Waves

Waves Vocabulary 11/4/13

To watch Untamed Science:
1. Log into Pearson Success Net
2. Go To: Interactive Digital Path
3. Go to the Big Question
4. Click 2nd Untamed Science Tab

Extreme Waves

Wave Vocabulary.doc

BIG Questions???

1.What forms a mechanical wave?

Pre-Thoughts:

Post-Thoughts:

2. What are the 3 types of Mechanical waves

Pre-Thoughts:

Post-Thoughts:

BIG Questions???

1.What forms a mechanical wave?

Pre-Thoughts:

Post-Thoughts:

2. What are the 3 types of Mechanical waves

Pre-Thoughts:

Post-Thoughts:

Bell Six

BIG Questions???

1.What forms a mechanical wave?

Pre-Thoughts:
voice box, microphones, megaphone, vocal cords, vibrations, movement, car engines, lights, phones, speed boats

Post-Thoughts:

2. What are the 3 types of Mechanical waves

Pre-Thoughts: Longitudinal, transverse, surface

Post-Thoughts:

Bell Seven

BIG Questions???

1.What forms a mechanical wave?

Pre-Thoughts: wind, electric rudder hitting something, your voice moving items/matter

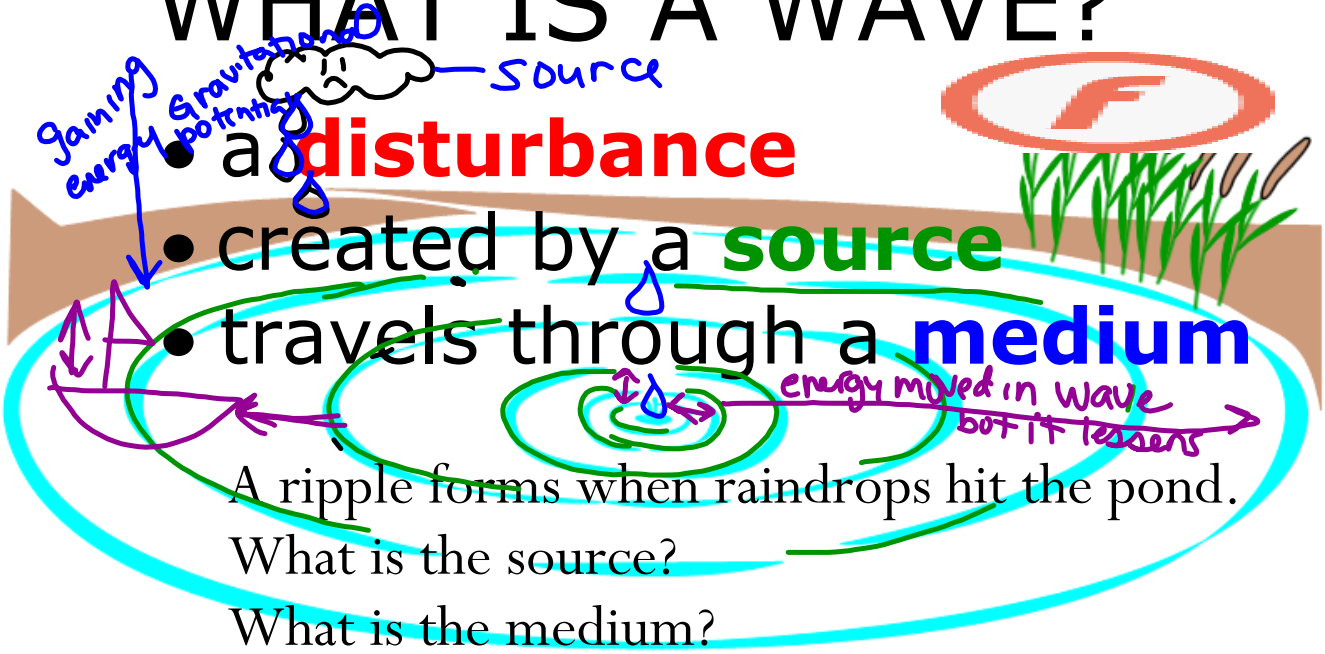
Post-Thoughts:

2. What are the 3 types of Mechanical waves

Pre-Thoughts: Logitudinal, surface & transverse

Post-Thoughts:

WHAT IS A WAVE?



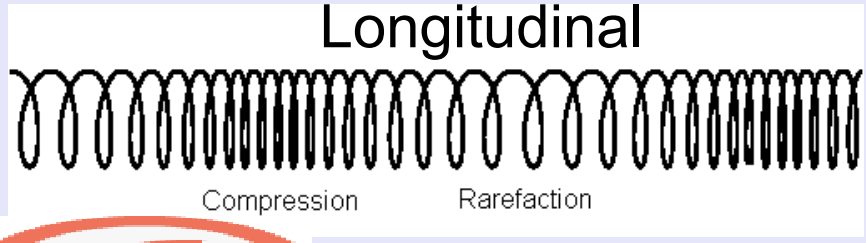
- a **disturbance**
- created by a **source**
- travels through a **medium**

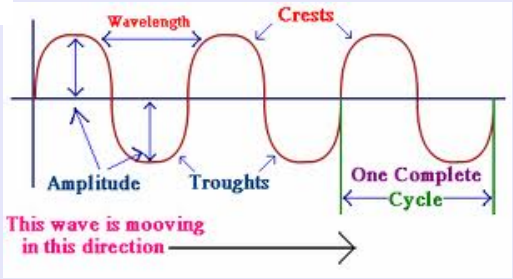
A ripple forms when raindrops hit the pond.
What is the source?
What is the medium?

(move the green dot here to reveal answer)

Waves_Notes.doc

Longitudinal





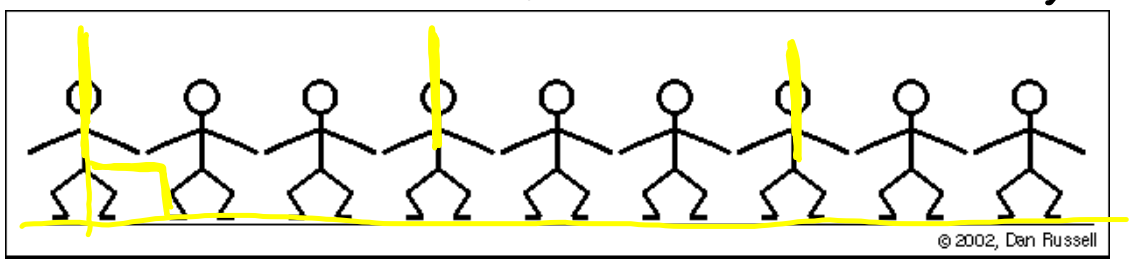
Transverse

TRANSVERSE WAVES

In which direction is the wave moving?

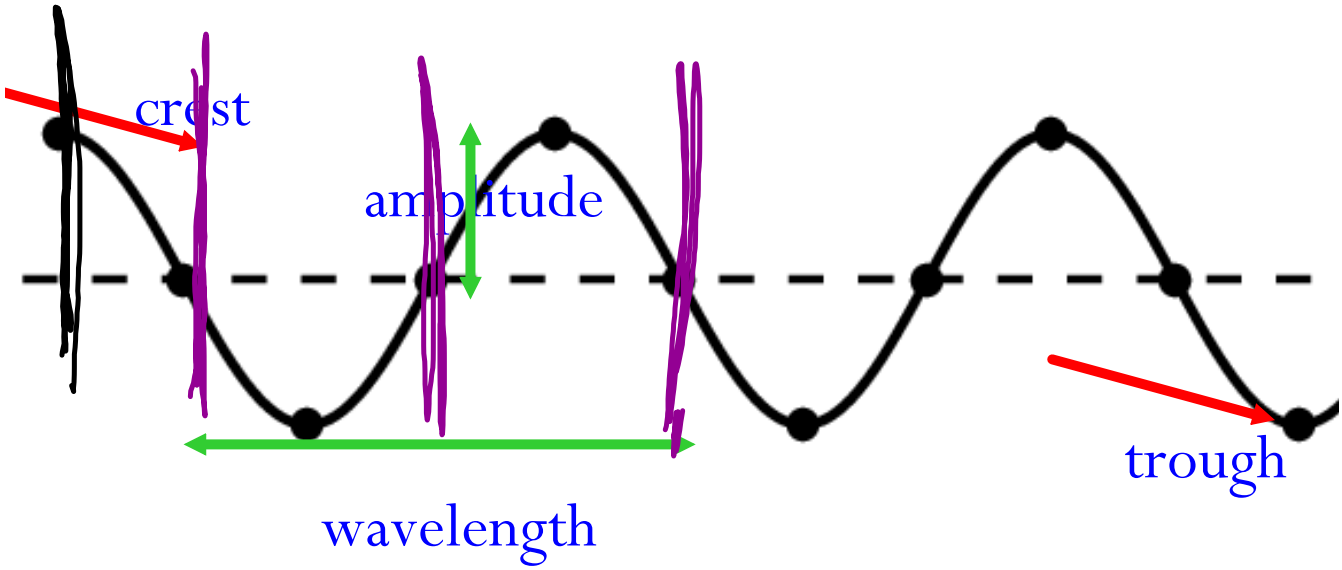
In which direction are the people moving?

moving right



Animation courtesy of Dr. Dan Russell, Kettering University

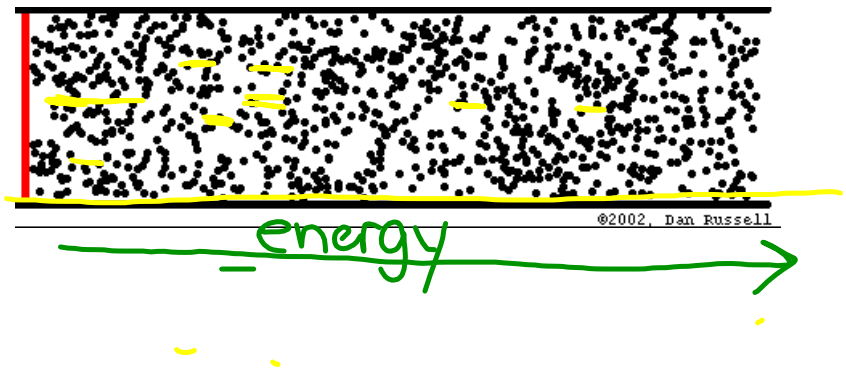
PARTS OF A TRANSVERSE WAVE



LONGITUDINAL WAVES

In which direction is the wave moving?

