Answers to Geology Homework Sections 25.1, 25.2, and 24.3

Section 25.1 Homework: Origin and Geology of the Moon

What is the main form of erosion on the surface of the moon? *

- Rivers
- Wind
- Oceans
- **Micrometeoroid bombardment**

Approximately how old is the Moon? *

- Around 3 billion years old
- Around 6,000 years old
- **Around 4.3 billion years old**
- Around 1 million years old

What was the name of the mission that originally LANDED the United States on the Moon? *

- Luna
- Mercury
- Gemini
- **Apollo**
- Zeus

How does the crust on the side of the Moon facing the Earth compare with the crust on the side of the Moon facing away from the Earth? *

- **The side facing the Earth is thinner and more dense**.
- The side facing the Earth is thicker and more dense.
- The side facing the Earth is thinner and less dense.
- The side facing the Earth is thicker and less dense.

Areas on the Moon that have higher elevation than the other areas are known as *

- mare
- **highlands**
- rilles
- mascons

What is the predominant type of rock on the Moon? *

- Sedimentary
- Metamorphic
- **Igneous Extrusive**
- **Igneous Intrusive**

This could be argued, because the highlands are made of anorthosite (igneous intrusive rock) and the mare basins are made of basalt (igneous extrusive rock). I would re-word this question if I were to give it to you on a test.

How were lunar maria formed? *

Lunar Maria were formed by large impacts from meteoroids. The original thin crust of the near side of the Moon is blasted away, leaving basalt to flow in to the mare basins.

Why would regolith not be the preferred soil for a back yard garden? *

Regolith has no nutrients and thus w ould not be sufficient for planting.

Lunar rays are most often formed by *

- Meteoroids and asteroids hitting the Moon directly
- **Meteoroids and asteroids hitting the Moon at an angle**
- The Sun's rays hitting the surface of the Moon
- Volcanic eruptions from below

Complete the Mini Lab on page 557. The table gives the weight of objects on the Moon. What are the approximate weights of the listed objects on Earth? What is the approximate ratio of what objects weigh on the Moon compared to what they weigh on Earth? *

The ratio you should have come up with is 1/6. Objects on Earth are six times heavier because the acceleration of gravity here is 9.8 m/s2, whereas the acceleration of gravity on the Moon is only 1.6 m/s2. This is mainly attributable to the fact that the Moon has a much lower mass than the Earth does. Higher mass means higher force of gravity given that two bodies have the same radii.

Detail the three steps involved in the formation of the Moon according to the Impact Theory. *

1) Earth is impacted around 4.3 billion years ago by a large, Mars-sized object known as Thea.
2) The material from Thea and the early Earth are sent out in to a cloud of material that continues to orbit around a common center of mass.
3) The material from Thea and the early Earth coalesce (come together) to form the Moon and the early Earth. The remaining material for planet Earth is acquired from later meteoroid impacts. This is why evidence of the impact is not seen.

Submit

Section 25.2 Homework: Lunar Phases

What was Galileo Galilei's evidence that the planets were orbiting the Sun, not the Earth? *

- The Moon had phases
- The planet Venus neither rises nor sets
- **The planet Venus has phases similar to the Moon**
- The planet Mars changed its position in the night sky

Why does the Moon rise and set about 50 minutes later each day on average? *

- ☐ The Moon is in sync with the Sun
- ☐ The Moon always has one side attracted to Earth
- ☐ Earth must rotate an additional 13 degrees of rotation for a point on Earth's surface to be directly under the Moon again
- ☐ The Moon is moving (revolving) around Earth
- ☐ **Both options 3 and 4 are correct**

What word describes the Moon getting brighter over time in a lunar cycle? *

- ☐ **Waxing**
- ☐ Weeping
- ☐ Warping
- ☐ Waning

The Moon's orbit around the Earth is mostly *

- ☐ circular
- ☉ **elliptical**
- ☐ square
- ☐ rectangular

Gibbous means that *

- ☐ **more than half of the lunar disc is visible**
- ☐ less than half of the lunar disc is visible
- ☐ the Moon is full
- ☐ the Moon is new

Total Lunar eclipses occur when *

- ☐ **The Moon is in the umbra of the Earth**
- ☐ The Earth is in the umbra of the Moon
- ☐ The Earth is in the penumbra of the Moon
- ☐ The Moon is in the penumbra of the Earth

Which type of eclipse would it NOT be a good idea to look at with the unprotected eye? *

- Total Solar Eclipse
- Partial Solar Eclipse
- Annular Solar Eclipse
- Total Lunar Eclipse
- **ALL Solar Eclipse!**

Describe why it is that the Moon goes through phases. What is happening? See animation above. *

The Moon is revolving around the Earth. The illumination perspective on the Moon changes as the Moon moves around the Earth with respect to the Sun. The Moon is reflecting light from the Sun and does not give off any light of its own.

