Phases, Eclipses and Tides

Key Concepts

- What causes the phases of the moon?
- What are solar and lunar eclipses?
- What causes the tides?

Key Terms

- Phases
- Eclipse
- Solar eclipse
- Umbra
- Penumbra
- Lunar eclipse
- Tide
- Spring tide
- Neap tide

Motions of the Moon

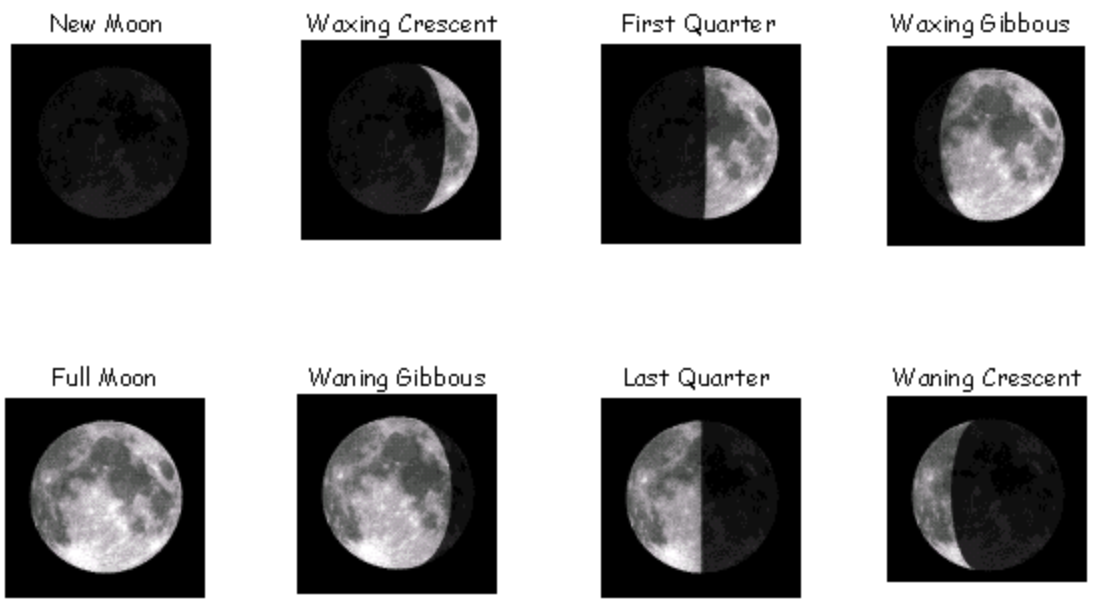
- The moon rotates and revolves around the Earth
- The changing relative positions of the moon, Earth and sun cause the phases of the moon, eclipses and tides
- The moon rotates once on its axis in 29.5 days.
- It takes the same time to revolve around the Earth = 29.5 days

