

Modeling the Daily and Monthly Tides

PROCEDURE

A: Model Set Up

1. Color the Moon/Ocean and Earth's crust discs.
2. Cut along the dotted line separating the Moon's path around the Earth's crust and the 2 discs you just colored.
3. Cut out the Moon/Ocean and Earth's crust discs. Make sure the arrow and moon stay attached to the ocean.
4. Use a pencil tip to punch a hole through the + on all 3 discs.
5. Stack the discs as follows from top to bottom:
 - a. Earth's crust
 - b. Moon/Ocean
 - c. Moon's path around Earth's crust
6. Attach the brass fastener through all 3 layers and peel back the fastener behind the half sheet.
7. Label the notches on the Moon's path around Earth's crust with v the following. This should be from the perspective of someone standing on that spot on Earth's crust. Notice the spin direction of the Earth's crust
 - a. Noon (12pm)
 - b. Sunrise (6am)
 - c. Sunset (6pm)
 - d. Midnight (12am)
8. Draw the phase of the moon near the correct notch.
 - a. Full moon
 - b. First quarter
 - c. New moon
 - d. Last quarter
9. ANALYSIS: Use the model to answer the following questions in your notebook.
 - a. What do the dots between the notches represent? (HINT: Think moon.)
 - b. Where would the Waxing crescent moon be located? Waning gibbous?
 - c. Turn the Ocean/Moon disc until it's full and position Earth's crust with D at noon. Which letters are at high/low tide? What time of day is each tide?
 - d. Turn the Ocean/Moon disc to the new moon. About how many days would it take the moon to make this revolution?
 - e. What two locations are now experiencing a high tide?
 - f. Turn the Earth's crust until A is at noon. How long did this rotation take (in Earth time)?
 - g. What two locations are now experiencing low tide?

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B: Gravity and Tides

10. Draw an arrow showing the direction of the Sun's gravity behind the sunlight on your diagram.
11. Notice the gravity arrow pointing from the Ocean to the Moon.
12. In your notebook, draw and label your model's CURRENT position (Moon at new). Include all 3 objects, arrow directions, and position of the ocean. You do not need to include the letters on the Earth's crust.
13. Turn the Ocean/Moon disc to each of the following phases and draw/label what you see in your notebook.
 - a. First quarter
 - b. Full moon
 - c. Last quarter
14. Label each drawing either Spring or Neap tide.
 - a. Spring tides are when the Sun and Moon are lined up.
 - b. Neap tides are when the Sun and Moon are perpendicular or at a 90 degree angle.
15. ANALYSIS: Now look at the direction of the arrows in your drawings.
 - a. Why would spring tides be the highest? Why would neap tides be the lowest? Think gravity
 - b. Compare your drawings to the graph of the highest and lowest tides of the month in December 2013. Explain how the data from your graph supports what you now know about Spring and Neap tides.
 - c. How would this graph look different if perigee were around the full moon?

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