In which direction are the particles moving?



Animation courtesy of Dr. Dan Russell, Kettering University

(move the green dot here to reveal answer)

★ All mechanical waves use a medium to travel ★ transverse can travel without a medium too!!

Waves Notes

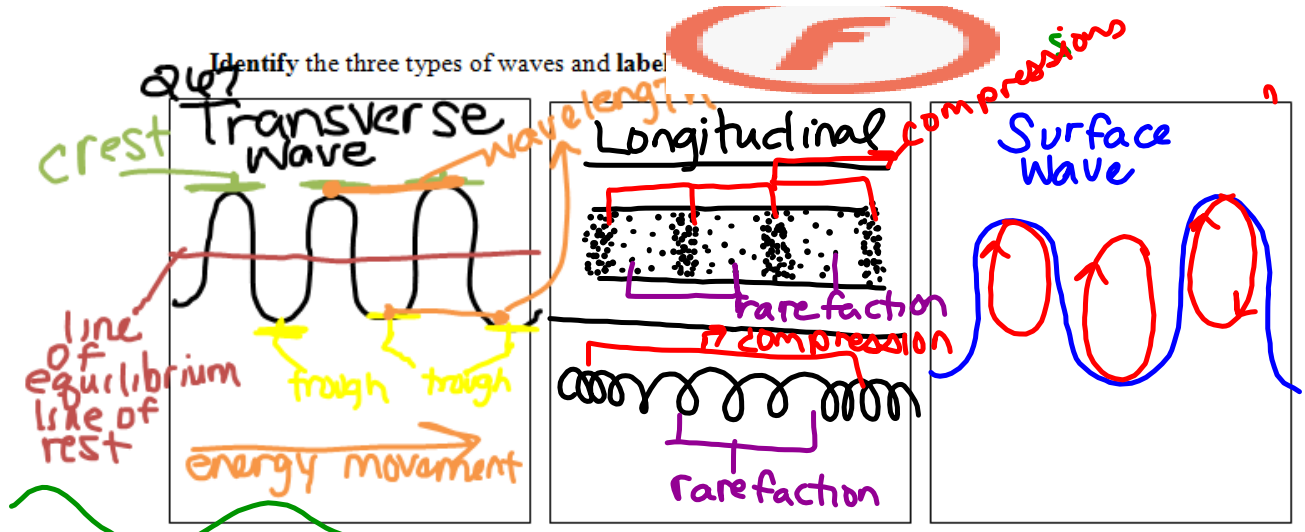
Summarize the creation of a wave.

1.	2.	3.	4.
An energy disturbance in a medium (matter)	Molecules in the medium would vibrate	The vibrations form waves	The waves carry energy across the medium

Explain the relationship between a wave's amplitude and the energy carried by the wave.

The maximum distance the medium (matter) moves from it rest position. The higher the amplitude on a wave the more energy

Identify the three types of waves and label



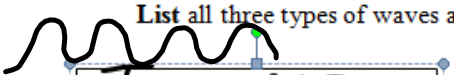
Describe each of their movements.

Transverse
They move perpendicular forming a 90° angle The medium (matter) moves up and down)

Longitudinal Waves move parallel to The rest position in The medium

Surface waves move in both perpendicular (transverse) and parallel (longitudinal) making the matter curve Moves through two mediums

List all three types of waves and **give** and example of each.

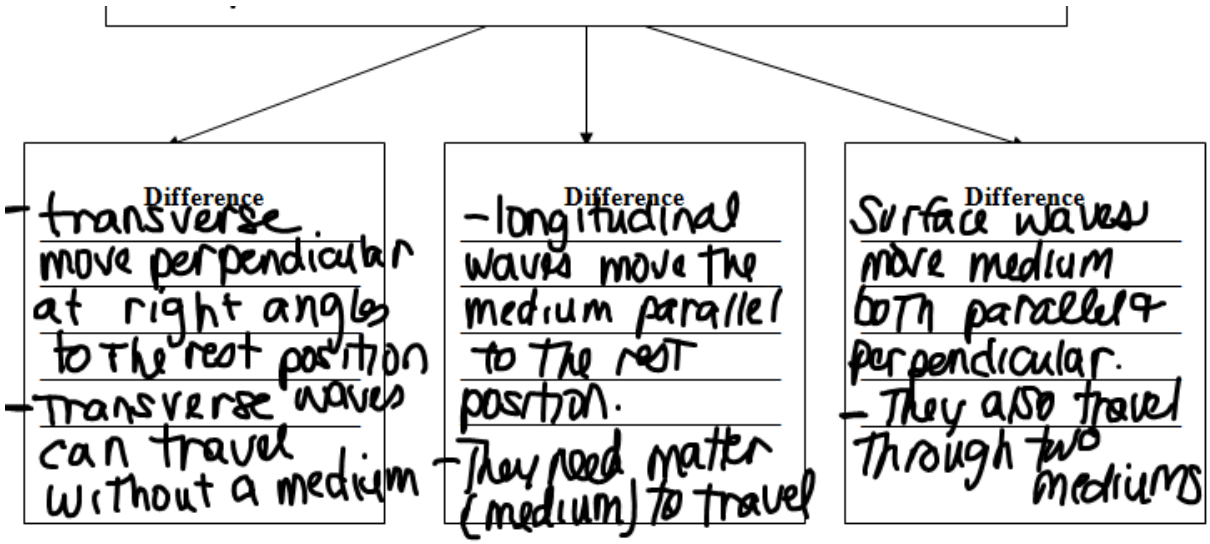


Transverse
Light waves
radiant energy
electromagnetic waves
Thermal energy
heat waves

Longitudinal
Sound waves

Surface
body of water
ocean
lakes
rivers

Similarities
They all affect life on earth
They are all mechanical waves
They all Travel Through matter (medium)
They all transfer energy Through a medium
Moves The Medium in certain directions


Difference
- transverse. move perpendicular at right angles to the rest position
- Transverse waves can travel without a medium
Difference
- longitudinal waves move the medium parallel to the rest position.
- They need matter (medium) to travel
Difference
Surface waves move medium both parallel & perpendicular.
- They also travel through two mediums

News You Can Use

- Unless you're a competitive swimmer, you probably didn't even know that some swimming pools are faster than others. But if you're an Olympic swimmer, like Missy Franklin, then you know that pool design can affect swimming speed. It all has to do with waves.
- Watch this video to see what makes some swimming pools faster than others:http://www.nbclearn.com/summerolympics/cuecard/59599

Show What You Know

Learn more about fast pool design at the link below. Then answer the following questions.

- http://www.browndailyherald.com/2012/04/16/pool-features-fast-technology/

What is a wave? A disturbance cause vibrations in a medium b/c swimming through waves

