Fundamentals of Geography

Geography= geo + graphy

The word Geo is derived from **Greek word** '**Gaea'** which means earth and the '**graphy'** is also taken from the Greek word **graphein,** which literally means ***to write*** about something.

Basically, geography is the ***study of places, people and their environments***. In other words it is the science of place, space, people and environment.

There are **3** main strands of geography:

1. **Physical geography**
2. **Human geography**
3. **Environmental geography**.

Physical geography is the study of the natural process of the earth's surface and the Plate tectonics. Which means to study the earth's oceans and land masses and aims to understand the forces that produce and change rocks, oceans, weather, and flora and fauna patterns.

Areas covered under physical geography:

1. **Geomorphology:** The Shape of the Earth's surface and how it came about.
2. **Hydrology**: The Earth's water.
3. **Glaciology:** glaciers and the ice sheets.
4. **Biogeography:** Species, how they are distributed and why
5. **Climatology:** the climate
6. **Pedology:** soils
7. **Palaeogeography:** how the continents have moved over time.
8. **coastal geography:** how the ocean and land affect each other.
9. **Oceanography:** the oceans and seas.
10. **Geomatics**: gathering, storing and processing geographic information; for example: making maps.

Human geography looks at the impact and behavior of people and how they relate to the physical world.

Areas of human geography include:

1. **Cultural geography:** how things like religion, language and government vary across the world.
2. **Development geography**: standard of living and quality of life across the world.
3. **Historical geography**: how people have studied and thought about geography in the past
4. **Population geography**: how populations grow in different places and people migrate
5. **Urban geography:** cities and built up areas.

NOTE: *All areas of geography are interconnected: for example, the way human CO2 emission affect the climate is part of both physical and human geography.*

Environmental geography is the study of systematic description of different components of environment and interactions of man with these components.

The term environment has been derived from a ***French word "Environ***" means to **surround**. It refers to both **abiotic (physical or non-living) and biotic (living) environment**.

Environment regulates the life of the organisms including human beings. Human beings interact with the environment more vigorously than other living beings.

In other words, environment refers to the materials and forces that surrounds the living organism.

Planet: *a planet is an* **astronomical body** *orbiting a star Sun. the word planet comes from the* ***Greek word*** ***"Planetai"*** *which means* ***" Wandereres"****. The earth is also a planet which gets its heat and light from the* ***sun, which is our nearest star.***

Apart from earth itself, five planets in the Solar system are often visible to the **naked eyes.**

NOTE: Although ***eight of the planetary bodies discovered before 1950*** remain planets under the current definition, some celestial bodies, such as ***Ceres, Pallas, Juno and Vesta*** (each object in the solar asteroid belt), and ***Pluto*** (the first trans-
Neptunian object discovered), that were once considered planets by the scientific community, are no longer viewed as planets under the current definition of planet.

Planets in the Solar System are divided into two main types:

large low-density gas giant planets, and smaller rocky terrestrials.

There are 8 planets in the Solar System according to the ***IAU definition.***

According to International Astronomical Union (IAU), a planet us a celestial body that meets the following criteria:

1. ***Is in orbit around the Sun,***
2. ***Has sufficient mass for its self – gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round shape, and***
3. ***Has cleared the neighborhood around its orbit.***

What is a planet?

The answer to this question is a highly controversial one. This has not always been the case, though. In fact, before 1978 the definition of a "planet" was not really necessary. Until the time a planet simply meant a body in orbit around the Sun, that reflected sunlight, and was not a planetary moon, asteroid, or comet.

However, with the discovery of Pluto's moon Charon in 1978 scientists were able to calculate Pluto's mass much more accurately than ever before and soon realized that it was much smaller than they had previously believed. At a tiny fraction of the mass of Mercury, Pluto was clearly a body much smaller than any other planet. This discovery led some to question whether Pluto was actually a planet or some other type of object.

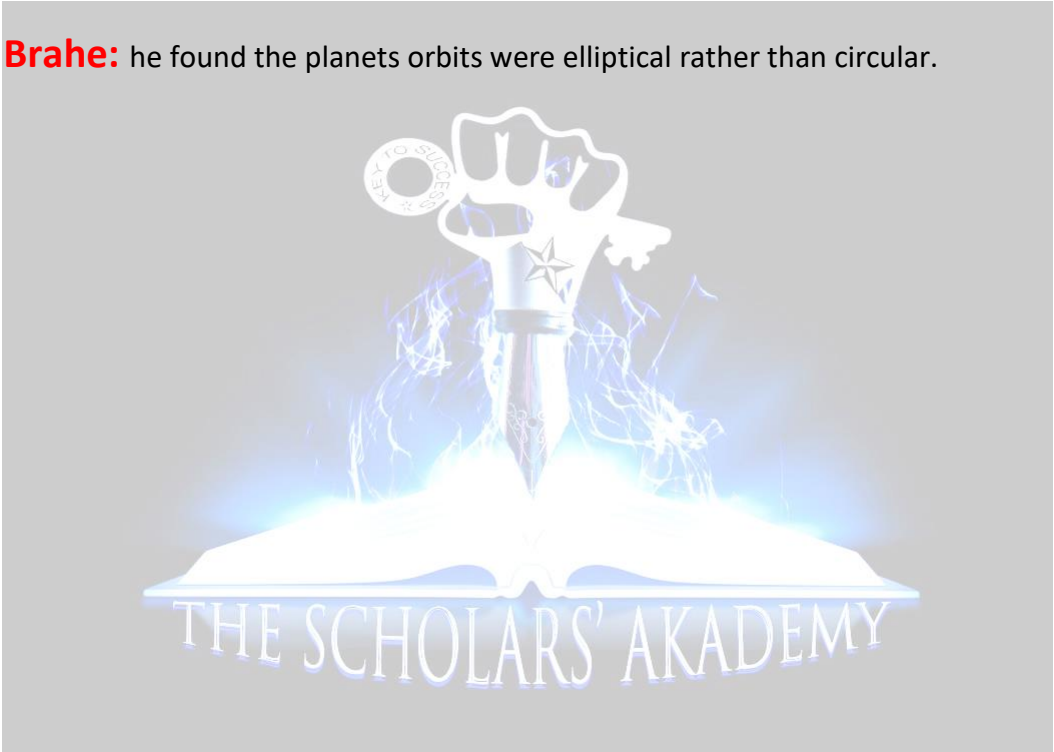
In 1990s and early 2000s the International Astronomical Union (IAU), the official governing body for matters concerning naming astronomical objects, came to a definition of the term "planet".

As increasing distance from the sun there are 4 terrestrials, Mercury, Venus, Earth and Mars. Then the four giant planets Jupiter, Saturn, and Neptune.

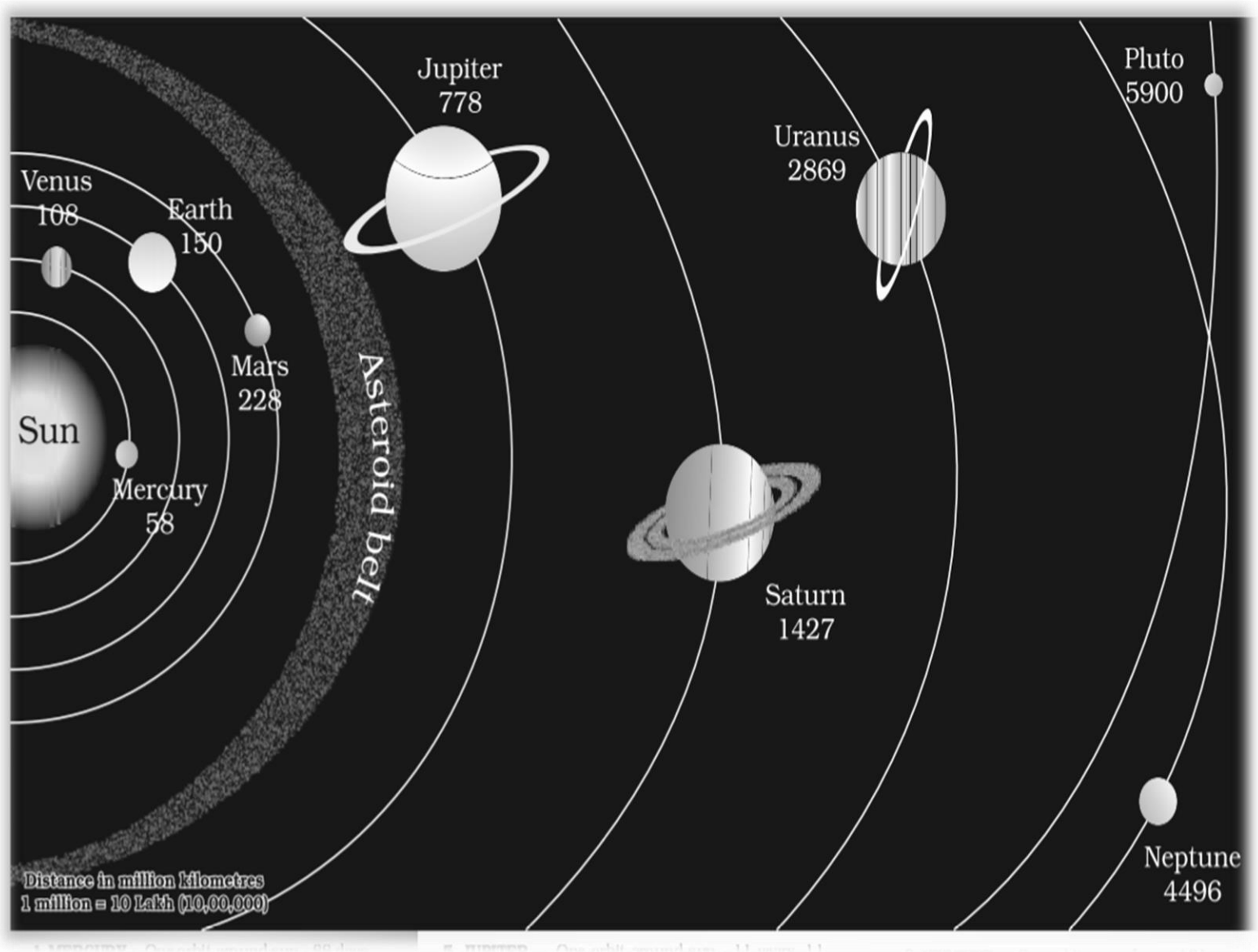
There are Six planets which are orbited by one or more natural satellites.

According to Ptolemy: Planets used to orbit the earth in deferent and epicycle motions. However later in 17th century **Gallileo Gallilei** supported by evidence from the first telescopic astronomical observations that the planets orbited the sun and not the earth

Tycho Brahe: he found the planets orbits were elliptical rather than circular.



Asteroids: Apart from the stars, planets and satellites, there ae numerous tiny bodies which also move around the sun. these bodies are called asteroids. They are found between the orbits of Mars and Jupiter.



Meteoroids: the small pieces of rocks which move around the sun are called meteoroids. Sometimes these meteoroids come near the earth and tend to drop upon it. During this process due to friction with the air they get heated up and bun. It causes a flash of light. Sometimes, a meteor without being completely burnt, falls on the earth and creates a hollow.

Jupiter, Saturn and Uranus have rings around them. These are belts of small debris. These rings may be seen from the earth with the help of telescopes.

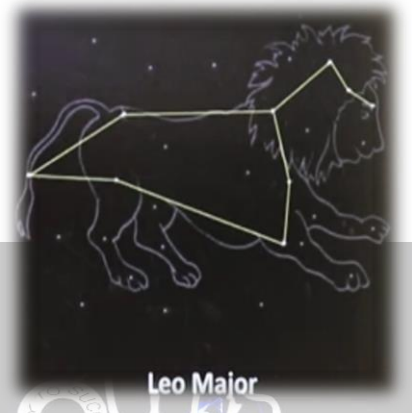
Celestial bodies:

The
Sun, the moon and all those objects shining in the night sky are called celestial bodies.

Constellation: various patterns formed by the different groups of stars may be seen at night, these groups of stars are called the constellations.

1

2



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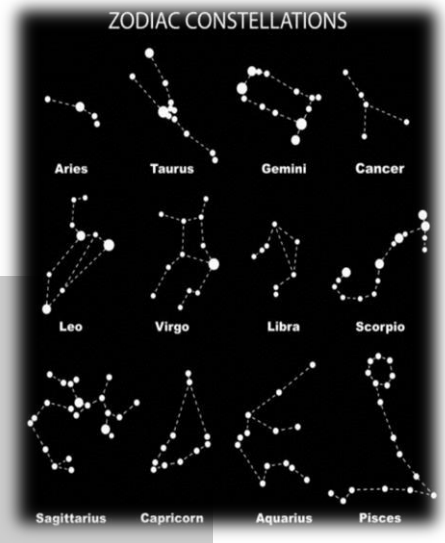


Astronomers: those who study the celestial bodies and their movements are called astronomers.

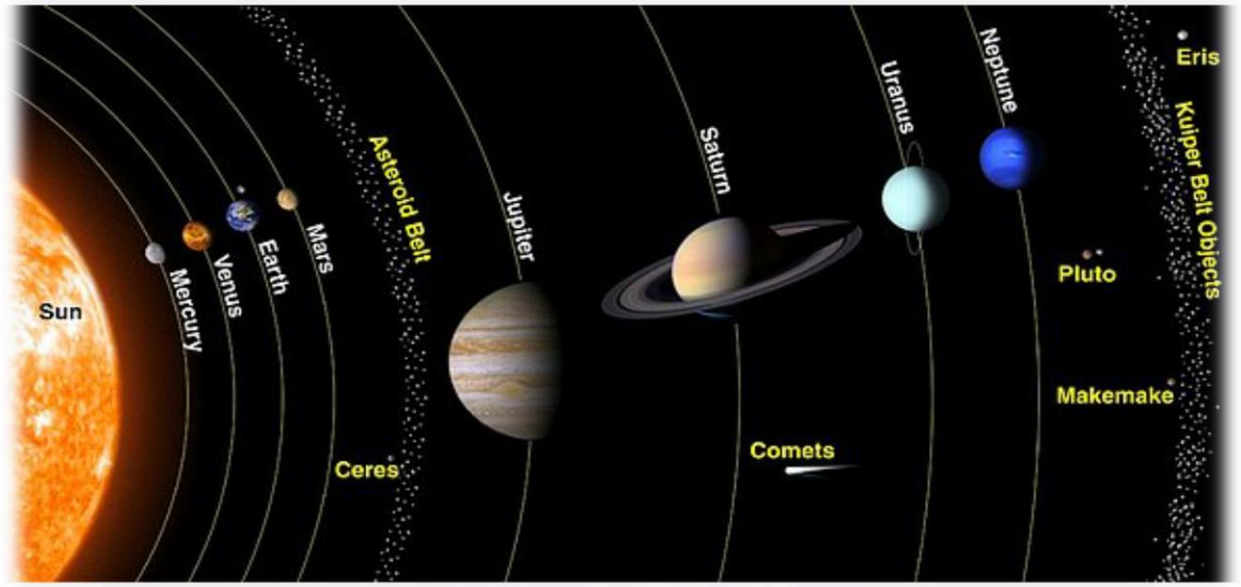
Father of geography: Eratosthenes(a Greek Scholar)

Satellite: it is a celestial body that moves around the planets in the same way as the planets move around the sun. the **Moon is the natural satellite of the planet Earth.**

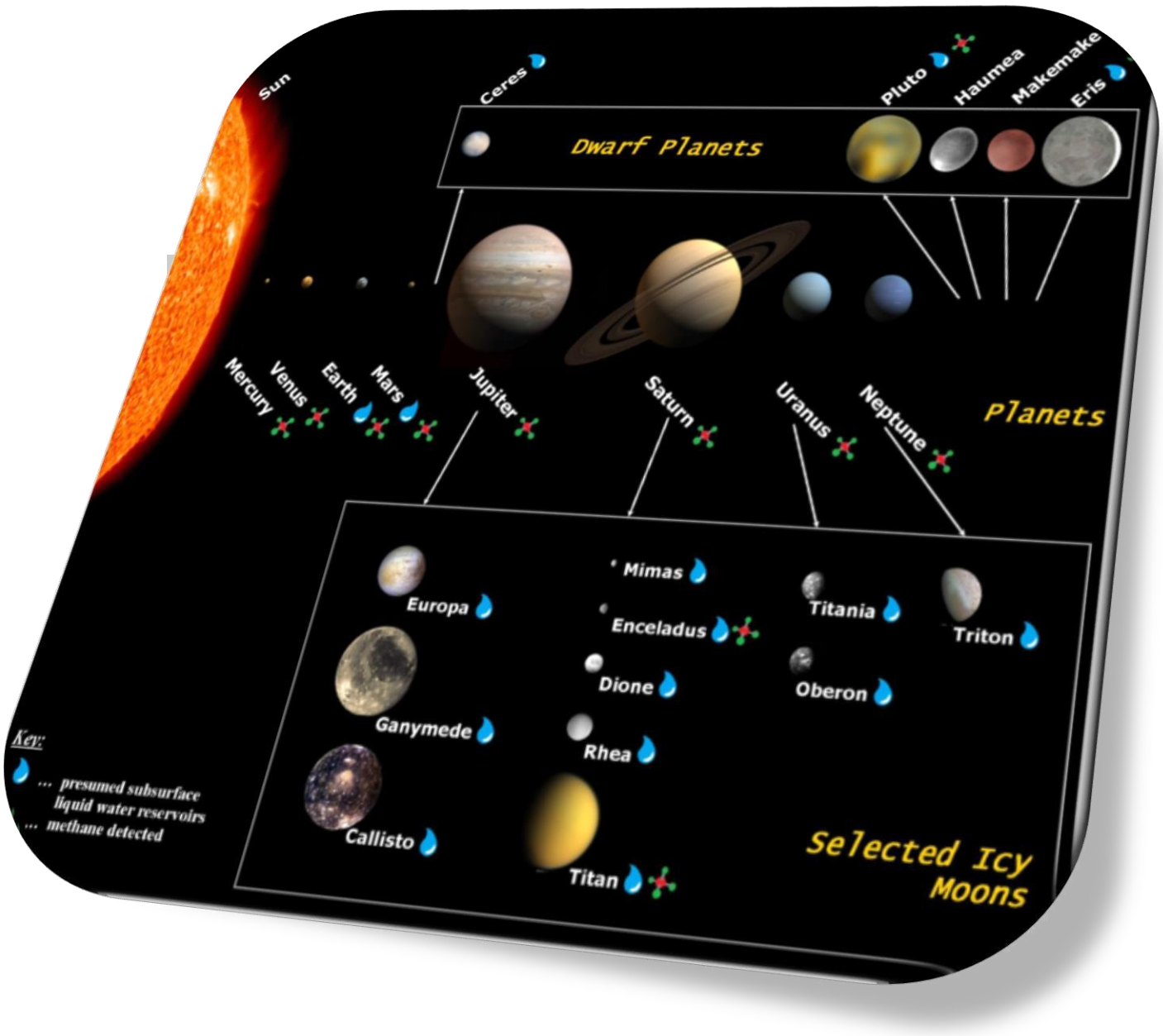
Galaxy: a galaxy is a huge system of billions of stars, and clouds of dust and gases. There are millions of such galaxies that make the Universe.

Galaxy in which our solar system lies is known as the Milky Way Galaxy. In ancient times it was imagined that a river of light flowing in the sky. Thus, it was named **Akash Ganga.**

Solar system: anything related to the Sun we call " Solar". Our Solar system consists of ***our star, the Sun,*** and everything bound to it by gravity – the planets **Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune, dwarf Planets such as Pluto, Haumea, makemake, eris, *dozens of moons and millions of asteroids, comets and meteoroids.*** Apart from our solar system, we have discovered thousands of planetary systems orbiting other stars in the Milky Way.



Jupiter has 79 moons.



Saturn has the highest number of Natural satellites (moons) 82.

Types of planets

The Planets falls into two categories based on their physical characteristics: the Terrestrial planets and the gas giants.

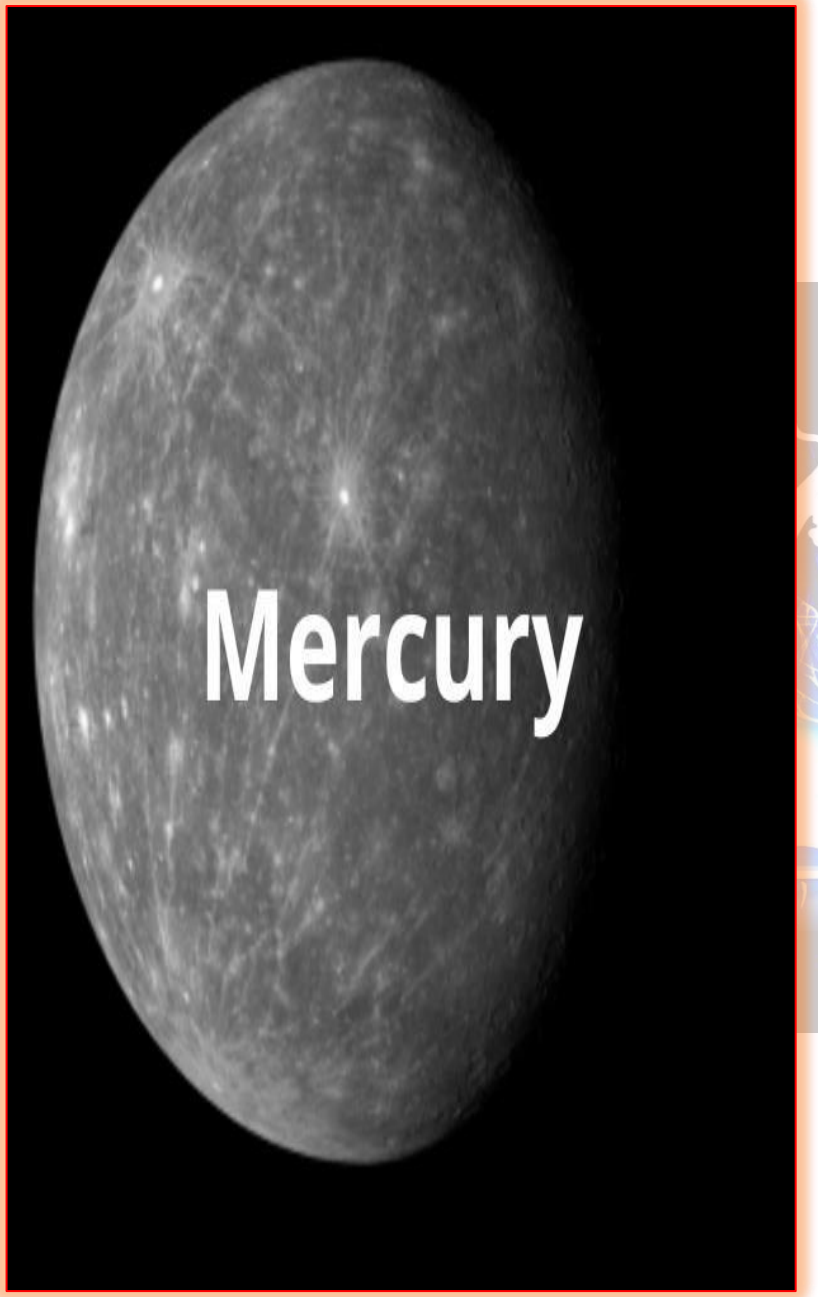
Terrestrial planets (inner planets): the four inner ***planets Mercury, venus, earth and Mars*** – are made up mostly of iron and rock are known as terrestrial or earthlike planets because of their similar size and composition.

Earth has one natural satellite-Moon and Mars has two moons named, ***Deimos and Phobos.***

Gas Giants (outer planets): Jupiter, Saturn, Uranus and Neptune – are giant worlds with thick outer layer of gas. Nearly all the planets' mass is made up of hydrogen and helium, giving them compositions like that of the sun.

Jupiter and Saturn have each been visited by several spacecraft, and were also host to long term missions including Juno and Gallileo at Jupiter, and Cassini at Saturn. Uranus and Neptune, however, have only been seen during one spacecraft flyby – that voyager 2 in the 1980s. some scientists are working on creating a Uranus or Neptune orbiter to fly there in the 2030s or so,

Planets' fascts



Mass:	330,104,000,000,000 billion kg (*0.055 x Earth*)
Equatorial Diameter:	4,879 km
Polar Diameter:	4,879 km
Equatorial Circumference:	15,329 km
Known Moons:	None
Notable Moons:	None
Orbit Distance:	57,909,227 km (*0.39 AU*)
Orbit Period:	87.97 Earth days
Surface Temperature:	-173 to 427°C
First Record:	14th Century BC
Recorded By:	Assyrian astronomers

1.

Mercury is the ***closest planet to the sun*** and is also **the smallest** of the

eight planets in our solar system.

2. It is **the smallest planet in the solar system** with a diameter of 4**,879 km** and is one of five planets that is **visible to the naked eye.**

3. After the Earth, Mercury is the **2nd densest planet.**

4. rotation period of **Mercury is only 58.65 days.**

5. **For every 2 orbits of the Sun, which takes around 88 Earth days,** Mercury **completes three rotations of its axis.** It is gravitationally locked and ***this rotation is unique*** to the solar system.

6. ***Every seven years or so, Mercury can be seen from Earth*** passing across the face of the Sun. this happens because Mercury's orbit is inclined by 7 degrees to the plane of Earth's orbit and its ***known as a transit.***

7. It is named for the ***Roman god Mercury***, the **messenger to the gods**,

8. Mercury has ***no moons or rings*** because of its low gravity and lack of atmosphere.

9. Mercury has been ***known to humanity since ancient times.***

10. ***Mercury orbits so quickly around the Sun*** that early civilizations believed it was actually two different stars – one which appeared in the morning and another which appeared in the evening.

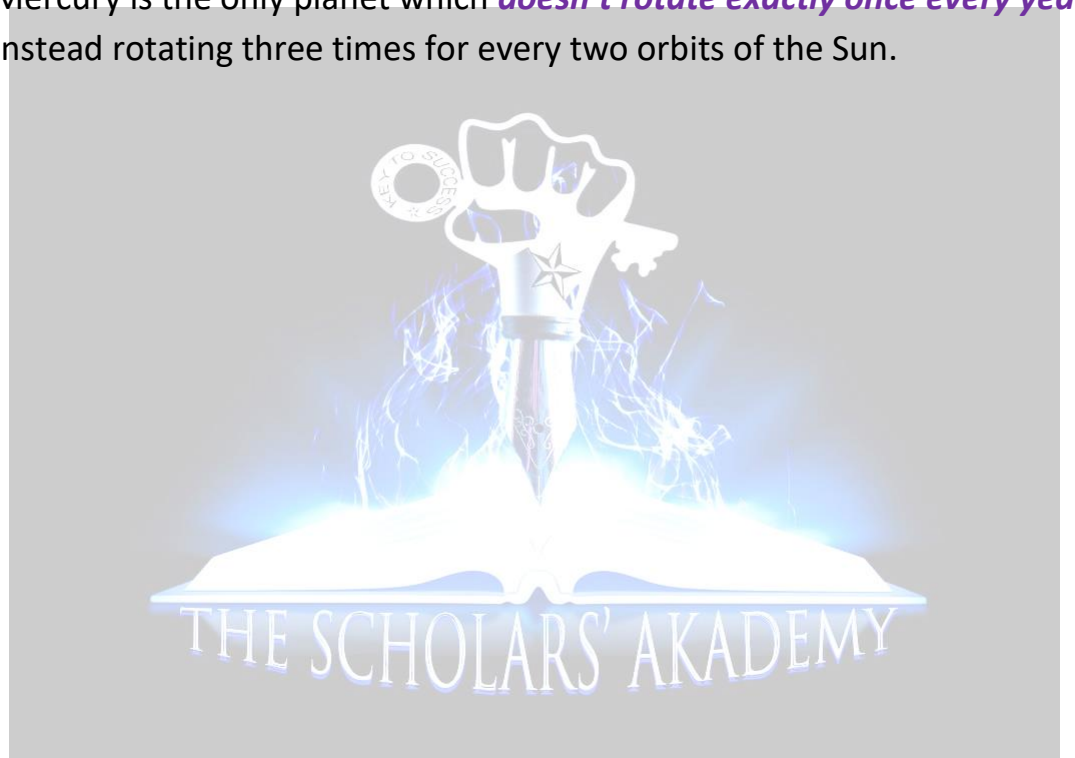
11. Astronomers didn't realize that mercury was a planet until 1543 when ***Copernicus published his Sun – centered model*** of the Solar system.

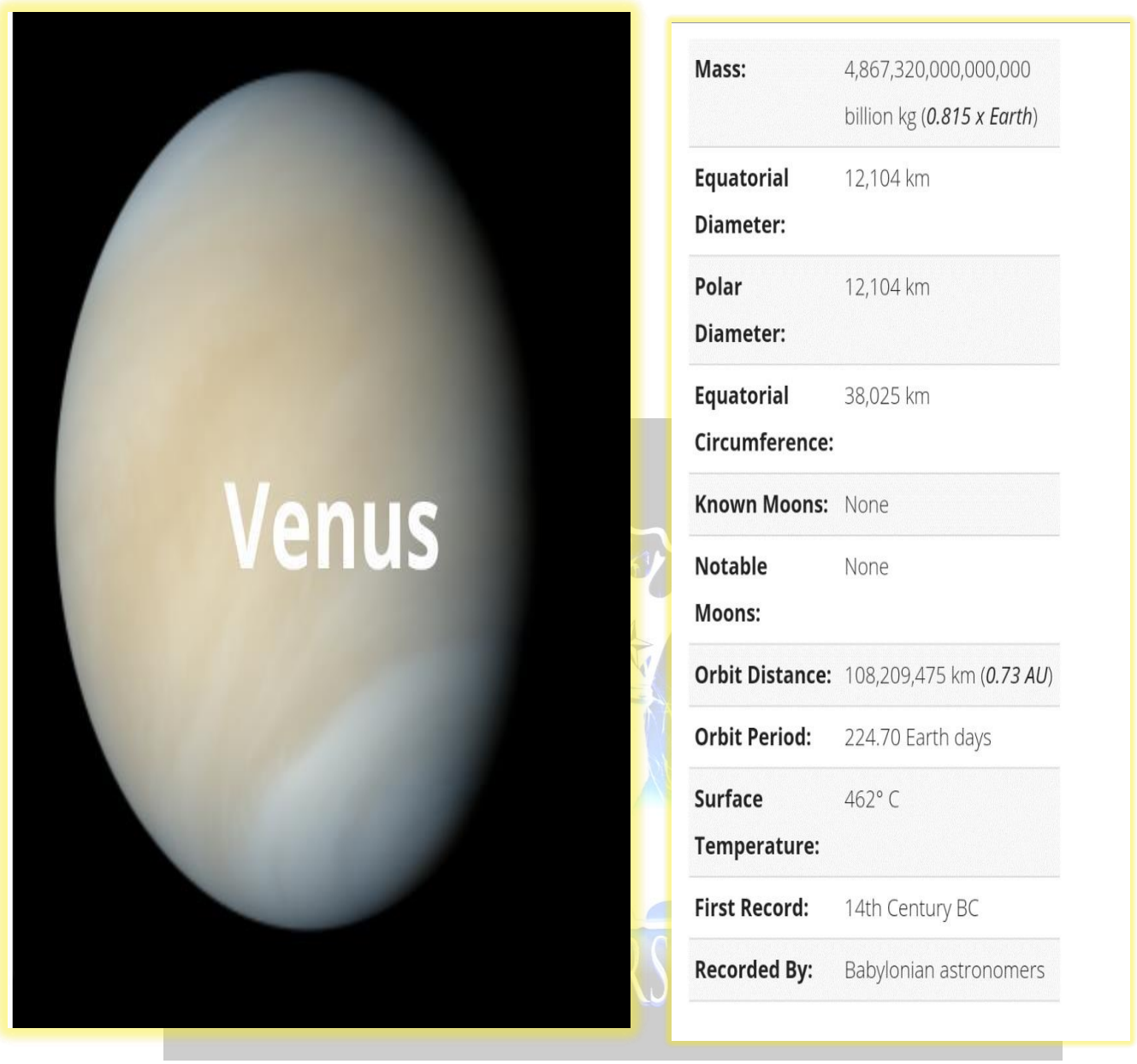
12. It was once believed that a planet called ***Vulcan*** existed between the orbit of Mercury and the sun. however, the existence of such a planet was never found.

13. Mercury ***orbits in an ellipse*** rather than circular.
14. Mercury is the ***second hottest planet.*** Venus, though farther from the sun than Mercury, actually experiences higher temperatures. This is because Mercury has no atmosphere to regulate temperature.

15. ***Mercury doesn't experience any seasons.*** The axis of Mercury has the ***smallest tilt*** of all other planets, and this results in a lack of seasons on its surface.

16. Mercury is the only planet which ***doesn't rotate exactly once every year*** instead rotating three times for every two orbits of the Sun.





1. **Venus** is the 2nd planet from the sun.

2. It is sometimes referred to as ***the sister to the earth*** or (***Venus and earth are twin planets***). Because of their size and mass are so similar.

3. Venus is named after the ***Roman Goddess of love and beauty,.***

4. Venus is ***the hottest planet in the solar system*** with an average surface temperature of **462 degree.**

5. Venus ***doesn't tilt on its axis*** which means there are no season either.

6. Venus is the ***only planet in the Solar system to be named after a female figure.*** Being the brightest and most visible of these planets the Romans named Venus after their goddess of love and beauty. As a result of its name, the ***planet has naturally been associated with love, femininity***, and romance throughout history.

7. Venus is the closest planet to earth.

8. Venus is also the ***closest planet to earth.***

9. The surface of Venus is hidden by an opaque layer of clouds which are formed from **Sulphuric acid.**

10. Venus is the ***second largest terrestrial planet.***

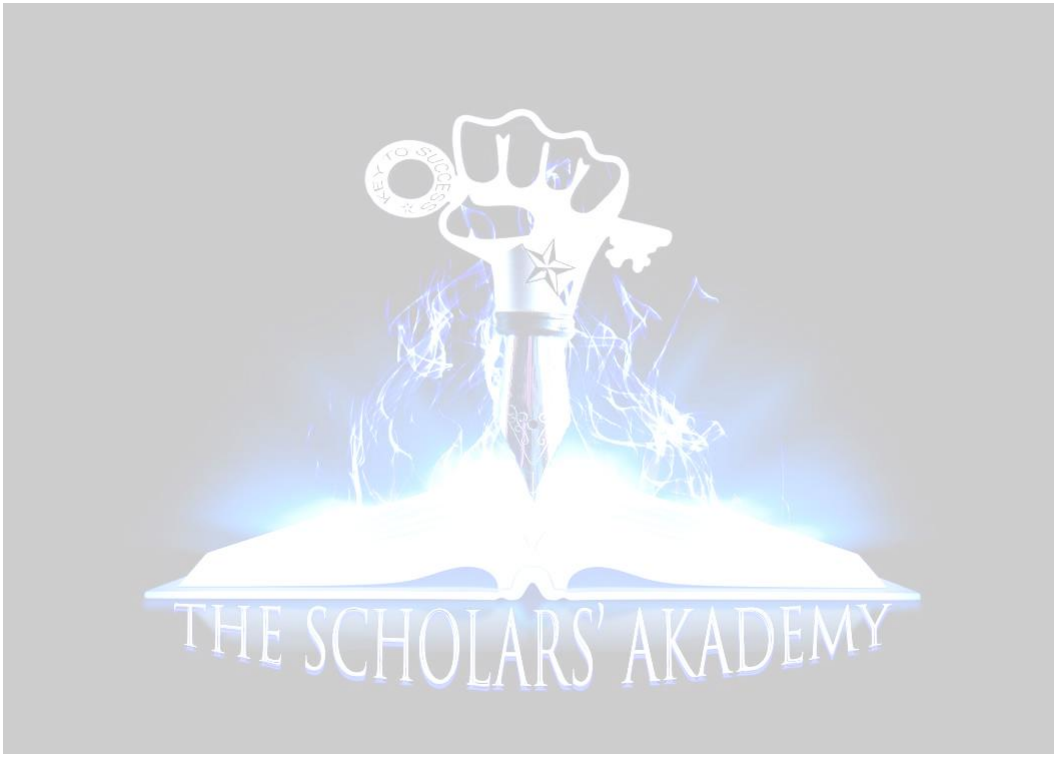
11. Venus is the ***second brightest natural object*** in the sky. The **moon is the only other natural object that is brighter.**

12. Venus is sometimes referred to as the ***"morning star" and "evening star".*** The planet has an apparent magnitude of -3.8 to -4.6 which makes it visible on a bright, clear day. It changes from being visible at sunrise to being visible at sunset.

13. ***One day on Venus is longer than one year***. Due to the slow rotation on its axis, it takes **243 Earth days** to complete one rotation. The orbit of the planet takes ***225 earth days***, making a year on Venus shorter on day on Venus.

14. A ***day on Venus is longer than on any other planet.***

15. ***Venus rotate in the opposite direction to other planets.*** Most ***other planets rotate counter-clockwise on their axis***, however **Venus, like Uranus, rotates clockwise**. This is known as a retrograde rotation and may have been caused by a collision with an asteroid or other object which caused the planet to change its rotational path.



EARTH PROFILE	
Mass:	5,972,190,000,000,000 billion kg
Equatorial Diameter:	12,756 km
Polar Diameter:	12,714 km
Equatorial Circumference:	40,030 km
Known Moons:	1
Notable Moons:	The Moon
Orbit Distance:	149,598,262 km (*1 AU*)
Orbit Period:	365.26 Earth days
Surface Temperature:	-88 to 58° C

1. ***Earth*** ***is the third planet from the Sun*** and ***largest of the terrestrial planets.***

2. Surprisingly, while it is only the ***fifth largest planet in terms of size*** and mass, it is the ***densest of all the planets***.

3. Earth is the ***only planet in the solar system not named after a mythological being***. Instead, its name is derived from the Old English word **"ertha'** and the Ango-Saxon word **"erda"** which ***means ground or soil.***

4. Earth was ***formed somewhere around 4.54 billion years ago*** and is currently the ***only known planet to support life*** –

5. ***The gravity between the earth and the moon causes the tides on earth***. This effect on the moon means it is tidally locked to earth - its ***rotation period is the same as its orbit time*** so it always presents the same face to earth.

6. ***The rotation of the earth is gradually slowing down.*** The deceleration the Earth's rotation is very slow, ***approximately 17 milliseconds per hundred years.*** Eventually this will lengthen our days but it will ***take around 140 million years before our day will have increased from 24 to 25 hours.***

7. Earth's atmosphere is composed of ***78% nitrogen, 21 % oxygen***, and trace **1 %** amounts of other gasses including ***argon and carbon dioxide.***

8. **The earth has an *Ozone Layer*** which protects it from harmful solar radiation. This shell is a **special type of oxygen that absorbs most of the Sun's powerful UV Rays.**

9. ***70 % of the earth's surface is covered by water.***

10. The ***first life on earth developed in the oceans*** through a process called **abiogenesis or biopoiesis**. This is a natural process in which life grows from non-living matter like simple organic compounds.

