Name _____ Class _____ Date _____

Graphing Tidal Cycles

Tides are the cyclical rise and fall of sea level caused by the gravitational attraction of Earth to the moon and, to a lesser extent, to the sun. Gravitational pull creates a bulge in the ocean on the side of Earth nearest the moon. This inertia creates a similar bulge on the opposite side of Earth from the moon. Tides develop as the rotating Earth moves through these bulges, causing periods of high and low water. In this lab, you will make a graph of tidal data to determine whether an area has diurnal, semidiurnal, or mixed tides.

Problem How can you determine the tidal pattern an area experiences?

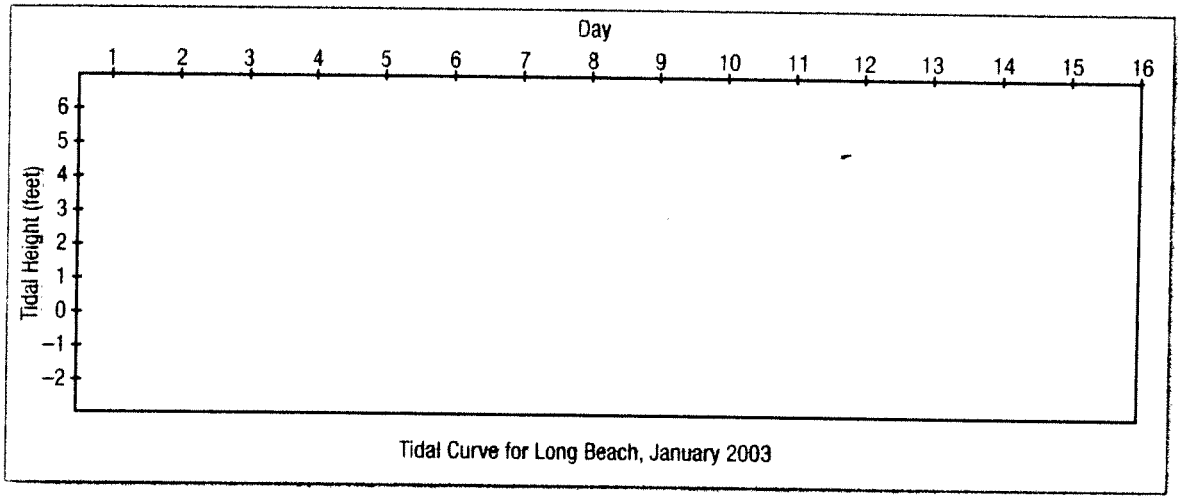
Materials

- pencil

Skills Graphing, Interpreting Data, Inferring, Drawing Conclusions

Procedure

1. Use the information in the Data Table to make a graph of the tidal cycle.



Tidal Curve for Long Beach, January 2003

Analyze and Conclude

1. **Applying Concepts** What tidal pattern does this area experience? Explain how you determined this.

_____

_____

_____

_____

2. **Calculating** What is the greatest tidal range for the data you graphed? What is the smallest tidal range? What types of tides correspond to each of these tidal ranges?

_____

_____

Name _____ Class _____ Date _____

3. **Draw Conclusions** Based on the graph, identify the days when each moon phase could have occurred: new moon, first quarter moon, full moon, last quarter moon. How do you know this?

_____

_____

_____

4. **Applying Concepts** On January 5th (Day 5 on the table) at 9:00 A.M., Jarred anchored his boat in about 4 feet of water at the beach. When he returned to his boat at 3:30 P.M., the boat was completely in the sand. What had happened? How long did Jarred have to wait to leave the area in his boat?

