

Tides: Virtual lab

Name _____

Block _____ Date _____

FOCUS QUESTION: What causes earth's ocean tides?

Have you ever wondered how the tides are formed? Why when we go to the beach do we see the edge of the water start the day at one point and 6 hours later, the water is at a different point? This simulation will help you answer that question!

*To get to the simulation, go to the following website:

SASCurriculumPathways.com

Once you're there, **LOG IN** at the top of the page

Username: **rose53adjective**

password:

**** Leave the password blank and hit ENTER!**

Click **SCIENCE** on the left; then choose **Our Universe** on the left to narrow the results

Look at the list now and choose **VLAB: TIDES** Click on that to start the simulation!

Follow the TABS at the top and use this sheet to record your answers. Some of the directions will be found in the simulation so if you are looking for what to do next, check the site! It's all there! :-)

TAB 1: Overview

Read the questions below. Then complete this Journal by interacting with the online Simulation. Remember: the Journal does NOT check your answers. Review your text entries and make sure you've transferred data to the correct table row(s).

****In this section, you will explore how earth's oceans are affected by the positions of the moon and sun. These two bodies cause earth's oceans, represented by the blue ellipse, to have high tides and low tides**

****In the Simulation (to the right) drag the slider to view the relationship of tides to the position of the moon.**

1.) _____ What is the relationship between the location of a high tide and the position of the moon? Between the location of a low tide and the position of the moon?

- a.) High tides occur at the points on the earth's surface that are aligned with the moon. Low tides occur at 90-degree angles from these points.
- b.) Low tides occur at the points on the earth's surface that are aligned with the moon. High tides occur at 90-degree angles from these points.

1.3 Do you notice any changes in the size of the ocean ellipse (the bulge of the ocean) as you progress through the days of a given week? Describe what you see in the simulation:

TAB 2: Patterns

2.1 Data Collection

In this section, you will examine the cyclical nature of tides. In the Simulation (to the right) **select a date**. Then **click the Play button** or **use the slider** to observe tides, their patterns, and associated height changes.

Use the **Transfer Data buttons** to transfer the height change data from the Data panel to the table. To complete the last column, **select the tide type** from the pull-down menu.

**** NOTE:** height change represents the ocean's height above (if positive) or below (if negative) its average level ******

Tide Patterns

Date	Tide	Time (AM/PM)	Height change (m)	Tide Type (Low/High)
Oct 8	1	2:06 am		
	2	8:21 am		
	3	2:39 pm		
	4	8:36 pm		
Oct 9	1	2:52 am		
	2	9:11 am		
	3	3:29 pm		
	4	9:26pm		
Oct 10	1	3:38 am		
	2	10:03 am		
	3	4:19 pm		
	4	10:16 pm		

TAB 3: Causes

According to Newton's universal law of gravitation, an attractive force exists between any two objects. Might such forces be responsible for the earth's tides?

3.1 Data Collection

In this section, you will explore what causes ocean tides. More specifically, you will investigate the gravitational effects of the moon and sun on the oceans.

**** In the Simulation (to the right) select a date.** Click the **sun and moon** to turn their gravitational forces **on/off**. Then click the **Play button** to see the resulting tides.

**** Use the Transfer Data buttons** to transfer the height change data from the Data panel to the table. To complete the last column, **select the tide type** from the pull-down menu.

Table 1: Moon and Sun (ON)

Date	Tide	Time (AM/PM)	Height change (m)	Tide Type (Low/High)
May 1	1	4:20 am		
	2	10:17 am		
	3	4:20 pm		
	4	10:49 pm		
May 2	1	5:04 am		
	2	11:06 am		
	3	5:04 pm		
	4	11:38 pm		

Table 2: Moon (ON)

Date	Tide	Time (AM/PM)	Height change (m)	Tide Type (Low/High)
May 1	1	4:20 am		
	2	10:17 am		
	3	4:20 pm		
	4	10:49 pm		
May 2	1	5:04 am		
	2	11:06 am		

	3	5:04 pm		
	4	11:38 pm		

Table 3: Sun (ON)

Date	Tide	Time (AM/PM)	Height change (m)	Tide Type (Low/High)
May 1	1	4:20 am		
	2	10:17 am		
	3	4:20 pm		
	4	10:49 pm		
May 2	1	5:04 am		
	2	11:06 am		
	3	5:04 pm		
	4	11:38 pm		

Table 4: Moon and Sun (OFF)

Date	Tide	Time (AM/PM)	Height change (m)	Tide Type (Low/High)
May 1	1	4:20 am		
	2	10:17 am		
	3	4:20 pm		
	4	10:49 pm		
May 2	1	5:04 am		
	2	11:06 am		
	3	5:04 pm		
	4	11:38 pm		

(Continue to next page and Tab 4)

TAB 4: Lunar Phases

4.1 Data Collection

In this section, you will examine how height changes are affected by the positions of the earth, moon, and sun.

**** In the Simulation (to the right) drag the slider to view tides for the month of September.**

**** Use the Transfer Data buttons to transfer the height change data for the indicated dates and times. To complete the last column, use the pull-down menu to select the lunar phase. The corresponding image shows the positions of the sun, earth, and moon, during that phase.**

Tides and Lunar Phases

Date	Time (AM/PM)	Height change (m)	Lunar Phase
Sep 1	12:57 am		
Sep 4	4:10 am		
Sep 8	7:51 am		
Sep 11	10:27 am		
Sep 15	1:33 am		
Sep 19	5:21 am		
Sep 23	7:59 am		
Sep 27	10:29 am		
Sep 30	12:35 am		

TAB 5: Analysis

Refer to the Journal, as needed, to answer the following questions.

Tide Patterns

A.1 How many high and low tides does Myrtle Beach experience per day?

high tides _____

#low tides _____

A.2 Approximately how much time passes between high tide and low tide?

A.3 The following table on the next page lists the times for the first high tides of each day, in the week of October 8.

Using this data:

- Calculate the time that elapses between successive high tides (subtract the time from the previous time and that will give you the 3rd column answer...see Oct 9 example)
- Determine the average time between successive high tides

Successive First High Tides

Date	Time (am/pm)	Time since previous first high tide
Oct 8	8:21 am	N/A
Oct 9	9:11 am	24 h 50 min
Oct 10	10:03 am	
Oct 11	10:56 am	
Oct 12	11:52 am	
Oct 13	12:50 pm	
Oct 14	1:50 pm	

Average time between first high tides = _____
(tidal period)

A.4) If the earth rotates once every 24 hours, why doesn't the tidal period equal 24 hours? _____

Tide Causes

A.5) What happened to the tides when the sun and moon were turned off in the Simulation? _____

A.6) Do your observations support the idea that the gravitational effects of the sun or moon, or both, are responsible for ocean tides? Yes No

Explain: _____

Effects of Lunar Phases

A.9) What relationship is there between the heights of earth's ocean tides and the moon's phases? _____

A.10) How do the positions of the earth, moon, and sun cause the differences in the tides noted in question A.9? _____
