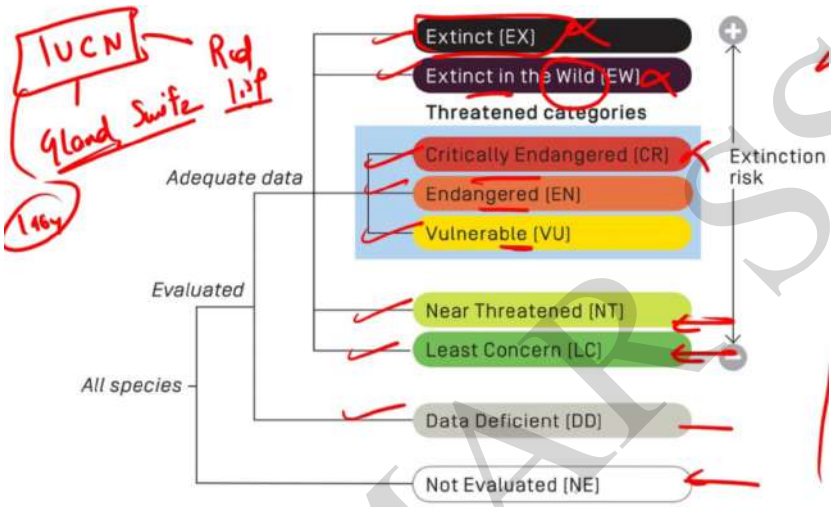
- Artificial ecosystems: Garden

- Biotic component of an ecosystem: Wind

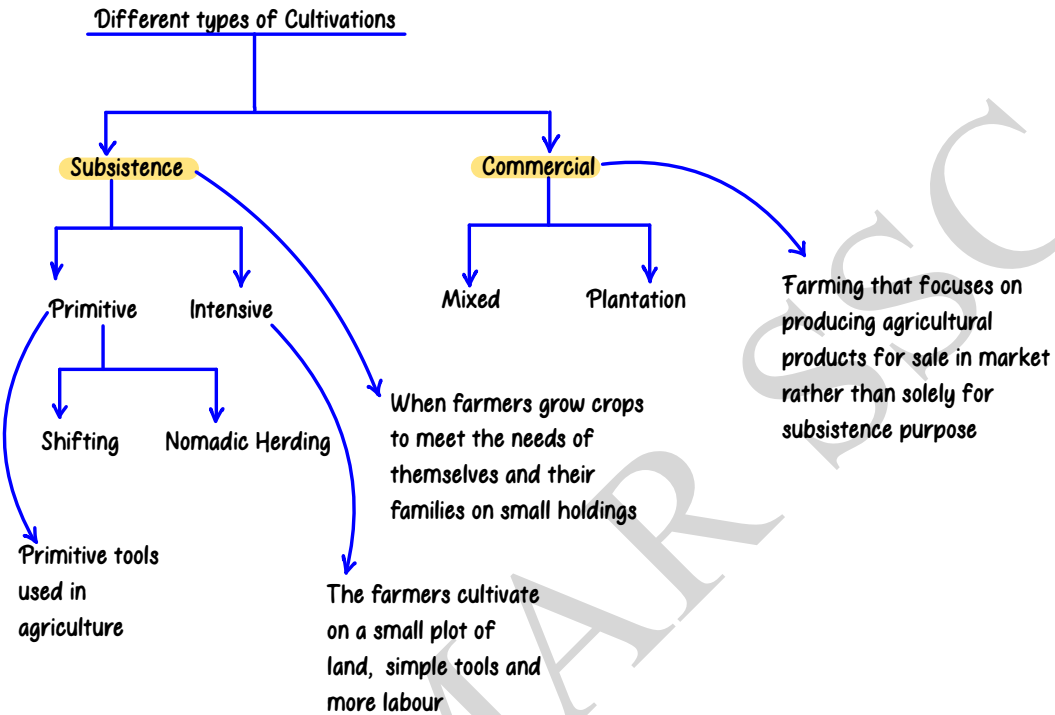
- Abiotic: non-living

IUCN

- Estd: 5 Oct 1948
- Red List of Threatened Species estd: 1964
- HQ: Gland, Switzerland
- Publishes Red List



# AGRICULTURE




- Shifting Agriculture: also known as Slash and burn agriculture

Names across the world

- Brazil: Roca
- Vietnam: Ray
- Indonesia: Ladang
- Sri Lanka: Chena

Names across India

- Western Ghats: Kumari
- Chattisgarh: Dipa
- Rajasthan: Waltra
- Jharkhand: Kuruwa
- North East: Jhum

## Mixed Farming

- It is a type of farming which involves both the growing of crops and raising of livestock (Agriculture + Livestock)

## Plantation Agriculture

- In this single type of crop or plant is grown in a big part of a land → Factory or processing unit connected
  - → Grown to earn profit
- Eg: Cotton, jute, sugarcane, rubber, tea, coffee
  - Somehow similar
- → Cash crops → Grown to earn the profit in local market

