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Declarations :

A Massage From Kumar Gaurav Sir...

"The one who has the struggle will also have the victory"

My lions and lionesses,

While taking the Phool-Patti class, there was a demand from your side for a book on General Studies that can pierce the skull of any exam. Keeping your requests in mind, I started thinking about it, and then I realized that if I should prepare such a book, it would make passing exams much easier for my lions and lionesses. After sharing this idea with Nirmal Sir, he immediately told me, "Do whatever you can for the benefit of the students. Lots of good wishes from my side for this upcoming book." After getting Sir's approval, I began working on it, and the result of that effort is the first edition of this book, which was launched on July 18, 2024. Thanks to your love, 50,000 students ordered the online book in just one day. This love increases the responsibilities of me and my team, and that's why I began addressing its shortcomings the very next day and started adding topics that could be asked in exams. For example, questions about the Maratha Empire might be asked in the future, so I included that topic.

In this book, every possible effort has been made to cover all the important sections of General Studies. It includes World Geography, Indian Geography, Indian Economy, Indian Constitution, Indian History, Physics, Chemistry, Biology, Computer Science, Environment, and various other sections. Additionally, at the end of each section, objective-type questions are provided for practice. Along with these questions, a QR Code is also included. By scanning the QR Code, you can practice all these questions on the Utkarsh app, where detailed explanations for each question are also available. Practicing these objective-type questions will further strengthen your preparation.

I trust in the hard work of my team that this second edition will prove to be useful in your exams.

"माँ तेरे पसीने की हर बूँद को मोती-सा चमकाऊँगा
तू सपने बड़े देखना पूरे करके मैं दिखलाऊँगा"

All the best...

Gaurav

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WORLD GEOGRAPHY

Universe

- Universe is the name given to the infinite sky in which infinite stars, moons, planets and celestial bodies are located.
- Universe = Existing matter + energy
- Generally, the combined mass of earth, planets, satellites, solar system, stars and galaxies is called 'Universe'.
- Father of Geography – Hecataeus (Book – Jus Periodus – meaning description of the earth)
- The word Geography was coined by Eratosthenes.
- Father of modern geography – Alexander von Humboldt
- Creator of the world map – Anaximander (made the world map on a scale)

Key definitions-

- In geography, that part of the earth is studied which is the place of residence of humans- **'Arthur Holmes'**.
- Geography is such an independent subject whose aim is to make people aware of the world, celestial bodies, land, animals, fruits, oceans, vegetation and every other thing seen in the areas of the earth surface- **'Strabo'**.
- Concepts related to the universe-
  - **I. Geocentric concept (geocentric theory): –** Under this concept, 'Claudius Ptolemy' considered the earth to be the center point of the entire universe.
  - **II. Heliocentric concept (sun-centered theory): –** Under this concept, 'Nicholas Copernicus' of Poland told that the sun is located at the center of the universe and the earth and other planets revolve around the sun.

Note:- Nicolaus Copernicus is considered the 'Father of Modern Astronomy'.

- Theories related to the origin of the universe:-
  - Big Bang Theory – **George Lemaitre (Belgian Astronomer)**
  - Equilibrium Theory – **Thomas Gold and Herman Bondi**
  - Oscillation Theory – **Dr. Allan Sandage**

Galaxy

- The diameter of the universe is 108 light years. There are about 100 billion galaxies in the universe. Galaxy is a huge cluster of innumerable stars. Each galaxy has about 100 billion stars.
- **Bulge –** The center of the galaxy is called.
- Our galaxy is called the Milky Way or Dudhmekhala. Its shape is spiral.
- **Milky Way –** The part of the galaxy which is visible at night.
- **Sun –** is a star of the galaxy.
- **Proxima Centauri –** It is the nearest star to the Sun.

Solar System

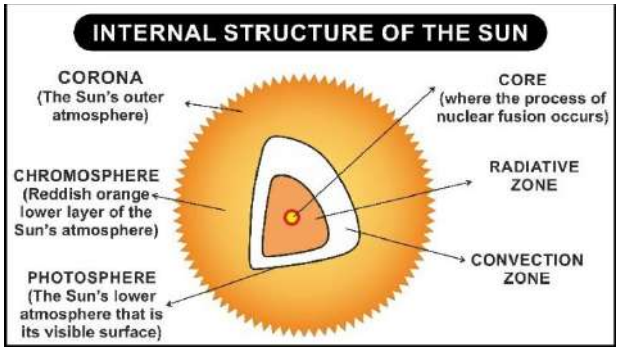
- The Sun and the planets, satellites, comets, meteors and asteroids revolving around it are collectively called the **'Solar System'**.

I. Sun–

- The Sun, which is the originator of the Solar System, is a star that provides energy and light.
- The age of the Sun is 5 billion years.
- The time for the Sun to continue providing energy in the future is 10^{11} years.
- It takes about 8 minutes 16.6 seconds for the Sun's light to reach the Earth.
- The solar flare is called Aurora Borealis at the North Pole and Aurora Australis at the South Pole.

Note:- The Sun is about 15 crore kilometers away from the Earth.

- The diameter of the Sun is 13 lakh 92 thousand km., which is about 110 times the diameter of the Earth.
- The Sun is 1.3 million times larger than the Earth and the Earth receives about 2 billionth of the Sun's heat.
- 99.999 percent of the mass of the Solar System is contained in the Sun.



- **Photosphere –** The part of the Sun which is visible to our eyes.
- **Sunspots –** Black spots on the surface of the Sun.
- **Corona-** The part of the Sun which is visible during a solar eclipse is called the Sun's corona.
- **Core –** The inner part of the Sun where the process of nuclear fusion takes place.

Note:– Midnight Sun- The sun shines for a long time in the northern polar circle. The midnight sun is visible in the Arctic region.

II. Planet:–

- The lightless celestial bodies revolving around the stars are called 'planets'.
- These are the bodies originated from the Sun and revolve around the Sun.
- All the planets revolve around the Sun from west to east, but **'Venus'** and **'Uranus'** are exceptions to this and revolve from east to west.

- The largest planet in the solar system is **'Jupiter'** and the smallest planet is **'Mercury'**.
- **Inner Planets :** Mercury, Venus, Earth and Mars are called inner planets.
- **Outer Planets :** Jupiter, Saturn, Uranus and Neptune are called outer planets.
- **Descending order of planets according to size–**

1. Jupiter	2. Saturn	3. Uranus
4. Neptune	5. Earth	6. Venus
7. Mars	8. Mercury	

- **Ascending order of planets according to their distance from the Sun–**

1. Mercury	2. Venus	3. Earth
4. Mars	5. Jupiter	6. Saturn
7. Uranus	8. Neptune	

Note:- Mercury, Venus, Mars, Jupiter and Saturn, these five planets can be seen with naked eyes.

A. Mercury

- It is the smallest and lightest planet in the solar system that is closest to the Sun.
- Here the days are extremely hot and the nights are icy. Mercury has the highest temperature difference among all the planets. Its temperature goes below 0°C at night and above 400°C during the day.
- Mercury has no satellite.
- Mercury completes its revolution around the Sun in 88 days. (In the shortest time)
- This planet is 1/18th of the Earth in size.
- One day on Mercury is equal to 90 days on Earth.

B. Venus

- Like Mercury, it also has no satellite.
- Venus completes one revolution around the Sun in 225 days (255 days in many sources).
- It is the closest, brightest and hottest planet to Earth.
- It is also called the 'evening star' and 'morning star'.
- It is also called 'Earth's twin sister'.
- It revolves around the Sun from east to west, opposite to the general direction of the planets.

C. Earth

- The Earth revolves around the Sun from west to east.
- Earth is the fifth largest planet in size. The axis of the Earth is an imaginary line, which is inclined **23 1/2˚** to the perpendicular drawn on the orbit plane. It makes an angle of **66 1/2˚** with the Earth's orbit plane.
  Note: - In terms of size and structure, the Earth is similar to Venus.
- The equatorial diameter of the Earth is 12,756 km. and the polar diameter is 12,714 km.
- The average distance of the Earth from the Sun is about 15 crore km.
- Earth is the only planet in the solar system on which there is life. Its density is the highest among all the planets.
- It completes one revolution from west to east on its axis in 23 hours, 56 minutes, 4 seconds.
- The earth completes one revolution around the sun in 365 days 5 hours 48 minutes, 46 seconds.
- The earth is also called the blue planet due to the presence of water.
- The only satellite of the earth is the moon.
- Goldie Locks John- Those areas where conditions are favorable for life.

Note:- The age of the Earth is approximately 4.6 billion years and life on it began approximately 3 billion, 80 crore years ago. Note:- The age of the Earth is approximately 4.6 billion years and life on it began approximately 3 billion, 80 crore years ago.

Moon

- The science that studies the surface of the moon and its interior is called selenology.
- The moon is the only satellite of the earth.
- It is the **fifth** largest satellite of the solar system.
- The moon completes one revolution around the earth in **27 days, 8 hours** (approximately).
- We can see about 57-58% of the moon from the earth.

Note: - The moon is also called a fossil planet.
The ratio of the forces required to raise tides and the moon is 11:5.

- The average distance between the moon and the earth is 3,84,400 km.
- **Super Moon -** When the moon is closest to the earth, then that situation is called Super Moon.
- **Blue Moon -** If there are two full moons in a calendar month, then the moon of the second full moon is called Blue Moon.
- **Missions sent by India to the Moon –**
  - **i. Chandrayaan-1 –** India launched it on 22 October 2008 from Satish Dhawan Space Center in Sriharikota, Andhra Pradesh and its launch vehicle was named PSLV-C-11.
    - ♦ The Moon Impact Probe of Chandrayaan-1 mission hit the south pole of the moon, that place was named Jawahar Point.
  - **ii. Chandrayaan-2 –** India launched it on 22 July 2019 from Satish Dhawan Space Center in Sriharikota, Andhra Pradesh and its launch vehicle was named GSLV Mark-III M-1.
  - **iii. Chandrayaan-3 –** was launched on July 14, 2023 from Satish Dhawan Space Center in Sriharikota, Andhra Pradesh and its launch vehicle was named LVM3M4. It soft landed on the south pole of the Moon at 6:04 am on August 23, 2023, making India the first country to reach the south pole of the Moon.
    - ♦ The place where Chandrayaan-2 left its footprints on the Moon was called Tricolor Point, while the place where Chandrayaan-3's lander landed was called Shiv Shakti Point.
    - ♦ Prime Minister Narendra Modi announced to celebrate National Space Day on August 23.
    - ♦ Lander – Vikram, Rover – Pragyan

Note:- Neil Armstrong was the first person to step on the surface of the Moon on July 20, 1969.

D. Mars

- It is also called the Red Planet.
- It completes its orbit around the Sun in 687 days.
- Mars is the second smallest planet in the solar system.
- 'Phobos' and 'Deimos' are two satellites of Mars.
- The largest volcanic mountain of the solar system 'Olympus Messi' and the highest mountain of the solar system 'Nix Olympia' are located on Mars. Its knowledge of day and the inclination of the axis is equal to that of the Earth.

- **Mangalyaan -** Indian Space Research Institute (ISRO) launched Mangalyaan (Mars Orbit Mission) on 5 November 2013 from Sriharikota (Andhra Pradesh) with the Polar Space Launch Vehicle PSLV-C-25.

E. Jupiter

- It takes 10 hours (least time) to rotate on its axis.
- It is the largest planet in the solar system in size.
- Jupiter completes its orbit around the Sun in **11 years and 11 months**.
- **Ganymede -** It is the largest satellite of Jupiter and the solar system.
- **Its satellites -** Io, Europa, Callisto, Almathia etc.

F. Saturn

- It is the second largest planet in the solar system in size.
- It completes its orbit around the Sun in **29 years and 5 months**.
- The presence of rings around it is its main feature.
- The density of Saturn is less than all the planets and water. It will float if kept in water. It appears like a yellow star in the sky.
- At present, Saturn is the planet with the most satellites (125).
- **Titan -** It is the largest satellite of Saturn. It is equal to Mercury in size.
- **Its satellites -** Phoebe, Mimansa, Enceladus, Dione, Rhea, Hyperion, Iapetus etc.
- **Phoebe -** It revolves in the opposite direction of Saturn's orbit.

G. Uranus

- It was discovered by 'William Herschel' in 1781 AD.
- Uranus is the third largest planet in size.
- It completes its revolution around the Sun in 84 years.
- Like Venus, it revolves around the Sun from east to west, opposite to the normal direction.
- Out of the nine rings around it, the names of five rings are Gamma (γ), Alpha (α), Delta (Δ), Beta (β), and Epsilon.
- Due to high axial tilt, it is also called the "lying down planet".
- Its largest satellite is Titania.

Note:- Here sunrise happens towards the perimeter and sunset happens towards the east.

H. Neptune

- It was discovered in 1846 by 'Johann Galle' (Germany).
- It is the planet farthest from the Sun.
- Neptune is the fourth largest planet in terms of size in the solar system.
- It completes its revolution around the Sun in 164 years.
- It is called the coldest planet in the solar system.
- 'Triton' and 'Merid' are the two satellites of Neptune.

Note:- Neptune is a 'green' coloured planet.

Small Solar System Bodies–

i. Pluto

- **Pluto** was discovered by **Clyde Tombaugh** in **1930.**
- In the conference of **International Astronomical Union** (IAU) held in Czech Republic on 24th August, 2006, it was stripped of its status as a planet and was declared a dwarf planet.
- The reasons for Pluto being removed from the category of planets are-
  1. It is smaller than the moon in size
  2. Its orbit is not circular
  3. It intersects or overlaps the orbit of Neptune
- IAU has given it a new name 134340.

ii. Asteroids

- Small celestial bodies revolving around the Sun between the orbits of Mars and Jupiter are called asteroids. When asteroids collide with the Earth, a huge crater is formed on the Earth. (Lonar Lake-Maharashtra)
- **Four Vesta–** This asteroid can be seen with naked eyes.

iii. Comet

- Billions of small bodies in the solar system are called comets or tail stars. These are bodies of gas and dust, which appear as long bright tails in the sky.

Note: - Halley's comet is visible after a gap of 76 years. It was last seen in the year 1986. It is noteworthy that Halley will be visible again in the year 2062.

iv. Meteors

- Meteors appear as bright streaks of light that flash in the sky for a moment and then disappear. They are pieces of asteroids and dust particles left behind by comets.

Note:- Satellite is a celestial body, which revolves around the planets in the same way as the planets revolve around the Sun.

- Man-made satellites - are artificial bodies. These are made by scientists, which are used to obtain information about the universe and for communication on earth. These are sent into space by rockets and are placed in the earth's orbit.
- Some Indian satellites present in space are IRS, EDUSAT, INSAT etc.

Other important points:-

Nearest planet to the Sun	Mercury
The smallest planet	Mercury
Planet with highest temperature difference	Mercury
The closest planet to Earth	Venus
The hottest planet	Venus
The brightest planet	Venus
Morning star	Venus
Evening star	Venus
Earth's twin sister	Venus
Planets with rings	Saturn
Planet with the most satellites	Saturn
The biggest planet	Jupiter
The densest planet	पृथ्वी
Red Planet	Mars

❑❑❑

Earth's Motions

- Earth is a planet of the solar system, it has two movements-

I. Rotation -

- Earth always rotates on its axis from west to east, which is called **'rotation or revolution'** of the Earth. Days and nights occur due to the rotation of the Earth, hence this movement is also called **'daily movement'**. Its duration is **23 hours 56 minutes 4 seconds**.

II. Revolution or annual movement-

- Along with rotating on its axis, the Earth completes one revolution around the Sun in an elliptical path in about **365 days and 6 hours**. This elliptical path of the Earth is called **'Earth orbit'** and this movement of the Earth is called **'revolution or annual speed**.

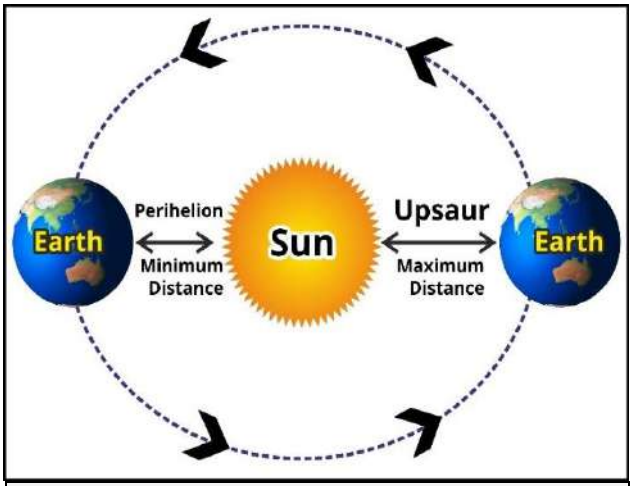
Note: - The earth revolves around the sun on its elliptical path at a speed of 29.8 km/s.

Perihelion

- When the earth is at the closest distance to the sun, it is called perihelion. This situation occurs on **'3rd January'**.
- At this time, the distance between the earth and the sun is 14.70 crore km.

Aphelion

- When the earth is at the maximum distance from the sun, it is called aphelion. This situation occurs on **4th July**.
- At this time, the distance between the earth and the sun is 15.21 crore km.

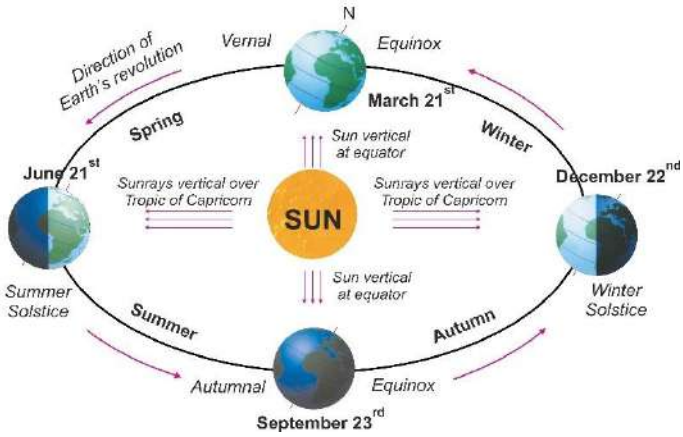


Note:- The imaginary line joining the aphelion and perihelion passes through the centre of the Sun. It is called the apside line.

Change of seasons-

- The earth not only rotates on its axis but also revolves around the sun, hence the position of the earth relative to the sun keeps changing, there are four main phases in the rotation of the earth-

THE SEASONS



1. Cancer Solstice

- On 21st June, the Sun shines perpendicularly on the Tropic of Cancer, this situation is called 'Cancer Solstice' or 'Summer Solstice'.
- On this day, the Northern Hemisphere has the longest day and the shortest night.
- On this day, the Southern Hemisphere has the shortest day and the longest night.

Note:- The sun is visible at midnight in Norway on 21st June.

2. Capricorn Solstice

- On 22 December, the Sun shines perpendicularly on the Tropic of Capricorn, this situation is called 'Makar Sankranti' or 'Winter Solstice'.
- On 22 December, the Southern Hemisphere has the longest day and the shortest night.
- On the same day, the Northern Hemisphere has the shortest day and the longest night.

3. Equinox

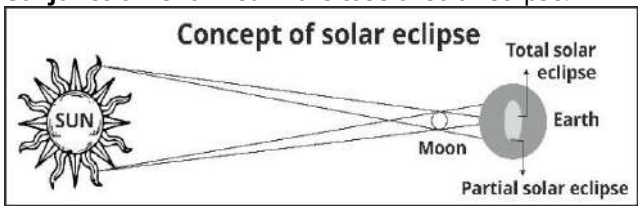
- This is the position of the earth when the sun shines perpendicularly on the equator and on this day the duration of day and night is equal everywhere.
- On 21st March and 23rd September the duration of day and night is equal all over the earth.
- The position of 21st March is called 'Spring Equinox'.
- The position of 23rd September is called 'Autumnal Equinox'.

Note:- There is a difference in the duration of day and night due to the Earth being tilted 23 1/2˚ on its axis.

Solar Eclipse and Lunar Eclipse-

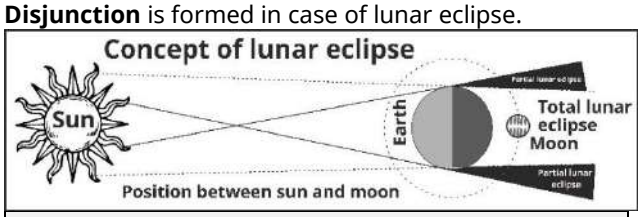
I. Solar Eclipse

- When the moon comes between the sun and the earth and the shining surface of the sun is not visible due to the moon, it is called a **solar eclipse** and this situation always occurs on **Amavasya**.
- **Conjunction** is formed in the case of solar eclipse.



II. Lunar Eclipse

- When the earth comes between the sun and the moon, the sunlight is not able to reach the moon and it becomes dark due to the shadow of the earth, this condition is called **lunar eclipse**.
- Lunar eclipse always occurs on the night of **full moon**.
- **Disjunction** is formed in case of lunar eclipse.



Note:- Lunar eclipse and solar eclipse can occur maximum seven times in a year.

Tide--

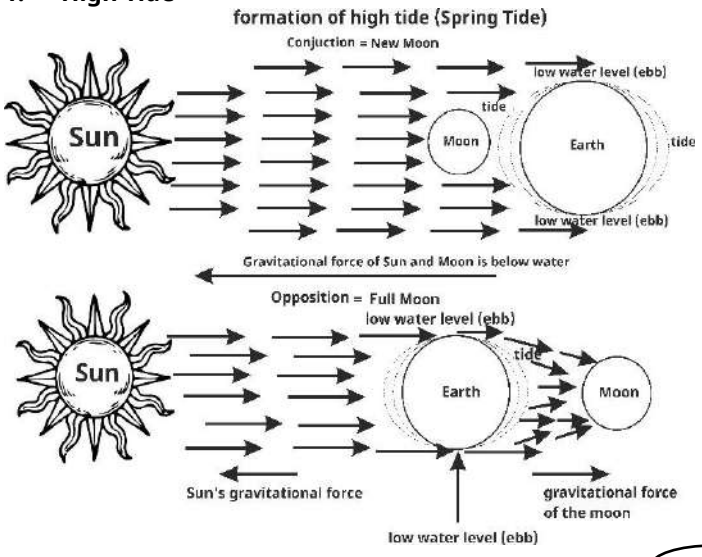
- The rising and falling of sea water due to the gravitational force of the sun and the moon is called **'tide'** and the waves produced by it are called **tidal waves**.
- The effect of gravitational force of the moon is double that of the sun, because it is closer to the earth than the sun.
- The rising and moving of sea water is called 'tide' and the falling and returning of sea water is called 'ebb'.
- The factors responsible for the tides in the oceans and seas are-
  1. Gravitational force of the sun
  2. Gravitational force of the moon
  3. Centrifugal force of the earth
- On earth, the high tide comes after 12 hours 26 minutes every day and the low tide comes after 6 hours 13 minutes.

Concepts related to the origin of tides -

i. Newton's gravitational force theory
ii. Havell's progressive wave theory
iii. Airy's canal theory
iv. Laplace's dynamic theory

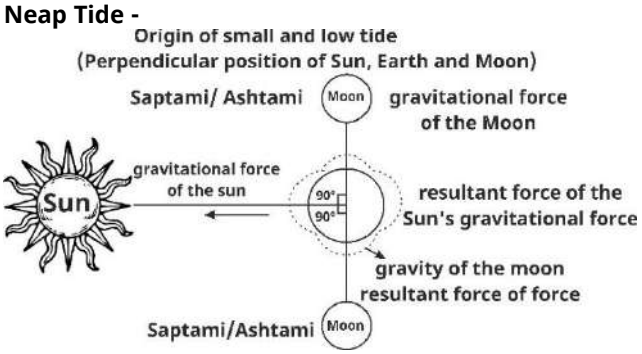
Types of Tide-

1. High Tide -



- When the Sun, Earth and Moon are in a straight line, then high tide occurs at that time, this situation is called 'Syzygi'.
- High tide occurs on full moon and new moon.
- Events of conjunction and opposition are found in high tide.

