



IAS BABA



PEP Sutras

GEOGRAPHY SmartNotes - 1

PEP - 2025

PRELIMS EXCLUSIVE PROGRAMME

ONE STOP DESTINATION FOR PRELIMS PREPARATION

The Solar System



Origin of Universe

Context

Big Bang initiated cosmic expansion.

Universe expands; red-shift observed.

Number of moons

- Mercury- 0
- Venus- 0
- Earth- 1
- Mars- 2
- Jupiter- 95
- Saturn- 146
- Uranus- 28
- Neptune- 16

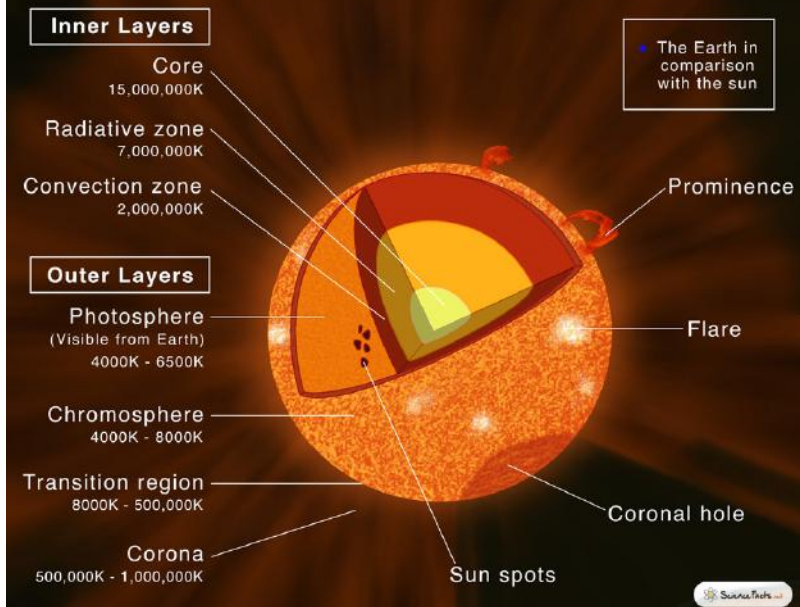
About Venus

- Created – 4.6 Bn years ago through Big Bang event
- Earth's sister planet
- Direction of rotation – opposite (E -> W) "Retrograde Rotation"
- Period of rotation – 243 D
- Period of revolution – 225 D
- Size – ~ same as earth
- Atmosphere – 96% CO₂
- Morning or Evening star
- Moon (natural satellite) – None
- Important satellites – Venera (1975), Akatsuki (2015)

About Sun

- **Age:** 5.9 billion years.
- **Diameter:** 1.39 million km (109 times radius of Earth (Earth – 6400km))
- **Distance from earth:** 150 mn km (Astronomical Unit)
- **Temperature:** 6000 °C on surface and 16 million °C in core.
- **Gravity :** 274 m/s² (28 times the gravity of the Earth (Earth gravity – 9.8 m/s²))
- **Rotation:** 25 days 9 hrs.
- Sun is rotating in counter-clockwise direction (when viewed from a long way above Earth's north pole).
- **Speed of rotation:** 7179.73 km/hrs. (earth's rotational velocity is 1675Km/hrs)
- **Mass -** equivalent to 3,32,900 Earth masses. The vast majority of the solar system's mass is in the Sun (~99.8%)
- **Composition -** 98% hydrogen and helium.

Layers of the Sun



Sun Spots



- Formed on photosphere.
- Dark patches on sun formed due to concentration of magnetic flux (movement of solar gas)
- Comparatively 500-1500 C cooler.
- Comes once in every 11 years
- Last for few days to months.
- Variable in size.
- Sunspot reduces earth temperature

Lagrange Point

- These are positions in space where the gravitational forces of a two-body system (like the Sun and the Earth) produce enhanced regions of attraction and repulsion. i.e. it is a balancing region
- Around earth and sun there are 5 lagrange point.

The Moon

- Created – 4.4 Bn years ago through Big Splat event.
- The only natural satellite of Earth
- Inclination with earth - Moon orbital plane is inclined at 5 degree w.r.t. Earth orbital plane (due to this solar and lunar eclipse is not seen every month)
- Period of rotation – 27.3 days
- Period of revolution – 27.3 days
- Gravity – 1.6 m/s²
- Other side of moon – not seen due to tidal locking
- Important satellite – Chandrayaan 1 (2008), Chandrayaan 2 (2019) and Chandrayaan 3 (July, 2023)