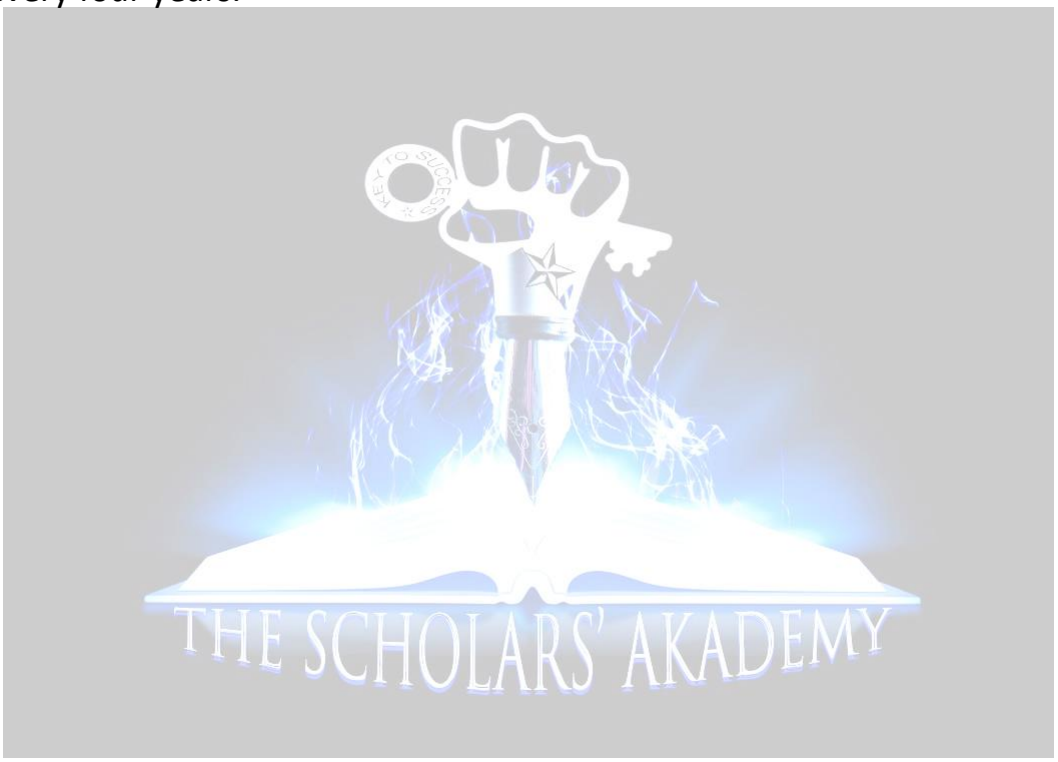
11. ***The highest point on earth is Mount Everest*** which reaches a height of 8.8 KM.

12. ***The lowest point is called Challenger Deep*** and at **10.9 KM** below sea level, it is further than the peak of Mount Everest.

13. Earth has one of the ***most circular orbits of all the eight planets***.

14. **It's axis of rotation is tilted 23.4 degree** away from the perpendicular of its orbital plane, which ***produces the seasons*** we experience.

15. A ***year on earth lasts just over 365 days*** which is why we have a ***leap year*** every four years.



Mass:	641,693,000,000,000 billion kg (*0.107 x Earth*)
Equatorial Diameter:	6,805 km
Polar Diameter:	6,755 km
Equatorial Circumference:	21,297 km
Known Moons:	2
Notable Moons:	Phobos & Deimos
Orbit Distance:	227,943,824 km (*1.38 AU*)
Orbit Period:	686.98 Earth days (1.88 Earth years)
Surface Temperature:	-87 to -5 °C
First Record:	2nd Millenium BC
Recorded By:	Egyptian astronomers

1) **Mars** is the ***fourth planet*** from the Sun and ***last of the terrestrial planets.***

2) It is named after a mythological figure – the Roman **god of War.**

3) It is sometimes called the **Red Planet** because of the **brownish – red color of its surface.**

4) It is the **2nd smallest planet** in the solar system behind Mercury.

5) ***Chinese astronomers*** call Mars the "**fire star"** while ancient Egyptian priests called it " **her Desher"** meaning 'the red one'.

6) The **landmass of Mars and Earth is very similar**. Despite Mars being just 15% the volume and 10 % the mass of Earth, it actually has a similar landmass because water covers about 70% of Earth's surface.

7) The **gravity of Mars is about 37 % the gravity found on Earth**. This means that on Mars you could in theory **jump 3 times higher** than you could on Earth.

8) Mars was once believed to be **home to intelligent life**. This came from the discovery of lines or grooves in the surface called **Canali** by Italian astronomer ***Giovanni Schiaparessli.*** He believed that these were not naturally occurring and were proof of intelligent life. However, these were later shown to be an optical illusion.

9) The ***tallest mountain*** is known in the solar system is on Mars. **Olympus Mons is a 21 KM high and 600 KM diameter** shield volcano that was formed billions of years ago. Scientists have found a lot of recent evidence of volcanic lava which suggests Olympus Mons may still be active.

10) The Martian surface is home to both the **largest known volcano, Olympus Mons, and largest known canyon, Valles Marineris**, in the solar System.

11) With the exception of Earth, **Mars is the most hospitable to life.**

12) It takes Mars **687 earth days to orbit the Sun** with its orbit radius of 227,840, 000 KM.

13) Mars is the only other planet besides earth that has **polar ice caps**. The northern cap is called the Planum boreum, with Planum Austral in the South. Water ice has also been found under the Martian ice caps.

14) Similar to the other terrestrial planets, **Mars' interior is divided into three layers : a crust, mantle, and core**

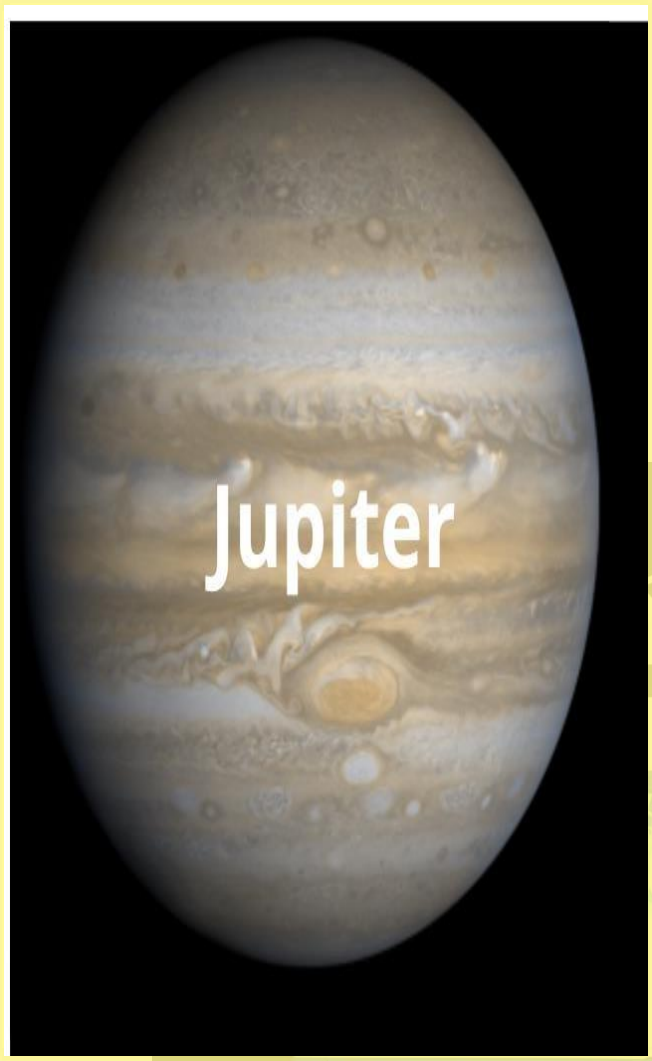
15) It takes Mars about **24 hours 40 minutes** to complete one full rotation, easily making the Martian day the closest in length to an Earth day.

16) **Mars has seasons like Earth,** but they last twice as long. This is because Mars is tilted on its axis by about 25.19 degrees.

17) The orbit of Mars is the most eccentric of the eight planets. This means it is the **least circular orbit** path of the planets.

18) Two moons of the Mars**, Phobos and Deimos**, were written about in the book "**Gulliver's Travels' by author Jonathan Swift** – 151 years before they were discovered.

19) Carbon dioxide is 95% at Mars, and 97% at Venus.



Mass:	1,898,130,000,000,000,000 billion kg (*317.83 x Earth*)
Equatorial Diameter:	142,984 km
Polar Diameter:	133,709 km
Equatorial Circumference:	439,264 km
Known Moons:	67
Notable Moons:	Io, Europa, Ganymede, & Callisto
Known Rings:	4
Orbit Distance:	778,340,821 km (*5.20 AU*)
Orbit Period:	4,332.82 Earth days (11.86 Earth years)
Surface Temperature:	-108°C
First Record:	7th or 8th Century BC

1) Jupiter is the largest and most massive planet in the solar System.

2) To put this in perspective, it would take **11 Earths lined up next** to each other to stretch from one side of Jupiter to the other and **it would take 317 earths to equal the mass of Jupiter.**

3) It has **79 moons.**

4) **Inner moons.** These orbit the closest to Jupiter and are sometimes **called the Amalthea group.** The names of the inner moons of Jupiter are ***Metis, Adrastea, Amalthea, and Thebe.***

Galilean moons. These are largest of Jupiter's moons and were discovered by Gallileo Galilei in 1610 – Io, **Europa, Ganymede** and **Callisto.** Ganymede is the largest moon in the solar system.

Outer moons: much smaller and farther away from Jupiter.

5) When Galileo discovered the four moons of Jupiter in 1610 this was the first proof of celestial bodies orbiting something other than earth.

6) Jupiter is the **fourth brightest object** in our solar system. After the ***Sun, the moon and Venus***, Jupiter is the brightest and is one of five planets which can be seen by naked eye from Earth.

7) Jupiter has the **shortest day** of the eight planets. The planet rotates very quickly on its axis once every **9 hours and 55 minutes.** This rapid rotation is also what causes the flattening effect of the Planet, which is why it has an **oblate shape.**

8) **One orbit of the Sun takes Jupiter 11.86 earth years**. This means that when viewed from Earth, the planet appears to move very slowly in the sky, it takes months for Jupiter to move from once constellation to the next.

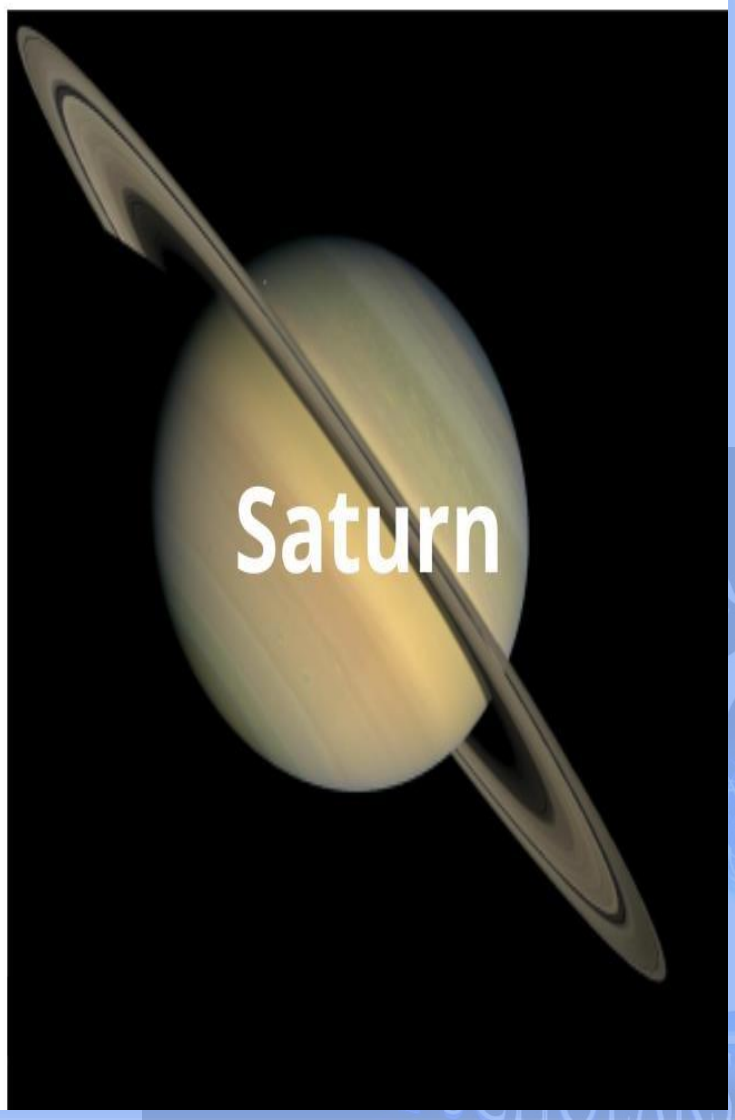
9) Jupiter has a faint ring system around it mostly comprised of **dust particles.**

10) **Jupiter does not experience seasons** like other planets such as Earth and Mars. This is because the axis is only tilted by **3.13 degrees.**

11) Jupiter's **Great Red Spot is an enormous storm** that has been raging for over 300 years. This storm is so wide that three Earth's would fit inside of it.

12) The composition of Jupiter's atmosphere is very interesting. At roughly **90 % hydrogen and 10 % helium.**

13) Its distance from the sun is five times the distance from the Earth . this means that it takes **about 43 minutes for sunlight to reach Jupiter.**



Mass:	568,319,000,000,000,000 billion kg (*95.16 x Earth*)
Equatorial Diameter:	120,536 km
Polar Diameter:	108,728 km
Equatorial Circumference:	365,882 km
Known Moons:	62
Notable Moons:	Titan, Rhea & Enceladus
Known Rings:	30+ (7 Groups)
Orbit Distance:	1,426,666,422 km (*9.58 AU*)
Orbit Period:	10,755.70 Earth days (29.45 Earth years)
Surface Temperature:	-139 °C
First Record:	8th Century BC

1) Saturn is the **6th planet** from the Sun and second largest planet of the Solar System in terms of diameter and mass.

2) If compared, it is easy to see why Jupiter and Saturn have been designated as ***relatives.***

3) From atmospheric composition to rotation, these two planets are extremely similar.

4) ***It is one of five planets able to be seen with the naked eye.***

5) It is also ***the fifth brightest object*** in the solar system.

6) In Roman mythology **Saturn was the father of Jupiter**, king of the gods.

7) The most common nickname for Saturn is **" the Ringed Planet".**

8) ***Saturn gives off more energy than it receives from the Sun.***

9) It takes Saturn **29.4 Earth years** to orbit the Sun. this slow movement against a backdrop of stars led to the planet being nicknamed " **Lubadsagush.**

10) Saturn has the **fastest winds** of any other planet in our solar system which is approximately **1,800 km per hour.**

11) Saturn has the highest number of moons. **The largest of which are Titan and Rhea.**

12) **Titan is the second largest moon in the Solar System, behind Jupiter's moon Ganymede.**

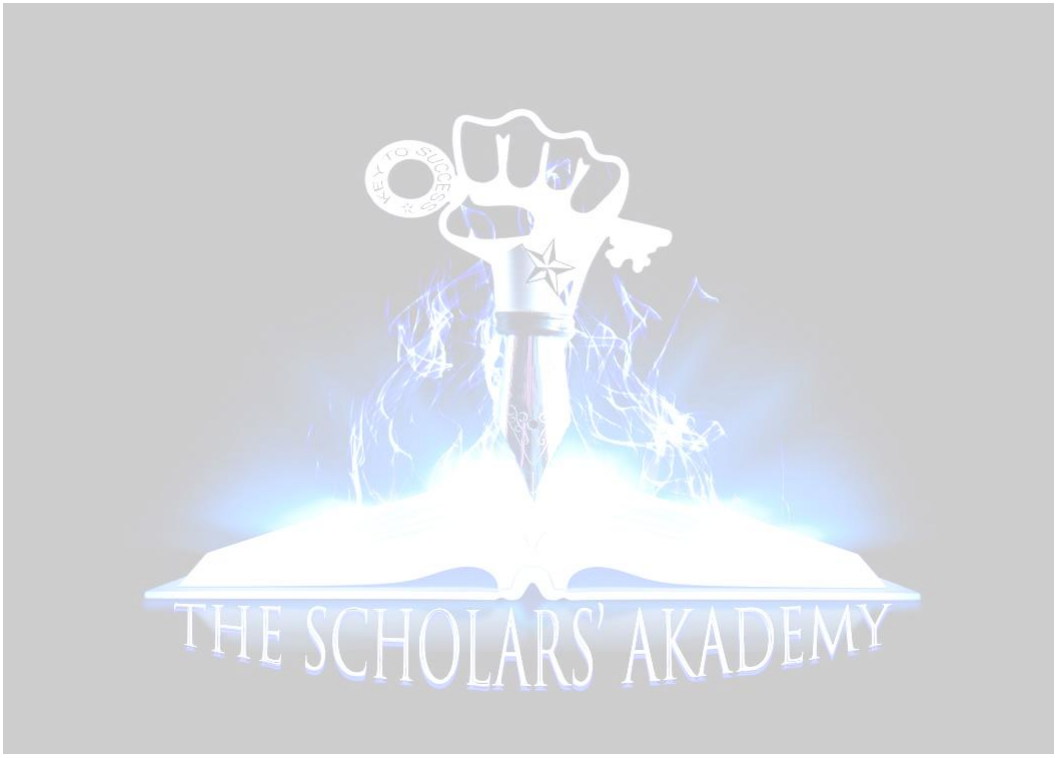
13) Saturn is the ***flattest*** of the eight planets.

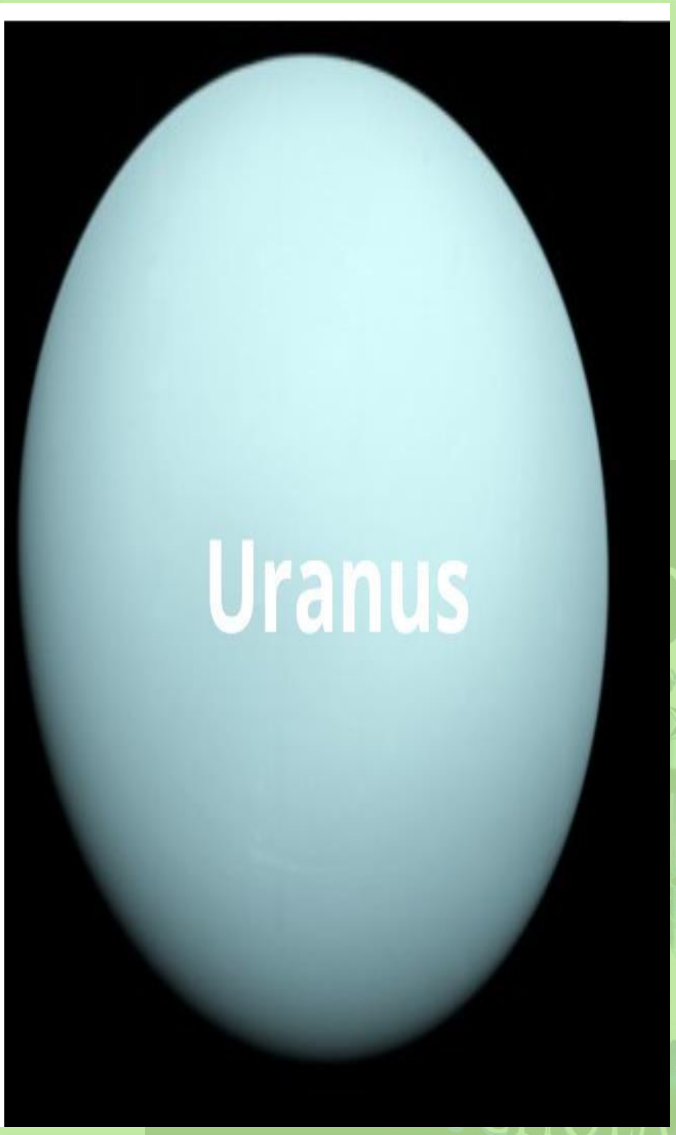
14) Saturn appears a **pale-yellow** color because its upper atmosphere contains **ammonia crystals.**

15) Saturn is known as a gas giant, but scientists believe it has a solid rocky core.

16) The interior of Saturn is very hot, reaching temperatures of up to **11,700 degree.**

17) Saturn is 1,424, 600,00 km from the Sun.





Mass:	86,810,300,000,000,000 billion kg (*14.536 x Earth*)
Equatorial Diameter:	51,118 km
Polar Diameter:	49,946 km
Equatorial Circumference:	159,354 km
Known Moons:	27
Notable Moons:	Oberon, Titania, Miranda, Ariel & Umbriel
Known Rings:	13
Orbit Distance:	2,870,658,186 km (*19.22 AU*)
Orbit Period:	30,687.15 Earth days (84.02 Earth years)
Surface Temperature:	-197 °C
First Record:	March 13th 1781

1) Uranus, is the seventh planet in the Solar System, and third of the gas giants.

2) ***William Herscel discovered Uranus in 1781.*** the planet is too dim to have been seen by ancient civilizations. Herschel himself believed that Uranus was a comet at first, but several years later it was confirmed as a planet – making Uranus the first planet discovered in modern history.
3) The original name was proposed by Herschel was " Georgian sidus" but scientific community didn't take to it, instead, Rranus was proposed and

accepted by astronomer Johann Bode and it comes from ancient Greek god Ouranos.

4) It rotates on its axis once every ***17 hours and 14 minutes***

5) .It takes 84 earth days to orbit the Sun.

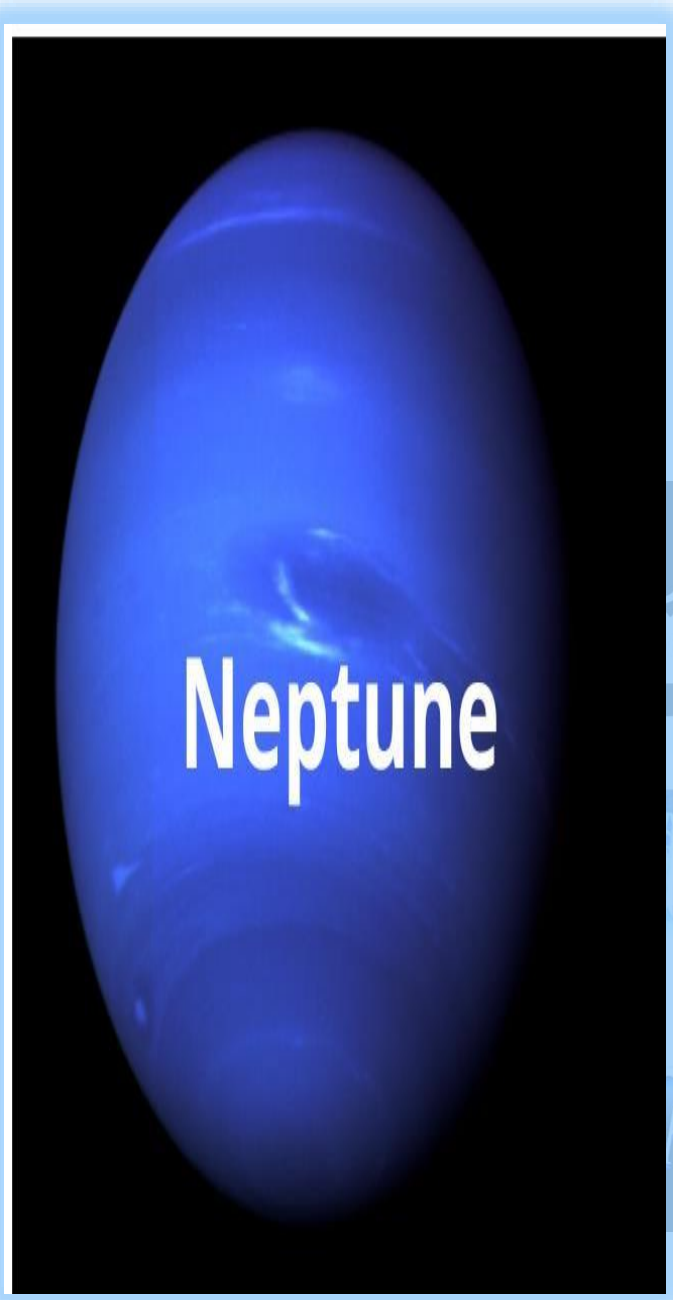
6) Uranus is often referred to as the **" Ice Giant"**. As it is the coldest planet in the solar system.

7) Uranus has ***13 presently known rings.***

8) Uranus has its axis tilted at **98 degree Celsius** on its orbital plane and is called ***lopsided planet.***

9) **Satellite *Tritania* belongs to Uranus,** Titan belongs to Saturn, and Triton belongs to Neptune.

10)



Mass:	102,410,000,000,000,000 billion kg (*17.15x Earth*)
Equatorial Diameter:	49,528 km
Polar Diameter:	48,682 km
Equatorial Circumference:	155,600 km
Known Moons:	14
Notable Moons:	Triton
Known Rings:	5
Orbit Distance:	4,498,396,441 km (*30.10 AU*)
Orbit Period:	60,190.03 Earth days (164.79 Earth years)
Surface Temperature:	-201 °C
First Record:	September 23rd 1846

1) Neptune has satellite but no rings.

Note: its rings were founded in 1980s however these rings are not stable and dark as well so these are seen randomly.

2) Moons: there are 14 known moons such as; **Triton,** Thalassa, Proteus, Nereid, Hippocamp, Despina, Neso, Galatea, Larissa,

3) It orbits around sun in almost **165 (164.8 earth years**) . it takes **maximun time for one orbit around sun.**

4) It has **17 times the mass** of the earth.

5) It was discovered by **Jean Joseph Le Verrier.**

6) Neptune is named after the **Roman God of the sea** because of the color.

7) Neptune has the **second largest gravity** of any planet in the solar system after Jupiter.

8) Winds on surface of **Neptune at the 2,100 km/hour**. The planet might have an actual solid surface deep down inside Neptune. Which means no one could stand on the surface of the Neptune.

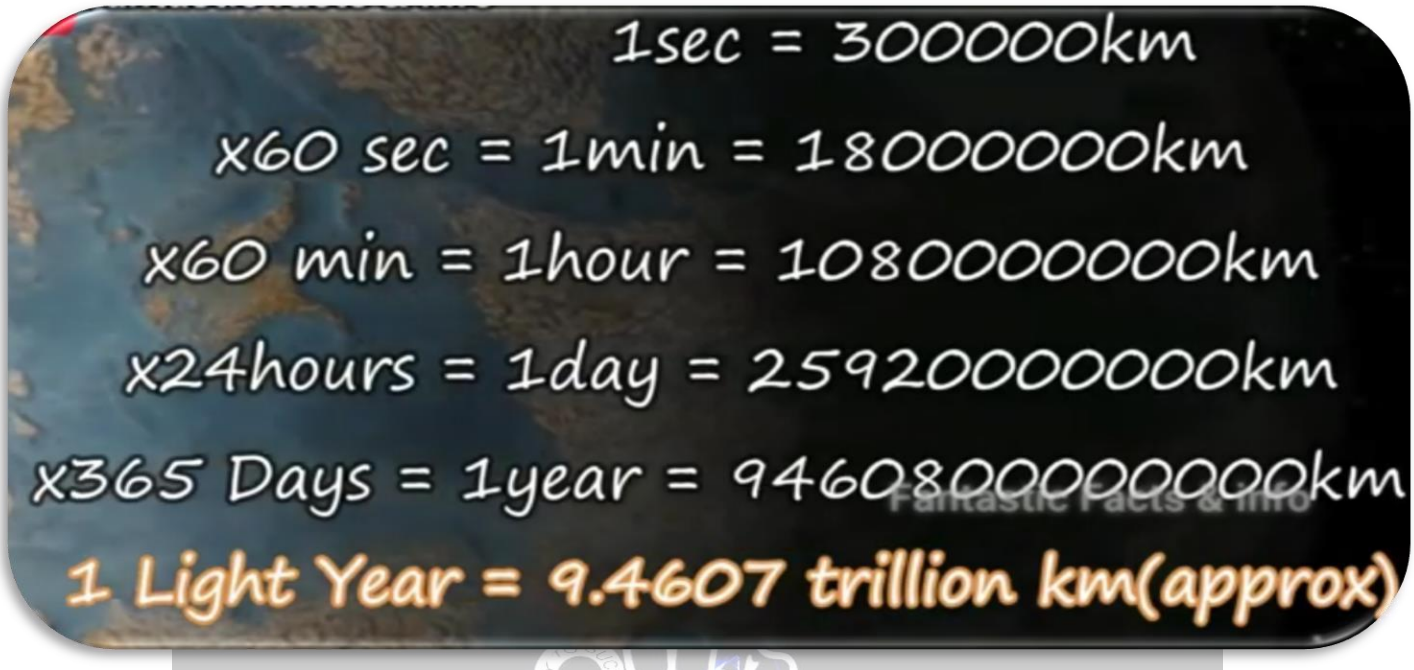
Miscellaneous facts about the solar system

1. Solar system: Solar System is constituted by the Sun in the centre, 8 planets, 180 satellites, comets meteors and asteroids.

2. Nebula: it is a moving cloud of gasses.
3. The sun by virtue of its mass and weight controls the movement of the planets.
4. **What is light year?**

   Distance in space is measured with the speed of light. And a light year is defined as the distance light travels in a year.

5. 



6. All the planets revolve around the Sun in an elliptical path.
7. Morning Star" A planet known by this name is Venus.
8. The Shape of the moon keeps changing every day.
9. Asteroids are found between Mars and Jupiter.
10. Which is the brightest planet in the Universe? Ans: Venus

11. Which part of the Sun is visible to human?

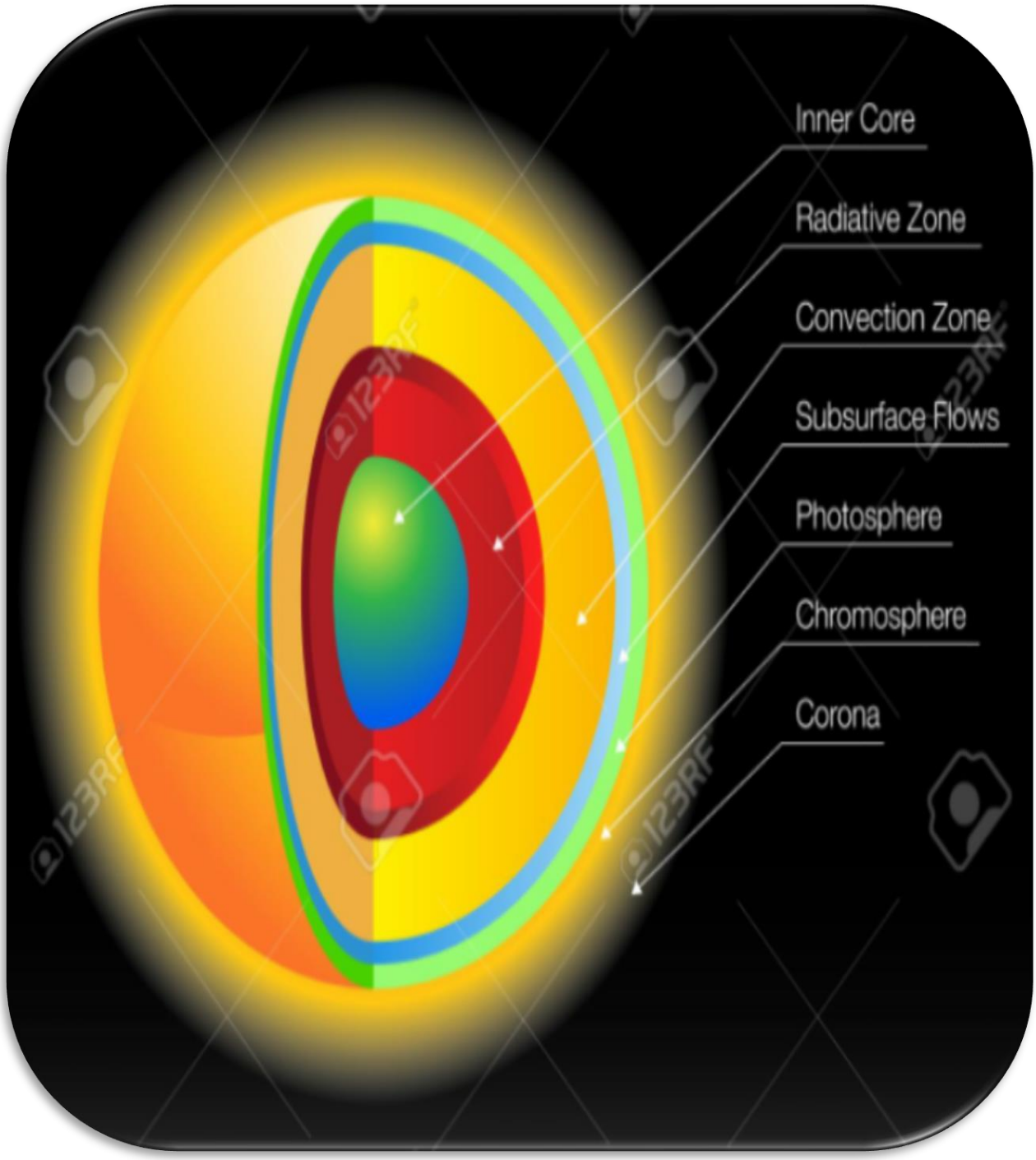
    Ans: Photosphere.

    NOTE: the part of the sun that we can see is known as the photosphere. The outer most part of the Sun, which is visible only at the time of the eclipse is known as corona.

12. Which part of the sun is visible at the time of Eclipse?

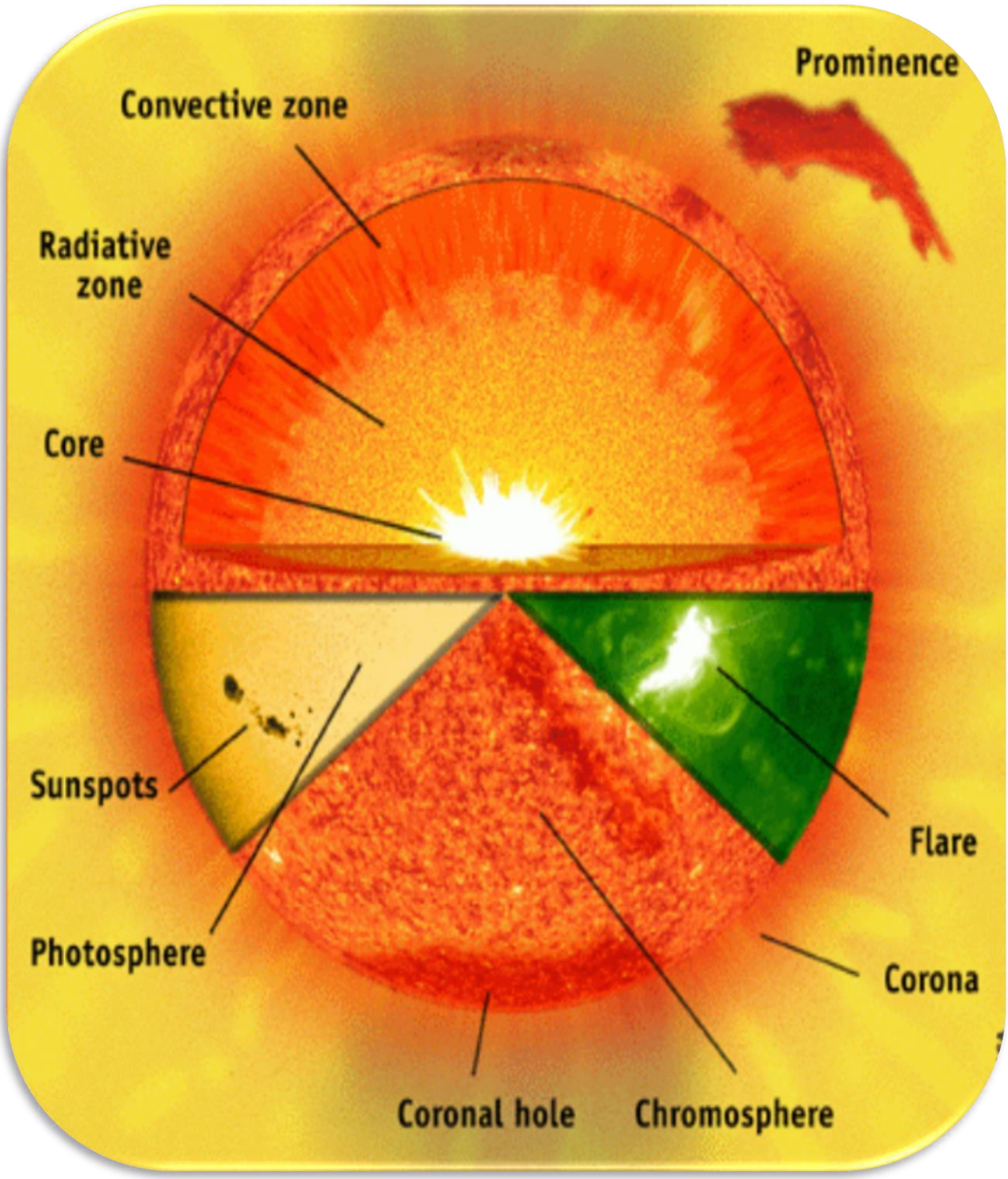
    Ans: Corona

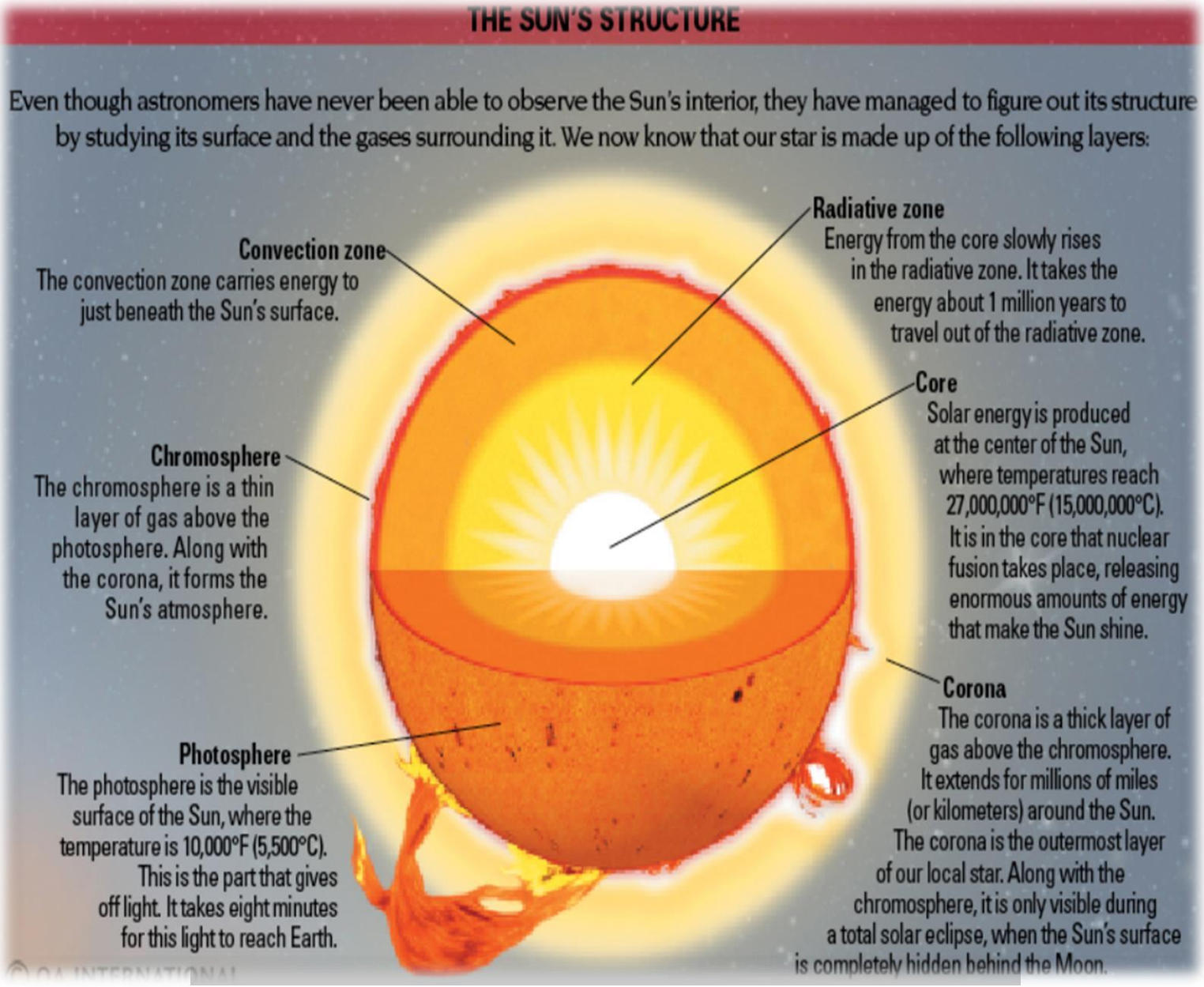
If there is no sun the colour of the sky would be black. Hydrogen is the most predominant gas in the sun.



Sun is made up of gases and has its own heat and light, it is known as a star.

