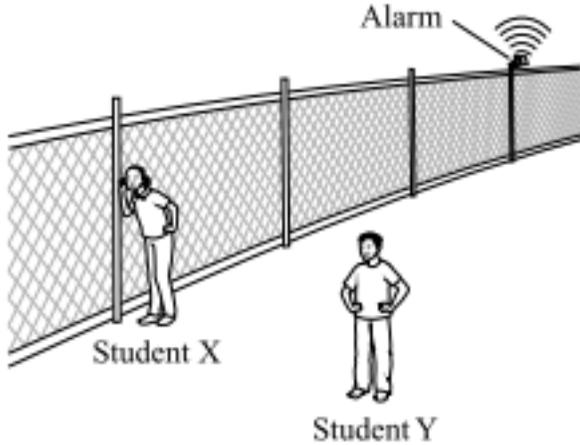


Standard: 4.5 - Recognize that mechanical waves generally move faster through a solid than through a liquid and faster through a liquid than through a gas.

1. A loud alarm attached to a metal fence begins to ring. Student X has her ear against a pole of the fence while student Y stands away from the fence, as shown below. Both students are the same distance from the alarm.



Which of the following statements explains what happens in this situation?

- A. Student X hears the alarm first because sound travels faster in solids than in gases.
- B. Student X hears the alarm at a higher pitch because solids are denser than gases.
- C. Student Y hears the alarm first because sound travels faster in gases than in solids.
- D. Student Y hears the alarm at a higher pitch because gases are denser than solids.

2. Sound travels through air, steel, and water at different speeds. Which list is ordered from the substance that sound will travel through the slowest to the substance that sound will travel through the fastest?

- A. air, water, steel
- B. steel, air, water
- C. water, air, steel
- D. water, steel, air

3. In which of the following media do sound waves **most likely** travel the fastest?

- A. crude oil
- B. distilled water
- C. solid steel
- D. warm air

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4. Which of the following would cause a change in the speed of a mechanical wave?

- A. the wave moving through a liquid
- B. the wave moving from a solid to a gas
- C. the wave being made by a larger vibration
- D. the wave being made by a smaller vibration

5. To locate objects in their environments, bats in flight and porpoises under water both use ultrasound waves with frequencies that are beyond human hearing. These animals produce an ultrasonic wave and then detect echoes from nearby objects.

If a porpoise and a bat both produce ultrasonic waves when they are 16 m from an object, which animal would hear its echo first and why?

- A. The bat would hear its echo first because sound travels faster in air than in water.
- B. The porpoise would hear its echo first because sound travels faster in water than in air.
- C. The bat would hear its echo first because the amplitude of sound waves is greater in air than in water.
- D. The porpoise would hear its echo first because the amplitude of sound waves is greater in water than in air.

6. Rita and John stand at opposite ends of a long section of steel track from an abandoned railroad line. Rita places a penny on her end of the track. John then strikes his end of the track with a rock.

- a. Describe what Rita sees happen to the penny on the track and explain her observation.

Rita puts her ear on the track. John strikes his end of the track with the rock again.

- b. Describe the difference in speed between the sound Rita hears in the air and the sound she hears through the track.
- c. With the rock, John strikes his end of the track harder than before. Identify which sound wave property he has changed.

7. Which of the following is a **main** factor that affects the speed of a wave?

- A. the pitch of sound
- B. the loudness of sound
- C. the amplitude of the wave
- D. the properties of the medium

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8. People perceive sound differently in air than they do under water. Which of the following correctly compares the motion of sound waves in air and in water?

- A. Sound waves travel faster in air than in water.
- B. Sound waves travel slower in air than in water.
- C. Sound waves travel in air but do not travel in water.
- D. Sound waves travel at the same speed in air and in water.