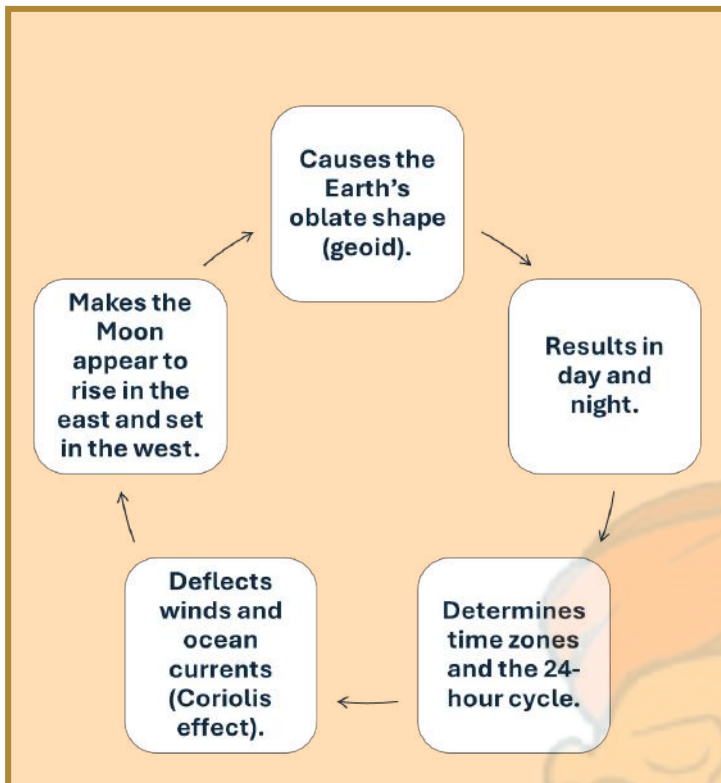
Types of Moon

Blue Moon: Refers to an additional full moon in a calendar month or season, typically the second of two full moons in a month.

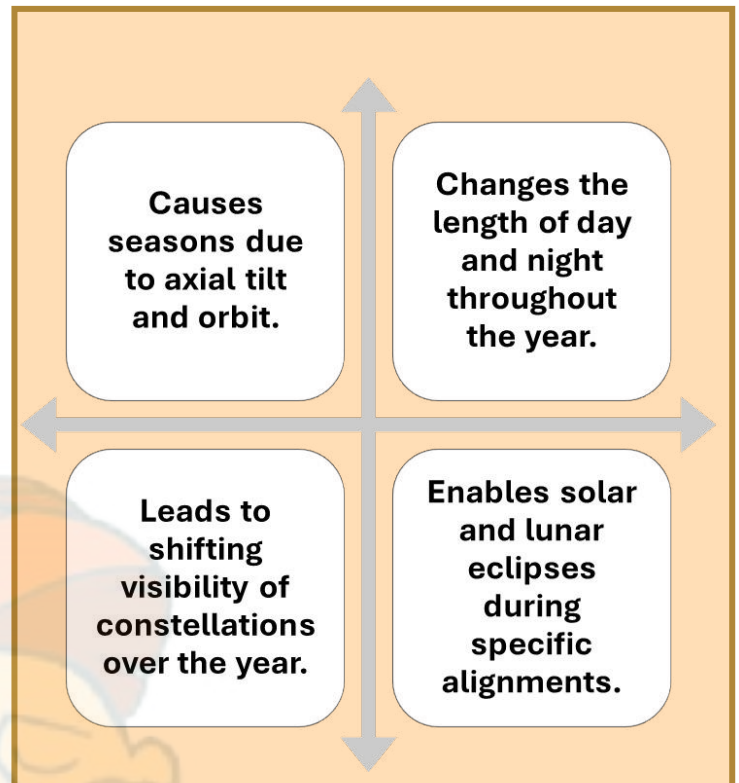
Supermoon: Occurs when a full moon is at its closest approach to Earth, appearing larger and brighter than usual.

Blood Moon: Happens during a lunar eclipse when Earth's atmosphere scatters sunlight, casting a reddish or orange glow on the moon.

Effects of Rotation



Effects of Revolution



Life Cycle of A Star

Nebula: A nebula is a giant cloud of gas and dust that exists in space between stars.

Main sequence star: A star that is fusing hydrogen to helium in its core.

Red giant: When a main sequence star less than eight times the Sun's mass runs out of hydrogen in its core, it starts to collapse and hydrogen fusion begins moving into the star's outer layer, causing them to expand.

Supernova explosion: The core of the star collapses and then rebounds back to its original size, creating a shock wave that travels through the star's outer layers. The result is a huge explosion called a supernova.

Planetary nebula: The red giant becomes unstable and begins pulsating, periodically expanding and ejecting some of its atmosphere. Eventually, all of its outer layers blow away, creating an expanding cloud of dust and gas called a planetary nebula.

White dwarf: After a red giant has shed all its atmosphere, only the core remains. Scientists call this kind of stellar remnant a white dwarf. A white dwarf is usually Earth-size but hundreds of thousands of times more massive.

Neutron star: After a red giant has shed all its atmosphere, only the core remains. Scientists call this kind of stellar remnant a white dwarf. A white dwarf is usually Earth-size but hundreds of thousands of times more massive.

Pulsars: The collapse of the core causes the neutron star to spin rapidly. This rapidly spinning neutron star emits radiation periodically. This spinning neutron stars are called pulsars.

