

Path of the Moon

- The moon moves west to east with respect to the background stars.
- The moon's path is a great circle in the sky inclined to the ecliptic by 5°
- Phases
- Sidereal period : The time it takes the moon to revolve once around the earth with respect to background stars = $27 \frac{1}{2}$ days
- Synodic period - The time between one new (or full) moon to the next new (or full) moon = $29 \frac{1}{2}$ days.

- Does the moon rotate?

Yes, but its period of rotation is equal to its period of revolution.

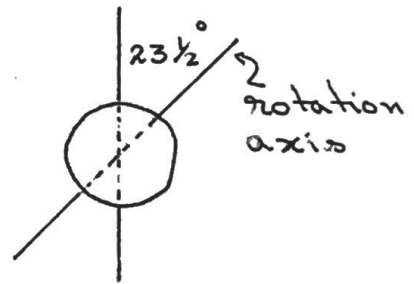
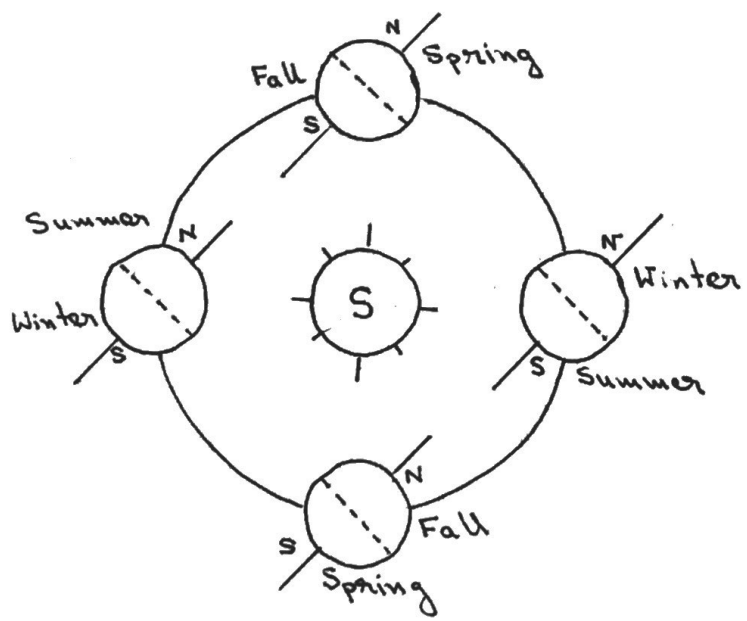
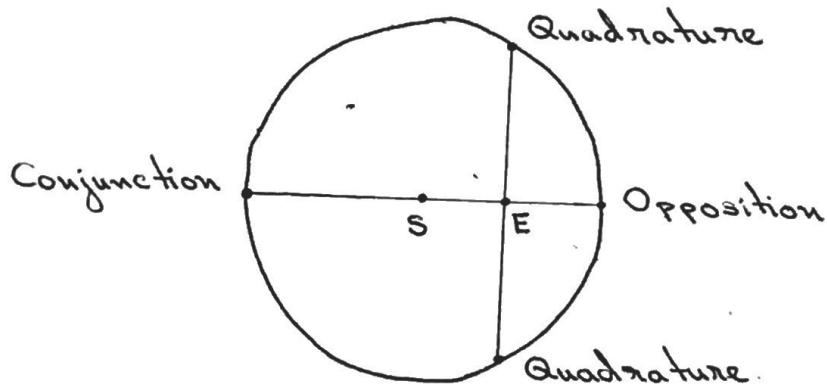
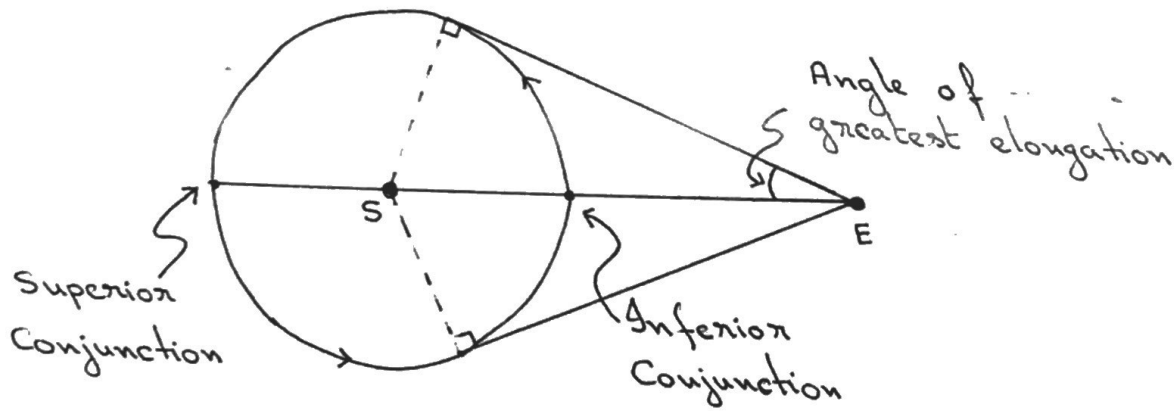
Hence, the moon keeps the same face towards the earth.

- On the equator sunrise is at 6 a.m. and sunset is at 6 p.m.

Phase	Moonrise	Moonset
New	6 a.m.	6 p.m.
1st quarter	12 noon	12 midnight
Full	6 p.m.	6 a.m.
3rd quarter	12 midnight	12 noon

Eclipses

- Angular diameter of sun and moon $\sim 1/2^\circ$
- Lunar eclipse : Earth's shadow on the moon. Phase of the moon is full. Eclipse (totality) can last $1 \frac{3}{4}$ hour and can be seen from more than half the earth's surface.
- Solar eclipse : Moon's shadow on the earth. Phase of the moon is new. Total solar eclipse has a maximum duration of $7 \frac{1}{2}$ min. The maximum diameter of the area that it can be seen is 267 km.
- Total solar eclipse occurs when the moon completely covers the sun [observer in the umbra].
- Partial solar eclipse occurs when the moon partly covers the sun [observer in the penumbra]
- Annular solar eclipse occurs when the moon is so far from the earth that its umbral shadow cone does not reach the earth's surface.
- An eclipse can occur when the moon is at one of the nodes and the line of nodes is pointing to the sun.
- The line of nodes rotates along the ecliptic (keeping the tilt of the moon's orbit at 5°). The period of rotation is 18.6 years.
- In a given year if there is a particular sequence of eclipses (LSSLS, say) then this pattern will be repeated after one saros cycle.
1 saros cycle = 18 years



Path of inferior planets (Mercury, Venus)

Angle of greatest elongation for Mercury = 28°

Angle of greatest elongation for Venus = 47°

Path of superior planets (Mars, Jupiter, Saturn, Uranus, Neptune, Pluto)

- Sidereal period (orbital period) : Time it takes a planet to move once around the sun w.r.t. background stars.
- Synodic period : Time between two successive oppositions or conjunctions.
- Prograde motion : The motion of a planet west to east w.r.t. background stars
- Retrograde motion : The motion of a planet east to west w.r.t. background stars
- Why is there a retrograde motion?
Retrograde motion occurs when the earth overtakes a slower moving superior planet.
- Why are there seasons?
Owing to the tilt of the earth's rotation axis by $23\frac{1}{2}^\circ$.
- Why do we see different constellations at different times of the year?
Owing to the position of the earth at different points along its orbit around the sun.