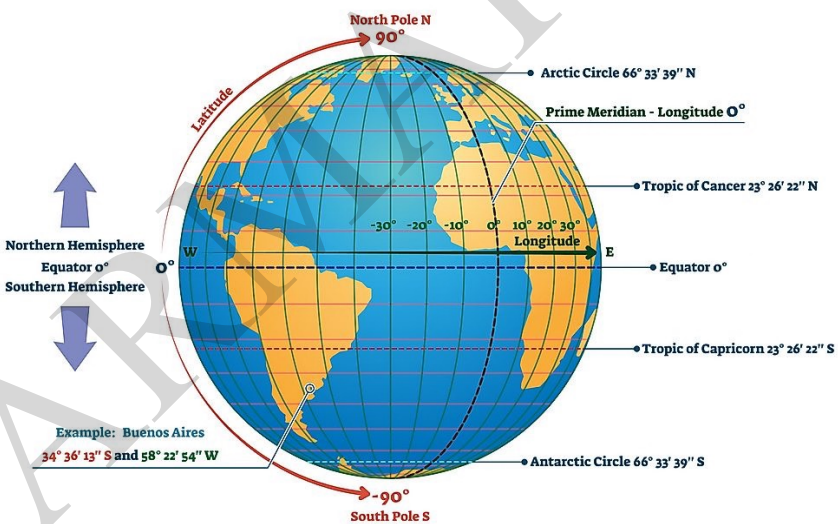
LONGITUDE AND LATITUDE
ROTATION AND REVOLUTION



Fundamentals of Earth

Phase 4: Eclipse

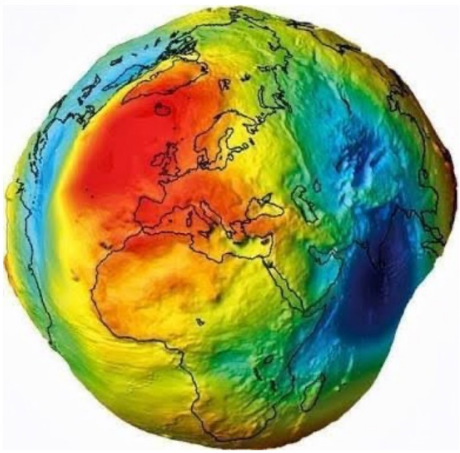
Age of Earth

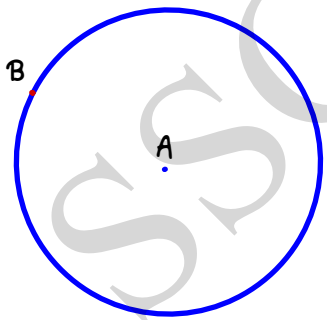
Technique used: Radioactive dating → invented by Ernst Rutherford (1905)

Types of Dating

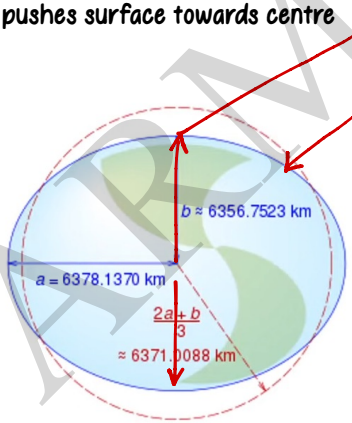
1. Uranium-lead dating method (oldest rocks)
2. Potassium-argon method
3. Rubidium-strontium method
4. Radiocarbon dating method
5. Chlorine-36 dating method
6. Carbon-dating (C^{14}) (latest rocks)

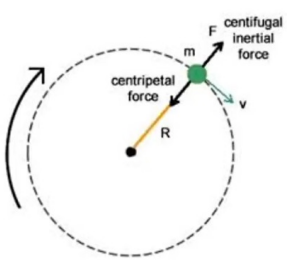
Shape of Earth





- Shape of Earth is Geoid or Oblate Spheroid (a little flat from top and bottom)
- Reason: more Centrifugal Force at Equator bulges earth at Centre and Gravitation force at poles pushes surface towards centre due gravitational force towards the centre, it flat in top and bottom

