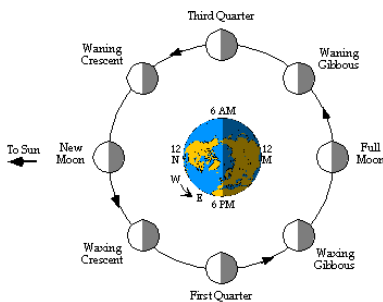


Moon's Phases and Tides

Moon Phases

- Half of the Moon is always lit up by the sun.
- As the Moon orbits the Earth, we see different parts of the lighted area.
- From Earth, the lit portion we see of the moon waxes (grows) and wanes (shrinks).

The revolution of the Moon around the Earth makes the Moon look as if it is changing shape in the sky



- The Moon passes through four major shapes during a cycle that repeats itself every 29.5 days.
- The phases always follow one another in the same order:

New moon



Waxing Crescent



First quarter



Waxing Gibbous



Full moon



Waning Gibbous



Third (last) Quarter



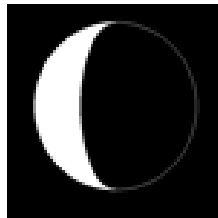
Waning Crescent



- IF LIT FROM THE RIGHT, IT IS WAXING OR GROWING



- IF DARKENING FROM THE RIGHT, IT IS WANING (SHRINKING)



Tides

- The Moon's gravitational pull on the Earth cause the seas and oceans to rise and fall in an endless cycle of low and high tides.
- Much of the Earth's shoreline life depends on the tides.
 - Crabs, starfish, mussels, barnacles, etc.
 -

Tides caused by the Moon

- The Earth's tides are caused by the gravitational pull of the Moon.
- The Earth bulges slightly both toward and away from the Moon.
-As the Earth rotates daily, the bulges move across the Earth.
- The moon pulls strongly on the water on the side of Earth closest to the moon, causing the water to bulge.

- It also pulls less strongly on Earth and on the water on the far side of Earth, which results in tides.

What causes tides?

- Tides are the rise and fall of ocean water.
- Water levels rise to their highest point of the day and fall to their lowest point every 12.5 hours.
- The tides result from the rotation of Earth on its axis as gravity from the moon and the sun pull on Earth and its water.
- Think of a model of Earth, without the pull of gravity from the sun or the moon, as looking something like the illustration below.

High vs. Low Tides

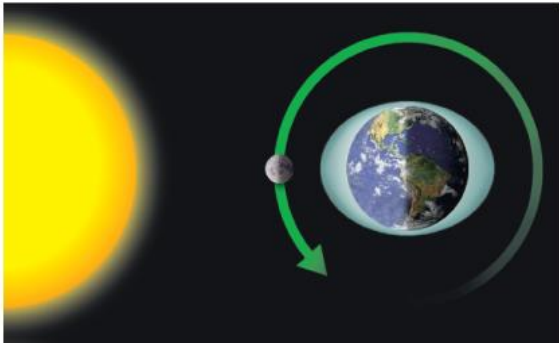
- During high tide, ocean levels are higher on shorelines
- During low tide, ocean levels are lower on shorelines

Spring Tide vs. Neap Tide

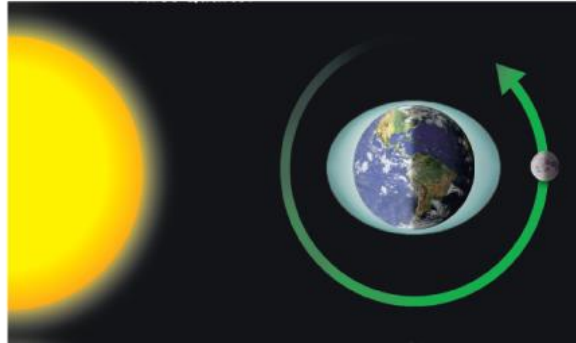
Spring Tides-

- Though the sun is much farther from Earth than the moon, its huge mass exerts a pull of gravity that also affects Earth's ocean tides.
- Together, the effects of the sun and the moon depend on the moon's phase—the position of the moon relative to the sun and Earth.
 - During **new moon** or **full moon**, the sun, the moon, and Earth are in a straight line. **The result is a spring tide.**
- Sun, Moon, and the Earth are in a straight line = strongest, largest tide
 - Sun→Moon→Earth = Very Strong Spring Tides
 - At a right angle = Still high tides but not as strong

