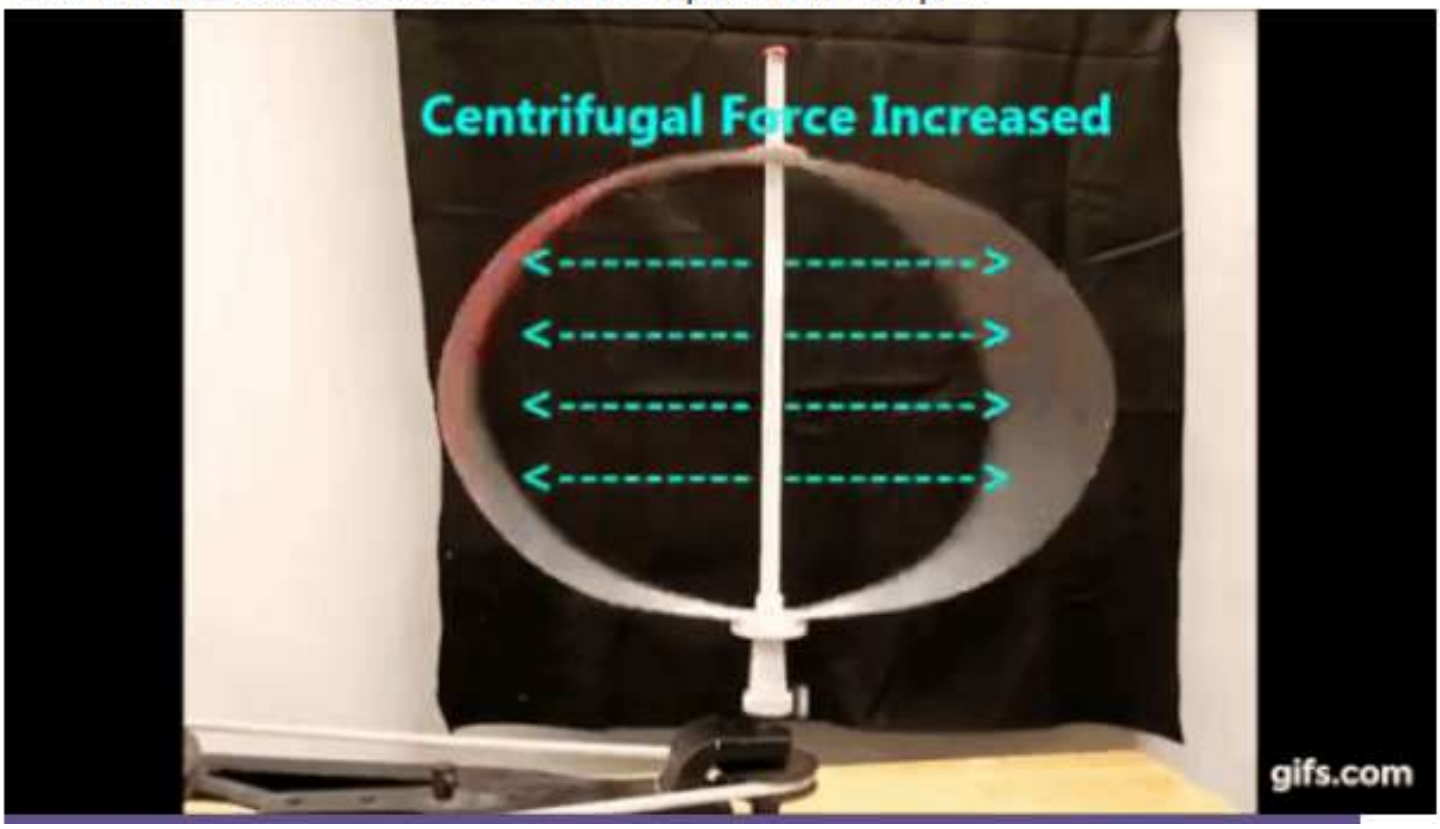
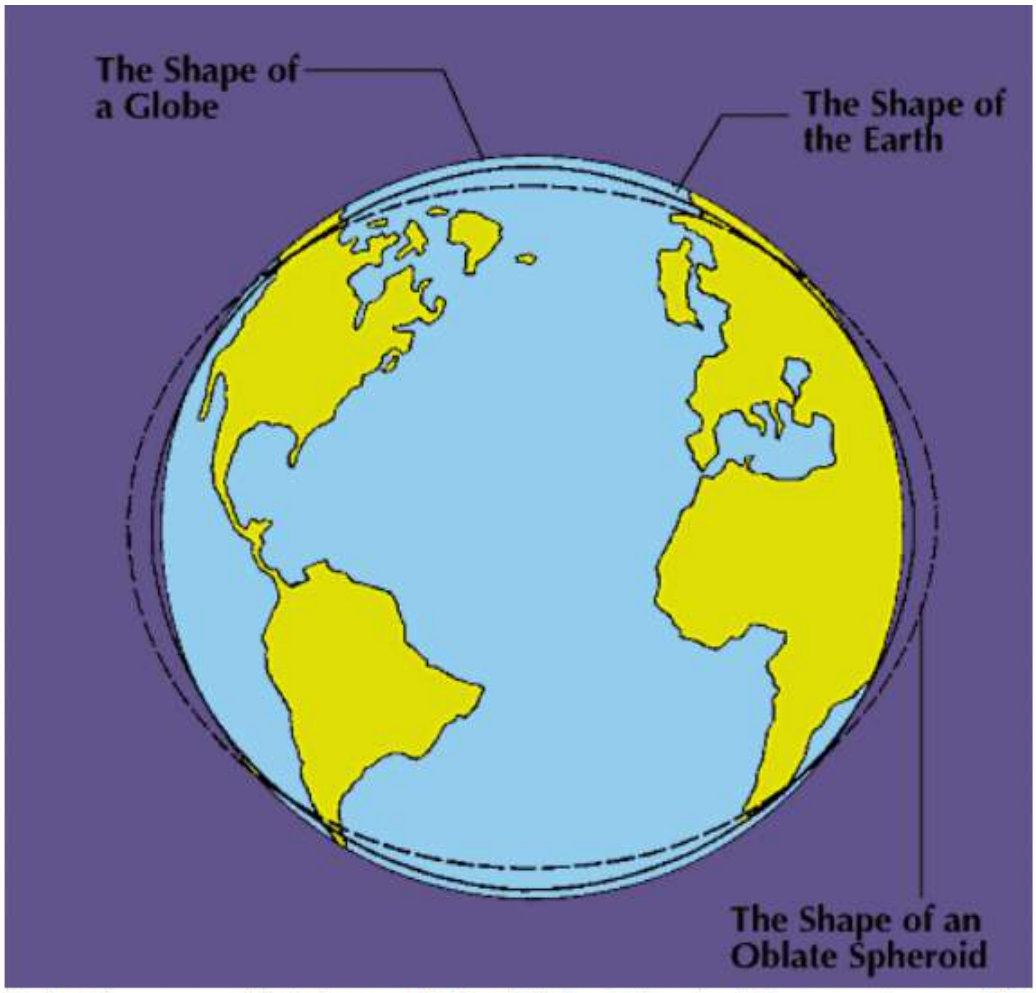
Geography Class 02

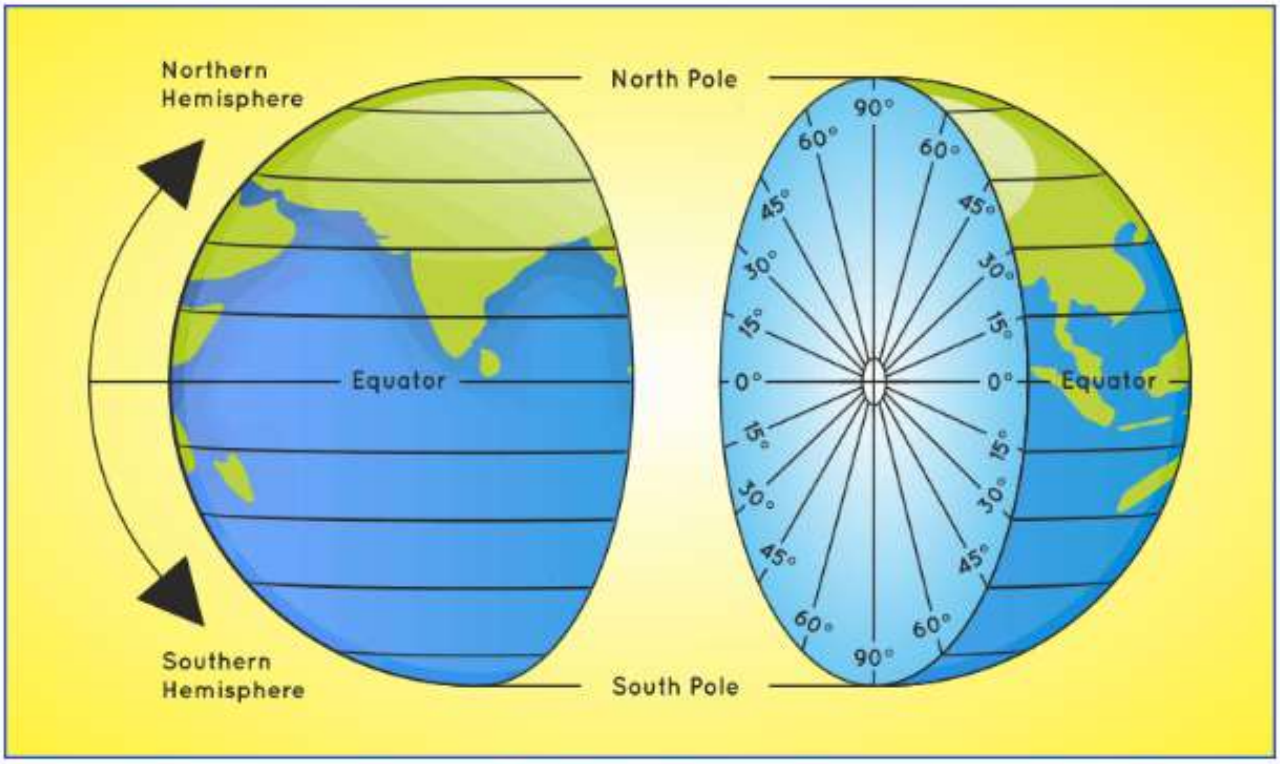
REVISION OF THE PREVIOUS CLASS (9:20 AM):