Check up

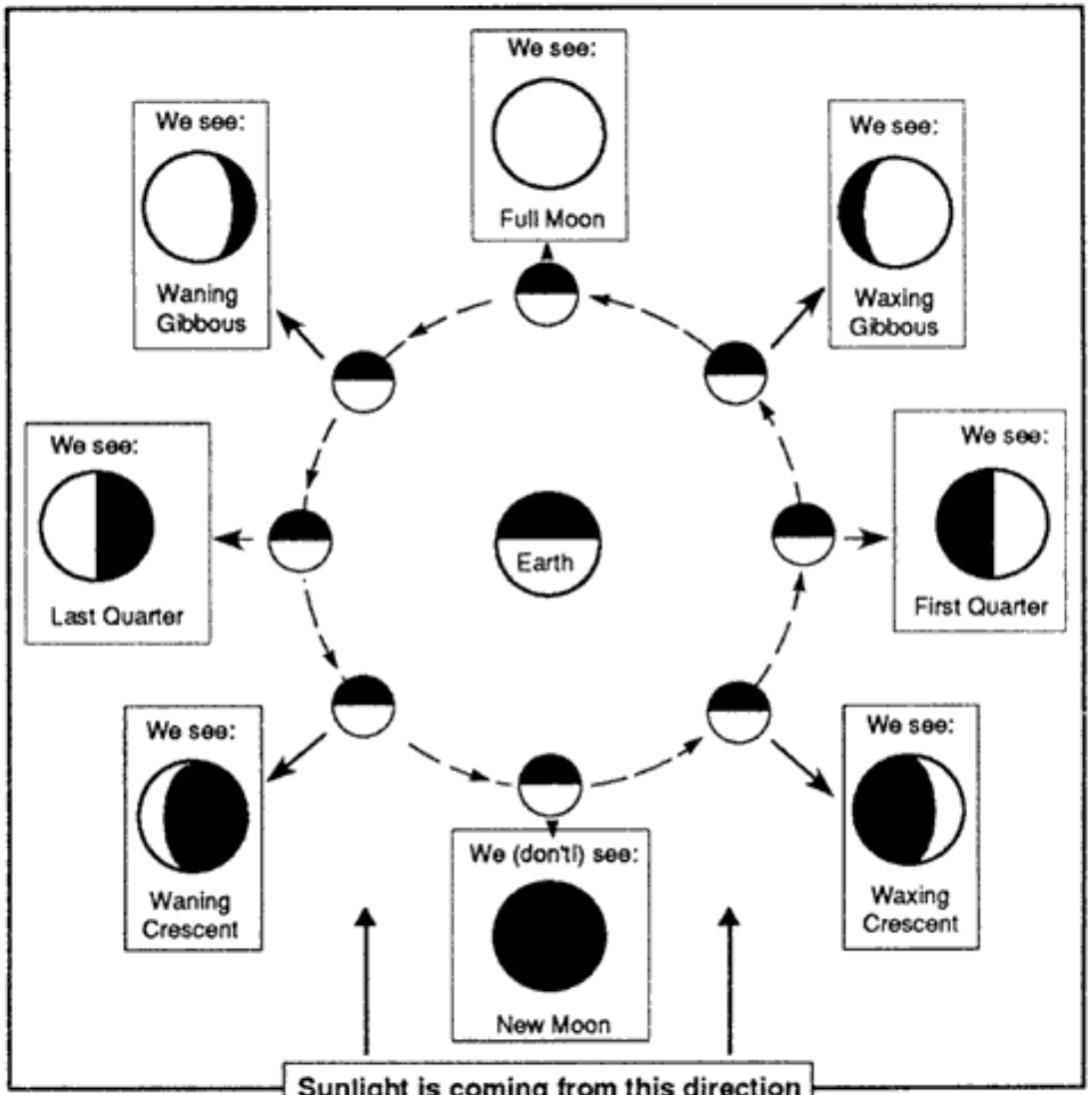
1. Why does the same side of the moon always face the Earth?
   - Draw a diagram to show (hint: p. 21)
2. Why is the moon's period of revolution around Earth so much shorter than Earth's period of revolution around the sun?
3. How many days does it take the moon to revolve around the sun?

Phases of the Moon

- Moon reflects the light from the sun
- Phases are different shapes of the moon that you see from Earth
- Caused by the changes in the relative position of the moon, Earth and sun.
- The phase that you see depends on how much of the sunlit side of the moon faces Earth