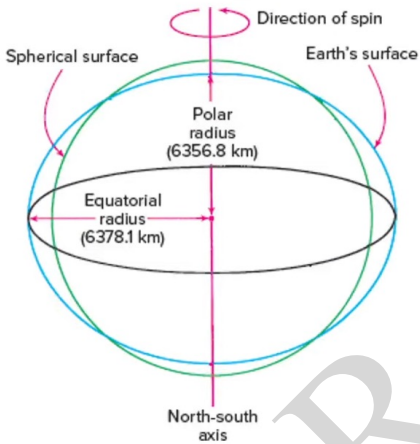


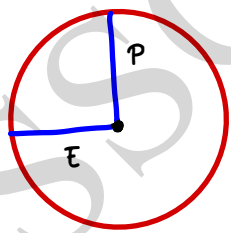


When a body revolves, two types of forces is applicable

- Centripetal Force: towards the axis of rotation or centre of curvature (inside)
- Centrifugal Force: directed away from the centre of the circle

Radius of Earth



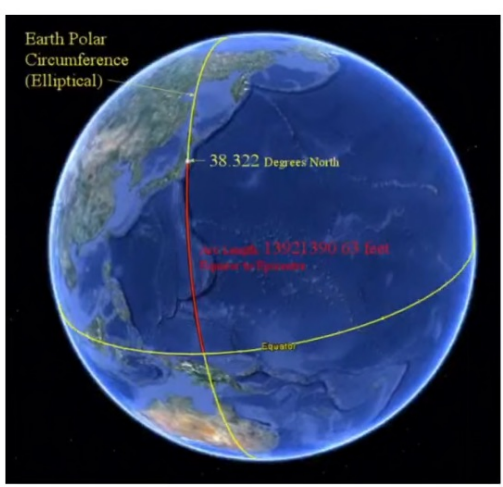


- Equatorial Radius: 6378 km
- Polar Radius: 6357 km
- Mean Radius: 6371

Why polar radius < Equatorial radius?

- Ans: Earth is bulged at the equator and flattened at the poles

Circumference of the Earth

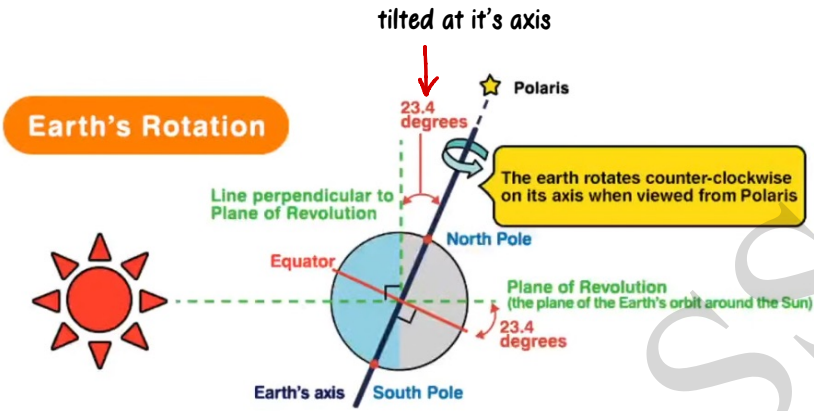


- Polar: 40,007 km
- Equatorial: 40,075 km
- Mean: 40,040 km

Why poles circumference < Equatorial?

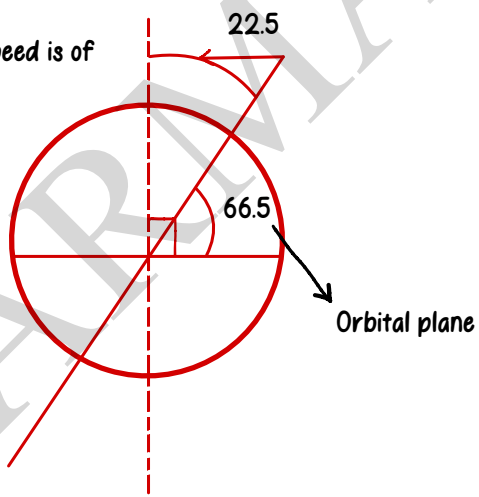
- Earth is bulged at equator and flattened at the poles

