

Name _____

Timing the Tides

- Purpose:**
- 1) collect data by observing and measuring
 - 2) organize, analyze, evaluate, make inferences, and predict trends from direct and indirect evidence;
 - 3) communicate valid conclusions
 - 4) Describe how the times of high and low tide change from one day to the next.
 - 5) Describe why the times of high and low tide change from one day to the next.

Background Information:

Tides are the periodic rise and fall of the ocean waters. They are caused by the gravitational pulls of the Moon and (to a lesser extent) Sun, as well as the rotation of the Earth.

The key to tides is the varying strength of the Moon's gravitational pull on different parts of the globe. The Moon pulls most on the water nearest to it, creating a high tide bulge of water. On the opposite side of the planet, about 7,926 miles (1,2760 km) away, the Moon's pull is much weaker and the water is left to form another high tide bulge. Low tides are found halfway between the highs. The rotating Earth carries us through these regions of high and low water.

Tide tables are commonly seen in newspapers and on television in coastal areas. They show that comparable local high and low ocean tides occur almost one hour later from one day to the next.

Materials:

Tide-Time Diagram	Transparency sheet	Push pin
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What to do:

1. Examine the **Tide Time Diagram**.
 - a. The diagram (not drawn to scale) shows Earth at the center as seen from far above Earth's North Pole.
 - b. The counterclockwise rotation of Earth and the direction of light arriving from the distant sun are shown.
 - c. Earth time is marked on one hour intervals along the circumference of the planet.
 - d. The large circular ring in the diagram shows the daily position of the Moon relative to Earth during one lunar month lasting from one new Moon phase to the next new Moon.
 - e. It has been rounded to 30 days for the purposes of this investigation.

- f. Every day, the moon's position advances along the circle representing the 30-day month.
 - g. The lower **Tidal Bulge/Moon Diagram** is of the Moon and Earth with the depth of the ocean greatly exaggerated.
 - h. It shows the theoretical locations of the ocean's two dominant tidal bulges.
 - i. One always faces the Moon (where lunar gravitation is strongest) and the other always faces directly away (where lunar gravitation is weakest).
2. Make a tracing of the lower diagram on a transparency sheet.
 - a. Place this directly over the upper diagram so that center points of the diagrams coincide.
 - b. Use a push pin to hold the two together at their centers.
 - c. Twist the transparency sheet so the Moon progresses from one daily position to the next.
 3. Place the Moon at its Day 1 position.
 - a. A point on Earth rotating through the center of the bulge facing the Moon would experience a high tide at this time.
 - b. The time of the high tide is found by reading the time on Earth clock indicated by the "Solar Time" arrow pointing at the high tide bulge.
 - c. Record the time of the high tide.
 4. Advance the Moon to its day 2 position.
 - a. Record the time of the high tide.
 5. Advance the Moon to its day 3 position.
 - a. Record the time of the high tide.
 6. Repeat step 3 for a total of 10 days.

Data:

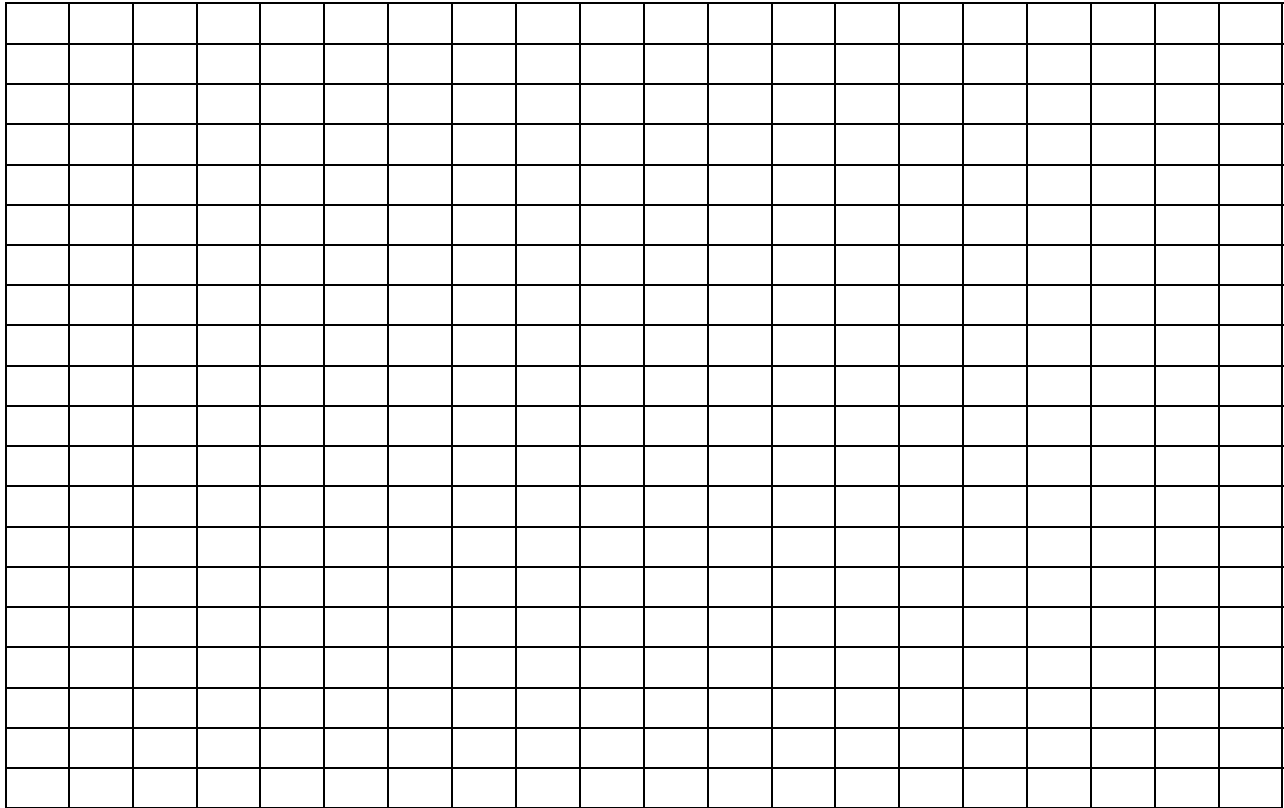
Position of Moon	Time of High Tide
Day 1	
Day 2	
Day 3	
Day 4	
Day 5	
Day 6	
Day 7	
Day 8	
Day 9	
Day 10	

