

Name: Key

Blk: _____ Date: _____

**Chemistry 11
Stoichiometry Unit Review**

Your Unit Test is scheduled for _____

The format:

30 Multiple Choice Questions (with flashbacks)

20 Short Answer

50 Marks TOTAL

MOLE to MOLE:

1. Water decomposes into its two elements: H_2 (g) and O_2 (g)

a. Write the balanced equation:



b. How many moles of hydrogen gas are produced if 0.500 mol of water are decomposed?

$$0.500 \text{ mol } H_2O \times \frac{2 \text{ mol } H_2}{2 \text{ mol } H_2O} = \boxed{0.500 \text{ mol } H_2}$$

c. How many moles of oxygen gas are produced if 0.250 mol of water decompose?

$$0.250 \text{ mol } H_2O \times \frac{1 \text{ mol } O_2}{2 \text{ mol } H_2O} = \boxed{0.125 \text{ mol } O_2}$$

MOLE to QUANTITY:

2. When 6.5 mol of potassium chlorate solid breaks down to the simpler compound of potassium chloride and oxygen gas, what mass of KCl (s) would be formed?

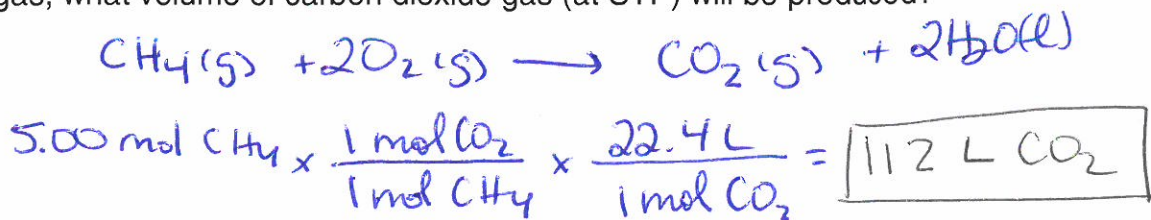


$$6.5 \text{ mol } KClO_3 \times \frac{2 \text{ mol } KCl}{2 \text{ mol } KClO_3} \times \frac{74.6 \text{ g}}{1 \text{ mol } KCl}$$

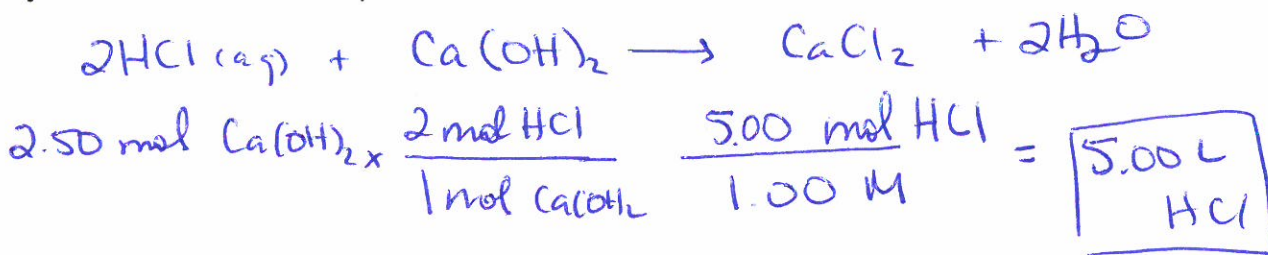
$$= \boxed{4.8 \times 10^4 \text{ g } KCl}$$


$$\begin{array}{r} 1 K = 39.1 \\ 1 Cl = 35.5 \\ \hline 74.6 \\ 3 O = 48.0 \\ \hline 122.6 \end{array}$$

3. When 5.00 mol of methane gas (CH₄) burns in the presence of excess oxygen gas, what volume of carbon dioxide gas (at STP) will be produced?



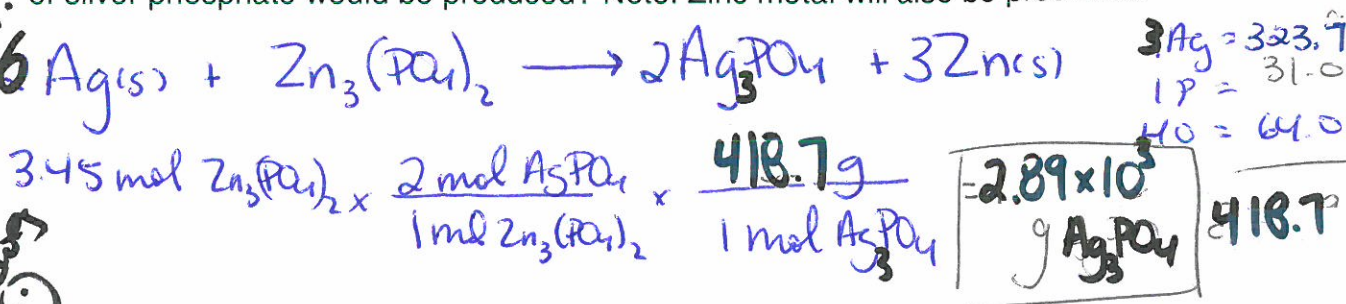
4. What volume of 1.00M HCl (aq) is needed to **neutralize** 2.50 mol of calcium hydroxide? The reaction produces calcium chloride and water.