_____

_____

_____

DATA TABLE Tidal Data for Long Beach, New York, January 2003

Day	Time*	Height*	Time	Height	Time	Height	Time	Height
1	05:45 A.M.	5.5	12:16 P.M.	−0.7	06:12 P.M.	4.4	———	—
2	12:18 A.M.	−0.5	06:35 A.M.	5.6	01:07 P.M.	−0.8	07:03 P.M.	4.4
3	01:10 A.M.	−0.5	07:23 A.M.	5.5	01:56 P.M.	−0.8	07:53 P.M.	4.4
4	01:59 A.M.	−0.4	08:11 A.M.	5.4	02:42 P.M.	−0.7	08:42 P.M.	4.3
5	02:45 A.M.	−0.2	08:59 A.M.	5.1	03:25 P.M.	−0.5	09:32 P.M.	4.2
6	03:30 A.M.	0.0	09:47 A.M.	4.8	04:07 P.M.	−0.3	10:23 P.M.	4.0
7	04:14 A.M.	0.3	10:35 A.M.	4.6	04:49 P.M.	−0.1	11:12 P.M.	3.9
8	05:01 A.M.	0.6	11:22 A.M.	4.3	05:32 P.M.	0.2	11:59 P.M.	3.9
9	05:54 A.M.	0.8	12:09 P.M.	4.0	06:18 P.M.	0.4	———	—
10	12:45 A.M.	3.9	06:56 A.M.	0.9	12:57 P.M.	3.7	07:10 P.M.	0.5
11	01:31 A.M.	3.9	07:59 A.M.	0.9	01:47 P.M.	3.5	08:02 P.M.	0.5
12	02:19 A.M.	4.0	08:57 A.M.	0.8	02:41 P.M.	3.4	08:53 P.M.	0.5
13	03:10 A.M.	4.1	09:50 A.M.	0.6	03:39 P.M.	3.5	09:41 P.M.	0.4
14	04:02 A.M.	4.3	10:38 A.M.	0.3	04:34 P.M.	3.6	10:28 P.M.	0.2
15	04:51 A.M.	4.6	11:26 A.M.	0.1	05:23 P.M.	3.7	11:15 P.M.	0.1
16	05:36 A.M.	4.8	12:12 P.M.	−0.1	06:08 P.M.	3.9	———	—
17	12:02 A.M.	−0.1	06:17 A.M.	5.0	12:57 P.M.	−0.3	06:51 P.M.	4.1
18	12:49 A.M.	−0.2	06:58 A.M.	5.1	01:40 P.M.	−0.5	07:32 P.M.	4.2
19	01:35 A.M.	−0.4	07:38 A.M.	5.2	02:22 P.M.	−0.6	08:15 P.M.	4.3
20	02:20 A.M.	−0.4	08:21 A.M.	5.2	03:30 P.M.	−0.7	09:01 P.M.	4.4
21	03:05 A.M.	−0.4	09:07 A.M.	5.1	03:44 P.M.	−0.7	09:51 P.M.	4.5
22	03:52 A.M.	−0.3	09:58 A.M.	4.9	04:27 P.M.	−0.6	10:44 P.M.	4.6
23	04:43 A.M.	−0.1	10:52 A.M.	4.7	05:13 P.M.	−0.4	11:37 P.M.	4.7
24	05:43 A.M.	0.1	11:48 A.M.	4.4	06:08 P.M.	−0.2	———	—
25	12:32 A.M.	4.7	06:53 A.M.	0.2	12:47 P.M.	4.2	07:11 P.M.	−0.1
26	01:30 A.M.	4.8	08:06 A.M.	0.2	01:50 P.M.	3.9	08:17 P.M.	0.0
27	02:31 A.M.	4.8	09:12 A.M.	0.1	02:57 P.M.	3.8	09:19 P.M.	0.0
28	03:35 A.M.	4.8	10:13 A.M.	−0.1	04:05 P.M.	3.9	10:17 P.M.	−0.1
29	04:37 A.M.	5.0	11:09 A.M.	−0.3	05:07 P.M.	4.0	11:13 P.M.	−0.2
30	05:33 A.M.	5.1	12:01 P.M.	−0.5	06:01 P.M.	4.2	———	—
31	12:06 A.M.	−0.3	06:22 A.M.	5.2	12:51 P.M.	−0.6	06:50 P.M.	4.3

*All times are listed in Local Standard Time (LST). All heights are in feet.
Source: Center for Operational Oceanographic Products and Services, National Oceanographic and Atmospheric Association, National Ocean Service.

NAME DATE CLASS

Chapter 17

STUDY GUIDE

Text Pages 490–495

• Ocean Waves and Tides

Match the items in Column I with the terms in Column II. Write the letter on the blank at the left.

