② $T = \frac{1}{f}$ $V = f\lambda$ $V_{string} = \sqrt{\frac{Tension}{mass\ density}}$

harmonics 1 2 3 4 ...

String & open Tube = $\frac{1}{2}\lambda, \lambda, \frac{3}{2}\lambda, 2\lambda \ldots$

Closed Tube $\frac{1}{4}\lambda, \frac{1}{2}\lambda, \frac{3}{4}\lambda, \ldots$

harmonics 1 2 3 ...

Name_____

20 points, due _____

Period ____

WAVES STUDY SHEET

1. The speed of transverse waves on a spring is 15 m/s. If the source produces a disturbance every 0.2 seconds, what is the wavelength of the waves produced?

$V = f\lambda$ $T = .2s = \frac{2}{10}s = \frac{1}{5}s$ $f = \frac{1}{\frac{1}{5}s} = 5hz$ $V = f\lambda$ $\lambda = \frac{V}{f} = \frac{15m/s}{5hz}$ $\lambda = 3m$

2. If a wave generator produces 10 meter-long waves every 4 seconds, calculate the wave speed.

$V = f\lambda = (\frac{1}{4}hz)(10m) = 2.5\ m/s$ $f = \frac{1}{4}hz$

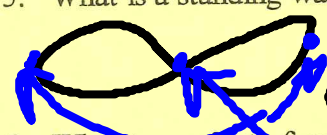
3. The violin 'A' string (440 Hz) has a length of 30 cm. At what speed does the fundamental frequency travel along the string?

$\frac{1}{2}\lambda = .3m$ $\lambda = .6m$ $V = f\lambda = (440hz)(.6m)$ $V = 264.0\ m/s$

4. A trumpet is an open tube with a length of 150 cm. Calculate the lowest note (fundamental frequency) that it can play. Assume v = 340 m/s.

$\frac{1}{2}\lambda = 1.5m$ $\lambda = 3m$ $V = f\lambda$ $f = \frac{V}{\lambda} = \frac{340m/s}{3m} = 113.3\ Hz$

5. What is a standing wave? How is it formed?



2 or more waves pass through each other and interfere with the same/multiple frequency. Appears to stand still with nodes & antinodes.

6. What type of interference produces nodes? Anti-nodes?

destructive constructive same amplitude

7. What is resonance? What conditions lead to its production?

↳ continual amplification of a standing wave.

External source of similar frequency: continuous amplification.

8. A rope, fixed at both ends, is vibrated by a machine at a fixed frequency (similar to the class demo). If the rope is placed under more tension, what will happen to wavelength? Why?

$V = \sqrt{Tension / mass\ density}$ since $V = f\lambda$ ↑Tension = ↑V ↑V = ↑λ so λ increases

9. Describe the difference between transverse and longitudinal waves. Give an example of each.

oscillates ⊥ to energy flow

oscillates ∥ to energy flow.

Transverse examples: WATER, LIGHT

longitudinal examples: SOUND

10. A microwave is simply a chamber with waves passing through it to heat up food. What is the danger of allowing the microwaves to become standing waves? How is this prevented?

standing wave created back to source = blows up food

fans and rotating food mixes up waves so not to create a standing wave