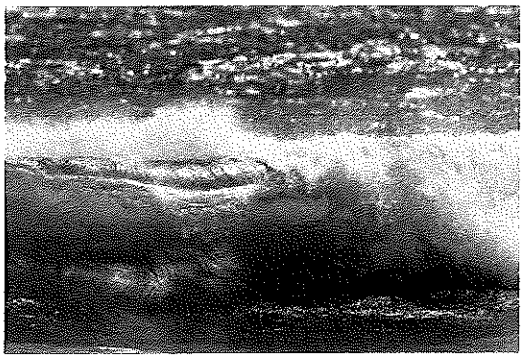
Reading Science

Name: _____ Date: 3/23/20

Waves All Around



1 Have you watched waves at the beach? Did you pay attention to their shapes? From the shore, they look like they are coming right at you. But what if you go on a pier jutting into the water? Ocean waves look different if you see them from their side.

2 If you look at one spot, you'll see the water rising and dipping in a regular pattern. Find something floating on the waves to look at. You will see that the object moves forward a little bit as the water goes up. Then it moves backward as the water goes down. The water molecules are not actually moving toward the shore. The waves we see are from pressure waves moving through the water. The high parts of the pressure wave push the water upward. The height of the water changes over time in a pattern physicists call a standing wave. Waves can be described by three properties. These properties are wavelength, frequency, and amplitude. You can see these properties easily in ocean waves.

3 The very highest point of each wave is the peak. The lowest point is the trough. The horizontal distance from peak to peak is the wavelength. You can also measure the distance from trough to trough. It will be the same. The frequency is how many peaks go by in a certain amount of time. For waves on the ocean, we could measure waves per minute. A common term for the passing of a wave from one peak to the next is one cycle. For waves with higher frequency, a unit called Hertz (Hz) is used. One Hz is 1 cycle per second. The last property is amplitude. The vertical distance between the peak and the trough is divided by 2 to give the amplitude. In other words, imagine a line that traveled along the middle height of the wave. The amplitude is the distance from that line to a peak or trough. There are many other waves in nature. Most are similar in shape and can be described by the same properties. We can look at a few examples.

4 First, imagine that you have tied one end of a rope to a door knob. You can stand so that your arm is pointed at the door knob and pull the rope straight. The rope will show the middle line we use to measure amplitude. If you move your arm up and down, you will see a wave in the rope. The amplitude is large on the end that you hold. Closer to the door knob, the rope cannot move up and down as far. Therefore, the amplitude is smaller. The amplitude of the wave goes to zero at the knot.

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5 Another type of wave is the sound wave. These are pressure waves. They move through matter such as air or water. Sound waves can be fed into a device called an oscilloscope. The screen of the oscilloscope will show the sound wave. A note of a single pitch, like from a flute or an opera singer, will show up as a regular wave. A really low note will have a low frequency. 20 Hz is about the lowest frequency a person can hear. A note of high pitch has a high frequency. When the opera singer hits "high C," she is producing sound waves at 1,046.5 Hz.

6 Light can also be described by a wave. We are not able to see the form of these waves. We can model them mathematically, however. Visible light does not have a different "pitch" like sound. Instead it comes in different colors. The property of wavelength changes when we compare light of different colors. The wavelengths of light are very, very small. A special unit of distance called a nanometer (nm) is used to report light wavelengths. There are one billion (1,000,000,000) nanometers in 1 meter. Violet light has the shortest wavelength at 400 nm. Red light has a wavelength of 740 nm. This is the longest wavelength of visible light. In contrast, the wavelengths of sound waves are measured in centimeters.

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1. What is the main point of paragraph 3?

   A. To define the unit Hertz

   B. To fully describe ocean waves

   C. To explain the three properties of waves

   D. To let the reader know that there are many different types of waves in nature

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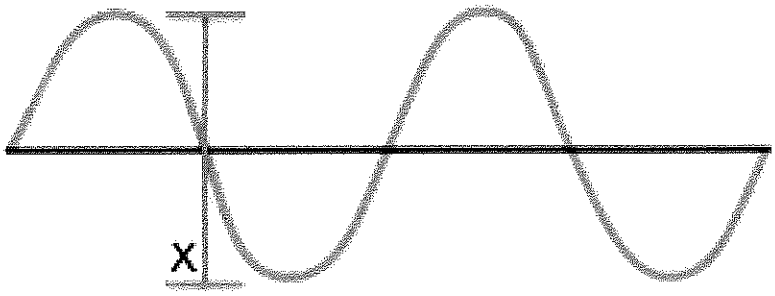

2. Which property of a wave is labeled X on the diagram above?

   A. Amplitude

   B. Frequency

   C. Wavelength

   D. None of the above

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3. Which phrase helps you understand the meaning of **vertical** in paragraph 3?

   A. *height of the peak*

   B. *divided by 2*

   C. *imagine a line*

   D. *along the middle*

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4. A subwoofer is a type of speaker which plays only the very low notes in a song or movie. Which of the following frequencies would you expect to be able to hear from a subwoofer?

   A. 10 Hz

   B. 25 Hz

   C. 750 Hz

   D. 1,050 Hz

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5. Amplitude can be described as:

   A. the distance between each peak.

   B. the distance between the rest position of the wave and the peak or trough.

   C. the number of cycles per second.

   A. the wavelength of visible light.