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Review of Previous Lesson

- State as many Vocabulary words and Learning Objectives that you remember from the last lesson as you can.
- Remember to grade yourself from 0 - 3.

1

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Wave Properties & Motion

Waves

2

Vocabulary

4/17/2018

Content:	Start	End
vibration		
oscillation		
equilibrium		
restoring force		
medium		
energy transfer		
frequency		
period		
compression		
rarefaction		

3

Vocabulary

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Content:	Start	End
crest		
trough		
amplitude		
wavelength		
longitudinal		
transverse		
wave speed		

4

Learning Objectives

4/17/2018

Content:	Start	End
Identify and explain relationship between a vibration and wave.		
Describe the steps in vibration.		
Recognise that only energy is transferred in wave motion.		
Understand and correctly apply a wave speed's dependence on media only.		
Calculate the speed of a wave given its wavelength and frequency or graphical depiction of a wave.		
Transverse or longitudinal, categorise examples of each, know sound and light classifications.		

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Resting / Equilibrium position:

– The position assumed by an object when it is not moving.

– An object is at rest/equilibrium if the forces acting on it are balanced *or* add up to a net force of 0 N.

http://www.physicsclassroom.com/class/waves/Lesson-0/Vibrational-Motion

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What Causes Objects to Vibrate?

- If a force is applied to an object, its equilibrium will be disturbed and the object may begin to wiggle, shake, **vibrate** or **oscillate**.

http://www.physicsclassroom.com/class/waves/Lesson-0/Vibrational-Motion 7

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What Causes Objects to Vibrate?

- With a continuous input of energy the vibration would keep going, without, it eventually stop as the mechanical energy of the object is lost to other objects.

http://www.physicsclassroom.com/class/waves/Lesson-0/Vibrational-Motion 8

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The Restoring Force

- As the object is displaced past its equilibrium position, a force capable of slowing it down and stopping it exists.
  - This force that slows the object down as it moves away from its equilibrium position is known as a **Restoring Force**.
  - The **Restoring Force** acts upon the vibrating object to move it back to its original equilibrium position.

http://www.physicsclassroom.com/class/waves/Lesson-0/Vibrational-Motion

http://commons.wikimedia.org/wiki/File:Simple_harmonic_oscillator.gif 9

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If there are balanced forces acting upon the object at the equilibrium position, then why does the object sway past this position? Why doesn't the object stop the first time it returns to the equilibrium position?

- Newton's first law of motion/inertia.
  - An object which is moving will continue its motion if the forces acting on it are balanced.
  - Balanced forces do not stop moving objects.

http://www.physicsclassroom.com/class/waves/Lesson-0/Vibrational-Motion 10

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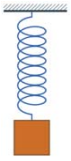
Steps in Vibration

1. Push/Pull *or* Stretch/Compress.
2. Accelerates towards resting/equilibrium position.
3. Reaches resting/equilibrium position.
4. Decelerates from resting/equilibrium position due to restoring force pulling it back towards resting/equilibrium position.
5. Reaches other end of vibration and repeats from 2.



http://www.physicsclassroom.com/class/waves/Lesson-0/Vibrational-Motion

http://commons.wikimedia.org/wiki/File:Simple_harmonic_oscillator.gif 11

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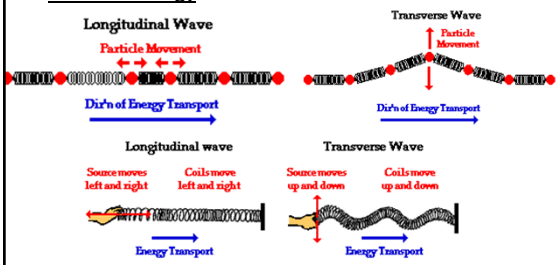
What is a Wave?

http://www.physicsclassroom.com/class/waves/Lesson-1/What-is-a-Wave

- A **vibration** or **oscillation** that travels through a medium from one location to another location, which **transfers energy** without the movement of matter.



The subsequent direction of motion of individual particles of a medium is the same as the direction of vibration of the source of the disturbance.

