

Earth and Universe

Universe

Matter

Energy

Light energy

Heat energy

Sound energy

Wind

Radiations

Stars

↓
Sun

planets

Moons

Asteroids

comet

ice

rocks

Gas

solar system

Galaxy.

The natural objects/bodies in our universe/space are k/a
celestial objects/bodies

↳ They are huge but they appear small as they
are far away.

eg. • moon

- asteroids
- planets
- etc.

- Star:
- Lump of dust and gas and it has its own light
 - Sun is a small sized star.

Planets: Celestial objects moving around star/sun.

Planet should satisfies 3 criteria:

- ① It should revolve around star/sun.
- ② It should have enough mass/gravity to attain spherical or near spherical shape.
- ③ It should have enough gravity to clear its surrounding.

[Pluto fails 3rd criteria]

Exoplanet

- Planets which are outside our solar system.
- It revolves around other star.



Such planets are called
exoplanets w.r.t. our
solar system.

w.r.t. $\Rightarrow$ with respect to

⇒ Eight Planets

fixed orbit

Planets also rotate or spin about their own axis.

↳ Rotation of earth causes day and night.

East to west rotation

E to W rotation

↑
Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune
↑

↓
(west to east)

↳ Sun rise in East & sets in west.

UV

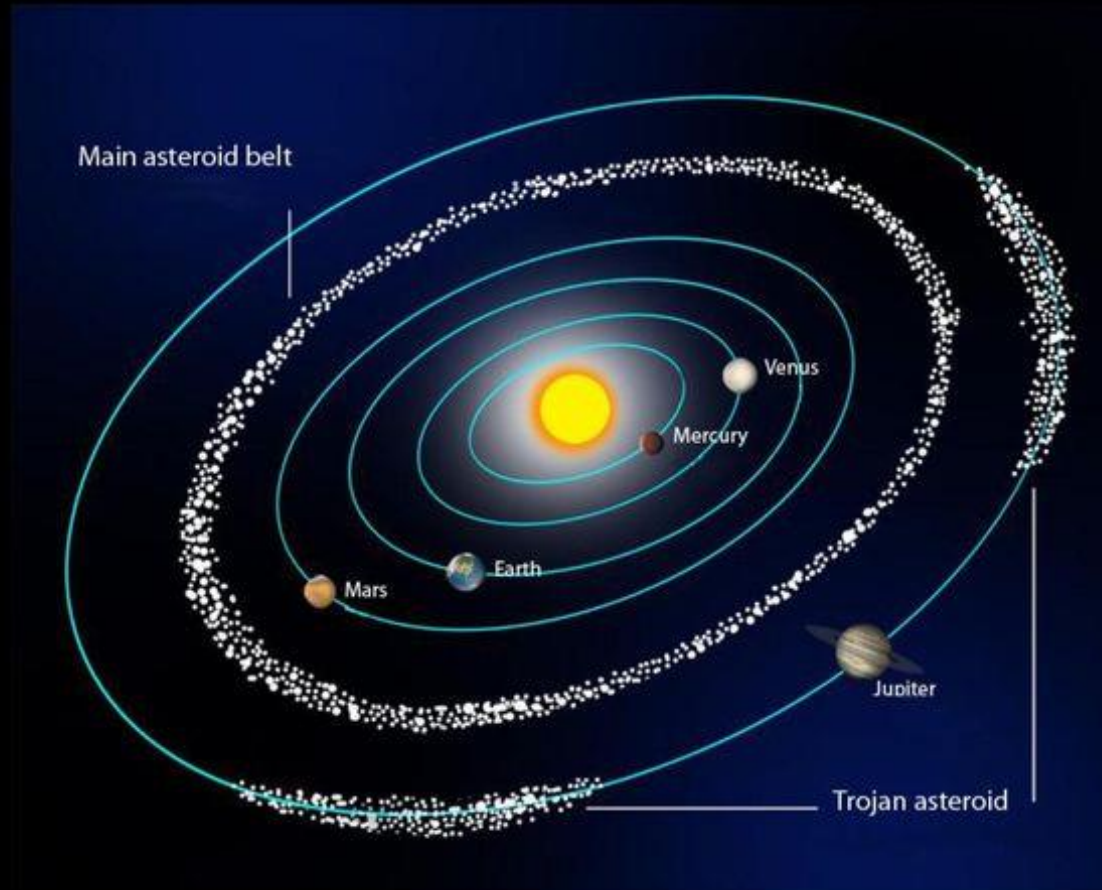
Inner planets (Terrestrial Planets)

- made up of rocks
- have solid surface.
- M, V, E, Mars.

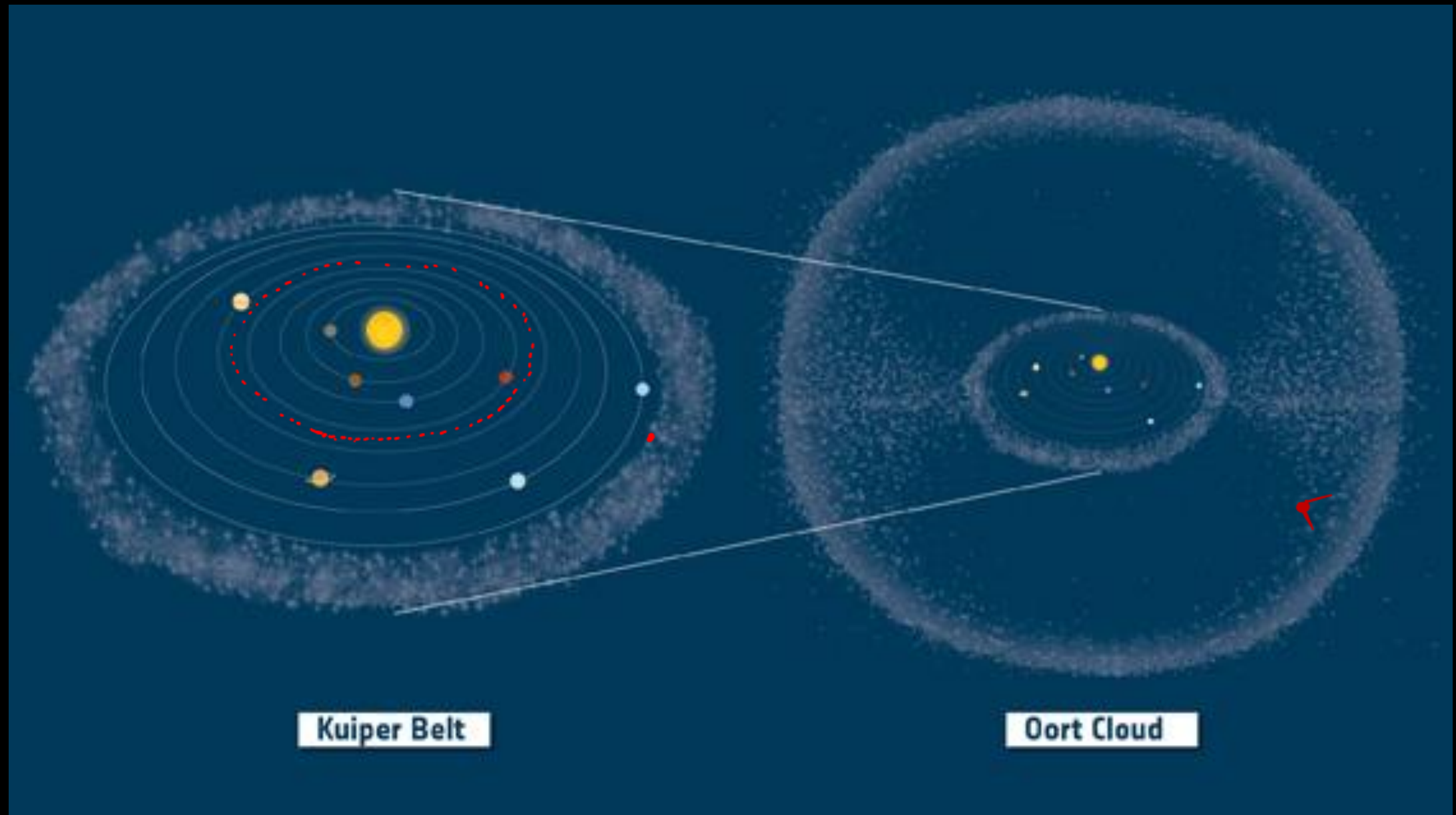
Asteroid belt separates
inner and outer planets

Outer Planets or Jovian Planets

- Gas giants (J, S, U, N)
- They lack solid surface.
- They have ring system just like Saturn.
- They have numerous moons.



The Jupiter Trojans are a large group of asteroids that share the orbit of the planet Jupiter around the Sun.



① Mercury:

- Smallest planet
- Closest planet to sun.
- It takes 88 days to revolve around sun. ($1 \text{ year} = 88 \text{ days}$)
- It does not have any moon / satellite.

② Venus

- Hottest planet
- It is the brightest (star like) object in the night sky.
- a.k.a. morning and evening star.
- No moon / satellite.
- It takes 224 days to revolve around sun. ($1 \text{ year} = 224 \text{ days}$)

③

Earth

- Only planet with life in our solar system.
- 70% of its surface is covered with water,
∴ earth is kha Blue planet.
- 365 days to complete 1 revolution

1 year = 365 days
- only 1 moon

④ Mars

→ a.k.a Red planet

→ It has a lot of rusted iron dust which makes it appear red.

