Group Members:

Date:

Chapter 8 Lab

*Properties and Concepts in Chemical Bonding*

Objectives:

 Students will be able to…

 [S11.C.1.1.2](file:///C%3A%5CUsers%5Cjatherly%5CStandard%5CStandardsBrowser) Explain the relationship between the physical properties of a substance and its molecular or atomic structure.

 [S11.C.1.1.3](file:///C%3A%5CUsers%5Cjatherly%5CStandard%5CStandardsBrowser) Explain the formation of compounds (ionic and covalent) and their resulting properties using bonding theories.

 [CHEM.A.1.2.1](file:///C%3A%5CUsers%5Cjatherly%5CStandard%5CStandardsBrowser) Compare properties of solutions containing ionic or molecular solutes (e.g., dissolving, dissociating).

Introduction:

 Over the past few days we have been studying the basic concepts in covalent, metallic, and ionic bonding. In any laboratory or environment you will find a vast array of different compounds and molecules, ALL of which exhibit some version of these three types of bonding. The bonding in these substances that you encounter in everyday life largely determines their use. A metallic skillet would not be useful if it were plastic. But, some cookware that comes into contact with similar surfaces IS plastic; is that safe?

 Your cars frame is artificially strengthened through processes that construct alloys, a mixture of two or more metals. Alloys are an extremely strong type of metallic binding. Plenty of covalent molecules around us also serve novel purposes. Gasoline, a predominantly covalent molecule, is liquid at room temperature and stores a TON of chemical energy in its bonds. The ionic solids in your food, drinks, and other consumables, provide you with the vitamins and minerals you need to survive.

 In this lab you will get hands on experience examining the different properties of these compounds. It is likely that you can already identify whether these elements exhibit more ionic or more covalent character; the more important objective is to investigate the differences in their properties, then relate that back to their bonding characteristics. In the extension questions you will answer some questions regarding the practical applications and bonding principals of these compounds.

 Take your time and read the directions carefully.

Procedure:

1. Document the physical properties of each compound before you conduct any tests (at least 3 for each).
2. Determine if the compounds are soluble in water by adding ~1 g of each substance to approximately 100 mL of water, stir to dissolve. Only perform this test where appropriate.
3. Measure the conductivity of each compound (dry) using the meter.
4. Determine the conductivity of the solutions you made in step 2, determine the conductivity of the metals and all liquids.
5. Determine in general either high or low melting point by adding some substance to a crucible and heating gently.
6. Using your data, identify the type of bond present.
7. Using your data, complete the extension questions.
8. Good luck, I will be here to ask questions when they arise!

Data: (30 points total):

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Physical properties | Sol.in water | Conductivity(raw) | Conductivity in water(for solids) | Melt? | Type of Bond |
| 1.) NaCl |  |  |  |  |  |  |
| 2.) CaCO3 |  |  |  |  |  |  |
| 3.) C12H22O11 |  |  |  |  |  |  |
| 4.) KCl |  |  |  |  |  |  |
| 5.) C2H5OH |  |  |  |  |  |  |
| 6.) Cu |  |  |  |  |  |  |
| 7.) Pb |  |  |  |  |  |  |
| 8.) H2O |  |  |  |  |  |  |
| 9.) C6H14 |  |  |  |  |  |  |
| 10.) CaCl2 |  |  |  |  |  |  |

Extension: (5 points each)

1. What is chemical bonding?
2. Which compounds are ionic, which are covalent, which are metallic?

2. Name some properties of nonmetals that correlate with your findings. Name some properties of metals that coincide with your data.

1. Of the ionic compounds what did you notice about their melting points? Justify a reason for your findings.
2. Can bond enthalpy or lattice energy be explained by melting point?
3. Determine the heat of formation of salt and the heat of formation of CaCO3, based on this data which would be harder to dissociate?
4. Which of the compounds dissolved in water? Which did not?
5. Which of the substances has the highest conductivity? Which has the lowest? Does your data align with your knowledge of bonding?
6. Which of the compounds has the highest melting point, why?
7. Which of the compounds conducted electricity? either in solution or raw. Based on bonding principles explain your findings.
8. Compare the solubility of compounds 1 and 2. Explain based on bonding principles.
9. Is this related in any way to the conductivity?