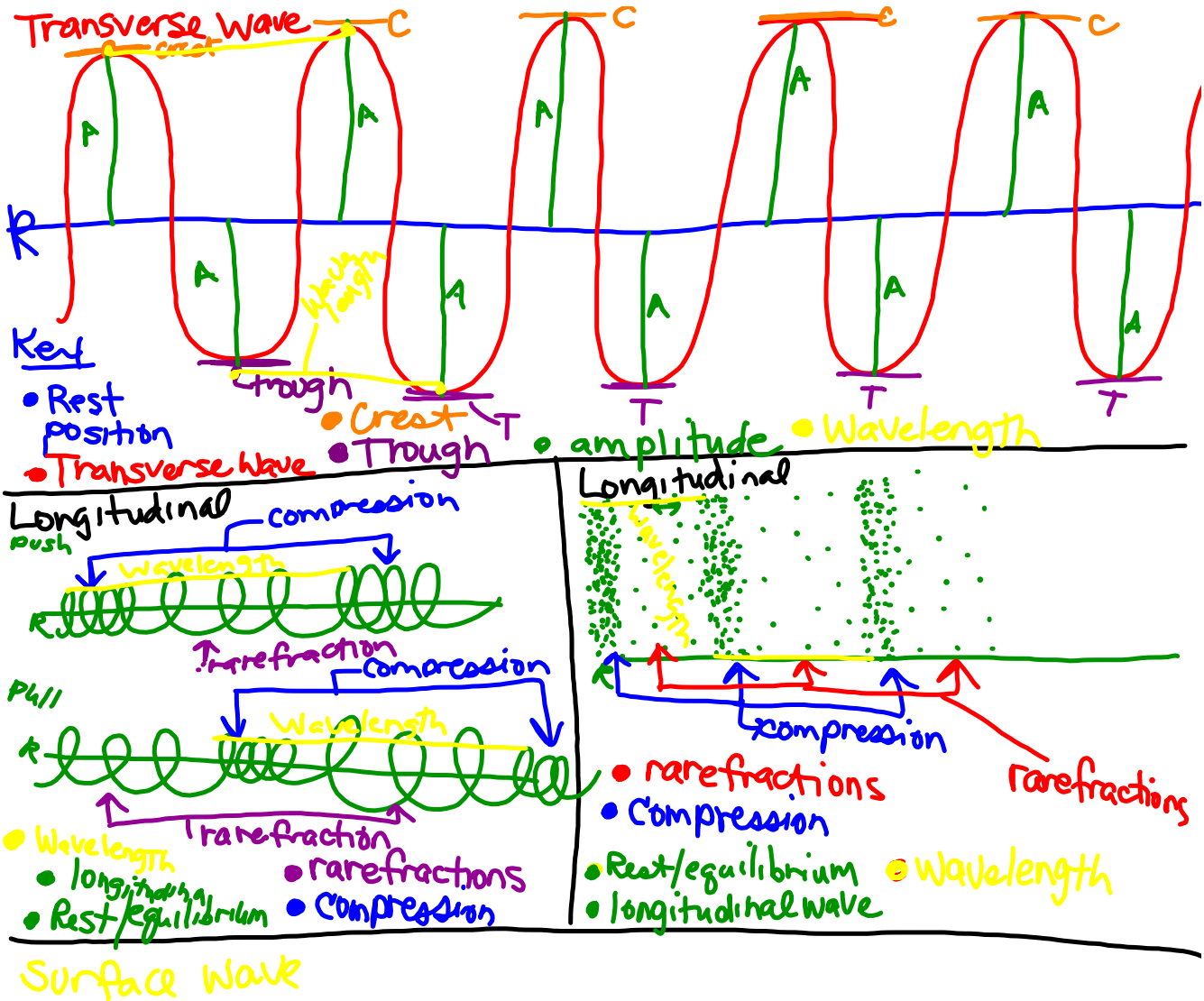
Swimmers disturb the water and cause waves. How does this affect their speed?

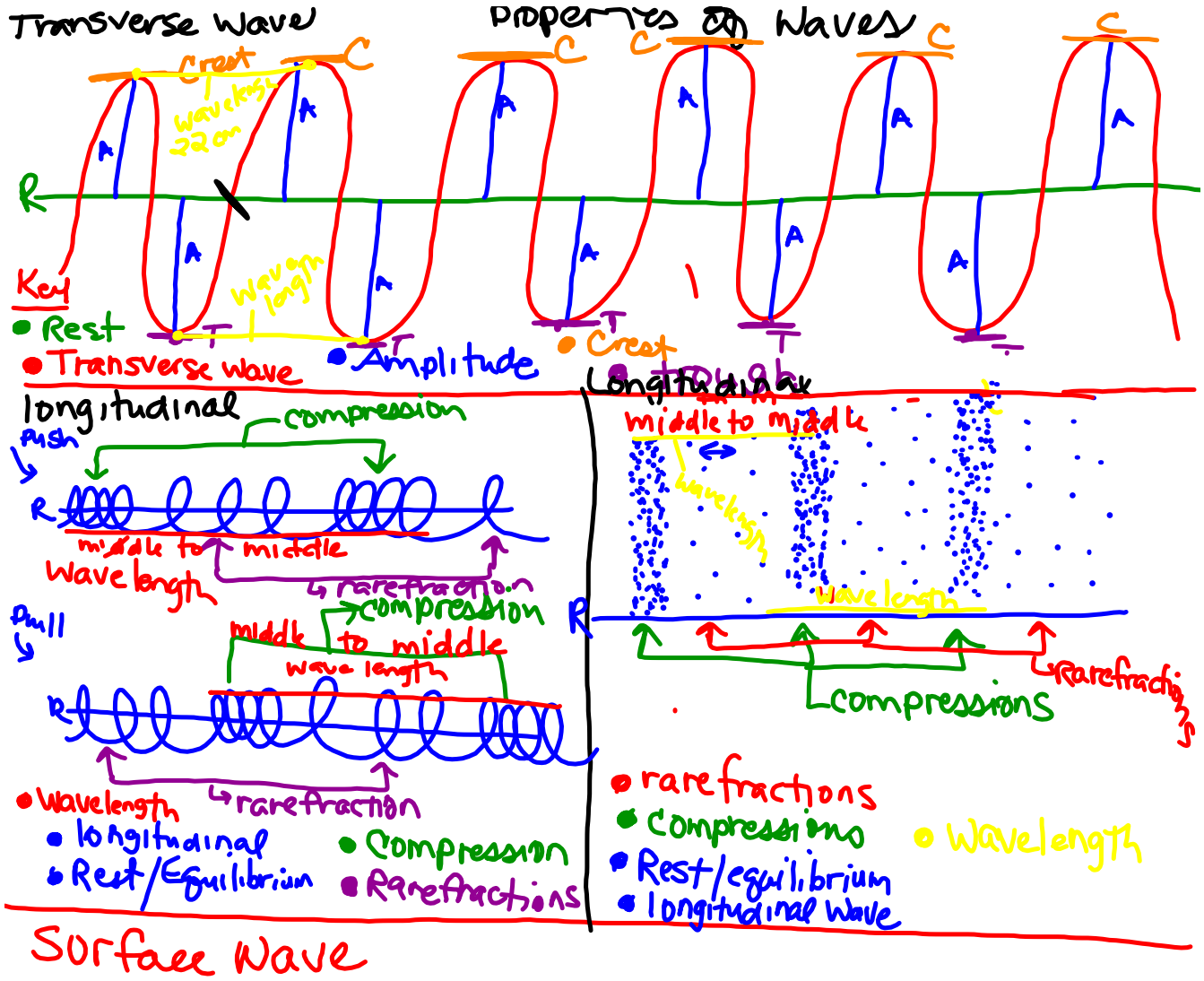
Identify features of fast pools and explain how they minimize waves.

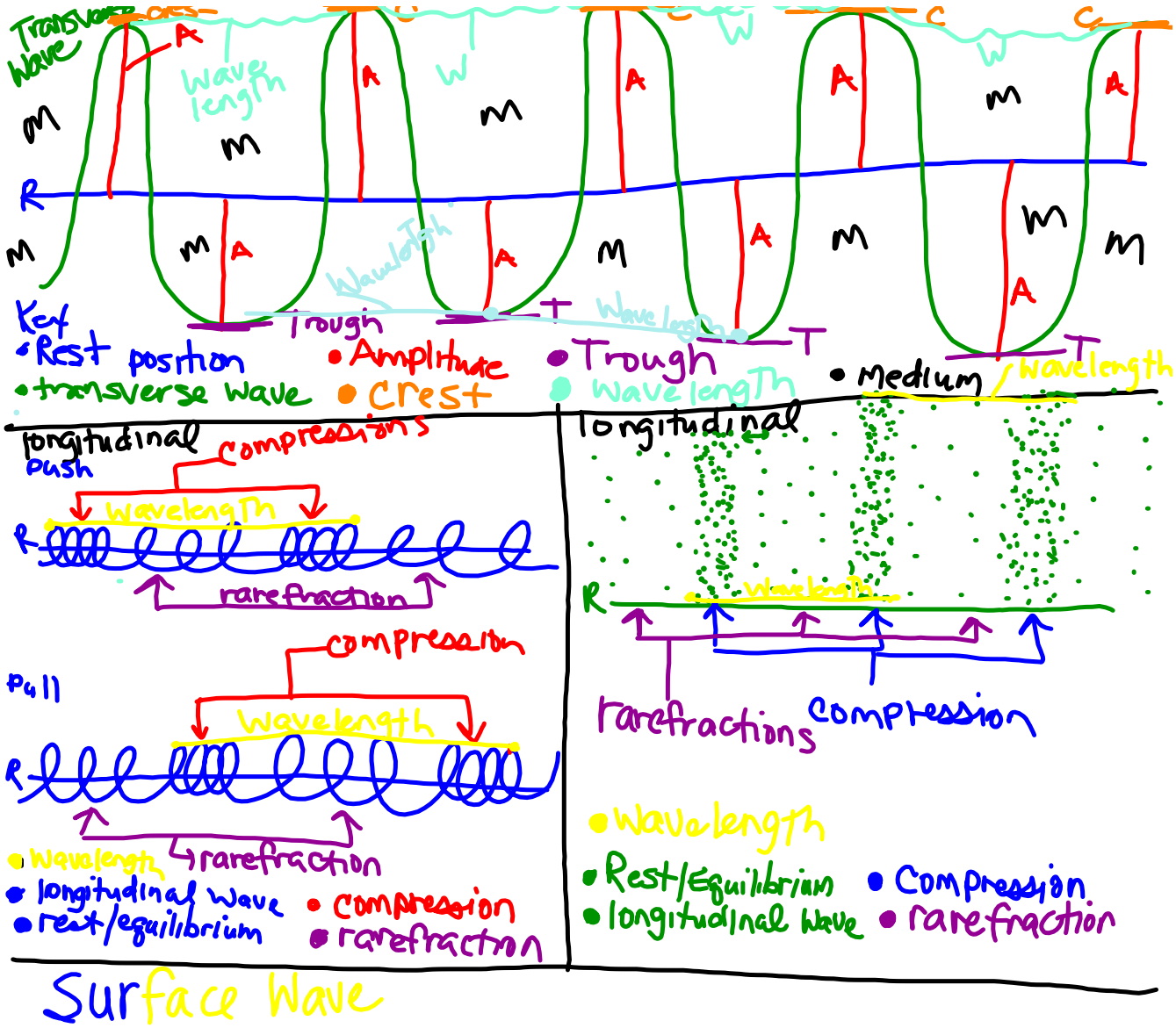
Why are the outer lanes of a pool often left empty during swimming competitions?

