



UPSC – CSE

Civil Services Examinations

Union Public Service Commission

General Studies

Paper I – Volume - 5

GEOGRAPHY OF WORLD



G.S. PAPER – 1 VOLUME – 5

GEOGRAPHY OF WORLD

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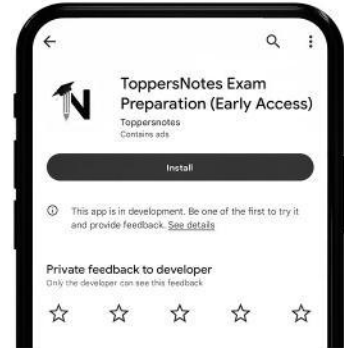
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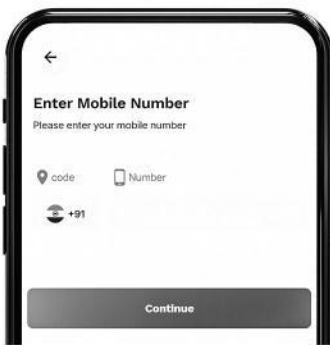
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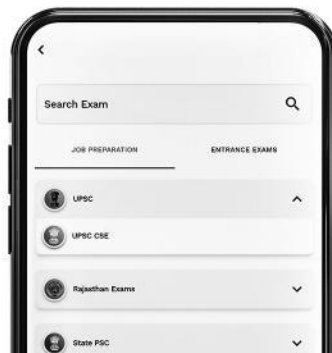
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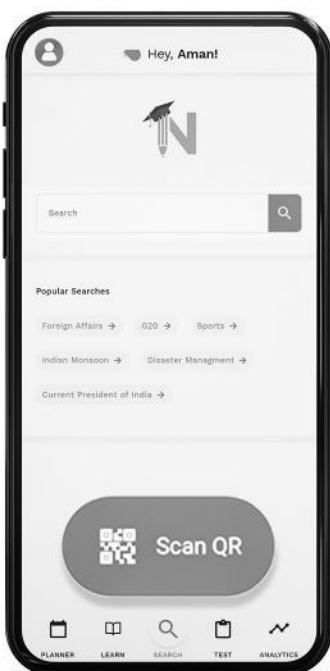
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1 CHAPTER

Universe and the Solar System

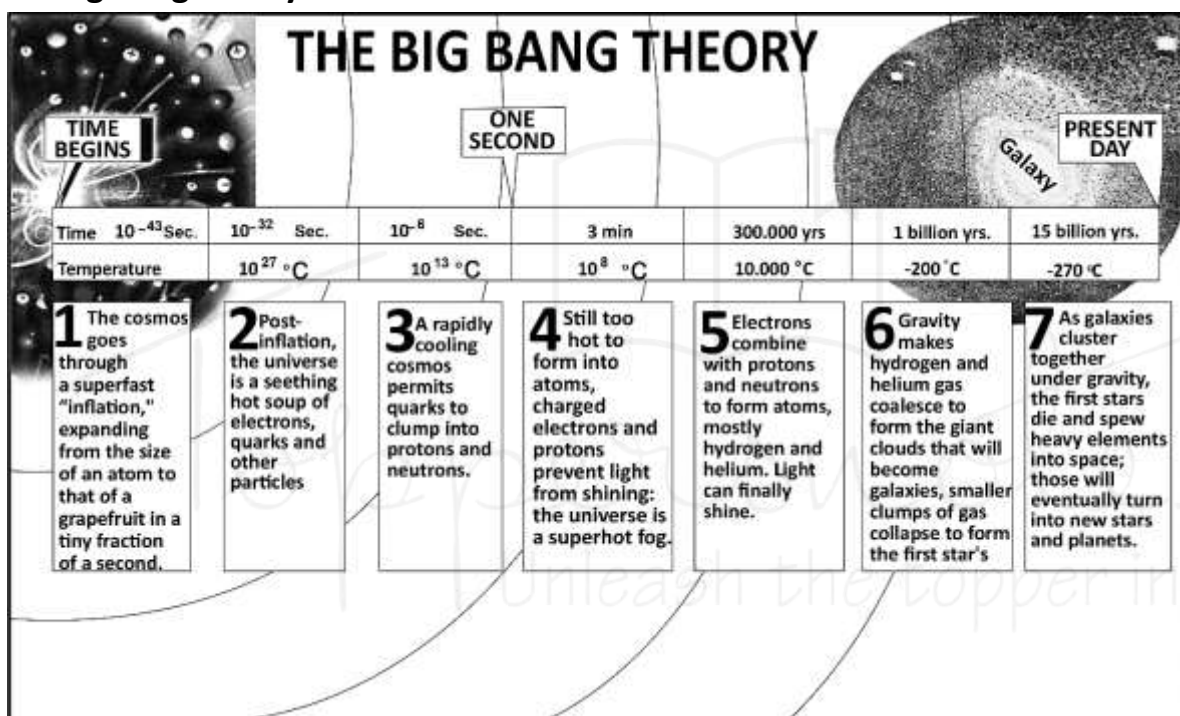


Origin of the Universe

- **Universe:** Everything that exists, including distant stars, planets, and satellites, as well as our own planet and all of its people.

Theories about origin of Universe:

1. Big Bang theory



- The **most popular argument** regarding the origin of the universe .
- aka **expanding universe hypothesis**.
- **Edwin Hubble in 1920 proved** that the universe is expanding .
- Took place **13.7 billion years** before the present.
- **Galaxies move further and further apart with time** and thereby, the **universe is considered to be expanding**.
- Scientists believe that though the space between the galaxies is increasing, observations do not support the expansion of galaxies.
- **Stages** in the development of the universe:
 - **Beginning-** All matter forming the universe existed in one place as a "tiny ball" (singular atom) with an unimaginally small volume, infinite temperature and infinite density.
 - **Big Bang-** "Tiny ball" explodes violently which led to a huge expansion.
 - The expansion continues even to the present day.
 - As it grew, some energy was converted into matter.

