Energy on the Move

Trace how mechanical waves transfer energy and interact.

PS.6 "The student will investigate and understand that waves are important in the movement of energy. Key ideas include energy may be transferred in the form of longitudinal and transverse waves..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each sentence that explains how energy moves or changes form, circle every medium named, and write L beside longitudinal-wave examples and T beside transverse-wave examples.

Waves at Work

1. At a school concert, a drummer strikes a bass drum. The drumhead moves the nearby air, creating a mechanical sound wave. The wave carries energy from the drum to listeners, but the air particles do not travel all the way across the room. They vibrate back and forth near their starting places. Sound in air is a longitudinal wave because the particle vibrations are parallel to the wave's direction. Without a medium, such as air, water, or a solid, a mechanical wave cannot transfer energy.

2. On a long rope, Maya gives one end a quick upward flick. A pulse travels along the rope while each section moves mostly up and down. This is a transverse mechanical wave, since its vibrations are perpendicular to the direction the pulse travels. The rope supplies the medium. When the pulse reaches the far end, it can reflect and travel back. Waves may also overlap. Two pulses can briefly combine, producing a larger or smaller displacement before continuing on their paths.

3. Wave energy is useful when people control or detect it. A microphone changes sound-wave energy into electrical signals that can be recorded or sent to speakers. Doctors use ultrasound, sound waves with frequencies above human hearing, to create images inside the body. Ocean waves can also move floating devices that generate electricity. In every case, energy is transferred, not created by the wave. Scientists consider the medium, wave type, and possible interactions when designing technologies that use waves safely and effectively.

2 ANSWER WITH EVIDENCE

Use the passage

1. Why is sound from the drum a mechanical wave, and what medium carries it to the listeners?

2. Compare the particle motion in the sound wave with the particle motion in the rope pulse.

3. What can happen when a rope pulse reaches the far end? What can happen when two pulses overlap?

4. How do a microphone and ultrasound each use wave energy?

3 YOUR TURN

Your own words

Create a three-panel labeled sketch of one useful mechanical-wave application. In Panel 1, show the source, medium, wave type, wave direction, and particle vibration. In Panel 2, show one wave interaction. In Panel 3, show a receiving device or result. Then write two sentences explaining how energy is transferred in your application.

ANSWER KEY

Energy on the Move

GRADES 7-8 · PS.6

PART 1 · READ AND MARK

Underline each sentence that explains how energy moves or changes form, circle every medium named, and write L beside longitudinal-wave examples and T beside transverse-wave examples. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Why is sound from the drum a mechanical wave, and what medium carries it to the listeners?	**It is mechanical because the drumhead makes nearby air move. Air is the medium that carries the sound-wave energy.**
2	Compare the particle motion in the sound wave with the particle motion in the rope pulse.	**In the sound wave, air particles vibrate parallel to the wave's direction. In the rope pulse, rope sections move up and down, perpendicular to the pulse's direction.**
3	What can happen when a rope pulse reaches the far end? What can happen when two pulses overlap?	**A pulse can reflect and travel back. Overlapping pulses can combine briefly to make a larger or smaller displacement.**
4	How do a microphone and ultrasound each use wave energy?	**A microphone changes sound-wave energy into electrical signals. Ultrasound uses sound waves to create images inside the body.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1 labels: an ultrasound transducer sends a longitudinal sound wave through gel and body tissue; wave direction and parallel particle vibrations are shown. Panel 2 labels: the sound wave reflects where soft tissue meets bone. Panel 3 labels: the transducer receives the reflected wave, and a computer creates an image. The transducer transfers electrical energy to ultrasound, and the sound transfers energy through the gel and tissue. Reflected ultrasound transfers energy to the receiver, which changes it into electrical signals for an image.

Accept equivalent descriptions of parallel and perpendicular particle motion. For the open task, accept any accurate mechanical-wave application that identifies a medium, a wave type, an interaction, and a valid energy transfer.