Plan Your Own Investigation 10-A

Skill Check

- ✓ Initiating and Planning
- ✓ Performing and Recording
- ✓ Analyzing and Interpreting
- ✓ Communicating

Comparing Conductivity

The transmission and use of electrical energy involves insulators, conductors, and semiconductors. For example, the wire that connects a computer to a wall plug consists of a conducting metal covered with an insulating plastic. Inside the computer, there are semiconductors. In this investigation, you will compare the conductivity of different materials and group together those with similar electrical properties.

Suggested Materials

- conductivity tester
- aluminum (strip or wire)
- coated wire
- copper wire
- small block of wood
- graphite
- metal comb
- nylon comb
- beaker
- distilled water
- tap water
- salt
- stir stick

Question

With a partner, brainstorm two or three scientific questions you can answer by testing the conductivity of the suggested materials.

Plan and Conduct

1. With your partner, decide how to use the conductivity tester to classify each material as a good conductor, a poor conductor (insulator), or a semiconductor.
2. Make a table to record your observations. List the materials you will be testing in your table. For the coated wire, include both the exposed wire and the coating on the wire.
3. Get your teacher's approval before continuing with your investigation.

Analyze and Interpret

1. List the materials you tested under the following categories: conductors, insulators, and semiconductors.

Conclude and Communicate

2. Write one or two sentences explaining what your results showed.

Extend Your Inquiry and Research Skills

3. **Research** Gases, such as air, are normally insulators. Under certain conditions, a gas can become a very good conductor, called a plasma. Learn more about plasmas, and write a paragraph to summarize where they are found and how they form.

Science Skills

Go to **Science Skills Toolkit 2** to learn more about scientific inquiry.

Plan Your Own Investigation 10-B

Skill Check

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Be a Charge Detective

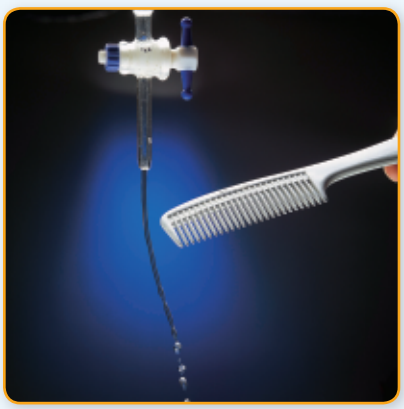
When two different materials are rubbed together, both materials become charged by friction. The material with the stronger hold on its electrons becomes negatively charged. The material with the weaker hold on its electrons becomes positively charged. The electrostatic series in **Table 10.1** lists several materials according to their ability to hold on to electrons.

Safety Precautions

- If you use a glass rod, handle it carefully and make sure that it cannot roll off your table. Do not use a glass rod that is chipped or cracked.
- If you are allergic to animal fur, do not use this material.

Suggested Materials

- pith ball electroscope
- some materials from **Table 10.1** in Section 10.1
- some materials that are not in **Table 10.1** (for example, wood, paper, plastic wrap, a plastic compact disc case)



You can bend a small stream of water by using a charged object. The closer a charged object is to the stream of water, the more the stream of water is deflected.

Question

How can new materials be added in the correct places in the electrostatic series?

Plan and Conduct

1. Plan how to use materials from **Table 10.1** to give a pith ball electroscope a known charge.
2. Decide how to use the charged pith ball electroscope and the laws of electric charges to infer the type of charge on a material that has an unknown charge.
3. Brainstorm how to add a new material in the correct place in the electrostatic series.
4. Create a data table to record your observations.
5. Have your teacher approve your investigation method and data table.
6. Conduct your investigation.

Analyze and Interpret

1. Compare your electrostatic series with the electrostatic series developed by your classmates. How can you resolve differences in the order of the materials?
2. Why are some materials difficult to place in an electrostatic series?

Conclude and Communicate

3. Write a sentence or two summarizing the electrical characteristics of two different materials that result in the formation of static charge when they are rubbed together.

Extend Your Inquiry and Research Skills

4. **Inquiry** A charged object can bend a small stream of water, as shown in the photograph. Particles dissolved in water allow induced charges to form. How would you predict the temperature of the water might affect the amount of bending? How would you test this?