NAME: HONORS CHEMISTRY

SECTION: Chemical Reactions Review Sheet

After studying chapters 6 and 7 (new textbook), you should be able to:

- List indirect evidence that a reaction has occurred.
- Identify the reactants and products in a chemical reaction.
- Rewrite a chemical equation from a description of a chemical reaction using appropriate symbols and formulas.
- Demonstrate the ability to write and balance chemical reactions when given the names or formulas of all reactants and products.
- Classify a reaction as synthesis, decomposition, single replacement, double displacement (precipitation), or combustion.
- Classify reactions as redox or non-redox.
- *(Show how electrons are lost or gained in redox reactions.*
- Identify acid-base reactions.
- State the driving forces that predict whether a reaction will occur.
- Predict the products of simple reactions given the reactants.
- Use the activity series of metals to predict whether a given reaction will occur and to predict the products of single replacement reactions.
- Use solubility tables to predict precipitant formation.
- Write net ionic equations for double displacement reactions.
- Identify spectator ions in double displacement reactions.

Problems for you to try:

1. List the seven diatomic elements.

2. What kind of visual (macroscopic) evidence indicates that a chemical reaction has occurred? Include a reaction that illustrates each type of reaction you included in your answer.

3. What are the driving forces that tend to make reactions likely to occur?

4. The text emphasizes balancing a chemical equation so that all of the coefficients are lowest multiple whole numbers. This is called “standard form.” Although it is not standard, coefficients in a balanced equation can be fractions. However, subscripts can never be fractions. Explain why each of these statements is true.

5. Changing the subscripts in a chemical equation can balance the equation mathematically. Why is this not allowed? Include an example using particle models to support your answer.

6. Determine the sum of the coefficients for each of the following chemical equations when they are balanced in standard form.

   a. $NaBH_4 + BF_3 \rightarrow NaBF_4 + B_2H_6$

   b. $NO + H_2 \rightarrow N_2 + H_2O$

   c. $Fe_2O_3 + CO \rightarrow Fe + CO_2$

7. Choose the correct symbol written below to describe each of the chemical reactions listed in questions a-i.

   S = synthesis SR = single replacement
   D = decomposition DD = double displacement
   C = combustion

Then, complete the equation by writing the correct name of the element or compound in each blank.

_____ a. oxygen + _____ → zinc oxide

_____ b. hydrochloric acid solution + calcium hydroxide solution → _____ + _____

_____ c. butane (a hydrocarbon)+ oxygen → _____ + _____

_____ d. sodium hydroxide + _____ → silver hydroxide + sodium nitrate

_____ e. barium acetate + potassium sulfate → _____ + _____

_____ f. _____ + _____ → copper (II) bromide

_____ g. sodium + magnesium chloride → _____ + _____

_____ h. copper (II) oxide → _____ + _____

_____ i. methane (a hydrocarbon) + _____ → carbon dioxide + water

8. Write balanced formula equations for each reaction in #7. Include states of matter as much as possible.

   a.

   b.

   c. butane = C_4H_{10}

   d.

   e.

   f.

   g.

h.

i. methane = CH_4

Which of the above equations represent redox reactions? Which of the above reactions are acid-base reactions?

9. Write a balanced formula equation for each of the following. (Hint: Identify the reaction type first.) Include as many symbols and states of matter as possible.

_____ a. The formation of solid copper (II) oxide from its elements

_____ b. Combining solutions of aluminum sulfate and iron (II) chloride

_____ c. Burning of gas ethane (C_2H_6) to release lots of energy

_____ d. Reacting solid zinc and liquid bromine

_____ e. Chlorine gas replaces bromide in solid sodium bromide

_____ f. Adding solid ammonium sulfide to sodium chloride solution

_____ g. Making solid magnesium chloride from its elements

_____ h. Reacting solid cobalt with fluorine gas

_____ i.Gaseous nitrogen monoxide reacts with gaseous carbon monoxide to form nitrogen gas and carbon dioxide gas. This reaction is catalyzed by platinum.

Which of the above equations represent redox reactions? Which of the above reactions are acid-base reactions?

10. You wish to make baking soda (sodium hydrogen carbonate). To do so, you bubble carbon dioxide into cold water that contains dissolved ammonia (NH_3) and sodium chloride. The other product is ammonium chloride, which remains dissolved in the water. At high concentrations, the baking soda is not soluble, so you can collect it by filtration. Write a balanced chemical equation (standard form) for this reaction. Include as many states of matter as possible

11. Use the table below to predict the products of the following decomposition reactions. Write balanced chemical equations.

Four Kinds of Decomposition Reactions: one compound to make smaller compounds or elements

1. (MCO_3) Metallic carbonates decompose into metallic oxides and carbon dioxide.
   $CaCO_3 \rightarrow CaO + CO_2$
   $K_2CO_3 \rightarrow K_2O + CO_2$
2. (MOH) Many metallic hydroxides decompose into metallic oxides and water.
   $2\ KOH \rightarrow K_2O + H_2O$
   $Ca(OH)_2$ ----> $CaO + H_2O$
3. ($MClO_3$) Metallic chlorates decompose into metallic chlorides and oxygen gas.
   $2\ KClO_3 \rightarrow 2\ KCl + 3\ O_2$
   $Ba(ClO_3)_2$ -→ $BaCl_2 + 3\ O_2$

***4. (XY) Binary (two-element) compounds decompose into two pure elements ***on tests
   $2\ HgO \rightarrow 2\ Hg + O_2$
   $2\ NaCl \rightarrow 2\ Na + Cl_2$

Type _____ a. _____$NaClO_3$ → _____+_____

Type _____ b. _____K_2O → _____+_____

Type _____ c. _____NaOH → _____+_____

Type _____ d. _____H_2CO_3 → _____+_____

Type _____ e. silver oxide _____ → _____+_____

Type _____ f. sodium chloride _____ → _____+_____

12. For each of the following double displacement reactions, predict the products, identify the precipitant (if one is formed), and write a complete balanced equation showing the states of matter. List the spectator ions and write the net ionic equation for the formation of the precipitate.

a. $FeSO_{4(aq)} + BaCl_{2(aq)} \rightarrow$

net ionic equation: Spectator ions:

b. zinc chloride + sodium sulfide

net ionic equation: Spectator ions:

13. Use your activity series to predict whether or not the following single replacement reactions will occur. If the reaction will occur, predict the formulas of the products and write the balanced equation. If the reaction will not occur, write "no reaction."

$K_{(s)} + H_2O_{(l)} \rightarrow$

$KCl + F_2 \rightarrow$

$Ag + Cu(NO_3)_2 \rightarrow$

$MgF_2 + Br_2 \rightarrow$

$Zn + H_2SO_4 \rightarrow$