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What is a Medium?

http://www.physicsclassroom.com/class/waves/Lesson-1/What-is-a-Wave

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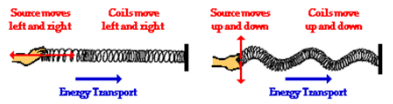
- The substance or material that carries the wave.
- Not the wave and it doesn't make the wave; it only carries or transports the wave from its source to other locations.
- In the case below, the medium through that the wave travels is the slinky coils.

e.g. Sound Waves — Longitudinal wave — Transverse Wave — e.g. Light Waves



The subsequent direction of motion of individual particles of a medium is the same as the direction of vibration of the source of the disturbance.

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What is the Medium?

http://www.physicsclassroom.com/class/waves/Lesson-1/What-is-a-Wave

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- water

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What is the Medium?

http://www.physicsclassroom.com/class/waves/Lesson-1/What-is-a-Wave

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- rope

15

What is the Medium?

http://www.physicsclassroom.com/class/waves/Lesson-1/What-is-a-Wave

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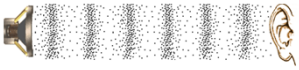

- air

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No movement of matter

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- Each particle/part/coil vibrates about its resting/equilibrium position only, each part returns continuously to the same resting/equilibrium, it does not move along with the wave or energy.

http://www.physicsclassroom.com/class/waves/Lesson-1/What-is-a-Wave

http://www.physicsclassroom.com/mmedia/waves/lw.cfm

17

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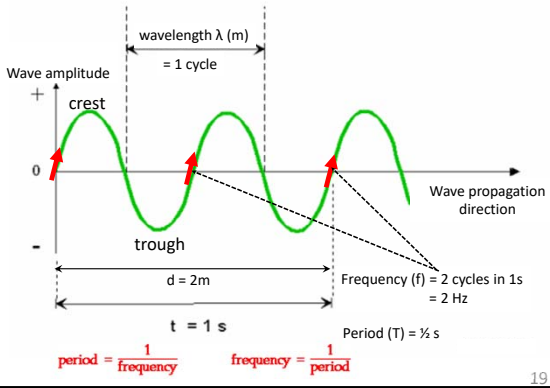
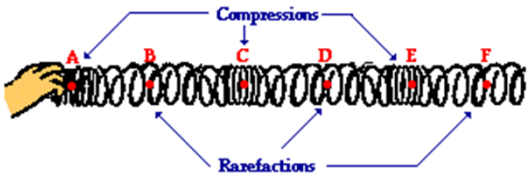
Energy transport with the movement of matter

- Unlike wave phenomena, the bat must move from its starting location to the contact location in order to transport energy.

http://www.physicsclassroom.com/class/waves/Lesson-1/What-is-a-Wave

18





http://www.physicsclassroom.com/class/waves/Lesson-2/The-Anatomy-of-a-Wave

The Speed of a Wave

- speed $= \frac{\text{distance}}{\text{time}}$
- wavelength (λ) = distance covered by 1 cycle
- period (T) = time taken for 1 cycle
- So the speed of a wave (v):
  - $v = \frac{\lambda}{T}$
- frequency (f)
  - $T = \frac{1}{f}$
- So the speed of a wave (v):
  - $\mathbf{v = \lambda f}$

What changes a wave's speed?

- Possible factors?
  - frequency, amplitude, wavelength, medium?
- https://phet.colorado.edu/sims/html/wave-on-a-string/latest/wave-on-a-string_en.html
- As frequency increases the wavelength decreases and vice versa. As **v** = λf, f and λ have no effect on **v**.
- Conclusion:
  - Wave speed depends only on the medium.

GCSE Science Revision - Types of Waves
JamJarMMX
https://www.youtube.com/watch?v=w2s2fZr8sqQ

Problems & Solutions:

- http://www.physicsclassroom.com/class/waves/Lesson-0/Properties-of-Periodic-Motion
- http://www.physicsclassroom.com/class/waves/Lesson-1/What-is-a-Wave
- http://www.physicsclassroom.com/class/waves/Lesson-1/Categories-of-Waves
- http://www.physicsclassroom.com/class/waves/Lesson-2/The-Anatomy-of-a-Wave
- http://www.physicsclassroom.com/class/waves/Lesson-2/Frequency-and-Period-of-a-Wave
- http://www.physicsclassroom.com/Class/waves/U10L2d.cfm#lab
- http://www.physicsclassroom.com/class/waves/Lesson-2/The-Wave-Equation

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Grade yourself.

- Grade yourself on the vocabulary and learning objectives of the presentation.

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