Sun is 150 million KM away from the earth.





13. What is the time taken by the light of the sun to reach the Earth?
    Ans: 8 minutes 18 seconds

14. Jupiter is the largest planet in size amongst all the planet.

15. Mercury is the planet which takes the shortest revolution.

16. Which planet in the solar system has the highest density?
    Ans: **Earth**

17. Shape of the earth is **Geoid.**

18. Distance of earth from moon is **384,000 km.**

19. Deepest point of the earth is: **Mariana Trench (11,034 m** deep from the mean sea level).

20. The moon is a celestial body that revolve around the Earth and is the only natural satellite.

21. **Jovial planets**: Jovial Planets are also called as **' giant planets'** because their structures are similar to the Jupiter.

22. Which planet appears to be yellowish?

Ans: **Saturn**

23. What is the gap between the orbit of mars and Jupiter called?
Ans: Asteroids

24. Stars appear to move from East to West.

25. The tilt of the earth is responsible for change of seasons.

26. The Pole Star is a North Star.

27. The moon moves around the earth in about **27 days.**

28. The moon takes **27 days** to complete one spin.

29. Mercury takes **minimum time for one orbit** around the sun.

30. Liquid Water cannot exist on the surface of the Mars due to **low atmospheric** pressure.

31. Approximate age of the earth is **4.5 billion years.**

32. Eratosthenes coined the term 'Geography' for the first time.

33. Jupiter has a giant storm called the **"Great Red Storm"**.

34. Mars is the planet whose length of the days and tilt of its axis are almost identical to those of the earth.

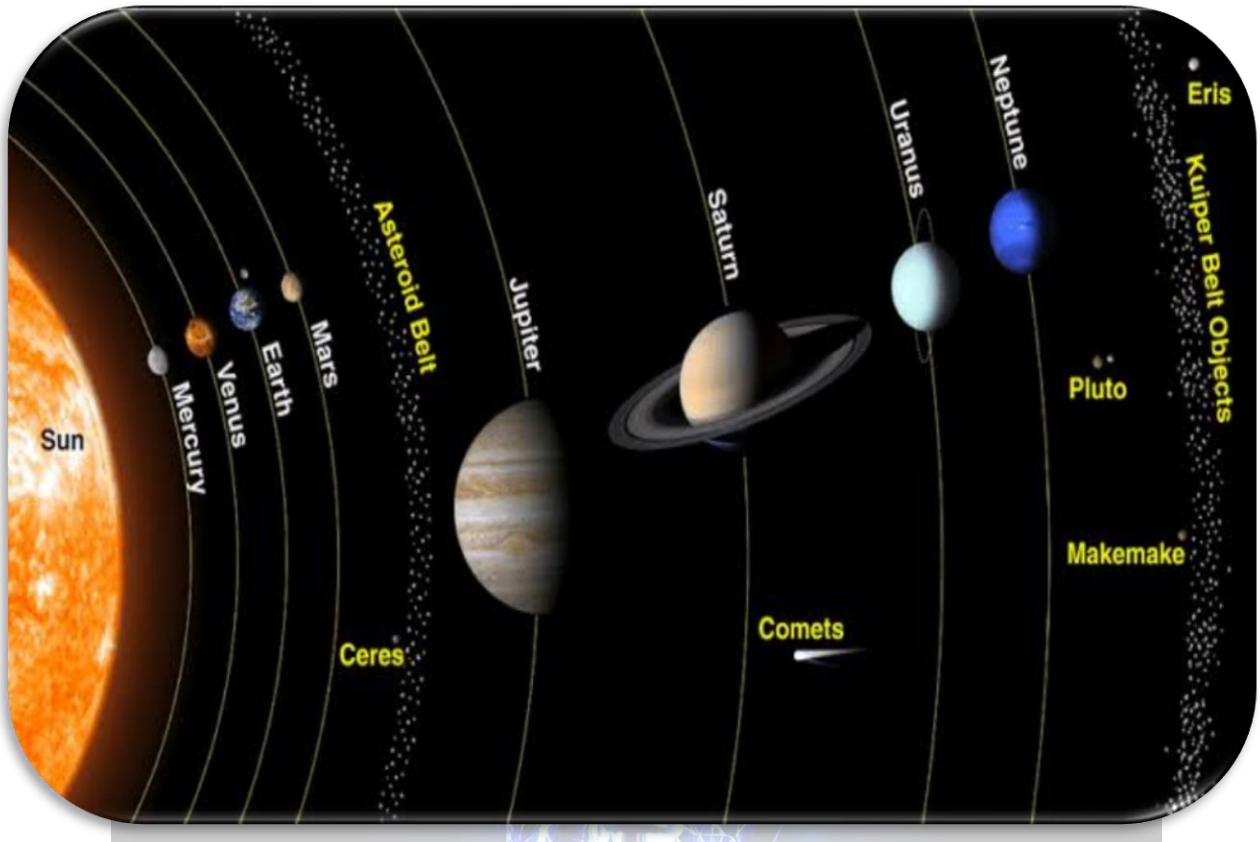
35. In **1632, Galileo Galilei** discovered that the earth revolves around the Sun.

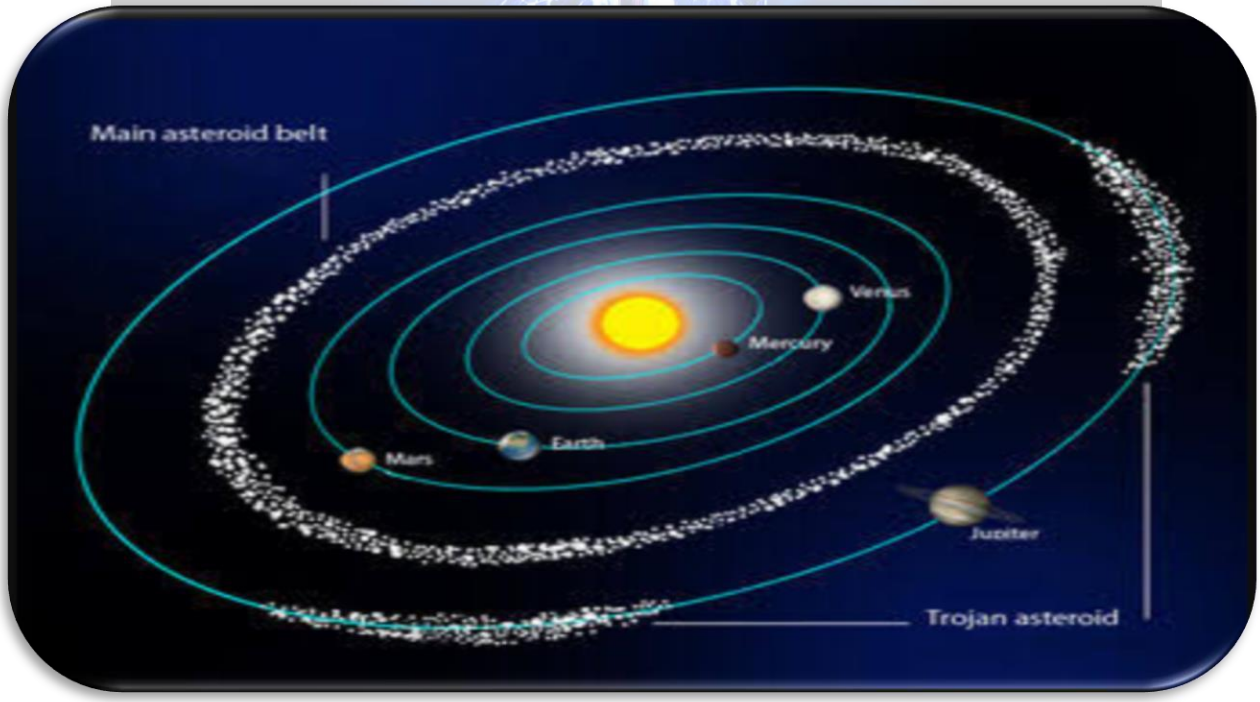
36. The exact time taken by the Earth for single rotation on its own axis is **23 hrs 56 minues 4.09 seconds.**

37. While Venus is seen only for one to two hours either after sunset or before sunrise. Jupiter is seen for the whole night whenever it is visible in the sky because the orbit of the Venus is inside the earth's orbit whereas the orbit of Jupiter lies outside the orbit of the earth.

38. The earth is the **densest** of all the planets in our solar system.

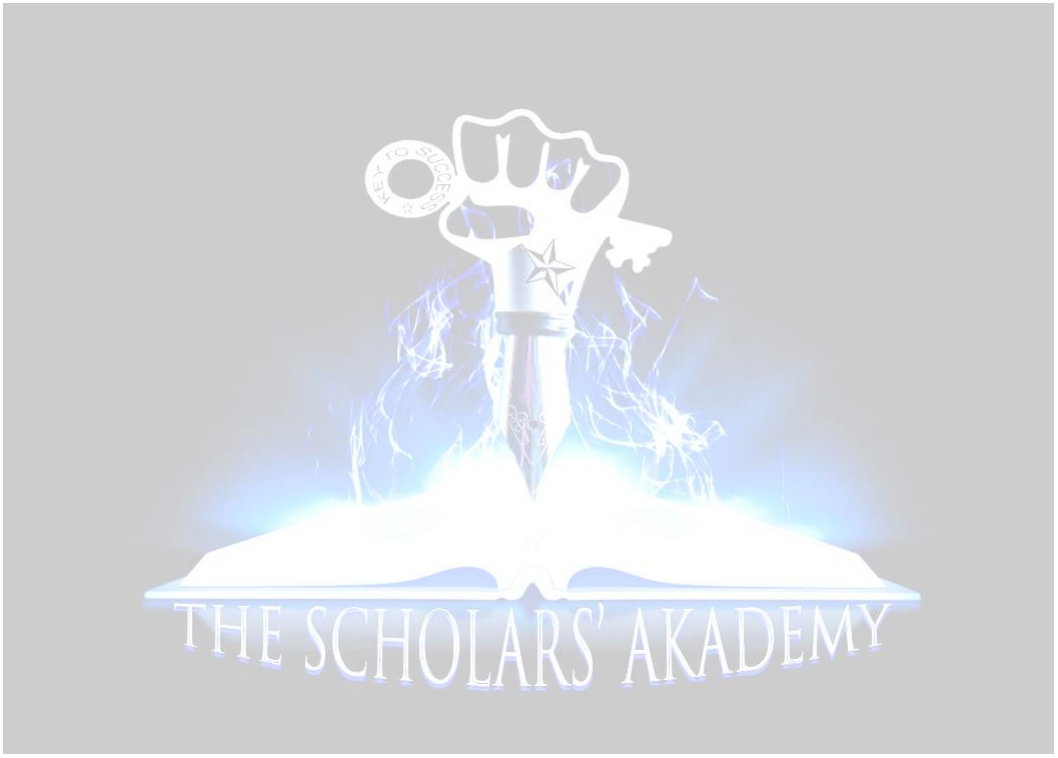
39. **Ceres** is the **largest asteroid** present in the Asteroid belt of the Solar System.



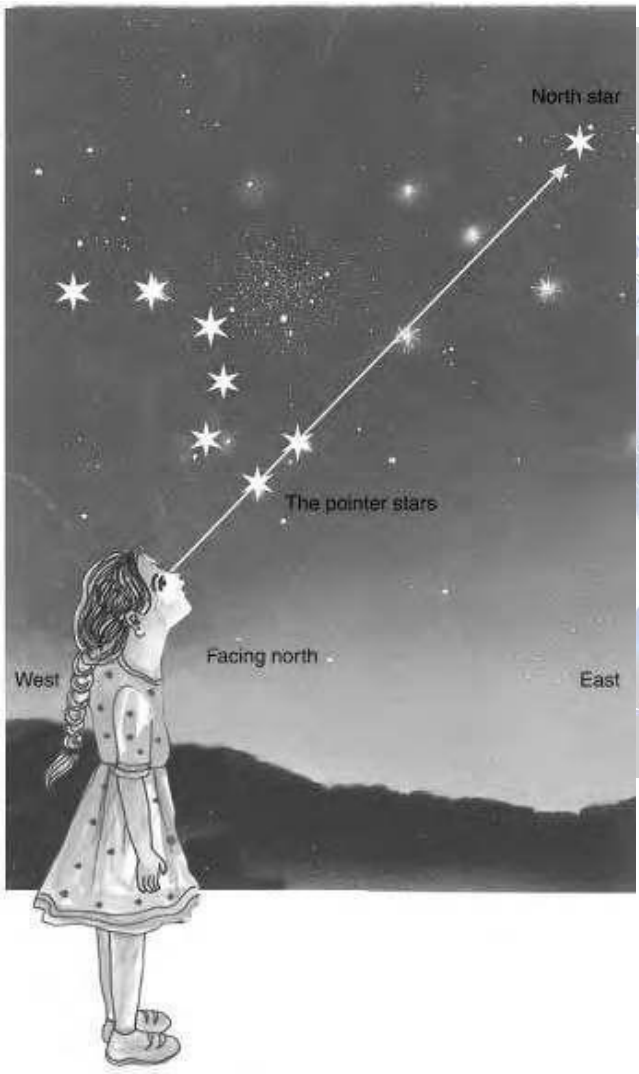


40. **Sunspots:** these are the irregular dark patches on the photosphere of the sun resulting from a localized fall in the temperature to about 4000K.

41. The milky way galaxy is a **spiral galaxy** and the solar system resides in one of its **spiral arms.**



asteroid



MOON FACTS

1. The Moon is Earth's only **natural satellite** with its onequarter the diameter of Earth.
2. Moon is the fifth largest satellite in the solar System and is larger than any dwarf planet.
3. Its distance from the Earth is 384,400 km or about 30 times earth's diameter., also known as Lunar Distance.
4. Its surface gravity is about one sixth of Earth's. on contrary Jupiter's moon Io is the only satellite in the Solar System known to have a higher surface gravity and density.
5. Luna, Selene (poetic) and Cynthia (Poetic) are the alternative names to Moon.
6. Moon appears so big as it is nearer to our planet than other celestial bodies.
7. The Moon does not have conditions favorable for life. It has neither water nor air. It has mountains.
8. **Neil Armstrong** was the first man to step on the surface of the moon on **29th July 1969.**

9. Neil Armstrong, accompanied by ***Edwin Aldrin (Pilot) and Michael Collings*** (who stayed behind in orbit as command module pilot, on **Apollo 11.**

10. Moon is the 2nd densest satellite among those whose densities are known anyway. The first densest is Jupiter's satellite **Io.**

11. **Moon does not have its own light.**

12. From earth, both the Sun and the Moon look about same size. This is because, the Moon is 400 times smaller than the Sun, but also 400 times closer to Earth.

13. The moon is **drifting away approximately 3.8 cm** away from our planet every year.

14. Moons gravitational force makes the earth move as well as tides, similarly the gravitational force of the earth cause influence of quakes rather moonquakes but not the earthquakes.

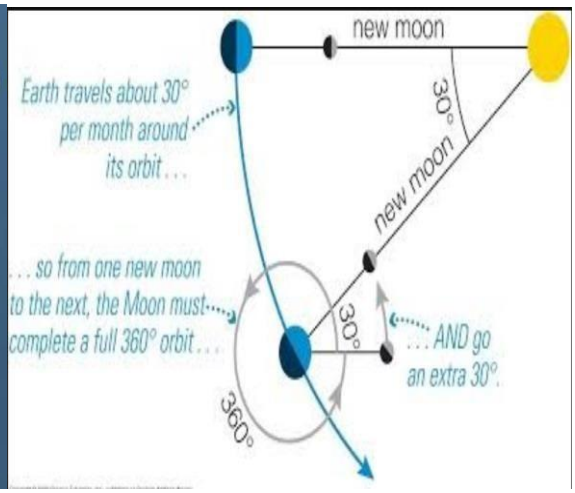
15. Unlike quakes on Earth that last only a few minutes at most, moonquakes can last up to half an hour.

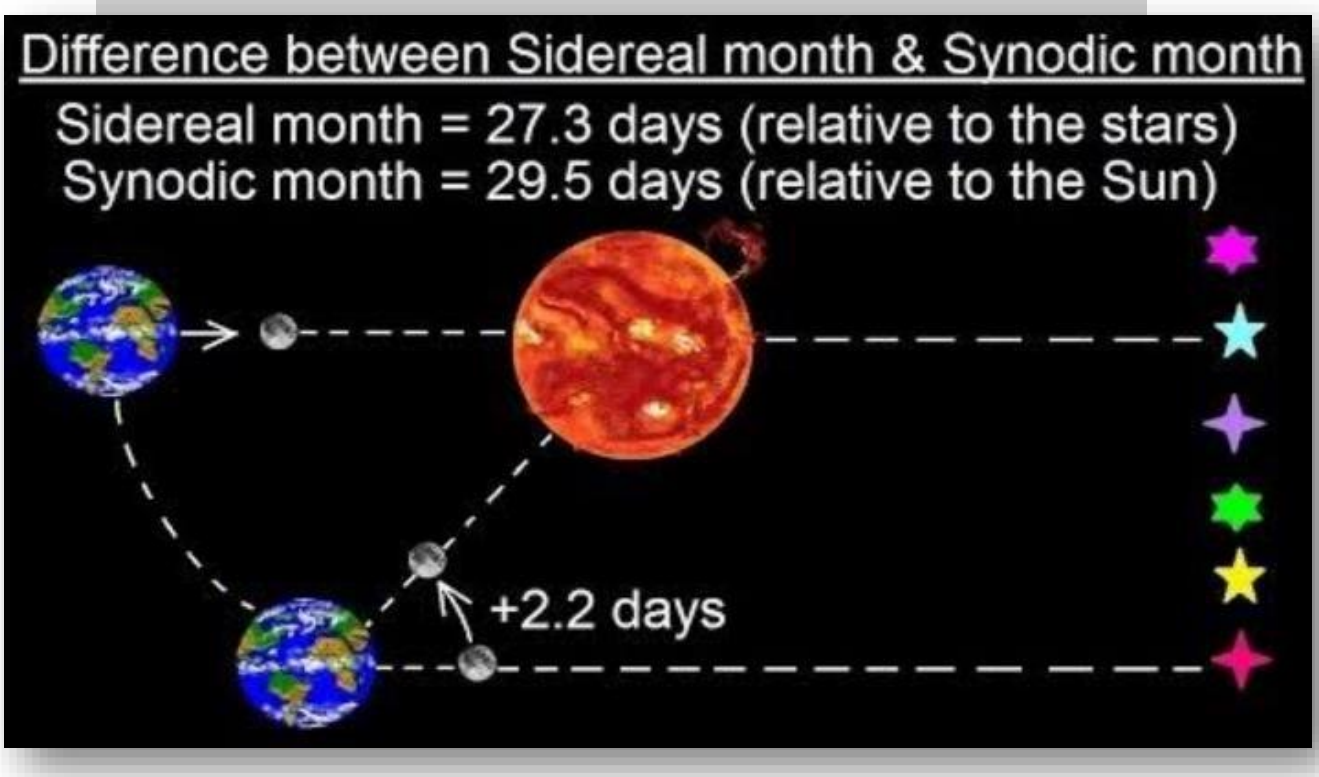
16. On April **2nd 1984, Indian Air force pilot Rakesh Sharma** made history by becoming the first Indian to travel to Space.

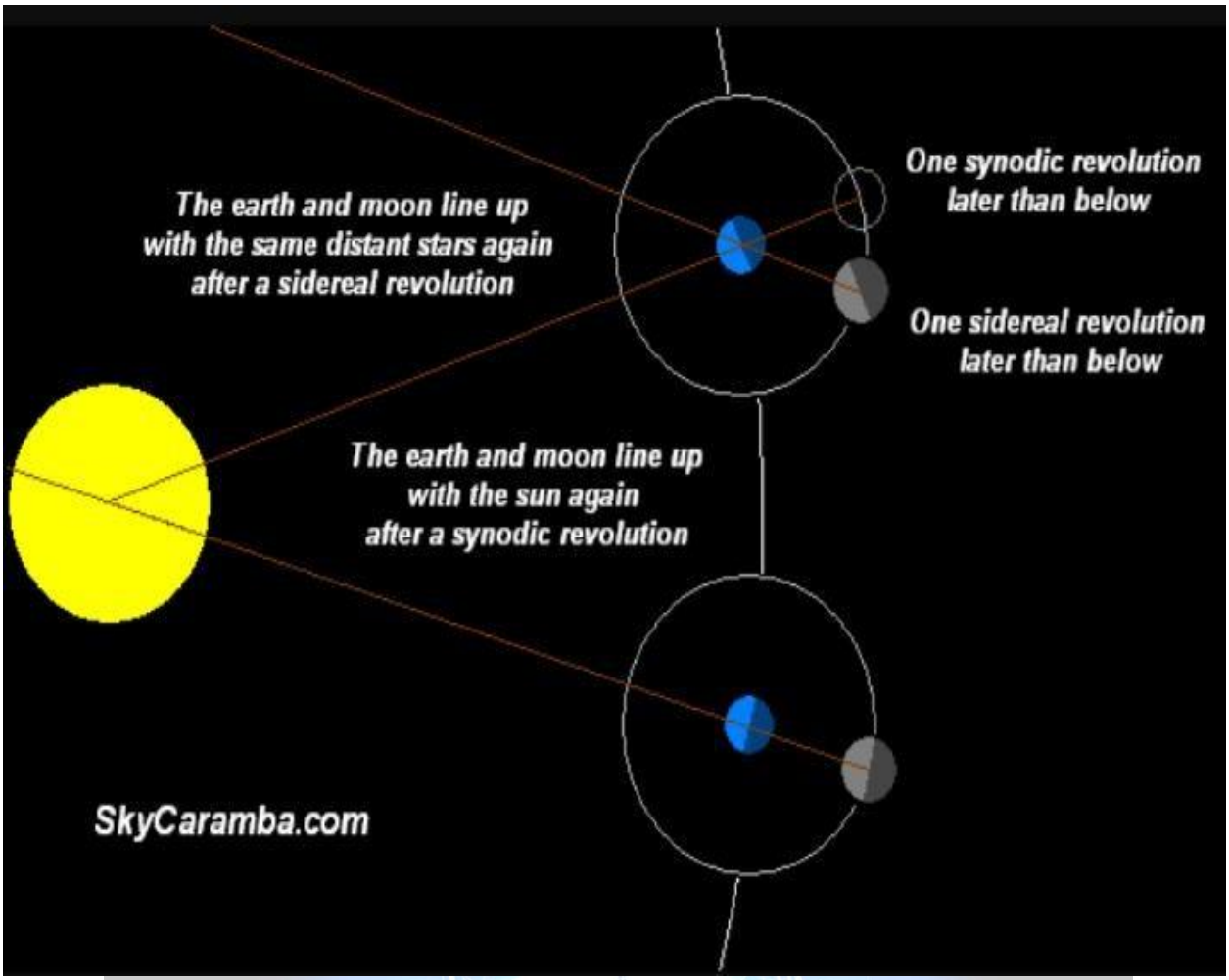
Sidereal period and Synodic Period:

The Moon's orbit around the Earth has a sidereal period of 27.3 days, and a synodic period of 29.5 days.


lunar day = 24 hours 49 minutes
moon
sidereal month
synodic month
360° orbital revolution
full moon to full moon
27.3 days
29.5 days


new moon
Earth travels about 30° per month around its orbit…
30°
new moon
… so from one new moon to the next, the Moon must complete a full 360° orbit…
30°
… AND go an extra 30°.
360°

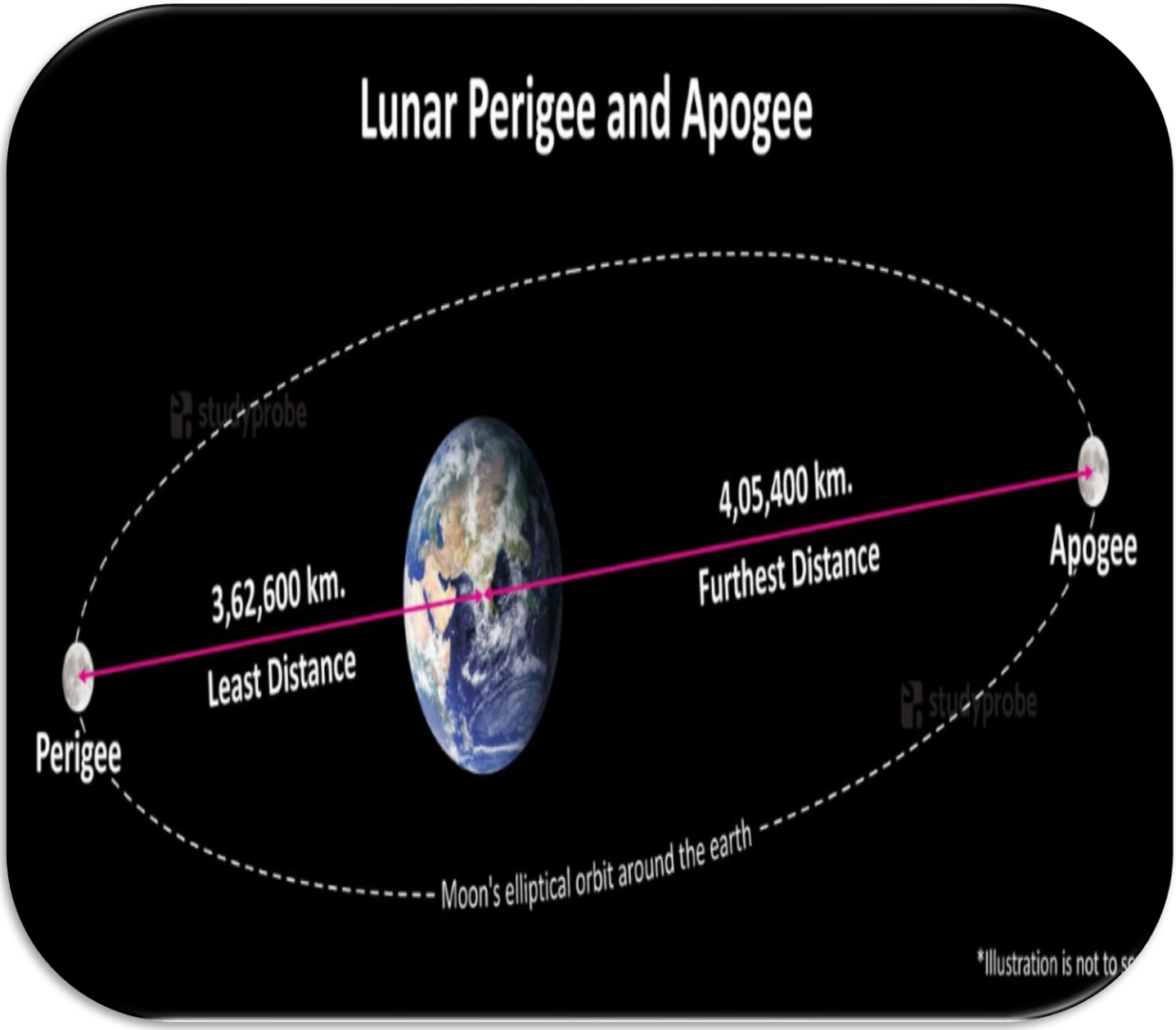

Difference between Sidereal month & Synodic month
Sidereal month = 27.3 days (relative to the stars)
Synodic month = 29.5 days (relative to the Sun)
+2.2 days



What is Perigee and Apogee?

While orbiting elliptically, Perigee is the condition when Moon is closest (least distance) from the earth.

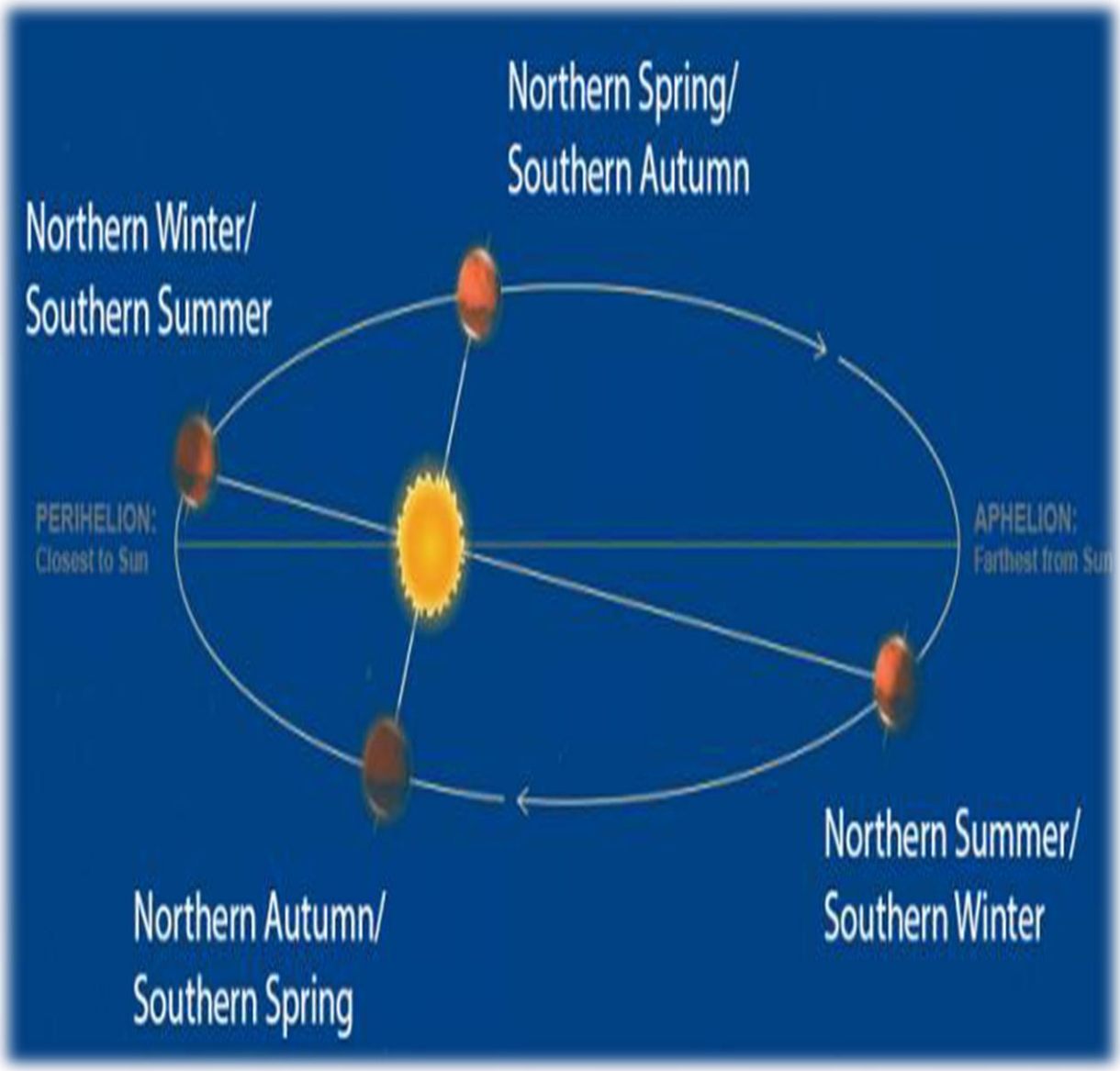
Apogee is the condition when Moon is farthest (max distance from the earth.

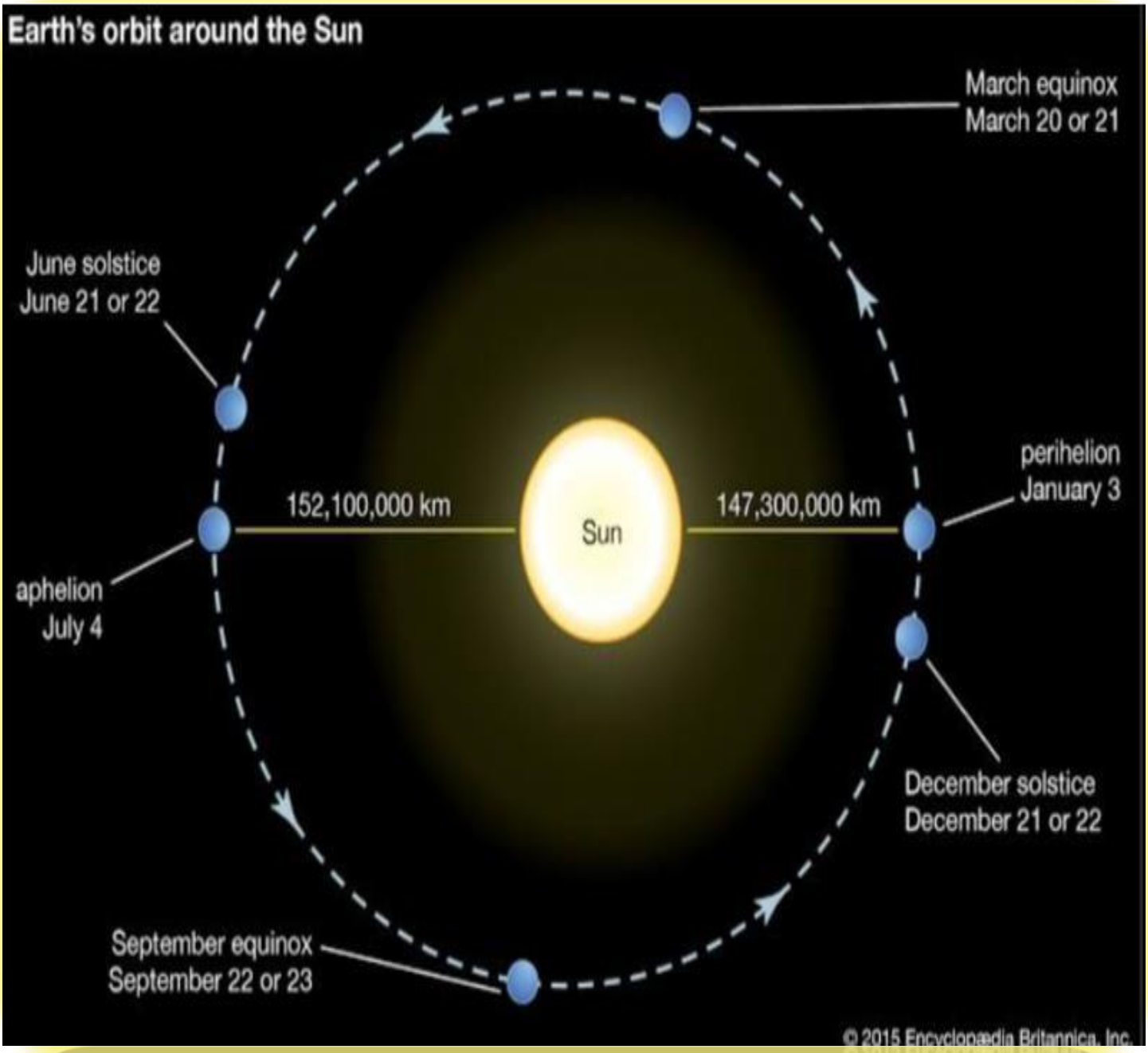


What is Perihelion and Aphelion?

Perihelion: While orbiting around the Sun, when Earth is at least distance or closest to the Sun is called Perihelion. Perihelion occurs on 3rd of January.

Aphelion: when Earth goes farthest from the Sun is called as Aphelion. Aphelion occurs on 4th July.