## Organic Farming

- Agricultural process that uses biological fertilisers and pesticides acquired from animal or plant waste
- Zero use of artificially made chemicals here

## Zero Budget Natural Farming (ZBNF)

- No use of any kind of fertilizers/pesticides

## Terrace Farming

- The process of cultivating crops on sites of hills or mountains by planting on graduated terraces carved into the slope
- It is mostly practised in India's hilly regions, such as Himachal Pradesh, Uttarakhand and certain North-Eastern provinces

- Soil conservation is aided
- Reduces soil erosion

## Intercropping and Mixed Cropping

- Similarities: growing two or more crops in the same field

### Differences

**Mixed Cropping**

- Seeds of two different crops are mixed before sowing

**Intercropping**

- Seeds are not mixed and grown in a row format

## Different Cropping Seasons

**Kharif**
- **Sowing**: July
- **Harvesting**: Sept-Oct
- Also known as Monsoon crops

**Rabi**
- **Sowing**: Oct
- **Harvesting**: April

**Zaid**
- Short cropping season
- May-June

| Kharif crops | Rabi crops | Zaid crops |
|---|---|---|
| 1. Rice | 1. Wheat | ~~1. Rice~~ |
| 2. Sugar-cane | 2. Barley | ~~2. Maize~~ |
| 3. Jute | 3. Gram | 3. Melons |
| 4. Cotton | 4. Mustard | ~~4. Groundnut~~ |
| 5. Tobacco | 5. Linseed | 5. Water melons |
| 6. Maize | 6. Pea | 6. Cucumber |
| 7. Soya bean | 7. Rapeseed | - Fodder crops |
| 8. Groundnut | 8. Castor | |

- Leguminous plants
- Millets

## Different Types of Crops

### Cotton
- It requires black soil
- Fibre crop and also known as Silver Fibre
- **Requires**: 210 frost free days
- Kharif crop

### Jute
- Golden fibre
- **Topmost producer**: India (West Bengal)
- **Topmost exporter**: Bangladesh
- Nor-westers good for growth of jute

### Coffee
- **Coffee bowl of the world**: Brazil (topmost producer)
- **India (topmost producer)**: Karnataka

**Arabica** **Liberica** **Robusta** → Coffee varieties

- Soil: laterite
- Blossom showers help in growth of coffee

## Rice

- Also known as paddy before processing
  Sowed in swampy areas → Methane gas is produced
- Requires: high rainfall and temperature
- Varieties:
  Aus: grown in March
  Aman: Jan-Feb
  Boro: Oct
- Staple crop

→ India's most consumed staple crops: Rice and Wheat

## Tea

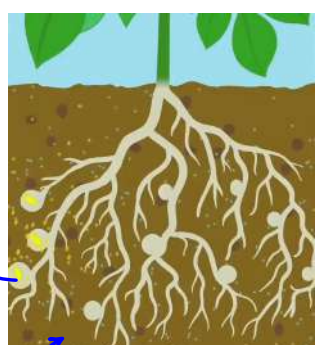
- Grown in acidic soil
- Moderate rainfall
- Required shadow
- India (Topmost producer): Assam
- In the world (topmost producer): China

## Leguminous crops

- Nitrogen fixing bacteria reside in their roots
- Kharif crops
- Eg: Pulse, Rajma, Soyabeans (top producer: MP)

→ No rhizobium reside in thier roots

Rhizobium bacteria



N
P
K
→ Macronutrient

## Millets

- Also known as Superfoods/Sri Anna
- Eg: Bajra, Ragi (finger millets), Jowar (Sorgum)
- Topmost producer: Rajasthan

## AGRICULTURAL REVOLUTION IN INDIA

| REVOLUTION | RELATED TO |
|---|---|
| Black Revolution | Petroleum Production |
| Blue Revolution | Fish Production |
| Brown Revolution | Leather, Cocoa |
| Golden Fibre Revolution | Jute Production |
| Silver Fibre Revolution | Cotton Production |
| Golden Revolution | Horticulture, Honey, Fruit Production |
| Silver Revolution | Egg Production |
| Green Revolution | Food Grain Production |
| Grey Revolution | Fertilizers |
| Red Revolution | Meat & Tomato Production |
| Yellow Revolution | Oil Seed Production |
| White Revolution | Dairy, Milk Production |
| Round Revolution | Potato Production |

**Green Revolution (wheat revolution)** → Spectacular increase in production of food grains

- **1st in:** Mexico + Latin America
- **Term:** William Gaud Father
- **World:** Norman Borlaug (USA)
- **India:** M S Swaminathan
  - → PL-480 variety of wheat (imported from USA)

In India
- → Increase in wheat production
  - → Introduction in High Yielding Variety seeds + Technology
- → It was introduced in two phases
  - 3rd FYI → 1960s
    - In 1st phase → Introduced in Punjab, Andhra
  - 1970s

**Estd:** FCI, CACP in 1965

## Demerits of Green Revolution

- Groundwater levels ↓
- Soil alkalinity ↑ → Gypsum can be added to reduce soil alkalinity and if the soil is acid then lime can be added