2. Neap Tide -



- When the Sun, Earth and Moon are at right angles, the gravitational force of the Sun and Moon acts oppositely to each other and thus low tide is generated. Such a situation is seen on the Saptami or Ashtami of Krishna Paksha and Shukla Paksha.
- Low tide is 20% lower than the normal tide and high tide is 20% higher than the normal tide.

Other important points:-

- The world's highest tide occurs in the 'Bay of Fundy' between New Brunswick and Nova Scotia in Canada. (15 to 18 meters)
- The tide is only 2.7 meters high on the Okha coast (Gujarat) of India.
- In South Hampton, located on the southern coast of England, the tide occurs four times a day.

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Latitude and Longitude

Latitude

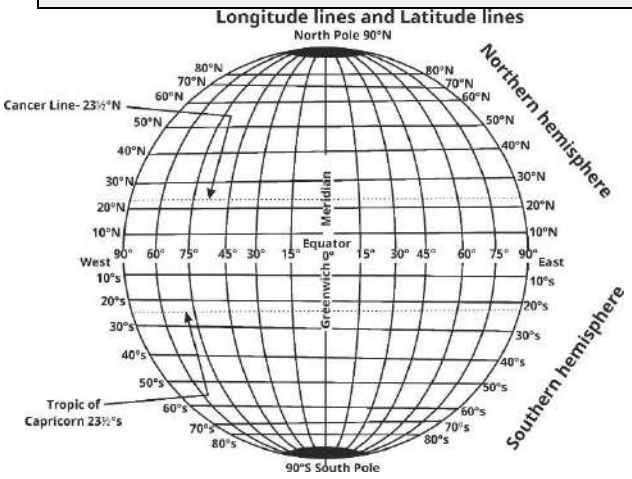
- The angular distance measured from the centre of the earth to any point on a meridian north or south of the equator is called latitude.
- The 0° latitude line is called the equator.
- The number of latitudes is 181.
- If a group of imaginary lines is drawn around the earth from west to east parallel to the equator, then it is called latitude line.
- The northern part of the equator is called the northern hemisphere and the southern part is called the southern hemisphere.
- In the northern hemisphere, $23^1/_2^\circ$ north latitude is called the 'Tropic of Cancer' and $66^1/_2^\circ$ north latitude is called the 'Arctic Tropic'.
- In the southern hemisphere, $23^1/_2^\circ$ south latitude is called the 'Tropic of Capricorn' and $66^1/_2^\circ$ south latitude is called the 'Tropic of Antarctica'.
- The distance between latitudes increases from the equator towards the equator. It is 110.6 km at the equator while it is 111.7 km at the pole.
- The area between two latitude lines is called the 'tropics'.

Note:- All latitude lines are parallel.

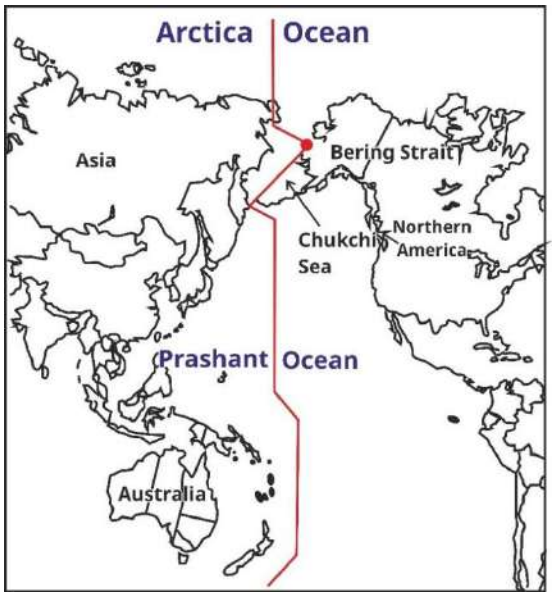
Longitude

- The angular distance of a place which is east and west of the prime meridian (0° longitude) is called longitude or the imaginary line joining the north and south pole is called longitude. The length of longitude lines is equal and their number is 360.
- The prime meridian is 0° longitude which passes through Greenwich in London (England).
- The distance between two longitude lines is 111.32 km on the equator and the distance between them is 0 km at the poles.
- All longitude lines are called great circles.
- The part between two longitude lines is called 'Gore'.
- All longitudes up to 180° situated east of Greenwich line are called eastern longitudes and all longitudes up to 180° situated towards the west are called western longitudes.
- The Earth is rotating on its axis from west to east.
- It takes 4 minutes for the Earth to cover a distance of 1° longitude.

Note:- Longitude lines are not parallel.
Note:- Zero degree latitude and zero degree longitude intersect in the Atlantic Ocean.



International Dateline



- The line drawn around 180° longitude on the earth, leaving out the landmasses, is called the "International Date Line".
- The International Date Line passes through the Arctic Sea, Chukchi Sea, Bering Strait and Pacific Ocean.
- There is a difference of one day to the east and west of the International Date Line.
- One day is added when we move towards the west of the Date Line and one day is subtracted when we move towards the east.

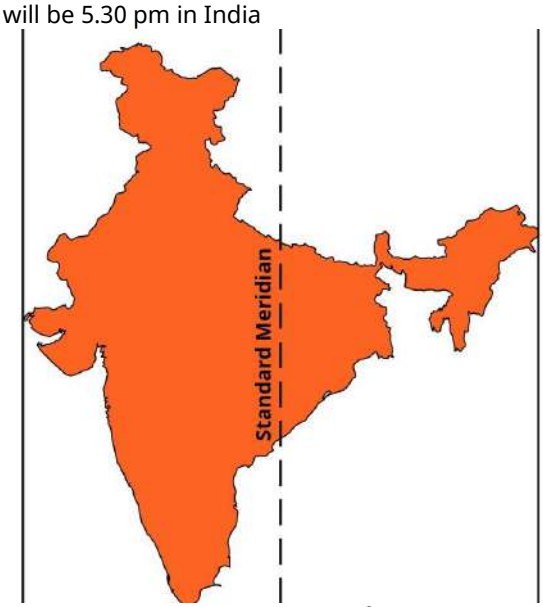
International Time Line (0° Longitude)–

- The earth rotates from west to east on its imaginary axis, so the time of places east of Greenwich will be ahead of Greenwich time and the time of places west of Greenwich will be behind.
- The local time of all places situated on a longitude is the same.
- The entire earth is divided into 24 zones.
- If the time of a particular place is considered in the entire country, then it is called the standard time of that country.

Note:- Some countries have more than one standard time due to excessive longitudinal expansion. The United States of America has six standard times and Russia has eleven standard times.

Standard time of India –

- The standard time is the mean of the meridian passing through the middle of a country.
- **Example-** The standard time of India is **82$^1/_2^\circ$ east meridian** which passes through Mirzapur near Allahabad in Uttar Pradesh.
- Indian standard time is **5 hours 30 minutes** ahead of Greenwich time, when it is 12 noon in Greenwich, then it will be 5.30 pm in India



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Geological History of the Earth

Geological Time Scale					
Eons	**Era**	**Period**	**Epoch**	**Age/Years before Present**	**Life/Major Events**
Big-Bang	13.7 billion years to 5 billion years			13.7 billion years ago	Origin of the Universe
Supernova				12 billion years ago	Origin of the Sun
Origin of Stars				5 billion years ago	–
Hadean	Pre-Cambrian period: 4.8 billion to 5.7 billion years			4.8 billion years to 3.8 billion years	Formation of continents and oceans
Proto-epochal period				3.8 billion years to 2.5 billion years	Bluegreen algae is the origin of single-celled bacteria
Phanerozoic				2.5 billion years to 570 million years	Origin of multi-jointed organisms
	Palaeozoic era (570 million years to 245 million years)	Cambrian		570 million years to 505 million years	No life on land, origin of invertebrates in water
		Ordovician		505 million years to 438 million years	Evidence of the first fish
		Silurian		438 million years to 408 million years	The first signs of life on land appeared in the form of plants
		Devonian		40.8 to 36.0 million years	Origin of organisms living on land and water
		Carboniferous		36.0 million years to 28.6 million years	First reptiles- first creatures with backbones
		Permian		28.6 million years to 24.5 million years	There is abundance of crawling creatures on water and terrestrial level.
	Mesozoic era (245 million years to 65 million years)	Triassic		245 million years to 208 million years	Origin of frogs and sea turtles
		Jurassic		208 million years to 144 million years	It was the age of the dinosaurs
		Cretaceous		144 million years to 65 million years	Extinction of dinosaurs in this era
	Cenozoic era (65 million years to present)	Tertiary period	Archaic	65 million years to 57 million years	Small mammals rodents etc
			Eocene	57 million years to 37 million years	Origin of the Rabbit
			Oligocene	37 million years to 24 million years	Origin of apes resembling humans
			Miocene	2.4 crore years to 50 lakh years	Evidence of orangutans, flowering plants and trees
			Pliocene	50 lakh years to 20 lakh years	Ancestors of early humans
		Fourth Kalpa	Pleistocene (Middle Pleistocene)	20 lakh years to 10000 years	Primitive Man
			Latest (Holocene)	from 10,000 years to the present	Modern Humans

- From the study of meteorites and samples of moon rocks, the age of the Earth has been found to be 4.6 billion years.
- The first attempt to explain the geological history of the earth was made by **'Caste-de-Buffon'**.
- **Uranium dating method** is used to determine the age of the Earth.

Note :- Organic dating method (C-14) is used to determine the age of organisms/organic matter.

The history of the Earth has been divided into several eras (great periods)-

Pre-Paleozoic Era

- This era is divided into two eras called Archaean and Pre-Cambrian -

I. Archaean Eon

- There is a complete lack of fossils in the rocks of this period, so it is also called the Azoic period.
- **Canadian** and **Fennoscandia** shields were formed in this period.

II. Pre-Cambrian period

- In this period, the land was devoid of life.
- In this period, the **Aravalli mountain** and the rocks of **Dharwad** series were formed.

Paleozoic era

- It is also called the primary era. It is divided into the following periods-

I. Cambrian period

- In this period, for the first time, the oceans encroached on the land parts and the oldest sedimentary rocks were formed.
- Vindhyachal mountain range in India was also formed in this period.
- In this period, the first vegetation and animals originated on the earth.

II. Ordovician period

- At this time, the first fish originated among the reptiles in the sea.

III. Silurian period

- Silurian period is called the **'era of vertebrates'**.
- Plants originated for the first time in this period.
- This is called the period of Caledonian mountain movements.

IV. Devonian period

- In this period, as a result of Caledonia movement, high mountain ranges developed on all continents.
- Due to the origin of shark fish in this period, it was known as Matsya era.

V. Carboniferous period

- In this period, reptiles originated and rocks of Gondwana order were formed.
- Due to the extensive deposition of coal in this period, it is also called **'Coal Age'**.

VI. Permian period

- Black Forest and Vosges mountains were formed during this period due to Variscan movement.
- Tianshan of Asia and Appalachian mountains of North America were also formed during this period.
- In this period there was abundance of reptiles in water and land.

Mesozoic Era

- It is also called the 'Secondary Era' and is divided into Triassic, Jurassic and Cretaceous periods.

I. Triassic Period

- This period was the period of origin of **Archeopteryx**.
- **Frogs and turtles** originated in this period.

II. Jurassic Period

- **Dinosaurs and reptiles** originated in this period.
- **Jura Mountains** belong to this period.
- Floral plants originated in this period.

III. Cretaceous Period

- In this period, Rocky and Andes mountains originated and volcanic lava erupted through fissures which led to the formation of Deccan Trap and black soil.
- Dinosaurs became extinct in this period.

Cenozoic Era

- This period is also called the **Tertiary period**.
- It is divided into **Paleocene, Eocene, Oligocene, Miocene and Pliocene** periods-

I. Paleocene Period

- In this period, the Rocky mountain range was formed in North America as a result of the Laramide movement.
- In this period, mammals and tailless monkeys first originated.

II. Eocene Period

- In this period, elephants, horses, rhinoceros, pigs etc. originated.

III. Oligocene Period

- In this period, the Greater Himalayas and cats, dogs, bears etc. originated.

IV. Miocene Period

- In this period, the Lesser Himalayas originated.

V. Pliocene Period

- In this period, the Shivalik originated.
- The evolution of human ancestors and the formation of the Great Northern Plains happened in this period.

Neozoic Era

- This era is also called the **Quaternary Era**.
- This era is divided into two eras called **Pleistocene and Holocene** –

I. Pleistocene Era

- In this era, birds, humans and other mammals first evolved in their present form.

II. Holocene Era

- In this era, the world attained its present state.
- Agriculture and animal husbandry started in this era.

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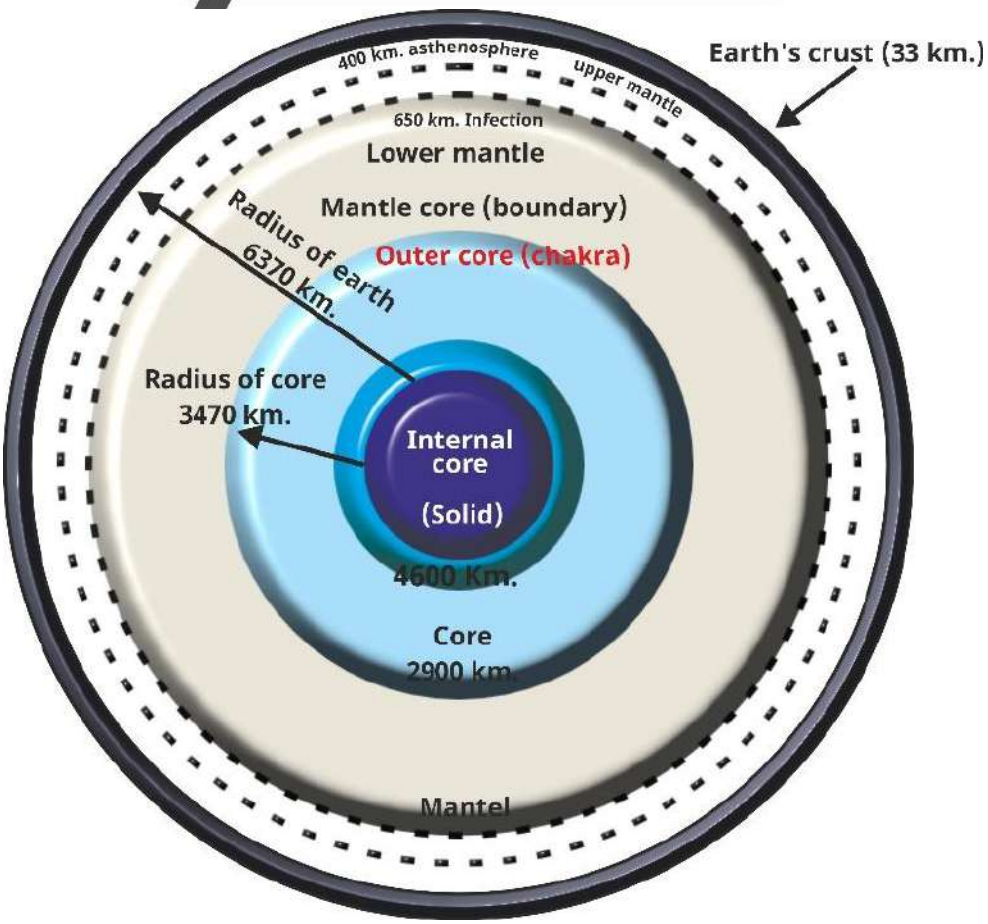
Internal Structure of the Earth



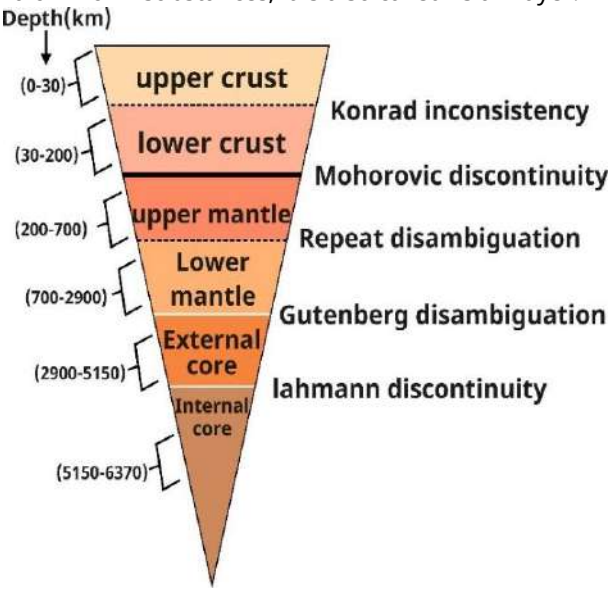
- The topography of the upper part of the earth is closely related to its internal structure and the study of the internal structure of the earth is called **'Geology'**.
- The average density of the earth is 5.5 g/cm^3 and the radius of the earth is about 6370 km.
- The temperature increases by 1°C at every 32 meters depth of the earth, but with increasing depth, the rate of increase in temperature decreases.

Different layers of the earth

- The internal part of the earth has been divided into three major spheres-

I. Crust

- This is the uppermost solid part of the earth.
- Its average thickness under the oceans is 5 km, while under the continents it is up to 30 km.
- On the basis of difference in the speed of seismic waves, the crust has been divided into two subdivisions- **upper crust and lower crust**.
- This density related discontinuity between the upper crust and lower crust is called **"Conrad Discontinuity"**.
- Since the earth's crust is made up of 'silica' and 'aluminum' substances, it is also called "sial" layer.



- The average density of this layer is 2.7 g/cm^3 – 3.0 g/cm^3.

Common elements of Earth's crust composition	
Element	**Weight (percentage)**
Oxygen (o)	46.60
Silicon (Si)	27.72
Aluminium (AL)	8.13
Iron (fe)	5.00
Calcium (ca)	3.63
Sodium (Na)	2.83
Potassium (k)	2.59
Magnesium (mg)	2.09

II. Mantle

- This region is mainly made up of rocks of basalt stone group.
- In the Earth's crust, the part below the earth's crust is called 'Mantle'.
- It starts from Mohorovicic discontinuity and is found up to a depth of 2900 km.
- This density related discontinuity between 'Upper Mantle' and 'Lower Mantle' is called "Rapiti Discontinuity".
- The part of the upper mantle is called "Asthenosphere".
- The density of asthenosphere is - 4.5 g/cm^3.
- Since the mantle is mainly made up of 'silica' and 'magnesium' substances, it is also called the 'boundary' layer.
- The average density of the mantle layer is 3.3 g/cm^3 – 5.5 g/cm^3.

Note:- It occupies 83% of the total volume of the earth.

III. Core

- It occupies 16% of the total volume of the earth.
- This is the last layer of the inner part of the earth.
- The part from Gutenberg discontinuity to a depth of 6,370 km is called the core.
- This layer is also divided into two parts, outer core and inner core and Lehman discontinuity is found between these layers.
- Due to the high amount of nickel and iron in the core layer, this layer is called "NiFe" layer.
- The average density of the upper part of the core is 10 g/cm^3 and the average density of the inner part is 12–13.6 g/cm^3.
- According to Pythagoras, 'The earth is round and it hangs freely in the sky.'
- According to Newton, the earth is similar to an orange whereas according to James Jean, instead of an orange, the earth was described as similar to a pear.

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Earth's Rocks

- All types of soft and hard substances found in the earth's crust are called rocks.
- More than 98 percent of the earth's crust is formed by only 8 major rock forming elements, which include oxygen, silicon, aluminum, iron, calcium, sodium, potassium and magnesium etc.

Classification of rocks

- There are three types of rocks according to the formation method -

I. Igneous Rocks

- Igneous rocks are also called **'primary rocks'**.
- Igneous rocks were formed first after the origin of the earth. This rock is without a thick layer, hard structure and without fossils.
- Sedimentary rocks and metamorphic rocks are formed from this rock.
- Fossils are found absent in igneous rocks and economically it is a very rich rock. Magnetic iron, nickel, copper, lead, zinc, manganese, gold and platinum are found in it.
- About 90 percent of the earth's crust is made up of igneous rocks.
- Igneous rocks are of two types –

A. Intrinsic igneous rocks-

- This rock is formed when magma does not reach the surface during volcanic eruption but cools down below the surface and solidifies. It has two sub-classes-

i. Inner Igneous Igneous Rocks – This rock is formed at a great depth inside the earth. Granite rock is an example of this rock.

ii. Intermediate Internal Igneous Rocks – During volcanic eruption, due to surface obstruction, magma solidifies in cracks, holes and tubes. Its main forms are – laccolith, phacolith, lapolith, batholith, sill dyke.

1. Batholith – It is in the shape of a large dome with steep edges. It is basically made of granite.

2. Lacolith – When magma lifts the upper layer upwards with more force and solidifies in a dome-shaped form, it is called laccolith.

- Its shape is umbrella-like.

3. Lapolith – When magma solidifies and takes a saucer-like shape, it is called lapolith.

4. Phacolith – When magma solidifies in a wavy shape, it is called phacolith.

5. Sill – When magma solidifies by spreading in layers parallel to the earth's surface, it is called phacolith.

6. Dyke/Kike – When magma solidifies in a perpendicular crack, it is called dyke.

B. Extrusive igneous rock –

- When the liquid and hot magma or lava material comes above the earth's crust, it cools down rapidly and takes a solid form, thus extrusive igneous rock is formed. This rock is also called 'volcanic rock'. Black soil is formed due to the erosion of this rock.

Metamorphism of igneous rock	
Igneous	**Metamorphic**
Granite	Gneiss
Syenite	Syenite Gneiss
Grebo	Serpentine
Basalt	Cysts
Bituminous Coal	Graphite

II. Sedimentary Rocks

- The rocks formed as a result of erosion and deposition of igneous and metamorphic rocks on the earth's surface are called **'sedimentary rocks'**.
- Sedimentary rocks are layered and fossils of plants and animals are found in them.
- There is a high possibility of finding deposits of iron ore, phosphate, natural gas, coal, mineral oil in these rocks.

  Note:- Coal is found in the sedimentary rocks of Godavari Mahanadi and Damodar river basins.

Note- Agra Fort and Delhi's Red Fort are made of sedimentary rocks called sandstone.

Metamorphism of Sedimentary Rock	
Sedimentary	**Metamorphic**
Sapinda	Sapinda Cyst
Sandstone	Quartzite
Shale	Slate
Limestone	Marble
Lignite Coal	Anthrocite Coal

III. Metamorphic Rocks

- When the composition and form of igneous and sedimentary rocks change due to heat, pressure and chemical reactions, then metamorphic rocks are formed.
- Metamorphic rocks are the hardest and fossil-free.

Metamorphism of Metamorphic Rock	
Metamorphic	**Metamorphic**
Slate	Phyllite
Phyllite	Schist

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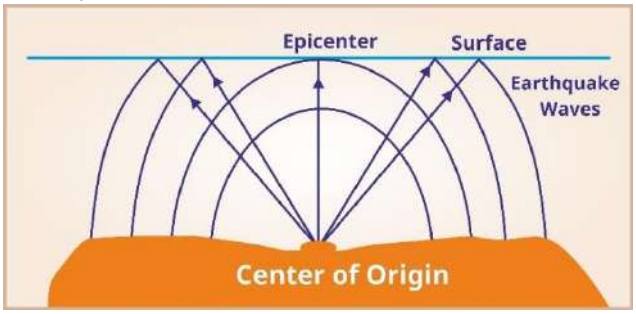
Earthquakes and Volcanoes

Earthquake

- The study of earthquakes is called seismology.
- The intensity of an earthquake is measured on the Richter scale.
- The release of energy due to the endogenous and exogenous forces of the earth results in the generation of waves which spread in all directions and produce vibrations, which is called an **earthquake**.
- The place from where seismic waves originate is called the 'focus'.
- The place where seismic waves are first felt is called the 'epicentre'.



