# **Ups and Downs**

### **Maritime activities throughout the world depend on accurate tidal and current information for safe operation. NOAA's National Ocean Service collects, studies and provides access to thousands of historical and real-time observations as well as predictions of water levels, coastal currents and other data.**

### The Tides and Waters Levels Tutorial Go to <http://oceanservice.noaa.gov/education/tutorial_tides/welcome.html>

Click on What are tides? Click the picture to see the animation.

1. Describe the difference between an ebb current and flood current.

Click on What causes tides?

1. What is the force that causes tides? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What 2 objects’ gravitational force is pulling Earth’s oceans?
3. Whose gravity has a greater pull on the oceans? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Why?

Click on Gravity, Inertia, and the Two Bulges

1. What is inertia and how does it cause a tidal bulge?
2. Draw and label the tidal bulge due to gravity, the tidal bulge due to inertia, and the direction of the moon’s gravitational pull.

 

Click on Frequency of Tides - The Lunar Day

1. What is a lunar day and how long is it?
2. Explain why a lunar day isn’t 24 hours like a solar day.
3. Why are high tides 12 hours and 25 minutes apart?

Click on Tidal Variations- watch the animation and read the information

1. Fill in the diagram below for a spring tide. Draw in the moon (it can be in 2 different locations) and the tidal bulge of the sun and moon.

**Spring tide**



1. Why are spring tides extremely high and low?
2. What 2 phases of the moon occur at spring tides?
3. Fill in the diagram below for a neap tide. Draw in the moon (it can be in 2 different locations) and the tidal bulge of the sun and moon.

**Neap tide**



### Click on Monitoring the Tides

1. List 3 reasons humans monitor tides.

### **Analyzing Real-time Water Level Data from Monitoring Stations**

NOAA Tides and Currents, managed by the Center for Operational Oceanographic Products and Services (CO-OPS), provides access to NOAA's vast collection of oceanographic and meteorological data (historical and real-time), predictions, and "nowcasts" and forecasts. Tides Online provides an easy way to view recent data from the National Water Level Observation Network, a network of 175 continuously operating water-level stations throughout the USA.

Open the Tides Online Web page at <http://tidesonline.nos.noaa.gov/>. On the left, click "State Maps," then on "CA" (California) and select "Point Reyes."

1. Sketch the section of the water level graph for yesterday. Label the axes including units, make a key for the predicted and actual data (you can leave off residual), title the graph and record the height of the water at each high and low tide.
2. Go to <http://oceanservice.noaa.gov/education/tutorial_tides/tides07_cycles.html> And look at the tidal patterns. What pattern occurs at Point Reyes, CA?
3. How do the observed and predicted data compare? What could cause any differences between the observed and predicted data?

Click the Back button twice on your browser or return to <http://tidesonline.noaa.gov/geographic.html>. "Click" on AL (Alabama) and select Dauphin Island, AL.

1. How many high and low tides did Dauphin Island, AL experience in the last lunar day?
2. What type of tidal pattern did Mobile experience?
3. What are the tidal heights in Dauphin Island, AL?
4. Based on Dauphin Island, AL location, state a hypothesis that explains why its tidal patterns are different from Point Reyes.

Click the Back button twice on your browser or return to: <http://tidesonline.noaa.gov/geographic.html>. "Click" on WA (Washington) and select Seattle, WA.

1. How many high and low tides did Seattle, WA experience in the last lunar day?
2. What type of tidal pattern did Seattle experience?
3. What are the tidal heights in Seattle, WA?
4. Based on Seattle’s location, state a hypothesis that explains why its tidal patterns are different from Point Reyes.
5. Find another location that has a mixed semidiurnal tidal pattern. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ How did you find know where to look?

### **Extra credit: answer on a separate piece of paper**

1. Explain why humans are interested in monitoring tides. What impact do tides have on human life? What impact might tides have on other organisms?
2. Discuss how tides are monitored. Describe the old and new methods of monitoring tides.