Earth's orbit around the Sun
March equinox
March 20 or 21
June solstice
June 21 or 22
perihelion
January 3
152,100,000 km
Sun
147,300,000 km
aphelion
July 4
December solstice
December 21 or 22
September equinox
September 22 or 23
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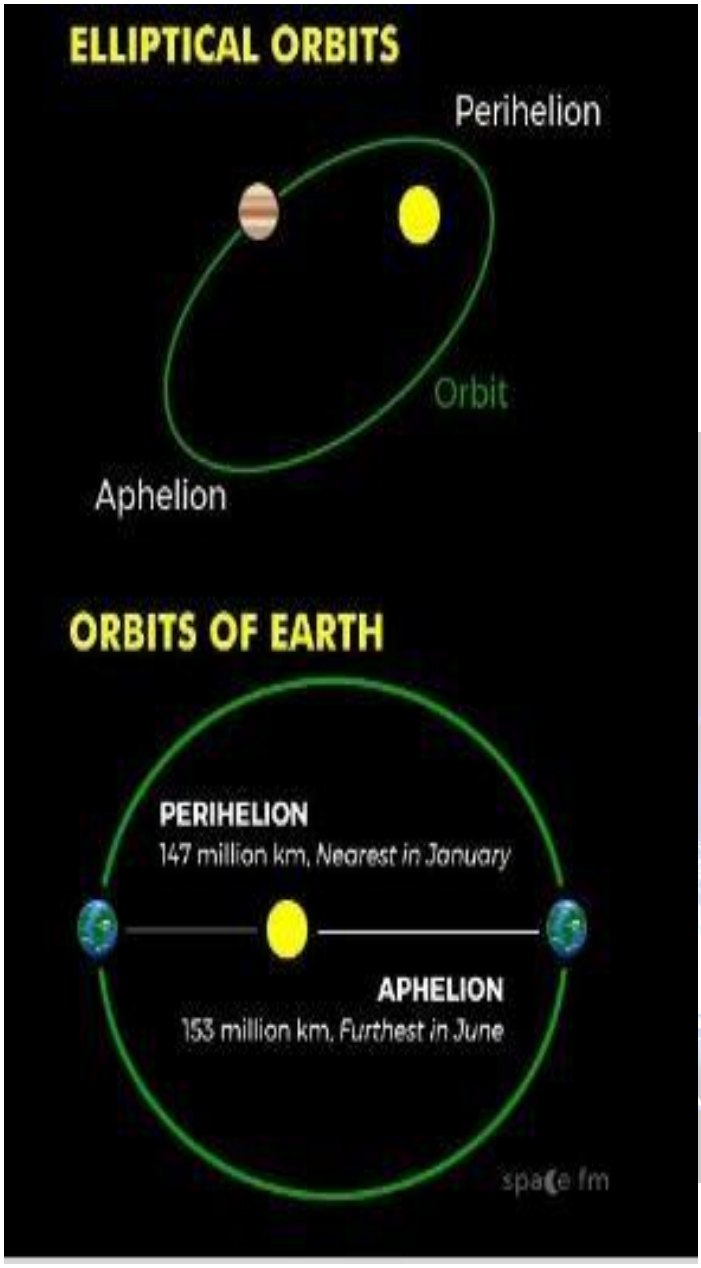
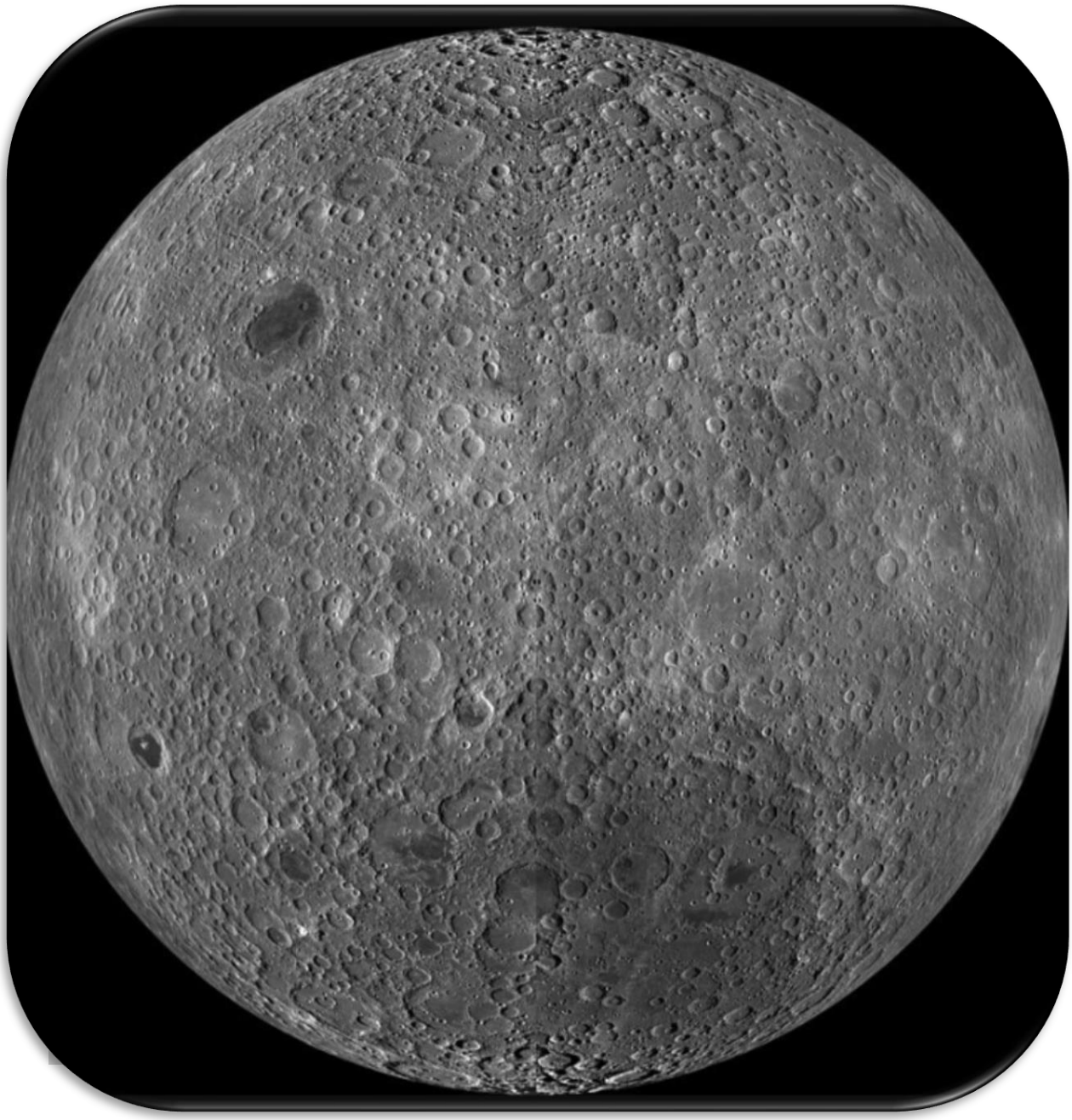
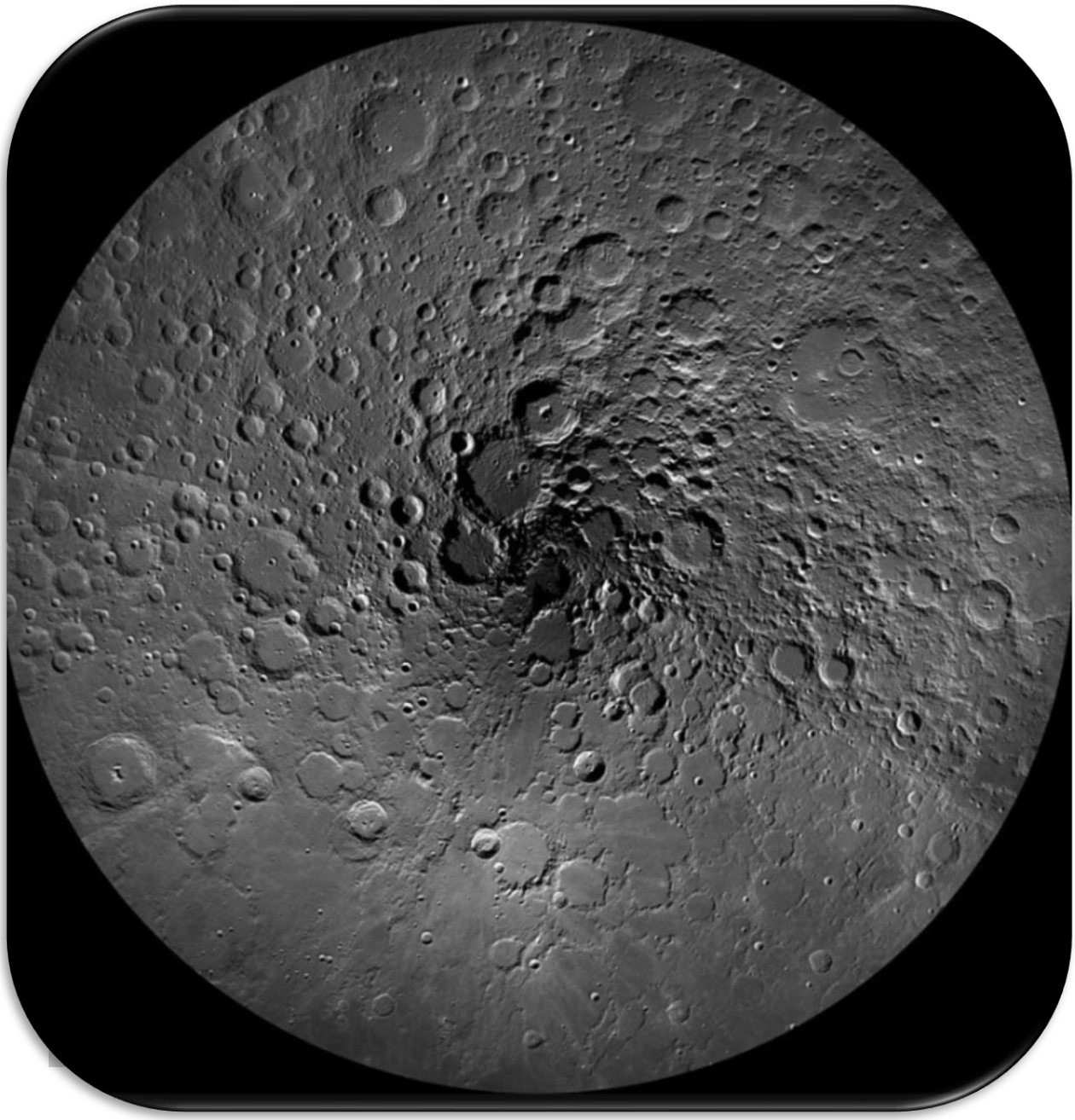

ELLIPTICAL ORBITS
Perihelion
Orbit
Aphelion
ORBITS OF EARTH
PERIHELION
147 million km, Nearest in January
APHELION
153 million km, Furthest in June
space fm

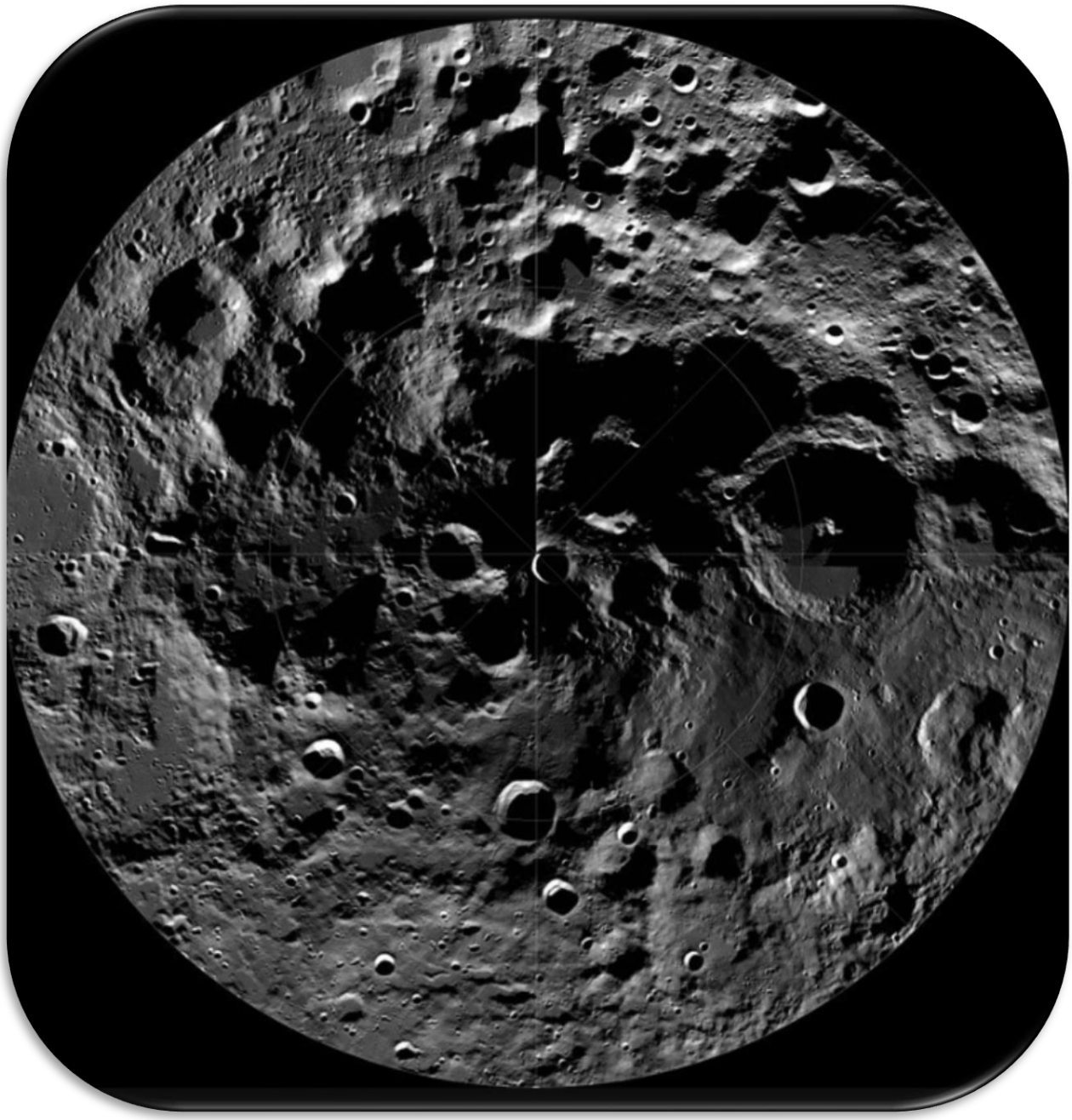


Far Side of the moon

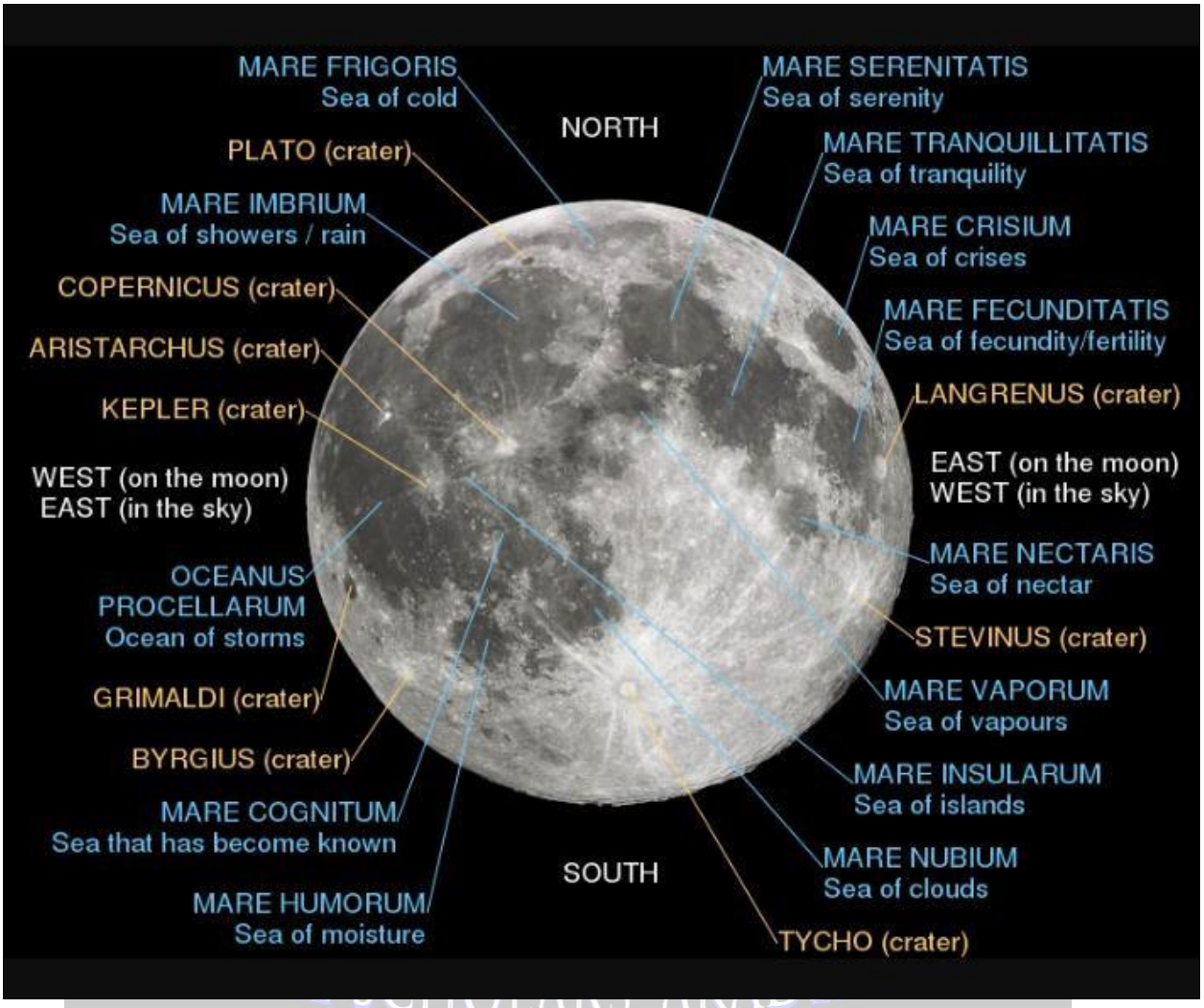
near side of moon



Lunar North Pole



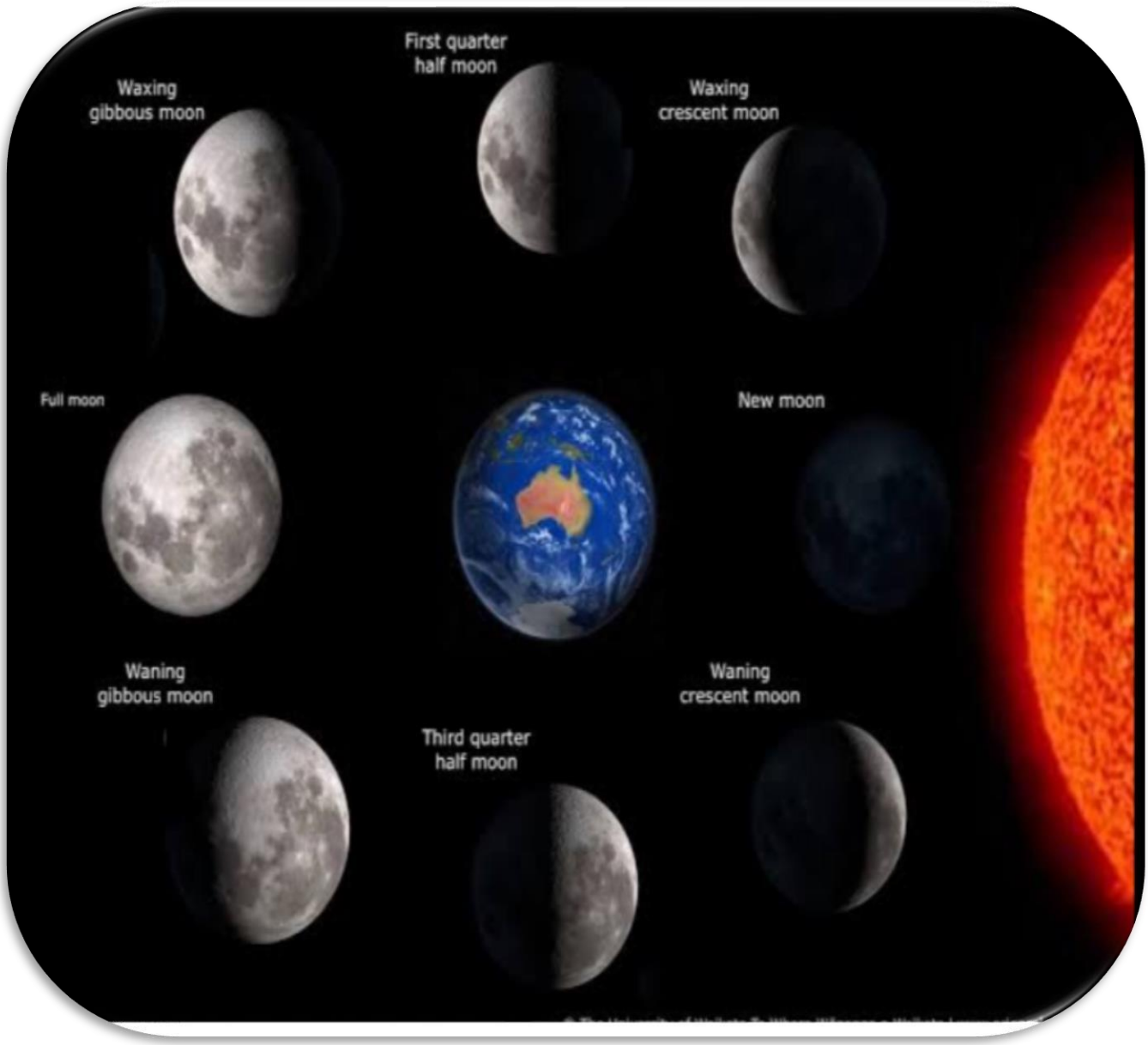
Lunar South Pole



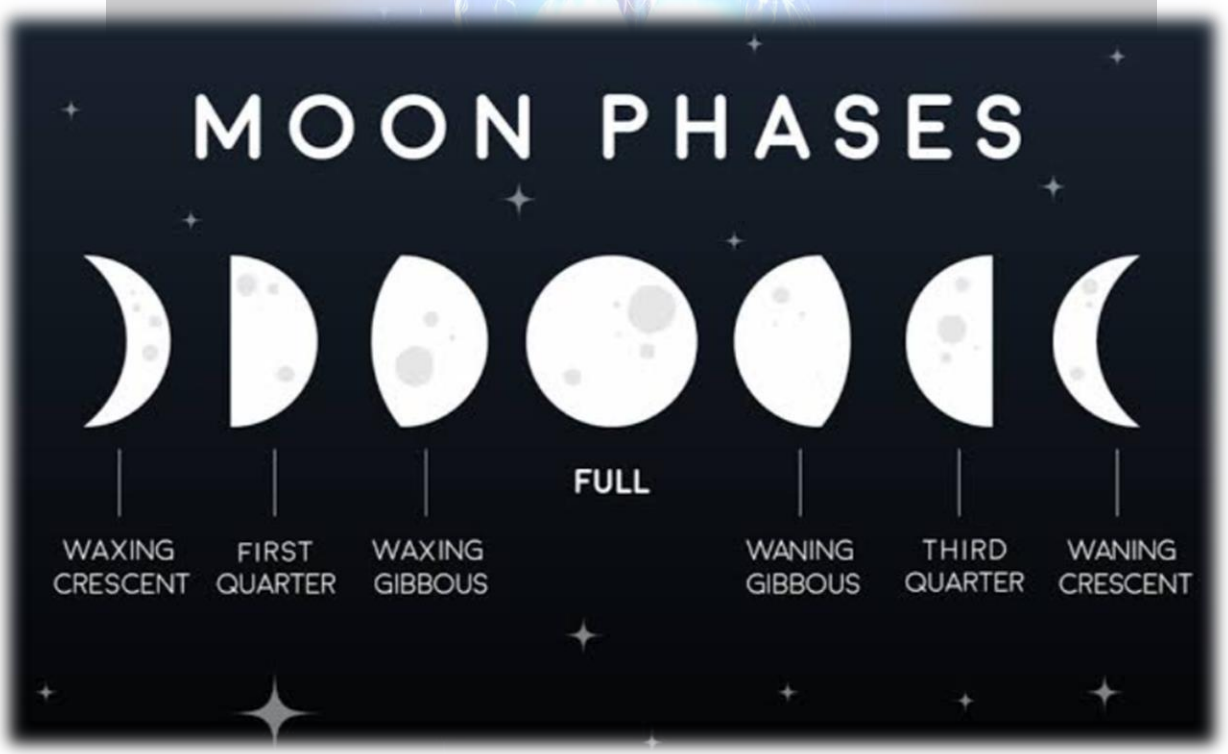
Phases of the moon

You may have noticed the Moon appears to change shape each night. Some nights, the Moon might look like a narrow crescent. Other nights, the moon might look like a bright circle. And on other nights, you might

not be able to see the moon at all. The different shapes of the moon that we see at different times of the month are called the Moon's phases.




NEW
YOUNG
WAXING CRESCENT
WAXING QUARTER
WAXING GIBBOUS
FULL
WANING GIBBOUS
WANING QUARTER
WANING CRESCENT
OLD


MOON PHASES
WAXING CRESCENT
FIRST QUARTER
WAXING GIBBOUS
FULL
WANING GIBBOUS
THIRD QUARTER
WANING CRESCENT

We have a slightly different view of the Moon each night. We describe how the Moon looks with the eight Mon phases, or shapes:

New: We cannot see the Moon when it is a new moon.

Waxing Crescent: In the Northern Hemisphere, we see the waxing crescent phase as a thin crescent of light on the right.

First Quarter: We see the first quarter phase as a half moon.

Waxing Gibbous: The waxing gibbous phase is between a half moon and full moon. Waxing means it is getting bigger.

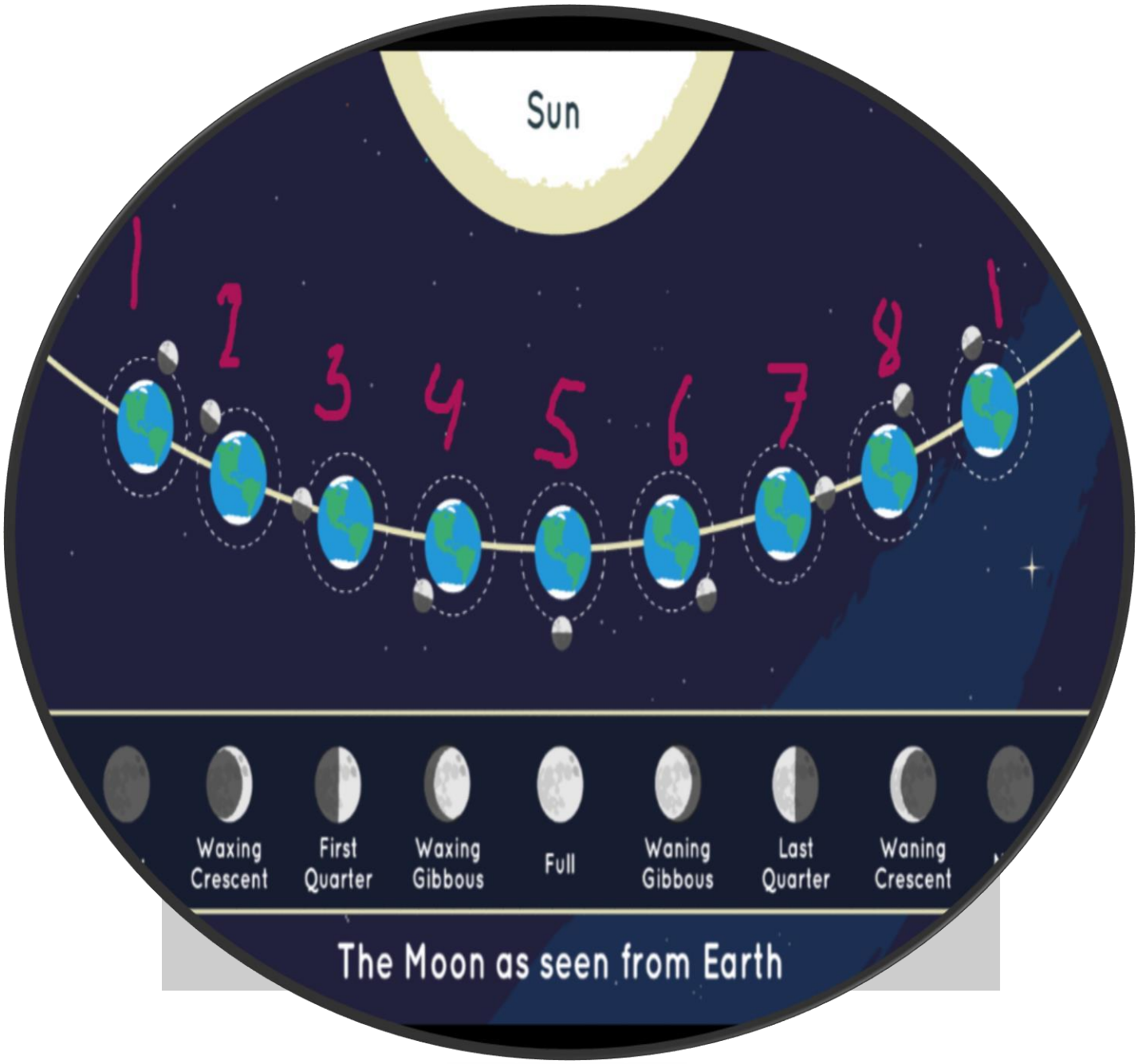
Full: We can see the Moon completely illuminated during full moons.

Waning Gibbous: The waning gibbous phase is between a half moon and full moon. Waning means it is getting smaller.

🌓 **Third Quarter**: We see the third quarter moon as a half moon, too. It is the opposite half as illuminated in the first quarter moon.

🌘 **Waning Crescent**: In the Northern Hemisphere, we see the waning crescent phase as a thin crescent of light on the left.

The Moon displays these eight phases one after the other as it moves through its cycle each month. It takes 27 days for the Moon to orbit Earth. That means the Moon's cycle is 27 days long.


Sun
1
2
3
4
5
6
7
8
1
Waxing Crescent
First Quarter
Waxing Gibbous
Full
Waning Gibbous
Last Quarter
Waning Crescent
The Moon as seen from Earth

The moon is covered by craters as well as dust and debris from comets, asteroids and meteoroid impacts.

The Moon's dark areas, called Maria – which is Latin for seas – are not actually seas. Instead, they are craters that lava seeped into billions of years ago.

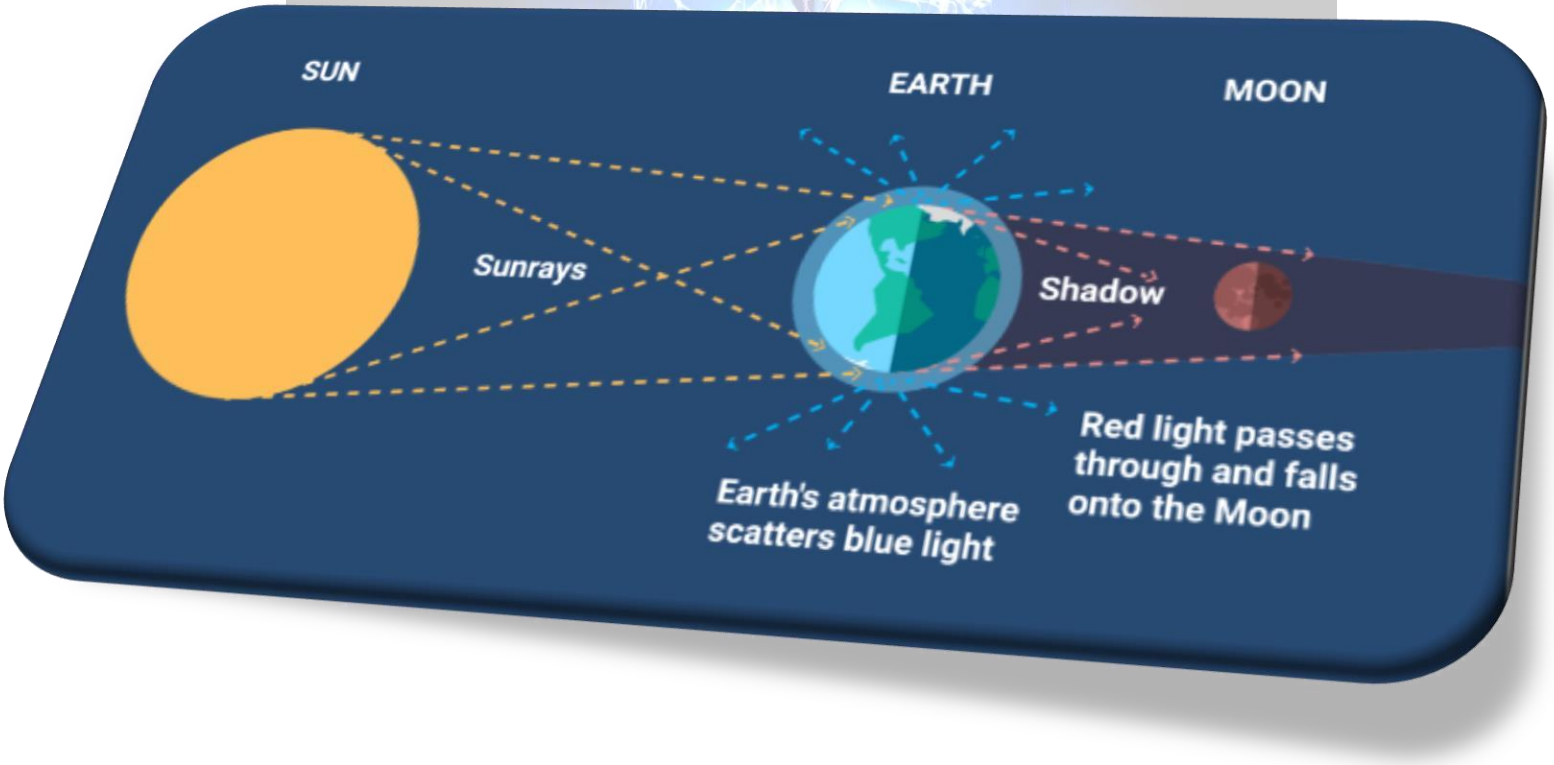
Types of full moons:

A full moon occurs when the side of the Moon facing Earth is fully lit up by te Sun. There are a few different types of unusual full moon types, which include blood moons, supermoons, blue moons, and harvest moons, and others.

Blood Moon:

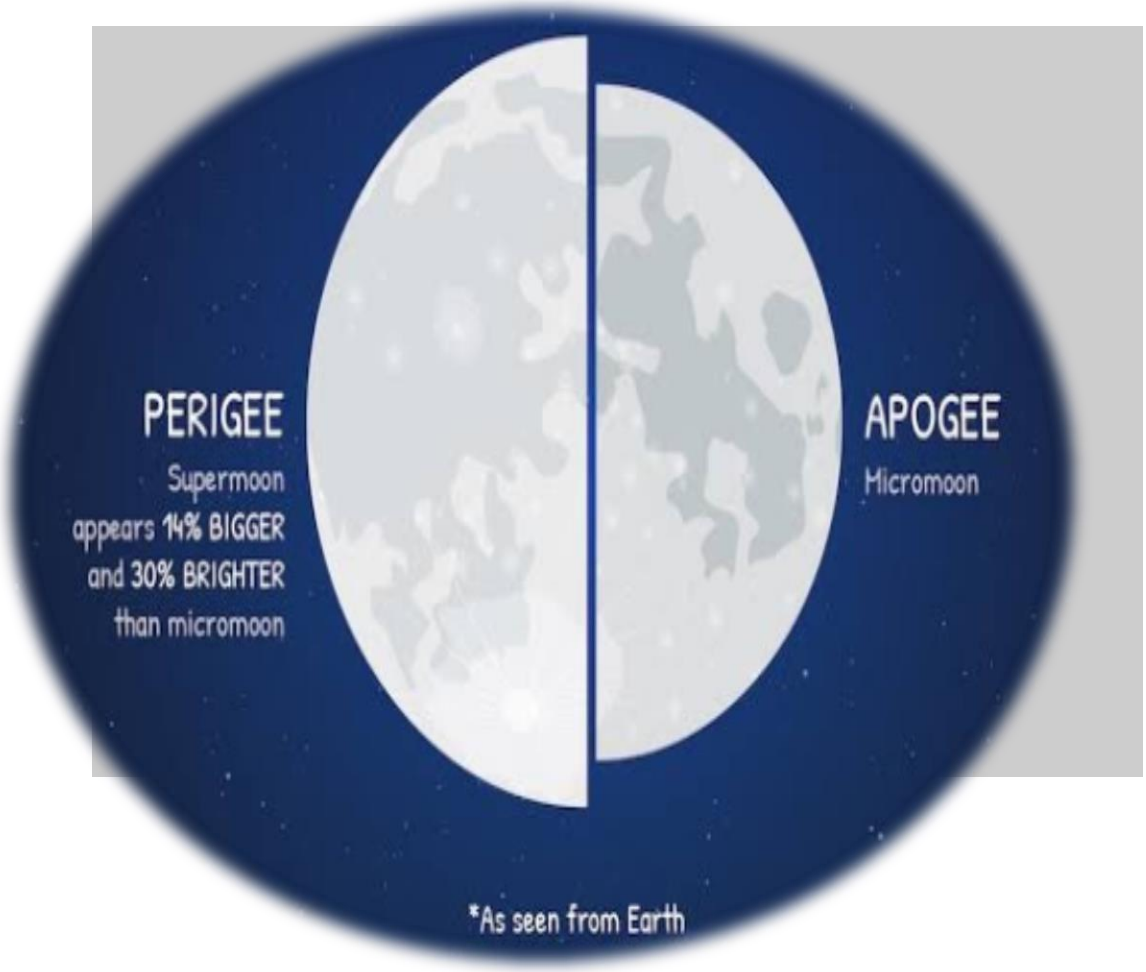
One meaning of a "Blood Moon" is based on its red glow. This Blood moon occurs during a total lunar eclipse, Earth lines up between the Moon and the Sun. This hides the Moon from the sunlight.

When this happens, the only light that reaches the Moon's surface is from the edges of the Earth's atmosphere scatter out most of the blue light. The remaining light reflects onto the Moon's surface with a red glow, making the Moon appear red in the night sky.



Super Moon:

A “Supermoon” appears to us as larger -than usual Moon in our night sky. A supermoon looks larger just because it’s a bit closer to Earth. “Supermoon” is actually just a nickname for what astronomers call a perigean full moon – a moon that is full and at its closest point in its orbit around Earth.



Blue Moon:

Blue moon is a rare phenomenon when you hear someone say, “once in a blue moon …. It means they are talking about something rare. A blue moon is not blue in color. In fact, a blue moon does it look any different than a regular, monthly full mon.

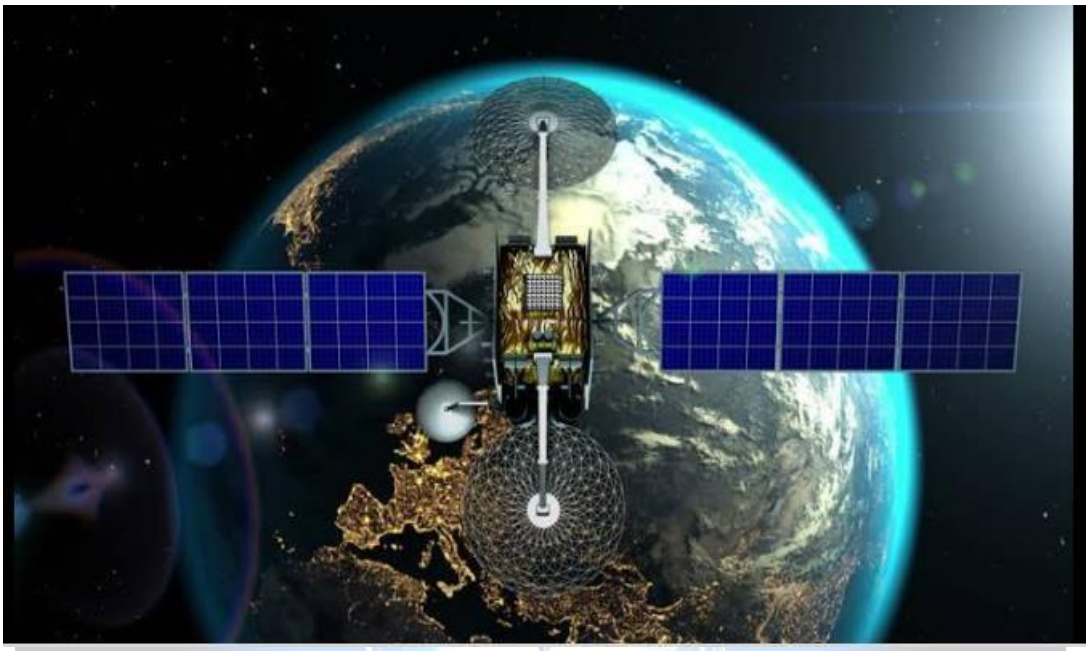
Rather, a blue moon is special because it is the ‘extra’ Moon in a season with four full moons. This usually only happens every two – and – a half hears.

Since the 1940s, the term “blue moon’ has also been used for the second full moon in a calendar month. This usually happens only every two – and -a half year.

Harvest Moon

The Term “Harvest Moon” refers to the full, bright Moon that occurs closest to the start of autumn. The name dates from the time before electricity, when farmers depended on the Moon’s light to harvest their crops late into the night. The Moon’s light was particularly important during fall, when harvests are the largest.

What is a Satellite?



1) An object orbiting around the Sun, earth or any other colossal body is known as a satellite.

2) There are two major types of categorization when it comes down to satellites, one is natural and the other is manmade.

3) Moon is one permanent natural satellite, the moon we know, which causes the tides in the sea.

4) Sometimes other objects like asteroids can enter into temporary orbits of the earth and become a natural satellite for a span.

5) Apart from these, the earth has many man-made satellites that are placed in the orbit and are used for different applications in

communications and information gathering. In other words, an artificial satellite is one that is put in our space by human efforts and follows the orbit of natural satellites.

6) Since they have a very large view field, they can collect data a lot faster than instruments that can collect data a lot faster than instruments that can be used at ground level. Apart from this, their view into space beyond earth is not blocked by clouds, dust, and other obscurities, due to which a satellite can view space a lot more efficiently than telescopes on earth.

7) Currently, there are more than 2,500 man-made satellites orbiting the earth.

8) On 4 October 1957 the Soviet Union launched the World's first artificial satellite, Sputnik 1.

9)

Types of Satellites:

There are 9 different types of satellites i.e. Communications Satellite, Remote Sensing Satellite, Navigation Satellite, LEO, MEO, HEO, GPS(Global Positioning System) , GEOs, Drone Satellite, Ground Satellite, Polar Satellite.

Geostationary Satellite: these satellites are placed into orbit at a distance of around 35,800 km from the earth's surface. They rotate in the same direction as the earth and one revolution of such satellites is the same as one day on earth (roughly 24 hours). This means that, as

seen from earth, these satellites will appear to be at the same spot throughout. Hence, the name “geostationary” satellites.
These satellites are used as communication satellites and for weatherbased applications.

Astronomical Satellite: these are used for observation of distant planets, galaxies, and other outer space objects. For example the Hubble Space Telescope.

Biosatellite: these are satellites designed to carry living organisms, generally for scientific experimentation.

Communication Satellites are satellites stationed in space for the purpose of telecommunications. Modern communications satellites typically use geosynchrounus orbit or low earth orbit.

A Communications Satellite is an artificial satellite that relays and amplifies radio telecommunication signals via a transponder; it creates a communication channel between a source transmitter and a receiver at different locations on Earth. Communications satelites are used for **Television, Telephone, Radio, Internent, and military applications**.

Most communications satellites are in geostationary orbit above equator, so that the satellite appears stationary at the same point in the sky; therefore the satellite dish antennas of ground stations can be aimed permanently at that spot and do not have to move to track the sastellite.

Earth observation satellite: intended for non-military uses as environmental monitoring, meteorology, map map making etc or for observing earth.

Navigational sattellite: use radio time signals transmitted to enable mobile receivers on the ground to determine their exact location.

Spaceships/ Crewed Spacecraft: large satellites able to put humans into an orbit, and return them to Earth.

Reconnaissance satellites: these are Earth observation satellite or communications satellite deployed for military or intelligence applications.

Recovry Satellites: used to provide a recovery of reconnaissance, biologivcal, space-production and otr payloads from orbit to Earth.

