WAVE Pre/Post Test

Name: ___________________________ Date: _____________ Period: ______

Multiple Choice: Circle the letter that represents the answer that best completes each statement.

1. The highest point of a wave is called the _______________.
   a) amplitude c) trough
   b) wavelength d) crest

2. The lowest part of a wave is called the _______________.
   a) amplitude c) trough
   b) wavelength d) crest

3. The _______________, or amount of energy a wave carries, is one-half the distance between the highest and lowest point of a wave.
   a) amplitude c) trough
   b) wavelength d) crest

4. _______________ is the distance from one crest to the next crest or one trough to the next trough.
   a) amplitude c) trough
   b) wavelength d) crest

5. The number of waves that pass a given point in a second is called the wave _______________.
   a) length c) frequency
   b) amplitude d) speed

6. Which of the following is **NOT** an example of an electromagnetic wave?
   a) x-ray waves c) microwaves
   b) sound waves d) light waves

Short Response

7. Is the speed of light faster or slower than the speed of sound? Describe a real-life of example that supports your answer. ___________________________
   ____
   ____

8. A wave can be defined as a regular disturbance that carries ______________ through matter or space without carrying matter.

Gridded Response

9. You can calculate the speed of a wave in meters per second (m/s) by multiplying the wave's frequency in hertz (Hz) by its wavelength in meters (m).

   If a particular sound wave has a frequency of 266 Hz and a wavelength of 1.29 m, what is the speed of the wave? **Grid your response in the appropriate box below.**

	⊘	⊘	⊘	
⊙	⊙	⊙	⊙	⊙
⓪	⓪	⓪	⓪	⓪
①	①	①	①	①
②	②	②	②	②
③	③	③	③	③
④	④	④	④	④
⑤	⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨	⑨

Extended Response

10. The two main types of waves are mechanical (waves that travel through matter) and electromagnetic (waves that travel through space). Why can't sound waves travel in outer space? ________________________________
____
____
____
____
____

Making Waves

Name: ________________________________ Date: __________________ Period: ________

Think about a beautiful autumn day. You are sitting by a lake in the park. The sun is glaring brightly onto the green blades of grass. You hear music coming from a man playing a guitar. A fish jumps out of the water and dives back making a splash. You see a circle of waves that move away from the fish's entry point. The circular waves pass by a floating leaf that fell from a tree nearby. How does the leaf move in response to the waves? What might you have observed if the fish was twice the size? Perform the following activity to test your answer.

1. Set a circular aluminum pie pan in the center of your station.
2. Fill the pie pan with the "blue" water to a depth of about 4 cm.
3. Fill a pipette with water.
4. Release a single drop of water onto the water's surface and observe what happens. Allow every member of your group to repeat.

What direction did the circular waves travel? (outward or inward) ____________________

5. Float a small cork on the surface of the water ear the middle of the pan.
6. After the water becomes still again, release several drops of water <u>near</u>, but <u>not on</u> the cork every 3 seconds from a height of about 10 cm.