- The intensity of earthquake waves is measured by a seismograph. It has three scales –
  1. Rossi-Ferrel scale
  2. Mercalli scale
  3. Richter scale

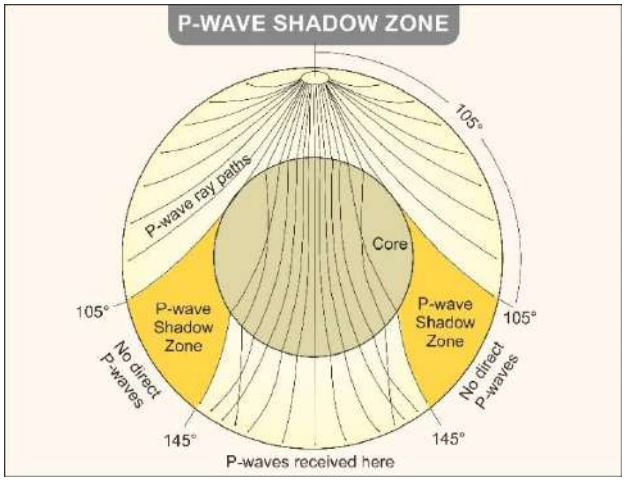
Note:- Before an earthquake, the amount of radon gas in the atmosphere increases.

- The line joining places with equal seismic intensity is called **'Isoseismal Lines'**.
- The line joining the seismic areas occurring at the same time is called **'Homoseismal Line'**.
- During an earthquake, many types of seismic waves are generated, which are divided into **three categories**-

I. Primary or Longitudinal Waves

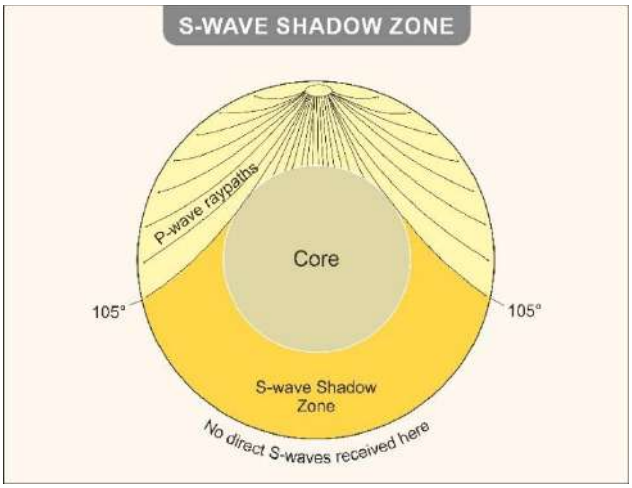
- Average velocity – 8 km/second
- These waves are also called **P waves**.
- P waves are not recorded in the area between 105 degrees to 145 degrees from the epicentre of the earthquake, which is called the P wave shadow area, but after 145 degrees, P waves start getting recorded again, i.e. the area between 105 degrees and 145 degrees is the shadow area for P waves.
- Primary waves act like 'sound waves'.
- These waves reach the surface first because they have the fastest speed among seismic waves.
- These waves can pass through solid as well as liquid and gaseous medium.
- The speed of P-waves is 66% more than that of S waves.

Note:- Only p waves pass through the central part of the earth, but their velocity decreases there.



II. Secondary or Transverse Waves

- These waves are also called **'S-waves'**.
- Average velocity- 4 km/sec
- After 105 degrees from the epicentre of the earthquake, S waves completely disappear or they cannot be recorded. Hence all the areas after 105 degrees are the shadow areas of S waves. Thus the shadow area of S waves is more extensive than the shadow area of P waves.
- These waves act like 'light waves'.
- S waves travel only in solid medium.
- Due to the part of the core of the earth being liquid, S waves cannot travel.
- Its speed is 40% less than that of P-waves.



III. Surface waves

- These waves are also called **'L – waves'**.
- They were discovered by H.D. Love.
- Average speed 1.5 to 3 km/sec
- L–waves affect only the upper part of the earth.
- These waves are very effective (destructive) and travel the longest distance on the surface.
- Another name is R-waves (Raylight waves).
- This is the wave that reaches the surface the latest.
- These waves travel only near the surface.

Volcano

♦ The natural hole or crack on the earth's surface, through which the earth's liquid substances, lava, ash, steam and gases come out, is called a volcano.

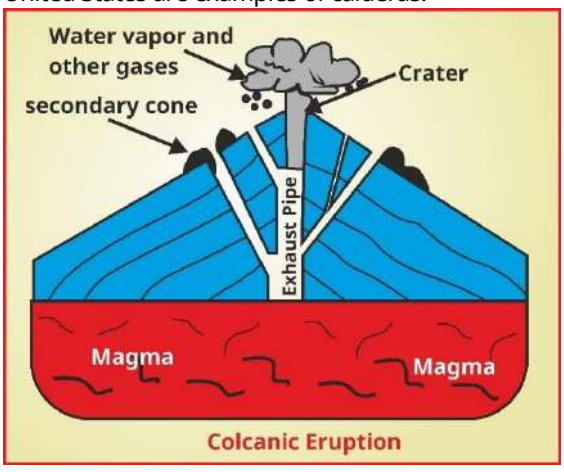
Substances related to volcanic activity

- **Lava –** The sticky/molten substance in volcanic eruption is called 'lava'.
- **Volcanic bombs –** Large pieces of rocks that come out during volcanic eruption are called volcanic bombs.
- **Pyroclasts** – Large pieces of rocks that come to the earth's surface during volcanic activity are called 'pyroclasts'. These are usually found at the bottom of volcanic mountains.
- **Lapilli** – The pieces of volcano that are equal to a pea are called lapilli.
- **Pumice –** The density of these rock pieces is less than that of water, so they can float in water.
- **Dust/ashes** – Very fine rock particles are called 'dust or ash'.
- **Cinde –** The lava that blows out in the air cools down quickly and turns into small solid pieces, which are called cinders.

> **Note-** Explosive eruptions are observed in volcanoes when the amount of silica in the magma of the volcano is high.

External landforms created by volcanic activity-

- The external topographies created by the explosive eruption of a volcano include the formation of various types of volcanic cones; **such as** craters and calderas.
  - **A. Crater –** The depression-like shape formed by the explosion process at the top of the cone is called a 'crater'. When the crater is filled with water, a **'crater lake'** is formed; **for example** - Lonar Lake (Maharashtra)
  - **B. Caldera -** This is a more expanded form of crater, which is formed when the size of the crater increases due to its sinking, thereby forming 'calderas'; **for example,** Aso Crater of Japan, Crater Lake of the United States are examples of calderas.



◆ **Three types of volcanoes according to the period of eruption–**

1. **Active Volcano –** The volcanoes from which lava, gas and fragmented material keep coming out are called **'active volcanoes'**.
   For example – Kilauea of Hawaii Island (America), Colima of Mexico, Ojas del Salado of Argentina-Chile, Stromboli and Etna of Italy, Cotopaxi of Ecuador, Mount Elbrus/Erebus of Antarctica, Barren of Andaman-Nicobar (India), Mount Taal of Philippines are the major active volcanoes.

Note
Stromboli – It is called the lighthouse of the Mediterranean.
Ojos del Salado – It is the world's highest active volcano.
Cotopaxi – It is the world's highest volcanic mountain.
Kilauea – It is the world's most active volcano.
Etna – It is Europe's most active volcano.

2. **Dormant Volcano –** Dormant volcanoes are those which have not been active for years, but can become active again anytime.
   For example – Vesuvius of Italy, Mayan of Philippines, Krakatoa of Indonesia, Fujiyama of Japan, Narcondam of Andaman-Nicobar (India) are the major dormant volcanoes.
3. **Extinct Volcano –** There has been no eruption in an extinct volcano for thousands of years and there is no possibility of it in the future too.
   For example – Kilimanjaro of Tanzania, Chimbarajo of Ecuador, Popa of Myanmar, Demband and Koh Sultan of Iran are the major dormant volcanoes.

Note:- Aconcagua - This is the world's highest dormant volcano, located in the Andes mountain range.

Other important points –

I. Smoke

- These are the symbols of the last stage of volcanic activity.
- Gas and water vapor come out from the smoke and the smoke containing sulphur is called 'solfatara'. **Example** – Mount Katmai of Alaska (USA) is called **'Valley of ten thousand smokes'**.
- The smoke of **'White Island'** of New Zealand is famous.

II. Geyser

- These are such sources of hot water from which hot water gushes out from time to time. **Example** – 'Old Faithful Geyser' and 'Excelsior Geyser' located in Yellowstone National Park of USA are famous.
- **Noctis Volcano** – A huge volcano higher than Mount Everest has been discovered on Mars, which was hidden for decades in one of the most prestigious areas of Mars. The volcano has been temporarily named "Noctis Volcano".
- **Mount Erebus Volcano** – A study has shown that Mount Erebus in Antarctica spews out gas containing about 80 grams of crystallized gold every day, which is worth about US$6,000. Mount Erebus is the highest active volcano in Antarctica (12,448 feet). Mount Erebus and Deception Island are the only two active volcanoes out of the total 138 volcanoes present in Antarctica.

Major volcanoes of the world		
S.No.	**Name**	**Country**
1.	Ojos del Salado	Argentina–Chile
2.	Cotopaxi (the world's tallest)	Ecuador
3.	Chimborazo	Ecuador
4.	Mount Cameron	Cameroon (Africa)
5.	Mount Erebus	Ross (Antarctica)
6.	Mount Etna	Sicily (Italy)
7.	Vesuvius	Italy
8.	Stromboli	Lipari Island (Italy)
9.	Krakatoa	Indonesia
10.	Katmai	Alaska (U.S.A.)
11.	Mount Rainier	U.S.A.
12.	Mount Shasta	U.S.A.
13.	Moanalua	Hawaiian Islands (U.S.A.)
14.	Fujiyama	Japan
15.	Mount Taal	Philippines
16.	Mount Pinatubo	Philippines
17	Mayon	Philippines
18.	Damavand	Iran
19.	Koh Sultan	Iran
20.	Kilimanjaro	Tanzania
21.	Kolyma	Mexico
22.	Mount Ruang	Indonesia
23.	Mount Ibu	Indonesia
24.	Kilauea Volcano	Hawaii, USA
25.	Mount Kanlaon Volcano	Philippines

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Plate Tectonics Theory

♦ Ocean covers **70.8%** of the total area of the earth and continent covers **29.2%.** Theories related to the origin of ocean and continent on earth-

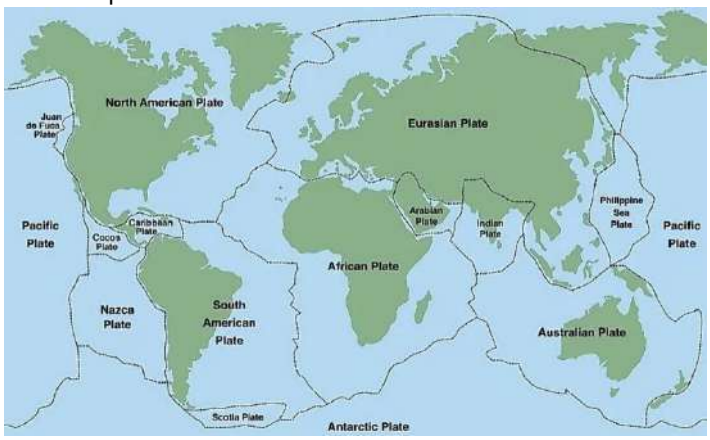
I. Continental drift theory

- This theory was given by 'Alfred Wegener' in the year 1912.
- He named the continent as Pangea and the ocean as 'Panthalassa'.
- Pangea was divided in the Jurassic era in which the northern part was named 'Angaraland' (Laurentia) and the southern part was named 'Gondwana Land' and the ocean between these two was named 'Tethys Sea' and later Angaraland separated and became the continent of North America, Europe and Asia. South America, Africa, peninsular India, Madagascar and Australia were formed from Gondwana Land.

II. Plate tectonics theory –

- This theory was given by 'Harry Hans' in the year 1962. In the year 1967, Morgan, Mackenzie, Parker and Holmes gave a scientific explanation of this theory.

◆ According to these theories, the Earth's lithosphere and hydrosphere are divided into seven main plates and some small plates –



- **Antarctic Plate –** This plate includes both Antarctic and oceanic plates, because the oceanic plate surrounds it from all sides.
- **North American Plate –** This plate is located in the North American continent, which includes the western Atlantic floor and the South American plate and the Caribbean islands work to determine the boundary of this plate.
- **South American Plate –** This plate is located in the South American continent, which includes the western Atlantic floor.
- **Pacific Ocean Plate –** The only plate among the big plates is an oceanic plate, all other plates are continental.
- **Indo-Australian-New Zealand Plate –** The plate located to the west of the Pacific Ocean plate, which has led to the formation of India, Australia and the Indian Ocean.
- **African Plate –** This plate includes the entire African continent and the eastern Atlantic floor.
- **Eurasian Plate –** This plate includes Europe, Asia continent and the eastern Atlantic Ocean floor.

♦ The important small plates are as follows–

- **Cocos Plate –** This plate is located between Central America and Pacific Ocean Plate.
- **Nazca Plate –** Located between South America and Pacific Ocean Plate.
- **Arabian Plate –** This plate includes most of the land of Arabian Peninsula.
- **Philippine Plate –** It is located between the Asian continent and the Pacific Ocean Plate.
- **Caroline Plate –** This plate is located between the Philippine and Indian Plates, north of New Guinea.
- **Fuji Plate –** It is located in the north-east of Australia.
- **Juan de Fuca Plate –** This plate is located south of Alaska and west of the North American Plate.

♦ **As a result of plate movement, there are three types of plate boundaries –**

1. Divergent Plate Boundary

- When two plates move away from each other in opposite directions, a new crust is formed, they are called **'divergent plates'**.
- The edges of this plate are called constructive edges.

Examples–

i. Mid Atlantic Ridge, where the American plates (North American and South American plates) and the Eurasian and African plates are separating.
ii. Red Sea Rift is a mid-ocean ridge between the African plate and the Arabian plate.

2. Convergent plate boundary

- When one plate sinks under another plate and the crust is destroyed, a convergent boundary is formed and in this boundary the plate of higher density sinks under the plate of lower density. This region is called 'Bay of Belt'.
- The edges of this plate are called destructive margins.

Example–

(i) Formation of folded mountains (Rocky Mountains and Andes Mountains)
(ii) Volcanic eruptions are also seen here.

3. Conservative plate boundary

- When two plates move parallel to each other, there is no interaction between them, hence it is called **conservative plate boundary**.
- A **transform fault is formed** in it.

Example–

(i) San Andreas fault near California.

❐❐❐

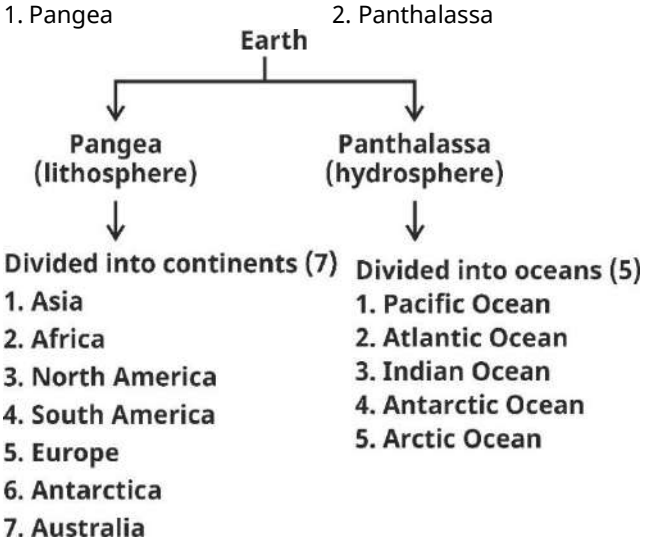
Continent

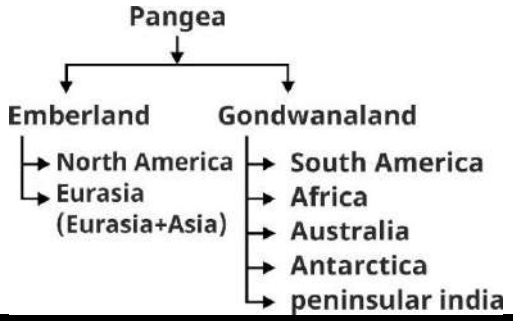
Continental drift theory

◆ The largest unit of landmass on Earth

◆ This theory was given by Alfred Wegener in the year **1912** and this theory divided the Earth into two parts-

1. Pangea 2. Panthalassa





Continent	
On the basis of area (in descending order)	**On the basis of population (in descending order)**
Asia	Asia
Africa	Africa
North America	Europe
South America	North America
Antarctica	South America
Europe	Australia
Australia	Antarctica (no population migration)

Asia Continent

◆ The word Asia is derived from the Hebrew word 'Asu' which means rising sun. It is spread over 30% of the total area of the world.

Country श	Capital	Currency
India	New Delhi	Rupee
Sri Lanka	Sri Jayawardenepura Kotte	Rupee
Nepal	Kathmandu	Rupee
Maldives	Male	Rufiyaa
Pakistan	Islamabad	Rupee
Indonesia	Jakarta/Nusantara	Rupiah
Bhutan	Thimphu	Ngultrum
Bangladesh	Dhaka	Taka
Myanmar	Naypyidaw	Kyat
China	Beijing	Yuan
Mongolia	Ulaanbaatar	Tugrik
Uzbekistan	Tashkent	Som
Kyrgyzstan	Bishkek	Som
Kazakhstan	Astana	Tenge
Tajikistan	Dushanbe	Somoni
Iran	Tehran	Rial
Saudi Arabia	Riyadh	Riyal
Yemen	Sanaa	Rial
Qatar	Doha	Riyal
Oman	Muscat	Omani Rial
Iraq	Baghdad	Dinar
Bahrain	Manama	Dinar
Kuwait	Kuwait City	Dinar
Jordan	Amman	Dinar
Lebanon	Beirut	Pound
Syria	Damascus	Pound
Cyprus	Nicosia	Pound
United Arab Emirates	Abu Dhabi	Dirham
Türkiye	Ankara	Lira
Israel	Jerusalem	New Shekel
Malaysia	Kuala Lumpur	Ringgit
Cambodia	Phnom Penh	Riel
Philippines	Manila	Peso
Taiwan	Taipei	Dollar
Singapore	Singapore	Singapore Dollar
Guam	Hagåtña	Dollar
Brunei	Bandar Seri Begawan	Dollar
Hong Kong	Victoria	Dollar
Laos	Vientiane	Lao kip
Thailand	Bangkok	Baht
Vietnam	Hanoi	Dong
North Korea	Pyongyang	Won
South Korea	Seoul	Won
Japan	Tokyo	Yen
Macau	Macau	Pataca
Afghanistan	Kabul	Afghani
Turkmenistan	Ashkhabad	Manat
Azerbaijan	Baku	Manat
Georgia	Tbilisi	Lari
Armenia	Yerevan	Dram

- The Arctic Ocean is situated in the north of the continent of Asia, the Indian Ocean in the south, the Pacific Ocean in the east and the Mediterranean Sea in the west.
- The boundary between the land part of Asia and Europe is the Ural mountain range and the Caucasus mountain and the continent of Asia is separated from North America by the Bering Strait and from Africa by the Red Sea and the Suez Canal.
- Asia is the largest continent in the world in terms of area and population. About 60 percent of the world's population lives here.
- The Arctic Circle, the Tropic of Cancer and the Equator pass through the continent of Asia.
- The continent of Asia is mainly located in the Northern Hemisphere, while some islands of the Indonesian archipelago come under the Southern Hemisphere.
- The highest point of the continent of Asia is Mount Everest (Nepal) and the lowest point is the Dead Sea (Jordan), which are the highest point and lowest point of the world respectively.
- Landlocked countries of the continent of Asia-

Kazakhstan	Uzbekistan	Tajikistan
Turkmenistan	Azerbaijan	Kyrgyzstan
Armenia	Afghanistan	Bhutan
Laos	Nepal	Mongolia

Mountains of the Asian Continent

- **Himalay Mountains -**
  - It is located in India, Nepal, Bhutan, China.
  - The highest peak of this mountain is **Mount Everest (8848.86 meters)**, which is located in Nepal. It is called **'Sagarmatha'** in Nepal. It is the highest peak of the world.

Note:-
- The second highest peak of the world is **Godwin Austin (K_2)** (8,611 meters), which is located in the Karakoram range of the Himalayas.
- The third highest peak of the world is **Kangchenjunga (8,598 meters)** which is located in the **Sikkim state** of India.

- **Arakanyoma Mountain -**
  - It is a new folded mountain located in Myanmar.
  - The highest peak of this mountain is Victoria.
  - he Andaman-Nicobar Islands are considered to be the southern part of this mountain.
- **Fujiyama –** It is the largest volcanic mountain in Japan.
- **Hindukush Mountains-**This mountain is located from the western part of the Pamir Knot to the Elburj Mountains of Iran.
- **Kurdistan Mountains-**This is the highest mountain of Iraq.
- **Mount Brama-**This is a famous volcanic mountain of Indonesia.
- **Elburj Mountains-**This is located in the northern part of Iran. Its highest peak is **'Mount Damavand'.**
- **Zagros Mountains-**This is located in the southern part of Iran. Its highest peak is **Mount Dena.**
- **Ararat Mountains-**Ararat Mountains are located in Turkey. The Elburj and Zagros mountain ranges meet in this mountain range.

Plateaus of the Asian continent

- **Tibet Plateau**
  - Located in China, it is the world's highest and largest plateau.
  - This plateau is located between the Himalayas and Kunlun Shan Mountains.
- **Pamir Plateau**
  - This plateau is called the roof of the world and the Pamir Knot.
  - This plateau is located in China, Kyrgyzstan, Tajikistan, Afghanistan.
- **Taklamakan Plateau –** It is located in the Tarim Basin region of China.
- **Mongolian Plateau–** Plateau located in China and Mongolia, south of which the Gobi Desert extends.
- **Potwar Plateau–** This plateau is located in the south-east direction of the Hindukush Mountains, which is in the northern part of Pakistan.
- **Anatolia Plateau.–** Located in Turkiye. This plateau region is also called Asia Minor.
- **Shan Plateau–** It is located in Myanmar.
- **Yunnan Plateau-** Yunnan Plateau spread in the south-eastern part of China is rich in tin, iron, coal and other mineral resources.
- **Loess Plateau-** It is situated in China.