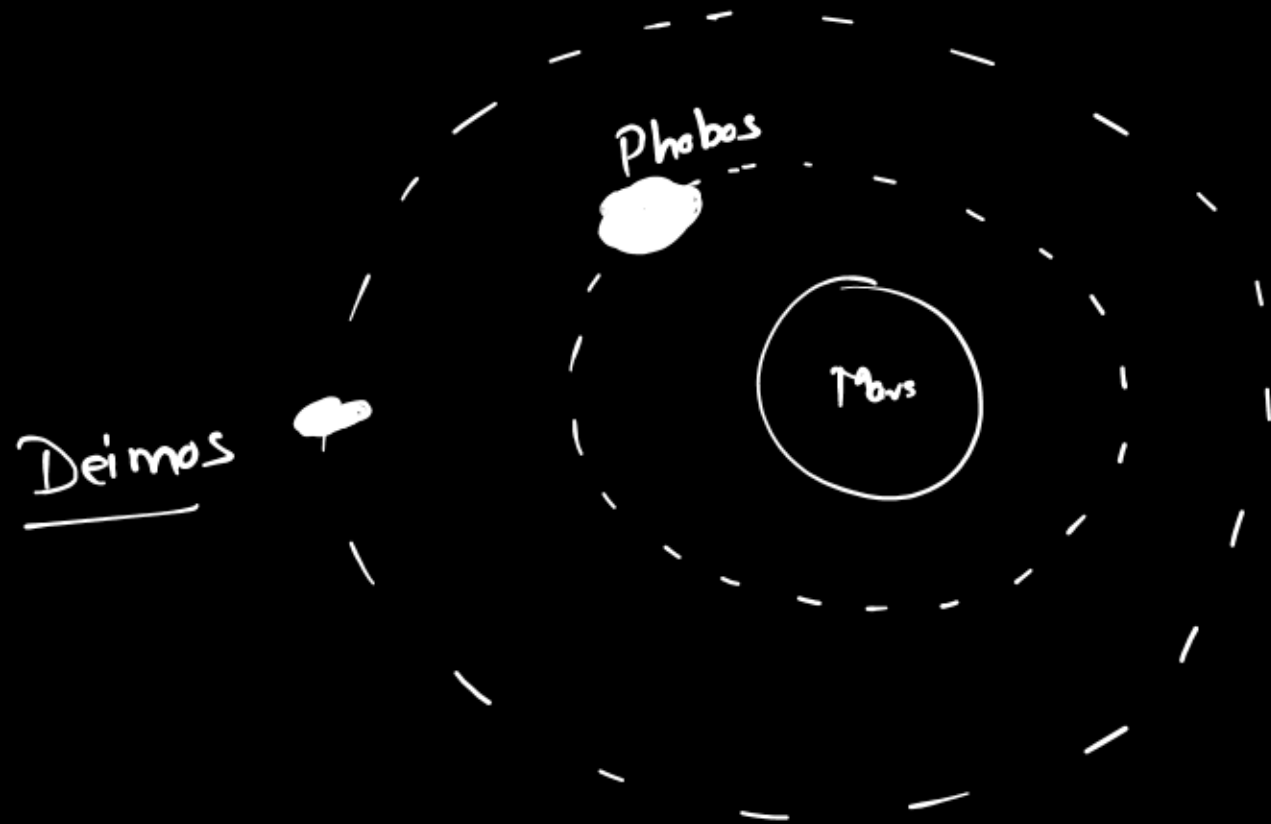
→ Its Atmosphere

- lot of Carbon dioxide (CO_2)
- small amt. of oxygen gas (O_2)
- Small amt. of water vapour ($\text{H}_2\text{O(g)}$)

→ It takes 687 earth days to revolve.

1 Mars year = 687 earth days

④ → it has 2 moons



⑤ Jupiter

- Largest planet
- Mainly made up of hydrogen and helium gas.
(H_2) He
- It does not have solid surface, but it does have solid core.
- It has ring of dust around it.
- It takes 12 earth years to revolve.
- It has ~ 95 moons

⑥ Saturn :

→ Second largest planet.

→ It is made up of gases

→ mainly Hydrogen & Helium gas.

→ trace amount of methane and
(very very small amount) ammonia gas.

→ Prominent rings of ice and rocks.

→ It takes 30 earth's years to revolve.

→ ~ 146 moons //

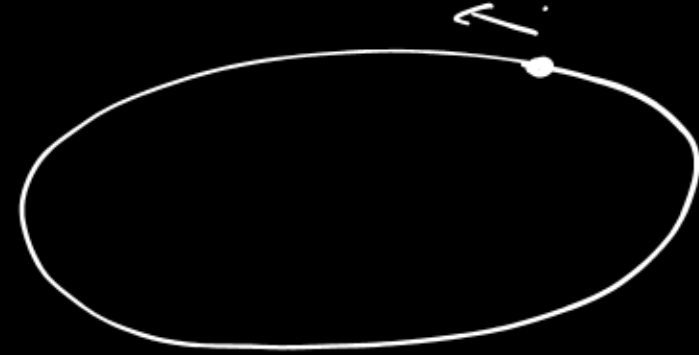
(7)

Uranus

- Third largest planet
- made up of gases and ice
- Its atmosphere has methane gas
 - Blue in colour
- It has faint rings.
- 84 years to revolve around sun.
- ~ 28 moons.

⑧ Neptune

- Farthest planet
- composed of gases and ice of water, ammonia, methane.
- It has faint rings.
- 165 years to revolve.
- ~ 16 moons

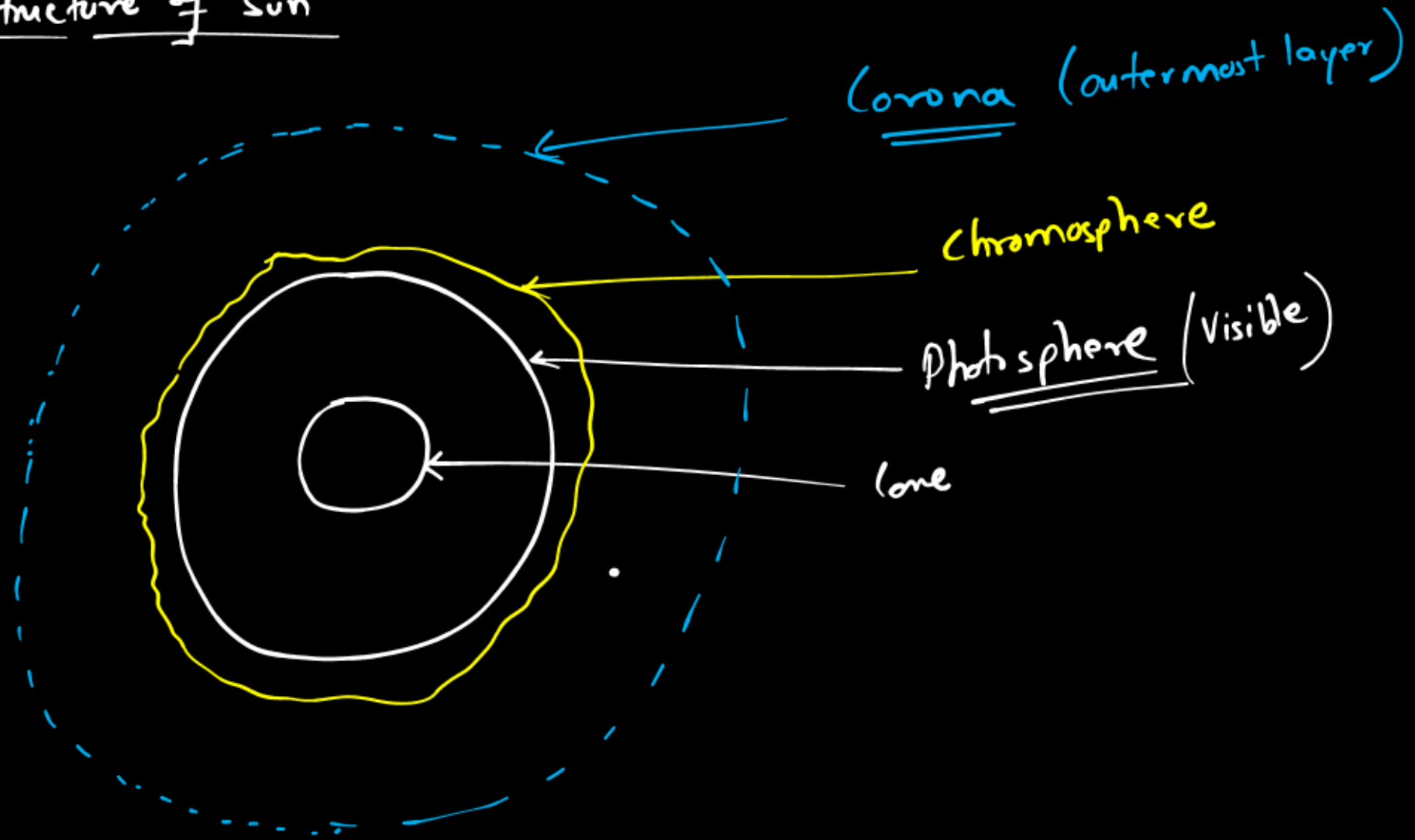


$$\frac{60000 \text{ km/hr}}{50 \text{ km/hr}}$$



The Sun

Structure of Sun



Sun →

→ It is mainly made up of hydrogen.

→ Hydrogen → continuously changing into helium. (gas)

binary

This process is called nuclear fusion.

§

This is also the main
source of energy for entire
solar system

→ It happens in the core of the sun.
→ This process is source of sun's energy.

Solar energy → heat
→ light
→ other radiation (X-ray, gamma ray)

Solar energy

→ Sun is 150 million km away from earth.

Extra info.

