

This print-out should have 9 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

Serway CP 14 03

001 10.0 points

A sound wave has a frequency of 755 Hz in air and a wavelength of 0.55 m.

What is the temperature of the air? Assume the velocity of sound at 0°C is 330 m/s.

Correct answer: 159.269°C.

Serway CP 14 67

002 10.0 points

By proper excitation, it is possible to produce both longitudinal and transverse waves in a long metal rod. In a particular case, the rod is 157 cm long and 0.203 cm in radius and has a mass of 36.2 g.

Find the required tension in the rod so that the ratio of the speed of longitudinal waves to the speed of transverse waves is 9. Young's modulus for the material is 7.2×10^{10} N/m².

Correct answer: 11507.7 N.

Power Output for Sound

003 10.0 points

A source of sound (1000 Hz) emits uniformly in all directions. An observer 3.08 m from the source measures a sound level of 57.7 dB.

Calculate the average power output of the source.

Correct answer: 70.1958 μ W.

Holt SF 13Rev 50

004 10.0 points

A rock group is playing in a club. Sound emerging outdoors from an open door spreads uniformly in all directions.

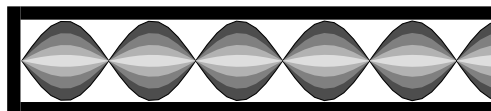
If the decibel level is 100 dB at a distance of 0.68 m from the door, at what distance is the music just barely audible to a person with a normal threshold of hearing? Disregard absorption.

Correct answer: 68000 m.

Standing Waves 23

005 (part 1 of 2) 10.0 points

The length of a hollow pipe is 473 cm. The air column in the pipe is vibrating and has six nodes.



Find the frequency of the sound wave in the hollow pipe. The speed of sound in air is 343 m/s.

Correct answer: 199.419 Hz.

006 (part 2 of 2) 10.0 points

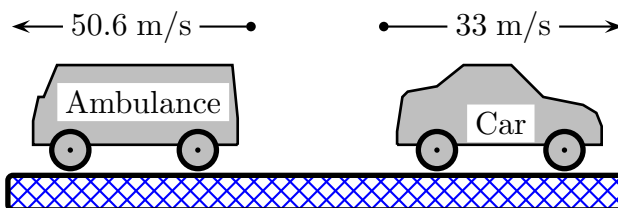
What is the fundamental frequency; *i.e.*, the lowest frequency the pipe can sustain?

Correct answer: 18.129 Hz.

Ambulance Siren and Car 01

007 (part 1 of 2) 10.0 points

An ambulance is traveling south at 50.6 m/s, away from a car that is traveling north at 33 m/s. The ambulance driver hears his siren at a frequency of 950 Hz.



What wavelength does a person who is standing between the car and the ambulance detect from the sound of the ambulance's siren? The velocity of sound in air is 343 m/s.

Correct answer: 0.414316 m.

008 (part 2 of 2) 10.0 points

At what frequency does the driver of the car hear the ambulance's siren?

Correct answer: 748.222 Hz.

Serway CP 14 25

009 10.0 points

An alert physics student stands beside the tracks as a train rolls slowly past. He observes the frequency of the train whistle at 472 Hz when the train is approaching him and 458 Hz when the train is receding from him.

What is the speed of the train? Assume the speed of sound in air to be 340 m/s.

Correct answer: 5.11828 m/s.