Phases of the Moon



Check Up

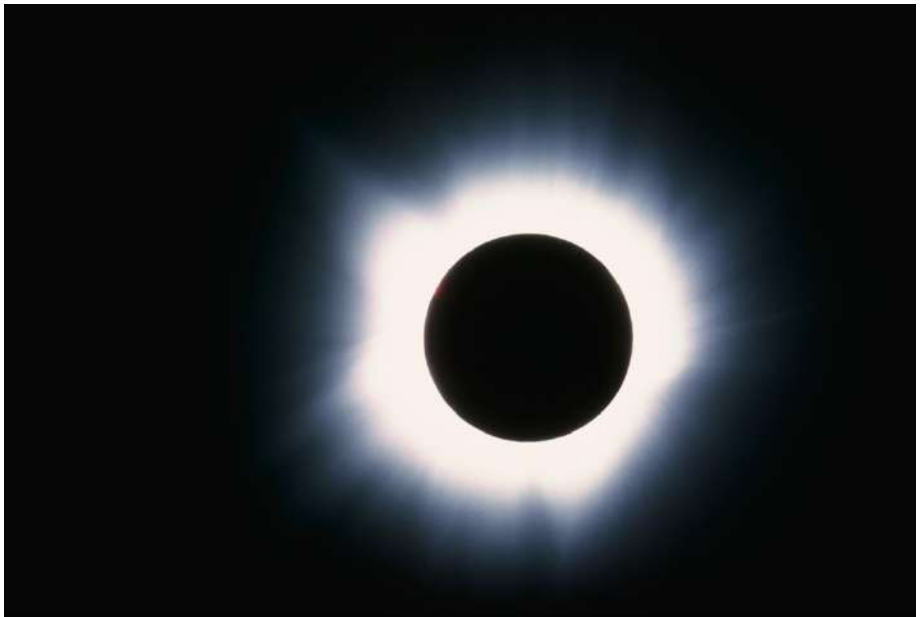
- In your Journal, sketch the position of the moon relative to the Earth and the sun at the time of the:
  - New moon
  - First quarter moon
  - Full moon
  - Third quarter moon
- During what phases are the moon, Earth and sun aligned in a straight line?

Predicting Phases of the Moon

- Predict the number of days between:
  - New moon and first quarter
  - First quarter and full moon
  - Full moon and third quarter
  - Third quarter and new moon
  - New moon and full moon
  - New moon and new moon

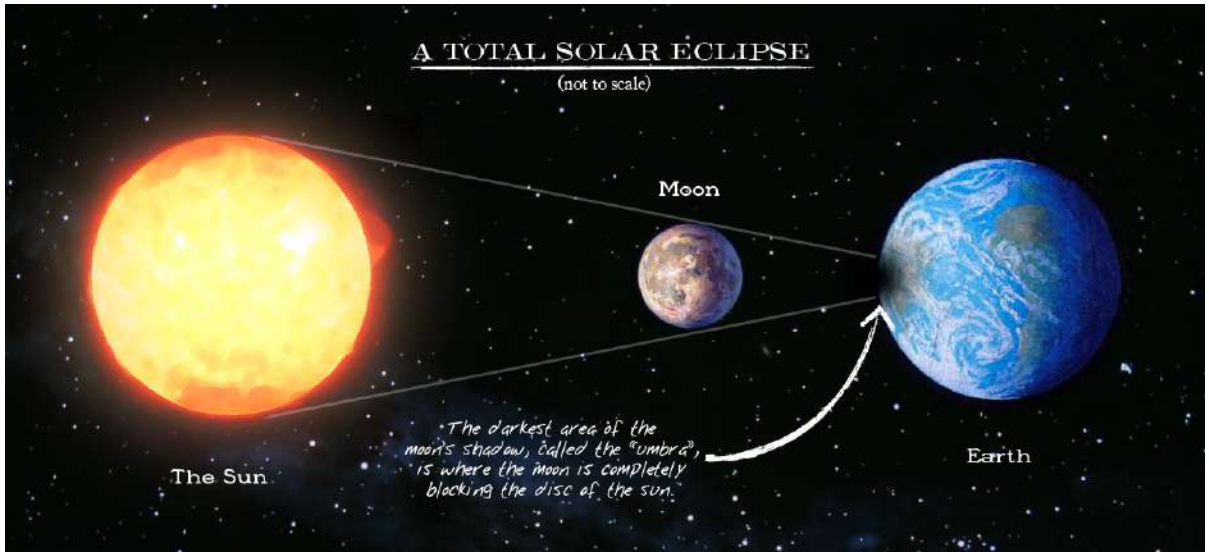
Eclipses

- Occurs when:
- moon's shadow hits Earth or
- Earth's shadow hits moon
- When an object in space comes between the sun and a third object it casts shadow on that object = eclipse



