Name ______________________ Date ____________ Class ____________

Enrich

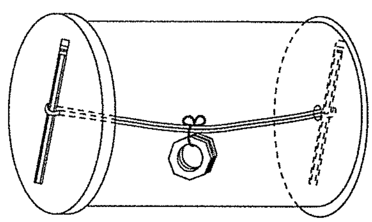
What Is Energy?

In even a simple action, energy is often transformed from one type into another (and back again). Follow the steps in the procedure. Then use a separate sheet of paper to answer the questions that follow it.

The Come-Back Can

Materials

coffee can with plastic lid
rubber band
metal nuts
2 nails
string
file



Procedure

1. Use a nail to punch a hole in the center of the bottom of the can and another in the center of the lid. File down the rough edges.
2. Use string to tie several nuts to the middle of the rubber band.
3. Slip one end of the rubber band through the hole in the bottom of the can. Slide a nail through the rubber band to secure the rubber band to the can. Repeat this process with the lid. Put the lid on the can. The rubber band should just reach both ends of the can without being stretched too tightly.
4. Gently roll the can on a hard, level floor. Once the can reaches the end of its path, it will begin to roll back to you.

Analyze and Conclude

1. When you roll the can along the floor, the rubber band twists. What kind of energy is in the twisted rubber band?
2. Why does the can stop before it begins to roll back to you?
3. What do you think happens to the rubber band as the can rolls back to you?
4. What kind of energy does the can gain as it rolls back to you?
5. What kind of energy are you adding to the can and rubber band when you first push the can?
6. If you were to push the can harder, what effect would this have on the energy in the rubber band?

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Enrich

Forms of Energy

Read the passage below. Then fill in the table, using $0.10 per kWh to calculate the cost of running each appliance for one day. Answer the questions that follow on a seperate sheet of paper.

The Cost of Electrical Energy

You know that the watt (W) is a unit of power and that a kilowatt (kW) is 1,000 watts. The unit used by electric companies to measure the energy you use in your home is called the kilowatt-hour (kWh). One kilowatt-hour is 1,000 watts of electrical energy used for 1 hour.

Each electrical appliance in your home uses a different amount of electrical energy. The cost of operating an appliance is determined by the power rating of the appliance, the number of hours it is used, and the cost of the electrical energy.

To calculate the cost of operating an appliance, you must first determine the energy used in kilowatt-hours. To do this, multiply the power rating (watts) of the appliance by the number of hours you use the appliance, then divide that number by 1,000. For example, a 100-watt light bulb used for 5 hours a day would use 0.5 kWh per day

$$\left(\frac{100\text{ W} \times 5\text{ h}}{1{,}000} = 0.5\text{ kWh}\right).$$

If you are paying $0.10 per kWh, then the cost of using that light bulb for 1 day would be 0.5 kWh × $0.10, or $0.05.

Appliance	Power Rating (W)	Estimated Time Used (h)	Cost ($)
Microwave oven	1,500		
Electric stove/oven	12,000		
Clothes dryer	5,000		
Vacuum cleaner	600		
Clothes washer	500		
Color television	200		
Dishwasher	1,300		

1. What is the total cost of running all the appliances above for your family for one day? What is the total cost for one week?
2. Discuss three things that people in the family could do to reduce their electric bill.

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Enrich

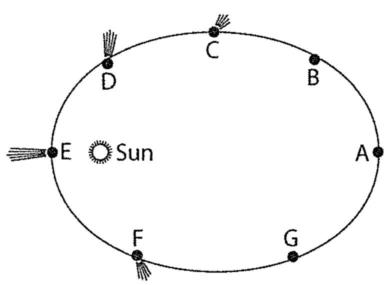
Energy Transformations and Conservation

In a swinging pendulum, potential energy is transformed to kinetic energy and back. The movement of planets and comets around the sun also shows the relationship between potential and kinetic energy. Read the passage. Then examine the diagram below it, and use the diagram to answer the questions that follow on a separate sheet of paper.

Orbits, Ellipses, and Energy

Planets and comets orbit the sun in ellipse-shaped paths. While they orbit the sun, they respond to the sun's gravitational pull. The farther away from the sun an object is, the less the sun's gravity attracts it, and the slower that object moves in its orbit. The energy of a comet at its slowest position is similar to that of a pendulum at the very top of its swing. As the comet moves toward the sun, it gains speed until, at its closest approach to the sun, it is traveling at maximum speed. The energy of a comet at this position is similar to that of a pendulum at the bottom of its swing. Then, the comet moves past the sun, slowing down as it moves farther into space. A comet will follow the same orbit for many hundreds or thousands of years, speeding up and slowing down, orbiting the sun many times.

The diagram below shows the orbit of a comet around the sun. Point A is farthest from the sun and point E is closest to the sun. The comet moves counterclockwise.



1. At what point in its orbit does the comet have the greatest potential energy? At what point does it have the least potential energy?
2. At what point in its orbit does the comet have the greatest kinetic energy? At what point does it have the least kinetic energy?
3. Describe the energy transformations that are taking place as the comet moves from point B to point D.
4. Describe the energy transformations that are taking place as the comet moves from point F to point G.
5. What happens to the comet's total energy when it is closest to the sun?
6. What happens to the comet's total energy when it is farthest from the sun?