What effect did this have on the cork? ____

____

7. Repeat procedural step 6, but release the single drops from a height of about 20 cm.

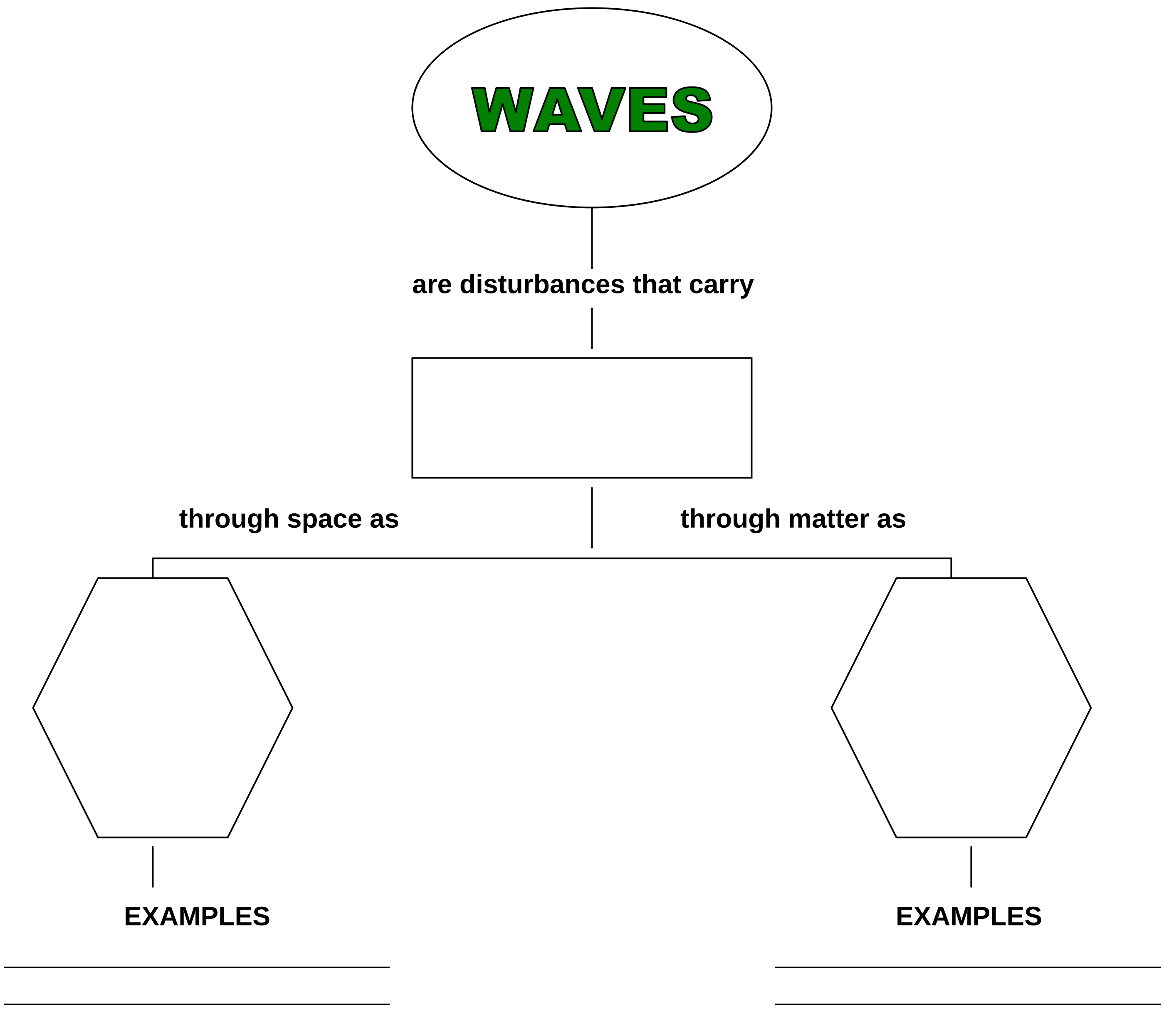
What effect did the increased height of the release point have on the water and the cork?

____

____

____

Complete the following feedback after reading “A Wave of Information”.



Write the kind or kinds of waves – mechanical, electromagnetic, transverse, or compressional – that apply to each term or description.

1. X rays ______________________

2. Water waves ______________________

3. Can travel only through a medium ______________________

4. Transfer energy, but not matter ______________________

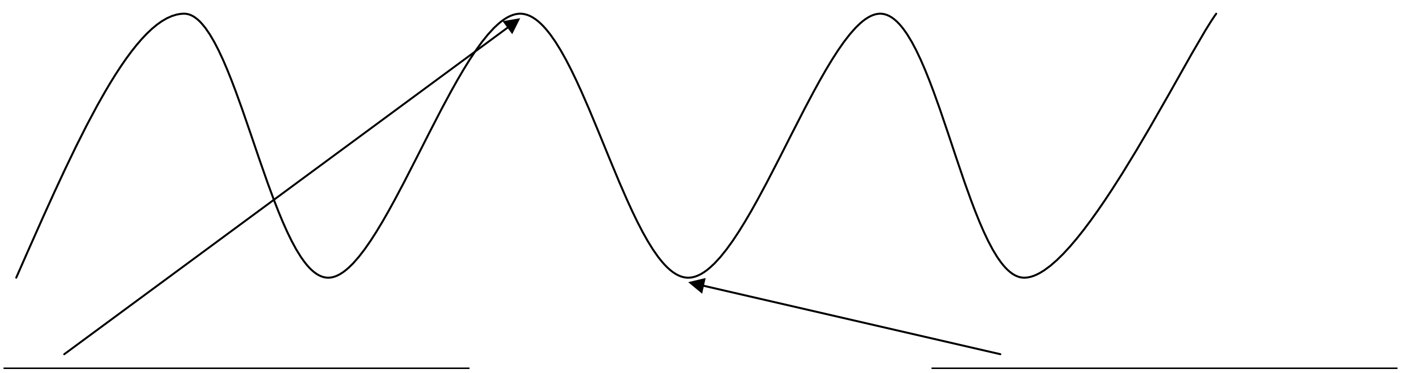
5. Has peaks and valleys ______________________

