Energy on the Move

Trace energy changes during a roller coaster ride.

P.6.6.7 "Determine the relationships between the concepts of potential, kinetic, and thermal energy."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the sentence in paragraph 2 that names the change from potential energy to kinetic energy. In paragraph 3, circle the part named in each of the two sentences that say kinetic energy changes to thermal energy.

A Ride Down the Hill

1. A roller coaster train waits at the bottom while a chain pulls it up a tall hill. The chain does work on the train, giving it more gravitational potential energy as it rises. This is energy stored because of the train's height above the ground. At the top, the train pauses for a moment. Compared with its position at the bottom, it now has more gravitational potential energy. Because it is almost still, it has very little kinetic energy, the energy of motion.

2. When the train rolls down the first hill, gravitational potential energy changes into kinetic energy. As it drops, its height decreases and its speed increases. The train still has both forms of energy partway down: it remains above the ground and is already moving. Near the bottom, it has less gravitational potential energy than at the top and more kinetic energy. The bottom is not the end of the ride. The moving train can climb another, smaller hill before reaching the station.

3. Even on a smooth track, moving parts rub together. In the wheel bearings, friction changes some of the train's kinetic energy into thermal energy, warming the bearings. As the train enters the station, brake pads press against its wheels. Friction at the brake pads changes more of the train's kinetic energy into thermal energy, warming the pads and slowing the train. Thermal energy is linked to the motion of tiny particles in matter. These changes mean less of the train's motion energy remains to carry it forward.

2 ANSWER WITH EVIDENCE

Use the passage

1. At the top of the first hill, how do the train's potential and kinetic energy compare with when it was at the bottom?

2. As the train rolls down the first hill, how are its changes in height and speed related to its potential and kinetic energy?

3. In the wheel bearings, how does friction link kinetic energy and thermal energy?

4. How are the energy changes in the wheel bearings and at the brake pads alike? What happens to the train at the brake pads?

3 YOUR TURN

Your own words

Imagine a toy car rolling down a ramp and then across a rough rug until it stops. In three or four sentences, explain how potential, kinetic, and thermal energy are related during the trip.

ANSWER KEY

Energy on the Move

GRADE 6 · P.6.6.7

PART 1 · READ AND MARK

Underline the sentence in paragraph 2 that names the change from potential energy to kinetic energy. In paragraph 3, circle the part named in each of the two sentences that say kinetic energy changes to thermal energy. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	At the top of the first hill, how do the train's potential and kinetic energy compare with when it was at the bottom?	**At the top, the train has more gravitational potential energy than it had at the bottom. Because it is almost still, it has very little kinetic energy.**
2	As the train rolls down the first hill, how are its changes in height and speed related to its potential and kinetic energy?	**As its height decreases, its gravitational potential energy decreases. Its speed increases as potential energy changes into kinetic energy.**
3	In the wheel bearings, how does friction link kinetic energy and thermal energy?	**Friction changes some of the moving train's kinetic energy into thermal energy, warming the bearings.**
4	How are the energy changes in the wheel bearings and at the brake pads alike? What happens to the train at the brake pads?	**In both places, friction changes some kinetic energy into thermal energy. At the brake pads, the train slows down.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

At the top of the ramp, the toy car has gravitational potential energy because it is raised above the bottom. As it rolls down, some potential energy changes into kinetic energy, so the car moves faster. Friction changes some kinetic energy into thermal energy during the trip. On the rough rug, this change continues until the car stops.

For the marking job, look for the first sentence of paragraph 2 underlined and “wheel bearings” and “brake pads” circled in the two energy-change sentences of paragraph 3. For Your Turn, accept other accurate explanations that connect the car's height and motion to potential and kinetic energy and identify friction as a cause of thermal energy.