1 astronomical unit

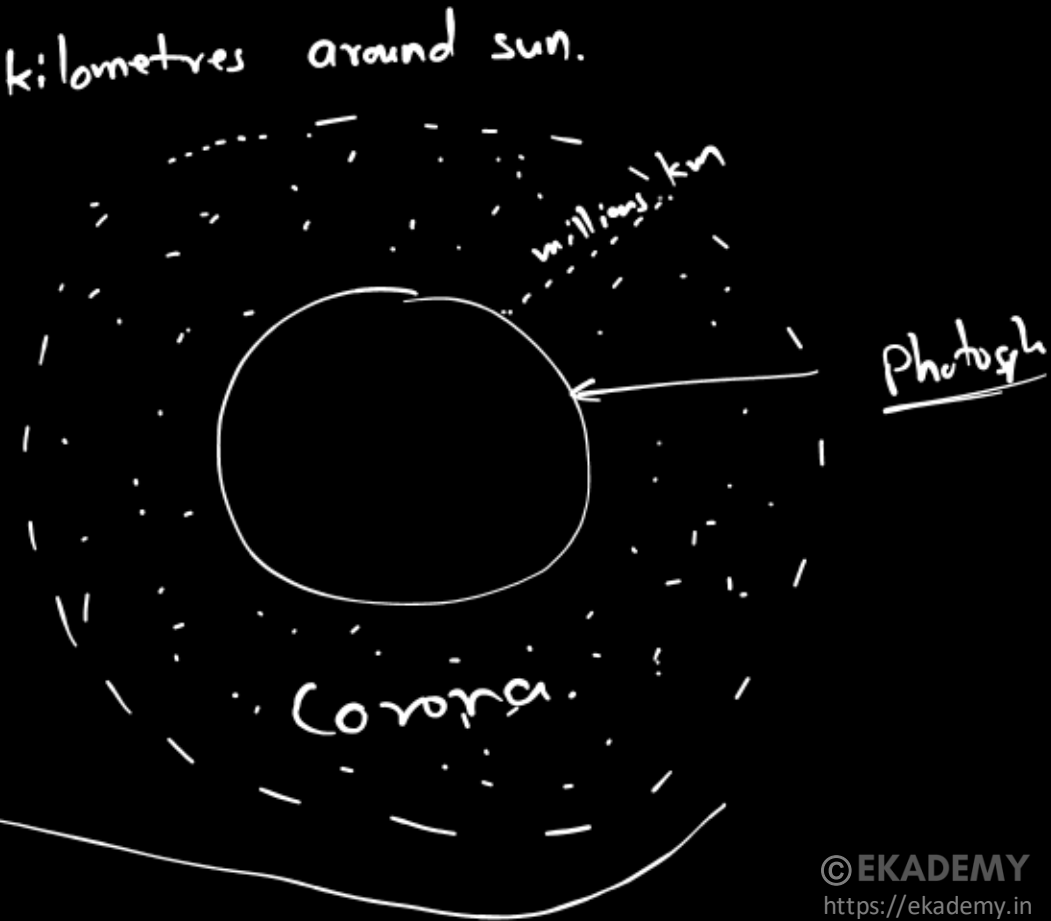
1 A.U.

↓
[it is the distance between
Sun and earth]

→ It has various layers like → Corona, photosphere, core.

→ Corona

- It forms the out part of Sun's atmosphere.
- made up of thick layer of gases.
- It extends for millions of kilometres around sun.
- Its temperature can reach upto 2 million $^{\circ}\text{C}$.
 - ↓
 - much hotter than Sun's surface.
- It can be seen during total solar eclipse.





*Image of the solar corona during a total solar eclipse
on Monday, August 21, 2017 above Madras, Oregon.
Credit: NASA/Aubrey Gemignani*

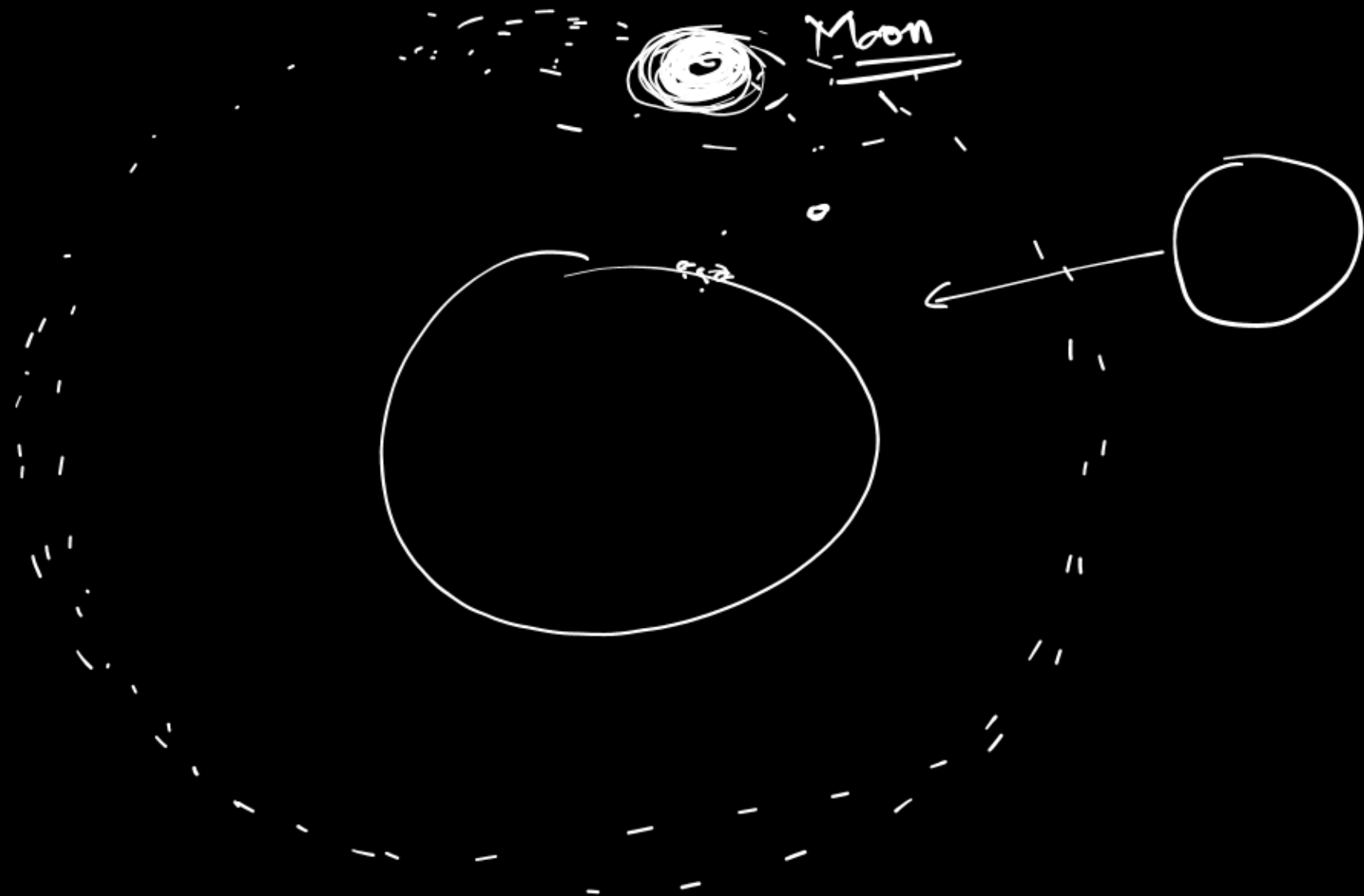
Photosphere

→ Visible surface of the sun which gives off light.

→ Light takes 8 min 20 second (499 seconds)
from photosphere to earth.

→ Temperature of photosphere is
 $\sim 5500^{\circ}\text{C}$





Core of the sun :

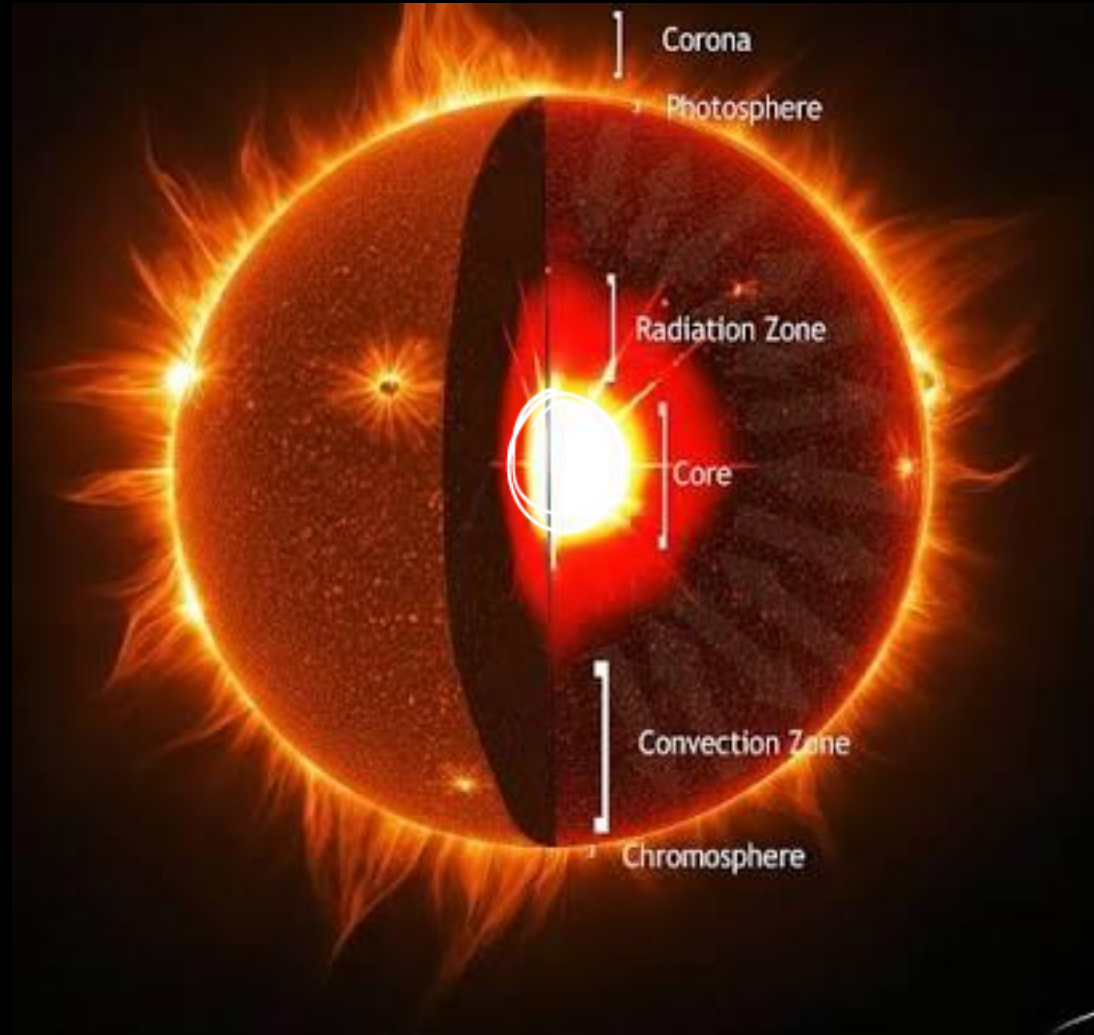
→ Centre of the sun, where nuclear fusion takes place.

