KEY

Name:_____ Stoichiometry Calculations Review

Directions: Solve for the following problems. Show all work!

1. If you had .569 moles of butane (C_4H_{10}) reacting with excess oxygen, how many grams of carbon dioxide will be produce?

$$1\ C_4H_{10} + O_2 \rightarrow 4\ CO_2 + H_2O$$

0.569 0.569

0.569 moles of CO_2

2. How many moles of oxygen gas needed to combine with 3.1 moles of SO_2?

$$2SO_2 + O_2 \rightarrow 2\ SO_3$$

$\frac{2\ SO_2}{1\ O_2} = \frac{3.1\ SO_2}{x\ O_2}$ 3.1 moles x

$\frac{3.1}{2} = \frac{2x}{2}$ **x = 1.55 moles O_2**

3. Calculate the gram formula mass of $Al_2(SO_4)_3$

342 g/mol

Al = 27(2) = 54
S = 32(3) = 96
O = 16(12) = +192
342 g/mol

4. Calculate the number of moles in 25.00 g LiCl.

$25.00\text{g} \times \frac{1\text{ mol}}{42.5\text{g}} =$ **0.59 moles**

Li = 7
Cl = 35.5
42.5 g/mol

5. Calculate the mass (in grams) of 3.00 moles Ca.

$3.00\text{moles} \times \frac{40\text{ g}}{1\text{ mol}} =$ **120g**

6. Determine the mass (in grams) of each of 1.25 mol $Ca_3(PO_4)_2$

$1.25\text{moles} \times \frac{310\text{ g}}{1\text{ mol}} =$ **387.5g**

Ca = (3)(40) = 120
P = (2)(31) = + 62
O = (8)(16) = + 128
310 g/mol

7. Calculate the percent composition for Mg and Cl in $MgCl_2$

Mg = 24.3
Cl = (2)(35.5) = 71
95.3 g/mol

Mg = $\frac{24.3}{95.3} \times 100 =$ **25.5%**

Cl = $\frac{71}{95.3} \times 100 =$ **74.5%**

8. Find the percent composition of carbon in $C_6H_{12}O_6$

$C = (6)(12) = 72$
$H = (12)(1) = 12$
$O = (16)(6) = 96$
$180\ g/mol$

$C = \frac{72}{180} \times 100 = \boxed{40.0\%}$

$H = \frac{12}{180} \times 100 = \boxed{6.7\%}$

$O = \frac{96}{180} \times 100 = \boxed{53.3\%}$

9. How many grams of sodium sulfate will be formed if you start with 200 grams of sodium hydroxide, 45 grams of sulfuric acid and produce 29 grams of water?

$2\ NaOH + H_2SO_4 \rightarrow 2\ H_2O + Na_2SO_4$

$200g + 45g = 29g + x$
$245 = 29g + x$
$-29 \quad -29$

$\boxed{x = 216\ g\ Na_2SO_4}$

10. Determine the molecular formula for a compound with an empirical formula NO_2 and a molar mass of 92.02 g/mol.

$NO_2 \times 2 = \boxed{N_2O_4}$

$N = 14$
$O = 2(16) = 32$
$46\ g/mol$

$\frac{92.02\ g/mol}{46\ g/mol} = 2$

11. Convert -45°C to Kelvin.

$K = °C + 273$
$K = -45 + 273$
$\boxed{K = 228\ K}$

12. Convert 657K to °C.

$K = °C + 273$
$657 = x + 273$
$-273 \quad -273$
$\boxed{°C = 384}$

13. BONUS: Using the equation below, calculate the mass of SO_2 needed to produce 2.5g of SO_3 if excess oxygen is available. *Hint, you must do a mole conversion first, then a mole:mole ratio calculation and then convert mass back to moles!

$2SO_2 + O_2 \rightarrow 2\ SO_3$
$\times \qquad 2.5g$

① $2.5g \times \frac{1\ mol}{80g} = 0.03125\ moles$

SO_3: $S = 32$
$O = (16)(3) = 48$
$80\ g/mol$

② $2 : 2$
$0.03125 \quad 0.03125$

$SO_2 = SO_2$

③ $0.03125\ mol/s \times \frac{64\ g}{1\ mol}$

$\boxed{2g\ SO_2}$