

CHAPTER 2	Investigation 2.E: Properties of Substances	BLM 2.3.5
HANDOUT		

In this investigation, you will study the properties of five different types of solids: non-polar covalent, polar covalent, ionic, network, and metallic. You will be asked to identify each substance as one of the five types of solids on the basis of its properties. In some cases, you will make inferences by drawing on past knowledge and experience. In other cases, you will use the process of elimination. The emphasis is on the skills and understanding you use to make your decisions.

### Question

Is the unknown solid non-polar covalent, polar covalent, ionic, network, or metallic?

### Materials

- distilled water
- 5 unknown solids
- 100 ml beaker and stirring rod
- conductivity tester
- metal plate (iron or aluminium)
- ring stand with clamp
- candle
- Bunsen burner
- match, lighter or striker
- timer
- tongs

### Safety Precautions

- Tie back long hair and any loose clothing.
- Before you light the candle or Bunsen burner, check that there are no flammable solvents anywhere in the laboratory.
- Avoid touching hot surfaces.
- Wash your hands when you have completed the investigation.

### Procedure

1. Read the entire procedure before you begin. Design a table in which to record your observations.

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2. Rub each solid on the surface of each other solid. Rank the relative hardness of each solid on a scale of 1 to 5. A solid that receives no scratch marks when rubbed by the other four is the hardest (5). A solid that can be scratched by the other four is the softest (1).
3. One at a time, place a small quantity (about 0.05 g) of each solid into 25 mL of distilled water in a 100 mL beaker. Observe and record the solubility of each solid.
4. For any solids that dissolved in Procedure Step 3, test the solution for electrical conductivity.
5. Test each of the five large solid samples for electrical conductivity.
6. One at a time, put a small sample of each solid on the metal plate using tongs. Place the plate on the ring stand and heat it with the burning candle. The plate should be just above the flame. Observe the relative melting points of the solids.
7. Repeat Procedure Step 6 with the flame of a Bunsen burner. Observe how soon the solid melts.

### Analysis

1. Based on what you know about bonding, classify each solid as non-polar covalent, polar covalent, ionic, network, or metallic. Give reasons to support your decision.

### Conclusion

2. Based on the properties you observed, write a working definition of each type of solid based on its properties.