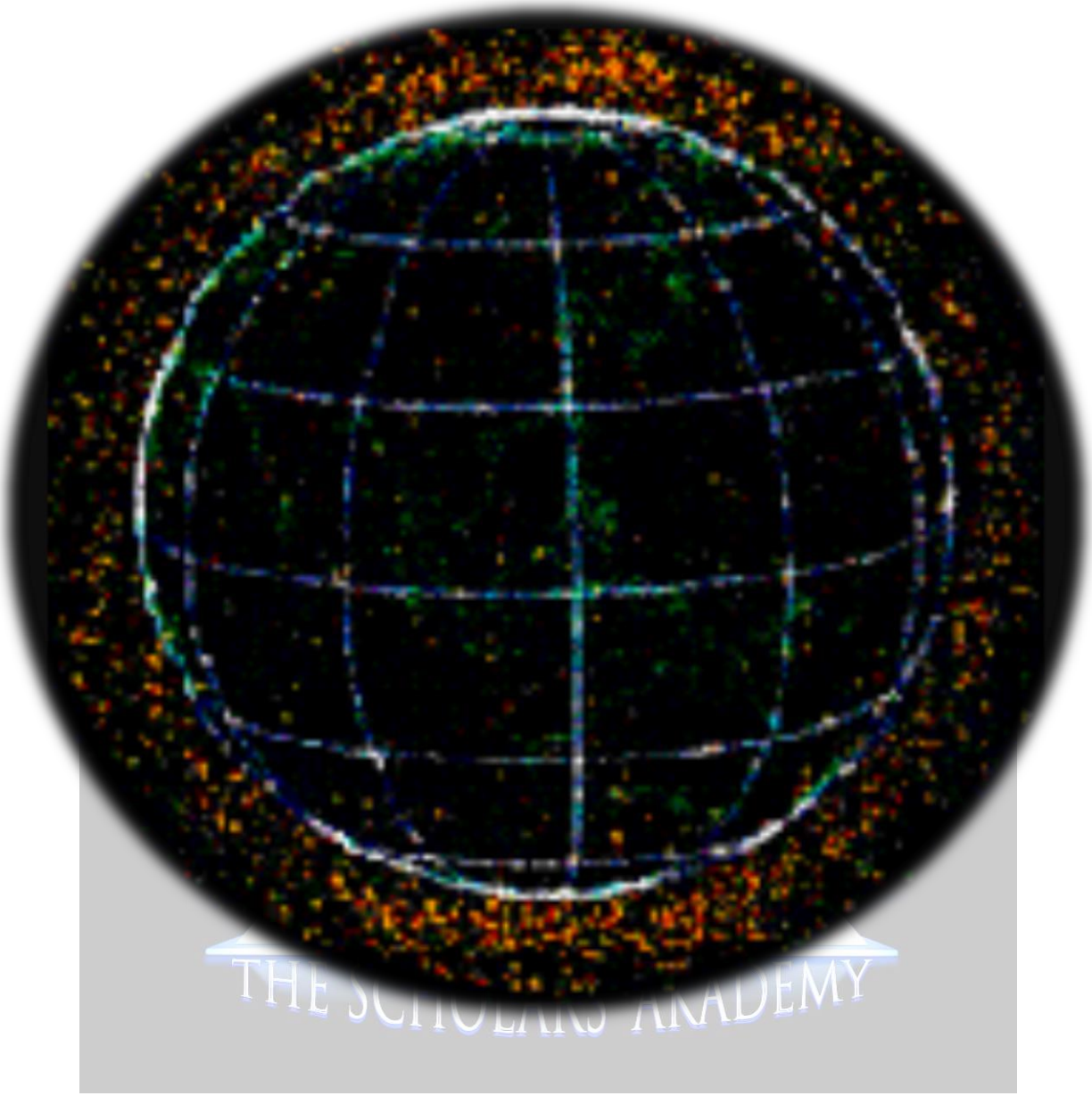
Weather Satellite: are primarily used to monitor Earth's Weather and Climate.

Currently, there are three meterological satellites Kalpana-1, INSAT-3A and INSAT-3D in the geosynchronous orbit from India.

The visible infrared imaging Radiometer Suite (VIIRS) multispectral composite image enhances fog in aqua colors and allows weather forecasters to identify aviation hazards.\

Multispectral composites combine satellite data collected at different wavelenghts of the electromagnetic spectrum and present them as Red-Green-Blue images.

THE SCHOLARS' AKADEMY


THE SCHOLARS ACADEMY

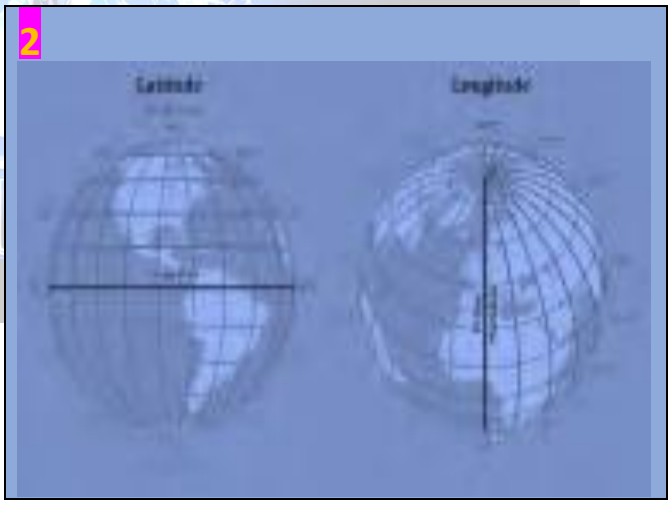
Earth

The earth is the third nearest planet to the Sun. in Size it is the fifth largest planet, it is slightly flattened at the poles, that's why it is described as a Geoid. Geoid means an earth like shape.

Latitudes and Longitudes

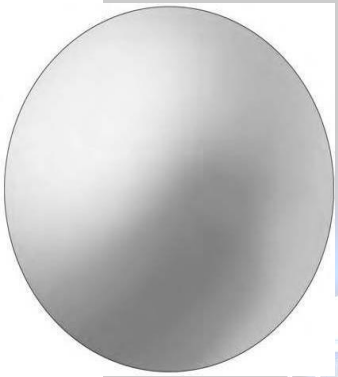
As it is difficult to describe the location of a point on a sphere like the earth, therefore it is needed to draw certain points of references and lines to find out the location of places.

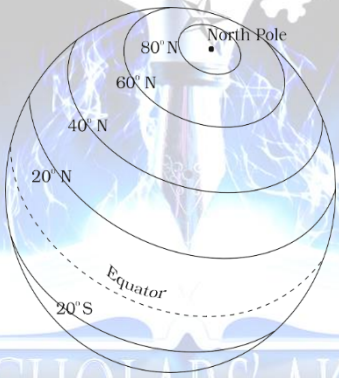
1. **You will notice that a needle is fixed through the globe in a tilted manner, which is called its axis.**



2. **Two points on the globe through which the needle passes are two poles – North Pole and South Pole.**
3. **NOTE: there is no such needle on real earth, it moves around its axis, which is an imaginary line.**

4. **Another imaginary line running on the globe divides it into two equal parts. This line is known as the equator.**
5. **The Northern half of the earth is known as the Northern hemisphere and the Southern half is known as the Southern hemisphere.**
6. **Both hemispheres are equally halves, therefore, the equator is an imaginary circular line and is a very important reference point to locate places on the earth.**
7. **All parallel circles from the equator up to the poles are called parallels of Latitudes.**
8. **All latitudes are always measured in degrees, and the equator represents the zero degree latitude. Since the distance from the equator to either of the poles is one-fourth of a circle round the earth, it will measure 1/4th of 360 degrees, i.e. 90 degree. Thus, 90 degrees north latitude marks the North Pole and 90-degree south latitude marks the South Pole.**



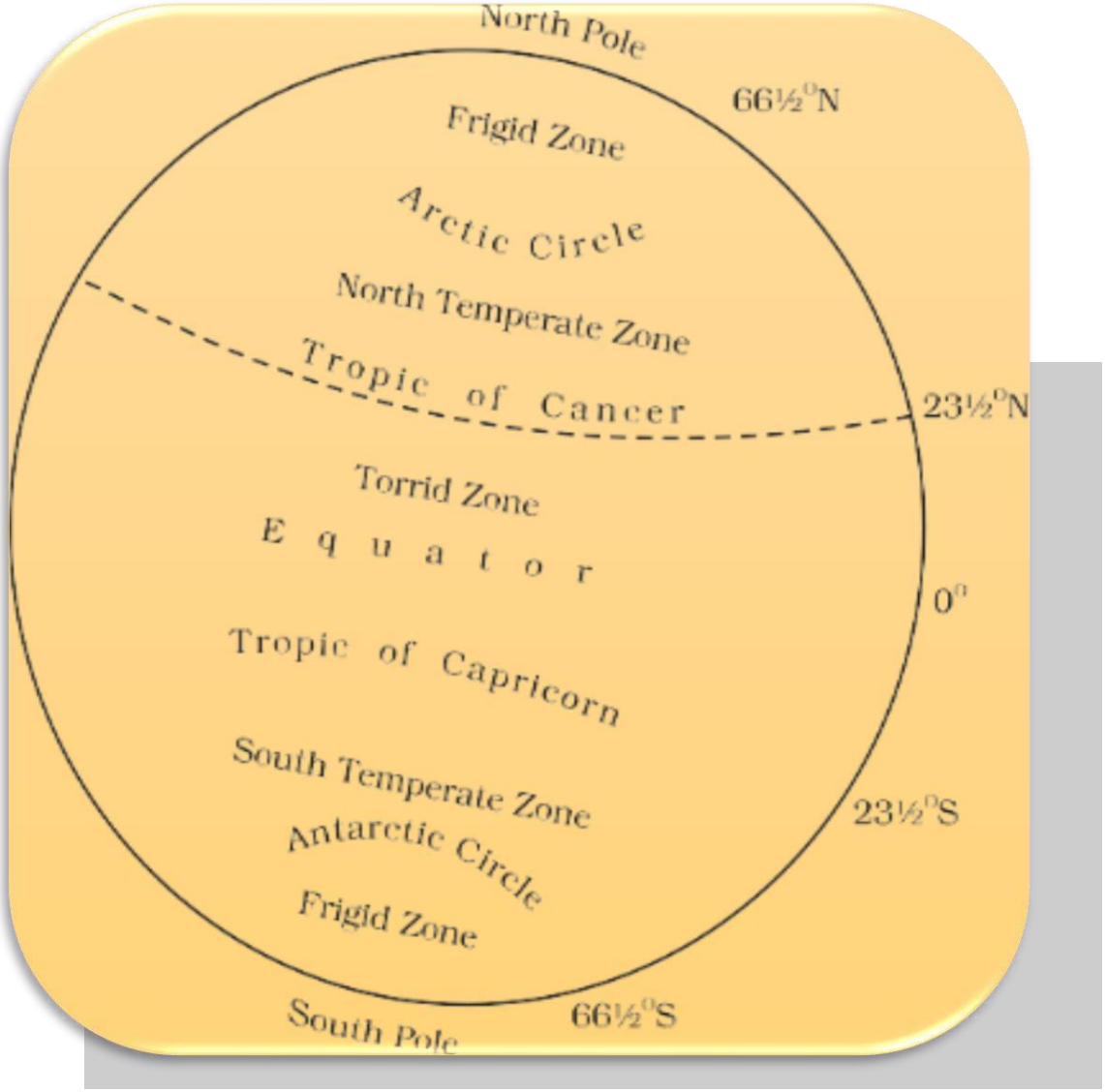


9. **All parallels north of the equator are called north latitudes. Similarly, all parallels south of the equator are called south latitudes.**

Besides the equator (0degree), the North Pole (90 degree) and the South Pole (90 Degree S), there are 4 important parallels of latitudes –

1. **Tropic of Cancer (23 ½ degree N) in the Northern hemisphere.**
2. **Tropic of Capricorn (23 ½ degree S) in the Southern hemisphere.**

3. **Arctic Circle at 66 ½ degree north of the equator.**
4. **Antarctic Circle at 66 ½ degree south of the equator.**



Heat zones of the Earth:

The mid-day sun is exactly overhead at least once a year on all latitudes in between the Tropic of Cancer and the Tropic of Capricorn.

Temperate Zone: **The angle of the Sun's rays goes on decreasing towards the poles. As such, the areas bounded by the Tropic of Cancer and the Arctic Circle in the Northern hemisphere, and the Tropic of Capricorn and the Antarctic Circle in the Southern hemisphere, have moderate temperatures. These are, therefore, called Temperate Zones.**

Frigid Zone: **areas lying between the Arctic Circle and the North pole in the Southern hemisphere, are very cold, it is because here the sun does not rise much above the horizon. Therefore, its rays are always slanting. These are, therefore, called Frigid Zones.**

• What are Longitudes?

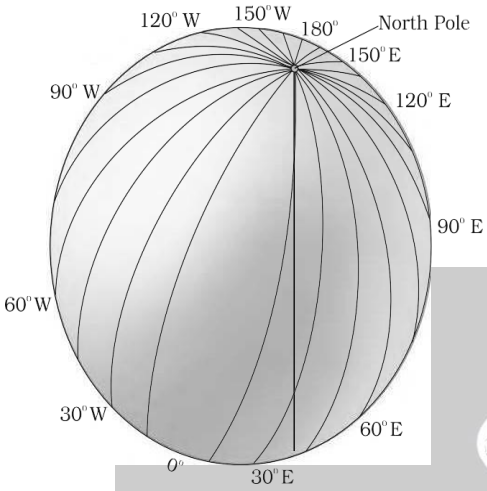
To fix the position of a place, it is necessary to know more than just the latitude of that place. For example

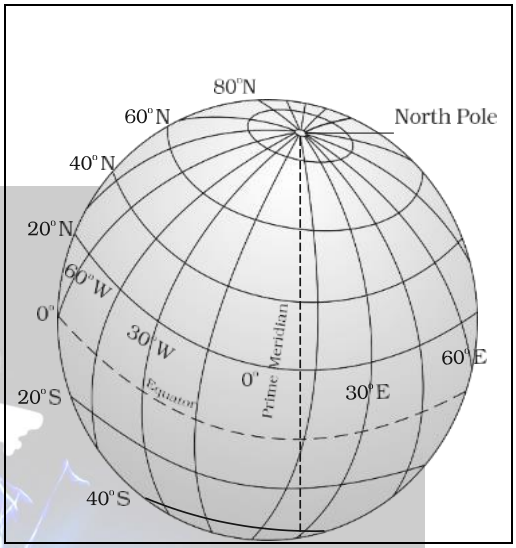
> **Hyderabad in Pakistan and Allahabad in India are situated on the same latitude 25.25 degree north. Now in order to locate them precisely, we must find out how far east or west these places are from a given line of reference running from the North Pole to the South Pole. These lines of references running from the North poke to the South Poke. These lines of refences are called the meridians of longitude, and the distances between them are measured in degrees of longitude.**

Each degree of longitude is divided into minutes, and minutes into seconds. They are semi-circles and the distance between them decreases steadily poleward until it becomes zero at the Poles, where all the meridians meet.

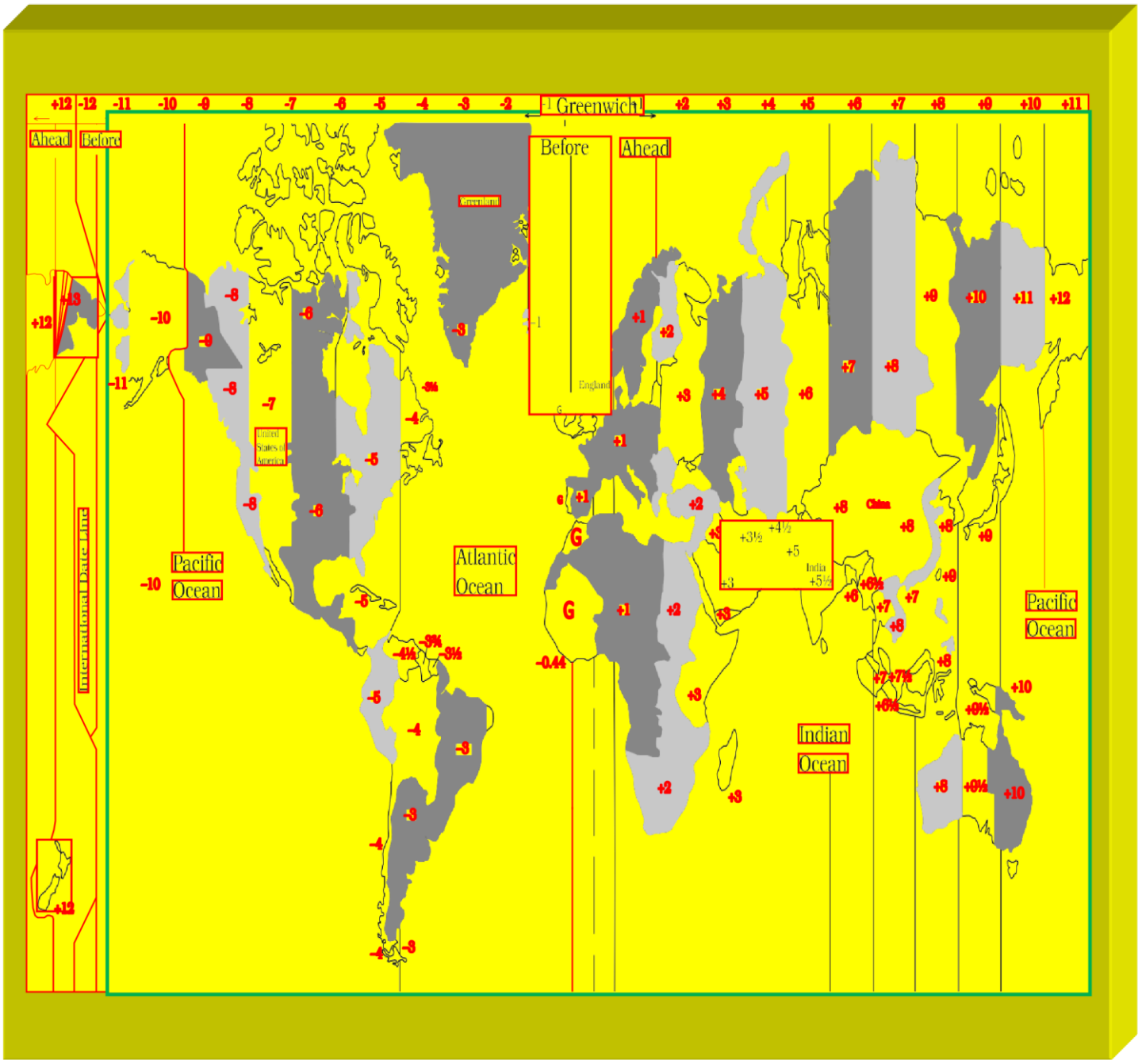
Unlike parallels of latitude, all meridians are of equal length.

Since, it was difficult to number the meridians. Hence, all countries decided that the count should begin from the meridian which passed through Greenwich, where the British Royal Observatory is located. This meridian is called the Prime meridian. Its value is 0 degree longitude and from it we count 180 degree eastward as well as 180 degree westward.





The Prime Meridian divides the earth into two equal halves, the Eastern Hemisphere and the Western Hemisphere.



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Longitude and Time

1. **The best means of measuring time is by the movement of the Earth, the Moon and the Planets. The Sun regularly rises and sets every day, and naturally.**

2. **Local time can be reckoned by the shadow cast by the Sun, which is the shortest at noon and longest at sunrise and sunset.**

3. **Likewise, when the Prime Meridian of Greenwich has the sun at the highest point in the sky. All the places along this meridian will have midday or noon.**

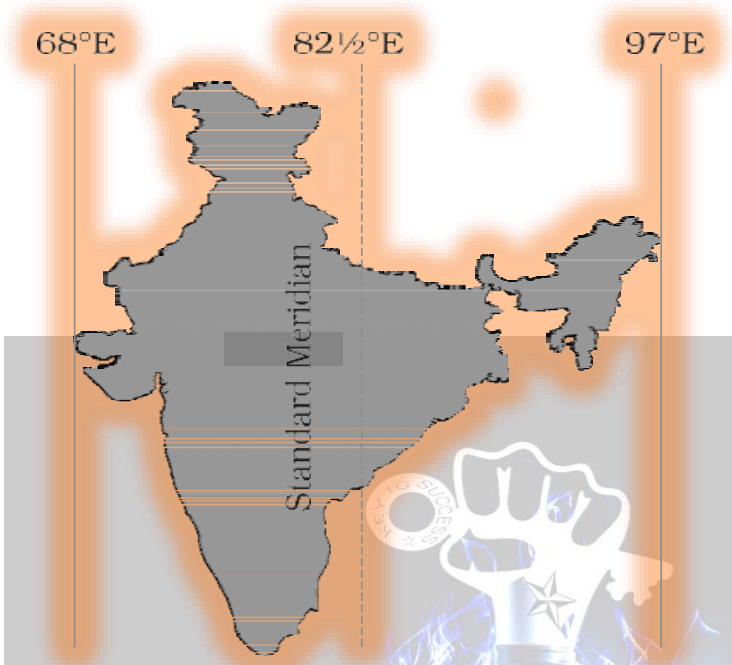
4. **As the earth rotates from West to East, those places are east of Greenwich will be ahead of Greenwich time and those to the West will be calculated as follows.**

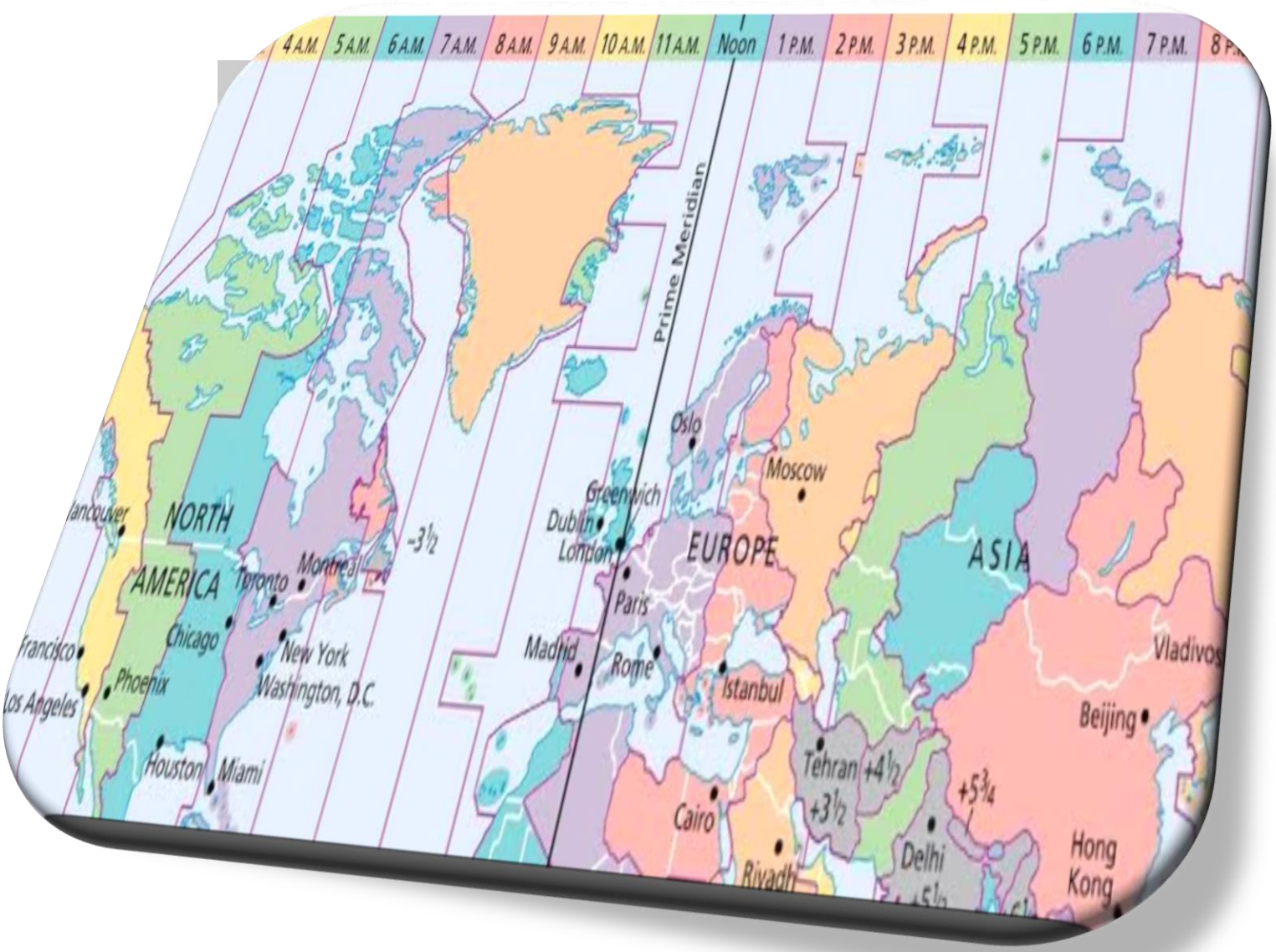
5. **The Earth rotates 360 degree in about 24 hours, which means 15 degree an hour or 1 degree in four minutes.**

6. **When it is 12 noon at Greenwich, the time at 15 degree east of Greenwich will be 15*4 = 60 minutes, 1 hour ahead of Greenwich time, which means 1 p.m. But at 15 degree west of Greenwich, the time will be behind**

7. **Greenwich time by one hour. It will be 11.00 a.m. Similarly at 180 degree, it will be midnight when it is 12 noon at Greenwich.**

8.




4 A.M.
5 A.M.
6 A.M.
7 A.M.
8 A.M.
9 A.M.
10 A.M.
11 A.M.
Noon
1 P.M.
2 P.M.
3 P.M.
4 P.M.
5 P.M.
6 P.M.
7 P.M.
Prime Meridian
NORTH AMERICA
EUROPE
ASIA
Vancouver
San Francisco
Los Angeles
Phoenix
Chicago
Houston
Miami
Toronto
Montreal
New York
Washington, D.C.
-3½
Dublin
London
Greenwich
Oslo
Moscow
Paris
Madrid
Rome
Istanbul
Cairo
Riyadh
Tehran
+3½
+4½
+5¾
Delhi
Beijing
Hong Kong
Vladivos

What is a Time Zone?

- A time zone is a geographic area, typically **15 degree** longitude wide, that share the same standard time. Standard refers to the fact that it is the official time in that area.
- Within a time zone, everyone has the same time.

Greenwich Mean Time?

1. Back in **1675, King Charles II** for the purpose of studying cartography, geography, meteorology, and related subjects

(including time) commissioned a **Royal Observatory in Greenwich** (pronounced **grin-ij).**

2. Later in **1721, the Royal Observatory began to use Greenwich as the location for the UK's Prime Meridian in map** making and navigation systems. The Prime Meridian is the longitude that is considered the anchor or central point of a map, labeled 0 degree.

NOTE: *fast forward to 1800s. the UK was in need of a standard time to keep the trains running on schedule. Up until then, towns and regions were able to set their own time as they saw fit. It was decided that the mean time – in other words, the time after correcting for changes in the apparent lengths of days caused by the Earth's rotation around the sun – in Greenwich at the Prime Meridian was going to be the standard. The first Public declaration of Greenwich mean Time, or GMT, was made in 1833.*

In 1884, the International Meridian Conference agreed that GMT was going to be the benchmark for all time zones around the world. The name for England's time zone is GMT+1, indicating that the standard time in France is one hour ahead of the standard time in England.

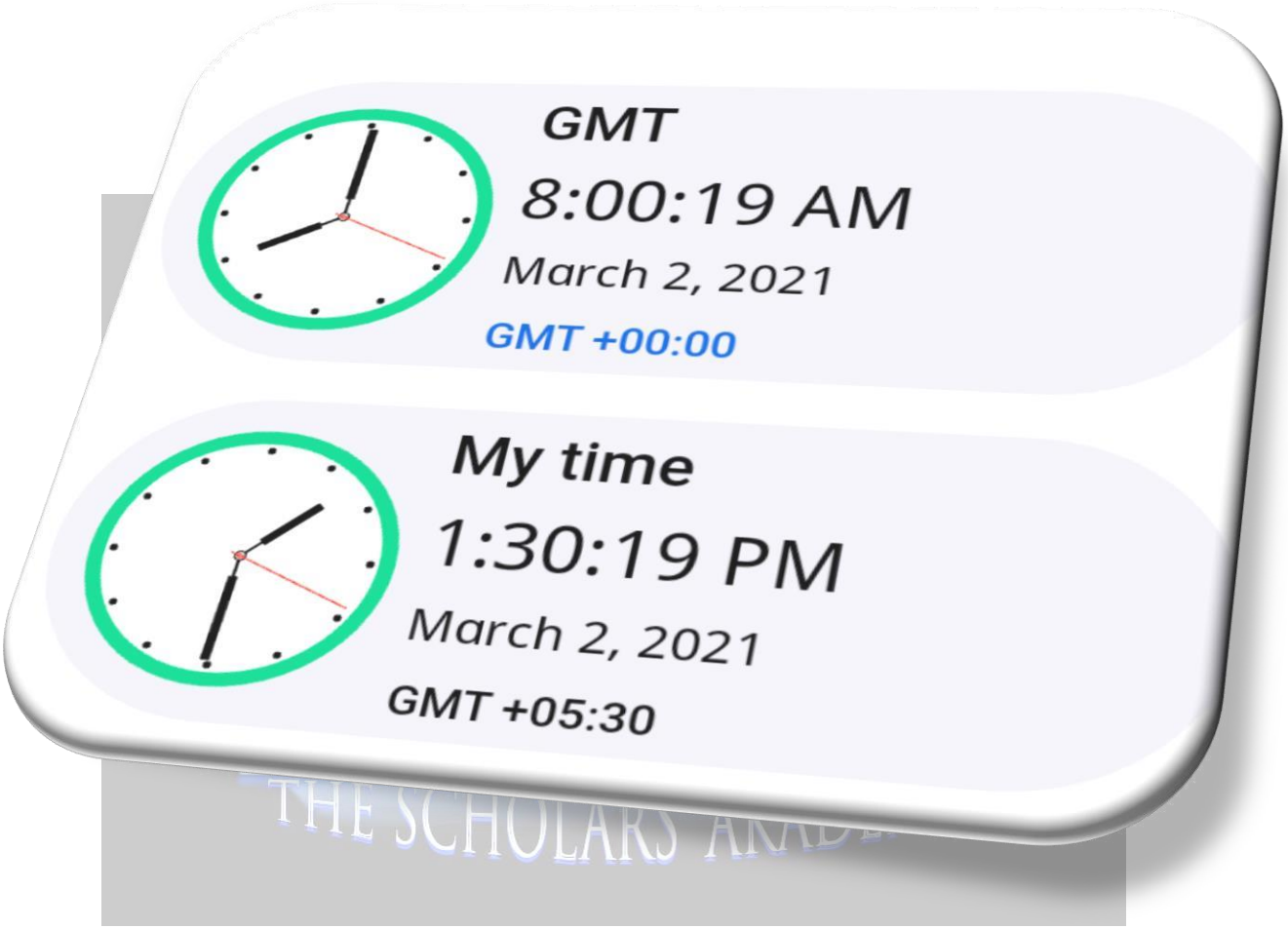
There are in total 24 potential time zones around the world – although some places, like Chine, set their own rules.

What is Coordinated Universal Time (UTC)?

With the advancements in measurements in time, scientists in the 1960s introduced a more sophisticated and precise time standard known as Coordinated Universal Time. It is coordinated and Universal because it is used around the world.

NOTE: you might be wondering why the acronym for Coordinated Universal Time is UTC and not CUT. Well, that's because in order to

get the French on board with the system, it was decided the name would be given in French and English. (Typique). Coordinated Universal Time in French is universal temps coordonne or, in other words, UTC.



What is a Standard Time Zone?

A standard Time Zone is defined as a geographical area or region throughout which the **same standard time is observed.**

Or

Standard Time is the synchronization area or region to a single time standard, rather than using solar time or a locally chosen meridian (longitude) to establish a local mean time standard. Historically, the concept was established **during the 19th century to aid weather forecasting and Train travel.**

What is Daylight Saving Time (DST)?

1. **Daylight Saving Time (DST) is the practice of setting of the clocks forward in spring by one hour from standard time during the summer months, and backward in autumn again in the fall, in order to make better use of natural daylight in the evenings.**

2. **Daylight Saving Time (DST) is used to save energy and make better use of daylight. DST is also used to reduce the amount of energy needed for artificial lighting during the evening hours. However, many studies disagree about DST's energy savings, and while some studies show a positive outcome, others do not.**

3. **Many countries in the Northern Hemisphere use DST in the Summer time, but not all. Daylight Saving Time usually starts in March-April and ends in September-November when the countries return to standard time, or winter time as it is also known.**

4. **On the other hand, in the southern Hemisphere the participating countries usually start the DST period in September-November and end DST in March-April.**

5. **Germany and Austria were the first countries to use DST in 1916.**

Advantages of daylight savings:

- **It helps to save energy.**
- **It provides additional daylight hours in the evening**
- **It increases productivity.**
- **It helps to increase the tourism as due to the increase daylight hours tourists would stay out for longer period & spend more.**

Problems

- **Mismatch in office timings, different working hours for banks and a chance that railway accidents might become more frequent.**

- **Implementing two time zones will require synchronizing railway traffic which otherwise will create utter confusion.**

- **With significant illiteracy levels, if the country were divided into two time zones there would be chaos at the border between the two zones. It would mean resetting clocks with each crossing of the time Zone.**

DST

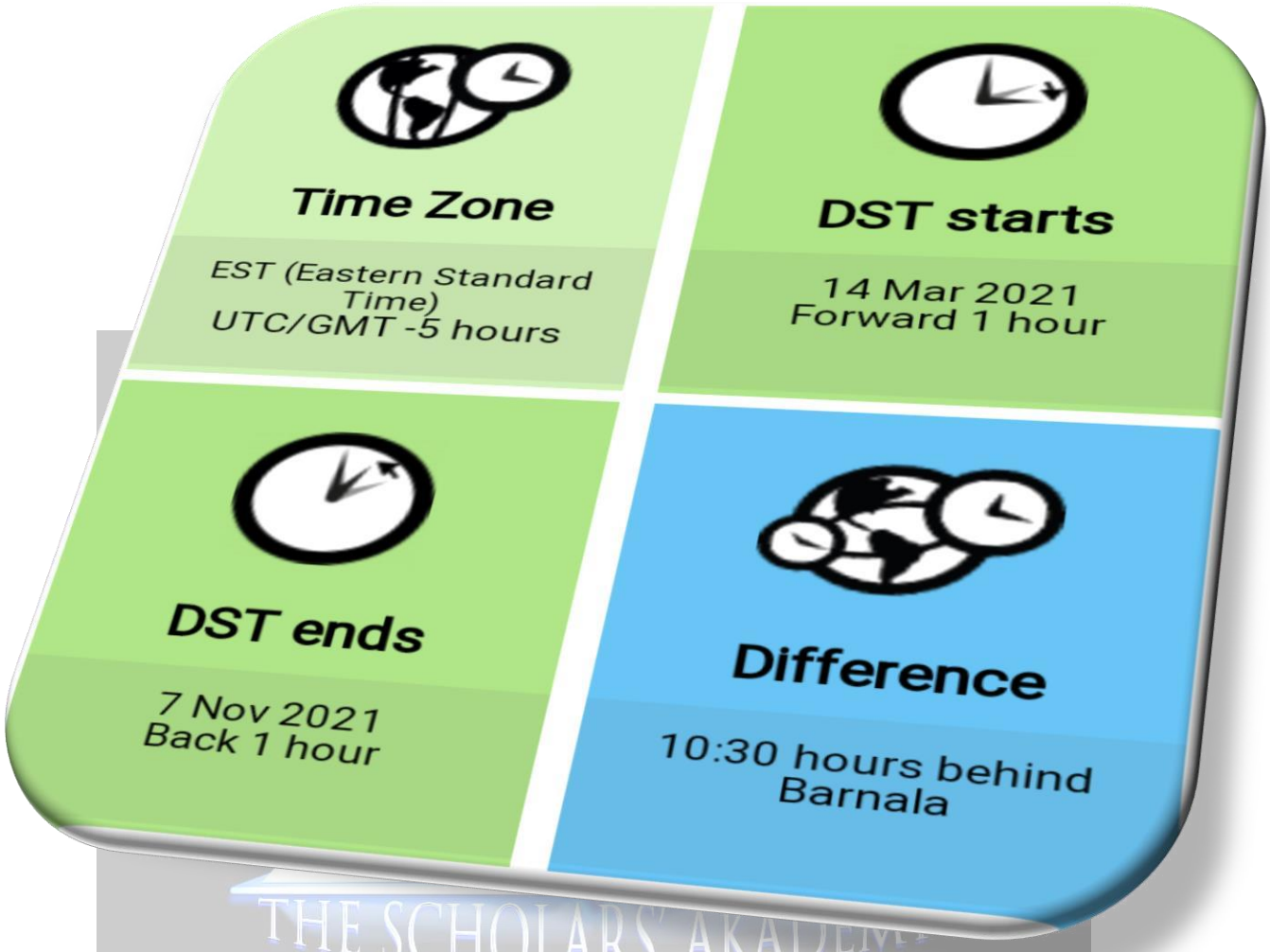
Time Zone Map

Starts On
March 14, 2021
at 02:00 AM

Set Your Clock
Ahead 1 hour

Ends On
November 7,
2021 at 02:00
AM

Set Your Clock
Back 1 hour


Time Zone
EST (Eastern Standard Time)
UTC/GMT -5 hours
DST starts
14 Mar 2021
Forward 1 hour
DST ends
7 Nov 2021
Back 1 hour
Difference
10:30 hours behind
Barnala

Indian Standard Time?

1. Indian Standard time (IST) is the time zone observed throughout India, with a time offset of **UTC+05:30.** India does not observe daylight saving time or other seasonal adjustments. In military and aviation time **IST is designated E* (Echo Star).**

2. India Standard Time (IST) is 05:30 hours ahead of **Coordinated Universal Time (UTC).** Indian Standard Time is a half-hour time zone. Its local time differs by 30 minutes instead of the normal whole hour.

3. Indian Standard Time (IST) is based on longitude 82.5 degree, which passes through **Mirzapur, near Allahabad in Uttar Pradesh**.

4. It is **5 hours 30 minutes** ahead of Greenwich Mean Time (GMT), now called the Universal Coordinated Time (UTC).

5. Keeper of the time in India is the CSIR- National Physical Laboratory (NPL), New Delhi, which records time using five caesium atomic clocks.

Historical background of Time Zone in India.

1. India used to have two time zones, Bombay time and Calcutta Time, first established in 1884 during the British Rule.

2. Indian Standard Time is an anachronism like many systems that were inherited from the British.
3. It was in 1906 that India had a single IST running through center of the country.

4. There was a one-hour – nine minutes time difference between Kolkata and Mumbai. Yet, today these cities, which are 1,650 km apart, share the same time.

5. Tea estates of Assam, where the concept of **"Bagan Time" (estate time)** exists, is there a provision for a separate time zone inside India. Bagan time is one hour ahead of IST.