- **Rapid expansion within fractions of a second after the bang- later, it slowed down.**
 - **Within the first 3 minutes from the Big Bang event, the first atom began to form.**
 - **Within 300,000 years from the Big Bang, temperature dropped to 4,500K and gave rise to atomic matter.**
 - **The universe became transparent.**
 - **Common misconception:**
 - Gives the complete origin of the universe but it **does not describe the energy, time and space involved in the creation of the universe.**
 - **Only explains how the universe emerged** from its initial high-temperature state.
 - **Only describes the size of the observable universe** and not the universe as a whole
 - **Evidences of Big Bang**
 - **Expanding galaxies:**
 - **Hubble in 1929 noted that galaxies outside our own Milky Way were all moving away from us,** at a speed proportional to its distance from us.
 - **Realized that there must have been an instant** in time (now known to be about 14 billion years ago) **when the entire Universe was contained in a single point in space.**
 - **The Universe must have been born in this single violent event** which came to be k/a “**Big Bang.**”
 - **Cosmic Background radiation:**
 - **Early photons ,the afterglow of the Big Bang k/a cosmic background radiation (CBR) can be observed even today.**
- ## 2. Pulsating theory
- **Universe is believed to be pulsing, expanding and shrinking alternately,**
 - According to this theory, the **universe's expansion may be halted by gravitational attraction at some point in the future, causing it to compress again.**
 - **After it has been constricted to a particular size, it will explode again, and the universe will begin to expand.**
 - **The pulsating universe is created by the universe's parallel expansion and contraction.**

Components of the Universe

Galaxy

- **Collection of millions or billions of stars, gas and dust, bound together by gravity.**
- Mainly divided into **four types viz. elliptical, normal spirals, barred spirals and irregular.**



Milky Way Galaxy

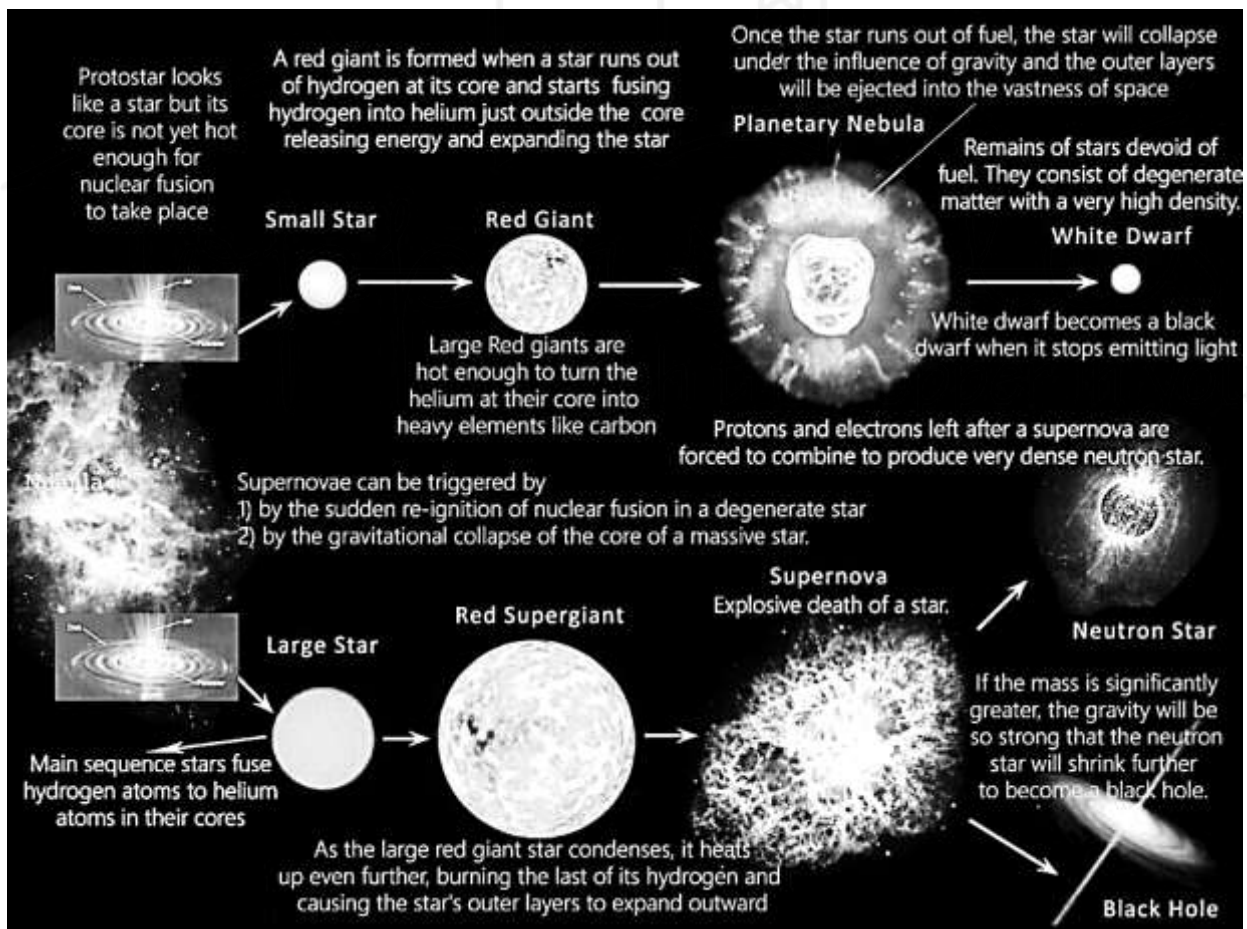
- **Shape- spiral.**
- **Has a disk-shaped structure** - diameter of roughly 100000 light years.
- Around its centre, the Milky Way galaxy **rotates gently in a counter-clockwise manner.**
- **Centre- All stars** (including the sun and the solar system) **rotate.**
- **Appears like a river of light flowing from one corner to the other** in the night sky, therefore k/a **Akash Ganga.**

Stars

- Incredibly **hot celestial beings** that generate their **own light**.
- Massive **clouds of hydrogen gas, helium, and dust**.
- **3 types** as per their colour and temperature:
 - **Red: low surface temperatures**
 - **White: high surface temperatures**
 - **Blue: very high surface temperatures**
- In the night sky, all **stars** (save the pole star) **appear to travel from east to west**- caused by the **earth's rotation** on its axis.
- The **monthly locations of the stars fluctuate**- due to interaction between the **rotation of the earth around its axis and the orbit** of the earth around the sun.

