Seasons & Moon Motion

Homework

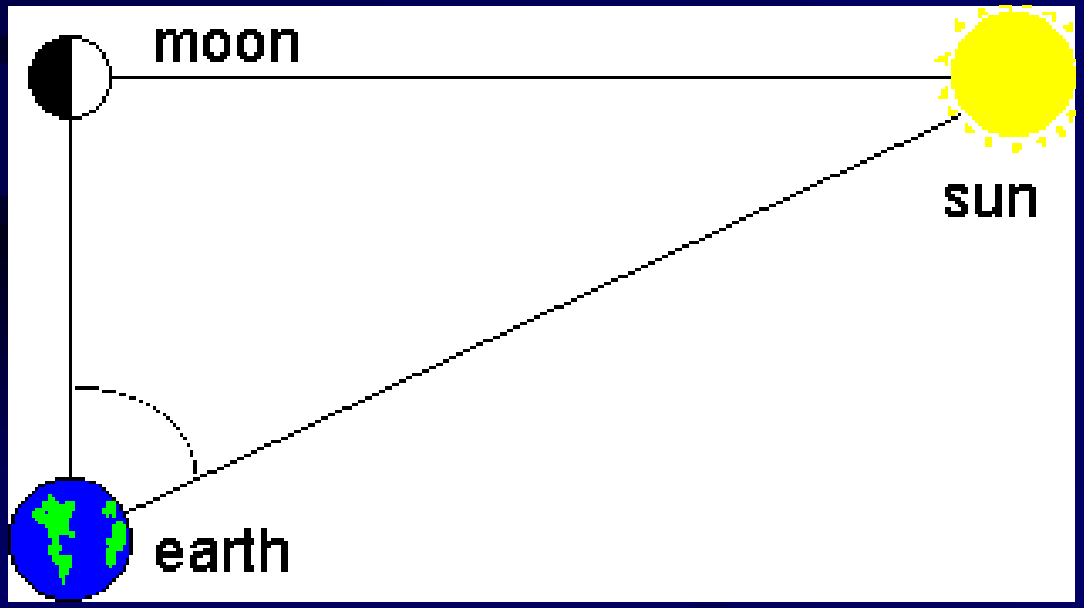
- Use 5 (million km) for the distance difference
- This is about a 3% difference
- Other questions?
- What should be in the study guide for the exam next Friday?

Motion of the Moon

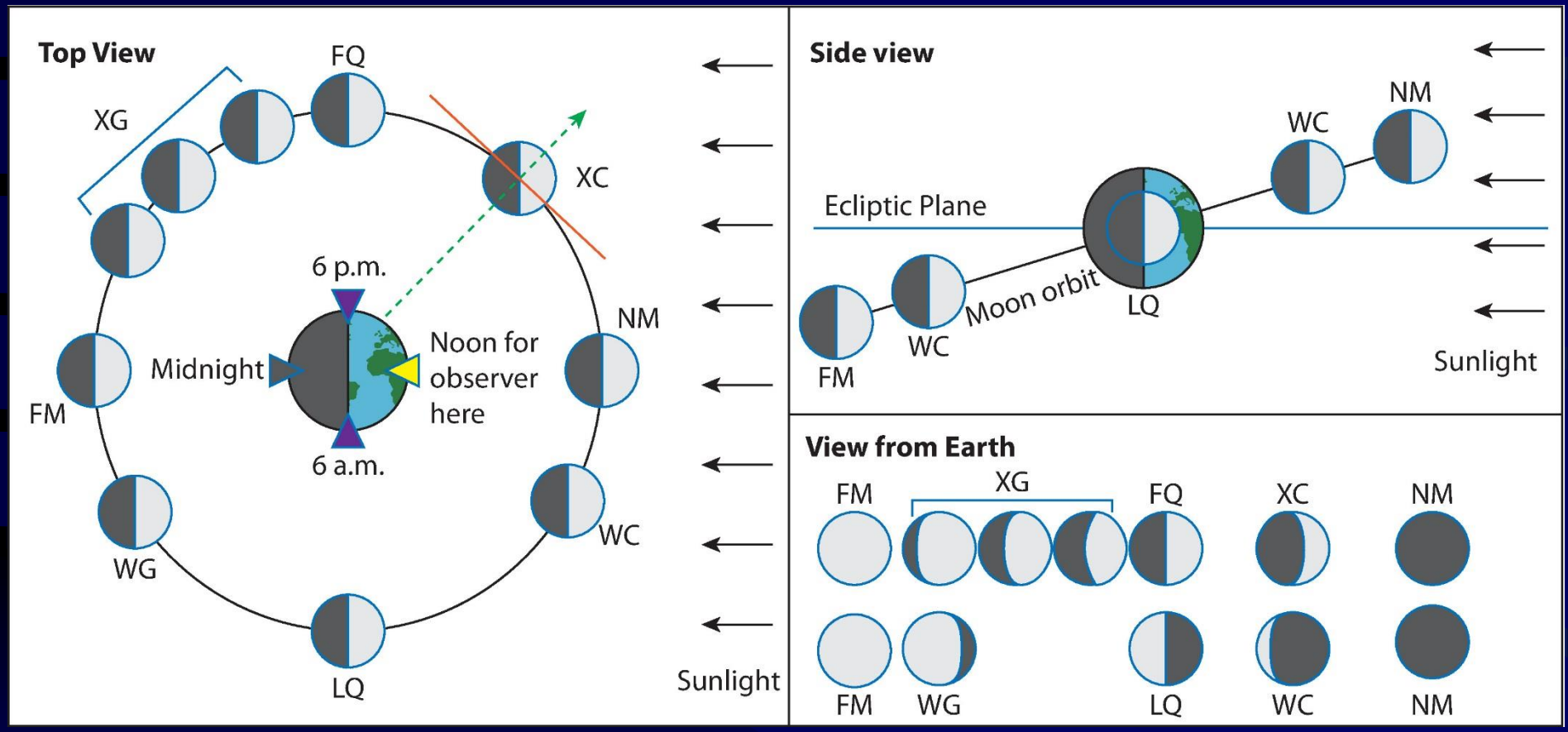
- Moon shines not by its own light but by reflected light of Sun