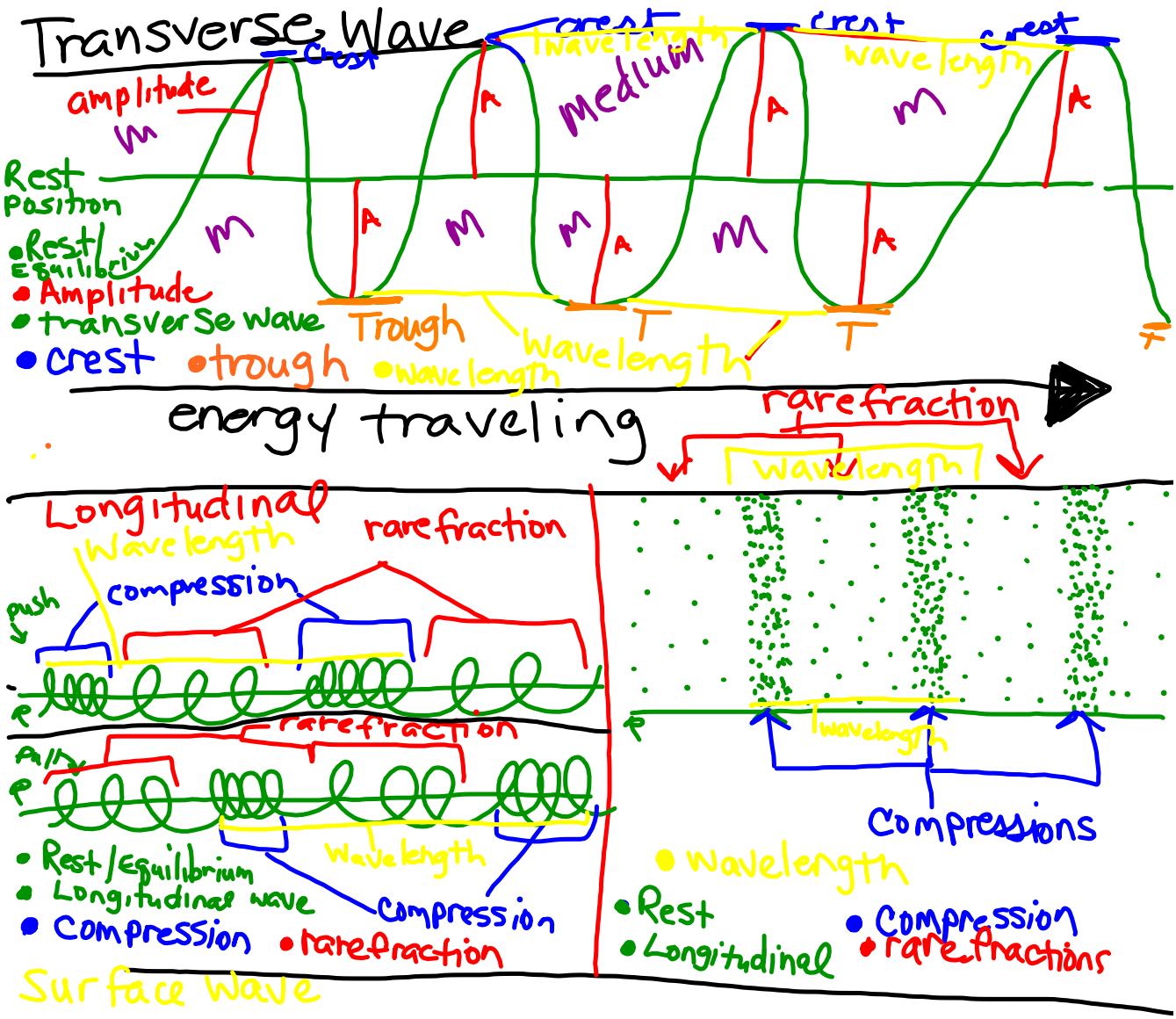
Open note quiz 267-275
write nb/or book page you found answer on

Speed Pool


Transverse Wave
crest
C
A
R
trough
Key
Rest position
Transverse Wave
Crest
Trough
T
amplitude
Wavelength
Longitudinal
push
compression
wavelength
rarefraction
pull
Wavelength
Wavelength
rarefractions
Compression
Rest/equilibrium
Longitudinal wave
Longitudinal
compression
rarefractions
rarefractions
Surface Wave

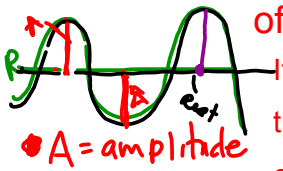

Transverse wave
properties of Waves
Crest
wavelength 2 cm
C
A
R
T
Key
Rest
Transverse wave
Amplitude
Crest
Trough
longitudinal
compression
push
middle to middle
Wavelength
rarefraction
pull
middle to middle
wave length
rarefraction
Wavelength
longitudinal
Rest/Equilibrium
Compression
Rarefractions
Longitudinal
middle to middle
wavelength
Wavelength
compressions
Rarefractions
rarefractions
compressions
Rest/equilibrium
longitudinal wave
Wavelength
Surface Wave


Transverse wave
wavelength
Key
Rest position
transverse wave
Amplitude
crest
Trough
wavelength
longitudinal
push
compressions
wavelength
rarefraction
pull
compression
wavelength
rarefraction
wavelength
longitudinal wave
rest/equilibrium
compression
rarefraction
Surface Wave
Trough
wavelength
medium
wavelength
longitudinal
rarefractions
compression
wavelength
Rest/Equilibrium
Compression
longitudinal wave
rarefraction


Transverse Wave
crest
amplitude
A
Medium
wavelength
Rest Position
Rest/Equilibrium
Amplitude
transverse wave
crest
trough
wavelength
Trough
T
energy traveling
rarefraction
wavelength
Longitudinal
Wavelength
rarefraction
compression
push
rarefraction
Rest/equilibrium
Longitudinal wave
Compression
rarefraction
Wavelength
Compression
Surface Wave
wavelength
Rest
Longitudinal
Compression
rarefractions
Compressions

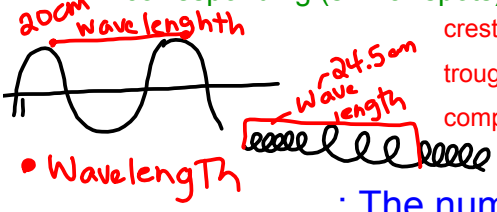
Calculating waves

Amplitude- measures the energy of a transverse wave



It is measured from the equilibrium / rest to the crest or trough

Wavelength: The distance between two corresponding (similar spots) On the wave.



crest to crest
trough to trough } Transverse
compression to compression longitudinal

Frequency: The number of waves that pass a certain spot in a certain amount of time

Unit of measurement is meters / second or hertz Hz

$f = \frac{\text{Speed}}{\text{wavelength}}$ ÷ m/s or hertz Hz

Speed: Is how far the wave travels In a given time . Determine

speed=wavelength x frequency

$S = W \times F$

1m X 1 Hz

Wavelength:Is the distance between two corresponding parts of the wave- trough to trough or crest to crest

Wavelength= Speed/Frequency

or

$W = \frac{S}{F}$ $\frac{342\ m/s}{50\ Hz} = 6.84\ m$

$S = W \times F$

$105 \times 620\ Hz = 6510\ m/s$

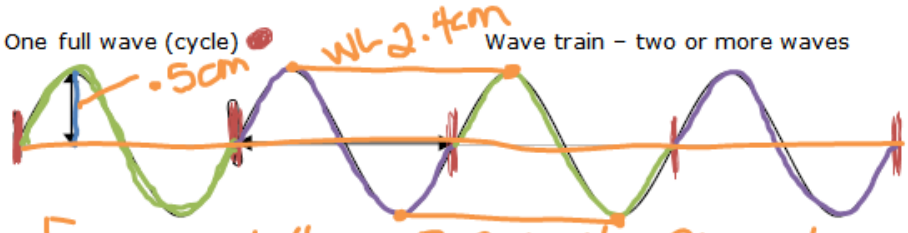
Wave Worksheet (1).doc

The pages that follow are the answers!

