**Chemical Bonds homework problems**

Name and date submitted (3 pts):

Instructions: Using this form as a template, create space in the document below and write or type your answers. Turn in your completed work as an email attachment.

(15 questions, 100 points possible).

1. What are valence electrons and why are they so important in chemistry? Answer in your own words using complete sentences
2. What is the basis of any chemical bond? Why do atoms bond at all?
3. How many valence electrons are in the following electron configuration?

1s2 2s2 2p6 3s2 3p6 4s2 3d10 4p3

1. What element on the Periodic Table has the above electron configuration?
2. Octet rule:
   1. What is the Octet Rule?
   2. What two energy sublevels in the atom are involved in making-up the necessary 8?
   3. Give 2 exceptions to this rule.
3. What is the difference between an atom and an ion?
4. A positively-charged ion is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. A negatively-charged ion is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Match the two lists:

List 1 List 2

Covalent bond Unequal sharing of valence electrons

Ionic bond Equal sharing of valence electrons

Polar covalent bond Transfer of valence electrons

1. Identify the types of atoms (metal or nonmetal) in the following compounds and then tell whether the compounds are predominantly ionic, covalent, polar covalent, or metallic.

Hint: Refer to the electronegativities on the back of your Sargent-Welch periodic table.

Rule of thumb:

If ∆ E.N. ˂ 0.4, → covalent

If ∆ E.N. ˃ 1.7, → ionic

If 0.4 ˃ ∆ E.N. ˃ 1.7, → polar covalent

If the compound is formed entirely of transition metals → metallic bonding

1. Sodium chloride (NaCl)
2. Bronze (Sn-Cu-Zn alloy)
3. Magnesium chloride (MgCl2)
4. Carbon dioxide (CO2)
5. Methane (CH4)
6. Stainless steel (Fe-Ni-Cr alloy)

Next 2 questions: Refer to the “Chemical Bonding Chart” posted next to this assignment

1. Ionic bonds
   1. State the general characteristics of ionic bonded substances
   2. Give the bond strength in KJ/mole for CaO (lime)
   3. Give the bond strength in KJ/mole for CaCl2 (road salt)
   4. If ionic bonds are so strong, why don’t we build passenger airplanes and automobiles out of CaCl2? (this will require some thinking, reasoning, and argumentation)
2. Covalent bonds
   1. State the general characteristics of covalently bonded substances
   2. Give the bond strength in KJ/mole of a typical carbon-hydrogen (C-H) bond
   3. Give the bond strength in KJ/mole of nitrogen gas found in the atmosphere (nitrogen-nitrogen).
   4. What is different about the N≡N bond which makes it so strong?
   5. How do covalent bonds compare with hydrogen bonds?

Next 3 questions - Lewis structures: Use “dots” for all valence electrons. Do not cut-and-paste. Do your own sketches, or use a drawing app like Paint, or use Word’s drawing feature, etc. There are many ways to sketch these using your computer.

1. Single bonds: The following covalent compounds contain only single covalent bonds. Draw their Lewis structures.
2. Hydrogen gas (H2)
3. Chlorine gas (Cl2)
4. Hydrochloric acid (HCl)
5. Methane – natural gas (CH4)
6. Hydrogen sulfide gas – rotten egg smell (H2S)
7. Chloromethane – a solvent (CH3Cl)
8. Double bonds: The following compounds or ions each contain at least one double or triple bond. Draw their Lewis structures.
9. Carbon dioxide (CO2)
10. Oxygen gas (O2)
11. Nitrogen gas (N2)
12. Cyanide – a poisonous, but very useful industrial compound (CN-)
13. Carbon disulfide – a solvent (CS2)
14. Ethylene – a flammable gas (C2H4)
15. Polyatomic ions: Draw the Lewis structures of the Polyatomic Ions below. Put them in square brackets and show the overall charge.
16. Hydroxide (OH-)
17. Phosphate (PO43-)
18. Sulfate (SO42-)
19. Nitrate (NO3-)