Birth and Evolution of a Star

- **Raw material** for star formation- **Hydrogen**.
- **Beginning of a star's life cycle**- **formation of thick clouds of hydrogen and helium gas (i.e. Nebula)** in galaxies.
- **Birth** - caused by the **gravitational collapse** of these too thick **clouds of gases** in the galaxy.



ProtoStar

- **Resembles a star**, but **core not heated enough for nuclear fusion** to occur- occurs only when the **initial temperatures** are very **high** - **hard to achieve and control**.
- **Difficult to view** - frequently **covered by dust**, which filters the light they emit.

T Tauri Star

- **Young** (< 10 million years old) , **light star experiencing gravitational contraction** .
- **Intermediate stage** between a **Protostar** and a low-mass **main sequence star**.

Main sequence stars of fusion ignition

- **Hydrogen + helium**.
- **Make up the vast majority of stars** in the universe (**about 90%**).
- A **star like the Sun** swells up to **become a red giant** at the end of its life, **before shedding its outer layers** as a planetary nebula and finally decreasing to become a white dwarf.

Final Stages of a Star's Life

- Enters **red-giant phase**- becomes a **red-giant star**.
- Can then **die out** by becoming a **white dwarf star** or exploding as a **supernova star** → development of **neutron stars and black holes, depending on its mass**.
- **White dwarf** - **tiny hot star** that is **at the end of its life cycle** - **leftovers of regular stars** that have exhausted their nuclear energy reserves.

NOVA

- Occurs on the **surface of a white dwarf**.
- **If two stars in the system are close enough** together, **material (hydrogen) from the partner star's surface can be transferred onto the white dwarf**.
- When enough material accumulates on the surface of a white dwarf, **nuclear fusion occurs**, resulting in a **dramatic brightening of the star**.

Supernova

- **Star's rapid death causes it to brighten to the brightness of 100 million suns** for a brief period of time.
- The **very bright burst of radiation disperses most or all of a star's material at a high velocity, causing a shock wave to propagate into the interstellar medium**.
- These shock waves **cause condensation in a nebula, opening the way for the formation of a new star**.
- **Responsible for a large amount of primary cosmic rays**.

Black Dwarf

- **Last stage** of star development.
- It is a **white dwarf that has cooled** to the point that **no substantial heat or light is emitted**.
- **No black dwarfs are projected to exist** in the universe yet since the time necessary for a white dwarf to achieve this condition is calculated to be greater than the universe's current age.

Brown Dwarfs

- Objects that are **too big to be planets but not big enough to be stars**.
- **Considered to develop** from a collapsing cloud of gas and dust in the **same manner as stars do**.
- The **centre of the cloud, however, is not thick enough to start nuclear fusion** when the cloud falls.

Neutron Stars

- Stars that **emit neutrons**.
-

- Mostly **made up of neutrons**.
- **Formed during supernova** pushing protons and electrons to combine to form a neutron star.
- **High density stars** (A sphere with a diameter of merely 20 kilometres can hold three times the mass of the Sun).
- If it has a **larger mass**, and **intensely high gravity** shrinking it even further, eventually becoming a black hole.

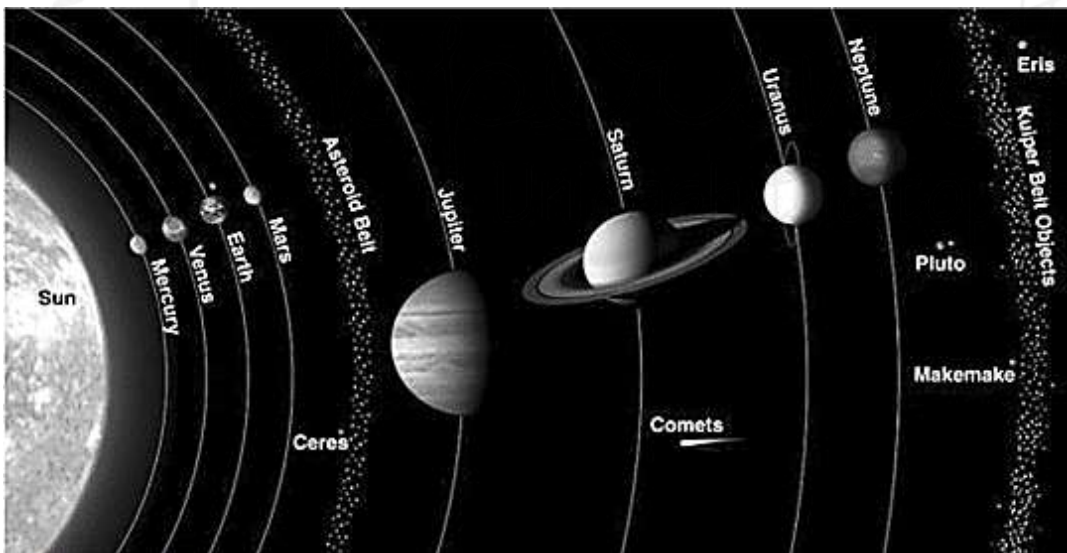
Black Holes

- At the end of their lives, **big stars are believed to create black holes**.
- **Gravitational pull is so strong** that nothing, **not even light, can escape it**.
- A black hole's **matter density can't be measured** (it's infinite!).
- **Warp space around them** and can pull nearby objects, including stars, into them.

Dark matter

- A kind of matter hypothesised in astronomy and cosmology to account for a significant amount of the **universe's mass that appears to be absent**.
- **Invisible to telescopes**- does not emit or absorb significant amounts of light or other electromagnetic energy.
- **A black hole is not the same as dark matter**.
- **Unknown elements** of dark matter.
- Might be a swarm of black holes, a dwarf, or a whole new particle.

