Honors Chemistry Hour\_\_\_\_\_\_\_ Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
Dr. Wexler
Ionization and Ionic Bonds Worksheet 1
Date\_\_\_\_\_\_

**Part I. Ionization**Why Ionize?
In neutral atoms, only noble gas elements have a stable number of valence electrons (2 for He, 8 for Ne and Ar, etc). To become stable, an atom will gain or lose electrons to adopt a noble gas configuration.

For example, Li will lose one electron and Be will lose two electrons to adopt the noble gas electron configuration of Helium (full outer shell). Oxygen will gain two electrons and Fluorine will gain one electron to adopt the noble gas electron configuration of Neon (full outer shell).

Ionic or Covalent?
Electron transfer is said to occur if the difference in electronegativities between the two metals is 1.7 or greater. If the difference is between 0.4 and 1.7, the bond is considered polar covalent (a hybrid between ionic and covalent). If the difference is 0.4 or less, the bond is considered covalent (electrons are shared, not transferred). In reality, however, the difference between pure ionic and pure covalent character is a continuum.

Questions:
1. Al will gain/lose \_\_\_\_\_\_ electron(s) to adopt the electron configuration of \_\_\_\_\_\_\_

2. Ca will gain/lose \_\_\_\_\_\_ electron(s) to adopt the electron configuration of \_\_\_\_\_\_\_

3. Cl will gain/lose \_\_\_\_\_\_ electron(s) to adopt the electron configuration of \_\_\_\_\_\_\_

4. S will gain/lose \_\_\_\_\_\_ electron(s) to adopt the electron configuration of \_\_\_\_\_\_\_

5. K will gain/lose \_\_\_\_\_ electron(s) to adopt the electron configuration of \_\_\_\_\_\_\_

6. Write the electron configurations for K, K+, and Ar:

K)

 K+)

 Ar)

7. Which two of the above are identical? Which two are stable (nonreactive)?

8. When an atom gains or loses electron(s) to adopt the electron configuration of a noble gas element, does it become that element? Explain why or why not.

9. When an atom gains three electrons, what will its charge be? Will it be a cation or an anion?

10. When an atom loses two electrons, what will its charge be? Will it be a cation or an anion?

**Part II. Ionic Bonds**Fill in the missing information in the table below:

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|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element | # of Protons | # of Electrons | # of Valence Electrons | Electronegativity |
| Magnesium |  |  |  |  |
| Hydrogen |  |  |  |  |
| Chlorine |  |  |  |  |

**Ionic Bonding Chemical Equation 1: Magnesium + Chlorine 🡪 Magnesium chloride**

 Mg + Cl2 🡪 MgCl2

11. Calculate the difference in electronegativity between chlorine and magnesium = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

12. Is this difference greater than 1.7? \_\_\_\_\_\_\_

13. Is the bond between Mg and Cl ionic or a hybrid between ionic and covalent (polar covalent)?.

14. Draw the Lewis structures of the reactant elements:
 Magnesium Chlorine Chlorine

Draw two arrows above to trace the transfer of magnesium’s two valence electrons to the chlorine atoms during ionic bond formation.

15. Draw the Lewis structure for Magnesium chloride (use brackets for each ion and write the charge on each ion)

**Ionic Bonding Chemical Equation 2: Hydrogen + Chlorine 🡪 Hydrogen chloride (hydrochloric acid)**

 H2 + Cl2 🡪 2HCl

16. Calculate the difference in electronegativity between chlorine and hydrogen = \_\_\_\_\_\_\_\_\_\_\_\_\_\_

17. Is this difference greater than 1.7? \_\_\_\_\_\_\_

18. Is the bond between H and Cl ionic or a hybrid between ionic and covalent (polar covalent)?