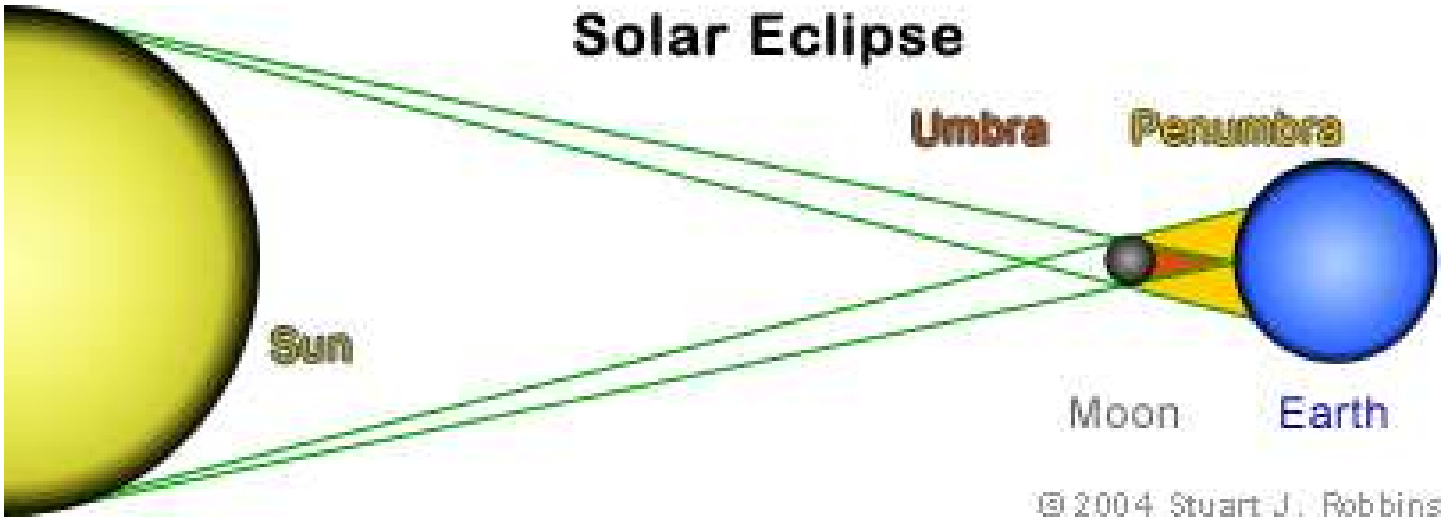
When do solar eclipses occur?

- New moon – moon is between sun and Earth
- Most months the moon is a little above or below sun in the sky.
- Solar eclipse occurs when the moon passes directly between the Earth and sun, blocking light from the sun



Total Solar Eclipses

- Umbra – darkest part of the moon's shadow, cone shaped
- Where the point of cone hits Earth, no light from the sun can be seen = total solar eclipse
- Sky gets completely dark, can see stars and the solar corona (faint outer atmosphere of the sun)