  ➔ Origin of the phases of the moon

- Moon revolves around the Earth
- period of revolution = **1 month**



Phases of the Moon



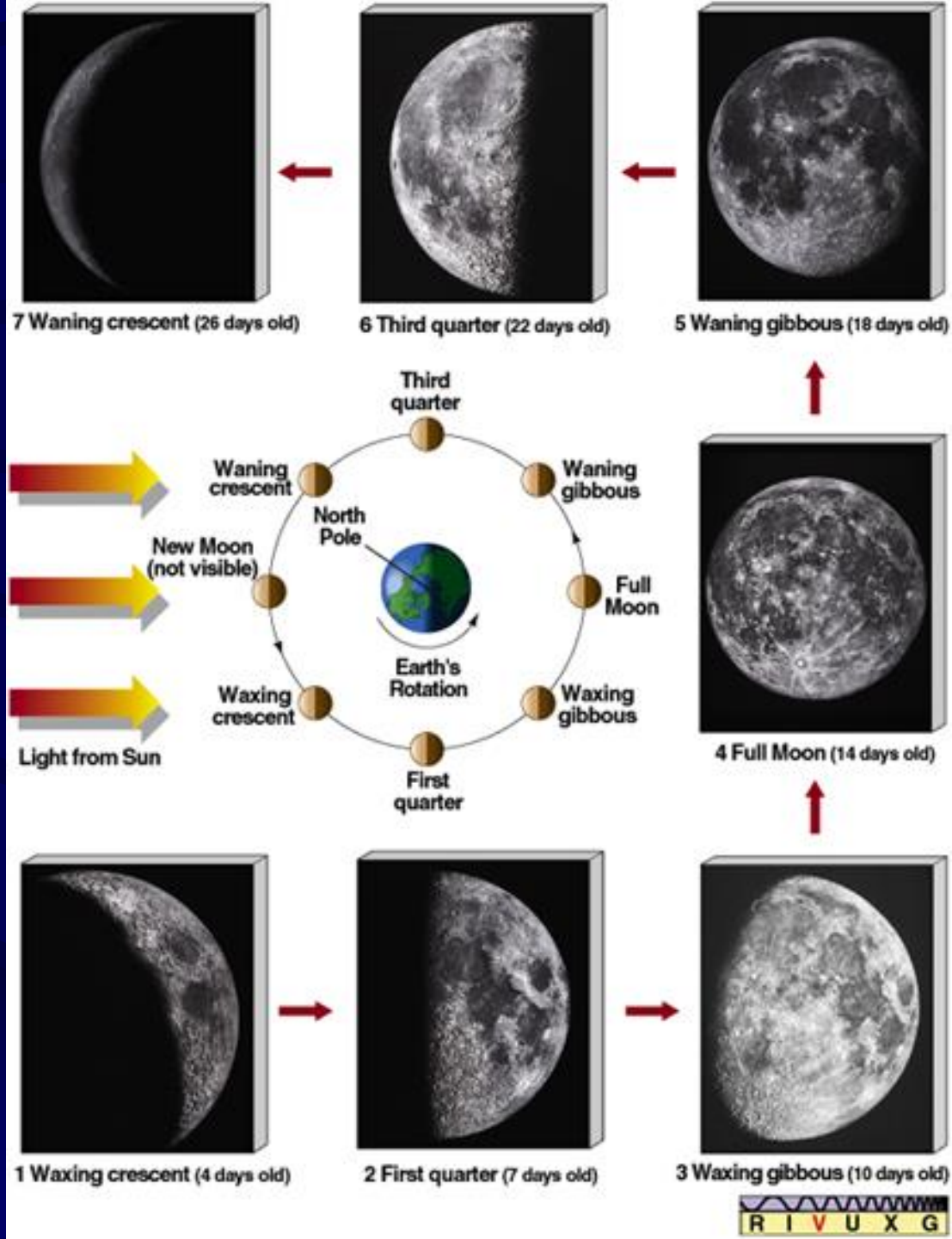
- The hemisphere of the moon facing the sun is ALWAYS bright
- On Earth we see VARYING parts of this bright side

