

Characteristics of Bonds -- Lab Write Up Instructions

Pre-Lab

1. Name, date, title
2. Purpose
3. Answer the following PreLab questions:
 1. Per the introduction, what are intermolecular forces and in what kind of compounds do they exist?
 2. Why do ionic compounds have such high melting points?
 3. How will you classify a compound as having a high volatility?
 4. Are ionic compounds or covalent compounds more soluble in water? Why?
4. Create a Data Table
 - Data Table : Data table should resemble this for Part I: Include all 4 chemicals in table (listed in the materials section)

Chemical	Volatility (High or low)	Time to melt (Seconds)	Melting Point (high or low)	Solubility (High or low)	Covalent or Ionic?

5. Post Lab: Be sure all data tables are filled in and answer conclusion questions in complete sentences.

Name _____ Date _____ Lab Group _____

Characteristics of Bonds Laboratory Activity

Purpose: In this lab you will examine the properties of ionic compounds and covalent compounds. The properties studied are: **volatility, melting point, and solubility in water.** You will use these properties to classify substances as ionic or covalent.

Background Information: Compounds have either covalent or ionic bonds depending upon the nature of the forces that hold them together. In ionic compounds, the force of attraction is between oppositely charged ions. This attraction is called an ionic bond. Compounds with ionic bonds form crystals with a regular pattern of positive and negative ions held together by the electrical force of attraction. In covalent compounds, the atoms are held together by an interaction between adjacent nuclei and shared electrons called covalent bonds. Covalent compounds exist in the form of distinct particles called molecules. The molecules of covalent compounds are held together in clusters by weak forces generally referred to as intermolecular forces. Intermolecular forces are much weaker forces than the covalent bonds that hold the elements together within the molecules or ionic bonds that hold the positive and negative ions together in crystals. These different forces account for the many properties of ionic and covalent compounds such as solubility, melting point, and the degree of volatility,

Melting -- In order to melt an ionic compound, it is necessary to break ionic bonds. Therefore, ionic compounds usually have high melting points. To melt a covalent compound, it isn't necessary to break bonds. It is only necessary to overcome the much weaker intermolecular forces that hold the particles together.

Volatility -- The particles in a volatile compound must be held together by weaker forces so that some can break away and travel through the air to our noses.

Solubility -- Ionic compounds tend to be soluble (or dissolve in) water because water is a polar compound that can exert enough force to overcome the ionic bond and cause the ions to go into solution. In general covalent compounds are less soluble in water. The tendency of compounds to dissociate or ionize in water tells a great deal about the way in which bonds hold the compound itself together.

Procedure:

Chemicals to be tested

Sodium chloride
PDB (paradichlorobenzene)
Potassium chloride
Shortening

Materials

evaporating dishes
test tubes
DI water (deionized water)
hot plate
test tube rack
stirring rod

1. Volatility – Carefully smell each compound. *Be sure to use correct “wafting” technique.* If you can detect an odor, assume that the compound has a high volatility. Record as high or low volatility.
2. Melting Point – Place a small amount of each substance individually in an evaporating dish. Heat the sample on a hot plate and record the time it takes for it to melt. The PDB will be heated on a hotplate under the fume hood. The longer it takes the compound to melt, the higher the melting point. Record the time it takes to melt, and whether or not it is considered to be a high or low melting point. If the compound hasn't melted in 3 minutes consider that the compound has a high melting point.
3. Solubility in Water – Put a micro-spatula of each material into a separate test tube. Stir each with a stirring rod (rinsed between each sample) and record how likely the substance is to dissolve in water. Record high or low solubility.

Conclusion Questions:

1. Explain why the type of bond could determine the volatility of a substance?
2. Does the strength of the bond have anything to do with the melting point? Explain why.
3. Water molecules are polar which means one side of the molecule is positively charged and the other side of the molecule is negatively charged. Which substances tend to dissolve easier in water, ionic or covalent? Why?
4. What kinds of elements are in the formulas for the ionic compounds?
5. What kinds of elements are in the formulas for the covalent compounds?
6. List the physical properties that indicate ionic bonding exists in a compound.
7. List the physical properties that indicate covalent bonding exists in a compound.