ENERGETIC EXPERIMENTS

Objective:

To engage students in three hands-on experiments that demonstrate the importance of energy efficiency

Classroom Preparation:

1 Begin the class by helping students to understand that "energy efficiency" means making sure that the energy you use is not wasted. Energy can be wasted if warm air escapes through drafty windows or if hot water drips down the drain. It can even be wasted if cold water runs down the drain if a home's water comes from a well. It takes electricity to pump water out of a well. New technology has increased the efficiency of certain products, such as lightbulbs, dishwashers, televisions, CD players, and clothes washers.

2 Divide students into small groups. Duplicate the activities on the facing page and give each group a copy along with the appropriate materials listed.

3 Write the following headings on the board so students can create a chart for each experiment:

Hypothesis: what I think will happen in this experiment:

Here's why I think my hypothesis is correct:

Here's what happened:

Test result:

Here's what we learned:

Here's how we can use what we learned in order to be more energy efficient:

4 Supervise each group as it sets up and conducts its experiments.

5 Ask each group to present its hypothesis, test results, and conclusions. What does each experiment demonstrate about energy efficiency? Ask groups to brainstorm ideas for turning their findings into useful energy-efficiency ideas for their home or school. You may wish to share the following conclusions:

Conclusion for Experiment One, "A Drop of Savings":
When a hot water tap leaks, you not only waste water, you waste the energy it takes to heat the water. That's why it's important to check your faucets to be sure there are no leaks or drips.

Conclusion for Experiment Two, "The Power of Insulation":
In a house, insulation (represented in this experiment by the newspaper) helps keep your home warm in winter and cool in summer. A well-insulated house is more energy efficient than a poorly insulated house.

Conclusion for Experiment Three, "Change a Light, Change the World":
An ordinary lightbulb uses energy to produce an intense heat that runs through its thin metal filament. The heat causes the filament to glow white hot, and eventually, the heat burns through the filament and the lightbulb stops working. This process, which was first patented by Thomas Edison, hasn't changed much over the last century.

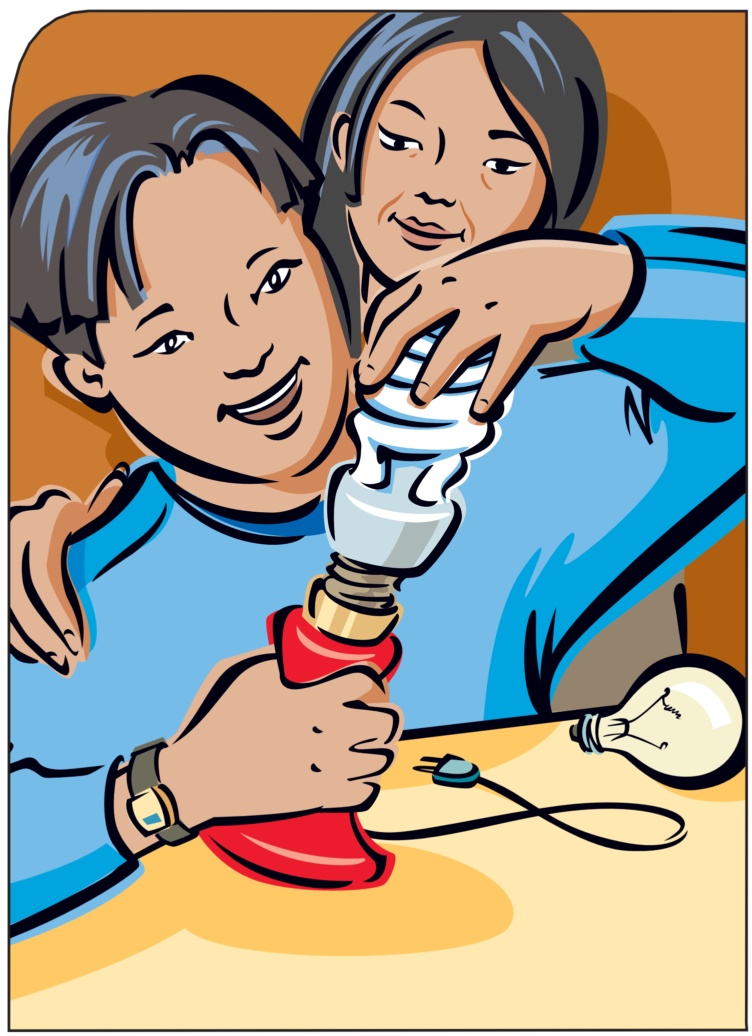
Compact fluorescent lightbulbs (CFLs) work very differently. Instead of heating a filament, they use energy to move subatomic particles, called electrons, into contact with special gases inside a glass tube. When these gases touch a special coating of paint inside the tube, they light up, or "fluoresce." That's why we call them *fluorescent* lightbulbs.

