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?

_____

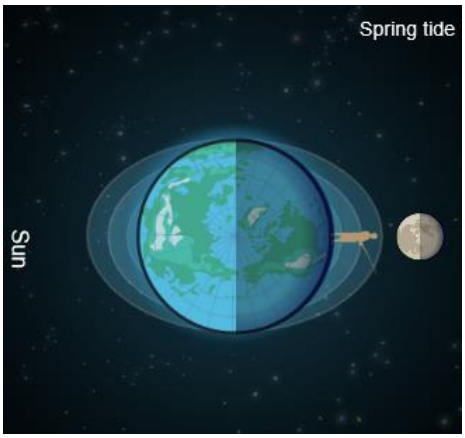
_____

_____

_____

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?

   _____

   _____

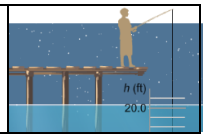
   The changing depth of water is due to **tides**.

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? _____

   _____

   _____

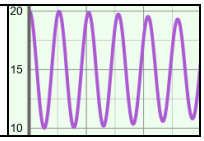
5. Extend your thinking: The Moon's **gravity** pulls on Earth.

   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. 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: _____

4. 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? _____