Name: KEY Period: _____

Waves and Sound Test Review

Use this review as well as your notes, homework, and labs from this unit to help you study for the test.

1. Define the following

Waves and Sound Formulas

$$f = \frac{\#\ oscillations}{time}$$

$$T = \frac{time}{\#\ oscillations}$$

$$f = \frac{1}{T} \qquad T = \frac{1}{f}$$

$$v = f\lambda \qquad v = \frac{d}{t}$$

   a. Frequency

How many oscillations (waves) every second.

   b. Period

The time needed for each oscillation (wave).

   c. Mechanical Wave

Requires a medium. (ex. sound)

   d. Electromagnetic Wave

Does not require a medium (ex. light)

   e. Reflection

A wave encounters a boundary and "bounces" off.

   f. Refraction

The bending of a wave entering a new medium as it changes speed.

   g. Diffraction

The bending of a wave around an obstacle.

   h. Resonance

One object causes another to vibrate at its natural frequency.

2. Is the speed of sound greater in air or water? Why?

Water. It is more dense (particles are closer together)

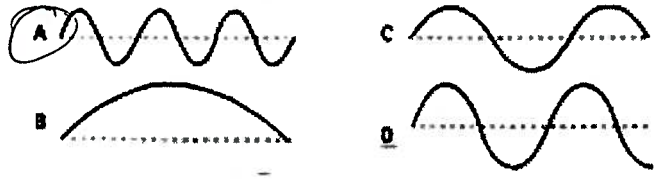
3. How are wavelength and frequency related if the speed of a wave is kept constant?

They are indirectly (inversely) related.

4. An astronaut is floating along in outer space when he sees an alien spaceship explode! Does the astronaut *hear* the explosion as well as see it? Why?

No. Sound is a mechanical wave and requires a medium (such as air) to travel through.

5. **Which of these waves has the highest frequency?**



6. **Jenny notices that whenever she sings a certain note, all of the windows in her house start to shake. Explain what this phenomenon is called and why it occurs.**

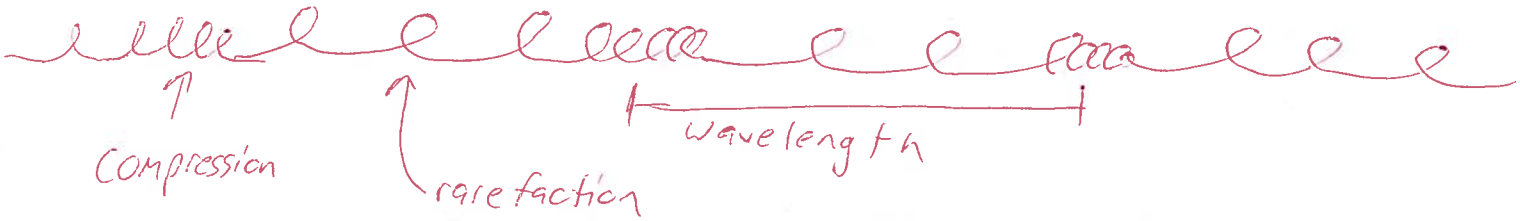
This is called resonance. The sound waves match the natural frequency of the glass which causes them to vibrate.

7. **Below are two situations demonstrating waves coming toward each other in a medium. For both situations, <u>sketch</u> the resulting wave that occurs at the point where the two waves coincide.**