→ Temperature $\Rightarrow$ 15 million $^{\circ}\text{C}$

15,000,000 $^{\circ}\text{C}$

Nuclear fusion in sun's core

The nucleus of Hydrogen atoms fuse/join to form nucleus of helium atom.



H $\rightarrow$ hydrogen
Fe $\rightarrow$ Iron



Nuclear fusion Sun's core

Asteroids :

- They are small rocky objects that orbits the sun.
- Mainly they are present in asteroid belt.
- Some asteroids are in the orbit of jupiter
k/a Trojans
- Very few are close to earth (between earth & Mars)
k/a Near earth objects (NEO)

Satellite

→ Celestial object that revolve around planet.

→ Moon is natural satellite.



• Artificial satellites are human made, object, revolve around earth/planets.

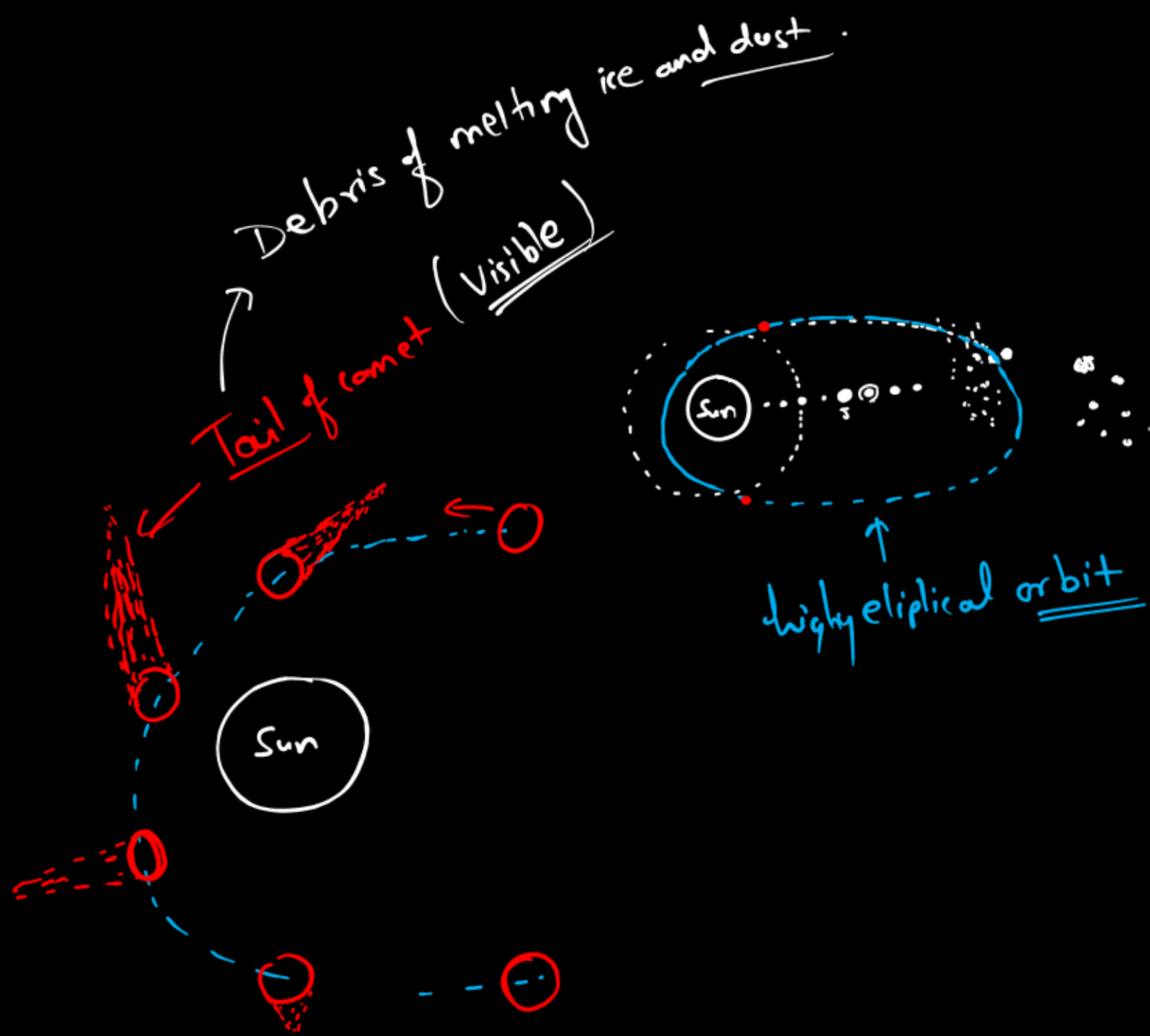
- Monitor weather
- GPS / Google map
- Communication.
- Internet
- Trapping of earth.

Comet:

- Big ball of rocks, ice and dust/gases.
- They have very big orbit around sun.
- Most common comet is Halley's comet, with orbit of around 75-76 years

last seen in 1986

Next: it will appear in 2061.



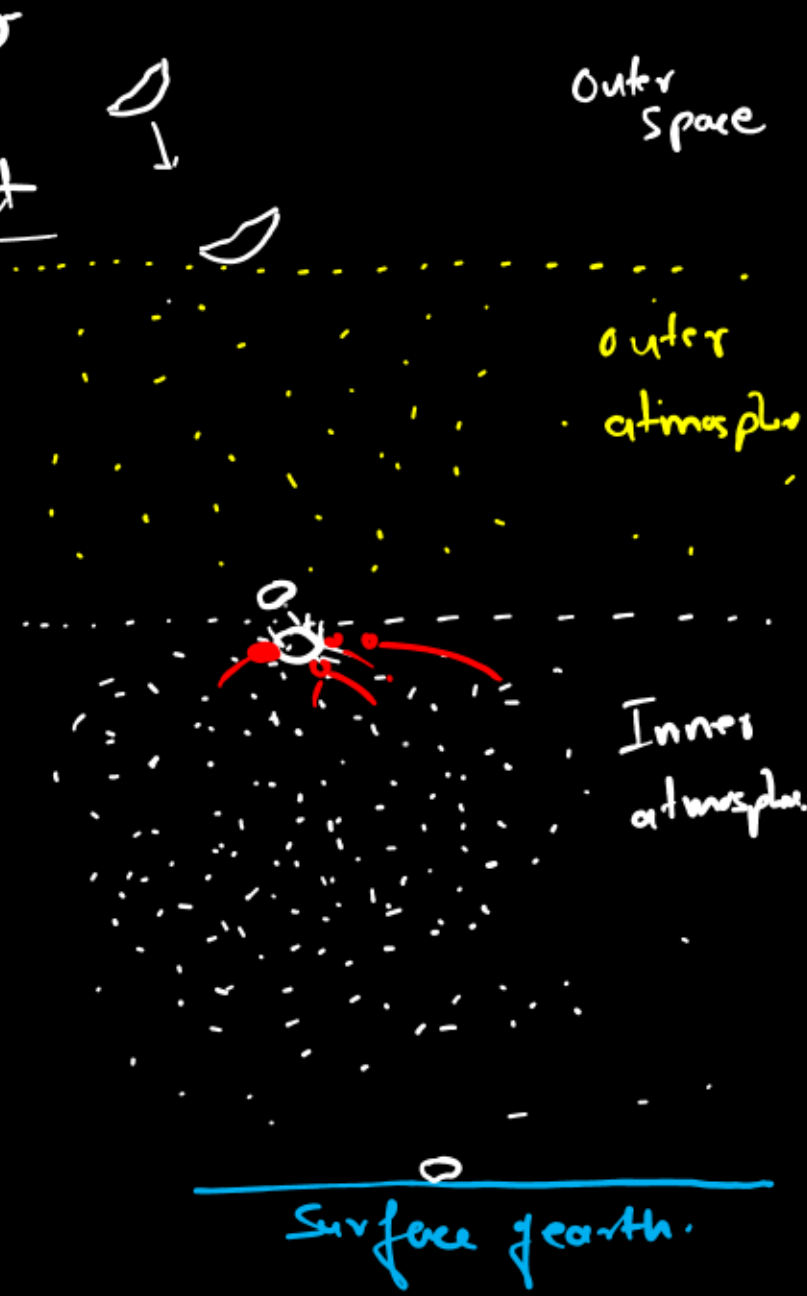
Asteroids/Comets



Meteoride: Small part (chunk) of any asteroid/comet
→ Most meteoride burn upon entering outer atmosphere.

