A. WAVES: ENERGY

We have all seen waves on the surface of water. But what exactly is a wave? A wave is a disturbance that transmits _____ but not ______. A wave must move through a material, but it does not move the material along with it. For example, as you sit on the beach, you can see the waves in the water. You are seeing the disturbance in the water. Since the water molecules are moving, you are seeing energy in motion. But where does the water end up? The water ends up in the lake, right where it started. If the water (the material) was moved onto the beach, very soon all of the water would be on the beach and the lake would be empty.

There are several parts to a water wave. The highest part is called the ___________. The lowest part is called the _________. The crest is higher than the normal rest position of the water. The trough is lower than the normal rest position of the water. How high the crest is above the normal water level is called the _________ of the wave.

If you dip your finger gently into some water, you will get a small amplitude. This is because you have put a small amount of energy in. But if you dip your finger in more violently, you get a larger amplitude because you have put more energy into the water.

Procedure:
1. Add about 3 cm of water to your box. This is called a ripple tank. Dip your finger up and down several times in the water. Describe what you see. What shape are the waves?

2. Dip the end of the pencil up and down several times in the water. Dip the end of the ruler up and down several times in the water. What shape do all of the waves have?

3. What happens to the waves when they hit the side of the box?

4. Put a tiny piece of cork in the center of your ripple tank. You are going to use your finger to make some waves near the cork. What do you think the cork will do?

5. Use your finger to make some waves near the cork. What does the cork do?

6. Does the cork bob up and down or does it ride a wave to the side of the ripple tank? What is transferred in a wave, only energy or only matter?

7. Dip your finger up and down gently several times. Did you put a little or a lot of energy in? Did your waves have small or large amplitudes?

8. Dip your finger more violently up and down several times. Did you put a little or a lot of energy in? Did your waves have small or large amplitudes?

9. Which do you think has more energy: a loud sound or a soft sound? Which do you think has more energy: a bright light or a dim light?

Summary: Tell what you learned about energy in waves.

A-2 WAVES: FREQUENCY AND WAVELENGTH

If you dip your finger into the water over and over, you will make a series of waves. If you move your finger quickly, you will make a lot of waves each second. This is called the _________ of the waves. If there are a lot of waves each second, this is a _____ frequency. If there are only a few waves each second, this is a _____ frequency.

If you are making a lot of waves, they will be close together. This is called the __________. When the waves are close together, they have a ______ wavelength. When they are far apart, they have a ______ wavelength. If you are making a lot of waves, they are close together. So we say that a high frequency has a ______ wavelength. If you are making fewer waves, they are farther apart. So we say that a low frequency has a ______ wavelength.

Procedure:
1. Use the dropper to drop a single drop of food coloring into your ripple tank. Do not hit the water. You are going to use your finger to make waves near the drop. What do you think will happen to the food coloring?

2. Use your finger to make some waves near the food coloring. What do you see? Is this what you predicted?

3. Dip your finger up and down very quickly. Do you see a lot of waves or a few waves? Is this a high frequency or a low frequency?

4. When you are dipping your finger up and down quickly, are the waves close together or far apart? Is this a small wavelength or a large wavelength?

5. Dip your finger up and down slowly. Do you see a lot of waves or a few waves? Is this a high frequency or a low frequency?

6. When you are dipping your finger up and down slowly, are the waves close together or far apart? Is this a small wavelength or a large wavelength?

7. When a guitar string is moving very quickly, do you think it is making a sound with a high frequency or a low frequency?

Summary: Tell something that you have learned about frequency and wavelength of waves.