## White Revolution (1970–96)

- Also known as "Operation Flood"
- Reduced scarcity of milk production in India
- **Father:** Dr. Varghese Kurien

## Different Cultures in Agriculture

- **Horticulture:** Culture of Garden crops
- **Viticulture:** Grapes
- **Aquaculture:** Aquatic plants and animals
- **Pisiculture:** Fishes
- **Sericulture:** Silk
- **Apiculture:** Bees
- **Silviculture:** Forest management
- **Hydroponics:** technique of growing plant using water-based nutrient solution rather than soil

## Soil Conservation Methods

- **Contour Bunding/Ploughing:** a land management practice for marginal, sloping and hilly land where the soil productivity is very low. It involves placement of the lines of stone along the natural rises of a landscape

- **Mulching:** the process of covering the top soil, with plant material, such as leaves, grass, crop residue, etc
  - → Retains soil moisture

- **Shelter belts:** Planting rows of trees on one side of an area that prevents the wind from eroding the soil

Contour Bunding

Mulching

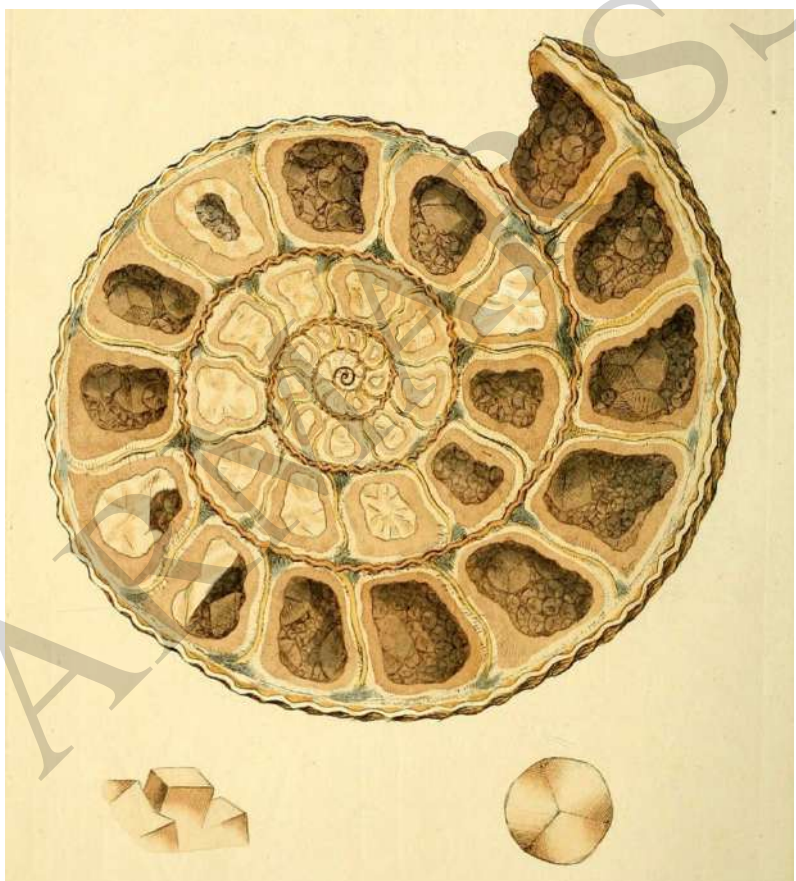
Shelter belts

## One Liners (MCQ)

- "Agriculture Census" is conducted in India at an interval of 5 yrs
- The technique of watering plants by making use of narrow tubes which deliver water directly at the base of the plant is called: Drip Irrigation
- The word agriculture is derived from the latin words Ager and Culture, where "Ager" means soil
- According to 2009 data by National Institute of Hydrology, 51.09% of land is used for agriculture

One of the adverse effects of DDT is that it can kill beneficial insects like honeybees

# MINERALS

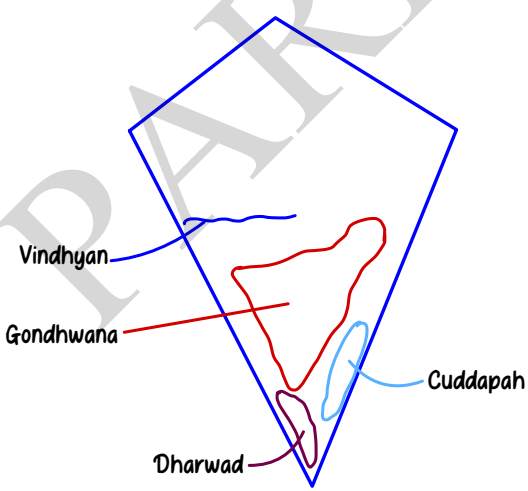


- **Minerals**
  - **Metallic**
    - **Ferrous**
      - Eg: Iron, Manganese, Chromite
    - **Non-ferrous**
      - Eg: Copper, Bauxite
  - **Non-Metallic**
    - **Fuel Minerals**
      - **Organic**
        - Eg: Fossil fuels, crude oil, natural gas
    - **Other Non-metallic Minerals**
      - **Inorganic**
        - Mica, Limestone, Graphite

