Stoichiometry Quiz Name KEY

Mole-Mole

1. How many moles of zinc would be required to react with 0.95 moles of copper (II) nitrate? $Zn + Cu(NO_3)_2 \rightarrow Cu + Zn(NO_3)_2$

$$.95\ mol\ Cu \times \frac{1\ mol\ Zn}{1\ mol\ Cu} = \boxed{.95\ mol\ Zn}$$

2. If you want to produce 25.0 moles of water from the combustion of propane, how many moles of oxygen will need to react?

$C_3H_8 + 5O_2 \rightarrow 4H_2O + 3CO_2$

$$25.0\ mol\ H_2O \times \frac{5\ mol\ O_2}{4\ mol\ H_2O} = \boxed{31.25\ mol\ O_2}$$

3. The reaction of sodium phosphate with barium chloride produced 0.56 moles of barium phosphate. How many moles of sodium chloride were also produced?

$2Na_3PO_4 + 3BaCl_2 \rightarrow 6NaCl + Ba_3(PO_4)_2$

$$0.56\ mol\ Ba_3(PO_4)_2 \times \frac{6\ mol\ NaCl}{1\ mol\ Ba_3(PO_4)_2} = \boxed{3.36\ mol\ NaCl}$$

Mass-Mass

4.) 10.0 grams of heptane (C_7H_{16}) react with oxygen according to the following equation. How many grams of water are formed?

$C_7H_{16} + 11O_2 \rightarrow 8H_2O + 7CO_2$

$$10.0\ g\ C_7H_{16} \times \frac{1\ mol\ C_7H_{16}}{100\ g\ C_7H_{16}} \times \frac{8\ mol\ H_2O}{1\ mol\ C_7H_{16}} \times \frac{18\ g\ H_2O}{1\ mol\ H_2O} = \boxed{14.4\ g\ H_2O}$$

5.) Use the equation from problem 4. If you make 35.0 grams of water how many grams of oxygen did you use?

$$35.0\ g\ H_2O \times \frac{1\ mol\ H_2O}{18\ g\ H_2O} \times \frac{11\ mol\ O_2}{8\ mol\ H_2O} \times \frac{32\ g\ O_2}{1\ mol\ O_2} = \boxed{85.55\ g\ O_2}$$

6.) The reaction of sodium phosphate with iron (III) chloride produces 325.0 grams of iron (III) phosphate. How many grams of iron (III) chloride were reacted?

$Na_3PO_4 + FeCl_3 \rightarrow FePO_4 + 3NaCl$

$325.0\,g\,FePO_4 \times \frac{1\,mol\,FePO_4}{150.85\,g\,FePO_4} \times \frac{1\,mol\,FeCl_3}{1\,mol\,FePO_4} \times \frac{162.35\,g\,FeCl_3}{1\,mol\,FeCl_3} = 349.78\,g\,FeCl_3$

7. Use equation 6 to answer the following question. If you have 125 gram of iron (III) chloride how much salt could you make?

$125\,g\,FeCl_3 \times \frac{1\,mol\,FeCl_3}{162.35\,g\,FeCl_3} \times \frac{3\,mol\,NaCl}{1\,mol\,FeCl_3} \times \frac{58.5\,g\,NaCl}{1\,mol\,NaCl} = 135.12\,g\,NaCl$

Gas Stoichiometry

8.) If 3.0 liters of N_2 is combined with 8.0 liters of H_2 at STP, according to the equation below, how many liters of NH_3 will be produced? Note: The equation needs to be balanced.

$N_{2\,(g)} + 3H_{2\,(g)} \Rightarrow 2NH_{3\,(g)}$

$3.0\,L\,N_2 \times \frac{1\,mol\,N_2}{22.4\,L\,N_2} \times \frac{2\,mol\,NH_3}{1\,mol\,N_2} \times \frac{22.4\,L\,NH_3}{1\,mol\,NH_3} = 6\,L\,NH_3$

$8.0\,L\,H_2 \times \frac{1\,mol\,H_2}{22.4\,L\,H_2} \times \frac{2\,mol\,NH_3}{3\,mol\,H_2} \times \frac{22.4\,L\,NH_3}{1\,mol\,NH_3} = 5.33\,L\,NH_3$

Mixed Stoichiometry

9.) The decomposition reaction for hydrogen peroxide is given below.

$2H_2O_{2\,(l)} \Rightarrow 2H_2O_{(l)} + O_{2\,(g)}$

How many grams of hydrogen peroxide must be decomposed to produce 5.5 liters of oxygen gas at STP?

$5.5\,L\,O_2 \times \frac{1\,mol\,O_2}{22.4\,L\,O_2} \times \frac{2\,mol\,H_2O_2}{1\,mol\,O_2} \times \frac{34\,g\,H_2O_2}{1\,mol\,H_2O_2} = 16.69\,g\,H_2O_2$

10.) Zinc reacts with hydrochloric acid (HCl) to form aqueous zinc chloride and hydrogen gas.

