

Lab: Types of Bond

Chemist: **Me!**

Learning Targets:

- I can describe the characteristics of types of bonds.

Background:

There are three major forms of bonding found in matter: ionic, covalent, and metallic bonding. Each form of bonding helps to explain specific properties observed. Such stresses induced on substances to show these properties include, crushing, dissolving, shocking, and burning the substance. Like early alchemists, you will be putting various substances through these four stresses in order to better characterize ionic, covalent, and metallic bonding properties. From your observations in the lab, you will attempt to classify the bond types of four unknown substances. Before we venture forth, let us take a moment to learn on how we can predict the identity of ionic, covalent, or metallic substances without testing their properties.

- ★ Ionic substances will always contain metal elements bonded to nonmetal elements or groups of nonmetals we know as polyatomic ions. Valence electrons from metals migrate into the outermost energy shells of nonmetals. The transfer of the electron creates a strong bond.
- ★ Covalent substances will always contain non metal elements only. Valence electrons are shared equally between all nonmetal atoms. The sharing of the electrons also results in a strong bond.
- ★ Metallic substances will always contain metal elements only. Valence electrons transition throughout the body of the metal substance. Due to the free movement of the electrons, metallic substances also have strong bonds.

So, all bonding types are considered strong bonds from the perspective of the atoms. Perhaps, through experimentation we can devise a better comprehension of what truly classifies these bond types?

Pre-Lab Questions:

1. Based upon the background read above, identify the type of bonding found in each of the following (metallic, ionic, or covalent):
 - a. BaCl_2 Ionic
 - b. C_4H_{10} Covalent
 - c. NaNO_3 Ionic
 - d. Fe Metallic
 - e. CO_2 Covalent
 - f. SF_6 Covalent

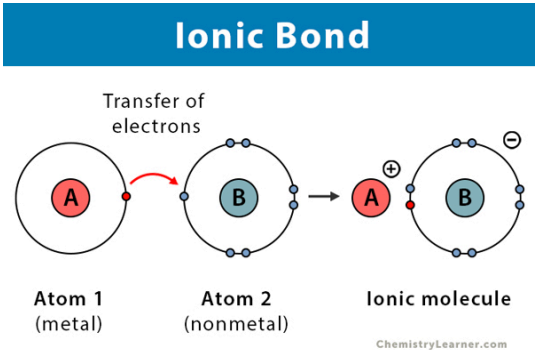
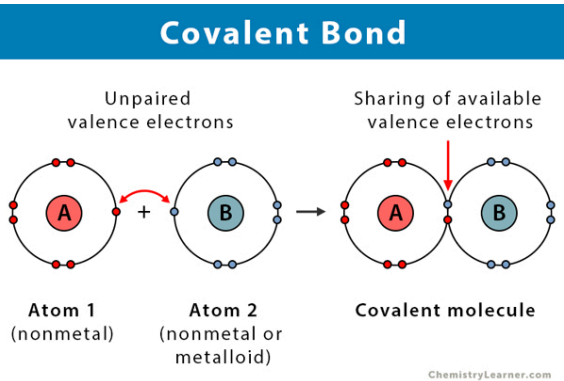
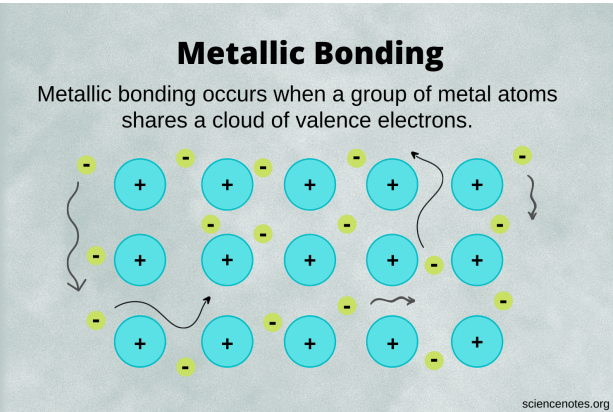
g. CaSO_4

Ionic

h. Ag

Metallic

2. Using background information, explain what happens to the electrons in each type of bonding. Draw a model that demonstrates the bonding behaviors for each bond type.

	Explanation	Model
Ionic	The electron from the metallic atom is transferred to the non-metallic atom creating positive and negative ions that attract each other. The Cation is positive and the Anion is negative.	 Ionic Bond Transfer of electrons Atom 1 (metal) Atom 2 (nonmetal) Ionic molecule ChemistryLearner.com
Covalent	Two nonmetallic atoms share electrons between them. A single covalent bond is where two electrons are shared. A double covalent bond is where 4 electrons are shared. A triple covalent bond is where 6 electrons are shared.	 Covalent Bond Unpaired valence electrons Sharing of available valence electrons Atom 1 (nonmetal) Atom 2 (nonmetal or metalloid) Covalent molecule ChemistryLearner.com
Metallic	The electrons of metallic atoms pool together to form a "sea of electrons" that is mobile. The valence electrons of the metal atoms are shared.	 Metallic Bonding Metallic bonding occurs when a group of metal atoms shares a cloud of valence electrons. sciencenotes.org

SAFETY:

- Tie hair back, wear goggles, move desks (if applicable), wash chemical spills with water
- Dispose of solutions down the drain. Solid waste in the trash.
- Notify the instructor of spills or broken glassware after asking if everyone is okay.