Chemistry 1 Name ________KEY____________
Unit 4 ALT 4b Study Guide – Reaction Stoichiometry Period _____ Date _______________

THIS COMPLETED STUDY GUIDE IS DUE 3/7/16 AS PART OF THE UNIT 4b PACKET #2. Your highest packet score of the three collected will be part of your ALT 4 grade.

Part 1: Types of Reactions: ***Know the following terms. Write a definition in the space provided***
You will need your Lesson 6 handout and your completed Lesson 6 video note guide.

Reactivity series (Lesson 6 video notes)
A list where the most reactive element is placed at the top and the least reactive element is at the bottom. A more reactive element will displace a less reactive element.

Decomposition reaction (p. 370) A reaction in which a single substance is broken down into two or more simpler substances.

Combustion reaction (Lesson 6 video notes)
A reaction in which a hydrocarbon is reacted with oxygen gas to produce CO2 gas, water vapor, heat and light.

Single exchange reaction (p. 371) A reaction in which a more reactive element (usually a halide or metal) displaces a less reactive element from a compound.

Double exchange reaction (p. 371)
A reaction in which there is an exchange of ions between reactants to form new products.

Combination reaction (p. 369) A reaction in which two or more reactants combine to form a single new product.

You will need to be able to recall each type of chemical reaction without assistance, classify example equations, predict products or reactants when given part of the reaction, and balance the final equation.

1. Classify each of the reactions below as combination (C), decomposition (D), single exchange (SE), double exchange (DE) or combustion (B aka burning).

__C__ $K_2O(s) + H_2O(l) \rightarrow 2KOH(aq)$

__DE__ $2MgCl_2(aq) + Na_2CO_3(aq) \rightarrow 2NaCl(aq) + MgCO_3(s)$

__D__ $2Al_2O_3(s) \rightarrow 4Al(s) + 3O_2(g)$

__SE__ $Cu(NO_3)_2(aq) + Zn(s) \rightarrow Cu(s) + Zn(NO_3)_2(aq)$ [Zn is above Cu in reactivity series]

__DE _ $H_2SO_4(aq) + 2NaOH(aq) \rightarrow Na_2SO_4(aq) + 2H_2O(l)$

__SE_ $2K(s) + 2H_2O(l) \rightarrow 2KOH(aq) + H_2(g)$ [K is above H in reactivity series]

___C_ $2O_2(g) + N_2(g) \rightarrow N_2O_4(g)$

__D__ $2NaF(s) \rightarrow 2Na(s) + F_2(g)$

__B__ $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$ + heat + light

2. Predict the products and write the correct balanced equation for the single exchange reaction between aqueous lithium bromide and fluorine gas. Remember that elemental fluorine is diatomic and its symbol is F_2.

$2LiBr(aq) + F_2(g) \rightarrow 2LiF(aq) + Br_2(aq)$ [F is more reactive than Br]

3. Predict the products and write the correct balanced equation for the double exchange reaction between aqueous sodium chloride and aqueous silver nitrate. One of the products will be a solid containing silver and the other will be a solution.

$NaCl(aq) + AgNO_3(aq) \rightarrow AgCl(s) + NaNO_3(aq)$

4. Explain how to use the reactivity series to determine whether or not a single exchange reaction will take place. Use the following equation as evidence.
   $2Fe(s) + 3ZnCl_2(aq) \rightarrow 2FeCl_3(aq) + 3Zn(s)$

The reactivity series lists elements from most reactive to least reactive so we can use it to determine if one metal is more reactive than another. In the reaction above Fe is above Zn in the list and therefore it will displace Zn and form a compound with Cl leaving elemental Zn metal.

Part 2: Understand and apply the concept of weighing by counting (Activity Lesson 8)
You will need your Lesson 8 handout.

5. Explain how you can use mass to count large numbers of objects.
   Take a small sample of objects, mass them and then calculate an average mass per object. Next, mass the collection of objects being careful not to include the mass of the bag or container the objects are in. To obtain the # of objects in the sample, divide mass of objects by average mass per object.