$Zn_{(s)} + 2HCl_{(aq)} \Rightarrow ZnCl_{2\,(aq)} + H_{2\,(g)}$

If there are 15.3 grams of HCl available to react at STP, how many liters of hydrogen gas would be produced from this reaction?

$15.3\,g\,HCl \times \frac{1\,mol\,HCl}{36.5\,g\,HCl} \times \frac{1\,mol\,H_2}{2\,mol\,HCl} \times \frac{22.4\,L\,H_2}{1\,mol\,H_2} = 4.69\,L\,H_2$

Stoichiometry Practice Test Name:_____

1) What mass of sodium hydroxide is necessary to react completely with 12.3 grams of aluminum nitrate as shown in the following double replacement reaction? Note: you must balance the equation.

$$3\ NaOH + 1\ Al(NO_3)_3 \rightarrow 3\ NaNO_3 + 1\ Al(OH)_3$$

6.9 g NaOH

2) Consider the reaction for the combustion of propane (C_3H_8 -- a common BBQ grill fuel).

A) Write the balanced equation for this reaction. (hint: in a combustion reaction propane will react with oxygen gas to form two products)

$$C_3H_8 + 5O_2 \rightarrow 4H_2O + 3CO_2$$

B) Calculate how many liters of carbon dioxide gas are formed from the combustion of 20.0 grams of propane at STP?

30.5 L CO_2

3) A) Write the balanced equation for the decomposition of magnesium chloride.

$$MgCl_2 \rightarrow Mg + Cl_2$$

B) If 25.0 grams of magnesium chloride decompose, how many grams of magnesium would form?

6.38 g Mg

C) If in the lab you performed this experiment and formed 5.95 grams of magnesium, what is your percent yield?

$$\frac{5.95\ g\ Mg}{6.38\ g\ Mg} \times 100\% = 93\%$$

4) Consider the synthesis of calcium and oxygen to form calcium oxide.

A) Write the balanced equation for this reaction.

$$2Ca + O_2 \rightarrow 2CaO$$

B) If you react 20.0 grams of calcium and 7.00 liters of oxygen, how many grams of calcium oxide will form (hint: this is a limiting reactant problem)?

28g CaO

35g CaO

C) Identify the limiting reactant and the excess reactant in the above reaction.

LR = Ca

ER = O_2

5) A) Balance the following equation for the single replacement reaction:

_____Cl_2 + __2__KBr → __2__KCl + _____Br_2

B) How many grams of bromine should form from the reaction of 80.0 grams of potassium bromide and 20.0 grams of chlorine?

53.78g Br_2

45.13g Br_2

C) If in the lab you performed this experiment, and you were able to collect 41.0 grams of bromine for this reaction, what is your percent yield?

$$\frac{41.0g\ Br_2}{45.13g\ Br_2} \times 100\% = 90.84\%$$

GENERAL CHEMISTRY – STOICHIOMETRY QUIZ

The reaction of sodium phosphate with aluminum chloride produces 0.66 mole of aluminum phosphate. How many moles of aluminum chloride were reacted?

$$Na_3PO_4 + AlCl_3 \longrightarrow NaCl + AlPO_4$$

30.0 grams of pentane (C_5H_{12}) reacts with oxygen according to the following equation. How many grams of carbon dioxide are formed?

$$C_5H_{12} + O_2 \longrightarrow CO_2 + H_2O$$

How many liters oxygen gas would be produced from the decomposition of 0.750 liters of sulfur trioxide gas?

$$SO_3 \longrightarrow S + O_2$$

You are required to produce 25.0 liters of hydrogen gas from the following reaction. How many grams of aluminum would you need to react in order to produce this volume of hydrogen?

$$Al + HCl \longrightarrow AlCl_3 + H_2$$

GENERAL CHEMISTRY – STOICHIOMETRY QUIZ

The reaction of sodium phosphate with aluminum chloride produces 0.66 mole of aluminum phosphate. How many moles of aluminum chloride were reacted?

$Na_3PO_4 + AlCl_3 \longrightarrow NaCl + AlPO_4$

.66mol $AlCl_3$

30.0 grams of pentane (C_5H_{12}) reacts with oxygen according to the following equation. How many grams of carbon dioxide are formed?

$C_5H_{12} + O_2 \longrightarrow CO_2 + H_2O$

91.66g CO_2

How many liters oxygen gas would be produced from the decomposition of 0.750 liters of sulfur trioxide gas?

$SO_3 \longrightarrow S + O_2$

1.125L O_2

You are required to produce 25.0 liters of hydrogen gas from the following reaction. How many grams of aluminum would you need to react in order to produce this volume of hydrogen?

$Al + HCl \longrightarrow AlCl_3 + H_2$

20g Al