- The earth has a Geoid or Oblate Spheroid shape.
- 

- 

- It simply means that the earth is slightly bulged at the equator and flattened at the poles.
- Such a shape was first proposed by **Isaac Newton.**

Latitudes:

- Latitude at any place is in fact the angular distance between the place and center of the earth.
- 

- This is measured in degrees from the center f the earth towards the north & south of the equator.
- Latitude(Angular distance) can be 90 degrees at maximum.
- The equator is a complete circle assumed at zero degrees.
- If we join all locations on the same latitude angular distance), we will get a circle which is called **parallel** of that latitude.
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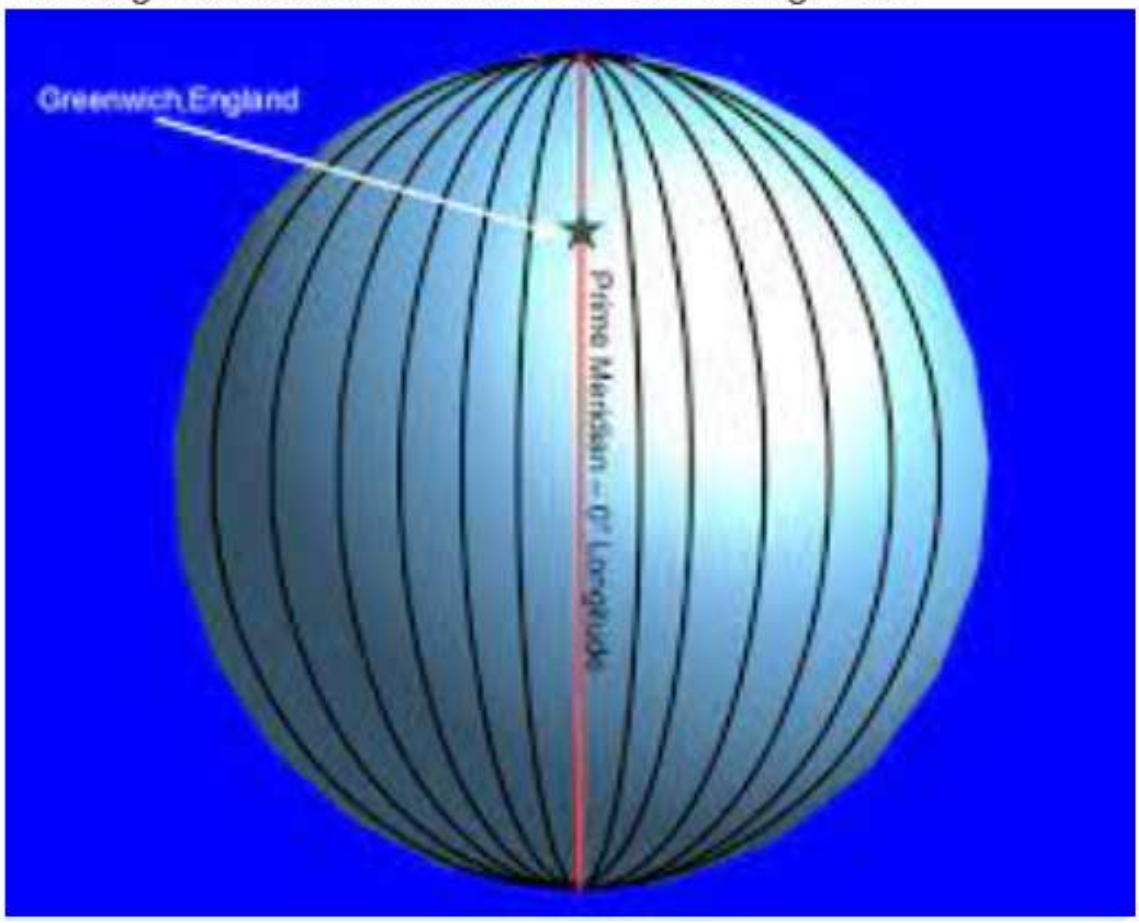
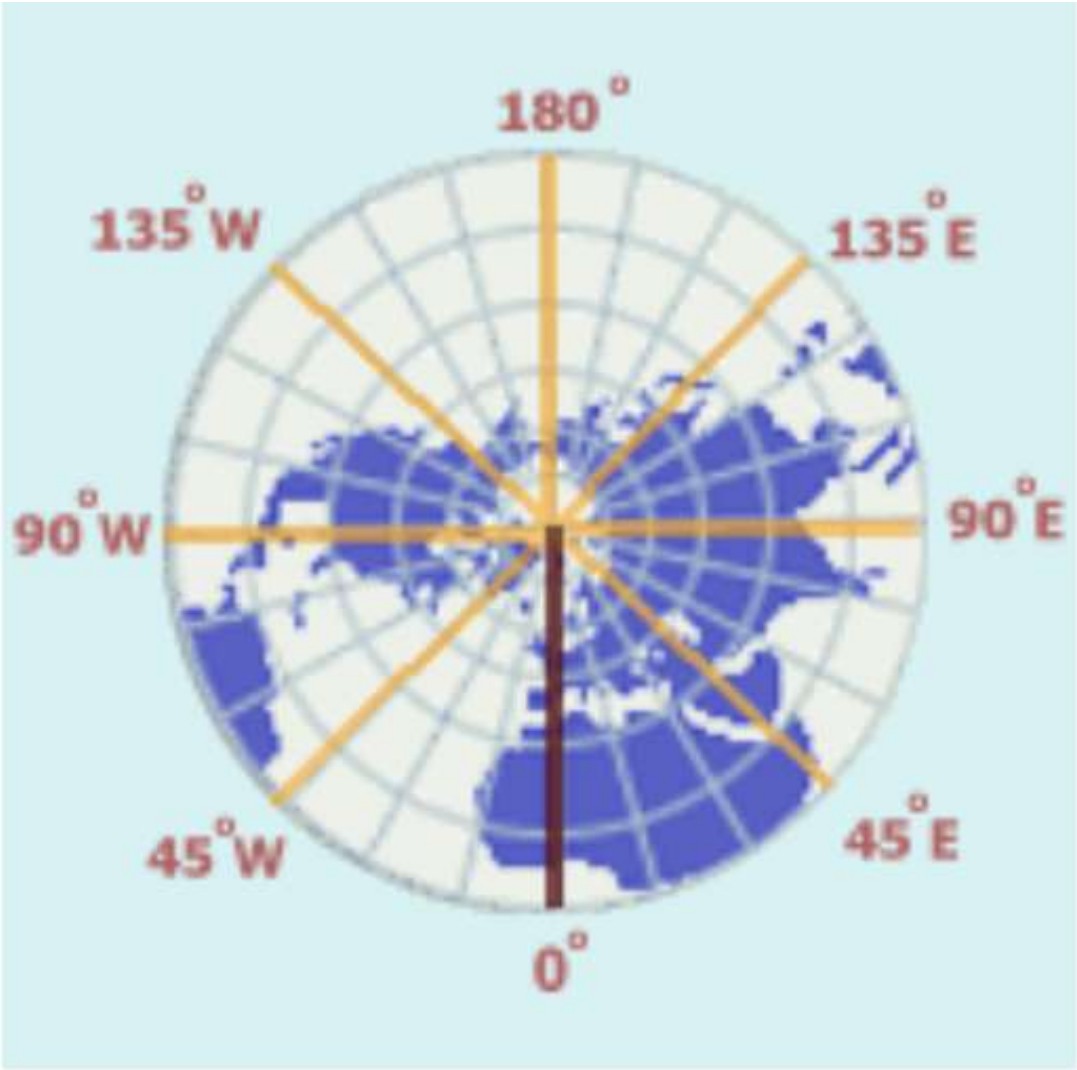
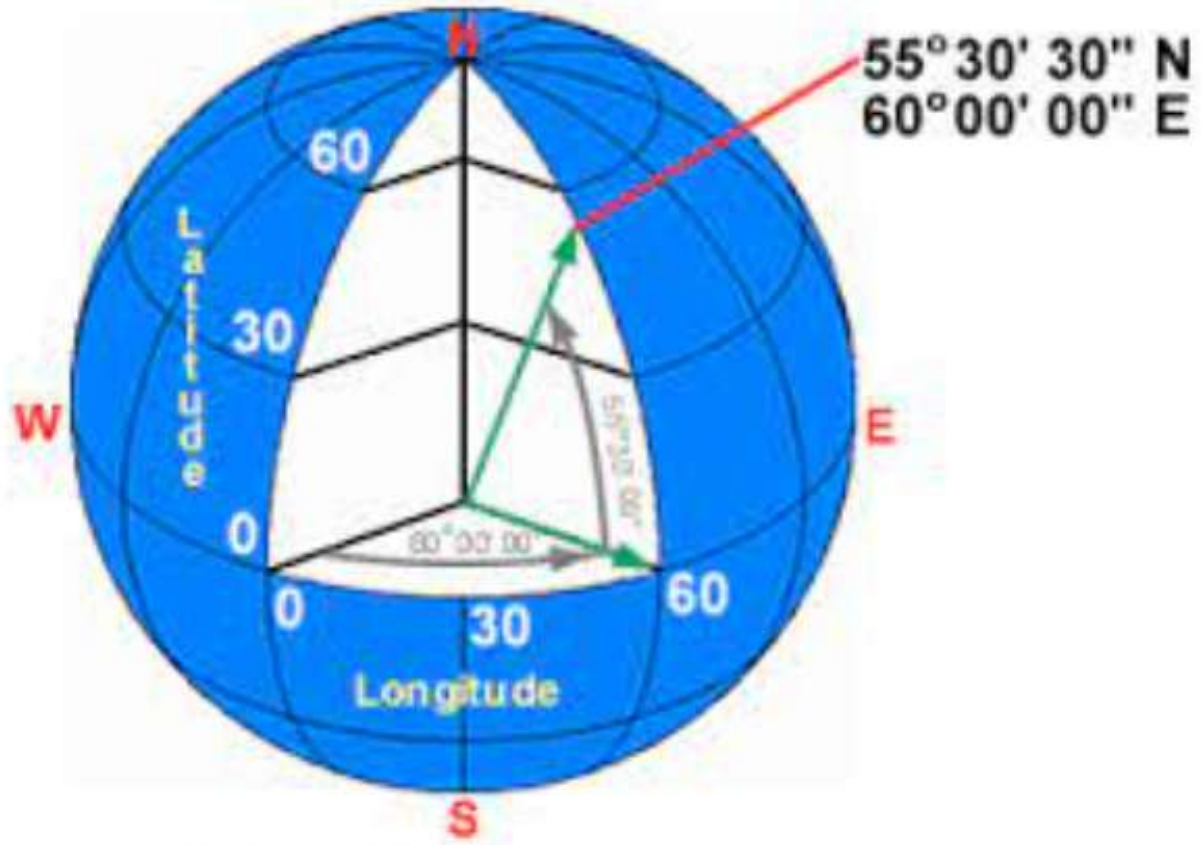
- The parallels of latitudes are always parallel to the equator and to one another.
- Length of the parallels will decrease from the equator, as we move to the poles.
- The distance between two parallels separated by one degree is always going to be the same(111 km), assuming Earth to be a perfect sphere.
- The attitudes are further subdivided into minutes where 1-degree latitude = 60 minutes/60'.