Major rivers of the Asian continent

- **Yangtze Kiang River**
  - It is the longest river of the Asian continent and the third longest river of the world.
  - This river originates from the Jari Hills situated in China.
  - Hangzhou, Wuhan and Shanghai cities of China are situated on the banks of this river.
  - Three Gorges Dam is situated on this river.
- **Mekong River**
  - The drainage area of this river is in China, Thailand, Laos, Cambodia, Vietnam.
  - This river originates from the Tibetan plateau and falls into the South China Sea.
  - Cambodia's capital Phnom Penh is situated on the banks of this river.
- **Hong Ho River**
  - This river originates from Kunlun Shan Mountain and falls into the Po Hai Bay of the Yellow Sea, due to which this river is called the Yellow River.
  - Famous for its erosion and floods, this river is called the 'Sorrow of China' and is the second longest river in Asia.
- **Brahmaputra River**
  - The origin of this river is from the Chemayungdung Glacier of Tibet.
  - The total length of this river is 2900 km. and its length in India is 916 km.
  - This river is known as Yarlung-Tsangpo in Tibet (China) and Padma in Bangladesh.
  - This river falls into the Bay of Bengal.
- **Indus River**
  - The origin of this river is from the Bokharchu Glacier of the Kailash mountain range in Tibet region.
  - Its total length is 2880 km and its length in India is 1,114 km.
  - Indus river falls into Arabian sea near Karachi.
- **Irrawaddy river**
  - This is the main river of Myanmar.
  - Myanmar's Yangon (Rangoon) city is situated on its delta region.
- **Salween river -** This is the longest river of Myanmar.
- **Chao Phraya River**
  - The main river of Thailand on the banks of which Thailand's capital Bangkok is situated.
- **Lena River**
  - This river originates from the mountainous region near Lake Baikal and falls into the Laptev Sea.
  - It is the largest river falling into the Arctic Ocean.

Major lakes of the Asian continent

- **Caspian Sea**
  - Situated in Azerbaijan, Iran, Kazakhstan, Turkmenistan, Russia, it is the world's largest lake as it divides the continents of Asia and Europe.
  - Volga and Ural rivers fall into this lake.
- **Pangong Lake**
  - This lake is located on the India-China border.
  - The Line of Actual Control (LAC) between India and China passes through here.
- **Tonle Sap Lake -** This lake is located in Cambodia.
- **Van Lake -** This lake located in Turkey is the world's saltiest lake.

- **Baikal Lake**
  - The world's deepest lake, located in Russia. The Lena and Angara rivers originate from this lake.
- **Dead Sea**
  - This lake is located between Israel and Jordan countries of the Asian continent and it is the second saltiest lake in the world.
  - The lowest point of the world is located on the land side of this lake.
- **Lake Toba –** This is an example of a crater lake located in Indonesia.

Major deserts of the Asian continent

- **Rub-al-Khali Desert –**
  - The world's largest sand-made area, which is located in Saudi Arabia.
  - This is the world's largest Erg desert.
- **Al Nafud Desert –** This is a hot desert located in Saudi Arabia.
- **Dasht-e-Kavir Desert –** Desert located in Iran which is also called the Great Salt Desert.
- **Dasht-e-Lut Desert-**This desert is located in eastern Iran.
- **Gobi Desert**
  - This desert is spread in Mongolia and China.
  - It is a cold desert.
- **Taklamakan Desert**
  - It is located in the north-west Xinjiang region of China.
  - It is the second largest erg desert in the world.
  - It is a cold desert.
- **Karakum Desert –** This desert is located in Turkmenistan and Kazakhstan.
- **Kyzylkum Desert –** This desert is located in Kazakhstan and Uzbekistan.
- **Thar Desert –** Spread in India and Pakistan, Thar is a desert of all three types – Erg, Raig and Hammada, which is the most biodiversity desert in the world.

Other important points of the continent of Asia-

- China is the country with the highest population in the world.
- Singapore is the country with the highest population density in the world.
- China is the largest country in Asia in terms of area and the smallest is Maldives.
- The area with the highest rainfall in the world is Mawsynram (Meghalaya) in India.
- Pangong Lake, the salt water lake situated at the highest altitude in Asia, is located in Ladakh (India) and Tibet.
- Thailand, Malaysia and Indonesia are the largest rubber producing and exporting countries in Asia.
- Bangladesh and India are the largest jute producing countries in Asia respectively.
- China ranks first in the world in the production of tobacco, wheat and rice etc.
- The canal connecting the Red Sea and the Mediterranean Sea is the Suez Canal.
- Angora breed goats of Turkiye are world famous.
- Pakistan is known as the country of canals in the world, whereas Bangladesh is known as the country of rivers.
- The countries producing maximum jute and sugarcane in Asia are Bangladesh and India respectively.
- The country with the highest population density in Asia is Singapore.
- The country producing maximum tin in Asia is Malaysia.
- The country manufacturing maximum ships in Asia is Japan.
- Nagasaki of Japan is situated on Kyushu Island.
- The largest network of irrigation canals in the world is in Pakistan.
- The deepest sea trench in the world is Mariana Trench (11,033 meters deep) in the Pacific Ocean near the Philippines Islands in Asia.
- The most densely populated island in Asia is Java.
- The country producing maximum natural rubber in Asia is Thailand.

Continent of Africa

Countries in the African continent

Country	Capital	Currency
Egypt	Cairo	Pound
Sudan	Khartoum	Pound
South Sudan	Juba	Pound
Sierra Leone	Freetown	Leone
Libya	Tripoli	Dinar
Algeria	Algiers	Dinar
Tunisia	Tunis	Dinar
Morocco	Rabat	Dirham
Nigeria	Abuja	Neira
Angola	Luanda	Kwanza
Namibia	Widhoek	Dollar
Zimbabwe	Harare	Dollar
Liberia	Monrovia	Dollar
Republic of Congo	Kinshasa	Franc
Congo	Brazzaville	Franc
Rwanda	Kigali	Franc
Senegal	Dakar	Franc
Burkina Faso	Ouagadougou	Franc
Mali	Bamako	Franc
Benin	Porto Novo	Franc
Burundi	Bujumbura	Franc
Cameroon	Yaoundé	Franc
Central African Republic	Bangui	Franc
Chad	N'Djamena	Franc
Comoros	Moroni	Franc
Ivory Coast	Yamoussoukro	Franc
Djibouti	Djibouti	Franc
Gabon	Libreville	Franc
Guinea Bissau	Bissau	Franc
Guinea	Conakry	Franc
Niger	Niamey	Franc
Togo	Lome	Franc
Somalia	Mogadishu	Shilling
Uganda	Kampala	Shilling
Kenya	Nairobi	Shilling
Tanzania	Dodoma	Shilling
Seychelles	Victoria	Rupee

Mauritius	Port Louis	Rupee
Ethiopia	Addis Ababa	Birr
Botswana	Gaborone	Pula
Zambia	Lusaka	Kwacha
Mozambique	Maputo	Metical
Cape Verde	Praia	Escudo
Eritrea	Asmara	Nakfa
Gambia	Banjul	Dalasi
Ghana	Accra	Cedi
Lesotho	Maseru	Loti
Madagascar	Antananarivo	Ariary
Malawi	Lilongwe	Kwacha
Mauritania	Nouakchott	Ouguiya
South Africa	Capetown (legislative) Pretoria (administrative)	Rand

- The African continent is the second largest continent in the world on the basis of area and population.
- Due to the African continent being economically, socially, educationally and technologically backward, it is also called the 'Dark Continent'.
- The African continent is the only continent through which the Tropic of Cancer, the Equator and the Tropic of Capricorn pass.
- **Geographical position of the African continent**
  - To the west of the African continent – Atlantic Ocean
  - To the east of the African continent – Indian Ocean
  - To the south of the African continent – Antarctic Ocean
  - To the north of the African continent – Mediterranean Sea
  - To the north-east of the African continent – Red Sea
- **The Tropic of Cancer passes through the following countries of Africa –**
  1. Western Sahara 2. Mauritania 3. Mali 4. Algeria 5. Libya 6. Egypt 7. Niger
- **The Equator passes through the following countries of Africa –**
  1. Sao Tome 2. Gabon 3. Republic of Congo 4. Zaire 5. Uganda 6. Kenya 7. Somalia
- **The Tropic of Capricorn passes through the following countries of Africa –**
  1. Namibia 2. Botswana 3. South Africa 4. Mozambique 5. Madagascar
- Horn of Africa is the eastern part of Africa, which includes 4 countries-
  1. Somalia 2. Ethiopia 3. Djibouti 4. Eritrea
- The southernmost point of the African continent is Cape Agulhas (South Africa).

Landlocked countries of the African continent –

Mali	Burkina Faso	Burundi
Chad	Central African Republic	South Sudan
Ethiopia	Uganda	Rwanda
Zambia	Zimbabwe	Malawi
Botswana	Lesotho	Niger
Swaziland		

Major mountains of the African continent

- **Atlas Mountains**
  - This mountain is formed by the convergence of Eurasian and African plates and it is a new folded mountain.
  - The highest peak of this mountain is **Mount Toubkal** (4167 m).
  - It is spread across Morocco, Algeria and Tunisia.
- **Mount Kilimanjaro**
  - This mountain is also known as Mount Kibo.
  - It is the highest peak of the African continent (5895 m), which is located in Tanzania.
  - It is a dead volcanic mountain. Coffee is cultivated on its slopes.
- **Drakensberg Mountains**
  - This mountain is located in South Africa and its highest peak is Thabana Netyana.
  - It is famous for the production of gold and diamonds.
- **Mount Kenya**
  - Situated in Kenya, it is Africa's second highest peak (5,199 m).
  - Kenya National Park is situated here.
- **Mount Cameroon**
  - Situated in the Cameroon coastal region of Africa, it is Africa's only active volcanic mountain.
  - It is important from the point of view of iron reserves.
- **Katanga Mountains**
  - It is the main copper, gold, tin, iron, diamond producing region of Zaire and Zambia.
  - Congo and Kasai rivers originate from this mountain.

Major plateaus of the African continent

- **Jos Plateau–**
  - This plateau is spread in the northern part of Nigeria and Niger and is famous for its tin reserves.
- **Bie Plateau**
  - Highland located in Angola from where the Zambezi River originates. This is a region rich in bauxite mineral.
- **Adamawa Plateau –** Plateau located on the border of Nigeria and Cameroon.
- **Abyssinian Plateau**
  - Lava plateau located in Ethiopia, which is famous for coffee production.
  - The rivers Shilebi and Juba originate from this plateau.
- **Tanganyika Plateau–** Plateau located in Tanzania, which is the eastern part of Lake Tanganyika.
- **Somali Plateau –** Plateau region located in Somalia which is famous for its petroleum reserves.
- **Katanga Plateau**
  - Plateau located in Zaire country which is famous for copper and uranium production.
  - Congo and Zaire rivers originate from this plateau.

Major deserts of the African continent

- **Sahara Desert**
  - Spread over 8.54 lakh km.
  - This is the world's largest desert, which is located in the northern part of Africa.
  - This desert is of all three types, **Erg, Rag and Hammada**, Hammada is the rocky desert of Sahara.
  - Eleven countries - Algeria, Chad, Egypt, Libya, Mali, Mauritania, Morocco, Niger, Tunisia and Western Sahara
- **Sahil Desert -** This semi-arid strip is located on the southern border of the Sahara Desert and extends from Pawai Senegal to Sudan.
- **Kalahari Desert**
  - This desert is located in Botswana and Namibia. This is the home of Bushmen, an ancient tribe of the African continent.
  - Ostrich bird is found in this desert.
- **Nubian Desert -** Desert located on the eastern border of Egypt and Sudan, which is on the western coast of the Red Sea.
- **Namib Desert**
  - Desert located in Angola, Namibia and South Africa, in which Khoi and Bushmen tribes live.
  - Benguela cold current contributes to the formation of this desert.
- **Western Desert -** This desert spread in Libya is a part of the Sahara Desert.

Major rivers of the African continent

- **Nile River**
  - The Nile River is the combined form of two branches named White Nile and Blue Nile. It is the longest river of the world (6650 km).
  - Aswan Dam and Nasser Lake are situated on this river in Egypt.
  - Egypt is called the boon of the Nile River.
  - Egyptian civilization was born on the banks of this river.
  - This river forms a delta on the Mediterranean Sea.
- **Zaire/Congo River**
  - This river originates from the confluence of Lua Laba and Lua Pula rivers and its two tributaries are Kasai and Ubangi.
  - This river crosses the equator twice.
  - Living Stone and Stanley Falls are situated on this river.
  - Half of the diamond trade in the world is obtained from the Kasai River Basin.
  - Inga Dam is built on this river.
- **Limpopo River**
  - This river forms the border between South Africa and Zimbabwe.
  - It crosses the Tropic of Capricorn twice.
- **Niger River**
  - This river originates from Futa Strait (Sierra Leone) and flows through Guinea, Mali, Niger, Nigeria and falls into the Gulf of Guinea.
  - This river is also called Palm Oil River.
  - Kainji Dam is situated on this river.
- **Zambezi River**
  - This river originates from Katanga Plateau and falls into Mozambique Channel (Indian Ocean).
  - Victoria Falls and Kariba Dam are situated on this river.
- **Orange River**
  - This river originates from Drakensberg Mountains and falls into the Atlantic Ocean.
  - It is the longest river of South Africa and forms the border between South Africa and Namibia.
  - Aguregise Dam is situated on this river.
- **Kasai River**
  - This river forms the border between Zaire and Congo countries and is the main tributary of Zaire.

Major lakes of the African continent

- **Lake Victoria**
  - The largest lake of the African continent, from where the Nile River (White Nile) originates.
  - It is located in Uganda, Kenya and Tanzania.
- **Lake Tanganyika**
  - The second deepest lake in the world after Lake Baikal, which is located in Tanzania, Zaire, Burundi and Zambia.
  - It is a fault lake.
- **Lake Nyasa/Malawi**
  - The third largest lake of the African continent, which is located in Tanzania, Mozambique and Malawi.
- **Lake Volta –** It is a freshwater man-made lake located in Ghana.
- **Lake Chad –** This lake is located in the countries of Chad, Niger and Cameroon.
- **Lake Nasser –** It is a man-made lake located on the Nile River in Egypt.
- **Lake Assal –** This lake located in Djibouti is the lowest point of Africa.

Other important points of the African continent:-

- Nigeria is the most populated country in Africa.
- Libya is the most urbanized country in Africa.
- Uganda, Kenya and Tanzania in Africa are called Wiggame Country i.e. the country of hunters.
- Egypt is called the junction of Asia and Europe continent.
- Somali Peninsula is the largest peninsula of the African continent.
- Most of Africa's bauxite is produced in Guinea.
- Ivory Coast is the country producing the most coffee in Africa.
- The tropical grasslands of Africa are called Savanna and the temperate grasslands are called Veld.
- Kimberley mine in Africa in terms of production and Orapa in terms of area are the world's largest diamond mines.
- Johannesburg of South Africa is called the city of gold and Kimberley is called the city of diamonds.
- The canal connecting the Mediterranean Sea and the Red Sea is the Suez Canal. The Suez Canal is called the **nerve** of the British Empire.

- The major primitive tribes found in Africa are Bushman (Kalahari), Pygmy (Congo Basin), Bedouin (Sahara Desert).
- The city of Johannesburg in Africa is one of the major gold producing cities in the world.
- The Transvaal region of Africa is famous for giraffes and zebras.
- The country producing the most olives in Africa is Tunisia.
- Angola, Botswana, Mozambique, Zimbabwe, Tanzania and Zambia are called frontline states.
- Jute is produced in Africa from a plant called sisal.
- Antwerp (Belgium) – The world's largest centre of diamond trade.
- Coffee cultivation – It is done by the Chagga tribe in the eastern slopes of Kilimanjaro.

North America Continent

Countries in the North American continent

Country	Capital	मुद्रा
United States of America	Washington D.C.	Dollar
Canada	Ottawa	Dollar
Bermuda	Hamilton	Dollar
Bahamas	Nassau	Dollar
Belize	Belmopan	Dollar
Dominique	Roseau	Dollar
Antigua and Barbuda	Saint John's	Dollar
Saint Lucia	Castries	Dollar
Puerto Rico	San Juan	Dollar
Saint Kitts and Nevis	Basseterre	Dollar
Saint Vincent and the Grenadines	Kingstown	Dollar
Mexico	Mexico City	Peso
Cuba	Havana	Peso
Dominion Republic	Santo Domingo	Peso
Panama	Panama City	Balboa
Costa Rica	San José	Colón
Honduras	Tegucigalpa	Lempira
Netherlands Etiennes	Blomstad	Guilder
Virgin Islands	Charlotte Amalie	Dollar
El Salvador	San Salvador	Dollar
Jamaica	Kingston	Dollar
Grenada	Saint George	Dollar
Guatemala	Guatemala City	Quetzal
Nicaragua	Managua	New Cordoba
Guadeloupe	Basse Terre	Franc
Martinique	Ford de France	Franc
Haiti	Port au Pres	Gorde
Greenland	Nuuk	Krone

- North America is bordered by the Arctic Ocean to the north, the Gulf of Mexico to the south, the Atlantic Ocean to the east and the Pacific Ocean to the west.
- It is the third largest continent in terms of area and the fourth largest continent in terms of population.
- This continent was discovered by Christopher Columbus in 1492 AD and the continent was named America after the Portuguese Amerigo Vespucci.
- This continent is called the country of the New World.
- Greenland – This is the largest island in the world, which is geographically a part of North America, while politically and administratively it is under Denmark (Europe).

Physical regions of the North American continent

- **Western Cordillera –** This is a long mountain range from Alaska to Panama.
- **Canadian Shield –** The oldest landmass of North America, the deposition of which has led to the formation of Great Bear, Great Slave, Winnipeg lakes.
- **Appalachian region-** A very ancient folded mountain range stretching from the Gulf of Saint Lawrence to central Alabama, which is a region rich in mineral resources.
- **Central Plains-** This is the southern part of the Canadian Shield.

Major mountain ranges of North America continent

- **Appalachian mountain range**
  - This mountain range located on the eastern coast of North America is the second oldest mountain range in the world.
  - Its highest peak is Mount Mitchell.
  - This region is famous for coal and petroleum reserves.
- **Rocky mountain range**
  - This mountain range is spread from Alaska to New Mexico in the western part of North America continent, which is the second longest mountain range in the world.
  - Its highest peak is Mount Elbert (4378 m).
- **Brooks mountain range -** The northernmost mountain range of North America continent, which is located in Alaska region.
- **Alaskan Range -** Its highest peak is **"Mount McKinley"** (6194 m) which is the highest peak of North America.
- **Mackenzie Mountain Range –** This is the longest and highest mountain range of Canada.
- **Sierra Nevada –** Block Mountain located in USA which is the largest mountain range in the world.

Major Plateaus of North America Continent

- **Yukon Plateau –** This plateau is located in Alaska of USA, to the north of which is 'Brooks Range' and to the south is 'Alaskan Range'.
- **Mexican Plateau –** It is located in Mexico between the western and eastern Sierra Madre mountain ranges.
- **Colorado Plateau –** It is located in the California province of the United States of America.
- **British Columbia Plateau –** This plateau is located in the British Columbia province of Canada.
- **Ozark Plateau –** This plateau is located in the Missouri and Arkansas provinces of the United States of America.

Major Deserts of North America Continent

- **Sonoran Desert –** The largest desert of North America spread in the north-western part. This desert is formed due to the effect of cold water current of California.
- **Mojave Desert –** It is a hot desert located in California region of USA.
- **Arizona Desert –** It is a hot desert located in Southern California province.
- **Great Basin Desert –** It is located in Sierra Nevada and Utah provinces of USA. Great Basin National Park is in this region.

Major lakes of North America continent

- **Lake Superior-** Situated on the border of the United States of America and Canada, it is the world's largest freshwater lake. It is connected to Lake Huron by the Soo Canal. It is an example of a glacial lake.
- **Lake Huron-** This glacial lake is located on the border of the United States of America and Canada.
- **Lake Michigan-** Glacial lake, which is completely located in the United States of America, Gary, Chicago, Milwaukee cities are located on its western shores.
- **Lake Erie-** It is located on the border of Canada and the United States of America. It is connected to Lake Huron by the Erie Canal and is also connected to Lake Ontario by the Welland Canal.
- **Lake Ontario-** Glacial freshwater lake which is located on the border of Canada and the United States of America.
- **Lake Winnipeg-** Freshwater lake on whose banks the city of Winnipeg is located, which is famous as the world's wheat market.
- **Athabasca Lake –** A freshwater lake formed by glacial effect, on whose northern shore Uranium City is situated.
- **Great Salt Lake –** A highly saline lake located in the Great Basin of the United States, on whose southern shore Salt Lake City is located.
- **Great Slave Lake –** A freshwater lake formed by glacial effect, Mackenzie River originates from this lake.

Major rivers of the North American continent

- **Riogrady River –** Forms the border of the United States and Mexico and falls into the Gulf of Mexico.
- **Mississippi River –** Famous for the Bird's Foot Delta, this river falls into the Atlantic Ocean and meets the Missouri River at Saint Louis.
- **Colorado River –** The world famous Grand Canyon is located on this river, it falls into the Gulf of California.
- **Columbia River –** Originates from the Rocky Mountains of the United States and falls into the Pacific Ocean. Grand Coulee Dam and Bolbile Dam are situated on this river.
- **Yukon River –** It is the largest river originating from the Mackenzie range and falling into the Bering Sea.
- **Mackenzie River –** This river originating from the Great Slave Lake falls into the Beaufort Sea. It is the longest river of Canada.
- **Nelson River –** This river originating from Lake Winnipeg falls into the Hudson Bay.

Other important points of North America continent

- Mexico City is the largest city of North America in terms of population.
- The 49° north latitude line forms the border between Canada and the United States.
- The temperate grasslands of North America are called prairies.
- Canada is the country that produces the most paper in the world.
- The world's largest lead zinc mine is Sullivan Mine located in British Columbia, Canada.
- The world's largest corn producing country is the United States of America.
- Cuba is called the 'sugar bowl' as it is the major producer of sugarcane.
- The Boothe Mine of the United States of America is the world's largest copper mine.
- The Saint Lawrence River joins the lakes to form the world's longest inland waterway.
- The 100° west longitude line passes through the middle of this continent.
- Arizona in the United States is famous for copper production.
- Niagara Falls is situated between Lake Erie and Lake Ontario.
- Winnipeg city, famous as the world's wheat market, is situated in Canada.
- Dead Valley situated in Southern California of the United States is an example of syncline valley.
- Hills named Green Hill, Black Hill and Blue Hill are situated in the United States.
- The cyclones blowing on the south-eastern coast of the United States are called hurricanes and tornadoes.
- Detroit region is the main centre of car industry.
- Wood Buffalo National Park of Canada is the world's largest park, which is situated in the North American continent.
- The cold Labrador current and the warm Gulf Stream flow on the eastern coast of North America.
- Major ranges of Rocky Mountains are- Cascade, Sierra Nevada, Sierra Madre, Coast Range.

South America Continent

Countries of the continent of South America

Country	Capital	Currency
Colombia	Bogota	Peso
Uruguay	Montevideo	Peso
Chile	Santiago	Peso
Argentina	Buenos Aires	Peso
Ecuador	Quito	Dollar
Guyana	Georgetown	Dollar
Suriname	Paramaribo	Dollar
Venezuela	Caracas	Bolivar
French Guiana	Cayenne	Franc
Brazil	Brasilia	Real
Peru	Lima	New Sol
Bolivia	La Paz	Boliviano
Paraguay	Asuncion	Guarani

- This continent is surrounded by the South Pacific Ocean and the South Atlantic Ocean and the Caribbean Sea in the north.
- In the north, North America is separated from this continent by the Panama Canal.
- South America, Central America, Mexico and the Caribbean countries are collectively called 'Latin America'.
- South America is the fourth largest continent in the world in terms of area and the fifth largest in terms of population.
- The Equator passes through three countries of the South American continent-
  1. Ecuador 2. Colombia 3. Brazil
- he Tropic of Capricorn passes through four countries of the South American continent-
  1. Chile 2. Argentina 3. Brazil 4. Paraguay
- In the southern part of the South American continent, there is an island called "Tierra-del-Fuego", which is separated from the mainland by the "Strait of Magellan".
- The southernmost tip of South America is the "Cape Horn".