Animation with Libration

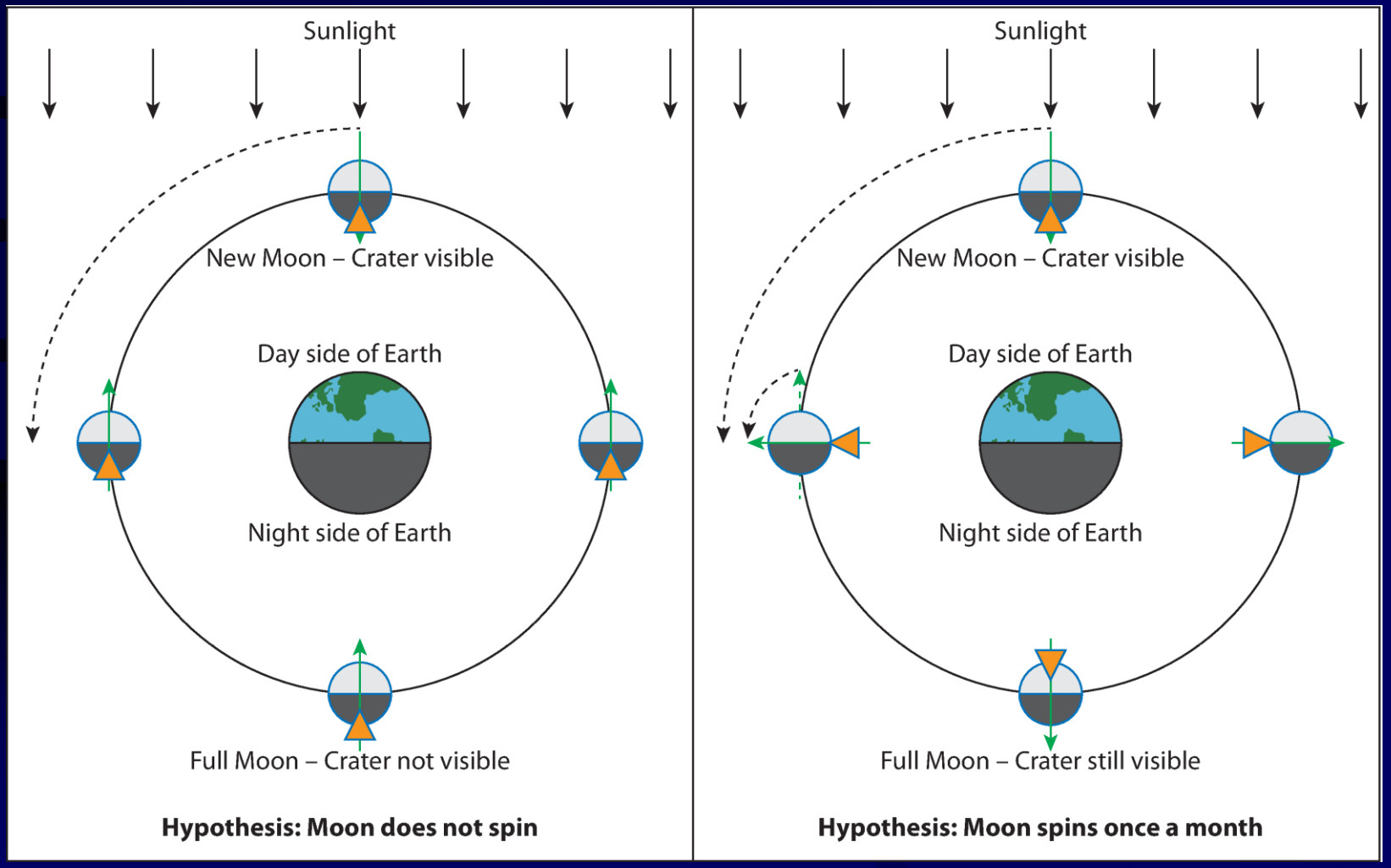
- https://commons.wikimedia.org/wiki/File:Lunar_libration_with_phase_Oct_2007.gif

Phases of the Moon (cont'd)

- Moon rotates around earth in **one month**
- Moon rotates around itself in the same time
- → always shows us the same side!
- → *"far side of the moon"*
- *Unknown until 1960s*



