



TEACHER GUIDE

THE MOON AND ITS PHASES GRADES 3-5

COMMON MISCONCEPTIONS

- **Phases of the moon are caused by Earth's shadow.**
Phases of the moon are caused by our view of the moon at different points of its orbit around the Earth.
- **The moon actually changes shape when it is changing phases.**
The moon never changes its shape – it is always a sphere. However, it may look like it's changing shape because parts of it are not visible without sunlight reflecting off of it.
- **The moon generates its own light.**
The moon does not generate its own light. There are no energy sources on the moon to generate light. The moonlight we see is just reflected sunlight.
- **The moon always rises at night and sets in the morning.**
The moon rises nearly an hour later each day, due to combination of the time it takes for the moon to orbit the Earth, and the time it takes for the earth to rotate on its own axis.
- **There is a 'dark side of the moon'.**
The moon has no side that is constantly dark; the front and back are alternately lit as the moon orbits the Earth. Far side, meaning the side currently away from the sun, is a more accurate term.

MOON PHASES

The moon's phases are caused by the position of the moon relative to the Earth and sun. The phases of the moon go from dark (new moon) to crescent, half, gibbous, full, gibbous, half, crescent and back to new moon. The moon is "waxing" when more of it is getting brighter each day and "waning" when it is less illuminated each day. Everyone on Earth always sees the same phase of the moon.

MOON COMPOSITION AND HISTORY

The moon is about a third the size of Earth, with a radius of 1,079.6 miles. It has a core, mantle and crust, like Earth. The surface of the moon experiences steady impacts from meteors, asteroids and comets, creating a pock-marked surface covered with powdery dust and rocky debris that effectively reflects sunlight. The light areas of the moon, called highlands, are volcanic rock, and the dark areas, maria, are impact basins filled with lava between 4.2 and 1.2 billion years ago. Surface temperatures reach about 260°F (127°C) in full sunlight, but in darkness, temperatures plummet to about -280°F (-173°C). Gravity is equal to about one-sixth of Earth's. The moon has a very weak atmosphere called an exosphere.

PLANETS AND MOONS IN THE SOLAR SYSTEM

There are eight planets in our solar system and all but 2 of them have moons. Starting closest to the sun, Mercury and Venus have no moons, Earth has one, Mars has two (Phobos and Deimos), and Jupiter has 67 moons (including the 4 that Galileo first saw: Io, Europa, Ganymede, Callisto). Saturn has 62 moons (Titan is the most massive), Uranus has 27 (all named for Shakespeare and Alexander Pope characters), and Neptune has 14 (Triton is the most massive). Pluto is considered a dwarf planet and has 5 moons. Including moons circling other moons, and moons circling other dwarf planets, there are 182 (and counting) moons in our solar system. Scientists are still finding more!

THE MOON AND TIDES

The moon causes tides in oceans, because the moon's gravitational pull creates a 'tidal force' that pulls on the water and causes it to bulge out on the side of the earth facing the moon. The water also bulges out on the side of the earth opposite the moon at the same time. The bulges are high tides, and the flatter parts are low tides. This is a more complex phenomena that is often addressed in higher grade levels.