NAME: DATE:

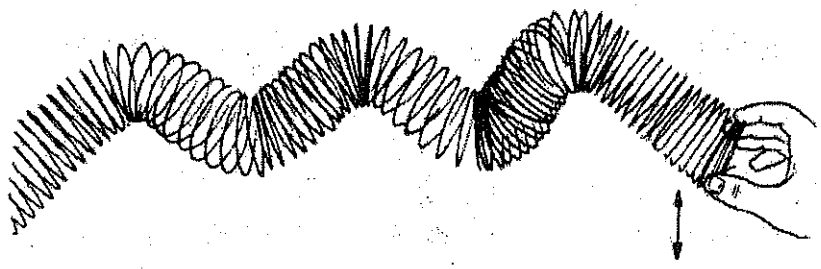
LAB11: Slinky Lab

INTRODUCTION

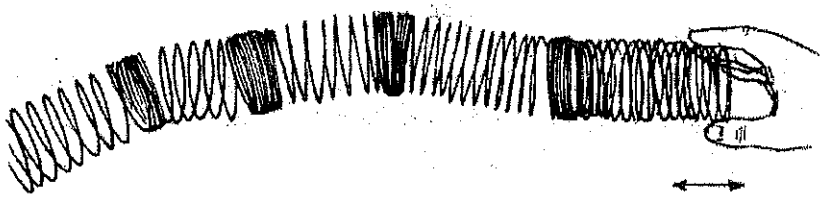
Waves occur all over the natural world. Light, sound, radiation, water ripples, etc. all occur as wave phenomena. There are two main types of waves that are found in the physical world: transverse waves, and longitudinal waves. Wave phenomena abide by the same rules regardless of the media it is transferred through – or in other words, there are not separate characteristics for light waves, or sound waves, or water ripples. Because of this we can investigate the characteristics of all waves using a coiled spring (slinky).

TERMS

- MEDIUM: the medium is the material that a wave is transmitted through. For example sound waves are transmitted through *air*, and water ripples are transmitted through *water*.
- TRANSVERSE WAVE: a transverse wave is a wave in which the vibrational displacement occurs in a direction perpendicular to the motion of a wave.



- LONGITUDINAL WAVE: also known as a compression wave ... a longitudinal wave is a wave in which the vibrational displacement occurs in the same direction as the motion of the wave.



- PULSE: a single disturbance in a media that moves along in a wave.
- WAVELENGTH: the length of a single pulse.
- AMPLITUDE: the maximum amount a disturbance is from a wave's rest position.
- FREQUENCY: the rate at which wave pulses pass a point.

OBJECTIVE

The objective of this lab is to observe and investigate the basic characteristics of waves, using a coiled spring.

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PROCEDURE

Record your observations neatly in the spaces below. ***Be careful not to tangle the slinky.***

I. TYPES OF DISTURBANCES

Stretch the slinky down the hall about 7 meters on the floor (use 3 floor tiles as 1 m). Send a pulse down the slinky by disturbing it at one end by swiftly pushing it forward.

(a) Describe the motion of the medium, in this case the slinky, as the pulse moves through it.

(b) Use the length of the slinky and a stopwatch to measure the velocity of the wave pulse ($v = d / t$). Try this several times using different methods for initiating the pulse (tap it, push it, hit it, etc.). Record your results below.

Type of disturbance: _____ time to go down 8 m slinky: _____

Type of disturbance: _____ time to go down 8 m slinky: _____

Type of disturbance: _____ time to go down 8 m slinky: _____

Type of disturbance: _____ time to go down 8 m slinky: _____

(c) What does this tell you about the effect of disturbance type on the speed of the pulse along the slinky?

II. TYPES OF WAVES

Create a longitudinal wave pulse by creating a disturbance in a direction parallel to the direction of the wave motion. Describe what happens to the medium (slinky) as the pulse travels from one end to the other.

Generate a transverse wave pulse by moving your hand quickly to either the left or the right. Describe the motion of the medium as the pulse moves through it

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III. WAVE CHARACTERISTICS

Again, stretch the slinky so it is 7 meters long and create a transverse wave pulse.

(a) Record the time it takes to get to the other end. Repeat this several times changing the height (*amplitude*) of the pulse each time and recording the time from one end of the slinky to the other. How does changing the amplitude of the pulse affect how long it takes to get from one end to the other?

(b) Now try generating more than one pulse. Slowly move you hand side to side at a constant rate. Describe what you see.

(c) Now move you hand side to side at a faster rate and describe what you see. Include in your description what happens to the speed, frequency and size (wavelength) of the wave pulses.

(d) What conclusions can you draw about how changing the amplitude and frequency of the source affects the characteristics of a wave?

(e) Now change the tension in the slinky. Do this by holding the slinky not at the end but about 1 meter in. Make sure it is still stretched 7 meters however. Make a wave pulse with as close to an identical disturbance as you did in part (a) above and record the time it takes to get to the other end. Repeat this again making the slinky even tighter. Describe how this changing the tension affects the characteristics of the wave (wavelength and speed).

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IV. WAVE BOUNDARIES

1. Have your partner hold one end of the slinky strongly. Send a wave down to them and let it reflect back. This is a fixed end reflection because the end of the slinky is not allowed to move. What do you notice about the shape and motion of the reflected wave as compared to the incoming wave?

V. MULTIPLE WAVE INTERACTION

1. With one person on each end of the slinky, have each person create one transverse wave of about the same size with a disturbance in the same direction. Describe what happens when the disturbances meet along the medium and after they meet. Sketch a picture of what you see.

2. Now have each person create a transverse wave, but this time make the disturbances in opposite directions (*one right one left*). Describe what happens when the disturbances meet along the medium and after they meet. Sketch a picture of what you see.

3. Now make one big pulse and one small pulse. Describe what happens when the disturbances meet along the medium, and after they meet. Sketch a picture of what you see.