

KINETIC ENERGY

ENERGY IN MOTION

TIME REQUIRED: 1 hour

MATERIALS: String, heavy and light objects (such as a pencil and a pack of index cards), paper cup, masking tape, ruler, textbooks, cardboard

ACTIVITY SHEET: Kinetic Energy Activity Sheet



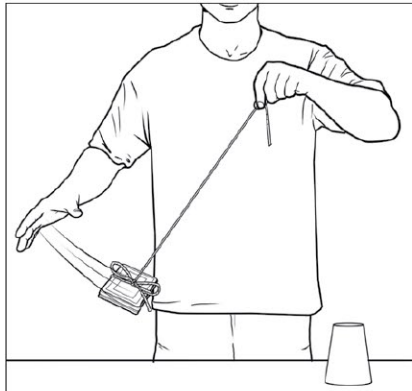
Central question:
What is kinetic energy?

Have students consider what happens to potential energy when it's released from its stored state. Explain that energy can't be created or destroyed, but it does change from one form to another. Potential energy is often converted into another type of energy called kinetic energy. Kinetic energy is the energy of motion. Kinetic energy can also transform back into potential energy. For example, you'd use kinetic energy to lift a ball to the top of a ramp. That energy would be stored in the ball as potential energy.



Central question:
What factors affect kinetic energy?

1. Explain that there are two factors that affect how much kinetic energy a moving object will have: mass and speed. Have students complete this demonstration to learn how mass influences an object's kinetic energy.
2. Select a light object (such as a pencil) and a heavy object (such as a pack of index cards). Tie a string around each object, leaving a three-foot-long piece attached. Have a student volunteer hold the light object in his or her right hand three feet above the ground. He or she should hold the other end of the string in his or her left hand so it is stretched horizontally. Have another student place a paper cup on the floor just under the first student's left hand, and mark the spot on the floor with a piece of masking tape. Tell the first student to let go of the object so it swings and collides with the paper cup (this may take a few tries to hit the cup). Have your other volunteer measure the distance the paper cup



moved after the swinging object struck it.

3. Repeat the process with the heavier object. Students will observe that the heavier object made more of an impact than the lighter one, moving the cup farther away. This is because the heavier object had a greater kinetic energy.



Central question:
How can potential energy become kinetic energy?

1. Reveal that racecars don't just go forward and side to side as they pass each other on the racetrack, they also go up! Racetracks aren't completely flat. On turns, the tracks are actually tilted. The highest racetrack banking is tilted a steep 33 degrees at the Talladega Super Superspeedway.
2. Racetrack bankings help drivers maintain grip as they whip around corners. The steeper bankings also create more potential energy in the racecars because the cars are raised higher in the air. When drivers come off a banking and onto the flat portion of the track, they have more speed as the potential energy transforms into kinetic energy.
3. Explain that engineers consider the

height of a racetrack's banking when considering how cars will perform. Remind students that three factors affect how much gravitational potential energy the racecar has at the top of a racetrack's banking: the height of the banking, the car's mass, and the force of gravity. Given the fact that mass impacts kinetic energy, all racecars must weigh 3,300 pounds (without a driver). Having identical masses makes sure the cars are competitively equal. NASCAR enforces these rules by inspecting each car before and after each race.

4. Tell students they will team up to test how potential energy turns into kinetic energy. Hand out the Kinetic Energy Activity Sheet and the experiment materials. After groups have completed the experiment, have them present their results and discuss as a class.



Central question:
How does kinetic energy influence NASCAR engineers' choices?

Explain that engineers spend a lot of time thinking about kinetic energy for both racecar performance and safety. Divide students into teams, and tell them to put on their make-believe "engineer caps." They'll need to imagine all the parts of a race from start to finish—that includes designing cars and tracks, installing safety protections for drivers and fans, understanding how vehicles will perform while racing and when making pit stops, and even things that could possibly go wrong during a competition. Have students create a list of the roles kinetic energy plays in each stage of racing.



NAME _____

RAMP IT UP

DIRECTIONS:

Try this experiment to see how changing a car’s potential energy changes its kinetic energy.

GATHER YOUR MATERIALS:

Books, cardboard, toy car, tape, ruler

PREDICT: Will a car racing down a ramp travel a shorter or greater distance if you raise the ramp’s height?

PROCEDURE:

- 1 Use books and cardboard to make a ramp. Use tape to secure both ends of the ramp to the books and floor.
- 2 Measure the height of the ramp. Record the height under “Run 1” in the table below.
- 3 Place your car at the top of the ramp. Release the car. Once it stops moving, use the ruler to measure how far it rolled from the end of the ramp.
- 4 Add two textbooks to raise the height of your ramp. Then repeat steps two and three.



DATA:		
	<i>Ramp Height</i>	<i>Distance Car Rolled</i>
<i>Run 1</i>		
<i>Run 2</i>		



CONCLUSIONS:

Answer these questions on a separate sheet of paper.

- 1 What happened when you raised the height of the ramp? Was your prediction correct?
- 2 Did raising the ramp’s height give the car more or less potential energy? Explain your answer.
- 3 Did the car in Run 1 or 2 end up with more kinetic energy? How could you tell?