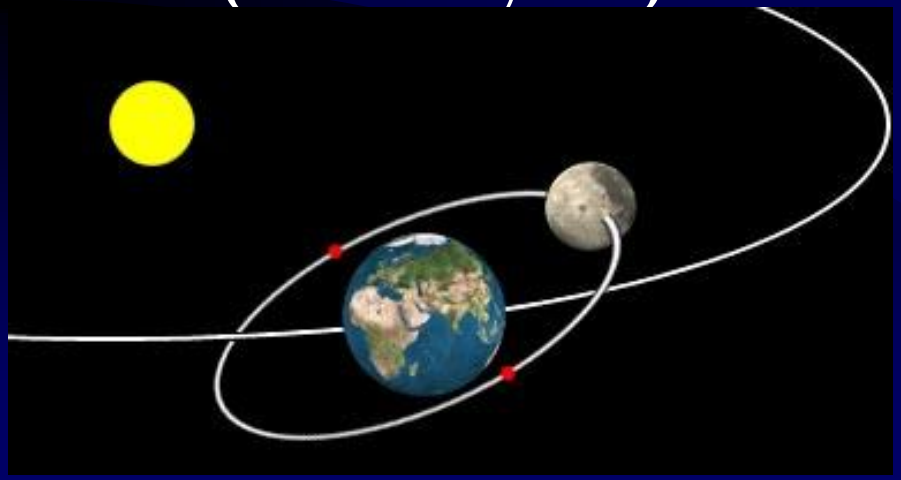
Does the Moon Rotate Around its Axis?

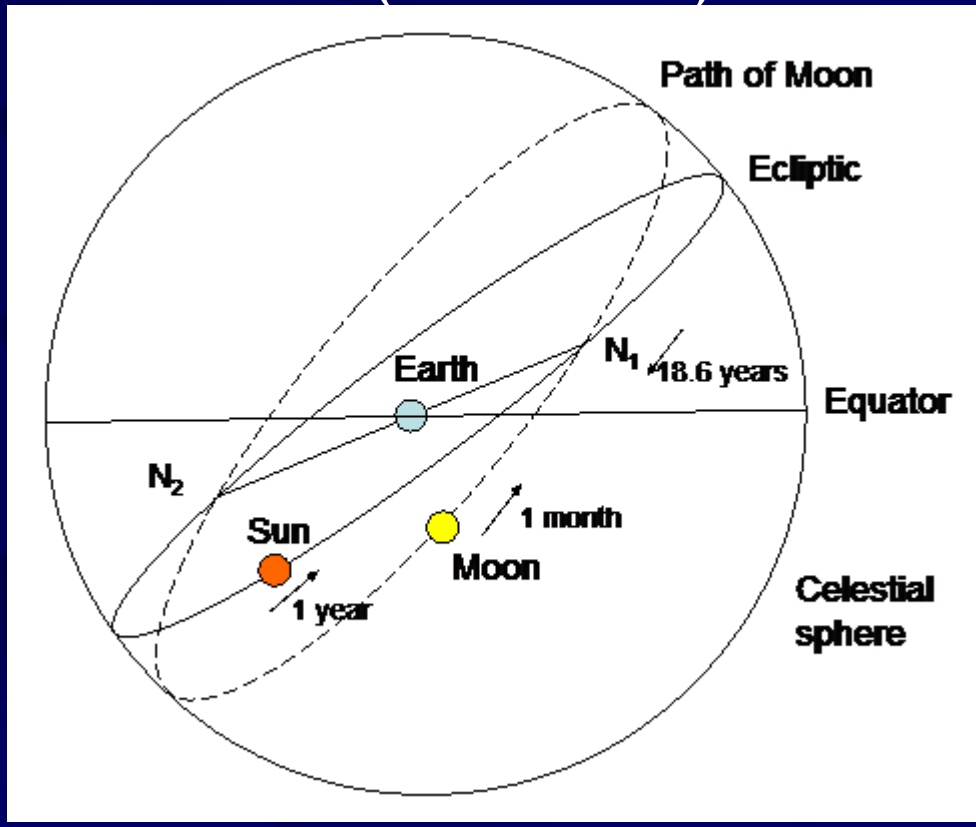


Motion of the Moon on the Celestial Sphere

- Close to, but not quite on the ecliptic
- The Moon's orbit is inclined 5 degrees relative to the ecliptic, i.e. Earth's (or Sun's) orbit
- Takes 1 month

  (Sun: 1 year)





There are different definitions of "month"

- Once around wrt what?
  - The stars (360, the real thing, sidereal month 27.3 days)
  - The sun (Full moon to full moon, synodic month 29.5 days)
  - Less relevant:
    - The spring point (tropical month)
    - Closest point to Earth (anomalistic month)
    - The ascending node (draconic month)

Eclipses

Solar: Moon between Earth and Sun

(S-M-E)

