24B Waves in Motion

NAME _____

How do waves move?

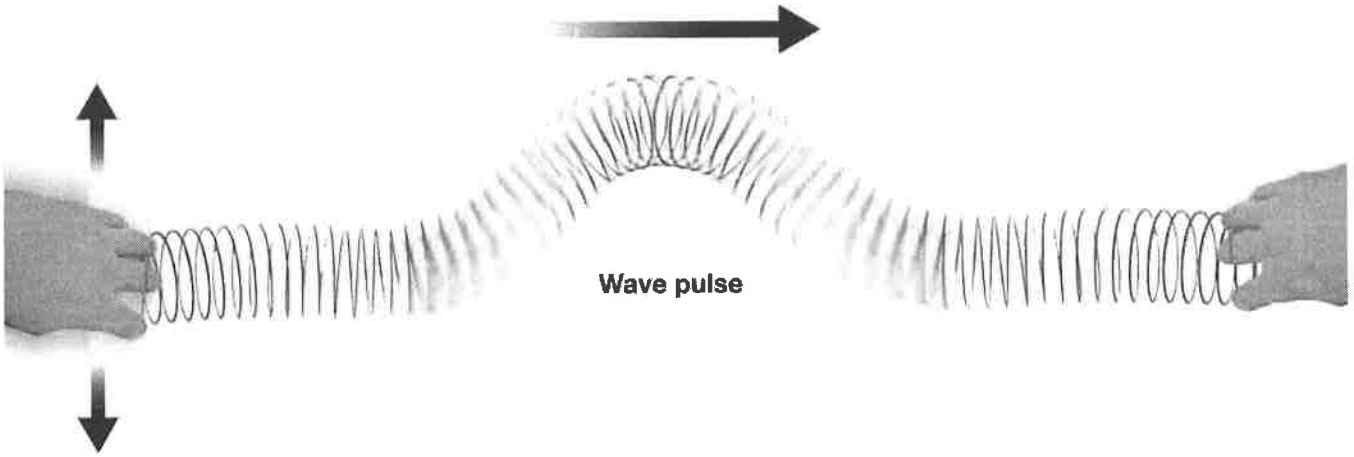
PER _____

Waves are oscillations that move from one place to another. Like oscillations, waves also have the properties of frequency and amplitude. In this investigation, you will explore waves on strings and in water. What you learn applies to all other types of waves as well.

Materials

- Metal Slinky® toy spring
- Meter stick
- Wave tray
- Food coloring
- Water

1 Making a transverse wave pulse



2. It takes two students to do this experiment. Each student takes one end of the spring.
3. Bring the spring down to the floor. Stretch it to a length of about 3 meters while keeping the spring on the floor.
4. One student should jerk one end of the spring rapidly to the side and back, just once. Make sure both ends of the spring are held tight and do not move once the wave is in motion. A wave pulse should travel up the spring.
5. Watch the wave pulse as it moves up and back. Try it a few times.

2 Thinking about what you observed

a. How is the motion of a wave pulse different from the motion of a moving object such as a car? (HINT: What is it that moves in the case of a wave?)

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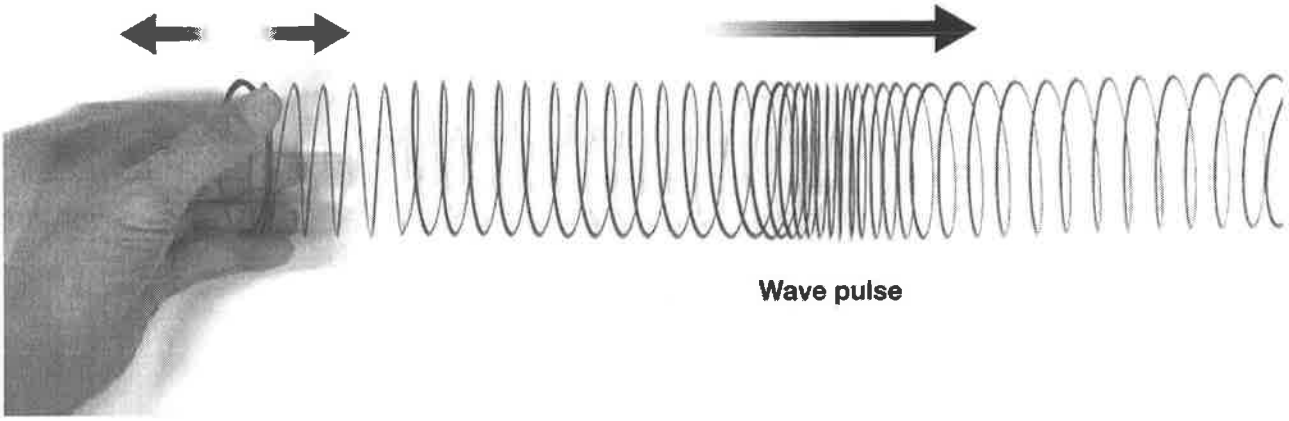
b. What happens to the wave pulse when it hits the far end of the spring? Watch carefully. Does the pulse stay on the same side of the spring or flip to the other side? Use the word "reflect" in your answer.

c. Imagine you broke the spring in the middle. Do you think the wave could cross the break? Discuss the reasoning behind your answer in a few sentences.

d. Why does the wave pulse move along the spring instead of just staying in the place you made it?