Major mountain ranges of South America continent

- **Andes mountain range**
  - This mountain range is located from the Caribbean Sea in the north of South America continent to Tierra del Fuego in the south.
  - It is the world's longest new mountain range and the world's second highest mountain range after the Himalayas.
  - Its highest peak is Mount Aconcagua (6960 m) which is located on the border of Argentina and Chile.
  - Bolivian plateau is located in the middle of this mountain range.
  - Bolivia's capital La Paz on the Andes mountain range is the highest capital in the world.

Major plateaus of South America continent

- **Bolivian plateau**
  - It is the highest plateau in South America.
  - The world's highest navigable lake Titicaca is located on this plateau.
- **Patagonia plateau –** Located in Argentina, it is the best example of a mountainous plateau.
- **Brazilian Plateau**
  - The plateau located in the eastern part of Brazil is a region rich in iron ore deposits.
  - The Parana River originates from this plateau.
- **Guyana Plateau**
  - This plateau is located in Venezuela.
  - The main river of this plateau is the Orenico River.
- **Manto Grasso Plateau**
  - The plateau located near the border of Bolivia in the south-western part of Brazil. From where the Paraguay River originates.

Major rivers of the South American continent

- **Amazon River**
  - It is the largest and second longest river in the world on the basis of catchment area.
  - This river originates from the Andes mountain range and flows through Brazil into the Atlantic Ocean.
  - The world's most extensive evergreen rain forests are found in this river valley, which are called Amazon, Selvas rain forests.

Note:-
- The Amazon rainforest is called the **lungs of the earth**.
- Marabou Island located on the Amazon River is the second largest river island in the world.

- **Orinoco River**
  - Venezuela's main river which originates from Guyana's Western Cordillera and falls into the Caribbean Sea.
  - The world's highest Angel Falls is situated on its tributary Caro River.
  - Orinoco River is called the "land of waterfalls".
- **Parana River**
  - South America's second largest river, which originates from the Brazilian highlands.
  - This river defines the border between Brazil and Paraguay. The city of Parana situated on this river is located in Argentina.
- **Sao Francisco River-** This river originates from the Minas Garais hills of Brazil and falls into the South Atlantic Ocean.
- **Purus River–** Originating from the Andes mountain range, it is the largest tributary river that meets the Amazon from the right side.
- **Japura River-** Originating from the Andes mountain range, it meets the Amazon River.

Note- The combined system of the rivers Parana, Paraguay, Uruguay and its tributaries is called 'La Plata' and the plain formed by them is called the La Plata plain.

Major lakes of South America continent

- **Lake Titicaca**
  - The world's highest navigable lake located in the Bolivian plateau, which is an example of a crater lake and is the largest freshwater lake in South America, located on the border of Peru and Bolivia.
  - It is also called 'Honeymoon Lake'.
- **Lake Maracaibo -** This is the largest lake in South America and the lake located in the north of South America is famous for its petroleum reserves.

Major deserts of South America continent

- **Atacama Desert**
  - It is the world's driest desert located in Peru and Chile. In this desert, a place called Arica (Chile) is the driest place in the world.
  - It is a tropical desert where nitrate reserves are found.
- **Patagonia Desert -** It is a temperate desert located in Argentina.

Major grasslands of the continent of South America

- **Llanos Grassland**
  - Located in Venezuela and Colombia. It is a tropical grassland.
- **Selvas Grassland –** The tropical grassland found in the Amazon River Basin is called Selvas.
- **Campos Grassland –** Tropical grassland located in Brazil, where a plant called Yerba is found.
- **Pampas Grassland –** Temperate grassland located in Argentina.

- Pampas is called the heart of Argentina.
- The major cotton producing area of Argentina is the Chaco Plain.
- Argentina is the world's largest meat exporting country.

Major tribes of South America continent

- Natives of South America – **Red Indian**
- Mixed tribes of Brazil – **Mestizo, Mulatto, Zambo**

Other important points of South America continent:-

- Brazil is the largest country in terms of area and population of this continent.
- The most urbanized country of South America is Uruguay.
- Brazil shares its border with all the countries of South America except Ecuador and Chile.
- Bolivia is the largest landlocked country of South America.
- The continent of South America is called the continent of birds.
- It is the wettest continent of the world.
- The condor found in South America is the largest predatory bird of the world.
- The forests of the eastern slope of the Andes Mountains are called Montana.
- La Paz, the capital of Bolivia, is the highest capital in the world. (3658 meters above sea level)
- In Argentina of South America, the grasslands are called Pampas.
- The country that produces the most coffee in the world is Brazil. Here the coffee plantations are called Fazenda.
- The world's coffee market is located in Sao Paulo (Brazil).
- The Santos port of Brazil is known as the Coffee port.
- The Chuquicamata region of Chile is famous for copper production. It is also called the Copper Capital of the World.
- Amapá Mine (Brazil) is the largest manganese mine in the world.
- The place named Arica in Chile is the driest place in the world. It is located in the Atacama Desert.

Antarctic Continent

- The Antarctic continent is the fifth largest continent in the world in terms of area.
- James Cook discovered the Antarctic continent in 1773, but he could not reach its mainland.
- Fabian Welling Schausen was the first person to discover the mainland of the Antarctic continent and Ramcharan ji was the first Indian.
- Amundsen was the first person to reach the South Pole and Dr. Giriraj Sirohi was the first Indian.
- **98 percent** of Antarctica is always covered with snow. It is also called the 'White Continent' due to being completely covered with snow.
- It is also called the uninhabited continent due to no population migration.
- It is also called the dynamic continent due to the continent having different shapes in winter and summer.
- This continent provides scientists with unique opportunities to give more information about the Earth, so it is called the continent dedicated to science.
- The South Pole is located almost in the center of this continent.
- India's first Antarctic expedition team was started in January, 1982 under the leadership of Dr. Syed Zahoor Qasim.
- India established its research centers on this continent, which are as follows-
  1. Dakshin Gangotri 2. Maitri 3. Bharati

Note:- Himadri Research Center has been established by India in the Arctic Ocean.

- The longest mountain range of the Antarctic continent is the Queen Maud mountain range and the highest peak is Mount Vinson Massif.
- The only active volcano of the Antarctic continent is Mount Erebus, which is the southernmost active volcano on Earth.
- The lowest temperature in the world was recorded in Vostok, Antarctica.
- **Ross Sea -** It is the world's largest marine bio-protected area.
- The process of depletion in the ozone layer was first discovered in Antarctica.
- When the Sun moves northwards, there is night for 6 months and when it moves southwards, there is day for 6 months.
- Penguins and krill (sea animals like shrimp) live in schools of fish here.
- Lichens and mosses are the main vegetation of the Antarctic continent.

Continent of Europe

Countries of the continent of Europe

Country	Capital	Currency
Albania	Tirana	Lek
Iceland	Reykjavik	Krone
Norway	Oslo	Krone
Austria	Vienna	Euro
Andorra	Andorra la Vella	Euro
Italy	Rome	Euro
Estonia	Tallinn	Euro
Greece	Athens	Euro
Germany	Berlin	Euro
Portugal	Lisbon	Euro
Netherlands	Amsterdam	Euro
Finland	Helsinki	Euro
France	Paris	Euro
Bulgaria	Sofia	Euro
Belgium	Brussels	Euro
Malta	Valletta	Euro
Monaco	Monaco Ville	Euro
Latvia	Riga	Euro
Luxembourg	Luxembourg City	Euro
Lithuania	Vilnius	Euro
San Marino	San Marino	Euro
Spain	Madrid	Euro
Slovenia	Ljubljana	Euro
Slovakia	Bratislava	Euro
Holy See (Vatican City)	Vatican City	Euro
Kosovo	Pristina	Euro
Croatia	Zagreb	Kuna

Czech Republic	Prague	Koruna
Denmark	Copenhagen	Danish Krone
Poland	Warsaw	Złoty
Belarus	Minsk	Ruble
Ireland	Dublin	Ruble
Russia	Moscow	Ruble
Bosnia Herzegovina	Sarajevo	Marka
Moldova	Kishinev	Leu
Romania	Bucharest	Leu
Macedonia	Skopje	Dinar
Serbia	Belgrade	Dinar
Ukraine	Kyiv	Hryvnia
United Kingdom	London	Pound
Liechtenstein	Vaduz	Franc
Switzerland	Bern	Swiss Franc
Sweden	Stockholm	Krona
Hungary	Budapest	Forint

- This continent is bordered by the Arctic Ocean in the north, Africa in the south, Mediterranean Sea, Asia, Caspian Sea and Ural mountain range in the east and Atlantic Ocean in the west.
- This continent is the sixth largest continent in the world in terms of area and the third largest continent in terms of population.
- Since most of the countries of the continent of Europe are surrounded by oceans on all three sides, it is also called the 'continent of peninsulas'.
- The highest point of this continent is Mount Elbrus and the lowest point is the Caspian Sea.
- **Eurasia –** Asia + Europe
- **Balkan States –** Bulgaria + Serbia + Montenegro + Romania + Greece + Albania
- **Scandinavia –** Norway + Sweden + Denmark + Iceland
- **Baltic States –** Estonia + Latvia + Lithuania
- **Great Britain –** Scotland + Wales + England
- **United Kingdom –** Great Britain + Northern Ireland.
- The northernmost capital of the world is Reykjavik which is the capital of Iceland.

Landlocked countries of the continent of Europe –

Andorra	Slovakia	Austria
Belarus	Kosovo	Czech Republic
Hungary	Liechtenstein	Luxembourg
Macedonia	Moldova	Switzerland
San Marino	Vatican City	Serbia

Major mountains of the European continent

- **Pyrenees Mountains**
  - This mountain forms the border between Spain and France and its highest peak is Poco de Anito (Spain) which is 3404 m high.
- **Caucasus Mountains –**
  - This is a new folded mountain situated between the Black Sea and the Caspian Sea.
  - The highest peak of this mountain is Mount Elbrus (5633 m), which is the highest peak of the European continent.
- **Alps Mountains**
  - This mountain is spread in France, Italy, Monaco, Germany, Slovenia, Liechtenstein, Switzerland and Austria.
  - The highest peak of this mountain is **Mount Block** (4810 m) and it is the second highest peak of the European continent.
  - The Rhine and Rhone rivers originate from this mountain.
- **Jura Mountains –** Folded mountains formed in the Jurassic period, which form the border between France and Switzerland.
- **Vosges Mountains –** This mountain forms the border between France and Germany.
- **Black Forest Mountains**
  - This is an example of a block mountain located in Germany.
  - The fault valley of the Rhine river is located between the Black Forest and Vosges Mountains.
- **Pennine Mountains –** Ancient folded mountains spread from north to south of England, which is an example of a residual mountain.
- **Carpathian Mountains**
  - This is spread in Poland, Czech Republic, Romania and Ukraine.
  - Carpathian and Vistula rivers originate from this mountain.
- **Apennine Mountains –** Folded mountains of the Alpine series located in Italy, whose highest peak is Mount Czornograde.
- **Ural Mountains**
  - This is a folded mountain that defines the boundary between Europe and Asia.
  - Ural River originates from this mountain.
- **Harz Mountains –** This is a mountain located between Lena and Saal rivers in central Germany.
- **Balkan Mountains –** Folded mountain of Alpine series extending from east to west in Bulgaria.
- **Cantabrian Mountains –** This is a folded mountain of Alpine series located in the Iberian Peninsula of northern Spain.

Major plateaus of the European continent

- **Bavarian Plateau**
  - This plateau is located in the southern part of Germany.
  - This plateau is located between the Danube River and Lake Constance.
- **Meseta Plateau –** Plateau located between Spain and Portugal, which is also called Iberian Plateau.
- **Massif Plateau –** Plateau located in France, from which the Seine and Loire rivers originate.
- **Scandinavian Plateau -** This plateau is located in Denmark, Norway and Sweden.

Major rivers of the European continent

- **Danube River**
  - This river originates from the Black Forest Mountains and falls into the Black Sea. It is the only river in the world that passes through eight countries.
  - This river passes through the capitals of various countries.

Country	Capital
Austria	Vienna
Slovakia	Bratislava
Hungary	Budapest
Serbia	Belgrade
Romania	Bucharest

- **Rhine River**
  - It originates from the Alps of Switzerland and falls into the North Sea.
  - This river is also called the Coal River.
  - This river is the busiest river in the world. Rotterdam port is situated on it.
- **Rhone River**
  - This river originates from the Alps of Switzerland and falls into the Mediterranean Sea. Saone is its tributary.
  - The city of Lyon in France is situated on this river.
- **Po River**
  - Po River is called the Ganga of Italy.
  - This river, famous as the Ganga of Italy, originates from the Alps and falls into the Adriatic Sea. This river forms the Lombardy plain in Italy.
- **Tiber River**
  - The capital of Italy 'Rome' is situated on this river.
- **Seine River –** The capital of France Paris is situated on this river, this river falls in the English Channel.
- **Oder River –** It forms the border between Poland and Germany and falls in the Baltic Sea.
- **Vistula River –** The most important river of Poland, on the banks of which the capital of Poland Warsaw is situated.
- **Volga River**
  - It originates from the Valdai Hills of Russia and falls in the Caspian Sea.
  - It is the longest river of the continent of Europe.
  - Saratov and Volgograd cities are situated on the banks of this river.
- **Ural River –** This river which forms the border between Asia and Europe falls in the Caspian Sea.
- **Thames River –** The largest river of England on which the cities of London, Oxford and Reading are situated.
- **Douro River –** The Douro River valley in western Portugal is famous for wine production.

Major lakes of the European continent

- **Lake Ladoga**
  - This is the largest lake of the European continent. The rivers Svir, Volkhov and Vuokso fall into this lake.
- **Lake Onega**
  - After Lake Ladoga, this is the second largest lake of Europe. The rivers Shuya, Suna and Vodla fall into this lake.
- **Lake Constance –** A lake located to the north of the Swiss Alps, which is located in Germany, Switzerland and Austria.
- **Lake Eisel –** A lake located in the Netherlands, which was earlier a part of the inland sea Zuder G.
- **Lake Venern –** This is the largest lake of Sweden, which is the third largest lake of the European continent.
- **Lake Vättern –** This is the second largest lake of Sweden.

Other important points of the continent of Europe:-

- The steppe region of Ukraine is called the world's granary and bread basket.
- Italy is the world's largest olive producing country.
- Copenhagen (Denmark) is called the key of the Baltic Sea.
- The English Channel separates the United Kingdom from France.
- The island of Iceland is called the island of the midnight sun.
- Germany's Ruhr region is famous for coal production. Due to this, it is called the black region of Germany.
- Finland is called the country of lakes.
- Turkey is called the sick man of Europe. It is located between the Black Sea and the Mediterranean Sea.
- Switzerland is called the playground of Europe.
- Due to being self-sufficient in food grain production, France is also called the country of farmers and the queen of the seas.
- Ural and Caucasus mountains separate Asia from Europe.
- Europe is the most urbanized continent of the world.
- The capital of France is Paris (situated on Seine river) which is famous as the most beautiful city and fashion city of the world.
- Italy is the country which produces maximum grapes and olives in the world.
- Champagne wine is produced the most in France. France is called the country of wine and beauties.
- Italy is called the India of Europe, because it is also an agricultural country like India.
- Gulf Stream – Europe is known by the nickname of warm blanket of Europe.
- Brenner Pass provides a route between Austria and Italy.

Australia/Oceania Continent

Countries in the Australian continent

Country	Capital	Currency
Australia	Canberra	Dollar
New Zealand	Wellington	Dollar
Micronesia	Palikir	Dollar
Fiji	Suva	Dollar
Marshall Islands	Majuro	Dollar
Nauru	Yaren	Dollar
Tuvalu	Funafuti	Dollar
Tonga	Nukuʻalofa	Paʻanga
Vanuatu	Port Vila	Vatu
Kiribati	Tarawa	Dollar
Papua New Guinea	Port Moresby	Kina
French Polynesia	Papeete	Franc
Western Samoa	Apia	Tala
New Caledonia	Noumea	Franc
Palau	Kodor	Dollar
Solomon Islands	Honiara	Dollar

- Oceania includes Australia, New Zealand and small and big islands of Pacific Ocean.
- The biggest country in this continent is Australia and the smallest country is Nauru.
- Since Australia is the biggest country in this continent, it is also called Australia continent.
- This continent is situated between the Indian Ocean and the Pacific Ocean. And is surrounded by Timor Sea in the North-West, Arafura Sea and Gulf of Carpentaria in the North and Great Australian Bight in the East.
- This continent was first discovered by James Cook and this continent was named Australia by Matthew Fielders.
- This is the smallest continent which is located in the Southern Hemisphere. Tropic of Capricorn passes through its middle.
- Australia continent is also called island continent and continent of thirsty land.

Province	Capital
Western Australia	Perth
Northern Australia	Darwin
Southern Australia	Adelaide
Queensland	Brisbane
New South Wales	Sydney
Victoria	Melbourne
Canberra	Canberra
Tasmania	Hobart

- The order of Australia's coastal cities is in a clockwise direction.

Trick – BSC+MA+PHD

B – Brisbane **S –** Sydney
C – Canberra **M –** Melbourne
A – Adelaide **P –** Perth
D – Darwin

Major mountains of the Australian continent

- **Great Dividing Range**
  - This is the longest mountain range of Australia which is located in the eastern part of Australia.
  - This is a western slope mountain range located in Victoria and Queensland.
  - This is the fourth longest mountain range of the world, whose highest peak is Mount Kosciuszko (2230 m), which is the highest peak of Australia.
  - Murray and Darling rivers originate from this mountain range.
- **Darling Range -** Mountains located in the south-western part of Western Australia which is an iron ore region.
- **Blue Mountains -** An extension of the Great Dividing Range located in the south-west of New South Wales, whose colour appears blue due to the drops of eucalyptus oil.
- **Macdonald Range -** Mountain range located in the central Australia region from which many small rivers originate.
- **Great Barrier Reef**
  - A coral reef in the sea along the north-eastern coast of Australia, which is called the Great Barrier Reef.
  - Its total length is more than 1900 km.
  - This coral reef is formed by the continuous deposition of the skeletons of small (coral) organisms.
  - It is also called the garden of the sea.

Major plateaus of the Australian continent

- **Kimberley Plateau -** Plateau located in north-western Australia which is world famous for gold and diamond reserves.
- **Hamersley Plateau -** It is located in the north-western part of Australia.
- **Arnhem Plateau -** It is located in the northern region of Australia.
- **Tuamba Plateau -** Plateau located in the south-eastern part of Queensland province of Australia.

Major deserts of the Australian continent

- **Great Victoria Desert –** Located in the Southern Australia province and Western Australia province, it is the largest desert of the Australian continent.
- **Great Sandy Desert –** Desert located in northern Western Australia, famous as Canning Basin.
- **Simpson Desert –** It is located in the Alice Spring region of Central Australia, rich in natural gas.
- **Stuart Desert –** A hot desert located on the border of New South Wales and Queensland.
- **Tanami Desert –** Coyote gold mine is located in this desert of Australia.
- **Gibson Desert –** It is located in Western Australia.

Major rivers of the Australian continent

- **Murray-Darling River**
  - This river originates from the Great Dividing Range.
  - These rivers together form the largest river system of Australia.
  - Between these rivers is the 'Riverina Plain', which is famous for wheat production.
- **Victoria River-**This river originates from the Kimberley Plateau in the north-west of Australia.
- **Swan River-**The city of Perth in Australia is situated on the banks of the Swan River.

Major Minerals of Australia

Kalgoorlie and Coolgardie	Major Gold Mines
New South Wales	Coal Production
Pilbara	Iron Ore Producer
Broken Hill and Mount Isa	famous for lead, zinc and silver
Alice Springs	for oil and natural gas
Waipa Area	famous for bauxite

Other islands of the Australian continent
Micronesia
→ Micronesia includes four island groups: Gilbert, Caroline, Marshall, and Northern Mariana Islands.
Polynesia
→ This is an island group located to the east of Melanesia and Micronesia. → Its main islands are Hawaii, Samoa, Tonga, East Kiribati.
Zealandia
→ 95 percent of it is located under the Pacific Ocean. It is a part of Gondwanaland. → This island is called the eighth continent.
Melanesia
→ It is situated between Indonesia and Philippines. → Their westernmost island is 'New Guinea Island'.

Other important points of Australia continent: -

- In Australia the deep wells are called the Great Artisan Basin.
- The temperate grassland located in Australia is called Downs.
- The original inhabitants of Australia are called 'Aboriginals'.
- After China, Australia has the largest number of sheep in the world. The sheep herders are called 'Jackaroo'. Merino type of sheep are found here.
- Australia is the largest exporter of wool in the world.
- The largest freshwater lake in Australia is Lake Eyre.
- The country that produces the most bauxite in the world is Australia.
- The northern plain of Australia is called the **Carpentaria** Plain.
- New Zealand, located in the south-east of Australia, is called Britain of the South.
- The grasslands of New Zealand are called Cantabri.
- Wellington of New Zealand is the southernmost capital of the world.
- The natives of New Zealand are called Maori.
- The largest lake of New Zealand is Lake Taupo and the largest river is Waikato.
- The national bird of New Zealand is Kiwi.
- Birds called Cockaburra and Emu are found in New Zealand. Cockaburra is also called Laughing Jackass.
- Wanganui River was declared a living entity by the Parliament of New Zealand.
- The highest peak of New Zealand is Mount Cook (3724 m) situated on the Southern Alps.

MAJOR STRAITS OF CONTINENTS:-

- **Strait of Malacca –** The Strait of Malacca separates Sumatra (Indonesia) from the Malaya Peninsula (Malaysia) and connects the Bay of Bengal to the South China Sea.
- **Strait of Bosphorus –** This strait connects the Black Sea to the Sea of Marmara and separates European Turkey from Asian Turkey.
- **Strait of Bab al-Mandev –**
  - Strait of Bab al-Mandev connects the Red Sea to the Gulf of Aden and separates Djibouti (Africa) from Yemen (Asia).
  - This strait is known by the nickname "Gate of Tears".
- **Strait of Hormuz** – This strait connects the Persian Gulf to the Gulf of Oman and separates Iran from Oman.
- **Palk Strait (Strait)**
  - This strait separates India from Sri Lanka and connects the Bay of Bengal to the Gulf of Mannar.
  - Sethusamudram project is proposed in the area of this strait.
- **Sunda Strait**
  - This strait connects the South China Sea to the Indian Ocean and separates Indonesia's Sumatra Island from Java Island.
  - Krakatoa volcano is located in its area.
- **Gibraltar Strait**
  - This strait connects the North Atlantic Ocean to the Mediterranean Sea and separates Morocco (Africa) from Spain (Europe).
  - This strait is called the gateway of the Mediterranean Sea.
- **Mozambique Strait**
  - This strait separates Madagascar from Mozambique.
  - The Mozambique Current flows through this strait, which later joins the Madagascar Current coming from the east of Madagascar to form the Agulhas Current.
- **Davis Strait**
  - This strait connects Baffin Bay to the Labrador Sea and separates Greenland Island from Baffin Island (Canada).
  - This is the widest strait in the world.
  - The cold Labrador Current flows through this strait.
- **Hudson Strait –** This strait separates the Baffin Islands from the mainland of Canada and connects Hudson Bay to the Labrador Sea.
- **Florida Strait –** This strait separates the Florida province of USA from the island of Cuba and connects the North Atlantic Ocean to the Gulf of Mexico.

Note: The Yucatan Channel connects the Gulf of Mexico to the Caribbean Sea.

