Waves and Energy Station Exploration

Name ____ Date ___________________ Hour _____

Each of the 8 Stations in this exploration has its own set of directions. Some of the Stations require you to watch video clips or use a computer simulation to complete the items. Use the following website to access the resources needed for each station: jms7science.weebly.com

STATION #1 – Computer Simulations

From the website, go to Station 1 and click on each of the simulations. After you have "played" with the simulations for a few minutes, draw a diagram and a 1-2 sentence summary for each simulation.

Forces, Energy, and Amplitude	Frequency, Wavelength and Amplitude
Use the words ***energy and amplitude*** in your summary.	Use the words ***frequency and wavelength*** in your summary.

STATION #2 – Vocabulary Cards

Make Vocabulary Cards for the following terms: ***Transverse Wave and Longitudinal Wave***

<u>Front of the card</u> – Vocabulary Term and a picture that helps you remember the definition

<u>Back of the card</u> – Definition and Examples

STATION #3 – Transverse Waves

1. Place the Slinky on its side on your table. Carefully stretch out the Slinky.
2. To start a disturbance in the Slinky, take one end and move it from side to side. Observe the movement of the Slinky.
3. Draw a picture of the wave your saw. Write a description of what happened when you moved the Slinky.

Transverse Wave		

4. Watch the video clip on the Station 3 page of the website, and then refer to page 13 in your textbook. Draw another diagram a transverse wave, **label the direction of the disturbance (matter) and the direction of the wave (energy).**

STATION #4 – Reading about Waves

Pick up one of the articles at the station. The summary strategy to be used for this article is at the end of the reading. Be sure to read the directions first.

STATION #5 – Slinky Wave Relationships

Use the Slinkys to make waves with the properties indicated. Draw a diagram of each one in the space provided.

High frequency, short wavelength	**High energy, large amplitude**
Low frequency, long wavelength	**Low energy, small amplitude**

STATION #6 – Vocabulary Cards

Make Vocabulary Cards for the following terms: ***Medium and Mechanical Wave***

Front of the card – Vocabulary Term and a picture that helps you remember the definition

Back of the card -- Definition and Examples

STATION #7 – Longitudinal Wave

1. Put the Slinky on the table. Slightly stretch the Slinky.
2. To start a different type of disturbance, push the Slinky from one end. Observe the movement of the Slinky.
3. In the data section, draw a picture of the wave you saw. Write a description of what happened when you moved the Slinky.

Longitudinal Wave		

4. Watch the video clip on the Station 6 page of the website, and then refer to page 14 in your textbook. Draw another diagram a longitudinal wave, **label the direction of the disturbance (matter) and the direction of the wave (energy).**

STATION #8 - Frequency, Wavelength, Amplitude

Pick up an activity sheet at Station 8. Follow all direction on the sheet, write in complete sentences.

Physics for Kids

Waves

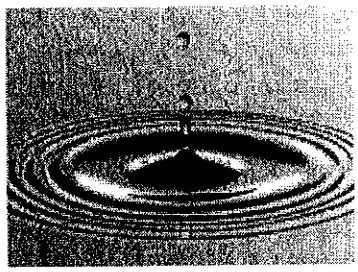
What is a wave?

When we think of the word "wave" we usually picture someone moving their hand back and forth to say hello or maybe we think of a tall curling wall of water moving in from the ocean to crash on the beach.

In physics, a wave is a traveling disturbance that travels through space and matter transferring energy from one place to another. When studying waves it's important to remember that they transfer energy, not matter.

Waves in Everyday Life

There are lots of waves all around us in everyday life. Sound is a type of wave that moves through matter and then vibrates our eardrums so we can hear. Light is a special kind of wave that is made up of photons that helps us to see. You can drop a rock into a pond and see waves form in the water. We even use waves (microwaves) to cook our food really fast.



Types of Waves

Waves can be divided into various categories depending on their characteristics. Below we describe some of the different terms that scientists use to describe waves.

