# SCIENCE ACTIVITIES

## All Charged Up

**Problem:**
How do electric charges act?

**Materials:**
1. Medium-sized round balloon for each student.
2. Individual baggies filled with a comb, pieces of cloth (silk, wool, cotton), foil, styrofoam, small pieces of torn up paper -- one per group.
3. Puffed rice cereal -- about 6 pieces per student.

**Follow This Procedure:**
Place five or six pieces of puffed rice cereal in a balloon. Blow up the balloon and tie its neck closed with string. Rub the balloon with wool cloth about twenty times. Move the cloth in only one direction. Predict what will happen between the cloth, the balloon, and the puffed rice.

Next, rub a plastic comb with the cloth as you did the balloon. Hold the balloon by the string, and bring the comb near it. Predict what will happen between them. Attempt to make the cereal "dance" inside the balloon by moving the comb around.

**Think About It:**
1. Did you give the balloon and the comb electrical charges? Explain what happens.
2. Compare the way the balloon and the comb acted with the way the balloon and the cloth acted.
3. Challenge: What caused the objects to change their motion?
4. Experiment with other variables such as other cereals or materials to rub the balloon.

All Charged Up

***Teacher Notes***

**Objective:**
Using the materials provided, students will investigate some properties and behaviors of charged objects.

**Materials:**
The materials are listed on the student sheet. You might want to have other cereal types, or other small materials available so students can investigate other variables.

**Teaching Suggestions:**
Allow students to work on this activity individually or in groups of two. Your students should have lots of fun with this activity. After their interest begins to wane, you should have students read pages 3 - 5 to learn more about charges and how objects become charged.

You could have students write a creative story about this activity.

**Extended Activities:**
Have students experiment with variables other than puffed rice cereal. Use other materials to rub the balloons.

# Conductors and Non-Conductors

**Problem:**
Do all objects conduct electricity?

**Gather these materials:**
1. One dry cell (size D)
2. Light bulb and bulb holder
3. Three lengths of insulated wire with insulation removed from each end, a variety of objects to be tested, such as styrofoam pieces, nail, aluminum foil, pencil, plastic straw, paper clip, cloth, etc.

**Follow this procedure:**
1. Use one dry cell (size D), light bulb and bulb holder, and 2 lengths of wire. Make the bulb light up.
2. Use the materials listed and test whether or not different materials conduct electricity
3. Make a table listing conductors in one column and non-conductors in another.
4. Test other objects in the room, such as the chalkboard, door frame, etc.

**Think it over:**
1. Which objects conducted electricity? How do you know?
2. How were the conducting materials similar?
3. What appliances need materials that easily conduct electricity?
4. What appliances need materials that do not easily conduct electricity?
5. Sum up in paragraph form why these appliances do or do not conduct electricity easily.
6. Using these vocabulary words: electric current, resistance, conductors, and insulators, sum up in paragraph form how this makes a toaster work.
Conductors and Non-Conductors

***Teacher Notes***

**Objectives:**
Students will identify objects that are conductors or non-conductors.

**Background Information:**
Think it Over from student sheet, in reference to questions 3 and 4:
Wires made of material other than copper and that are very thin cause higher resistance because it is harder for the current to pass through. The wires become so hot that they either give off light or heat or both. Examples of appliances that do not easily conduct electricity and have a higher resistance are light bulbs, hair dryers, toasters, electric blankets, etc. Appliances that easily conduct electricity are refrigerators, televisions, stereos, etc.

**Materials:**
Suggestion: For groups of 4 students.
1. One dry cell (size D)
2. Light bulb and bulb holder
3. 3 lengths of insulated wire with insulation removed from each end.
4. A variety of objects to be tested, such as styrofoam pieces, nail, aluminum foil, pencil, plastic straw, paper clips, cloth, etc.
5. Section of student text titled What is Electric Current.

**Teaching Strategies:**

1. Divide the class into groups.
2. Challenge students to find as many ways as possible to make the light bulb light.
3. Students should use the materials listed and test whether or not different materials conduct electricity.
4. Students should make a table, one per group, listing conductors in one column and non-conductors in another.
5. Students should test other objects in the room, such as the chalkboard, door frame, etc. Add results to the table.

**Activity Results:**

1. Bulbs will light when using conductors such as wire, foil, nails, etc.
2. Bulbs will not light when using non-conductors such as cork, foam, cloth, etc.

## Circuit Circus

**Problem (Part A):**
How many ways can you arrange a battery, one wire, and one flashlight bulb to make the bulb light?

**Gather these materials:**
1. One dry cell (size D)
2. One bare, uncoated copper wire
3. One flashlight bulb
4. Paper for diagramming

**Procedure (Part A):**
1. Arrange the materials in as many ways as you can so that the bulb lights.
2. Make a sketch of each set-up. Include sketches of failures as well as successes.