LONGITUDE (9:55 AM):

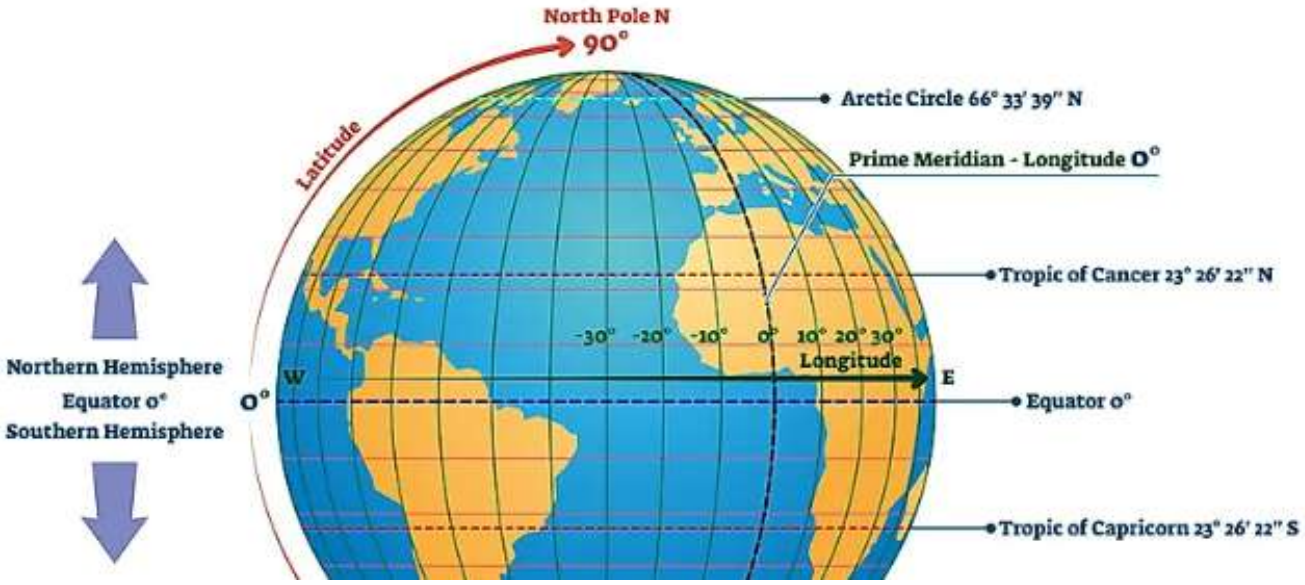
- Even longitudes are angular distances from the **Prime Meridian** that passes near **London** from **Greenwich.**
- They can be either east or west from the prime meridian.
- 180 degrees east and west is the same longitude.
- 

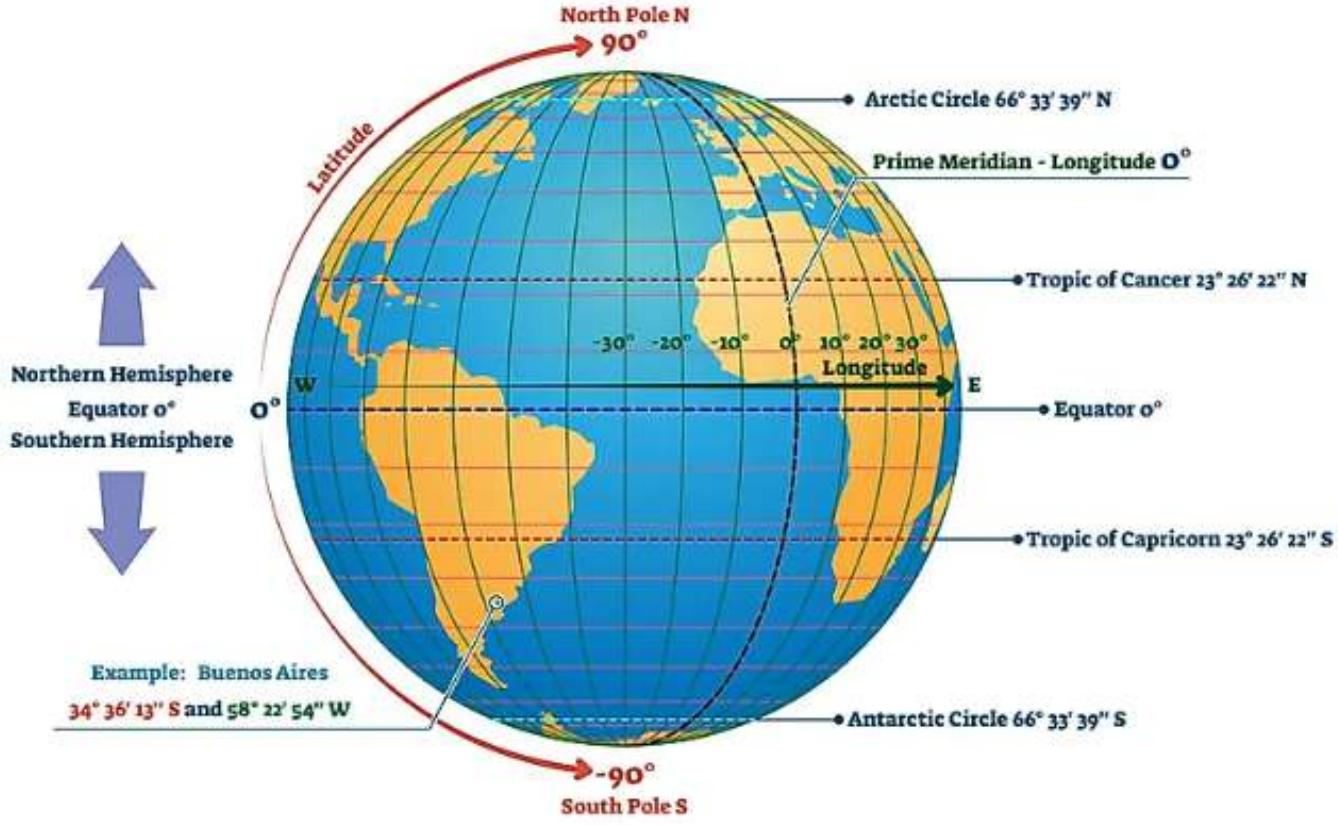
- 

- **Meridian** is the line connecting the paces with the same latitude.
- Meridians are semi-circ kes running from pole to pole.
- Meridians 0f the longitudes aren't parallel to each other and the distance between them decreases as we move from the equator to the poles.
- The distance between two longitudes and the equator separated by one degree is equal to 111 km, and it decreases towards the poles.
- Latitudes and longitudes intersect each other at rights angles.
- Combining latitudes and longitudes will give us the **system of coordinates** through which we can locate any place on earth
- Every place on earth will have a unique coordinate.

