# **Activity: Graphing Tides - Tidal Patterns from Monterey Bay**

## Engage:

- Go to: http://www.amusingplanet.com/2012/10/michael-martens-dramatic-pictures-of.html
- Here you will see pictures of various areas during a high and low tide
  - List several observations about each of the different pictures
  - Construct an explanation based on valid and reliable evidence about what you think caused the tidal changes in the pictures.



#### **Overview:**

Looking at a picture of Monterrey Bay in California... http://mbari2010interns.files.wordpress.com/2010/06/monterey-bay.jpg

- Know that there are many changes in the tides at this location
- You will be using real data to calculate the reasons for these tides

## <u>Part 1:</u>

Analyze and describe the tidal patterns of Monterey Bay over a 24-hour period of time.

## **Procedure:**

- 1.) Go to: http://aspire.cosmic-ray.org/Labs/Tides/new\_tide.html
- 2.) On the right hand side of the screen, you will see a calendar, a clock bar with time of day, and the phases of the moon.
- 3.) Select March 30th from the calendar. You will be collecting data for this entire day.
- 4.) Adjust the clock bar all the way to the left (12 am).
- 5.) Record data every hour for 24 hours for the day you have selected.
  - a. To do this...You will need to adjust the hour using your mouse, and then click on the "Record Data" icon for each hour during the day.
- 6.) Once you have clicked "record data" for the entire day, click on the "View Data" icon. This will list all of your selected data.
- 7.) In the data table next to your graph, record your data. (Round all numbers to the nearest tenth)

- 8.) Plot your data on your graph.
  - a. Make sure your label the X & Y axis appropriately & write in the times where appropriate
- 9.) Use the graph to answer your analysis questions.

#### Part 1: Analysis Questions

1.) Use your graph to answer the following:

- a. How many high tides are there?
- b. At what time(s) do the high tides occur?
- c. How many low tides are there?
- d. At what time(s) do the low tides occur?
- e. How many hours are there between high tide(s) and low tides(s)?
- 2.) Explain the relationship between the number of tides per day and a 24-hour day.
- 3.) Construct an explanation based on evidence, regarding the connection between the time between high and low tides and the time it takes the Earth takes to complete one rotation (24hrs).
- 4.) Hypothesize what would happen if the earth stopped spinning on its own axis. Which of the following would occur? (*More than one answer is possible.*) & Explain your reasoning.
  - a. The pattern of tides would remain the same.
  - b. There would be no tides.
  - c. The temperature of the ocean would change.
  - **d.** Circulation of ocean waters would decrease.

#### Part 2:

Analyze and describe the tidal patterns of Monterey Bay over a 29-day period of time and explain how these tidal patterns are affected by moon phases.

# **Procedure:**

- 1.) Go back to: http://aspire.cosmic-ray.org/Labs/Tides/new\_tide.html
- 2.) On the right hand side of the screen, you will see a calendar, a clock bar with time of day, and the phases of the moon.
- 3.) You will need to collect data for 29 days.
  - a. Select March 1<sup>st</sup> on the calendar to begin collecting data.
  - b. Select a time of day to collect data. It can be any time, but the time should remain the same for all 29 days of data collection.
    (Remember, time of day stays the same; only the day changes!!)
- 4.) Record the data for all 29 days using the "Record Data" icon.
  - a. To do this...You will need to click on each date on the calendar and then adjust the time to whichever time you choose using your mouse, and then click on the "Record Data" icon for each day.
  - b. NOTE: The "record Data" button ONLY records date, time, & sea level
- 5.) Once you have clicked "record data" for the entire month, click on the "View Data" icon. This will list all of your selected data. DO NOT CLOSE THIS WINDOW!
  - a. Copy ALL of this data onto your chart
    - i. NOTE: Round all numbers to the nearest tenth
- 6.) Once all your data has been collected and recorded, click the "back arrow" to go back to the calendar. Click on March 1<sup>st</sup> again.
- 7.) Go back through all your days of data collection and on your data table under "Phases of the Moon" & draw what the moon looks like on each day.
- 8.) On your data table, Label the following phases of the moon right beside your sketches of the moon: New Moon, 1st Quarter, Full Moon, 3rd quarter.
- 9.) Plot your data on your graph.
  - a. Make sure your label the X & Y axis appropriately & write in the dates where appropriate
  - b. Now draw & label the following phases of the moon at the top of your graph in the appropriate spots: New Moon, 1st Quarter, Full Moon, 3rd quarter.
- 10.) Use the graph to answer your analysis questions.

#### Part 2: Analysis Questions:

- 1. What might you infer about the connection between high tides and position of the moon?
- 2. What force do you think causes high and low tides?

3. Analyze your data and make a claim about which type of tide cycle you have on your graph including why you think you are correct. *(Diurnal, Semidiurnal, Mixed Semidiurnal)* 

4. Explain the impact of climate change as it relates to tides. What is their connection? Predict the future consequences of this connection and human sustainability.



waxing crescent

first quarter

waxing gibbous