Shadow of Moon falls on Earth

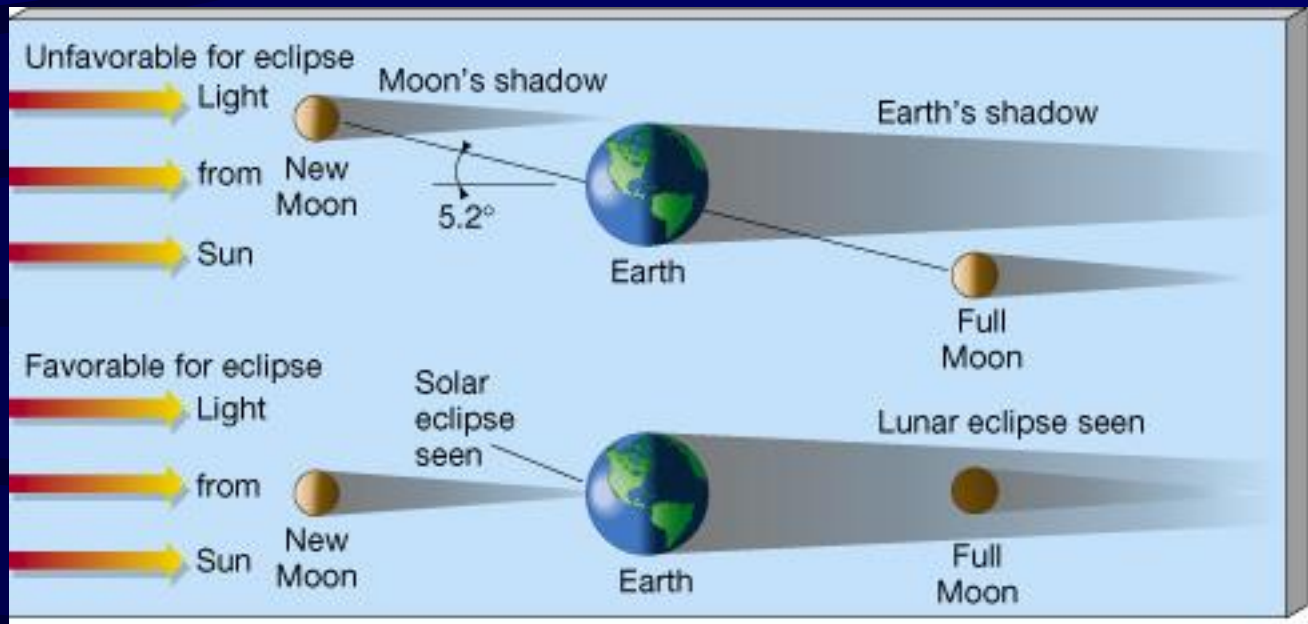
Short (Minutes)!

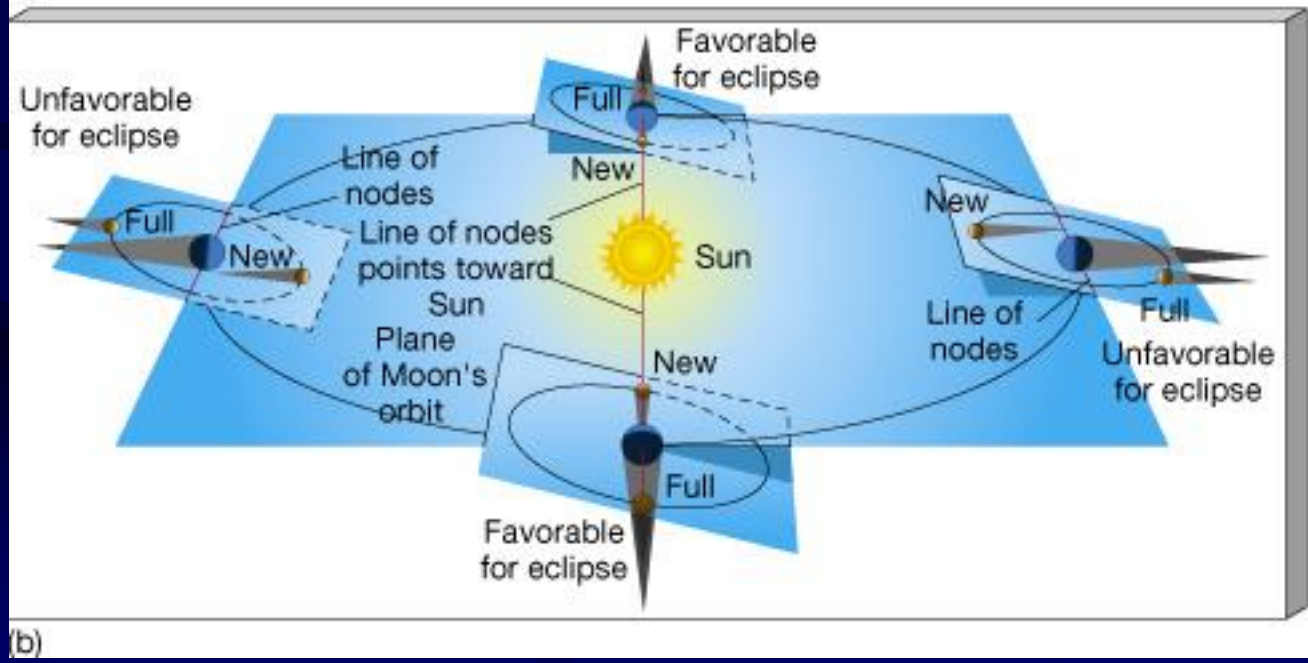
Lunar: Earth between Sun and Moon

(S-E-M)