- **Bering Strait**
  - This strait connects the Arctic Ocean to the North Pacific Ocean and separates Siberia of Russia from Alaska of North America.
  - The International Date Line passes through this strait.
- **Strait of Magellan –** This strait separates Tierra del Fuego Island from the mainland of South America and connects the South Atlantic Ocean to the South Pacific Ocean.

- **Drake Passage Strait –** This strait separates South America and Antarctica.
- **Strait of Dover –** This strait separates the United Kingdom (UK) from France and connects the North Sea to the English Channel.
- **North Channel-** It connects the Irish Sea to the Atlantic Ocean and separates Northern Ireland from Scotland.
- **Cook Strait-** This strait separates the Northern Alps of New Zealand from the Southern Alps.
- **Bass Strait-** This strait connects the Southern Ocean to the Tasmania Sea and separates the Tasmania Island from Australia.
- **Torres Strait-** This strait is between Australia's Cape York Peninsula and Papua New Guinea Island.

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Oceans and Oceanic Relief

- There are two main parts on the surface of the earth- continents and oceans.
- Oceans cover 70.8% of the earth's surface and continents cover 29.2%.
- About 97.5% of the total water present on earth is in oceans, which is saline water.

Note-
- Due to abundance of water on earth, it is called **'aquatic planet'** and due to its blue appearance from space, it is called **'blue planet'**.
- The depth of the sea is measured by sound intensity measuring instrument (SONAR) and the unit of measuring sea depth is **"fathom".**
- **1 fathom = 6 feet**

I. Ocean-
- The part of the hydrosphere whose boundary is uncertain is called ocean.
- The average depth of the oceans is 3,800 meters and the average height of the land is about 840 meters. There are a total of five oceans on Earth-
- **Pacific Ocean-**
  - The Pacific Ocean, spread over **1/3rd** of the total area of the Earth, is the largest and deepest ocean on Earth.
  - The average depth of the Pacific Ocean is **4280 meters**.
  - **To its north** are the Bering Strait and the Arctic Ocean, while **to its south** is Antarctic.

Note- Bering Strait- separates Russia (Asia) and North America, while it connects the Arctic Ocean to the Pacific Ocean.

  - Asia, Australia and the continent of North America and South America are located to the west of the Pacific Ocean.
  - The shape of the Pacific Ocean is 'triangular'.
  - The Pacific Ocean lacks mid-ocean ridges.
  - **The Albatross Plateau** is located in the Pacific Ocean.
  - **Major Trenches-** Mariana Trench (world's deepest trench), Kermadec Trench, Aleutian Trench, Curiel Trench, Japan Trench, Philippine Trench, Atacama Trench, Rikyu Trench, Nero Trench, Brooke Trench, Bailey Trench, Planet Trench etc.
  - There are more than 2000 islands in this ocean.
  - **Major Islands-** Japan, Philippines, New Guinea, New Zealand, Aleutian Islands, British Columbia Islands and Chile Islands are the main ones.
  - Coral reefs are the main feature of the Pacific Ocean.
- **Atlantic Ocean –**
  - The Atlantic Ocean has Greenland and Arctic Ocean to its north, while the Antarctic Ocean lies to its south and is spread between the continents of Europe and Africa in the east and North America and South America in the west.
  - The shape of the Atlantic Ocean is like the 's' of the English alphabet.
  - Its area is half of the Pacific Ocean and **1/6th** of the entire Earth.
  - From the trade point of view, the Atlantic Ocean is the busiest ocean of the world.
  - The **Mid-Atlantic Ridge** is situated in the middle of the Atlantic Ocean. Its extension is from north to south; the northern ridge is called "Dolphin Ridge" and the southern ridge is called "Challenger Ridge".
  - **The Telegraphic Plateau** is situated in the Atlantic Ocean.
  - The **Caribbean Sea –** is the largest marginal sea of the Atlantic Ocean.
  - **Major Trenches –** Puerto Rico Trench (the deepest trench of the Atlantic Ocean), Cayman Trench, South Sandwich Trench, Romansh Trench, etc.
  - **Major islands** – Azores Island, Paiko Island, Capverde Island, Saint Paul Island, Newfoundland Island, Greenland, Iceland etc.
  - **Major fishing banks –** Grand Bank, George Bank, Saint Pierre Bank, Will Island Bank and Dogger Bank.
- **Indian Ocean –**
  - An ocean which is named after a country i.e. India.
  - The Indian Ocean is also called the **'semi-ocean'**.
  - The Indian Ocean is surrounded by Asia in the north, Antarctica in the south, Africa in the west and Asia and Australia in the east.
  - The average depth of the Indian Ocean is **4000 meters**.
  - Due to the geographical location of the Indian subcontinent, the shape of the Indian Ocean is like the **'M'** shape of the English alphabet.
  - **Major trenches –** Sunda Trench, Mauritius Trench, Ob Trench, Diamantina Trench, Amirante Trench etc.
  - **Major islands-** Madagascar, Sri Lanka, Java, Sumatra, Andaman-Nicobar, Mauritius, Zanzibar, Maldives, Seychelles, Diego Garcia, Cocos Island etc.

Note:- The shape of this ocean is almost triangular.

- **Arctic Ocean –**
  - The Arctic Ocean is located in the North Pole.
  - The Arctic Ocean is the smallest ocean among all the oceans.
  - This ocean is connected to the Pacific Ocean by a narrow shallow water.
  - The average depth of the Arctic Ocean is **3500 meters**.
  - The widest continental submerged coast in the world belongs to this ocean.

- The Ferry-Island forest area and the East Zone Mayen forest area are in this ocean.
- The Celebes Sea is in this ocean.
- **Major islands-** Bear, Gemelia, Swiss version island etc.
- **Major ridges-** Farao ridge and Swiss version ridge etc.

♦ **Antarctic ocean-** This ocean is insufficient.

II. Ocean floor relief-

♦ Like land mass, high mountains, deep trenches, plains etc. are also present inside the oceans.

♦ Ocean floor is divided into 4 main categories-

♦ **Continental shelf-**

- In the meeting area of continent and ocean, the submerged part of the continent extended towards the ocean is called 'continental shelf/continental shelf'.
- The slope of continental shelf is 1° or even less.
- This is the shallowest area of the ocean.
- The average width of continental shelf is 80 km. The width of the shelf varies in different oceans.

Note- The Siberian shelf in the Arctic Ocean is the widest shelf in the world (1500 km).

- Global fishing area This area is formed at the place where warm current and cold current meet. Major global fishing areas are Dogger Bank, Grand Bank and Georges Bank.
- 20 percent of the world's total mineral oil and gas production is obtained from the continental shelf.

♦ **Continental slope -**

- The oceanic area with a very steep slope between the continental shelf and the deep sea plain is called 'continental slope'.
- The depth of water on this slope ranges from 200 meters to 3000 meters.
- Its average slope is between 2° to 5°.

Note:- The low slope area at the end of the continental slope is called **'continental uplift'.**

♦ **Deep ocean plains –**

- The deep ocean floor similar to a plain after continental uplift is called 'ocean plains'.
- Its depth ranges from 3000 to 6000 meters. Its shape is flat due to the deposition of sediments.
- The ocean plains have the maximum expansion in the Pacific Ocean.
- The skeletons of marine creatures are found deposited on deep ocean plains. Volcanic mountains and islands, ridges, trenches, trenches, fractures etc. structures are also located in between these plains.
- The ocean plains have the maximum expansion between 20°N to 60°S latitudes.

➢ **Ocean trenches –**

- Ocean trenches are the deepest parts of the oceans. It includes submerged trenches and troughs.
- Its average depth is 3 to 5 km.
- Till now a total of 57 trenches have been discovered in the world out of which 32 trenches are found in Pacific Ocean, 19 trenches in Atlantic Ocean and 6 trenches in Indian Ocean.

Note:- The deepest trench in the world is Mariana Trench (11022 m) situated in Pacific Ocean.

Oceanic Trench

S.No.	Trench	Depth (in m)	Location
1.	Mariana	11,022	Pacific Ocean
2.	Mindanao	10,500	Pacific Ocean
3.	Tonga	9,000	Pacific Ocean
4.	Puerto Rico	8,392	Atlantic Ocean
5.	Sunda	8,152	Indian Ocean
6.	Atacama	8,065	Pacific Ocean
7.	Romansh	7,254	Southern Atlantic Ocean

Major islands of the world

♦ **Greenland Island-**It is the largest island in the world, located in the south of the Arctic Ocean and in the north of the Atlantic Ocean.

♦ **Papua New Guinea Island-**It is an island located in the north of Australia, which is the second largest island in the world. It is located in the Pacific Ocean.

♦ **Borneo Island-**It is the **third largest island** in the world and **the largest** island in Asia. It is located in the south-west Pacific Ocean.

♦ **Madagascar Island-**It is an island located in the eastern part of Africa, which is located in the Indian Ocean. It is **the fourth largest island** in the world.

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Temperature and Salinity in Ocean Water

♦ About **97.5%** of the total water present on earth is in the form of ocean water. This water has two important properties-

1. Temperature-

♦ The measurement of solar energy reaching the earth is called temperature, which is measured by different units-

- Fahrenheit (˚F) – On the basis of this scale, water freezes at 32˚F and boils at 212˚F. 1˚C temperature is equal to 1.8˚F.
- Celsius/Centigrade – On the basis of this scale, water freezes at 0˚C and boils at 100˚C.
- Kelvin – Kelvin scale is used in extremely low temperature conditions. Absolute zero temperature on Kelvin scale is – 273.15˚K and the freezing point of water is 273.15˚K.
- The temperature of ocean water is highest in August and lowest in February.
- The average daily temperature difference of the surface of ocean water is negligible (1°C).
- Generally, the temperature of the oceanic part remains between 5°C to 33°C.
- The ocean water near the equator remains the warmest and the temperature gradually decreases as we move towards the poles.
- With each latitude, there is a decrease of 0.5° Fahrenheit.
- The maximum absorption of solar heat is done by the upper surface of the water.
- Most of the fishing areas of the world are in those areas where the temperature of sea water is optimum.0000

- The maximum daily temperature difference occurs near "New Foundland" in the north-western Atlantic Ocean and near "Vladivostok" in the north-western Pacific Ocean.
- The highest temperature is found in the tropical oceans surrounded by land.
- The temperature of sea water decreases with increasing depth. There is no fixed rate of decrease in temperature downward.
- In tropical regions, due to trade winds, the temperature of the eastern part of the oceans is found to be lower than the temperature of their western part.
- In temperate regions, due to the effect of westerly winds, the temperature of the eastern part of the oceans is higher than the western part.

2. Salinity –

- The ratio of the weight of sea water and the weight of the substances dissolved in it is called **'sea salinity'**.
- सागरीय लवणता को प्रति हजार ग्राम जल में उपस्थित लवण की मात्रा ($‰$) के रूप में दर्शाया जाता है। महासागरों की औसत लवणता $35‰$ होती है।

  Sea salinity is expressed as the amount of salt present per thousand grams of water ($‰$) . The average salinity of the oceans is $35‰$

Note:- Salinity of $24.7‰$ is the upper limit for demarcating salty water.

- The Atlantic Ocean is the ocean with the highest salinity.
- The effect of sea salinity is on waves, currents, temperature, fish, marine organisms, plankton etc.
- The amount of salinity decreases as we move from the equator towards the poles.
- The highest salinity is found between 20°–40° latitudes in the northern hemisphere and 10°–30° latitudes in the southern hemisphere.

Note:- Salinity increases with depth at the equator.

- **Isohaline –** The line joining places with equal salinity is called **'isohaline'.**

Salinity in Sea Water		
S.No.	**Salts**	**Percentage**
1.	Sodium Chloride	77.8
2.	Magnesium chloride	10.9
3.	Magnesium sulfate	4.7
4.	Calcium sulfate	3.6
5.	Potassium sulfate	2.5
6.	Calcium carbonate	0.3
7.	Magnesium bromide	0.2

♦ **Salinity in inland seas and lakes-**

- Van Lake of Turkey- **330** $‰$ (World's most salinated lake)
- Dead Sea in Jordan-**238** $‰$
- USA's Great Salt Lake- **220** $‰$
- The amount of salinity is found to be 37 to 41 $‰$ (per thousand) in the Mediterranean Sea, Red Sea and Persian Gulf.

Ocean Waves and Currents

I. Ocean Waves –

♦ Waves are actually a form of energy. It is the oscillatory motion of the ocean surface, in which the sea water level rises and falls, but does not flow from its place to another place.

♦ The upper part of the wave is called the **'wave peak'** and the lower part is called the **'wave trough'**.

♦ **Wave length –** The horizontal distance between two adjacent wave crests is called the 'wave length'.

♦ **Wave speed –** The rate of movement of a wave through water is called the **'wave speed'.** Wave speed is measured in **'knots'.**

♦ **Time period –** The period between the passing of two consecutive waves at any fixed place is called the **'time period'** of the wave.

Note:- The speed of the wave and the length of the wave depend on its time period.

♦ **Reasons for wave formation-**

i) Atmospheric circulation and winds
ii) Landslides in water
iii) Volcanic eruptions on the sea floor
iv) Gravitational force of the moon and the sun.
v) Cyclone

II. Ocean currents-

♦ Ocean currents are similar to river flow in oceans. The flow of a mass of ocean water for a very long distance in a particular direction is called **'ocean current'**.

♦ **Reasons for the origin of ocean currents-**

♦ The following factors are responsible for the origin of ocean currents-

(i) Earth's rotation and gravitational force (ii) Air pressure and winds (iii) Evaporation and rainfall (iv) Variation in temperature (v) Difference in density (vi) Shape of continents

♦ Ocean currents are classified into hot and cold water currents on the basis of temperature-00

i. Warm currents – The water currents flowing from the tropics towards the high temperate and sub-polar zones in the lower latitudes are called warm currents.

Note:- Warm currents usually flow from the equator towards the poles. The temperature of their water is higher than the temperature of the water coming in their way.

- The water currents of the northern hemisphere flow towards their right and the water currents of the southern hemisphere flow towards their left. This phenomenon occurs due to the effect of Coriolis force.

Note:- The only exception to the general system of circulation of ocean currents is found in the northern part of the Indian Ocean. In this part, the direction of flow of the currents changes with the direction of the monsoon wind – warm currents start flowing towards the cold oceans and cold currents start flowing towards the warm oceans.

ii. **Cold currents –** Cold currents flow from high latitudes towards low latitudes. These usually flow from the poles towards the equator. Hence, these currents reduce the temperature in the areas where they flow.

Atlantic Ocean currents	
Warm Currents	**Cold Currents**
North Equatorial Current	Labrador Current
South Equatorial Current	Benguela Current
Florida Current	East Greenland Current
Gulf Stream Current	Canary Current
North Atlantic Current	Falkland Current
Antilles Current	Antarctic Drift/South Atlantic Drift
Brazil Current	
Antequatorial Guinea Current	

Warm Currents –

- **North Equatorial Current –**
  - In the Atlantic Ocean, due to the north-eastern trade winds, a warm current flows north of the equator, which pushes the warm water of the equator from east to west.
  - It flows from the coast of Africa to the Western Islands and Brazil.
- **Florida Current –**
  - It flows from the **Yucatan Channel to Cape Hatteras.**
  - The Andes Current or Antilles Current joins it.
- **Gulf Stream Current –** The Florida Current from Cape Hatteras to Grand Bank is called the **'Gulf Stream Current',** which flows with the same name to the Grand Bank of **New Foundland Island.**
- **North Atlantic Current –**
  - This current has three branches – **Norwegian Current, Irminger Current, Rennell Current.**
  - This current causes rainfall throughout the year in Europe.
- **South Equatorial Current-** This current flows parallel to the equator in the south from Angola coast (east) to Brazil coast (west).
- **Antilles Current-** This current flows on the eastern coast of the Western Islands.
- **Brazil Current**
  - Brazil Current is a warm current with high temperature and high salinity.
  - This current flows parallel to the Brazil coast.
- **Antiequatorial Current-** The current flowing from west to east opposite to the Atlantic Equatorial Current is called the **Antiequatorial Current.** This is a warm current.

Cold Currents

- **Labrador Current –**
  - This current flows from north to south along the Labrador coast through Baffin Bay and Davis Strait.
  - **Near 40° north latitude,** the **Gulf Stream** meets the warm current. Here, due to their meeting, dense fog is formed due to heat inversion and fishing areas called Grand Bank, Georges Bank have developed here.
- **Greenland Current –**
  - This current flows from eastern Greenland to the North Atlantic Drift region. This current causes the effect of freezing and cold waves in the coastal areas of Greenland and Iceland.
  - On the southern coast of Greenland, this current meets the **Labrador Current**.
- **Canary Current –**
  - This current flows from Madeira to Cape Verde.
  - This current is responsible for the formation of **Sahara Desert** in Africa.
  - It flows along the western coast of Africa.
- **Falkland Current –**
  - It flows along the eastern coast of Argentina.
  - Due to the meeting of **Falkland Current** and **Brazil Current,** dense fog prevails in this area.
- **Benguela Current –** Flows in the north direction along the western coast of South Africa. This current is responsible for the origin of **'Kalahari Desert'.**
- **Antarctic Current/South Atlantic Current –**
  - Current flowing from west to east due to westerly winds in the South-East Ocean.
  - It is a combined form of Brazil Current and Falkland Current, which is a cold current.

Pacific Ocean currents	
Warm Currents	**Cold Currents**
North Equatorial Current	Oyashio Current
Southern Equatorial Current	California Current
Kuroshio Current	Humboldt/Peru Current
North Pacific Current	Okhotsk Strait
Alaska Current	Kurile Equatorial Current
Eastern Australia Current	
El Nino Current	
El Nino and La Nino Current	

Warm Currents

- **North Equatorial Current –** This current starts from the coast of Central America (Mexico) due to the north-eastern trade winds and flows west to the Philippines.
- **South Equatorial Current –** It flows from the coast of Central America in the east to the eastern coast of Australia in the west.
- **Kuroshio Current –**
  - The North Equatorial Current flows northwards along the Philippine Islands, along the coasts of Taiwan and Japan.
  - It is the forward extension of the North Equatorial Current.
  - This current forms a fish bank after meeting the Oyashio Current (cold current).
- **North Pacific Drift Current –**
  - It reaches the western coast of North America from the south-eastern coast of Japan and forms two branches.
  - Alaska Current (warm)
  - California Current (cold)

- **Alaska Current –**
  - A branch of the North Pacific Ocean current flows along the Alaska coast on the western coast of North America.
  - This current meets the North Equatorial Current in the lower latitudes.
- **East Australia Current –** It turns towards the south due to the effect of Coriolis force generated due to the rotation of the Earth and starts flowing along the eastern coast of Australia.
- **Tsushima Current –** That part of the Kuroshio Current which separates near **30° North latitude** and flows from the western coast of Japan to the Sea of Japan.
- **El Niño and La Niña Currents –**
  - El Niño and La Niña are seasonal phenomena.
  - El Niño originates from the increase in the temperature of the water of the eastern Pacific Ocean, while La Niña is related to the increase in the temperature of the water of the western Pacific Ocean.
  - Due to the effect of El Niño, there is excessive rainfall in the eastern Pacific Ocean region and drought in the western Pacific Ocean region. This has an adverse effect on the monsoon of India.

Cold currents

- **Oyashio Current –** It starts from the Bering Strait and flows from north to south near the eastern coast of the Kamchatka Peninsula.
- **California Current –** This current flows from north to south along the western coast of North America. It is formed from the North Pacific Ocean Current.
- **Peru Current –** Current flowing from south to north along the western coast of South America in the South Pacific Ocean. This current has created the Atacama Desert.
- **Okhotsk Current –** This current flows from north to south in the North Pacific Ocean.

Indian Ocean currents	
Warm Currents	**Cold Currents**
North-East monsoon Current	Western Australian Current
Anti Equatorial current	Western Wind Current
South-west monsoon Current	
Mozambique Current	
Madagascar Current	
Agulhas Current	

Warm Currents

- **North-East Monsoon Current –** This current flows in the Bay of Bengal and Arabian Sea north of the Equator. In winter, the North-East Monsoon Current flows from land to water.
- **Anti-Equatorial Current –** An opposite current is born during the North-East monsoon. It flows between Zanzibar and Sumatra in winter.
- **South-West Monsoon Current –** The direction of summer monsoon winds in the Northern Hemisphere changes to South-West direction. This current enters the Bay of Bengal and Arabian Sea with its many small sub-currents.
- **Mozambique Current –** This current originates from the South Equatorial Current. It flows between the eastern coast of Africa and Madagascar.
- **Madagascar Current –** This current flows on the eastern coast of Madagascar.
- **Agulhas Current –** It is formed by the **Mozambique Current** and **the Madagascar Current.** This current flows from north to south in the south-eastern part of the African continent.

Cold Currents

- **Western Australian Current –** This current is formed when the westerly wind current of the South Equatorial Current flows towards the north. This current flows from south to north on the western coast of the Australian continent.
- **Western Wind Current –** Flows from west to east in the south of the Indian Ocean and further forms the Western Australian Current.
- **Sargasso Sea –** The area of calm and stable water situated in the middle of the water currents flowing around between 20° to 40° north latitudes and 35° to 75° west longitudes in the North Atlantic Ocean is known as the Sargasso Sea.
- It is a calm water area situated between the Gulf Stream, Canary and North Equatorial currents. Thick sea grass floats on its shores. This grass is called Sargassum in Portuguese language, after which this sea has been named Sargasso Sea.
- Sargasso is a rootless grass.
- Sargasso Sea was first seen by Spanish sailors.
- The area of this sea is about 11,000 square km.
- This sea is known as an oceanic desert.

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Atmosphere

- The gaseous cover around the earth is called **atmosphere**. The first information about air was given by the Greek scholar **Anaximander**.
- All the organisms and plants of the biosphere get the gases, heat and water necessary for their existence through the atmosphere.
- The atmosphere remains connected to the earth due to its gravitational force.
- The atmosphere maintains the average life-sustainable temperature **(15°C)** on earth.
- The atmosphere extends up to a height of 1600 km.
- The atmosphere is mainly made up of oxygen and nitrogen which is 99 percent of clean and dry air.

Note:- Carbon dioxide is in very small quantity but it absorbs the heat released by the earth, due to which the earth remains warm. It is also necessary for the growth of plants.

Note:- The density of the atmosphere varies with height. This density is highest at sea level and as we go upwards it decreases rapidly.

A. Composition of the atmosphere

♦ Gases, water vapour and dust particles are present in the atmosphere. Thus the composition of the atmosphere is made up of the following elements-

I. Gases-

♦ About 99 percent of the mass of the entire atmosphere is limited to a height of 32 km from the surface of the earth.

Note:-

♦ Carbon dioxide, nitrous oxide, surface ozone, water vapour and methane are the major greenhouse gases.
♦ The amount of water vapour in the atmosphere is 0-4%.
♦ **Inert gases-** Helium, Neon, Argon, Krypton, Xenon and Radon.
♦ All other inert gases except **radon gas** are found in the atmosphere.

Gases present in the atmosphere and their quantity

Names of Gases	Chemical Formula	Mass (%)
Nitrogen	N_2	78.8
Oxygen	O_2	20.95
Argon	Ar	0.93
Carbon di Oxide	Co_2	0.036
Neon	Ne	0.002
Helium	He	0.0005
Methane	CH_4	0.0002
Krypton	Kr	0.0001
Xenon	Xe	0.00009
Hydrogen	H_2	0.00005

1. Nitrogen (N_2)

- This gas is found in the **highest quantity** in the atmosphere.
- Due to the presence of nitrogen gas, we can feel the strength of the winds, air pressure and reflection of light.
- Nitrogen gas prevents objects from burning quickly. If there was no nitrogen gas in the atmosphere, it would have been difficult to control fire.
- It is essential for all living beings and plants present in the biosphere.

