

## The Tides

Winds, currents, and unequal heating of the earth's surface all help to keep ocean water in constant motion. There are two other factors that have a great effect on the ocean as well: the Sun and the Moon. Both of these masses of matter have gravitational pull on the earth.

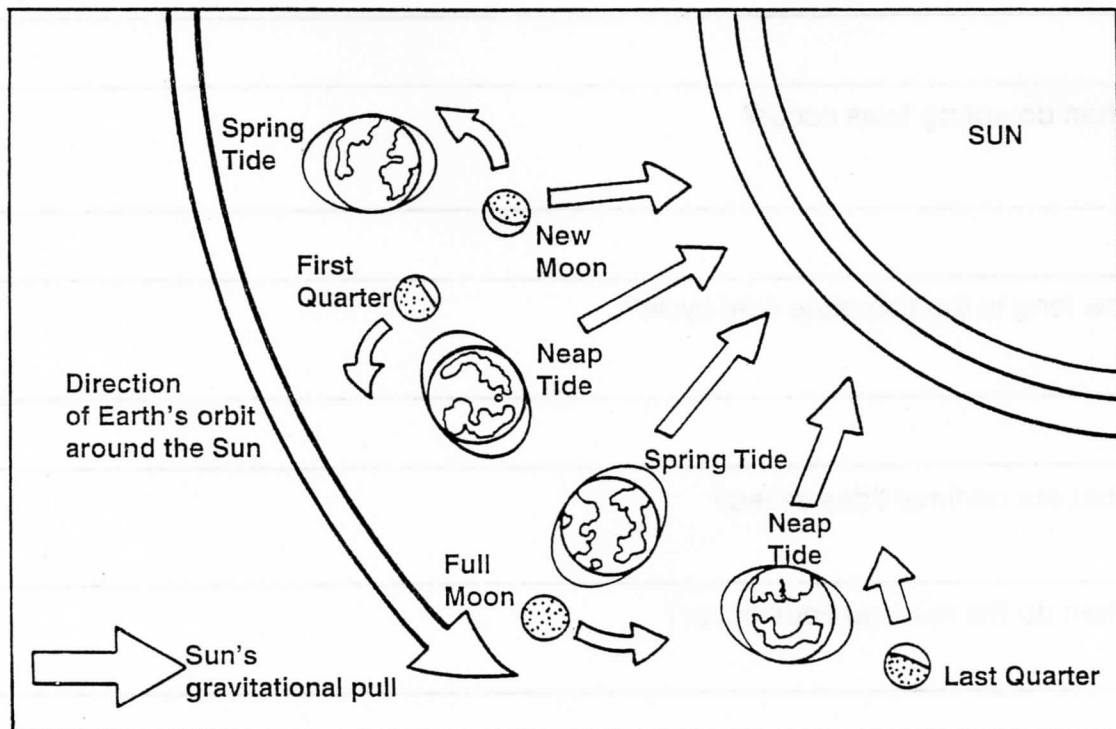
The huge Sun has a greater actual gravitational pull, but it is so far away that it has only a small tidal effect.

The Moon has less actual gravitational pull, but it is much closer to the earth than the Sun, so it has quite an effect on the ocean waters. The Moon exerts the same pull on the land as it does on the waters. Rock and soil particles are not very easily moved, but water particles are. The pull of the Moon causes the oceans to bulge up toward the Moon. This bulging causes higher water levels on some areas on Earth while simultaneously causing lower water levels on other areas. As the Moon moves around the earth, the tides change. It takes about  $24\frac{1}{2}$  hours for the tides to complete a full cycle.

Twice each month the Moon and Sun line up together with Earth. When this occurs, the gravity of both the Sun and Moon work together to cause extra high tides. These are known as spring tides. Spring tides happen every time there is a full Moon or a new Moon. They are not actually related to the seasons.

When the Moon is at right angles to the Sun in its travels around Earth, the gravitational forces of the two tend to neutralize each other. Minimal tide movements occur at these times. These tides are called neap tides.

Some large bays and estuaries magnify the tidal forces by restricting the movement of water into a narrower and narrower space. This situation can cause a wave that is known as a tidal bore. These waves can be as high as 50 feet! The typical tidal range is more like three feet.



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

For the student:

1. Name three things that move water.

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2. What two celestial bodies cause the tides?

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3. How do these celestial bodies cause tides?

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4. Which body influences tides the most? Why?

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5. Why don't these celestial bodies affect the land as much?

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6. When do spring tides occur?

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7. How long is the complete tidal cycle?

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8. What are minimal tides called?

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9. When do the minimal tides occur?

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