**Key Concepts**

* **Waves transfer energy**
* **A force starts a wave**
* **Waves have properties that you can measure**
* **Waves behave in predictable ways**

**Page195**

A wave is a disturbance\_\_ that transfers \_ energy\_\_ from one place to another.  
without transferring \_\_\_matter\_\_\_\_\_\_\_\_\_\_.

* **Waves** can transfer energy without moving \_\_matter\_\_\_\_\_\_the entire distance.

FORCE, MEDIUM, VACUUM are not in the book. So figure it out. You are smart and can do it!

* **Force**: A force starts a \_disturbance\_ that sends a \_\_wave\_\_\_\_\_

through \_\_matter\_\_\_\_\_\_.

Example: *An earthquake is the result of a sudden release of energy that was built up in rock. This potential energy came from the tectonic forces that continued pushing and pulling on the plates even though they were stuck.*

* **Medium:** A medium is any type of \_matter\_\_\_\_\_\_ that a wave moves through.

Example: *Water is the \_\_\_medium\_\_\_\_\_\_\_\_ for an ocean \_\_wave\_\_\_\_\_\_\_\_*.

Kinds of Waves*(Any kind of wave can be classified as one of two types)*

**Mechanical or Physical Wave**:

Mechanical waves travel only through \_\_matter\_.

This means that a mechanical wave must have a medium to transfer energy.

*Examples: Sound and earthquake waves.*

**Electromagnetic**:

Electromagnetic waves can travel through empty space or matter.

Electromagnetic waves are formed when a charged particle like an electron vibrates.

Electromagnetic waves transfers energy through a field. That is why they do not need a \_\_\_medium\_\_\_ to transfer \_\_\_\_energy\_\_.   
This means electromagnetic waves can travel through a vacuum (empty space).

***There are two types of wave motions****.*

1. If the disturbanceis \_perpendicular\_ to the direction the wave travels, then this is a Transverse Wave . This wave creates an up and down action.

Examples: *The rope demonstration*, a flag waving in the breeze, *and   
 electromagnetic waves.*

1. If the wave makes particles of a medium move back and forth, parallel

to the direction the wave travels, then it is a **longitudinal**  wave.This \_\_\_wave\_\_ travels in the same direction as the \_\_disturbance\_ .

*Examples: Coiled spring, and a sound wave.*

1. Sometimes a wave can be classified as both transverse and longitudinal.

We call these combination waves.

*Examples: water waves and some seismic waves.*

1. Seismic waves are mechanical waves because they need matter (land)

to move or transfer energy.

Classify the seismic waves in the diagram below (a check means yes).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Seismic Wave | Mechanical | Longitudinal | Transverse | Combination |
| P Wave |  |  |  |  |
| S Wave |  |  |  |  |
| L or Surface wave |  |  |  |  |

**Properties** of **Waves.**

* **Crest:** The crest is the \_\_\_\_high\_\_\_ point or \_\_\_wave\_\_\_ peak.
* **Trough:** The \_\_\_trough\_\_\_\_ is the lowest point or valley of a \_\_\_\_\_wave\_\_\_.
* **Wavelength:** This is the distance from one point on a wave such as a crest to the same point on the very next\_\_\_\_ . Why do most scientists measure wavelength crest to crest? Because is much easier making it more accurate.  
  Besides going crest to crest, you could also measure trough to trough.
* **Frequency**: The number of wavelengths passing through apoint each second. Frequency is measured in hertz . One hertz equals one wave per second .
* **Wave Speed:** A waves speed depends on the medium it travels through or interacts with. Write the following waves in order form slowest to fastest.

Electromagnetic waves, seismic waves, ocean waves, sound waves.

Ocean , sound , seismic , electromagnetic .

* **Amplitude:** This is the distance between a line through the middle of a wave (rest position) and the \_\_\_\_crest\_\_ or \_\_\_trough\_\_\_.
  + The \_\_\_\_\_\_amplitude\_\_\_ determines how much power or energy is in a transverse mechanical \_\_\_\_\_\_\_wave\_\_\_ .
  + The bigger the \_amplitude\_\_\_\_ the greater the \_\_\_\_energy\_\_\_!
* **Rest Position or Line at Rest:** A line dividing the wave in half**.**

**Properties (Parts) of a wave**

**Line**

**At**

**Rest**

Crest

**Wavelength**

**Amplitude**

Trough

**Wavelength**

**Two Forces in Waves** *(Rarefaction and compression are not in the textbook)*

* **Rarefaction:** A force that pulls apart.