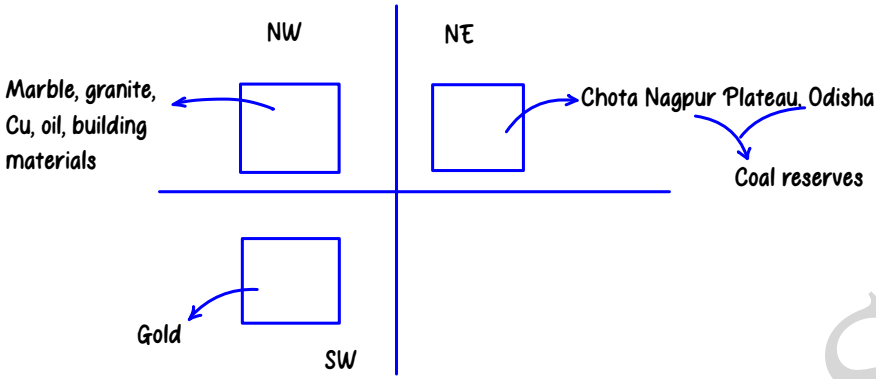
Mining → Ore = Metal + Impurities

Refining → Gives metals/non-metals

## Distribution of Minerals

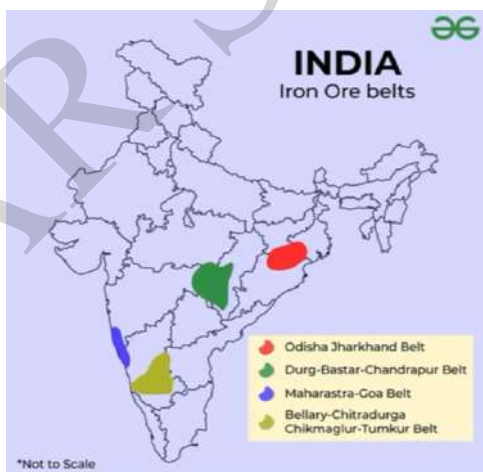



- **Gondhwana**: Gold
- **Dharwad/Cuddapah**: Gold, Iron
- **Vindhyan**: Non-metallic minerals




**Iron**

- **Ores**
  - Hematite
  - Magnetite → Has highest % of iron (roughly 70%)
  - Limonite




**Reserves**

- **Topmost:** Odisha (Hematite)
- Karnataka (Magnetite)

- **Topmost reserve in the world:** Australia

**Production**

- Odisha > Chattisgarh > Karnataka

| State | Region | Mines |
|---|---|---|
| Odisha | Sundargarh<br>Mayurbhanj<br>Jhar | Badampahar |
| Jharkhand | Singhbhum | Noamundi |
| Chhattisgarh | Durg<br>Bastar | Dalli Rajhara<br>Bailadila<br>Dantewada |

- Karnataka — Ballari, Chikkamangaluru, Chitradurga — Baba budan giri, Kudremukh

Manganese (Mn)

Reserve

- Topmost in world: South Africa
- Topmost in India: Odisha
  - Sundargarh
  - Keonjhar
  - Kalahandi
  - Mayurbhanj
  - Koraput
- Karnataka: Ballari, Chikkamangaluru

Bauxite: Ore of Aluminium; non-ferrous

Reserve

- Topmost in world: Australia
- Topmost in India: Odisha

- Jharkhand: Lohardaga, Palamu, Ranchi
- Gujarat: Bhavnagar, Junagarh
- Madhya Pradesh: Katni, Balaghat

Few Aluminium producing Companies and their HQ

- NALCO → HQ: Bhubaneswar (Odisha)
- BALCO → HQ: New Delhi
- HINDALCO → HQ: Mumbai
- Vedanta Resources → HQ: Mumbai

Copper

Production

- Topmost in India: Madhya Pradesh
  - Balaghat (mines)
  - Malajkhand (region)

- **Rajasthan**
  - Jhunjhunu and Alwar (regions)
  - Khetri (mines)
- **Jharkhand**: Singhbhum

**Mica**: it is used as insulators in electronics and electrical appliances

**Production**

- **India**: Andhra (top), J & K, Bihar

**Gold**

- Kolar Gold Fields
- Hutti Gold Mines (Raichur)

→ Karnataka

- Ramagiri: Andhra Pradesh

**Diamond**

- **India**: Madhya Pradesh (Panna) is the only state that produces diamond
- **Topmost in World**: Russia

**Lithium**: known as "White Gold"

**World**

- **Reserve (top)**: Chile
- **Production (top)**: Australia

**Coal**

- Known as "Black Gold" and "Buried Sunshine"
- Calorific value ↑
- Carbon content ↑
- Moisture content ↓