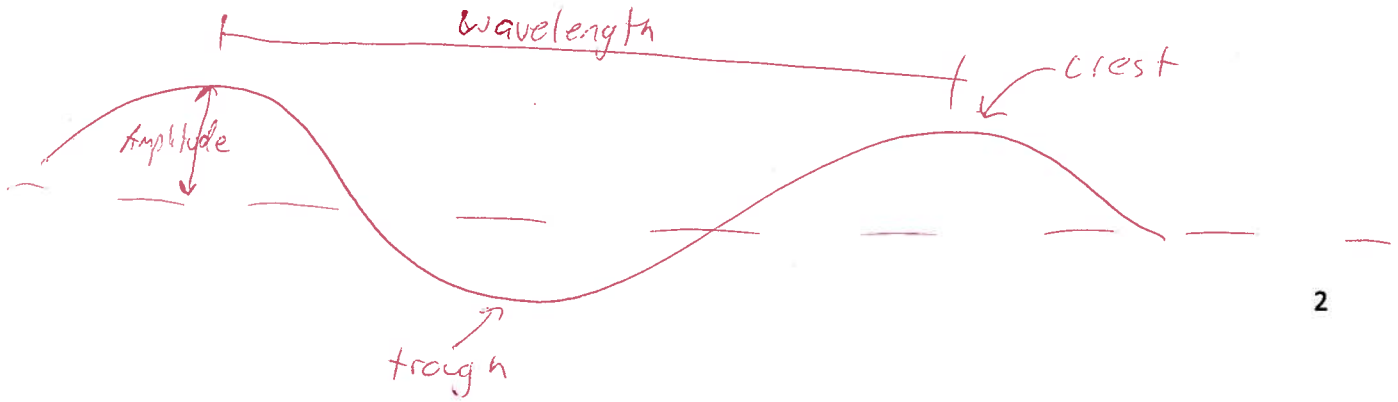
8. **You are standing on a street corner observing a noisy car that is driving toward you. Describe what the sound of the car will be like as it passes by and explain why this occurs.**

The frequency of the sound will be greater as the car moves toward you and will be less as it moves away. This is called the Doppler Effect

9. **Draw a longitudinal wave and label compression, rarefaction, and wavelength**



10. **Draw a transverse wave and label crest, trough, amplitude and wavelength**



11. The speed of a wave in a certain stretched slinky is found to be 4.94 m/s. Suppose a student produced waves in the slinky by moving their hand back and forth 60 times every 20 seconds.
    a. What is the frequency of the waves?

$f = \frac{\#osc}{time} = \frac{60}{20} = 3Hz$

    b. What is the wave period?

$T = \frac{1}{f} = \frac{1}{3} = 0.33\,sec$ or $T = \frac{time}{\#osc} = \frac{20}{60} = 0.33\,sec$

    c. What is the wavelength of each wave?

$V = f\lambda$

$4.94 = (3)\lambda \rightarrow \lambda = \frac{4.94}{3} = 1.65m$

12. A tuning fork has a fundamental frequency of 512 Hz. How many seconds does it take for the tuning fork to complete one vibration?

$T = \frac{1}{f} = \frac{1}{512} = 0.002\,s$

13. A dolphin produces a sound wave that has a wavelength of 0.075 meters and a frequency of 21,000 Hz. The dolphin hears the echo after 0.58 seconds because the sound has reflected off of a fish. How far away is the dolphin from the fish?

$t = \frac{0.58}{2} = 0.29s$

$V = f\lambda$

$V = (21{,}000)(0.075)$

$V = 1575\,m/s$

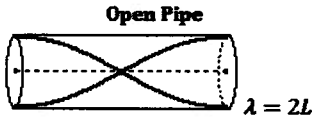
$V = \frac{d}{t}$

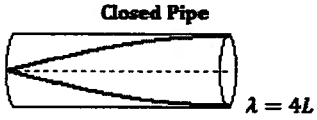
$1575 = \frac{d}{.29}$

$d = (1575)(.29) = 457m$

14. A standing wave is produced in a closed pipe that has a length of 0.5 meters. What is the wavelength of the wave?

$\lambda = 4L = 4(.5) = 2m$





15. A student is performing a lab where they are attempting to calculate the speed of sound. The student holds a 380 Hz tuning fork over an *open* tube and notices that the sound is amplified greatly when the tube is a length 45 cm. Calculate the speed of sound in this experiment.

$V = f\lambda$

$V = (380)(.9)$

$V = 342\,m/s$

$\lambda = 2L$

$\lambda = 2(.45)$

$\lambda = 0.9m$