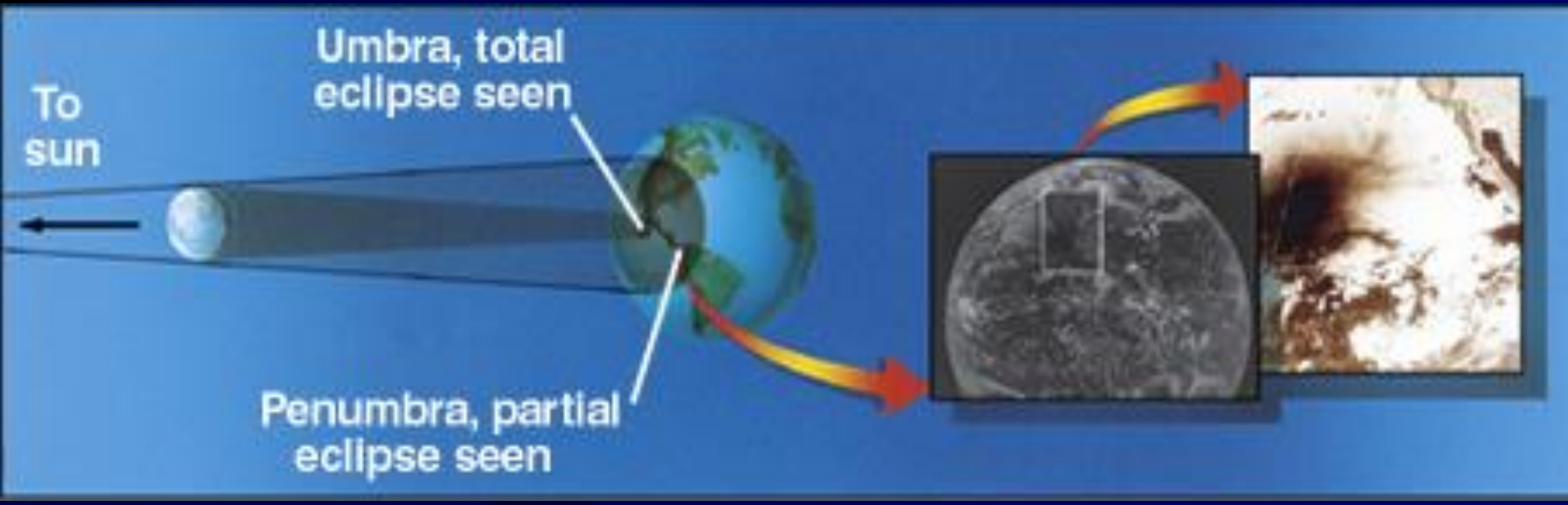
Shadow of Earth falls on Moon

Long (Hours)!