6. Matter moves in same direction as the wave travels ______________________

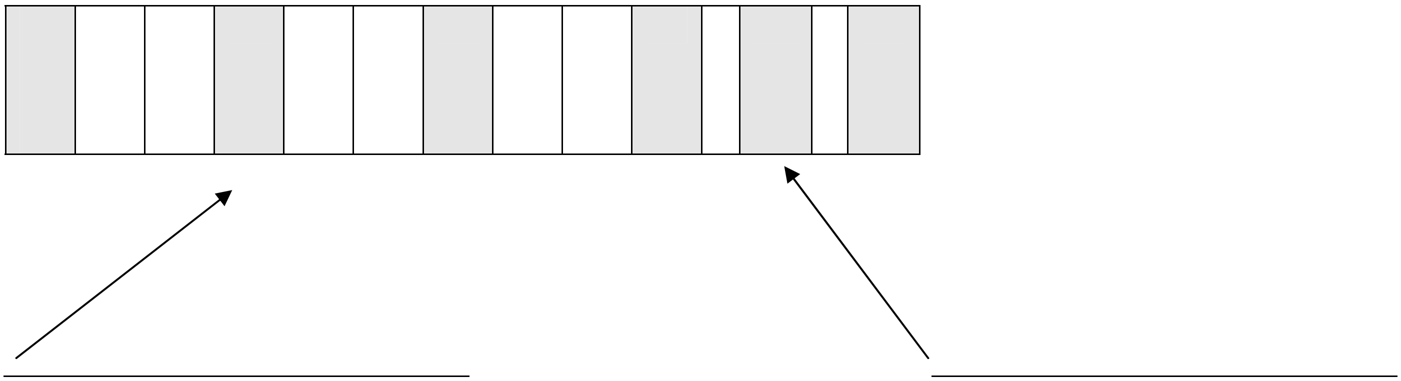
7. Matter moves perpendicular to the direction the wave travels ______________________

For each diagram identify the type of wave, label the parts, and give an example.

Type of wave: ______________________ **Example:** ______________________



Type of wave: ______________________ **Example:** ______________________



HOMEWORK EXTENSION: Draw a cartoon that depicts why sound waves can't travel in outer space.

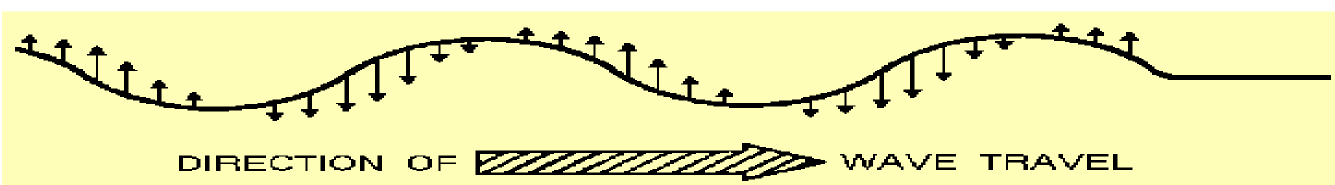
A Wave of Information

A wave is a way in which energy travels from one place to another. There are many kinds of waves, such as water waves, sound waves, light waves, radio waves, microwaves and earthquake waves.

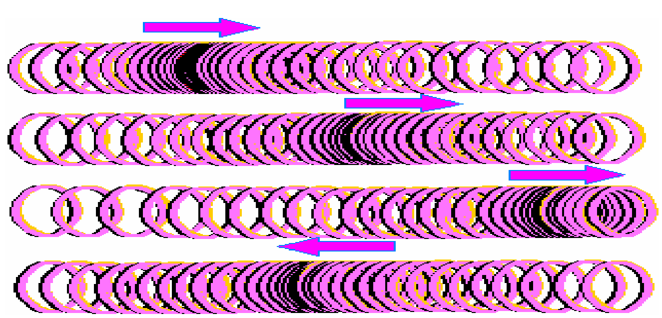
Waves are regular disturbances that carry **energy** through matter or space without carrying matter. For example, waves on the ocean's surface carry energy from place to place, but the water itself moves mostly up and down. However, when you throw a baseball to a friend, the ball carries both energy and matter.