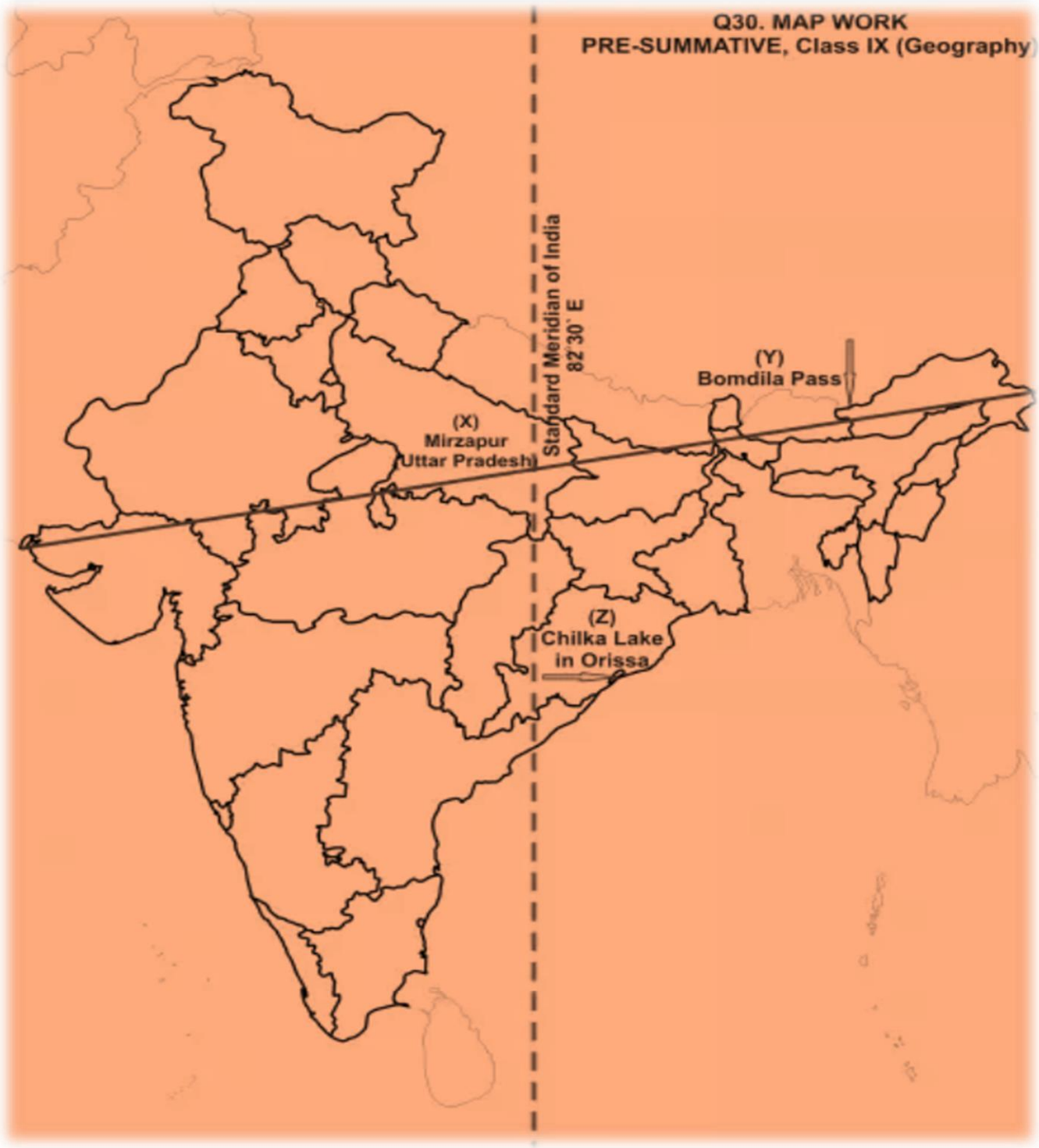
Note: France is the country with the most time zones in the world, mistly due to its various territories around the world.

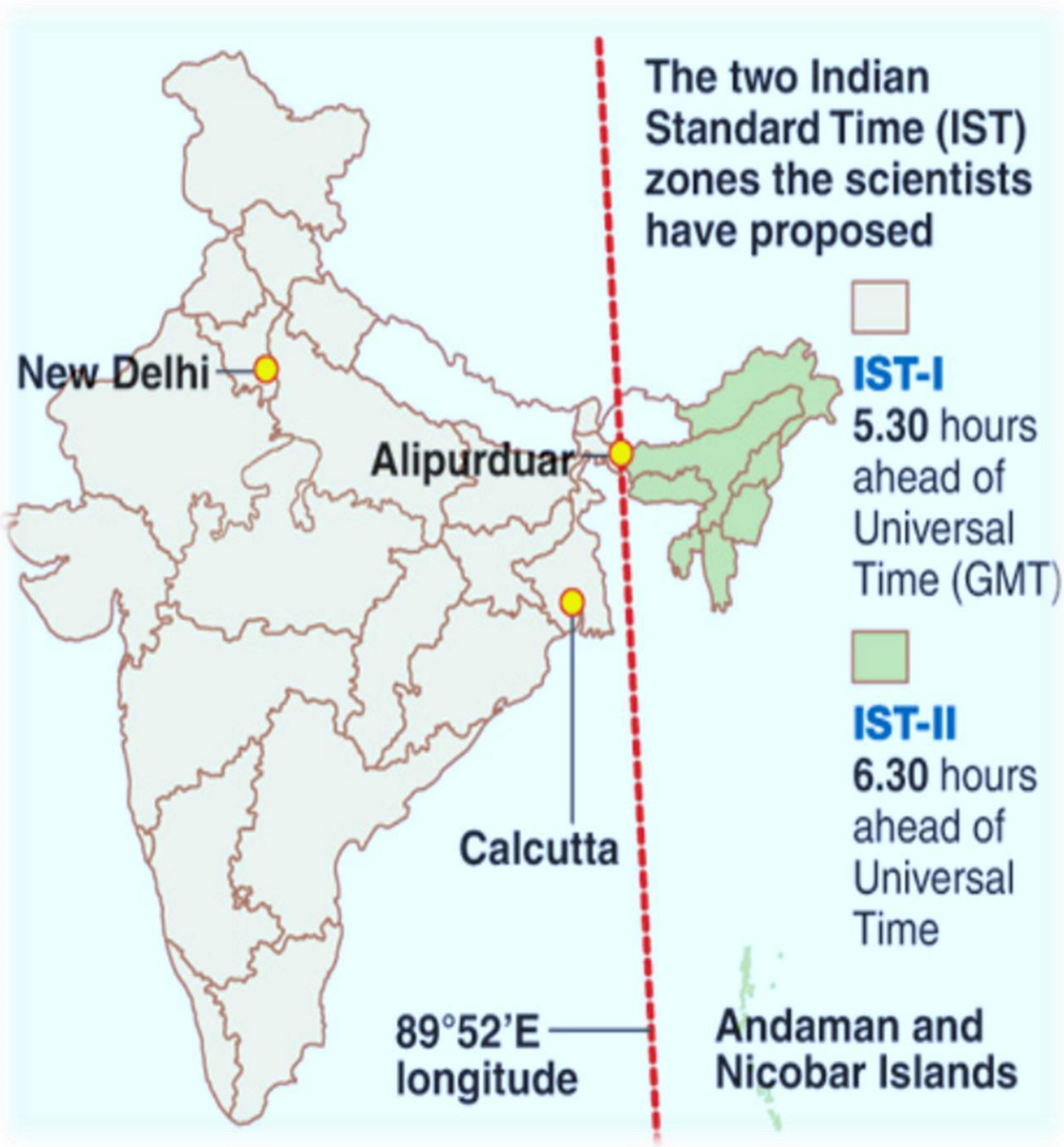
The United States of Russia are tied for the second place, as there are **eleven time zones in Russia**, which currently observe times ranging from UTC + 02:00 to UTC + 12:00.

Convergence of all time zones:

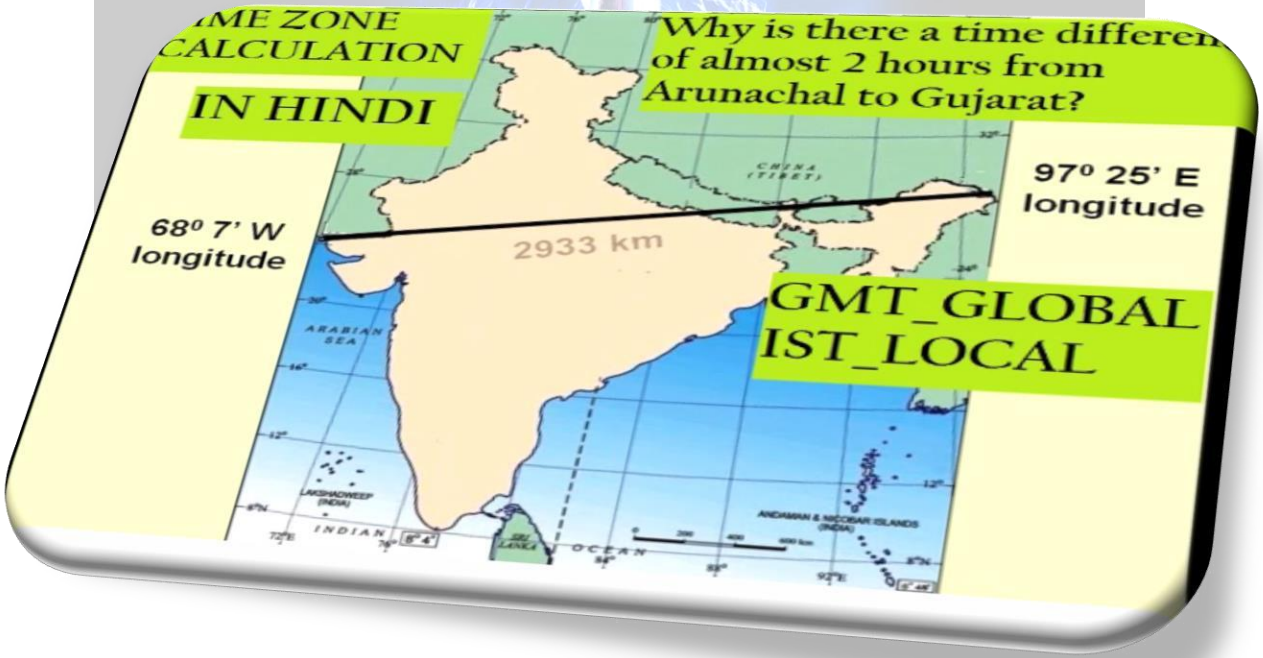
All time zones converge in Antarctica. Antarctica is a continent with no part-time residents but has several research stations located on it.

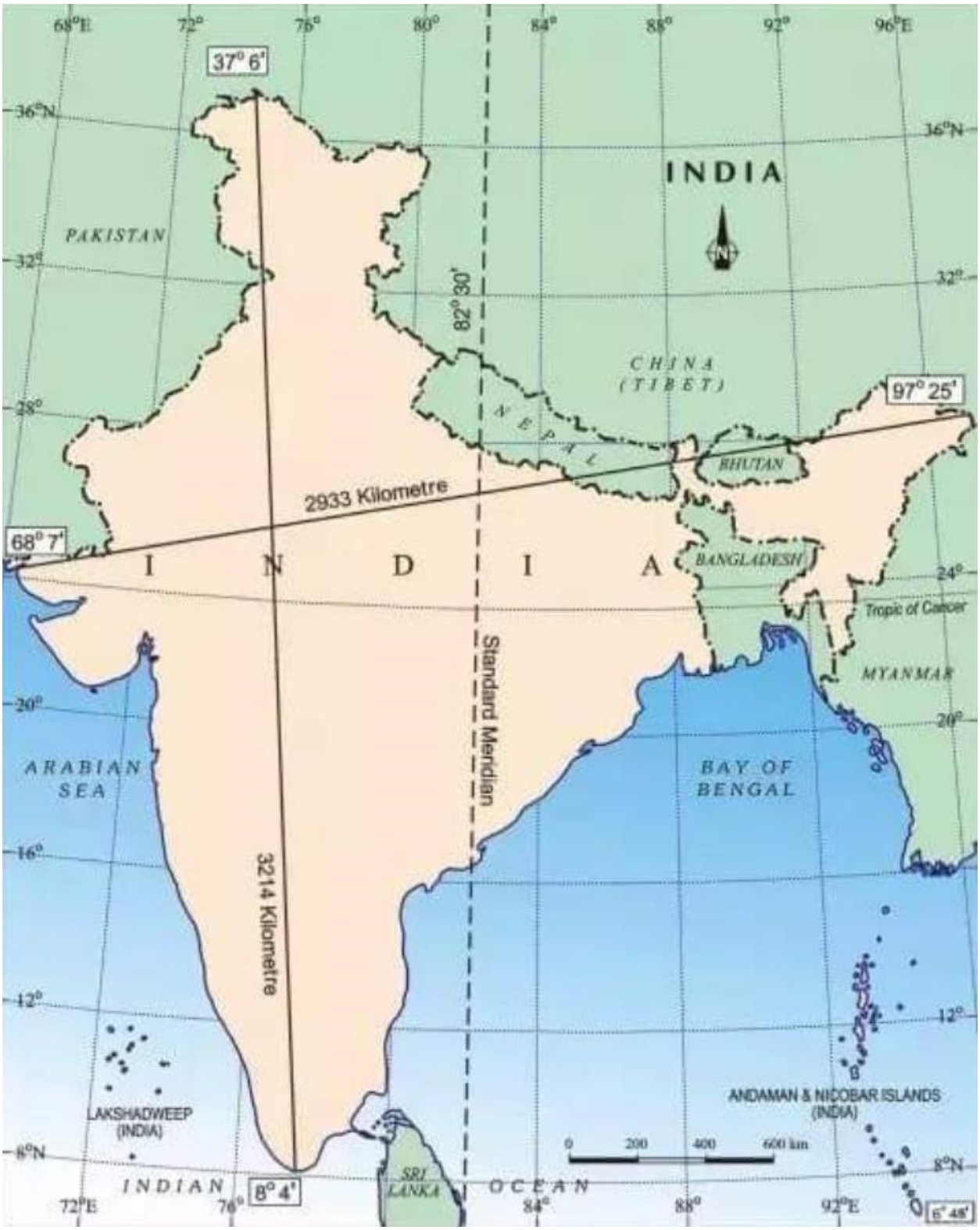

INDIA
map not to scale
Mirzapur
JAMMU & KASHMIR
Srinagar
HIMACHAL PRADESH
Shimla
Chandigarh
PUNJAB
UTTARANCHAL
Dehradun
DELHI
HARYANA
PAKISTAN
TIBET (CHINA)
ARUNACHAL PRADESH
NEPAL
SIKKIM
Gangtok
BHUTAN
Itanagar
UTTAR PRADESH
RAJASTHAN
Jaipur
Lucknow
Patna
BIHAR
ASSAM
Dispur
NAGALAND
Kohima
Shillong
Imphal
MANIPUR
MEGHALAYA
Agartala
TRIPURA
Aizawl
MIZORAM
GUJARAT
Gandhinagar
Bhopal
MADHYA PRADESH
Ranchi
JHARKHAND
WEST BENGAL
Calcutta
MYANMAR
CHHATTISGARH
Raipur
DIU
DAMAN
DADAR & NAGAR HAVELI
MAHARASHTRA
Mumbai (Bombay)
ORISSA
Bhubaneshwar
BANGLADESH
Hyderabad
ANDHRA PRADESH
YANAM (Pondicherry)
BAY OF BENGAL
ARABIAN SEA
Panaji
GOA
KARNATAKA
Bangalore
Chennai (Madras)
PONDICHERRY (Puduchchery)
KARAIKAL (Pondicherry)
LAKSHADWEEP
MAHE (Pondicherry)
TAMILNADU
KERALA
Port Blair
ANDAMAN & NICOBAR ISLANDS
Thiruvananthapuram

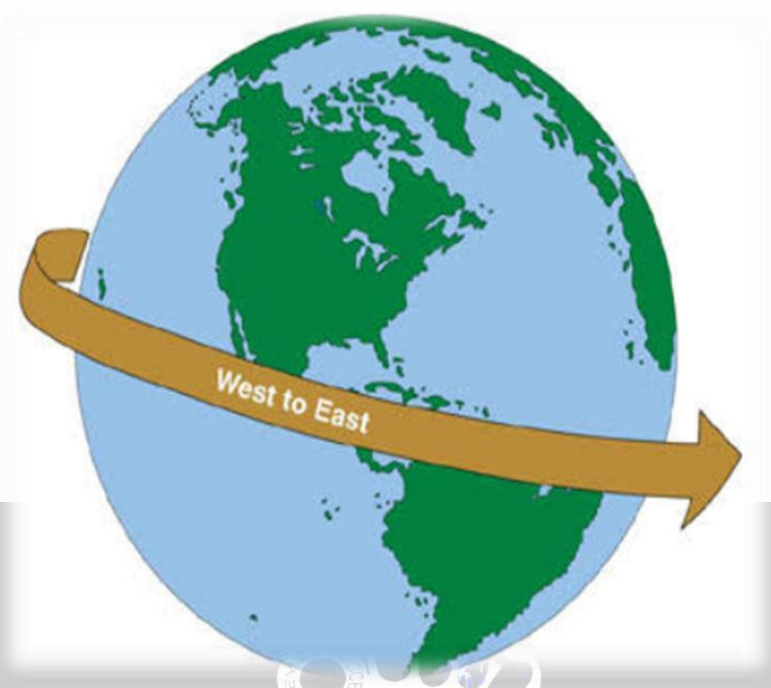

Q30. MAP WORK
PRE-SUMMATIVE, Class IX (Geography)
Standard Meridian of India
82°30` E
(Y)
Bomdila Pass
(X)
Mirzapur
Uttar Pradesh
(Z)
Chilka Lake
in Orissa


The two Indian Standard Time (IST) zones the scientists have proposed
New Delhi
Alipurduar
Calcutta
89°52'E longitude
Andaman and Nicobar Islands
IST-I
5.30 hours ahead of Universal Time (GMT)
IST-II
6.30 hours ahead of Universal Time


2:00 PM
3:00 PM
TWO TIME ZONES IN INDIA

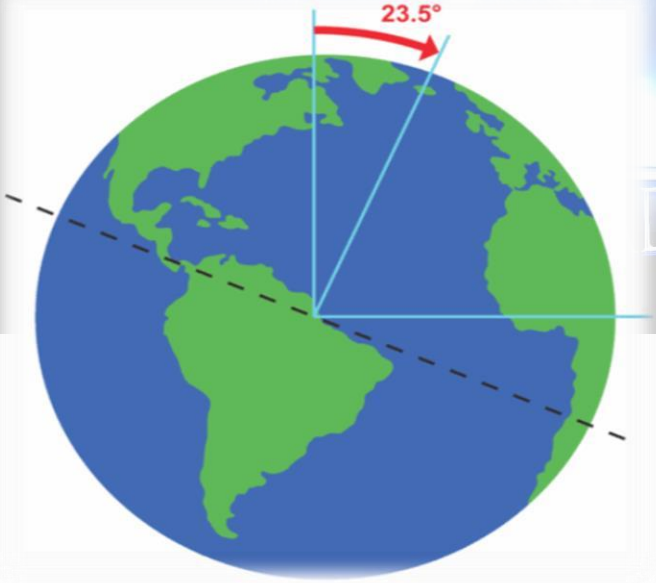

IME ZONE
CALCULATION
IN HINDI
Why is there a time differen
of almost 2 hours from
Arunachal to Gujarat?
97⁰ 25' E
longitude
68⁰ 7' W
longitude
2933 km
GMT_GLOBAL
IST_LOCAL


INDIA
PAKISTAN
CHINA (TIBET)
NEPAL
BHUTAN
BANGLADESH
MYANMAR
ARABIAN SEA
BAY OF BENGAL
INDIAN OCEAN
SRI LANKA
LAKSHADWEEP (INDIA)
ANDAMAN & NICOBAR ISLANDS (INDIA)
37° 6'
97° 25'
68° 7'
8° 4'
6° 45'
82° 30'
2933 Kilometre
3214 Kilometre
Standard Meridian
Tropic of Cancer
0 200 400 600 km
68°E
72°
76°
80°
84°
88°
92°
96°E
36°N
32°
28°
24°
20°
16°
12°
8°N



1

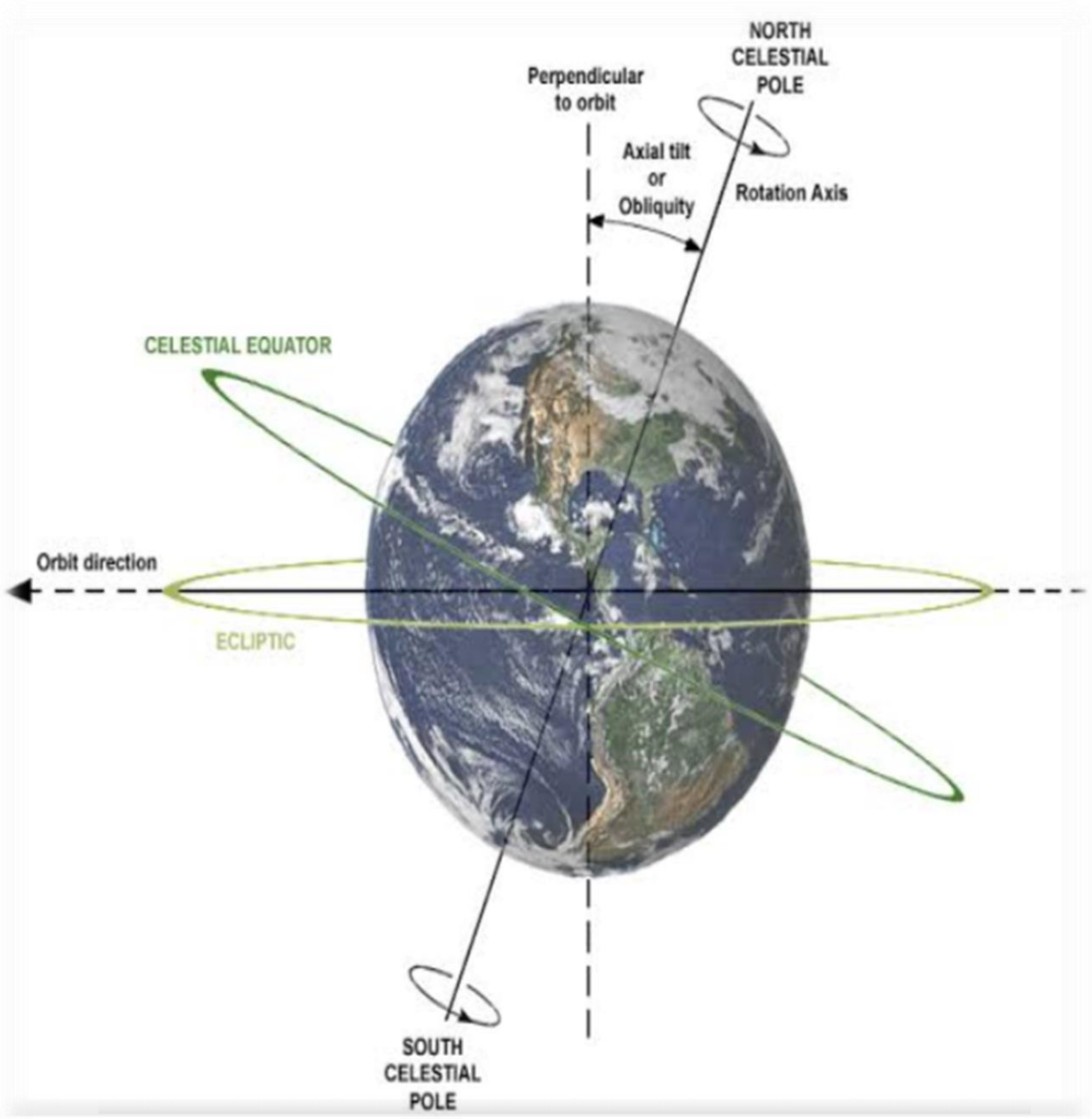
Earth rotates on its own axis from west to east.



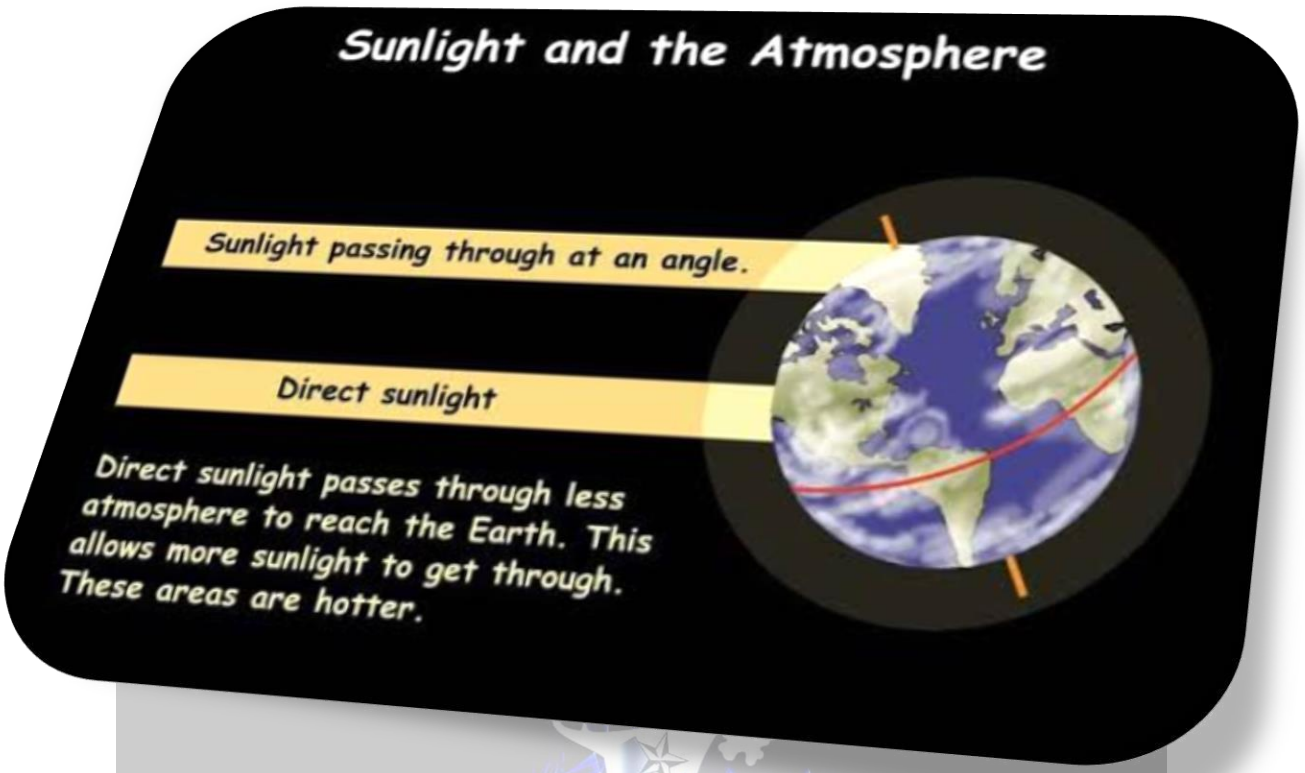
2

Earth is tilted 23.5 degree

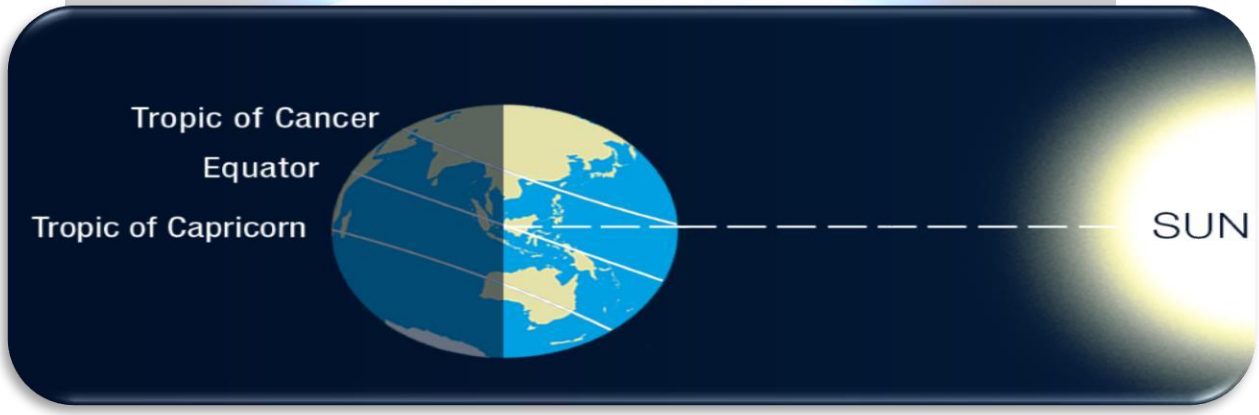
3


NORTH
CELESTIAL
POLE
Perpendicular
to orbit
Axial tilt
or
Obliquity
Rotation Axis
CELESTIAL EQUATOR
Orbit direction
ECLIPTIC
SOUTH
CELESTIAL
POLE

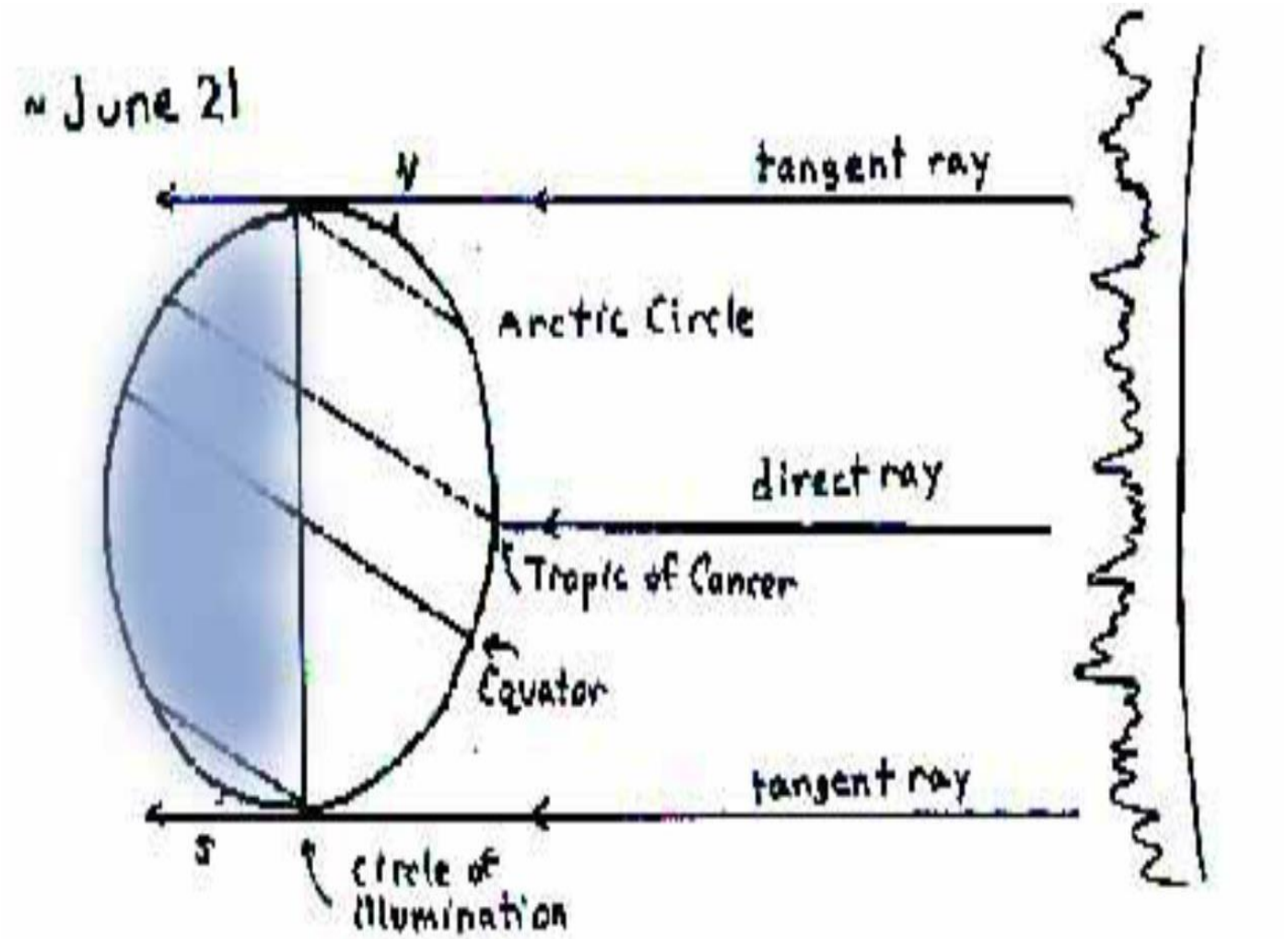
4

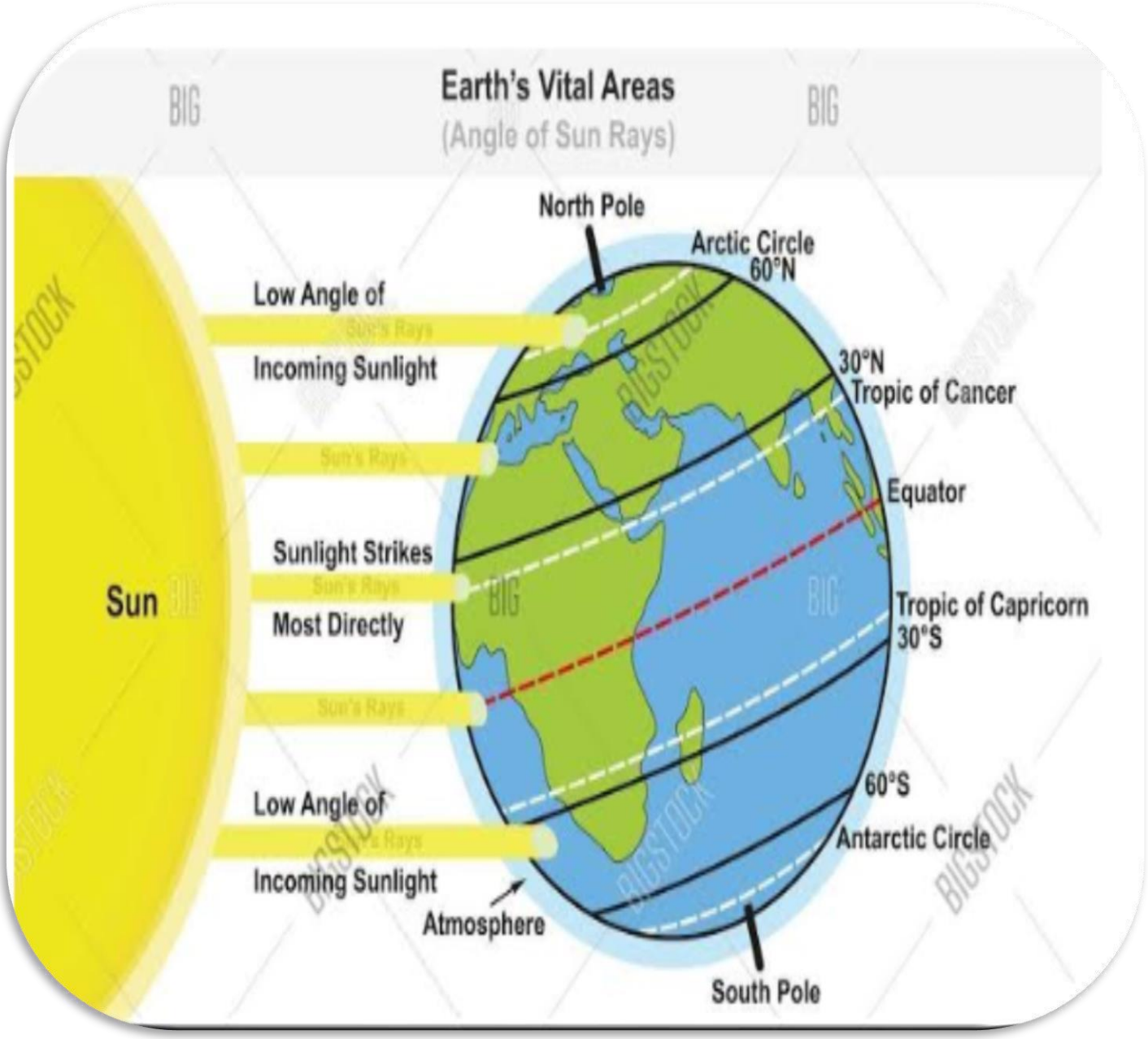

Sunlight and the Atmosphere
Sunlight passing through at an angle.
Direct sunlight
Direct sunlight passes through less atmosphere to reach the Earth. This allows more sunlight to get through. These areas are hotter.

5


Tropic of Cancer
Equator
Tropic of Capricorn
SUN

6

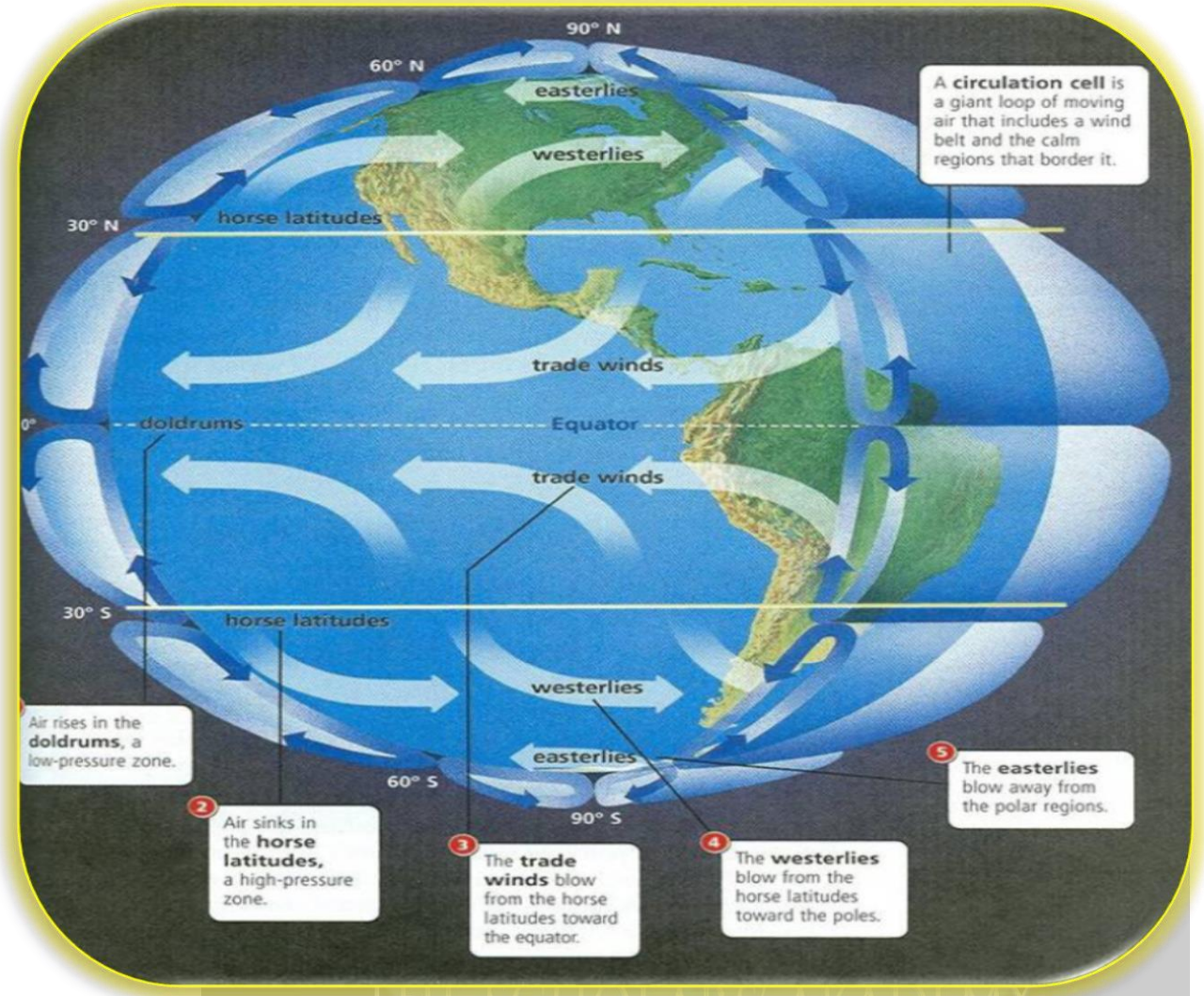


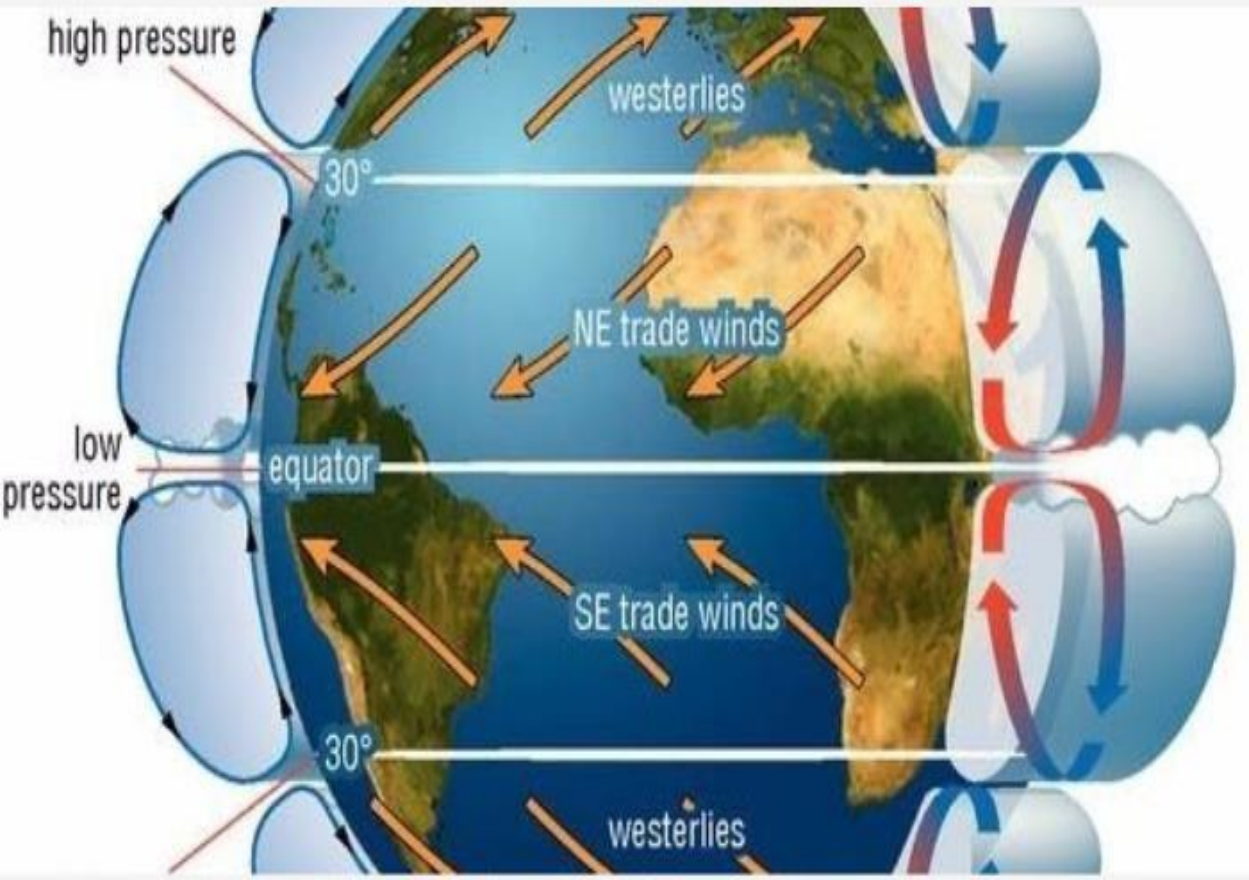


Doldrums: **Doldrums are formed in the equatorial belt of low atmospheric pressure where the North-East trade winds converge on and meet each other, forming calms and light surface winds and a strong upward air movement.**

Doldrum is the region 5 degree north and 5 degree south of the equator.