Meteor: Few meteoride enters inner atmosphere and catch fire. They are called meteors.
If meteors breaks into several pieces, then it is called meteor shower.

Meteorite: Meteoride touching the surface of earth are called meteorite.
└─ Small ─┘
└─ Large ─┘



Earth

Structure of earth.
↳ internal layers.

Movement of earth

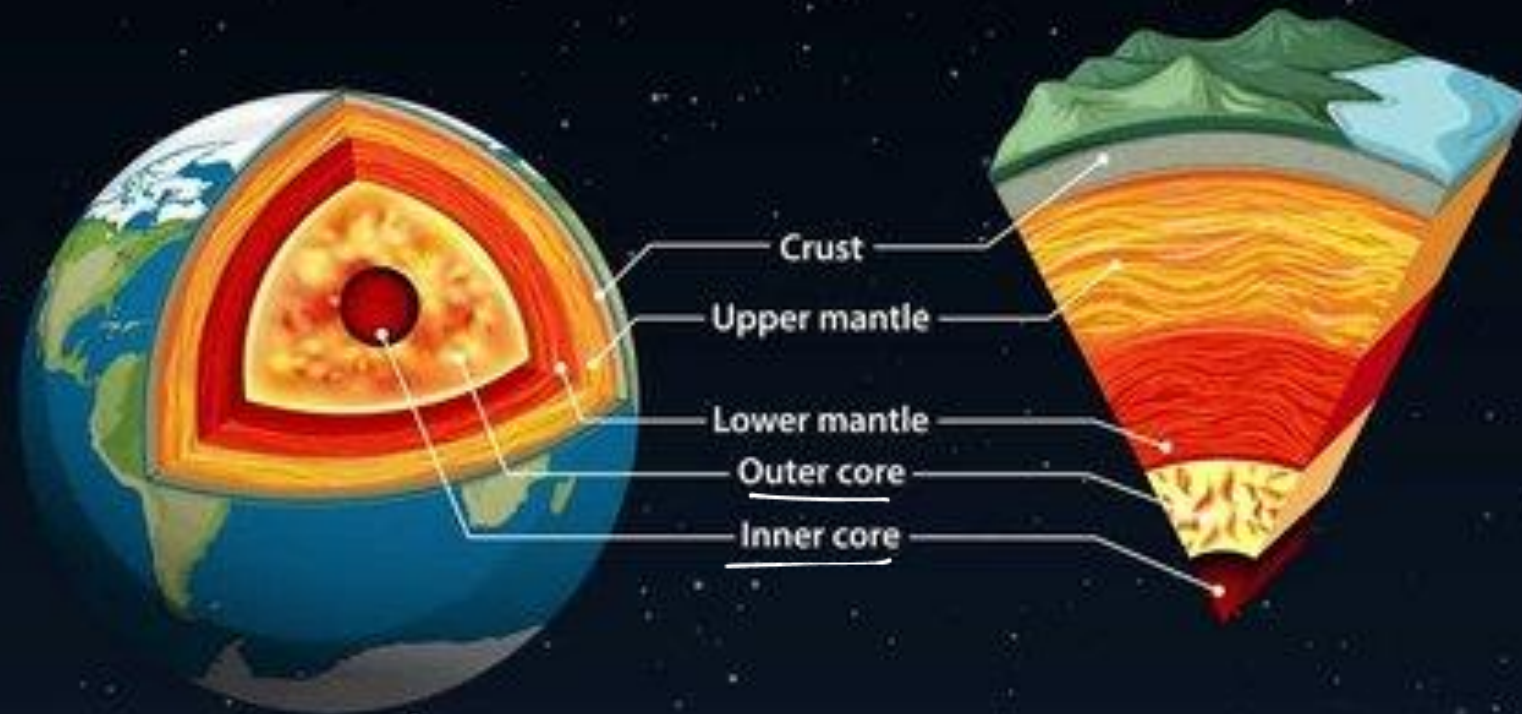
Revolution
around
Sun

Rotation on its axis

⇒ Earth has a blanket of air around it called atmosphere.

⇒ Earth is approx. 4.5 billion years old.

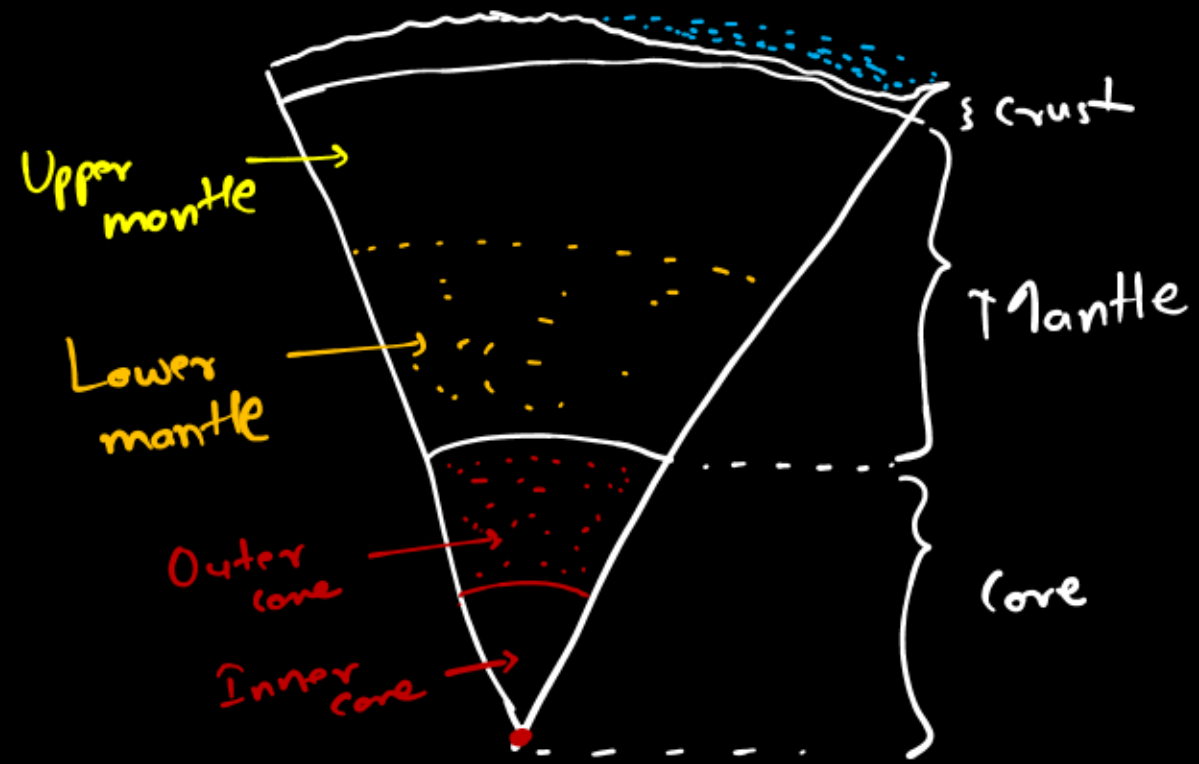
EARTH STRUCTURE



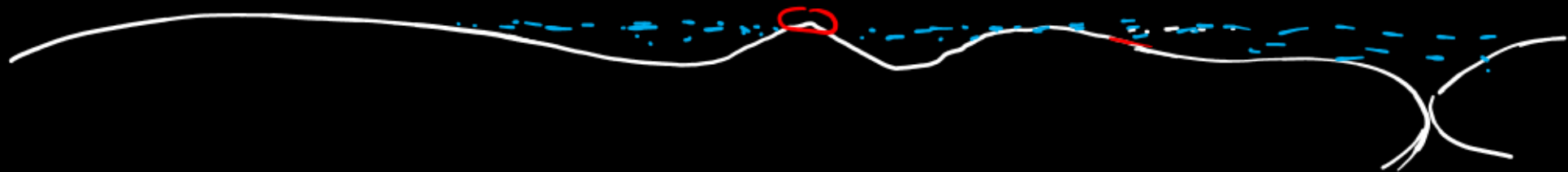
→ Earth

Crust:

- It is outermost layer
- It is rocky and is broken into many pieces called plates
- Crust forms continents (land masses) and oceanic floor
- It is just 5-7 km thick under the ocean floor and upto 100 km thick under the continents



Radius of earth is ~6400 km



Mantle

→ It is just below the crust.

→ It is the thickest layer of earth.

↳ around ~2800 km thick. layer.

→ Its upper layer is made up of solid rocks, while lower layer consists of molten rock (magma) Lava

→ Molten rocks or magma comes out on the crust when volcano erupts.

→ It is made up of iron, magnesium, aluminium, silicon.

Outer Core :

- Outer core is very hot and exist in molten state.
- It is about 2200 km thick.
- It ~~is~~ contains iron and nickel with small amount of Sulphur.
- It is denser than lower mantle

Inner Core :

- Hottest layer and also solid because of very high pressure
- It mainly contains iron.
- It is about 1200 km thick.

* Important information.