Rotation of Earth

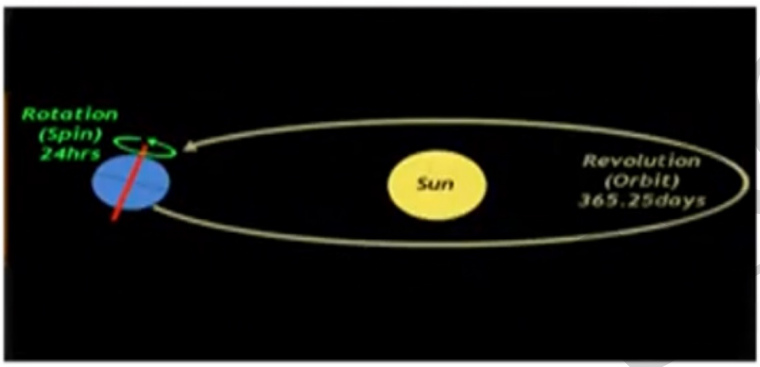


- Rotation: spinning on its own axis
- One rotation of Earth: 23 hour 56 mins 4 sec
- Direction: West to East
- Rotational Speed is maximum at Equator and minimum at Poles

Fastest rotation speed is of Jupiter



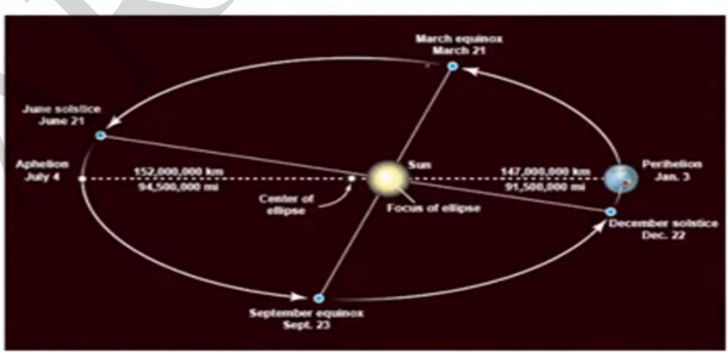
Revolution of Earth



- Revolving around the Sun in Elliptical orbit
- One revolution: 365 days 6 hours 9 minutes and 9 sec
- Orbital speed: 29.8 km/sec
- Max orbital speed: Mercury
- Min orbital speed: Neptune

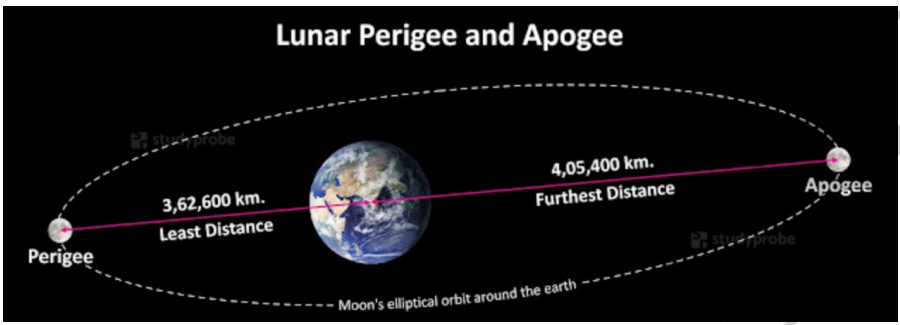
6 x 4 = 24 hrs → Leap year concept (366 days)

Distance from the Sun

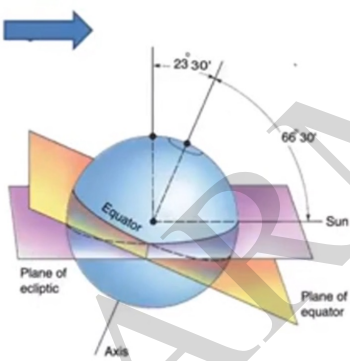


- When nearest to Sun: Perihelion (January 3rd – 14,75,00,000 km)
- When farthest from Sun: Aphelion (July 4 – 15,25,00,000 km)

- Perigee: the point of moon's orbit when it is closest to Earth
- Apogee: When moon is farthest from Earth



Inclination of the Earth's axis



- Axial Inclination: Inclination of Earth on its axis = $23\frac{1}{2}^{\circ}$
- Orbital Inclination: Inclination of Earth on its orbital plane = $66\frac{1}{2}^{\circ}$