When you use CFLs, most of the energy goes directly into creating light instead of heat and light, so much less energy is issued to create the same amount of light. A 15-watt CFL produces as much light as an ordinary 60-watt bulb. Because there is no filament to burn out, CFLs also burn much longer than ordinary lightbulbs—for years instead of weeks.

Curriculum Connections

Science
NSES Standards:
Science as Inquiry
Physical Science
Science in Personal and Social Perspectives

Math
NCTM Standards:
Problem Solving
Connections



ENERGETIC EXPERIMENTS

A Drop of Savings

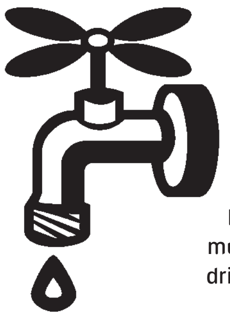
EXPERIMENT ONE

Materials:

- measuring cup
- sink with hot tap water
- clock or watch

Directions:

1 Place your measuring cup under the tap.



2 Create a “leak” in your sink by turning on the hot water tap just enough to create a drip. Set your measuring cup under the drip, and collect the dripping water for ten minutes. While you’re waiting, write your hypothesis on your chart. How much water do you think will drip out? Why?

3 Check on the drip after ten minutes. How much water did you collect?

4 Figure out how much water would drip out in an hour. (Multiply by six.) How much water would drip out in a day? (Multiply your last answer by 24.) How much water would drip out in a year? (Multiply your last answer by 365.) How could you test your hypothesis?

What kind of fuel was used to make the water hot? How does that impact the environment?

The Power of Insulation

EXPERIMENT TWO

Materials:

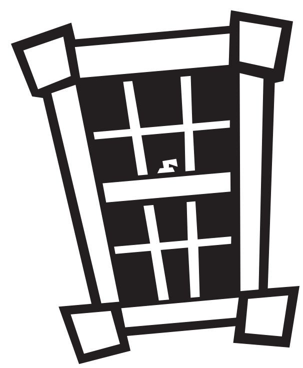
- two paper cups
- measuring cup
- crushed ice or snow from outside
- newspaper
- rubber band
- warm sun or lamp
- magic marker
- ruler
- clock or watch

Directions:

1 Pour one cup of crushed ice or snow into each cup. Make a mark on each cup to show the height of the ice/snow. Wrap several sheets of newspaper around one cup, and leave the other cup unwrapped. Place both cups under a lamp or on a sunny windowsill for ten minutes.

2 While you’re waiting, write your hypothesis on your chart. What do you think will happen? Why?

3 After ten minutes, use the ruler to see how far the ice/snow has melted in each cup. Record your findings. Then, pour the water from the melted ice/snow into the measuring cup, and measure the amount of water. Which cup of ice/snow melted faster? Record your conclusions.



Change a Light, Change the World

EXPERIMENT THREE

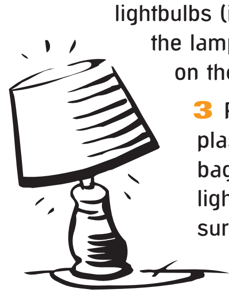
Materials:

- desk lamp plugged into a power outlet
- several clear incandescent lightbulbs, some burned out and some still usable
- a 23-26-watt CFL
- sealable plastic bag
- five ice cubes
- clock or watch
- measuring cup

Directions:

1 Carefully study and describe the difference between the working and burned-out lightbulbs. Hint: Carefully examine the filament. How do you think lightbulbs work?

2 Unplug the lamp. Screw one of the working lightbulbs (ideally, a 100-watt bulb) into the lamp. Plug in the lamp. Switch on the light.



3 Place the ice cubes in the plastic bag and seal it. Hold the bag six inches above the lightbulb for two minutes. Make sure the bulb doesn’t melt the plastic. What do you think will happen? Record your hypothesis.

4 After two minutes, pour out and measure the water in the bag. What happened? Why? Note your findings.

5 Now try this experiment again using a 23-26-watt CFL screwed into the same lamp. How long did it take the CFL to melt the ice? Why do you think there was a difference in time? How can you use your findings to be more energy efficient at home?

For more details about the differences between CFLs and ordinary lightbulbs, visit *www.howstuffworks.com/question236.htm*.