- 

Important latitudes and longitudes:

- 

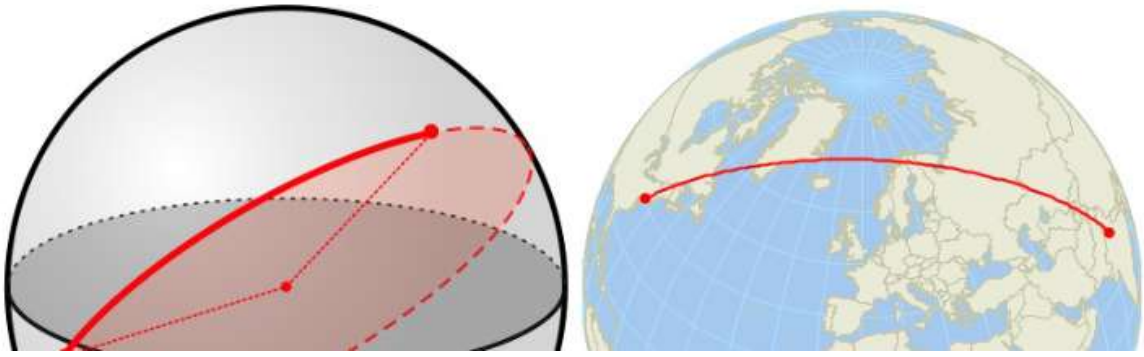

North Pole N
90°
Latitude
Arctic Circle 66° 33' 39" N
Prime Meridian - Longitude 0°
Tropic of Cancer 23° 26' 22" N
-30° -20° -10° 0° 10° 20° 30°
Longitude
W
E
Northern Hemisphere
Equator 0°
Southern Hemisphere
0°
Equator 0°
Tropic of Capricorn 23° 26' 22" S
Example: Buenos Aires
34° 36' 13" S and 58° 22' 54" W
Antarctic Circle 66° 33' 39" S
-90°
South Pole S

Differences between the longitudes and the latitudes:

Longitude	Latitude
It measures the (angular) distance east or west of the prime meridian.	It measures the (angular) distance north and south of the equator.
They are also referred to as meridians	They are also referred to as parallels.
They are not parallel and they meet at poles.	They are parallel and they never meet one another.
The distance between two consequent longitudes is not the same	The distance between two consequent latitudes is the same at 111 km

GREAT CIRCLE (10:30 AM):

- A Great Circle is the largest circle that can be drawn over the Earth in such a manner that it divides the Earth into two hemispheres.



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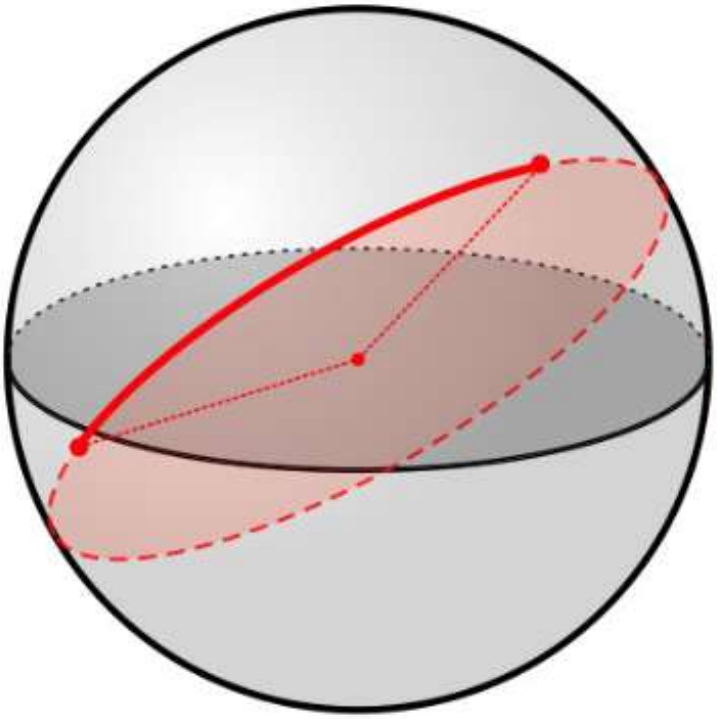
-  
- It is a circle with the longest possible circumference.
- We can have an infinite number of such great circles if we consider different planes and not only the planes of latitudes and longitudes.
- Among the parallels, the equator is the only great circle.
- All the meridians/longitudes are a part of the great circle.
- The concept is used for navigation because we can find the shortest distance between any two points through a great circle.

