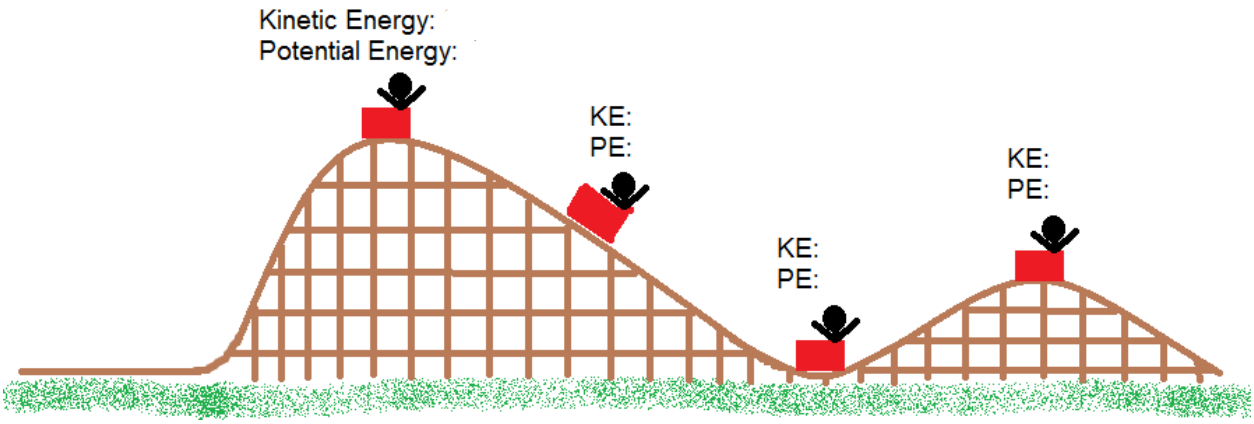
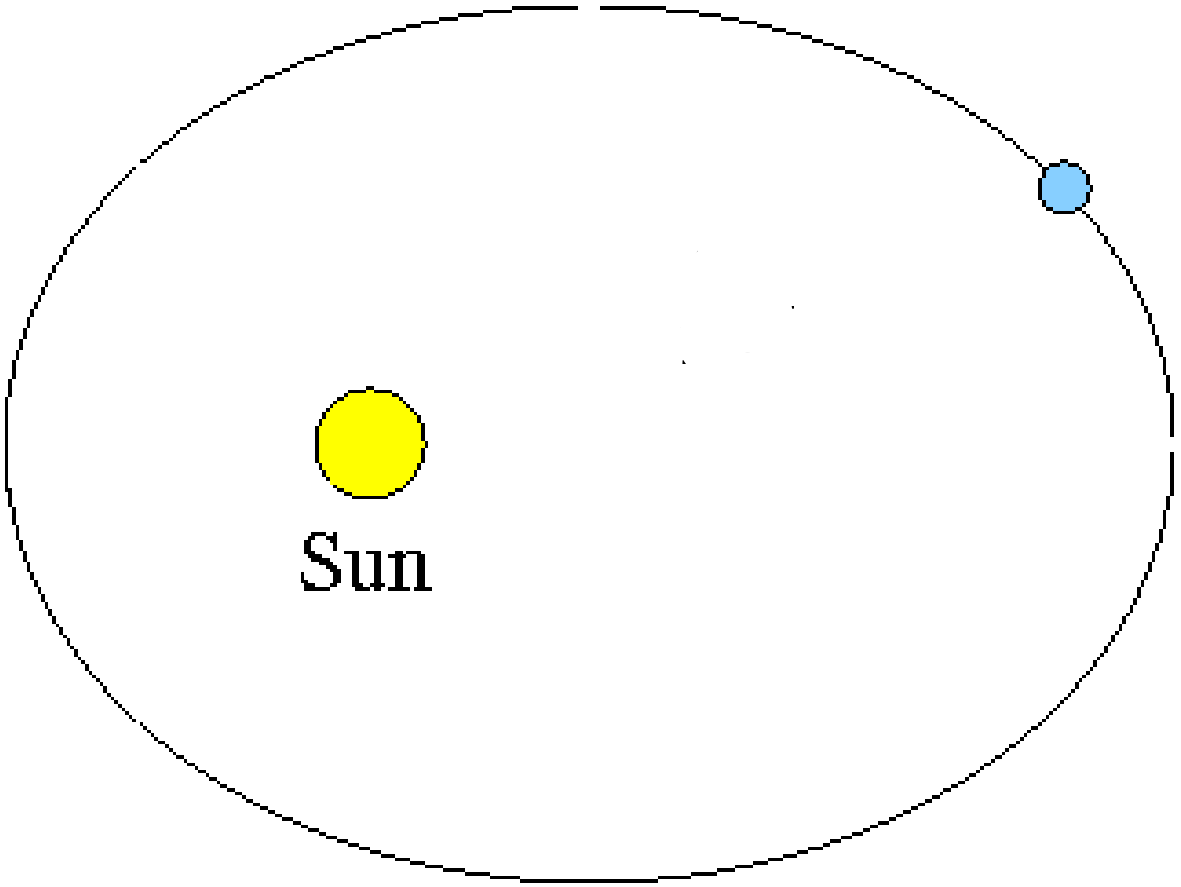
Section 5: The Sun-Earth-Moon System