6. How many grains of rice are in a sample that weighs 2500 grams? A sample of 100 rice grains has a mass of 2.21 grams. Calculate the average mass of one rice grain by dividing 2.21 grams by 100 rice grains to get 0.221 g/1 rice grain. Then divide the sample mass of 2500 grams of rice by the average mass per grain to get total rice grains = 113,122 grains of rice.

Part 3: Scientific Notation (Lesson 9)

Write the number using scientific notation.

8400 = ___________8.4×10^3

27000 = __________2.7×10^4_

0.023 = __________2.3×10^{-2}_

0.00019 = ________1.9×10^{-4}_

0.00000000500 = __5.00×10^{-9}__

Write the number in expanded form.

3.82×10^4 = ____38,200_________

2.5×10^{-2} = _____0.025_________________

1.2091×10^5 = __120,910__________________

6.342×10^{-3} = ___0.006342______________

8.5×10^{12} = _8,500,000,000,000__

Part 4: Understand the relationship between mass and moles (Lessons 9, 10, and 11)
Distinguish between Avogadro's number and the mole.

7. What is a mole? What is Avogadro's number? How are the two related?
   A mole is a counting unit. Avogadro's number= 6.02×10^{23}; it represents the number of particles present in one mole of a substance. 1 mole = 6.02×10^{23} where particles can be atoms, formula units, ions, molecules etc.)

8. How do you find the molar mass of any element? Give one or two examples. Include correct units.
   Molar mass of any element is equal to the element's average atomic mass in grams. For example, the molar mass of lithium (Li) = 6.941 grams per mole or
   fluorine (F) = 19.0 g/mole

Round molar mass to one decimal and show answers to #10 in correct scientific notation.

9. Find the molar mass of the following compounds	10. How many moles are in 12.5 g of each compound? SHOW WORK.
a. KNO_3 K: 1 x 39.1 g/mol=39.1 g/mol N: 1 x 14.0 g/mol=14.0 g/mol <u>O: 3 x 16.0 g/mol=48.0 b/mol</u> Molar mass KNO_3 = 101.1 g/mol	a. KNO_3 $12.5\ \cancel{g\ KNO_3} \times \frac{1\ mol\ KNO_3}{101.1\ \cancel{g\ KNO_3}}$ = 0.12364 mol KNO_3 =0.12 mol KNO_3 = 1.2×10^{-1} mol KNO_3
b. Na_2SO_4 Na: 2 x 23.0 g/mol = 46.0 g/mol S: 1 x 32.1 g/mol = 32.1 g/mol <u>O: 4 x 16.0 g/mol=64.0 g/mol</u> Molar mass Na_2SO_4 = 142.1 g/mol	b. Na_2SO_4 $12.5\ \cancel{g\ Na_2SO_4} \times \frac{1\ mol\ Na_2SO_4}{142.1\ \cancel{g\ Na_2SO_4}}$ = 00.08796 mol =0.09 mol Na_2SO_4 = 9×10^{-2} mol Na_2SO_4
c. $Al_2(CrO_4)_3$ Al: 2 x 27.0 g/mol=54.0 g/mol Cr: 3 x 52.0 g/mol=156.0 g/mol <u>O: 12 x 16.0 g/mol= 192.0 g/mol</u> Molar mass $Al_2(CrO_4)_3$ = 402.0 g/mol	c. $Al_2(CrO_4)_3$ $12.5\ \cancel{g\ Al_2(CrO_4)_3} \times \frac{1\ mol\ Al_2(CrO_4)_3}{402.0\ \cancel{g\ Al_2(CrO_4)_3}}$ = 0.0310845 mol $Al_2(CrO_4)_3$ = 0.031 mol $Al_2(CrO_4)_3$ = 3.1×10^{-2} mol $Al_2(CrO_4)_3$