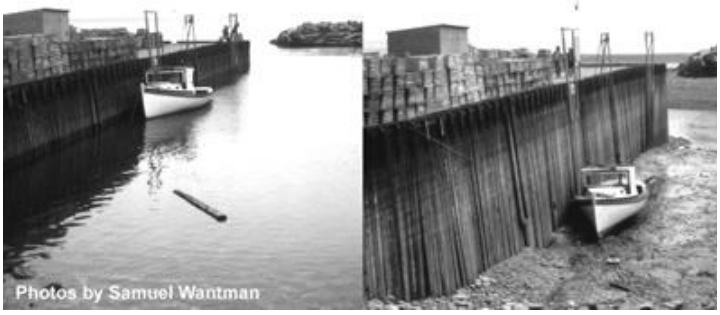
Name: _____ Date: _____

Student Exploration: Tides

Vocabulary: gravity, high tide, low tide, neap tide, spring tide, tidal bulge, tides

Prior Knowledge Question (Do this BEFORE using the Gizmo.)



What is happening in these images?

_____

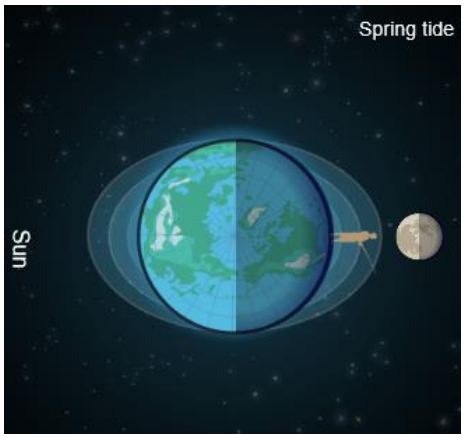
_____

_____

_____

Gizmo Warm-up

The *Tides* Gizmo shows the relative positions of the Earth, Moon, and Sun. (None of the distances are to scale.) An observer stands on Earth.



1. Set the **Speed** to **Slow**. Select the BAR CHART and press **Play** (▶). What do you notice?

   _____

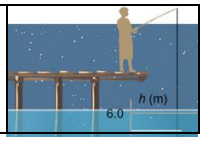
   _____

   The changing depth of water is due to **tides**.

2. Click **Pause** (⏸) when the water is at its highest level. This is called **high tide**. What is the height of water during high tide? _____

3. Click **Play**, and then **Pause** when the water is at its lowest level, called **low tide**. What is the height of water during low tide? _____

4. Click **Reset** (↺). Click **Play**, and then click **Pause** after one day. Select the GRAPH tab. How many high tides are there in a day? _____ Low tides? _____

Activity A: **The Moon and tides**	Get the Gizmo ready: • Click **Reset**. • Select the BAR CHART tab.	

Question: What causes high and low tides?

1. Observe: Click **Play** and watch the tides for a while on the BAR CHART and SIMULATION panes. Notice the oblong bands of water around Earth. These are **tidal bulges**.

   A. How many tidal bulges are there? _____

   B. What kind of tide does the observer experience as he passes through a tidal bulge?

   _____

   C. What kind of tide does the observer experience when he is between tidal bulges?

   _____

   D. In one day, how many times does the observer pass through a tidal bulge? _____

2. Form hypothesis: What do you think causes the tidal bulges to form? _____

   _____

3. Observe: Set the **Speed** to **Fast** and click **Play**. What do you notice about the tidal bulges and the position of the Moon? _____

   _____

4. Draw conclusions: How does the Moon influence the tides? _____

   _____

   _____

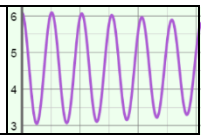
5. Extend your thinking: The Moon's **gravity** pulls on Earth.

   A. How does the Moon's gravity affect the oceans nearest to the Moon? _____

   _____

   B. What happens on the side of Earth opposite the Moon? _____

   _____

Activity B: **The Sun and tides**	Get the Gizmo ready: • Click **Reset**. • Select the GRAPH tab.	

Question: How does the Sun influence tides?

1. Observe: Set the **Speed** to **Fast** and click **Play**. Observe the shape of the tidal bands over time. After 15 days or so, click **Pause**. How do the tidal bands change over time?

   _____

   _____

2. Analyze: On the GRAPH tab, click the "**–**" button twice to zoom out.

   A. What do you notice? _____

   B. When the high tide is very high, and the low tide is very low, it is a **spring tide**. On which days did the observer experience a spring tide? _____

   C. When there is a smaller difference between high and low tide, it is a **neap tide**. On which day did the observer experience a neap tide? _____

3. Sketch: As the Moon orbits Earth, there are two periods of spring tides and two periods of neap tides. Sketch the positions of the Earth, Moon, and Sun for each spring and neap tide.

Spring tide	Neap tide
Spring tide	Neap tide

(Activity B continued on next page)

Activity B (continued from previous page)

4. Analyze: List the type of tide (spring or neap) that occurs in each situation:
   A. The gravity of the Sun and Moon pull Earth's surface in the same direction: _____
   B. The gravity of the Sun and Moon pull Earth's surface in opposite directions: _____
   C. The gravity of the Sun and Moon pull Earth's surface at right angles: _____

5. Draw conclusions: How does the Sun's gravity influence tides? _____

_____

_____

_____

_____

_____

_____

6. Extend your thinking: Think about how the Moon would look for the observer on Earth.
   A. What kind of tides (spring or neap) would you expect during a full Moon? _____
   B. What kind of tides would you expect during a new Moon? _____
   C. What kind of tides would you expect during a half Moon? _____