Section 5 Question: What would the Earth be like with no moon?

What do you See?
(Picture)

What do you think?

Consider the following discussion between two students about the cause of the phases of the Moon.

Student 1: *The phase of the Moon depends on how the Moon, Sun, and Earth are aligned with one another. During some alignments only a small portion of the Moon's surface will receive light from the Sun, in which case we would see a crescent Moon.*

Student 2: *I disagree. The Moon would always get the same amount of sunlight; it's just that in some alignments Earth casts a larger shadow on the Moon. That's why the Moon isn't always a full Moon.*

Do you agree or disagree with either or both of the students? Explain your reasoning.

What do you think now?

Focus Question A: What creates the lunar phases that we observe from Earth?

Predictions:

Observations:

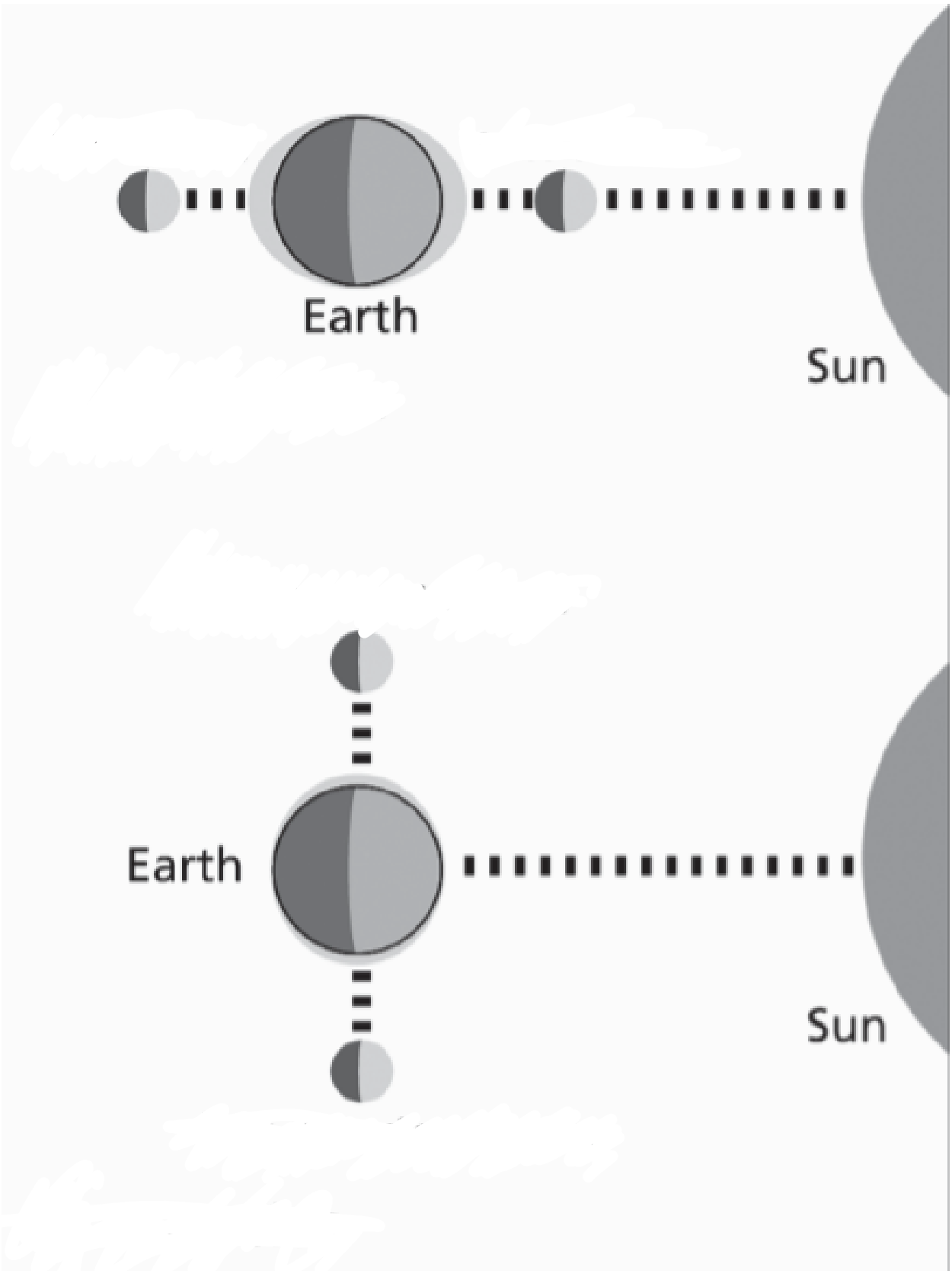
How do your observations compare with your moon observation chart?
Explanation:

