Waves Carry Energy

Compare how matter moves as wave energy travels.

PS.6.a "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 tells how matter moves, and circle each use of *transverse* or *longitudinal*. Then use your marks to compare particle motion with the direction energy travels.

A Rope Pulse and a Boat Horn

1. At a lake, Maya flicks one end of a long rope tied to a dock. A pulse travels along the rope toward the dock, carrying energy. Each section of rope moves up and down while the pulse moves forward. This is a transverse wave because the material moves perpendicular to the direction energy travels. The rope sections do not travel all the way to the dock. They return near their starting positions after the pulse passes.

2. Later, Maya hears a boat horn across the water. The horn makes nearby air particles vibrate back and forth. Each particle bumps the next one, forming regions where particles are closer together and regions where they are farther apart. The disturbance moves from the horn to Maya's ear, transferring energy through the air. This is a longitudinal wave because particle motion is parallel to the direction the energy travels. The air itself does not cross the lake.

3. Both waves transfer energy without carrying the same piece of matter from source to receiver. At the dock, the rope's motion is sideways compared with the pulse's travel. In the air, the particles move in the same line as the sound disturbance. A wave can therefore be identified by comparing the direction of particle motion with the direction energy travels. In a transverse wave, those directions are perpendicular. In a longitudinal wave, they are parallel.

2 ANSWER WITH EVIDENCE

Use the passage

1. In the rope event, how do the rope sections move, and in what direction does the pulse carry energy?

2. What two details in the boat-horn event show that the sound wave is longitudinal?

3. Why do the rope sections and air particles not travel from the source all the way to the receiver?

4. State the direction relationship for particle motion and energy travel in a transverse wave and in a longitudinal wave.

3 YOUR TURN

Your own words

Create two labeled panels using sources not named in the passage. In one panel, show a transverse wave and in the other, show a longitudinal wave, with arrows for energy travel and matter motion, plus one sentence explaining each relationship.

ANSWER KEY

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GRADES 7-8 · PS.6.a

PART 1 · READ AND MARK

Underline each sentence that tells how matter moves, and circle each use of *transverse* or *longitudinal*. Then use your marks to compare particle motion with the direction energy travels. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	In the rope event, how do the rope sections move, and in what direction does the pulse carry energy?	**The rope sections move up and down. The pulse carries energy forward along the rope toward the dock.**
2	What two details in the boat-horn event show that the sound wave is longitudinal?	**Air particles vibrate back and forth, and their motion is parallel to the direction the energy travels. The passage also describes regions where particles are closer together and farther apart.**
3	Why do the rope sections and air particles not travel from the source all the way to the receiver?	**They vibrate near their starting positions while the wave disturbance transfers energy from place to place.**
4	State the direction relationship for particle motion and energy travel in a transverse wave and in a longitudinal wave.	**In a transverse wave, particle motion is perpendicular to energy travel. In a longitudinal wave, particle motion is parallel to energy travel.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1: A wave travels along a guitar string. Draw energy moving along the string and string sections moving up and down. The string motion is perpendicular to the energy travel, so this is a transverse wave. Panel 2: A pushed slinky sends compressions along its length. Draw energy moving forward and coils moving back and forth in the same line. The coil motion is parallel to the energy travel, so this is a longitudinal wave.

Accept accurate student-selected examples that clearly show energy transfer and correctly compare matter motion with energy direction. For transverse waves, the directions must be perpendicular. For longitudinal waves, the directions must be parallel.