New Moon, Spring Tide



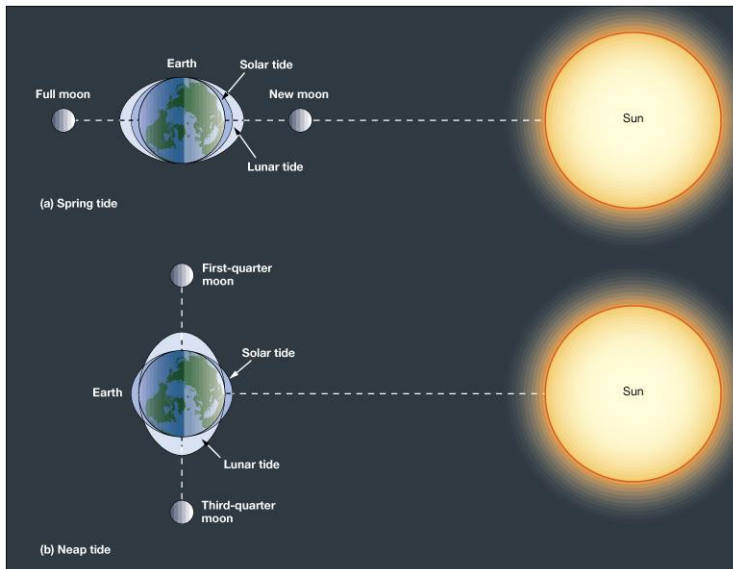
Full Moon, Spring Tide



Neap Tides

- During first quarter of the lunar month, the line from the moon to Earth is at a right angle to the line between Earth and the sun.
- The result is a neap tide.
- The same effect happens during third quarter.
- These occur during **first and last quarter moons**. The gravitational pull is not as strong.

- Sun → Earth
- ↓
- Moon



Spring Tide

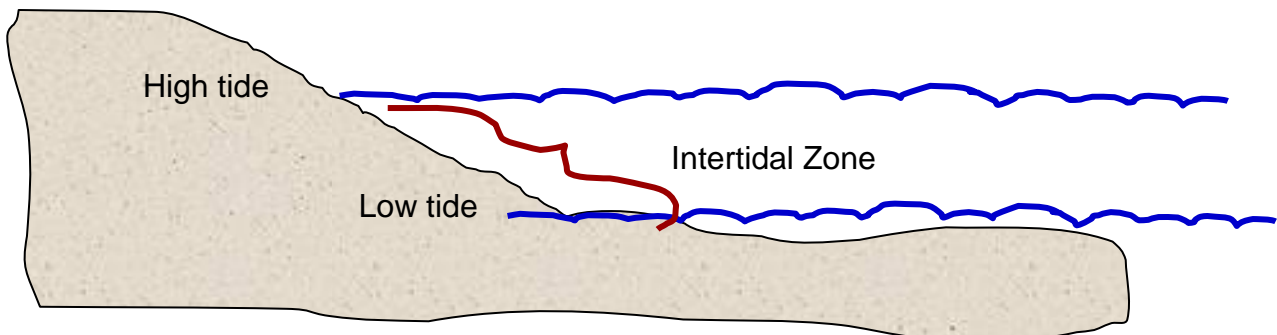
Highest high tide and lowest low tide

Neap Tide

Moderate tidal range

Description of tides

- High water: a water level maximum ("high tide")
- Low water: a water level minimum ("low tide")
- Tidal range: the difference between high and low tide
- Spring Tide: full moon and new moon (14.77 days)
- Neap Tide: 1st quarter and 3rd quarter (14.77 days)



- How many high tides occur daily?
 - Two
- How many weekly?
 - Fourteen
- How many in 30 days?
 - Sixty