→ Quality of coke

**Four varieties**

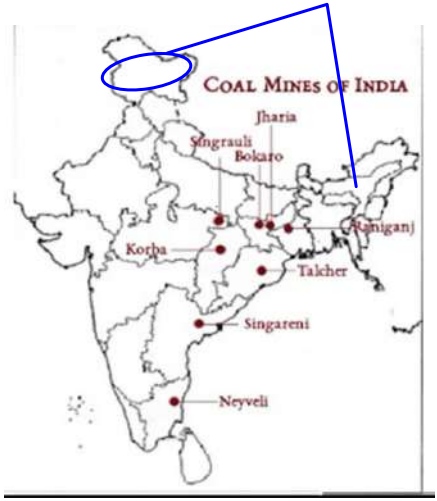
- Anthracite: 80–90%
- Bituminous: 60–80%

→ Coking coal (used in metallurgy)

- Lignite: 40–60%
- Peat: <40%
  - Also found in India
  - Brown coal

Mostly found in India

Tertiary Coal



- Reserve (top): USA

India
- Reserve (top): Odisha > Jharkhand > Chhattisgarh
- Production (top): Chhattisgarh > Odisha

| States | Mines |
|---|---|
| Jharkhand | Jharia, Bokaro, Giridih, Karanpura |
| Chattisgarh | Hasdeo, Korba, Mand-Raigarh |
| Tamil Nadu | Neyveli |
| Odisha | Jharsuguda, Talcher, Ib valley |

- Madhya Pradesh: Singareni (coal mines)

Tertiary Coal: low-grade coal → Seen in J & K, Meghalaya
→ Peat is a tertiary coal

Oil and Natural Gas
→ Largest component of natural gas: Methane

India
- Western offshore: Mumbai High, Gujarat
- Assam: Digboi

Rare Earth Metals
- Total: 17 → 15 lanthanides + 2 (Yttrium, Scandium)
- Topmost producer+ reserve in world: China
- India (topmost): Kerala (Producer); Andhra (Reserve)
  → Rich in Monazite sand, thorium

## One Liners (MCQs)

- Main mineral constitutions of continental mass are: Silicon, Aluminium
- Hirakud Captive Thermal Power Plant is located in: Odisha
- The major resources of Gondhwana coal, which are metallurgical coal are located in: Damodar valley
- Peat has low carbon content and high moisture content
- Reserves of silver found in: Odisha, Jharkhand, Andhra, Gujarat
- Amarkantak Plateau, Maikal hills and the plateau region of Bilaspur-katni are known for presence of: Bauxite
- H.V.J gas pipeline from Hazira in Gujarat to Jagdishpur in UP) passes through: Madhya Pradesh
  - H: Hazira in Gujarat
  - V: Vijaipur in MP
  - J: Jagdishpur in UP
  - India's 1st interstate gas pipeline, the project began in 1986, with the establishment of GAIL Ltd.
  - Guj-Raj-MP-UP-Haryana-Delhi
- Feldspar is a large group of rock-forming silicate minerals that constitutes more than 50% of the Earth's crust and is widely used in the glass and ceramic industries
- Jaduguda is know for Uranium deposits
  - In Singhbhum, Jharkhand
  - Also found in Cuddapah, Andhra

# WORLD MAP

## Continents

- Top (Area + Population wise): Asia
- 2nd (Area + Population wise): Africa

- Strait: a narrow water body that separates two landmasses/joins two water bodies

- Strait of Malacca
  - Separates Malaysia and Indonesia
  - Joins Java Sea and Andaman Sea
- Sunda Strait
  - Separates Sumatra and Java
  - Joins Java Sea and India Ocean

## ASIA


- Indonesia
- Malaysia
- East Timor
- Thailand
- Cambodia
- Laos
- Vietnam
- Myanmar
- Philippines

### INDONESIA

- Country with most no. of Muslim population
- Sumatra (Largest island), Kalimantan, Sulawesi, Java, Papua (5 main islands of Indonesia)
- Capital: Jakarta (at present) → Will change to Nusantra
  - Due to Global Warming

