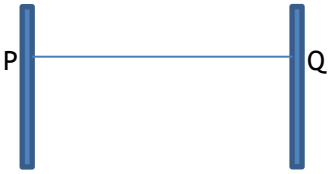
AP Physics
Sound and Wave Test

Name:_____
Period: 2-3A 3B-4 5-6A 6B-7



A rope is stretched between vertical supports. The points where it's attached (P and Q) are fixed. The linear density of the rope is 0.4 kg/m, and the speed of transverse waves on the rope is 12m/s.

a) What is the tension in the rope?

b) With what frequency must the rope vibrate to create a traveling wave with a wavelength of 2 m ?

The rope can support standing waves of lengths 4 m and 3.2 m, whose harmonic numbers are consecutive integers.

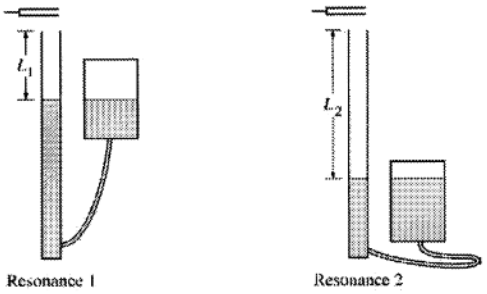
c) Find the length of the rope.

d) Find the mass of the rope

e) What is the harmonic number of the 4 m standing wave?

f) On the diagram below, sketch the 4m standing wave, label the nodes and antinodes.

P●----------●Q



Note: Figure not drawn to scale.

A vibrating tuning fork is held above a column of air, as shown in the diagrams above. The reservoir is raised and lowered to change the water level, and thus the length of the column of air. The shortest length of air column that produces a resonance is L_1 = 0.25 m, and the next resonance is heard when the air column is L_2 = 0.80 m long. The speed of sound in air at 20°C is 343 m/s and the speed of sound in water is 1490 m/s.

(a) Is the tube considered an open tube or a closed tube. Explain.

_____open _____closed

(b) Calculate the wavelength of the standing sound wave produced by this tuning fork.

(c) Calculate the frequency of the tuning fork that produces the standing wave, assuming the air is at 20°C.

(d) Calculate the wavelength of the sound waves produced by this tuning fork in the water.

(e) The water level is lowered again until the next resonance is heard. Calculate the length L_3 of the air column that produces next resonance.

(f) The student performing this experiment determines that the temperature of the room is actually slightly higher than 20°C. Is the calculation of the frequency in part (b) too high, too low, or still correct?

_____Too high _____Too low _____Still correct

Justify your answer.