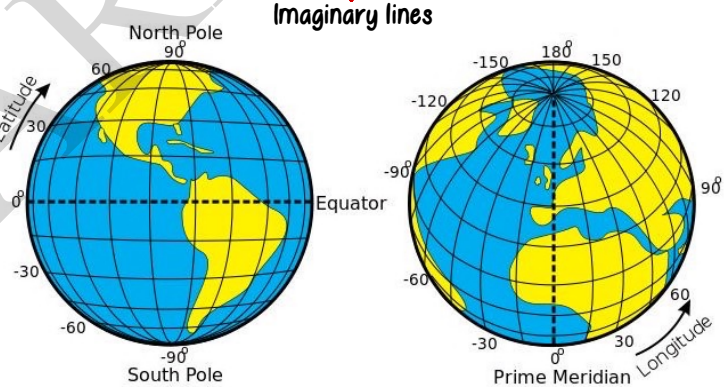
Hemisphere

- Equal division of Earth in two parts
- Equator: divides the globe horizontally into 2 equal parts – Northern and Southern Hemisphere
- Prime Meridian and International Date Line: divides the globe vertically – Eastern and Western Hemisphere

Latitude and Longitude

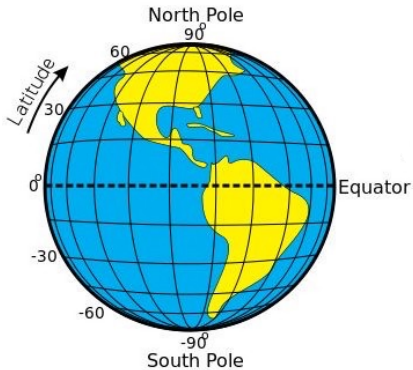
↓

Imaginary lines



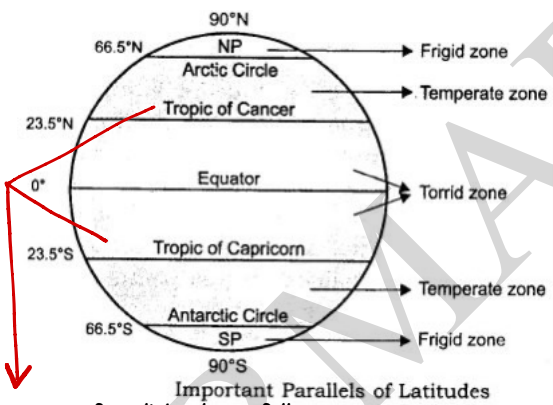
Horizontal lines

Vertical lines



Latitude

- Imaginary horizontal lines on the globe that run from East to West
- Angular Distance of a place from the equator
- 1 degree of latitude = 111 km (approx)
- Total latitudes: 181
- Distance b/w each latitude is same

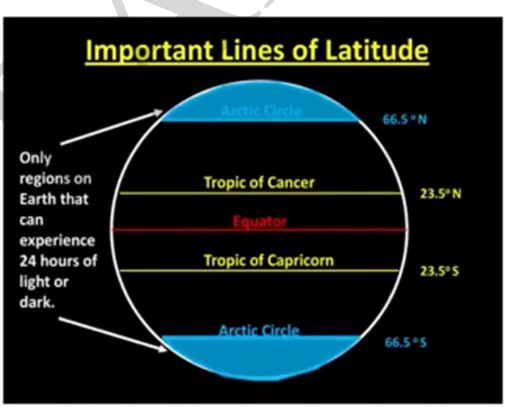


Important Parallels of Latitudes

Direct ray of sunlight do not fall beyond these tropics

Important Latitudes:

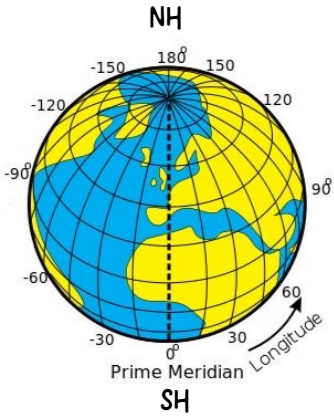
- 0 : Equator
- $23\frac{1}{2}$°N: Tropic of Cancer
- $66\frac{1}{2}$°N: Arctic Circle
- $23\frac{1}{2}$°S: Tropic of Capricorn
- $66\frac{1}{2}$°S: Antarctic Circle
- Largest latitude: Equator
- Smallest latitude: Poles (North and South)