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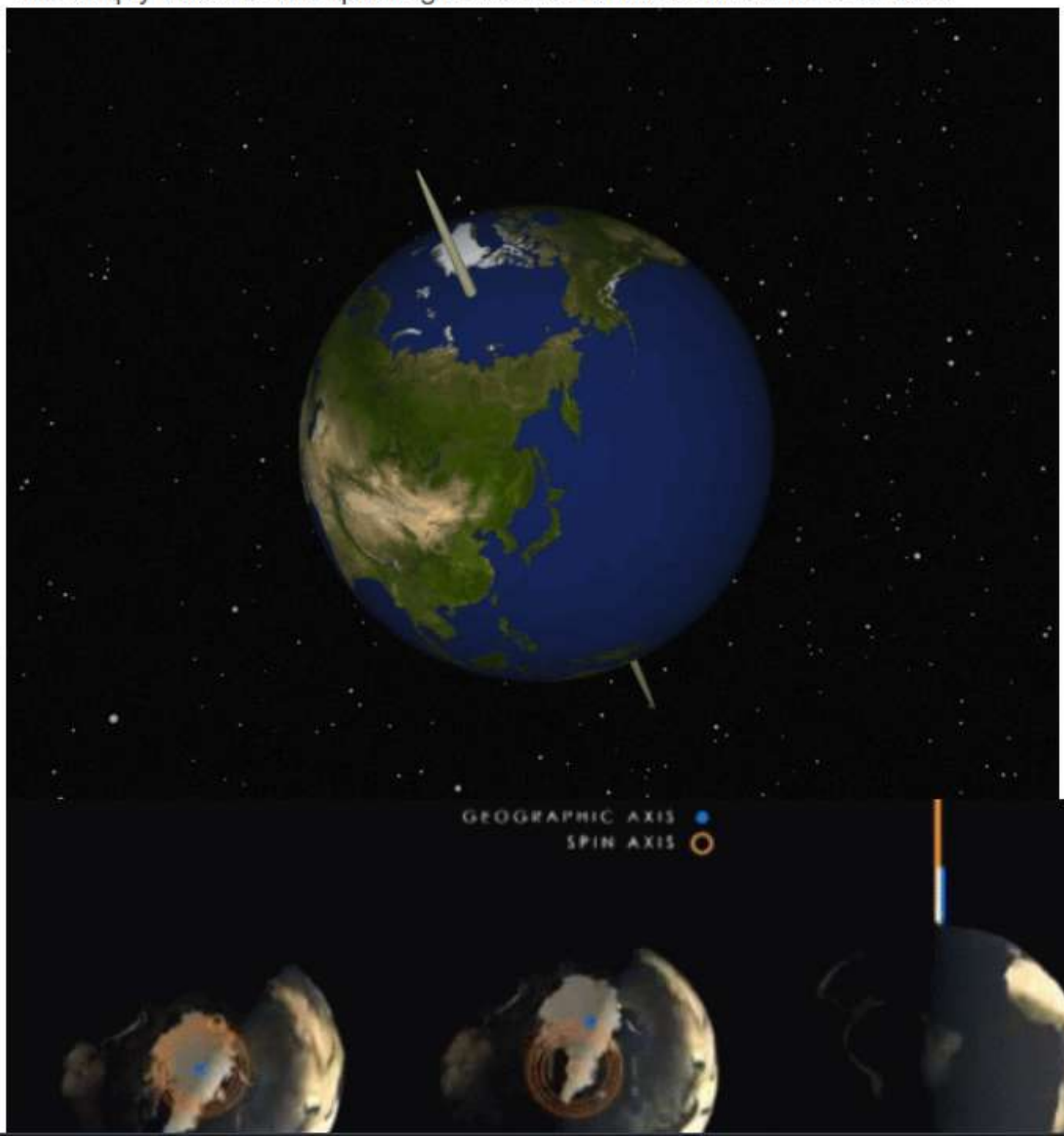
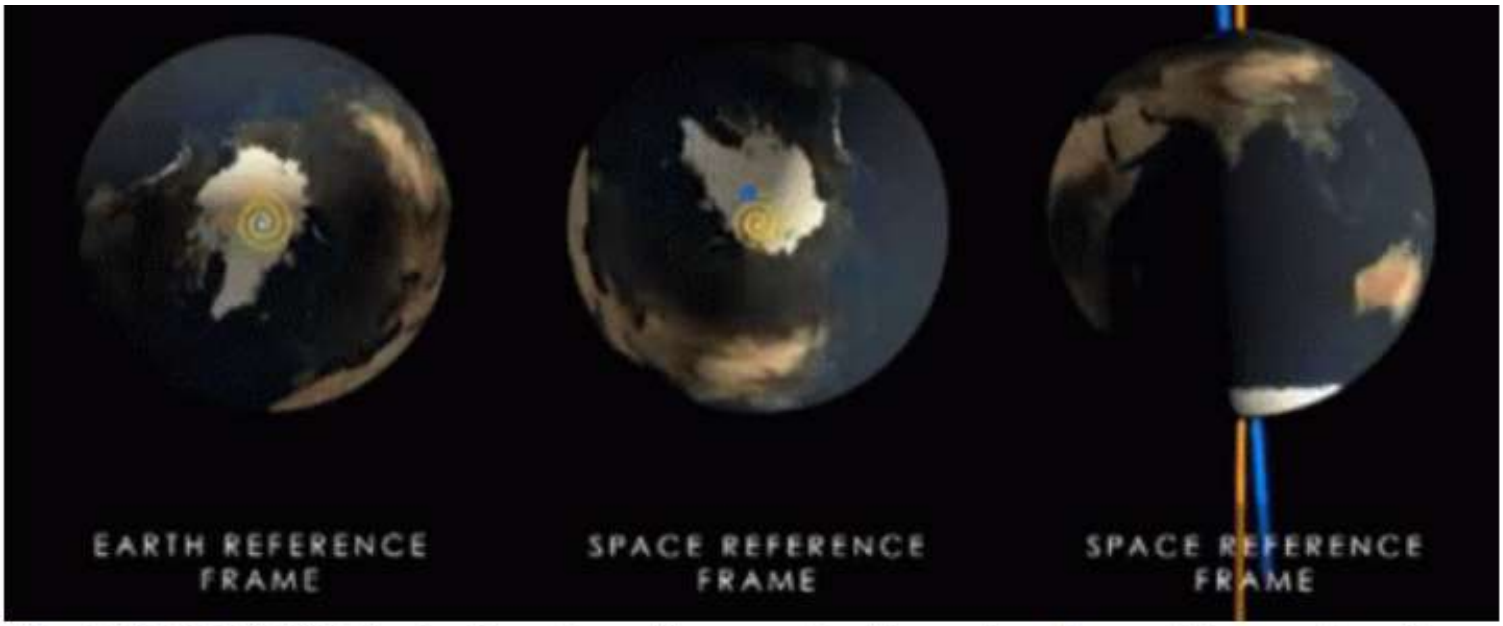
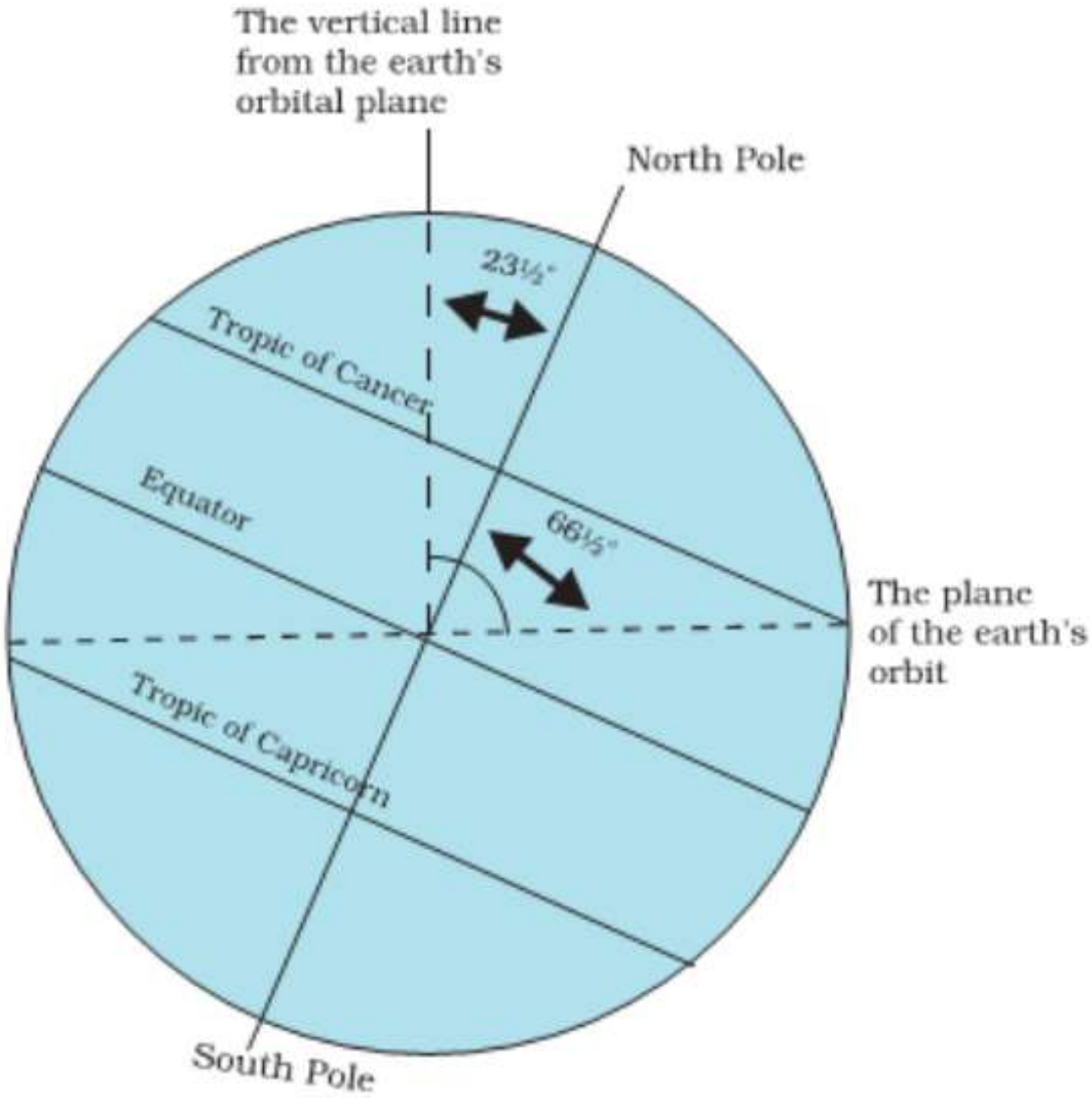
- This is because of the earth's curvature.
- Any two points on the earth can be connected through a great circle.
- Even though the great circle shows us the shortest distance, we still need longitudes and latitudes to give references to any particular place.

ROTATION OF THE EARTH (11:00 AM):