11/5/14

Wave Worksheet

One full wave (cycle)



Wave train – two or more waves

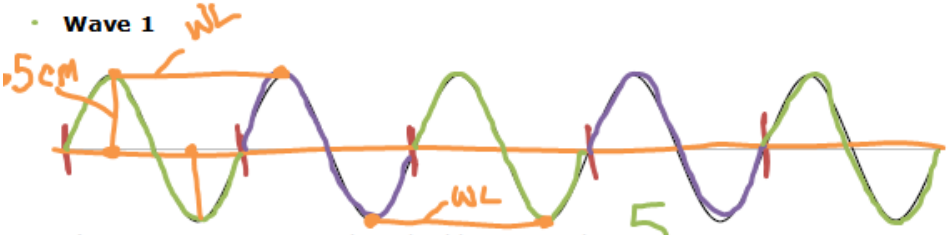
Frequency = 4 S = 2.4 x 4 = 96 cm/s

4 Waves on The wave train

Amplitude – measures the energy of a transverse wave
a) measured from the equilibrium position to the top of a crest or the bottom of a trough (see vertical arrow)
Wavelength – length of a single wave cycle (horizontal arrow double sided arrow)
Frequency-# of waves that pass a point in a given amount of time
Speed = wavelength x frequency

The time from the beginning to the end of the wave train in each situation is 1 second.

Wave 1

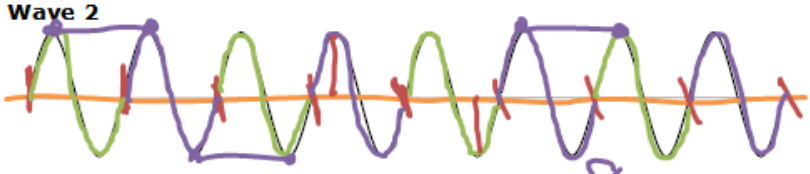


a) How many waves are there in this wave train? 5

b) Wavelength 1.8 cm c) Amplitude .5 cm d) frequency 5 Hertz e) speed 9 cm/s

11/5/14

Wave 2



a) How many waves are there in this wave train? 8

b) Wavelength 1 cm c) Amplitude .6 cm d) frequency 8 Hz e.) speed 8 cm/s

$S = W \times F$

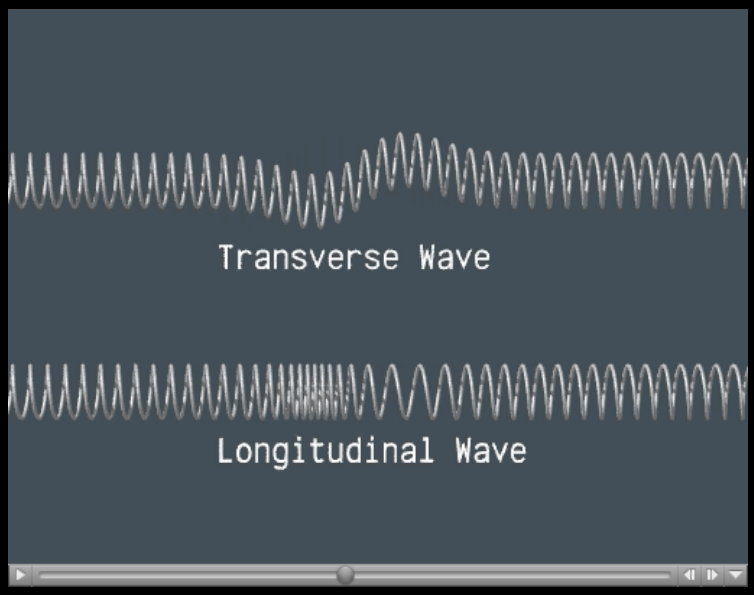
Wave 3

a) How many waves are there in this wave train? 3

b) Wavelength 3.2 cm c) Amplitude .4 cm d) frequency 3 Hz e.) speed 9.6 cm/s

$S = W \times F$

WAVE PULSES ON A SPRING

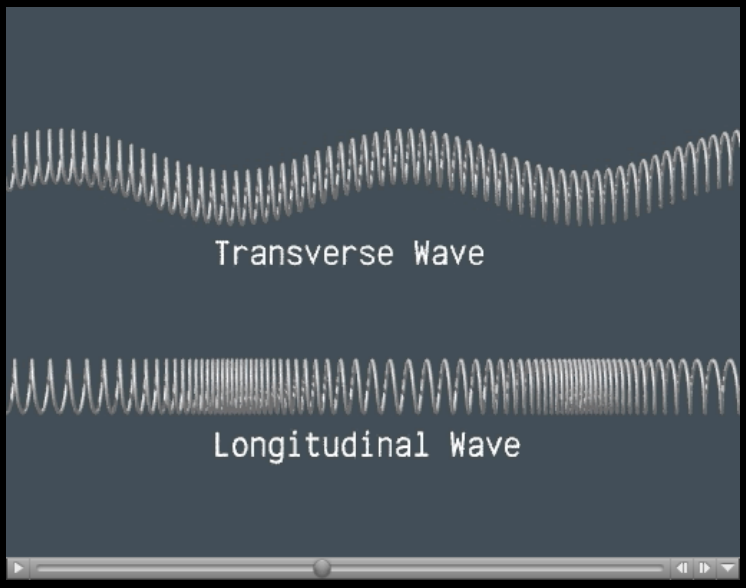


click for movie

by Dr. Michael R. Gallis
Penn State Schuylkill

SOME RIGHTS RESERVED

PERIODIC WAVES ON A SPRING



click for movie

by Dr. Michael R. Gallis
Penn State Schuylkill

SOME RIGHTS RESERVED

Waves on a string interactive lab

Waves on a string Student Phet lab sheet

The pages that follow are the answers

1. What happened to the amplitude?

2. What does that mean about the energy?

3. Where did The energy go?

Waves on a String Simulation

Amplitude setting	Height of wave at the start (be sure your ruler is lined up correctly)	Distance ring moves on pole (end)
100	11cm	3cm
50	5cm	2 cm
5	1cm	.5cm

Discuss what happened to the energy at the end of the wave when we changed the amplitude.

The energy of each amplitude was lessened as it traveled across the wave because it had to use energy to push matter up & down.

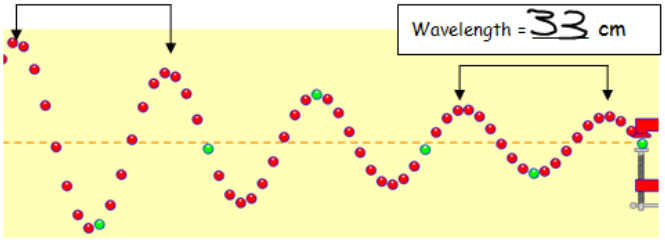
5. Repeat number 4 - using ◉ Fixed End and then ◉ No End

Why didn't we use these options for the experiment with the amplitude button?

- Try out the step button after you hit pause. This may be useful for collecting data.

Data:

wavelength = 33 cm



7. Talk about the wavelength of the two waves you measured.

How were the wavelengths similar and how they were different?

The wave length That I measured both had a measurement of 33 cm, but The amplitude decreased across The wave

Teacher check-off

5. Talk about the data.
   - Decide on a way your group can explain wave **frequency** to the class.
   - Write your idea(s) on the lines.

Amount of waves that pass a certain time. Lesser the frequency the less amplitude, which means less energy. The greater the frequency the lesser the wavelength

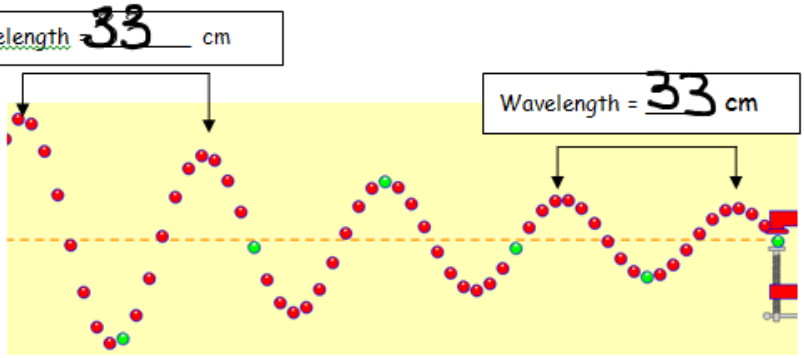
Frame: Our data show that the higher the number chosen for the frequency on the slider, the greater the number of waves passing certain spot in a certain amount of time.

Teacher Check- point

6. For this next part we will investigate **wavelength**.
   - You need to be on ◉ Oscillate
   - The rest of your screen should be set up like we did for **number 4**.
   - Try out the step button after you hit pause. This may be useful for collecting data.

Data:

wavelength = 33 cm



7. Talk about the wavelength of the two waves you measured.

How were the wavelengths similar and how they were different?

The wavelength on pulse got larger because The wave lost energy. When The wave was on oscillate a constant flow of energy & kept The wavelength The same distance which means energy stayed The same

Teacher check-off

2

Waves on a String Simulation

4. Fill in the table by working together counting the waves and using the timer.

$F = \frac{\#}{W}$

Data:

frequency	Time interval	Number of waves:			**Average** number of waves counted in 10 second period	Number of waves in 1 second **frequency***
		Trial #1	**Trial #2**	**Trial #3**		
50	10 seconds	18	19	18	18÷10	1.8 Hz
10	10 seconds	5	5	5	5÷10	.5 Hz
100	10 seconds	32	31	31	31÷10	3.1 Hz

*To find **frequency**, divide the **average** number of waves counted by the **time interval.**

Waves on a String Simulation

- Decide on a way your group can explain wave **frequency** to the class.
- Write your idea(s) on the lines.

Find The amount of waves in certain distance in a set time.