There are two basic types of waves: **mechanical waves and electromagnetic waves**. In the case of mechanical waves such as sound, light, and water, energy transfer must occur through matter. The matter through which a mechanical wave travels is called a **<u>medium</u>**. Particles in the medium must move in order for the mechanical wave to travel through the medium. For example, a sound wave travels through the air because energy is transferred from gas molecule to gas molecule. In the case of electromagnetic waves, energy travels through space or air. They can even travel through the solid walls of your home. When you use a microwave oven to cook some popcorn or get an x-ray at the doctor's office, you use a different kind of wave – one that doesn't need matter as a medium. These are also the waves that bring you radio and television programs.

Mechanical waves can be either **transverse** or **compressional**. In a mechanical transverse wave, matter moves perpendicular to the direction the wave travels. Imagine the illustration below shows a rope tied to a doorknob that is being moved up and down. As indicated by the arrows, the rope, or medium, is moving up and down as the energy of the wave is travel straight.

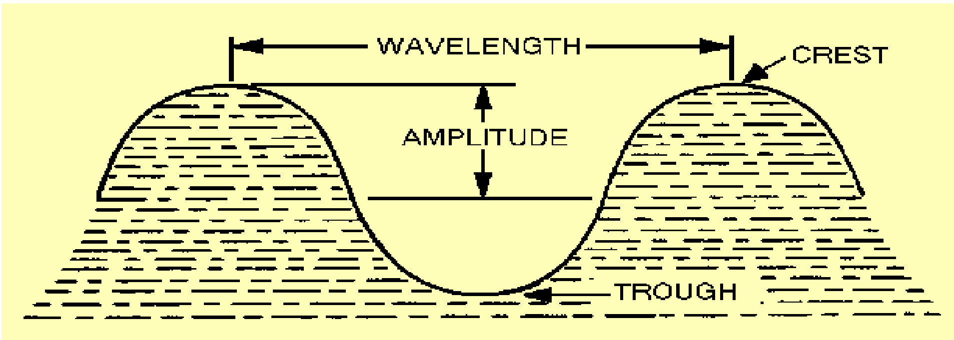


In a compressional wave, matter in the medium moves forward and backward in the same direction the wave travels. You can demonstrate a compressional wave by pulling and pushing a Slinky toy together as shown in the illustration to the right.



Wave Properties

All transverse waves have common properties:



The highest point the wave reaches is called the crest. The lowest point is called the trough. The distance from one crest to the next is the wavelength. The amplitude of a wave is one-half the distance between the crest and the trough.

Compressional waves do not have crests and troughs. Instead, they have compressions and rarefactions. The crest of a transverse wave can be compared to the compression of a compressional wave, while a trough can be compared to a rarefaction.

Illustration 1 shows a Slinky toy that is being pushed toward the lab table creating a compression at the end. This means that the particles are more dense in that part of the Slinky than they are in the surrounding area.

Illustration 1

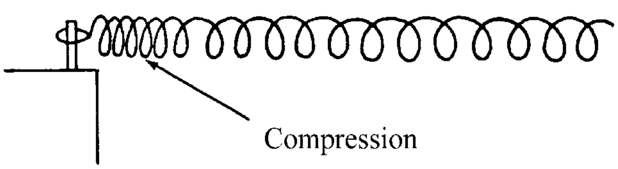
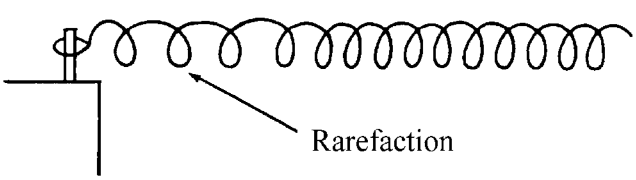


Illustration 2 shows a Slinky toy that is being pulled away from the lab table causing a separation of the coils. This expansion of the spring means that the particles are less dense in that part of the Slinky than they are in the surrounding area.