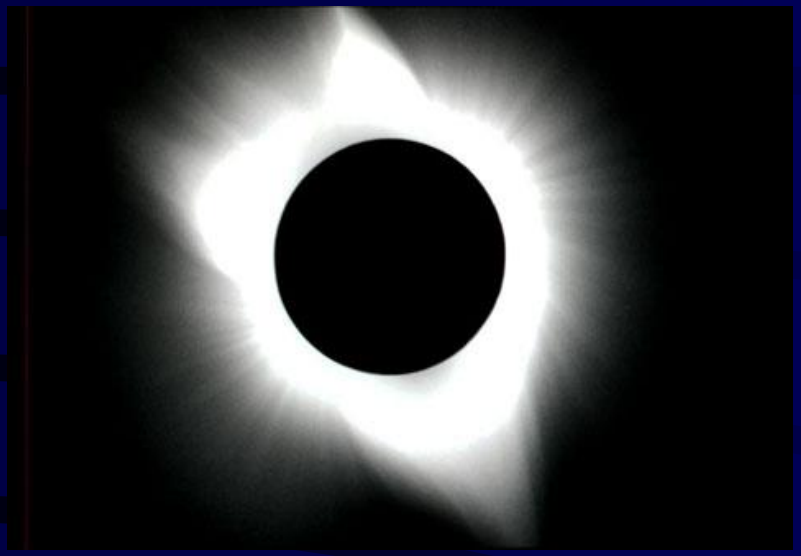


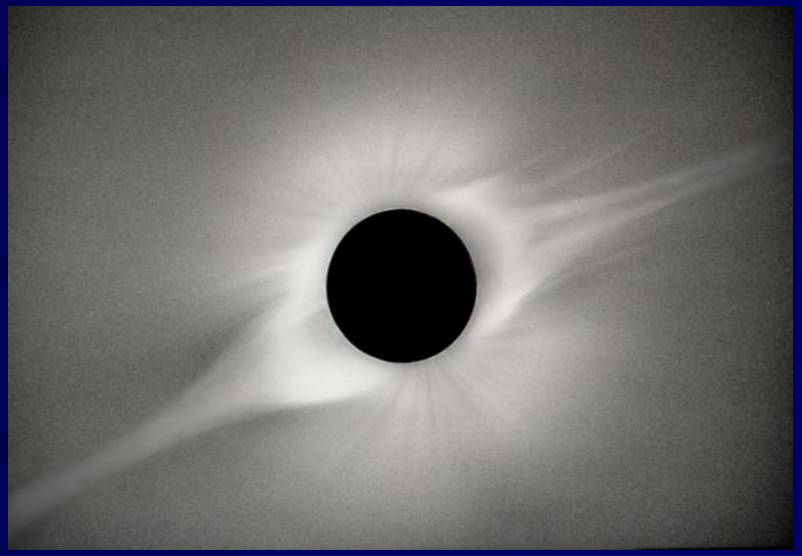
Solar Eclipses

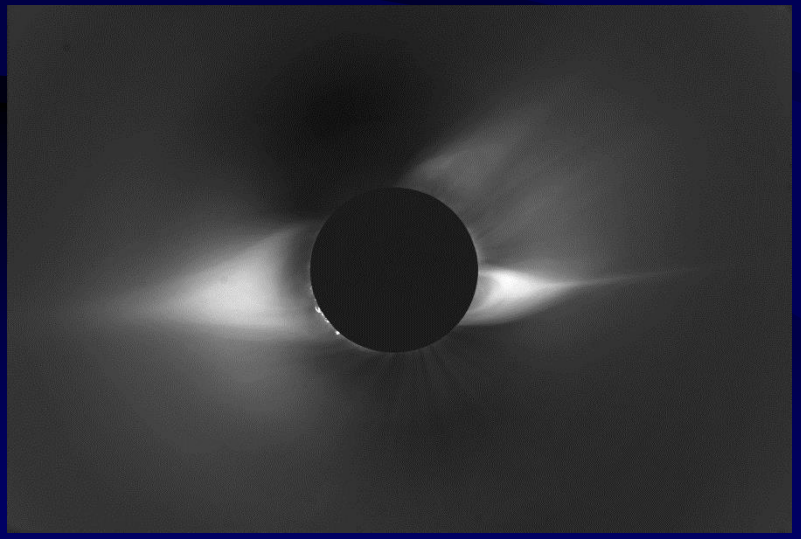


- Umbra – region of total shadow
- Penumbra – region of partial shadow
- Totality lasts only a few minutes!
- Why isn't there a solar eclipse every month?