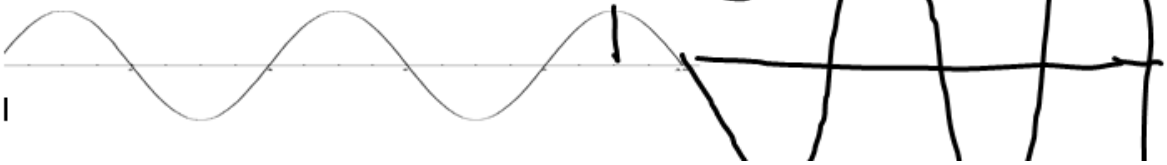
$F = \frac{S}{W}$

Frame: Our data show that the higher the number chosen for the frequency on the slider, the more the number of waves passing a point in a certain amount of time.

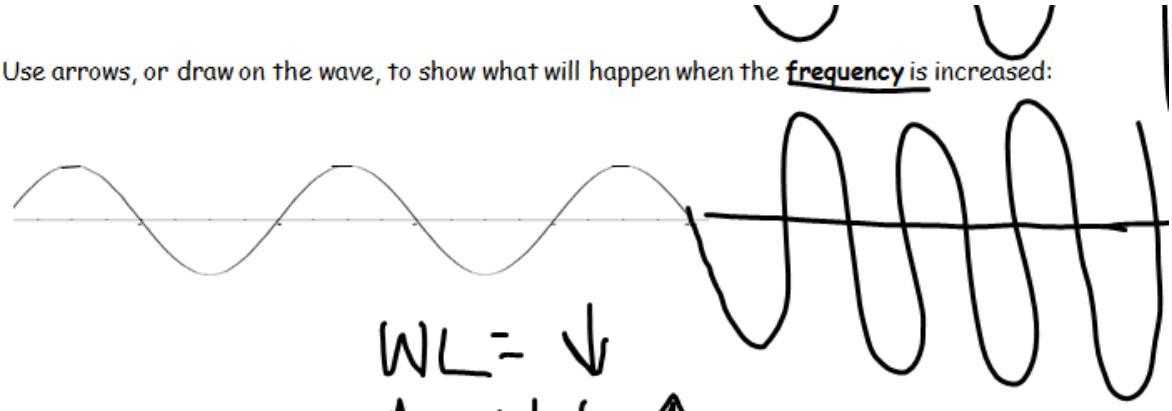
Frame: Our data show that the higher the number chosen for the frequency on the slider, the more the number of waves passing a point in a certain amount of time.