Partial Solar Eclipse

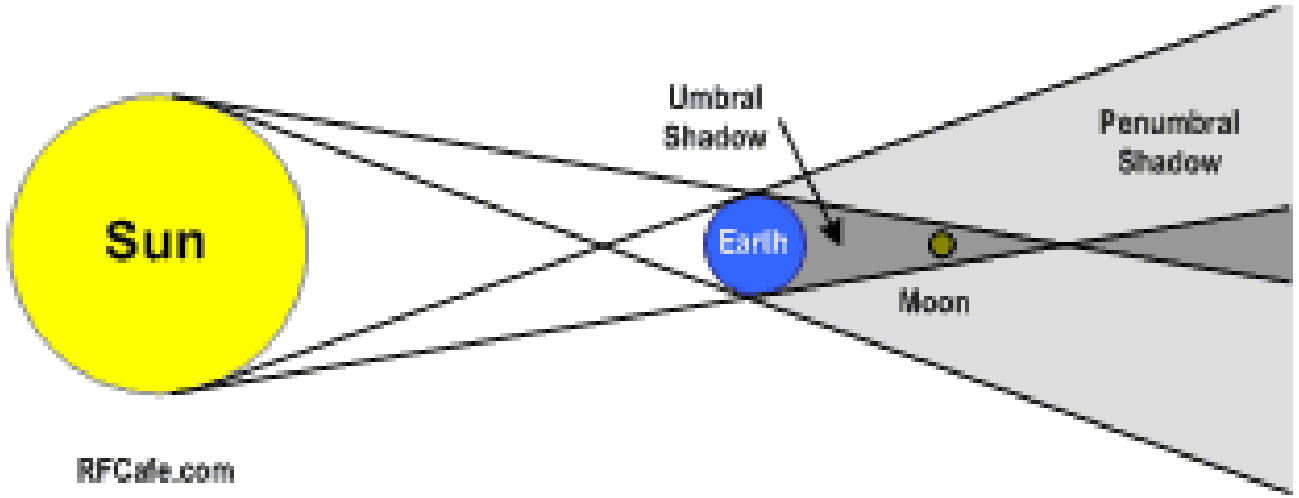
- Penumbra – larger part of moon's shadow that is not as dark
- Part of sun is visible through the penumbra
- People in the penumbra see a partial eclipse
- Not safe to look at the sun during a partial eclipse because an extremely bright part of the sun remains visible

When do Lunar Eclipses Occur?

- During the full moon when the Earth is directly between the sun and moon
- Moon is in Earth's shadow

Total Lunar Eclipses

- Earth's shadow has an umbra and penumbra
- When moon is in Earth's umbra – you see a total lunar eclipse
- Can see total lunar eclipse from anywhere on Earth



Partial Lunar Eclipse

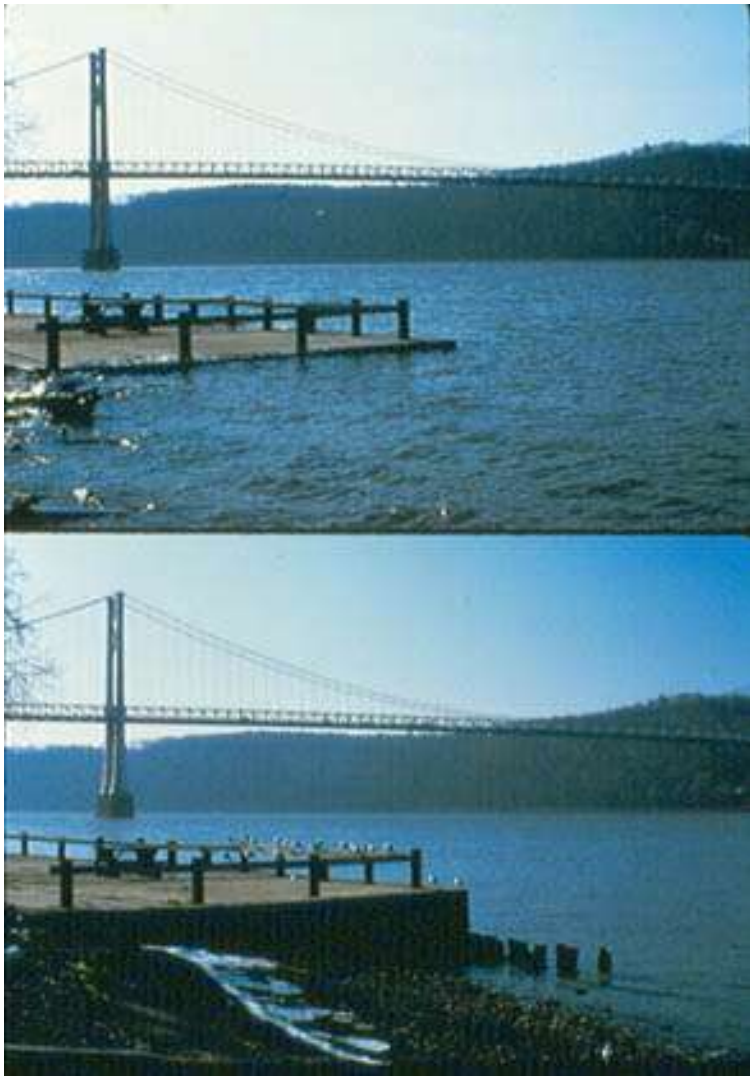
- Most lunar eclipses, Earth, the moon and the sun are not quite in line = partial lunar eclipse
- Moon passes partly into the Earth's umbra