Uses

1. In Climatology:
- Temperature zones, wind
- Responsible for Pressure System
- Planetary Winds System

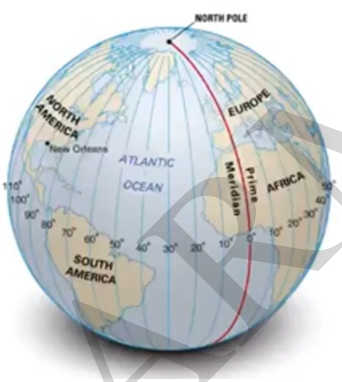
2. Location of place



Longitudes

- Imaginary vertical lines over the globe that run North to South
- Angular Distance of a plane from Prime Meridian
- Distance from each longitude varies from poles towards equator
- Least distance at poles and maximum distance at equator: 111.32 km
- Total longitudes: 360

*
- All longitudes divide Earth into 2 equal parts
- All longitudes are Great Circle (circle in case of longitudes)



Important Meridians

- Prime Meridian: 0 degree longitude (passes from Greenwich, London)
- International Date Line: 180 degree Meridian

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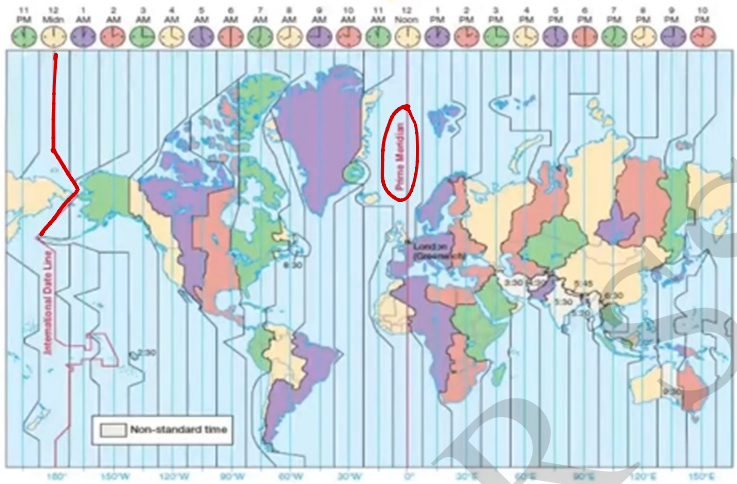
Zig-Zag lines

International Date Line



Prime Meridian

- It passes through Greenwich in London
- Countries: 8
  - UK
  - France
  - Spain
  - Algeria
  - Mali
  - Burkina Faso
  - Togo
  - Ghana

- TRICK: BSF GAMe in TOGO Kingdom

$360^\circ = 24$ hrs

$\frac{360^\circ}{24} = 1$ hr

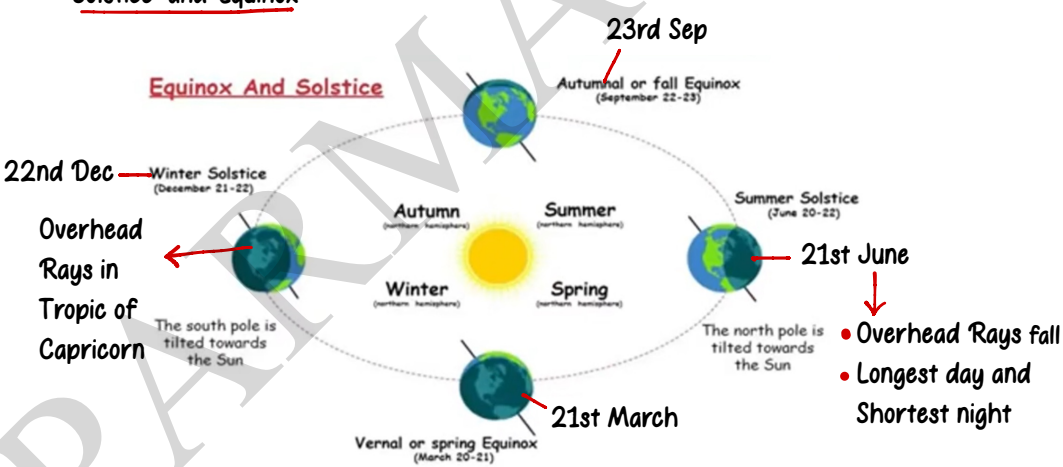
$15^\circ = 1$ hr

$15^\circ = 60$ mins

$1^\circ = \frac{60}{15} = 4$ mins

- Moving East away from prime meridian, will increase the time by an hour for every 15°, consecutively if we move to West from the prime meridian, the time will decrease by an hour

