Wave Paths

Use arrow models to compare wave interactions with materials.

S8P4.d "Develop and use a model to compare and contrast how light and sound waves are reflected, refracted, absorbed, diffracted or transmitted through various materials."

NAME ______________________________ DATE ______________

1 READ AND MARK

Read it twice

YOUR JOB Circle each word that names a wave interaction. In the margin, write L, S, or L/S beside each circled word to show whether the passage describes light, sound, or both.

Waves at the Water and Wall

1 Scientists use models to track what happens when a wave meets a material. In a model, draw an arrow toward a surface for an incoming light ray or sound wave. Then add arrows to show energy leaving, changing direction, or entering the material. The arrows do not show the real size of a wave. They help compare paths and energy changes. Light is an electromagnetic wave, while sound is a mechanical wave that needs matter, but both can interact with materials.

2 At a calm pond, smooth water can reflect light from a flashlight. A light model shows the reflected ray leaving the surface at the same angle, measured from a line perpendicular to the water. Light can also enter clear water. Its speed changes, so its path bends, or refracts. Some light is absorbed by dark, muddy water and changes mainly into thermal energy. The remaining light may transmit through the water, which is why a shallow, clear pond can reveal stones below.

3 Sound behaves differently at the pond because it travels through matter as vibrations. A shout can travel through air toward a concrete wall. The wall may reflect some sound, producing an echo. It can absorb some sound, changing vibration energy mainly into thermal energy. Sound can transmit through the wall if vibrations pass from the wall into air on the other side, although it is usually quieter. Around a doorway, sound can diffract, spreading after it passes an edge or opening. Light can diffract too, but its spreading is often less noticeable around everyday openings.

2 ANSWER WITH EVIDENCE

Use the passage

1 How do arrows in a wave model help you compare what happens when light or sound meets a material?

2 Compare reflection of light at the pond with reflection of sound at the concrete wall.

3 How is refraction of light in clear water different from diffraction of sound around a doorway?

4 What happens to energy when light is absorbed by muddy water and when sound is absorbed by a concrete wall?

3 YOUR TURN

Your own words

Create two arrow models of waves meeting a glass window, one panel for light and one panel for sound. In each panel, show and label an incoming arrow, a reflected arrow, and a transmitted arrow. Show a refracted light arrow inside the glass, then write two sentences comparing the models.

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PART 1 · READ AND MARK

Circle each word that names a wave interaction. In the margin, write L, S, or L/S beside each circled word to show whether the passage describes light, sound, or both. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do arrows in a wave model help you compare what happens when light or sound meets a material?	**They show the incoming wave and show energy leaving, changing direction, or entering the material.**
2	Compare reflection of light at the pond with reflection of sound at the concrete wall.	**Light reflects from smooth water, and the reflected ray leaves at the same angle. Sound reflects from the concrete wall and produces an echo.**
3	How is refraction of light in clear water different from diffraction of sound around a doorway?	**Light refracts by bending when its speed changes as it enters water. Sound diffracts by spreading after it passes an edge or opening.**
4	What happens to energy when light is absorbed by muddy water and when sound is absorbed by a concrete wall?	**In both cases, the wave energy changes mainly into thermal energy.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The light panel shows an incoming ray, a reflected ray, and a transmitted ray that bends as it enters the glass. The sound panel shows an incoming sound wave, a reflected wave, and a quieter transmitted wave caused by vibrations passing through the glass.

Accept accurate arrows and labels showing reflection and transmission in both panels, plus refraction only for the light ray at the glass boundary. Accept explanations that identify bending of light and vibration-based transmission of sound.