6. Use arrows, or draw on the wave, to show what will happen when the **amplitude** is increased:

energy ↑ WL = ↓ Freq. ↑

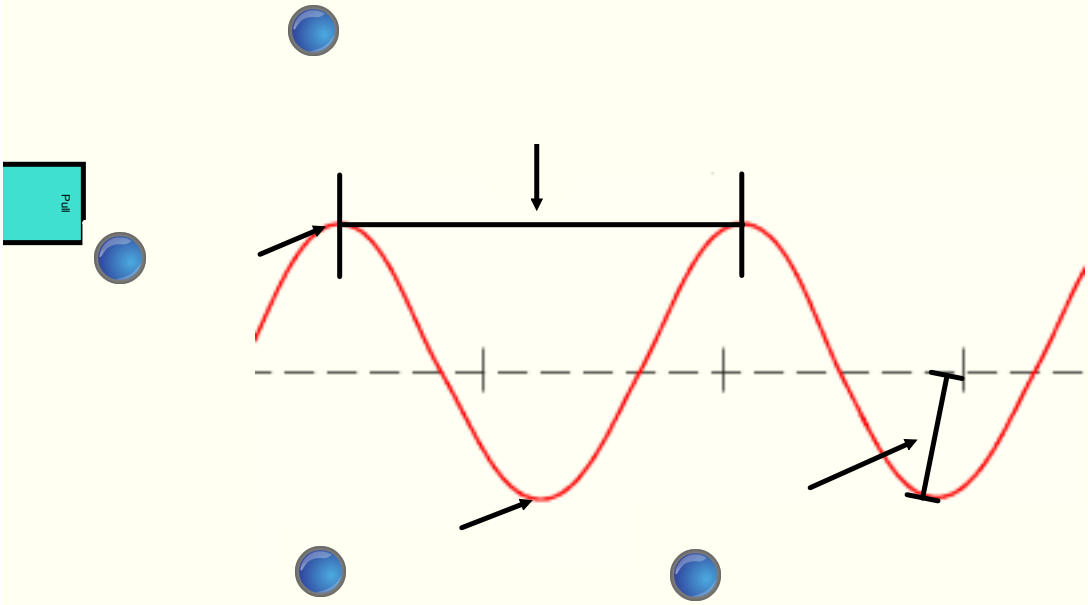


7. Use arrows, or draw on the wave, to show what will happen when the **frequency** is increased:

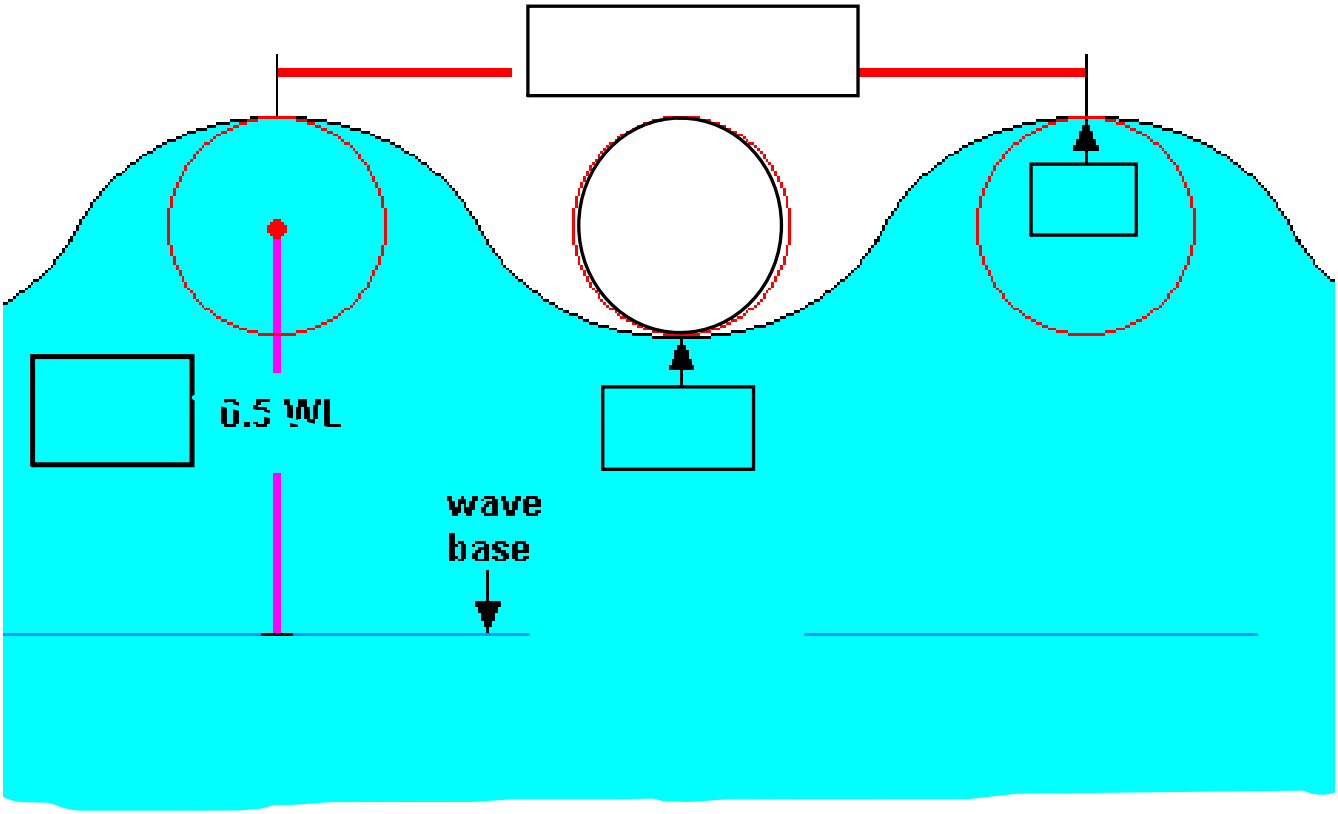


WL = ↓
Amplitude = ↑
energy = ↑

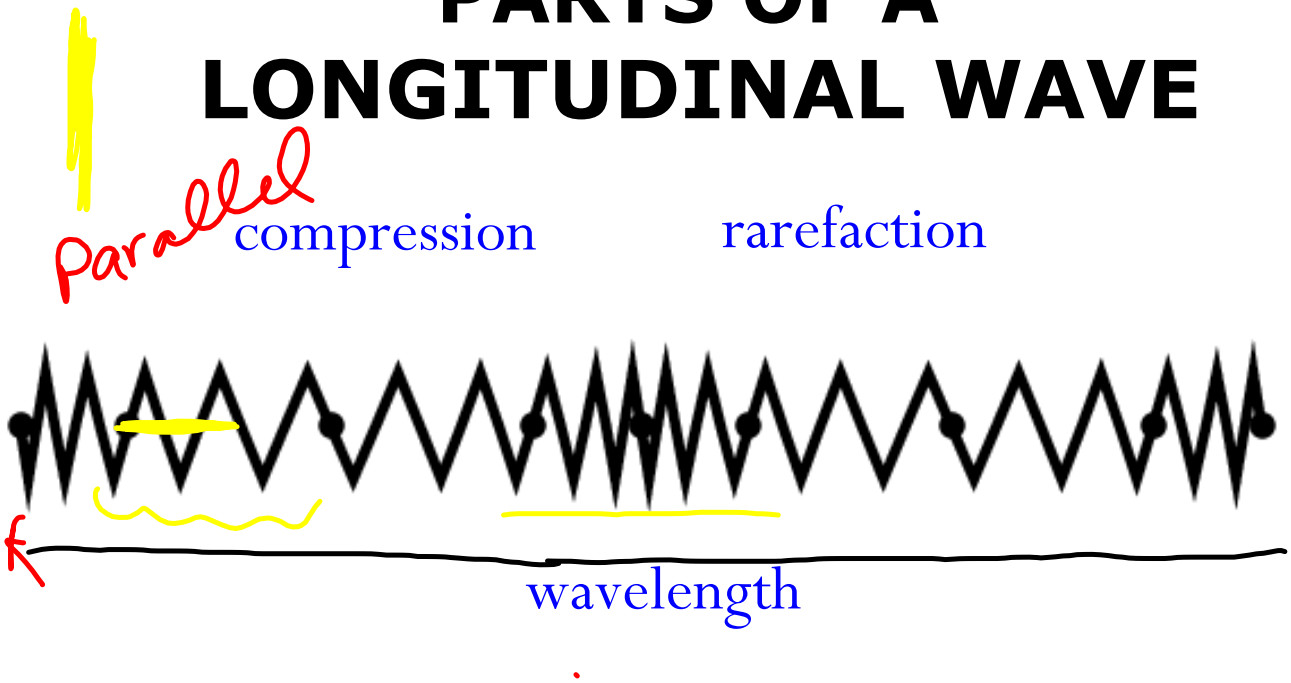
Properties of Transverse Waves



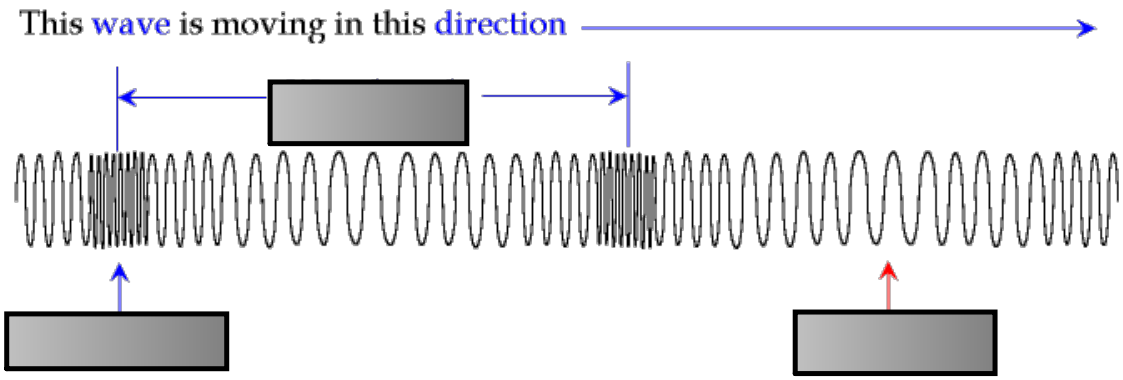
Properties of Surface Waves



PARTS OF A LONGITUDINAL WAVE



Properties of Longitudinal Waves



276

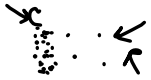
The Nature of Sound : What is Sound?

It is a disturbance in a medium (solid, liquid, or gas) That forms Vibrations. The repeated. Vibrations form a wave that carries energy

It's a longitudinal wave

Making Sound Waves

A disturbance in a medium. Which moves The matter in the medium parallel to the rest position. When the matter is pushed together they are called a compression. After The compression the Matter bounces back to its rest position called a rarefraction

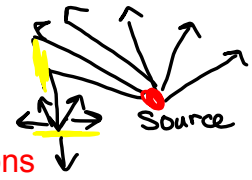


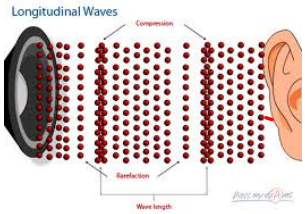
How Sound Waves Travel

They carry energy through a wave -They vibrate particles in the medium can travel through solids, liquids gasses

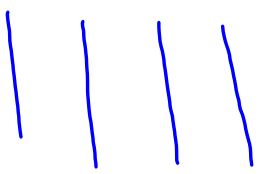
Diffraction of Sound Waves

Longitudinal waves do not travel in only one direction. They can bend and travel around corners in all directions





Longitudinal



What Factors Affect the Speed of Sound

Temperature

The colder the temperature the Slower the speed of longitudinal wave.

Stiffness (State of matter)

Longitudinal waves travel faster in medium that is more stiff (solid)

Density :

The more dense a medium is The slower the longitudinal wave

Mrs. Jeffcotts room more dense compared to Mrs. McClures room less dense

The Nature of Sound

What is Sound?

(solid,
That forms
Vibrations. The repeated.
Vibrations form a wave that
carries energy.

Making Sound Waves

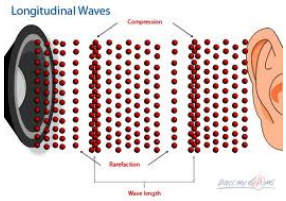
A disturbance in a medium. Which moves The matter in The medium parallel to The rest position. When The matter is pushed together They are called a compression. After The compression The matter bounces back to its rest position called a rarefraction.

How Sound Waves Travel

: They carry energy through a wave. The vibrate particles in The medium can travel through solids, liquids & gasses.

Diffraction of Sound Waves

Longitudinal waves do not travel in only one direction. They can bend and travel around corners in all directions



What Factors Affect the Speed of Sound

Temperature

The sound waves in longitudinal waves travel faster slower when the temperature is colder. warmer

Stiffness

(State of matter

Longitudinal waves travel faster through solid stiff matter better than liquids and gasses.
(train rail)

Density

: the more dense an area the Slower the sound wave (longitudinal wave)

(Mrs. Jeff co H's very dense room compared to Mrs. McClure s room)

What is Sound

Making Sound Waves

How sound waves travel

Diffraction of Sound Waves

What factors Affects the Speed of Sound

Temperature

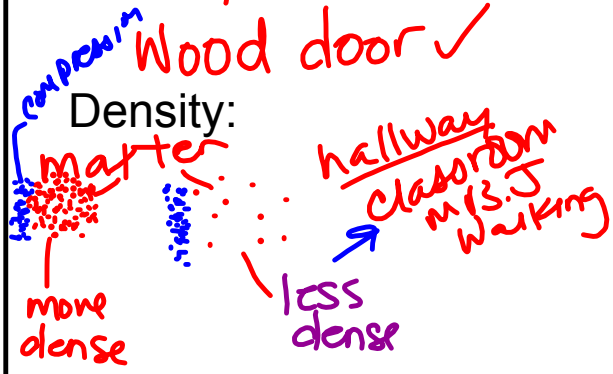
Stiffness

Sound travels faster when the medium is more sturdy (solid)

Water

Wood door ✓

Density:



-Sound travels slower in denser medium

sound graphic organizer.doc

what affect loudness

a loudness depends

on the intensity
Of a sound wave
The greater the

amplitude of the wave
The louder it sounds

-intensity-the amount

of energy a sound wave

has in a sec as it travels

Through an area.

