

Shedding Light on Ions

Problem

What kinds of compounds produce ions in solution?

Skills Focus

controlling variables, interpreting data, inferring

Materials



2 dry cells, 1.5-V

small light bulb and socket

4 lengths of wire with alligator clips on both ends

2 copper strips

distilled water

small beaker

small plastic spoon

sodium chloride

graduated cylinder, 100-mL


additional materials supplied by your teacher

or a
conductivity
probe

Procedure



Review the safety guidelines in Appendix A in your textbook.

1.  Make a conductivity tester as described below or, if you are using a conductivity probe, see your teacher for instructions.

| Making a Conductivity Tester | |
|------------------------------|--|
| A. | Use wire with alligator clips to connect the positive terminal of a dry cell to a lamp socket. CAUTION: <i>The bulb is fragile and can break.</i> |
| B. | Similarly, connect another wire between the negative terminal of the cell and the positive terminal of the second cell. |
| C. | Connect one end of a third wire to the negative terminal of the second dry cell. |
| D. | Connect one end of a fourth wire to the other terminal of the lamp socket. |

Atoms and Bonding ▪ Skills Lab**Shedding Light on Ions** *(continued)*

2. Pour about 50 mL of tap water into a small beaker. Place the copper strips in the beaker. Be sure the strips are not touching each other. Attach the alligator clip of the free end of one wire to a copper strip. Do the same with the other wire and the other copper strip. Record your observations in the data table.
3. Disconnect the wires from the copper strips. Take the strips out of the beaker, and pour out the tap water. Dry the inside of the beaker and the copper strips with a paper towel.
4. Pour 50 mL of distilled water into the beaker. Reconnect the conductivity tester and test the water as in Step 2. Keep the copper strips about the same distance apart as in Step 2. Record your observations in the data table.
5. Use 3 spoonfuls of sodium chloride to make a small pile on a clean piece of paper. Dry off the copper strips of the conductivity tester and use it to test the conductivity of the sodium chloride. Record your observations.

Data Table

| Sample | Observations | Produced Ions in Solution? (yes/no) |
|--------------------------|--------------|-------------------------------------|
| Tap water | | |
| Distilled water | | |
| Sodium chloride | | |
| Sodium chloride in water | | |
| | | |
| | | |
| | | |

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6. Add 1 spoonful of sodium chloride to the distilled water in the beaker. Stir with the spoon until the salt dissolves. Repeat the conductivity test and record your observations.
7. Disconnect the conductivity tester and rinse the beaker, spoon, and copper strips with distilled water. Dry the beaker as in Step 3.
8. Test sucrose (table sugar) in the same ways that you tested sodium chloride in Steps 4 through 7. Test additional materials supplied by your teacher.
 - If the material is a solid, mix 1 spoonful of it with about 50 mL of distilled water and stir until the material dissolves. Test the resulting mixture.
 - If the substance is a liquid, simply pour about 50 mL into the beaker. Test it as you did the other mixtures.

Analyze and Conclude

Write your answers in the spaces provided.

1. **Designing Experiments** What were the variable parameters in your experiment? What were the controlled parameters?

2. **Controlling Variables** Why did you test both tap water and distilled water before testing the sodium chloride solution?

3. **Inferring** Could you have used tap water in your tests instead of distilled water? Explain.

Atoms and Bonding ▪ *Skills Lab***Shedding Light on Ions** *(continued)*

4. **Drawing Conclusions** Based on your observations, complete the column in your data table indicating whether each substance produced ions in solution.

5. **Inferring** How can you account for any observed differences in conductivity between dry and dissolved sodium chloride?

6. **Communicating** Based on your observations, decide whether or not you think sucrose (table sugar) is made up of ions. Explain how you reached your answer, using evidence from the experiment.

Design an Experiment

Design an experiment to test the effects of varying the spacing between the copper strips of the conductivity tester. *Obtain your teacher's permission before carrying out your investigation.*