- This simply refers to the spinning movement of the earth on its own axis.
- 

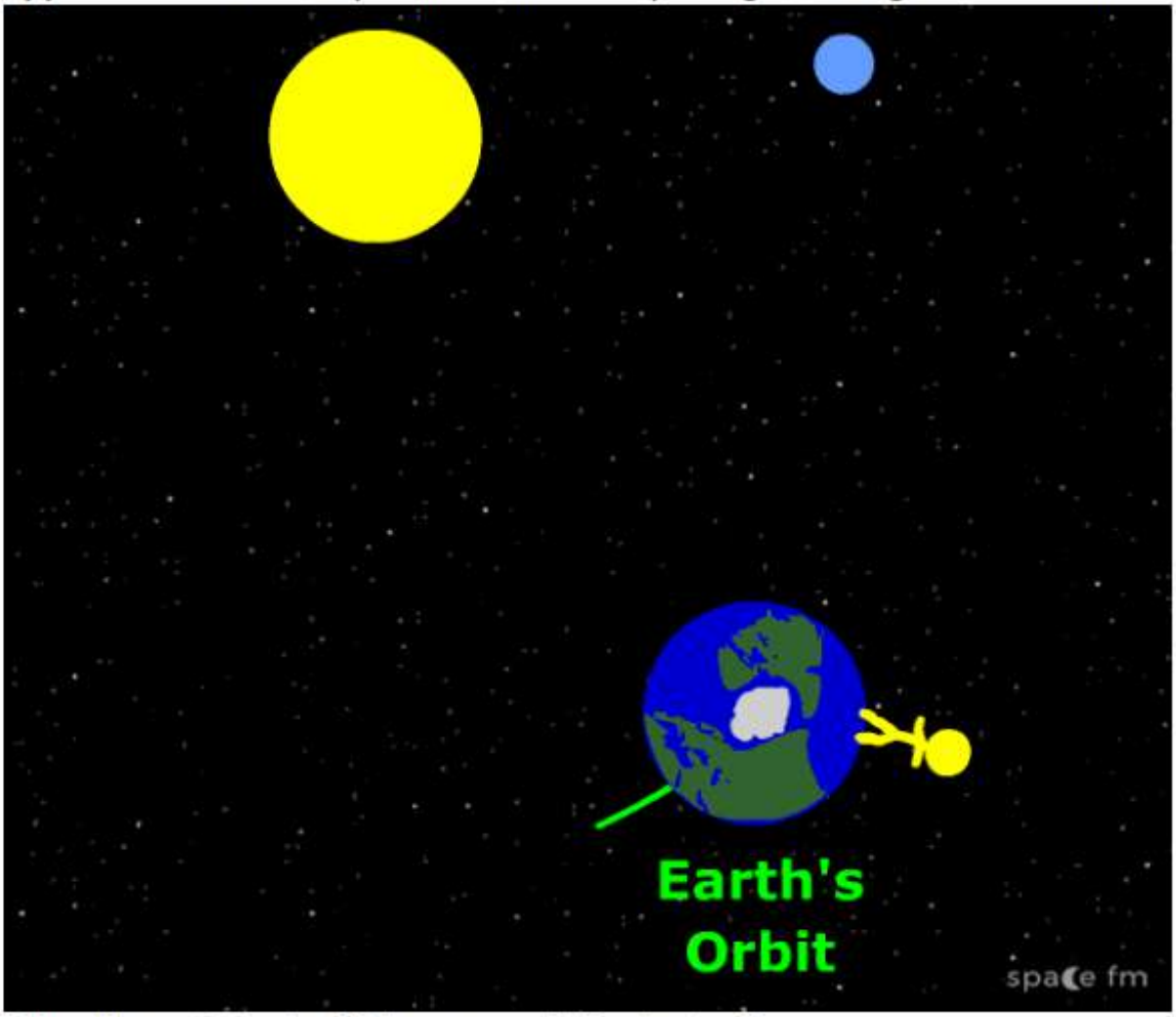
- 

- The **axis of rotation** is the imaginary line passing through poles and the center of the earth around which the earth rotates.
- The **orbital Plane** is the plane in which the Earth orbits around the sun.
- 66.5 degrees is the angle between the axis of rotation and the revolution orbital plane.
- 23.5 degrees is the **angle of tilt** by which the original axis of rotation is tilted.

- 

- The reason for the tilt is assumed to be a large impact that happened at the initial stages of the earth's formation.
- The direction of rotation is west to east- anticlockwise from the northern hemisphere/clockwise direction from the southern hemisphere.

SOLAR DAY (11:30 AM):

- It is the time taken for the earth to rotate on its own axis so that the sun appears in the same position in the sky.
- The solar day is 24 hours long.
- **Sidereal day:**
- It is the time taken by the earth to rotate on its own axis so that a distant star appears in the same position after completing 360 degrees of rotation.
- 

- The sidereal day is 23 hours and 56 minutes long.

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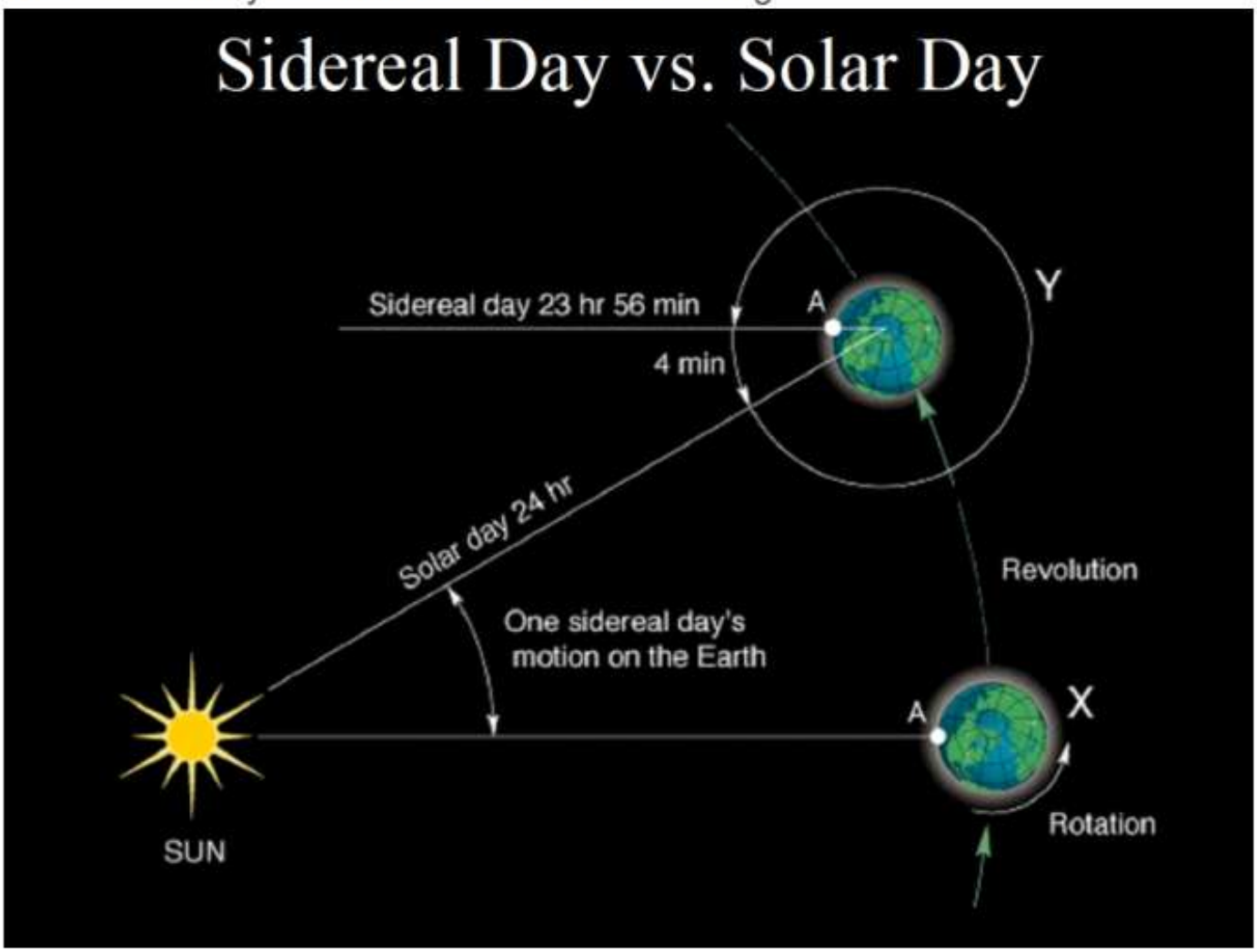
- 

