Honors Chemistry **Name** _____

Unit 5 Chemical Bonding Test **Block** _____ **Score** ___/60 points

1.) Based on the electronegativity chart provided below, choose two atoms that will form a polar covalent bond. Write the atoms and their electronegativity values, and indicate the difference in their electronegativity values. Explain how polar covalent bonds are different from the other bond types in terms of their molecular structure. (5 points)

H 2.1						
Li 1.0	Be 1.5	B 2.0	C 2.5	N 3.0	O 3.5	F 4.0
Na 0.2	Mg 1.2	Al 1.5	Si 1.8	P 2.1	S 2.5	Cl 3.0

Answers may vary…
Example: P = 2.1 F = 4.0
Electronegativity difference = **1.9**
A polar covalent bond is formed…
Because of an **uneven distribution of electrons** and
and **ΔEN is between 0.5 and 2.0 for 2 nonmetals**

2.) Explain why elements in the d-block of the periodic table are called Transition elements.

Elements in the d-block have many **unpaired electrons** so they are **eager to bond** in order to **become stable**. Therefore, they alter their oxidation state in order to form more bonds. (1 point)

3.) Explain why the oxidation number for Group 13 is different than the oxidation number for Group 15. Which subatomic particles are involved? Give an example from each group by showing the electron configuration for the atom and the ion. (8 points)

Group 13 metals have an oxidation number of **+3** because they **lose three electrons:** 2 from s and 1 from p
Example: aluminum atom (Al) = $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$ aluminum cation (Ag^{+3}) = $1s^2\ 2s^2\ 2p^6$

Group 15 nonmetals have an oxidation number of **-3** because they **gain three electrons** in the p-block.
Example: nitrogen atom (N) = $1s^2\ 2s^2\ 2p^3$ nitrogen anion (N^{-3}) = $1s^2\ 2s^2\ 2p^6$

4.) Draw the Lewis dot structures for the following atoms: (7 points)

Ne S Cl Mg Si Ga N

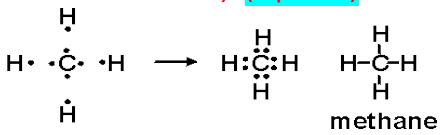
5.) Explain how ionic bonding occurs. Which subatomic particles are involved? Use Lewis dots to show how atoms on the periodic table form an ionic bond. Label the cation and the anion formed. (10 points)

Ionic bonding occurs when a **metal** **transfers** **valence electrons** to a **nonmetal** forming a **cation** and an **anion**.
(Lewis structure must show a curved arrow and not a connecting bond line. Student must also draw charges on ions and all lone pair electrons.)

(1 point for each underlined word; 1 point for each atom including curved arrow; 1 pt for Lewis dots of each ion)

6.) Explain how covalent bonding occurs. Which subatomic particles are involved? Use Lewis dots to show how atoms on the periodic table form a covalent bond.

Covalent bonding occurs when **two nonmetal atoms share valence electrons**. *(Lewis dots must show single, double, or triple bonds. Lone pairs must be included.)* (6 points)



(1 point for each underlined word; 1 point for Lewis dots of each atom; 1 point for proper bond type.)

7.) Fill in the chemical formulas for the following compounds and molecules. (10 points)

CCl_4	_carbon tetrachloride_	PCl_3	_phosphorus trichloride_
$LiC_2H_3O_2$	_lithium acetate_	HNO_3	_nitric acid_
$SiBr_4$	_silicon tetrabromide_	$Ca(ClO_4)_2$	_calcium perchlorate_
Ti_3P	_titanium I phosphide_	$(NH_4)_3N$	_ammonium nitride_
Ga_2O_3	_gallium oxide_	FeF_2	_iron II fluoride_

8.) Fill in the chemical names for the following compounds and molecules. (10 points)

boron trihydride	_BH_3_	magnesium sulfite	_$MgSO_3$_
lead II chromate	_$PbCrO_4$_	sodium hydroxide	_NaOH_
sodium peroxide	_Na_2O_2_	dichlorine monoxide	_Cl_2O_
water	_H_2O_	iron III cyanide	_$Fe(CN)_3$_
hydrofluoric acid	_HF_	dinitrogen pentasulfide	_N_2S_5_

9) Indicate the number of atoms for each element in potassium permanganate. (3 points)

$KMnO_4$ has 1 potassium atom, 1 manganese atom, and 4 oxygen atoms.