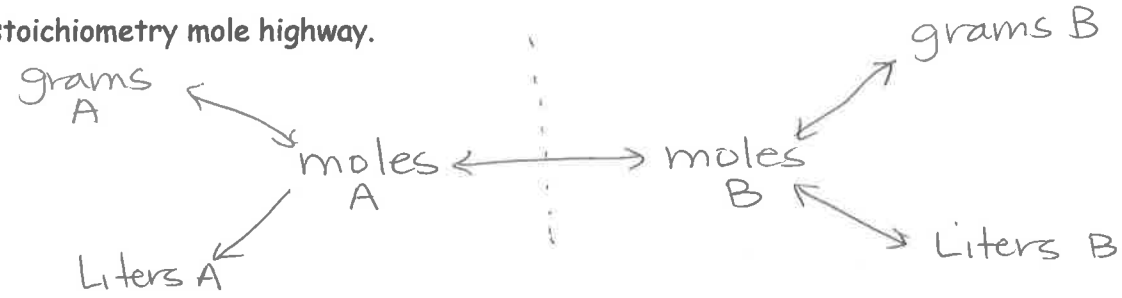
Mrs. Nielsen
Name Key Date _____ Chemistry Period _____

Stoichiometry Exam Review

1. Draw the stoichiometry mole highway.



2. What is the equation for percent yield?

$$\%\ \text{yield} = \frac{\text{experimental}}{\text{theoretical}} \times 100$$

3. What is the equation for percent error?

$$\%\ \text{error} = \frac{|\text{theoretical} - \text{experimental}|}{\text{theoretical}} \times 100$$

4. Oxygen was discovered by Joseph Priestley in 1774 when he heated mercury (II) oxide to decompose it to form its individual elements.

   a. Write a balanced equation for this reaction.

$$2\,HgO \xrightarrow{\Delta} 2\,Hg + O_2$$

   b. How many moles of mercury (II) oxide, HgO, are needed to produce 125 g of oxygen, O_2?

$$125\,g\,O_2 \times \frac{1\ mol\,O_2}{32\ g\,O_2} \times \frac{2\ mol\ HgO}{1\ mol\,O_2} = \boxed{7.81\ mol\ HgO}$$

   c. How many moles of mercury are produced from 125 g of oxygen, O_2?

$$125\,g\,O_2 \times \frac{1\ mol\,O_2}{32\ g\,O_2} \times \frac{2\ mol\ Hg}{1\ mol\,O_2} = \boxed{7.81\ mol\ Hg}$$

5. When copper metal is added to silver nitrate in solution, silver metal and copper (II) nitrate are produced. What mass of silver is produced from 100. g of Cu?

$$Cu + 2AgNO_3 \longrightarrow 2Ag + Cu(NO_3)_2$$

$$100.\,g\,Cu \times \frac{1\ mol\,Cu}{63.55\ g\,Cu} \times \frac{2\ mol\,Ag}{1\ mol\,Cu} \times \frac{107.87\ g\,Ag}{1\ mol\,Ag} = \boxed{339\ g\,Ag}$$

6. Laughing gas (nitrous oxide, N_2O) is sometime used as an anesthetic in dentistry. It is produced when ammonium nitrate is decomposed according to the following reaction.

$$NH_4NO_{3(s)} \rightarrow N_2O_{(g)} + 2\,H_2O_{(l)}$$

a. Balance the equation above.

b. How many grams of NH_4NO_3 are required to produce 16.8 L of N_2O at STP?

$$16.8\ L\ N_2O \times \frac{1\ mol\ N_2O}{22.4\ L\ N_2O} \times \frac{1\ mol\ NH_4NO_3}{1\ mol\ N_2O} \times \frac{80.06\ g\ NH_4NO_3}{1\ mol\ NH_4NO_3}$$

$= 60.0\ g$

c. How many grams of water are produced along with 16.8 L of N_2O at STP?

$$16.8\ L\ N_2O \times \frac{1\ mol\ N_2O}{22.4\ L\ N_2O} \times \frac{2\ mol\ H_2O}{1\ mol\ N_2O} \times \frac{18.02\ g\ H_2O}{1\ mol\ H_2O}$$

$= 27.0\ g$

7. What mass of aluminum is produced by the decomposition of 5.0 kg of Al_2O_3?

$$2\,Al_2O_3 \longrightarrow 4\,Al + 3\,O_2$$

$$5.0\ kg\ Al_2O_3 \times \frac{1000\ g}{1\ kg} \times \frac{1\ mol\ Al_2O_3}{101.96\ g} \times \frac{4\ mol\ Al}{2\ mol\ Al_2O_3} \times \frac{26.98\ g\ Al}{1\ mol\ Al}$$

$= 2600\ g\ Al$

8. Quicklime, CaO, can be prepared by roasting limestone, $CaCO_3$, according to the following reaction.

$$CaCO_{3\,(s)} \xrightarrow{\Delta} CaO_{\,(s)} + CO_{2\,(g)}$$

a. What does the Δ sign over the arrow mean? heat is req'd ~~added~~ to make the reaction happen

b. Calculate the theoretical yield of CaO when 2.00×10^3 g of $CaCO_3$ are heated.

$$2.00 \times 10^3\ g\ CaCO_3 \times \frac{1\ mol\ CaCO_3}{100.09\ g} \times \frac{1\ mol\ CaO}{1\ mol\ CaCO_3} \times \frac{56.08\ g\ CaO}{1\ mol\ CaO}$$

$= 1120\ g\ CaO$

c. The experimental yield of CaO is 1.05×10^3 g. Calculate the percent yield.

93.7%

d. Calculate the percent error for this experiment.

6.30%