Column I

_____ 1. Force exerted by objects on every other object

_____ 2. Exerts a strong pull on water in the ocean

_____ 3. Movement in which water, whether in an ocean, lake, or swimming pool, alternately rises and falls

_____ 4. Difference between high and low tide

_____ 5. Created by the collapse of a wave

_____ 6. Highest point of a wave

_____ 7. A rise and fall in the surface level of the ocean caused by a giant wave

_____ 8. When high tides are higher and low tides are lower than normal

_____ 9. Vertical distance between a wave's crest and trough

_____ 10. Horizontal distance between crests of successive waves

_____ 11. Lowest point of a wave

_____ 12. When high tides are lower and low tides are higher than normal

Column II

a. breaker
b. neap tide
c. crest
d. gravity
e. spring tide
f. tidal range
g. tide
h. trough
i. moon
j. wave
k. wave height
l. wavelength

13. Label Figures 1–4 as either *spring tide* or *neap tide*.

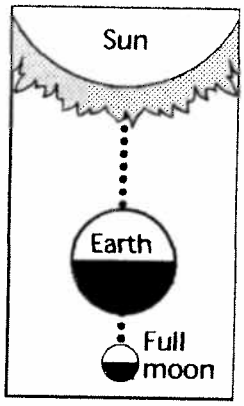


FIGURE 1

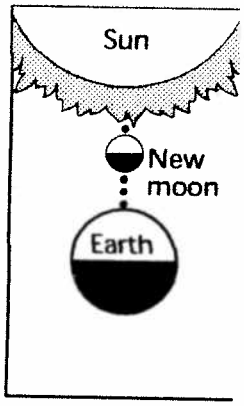


FIGURE 2

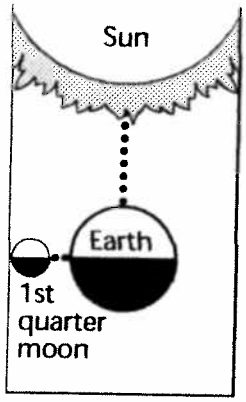


FIGURE 3

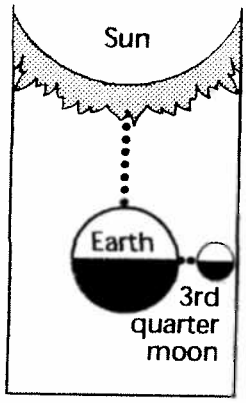


FIGURE 4

_____ _____ _____ _____

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Chapter 17

STUDY GUIDE

Text Pages 484–489

• Ocean Currents

Write answers on the lines provided.

1. What currents are influenced by the Coriolis effect? _____

2. Where surface currents carry water away from an area, an upwelling may occur. What is it that "wells up"? What does it carry with it? _____

_____

3. Is the Gulf Stream a surface current or a density current? _____

4. What kind of water movement helps the fishing industry? How? _____

_____

5. Explain how understanding the Gulf Stream helped eighteenth century sailing ships travel more rapidly from America to England. _____

