# Customized Lab: Properties of Covalent and Ionic Compounds

This is a shorter version of the Properties of Covalent and Ionic Compounds lab in PASCO’s Chemistry through Inquiry lab manual. This “mini” version of the lab has students compare covalent and ionic compounds. In the “full” version students compare ionic compounds with both polar-covalent and non-polar covalent compounds. The full version also contains more questions and has students draw the different materials at the molecular level. These activities could be added as extensions to this shorter lab.

**Mini Lab Design:**

* Each student has a copy of the student lab sheet. The answers are recorded here.
* The lab has two stations. Each station has the instructions on what the students need to do. Provide as many copies of this sheet as necessary. Station 1 requires that students use the hotplate and station 2 requires the conductivity sensor.
* The lab should take about 45 minutes if students understand what they are suppose to do and split up the work.

**Teacher Suggestions:**

* Step 1 in the data collection section asks students to find the conductivity of distilled water. Do this step as a class and demonstrate how to use the conductivity sensor.
  + The solution being tested must be above the small circular openings about 3 cm up on the conductivity probe.
  + The conductivity probe needs to be thoroughly washed between trials.
  + Start at the lowest setting on the conductivity sensor and move to higher settings as needed.
* Have students work in groups of 2 or 3 and then have them split up the work in order to finish the lab in a quicker amount of time.
* More than one group can use a hotplate at a time. It is important that the hotplates are heated before the students put the samples on the hotplate.
* Encourage the students to check their work between the knowns and unknowns and if they are unsure about some results the students may need to re-do that portion.

**Lab Equipment:**

|  |  |  |
| --- | --- | --- |
| Data collection system | Masking tape | Test tube rack |
| Conductivity sensor | Wash bottle and waste container | Stopper, (3) to fit the test tubes |
| Hot plate | Distilled (deionized) water, 30 mL | Spatula |
| Graduated cylinder, 10-mL | Table salt (NaCl), 1 g | Tongs |
| Test tube (5), 15-mm x 100-mm | Table sugar (C12H22O11), 1 g | Aluminum foil square (6), 5-cm x 5-cm |
| Unknown A, 1 g1 | Unknown B, 1 g1 | Unknown C, 1 g1 |

1 Use glucose (also called dextrose, C6H12O6) for unknown A; use wax pieces for unknown B; and use potassium chloride (KCl) for unknown C.

**Determining Hardness and Melting Point – Station 1**

Testing Hardness

1. 🞎 Feel each material with your hands.

2. 🞎 Determine which of the following categories best describes the material:

**Brittle and granular** – the material is made up of grains, it feels hard, yet brittle.

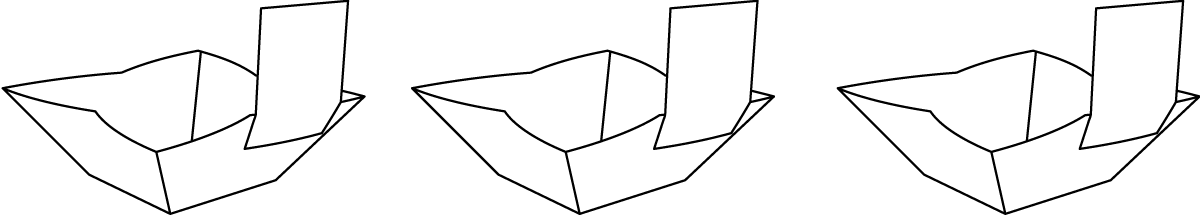
**Soft and waxy** – the material is soft to the touch and/or has a waxy feel.

Testing Melting Point

1. 🞎 Plug in the hot plate and set it to its highest setting.

2. 🞎 Create and label aluminum foil dishes.

a. Fold a piece of aluminum foil (5-cm × 5-cm squares) into a small dish.

b. Place a piece of tape on each dish and label the dish with the substance you are finding the melting point of. These dishes will be placed on the hot plate, so make sure that the label is positioned so that it will not directly touch the heating surface.

salt

3. 🞎 Use a spatula to place a pea-sized sample of each substance in the appropriately labeled aluminum dish.

4. 🞎 Place the aluminum dishes containing the samples onto the hot plate and heat it for a maximum of three minutes.

**Low Melting Point** - If the material melts in less than 3 minutes.

**High Melting Point** – If the material does not melt in 3 minutes.

5. 🞎 Use tongs to remove the aluminum dish from the hot plate. Remove the foil immediately when the material melts or after 3 minutes if it does not melt.

**Determining Solubility and Conductivity – Station 2**

Testing Solubility in Water

1. 🞎 Use a spatula to place a pea-sized sample the material in an appropriately labeled test tube.

2. 🞎 Fill the test tube containing your samples with a little less than half way full (about 5-8 mL) of distilled water.

3. 🞎 Stopper the test tube and gently shake the test tube for two minutes or until dissolved.

4. 🞎 Observe each test tube and record whether the substance dissolves or not.

**Soluble** – The material dissolves in water.

**Not Soluble** – The materials does not dissolve in water.

5. 🞎 Save the mixtures you created and use them to test the conductivity of each substance in water. Directions for this test are provided below.

Testing Conductivity in Solution

Test the conductivity of your material by following the steps below:

1. 🞎 Clean the conductivity sensor thoroughly using distilled water.

2. 🞎 If the substance did not completely dissolve, decant the solution into another test tube.

3. 🞎 Place the conductivity sensor in the test tube containing the solution without any solids.

4. 🞎 Start with the conductivity sensor at its lowest setting: (0 to 1000 µS/cm). If the conductivity sensor is saturated (reads 1000 µS/cm), then change to the middle setting  (0 to

10,000 µS/cm). If the conductivity sensor is saturated at the middle setting (reads 10,000 µS/cm),  
 then change to the highest setting Cond Icon wave (0 to 100,000 µS/cm).

5. 🞎 Record the conductivity (µS/cm) in your table.

6. 🞎 Clean the conductivity sensor thoroughly using distilled water.

7. 🞎 Determine if the material conducts electricity when it is mixed with water:

**Conductor** – the conductivity of the sample is much greater (100 times or more) than the  
 distilled water

**Non-Conductor** – the conductivity is similar to distilled water.