Check up

- In your journal, sketch the positions of the sun, the moon, and Earth during a solar and a lunar eclipse

Tides

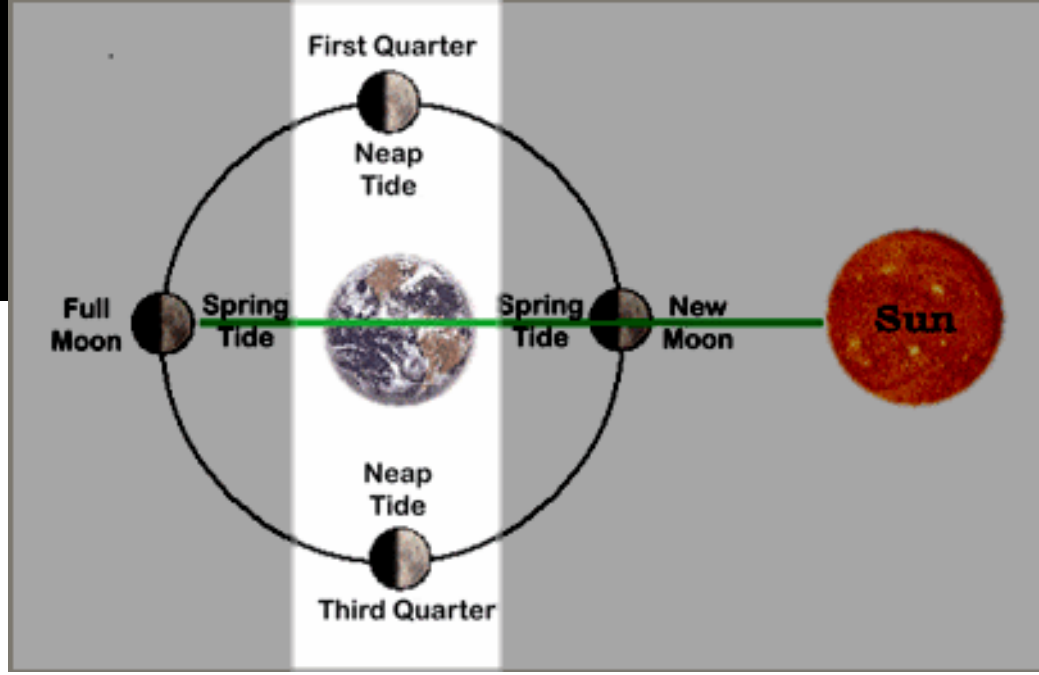
- Rise and fall of ocean water that occurs every 12.5 hours
- Water rises for 6 hours and then falls for 6 hours
- Caused by differences in how much the moon's gravity pulls on different parts of Earth