_____

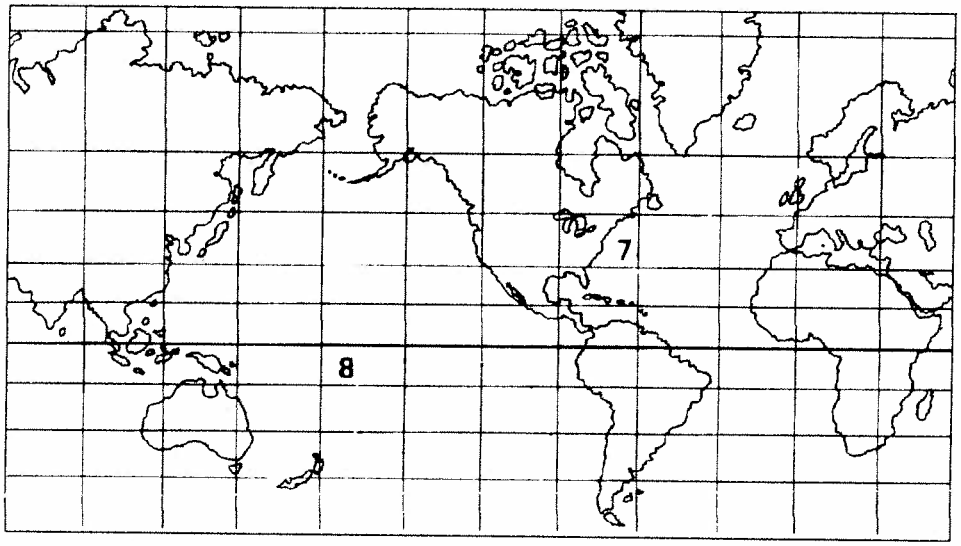
_____

6. Which coasts of continents tend to be warmer, the eastern or the western? Explain. _____

_____

7. On the map below, draw an arrow to represent the Gulf Stream and label it.

8. On the map, draw an arrow representing the South Equatorial Current west of South America and label it.



NAME DATE CLASS

Chapter 11

REINFORCEMENT

Use with Section 2

• Ocean Currents

Use the information from your book and the map below to answer the questions on the lines provided.

1. What kind of current forms when more dense seawater moves toward less dense seawater?

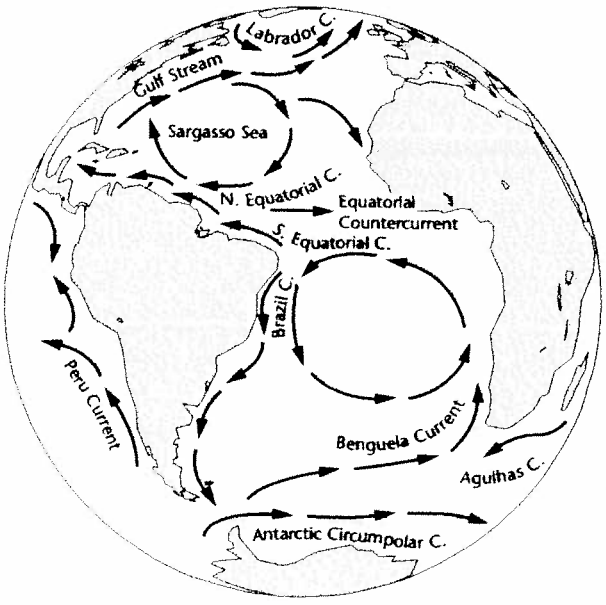
2. What is the name of the current that flows southerly along the west coast of the United States? _____ Is this current warm or cold? _____

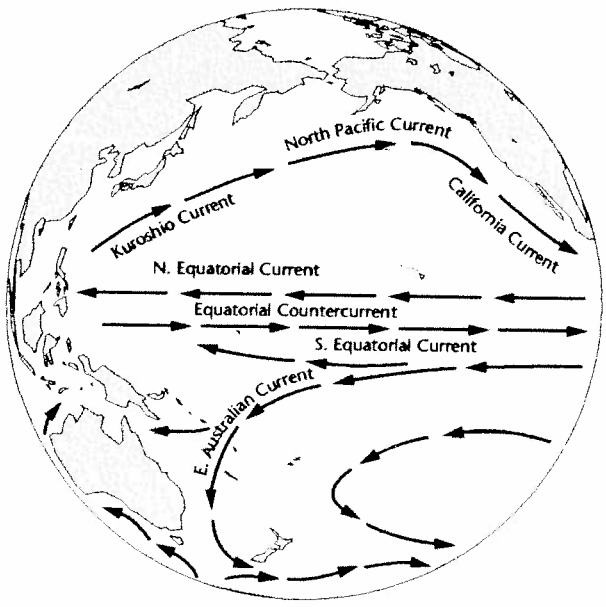
3. In what direction do cold currents generally flow in the northern hemisphere? _____

4. If a raft drifted on the Gulf Stream, beginning in Florida, where might it reach land? _____

5. Why is the climate of the British Isles more moderate than the climate of other places at that same latitude? _____

6. Because of the influence of the Coriolis effect, what is the general motion of surface currents in the North Atlantic Ocean? _____
   In the South Pacific Ocean? _____





NAME DATE CLASS

Chapter 11

ENRICHMENT

Use with Section 2

• Ocean Currents

Currents and Climate

The table below gives information on two of the world's currents. Use it and the map of world currents in your textbook to answer the questions that follow.