What TWO conditions MUST be satisfied in order for a Lunar Eclipse to take place? In other words, what phase and planar arrangement is required? See animation above. *

The following two conditions must be satisfied.

1) The Moon must be in a full phase.
2) The orbital plane of the Moon and the orbital plane of the Earth, which are offset from each other by 5 degrees, must intersect at the line of nodes at the same time there is a full Moon.

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Section 24.3 Homework: Tides

Which physical law best describes the reason that ocean tides occur? *

- Newton's 1st Law
- Kepler's 2nd Law
- Einstein's Law E = m x c squared
- **Newton's Law of Gravitation**
- Newton's 3rd Law

Which phase of the moon can result in exceptionally high tides and exceptionally low tides? *

- First quarter
- Third Quarter
- New Moon
- Full Moon
- **Both options 3 and 4 are correct**

Exceptionally high high tides and exceptionally low low tides are called *

- neap tides
- **spring tides**
- slack tides
- ebb tides

The greatest tidal pull (highest high and lowest low tides) occurs when *

- **The Sun, the Moon, and the Earth are in a straight line with each other (Full or New Moon phases)**
- The Sun, the Moon, and the Earth are at right angles to each other (1st or 3rd Quarter phases)
- The Moon is in its waxing gibbous phase
- The Moon is in its waning crescent phase

The Sun's tide making force is about _____ of the Moon's tide making force. This is primarily due to the fact that the Moon is _____ to Earth. *

- 1/2, farther
- 1/4, closer
- **1/2, closer**
- 3/4, farther

What part of North America would have the greatest tidal range? *Tidal range is the difference between the highest high and lowest low tides seen in a given area during a particular phase of the Moon.

- Gulf of Mexico
- Southern California
- Lake Superior
- **Bay of Fundy, Nova Scotia**

What condition would create the greatest tides encountered throughout the whole year? *Apogee is when the Moon is farthest from Earth. Perigee is when the Moon is closest to Earth. Aphelion is when the Earth is farthest from the Sun. Perihelion is when the Earth is closest to the Sun.

- When the Moon is at apogee and the Earth is at aphelion in July
- **When the Moon is at perigee and the Earth is at perihelion in January**
- When the Moon is at apogee and the Earth is at perihelion in January
- When the Moon is at perigee and the Earth is at aphelion in July

Explain why it is possible to have two tidal ocean bulges on opposite sides of the Earth when the Moon can only be on one side of the Earth at any given time? *Hint: Think about what happens when you accelerate away from a stop light in a car like a Porsche with great acceleration. What happens to your body in the seat? Do you move backwards as the car accelerates forwards? Does the Earth accelerate toward the pull of the Moon and the Sun? If so, what will happen to the ocean water on the side of the world facing away from the Moon? In physics, we call this inertia, the tendency of an object at rest to stay at rest.

The Earth is accelerating towards the Moon and the Sun in the case of a New Moon. This causes the tidal bulge opposite the Sun and the Moon to bulge outwards due to inertia. Remember that inertia is NOT a Force. It is simply a momentum, or the tendency of an object at rest to stay at rest or an object in motion to stay in motion (Newtonôs 1st Law of Motion). The object in this case is the Ocean on the opposite side. The ocean on the side of the Earth facing the Moon will get pulled higher because it is closer to the massive objects. Things are more complicated during a Full Moon when the Sun is on one side and the Moon is on the other side of the Earth. The Moon pulls on its side of the Earth with double the tide making force, so inertia will want to keep the ocean opposite the Moon in the same place and the Sun will pull on the tidal bulge opposite the Moon with half the force of the Moon. See me if this is too confusing and Iôll show you using force free body diagrams.

Look at the website called "How do Tides Work?" This site is found by clicking on the link at the top of this homework in the title. Approximately how many hours fall in between high and low tide and Cape Porpoise Harbor, Maine? *

- ☐ 12 hours
- ☐ 18 hours
- ☐ 24 hours
- ☉ **6 hours**

What is the reason for the difference in time between high and low tide in the last question? *

- ☉ **The Earth is rotating underneath the tidal bulges**
- ☐ The Earth is revolving around the Sun
- ☐ The Moon is revolving around the Earth
- ☐ The Moon is rotating

Fin!