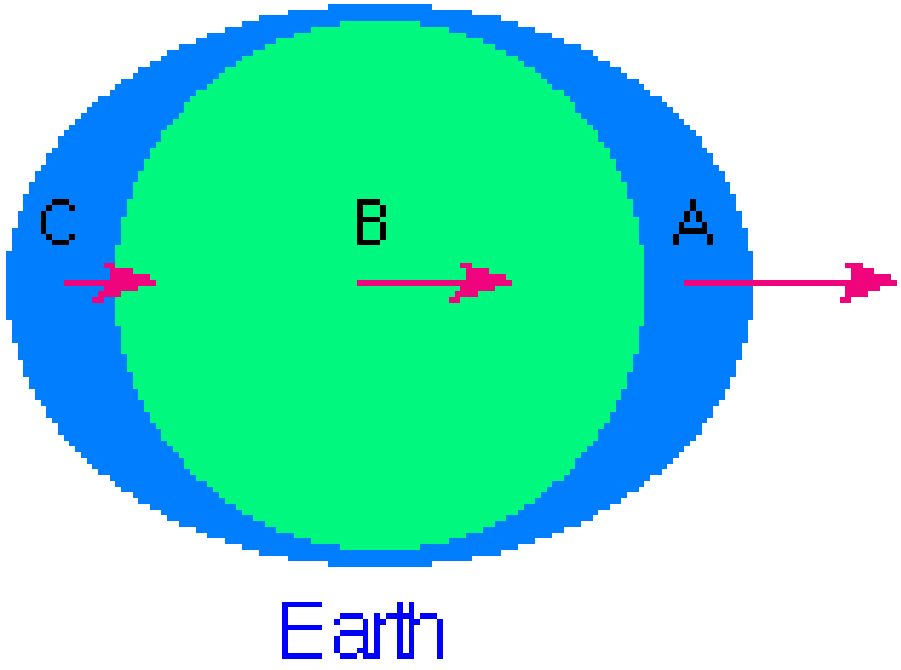


The Tide Cycle

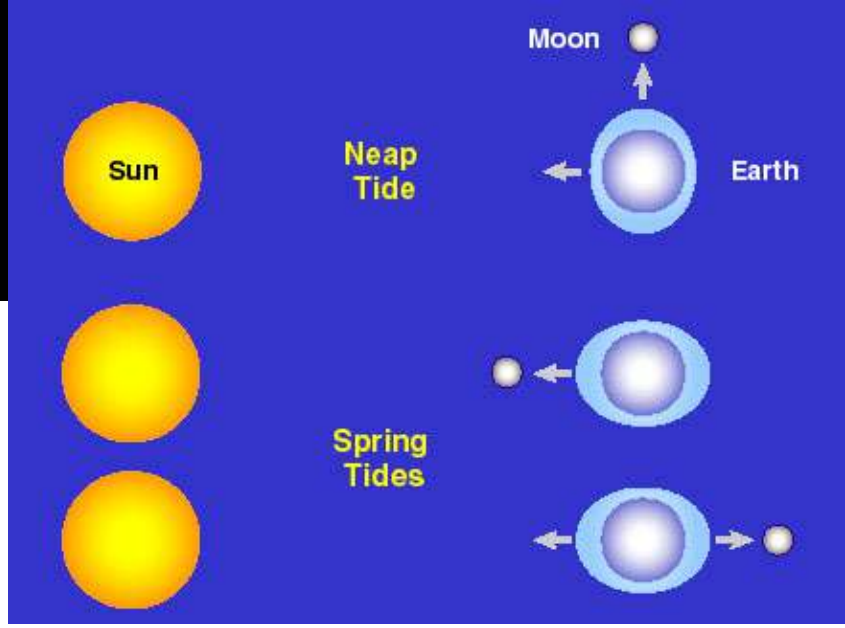
- High tides occur on the side of the Earth closest to the moon due to the moon's gravity pulling on the water
- High tides also occur on the side of the Earth farthest from the moon. The moon's gravity pulls on the Earth more strongly than it pulls on the water leaving it behind
- In between the two high tides, low tides occur