* Gravitational force of earth is aka gravity

* Earth is able to hold the layer of atmosphere due to force of gravity.

* Earth has its magnetic field (because of molten outer core)
↳ Protects earth against harmful solar radiations

Movements of Earth

① Rotation on its axis

② Revolution around sun.

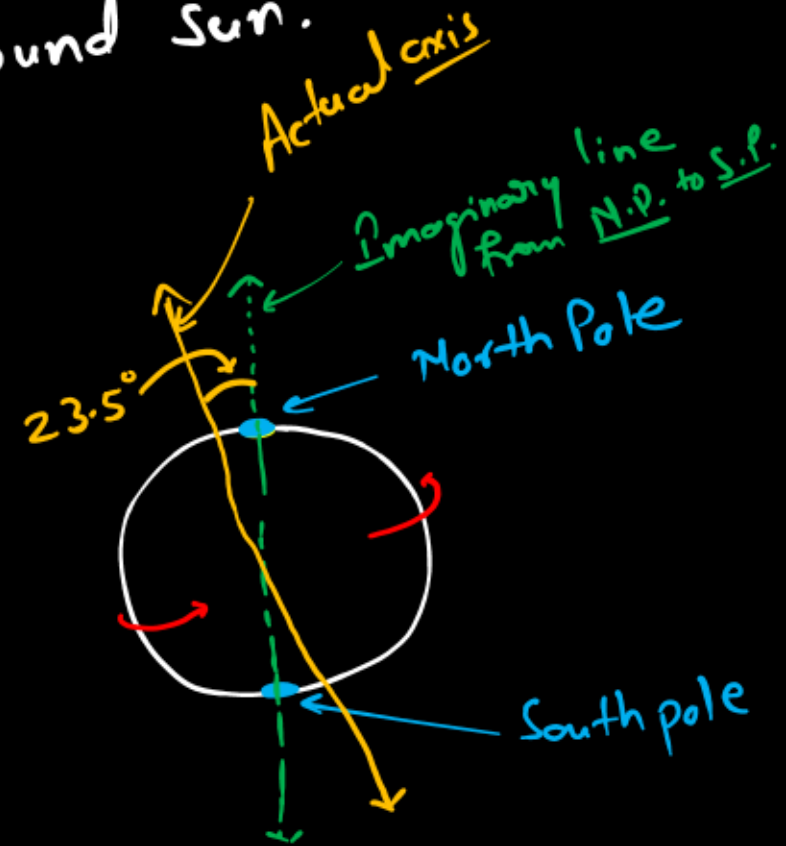
① Rotation

"Spinning of earth on its axis"

Axis: Axis is tilted by 23.5° .

* Earth rotates about this axis from west to east

$\Rightarrow$ It takes around 24 hrs to complete one rotation.



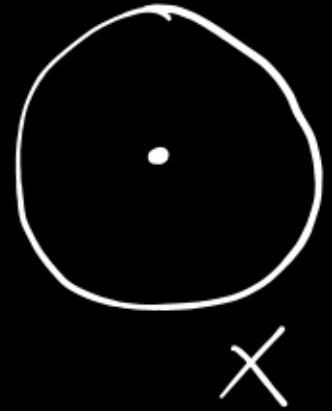
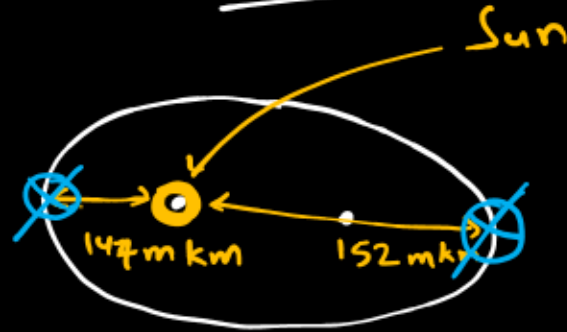
→ Rotation of earth causes days and nights.

Revolution:

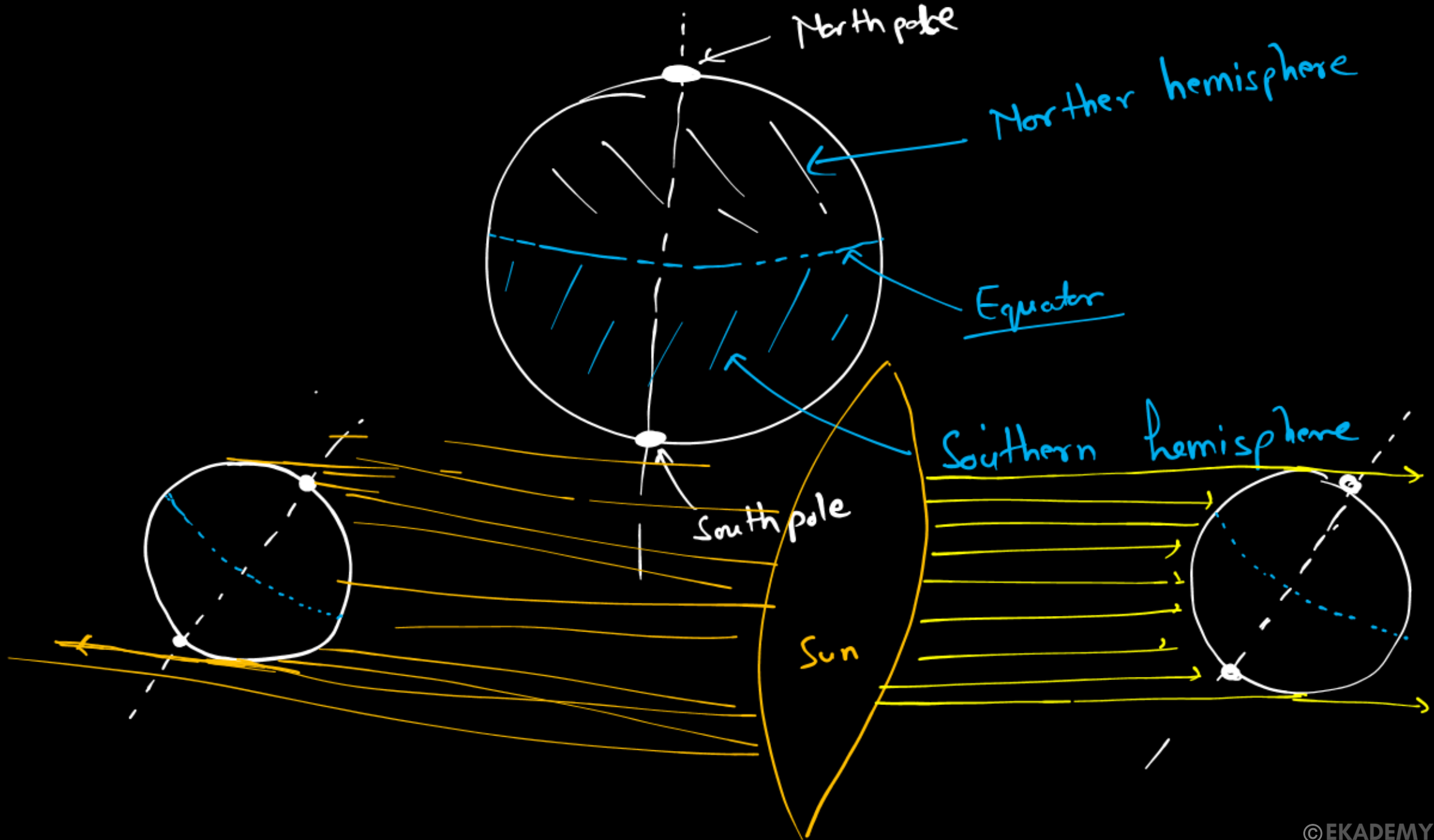
→ Movement of earth around sun in a fixed path, which is

NOT circular

↳ Orbit is elliptical



⇒ Revolution of earth and its tilt on its axis causes change in the season during a year.

