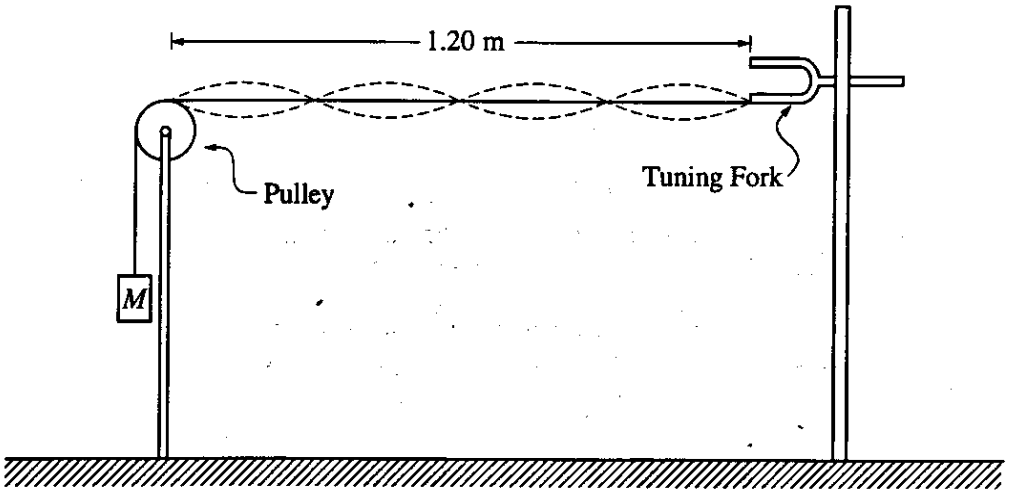
AP Physics Chapter 10/11 Test. Answer all 4 of the questions and email them back to me at jeff@szeryk.ca

1)



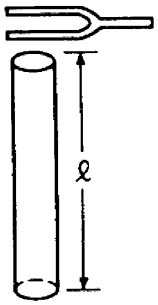
To demonstrate standing waves, one end of a string is attached to a tuning fork with frequency 120 Hz. The other end of the string passes over a pulley and is connected to a suspended mass *M* as shown in the figure above. The value of M is such that the standing wave pattern has four "loops." The length of the string from the tuning fork to the point where the string touches the top of the pulley is 1.20 m. The linear density of the string is 1.0×10^{-4} kg/m, and remains constant throughout the experiment.

(a) Determine the wavelength of the standing wave.

(b) Determine the speed of transverse waves along the string.

(c) The speed of waves along the string increases with increasing tension in the string. Indicate whether the value of *M* should be increased or decreased in order to double the number of loops in the standing wave pattern. Justify your answer.

2)



A hollow tube of length ℓ, open at both ends as shown above, is held in midair. A tuning fork with a frequency f_0 vibrates at one end of the tube and causes the air in the tube to vibrate at its fundamental frequency. Express your answers in terms of ℓ and f_0.

(a) Determine the wavelength of the sound.

(b) Determine the speed of sound in the air inside the tube.

(c) Determine the next higher frequency at which this air column would resonate.

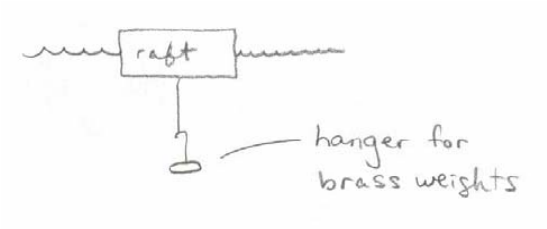
3) An object swings on the end of a cord as a simple pendulum with period *T*. Another object oscillates up and down on the end of a vertical spring, also with period *T*. If the masses of both objects are doubled, what are the new values for the periods?

Pendulum	Mass on Spring
(A) $\frac{T}{\sqrt{2}}$	$\sqrt{2}T$
(B) T	$\sqrt{2}T$
(C) $\sqrt{2}T$	T
(D) $\sqrt{2}T$	T

4) An unoccupied, 10 kg wooden raft made of driftwood with specific gravity 0.60 floats on the surface of a calm pond. [The density of water is 1,000 kg/m^3.]

a. What is the volume of the raft?

b. Determine the buoyant force acting on the raft while it floats.



Now a student under the water hangs brass (density = 8,000 kg/m^3) masses on a light string attached to the raft, as shown in the diagram above. The student adds a little at a time until the moment when the raft becomes completely submerged.

c. Determine the new buoyant force on the raft.

d. Calculate the minimum mass of brass that the student must hang from the raft to allow the raft to become completely submerged.

e. If instead the 10 kg raft were made of freshly cut wood with specific gravity 0.80, how would the answer to part (d) change? Check one box and justify your answer briefly.

□ More brass would be necessary.
□ Less brass would be necessary.
□ The same amount of brass would be necessary.