Solstice and Equinox



- Overhead Rays fall
- Longest day and Shortest night

- Day and Night: due to Rotation
- Seasons:
  1. Revolution
  2. Tilt

Solstice

Summer – June 21

1. Vertical rays on Tropic of Cancer
2. Northern Hemisphere gets more heat
3. Continuous sun rays on North Pole for 6 months, continuous days
4. known as Kark Sankranthi

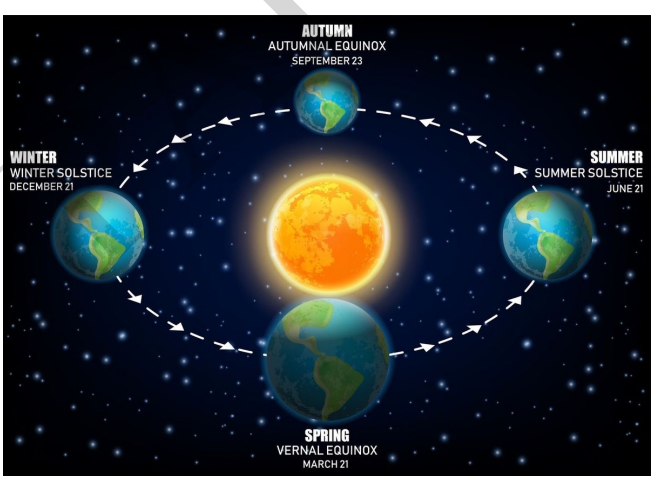
Insolation: incoming solar radiations

Winter – Dec 22

1. Vertical rays on Tropic of Capricorn
2. Southern Hemisphere gets more heat
3. Continuous Sun rays on South Pole for 6 months, continuous daylight
4. known as Makar Sankranthi

Equinox

- Direct rays of the Sun fall on the Equator
- At this position neither of the poles is titled towards the Sun
- So, the entire Earth experiences Equal days and nights

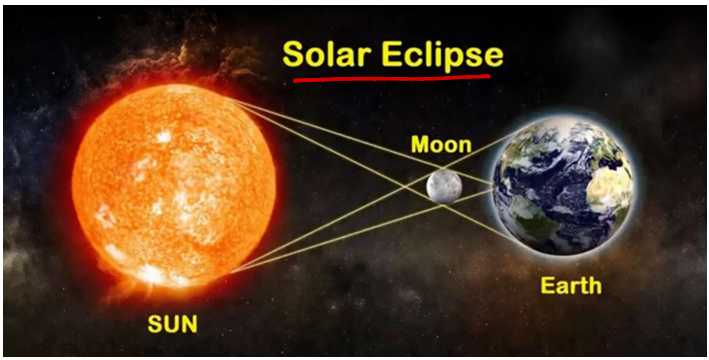


Vernal Equinox

- March 21: It is spring in the NH and autumn in the SH

Autumnal Equinox

- Sep 23: it is autumn in NH and spring in SH



- Sun (at its constant position) is obscured by the moon

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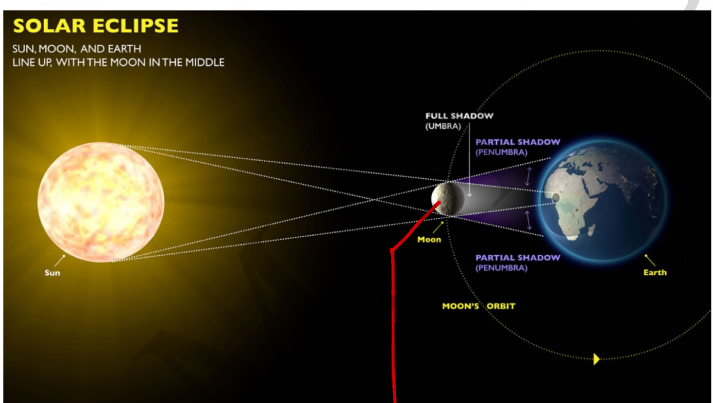
New Moon
- Amavasya