In the wave diagram below, the part of the wave undergoing rarefaction is part A or B? **\_\_\_B\_\_\_\_**

* **Compression:** A force that pushes together. This force will shorten or squeeze something \_together\_\_, decreasing its \_wavelength\_. Think press.

In the wave diagram below, the part of the wave that is being compressed is part A or B?**\_\_\_\_A\_\_\_\_**

|  |  |
| --- | --- |
| [http://t2.gstatic.com/images?q=tbn:ANd9GcTSujeJx3lykVIfe-V7Smoy02_WEfas_T10qEDLIzULTHenZcUJ](http://www.google.com/imgres?q=longitudinal+wave&start=229&hl=en&sa=X&tbo=d&rls=com.microsoft:en-us:IE-SearchBox&biw=1440&bih=719&addh=36&tbm=isch&tbnid=XvBqRMrMRfe6jM:&imgrefurl=http://www.studyphysics.ca/newnotes/20/unit03_mechanicalwaves/chp141516_waves/lesson43.htm&docid=mx_KnzIVsl_QyM&imgurl=http://www.studyphysics.ca/newnotes/20/unit03_mechanicalwaves/chp141516_waves/images/longitudinal.png&w=370&h=59&ei=je-jUO-7MYb68QTi7oCwBw&zoom=1&iact=hc&vpx=312&vpy=451&dur=1797&hovh=47&hovw=296&tx=153&ty=43&sig=111892519755107837178&page=10&tbnh=32&tbnw=201&ndsp=29&ved=1t:429,r:24,s:229,i:259) |  |

**A**

**B**

**Waves Interact with Matter (p.201)**

When a wave encounters matter several things can occur.

**Transmission**

When a wave goes through a medium , we call it transmission.

Example: Light waves going through a window, sound waves going through a door.

**Absorption**

When a wave enters a medium and does not pass through or bounce off, we call this absorption. The wave is absorbed by the medium. Because of this added wave energy, particles in the medium increase their motion. This increased motion makes the medium hotter. Another way of saying this would be absorption converts a waves like sound into heat. .

Example: *When you hit a baseball with a bat (homerun), some of the sound and kinetic energy is converted into heat.*

**Reflection**

When a wave encounters a medium and bounces back, we call this reflection.

Example: When you shout near a mountain and the sound echoes.

*Page 202 talks about the angle of reflection. Read that explanation and try to put this science law in your own words.*

*The angle the wave hits, is the same as the angle it bounces off.*

**Refraction**

When a wave moves from one medium to another, and changes speed as it changes direction , we call this refraction .

Example: If you look at someone who is standing in a pool, they sometimes look bent or cut in half.

In the diagram below, the line of sight for each student is represented by an arrow. Only one student would experience refraction of the fish in the tank. Which student would experience refraction? Student **B**

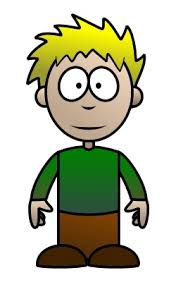
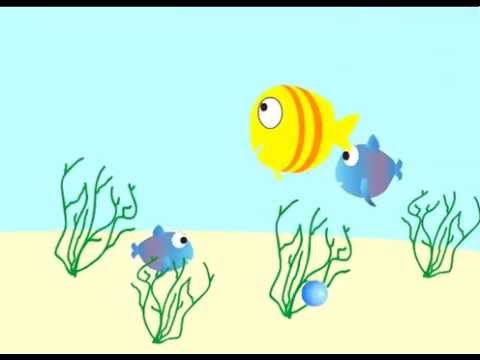
Why did only one student experience refraction?   
Both students A, and B looked at the fish straight on. Only student C looked at the fish in an angle other that 90 degrees.

****

**B**

****

**C**

****

**A**

**Diffraction**

When a wave changes direction as it travels past the edge of an object , or goes through an opening , we call this diffraction.