Solar System



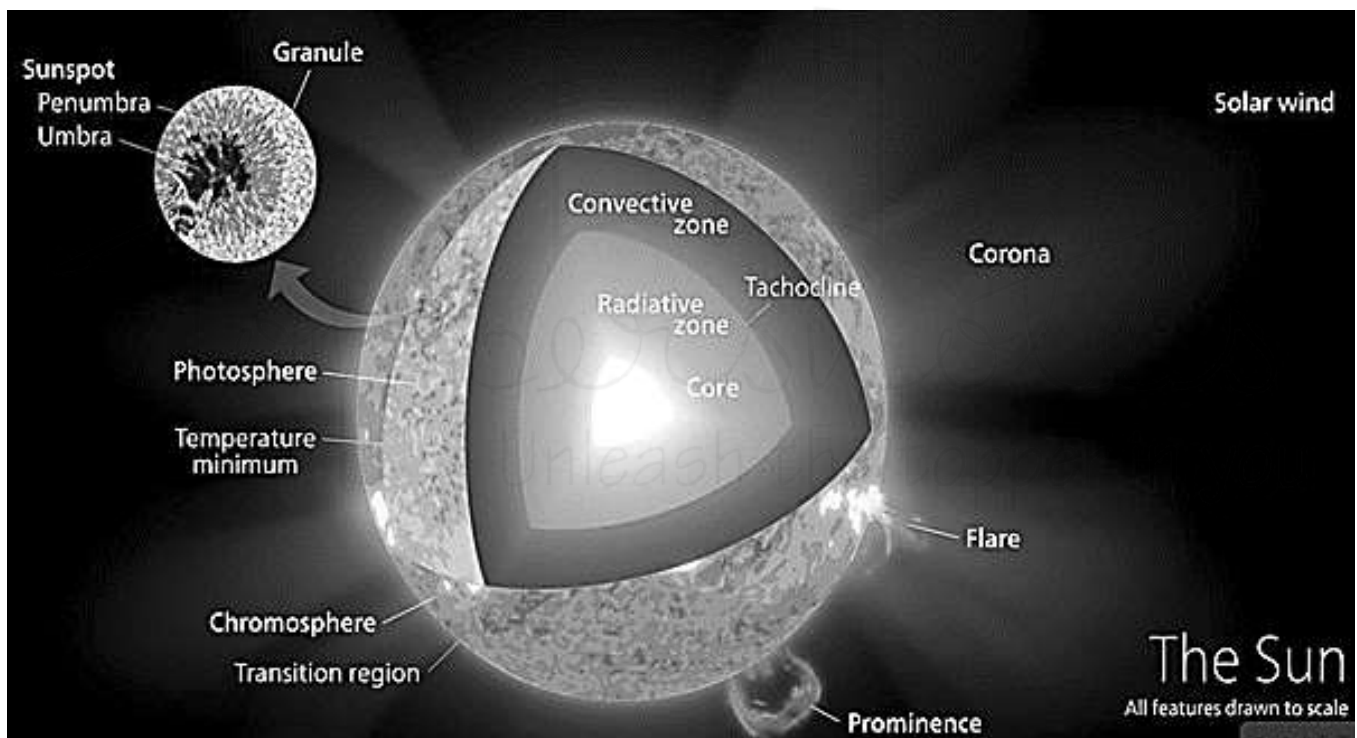
- **Age: 4.6 billion years old**
- **Distance: 27,000 light years** from the Milky Way's centre.
- **Components - sun, eight planets and their satellites + asteroids, comets, and meteors.**
- **Sun- centre of the solar system.**
- The sun's **gravitational influence maintains** the whole **solar system** rotating around it → sun's **gravitational pull determines velocity** of all solar system **components**.
- **~ 99.9% of the matter in the solar system - from the sun.**

Sun

- **Age:** 4.6 billion years.
- **Diameter:** 1.39 million km.
- **Temperature:**
 - **Surface-** 6000 °C on surface
 - **Core:** 16 million °C
- **Density:** 1.41 times that of water.
- **Rotation time:** 25 days and 9 hours.
- **Rotational speed:** 7179.73 km/h. (rotates **counter-clockwise**)
 - The **earth's rotational velocity** is 1675 kilometres per hour.
- **Mass:** 3,32,900 times of Earth masses.
- **Distance:** 150 million kilometres away from Earth
- **Time taken by light to reach earth:** 8 minutes and 20 seconds.



Time taken by light to reach Earth from the closest star, proxima centauri : 4.3 light years.



Internal Structure and Atmosphere of the Sun

- **Solar interior** - core, radiative zone and the **convective zone**.
- **Solar atmosphere** - **photosphere**, **chromosphere**, and the **corona** (solar wind is an outflow of gas from the corona).
- **Photosphere**
 - **Bright outer layer of the Sun** emits most radiation.
 - Extremely **uneven surface**.
 - **Effective temperature** on the outer side of the photosphere- **6000°C**.
- **Chromosphere**
 - **Just above the photosphere** is the chromosphere.
 - **Relatively thin layer** of burning gases.

- The chromosphere is a **bit cooler — 4,320° C.**
- **Corona**
 - **Atmosphere of plasma** that surrounds the Sun and other celestial bodies.
 - **Stretches millions of kilometres into space** and may be **viewed best during a total solar eclipse.**

Plasma

- **Ionised gas** (atoms and molecules are converted into ions typically by removing one or more electrons from the outer shell)
 - **Eg. Lightning and electric sparks** -made from plasma.
 - **Neon lights** - 'plasma lights'- light comes from the plasma inside of them.
- **Sunspot**
 - **Dark patch on the surface of the Sun.**
 - **Appear as dark areas** - as **about 500-1500°C cooler than the surrounding chromosphere.**
 - **Has a lifetime** ranging from a few days to a few months.
 - **Each spot has a black centre or umbra**, and a **lighter region or penumbra**, surrounding it.
 - **Sun - 1% cooler when it has no sunspot** and that this variation in solar radiation might affect the climates of the Earth.
 - **Solar prominence**
 - **An arc of gas that erupts from the surface of the Sun.**
 - Can loop **hundreds of thousands of miles into space.**
 - **Held above the Sun's surface by strong magnetic fields** and can last for many months.
 - Later they **erupt, spewing enormous amounts of solar material into space.**
 - **Solar Wind**
 - **Stream of energised, charged particles**, primarily electrons and protons, **flowing outward from the Sun.**
 - **Speeds upto 900 km/s** and at a **temperature of 1 million degrees (Celsius).**
 - **Made of plasma** (ionised atoms).
 - **Solar Flares:**
 - **Magnetic anomalies cause solar flares to form** on the sun's surface.
 - **Magnetic storms that seem like brilliant spots** with a **gaseous explosion on the surface.**