Horse latitude: **Horse Latitudes are located at 30 degree north and South.**





How days and nights are formed on earth?

Day and night are due to the Earth rotation on its axis, and not its orbition around the Sun.

The term one day is determined by the time the Earth takes to rotate once on its axis and includes both day time and the Night Time.

An earth day is 24 hours because the Earth spins on its axis once every 24 hours.

At any one time half of the Earth's sphere is in sunlight (Which is known as Day) while the other half is in darkness (Which is known as Night).

The duration of the day and night is not equal at all places on the earth because of the inclined axis.

The sun, the moon, the stars seem to move from east to west because the earth spins from west to east.

The speed of rotation has created a centrifugal force resulting in a bulge in the middle portion of the earth and a flattened top at the poles.

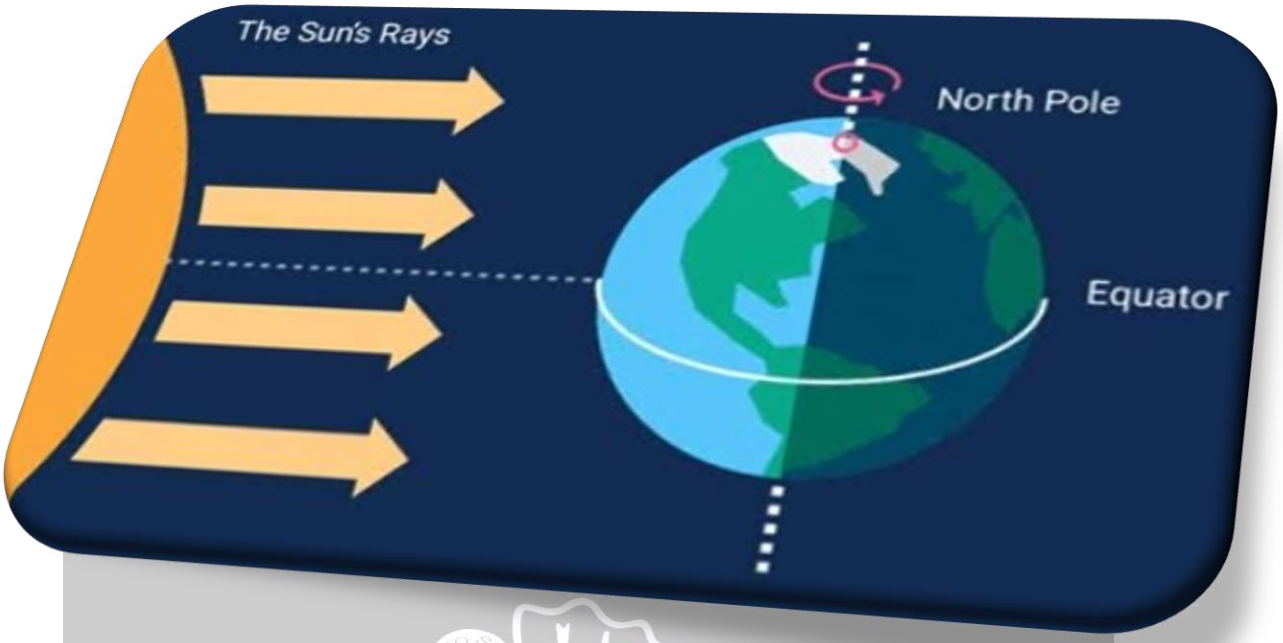
The earth's rotation also affects the movements of water in oceans.

Rotation causes difference in time over various places on the earth.

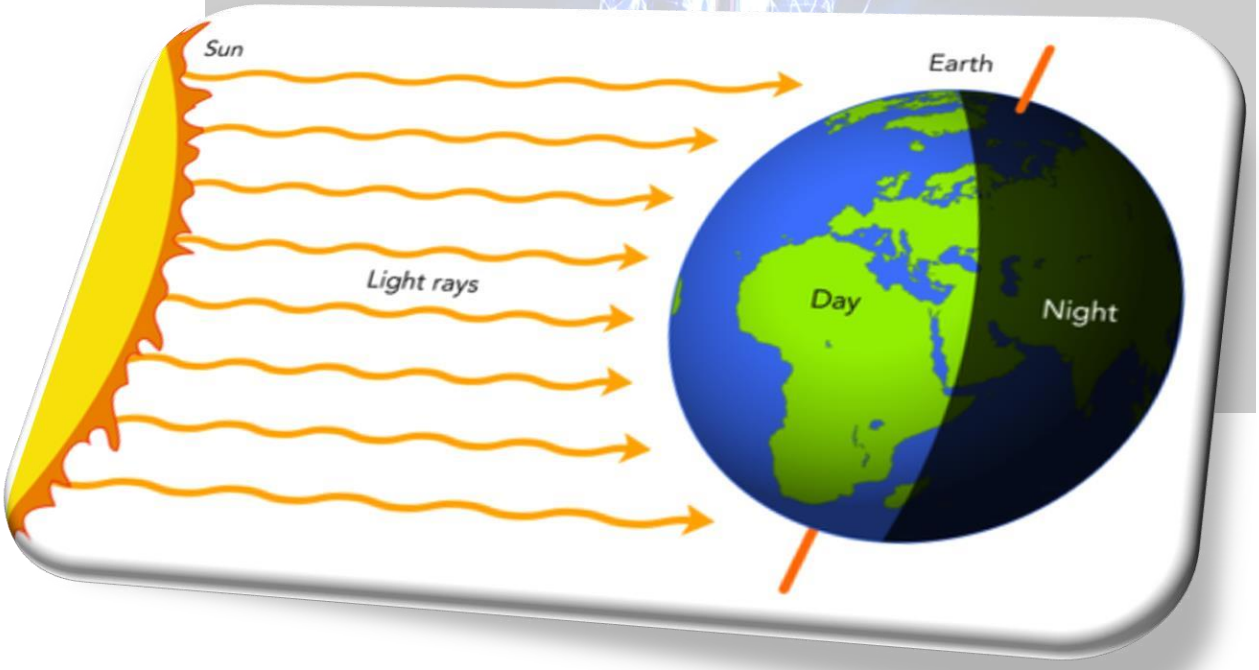
The side of the earth towards the sun constantly gains heat and the side away from the sun constantly loses heat by radiating it into outer space.

1. **The duration of the period of 23 hours 56 minutes and 4 seconds is called the Sidereal Day.**
2. **The Earth's revolution around the Sun takes much longer than its rotation on its axis. One complete revolution takes 365.25 days, or one year. The Earth revolves around the Sun because gravity keeps it in a roughly circular orbit around the Sun.**

1.

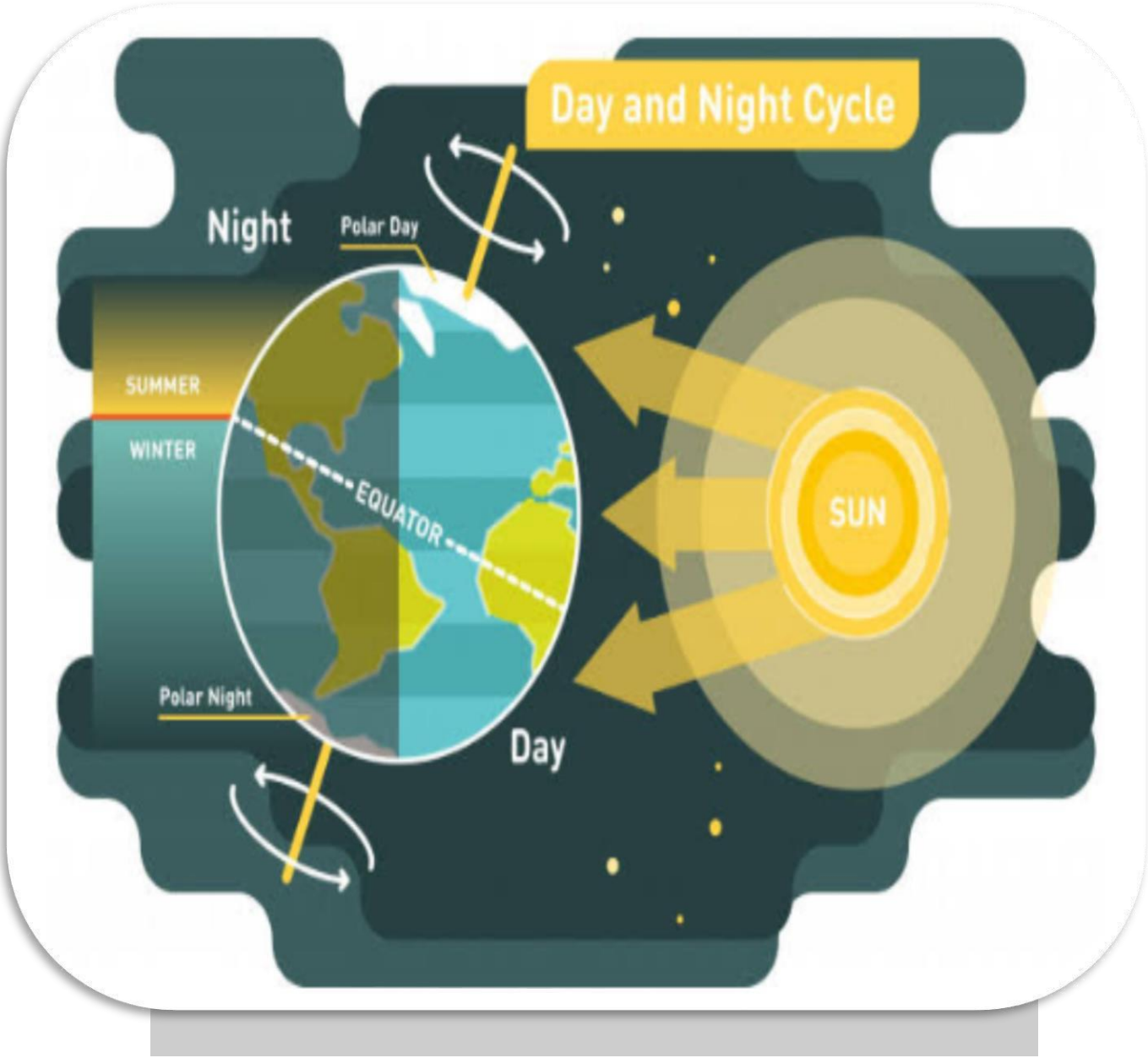

The Sun's Rays
North Pole
Equator

2.

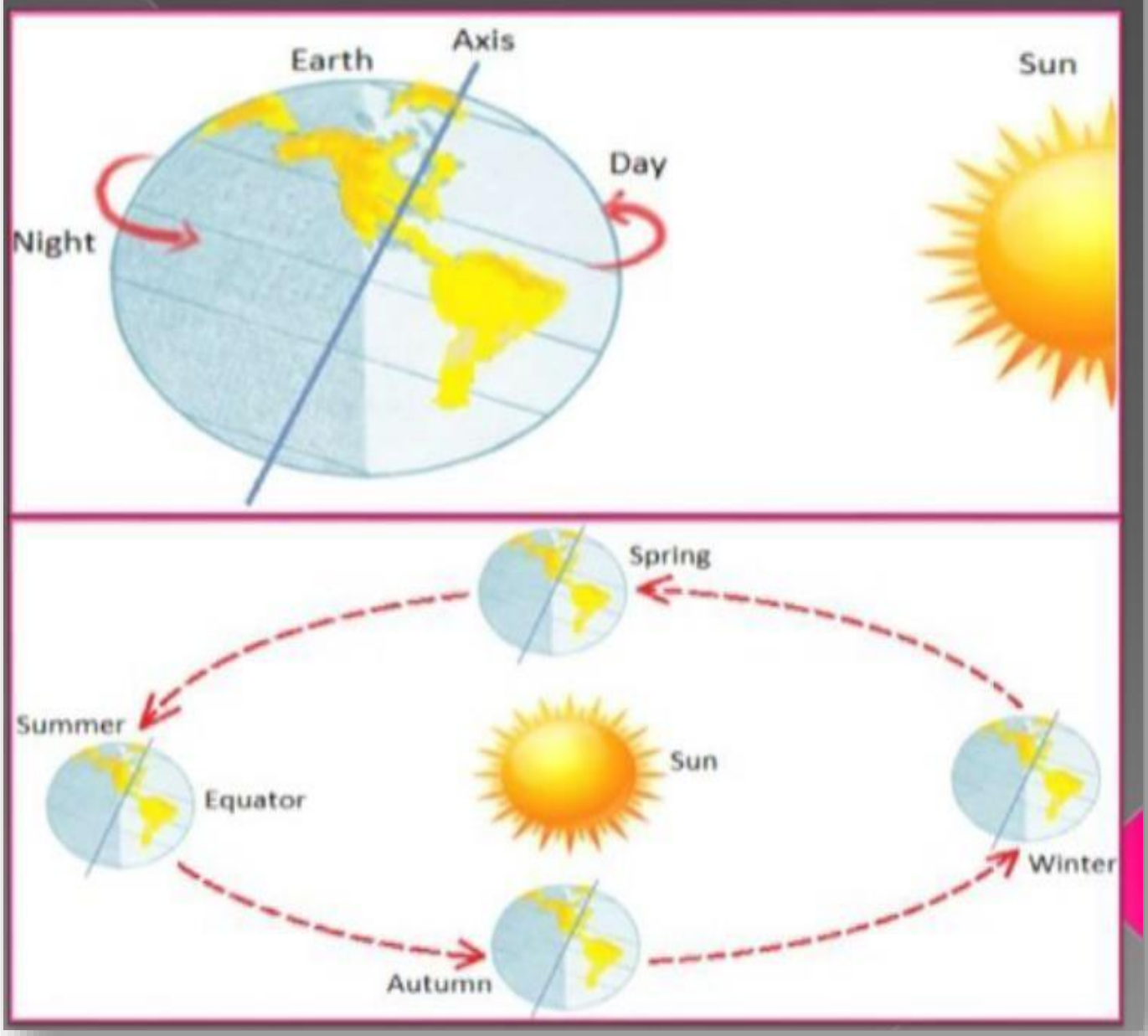

Sun
Earth
Light rays
Day
Night

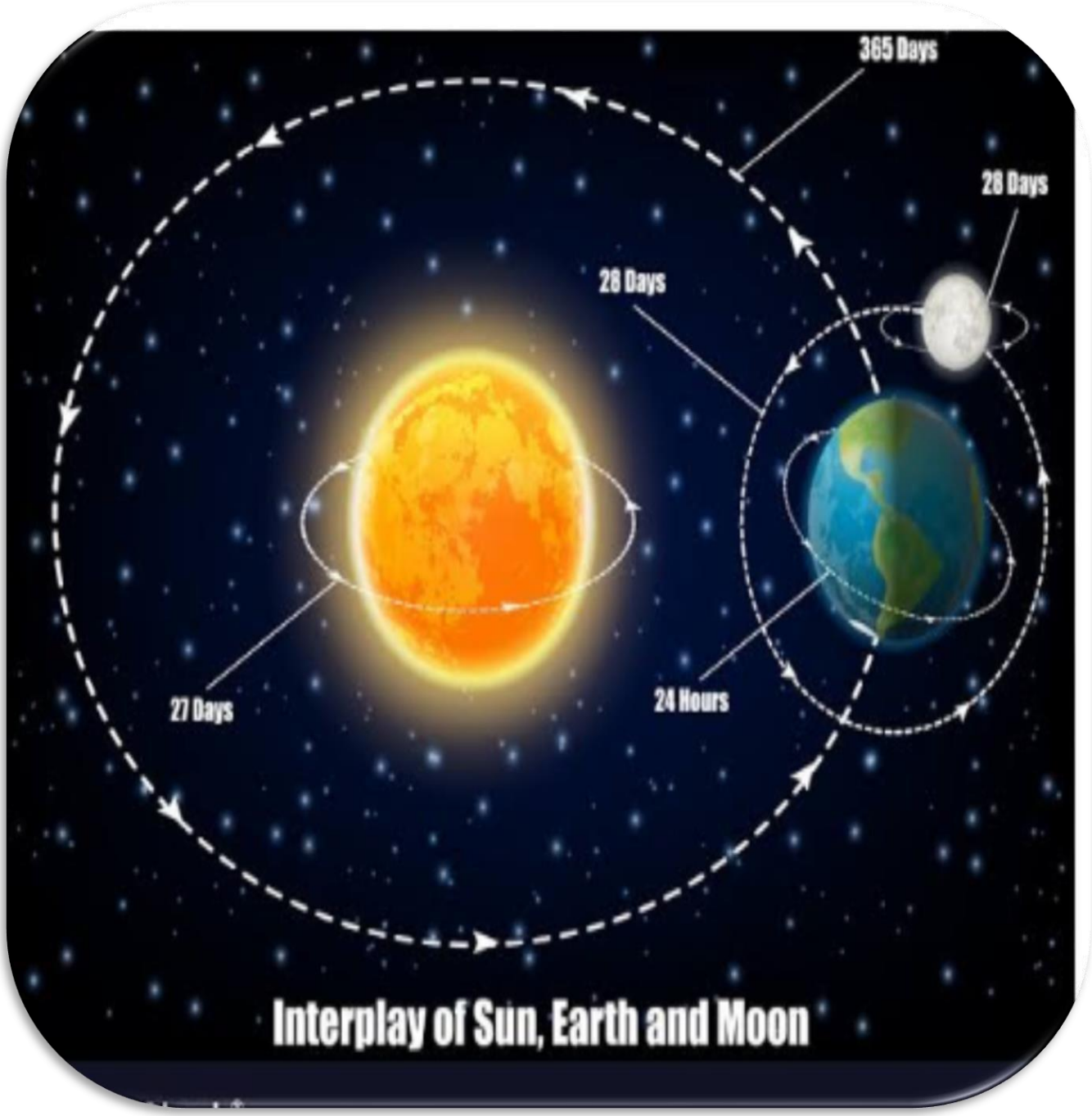
3.

4.


Day and Night Cycle
Night
Polar Day
SUMMER
WINTER
EQUATOR
SUN
Polar Night
Day

The Motions of the Earth




365 Days
28 Days
28 Days
27 Days
24 Hours
Interplay of Sun, Earth and Moon

5.

Why do we have a leap year?

1. Our calendar has **365 days in a year**, because that's pretty much how long it takes the Earth orbit the Sun. But the problem is that in reality it takes the Earth around **365 ¼ days or 365.25 days (actually 365.24219 days)** to circle the Sun (that's a Solar year), which means our calendar is out by around a quarter of a day a year.

2. The Earth revolves around the sun in **365 days, 5 hours, 59 minutes and 16 seconds.** The time a planet takes to revolve around the sun is called a year.

Chronology:

1) In 45 B.C. a decree by Julius Caesar began the practice of adding an extra day every four years, with the creation of the Julian calendar - - making up for those quarter days.
2) That would be perfect if a solar year were exactly 365 ¼ days – but 365.242 is a teeny bit less than that, and over time that teeny bit adds up.
3) Fast-forward, by 1582 A.D. that slight discrepancy in the Julian calendar added up to 10 days. So, Pope Gregory XIII created the Gregorian calendar, coined the term "leap year" and established February 29 as the official date to add a leap year. He also introduced a rule to take into account the discrepancy in the Julian calendar.
4) Now, a leap year occurs in every year that is divisible by four, but only in century years that are evenly divided by 400.
5) Therefore, 800, 1200 and 2000 were leap years – but 1700 and 1900 were not, because even though they are divisible by four, they are not divisible by 400.

Calculation of Leap year:

Each year lasts about **365 days and slightly under 6 hours**. That extra 6 hours adds up to an extra day over the course of 4 years, which is why **leap years occur almost every 4 years.**

In fact, leap years are a way to ensure that our calendar is on track.

There are roughly **365.24 days** in a year, which means that we need to add **1 extra day once every 4 years,** and **a year with 1 extra day is known as a leap year.**

We need to do this to ensure that we don't fall several hours behind each year.

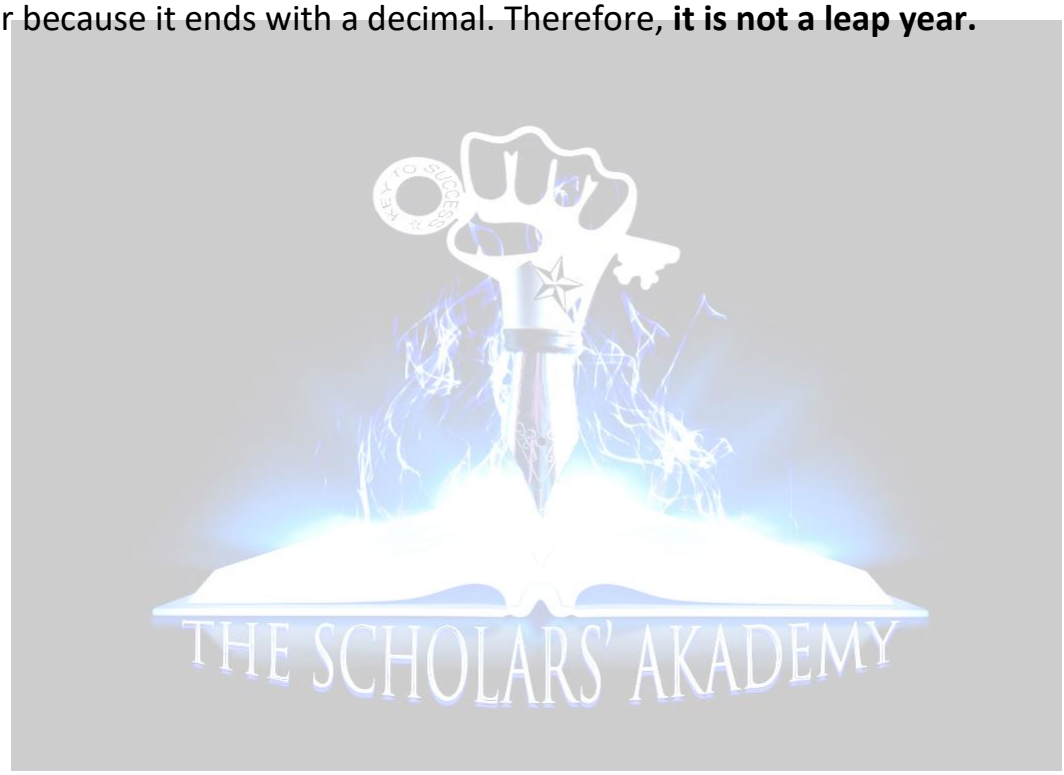
Calculating leap years is easy, but there are a few special rules to keep in mind as you do your calculations. If you prefer to look at a calendar instead of doing the math, then this is also an option.

Method 1. **If the number is divisible by 4.**

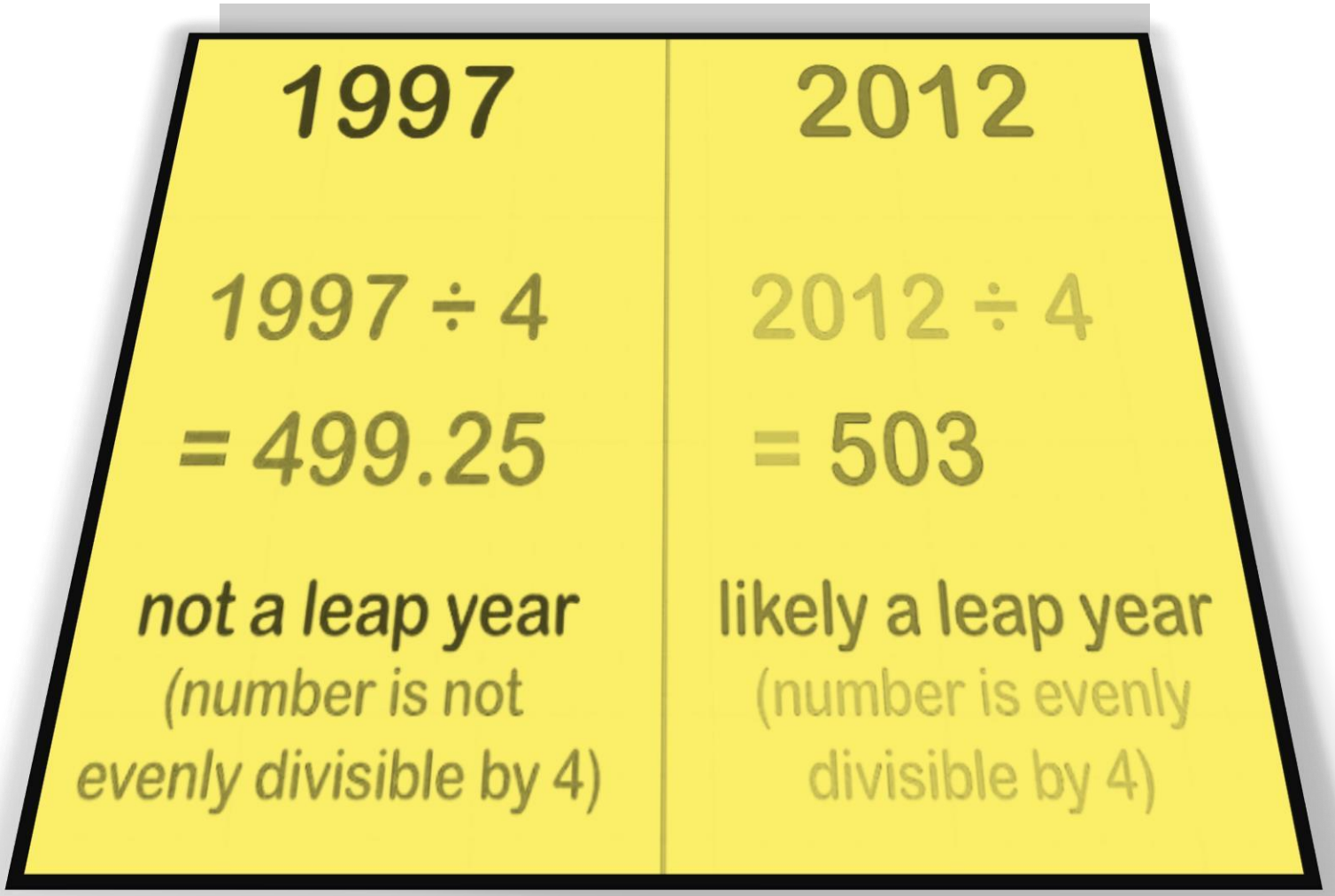
If we want to look at a past years, or go with future year to check whether a leap year or not.

Divide the year by 4 will result in a whole number with **no remainder** if the number is evenly divisible. In other words, The number must be evenly divisible by 4, otherwise, it is not a leap year.

For example, diving **1997 by 4 gives you 499.25**, which is not a whole number because it ends with a decimal. Therefore, **it is not a leap year.**



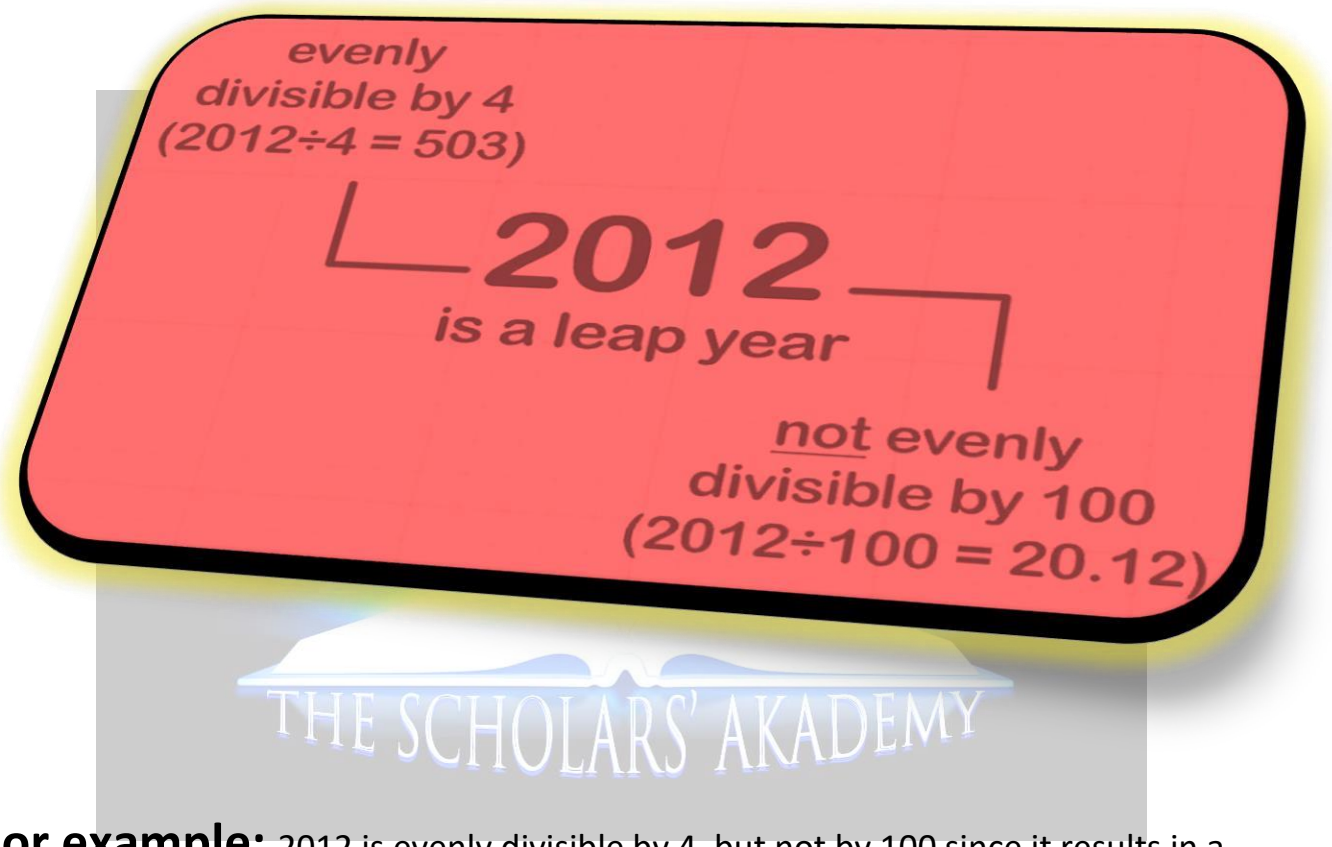
When you divide **2012 by 4, you get 503,** which is **a whole number**. This means that **2012 is likely a leap year.**



2. If the number is not evenly divisible by 100.

If a year is evenly divisible by 4, but it is not evenly divisible by 100, then it is a leap year. But,

> ***If a year is divisible by both 4 and 100, then it might be a leap year, and you will have to perform 1 more calculation to check.***



For example: 2012 is evenly divisible by 4, but not by 100 since it results in a decimal answer (20.12). this means that **2012 is definitely a leap year.**

On the other hand, **2000 is divisible by 4 and it is also evenly divisible by 100** since it leaves a result of 20. That means 2000 might not be a leap year and you will have to divide it 1 more time.

3. If the number is evenly divisible by 400 to confirm a leap year.

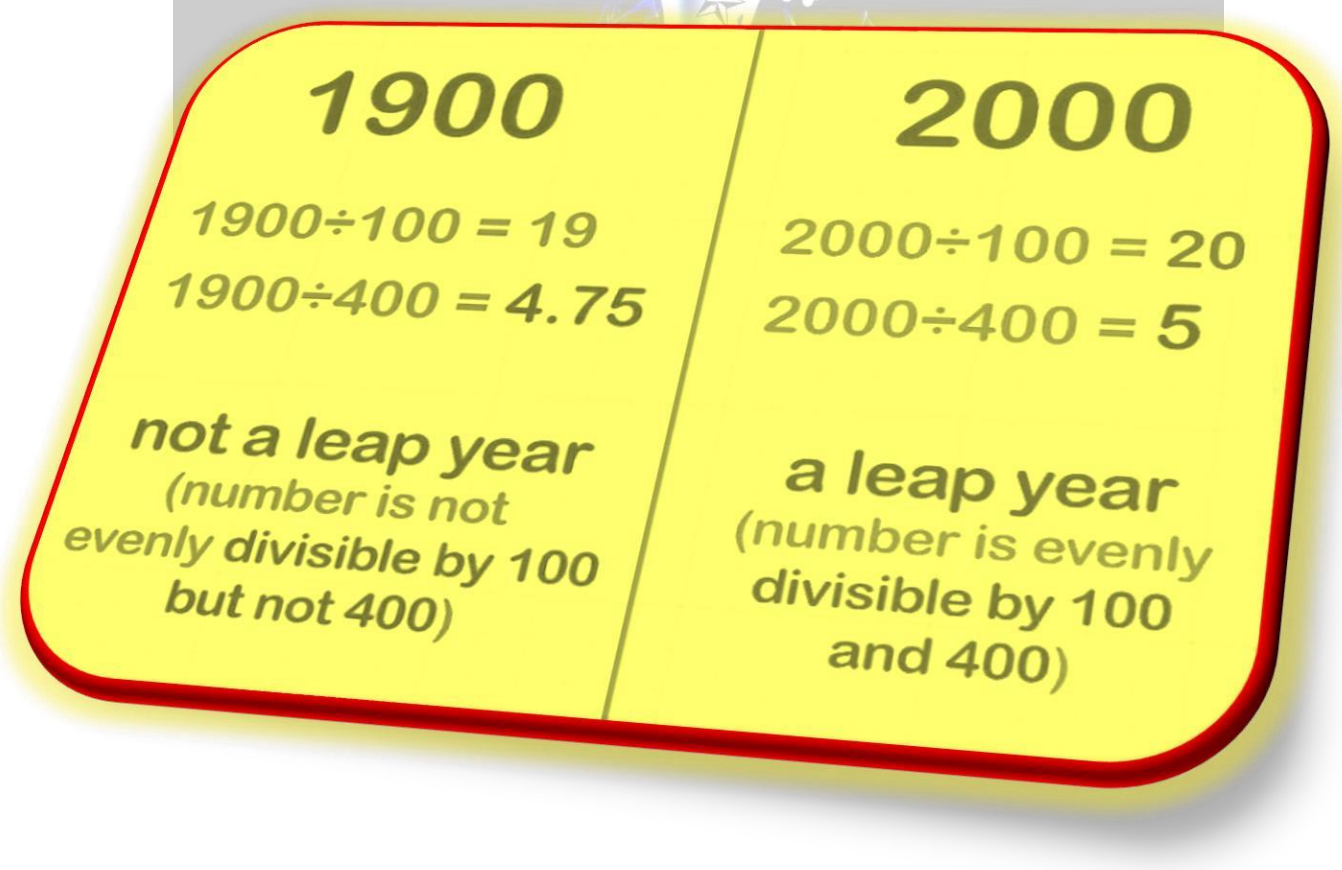
If a year is divisible by 100, but not by 400, then it is not a leap year.

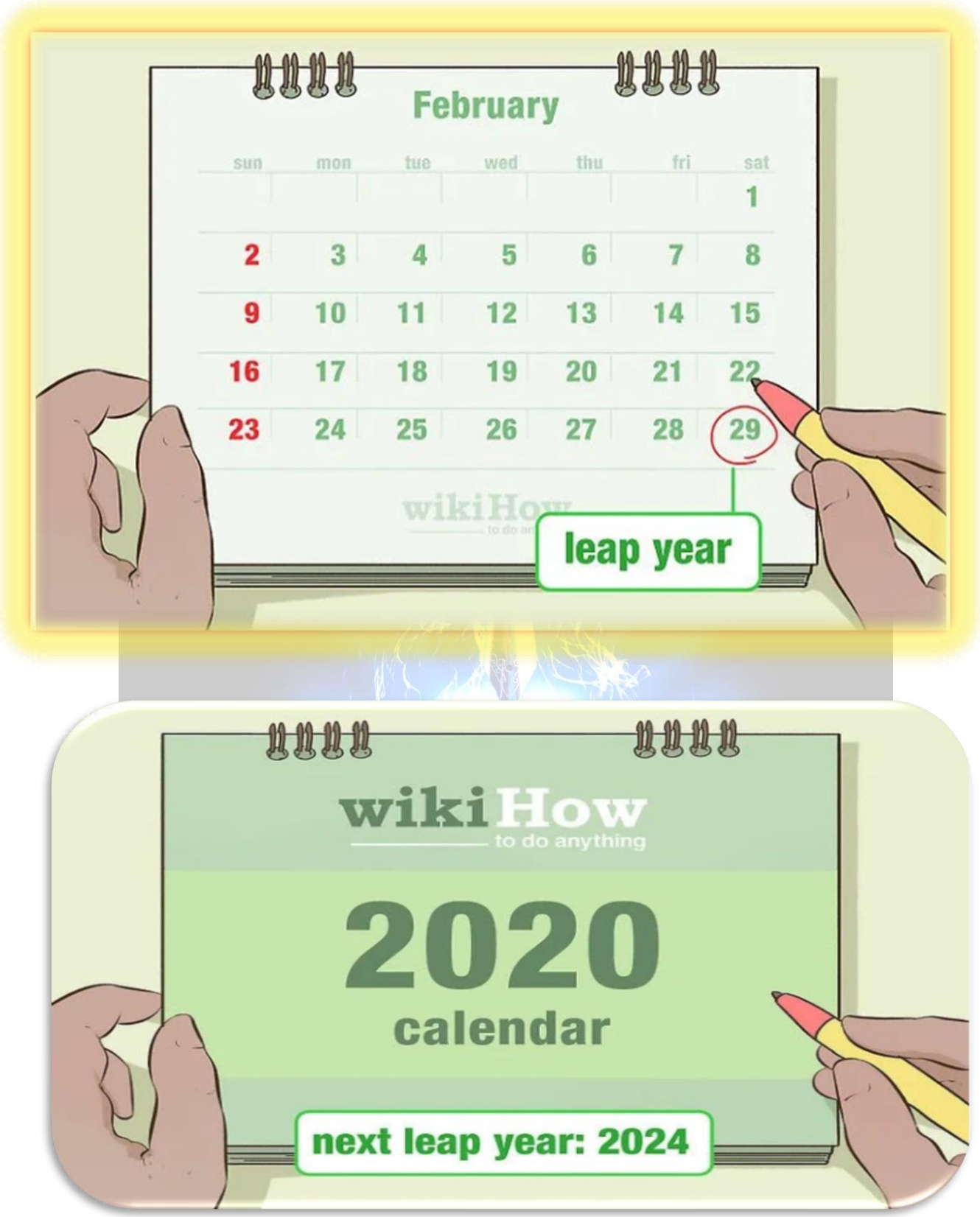
If a year is divisible by both 100 and 400, then it is a leap year.

