Chapter 25 **Earth's Moon**	Name
	Period

Section 25.1 Objectives:

- Explain current hypothesis regarding how the moon was formed
- Describe features and properties of the moon

Vocabulary

- Meteoroid
- Crater
- Ray
- Micrometeoroid
- Mascons
- Regolith
- Maria
- Rille

ORIGIN OF THE MOON	The most widely accepted model for the origin of the moon is that when the solar system was forming, a body the size of Mars impacted Earth. The resulting debris was ejected into space, began orbiting around Earth, and eventually united to form the moon.
DEVELOPMENT OF THE MOON	Once the moon coalesced, it underwent four phases: 1. _____ 2. _____ 3. _____ 4. _____
FORMATION OF THE CRUST	The moon experienced _____, melting the moon's surface forming a "magma ocean". As the material cooled it underwent differentiation, resulting in denser material sinking towards the mantle and lighter material floating to the top, becoming the crust.
EXCAVATION OF LARGE IMPACT BASINS	Lunar crust was impacted by debris creating large impact basins and cracks from which lava flowed to the surface. About 3.8 billion years ago, _____such _____.
FILLING OF MARIA BASINS	Over millions of years, magma rose to the surface filling the largest of the impact basins with iron rich basalt creating _____ (_____). The interior of the Moon gradually cooled and became geologically inactive.
FORMATION OF RAYED CRATERS	Because the moon is less dense and has no atmosphere to protect itself, _____ continue to bombard the moon's surface creating new craters.
PROPERTIES/FEATURES OF THE MOON	The moon's _____on its axis _____ its _____ around the Earth resulting in the same lunar hemisphere always facing Earth.

LAYERS OF THE MOON	Layers of the Moon (from the middle going "up" to the surface) include: • Iron core • Partially molten region • Rigid lithosphere • Crust
LUNAR MARIA	The dark areas of the Moon are great basins and level plains, formed when lava spewed up to the surface through the fractures made by earlier giant impacts. Scientists studying the moon rocks have determined that the _____ are the _____ _____, ranging in age from 3.1 – 3.8 billion years old. The moon's gravity is greater over some of the more circular maria. Higher gravity readings indicate the material beneath the surface has a different density than the surrounding rock. These _____are called _____, short for "mass concentrations." _____ are trench-like valleys running through maria bedrock. They may have formed when a river of molten lava flowed along the surface. After a hard crust formed over the river, the molten lava drained away, leaving a hollow tunnel, the roof of which later caved in.
LUNAR HIGHLANDS	The _____appear brighter than maria because their rocks are lighter in _____ and _____. Within the lunar highlands are a few mountain ranges and many craters. Most lunar mountain ranges lie at the edges of maria. Two types of rock have been retrieved from the lunar highlands: • A light-colored, coarsely crystalline igneous rock similar in composition to gabbro. Scientists think that this what makes up all the Moon's solid crust, except in areas where mare basalts cover it. • _____ made of angular fragments cemented together with fine material. Scientists think these rocks were _____ that melted the rocks together.

	Most highland rock specimens are between 4.0 and 4.3 billion years old. Some specimens collected by the *Apollo 17* mission, have been dated at between 4.2 and 4.5 billion years, nearly the age the Moon itself is thought to be. This correspondence in age _____ the _____ that the _____are the _____.
LUNAR CRATERS AND RAYS	_____are _____on the Moon's surface that form after a meteoroid strikes. The smallest craters are microscopic pits, while the largest is nearly 1100 km across. _____are rugged cliffs. The rims may tower thousands of meters above the surrounding plains, and their floors may lie a thousand meters below the plains. _____ (bright streaks) radiate from a number of craters. Scientists believe that rays consist of shattered rock and dust that were splashed out by the meteoroids that formed the craters.
LUNAR SOIL	Lunar soil is not really soil. Scientists prefer to call it _____, which means _____ _____. Regolith is a grayish brown mixture of small rock pieces and fine particles that range in size from sand grains to fine dust. Unlike Earth soil, regolith contains no water or organic material. Regolith is formed by the smashing impact of meteoroids of all sizes. When large meteoroids explode, they mix rock fragments over broad areas – this stirring of regolith is called gardening. Regolith also contains tiny beads of glassy material which form from rock melted by high-speed meteoroid impacts.