### MALAYSIA

- Capital: Kuala Lumpur

### EAST TIMOR

- Capital: Dili

### THAILAND

- Capital: Bangkok

### CAMBODIA

- Capital: Phnom Penh

### VIETNAM

- Capital: Hanoi

### LAOS

- Capital: Vientiane

### MYANMAR

- Earlier known as "Burma"
- Capital: Nay Pyi Taw

### PHILIPPINES

- Capital: Manila

Gobi Desert

Islands disputed between Japan and Russia

Located between mainland China and Korean Peninsula

A country that is only surrounded by land and no ocean/ coastline


**LAOS**

- Landlocked country

- South Korea
- North Korea
- Yellow Sea
- Japan
- Kuril Islands
- Taiwan

**SOUTH KOREA**

- Capital: Seoul
- Shares border with North Korea

**NORTH KOREA**

- Capital: Pyongyang
- Shares borders with China and Russia

**JAPAN**

Largest island: Honshu

- Capital: Tokyo

**TAIWAN**

- Earlier known as Formosa
- Capital: Taipei

*Lake Baikal: World's deepest lake in Russia

# SOUTHWEST ASIA


Caspian Sea (it is a lake), a landlocked water body of Europe and Asia

All landlocked

TURKMENISTAN
- Capital: Ashgabat

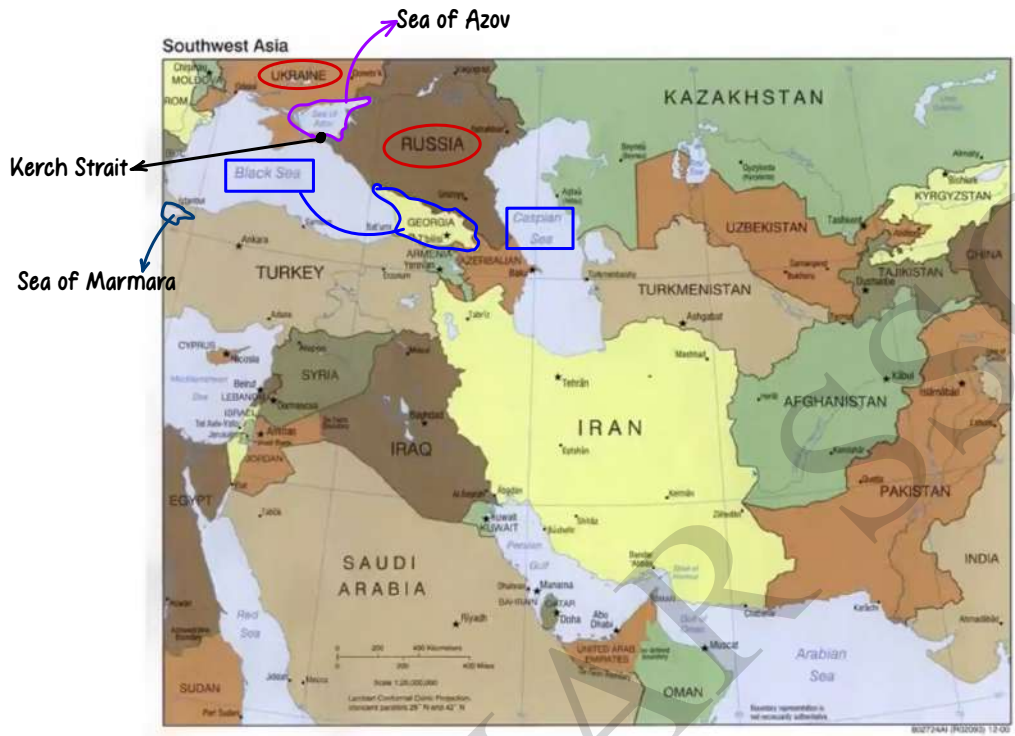
UZBEKISTAN
- Capital: Tashkent

KAZAKHSTAN
- Capital: Astana

TAJIKISTAN
- Capital: Dushanbe

KYRGYZSTAN
- Capital: Bishkek

* Liechtenstein and Uzbekistan are the only doubly landlocked countries
  - Country that is surrounded by landlocked countries




*CASPIAN SEA → Surrounding 5 countries

Rivers Volga, Ural, and Terek discharge into the Caspian Sea

- Old name: Persia

IRAN
- Capital: Tehran

AZERBAIJAN
- Capital: Baku

T: Turkmenistan
A: Azerbaijan
R: Russia
I: Iran
K: Kazakhstan

*BLACK SEA → Bordered by

Rivers Danube, Dnieper, Dniester discharges in the Black Sea

The: Turkiye
Bu: Bulgaria
R: Russia
G: Georgia
U: Ukraine
R: Romania

KERCH STRAIT
- It connects Black Sea and the Sea of Azov
- Separates Kerch (Ukraine) and Russia

BOSPORUS STRAIT
- It connects the Black Sea to the Sea of Marmara

UKRAINE
- Capital: Kyiv

RUSSIA
- Capital: Moscow

TÜRKIYE
- Capital: Ankara
- Spreads across two continents: Europe and Asia

IRAQ
- Old name: Mesopotamia
- Capital: Baghdad

Strait of Hormuz

- Connects the Persian Gulf (west) to the Gulf of Oman and the Arabian Sea (southeast)


Referred as "the land between two rivers"
— Tigris and Euphrates rivers

SUEZ CANAL

- Connects the Mediterranean Sea to Red Sea

Mediterranean Sea

Red Sea

Bab-al-Mandab Strait (Gateway of Grief or the Gate of Tears)