Pitch

the frequency of

a longitudinal

- affects The pitch. The more

frequent The higher

the pitch - The less frequent the

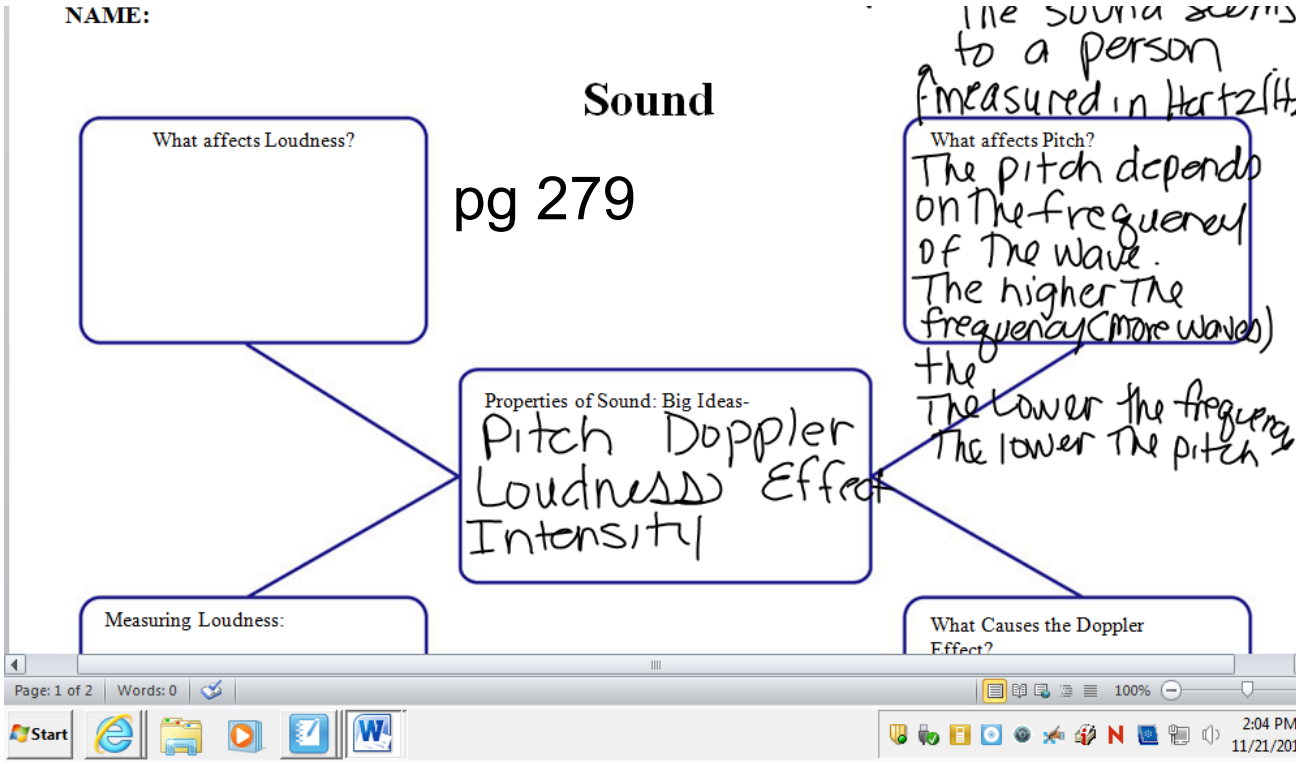
lower the pitch

higher

. high pitch

pitch

lower


NAME:
Sound
pg 279
What affects Loudness?
What affects Pitch?
The pitch depends on the frequency of the wave. The higher the frequency (more waves) the
The lower the frequency the lower the pitch
Properties of Sound: Big Ideas-
Pitch Doppler
Loudness Effect
Intensity
Measuring Loudness:
What Causes the Doppler Effect?
Page: 1 of 2
Words: 0
100%
Start
2:04 PM
11/21/201

Sound

Properties of Sound: Big Ideas-
Pitch Doppler Effect
Loudness
Intensity

What affects Loudness?
depends on the energy and intensity of a longitudinal sound wave.
-The more energy the louder it sounds

282-283

284 The amount of energy a wave carries over a certain area.

Measuring Loudness:
We measure loudness in decibels (dB)
-A 10 dB increase represents a tenfold (mult. by 10) increase
30dB to 50dB 50 - 30 = 20dB
10x10=100x's more intense
★ Over 100dB can damage your ear permanently.

What affects Pitch?
The pitch depends on the frequency of the wave.
The higher the frequency (more waves) the
The lower the frequency the lower the pitch

pitch-how high or low the sound seems to a person
measured in Hertz (Hz)

What Causes the Doppler Effect?
The doppler effect occurs because the motion of the source causes the wave to either get close together or spread out

pic pg 856

Low pitch

High pitch

Longitudinal Waves

Energy

Compressions

Tuning Fork Lab

Tuning Fork Lab Sheet

Pitch

Rarefactions

Frequency

11/14/14

Name: _____ Period: _____

Tuning Fork Lab

What is a tuning fork?

Tuning forks are U-shaped metal objects with a handle. They can be made of steel or aluminum. A tuning fork can give you a standard pitch. Musicians use them to tune their instruments.

Most tuning forks have their pitch (or frequency) stamped on the handle. A tuning fork marked 256 gives off 256 vibrations per second and has a frequency of 256 Hz. This is equal to "C" on the musical scale. A tuning for marked 384 give off 384 vibrations per second and has a frequency of 384 Hz. This is equal to "G" on the musical scale.

Question: How do the size and pitch of a tuning fork effect its sound and the waves it creates?

Materials:

-3 different tuning forks -1 cup of water -paper towels

11/14/14

Procedure:

1. You and your partner will test the sound of 3 different tuning forks. Write a description of each tuning fork in the chart. Use this chart to record your observations.

2. Complete the "Listen" section of the chart for each tuning fork.

3. Tap each tuning fork against the sole of your shoe and listen. Record your observations and describe the pitch in the chart.

4. Complete the "Water" section of the chart for each tuning fork.

5. Fill a cup with 4 cm of water.

6. Tap each tuning fork against the sole of your shoe and place the tips of the prongs in the water. Record your observations in the chart.

11/14/14

Conclusion:

1. Rank you tuning forks from lowest to highest pitch.
Answers will vary according to your group

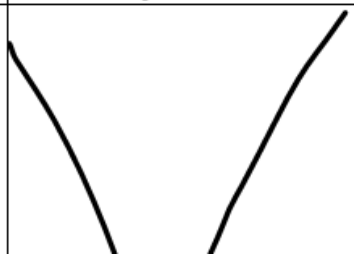
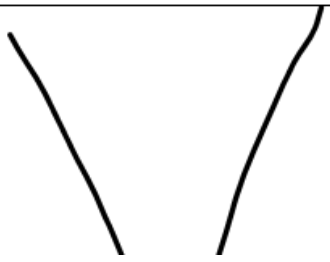
2. Which tuning fork made the most waves in the water? The highest frequency

3. Which tuning fork made the fewest waves? The lowest frequency

4. Based on your observations, how do the size and pitch of a tuning fork affect its sound and the waves it creates? The higher the frequency the higher the pitch and the more waves created by the tuning fork.

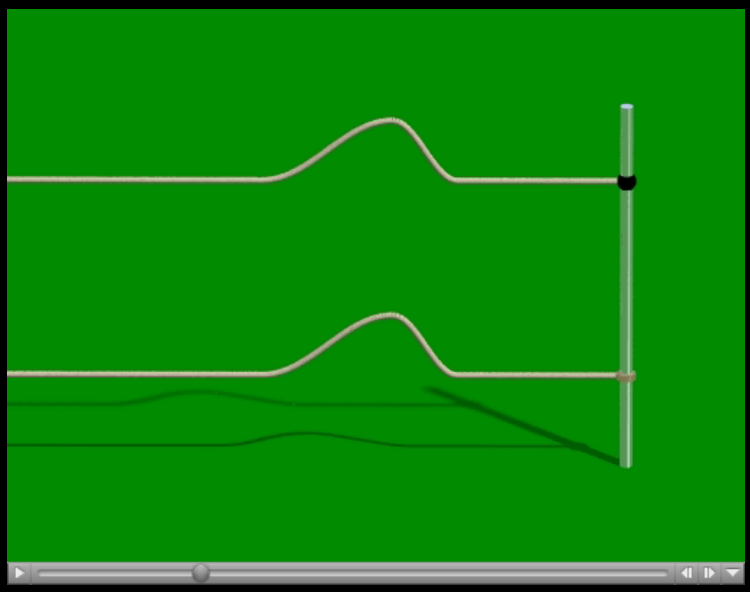
11/14/14

Observation Chart

	Description of tuning fork (pitch, length, thickness)	Observations (What do you see or hear?)	Description of the pitch (low, med, high)
Listen Tuning Fork #1	Answers will vary per group		high pitch highest #
Listen Tuning Fork #2	300↑ Answers will Vary per group		med pitch middle #
Listen Tuning Fork #3	Answers 200 will vary per group		lowest pitch lowest #
Water Tuning Fork #1			

WHAT DO YOU THINK HAPPENS WHEN A WAVE REACHES A BOUNDARY?

WAVE PULSE REFLECTION



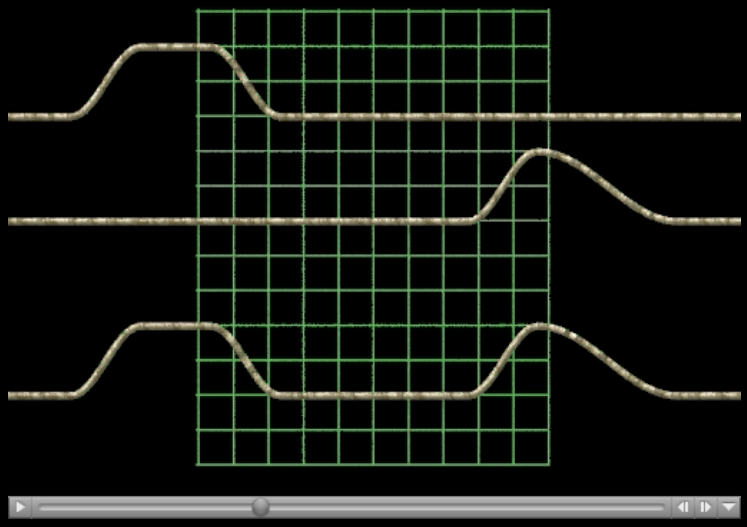
click for movie

by Dr. Michael R. Gallis
Penn State Schuylkill

SOME RIGHTS RESERVED

WHAT DO YOU THINK HAPPENS WHEN TWO WAVES MEET EACH OTHER?

CONSTRUCTIVE INTERFERENCE



click for movie

by Dr. Michael R. Gallis
Penn State Schuylkill

SOME RIGHTS RESERVED

Attachments

- Wave Vocabulary.doc
- Waves_Notes.doc
- Speed Pool
- Wave Worksheet (1).doc
- Waves on a string
- Waves on a string Student Phet (3).doc
- sound graphic organizer.doc
- Extreme Waves
- Tuning+Fork+lab.doc