

Standard: 4.2 - Distinguish between mechanical and electromagnetic waves.

- 1) Waves can be classified as either electromagnetic or mechanical.
 - a. Describe **two** differences between electromagnetic and mechanical waves.
 - b. Give **two** examples of electromagnetic waves.
 - c. Give **two** examples of mechanical waves.

- 2) Which of the following is a difference between electromagnetic waves and mechanical waves?
 - A. Electromagnetic waves transmit energy, and mechanical waves transmit information.
 - B. Electromagnetic waves are always longitudinal, and mechanical waves are always transverse.
 - C. Electromagnetic waves can travel through a vacuum, and mechanical waves require a medium.
 - D. Electromagnetic waves have only low frequencies, and mechanical waves have only high frequencies.

- 3) Which of the following properties makes a light wave **different** from all mechanical waves?
 - A. A light wave slows down in a vacuum.
 - B. A light wave is able to transmit energy.
 - C. A light wave exists as a transverse wave.
 - D. A light wave can travel without a medium.

- 4) Which of the following statements **best** describes a difference between mechanical waves and electromagnetic waves?
 - A. Mechanical waves can produce colored light, while electromagnetic waves cannot.
 - B. Mechanical waves can travel in any direction, while electromagnetic waves travel only in one direction.
 - C. Mechanical waves travel only through a medium, while electromagnetic waves can also travel through a vacuum.
 - D. Mechanical waves travel only at the speed of light, while electromagnetic waves can travel at many different speeds.

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5. When fireworks explode, they create light waves and sound waves. An investigation is performed to study the differences between the two types of waves. Three cameras capable of recording audio and video are set up at safe nearby locations in clear view of the fireworks.

- Camera 1 is placed in an open field.
 - Camera 2 is placed in a vacuum-sealed glass container.
 - Camera 3 is placed behind sheets of polarizing glass that block electromagnetic waves.
- a. Identify whether audio only, video only, or both audio and video of the fireworks will be recorded by **each** camera.
 - b. Explain **each** of your answers for part (a).

Suppose a camera records both audio and video.

- c. Will the light or the sound from the fireworks be recorded first? Explain your answer.

6. Which of the following observations demonstrates that visible light waves are electromagnetic and not mechanical?

- A. Sunlight can pass through gas.
- B. Sunlight can pass through solids.
- C. Sunlight can pass through liquids.
- D. Sunlight can pass through a vacuum.

7. Which of the following statements **best** explains why lightning is seen before thunder is heard?

- A. Electromagnetic waves travel faster than mechanical waves in air.
- B. Electromagnetic waves have a higher frequency than mechanical waves.
- C. Electromagnetic waves experience less interference than mechanical waves.
- D. Electromagnetic waves form faster than mechanical waves during a thunderstorm.

A star suddenly explodes. Which of the following types of waves reach Earth's surface?

- A. light only
- B. sound only
- C. sound followed by light
- D. light followed by sound

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8. Which of the following is an example of an electromagnetic wave?

- A. a radio wave
- B. a water wave
- C. the oscillation of a spring
- D. the vibration of a violin string

9. A sound wave can be transmitted through all of the following **except**

- A. a gas.
- B. a liquid.
- C. a solid.
- D. a vacuum.

10. The distance between Earth and the Moon was determined by measuring the time it took for light waves from Earth to travel to the Moon and back. Why was it **not** possible to use sound waves for this experiment?

- A. Sound waves must move through a substance.
- B. Sound waves would change frequency on the return to Earth.
- C. Sound waves move too slowly for the technique to be accurate.
- D. Sound waves move more slowly in Earth's atmosphere than in space.