3 Making a longitudinal wave pulse



1. Just like the wave you made in Part 1, each student takes one end of the spring.
2. Bring the spring down to the floor. Stretch it to a length of about 3 meters while keeping the spring on the floor.
3. One student should jerk one end of the spring rapidly forward and back, just once. Make sure both ends of the spring are held tight and do not move once the wave is in motion. A wave pulse should travel up the spring.
4. Watch the wave pulse as it moves up and back. Try it a few times.

4 Thinking about what you observed

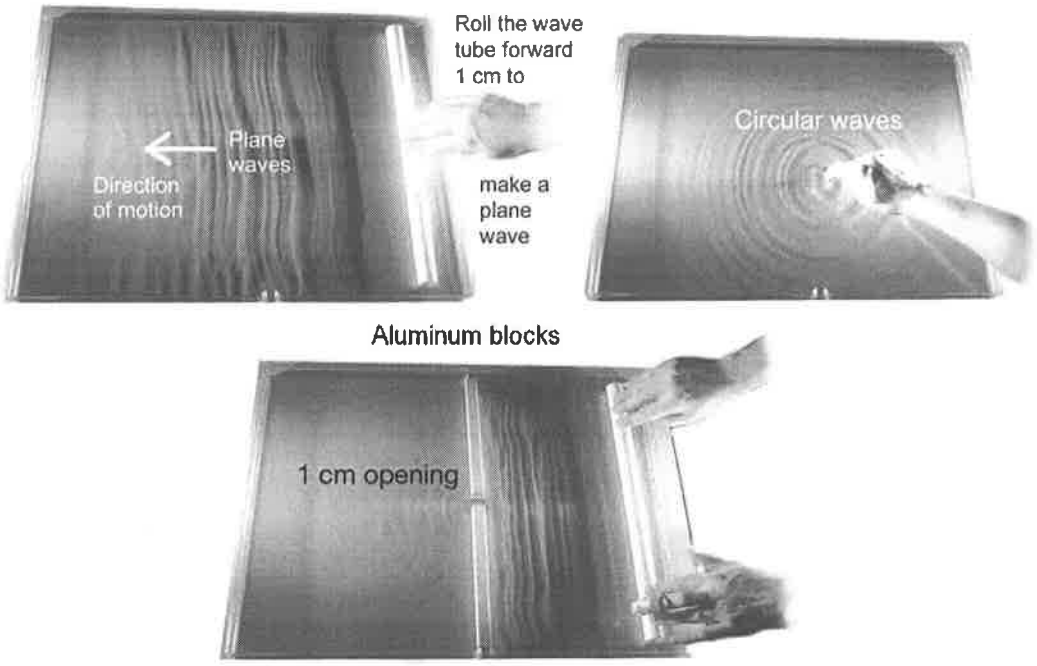
a. How is the motion of the longitudinal wave pulse different from the transverse wave pulse you made in Part 1? (HINT: How is the motion of the spring itself different?)

b. What happens to the wave pulse when it hits the far end of the spring? Does it behave like the transverse wave, or much differently? Use the word "reflect" in your answer.

c. Why do you think longitudinal waves are also sometimes called "compressional waves"?

d. Do you think a wave can be made by only stretching the Slinky® instead of compressing it? Make a prediction then try it and see if you were right.

5 Waves in water



1. Fill a flat tray with about one-half centimeter of colored water. The color helps you see the waves.
2. Roll the wave tube forward about 1 cm in a smooth motion. This launches a nearly straight wave called a ***plane wave*** across the tray.
3. Next, poke the surface of the water with your fingertip. Disturbing a single point on the surface of the water makes a ***circular wave*** that moves outward from where you touched the water.
4. Arrange two aluminum blocks so they cross the tray leaving a 1 cm opening between them.
5. Make a plane wave that moves toward the blocks. Observe what happens to the wave that goes through the opening.

6 Thinking about what you observed

a. Draw a sketch that shows your plane wave from the top. Also on your sketch, draw an arrow that shows the direction the wave moves.

b. Is the wave parallel or perpendicular to the direction the wave moves?

c. Draw another sketch that shows the circular wave. Add at least four arrows that show the direction in which each part of the wave moves.

d. At every point along the wave, are the waves more parallel or perpendicular to the direction in which the circular wave moves?

e. Sketch the shape of the wave before and after passing through the 1 cm opening.

f. Does the wave change shape when it passes through the opening? If you see any change, your answer should state into what kind of shape the wave changes.

g. Are the waves you made in the water transverse or longitudinal waves, and why?