Mechanical Waves and Electromagnetic Waves

All waves can be categorized as either mechanical or electromagnetic.

Mechanical waves are waves that require a medium. This means that they have to have some sort of matter to travel through. These waves travel when molecules in the medium collide with each other passing on energy. One example of a mechanical wave is sound. Sound can travel through air, water, or solids, but it can't travel through a vacuum. It needs the medium to help it travel. Other examples include water waves, seismic waves, and waves traveling through a spring.

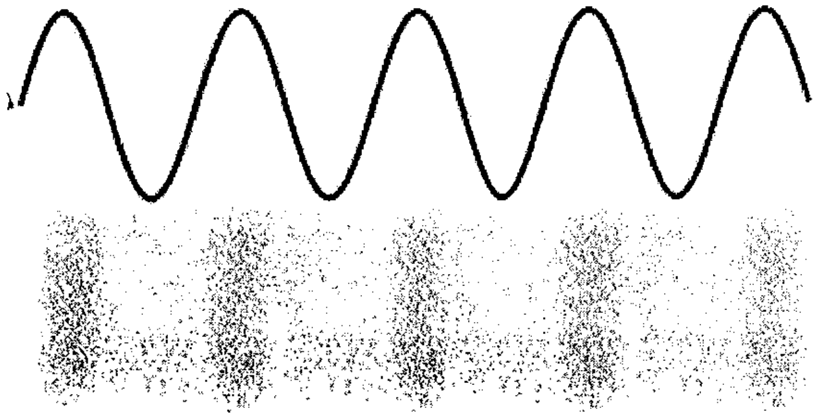
Electromagnetic waves are waves that can travel through a vacuum (empty space). They don't need a medium or matter. They travel through electrical and magnetic fields that are generated by charged particles. Examples of electromagnetic waves include light, microwaves, radio waves, and X-rays.

Transverse Waves and Longitudinal Waves

Another way to describe a wave is by the direction that its disturbance is traveling.

Transverse waves are waves where the disturbance moves perpendicular to the direction of the wave. You can think of the wave moving left to right, while the disturbance moves up and down. One example of a transverse wave is a water wave where the water moves up and down as the wave passes through the ocean. Other examples include an oscillating string and a wave of fans in a stadium (the people move up and down while the wave moves around the stadium).

Longitudinal waves are waves where the disturbance moves in the same direction as the wave. One example of this is a wave moving through a stretched out slinky or spring. If you compress one portion of the slinky and let go, the wave will move left to right. At the same time, the disturbance (which is the coils of the springs moving), will also move left to right. Another classic example of a longitudinal wave is sound. As sound waves propagate through a medium, the <u>molecules</u> collide with each other in the same direction as the sound is moving.



In the above picture the top wave is transverse and the bottom wave is longitudinal.

Interesting Facts about Waves

- Waves in the ocean are mostly generated by the wind moving across the ocean surface.
- The "medium" is the substance or material that carries a mechanical wave.
- One of the most important things to remember about waves is that they transport energy, not matter. This makes them different from other phenomenon in physics.
- Many waves cannot be seen such as microwaves and radio waves.
- The tallest ocean wave ever recorded was 1,720 feet tall and occurred in Lituya Bay in Alaska.

$2.00 Summary

Write a summary of the information that you just read. Pretend that each word that you write will "cost" you 10 cents and you are limited to spending $2.00. In other words, write a summary that is as close to 20 words as you can get it. Remember, if you only have $2.00 to spend, you cannot use more than 20 words.