Impact of Solar winds:

1. Aurora

- **A natural light show in the sky** - commonly observed in **high latitudes** (Arctic and Antarctic). (This is due to the earth's magnetic field lines and the solar wind.)
- **Caused by Charged particles (electrons and protons)**, entering the atmosphere from above, creating **ionisation** and **excitation** of atmospheric elements, as well as **visual emissions.**

2. Some planets have atmospheres, while others don't.

- **Solar wind particles have a well-developed magnetic field** - reach the planet - **deflected.**
- **Magnetosphere** -
 - **Region around a planet dominated by the planet's magnetic field**- **Earth** has the **strongest magnetosphere** of all the rocky planets.
 - **Overall shape** is determined by the **solar wind.**

- **Planets with a weak / non-existent magnetosphere** - prone to solar wind atmospheric stripping.
- **Side facing the Sun**- magnetosphere is generally shaped like a hemisphere,
- **Opposite side**- extends in a lengthy trail.
- **Magnetopause** -
 - **Abrupt boundary between a magnetosphere and the surrounding plasma.**
 - **Boundary between the planet's magnetic field and the solar wind.**

Planets

- A celestial body that orbits a star in an elliptical path.
- **2 groups:**
 - **Terrestrial Planets-**
 - **Inner planets** (as they lie between the sun and the belt of asteroids)
 - Have smaller and denser bodies
 - **Composition-** silicates and metals.
 - **Dense, rocky compositions, few or no moons, and no ring systems.**
- **Mercury (Buddh):**
 - **Smallest and closest** to the sun.
 - **Distance from Sun:** 57.91 million km
 - **Orbital period:** 87.97 Earth days,(Shortest)
 - **Length of day:** 58d 15h 30m
- **Venus (shukr):**
 - **Brightest planet** in the solar system (**morning/ evening star**)
 - Rotates in **anticlockwise direction**
 - The **hottest** planet in the Solar System- high concentration of CO₂ and thick atmosphere.
 - **Distance from Sun:** 108.2 million km
 - **Orbital period:** 225 days
 - **Length of day:** 116d 18h 0m
- **Earth (Prithvi):**
 - Only known planet to **sustain life.**
 - **Distance from Sun:** 149.6 million km
 - **Age:** 4.543 billion years
 - **Orbital period:** 365 days
 - **Natural Satellite:** MOON
- **Mars (Mangal):**
 - **Red Planet:** Presence of **iron oxide on surface**
 - **Length of day:** 1d 0h 37m
 - **Distance from Sun:** 227.9 million km
 - **Orbital period:** 687 days
 - **Natural satellites:** Phobos, Deimos
 - **Jovian planets / Gas Giants -**
 - planets of outer circle
 - Have a **greater size and less dense materials.**

- They usually have a **thick atmosphere**, consisting of **helium and hydrogen**.
- **Jupiter(Brhaspati):**
 - **Largest planet of the solar system**
 - **Length of day:** 0d 9h 56m
 - **Distance from Sun:** 778.5 million km
 - **Age:** 4.603 billion years
 - **Orbital period:** 12 years
 - **Natural satellites:** Io, Europa, Ganymede, and Callisto(called the Galilean satellites because Galileo discovered them.)
 - **Saturn(shani)**
 - ☞ **Saturn's rings** are probably made up of **billions of particles of ice and ice-covered rocks**.
 - ☞ **Length of day:** 0d 10h 42m
 - ☞ **Distance from Sun:** 1.434 billion km
 - ☞ **Orbital period:** 29 years
 - ☞ **Moons:** Titan, Enceladus, Mimas, Tethys, etc.
 - ☞ **Titan - second-largest moon** in the Solar System (larger than Mercury)
 - ☞ **Only satellite in the Solar System with a substantial atmosphere (nitrogen-rich).**
 - **Uranus(arun)**
 - ☞ Rotates in **clockwise direction** i.e opposite of the sun's rotation.
 - ☞ **Length of day:** 0d 17h 14m
 - ☞ **Distance from Sun:** 2.871 billion km
 - ☞ **Orbital period:** 84 Years
 - ☞ **Natural satellites:** Miranda, Ariel, Umbriel, Titania, and Oberon.
 - **Neptune(Varun)**
 - ☞ **Farthest known planet**
 - ☞ **Uranus and Neptune - Twin planets.**
 - ☞ **Strongest sustained winds** (2,100 km/h) of any planet in the Solar System found here.
 - ☞ **Length of day:** 0d 16h 6m
 - ☞ **Distance from Sun:** 4.495 billion km
 - ☞ **Orbital period:** 165 years
 - ☞ **Natural satellites:** Triton, Hippocamp, Proteus, Nereid, etc.

Asteroids

- **Rocky remains** left over from the formation of the solar system.
- These **remains failed to consolidate** due to **Jupiter's gravitational influence**.
- **Composition** - refractory stony and metallic materials, with some ice.
- **Size-** microscopic to hundreds of kilometres.
- **Ceres** - largest asteroid (946 km in diameter), a protoplanet, and a dwarf planet.
- **All other asteroids** are considered as **tiny** Solar System bodies.