Data Analysis:

Make a graph of the data. (Remember TAILS & DRY MIX)

What is the best kind of graph for this data? _____

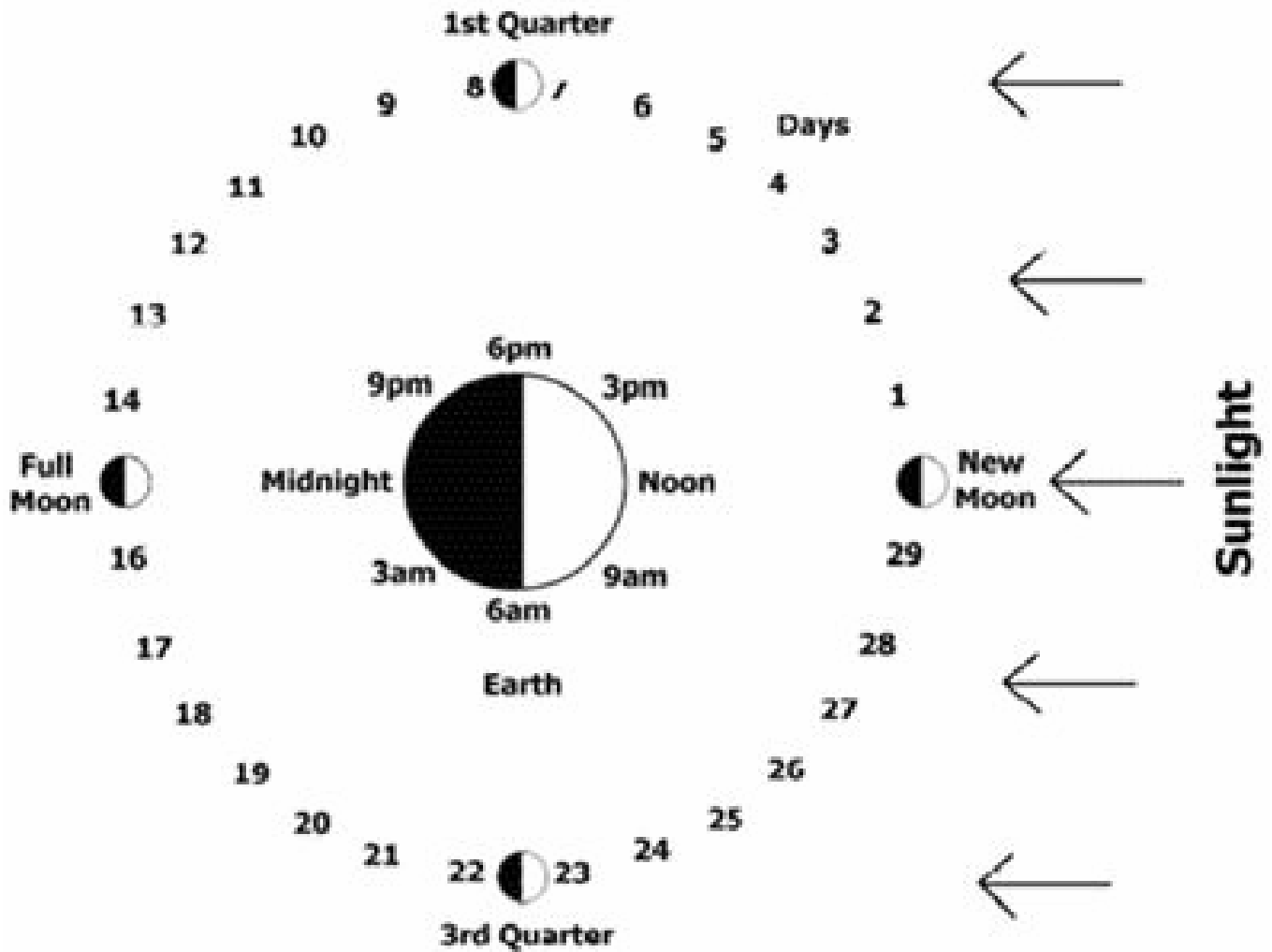
Why? _____



Questions & Conclusions:

1. Compare the time of the Day 2 high tide to the Day 1 high tide. What do you notice?
2. The time lag investigated in this activity is usually less than an hour, but how much less? To make an estimate, determine from the diagrams the times of comparable high tide on Day 10 and Day 20. From this information, find how many minutes later the tide occurred on Day 20 than on Day 10, and divide by 10. What is an estimate of the difference?
3. Why do you think this difference exists?

Tide Time Diagram



Tidal Bulge / Moon Diagram

