Wave Energy Transfer – Student Activity

Seismic waves are energy waves released during earthquakes.

1. **Teacher Demonstration - Seismic waves move in all directions from the source**

1. Describe what happened when the falling object hit the water surface.

_____

_____

2. To which form of energy was the object's potential energy converted?

_____

2. **Teacher Demonstration (or student activity) - Waves energy can travel in pulses through a medium.**

Although "media" commonly refers to mass communications (radio, TV internet etc.) it is used in Science when referring to more than one intervening substance (medium) through which energy is transmitted.

Materials

- A table, desk or concrete path
- A slinkie (coiled steel or plastic).
- Two students or one teacher and one student

Method

1. Bunch up a handful of coils at one end of the slinkie.
2. Ask another to stretch (but not overstretch) the slinkie and hold the other end firmly.
3. Lower the slinkie until it just touches the hard surface below.
4. Release the bunched coils and watch the compressed zone travel along the slinkie to the other end.
5. Repeat and discuss.

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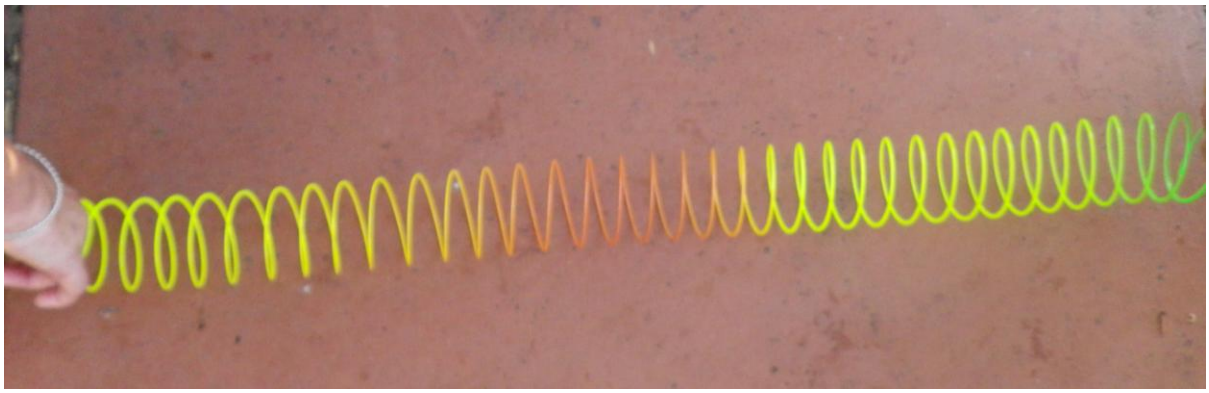


3. When the bunch of coils was released from one end, what happened to the slinkie? How was the energy transferred?

_____

_____

4. Energy travels as a zone of compaction within the extended coil. Repeat the experiment and check if this statement agrees with your observation.

Does it? _____

5. Did the length of the slinkie increase or decrease as the energy pulse travelled along it?

_____

A medium is the material that energy waves can pass through. E.g. Light waves pass through the media of air and water. Through which medium did the elastic energy of compression travel?

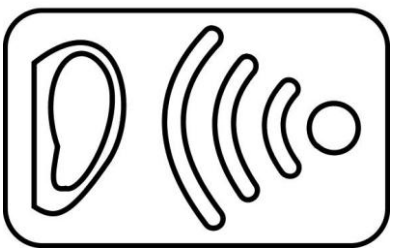
_____

Student Activity
Waves are energy passed on through movement of molecules (vibration).

AIM **To demonstrate that energy waves travel through solid media such as the Earth**

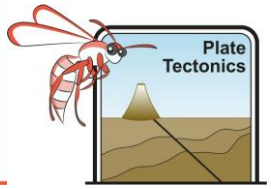
Materials

- A wooden desk
- A ruler



Method

1. Lay the ruler to the bone behind your ear (mastoid process)
2. Lay the other end of the ruler onto your desk
3. Scratch underside of desk directly below the ruler
4. Repeat scratching without the ruler



6. What did you observe?

_____

_____

7. Why do compression waves such as sound travel more easily in a ***solid*** than a ***liquid***?

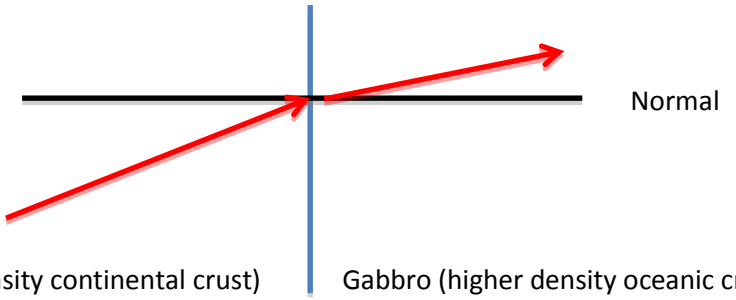
_____

_____

_____

When a wave passes from one medium into another with a higher refractive index, RI (generally a more dense medium) the wave is bent or refracted towards the normal (a plane at right angles to the interface between the two media)

Direction of wave (light or seismic energy) movement



Sandstone (low density continental crust)
Water (Low RI)

Gabbro (higher density oceanic crust)
Oil (higher RI)

In the school laboratory light energy is easier to manipulate than seismic energy!

Teacher Demonstration 3 - Refraction (bending) of light waves

8. Draw below what the pencil looks like before it is placed into the liquids

9. Draw what the pencil looks like and label the differences which appear to happen when it is partially immersed in liquids with different refractive indices (different media).

10. What appears different when the pencil is viewed through different media?

_____

11. Name the different media through which light energy was transmitted.

_____

12. Earthquakes energy waves are transmitted through different density layers in the Earth. Would you expect them to be refracted (bent)? Explain your answer.

_____

_____

Interesting Fact

When Aboriginal or other hunting people spear fish, they must compensate for refraction. Light rays are bent passing from water to air. The apparent position of a fish will not be its actual position. In time a hunter's brain makes habitual adjustments.
This skill is not necessary when spearfishing underwater as both the hunter and the prey are in the same medium.

Beautiful petroglyph of a fish from the Burrup Peninsula on the Pilbara coast.

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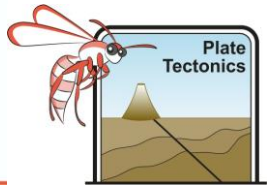

Fun Extension - Teacher Demonstration

What happened when glass was placed in water? _____

What happened when glass was placed in glycerol? _____

In movies people hide diamonds in ice cubes in their freezers. Will this work? Explain your answer using the data below.

_____

_____

RI air	1.00	RI glycerol	1.47	RI diamond	2.42
RI ice	1.31	RI plain glass	1.45	RI methylene iodide	1.74
RI water	1.33	RI Lab. glass	1.47		

Extra for experts

How could a sneaky science student find out if cheaper stones such as cubic zirconia or spinel had replaced diamonds in a damaged bracelet? (This might require an Internet search.)