Kuiper Belt:

- A **circumstellar disc in the outer Solar System**.
- Spans 30 AU from Neptune's orbit to around 50 AU from the Sun.
- **Pluto (39 AU)- largest known object in the Kuiper belt.**

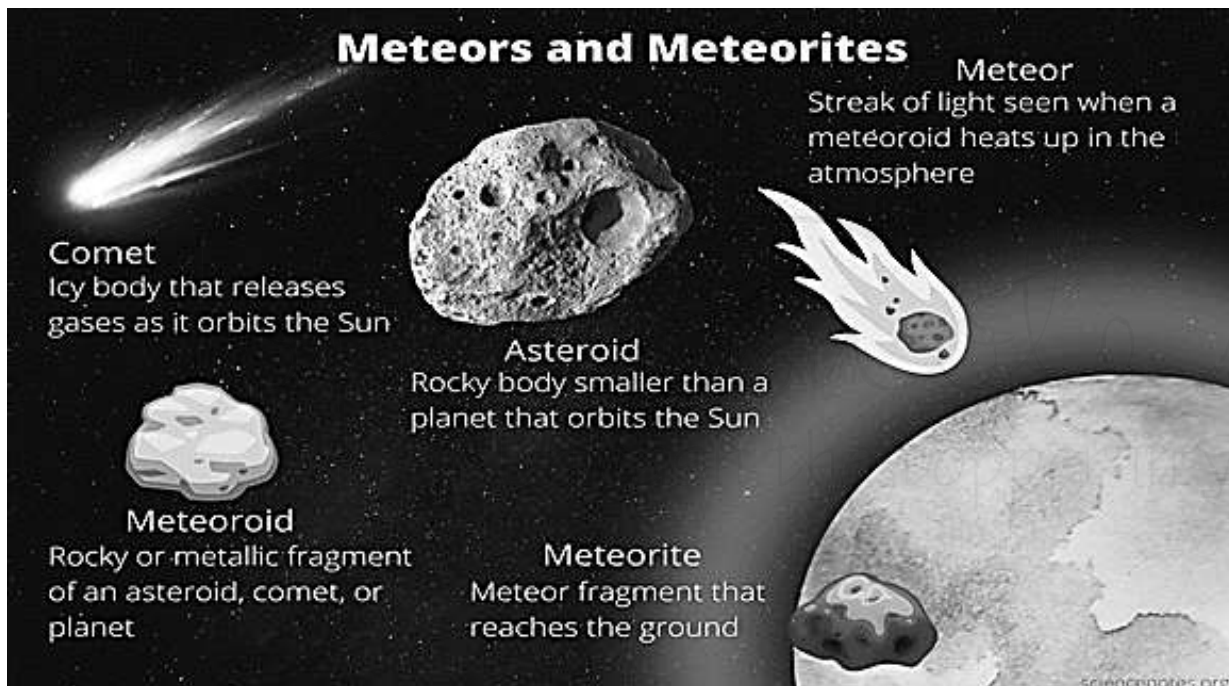
Oort cloud

A giant shell of icy bodies that encircle the solar system occupying space at a distance between 5,000 and 100,000 AU.

Comets

- An icy small solar system body- heats up (when passing close to the Sun) due to solar radiation and the solar wind - begins to outgas (release gases) - atmosphere and sometimes a tail visible .
- Have highly elliptical orbits.
- **Composition-** Stony and metallic minerals held together by frozen gases (water, ammonia, methane, and carbon dioxide).
- **Types:**
- **Short-period comets** - orbital period - 100 years- generally originate in the Kuiper belt.
- **Long period comets** - orbital period - thousands of years, come from the more distant Oort Cloud.

Meteoroid, Meteor and Meteorite



- **Meteoroid:** Any solid debris originating from asteroids, comets, or other astronomical objects that drifts across interplanetary space.
- **Meteor:** A flash of light that emerges in the sky when a meteoroid hits the atmosphere (mesosphere) at a high speed and burns up due to friction. Sometimes known as a 'shooting star' or a 'falling star.'
- **Meteorite:** When a meteoroid does not burn entirely and lands on the surface of the Earth.

Meteorite crater:

- A circular depression generated on the earth's surface as a result of a meteorite impact.
- Most visible meteorite craters - Moon and Mercury's surfaces (because they are geologically inactive due to a negligible atmosphere).
- **World's Largest Meteor Crater:** 1,300 metres deep Arizona(US).

- **Chicxulub crater (Mexico's Yucatan Peninsula)** - caused by a meteor impact that is **believed to have wiped out the dinosaurs** (mass extinction at the end of the Cretaceous 65 million years ago).
- **Meteorite craters in India**
 - **Lonar Lake (1.8 km in diameter)** in Buldhana District of **Maharashtra**.
 - **Dhala crater (14 km in diameter)** in Shivpuri district, **Madhya Pradesh**.
 - **Ramgarh crater (3.5 km in diameter)** is a potential meteorite crater in **Kota plateau** in **Rajasthan**.

Meteor Showers

- **Occurs when Earth encounters many meteoroids at once.**
- **Comets also orbit the sun.**
- **As a comet gets closer to the sun, some of its icy surface boils off, releasing** lots of particles of **dust and rock (meteoroids)**.
- This **comet debris gets scattered along the comet's path**, especially in the **inner solar system** (including planets Mercury, Venus, Earth and Mars).
- When **Earth makes its journey around the sun**, its orbit crosses the orbit of a comet i.e. **Earth encounters a bunch of comet debris**.
- **These meteoroids when enter the earth's atmosphere burn up and cause continued lighting of sky for some time** k/a meteor shower.
- **Named for the constellation where the meteors appear to be coming from.**
- **Eg. Orionids Meteor Shower** appears to be **originating near the constellation 'Orion the Hunter'**.

Moon

- **Diameter - one-quarter** of earth.
- **Distance from earth- 3,84,400 km.**
- Light takes only a second to reach us from the moon.
- **Tidally locked to the earth**, meaning that the **moon revolves around the earth** in about 27 days which is the **same time it takes to complete one spin**.
- Hence, **only one side of the moon is visible from earth**.
- **Without moon, Earth's tilt could vary as much as 85 degrees** (at present the Earth's axis of rotation is tilted at an angle of 23.5° relative to our orbital plane).

Tidal locking - Object's orbital period = rotational period.

