

Name: _____

Date: _____

Physical Science
Bonding
Physical Properties of Two Solids

Introduction:

Some solids consist of molecules in which the atoms are held together by _____ bonds. These solids are called _____ compounds, because they are made of _____ (instead of ions). Other solids consist of an array of positive and _____ ions, arranged in such a way that every positive ion has only negative neighbors and vice versa; the solid is held together because of the _____ between ions of _____ charge. These solids are called _____ compounds. In this experiment, you will examine the physical properties of the covalent/ _____ solid "camphor" (in which atoms are joined by _____ bonds) and the ionic solid sodium chloride/ table salt (in which atoms are held together with _____ bonds).

Safety:

Please note that pure camphor can irritate your skin; handle camphor with forceps at all times. And wash your hand when you are done.

Materials: water, test-tubes and rack, watch glasses, scoopula, salt, camphor, Bunsen burner, matches, test-tube clamp, conductivity tester, stoppers, cyclohexane,

Procedure:

1. Divide your salt evenly into four separate test-tubes and label your test tubes 1-3. Do the same with the camphor and label the test tubes 4-7
2. Smell the sodium chloride in test tube 1 and then record your observations in the data table.
2. Smell the camphor in test-tube 4 and then record your observations in the data table.
4. Place test-tube 1 and 4 over a very low Bunsen burner flame and gently heat until one of the solids melts. Then heat strongly for about one minute. Observe and note the compound melts and boils off first (only one will disappear). Turn off the Bunsen burner. Record your observations in the data table.
5. Using a scoopula the sample of NaCl from test tube 2 onto a watch. Repeat this procedure with the sample of camphor (same sizes as before) from test tube 5. Crush each of the chemicals with the bottom of an empty test tube (one sample should be significantly softer than the next). Record the hardness of each solid in the data table.
6. Obtain two test tubes. Obtain test-tubes 3 and 6. Fill each tube about $\frac{1}{4}$ full with water. Mix the contents of the tubes by placing the stopper in the top of the tubes and shake for about one minute (ensure your keep your thumb over the stopper so that it does not pop off). Observe and note whether any of the compounds are soluble in water. Keep the test tubes for the next step.
7. At the front of the class will be dry samples of salt and camphor in watch glasses. Using a conductivity tester your teacher will test the conductivity of the salt and camphor crystals. Record your findings. Next, pour some of the liquid from the test tubes (step 6) separate watch glasses. Measure and record the conductivity of the solutions. Dump the contents of the tubes down the sink (place any pieces of camphor in the trash). Rinse and dry the tubes and the watch glasses. Return all equipment.

8. This last step will also be done as a demonstration: place a sample of NaCl in one tube and a sample of camphor in the other. Fill each tube about $\frac{1}{4}$ full with the “non-polar” solvent cyclohexane. Mix the contents by placing the stopper in the top of the tubes and shake for about one minute (ensure you keep your thumb over the stopper so that it does not pop off). Observe and note the solubility of the compounds in cyclohexane.

Data Table:

	Salt	Camphor
1. Odor (strong, weak, or none)		
2. Type of bonds between atoms (ionic or covalent)		
3. Melting point (high or low)		
4. Boiling point (high or low)		
5. Hardness (hard/brittle or soft)		
6. Solubility in a polar solvent such as water (soluble or insoluble)		
7. Electrical conductivity of solid (good or poor)		
8. Electrical conductivity when dissolved in water (good or poor)		
9. Solubility in a non-polar solvent (soluble or insoluble)		
8. Electrical conductivity when dissolved in cyclohexane (good or poor)		

Analysis:

1. List the properties of an ionic compound salt that were observed from this lab.
2. List the properties of the molecular compound camphor that were observed from this lab.
3. Camphor has the formula $C_{10}H_{16}O$, why when camphor dissolved in cyclohexane was it unable to conduct electricity?
4. Salt has the formula $NaCl$, how is the make up of this compound different than the make-up of camphor?
5. What does the phrase "like dissolve like" mean?
6. What is a polar solvent, what does this say about salt?
7. Cyclohexane is a non-polar solvent what does this say about camphor?
8. List the following compounds as ionic (I) or covalent (C) and suggest a reason why?
 - a. K_2S _____
 - b. C_2H_6 _____
 - c. Al_2O_3 _____
 - d. SF_6 _____

