

This week we have only one hour for the tutorials. Please ask the students to do one (or two) problems on the blackboard from the following list.

To be handed in problem is attached at the end of this document.

For the problems to be marked each problem is worth 10 points

A student may discuss the problems with other students but may not copy from others.

Problem 21.13

A guitar string with a linear density of 2.0 g/m is stretched between supports that are 60 cm apart. The string is observed to form a standing wave with three antinodes when driven at a frequency of 420 Hz . What are (a) the frequency of the fifth harmonic of this string and (b) the tension in the string?

Problem 21.45

A steel wire is used to stretch a spring. An oscillating magnetic field drives the steel wire back and forth. A standing wave with three antinodes is created when the spring is stretched 8.0 cm . What stretch of the spring produces a standing wave with two antinodes.



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Problem 21.48

A narrow column of air is found to have standing waves at frequencies of 390 Hz , 520 Hz , and 650 Hz and at no frequencies in between these. The behavior of the tube at frequencies less than 390 Hz or greater than 650 Hz is not known.

- Is this an open-open tube or an open-closed tube? Explain.
- How long is the tube?
- Draw a displacement graph of the 520 Hz standing wave in the tube.
- The air in the tube is replaced with carbon dioxide, which has a sound speed of 280 m/s . What are the new frequencies of these three modes?

Problem 21.50

A 40-cm-long tube has a 40-cm-long insert that can be pulled in and out. A vibrating tuning fork is held next to the tube. As the insert is slowly pulled out, the sound from the tuning fork creates standing waves in the tube when the total length L is 42.5 cm, 56.7 cm, and 70.8 cm. What is the frequency of the tuning fork?