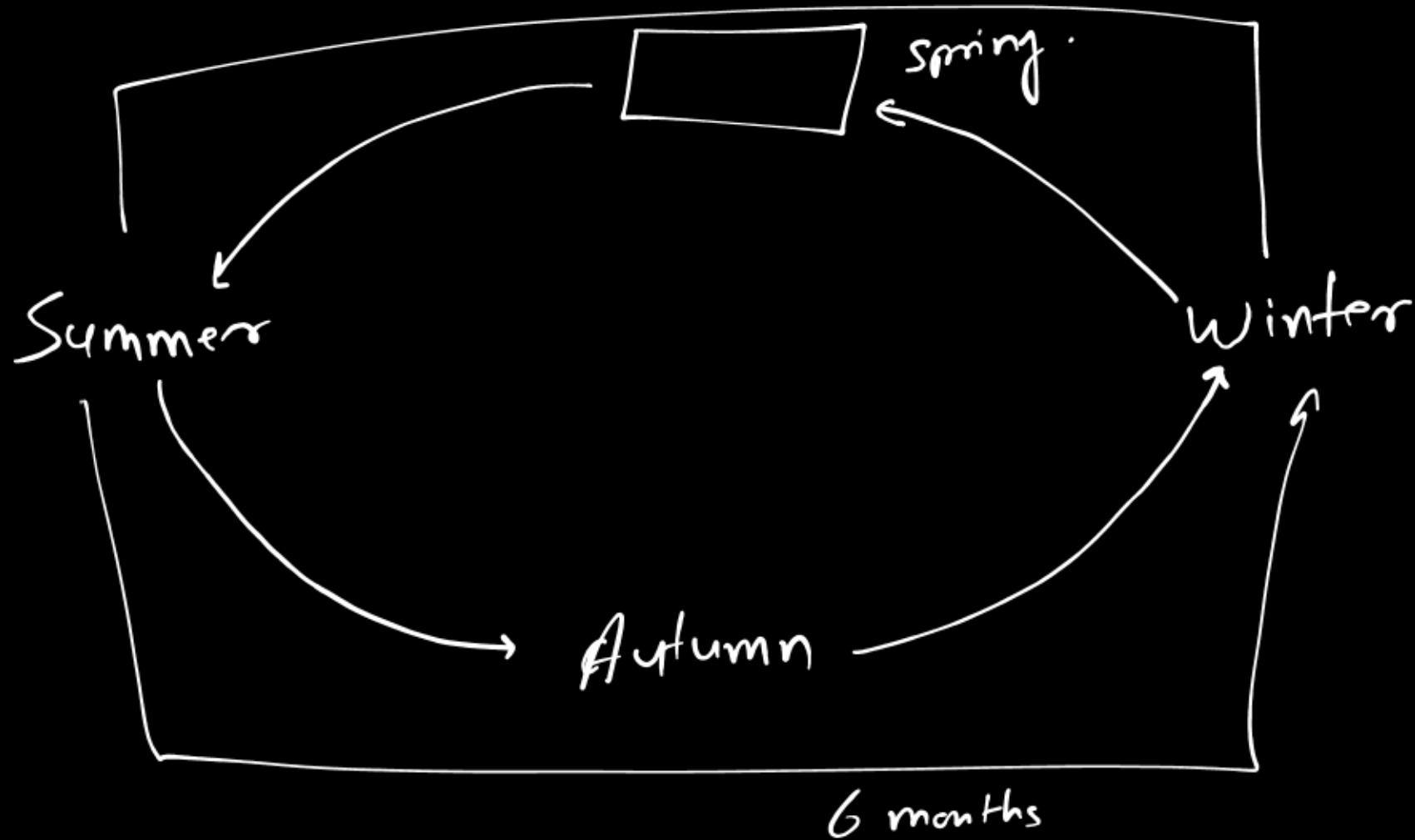


Moon ||

Artificial satellite

|| Space Travel

about 6 months.



Moon →

↳ Only natural satellite of earth.

↳ It is 3,84,400 km away from earth.

→

→ Size of moon = $\left(\frac{1}{4}\right)^{\text{th}}$ of size of earth.

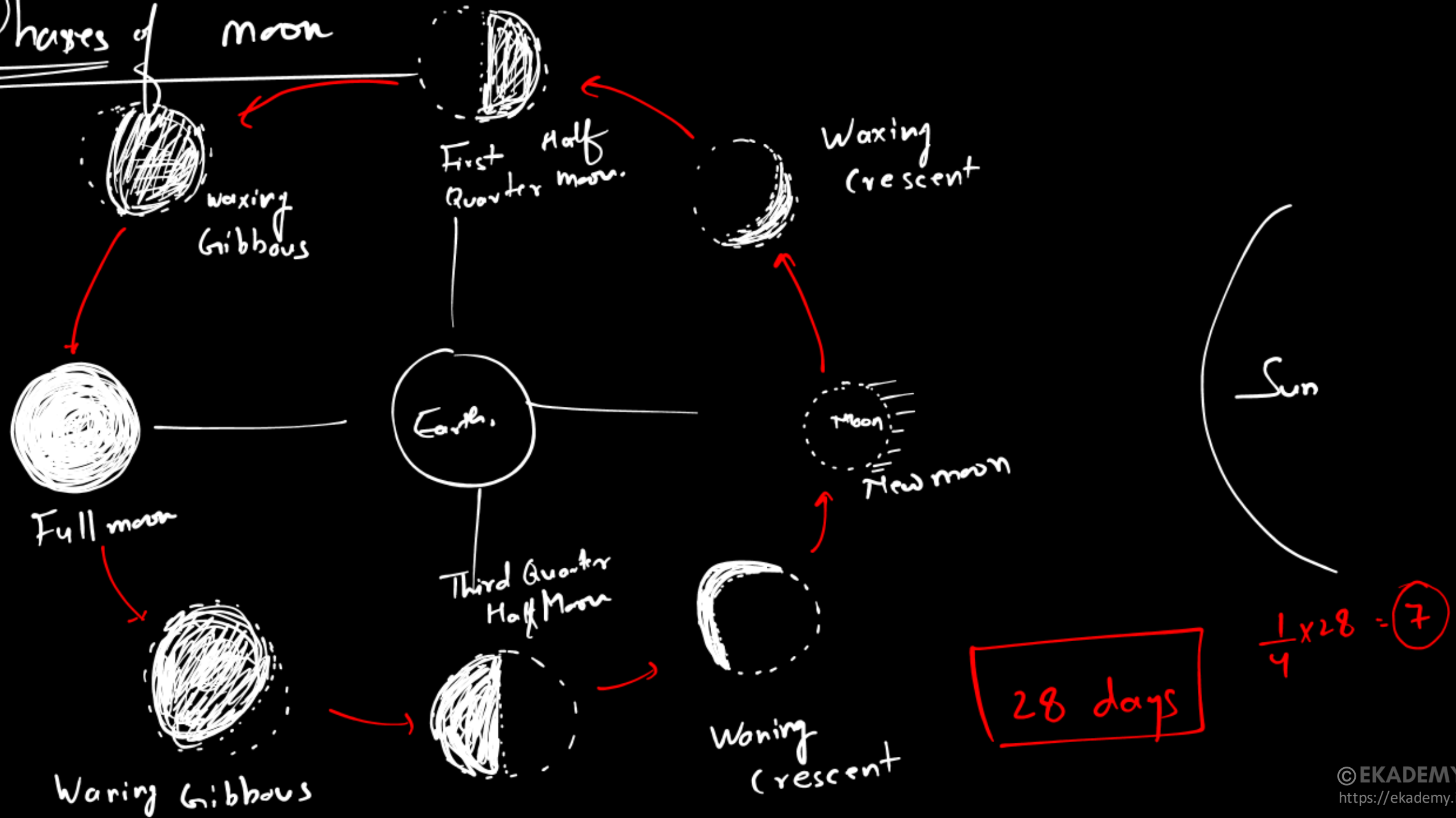
→ No atmosphere: It's daytime temp = 120°C & at night temp is -130°C

→ Crust of moon is covered with very thick layer of dust.

→ Because of no air, sound can not be heard

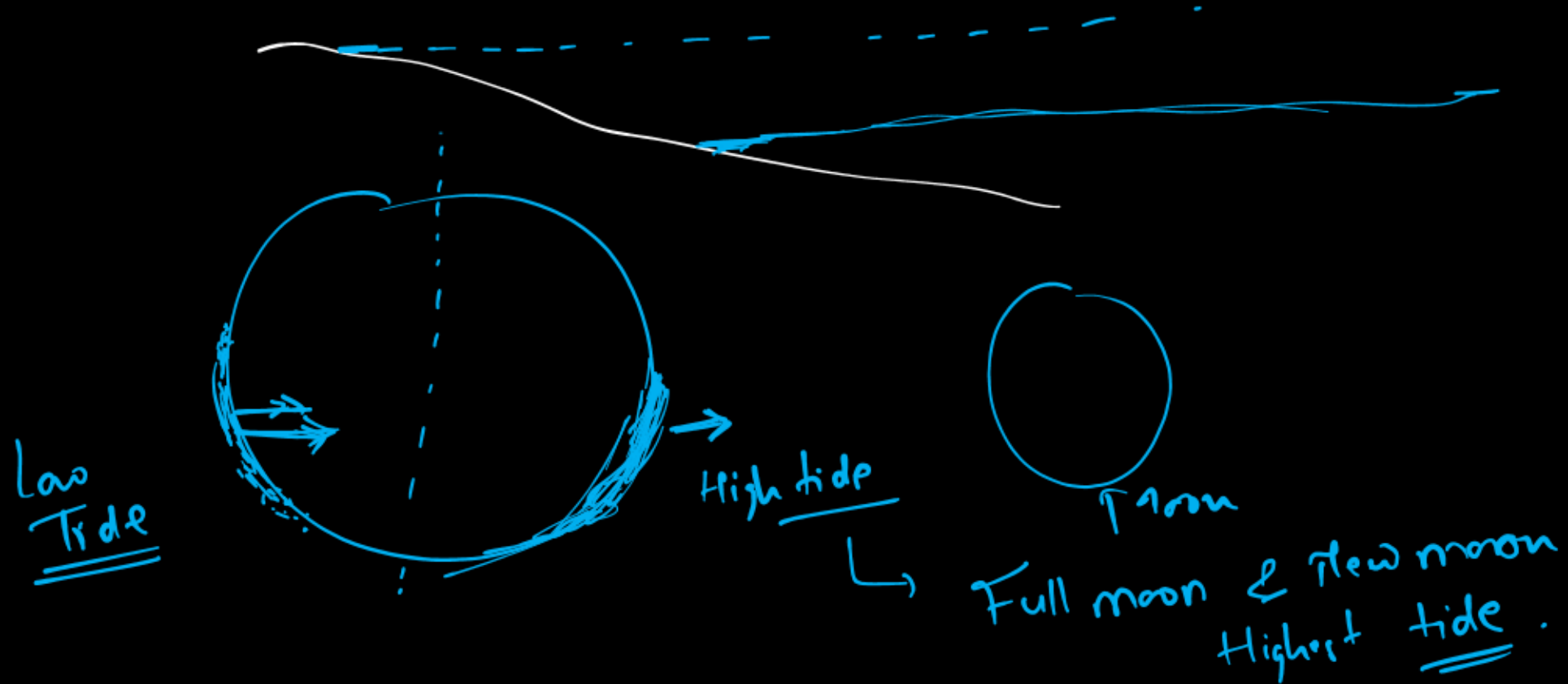
→ Gravitational force is $\left(\frac{1}{6}\right)^{\text{th}}$ of earth

Phases of moon



Moon and the Tides

It cause tides by pulling the water of sea and ocean.