Current	Location	Characteristics
Gulf Stream	Atlantic Ocean	warm; flows north; divides into the Caribbean Current and the Antilles Current
Labrador Current	Atlantic Ocean	cold; flows south; ends about where it meets the Gulf Stream

1. The coast of Norway is almost always free of ice, even in the winter. Why? _____

2. Labrador, in Canada, is farther south than Norway. Labrador's coast is blocked by ice for about six months of the year. Why? _____

3. The city of Oslo, Norway, has an average high temperature of –1°C and an average low temperature of –7°C in the winter. The city of Bergen, Norway, has average winter temperatures of 6°C and –3°C. Both cities are at about the same latitude. One city is on the Norwegian coast; the other is inland. A mountain is between them. Which city do you think is on the coast? Why? What effect do you think the mountain has on the temperature of the inland city?

NAME DATE CLASS

Chapter 11

REINFORCEMENT

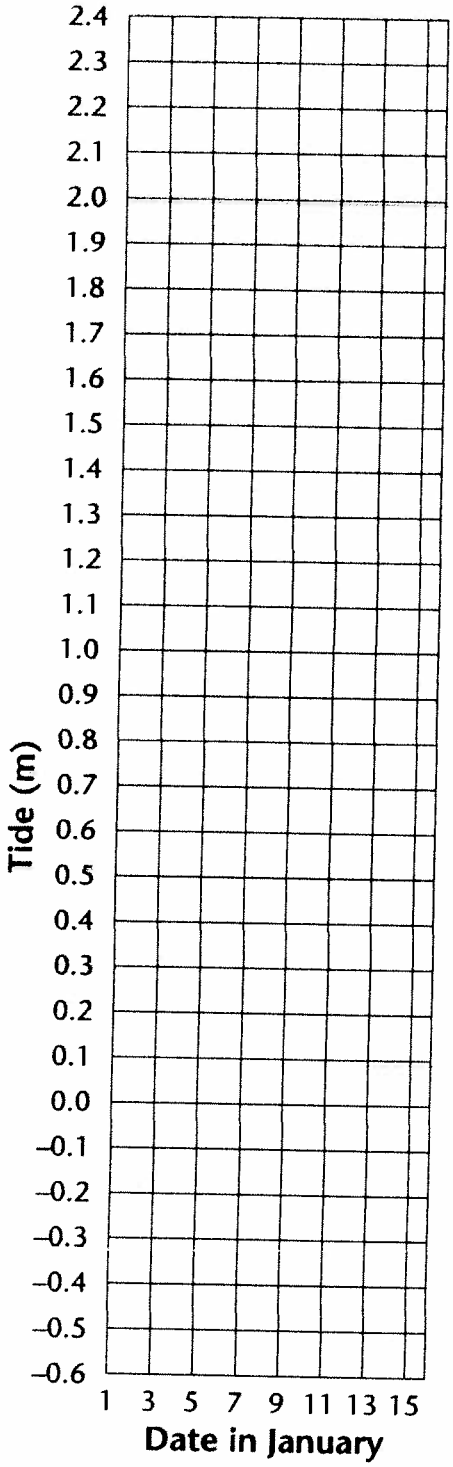
Use with Section 3

• Ocean Waves and Tides

On the graph, plot each data point for high tide. Connect these data points with a red pencil. Plot each data point for low tide. Connect these data points with a blue pencil. Then answer the questions.