For example:

1900 is evenly divisible by 100, but not 400 since it gives you a result of 4.75. this means that **1900 is not a leap year.**

On the other hand, 2000 is evenly divisible by 100 and 400, since it gives you a result of 5. That means the year **2000 is a leap year.**





1. **Why do we have leap years?**

Ans: each year is technically 12 months and a fraction of a day, close o .25 day. Every four years, the fraction is compiled to create a whole day and added to that year.

2. **Why do we check for divisibility by 100? Is it not enough to check divisibility by 4?**

Ans; No, there is still a small error that must be accounted for. To eliminate this error, the Gregorian calendar stipulates that a year that is evenly divisible by 100 (for example, 1900) is a leap year only if it is also evenly divisible by 400. For this reason, the following years are not leap years: ***1700, 1800, 1900, 2100, 2200, 2300, 2500, 2600.*** This is because they are evenly divisible by 100 but not by 400.

3. **Why specifically divided by 4, 100, and 400?**

Ans: these numbers resulted from complex calculations that were done to ensure that, over a long period of time. Our calendar years would stay as close as possible to the actual time it takes the earth to revolve around the sun. this includes somewhat arbitrary additions/subtractions of an extra day to certain years.

Generally speaking, leap years occur every 4 years, and they are the years divisible by 4 (2000, 2004, 2008 etc.).

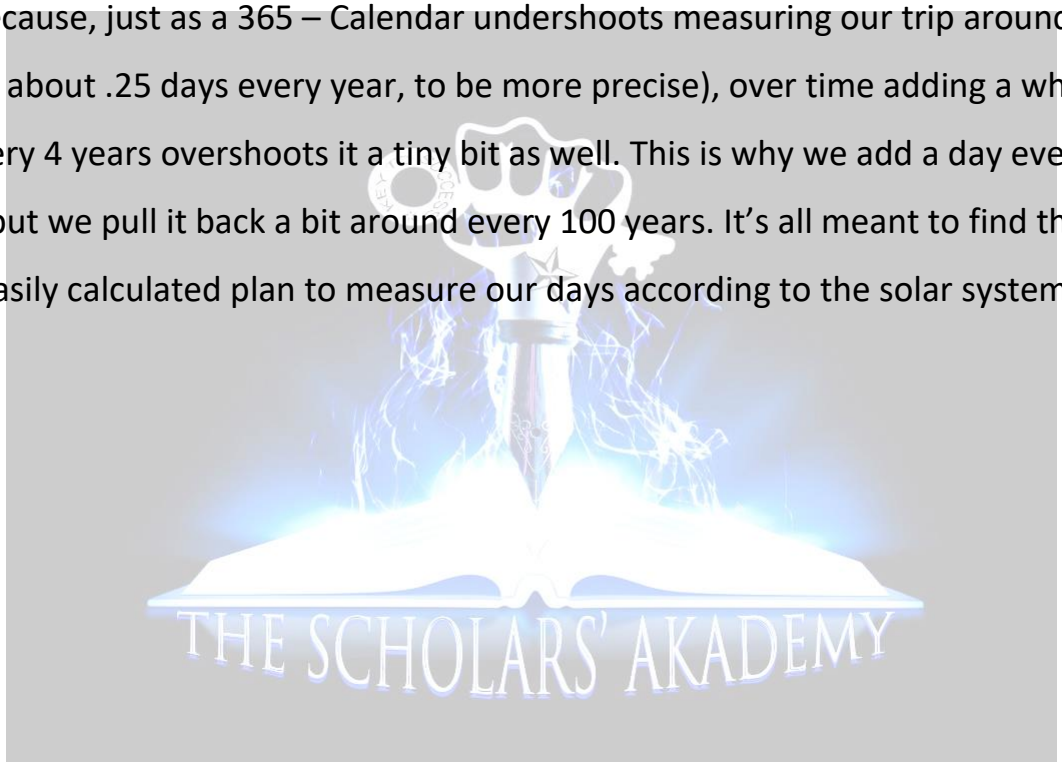
However, for three out of four years divisible by 100, the leap year thing is skipped; only those years divisible by 100 that are also divisible by 400 remain leap years (so: 1600 was a leap year, while 1700, 1800, and 1900 were not; 2000 was a leap year, while 2100, 2200 and 2300 will not be).

4. **If 1896 is a leap year, then why is 1900 not a leap year?**

Ans: if a year is divisible by 100 but not 400, then it is not a leap year. 1900 is divisible by 100, but not 400.

5. **Since you state "any year divisible by 4 is a leap year", why aren't 1700, 1900 and 2100 leap years?**

Ans: because, just as a 365 – Calendar undershoots measuring our trip around the sun (by about .25 days every year, to be more precise), over time adding a whole day every 4 years overshoots it a tiny bit as well. This is why we add a day every 4 years, but we pull it back a bit around every 100 years. It's all meant to find the most easily calculated plan to measure our days according to the solar system.



SEASONS ON EARTH

Why do the seasons change on Earth?

1. As the Earth spins on its axis, producing night and day, it also moves about the sun in an elliptical (elongated circle) orbit that requires about 365 ¼ days to complete.

2. The earth's spin axis is tilted with respect to its orbital plane. This is what causes the season.

3. Therefore, two things cause the seasons to change. First, the earth moves around the Sun. Second the Earth's tilted axis causes the seasons.

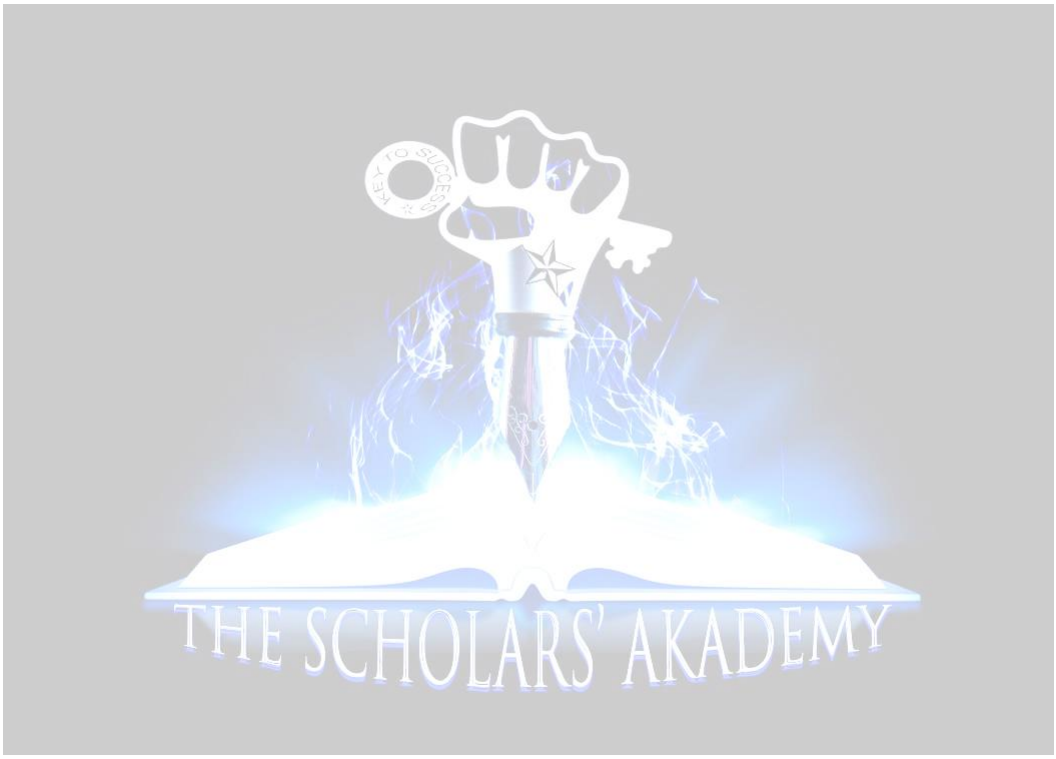
4. The earth spins around an axis. This imaginary line extends from the south Pole to the North Pole. But the Earth's axis is not vertical. It's actually tilted at an angle of 23.f degree. The planet Earth is always tilted in the same direction as it orbits the Sun.

5. The tilt of Earth's axis hasn't always been **23.5** degree. Every **40,000** years, it cycles between **22 degree and 24.5 degree.**
6. Throughout the year, different parts of Earth receive the Sun's most direct rays. So, when the North Pole tilts towards the Sun, it's summer in the Northern Hemisphere. And when the South Pole tilts towards the Sun, it's winter in the Northern Hemisphere.

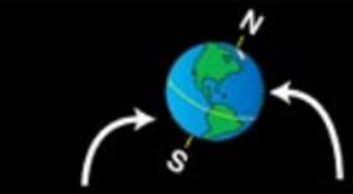
7. As Earth orbits the sun, its tilted axis always points in the same direction. So, throughout the year, different parts of Earth gets the sun's direct rays.
8. Sometimes it is the North Pole tilting toward the sun (around June) and sometimes it is the South Pole tilting towards the sun (around December).

9. **It is summer in June in the Northern Hemisphere because the sun's rays hit that part of Earth more directly** than at any other time of the year. It is winter in December in the Northern Hemisphere, because that is when it is the South Pole's turn to be tilted towards the Sun.

10. **Not all parts of the Earth have four distinct seasons**. But they all experience seasonal variation. Closer to the North Pole and the South Pole, daylight and temperatures change with the seasons.



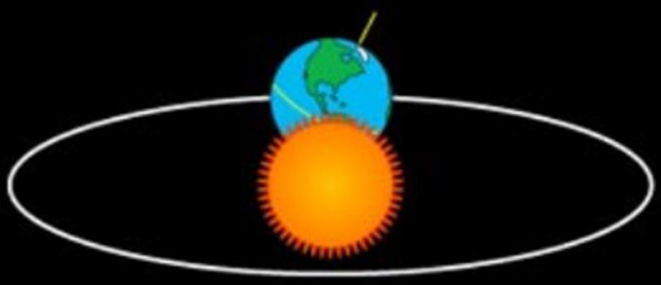
Earth has seasons because its axis is tilted.
Earth rotates on its axis as it orbits the Sun,
but the axis always points
in the same direction.



Southern Hemisphere

Northern Hemisphere

December:
Summer south of the equator, winter north of the equator. The Sun shines directly on the Southern Hemisphere and indirectly on the Northern Hemisphere



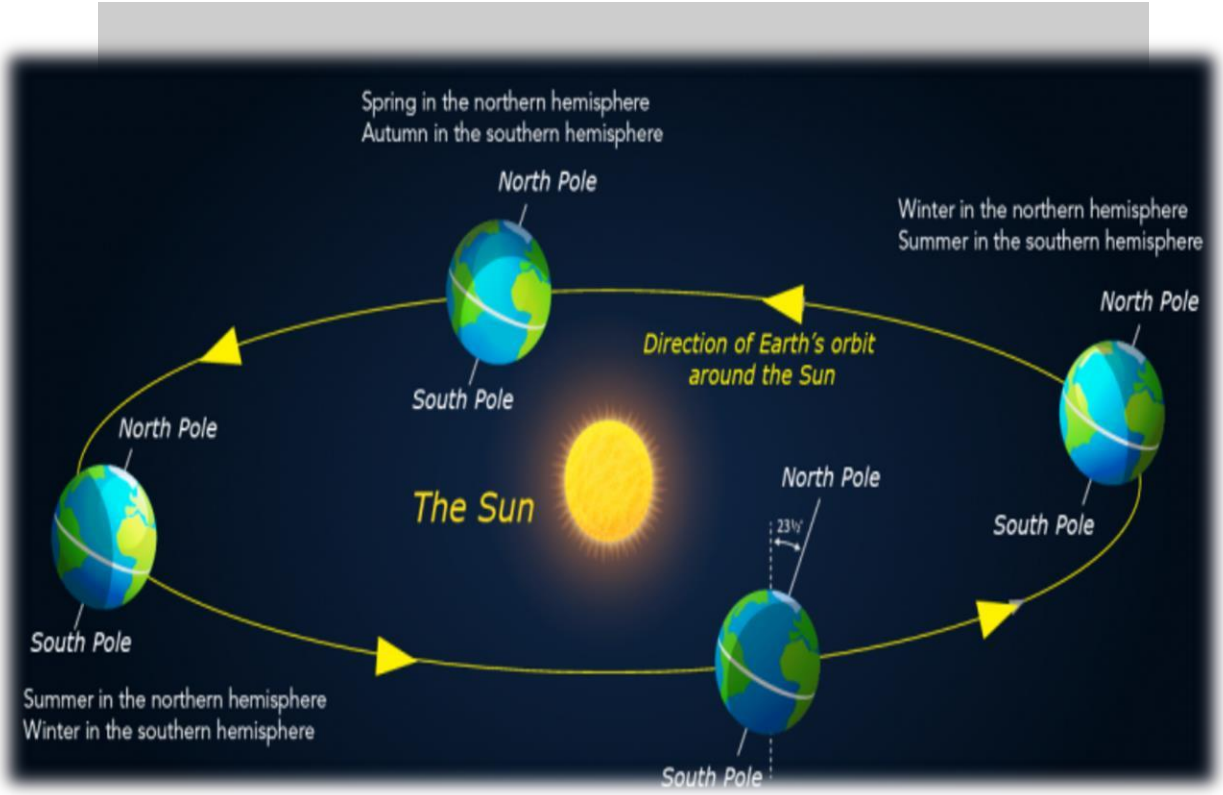
March:
Fall south of the equator, spring north of the equator. The Sun shines equally on the Southern and Northern Hemispheres

June:
Winter south of the equator, summer north of the equator. The Sun shines directly on the Northern Hemisphere and indirectly on the Southern Hemisphere

September:
Spring south of the equator, fall north of the equator. The Sun shines equally on the Southern and Northern Hemispheres

How are Seasons different in the Northern and Southern hemispheres?

Ans: Seasons happen at different times in different parts of the world. The tilt of the Earth doesn't change as it rotates around the Sun. But the part of the planet that gets the most direct sunlight does change.



Northern Hemisphere is tilted away from the Sun from **September to March.** That means the northern half of the planet doesn't get as much light and heat from the Sun. This causes autumn and winter. During the same months, the Southern Hemisphere is tilted towards the Sun. That means the southern half of the planet gets spring and winter.

- **From March to September,** the Northern Hemisphere is tilted towards the Sun. So that's when the northern half of the Earth experiences spring and summer. During the same months, the Southern hemisphere experiences autumn and winter.

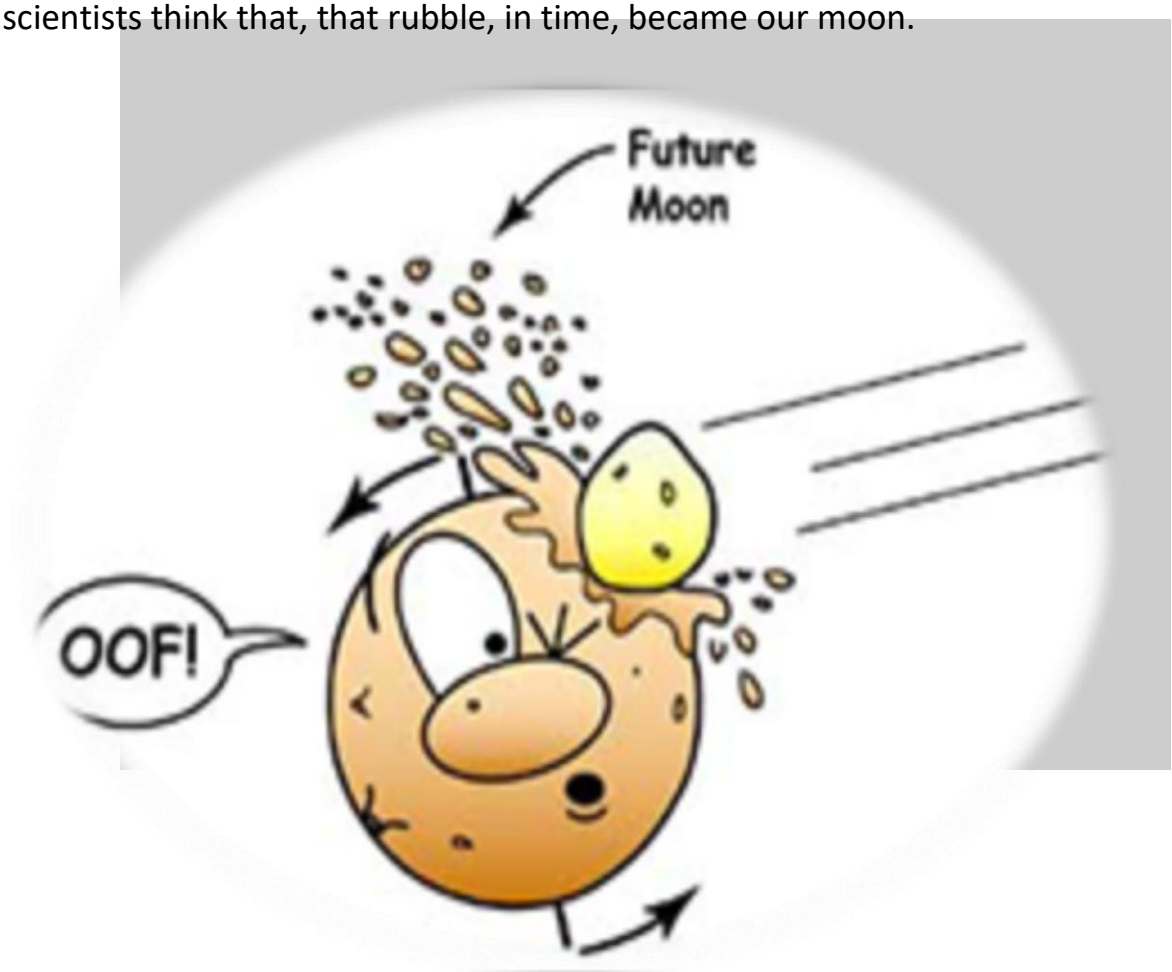
Similar to earth, other planets also have seasons, but the length and intensity of each season varies from planet to planet.

1. On Earth, seasons lasts between **90 and 93 days.**
2. On Venus, seasons lasts between **55 and 58 days.**
3. On mars, seasons change about once every six months. Summer lasts 1**99** days and winter lasts **146 days.**
4. On Saturn, seasons last about **seven years.**
5. And if you lived on Neptune, you would have to wait more than 40 years for the seasons to change.

What causes the Earth to tilt?

Long, time ago, when Earth was young, it is thought that something big hit Earth and knocked it off-kilter. So instead of rotating with its axis straight up and down, it leans over a bit.

By the way, the big thing that hit Earth is called Theia. It also blasted a big hole in the surface. That big hit sent a huge among of dust and rubble into orbit. Most scientists think that, that rubble, in time, became our moon.



Many people believe that Earth is closer to the sun in the summer and that is why it is hotter. And, likewise, they think Earth is farthest from the sun in the winter.

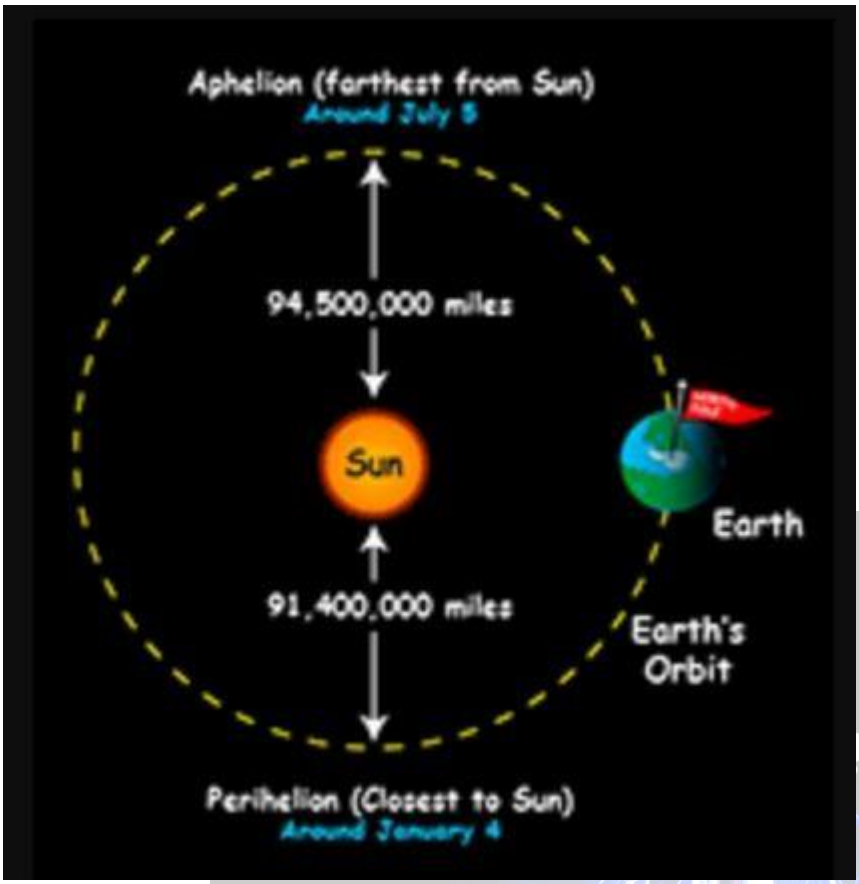
Although this idea makes sense, ***it is incorrect?***

Ans: it is true that Earth's orbit is not a perfect circle. It is a bit lop-sided. During part of the year, Earth is closer to the sun that at other times. However, in the Northern Hemisphere, we are having winter when Earth is closest to the sun and summer when it is farthest away! Compared with how far away the sun, is this **change in Earth's distance throughout the year does not make much difference to our weather.**

Actually, there is a different reason for Earth's seasons.

Earth's axis is an imaginary pole going right through the center of Earth from "top" to "bottom". Earth spins around this pole, making one complete turn each day. That is why we have day and night, and why every part of Earth's surface gets some of each.

Earth has seasons because its axis doesn't stand up straight.



Solstice and Equinox

The first days of winter and summer. Others refer to them as the **shortest and longest days of the year.**

In the summer, days feel longer because the Sun rises earlier in the morning and sets later a night. **When the North Pole of the Earth is tilted towards the Sun, we in the northern hemisphere receive more sunlight and it's summer**. As the Earth moves in its orbit, the tilt of the North Pole changes. When it is tilted away from the Sun, it is winter in the northern hemisphere. In between we have **autumn and Spring.**

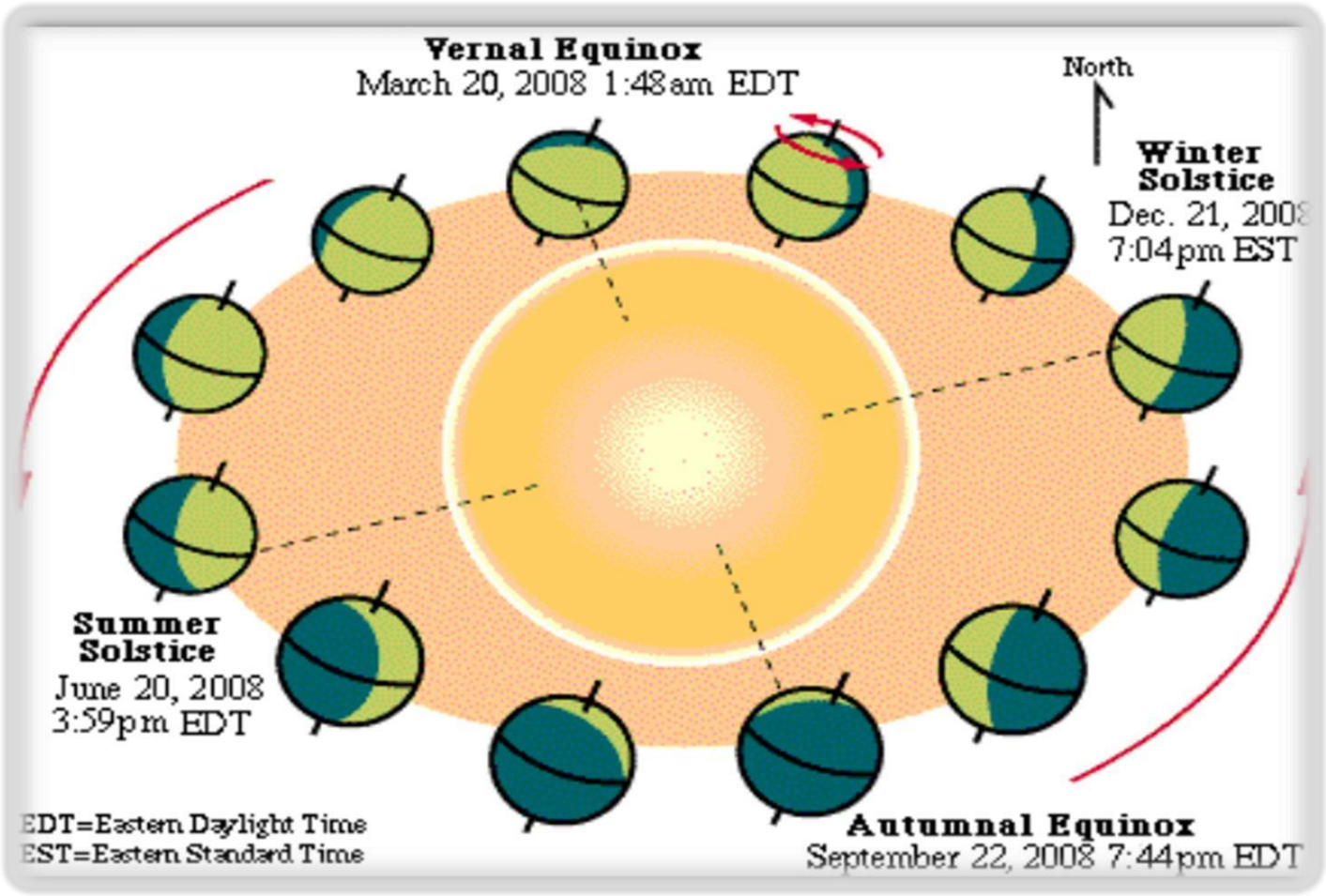
The day that the Earth's North Pole is tilted closest to the sun is called **the Summer solstice.** This is the longest day (most daylight hours) of the year for people living in the northern hemisphere. It is also the day that the Sun reaches its highest point in the sky.

The Winter solstice, or the shortest day of the year, happens when the Earth's North Pole is tilted farthest from the Sun.

In between, there are two times when the tilt of the Earth is Zero, meaning that the tilt is neither away from the Sun nor towards the Sun.

These are the vernal equinox – the first day of fall.

Equinox means “equal. “During these times, the hours of daylight and night are equal. Both are 12 hours long.



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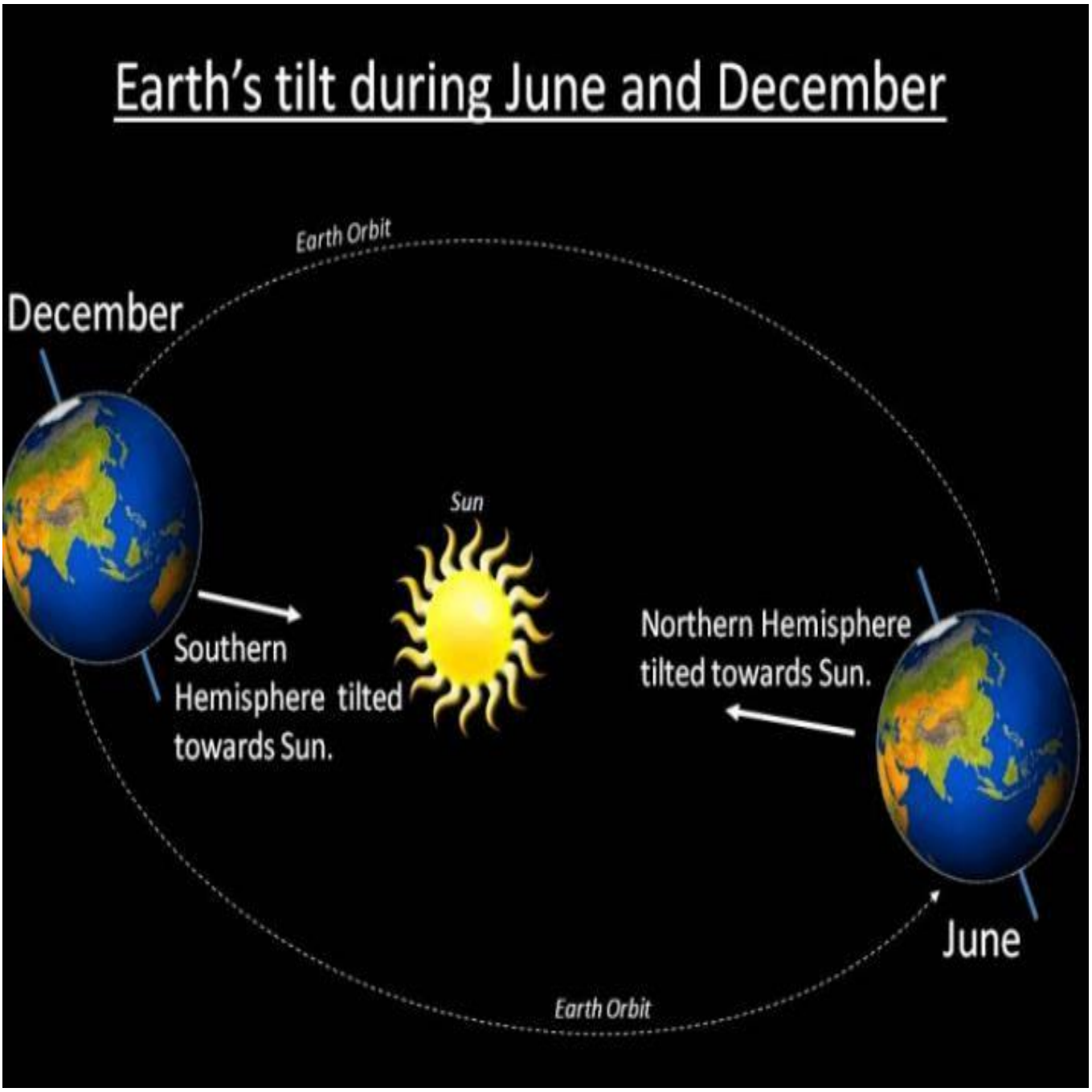
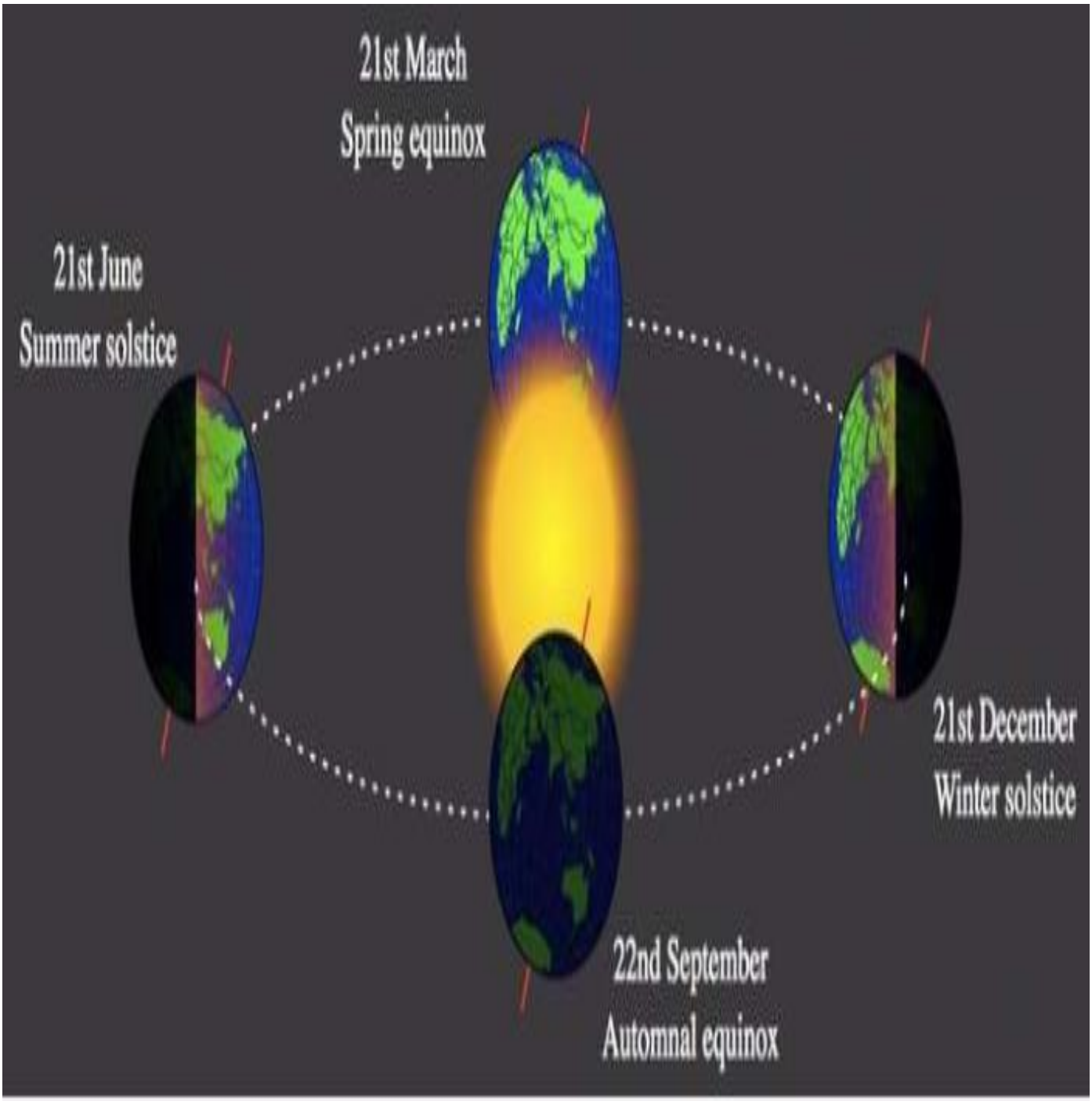
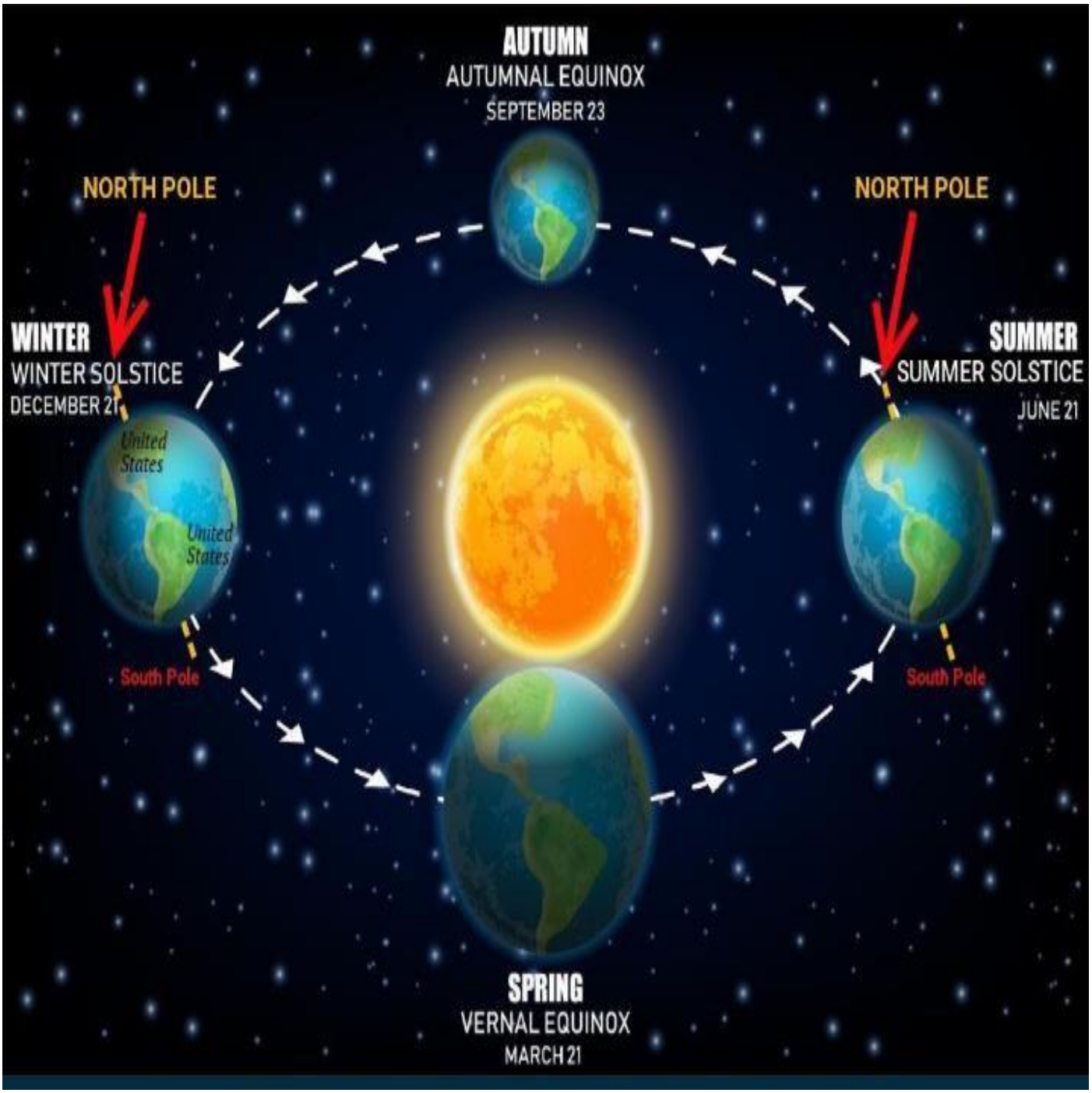

Earth's tilt during June and December
Earth Orbit
December
Sun
Southern Hemisphere tilted towards Sun.
Northern Hemisphere tilted towards Sun.
June
Earth Orbit

2.


21st March
Spring equinox
21st June
Summer solstice
21st December
Winter solstice
22nd September
Automnal equinox


AUTUMN
AUTUMNAL EQUINOX
SEPTEMBER 23
NORTH POLE
NORTH POLE
WINTER
WINTER SOLSTICE
DECEMBER 21
SUMMER
SUMMER SOLSTICE
JUNE 21
United States
United States
South Pole
South Pole
SPRING
VERNAL EQUINOX
MARCH 21