

Chapter

13

HOLT PHYSICS

Mixed Review

Sound

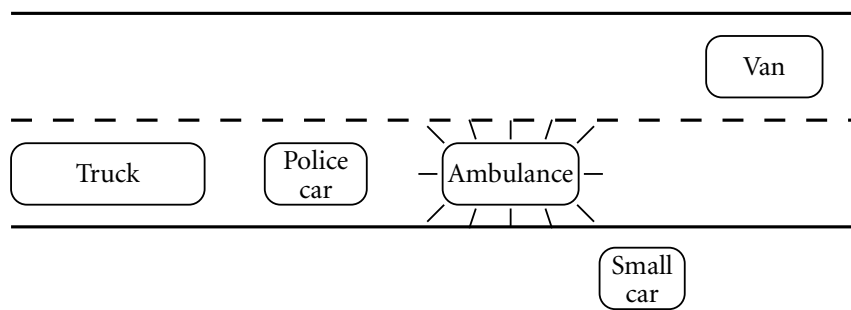
1. The speed of sound increases with temperature. It is 331 m/s in air at 0°C and 343 m/s in air at 20°C. A glass pipe vibrates with a frequency of 151 Hz.

a. What is the wavelength of the sound produced by the column of air in the pipe on a cold day (0°C) and on a warmer day (20°C)?

b. How does air temperature affect the wavelength of the sound produced by the pipe?

2. The driver of an ambulance turns on its siren as the ambulance heads east at 30 mph. A police car is following the ambulance at 30 mph. A truck behind the police car is moving at 20 mph. A van is traveling west in the opposite lane at 20 mph. A small car is stopped at the side of the road. The vehicles are positioned as shown.

a. On the diagram, sketch and label arrows to indicate the velocity of each vehicle.



b. Rank the sounds perceived by the passengers in each of the vehicles in order of decreasing frequency.

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- 3.** A 330 Hz tuning fork is vibrating after being struck. It is placed on a table near but not directly touching other objects, including other tuning forks. Eventually one glass and one other tuning fork start vibrating. Explain why this happens.

- 4.** The first harmonic in a pipe closed at one end is 487 Hz.

- a.** Find the next two harmonic frequencies that will occur in this pipe.

- b.** What are the corresponding wavelengths of the first three harmonics?
(Hint: assume the speed of sound is 345 m/s.)

- c.** What is the length of this pipe?

- d.** Repeat this exercise for a pipe open at both ends.

- 5.** A piano tuner uses a 440 Hz tuning fork to tune a string that is currently vibrating at 445 Hz.

- a.** How many beats per second does he hear?

- b.** What other frequency could produce the same sound effect? Explain why.

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