Data Table

Date in January	Height of high tide (meters)	Height of low tide (meters)
1	1.4	0.5
2	1.5	0.4
3	1.7	0.2
4	1.8	–0.1
5	2.1	–0.3
6	2.2	–0.5
7	2.3	–0.6
8	2.3	–0.6
9	2.3	–0.6
10	2.1	–0.5
11	1.9	–0.2
12	1.6	–0.1
13	1.6	0.2
14	1.6	0.4
15	1.6	0.4



1. On which days was the tidal range greatest?

_____

2. On which day was the tidal range the lowest?

_____

NAME DATE CLASS

Chapter 11

ENRICHMENT

Use with Section 3

• Ocean Waves and Tides

Calculating Wave Speed

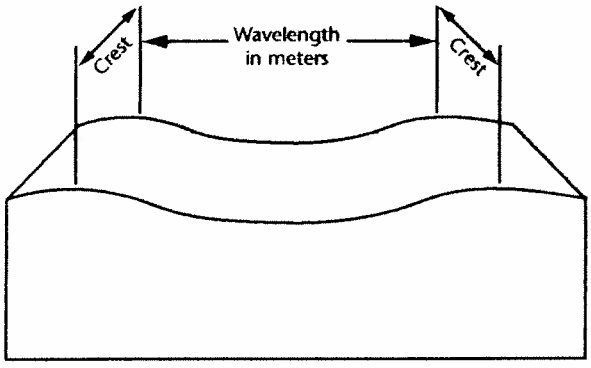
The speed of waves can be easily calculated if you have some basic information. To calculate the speed of a wave, you need to know two things: the wavelength and the wave period. A wave period is the time it takes for two consecutive wave crests to pass the same place (or point). For example, if a wave crest passed a rock and 8 seconds later the very next wave crest passed the same rock, the period would be 8 seconds.

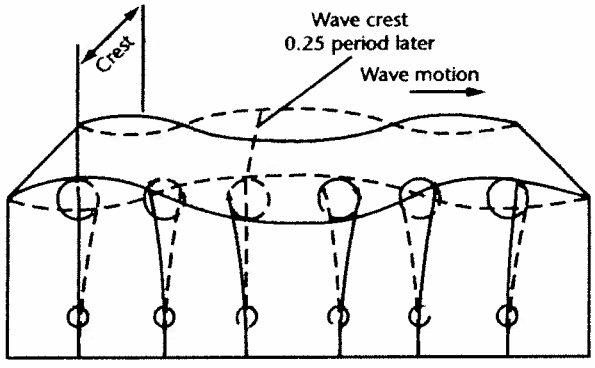
Scientists have determined that wave speed is equal to the wavelength divided by the period of the wave. That means that once you know the wavelength and the wave period, you can find the wave speed, using this formula:

$$\text{Wave speed (m/s)} = \frac{\text{Wavelength (m)}}{\text{Periods (s)}}$$

Notice that wavelength is measured in meters (m) and wave period is measured in seconds (s). Use the formula to help you complete the table below. Show all of your work on the back of this worksheet.

Wavelength (m/s)	Period (s)	Wave speed (m/s)
24	8	
165	10	
48	8	
112	4	
172	10	
15.4	2	
196.5	15	





NAME DATE CLASS

Chapter 18

STUDY GUIDE

Text Pages 504–509

• The Seafloor

Write the term that matches each description below on the spaces provided. Then complete Item 9.

1. ___ [E] ___ ___ ___ ___ ___ ___
2. ___ ___ ___ ___ ___ ___ ___ ___ [L] ___ ___ ___
3. ___ [O] ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
4. ___ ___ [A] ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
5. ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ [F]
6. ___ ___ ___ ___ ___ ___ ___ [S] ___
7. ___ [R] ___ ___ ___ ___
8. ___ ___ ___ [O] ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

1. Inactive volcano found on the ocean floor
2. Flat seafloor in the deep ocean formed when deposits of sediment filled valleys
3. Area at the end of the continental shelf
4. Sediments found where rivers meet oceans
5. Gently sloping part of the continent that extends underwater
6. Mineral concentrated with nickel and cobalt in nodules found across 20 to 50 percent of the Pacific basin
7. Deep ocean valley that forms where one part of the seafloor is pushed beneath another part
8. Underwater mountain chains that form when forces within Earth cause the seafloor to spread apart
9. Write the letters in the boxes on the lines provided. Then unscramble the letters to complete the sentence that follows.

___ ___ ___ ___ ___ ___ ___ ___

All of the features identified in this activity are part of the _____.