Blackhole: If the mass of the star is more than 3 solar masses the core collapses under its weight resulting in the formation of a blackhole.

Quasar: The spinning blackhole gives out radiation similar to neutron star. This spinning blackhole is called a quasar.

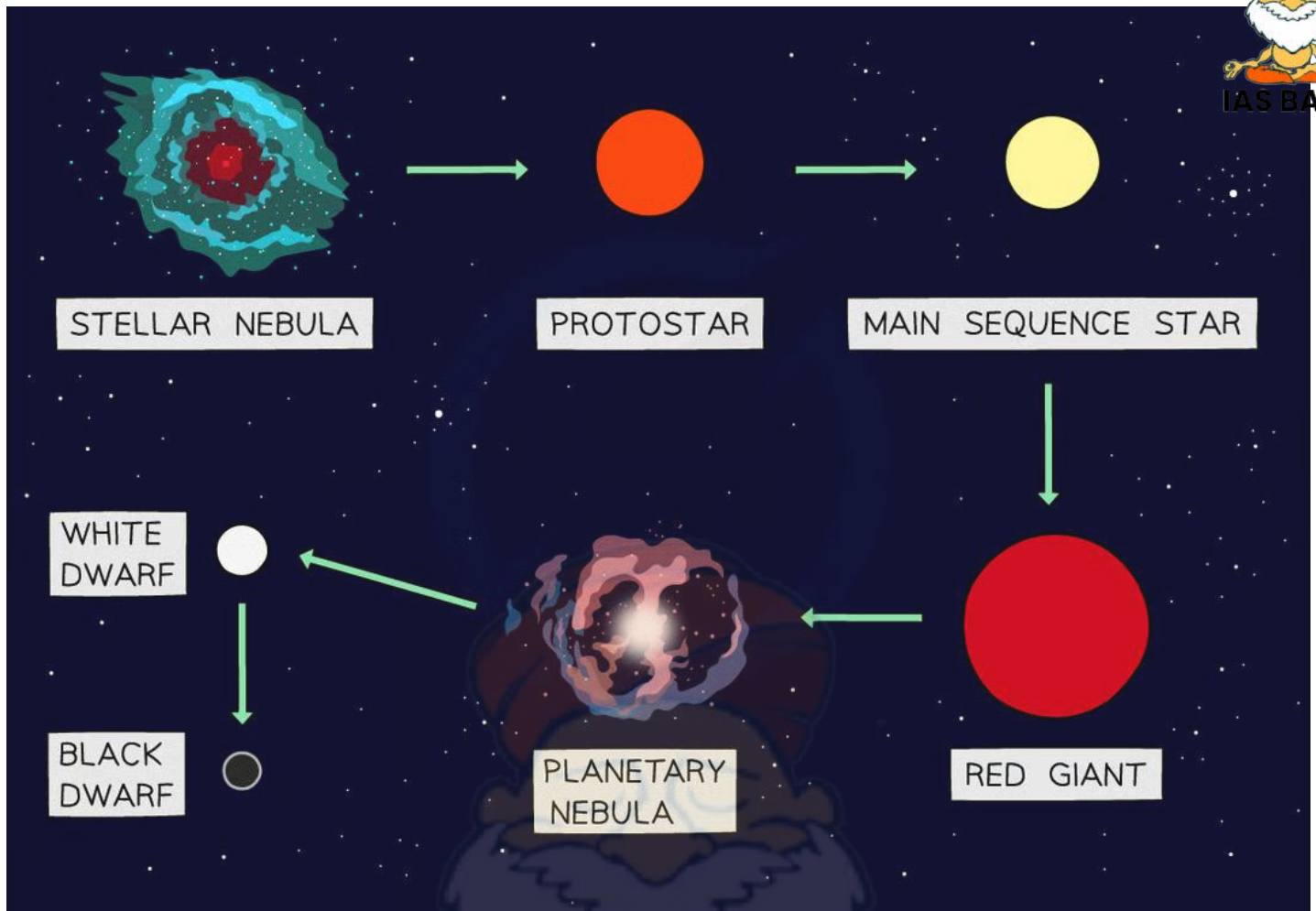


Fig. Life Cycle of A Star

Origin of Solar System Hypothesis

- **Nebular Hypothesis:** Proposed by Kant and Laplace, it states that the solar system formed from a rotating cloud of gas and dust (nebula). The Sun formed at the center, and planets formed from the remaining material in a flattened disk.
- **Planetesimal Hypothesis:** Developed by Chamberlin and Moulton, it suggests that small celestial bodies (planetesimals) collided and coalesced to form planets.
- **Tidal Hypothesis:** Proposed by Jeans and Jeffreys, it posits that a star passed close to the Sun, pulling out material due to gravitational forces, which later condensed to form planets.
- **Protoplanet Hypothesis:** A modern adaptation of the nebular hypothesis, it explains that eddies in the gas and dust disk around the Sun condensed into protoplanets, which grew into planets.
- **Capture Theory:** This theory suggests that the Sun captured rogue planets or material from interstellar space, which later formed the solar system.