Illustrations 2



Message in a Bottle

Name: ________________________________ Period: ______ Date: ________________

You and your group members have been stranded on an island for four years (no, this is not “Cast Away”) and one morning a bottle floats onto the shore with a piece of paper in it. Could it be a picture of Blues Clues (my daughter’s dream) or maybe a recipe for liver and onions (my daughter’s nightmare). You crawl over leaving tracks in the damp sand and remove the cork from top. As you begin to read, you realize it is a lab activity from your science teacher. You are so excited (as always) that you wake up your fellow scientists. You begin to scamper around the island in search of your supplies. You build a weird contraption exactly to specifications and then follow these simple directions:

1. Obtain and become familiar with the Pixie Stix Pendulum. Practice using the pendulum.
2. One team member will position the bottle directly in the center of one end of the paper about 6” above the surface. He/she should be holding the pencil and the cap should be facing the paper!
3. A second team member will pull the bottle back to the edge of the paper and remove the tape from over the cap while releasing the bottle (creating a pendulum).
4. A third team member will <u>slowly</u> pull the piece of paper in a straight and steady fashion.
5. A fourth team member will time the event. Time should be started when the first drop of sand hits the paper and stopped when the sand no longer is dropping on the paper.
   ** You may need to repeat this procedure several times until the desired results are obtained!

Now it is time to label your wave. Read the following descriptions and then use the chalk to write the wave properties on the paper in the correct locations.

<u>Trough</u> – the lowest point of the wave

<u>Crest</u> – the highest point of the wave

<u>Amplitude</u> – ½ the distance between the crest and the trough. Use a piece of string the cut the wave you created in half horizontally and then measure from that point to either the crest or trough and that will equal the amplitude.

<u>Wavelength</u> – the distance between one crest and the next crest or one trough and the next trough. This can be measured using a ruler or meter stick.

<u>Frequency</u> – The number or waves that pass a given point in 1 second (1 s) Frequency is measured in waves per second, or Hertz (Hz). [1 s = 1 Hz] To determine this you will have to divide the number of waves created by the time it took to create them. For example, if you created 4 waves in 10 seconds (4 divided by 10) you created .4 waves per second or .4Hz.

<u>Wave Speed</u> – wave frequency X wavelength = wave speed
This one should be easy because you already know the wave frequency and wavelength. Just multiply, and voila! The answer is written in m/s.

A wave's amplitude is important. It is a measure of the energy the wave carries. For example, the waves that make up bright light have greater amplitudes than the waves that make up dim lights. Waves of bright light carry more energy than the waves that make up dim light. In a similar way, loud sound waves have greater amplitudes than soft sound waves. Loud sounds carry more energy than soft sounds.

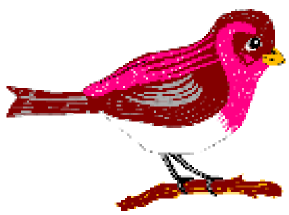
1. The amplitude of a wave can be measured from the (medium, crest) or the (trough, wavelength) to the rest position of the wave's medium.

2. Waves of bright light or loud sounds have (greater/less) amplitudes which means they carry (more, less) energy than dim light or soft sounds.

3. The wavelength of visible light determines its (color, shape). For example, the difference between red light and green light is that (red, green) light has longer wavelength.

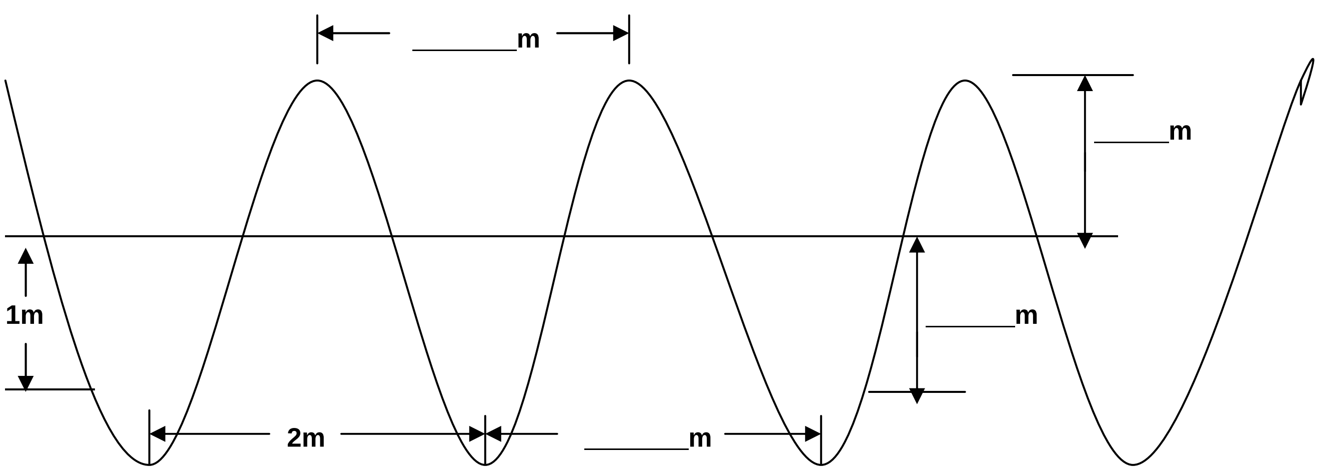
4. The number of waves that pass a point in one (second, minute) is the wave's (amplitude, frequency).