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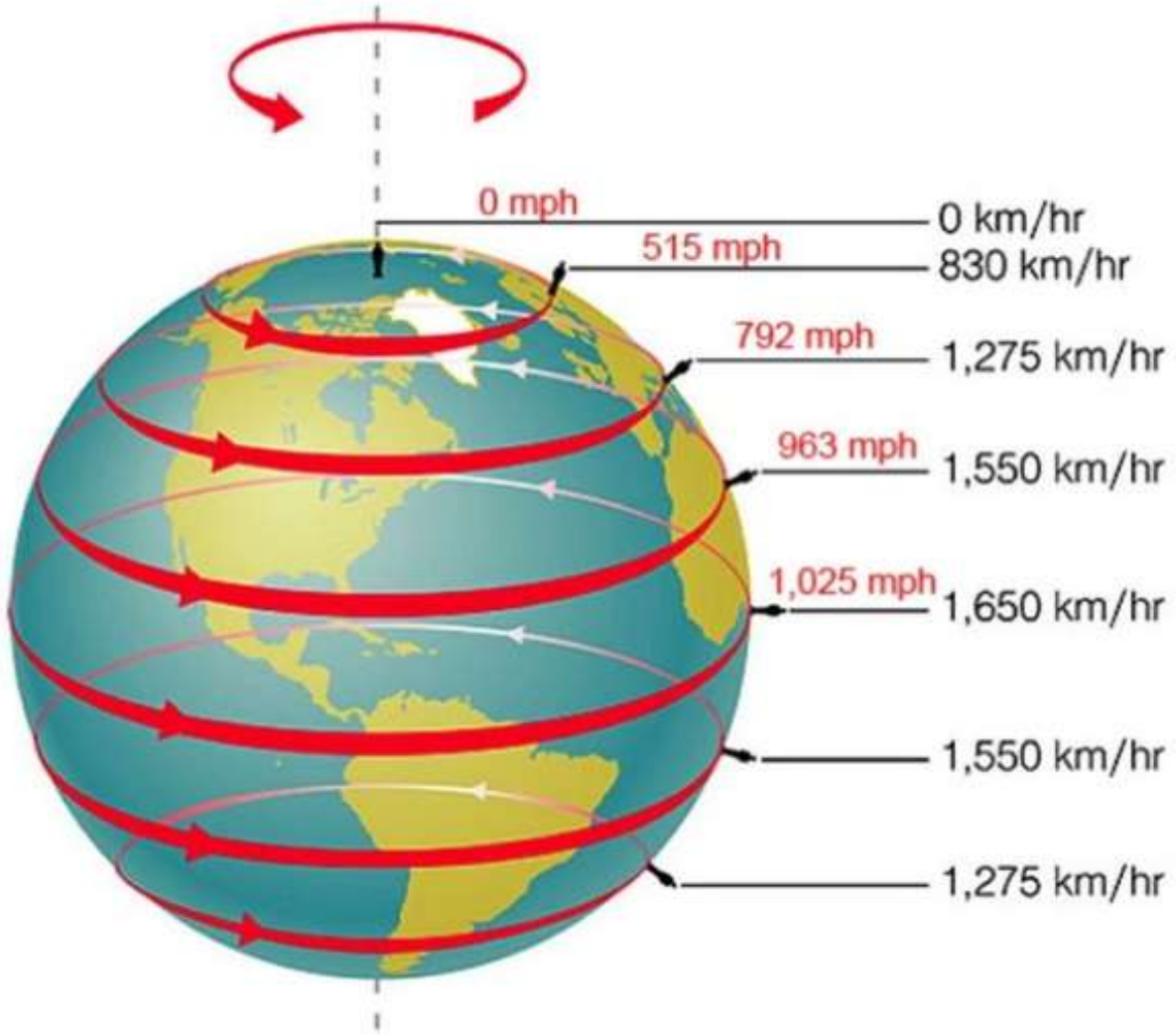
Speed of the Earth's rotation:

- It is 1650 km/hour at the equator.
- The linear speed is highest at the equator and it decreases as we go to the poles.



- We cannot feel this fast motion due to the gravitational force of the earth.

The implication of different linear speeds:

- The linear speed of the earth's rotation is very high near the equator so a launch from the region can impart an initial thrust or momentum.
- This initial thrust will help the rocket to achieve the **escape velocity** (11.2 km/second) easily.
- This initial thrust can save the fuel to be used for launching heavy satellites.
- Lesser fuel would mean lighter rockets which will have more chances of success.
- **Kourov** of French Guyana has been the world's most preferred site for launching heavy satellites(usually above 3000 kg).
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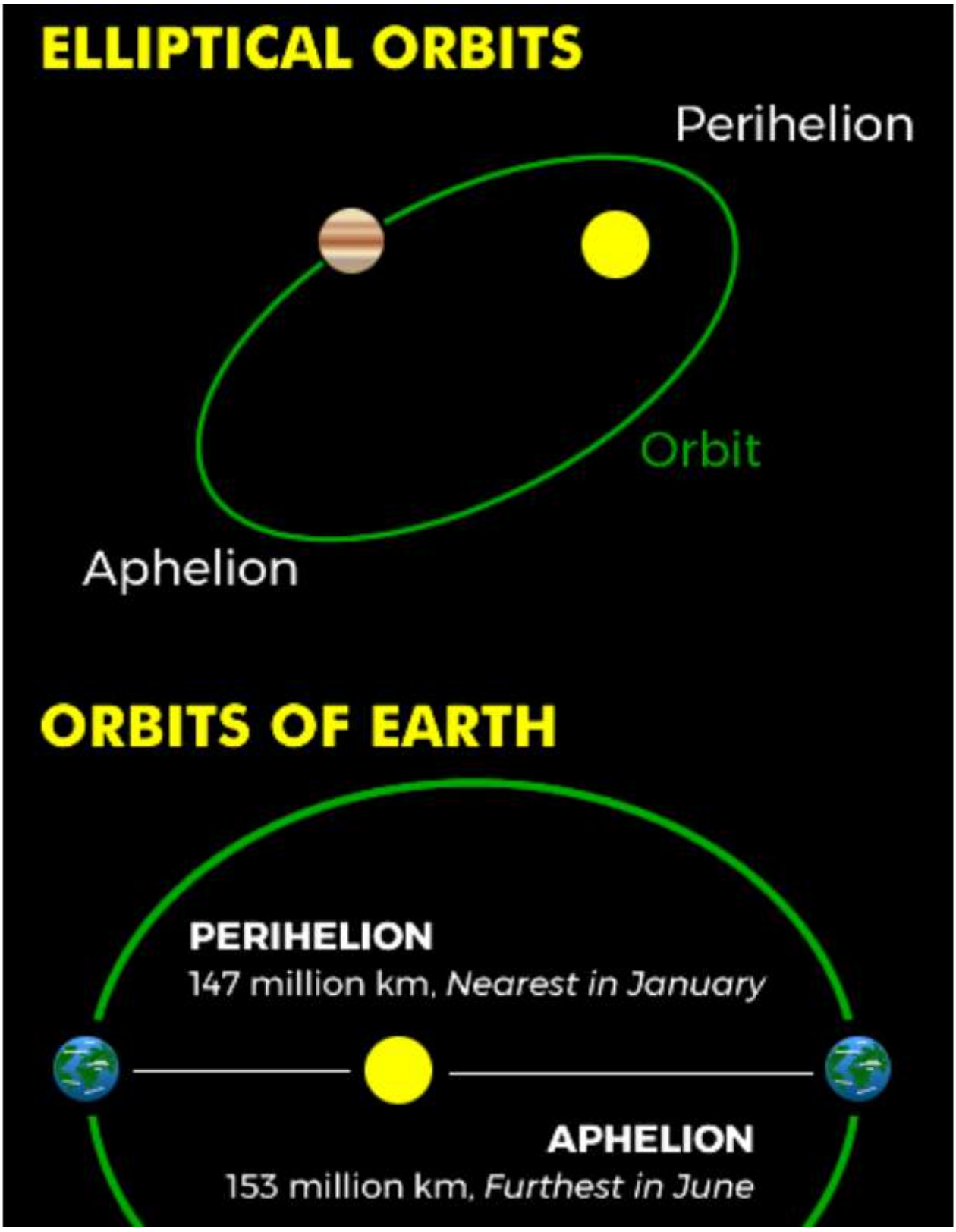
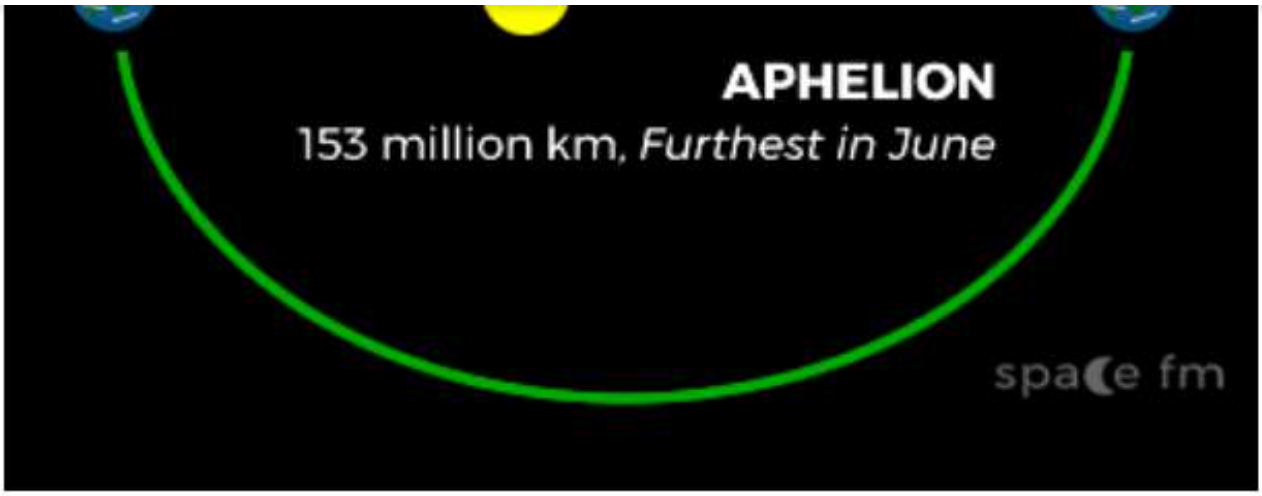
- Before India launched the Geosynchronous Satellite Launch Vehicle Mark III or GSLV Mk III in 2014, even India used Kourov for launching heavy satellites.
- Another step taken to utilize the initial thrust is to launch the satellites from the eastern part of the continent.

Revolution:

- The movement of the earth around the sun is called a revolution.
- The Earth revolves around the sun in an elliptical shape.
- **Perihelion** is the position of the earth when it is nearest to the Sun- January 3rd.
- **Aphelion** is the position of the earth when it is farthest from the Sun- July 4.