Name: ______________________ Date: ____________

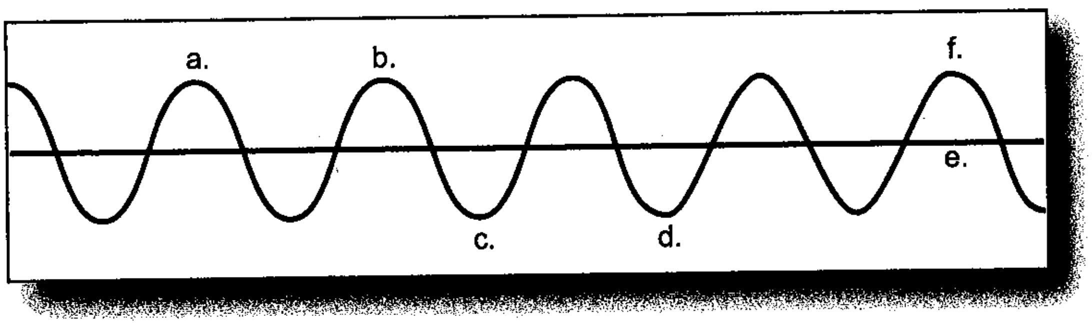
Understanding How Waves Are Alike

All waves have wavelength, amplitude, and frequency. The highest point on all waves is called the **crest**, and the lowest point is called the **trough**. When you are measuring the **wavelength**, you are measuring the distance from one crest to the next, or one trough to the next. To find the **amplitude**, you have to find the center and then measure the displacement of a crest or trough from that center. **Frequency** is a measurement of how many waves are completed in a specific period of time. For example, one wave per second has a frequency of one hertz. The following diagrams will help you understand how light waves, sound waves, radio waves, and water waves are alike.

Complete the following.

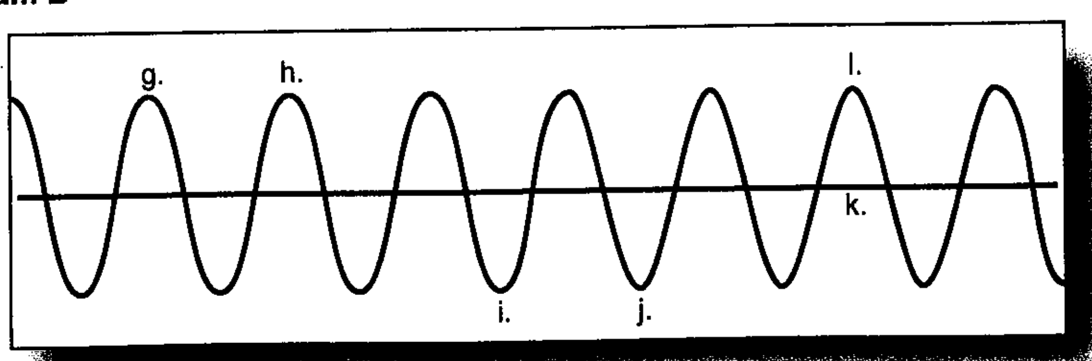
1. Connect a-b with a line on Diagram A to show a wavelength, which is from one high point to the next high point. Label a-b "crest."
2. Connect c-d with a line to show a wavelength, which is from one low point to the next low point. Label c-d "trough." A wavelength is crest to crest or trough to trough.
3. Connect e-f with a line to show the amplitude, which is the distance from the baseline to the crest or trough.

Diagram A



4. Connect g-h with a line on Diagram B to show a wavelength, which is from one high point to the next high point. Label g-h "crest."
5. Connect i-j with a line to show a wavelength, which is from one low point to the next low point. Label i-j "trough." A wavelength is crest to crest or trough to trough.
6. Connect k-l with a line to show the amplitude, which is the distance from the baseline to the crest or trough. Another word for amplitude is displacement.

Diagram B



Comparing Waves

1. Measure the **amplitude** of the wave in Diagram A, use cm or mm. ________________

2. Measure the **amplitude** of the wave in Diagram B, use cm or mm. ________________

3. Does one wave have a larger amplitude than the other? If so, what does this tell you about the **energy** carried in the waves?

4. Measure the **wavelength** of the wave in Diagram A, use cm or mm. ________________

5. Measure the **wavelength** of the wave in Diagram B, use cm or mm. ________________

6. Is there a difference in the wavelengths of these 2 waves? If so, what does this tell you about the **frequency** of the 2 waves?