

**Purpose:** To investigate the physical properties of common solids and to relate a substance's bonding type to properties observed in the lab.

### Materials

Paraffin wax	Sucrose ( $C_{12}H_{22}O_{11}$ )	Spot Plate	Conductivity tester
Aluminum metal (Al)	Unknown solids	Hot plate	Microwell plate
Sodium Chloride (NaCl)	Toothpicks	Distilled water	

### Procedure

**Work in groups of 3. Collect all 5 substances in microwell plates before starting. "A" groups start with step 1, "B" groups start with step 2, "C" groups start with step 3 (without grinding first is fine).**

1. Place a small amount of each solid (1-2 crystals) in microwell plate (be sure to label!).
2. Place a few crystals of each on foil at the hot plate station. Place foil on hot plate. Do not heat for longer than 30 seconds. Record the melting point as low, medium, or high.
3. Place a few crystals of each substance separately on a watch glass and try to grind up the substance using a scoopula. The harder the substance the more difficult it is to grind. Record how hard it is using a 1-5 scale..
4. Place a small amount of each ground substance in a beaker and test the conductivity of each substance in its solid state. (Please make sure to turn off the device when finished.)
5. Add 25mL of distilled water to each beaker and stir with a stir stick (use a separate stick for each solid). Record if the substance dissolves in water.
6. Test the conductivity of the mixture in the beaker. Do not let the probe touch any solid material left in the beaker. Record your results.

### Observation Table

Test	Paraffin wax	Sodium chloride	Sucrose	Unknown #1	Unknown #2
Conductivity (solid)					
Solubility in water-					
Conductivity (in water)					
Melting Point -low, medium, high					
Hardness– (1-5 scale)					
Odour					

## Analysis:

1. Summarize the lab results in the following table:

	<b>Ionic Bonds</b>	<b>Covalent Bonds Polar</b>	<b>Covalent Bonds Non-Polar</b>
Melting point (high, medium, low)			
Soluble in water (yes/no)			
Conducts electricity (yes/no. If yes, in what state)			
Hardness			
Odour			

2. What type of bonding exists in the unknown solids? Use data collected from the lab to explain how you arrived at the answer.
3. In order for a substance to conduct electricity, it must have free-moving charged particles so that the electricity can flow.
  - a) Explain the conductivity results observed for sodium chloride in the solid state and in aqueous solution.
  - b) Explain the conductivity results observed for sugar.
4. Use your understanding of intramolecular and intermolecular forces to explain the differences between:
  - a) The solubility of polar covalent and non-polar covalent compounds in water.
  - b) The melting point of ionic, polar covalent and non-polar covalent compounds.