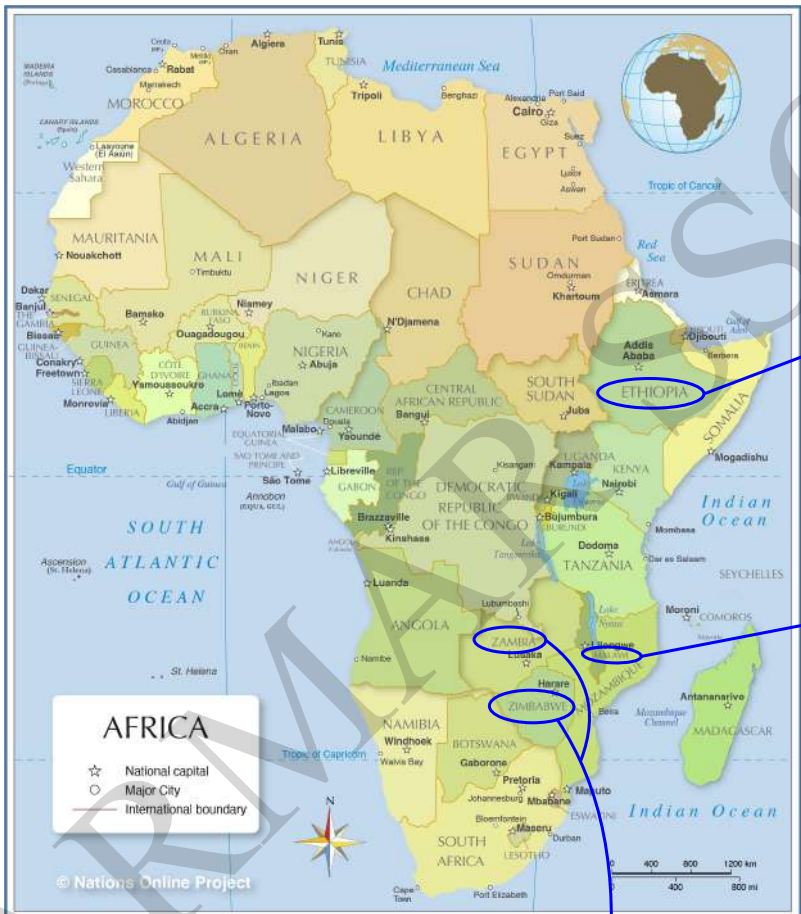
- Connects the Red Sea to the Gulf of Aden


Dead Sea: high salinity

RED SEA → Bordering countries

- D: Djibouti
- E: Eritrea
- S: Saudi Arabia
- S: Sudan
- E: Egypt
- Y: Yemen

# AFRICA




Old name: Abyssinia

Old name: Nyasaland

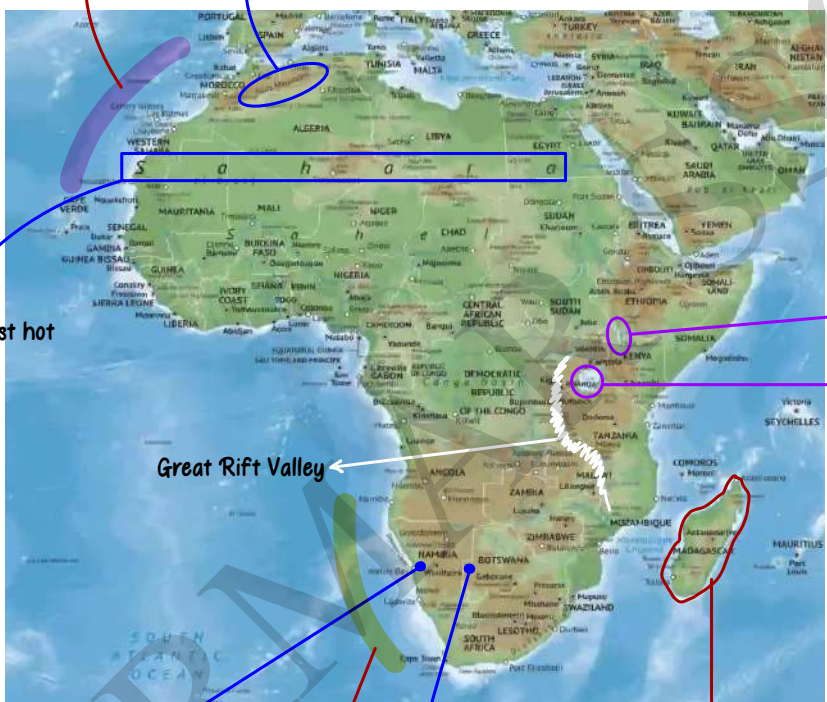
- Zimbabwe + Zambia (previously known as) → Rhodesia

## AFRICA

- Known as "Continent of Continents"
- Known as Dark Continent and Black Continent

Canary current

Atlas Mountain Range: NW part of Africa




World's largest hot desert

Lake Turkana

Lake Victoria

Great Rift Valley

Namib Desert

Kalahari Desert

Benguela current

Madagascar (island country)

- Longest river of the world: Nile (formed from Blue Nile + White Nile)
  - Empties in: Mediterranean Sea
  - Origin: Lake Victoria of Tanzania
  - Empties at: Mediterranean Sea
- Highest peak of Africa: Mt. Kilimanjaro

