

Wave Path Detectives

Use evidence to model how light and sound interact with materials.

MS-PS4-2 "Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings..."

NAME _____

DATE _____

1 READ AND MARK _____ Read it twice

YOUR JOB Underline each observation that tells what happened after a wave met a material. In the margin, write R, A, or T for reflection, absorption, or transmission beside the evidence, using more than one letter if the evidence supports more than one path.

Evidence at the Concert Setup

- ① Scientists use models to track what happens when a wave reaches a material. A light model can use arrows for the incoming and outgoing paths. A mechanical sound-wave model can use curved lines spreading from a source. At a boundary, wave energy may return from the material, enter it and be taken up by the material, or pass into and through the material. The amounts can differ, so a model should show more than one possible path when evidence supports it.
- ② During a school concert setup, students shine a flashlight toward a smooth metal music stand. From the side, they see a bright patch on a white screen placed where the light leaves the stand. When they replace the stand with a sheet of black felt, the screen has no bright patch, and the felt becomes slightly warmer after a lamp shines on it. A clear acrylic sheet lets light reach the screen behind it, although the screen is dimmer than without the sheet. These observations give evidence for different wave paths.
- ③ Students also test sound with a small speaker. A microphone on the same side as the speaker records a second, later sound after a clap-like pulse meets a rigid plywood panel several meters away. Because it arrives separately, that later sound is an echo. With a thick cork panel in the same place, the microphone records a much weaker later signal, while the cork vibrates a little. With an open classroom doorway, a microphone in the hall records the pulse. These results can be represented with arrows or lines, labels, and relative strengths.

2 ANSWER WITH EVIDENCE Use the passage

- 1 Use the metal music stand observations to write a light-wave model in words. State the incoming path, the outgoing path, and the process at the stand.

- 2 What does the warmer black felt and the missing bright patch suggest about the light energy? Name the main process and use the evidence.

- 3 What pathway must a model of the acrylic sheet include? What does the dimmer screen imply about the amount of light on that pathway?

- 4 Extend the sound models for the cork panel and the open doorway. For each one, name the main process and cite its evidence.

3 YOUR TURN Your own words

Create a two-panel model for a place you know. Panel 1 must show a light wave meeting a material, and Panel 2 must show a sound wave meeting a different material. In each panel, name the material, show an incoming arrow or line and outgoing path or paths, label reflected, absorbed, or transmitted, and write one observation your model predicts.

PART 1 • READ AND MARK

Underline each observation that tells what happened after a wave met a material. In the margin, write R, A, or T for reflection, absorption, or transmission beside the evidence, using more than one letter if the evidence supports more than one path. Accept any marking that follows this job and points at the right text.

PART 2 • ANSWERS

#	QUESTION	ANSWER
1	Use the metal music stand observations to write a light-wave model in words. State the incoming path, the outgoing path, and the process at the stand.	Light travels from the flashlight to the metal stand, then travels from the stand to the white screen. The stand reflects light.
2	What does the warmer black felt and the missing bright patch suggest about the light energy? Name the main process and use the evidence.	Absorption is the main process. The felt warms, showing that it takes in light energy, and no bright patch appears on the screen.
3	What pathway must a model of the acrylic sheet include? What does the dimmer screen imply about the amount of light on that pathway?	The model must include transmitted light passing through the acrylic to the screen. The dimmer screen shows that less light reaches the screen than when no sheet is present.
4	Extend the sound models for the cork panel and the open doorway. For each one, name the main process and cite its evidence.	For cork, absorption is the main process because the cork vibrates and the later signal is much weaker, although a weak reflected path may remain. For the doorway, transmission is the main process because the microphone in the hall records the pulse.

PART 3 • YOUR TURN (SAMPLE ANSWER)

Panel 1, Light: flashlight beam → glass window. A large arrow continues through the glass to the sidewalk, labeled transmitted, and a small arrow returns indoors, labeled reflected. Prediction: a person outside sees light on the sidewalk. Panel 2, Sound: drum pulse → thick foam wall panel. A small line returns to the room, labeled reflected, while most of the line ends in the foam, labeled absorbed. Prediction: the sound returning to the room is weak.

Accept arrows, labeled lines, or clear written path descriptions. Require each claim about reflection, absorption, or transmission to match an observation or prediction, and allow models that show more than one path for a material.