2. Oxygen (O_2)

- After nitrogen, the second most abundant gas in the atmosphere is 'oxygen'.
- It is a life-giving gas because without it, the life of animals and humans cannot be imagined.
- In the absence of oxygen, we cannot burn fuel. It is the main source of energy.
- Oxygen gas is spread in the atmosphere up to an average height of 64 kilometers.

3. Argon (Ar)– Argon is found in the highest quantity in the category of **inert gases** present in the atmosphere. Inert gases are mainly used in the manufacture of electric bulbs.

4. Carbon-di-oxide (CO_2)

- This gas is found in the lowest layer because it is the heaviest gas. Its maximum expansion is up to a height of 32 km.
- This gas gets mixed in the atmosphere due to burning of fossils and respiration of various types of living beings.

Note –

♦ **'Kyoto Protocol' (1997)** and **'Paris Climate Conference' (2015)** were held to control the amount of carbon-di-oxide in the atmosphere.

5. Ozone (O_3)

- Ozone gas is made up of **three atoms of oxygen** (O_3). It is a light blue coloured temporary gas.
- Ozone is mainly found in the **stratosphere** and **troposphere**.
- In the lower layer of the stratosphere, it absorbs the harmful **ultraviolet rays** of the sun and prevents them from reaching the earth's surface.
- The ozone layer is currently being depleted by nitrous oxide and chlorofluorocarbon **(CFC) gases**.
- The **'ozone hole'** was discovered by Joseph Forman, B. Gardiner and J. Shanklin over the Antarctic continent.
- **"World Ozone Day"** is celebrated on 16 September.

Note:-

♦ The thickness of the ozone layer in the atmosphere is measured in **'Dobson'**.
♦ The **'Montreal Protocol' (1987)** and the **'Kigali Agreement' (2016)** were signed to prevent ozone depletion.

II. Water Vapour

♦ Water vapour is the gaseous state of water, its quantity decreases with height.
♦ About **90%** of the total water vapour in the atmosphere is limited to a **height of about 8 km**.
♦ Its quantity decreases as we move from the equator towards the poles.
♦ Due to **water vapour, dew, fog, clouds** etc. are formed and it rains.
♦ CO_2 and water vapour are responsible for maintaining the temperature of the earth.
♦ The balance of water vapour in the atmosphere is maintained through the **'water cycle'**.

III. Dust Particles

♦ These mainly include sea salt, microscopic soil particles, smoke soot, ash, pollen, dust and meteorite particles.
♦ These are mainly found in the lower level of the atmosphere i.e. the troposphere.
♦ Due to the presence of **dust particles, the various colours of sunrise, sunset, clouds and rainbow** are scattered.
♦ The blue colour of the sky is visible due to dust particles.

Structure of the atmosphere

♦ From the viewpoint of chemical composition, the atmosphere is divided into two layers-

i. Homosphere- The mixture of gases remains almost the same in the thickness of **80 km** of the atmosphere. Hence, it is called **"homosphere".** It has 3 spheres-
a) Troposphere b) Stratosphere c) Mesosphere

ii. Heterosphere- After the thickness of **80 km** of the atmosphere, separate molecular layers of nitrogen, oxygen, helium and hydrogen are found, hence it is also called **'heterosphere'.**

♦ On the basis of thermal characteristics, the atmosphere is divided into **5 layers**-

➢ **Troposphere**

- This is the **lowest layer** of the atmosphere, in which all weather related activities like thunder, storm, rain, hurricane take place, due to which it is also called **convection sphere**.
- The height of the troposphere is 18 km at the equator and 8 km at the poles and its average height is **13 km**.
- In this sphere, the temperature decreases by **1°C** for every **165 meters** of height and on an average, the temperature decreases by **6.4°C** for every **1000 meters** of height. This is called the **'normal temperature fall rate'**.
- The troposphere is separated from the stratosphere by the **'Tropopause'**.
- The temperature of the tropopause above the equator is **-80°C** and above the poles, the temperature is **-45°C**.
- The very fast winds blowing near the tropopause are called **'jet streams'**, which move in the troposphere.

➢ **Stratosphere**

- The layer above the troposphere is called the **'stratosphere'**. This layer was discovered by **'Tejrans de Bort'**.
- The temperature remains constant in this layer.
- The height of the stratosphere from the surface is about 50 km. and its average height is considered to be 32 km.
- There is a **lack** of seasonal activities in the stratosphere - storms, hurricanes, cyclones etc. Due to which airplanes fly in this layer.
- The lower layer with high ozone gas in the stratosphere is called the **'ozone layer'** which extends from **15 to 35 km**.
- The upper limit of the stratosphere is called the **'stratopause'** which separates the stratosphere from the mesosphere.

➢ **Mesosphere**

- The height of the mesosphere is **50 to 80 km.** The temperature in this sphere falls suddenly.
- The upper limit of the mesosphere i.e. at the height of **80 km**. the temperature falls to about **–100°C**, this minimum temperature limit is called the mesopause, which separates the ionosphere from the mesosphere.

➢ **Ionosphere**

- The ionosphere extends between **80-400 km**.
- Electrically charged particles predominate in this sphere, hence the ionosphere makes communication possible by reflecting radio waves to the earth.
- Communication satellites are located in this sphere.
- The temperature in this sphere increases with height.
- The ionosphere is divided into several layers –
  - **D-layer –** In this layer, radio waves of long wavelength i.e. low frequency are reflected.
  - **E-layer –** This layer is also called **'Kennelly-Heaviside layer'**. In this layer, radio waves of medium and high frequency are reflected.
  - **F-layer –** This is also called **'Appleton layer'.** Radio waves of medium and high frequency (short wavelength) are reflected by this.
  - **G-layer –** All short, medium and long wavelength waves are reflected by this.

➢ **Exosphere**

- This layer is the uppermost layer of the atmosphere, which extends from the atmospheric part above 400 km to about 1000 km.
- The important feature of this layer is the occurrence of Aurora Australis and Aurora Borealis in it. This is why they are called Northern Polar Light (Aurora Borealis) and Southern Polar Light (Aurora Australis) and here the atmosphere is found to be rarefied.
- **Hydrogen and helium** gases and **electrically charged particles** predominate in this sphere.

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Atmospheric Pressure and Winds

Air pressure –

♦ The weight exerted by all the layers of atmosphere on unit area of land surface and sea level is called **'air pressure'**.

♦ Air pressure was discovered by **Guericke**.

♦ The unit of measuring air pressure is **barometer** and it is also measured in millibar and pascal.

♦ The average atmospheric pressure at sea level is **1013.25 millibar**.

♦ **Air pressure** is highest at sea level and it keeps on decreasing as we go towards higher altitude.

♦ Standard temperature and air pressure at a given altitude –

Level	Air pressure (in millibar)	Temperature (in cm)
Sea level	1013.25	15.2
1 km.	898.76	8.7
5 km.	540.48	–17.3
10 km.	265.00	–49.7

♦ **Isobar –** The imaginary line joining the places with equal air pressure at the sea level is called isobar.

♦ **Pressure gradient –** The mutual distances of isobar lines show the direction and rate of difference in air pressure, which is called pressure gradient. When isobar lines are close together, the pressure gradient is high and when isobar lines are far apart, the **pressure gradient** is low.

♦ **Distribution of atmospheric pressure**

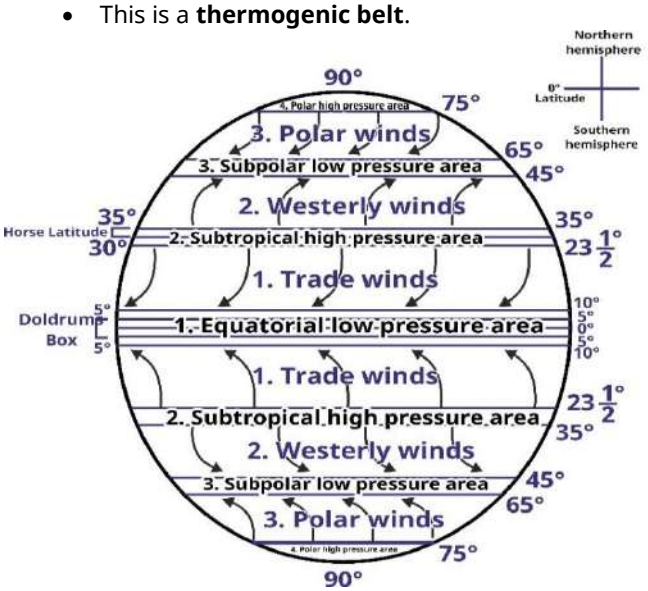
I. Vertical distribution – The air density and atmospheric pressure are high in the lower layers of the atmosphere. The air pressure decreases with altitude. The average rate of decrease in air pressure in the troposphere is about **34 millibars** per **300 meters** of altitude.

II. Horizontal distribution – The latitudinal distribution of atmospheric pressure is called the **horizontal distribution** of air pressure. Due to their regional cover, air pressure zones and belts are formed.

Air pressure zones and winds

➢ **Equatorial low air pressure zone –**

- This is a zone of extremely low air pressure.
- This belt stretches between **0˚ to 10˚** latitudes in both hemispheres near the equator/equator.
- Due to the seasonal **northward** and **southward** movement of the sun, this belt keeps shifting. (Temporary belt)
- The temperature remains high on the equator throughout the year due to the perpendicular rays of the sun falling on it, hence it is also called the **thermal low air pressure belt**.
- Due to the atmospheric conditions being extremely calm, this belt is called the **doldrums/calm belt**.
- In this region, the trade winds coming from the subtropical high pressure belts situated in both hemispheres converge.
- Hence this belt is also called **Inter Tropical Convergence Zone (ITCZ)**.
- This is a **thermogenic belt**.



♦ **Subtropical high pressure belt –**

- This belt is found between **30˚ and 35˚ latitudes** in both hemispheres.
- Despite high temperatures in summers, high atmospheric pressure is found here and the atmosphere remains very calm here.
- This atmospheric pressure zone is also called **horse latitude** because boats carrying horses had difficulty in calm atmospheric conditions, due to which the horses were thrown into the sea to lighten the weight of the boats and it is a **dynamic belt**.

♦ **Subpolar/Subpolar Low Pressure Belt –**

- The subpolar low pressure belt extends from 45˚ north latitude to the Arctic Circle (**66$^1/_2$˚N)** in the northern hemisphere and from 45˚ south latitude to the Antarctic Circle (**66$^1/_2$˚S)** in the southern hemisphere.
- The rotation of the earth plays an important role in its formation, because due to the rotation of the earth, the air from these latitudes spreads and is transferred and a low air pressure area is formed here and it is a **dynamic belt**.

♦ **Polar high air pressure belt –**

- This belt is found in both the hemispheres from **75˚ latitude** to the North Pole and South Pole.
- Due to extremely low temperature, cold and heavy winds of the atmosphere keep descending on the surface here; due to which a high air pressure area is formed here and it is a **thermal belt**.

Wind

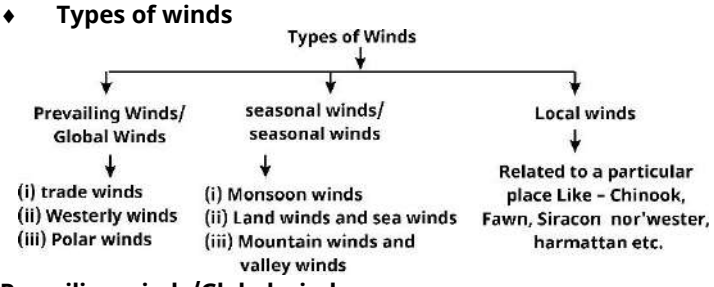
♦ Due to horizontal differences in the air pressure on the earth, the air flows from the high air pressure area towards the low air pressure. This horizontally moving air is called **wind**.

Laws related to wind

(i) Coriolis Law –

- It is a **virtual force**, which is generated by the rotation of the earth.
- The greater the wind velocity, the greater will be the deflection in the direction of the wind as per Coriolis law.
- The Coriolis force is zero at the equator and maximum at the poles.
- The Coriolis force is perpendicular to the air pressure gradient force. In the northern hemisphere, it is applied to the right of the air pressure gradient force and in the southern hemisphere, it is applied to the left.

♦ **Types of winds**



Prevailing winds/Global winds

♦ Between the fixed belts of high and low pressure on the surface, winds blow in a fixed direction throughout the year. Due to this, they are known as prevailing, permanent, eternal, planetary or global winds. The following are the types of prevailing winds –

♦ **Trade winds –**
- The winds blowing from the subtropical high pressure zones towards the equatorial low pressure zones are called **trade winds**.
- In the northern hemisphere, their direction is from north-east to south-west and in the southern hemisphere, from south-east to north-west. Hence, they are also called **easterly winds**.
- In ancient times, these winds used to facilitate trade for cargo ships, due to which they are also called **trade/commercial winds**.
- Near the equator, the trade winds of both the hemispheres collide with each other and rise up and cause heavy rainfall.
- The **doldrums belt** (calm belt) and the **intertropical convergence zone** are found in the trade wind belt.

➢ **Westerly winds –**
- The western winds blowing from the subtropical high pressure zone towards the subpolar low pressure zone are called **westerly winds**.
- Due to the rotation of the earth, their flow direction in the northern hemisphere is from south-west to north-east and in the southern hemisphere from north-west to south-east.
- The flow of winds is more permanent and definite in the southern hemisphere as compared to the northern hemisphere. The best development of westerly winds takes place between 40˚– 65˚ southern latitudes because there is a lack of terrestrial part here.

Note:- The westerly winds are known as **roaring forties** at 40˚ latitude in the Southern Hemisphere, **fierce/terrifying fifties** at 50˚ latitude and **screaming sixties** at 60˚ latitude.

➢ **Polar winds-**
- The winds blowing from polar high pressure areas towards sub-polar low pressure areas are called **polar winds**.
- Polar winds blow from north-east to south-west in the Northern Hemisphere and from south-east to north-west in the Southern Hemisphere.
- Due to low temperature, these winds have less capacity to hold water vapour.
- Polar winds, combined with westerly winds, give rise to cyclones and anticyclones.

Seasonal winds

♦ The winds whose direction changes with the season or time are called **seasonal winds**. These are considered to be the transformed form of the planetary winds. Types of seasonal winds –

➢ **Monsoon winds –**
- All those winds of the surface whose direction changes completely with the season are called **monsoon winds**.
- Monsoon winds blow from the sea towards the land in summer and from the land towards the sea in winter. They originate in the trade winds belt between the Tropic of Cancer and the Tropic of Capricorn.
- The most ideal conditions of monsoon winds are found in the Indian monsoon and South-East Asia.

➢ **Land breeze and sea breeze**

Land Breeze	Sea Breeze
The daily winds blowing from land towards the sea at night in coastal areas are called **land breeze**.	The daily winds that blow from the sea towards the land during the day are called **sea breeze**.
After sunset, due to intense radiation from the land surface, the surface cools down and high air pressure develops and relatively low air pressure develops on the water surface, due to which land breeze originates from the centre of high air pressure towards the centre of low air pressure.	Due to high temperature during the day, low air pressure develops on the land surface and relatively high air pressure develops on the water surface, which gives rise to sea breeze.

➢ **Mountain Breeze and Valley Breeze**

Mountain breeze (Katabatic Winds)	Valley Breeze (Anabatic Winds)
The winds blowing from the mountain peaks towards the valleys at night are called **mountain breeze** because at night, due to the mountains getting cold, a high air pressure area is formed and due to the valleys getting warm, a low air pressure area is formed. Due to which the winds blow from high air pressure to low air pressure.	In mountainous regions, during the day the mountain slopes are warmer than the valley floor. Hence the winds that rise from the valley floor towards the mountain slopes are called **valley breeze**.

Local winds

◆ These winds blow due to local difference in temperature and air pressure and their area of influence is limited. While warm local winds increase the temperature of a particular region, cold local winds sometimes lower the temperature even below freezing point. Local winds are limited to the lower layers of the troposphere. Local winds are of two types – 1. Warm winds, 2. Cold winds

I. Warm local winds

➢ **Chinook**
- The warm wind descending from South Colorado in the United States to British Columbia in Canada in the north and on the eastern slopes of the Rocky Mountains is called **Chinook**.
- Chinook is also called (Snow Eaters) Him Bhakshni in the local language because it melts the snow before time.
- Chinook winds are beneficial for animal husbandry, with its arrival the pastures become snow-free.

➢ **Sirocco**
- It is a dry hot wind filled with sand which blows from the Sahara desert region northwards through the Mediterranean Sea and enters Italy and Spain. Its other local names are – Sirocco (in Italy), Khamsin (in Egypt), Ghibli (in Libya), Chile (in Tunisia), Levash (in Spain).
- The rain caused by it is called **blood rain** (due to the presence of red soil).

➢ **Foehn**
- The strong, gusty, dry and hot local wind that descends on the leeward slopes of the Alps mountain range is called **Foehn**.

- It has the maximum effect in Switzerland.
- This wind melts the snow on the mountains, which makes the pastures suitable for grazing by animals and helps the grapes to ripen quickly.

➢ **Black Roller –** It is a hot and dusty dry wind that blows in the vast plains of North America.
➢ **Harmattan –** It is a hot and dry wind blowing from north-east to west in the Sahara desert. On the Guinea coast of Africa, it is known as Doctor wind.
➢ **Brickfielder –** It is a hot and dry wind blowing in the Victoria province of Australia.
➢ **Nor'wester –** It is a hot and dry wind blowing in North New Zealand.
➢ **Loo –** Loo is a very hot and dry wind. It blows in the north-western plains of India and Pakistan in the months of May and June.
➢ **Yamo –** It is a hot and dry wind blowing in Japan.
➢ **Simoom –** Hot and dry wind blowing in the Arabian desert which causes sand storms.
➢ **Shamal –** It is a hot, dry and sandy wind blowing in the desert areas of Iraq, Iran and Arabia.
➢ **Seston –** It is a fast-moving wind blowing in summers in eastern Iran.
➢ **Karaburan –** It is a dusty wind blowing towards north-east in the Tarim Basin of Central Asia.
➢ **Zonda –** This is a dry wind blowing from the Andes Mountains towards the plains in Argentina and Uruguay. It is also called cold phone. It is a hot and dry wind.
➢ **Santa Ana –** It is a hot and dry wind blowing in the California province of the United States of America.

II. Cold local winds

♦ **Mistral -** This wind originates in the Alps and flows through the valley of the Rhone River in France towards the Mediterranean Sea. This wind causes the temperature to fall below freezing point.
♦ **Bora -** It flows from the north-eastern mountains in Central Europe to the eastern shores of the Adriatic Sea. These winds blow more in Italy and Yugoslavia.
♦ **Blizzard -** These are polar winds containing ice particles that flow in the Siberian region, Canada, and the United States of America. This wind is called **Buran** in the Tundra region of Russia (in the Purga region).
♦ **Norte -** It is a polar wind that flows in the southern region of the United States of America and Mexico. It is also called Northern winds.
♦ **Pampero -** These are cold winds that blow in Argentina, Chile and Uruguay.
♦ **Juran –** These are cold and dry winds blowing at night from Jura Mountains (Switzerland) to Italy.
♦ **Baise –** These are cold and dry winds blowing in France.
♦ **Papagayo –** These are cold winds blowing on the coast of Mexico.
♦ **Southern Burster –** These are strong and dry cold winds blowing in New South Wales province of Australia.
♦ **Levanter –** These are very powerful eastern cold winds blowing in Southern Spain and France.
♦ **Gregale –** These are winter winds blowing in the central part of the Mediterranean regions of South Europe.
♦ **Ponant –** These are cold winds blowing in the Mediterranean region on the Corsica coast and in France.

Fronts, cyclones and anticyclones

Fronts

♦ The middle boundary region formed by the meeting of two air masses of opposite nature (temperature, speed, direction, humidity, density etc.) is called front. There is a transition region of 5 to 80 km width between these two air masses, which is called front region.
♦ Fronts help in weather forecasting.
♦ The process of formation of fronts is called front generation and the process of their destruction is called front decay. Cyclones, anticyclones and lightning storms originate from front generation and front decay.
♦ Fronts are formed the most where there is the greatest difference in the temperature of the air masses. Fronts are always located in low air pressure basins.
♦ There are 4 types of fronts-

I. Warm front

- When warm air masses rapidly settle above cold air masses, this contact area is called warm front.
- Due to the gentle slope of warm front, rainfall is slow but for a long time. The type of clouds in warm front changes many times.

II. Cold front

- When cold and heavy air rapidly pushes warm air masses upwards, this contact area is called cold front.
- The slope of cold front is high, it causes heavy rainfall for a short time.

III. Occluded front

- In occluded front, cold front and warm front meet each other and the contact of warm air masses with the surface ends.
- Combined characteristics of cold front and warm front are found in the occluded front.

IV. Permanent/Stationary Front- When the front becomes stable, it is called permanent front i.e. in permanent front, air masses (cold and hot) become parallel to each other, due to which the ascent of air stops. This does not lead to the formation of cyclones.

Front Regions-

I. Arctic Front Region

- The Arctic front region is found in Eurasia and North America.
- Arctic fronts are formed by the meeting of continental winds and polar ocean winds.

II. Polar Front Region

- The polar front region is found mostly in the North Atlantic Ocean and North Pacific Ocean.
- The polar front is formed by the meeting of polar cold air masses and tropical hot air masses.

III. Intra-tropical Front Region

- This front region is spread over the Mediterranean low pressure belt.
- This frontal region is formed by the meeting of north-east and south-east trade winds at low pressure.

- **Humidity –** The water vapour present in the atmosphere is called humidity. It is mainly of three types-
  1. **Absolute Humidity –** The amount of water vapour present in per unit volume of air is called absolute humidity.
     - It is expressed in grams per cubic metre.
  2. **Relative Humidity –** The ratio of water vapour present in air at any temperature and the capacity of the same air to hold water vapour at the same temperature is called relative humidity.

Relative humidity =

$$\frac{\text{the amount of water vapor present in the air at a given temperature}}{\text{the capacity of the same air to hold water vapor at the same temperature}} \times 100$$

     - It is expressed in percentage.

     Note: - Relative humidity increases when the temperature of air decreases and relative humidity decreases when the temperature increases.

     Note: - The relative humidity of saturated air is 100%.
  3. **Specific Humidity –** he weight of water vapour per unit weight of air is called specific humidity.
     - It is measured in grams per kilogram.
- **Condensation –** The process of conversion of water from gaseous state into liquid or solid is called condensation.

Major factors –

1. Relative humidity of air
2. Decrease in temperature

- **Dew Point –** The temperature of air at which water changes from its gaseous state to liquid or solid state is called dew point.

  Note:- For dew to occur, the freezing point of dew point must be above 0°C.
- **Rainfall –** When water vapour falls on the earth in the form of water droplets, it is called rainfall.
  - **A. Convectional Rainfall –** When the surface becomes extremely hot, the air moving with it also becomes hot. The air heats up and expands and becomes lighter. This lighter air rises upwards and forms convective currents.
    - his air cools down as it goes up and the water vapour present in it starts condensing. This condensation forms cumulus clouds, which leads to rain. This is called convective rainfall.
  - **B. Cyclonic Rainfall –** The rainfall caused by cyclones is called cyclonic rainfall and frontal rainfall.
  - **C. Orographic Rainfall –** When the hot air filled with water vapour has to rise up along the slope of a plateau or mountain, this air cools down. It becomes saturated as it cools down and the water vapour starts condensing as it rises up, the rainfall caused by which is called Orographic Rainfall.

