Where Energy Goes

Trace energy through a moving system.

8.15 "Use models to construct an explanation of how energy is transformed but still conserved."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each place energy changes form, and circle each place energy moves between objects or crosses a system boundary so you can trace where it goes.

The Wind-Up Car

1. At a toy workshop, Mara winds a small car by turning its key. Her hand does work on a metal spring inside the car, storing energy in the bent spring. When she lets go, the spring unwinds and turns the wheels. The car rolls across a wooden floor. A useful model can show this sequence with arrows: motion of Mara's hand, energy stored in the spring, and motion of the car. Each arrow tracks energy moving or changing form, not energy being made from nothing.

2. The car rolls into a light wooden block. After the bump, the block slides forward, but the car slows. Some of the car's energy has moved to the block. The block's bottom and the car's wheels rub against the floor, warming the surfaces slightly. The bump makes a sound as nearby air vibrates. Those effects may be too small to notice without careful tools. A model that shows only the car and block leaves out energy that spreads into the floor and air.

3. Imagine drawing a boundary around the car, block, floor, and nearby air. Energy enters this system from Mara's hand as she winds the spring. Eventually, the car and block stop moving, but their motion energy has not vanished. Much has become thermal energy in the floor, wheels, and block. Sound carries some energy into more distant air. A smaller boundary around only the car would show energy crossing out toward the block, floor, and air. Either boundary can help explain conservation if the model tracks transfers across it.

2 ANSWER WITH EVIDENCE

Use the passage

1. Write an arrow model that traces energy from Mara's moving hand to the rolling car. Name the energy at each step.

2. Extend a model of the collision to show where the car's energy goes as it slows. Include the block and two other places.

3. If the system boundary surrounds only the car, what energy enters it, and where does energy leave it?

4. The block eventually stops sliding. How would you extend the energy model to explain its stop without showing energy disappearing?

3 YOUR TURN

Your own words

Choose an everyday device other than a wind-up toy. Make an arrow model with at least three energy forms, name your system boundary, and explain where energy crosses it without being destroyed.

ANSWER KEY

Where Energy Goes

GRADE 8 · 8.15

PART 1 · READ AND MARK

Underline each place energy changes form, and circle each place energy moves between objects or crosses a system boundary so you can trace where it goes. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Write an arrow model that traces energy from Mara's moving hand to the rolling car. Name the energy at each step.	**Motion energy of Mara's hand → energy stored in the bent spring → motion energy of the car.**
2	Extend a model of the collision to show where the car's energy goes as it slows. Include the block and two other places.	**Car motion energy → block motion energy, thermal energy in the floor and surfaces, and sound energy in the air.**
3	If the system boundary surrounds only the car, what energy enters it, and where does energy leave it?	**Energy enters from Mara's hand as she winds the spring. Energy leaves for the block, floor, and air as the car moves and collides.**
4	The block eventually stops sliding. How would you extend the energy model to explain its stop without showing energy disappearing?	**Show the block's motion energy changing to thermal energy as its bottom rubs against the floor.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

My system is a battery-powered flashlight, including its battery and bulb. Chemical energy in the battery → electrical energy in the circuit → light and thermal energy that leave the flashlight and spread into the room. The flashlight's stored energy decreases, but energy is transferred to the surroundings rather than destroyed.

Accept equivalent energy labels and arrow models that track transfers accurately. For Part 3, the chosen boundary must make clear where energy leaves or enters the system.