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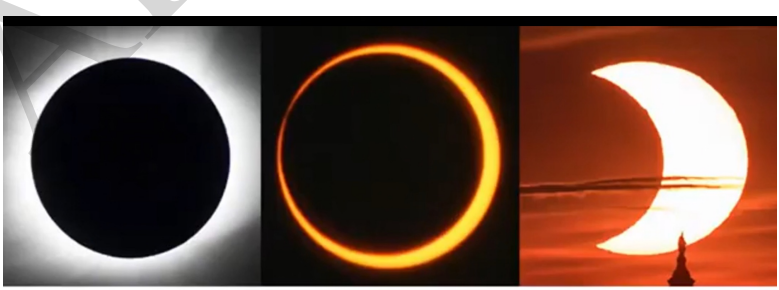
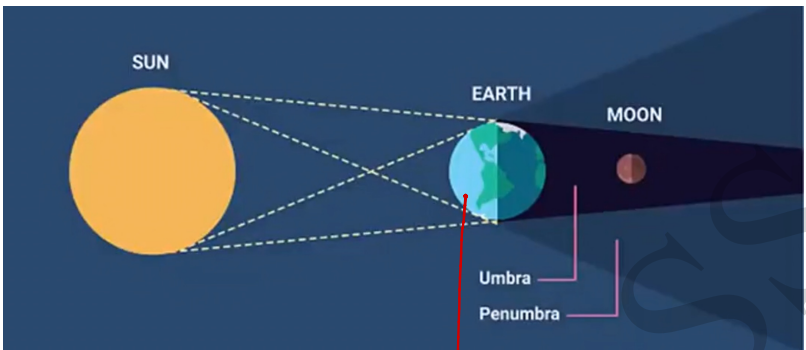
Moon is blocking Sun's light



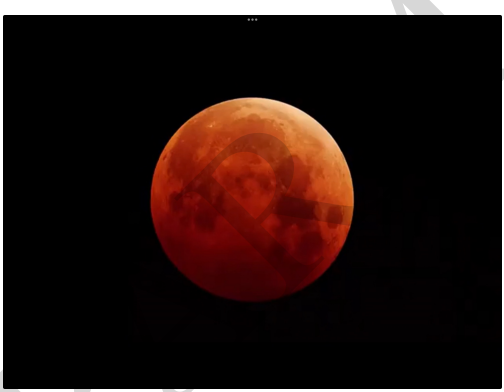
Total Solar Eclipse | Annular Solar Eclipse | Partial Solar Eclipse

Lunar Eclipse

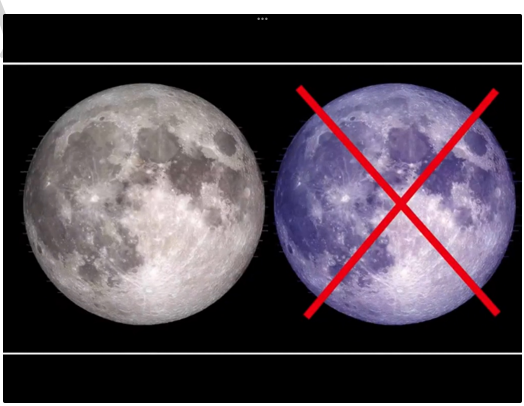


- Full Moon condition- Purnima

Earth blocks Sun's light
(light refraction) → scatters more
causing blue colour
light to vanish and red → scatters less
light to reach moon



Red Moon



Blue moon

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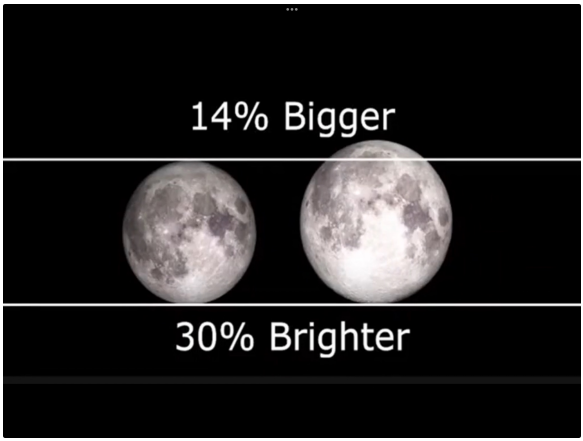
2 full moon in a month



- Lunar Eclipse + Perigee → Moon appears bigger than its normal size

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Super Moon condition