Cyclones

- A changing and unstable cycle of winds, with low air pressure in the centre and high air pressure outside, is called a **cyclone**.
- A cyclone is a centre of low air pressure, around which isobar pressure lines are concentrated and there is high air pressure towards the periphery or outside, due to which the winds start blowing towards the centre in a circular motion.
- Due to the rotation of the earth, their direction is opposite to the direction of the clock hands (anticlockwise) in the northern hemisphere and in the direction of the clock hands (clockwise) in the southern hemisphere.
- Types of cyclones –

I. Temperate cyclones

- These cyclones are elliptical, circular, semi-circular and V-shaped, due to which they are called low troughs or turfs.
- These cyclones are found in both hemispheres between 35˚ to 65˚ latitudes, whose speed is usually from west to east due to westerly winds. They develop more in winter.
- The main area of temperate cyclones is the Atlantic Ocean and north-western Europe.
- These cyclones originate from the meeting of two air masses with opposite properties, cold and hot.
- There is low air pressure in its center and high air pressure outside.
- The long diameter of an ideal temperate cyclone is 1920 km and the short diameter is 1040 km.
- The normal speed of temperate cyclones is 32 km/hour to 48 km/hour.
- Mediterranean cyclones are so powerful that they cross the Mediterranean Sea and reach Pakistan and north-western India where they are called western disturbances.
- This rain in winter in India is beneficial for wheat cultivation in Punjab, Haryana, Uttar Pradesh.

II. Tropical cyclones

- Cyclones that originate and develop in the oceans of tropical regions are called tropical cyclones. They originate between 5˚ to 30˚ north latitudes and 5˚ to 30˚ south latitudes.
- Tropical cyclones are extremely destructive atmospheric storms, which originate in the oceanic region between the Tropic of Cancer and the Tropic of Capricorn.

Note :--

- The place from where the tropical cyclone crosses the coast and reaches the land is called the landfall of the cyclone.
- The place near the equator where the trade winds of both the hemispheres meet is called the intertropical convergence zone.

- The direction of air circulation in a tropical cyclone is opposite to the clockwise direction (anticlockwise) in the northern hemisphere and clockwise direction (clockwise) in the southern hemisphere.

- There is also a difference in the nature of tropical cyclones, for example – a cyclone moving at a speed of 32 km per hour is called a weak cyclone. Whereas a cyclone moving at a speed of 120 km per hour is called a hurricane. A cyclone moving at a speed of 200 km per hour is called a super cyclone.
- The diameter of tropical cyclones ranges from 80 to 300 km.

♦ **Major areas of tropical cyclones –**

- Such cyclones occurring in the Caribbean Sea of North America are called hurricanes. These cyclones occur from June to October.
- In the China Sea region, such cyclones are called typhoons. These continue from July to October. They affect the Philippines, China and Japan.
- In Australia, tropical cyclones are known as Willy Willies.
- In the Indian Ocean region, such cyclones are known as cyclones only. They occur on the coast of India, Bangladesh, Myanmar, Madagascar.

Anticyclone

♦ The air circulation system with conditions opposite to those of a cyclone is called an anticyclone.
♦ Anticyclones originate more in subtropical high pressure areas, while it is absent in the areas around the equator.
♦ Due to the presence of high pressure in the center of the anticyclone and relatively low pressure area on the outside, the winds blow from the center towards the periphery.
♦ In anticyclones, the winds blow clockwise in the Northern Hemisphere and anticlockwise in the Southern Hemisphere.
♦ Anticyclones are more extensive than cyclones.

Note:-

♦ In a cyclone, the air moves towards the centre, rises, cools down and causes rain, whereas in an anticyclone the weather is clear.

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Industrial Regions of the World

♦ The area where many factories of various chain-linked industries are developed is called industrial region.

Major industrial regions of the world

Industrial regions of the United States of America

♦ **New England Industrial Region**

- Boston, Meridan and Baltham are the major cities of this region.
- Boston is the main centre of cotton textile industry of the United States of America.
- Baltham city is famous for the manufacture of watches.

♦ **Ohio-Indiana Small Industrial Region**

- The major cities of this region are Pittsburgh and Akron.
- Pittsburgh city is the main centre of iron and steel industry in the world, hence this city is called the steel city of the world.

♦ **Great Lake Industrial Region**

- The Great Lake region of the United States of America is near five lakes.
- The world's largest meat market is located in the city of Chicago, situated on the banks of Lake Michigan.
- Detroit city is the main centre of the city of motor vehicle industry in the world.

♦ **California Industrial Region**

- The climate here is suitable for citrus fruits.
- The Los Angeles city of this state is famous for the film industry.
- Computer based hardware and software industries have developed in the Silicon Valley region of this state.

Major industrial Centres	Industry
Pittsburgh	iron Steel
Detroit	Motor car
Chicago	Meat processing
Los Angeles (Hollywood)	Film and aircraft
San Francisco	Refining, Shipping and Technical Industries

Industrial regions of Canada

♦ Iron and steel have developed extensively in the provinces of Ontario and Quebec.
♦ Windsor and Ottawa are the main centres of transport industries in Canada. Windsor is called the Detroit of Canada.

Major Industrial Centres	Industry
Montreal	Ships and Aircraft
Ottawa and Montreal	Paper Industry
Hamilton (Birmingham, Canada)	Iron and steel engineering
Toronto	Engineering and Automobile

Industrial regions of Britain –

♦ Industrial region of Britain is mostly based on imported raw material.

♦ **London Industrial Region**

- The main cities of this region are London and Oxford.
- London city is famous for cotton textile, engineering and motor vehicle industry.
- Oxford city is called the city of education.

♦ **Midland Industrial Region**

- The main city here is Manchester, which is the main center of cotton textile industry in the world, it is called the textile city of the world.
- Derbyshire city of this region is famous for woolen textile industry.
- Birmingham is famous for iron-steel and cotton textile.

Major Industrial Centres	Industry
Manchester	Cotton Textile Industry
Liverpool	Shipbuilding and Oil Refining
London	Engineering and Transportation
Derbyshire	Woolen Textile Industry
Birmingham	Iron Steel

Major industrial regions of Germany –

♦ The main industrial region of Germany is the Rhine Valley. The Ruhr region here is also called the industrial heart of Germany.

Major Industrial Centres	Industry
Munich and Augsburg	Chemical Industry
Frankfurt	Automobile
Hamburg	Shipping industry
Aisen	Iron Steel

Major industrial regions of Russia

- **Ural Industrial Region**
  - This region is located in Asian Russia and European Russia region.
  - This industrial region is connected to Vladivostok and Leningrad by Trans-Siberian Railway.
  - Russia's largest ferroalloy factory is located in Chiliabisk.
- **Moscow-Gorky Industrial Region**
  - Gorky city is the main center of Russia's motor vehicle industry, so it is called the Detroit of Russia.
  - Ivanovo city is the main center of Russia's cotton textile industry, so it is called the Manchester of Russia.
- **Leningrad/Saint Petersburg Industrial Region**
  - Leningrad is located in the coastal region of European Russia where ice breaking machines, paper industry, ship building industry are developed.

Major Industrial Centres	Industry
Moscow and Gorky	Iron & Steel Chemical Industry
Ivanovo (Manchester of Russia)	Cotton Textile Industry
Leningrad	Textile, Chemical and Paper Industries

Major industrial areas of France

- **Paris Industrial Region**
  - This region spread in the areas near the Seine River in France is famous for wine production from grapes.
  - A dense network of automobile, aircraft, steel, cotton textile, silk textile industries is found in Paris.
  - The city of Paris is called the fashion city of the world.
- **Lorraine-Saar Industrial Region**
  - Here coal is found in the Saar region and a lot of raw iron is found in the Lorraine region, due to which heavy metal industries are predominant in this region.
  - The headquarters of Arcelor Mittal Company is located in Luxembourg City, the capital of Luxembourg.

Major Industrial Centres	Industry
Paris	Aircraft and Transportation
Champagne and Bordeaux	Wine Industry
Lyons	Silk textile and Food processing
Saar and Laurent area	Iron Steel

Major industrial areas of Japan

- **Tokyo-Yokohama Industrial Region**
  - Tokyo is the main centre of cotton textile industry.
  - Yokohama city of this region is famous for rubber and tyre industry and motor vehicle industry.
  - Ship building industries are predominant in Tokyo, Yokohama, Kawasaki.
- **Nagoya-Industrial Region**
  - Nagoya is the main centre of motor vehicle industry of Japan, hence it is called Detroit of Japan.
  - Nagoya-Yokohama are also the main centres of textile manufacturing in Japan.
- **Nagasaki-Kyushu Industrial Region**
  - The main cities of this region, Nagasaki and Yawata, are famous for iron-steel industry.
  - Yawata city is the main centre of iron and steel industry of Japan, hence it is called Pittsburgh of Japan.
  - Osaka city is the main centre of cotton textile industry, hence it is called the Manchester of Japan.

Major Industrial Centres	Industry
Nagoya	Aircraft, motorcars
Osaka	cotton textiles, iron and steel, ships
Yawata	Iron Steel
Tokyo and Nagasaki	Ship engineering, textiles

Major industrial areas of China

- **Shanghai-Wuhan Industrial Region**
  - Cotton textile industry is developed on a large scale in Shanghai, hence Shanghai is called the Manchester of China.
- **Kunming Industrial Region**
  - This region is located in the Yangtze River region which is famous for oil refining, iron steel and cement industry.
- **Beijing Tingxin Industrial Region**
  - This industrial region is located in the delta of Huang-Ho River.
  - Beijing city is famous for textile industry and Tingxin chemical industry.

Major Industrial Centres	Industry
Shanghai	Textiles, machinery, shipbuilding and railway engines
Wuhan	Textiles, ships and iron-steel
Anshan Mukden	Iron Steel
Beijing	Textiles, machinery and steel machinery

Major industrial areas of Italy

- Most of the industries in Italy are located in the valley of the river Po in the northern part where three-fourths of the industries of the entire country are located in Lombardy, Piedmont and Liguria.
- Milan is the main industrial center of Italy, which is famous for silk textiles, it is called the Manchester of Italy.
- The Italian city of Turin is world famous for the manufacture of motor vehicles, it is called the Detroit of Italy.

Major Industrial Centres	Industry
Milan	For silk garments
Turin	For motorcars

Major industrial regions of Brazil

Major Industrial Centres	Industry
Sao Paulo	Coffee industry
Rio de Janeiro	Textile Industry and Coffee Industry

Major industrial regions of Denmark

Major Industrial Centres	Industry
Copenhagen	Dairy industry

Major cities located on the river banks	River
Perth (Australia)	Swan
Khartoum (Sudan)	Nile
Baghdad (Iraq)	Tigris
Rome (Italy)	Tiber
Warsaw (Poland)	Vistula
Sydney (Australia)	Darling
St. Louis (USA)	Mississippi
Berlin (Germany)	Spree
Karachi (Pakistan)	Indus
Paris (France)	Seine
Belgrade (Serbia)	Danube
London (England)	Thames
Cairo (Egypt)	Nile
Stalingrad (Russia)	Volga
Ankara (Turkey)	Kizil
Montreal (Canada)	St. Lawrence
Cologne (Germany)	Rhine
Moscow (Russia)	Moscow (Russia)
Shanghai (China)	Yangtze River
Aswan (Egypt)	Nile

❑❑❑

Chapter wise objective type questions

1. Match the following List-I with List-II and select the correct code–

List-I	List-II
A. Big Bang theory	1. Copernicus
B. equilibrium theory	2. Georges Lemaître
C. Oscillation theory	3. Allan Sandage
D. Heliocentric theory	4. Thomas Gould and Herman Bondi

Code:

	A	B	C	D
(a)	A-2	B-4	C-3	D-1
(b)	A-1	B-2	C-3	D-4
(c)	A-2	B-3	C-4	D-1
(d)	A-3	B-1	C-2	D-4

2. Which planet takes 88 days to revolve around the Sun?
(a) Earth (b) Mars
(c) Saturn (d) Mercury

3. Which planet of the solar system does not have a satellite?
(a) Mars (b) Mercury
(c) Venus (d) Both b and c

4. Which planet is called the 'lying down planet'?
(a) Neptune (b) Uranus
(c) Saturn (d) Mars

5. Which of the following are included in the inner planets-
(a) Mercury, Venus, Earth and Uranus
(b) Venus, Earth, Mars and Neptune
(c) Mercury, Venus, Earth and Mars
(d) Uranus, Neptune, Saturn and Mercury

6. Asteroids are found between which planets?
(a) Mars - Earth
(b) Jupiter - Saturn
(c) Saturn - Uranus
(d) Mars - Jupiter

7. The decreasing order of the planets of the solar system in terms of size is-
(a) Jupiter, Saturn, Uranus, Neptune, Earth, Mars, Venus, Mercury
(b) Jupiter, Saturn, Neptune, Uranus, Earth, Venus, Mars, Mercury
(c) Jupiter, Saturn, Uranus, Neptune, Earth, Venus, Mars, Mercury
(d) Jupiter, Saturn, Neptune, Uranus, Earth, Mars, Venus, Mercury

8. Phobos and Deimos are the two satellites of which planet?
(a) Uranus
(b) Mars
(c) Saturn
(d) Neptune

9. The largest satellite of the solar system is-
(a) Ganymede
(b) Moon
(c) Titania
(d) Titan

10. The highest mountain of the solar system 'Nix Olympia' is situated on which planet?
(a) Mars (b) Saturn
(c) Uranus (d) Neptune

11. When was Pluto derecognised as a planet?
(a) 2007 (b) 2006
(c) 2009 (d) 2008

12. On which of the following dates does summer solstice occur?
(a) 21 March
(b) 22 December
(c) 21 June
(d) 23 September

13. A solar eclipse occurs when-
(a) The Moon is between the Earth and the Sun.
(b) The Sun is between the Moon and the Earth.
(c) The Sun, the Moon and the Earth are not in a straight line.
(d) The Earth is between the Moon and the Sun.

14. When the duration of day and night is equal, on which line do the rays of the Sun fall directly?
(a) On 0° longitude line
(b) On the equator
(c) On the Tropic of Capricorn
(d) On the Tropic of Cancer

15. When is the Earth at its minimum distance from the Sun?
(a) 4 July (b) 21 June
(c) 3 January (d) 21 December

16. Choose the mismatched statement from the following-
(a) Perihelion occurs on 3 January.
(b) When the Earth is at its minimum distance from the Sun, it is called perihelion.
(c) Aphelion occurs on 21 June.
(d) When the Earth is at its maximum distance from the Sun, it is called aphelion.

17. Day and night are of equal length on earth-
(a) on 21st March and 23rd September
(b) on 22nd December and 21st June
(c) on 21st March and 21st June
(d) on 23rd September and 21st June

18. Who gave the gravitational force theory related to the origin of tides?
(a) Newton
(b) Laplace
(c) Havell
(d) Airy

19. At which place in the world does the highest tide occur?
(a) Gulf of Mexico
(b) Bay of Bengal
(c) Gulf of Kutch
(d) Bay of Fundy

20. How many minutes does the earth take to cover a distance of 1° longitude?
(a) 5 minutes (b) 8 minutes
(c) 4 minutes (d) 6 minutes

21. The line joining the North Pole and South Pole of the Earth is called –
(a) Longitude line (b) Latitude line
(c) Equator (d) Tropic of Capricorn

22. Which of the following is the International Date Line?
(a) 360° longitude (b) 190° longitude
(c) 180° longitude (d) 0° longitude

23. Match the following List-I with List-II and select the correct code–

List -I	List -II
A. Tropic of Cancer	1. $66\frac{1}{2}°$ northern latitudes
B. Arctic line	2. $66\frac{1}{2}°$ southern latitudes
C. Tropic of Capricorn	3. $23\frac{1}{2}°$ southern latitudes
D. Antarctic line	4. $23\frac{1}{2}°$ northern latitudes

Code:
(a) A-4 B-1 C-3 D-2
(b) A-4 B-2 C-3 D-1
(c) A-4 B-3 C-2 D-1
(d) A-3 B-1 C-4 D-2

24. How many years ago is the age of dinosaurs considered to be?
(a) About 100 million years ago
(b) About 300 million years ago
(c) About 180 million years ago
(d) About 450 million years ago

25. In which era was the Aravali mountain formed?
(a) Cambrian era
(b) Carboniferous era
(c) Pre-Cambrian era
(d) Miocene era

26. In which of the following eras did mammals and tailless monkeys first originate?
(a) Palaeozoic era
(b) Mesozoic era
(c) Cenozoic era
(d) Kainozoic era

27. Which era is also called the 'Coal Age'?
(a) Carboniferous era
(b) Cretaceous era
(c) Triassic era
(d) Miocene era

28. Which of the following was formed in the Pliocene period of the Cenozoic era?
(a) Rocky Mountains
(b) Great Himalayas
(c) Great Indian Plains
(d) Appalachian Mountains

29. The correct order of the layers of the earth from the surface towards the centre is-
1. Nife
2. Seema
3. Sial
Code:
(a) 1, 2, 3
(b) 2, 3, 1
(c) 3, 1, 2
(d) 3, 2, 1

30. In which layer of the earth nickel and iron are found in abundance?
(a) Nife
(b) Sial
(c) Seema
(d) None of the above

31. What is the rate of increase of temperature with depth as we move from the surface of the earth towards the centre (Earthquake)?
(a) 1°C per 20 m
(b) 1°C per 32 m
(c) 1°C per 40 m
(d) 1°C per 45 m

32. Which elements are predominant in the mantle layer?
(a) Silica and aluminium
(b) Nickel and iron
(c) Aluminium and magnesium
(d) Silica and magnesium

33. Gutenberg discontinuity is located –
(a) Between the crust and the mantle
(b) Between the upper crust and the lower crust
(c) Between the mantle and the core
(d) Between the upper core and the inner core

34. Match the following List-I with List-II and select the correct code–

List-I	List-II
A. Conrad discontinuity	1. Between the upper mantle and the lower mantle
B. Repeti disambiguation	2. Between the outer core and the inner core
C. Mohorovičić discontinuity	3. upper crust and lower crust
D. Lehmann discontinuity	4. lower crust and upper mantle

Code:
(a) A-1 B-3 C-4 D-2
(b) A-3 B-1 C-4 D-2
(c) A-2 B-3 C-1 D-4
(d) A-4 B-2 C-3 D-1

35. Which element is found in the highest quantity on the earth's crust?
(a) Oxygen
(b) Aluminium
(c) Silicon
(d) Iron

36. In which type of rocks are the remains of plants and animals found?
(a) Igneous rock
(b) Sedimentary rock
(c) Metamorphic rock
(d) None of the above

37. What is the metamorphic form of limestone?
(a) Quartzite
(b) Phyllite
(c) Marble
(d) Gneiss

38. Which of the following rocks is the oldest in terms of formation?
(a) Sedimentary
(b) Metamorphic
(c) Igneous
(d) None of the above

39. Match the following List-I with List-II and select the correct code–

List-I	List-II
A. Granite	1. Sedimentary rock
B. Petroleum	2. Igneous rock
C. Phyllite	3 . Igneous rock
D. Basalt	4. Metamorphic rock

Code:
(a) A-3 B-1 C-4 D-2
(b) A-4 B-3 C-2 D-1
(c) A-1 B-2 C-3 D-4
(d) A-2 B-3 C-1 D-4

40. Which one of the following is not a metamorphic rock?
(a) Marble
(b) Limestone
(c) Quartzite
(d) Slate

41. Match the following List-I with List-II and select the correct code–

List-I (Volcano)	List-II (Location)
A. Fujiyama	1. Italy
B. Katmai	2. Antarctica
C. Vesuvius	3. Japan
D. Mount Erebus	4. United States of America

Code:
(a) A-3 B-4 C-1 D-2
(b) A-2 B-3 C-4 D-1
(c) A-1 B-4 C-3 D-2
(d) A-4 B-3 C-2 D-1

42. Before an earthquake, the amount of which gas increases in the atmosphere?
(a) Nitrogen
(b) Radon
(c) Oxygen
(d) Hydrogen

43. The point on the surface of the earth where seismic waves are felt first is known by what name?
(a) Earthquake focus
(b) Origin centre
(c) Epicentre
(d) Hypocentre

44. Which of the following seismic waves reach the surface of the earth first?
(a) P- waves
(b) S- waves
(c) L- waves
(d) All of the above

45. Choose the incorrect statement from the following related to S-waves.
(a) These waves are also called secondary/transverse waves.
(b) These waves travel only in solid medium.
(c) Its speed is 40% less than that of P-waves.
(d) S-waves move like 'sound waves'.

46. Which of the following is not an active volcano?
(a) Chimborazo
(b) Kilauea
(c) Barron
(d) Mount Taal

47. 'Valley of ten thousand smokes' is located in –
(a) California
(b) Hawaiian Islands
(c) Alaska
(d) Mexico

48. Which of the following is called the 'Lighthouse of the Mediterranean'?
(a) Krakatoa (b) Stromboli
(c) Kilimanjaro (d) Popa

49. Who gave the plate tectonics theory in the year 1962?
(a) Alfred Wegener
(b) Harry Hans
(c) Mackenzie
(d) Morgan

50. Which plate is located to the south of Alaska and to the west of the North American plate?
(a) Juan de Fuca Plate
(b) Cocos Plate
(c) Nazca Plate
(d) Philippine Plate

51. San Andreas Fault near California is formed on which type of plate edge?
(a) Constructive Edge
(b) Destructive Edge
(c) Both a and b
(d) Conservative Edge

52. Choose the mismatched statement from the following-
(a) Fuji Plate – Located in the north-east of Australia.
(b) Philippine Plate – Located between the Asian continent and the Pacific Ocean plate.
(c) Arabian Plate – Located between the North America and African continent.
(d) African Plate – Includes the entire African continent and the eastern Atlantic Ocean floor.

53. Which of the following plates is not included in the seven main plates?
(a) African Plate
(b) Arabian Plate
(c) Eurasian Plate
(d) South American Plate

54. Choose the correct statement from the following statements-
1. According to Alfred Wegener, the northern part of Pangea was called Angaraland and the southern part was called Gondwana Land due to its division.
2. South America, Africa and Peninsular India etc. were formed from Gondwana Land.
3. The sea between Angaraland and Gondwana Land was called the 'Arctic Sea'.
Code:
(a) Only 2
(b) Only 2 and 3
(c) Only 1 and 2
(d) All of the above

55. Which is the largest and the smallest continent in the world on the basis of area?
(a) Africa and Australia
(b) Asia and Europe
(c) Asia and Australia
(d) North America and Antarctica

56. Match the following List-I with List-II and select the correct code–

List-I (Plateau)	List-II (Country)
A. Shan Plateau	1. China
B. Taklamakan Plateau	2. Myanmar
C. Anatolia Plateau	3. Pakistan
D. Pothohar Plateau	4. Turkiye

Code:
(a) A-3 B-2 C-1 D-4
(b) A-2 B-1 C-4 D-3
(c) A-4 B-3 C-1 D-2
(d) A-1 B-2 C-4 D-3

57. Choose the incorrect statement from the following–
(a) Gobi Desert – Mongolia
(b) Rub-al-Khali Desert – Iraq
(c) An Nafud Desert – Saudi Arabia
(d) Dasht-e Kavir Desert – Iran

58. The southernmost point of the African continent is-
(a) Cape Town
(b) Cape Hope
(c) Pretoria
(d) Cape Agulhas

59. Choose the mismatched pair from the following-

Country		Capital
(a) Egypt	–	Cairo
(b) Libya	–	Rabat
(c) Botswana	–	Gaborone
(d) Zimbabwe	–	Harare

60. Which of the following continents is also called the 'Dark Continent'?
(a) North America
(b) Africa
(c) South America
(d) Australia