 $L = \frac{\text{mol}}{M}$

5. When an excess of silver reacts with 3.45 moles of zinc phosphate, what mass of silver phosphate would be produced? Note: Zinc metal will also be produced.



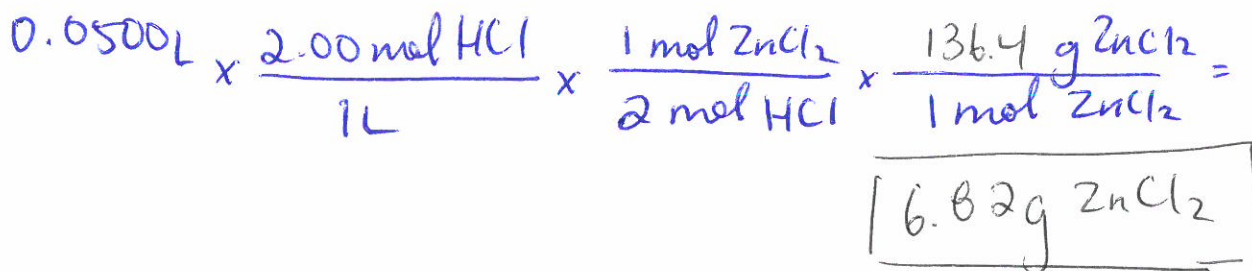
Just plug this in that it's not correct... 😊

QUANTITY to QUANTITY:

6. Zinc metal reacts with HCl to produce zinc chloride and hydrogen gas. What mass of zinc chloride can be produced by reacting 50.0 mL of 2.00 M HCl with sufficient Zn?



$1\text{Zn} = 65.4$
 $2\text{Cl} = 71.0$
 136.4





7. What volume of methane gas (CH₄) must be burned to produce 56.0 L of CO₂ at STP?

$$56.0 \text{ L CO}_2 \times \frac{1 \text{ mol CO}_2}{22.4 \text{ L}} \times \frac{1 \text{ mol CH}_4}{1 \text{ mol CO}_2} \times \frac{22.4 \text{ L}}{1 \text{ mol CH}_4} = \boxed{56.0 \text{ L CH}_4}$$

8. Nitric acid reacts with Sodium hydroxide to produce sodium nitrate and water. If 25.0 mL of the Nitric acid reacts with 0.750 g of solid NaOH, what is the concentration of the nitric acid?



$$0.750 \text{ g NaOH} \times \frac{1 \text{ mol NaOH}}{40.0 \text{ g NaOH}} \times \frac{1 \text{ mol HNO}_3}{1 \text{ mol NaOH}} = \frac{1.88 \times 10^{-2} \text{ mol HNO}_3}{0.0250 \text{ L}} = \boxed{0.750 \text{ M HNO}_3}$$

Limiting Reactants:

For each of the following questions identify:

- the amount of product(s) that will form
- the Limiting Reactant
- the Excess reactant(s) and how much is (are) left over

$$\begin{array}{r} 1 \text{ K} = 39.1 \\ 1 \text{ Cl} = 35.5 \\ \hline 74.6 \end{array}$$

9. For the reaction: $\text{HCl}(aq) + \text{KOH}(aq) \rightarrow \text{KCl}(aq) + \text{H}_2\text{O}(l)$
If 50.0 mL of 1.25 M HCl reacts with 75.0 mL of 1.00 M KOH

$$\text{a. } 0.0500 \text{ L} \times \frac{1.25 \text{ mol HCl}}{1 \text{ L}} \times \frac{1 \text{ mol KCl}}{1 \text{ mol HCl}} \times \frac{74.6 \text{ g}}{1 \text{ mol KCl}} = 4.66 \text{ g KCl}$$

$$0.0750 \text{ L} \times \frac{1.00 \text{ mol KOH}}{1 \text{ L}} \times \frac{1 \text{ mol KCl}}{1 \text{ mol KOH}} \times \frac{74.6 \text{ g}}{1 \text{ mol KCl}} = 5.60 \text{ g KCl}$$

10. For the reaction: $6 \text{ClO}_2(g) + 3 \text{H}_2\text{O}(l) \rightarrow 5 \text{HClO}_3(aq) + \text{HCl}(aq)$
If 71.0 g of ClO₂ is mixed with 19.0 g of water.

