

In your group, examine each toy, one at a time.

Answer the following questions about each toy, and record your answers on your *Energy Observations* page.

1. How do you know the toy has kinetic energy? What indicators did you use?
2. How can you increase its kinetic energy?
3. How do you know when its kinetic energy has increased?
4. Where do you think the toy gets the energy that allows it to move?
5. What factors affect how the toy moves?

## Communicate

### Share Your Ideas

With your class, discuss the available energy of the toys you examined. Share your ideas about the types of energy in the toys and what indicators you observed. Also share your ideas about how you can control the amount of energy in each toy. It may be difficult to determine exactly where the energy came from, but think about it, and express it in your own words.



| Energy Observations |                                     |             |                   |
|---------------------|-------------------------------------|-------------|-------------------|
| Name: _____         |                                     | Date: _____ |                   |
| Object              | Observation of how the object works | Indicator   | Type(s) of energy |
|                     |                                     |             |                   |
|                     |                                     |             |                   |
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|                     |                                     |             |                   |

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### What Indicates That Kinetic Energy Is Present? What Affects How Much Kinetic Energy an Object Has?

You knew energy was present in all of the objects as you were playing with them because you could see the objects moving. Motion is an indicator of kinetic energy. You found ways to increase the motion of each of the toys. When you wound the windup toy tighter, it moved faster or for a longer time. When you pulled the steel ball higher before letting go of it, the ball on the opposite side also sprung up higher. When you dropped the ball from a higher position or threw it toward the ground with more force, it moved faster and bounced higher. When you saw more movement, you knew the objects had more energy in them.

But what allowed each object to move? And why did it have more energy sometimes than at other times? You may have figured that out for some of the objects.

**potential energy:** energy that is stored to be transformed at a later time.

**elastic potential energy:** stored energy released when an object's shape is changed (as in a stretched rubber band or a coiled spring).

**gravitational potential energy:** stored energy of an object based on its position above the ground.

When you wind up the windup toy, energy is stored in its spring. Although you cannot see it, the spring holds **potential energy**. Potential energy is energy that is stored up until it is released and transformed. A battery in a flashlight stores chemical energy that it releases as electrical energy when you turn on the flashlight. A similar thing happens in the windup toy. The spring in the toy stores up potential energy until you release it. Then the potential energy is transformed into kinetic energy, and the toy moves. The particular type of potential energy in the spring of the windup toy is **elastic potential energy**. Elastic energy is present when something "stretchy" or "springy" is taken from a relaxed position to a position where it is under stress.

Newton's cradle presents a different way to transform potential energy into kinetic energy. In this device, a steel ball is raised and then released so that it swings into the other balls. You may have figured out that lifting and then dropping one of the steel balls provides the energy to the toy. If you don't lift the ball, there is no motion and no kinetic energy. When you lift a ball, however, you transfer energy to the toy. This energy is called **gravitational potential energy**. Gravitational potential energy is the energy an object stores because of how high above the ground it is.

The bouncy ball gets its energy both from elastic potential energy and gravitational potential energy. When you drop the ball to the floor, it bounces back up at you. Then it falls down and bounces again. Many energy transformations keep it in motion.

## Reflect

Answer the following questions based on the toys you examined:

1. Describe the energy that was transformed to make each toy move.
2. What did you do to control each type of energy you observed?
3. What factors controlled the amount of energy available in each of the toys you examined? Remember, a factor is a characteristic that you can measure.