Formation of Moon:

- Formation is an **outcome of 'giant impact'** aka **'the big splat'**.
- A **body of the size 2-3x of mars collided into the earth** shortly after the earth was formed- **blasted a large part of the earth into space**.
- **Part of blasted material** - continued to orbit the earth - **formed into present moon** about 4.44 billion years ago.
- **Moon used to revolve much closer to Earth than today.**
- **Earth rotates -> Moon's gravity causes tides.**
- **Little friction between the tides and the turning Earth-** earth's rotation slows down just a little (1.4 milliseconds in 100 years).
- As Earth slows- **Moon drifts away a little** (four centimetres per year).



Types of Moon:

1. Blood Moon/ Copper Moon

- Total lunar eclipses aka **blood moons** because of the **reddish orange glow** the moon takes on.
- Total lunar eclipse - Earth moves **between the Sun and the Moon** - cuts off the Moon's light supply.
- Surface of the Moon takes on a **reddish glow** instead of going completely dark.
- Reddish color during totality **due to Rayleigh scattering**.

Rayleigh scattering

Same mechanism **responsible for causing colorful sunrises and sunsets**, and for the sky to look blue.

2. Blue Moon

- **Appearance: two and a half years** on average.
- Blue moon **does not mean blue coloured moon**. It is just **second full moon of any calendar month**.

3. Super moon

- Full moon occurs at its perigee.
- Rare event.
- Has to satisfy **two conditions**
 - Moon must be **closest** to the earth
 - Should be a **full moon**.
- Moon- **30 % brighter** and **14 % larger**.
- Difference cannot be **seen with naked eye**.

Dawn and Twilight

- **Dawn:**The period between **sunrise** and full **daylight**.
- **Twilight:** The period between **sunset** and complete **darkness**.
- **Occurrence-** Earth receives **scattered or refracted light** from the sun **when** it is still **below the horizon** during **dawn and twilight**.
- **Poles-** **winter darkness** is much **longer-** mostly **merely twilight**.

Eclipse

- **Occurrence:** When the **Sun, the Earth, and the Moon** are in a **straight line**.
- **Types :**

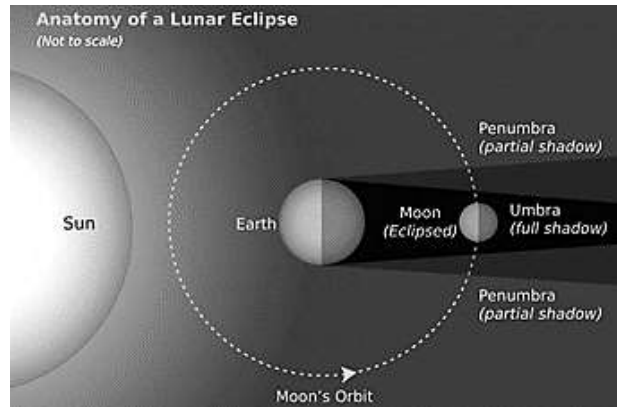
1. Lunar Eclipse

- **Ideal Position:** Only when the Sun, the Earth, and the Moon are in a straight line, and the **Earth is between the Sun and the Moon**,
- Possible only on a **Full Moon day**. However, since these **three bodies must be in the same plane as the ecliptic**, a lunar eclipse **does not occur on every Full Moon day**.

Total lunar eclipse: Moon exactly in the plane of the ecliptic.

Partial lunar eclipse: Moon close to the ecliptic plane.

No eclipse: Moon much above or far below the ecliptic plane.



2. Solar Eclipse

- **Ideal Position:** Only when the Sun, the Earth, and the Moon are all in a straight line, and the Moon is between the Sun and the Earth.
- Possible on a **New Moon day** -But **does not occur on every New Moon day**.

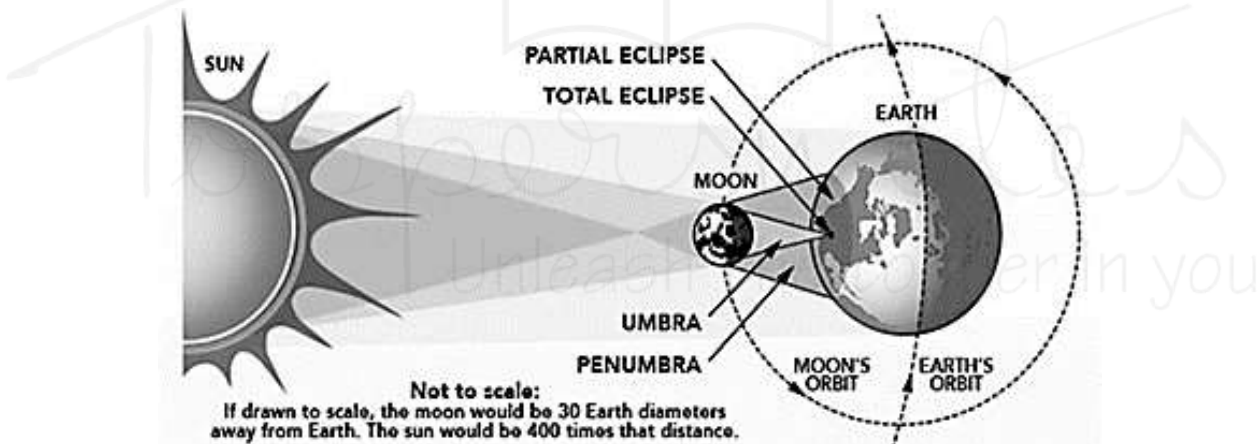
Total Solar Eclipse: Moon is **exactly** in the plane of the ecliptic.

Partial solar eclipse: Moon is **close** to the ecliptic plane.

No Eclipse : Moon is **much above or far below** the ecliptic plane.

Annular Eclipse: Moon **covers the sun but the sun can be seen around the edges of the moon**.

- **Diamond Ring Effect:** A visual phenomena **can be seen from Earth** when standing in the **umbra** of the moon's shadow.