The Tide Cycle





Spring Tides

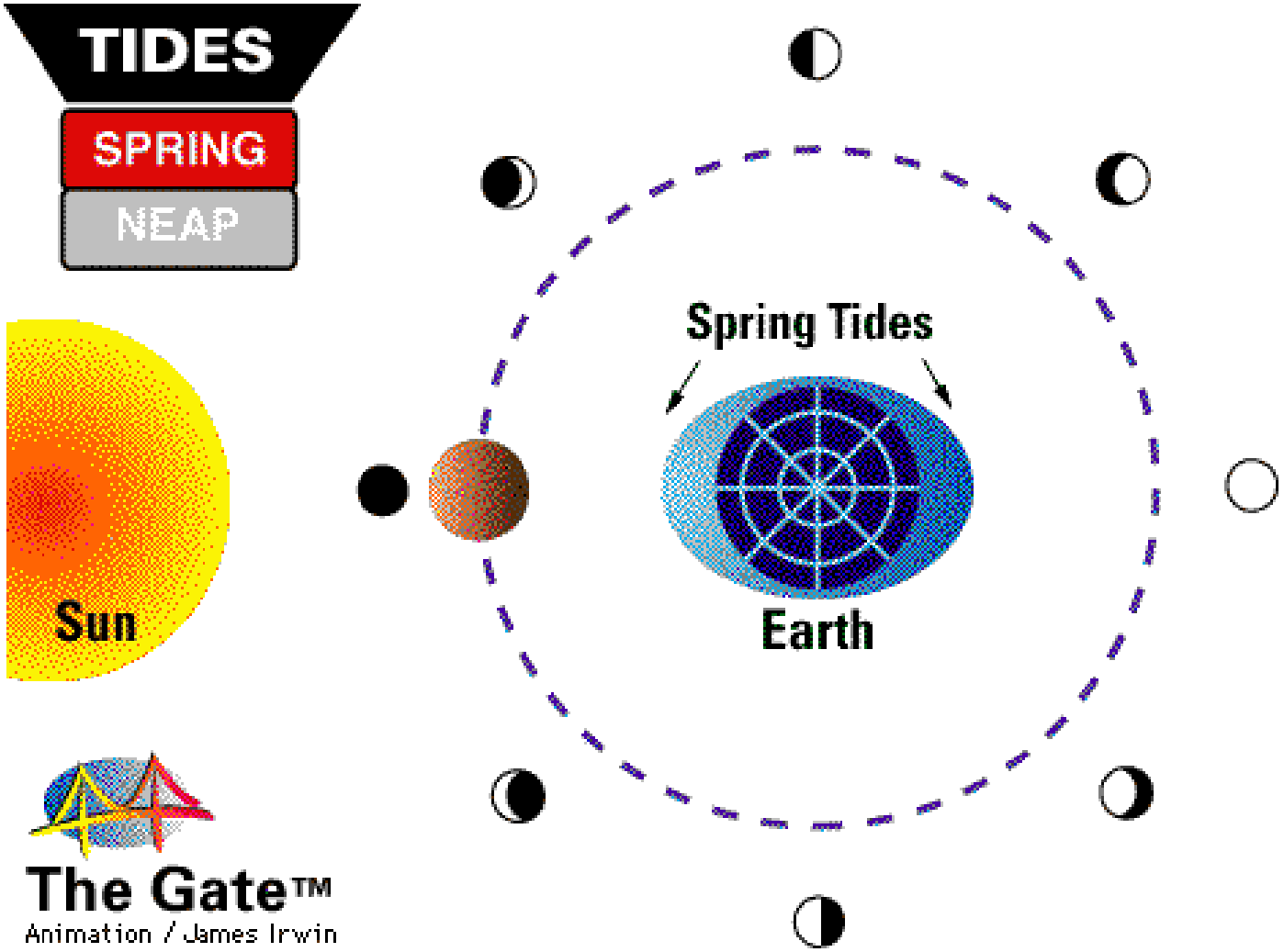


- Sun's gravity pulls on Earth's waters
- During a new moon – sun, moon and Earth are nearly in a line.
- Gravity of sun and moon pull in same direction
- Combination of forces produce tide with greatest difference between low and high tide
- Called a spring tide – occur twice a month during full and new moons

Neap Tides

- During moon's 1st and 3rd quarter, line between Earth and the sun is at right angles to line between Earth and moon.
- Sun's pull is at right angles to moon's pull.
- Produces a neap tide = least difference between high and low tide
- Occur twice a month

Spring Tides and Neap Tides



Check up

- In your Journal, explain the difference between spring tides and neap tides. Include a diagram