## NORTH AMERICA

Arctic Ocean

Earlier was part of Russia

Largest Island


**Bering Strait**
- Connects Arctic Ocean and Pacific Ocean

**49th Parallel Line**
- Boundary between USA and Canada

**Panama Canal**
- Connects the Atlantic Ocean with Pacific Ocean
- Links North America and South America

## NORTH AMERICA


**CANADA**
- Capital: Ottawa

Great Lakes: Near Canada-USA border

Old fold mountains

**Great Lakes consists of**
- H: Huron
- O: Ontario
- M: Michigan
- E: Erie
- S: Superior

**Desert**
- Mojave Desert
- Sonoran Desert

- **Lake Superior**: largest freshwater lake in the world

- **Highest peak of North America**: Mt. McKinley (also called Denali)

## SOUTH AMERICA


### ECUADOR
- **Capital**: Quito
- First country from which equator passes

### VENEZUELA
- Capital: Caracas

### BRAZIL
- **Capital**: Brasilia
- **Currency**: Brazilian Real

### CHILE
- **Capital**: Santiago

### PARAGUAY
**Capital**: Asuncion

### ARGENTINA
- **Capital**: Buenos Aires

### BOLIVIA
- **Capital**: La Paz

### URUGUAY
- Capital: Montevideo


Amazon forest

ANDES MOUNTAIN RANGE (World's longest chain of mountains)

- Young fold mountains
- Highest peak: Mt. Aconcagua (Argentina)
- Driest desert: Atacama Desert

EUROPE

Arati Saha was 1st Indian women swimmer to cross the English Channel

Separates Europe and Asia


Ural Mountain Ranges(Old fold mountains)

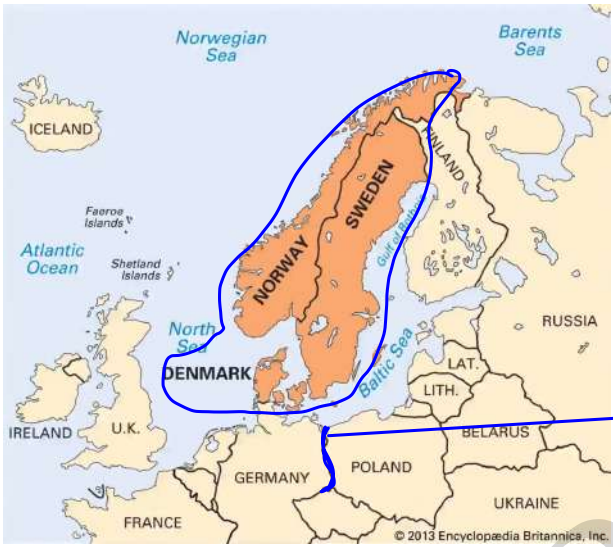
English Channel

Highest peak: Mt. El'brus

CYPRUS

- Underwater canyon: Eratosthenes

Alps Mountain Ranges (Young fold mountains)

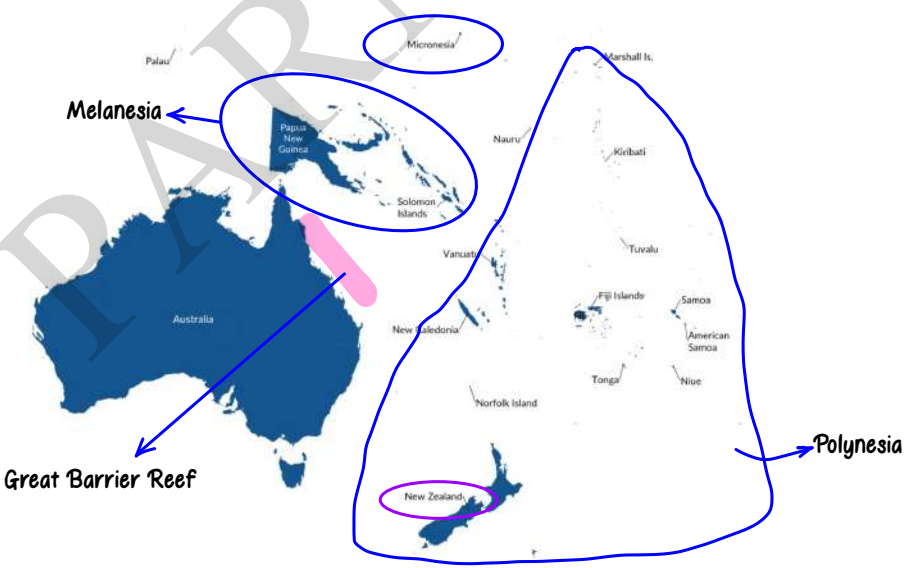



Hindenburg Line between Germany and Poland (German defensive line in French territory during World War I)

- Scandinavian countries: Norway + Sweden + Denmark
- Nordic countries: Denmark + Finland + Sweden + Norway + Iceland

- Block mountain in Germany: Rhine Valley
- Vosges mountain in France

## OCEANIA




Bass Strait

Great Australian Desert (Gibson Desert)

ARCTIC

- India's first research centre: HIMADRI
  - Estd: 2008

ANTARCTICA

- Highest peak: Mt. Vinson
- Indian Research Centre in Antarctica: Bharati, Dakshin Gangotri, Maitri
  - Estd: 1984