2 CHAPTER

Earth



Geographical Coordinates: Latitudes and Longitudes

- Shape of Earth- 'Geoid'
- Latitudes and longitudes are **imaginary lines** used to **pinpoint a location** on the globe.
- Eg: The location of New Delhi is 28° N, 77° E.

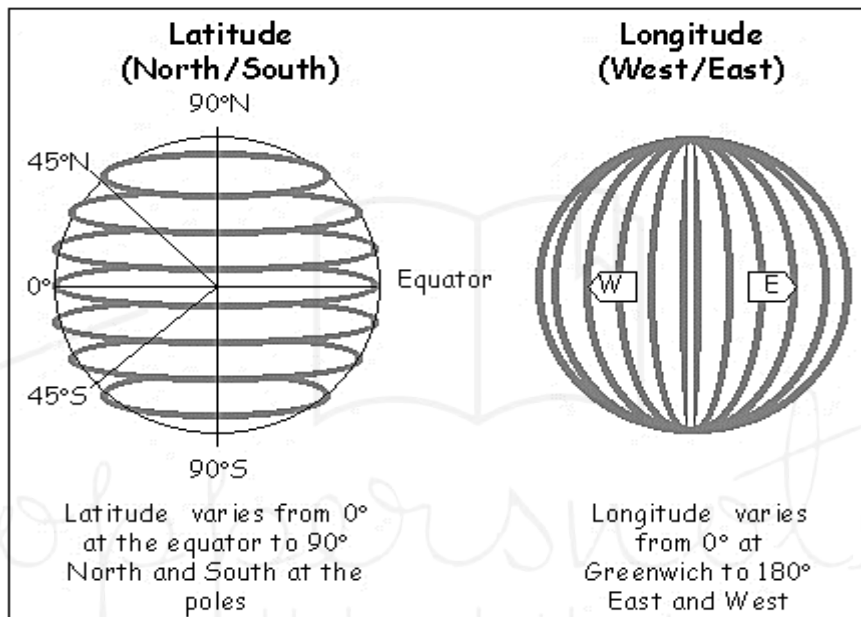


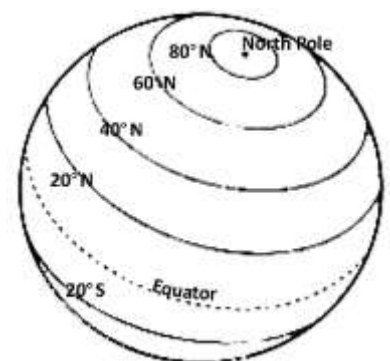
Fig : Latitudes and Longitudes

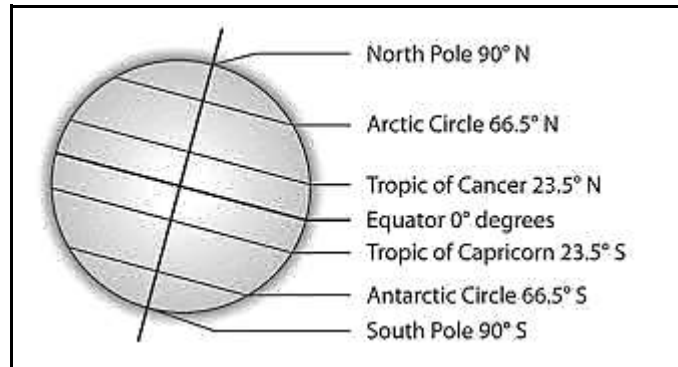
Latitudes

- Angular distance of a place on the earth's surface from the earth's centre.
- **Equator:** Another imaginary line running on the globe; divides it into two equal parts.
 - **Northern Hemisphere:** Upper half of the earth
 - **Southern Hemisphere:** Lower Half of the Earth
- **Parallels of Latitude :** All parallel circles from the equator up to the poles.
- Latitudes are **measured in degrees**.
- **Equator- zero degree latitude.**

Important Parallels of latitude:

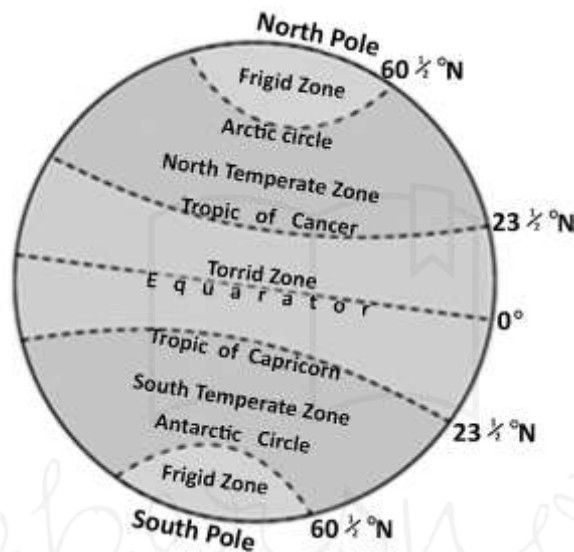
- **Arctic Circle:** $66\frac{1}{2}^{\circ}$ N in the Northern Hemisphere
- **Tropic of Cancer:** $23\frac{1}{2}^{\circ}$ N in northern hemisphere
 - **Tropic of Capricorn:** $23\frac{1}{2}^{\circ}$ S in southern Hemisphere
- **Antarctic circle:** $66\frac{1}{2}^{\circ}$ S in Southern hemisphere





Latitudinal Heat zones of Earth/ Tropics

- Receive maximum heat.



- Bordered on north by the Tropic of Cancer and on south by the Tropic of Capricorn
- Define the northern and southern extremes of places where the sun passes directly overhead seasonally.
- On all latitudes between the Tropics of Cancer and Capricorn, the midday sun is exactly overhead at least once a year.

Longitude

- An angular distance along the equator measured in degrees east or west of the Prime (or First) Meridian.
- Represented by a sequence of semi-circles that go from pole to pole and pass across the equator- aka meridians.
- **Function:** to calculate local time in relation to G.M.T. or Greenwich Mean Time, often known as World Time.
- **1884** - meridian passing through the Royal Astronomical Observatory at Greenwich, near London was chosen as Zero meridian or Prime meridian.