Focus Question B: What is the relationship between tides on Earth and lunar phases?
Predictions:
Data

Table 1: Heights of High and Low Tides in Five Coastal Locations During January 2009 (All heights are in feet.)

			Kings Point, New York		Fort Pulaski, Georgia		Portland, Maine		Duck, North Carolina		New London, Connecticut	
Date	Moon Phase	Moon Phase	High	Low	High	Low	High	Low	High	Low	High	Low
1/04/09	First Quarter	2	5.9	–0.5	6.6	0.5	8.5	0.6	2.7	–0.5	1.9	–0.1
1/07/09	Waxing Gibbous	3	9.6	1.1	7.4	0.4	9.9	0.6	4.1	0.1	3.9	0.4
1/11/09	Full Moon	4	9.3	–1.5	8.5	–1.5	12.3	–1.5	4.7	–1.4	4.4	–0.8
1/15/09	Waning Gibbous	3	8.0	–0.6	7.1	–0.7	10.0	–1.5	3.5	–0.7	2.8	–0.3
1/18/09	Last Quarter	2	7.8	0.7	6.6	0.2	9.3	0.5	3.1	–0.2	2.6	0.1
1/21/09	Waning Crescent	1	9.1	0.8	6.4	0.7	9.7	1.5	4.0	1.1	3.5	0.8
1/25/09	New Moon	0	7.5	–0.5	7.0	0.1	9.5	0.2	3.8	0.0	2.7	0.8
1/31/09	Waxing Crescent	1	7.8	–0.3	6.7	–0.1	9.7	0.3	3.2	0.1	3.4	0.1

Graph of Tides and Lunar Phases for _____


Earth
Sun
Earth
Sun

Focus Question D: What other affects do tidal forces have on the Earth?
Predictions:
Observations:
Explanation:

RETURN TO WDYTN

Extension:

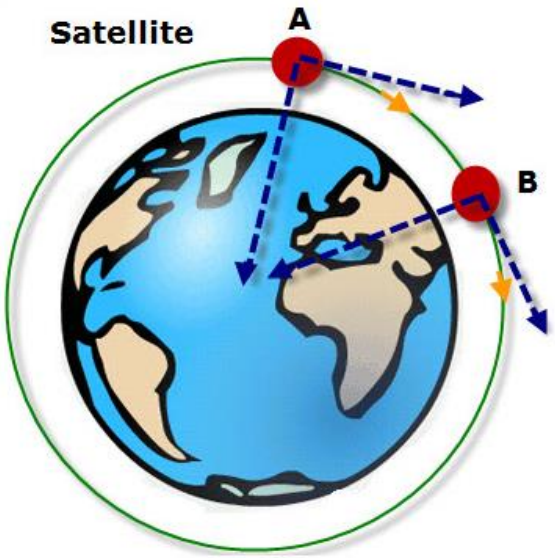
Table 2: Change in Rotation of Earth Due to Tidal Forces		
Period	**Date (millions of years ago)**	**Length of Year (days)**
Precambrian	600	424
Cambrian	500	412
Ordovician	425	404
Silurian	405	402
Devonian	345	396
Mississippian	310	393
Pennsylvanian	280	390
Permian	230	385
Triassic	180	381
Jurassic	135	377
Cretaceous	65	371
Present	0	365.25

Claim:

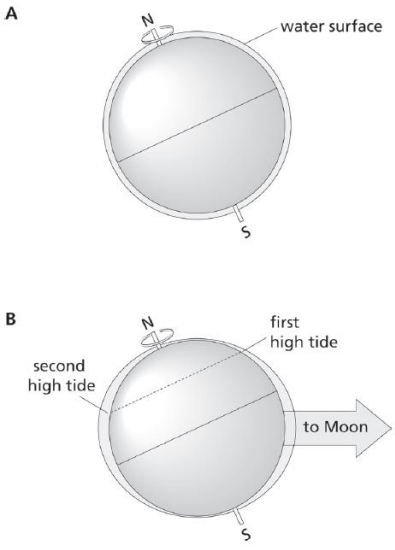
Evidence:

DIGGING DEEPER

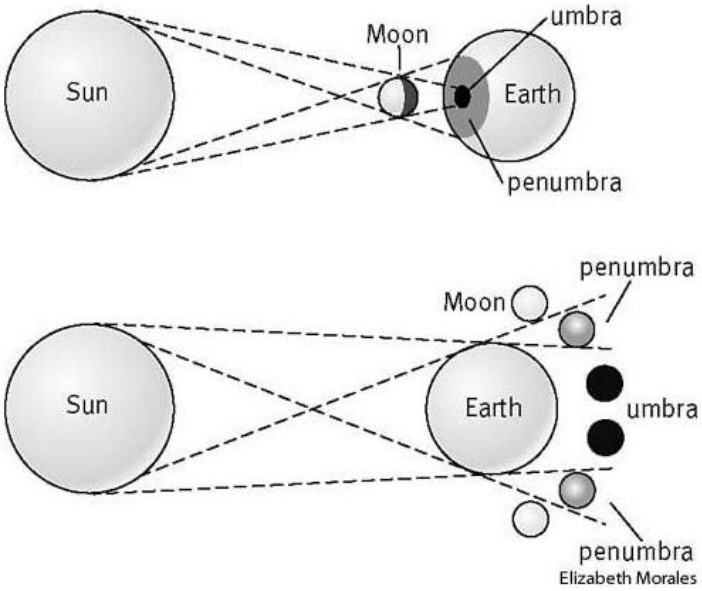
Newton's Laws	
• Newton's Laws describe the way that objects move. • There are 3 Laws of Motion and the Law of Gravitation • Newton's Law of gravitation can expressed mathematically as; $F = G\frac{m_1 m_2}{d^2}$ Where G is the gravitational constant, m_1 and m_2 are the masses of the objects, and d is the distance between the objects	Describe two ways to reduce the amount of gravitational force between two objects. The planets orbit around the Sun is due a balance between the following two forces. 1. 2.



Formation of Earth and Moon	
• Earth and the other planets in the solar system separated into density layers as they began to cool after initial formation. • Earth and Moon formed approximately 4.6 billion years ago.	Describe or illustrate the events of the Large Impact Theory.
Tides	
• There are two simultaneous high and low tides on Earth at all times. • Tides and Moon rise/set occurs 50 min later ach day	Two ways the moon continues to affect Earth.



Eclipses	
• The orbital path of the moon is inclined ~25° relative to Earth • Eclipses can only be observed from small area on Earth. • There can be up to 7 eclipses in one year.	During which moon phase(s) can a solar eclipse occur? Why? During which moon phase(s) can a lunar eclipse occur? Why?



Chapter 1, Section 5 E.B.C.
The Sun-Earth-Moon System

Name:_____
Period:_____

Question (2)		
Claim 1 (2)		
A. Supporting Evidence (3)	B. Supporting Evidence (3)	
Claim 2 (2)		
A. Supporting Evidence (3)	B. Supporting Evidence (3)	
Analysis (6)		

	Claim *A statement or conclusion that answers the original question/problem.*	**Evidence** *Scientific data that supports the claim. The data needs to be appropriate and sufficient to support the claim.*	**Analysis** *A justification that connects the evidence to the claims. It shows why the data counts as evidence by using appropriate and sufficient scientific principles and vocabulary.*
0	Does not make a claim, or makes an inaccurate claim.	Does not provide evidence, or only provides inaccurate or vague evidence.	Does not provide an analysis, or only provides an irrelevant analysis.
1	Makes an accurate but vague or incomplete claim.	Provides vague evidence and does not include specific data.	Repeats evidence and links it to claim, but does not include specific scientific principles.
2	Makes accurate and complete claim.	Provides correct evidence but does not include specific data.	Connects all evidence to the claims using scientific principles or vocabulary but not both.
3		Provides correct evidence and includes specific data.	Connects all evidence to both claims using scientific principles and vocabulary.

CHECKING UP: Page 64, 1 through 4 (2 points each)

____
14

1.

2.

3.

4.

The tide table in your investigate provides the predicted height of the tides. Look down the table to see how much variation there is in the tide heights. Recalling that the Sun also exerts tidal force on the ocean water, sketch a picture of the position of Earth, the Moon, and the Sun for: (6 points)

I. The highest high tide you see in the tidal chart.

II. The lowest high tide you see in the tidal chart.

III. The lowest low tide you see in the tidal chart.