

CHEMLAB 5 Ionic or Covalent?

Compounds can be classified by the types of bonds that hold their atoms together. Ions are held together by ionic bonds in ionic compounds; atoms are held together by covalent bonds in molecular compounds. You cannot tell whether a compound is ionic or molecular simply by looking at a sample of it because both types of compounds can look similar. However, simple tests can be done to classify compounds by type because each type has a set of characteristic properties shared by most members. Ionic compounds are usually hard, brittle, water-soluble, have high melting points, and can conduct electricity when dissolved in water. Molecular compounds can be soft, hard, or flexible; are usually less water-soluble; have lower melting points; and cannot conduct electricity when dissolved in water.

PROBLEM

How can you identify ionic and molecular compounds by their properties?

HYPOTHESIS:

OBJECTIVES

- **Examine** the properties of several common substances.
- **Interpret** the property data to classify each substance as ionic or molecular.

MATERIALS

glass microscope slides

marker

hot plate

spatula

small beakers (50- or 100-mL)

stirring rod

balance

conductivity tester

graduated cylinder, small

thermometer (must read up to 150°C)

1- to 2-g samples of the following:

salt substitute (KCl), dextrose ($C_6H_{12}O_6$), urea (NH_2CONH_2), table salt (NaCl), aspirin

SAFETY PRECAUTIONS



Use care when handling hot objects.

PROCEDURE

1. Use a marker to label each glass slide.
2. Record all data in the table under Data and Observations.
3. Use a spatula to place about one-tenth (about 0.1 to 0.2 g) of the first of your substances on slide.
4. Repeat step 3 with your other substances on slides. Be sure to use a clean spatula for each sample. Record in your data table which substance was put on each slide.
5. Place the slide on a hot plate. Turn the heat setting to medium and begin to heat the slide.
6. Gently hold a thermometer so that the bulb just rests on the slide. Be careful not to disturb your compounds.
7. Continue heating until the temperature reaches 135°C. Observe each section on the slide and record which substances have melted. Turn off the hot plate.
8. Label beakers with the names of your substances.
9. Weigh equal amounts of the four substances (1-2 g of each), and place the weighed samples in their labeled beakers.
10. Add 10 mL of distilled water to each beaker.
11. Stir each substance, using a clean stirring rod for each sample. Note on your table whether or not the sample dissolved completely.
12. Test each substance for the presence of electrolytes by using a conductivity tester. Record whether or not each acts as a conductor.

DATA AND OBSERVATIONS

Substance	Did it melt?	Did it dissolve in water?	Did the solution conduct electricity?	Classification
A: urea (NH ₂ CONH ₂),				
B: sodium chloride (NaCl),				
C: potassium chloride (KCl)				
D: dextrose (C ₆ H ₁₂ O ₆)				
E: aspirin				
F:				

ANALYZE AND CONCLUDE

1. Interpreting Observations What happened to the bonds between the molecules when a substance melted?

2. Comparing and Contrasting Did all compounds melt at the same temperature?

3. Classifying Complete your data table by classifying each of the substances you tested as ionic or molecular compounds based on your observations.

APPLY AND ASSESS

1. What are the differences in properties between ionic and molecular compounds?

2. How did the melting points of the ionic compounds and the molecular compounds compare? What factors affect melting point?

3. The solutions of some molecular compounds are good conductors of electricity. Explain how this can be true when ions are required to conduct electricity.

4. Consider a mixture of sand, salt, and water. How can you make use of the differences in properties of these materials to separate them?