CHAPTER 25.1 REVIEW

1. According to the most widely accepted theory, what event led to the formation of the moon?

2. What factors might affect the length of the rays formed after an impact?

3. How does the size of the moon's core support the impact theory of the moon's formation?

4. Compare and contrast the moon's maria and highlands.

Section 25.2 Objectives

- Describe the motions of the moon.
- Explain the reason the moon goes through phases.
- Analyze how the Earth-moon-sun geometry causes lunar and solar eclipses.

Vocabulary:

- Phases
- Waxing
- Lunar eclipse
- Waning

- Gibbous
- Solar eclipse
- Umbra
- Penumbra

THE MOON'S MOTIONS	The Moon travels in a regular and predictable motion. By keeping track of the Moon's motion, astronomers can predict exactly when the Moon will pass between Earth and the sun, and exactly where the shadow of the Moon will fall upon the Earth.
THE MOON'S ORBIT	• The Moon _____and _____. This motion is apparent – it's really a result of Earth turning on its axis. • The Moon takes about _____to complete one orbit. • When the Moon is on the side of Earth opposite the Sun, it is seen mostly in the night sky. When it is between Earth and the Sun, it is seen mostly in the daytime sky. • The Moon orbits in a different plane than Earth does. This is important in determining how often eclipses occur. The Moon rises above the horizon at different times each day or night. This happens because every time Earth spins around once, the Moon moves about 13° eastward along its orbit. Thus, Earth must rotate an extra 13° more each day for a point on its surface to be roughly under the Moon again. Since Earth takes about 50 minutes to spin 13°, the _____about _____ _____. The _____around Earth is _____. The Moon's average distance from Earth is about 384,000 km (or about 238,080 miles).

	_____ – when the Moon is _____ to Earth. _____ – when the Moon is _____ from Earth.
THE MOON'S PHASES	The phases of the moon are the progression of changes in the moon's appearance during the month. Lunar phases are a result of the _____ and the _____ from its surface. The _____the half of the Moon that is _____. We see changing amounts of the sunlit half. From Earth, the face of the Moon changes from all dark (the "new moon") to all light (the "full moon"), in about two weeks. During this time the Moon is said to be _____ (showing more brightness). During the next two weeks, the Moon gradually changes from all light (the "_____") back to all dark (the "_____"). During this time the Moon is said to be _____ (showing more darkness, less light). <u>Waxing Phases</u> • _____– first visible thin slice of moon • _____– half the lighted side of moon is visible • _____– more than one-quarter is visible • _____– all the moon's lighted side is visible <u>Waning Phases</u> • _____– starts after a full moon when more than half of lit side of moon is still visible • _____– only half the moon's lighted side is visible • _____– last visible slice before a new moon
LUNAR ECLIPSES	_____occur when the _____is located _____the _____ and the _____. During a lunar eclipse, Earth's shadow _____from reaching the Moon.

	• _____ - the area of _____. This area is shaped like a long, narrow cone stretching into space. • The _____ is the area of _____. This area is also cone-shaped, but it becomes wider as it stretches into space. Full moons occur each month, but lunar eclipses occur less often because of the 5° angle between the plane of Earth's orbit and the plane of the Moon's orbit. Since the "full moon" is usually above or below Earth's umbra, no eclipse occurs. When we do see a lunar eclipse, the Moon usually remains visible, but has a red or coppery color. This color results when Earth's atmosphere bends some sunlight (mostly longer red wavelengths) into the umbra. A _____occurs when the Moon is fully within Earth's umbra. A _____occurs when only a portion of the Moon is in Earth's umbra. On average, at least one total lunar eclipse occurs every year. This type of eclipse may last as long as two hours.
SOLAR ECLIPSE	A _____occurs when the _____ comes _____ the _____ and _____, and the Moon's shadow hits Earth's surface. A solar eclipse only occurs at the "new moon" phase. At least one solar eclipse occurs every year, however, a given area experiences a total solar eclipse only once every three or four centuries. _____– the Moon is at perigee with the Earth, and areas of Earth within the umbra experience the total eclipse (the _____). _____– the Moon is at perigee with the Earth, and areas of Earth within the penumbra experience the partial eclipse (_____is covered by the Moon). _____– the Moon is at apogee with the Earth, and areas of Earth within the penumbra experience the annular eclipse (a _____).

SECTION 25.2 REVIEW QUESTIONS

1. Why does the moon rise at a different time each day or night?

2. What is the difference between a partial and a total lunar eclipse?

3. What is the difference between an annular and a total solar eclipse?

4. How many days would you expect to fall between the new moon and the first quarter? The last quarter?