Solar Corona







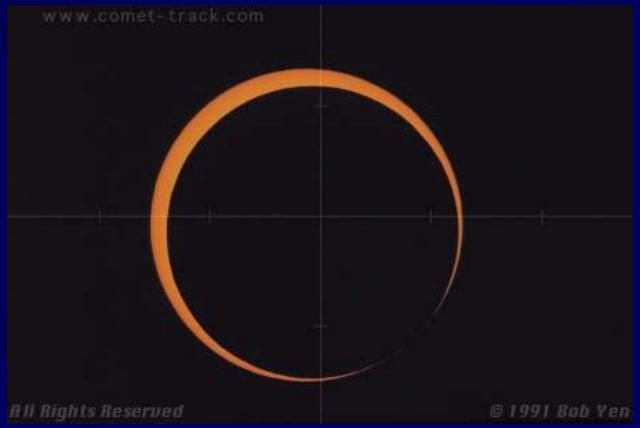
Inside the Umbra

Annular Eclipse

1

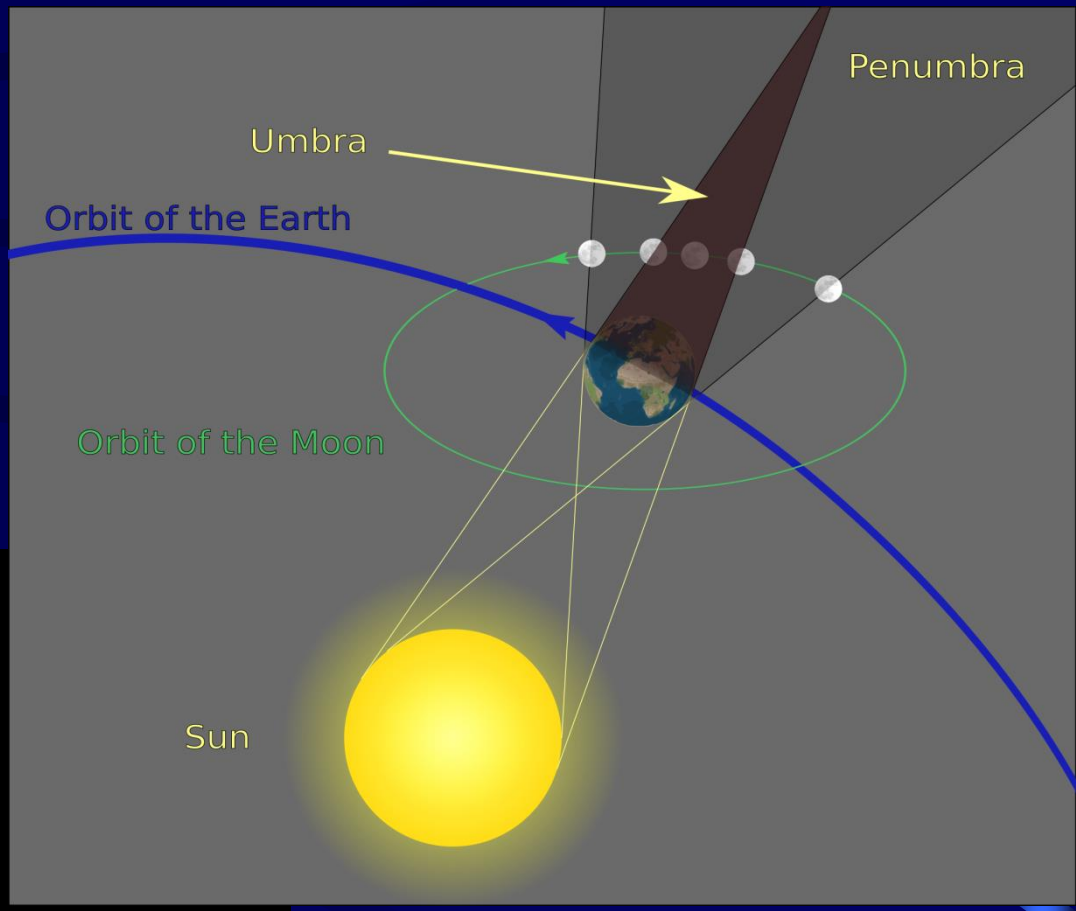
2

3



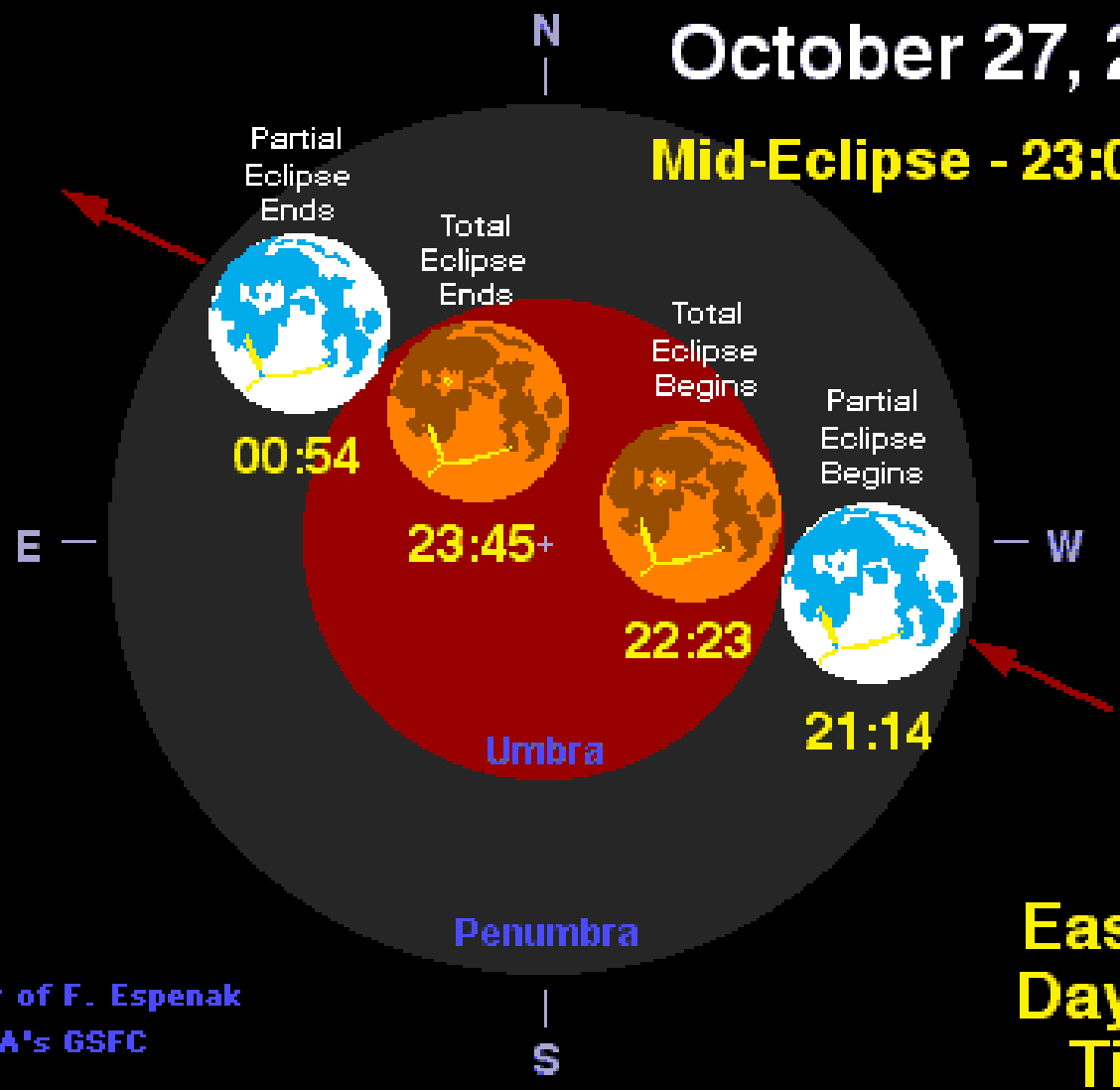
Lunar Eclipses

Moon moves into earth's shadow…



…and out of it (takes hours!)

Total Eclipse of The Moon



Moon's orbit is tilted wrt the ecliptic