



# Earth Science

LAB #10: TIME AND TIDES

Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Time and Tides

## Lab #10

**Discussion:** Most people are aware that the tides are caused by the moon. Some people are aware that the highest high tides and lowest high tides are related to the lunar phase. Not many people can explain the role the sun plays in the tides nor can they really explain why there are two high tides a day on Earth.

**Purpose:** By the time you finish this investigation, you should be able to:

1. estimate the mean solar time from a map that shows equinox shadow positions and longitude lines
2. explain the cause of tides in terms of both the sun and the moon
3. explain why there are two tidal bulges
4. explain why it takes 24 hours and 50 minutes to pass through two tides

**Hypothesis:** The force of gravity from the moon is the main cause of tides.

Vocabulary: define the following terms.

Neap tide: \_\_\_\_\_  
\_\_\_\_\_

Spring tide: \_\_\_\_\_  
\_\_\_\_\_

Diurnal tide: \_\_\_\_\_  
\_\_\_\_\_

Semidiurnal tide: \_\_\_\_\_  
\_\_\_\_\_

Mixed semidiurnal tide: \_\_\_\_\_  
\_\_\_\_\_

Local solar time: \_\_\_\_\_  
\_\_\_\_\_

Mean solar time: \_\_\_\_\_  
\_\_\_\_\_

**Theory:**

Since the motions of the Earth and Moon determine local time and because they are cyclic, they are predictable. Tides are caused by the Sun, Earth, and Moon and the difference in gravity from one side of the Earth to the other. Local mean time is caused by the relative position of the Sun which results from the rotation of Earth on its axis.



**Materials:**      large washer                  penny                  metric ruler (with a large hole)

**Method:**

Tides: Using the materials from the lab, make a sketch similar to the diagram in the Theory section that shows the two possible positions of the Earth, Moon, and Sun that show when tides would occur. Make your sketches in the Data Collection and Processing section below. Be sure to label all parts of your sketch. List the lunar phases that occur during spring and neap tides.

**Data Collection and Processing:**

1. Spring tides.

2. Neap tides.

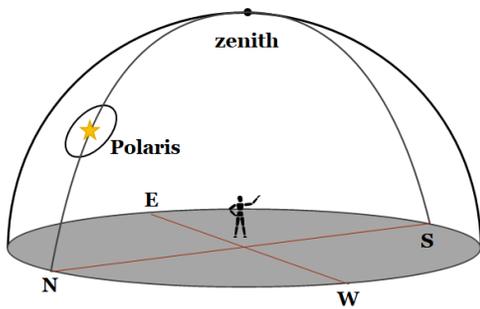
**Analysis and Conclusions:**

1. Write the letter that corresponds to local solar times in the correct positions around the globe below.

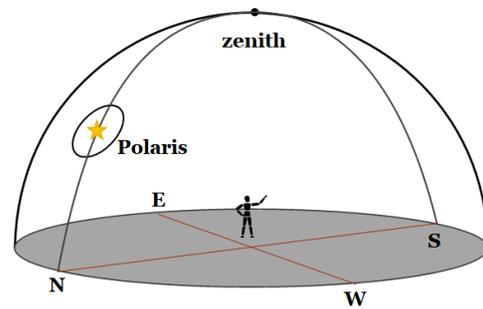
- A. Noon
- B. Midnight
- C. 8:00 am
- D. 6:00 pm
- E. 11:00 am
- F. 4:00 am
- G. 2:00 pm



2. On the diagrams below, draw arcs that show the apparent path of the Sun for the first day of each of the given seasons.

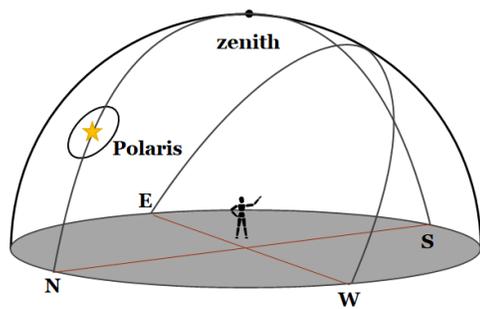


Winter

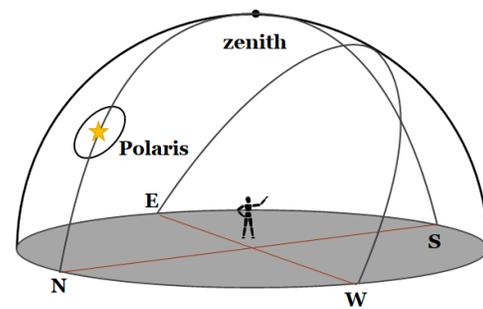


Fall

3. On the diagrams below, draw a small circle representing the Sun for each local solar time indicated.

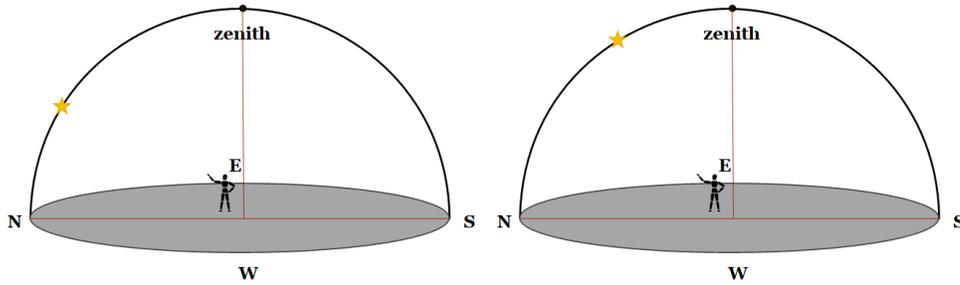


6:00 a.m.



2:00 p.m.

4. Using a protractor, determine the latitude of the observer in each of the diagrams.



5. Explain how tides occur.

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6. Explain why there are two tides a day.

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7. Explain why the tides are not exactly 12 hours apart. How much time occurs between the two high tides each day?

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