5. Which noise from the sources below would have the greater amplitude?



Use the words in the box to label the diagram. You will use each term more than once.

amplitude	Wavelength



What is the wavelength of the wave shown in the diagram? ________________
What is the amplitude of the wave shown in the diagram? _________________

It's Slinky! It's Slinky!

for fun, it's a wonderful toy

"What walks down stairs alone or in pairs and makes a slinkity sound
A spring, a spring! A marvelous thing! Ev'ryone knows, it's Slinky
It's Slinky! It's Slinky! For fun it's a wonderful toy
It's fun for a girl and a boy! It's fun for a girl and a boy!

Name: ___________________________ Period: _____ Date: ________________

We have learned that there are two basic types of waves, transverse and compressional. Let's use an old fashioned slinky toy to help visualize these waves.

A wave can be classified by the direction in which it disturbs the medium. A bobber on the end of your fishing line will float calmly on the lake until a fish pulls it down. In response, the bobber will bounce up and down vertically, but the water waves generated will move horizontally out from the original disturbance. This is an example of a **transverse wave** because the disturbance moves the medium at right angles to the direction in which the wave travels. As the disturbance moves horizontally outward, the medium is disturbed for an instant in a vertical plane. Try this:

1. Place a large Slinky on a smooth level surface. Have a partner hold the opposite end firmly.
2. Stretch the spring until the coils are no more than 1 cm apart.
3. Suddenly move your end of the spring sideways about 20 cm, then quickly return it to its original position. A ***pulse*** should travel along its length and reach your partner
4. Compare the direction that the medium (Slinky) moved compared to the direction of the pulse (wave). Illustrate this in the box below and use arrows to show the direction the pulse and medium.

This is an example of a transverse wave.

In a **Compressional wave**, the medium moves forward and backward in the same direction the wave travels. Try this:

1. Bring the Slinky back to its original starting position.
2. While holding the end of the Slinky with one hand, reach down the spring with the other hand and pull about 10 or 15 coils towards you. Quickly release them.
3. Once the Slinky has settled, quickly push one end of the coiled spring toward your partner, then pull it back to its original position.
4. Observe the direction in which the pulse moves and the direction in which the coils of the medium (Slinky) move. Illustrate this in the box below using arrows.

This is a compressional wave.
The parts that were close together are called ***compressions*** and
the parts that are father apart are called ***rarefactions***.

Okay big shots – its time to prove that we are on the same wavelength – you know, have the same frequency! Using the scientific method, create a lab report in which you use a Slinky to determine how different amplitudes of the Slinky will affect the frequency and speed of the wave. You must include a catchy title, purpose, hypothesis (If…then…), materials, procedure, results (table), and conclusion.

Here are some handy dandy hints to keep in mind:

- Use sidewalk chalk or chalk box to draw a line that represents the wave's center line
- The amplitude of the Slinky must be the uncontrolled variable so make sure all other variables are controlled in order to create a fair test.
- Two people should get in a good rhythm with making the waves at the desired amplitude Before the "timer" and "marker" begin
- Calculate the frequency of the waves by dividing the number of pulses you timed by the number of seconds you timed them.
- Use the formula *wavelength x wave frequency = wave speed* to calculate the speed of the waves in each trial
- You will complete three trials for two separate amplitudes.

Example of how to set up data table:

Trial	Length of Slinky	Amplitude of waves	Number of crests	Time of wave	Frequency	Wavelength	Wave Speed