Humans on moon

Apollo 11

→ Neil Armstrong

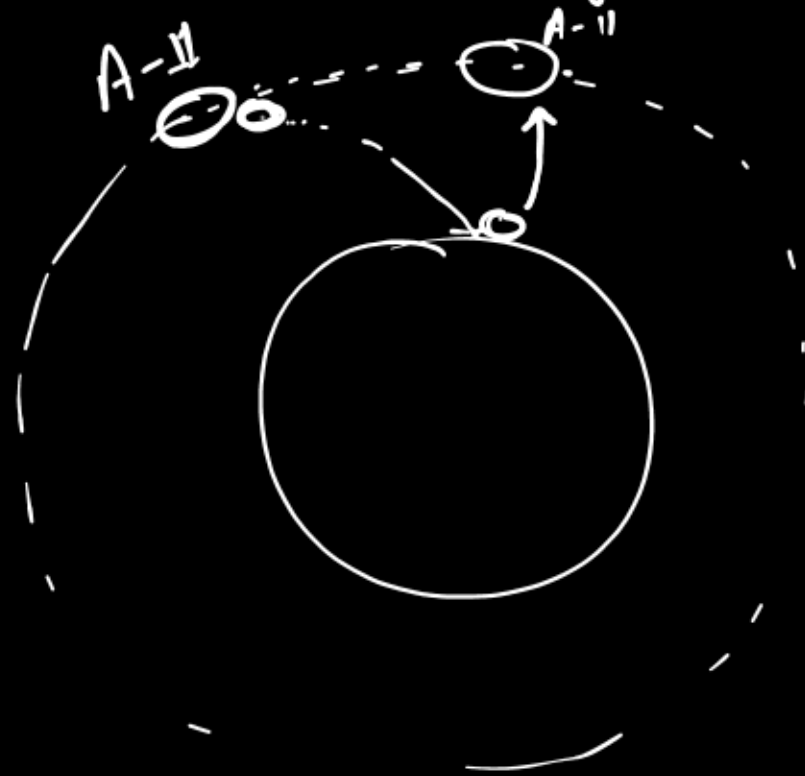
→ Edwin Aldrin

→ Michael Collins

} Landed on moon

} → was in the spacecraft
circling the moon.

20 July 1969



Artemis Mission

NASA

- Artemis I → 2022
 - Artemis II → April, 2026
 - Artemis III → 2027 →
 - Artemis IV → 2028 ||
- [Human will land on Lunar surface again]

Eclipses

└ Sun, Earth and Moon come in a straight line.

Creates eclipse

└ Solar Eclipse

└ Lunar Eclipse

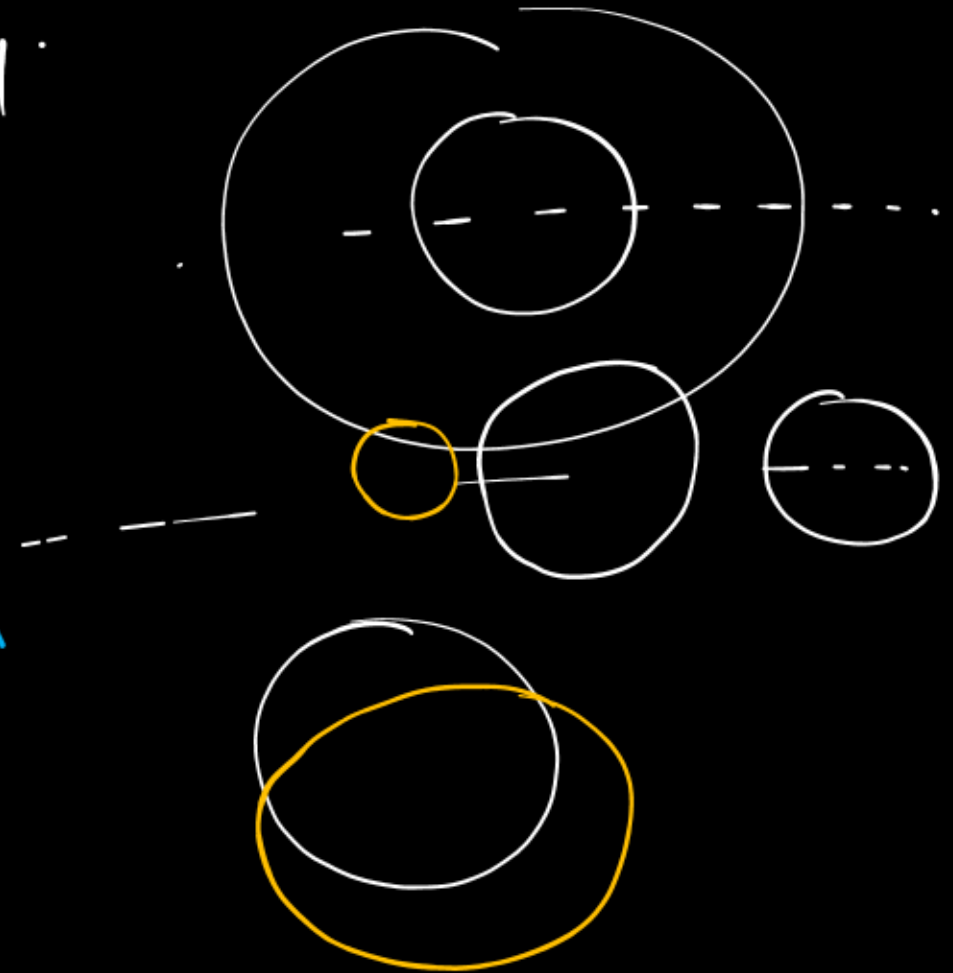
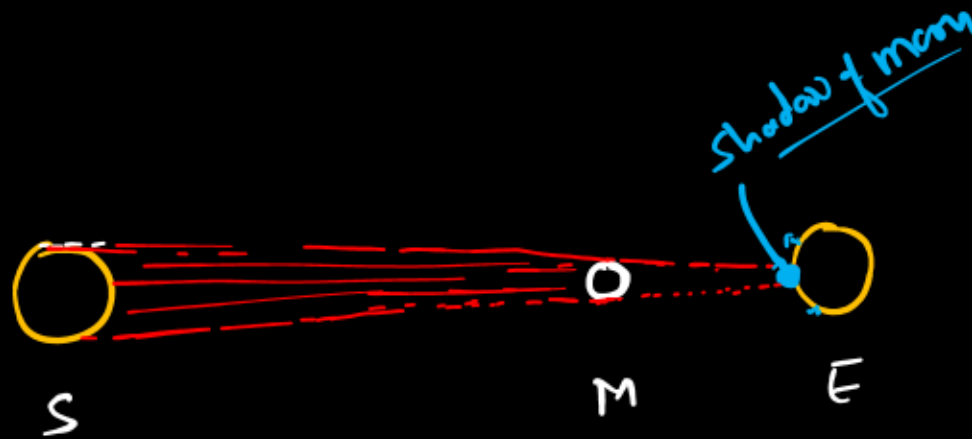
- Moon comes between Sun and earth.
- Moon casts shadow on earth
- Solar eclipse can be seen only from the part on the earth where the shadow falls.

◦ Total Solar eclipse

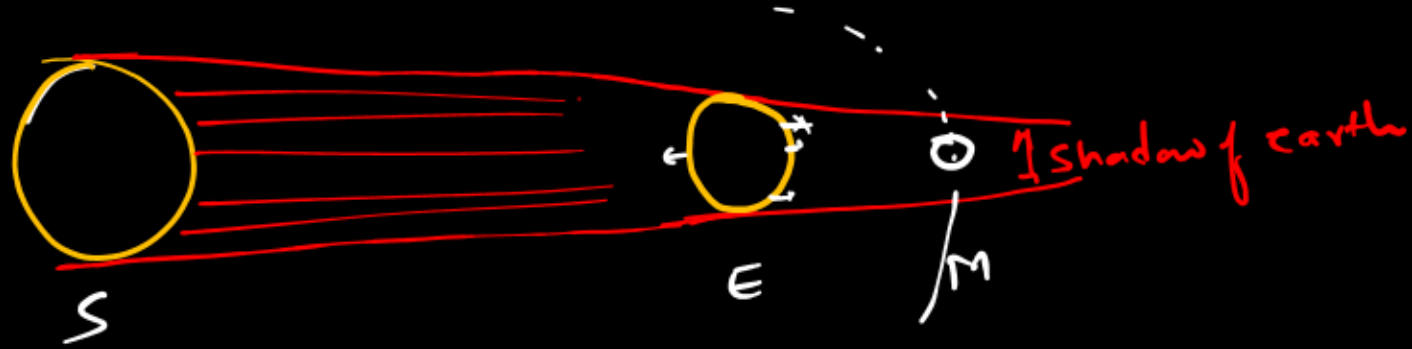
↳ when moon covers sun completely.
↳ Rare phenomenon.

◦ Partial Solar eclipse

↳ Moon partially covers the sun.



Lunar eclipse



→ Total Lunar eclipse

→ Partial Lunar eclipse

Artificial Satellites

- Sputnik-I by USSR was the first artificial satellite.

- Rockets are used to launch satellite.

- Uses of Satellites
 - Communication
 - weather forecasting,
 - Navigation (GPS)
 - Defence

- Aryabhata, (1975) first satellite of India.

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End of the chapter