NAME: HONORS CHEMISTRY

SECTION: Putting It All Together I

Communicating in Chemistry

This year, you have learned to communicate in the language of chemistry: symbols, formulas, and equations. You have also learned to count in chemistry: moles. You certainly know the symbols of the most frequently used elements by now. (If you don't, do something about it before it becomes obvious!)

Part I: Formula Writing

Review your class notes as needed.

a) Which are the diatomic elements?
b) Ionic formulas are determined by equalizing the amount of positive charge with the amount of negative charge.
c) *Simple* covalent formulas are determined from the bonding capacity of the group:

Group:	1	2	13	14	15	16	17
# of bonds:	1	2	3	4	3	2	1

(We'll look at more complicated ones in a later sheet.)

Write formulas for:

a) The compound formed between: (See pp. 116-123, pp. 129-132 in your textbook)

1. potassium & fluorine _____
2. magnesium & nitrogen _____
3. calcium & iodine _____
4. carbon & hydrogen _____
5. oxygen & chlorine _____
6. aluminum & sulfur _____
7. boron & fluorine _____
8. sodium & bromine _____
9. phosphorus & bromine _____
10. sodium & oxygen _____

b) Ionic compounds—Review the formulas and charges of the polyatomic ions!

1. ammonium sulfide _____
2. calcium sulfate _____
3. iron (III) nitrate _____
4. magnesium chlorate _____
5. potassium phosphate _____
6. barium nitrite _____
7. lead (IV) chloride _____
8. sodium chromate _____
9. copper (I) sulfate _____
10. zinc hydroxide _____

c) Covalent compounds—those formed between two nonmetals. Use prefixes to designate the number of each kind of atom in the formula! (Refer to pp. 124-126 in your textbook)

1. dinitrogen pentoxide _____
2. sulfur hexafluoride _____
3. carbon tetrachloride _____
4. dinitrogen monoxide _____
5. silicon dioxide _____
6. carbon monoxide _____
7. arsenic trichloride _____
8. phosphorus pentachloride _____

Part II: Naming Compounds (Refer to 134 in your textbook)
Mix them up and name them!

1. $NaHCO_3$ _____
2. S_2Cl_2 _____
3. $SnCl_4$ _____
   (This one needs a Roman numeral. Why?)
4. $KMnO_4$ _____
5. Li_2SO_4 _____
6. CO_2 _____
7. Fe_2O_3 _____
8. $CuSO_4 \bullet 5H_2O$ _____
9. SO_3 _____
10. $(NH_4)_2SO_4$ _____
11. Ba_3N_2 _____
12. P_2O_5 _____
13. $BaHPO_4$ _____
14. BF_3 _____
15. Na_2CrO_4 _____
16. $CaSO_3$ _____
17. $LiHSO_4$ _____
18. SiF_4 _____
19. Cr_2O_3 _____
20. P_2O_3 _____

Part III: Organic Nomenclature
Use 4-carbon molecules to draw a straight chain alkane, alkene, and alkyne. Name each molecule. (Refer to pp. 643-654, 656-658 in your textbook.)

Draw 2-pentanol and 3-pentanol. Draw bromocylopentane. (Refer to p. 664 in your textbook)

Part IV: Equations
We did the words; now let's do sentences. Review the steps in writing a chemical equation. (Refer to pp. 144-157 in your textbook.)

a) Translate these sentences into balanced equations:
   1. Methane gas, CH_4, is burned in oxygen to form carbon dioxide and water vapor.
   2. Solutions of silver nitrate and potassium chromate are added together, producing a precipitate of silver chromate and a solution of potassium nitrate.
   3. Hydrogen gas is combined with chlorine gas to make hydrogen chloride gas.
   4. Iron is heated in air to form iron (III) oxide.

5. Sulfuric acid, H_2SO_4, is neutralized by potassium hydroxide to form water and potassium sulfate solution.

6. Water is decomposed by electrolysis into hydrogen gas and oxygen gas.

b) Other symbols give quite a bit of information about a chemical reaction. Review your notes. Then, go back and put the states of matter into your equations above. (Refer to Ch. 7)

c) *Recognizing patterns* enables you to predict what will happen in a chemical reaction. (Refer to Ch. 7)
Combustion of hydrocarbons produces CO_2 and H_2O.
Synthesis reactions combine elements or small molecules to make larger molecules.
Decomposition breaks larger molecules into smaller molecules or elements, using heat or electricity.
Single displacement reactions involve a more reactive element displacing a less reactive element from its compound. While the activity series (p. 266) enables you to predict qualitatively when this will happen, the Table of Standard Reduction Potentials (p. 615) enables you to make a more exact prediction.
Double displacement reactions occur when two ionic compounds "change partners," resulting in two new compounds. This will occur when the reaction produces a precipitate (refer to the solubility table) OR an unionized molecule such as H_2O.

Predict the products of the following reactions and write a balanced chemical equation. In each case, <u>tell which type of reaction is occurring</u>. Which of these reactions are redox reactions?

1. A solution of lead (II) nitrate is added to a solution of sodium iodide. Type: _____

2. A strip of magnesium ribbon is placed in a solution of zinc chloride. Type: _____

3. Gasoline, C_8H_{18}, is burned in an automobile engine. Type: _____

4. A molten (liquified) sample of sodium chloride is decomposed using electrolysis.
Type: _____

5. Aluminum metal is heated in the presence of sulfur. Type: _____

6. Nitric acid (HNO_3) is reacted with potassium hydroxide. Type: _____

d) Nuclear Equations (Refer to pp. 615-621 in your textbook.)

1. What is the composition of: alpha particles beta particles gamma radiation

2. Compare nuclear fission and fusion.

3. Balance the following nuclear reactions. What type of nuclear decay does each reaction represent?

$^{240}_{92}U \rightarrow {}^{0}_{-1}e + ?$

$^{240}_{96}Cm \rightarrow {}^{4}_{2}He + ?$

Part V: The Mole Concept

Refresh your memory before launching into Putting It Together II! Moles give us a way of *counting* things that are too small to measure directly. A sliding scale of relative masses has been assigned to each of the elements, assigning the mass of "1 mole" of that element. (See pp. 208-215 & pp. 218-224 in your textbook)

a) How many particles are in a mole? _____
What sort of particles would be counted or measured in moles?

_____ _____ _____

b) Find the gram formula mass (gfm) of
1) $(NH_4)_3PO_4$ 2) $C_{12}H_{22}O_{11}$ 3) $CuSO_4 \bullet 5H_2O$

c) What is the mass (in grams) of one mole of water molecules?

d) What is the mass (in grams) of one water molecule?

e) How many water molecules are contained in 30.0 g of water?

f) How many atoms of hydrogen are in 30.0 grams of water?