$$\begin{array}{r} 1 \text{ Cl} = 35.5 \\ 2 \text{ O} = 32.0 \\ \hline 67.5 \end{array}$$

$$71.0 \text{ g ClO}_2 \times \frac{1 \text{ mol ClO}_2}{67.5 \text{ g}} \times \frac{5 \text{ mol HClO}_3}{6 \text{ mol ClO}_2} \times \frac{84.5 \text{ g}}{1 \text{ mol HClO}_3} = 174.1 \text{ g HClO}_3$$

$$19.0 \text{ g H}_2\text{O} \times \frac{1 \text{ mol H}_2\text{O}}{18.0 \text{ g H}_2\text{O}} \times \frac{5 \text{ mol HClO}_3}{3 \text{ mol H}_2\text{O}} \times \frac{84.5 \text{ g}}{1 \text{ mol HClO}_3} = 148.7 \text{ g HClO}_3$$

$$\begin{array}{r} 1 \text{ H} = 1.0 \\ 1 \text{ Cl} = 35.5 \\ 3 \text{ O} = 48.0 \\ \hline 84.5 \end{array}$$

11. For the reaction: $2 \text{MnI}_2(s) + 13 \text{F}_2(g) \rightarrow 2 \text{MnF}_3(s) + 4 \text{IF}_5(l)$
If 1.23 g of MnI₂ reacts with 25.0 g of F₂.

$$\begin{array}{r} 1 \text{ Mn} = 54.9 \\ 2 \text{ I} = 253.8 \\ \hline 308.7 \end{array}$$

$$1.23 \text{ g} \times \frac{1 \text{ mol MnI}_2}{308.7 \text{ g}} \times \frac{2 \text{ mol MnF}_3}{2 \text{ mol MnI}_2} \times \frac{111.9 \text{ g}}{1 \text{ mol MnF}_3} = 0.446 \text{ g MnF}_3$$

$$\begin{array}{r} 1 \text{ Mn} = 54.9 \\ 3 \text{ F} = 57.0 \\ \hline 111.9 \end{array}$$

$$25.0 \text{ g F}_2 \times \frac{1 \text{ mol F}_2}{38.0 \text{ g F}_2} \times \frac{2 \text{ mol MnF}_3}{13 \text{ mol F}_2} \times \frac{111.9 \text{ g}}{1 \text{ mol MnF}_3} = 1.05 \text{ g MnF}_3$$

$$1 \text{ Fe} = 55.8$$

$$2 \text{ S} = \frac{64.2}{120.}$$

Percent Yield:

12. A 100.0 g sample of impure FeS₂ is roasted to produce Fe₂O₃ and SO₂:



and 4.50 L of SO₂ (g) is collected at STP:

a. What is the THEORETICAL YIELD of SO₂?

$$100.0 \text{ g} \times \frac{1 \text{ mol FeS}_2}{120.0 \text{ g}} \times \frac{8 \text{ mol SO}_2}{4 \text{ mol FeS}_2} \times \frac{22.4 \text{ L}}{1 \text{ mol SO}_2} = \boxed{37.3 \text{ L SO}_2}$$

b. What is the PERCENT YIELD?

$$\text{P.Y} = \frac{\text{actual}}{\text{expected}} \times 100 \rightarrow \frac{4.50 \text{ L}}{37.3 \text{ L}} \times 100 = \boxed{12.1\%}$$

13. The reaction SiO₂ (s) + 4 HF (g) → SiF₄ (g) + 2 H₂O (g) produces 2.50 g of H₂O when 12.2 g of SiO₂ is treated with an excess of HF.

a. What is the Theoretical Yield of H₂O?

$$12.2 \text{ g SiO}_2 \times \frac{1 \text{ mol SiO}_2}{60.1 \text{ g SiO}_2} \times \frac{2 \text{ mol H}_2\text{O}}{1 \text{ mol SiO}_2} \times \frac{18.0 \text{ g H}_2\text{O}}{1 \text{ mol H}_2\text{O}} = \boxed{7.31 \text{ g H}_2\text{O}}$$

b. What is the Percent Yield?

$$\text{P.Y} = \frac{\text{actual}}{\text{expected}} \times 100 \Rightarrow \frac{2.50 \text{ g H}_2\text{O}}{7.31} \times 100 = \boxed{34.2\%}$$

c. How much SiF₄ would form?

$$12.2 \text{ g SiO}_2 \times \frac{1 \text{ mol SiO}_2}{60.1 \text{ g}} \times \frac{1 \text{ mol SiF}_4}{1 \text{ mol SiO}_2} \times \frac{104.1 \text{ g SiF}_4}{1 \text{ mol SiF}_4} = \boxed{21.2 \text{ g SiF}_4}$$

$$\text{P.Y} = \frac{x}{21.2 \text{ g}} \times 100 = 34.2 \div 100$$

$$21.2 \left(\frac{x}{21.2} \right) = (0.342) 21.2$$

$$\rightarrow x = \boxed{7.25 \text{ g SiF}_4}$$