Example: Ocean waves diffract as they go around the poles of a pier.

*This is not in the book. Diffraction makes the wave different. This means that whatever wave you are observing (sound or light for example) may look or sound different. Think about this then write an example. You are in the kitchen. You hear your dad watching football in the other room. You go in the TV room and see your dad crying to a sad Hallmark movie. Diffraction of the TV sound made the movie sound like a ball game.*

**Key Concepts # 2**

* **Waves transfer energy**
* **A force starts a wave**
* **Waves have properties that you can measure**
* **Waves behave in predictable ways**

**Wave Definition**

A wave is a **disturbance** that transfers **energy** from one place to another.

* **Waves:** Waves can transfer **energy** over a distance without moving   
   **matter** the entire distance.
* **Force**: A **force** is what starts a \_**disturbance** that sends a \_\_**wave** through some kind of **matter/medium**.

*Example:* *An earthquake is the result of a sudden release of energy that was built up in rock. This potential energy came from the tectonic forces pushing and pulling rock.*

* **Medium:** A medium is any type of \_\_\_**matter\_\_** that a wave moves through.

Example: *Water is the \_\_****medium****\_\_ for an ocean \_\_\_****wave****\_\_\_\_*.

**Mechanical/Physical Wave**:

Mechanical wave transfers energy through \_\_\_\_**matter**\_\_\_\_. Therefore a mechanical wave has to have a **medium** to transfer energy.

Examples: Sound, water, and earthquake waves.

1. **Transverse Wave:** The direction this wave travels is **perpendicular** to the disturbance. This wave creates an up and down action.

Example: *The rope demonstration*.

1. **Longitudinal Waves**: A **longitudinal**  wave travels in the same direction as the **disturbance**.

Example: *Coiled spring, sound wave*.

C 73

**Electromagnetic**: This wave transfers energy through a **field**. It does not need a   
 **medium** to transfer **energy**!

**Properties (Parts) of a wave**

Crest

**Line at**

**Rest,**

**Rest Position**

**Wavelength**

**Amplitude**

Trough

**Wavelength**

**Properties** Of A **Wave.**

* **Crest:** The crest is the high point or wave peak.
* **Trough:** The trough is the lowest point or valley of a wave.
* **Amplitude:** This is the distance between a line through the middle of a wave (line at rest) and the crest or trough.
  + The Amplitude determines how much energy or power is in a

mechanical wave.

* + The bigger the amplitude the greater the energy!
* **Wavelength:** This is the distance from one wave crest to the very next wave crest… Or from one trough to the next trough.
* **Frequency**: The number of waves passing through afixed point in a certain moment of time

**Two Forces in Waves**

* **Rarefaction:** A force that pulls apart.

In the wave diagram below, the part of the wave undergoing rarefaction is part **B**

* **Compression:** A force that pushes together. This force will shorten or squeeze something together, decreasing its volume . Think press. In a wave, compression will shorten the **wavelength**.

In the wave diagram below, the part of the wave that is being compressed is part **A**

|  |  |
| --- | --- |
|  |  |

[http://t2.gstatic.com/images?q=tbn:ANd9GcTSujeJx3lykVIfe-V7Smoy02_WEfas_T10qEDLIzULTHenZcUJ](http://www.google.com/imgres?q=longitudinal+wave&start=229&hl=en&sa=X&tbo=d&rls=com.microsoft:en-us:IE-SearchBox&biw=1440&bih=719&addh=36&tbm=isch&tbnid=XvBqRMrMRfe6jM:&imgrefurl=http://www.studyphysics.ca/newnotes/20/unit03_mechanicalwaves/chp141516_waves/lesson43.htm&docid=mx_KnzIVsl_QyM&imgurl=http://www.studyphysics.ca/newnotes/20/unit03_mechanicalwaves/chp141516_waves/images/longitudinal.png&w=370&h=59&ei=je-jUO-7MYb68QTi7oCwBw&zoom=1&iact=hc&vpx=312&vpy=451&dur=1797&hovh=47&hovw=296&tx=153&ty=43&sig=111892519755107837178&page=10&tbnh=32&tbnw=201&ndsp=29&ved=1t:429,r:24,s:229,i:259)

**A**

**B**