CHEM 109
Introduction to Chemistry
Fall 2011 Name: _____

Examination 5

Multiple Choice Questions

1. What is the correct electron configuration for Silver(Ag)?

   a) [Ar] $5s^3\ 4d^8$
   b) [Ar] $5s^2\ 4d^9$
   c) [Ar] $5s^1\ 4d^{10}$ ***** **Ag, like Cu, is an exception where the *d* subshell is filled before the 5*s* subshell, giving it one valence electron, consistent with its placement in Group 1B.**
   d) [Ar] $4d^{11}$

2. What ion will Sulfur (S) typically form when combined with an appropriate metal?

   a) S^{4+}
   b) S^{2+}
   c) S^{2-} *****
   d) S^{4-}

3. When forming its typical ion, an atom of Zinc (Zn) will:

   a) lose 4 electrons.
   b) lose 2 electron. ***** **To form the Zn^{2+} ion.**
   c) gain 2 electron.
   d) gain 4 electrons

4. The Heavy Metal Lead (Pb) will typically form compounds of the following two ions:

   a) Pb^{2+} & Pb^{3+}
   b) Pb^{2+} & Pb^{4+} *****
   c) Pb^{3+} & Pb^{4+}
   d) Pb^{3+} & Pb^{5+}

5. The chemical formula for the compound formed when Aluminum (Al) and Sulfur (S) combine is:

a) Al_2S_3 ***** **Al^{3+} x 2 = 6+**
b) AlS_2 **S^{2-} x 3 = 6-**
c) Al_2S
d) Al_3S_2

6. The name of the compound Cu_3PO_4 is:

a) Copper (I) Phosphide
b) Copper (III) Phosphide
c) Copper (III) Phosphate
d) Copper (I) Phosphate ***

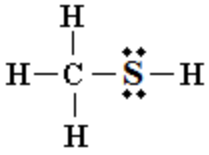
7. The chemical formula for Potassium Nitride is:

a) K_3N_2
b) K_3N *** **K^{+} x 3 = 3+**
c) KN **N^{3-} x 1 = 3-**
d) KN_2

8. How many Lone Pairs of electrons will the following molecule contain? (Hint: Start by writing the Lewis Structure for the molecule.)

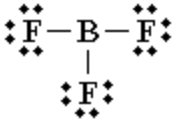
CH_3SH

a) 1
b) 2 ***
c) 3
d) 4



9. Draw a correct Lewis Structure for the BF_3 molecule. How many valence electrons are assigned to the Boron (B) atom?

a) 2
b) 4
c) 6 ***
d) 8

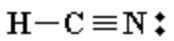


10. Which of the following atoms can expand its octet?

a) Boron (B)
b) Helium (He)
c) Oxygen (O)
d) Xenon (Xe) ***** **Must be Period 3 or Higher.**

11. What is the <u>total</u> number of Triple Bonds in a molecule of CH_3CN? (Hint: Start by writing the Lewis Structure for the molecule.)

a) 0
b) 1 *****
c) 2
d) 3



12. What is the name of the following compound?

OF_2

a) Oxygen Fluoride
b) Fluoro Oxide
c) Oxo Fluoro
d) Oxygen Difluoride *****

13. How many moles is 4.8×10^{24} molecules?

a) 2 moles
b) 4 moles
c) 6 moles
d) 8 moles ***** **$(4.8 \times 10^{24}$ molecules) / $(6.022 \times 10^{23}$ molecules/mol) = 8 mole**

14. How many moles is 2.5 g Cu?

a) 0.039 mole ***** **(2.5 g) x (1 mole Cu / 63.55 g) = 0.039 mole Cu**
b) 0.087 mole
c) 0.125 mole
d) 0.256 mole

15. How much does one mole of OCl_2 weigh?

a) 35,1 g
b) 86.9 g ***** **16 + 2 x (35.45) = 86.9 g/mol**
c) 123 g
d) 219 g

Short Answer Questions

1. Write the condensed Electron Configuration for the following:

   Mg = **[Ne] $3s^2$**

   Mg^{2+} = **[Ne]**

   What is the number of Valence Electrons for each of the following?

   Mg = **2** Mg^{2+} = **0 or 8**

2. Complete the following chemical reaction, including solubility notation, and then write the Net Ionic Equation for the reaction. Your equations must be balanced.

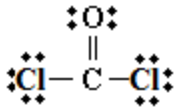
   2 $NaCl_{(aq)} + Pb(NO_3)_{2(aq)} \longrightarrow$

   $PbCl_{2(s)} + 2\ NaNO_{3(aq)}$

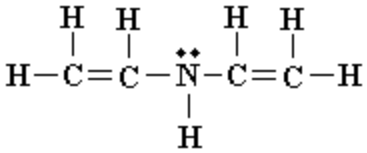
   Net Ionic Equation:

   $Pb^{2+}_{(aq)} + 2\ Cl^-_{(aq)} \longrightarrow PbCl_{2(s)}$

3. Write the Lewis Structure for Phosgene (CCl_2O). Your structure must be complete and contain all necessary Lone Pairs.



4. Write the Lewis Structure for $CH_2CHNHCHCH_2$. Your structure must be complete and contain all necessary Lone Pairs.



5. What is the number of Hydrogen atoms in 3.5g of Ammonium Sulfate; $(NH_4)_2SO_4$?

3.5 g x (1 mol / 132.17 g) x (6.022×10^{23} molecule/mol) x (8 atoms H / molecule)

= 1.3×10^{23} atoms Hydrogen

Useful Information

Solubility Rules

Substances	Solubility	Common Exceptions
Alkali metals and Ammonium compounds	Soluble	None
Nitrates, Acetates, Chlorates, and Perchlorates	Soluble	None
Chlorides, Bromides, and Iodides	Soluble	Ag^{+} and Hg_2^{2+} halides and Hg^{2+} iodides are insoluble. $PbCl_2$, $PbBr_2$, PbI_2 and $HgBr_2$ are slightly soluble.
Sulfates	Soluble	Sr^{2+}, Ba^{2+}, Pb^{2+} and Hg_2^{2+} sulfates are insoluble. $CaSO_4$ and Ag_2SO_4 sulfate are slightly soluble.
Hydroxides	Insoluble	Alkali metal and Ba^{2+} hydroxides are soluble. $Sr(OH)_2$ and $Ca(OH)_2$ are slightly soluble.
Sulfides, Carbonates, Phosphates	Insoluble	Alkali metal and NH_4^{+} compounds are soluble. CaS, SrS and BaS are soluble.