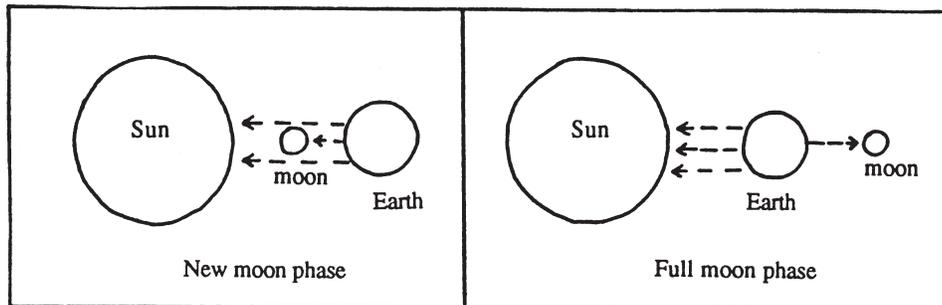
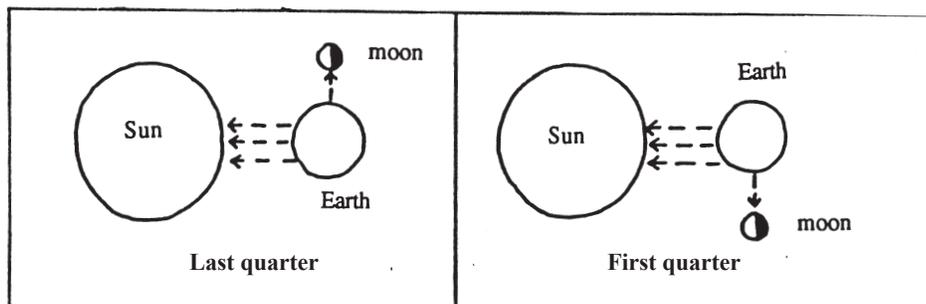


WHAT CAUSES TIDES?

Tides are caused by the gravitational pull of the sun and the moon on the earth. Along the Pacific coast, there are usually two high tides of unequal height and two low tides of unequal height approximately every 24 hours. Because of the speed of the moon as it travels around the earth, the tides come a little later each day. High tides occur every 12 hours and 25 minutes. Low tides are halfway, or six hours, 12 minutes and 30 seconds after each high tide. The tides along most of the Atlantic coast are the same height each day. When the sun and the moon are in line with the earth, as they are during a new moon and a full moon, the gravitational pull on the earth is combined. As a result, the highest tides are higher and the lowest tides are lower. These tides are called spring tides.



During a half moon, when the sun and moon are at right angles to the earth, their forces work against each other. As a result, the tides, called neap tides, are not very high or very low.

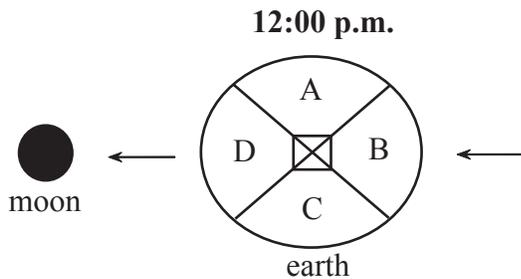


Spring and neap tides follow each other every week.

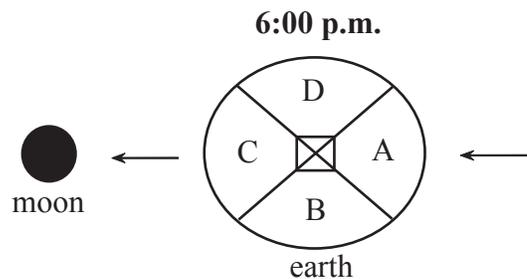
WHAT CAUSES TIDES? (cont.)

Although the sun affects the tides, the pull of the moon is stronger due to its proximity to the earth, therefore, for simplicity's sake, only the effects of the moon are depicted in the illustrations below. The gravitational pull of the moon causes the water on two quarters of the surface of the earth to pool, the quarter nearest to the moon, and the quarter furthest from the moon. The water pools on the face of the earth closest to the moon because the gravitational force of the moon pulls the water towards it. The water pools on the opposite side of the earth because the gravitational force of the moon pulls the solid body of the earth away from the water.

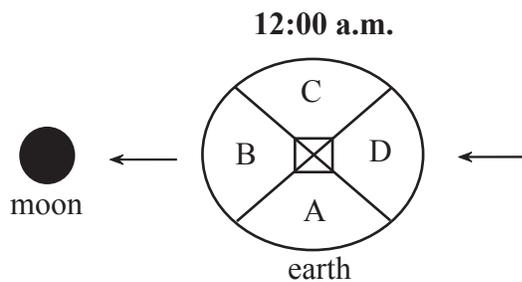
The illustrations below depict the earth from an aerial view looking down on the Arctic. Each letter in the diagrams represents a quarter of the surface of the earth from the North Pole to the South Pole. The earth rotates faster than the moon revolves around the earth, therefore, most areas experience two high tides and two low tides each day. The arrows show the direction of the moon's gravitational pull.



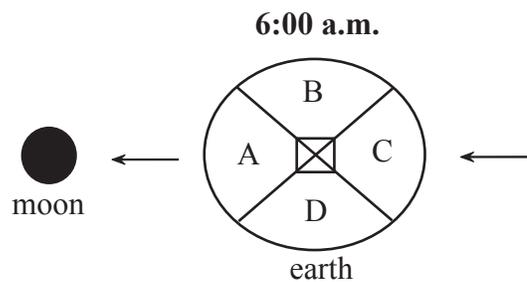
Legend
 A and C = low tide
 B and D = high tide
 ← = gravitational pull
 □ = Arctic



Legend
 B and D = low tide
 A and C = high tide
 ← = gravitational pull
 □ = Arctic



Legend
 A and C = low tide
 B and D = high tide
 ← = gravitational pull
 □ = Arctic



Legend
 B and D = low tide
 A and C = high tide
 ← = gravitational pull
 □ = Arctic

TIDAL ZONES

Constant change is a way of life for the plants and animals that live in tidepools (rocky areas along a shoreline that are affected by the rising and falling of the tides). Tidepool dwellers are challenged by differing levels of light, temperature, oxygen, salt, and food in the water. The adaptations of each animal and plant determine how they can cope with these constant changes and where they will be able to live in the tidepool zone.

The intertidal zone is divided into four zones; spray, upper, middle and lower. Rocks in these zones provide a place where plants and animals can attach themselves. Here they can be protected from waves, sun and wind. Water moving around the rocks carries oxygen and food to the attached plants and animals and carries away waste and eggs.