**Think it over:**
In your own words, describe the similarities between your successful trials.

**Problem (Part B):**
How do various arrangements of batteries and bulbs affect bulb brightness?

**Gather these materials:**
1. Two dry cells (Size D)
(If you do not have access to flashlight bulbs and bulb holders, you can use the bulbs and bulb holders from a set of miniature tree lights. Just cut the wires between bulbs. Size D dry cells will light these tree lights.)
2. Flashlight bulbs
3. Wires
4. Bulb holders

**Procedure (Part B):**
1. Using one battery, light as many bulbs as you can. Keep track of your trials through your sketches.
2. Using two batteries, light as many bulbs as you can. Again keep track of your various arrangements of materials.
3. Using three bulbs and two batteries, discover arrangements that give different degrees of bulb brightness. Keep a record of your trials.

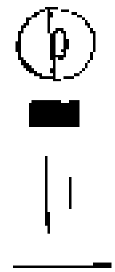
**Think it over:**
1. How did you make the most lights glow using only one battery? Compare results with class.
2. What set-up lit the most lights when you used two batteries? Compare results with the rest of the class.
3.How many different degrees of brightness did you obtain using three bulbs and two batteries? Compare results with class.

**Problem (Part C):**
How many different ways can you connect bulbs and batteries and still have a working circuit?

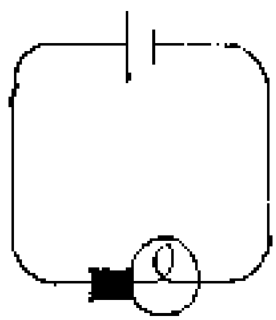
**Gather these materials:**
1. Bulbs

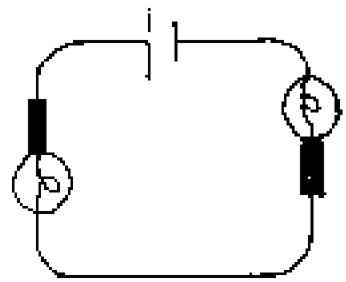
2. Sockets
3. Batteries and wire (Size D)
4. Battery holders

**Information:**
A shorthand notation for drawing circuits is very convenient when studying and comparing circuits. Circuit symbols for a light bulb, bulb holder, a battery, and wire appear in order below.



**Activity:**
1. Connect the materials as shown in the circuit diagrams.

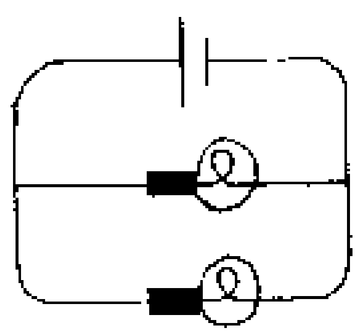




Do each of these circuits work?
These bulbs are connected in series.

2. Using the second diagram unscrew one of the bulbs. What happens?

3. Set up the materials as shown in the following diagram.



These bulbs are connected in parallel.

4. Unscrew one of the bulbs. What happens?

**Think it over:**
1. Build a circuit using two batteries and one bulb in which the batteries are connected in series. In parallel. Sketch your circuits.
2. In your own words describe the differences between series and parallel circuits.

***Teacher Notes***

**Objectives:**
1. Using bulbs, wires and batteries, students will make a complete electric circuit.
2. Students will use symbols to illustrate and compare circuits they construct.
3. Using bulbs, wires, and batteries, students will make series and parallel circuits.

**Background:**
A circuit is a path for electric energy to follow. Without a complete path, no energy flows and bulbs will not light. Students will learn that both ends of a battery must be involved in a complete circuit. Use science books and reference books to gain a greater understanding of electric circuits if you feel your background knowledge is limited.
Houses are wired in parallel so that other parts of a circuit continue to work even if one appliance or light bulb fail. Houses and other buildings have many circuits in them, and these circuits are protected by fuses or circuit breakers. Too many appliances on one circuit will draw too much current, which in turn can melt insulation and cause a fire. Fuses and circuit breakers are designed to open the circuit before overheating takes place.

**Materials:**
Size D batteries
Bare copper wire, insulated wires, or foil ribbons
Flashlight bulbs and bulb sockets
Battery holders

(***NOTE:*** If you do not have bulbs and bulb holders, do not despair. Miniature tree lights will work well in this activity. All you have to do is cut the wires between lights on a string of tree lights. While there may seem to be lots of wire, each bulb holder has only one wire in and one wire out. You can use these bulbs and wires with the batteries. About one inch of insulation needs to be stripped off the end of each wire. Also, wide rubber bands stretched around the length of the battery serve as battery holders and will hold wires in place on the + and - ends.)

**Teaching Suggestions:**
You may wish to make Part C optional.

1. In Part A allow and encourage students to try a number of arrangements to light the bulb. They will learn through experimentation or imitating others, that both ends of the battery, the threaded portion of the bulb, and the base of the bulb must all be involved in successful attempts to light the bulb.
2. Part B presents a unique challenge for the students to be creative and innovative. Encourage the students to explore. Some students may actually succeed in getting more than five bulbs operating at once.
3. Part C introduces students to series and parallel circuits. Through this activity, students should be able to come up with their own descriptions or definitions of series circuits.
4. Expect student answers to vary on the Think It Over sections of each part of this activity.

**Extended Activities:**
1. Invite an electrician to talk to the class about planning and wiring electricity for homes.
2. If students show interest, do a batteries and bulbs unit from a science program.