

## Quiz.

1. If I put an alarm clock into an air-tight chamber and evacuated all the air out of it, would we be able to hear the alarm when it went off?
  - a) No, sound requires a medium to travel through.
  - b) Yes, although the alarm is in a vacuum, the room is full of air.
  
2. Which scenarios are analogous to shattering a glass by singing at a specific frequency? (Circle all that apply.)
  - a) tuning a stereo to a certain radio station
  - b) an army destroying a bridge by marching across it in step
  - c) pushing a child on a swing so they are swinging very high
  
3. Sound travels the fastest in \_\_\_\_\_.
  - a) water
  - b) air
  - c) steel
  - d) vacuum
  
4. Radio waves travel at the speed of light. Who would hear the music from a concert first?
  - a) someone at the concert sitting in the back row
  - b) someone 5 miles away listening to the concert over the radio
  
5. A cop uses the Doppler effect to determine whether or not a car is speeding. In order for this to work,
  - a) the car must be approaching.
  - b) the car must have already passed.
  - c) the car may either be approaching or have already passed.
  
6. Sound travels the slowest in
  - a) cold air
  - b) dry metal
  - c) hot water
  - d) ice
  - e) warm air
  
7. In an auditorium with poorly-placed speakers, it is possible to be sitting in a seat where there is no sound.
  - a) True
  - b) False
  
8. Approaching trains have a higher pitch than departing trains. If approaching galaxies appear "bluer" than galaxies that are receding, then \_\_\_\_\_.
  - a) blue waves have a lower frequency than red waves.
  - b) blue waves have a higher frequency than red waves.

9. The source of all waves is always \_\_\_\_\_.
- a) a sound
  - b) a pressure difference
  - c) a temperature difference
  - d) a vibrating object

Answer Key.

1. a)

Although the room itself is full of air, if there is no air in the vacuum chamber then the sound energy cannot make its way into the air in the room.

2. a), b), & c)

All of these are examples of resonance! When forced vibrations match an object's natural frequency, the vibrations are amplified considerably.

3. c)

The speed of sound in steel is 11x the speed of sound in air, the speed of sound in water is 4x the speed of sound in air, and sound cannot travel in a vacuum.

4. b)

The speed of light is almost a million times faster than the speed of sound!

5. c)

The Doppler effect depends on the relative motion between the source and observer. An approaching car will have a higher frequency and a car that has already passed will have a lower frequency, but the cop will still be able to calculate your speed.

6. a)

Of the different phases of matter, sound travels the slowest through a gas. Sound also travels slower in a cold medium than a hot medium.

7. a)

All waves are subject to interference, and that includes destructive interference. If two sound waves are perfectly out of phase at a certain location in the room, they will cancel, and no sound will be heard!

8. b)

Pitch is related to frequency. A higher pitch corresponds to a higher frequency. Approaching sources are observed to have higher frequencies, so a "bluer" wave must be associated with a higher frequency.

9. d)

Waves are disturbances that carry energy, and waves are caused by an oscillating object. However, not all waves deal with sound, pressure, or temperature.