4 july is American Independence day also

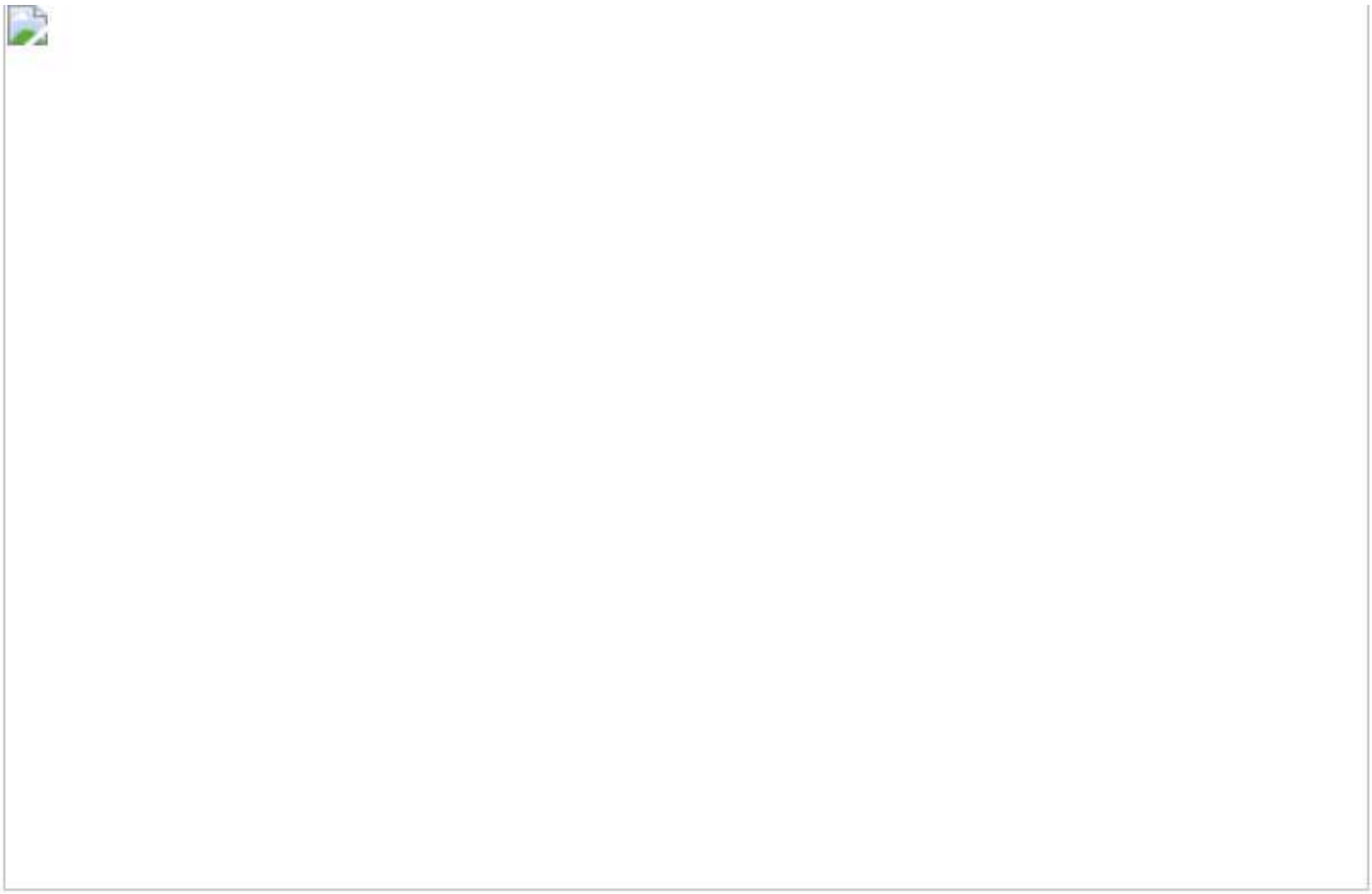

ELLIPTICAL ORBITS
Perihelion
Orbit
Aphelion
ORBITS OF EARTH
PERIHELION
147 million km, Nearest in January
APHELION
153 million km, Furthest in June



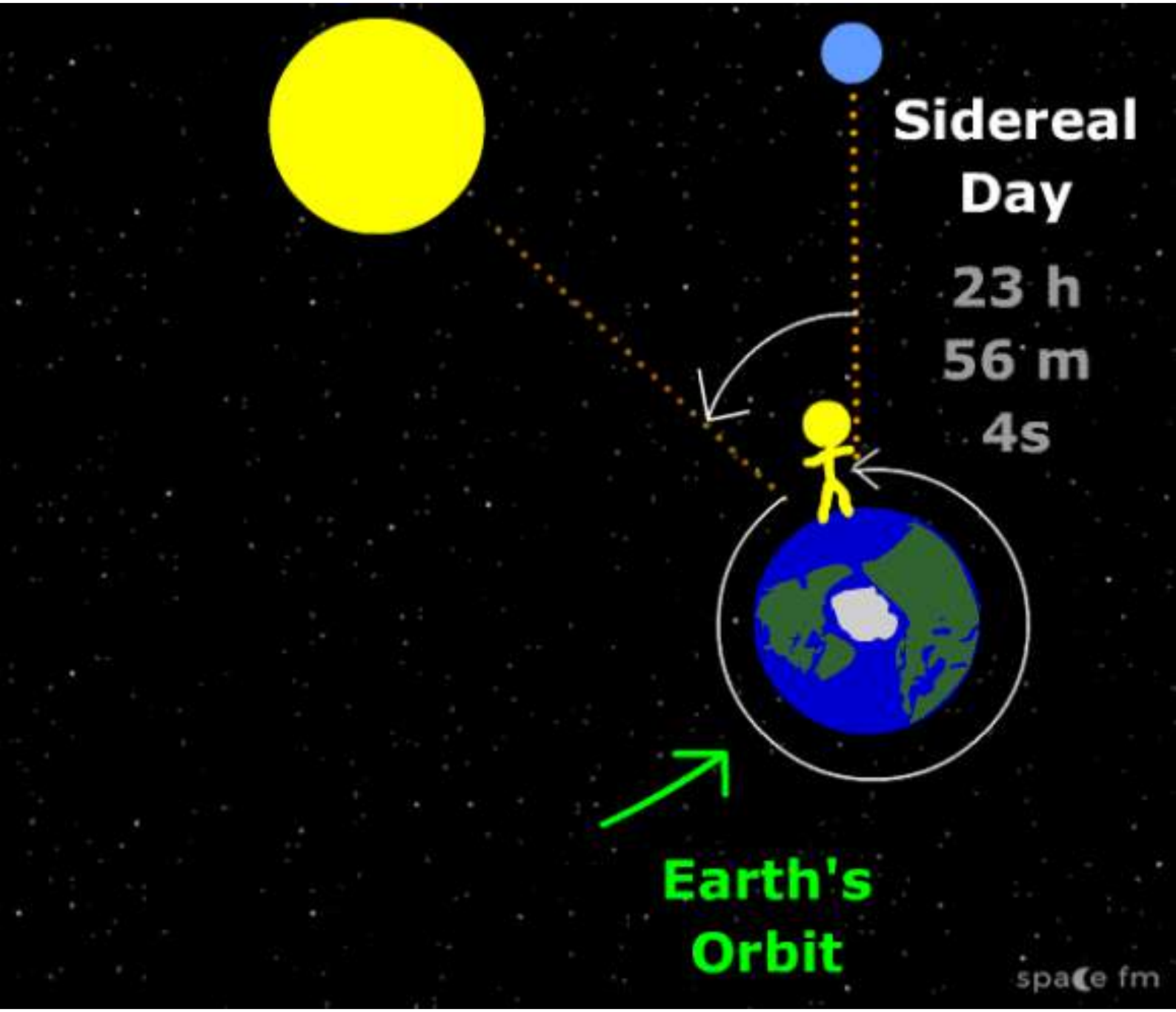
- Due to the large distance, the earth receives roughly the same sunlight both at aphelion and perihelion.
- Some differences whatsoever would be due to other factors like tilt, etc.
- The time for revolution is 365 days 5 hours and 48 minutes.
- This is why after 4 years, we add another day in the **leap year.**
- The direction of the revolution is anticlockwise/west to east.
- The average speed of revolution is around 1 lakh km/hour.
- This speed is more at the perihelion and less at the aphelion.

Reason for an elliptical orbit instead of a circular orbit:

- Earth undergoes both the gravitational force and the force of the revolutionary motion.
- The reason for the elliptical orbit is that these two forces are not totally balanced.
- If these forces were balanced, we would have had a circular orbit of revolution.

- 
- This is why the circle is taken as a special case of an ellipse.
- **Kepler** was the first who told that the earth's revolution orbit is elliptical rather than circular.
- This was proved by Newton in his book **Principia** which was written at the insistence of his friend **Halley** who was also an esteemed astronomer.
- The book Principia also gave us the three laws of motion and the laws of gravity.

The topics for the next class are seasons & time zones.


Sidereal
Day
23 h
56 m
4s
Earth's
Orbit
space fm