

Stoichiometry Review

KEY

1. Potassium reacts with oxygen to produce potassium oxide.

a. Write the balanced equation for this reaction.



b. What type of reaction is this?

COMBO

c. What is the mass of 5.0 L of oxygen at STP?

$$\frac{5.0L O_2}{22.4L O_2} \times \frac{1mol O_2}{1mol O_2} \times \frac{32.00g O_2}{1mol O_2} = 7.1g O_2$$

d. What is the mass of  $2.0 \times 10^{22}$  molecules of potassium oxide?

$$\frac{2.0 \times 10^{22} \text{ molec } K_2O}{6.022 \times 10^{23} \text{ molec } K_2O} \times \frac{1mol K_2O}{1mol K_2O} \times \frac{94.20g K_2O}{1mol K_2O} = 3.1g K_2O$$

e. Use the balanced equation to determine the mass of oxygen necessary to produce 4.0 g potassium oxide.

$$\frac{4.0g K_2O}{94.20g K_2O} \times \frac{1mol K_2O}{1mol K_2O} \times \frac{1mol O_2}{2mol K_2O} \times \frac{32.00g O_2}{1mol O_2} = .68g O_2$$

2. Sodium chloride reacts with silver (I) nitrate to yield silver (I) chloride and sodium nitrate.

a. Write the balanced equation for this reaction.



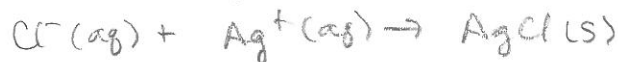
b. What type of reaction is this?

DR

c. Write the complete ionic equation for this reaction.



d. Write the net ionic equation for this reaction.



e. If 10.0 grams of silver (I) nitrate reacts with 15.0 grams of sodium chloride, what mass of sodium nitrate is produced?

$$\frac{10.0g AgNO_3}{169.88g AgNO_3} \times \frac{1mol AgNO_3}{1mol AgNO_3} \times \frac{1mol NaNO_3}{1mol AgNO_3} \times \frac{85.00g NaNO_3}{1mol NaNO_3} = 5.00g NaNO_3$$

$$\frac{15.0g NaCl}{58.44g NaCl} \times \frac{1mol NaCl}{1mol NaCl} \times \frac{1mol NaNO_3}{1mol NaCl} \times \frac{85.00g NaNO_3}{1mol NaNO_3} = 21.8g NaNO_3$$

f. What is the limiting reagent? What is the excess reagent?

LR =  $AgNO_3$  ER =  $NaCl$

g. What mass of excess reagent is left over?

$$21.8g NaNO_3 - 5.00g NaNO_3 = 16.8g NaNO_3$$

$$\frac{16.8g NaNO_3}{85.00g NaNO_3} \times \frac{1mol NaNO_3}{1mol NaNO_3} \times \frac{1mol NaCl}{1mol NaNO_3} \times \frac{58.44g NaCl}{1mol NaCl} = 11.6g NaCl \text{ left over}$$

3. Lithium reacts with calcium carbonate.

a. Write the balanced equation for this reaction.



b. What type of reaction is this?

SR

c. If 20.0 grams of lithium reacts with 20.0 grams of calcium carbonate, what is the theoretical yield of lithium carbonate?

$$\frac{20.0 \text{ g Li} \mid 1 \text{ mol Li} \mid 1 \text{ mol Li}_2\text{CO}_3 \mid 73.89 \text{ g Li}_2\text{CO}_3}{6.94 \text{ g Li} \mid 2 \text{ mol Li} \mid 1 \text{ mol Li}_2\text{CO}_3} = 106. \text{ g Li}_2\text{CO}_3$$

$$\frac{20.0 \text{ g CaCO}_3 \mid 1 \text{ mol CaCO}_3 \mid 1 \text{ mol Li}_2\text{CO}_3 \mid 73.89 \text{ g Li}_2\text{CO}_3}{100.09 \text{ g CaCO}_3 \mid 1 \text{ mol CaCO}_3 \mid 1 \text{ mol Li}_2\text{CO}_3} = \boxed{14.8 \text{ g Li}_2\text{CO}_3}$$

d. If 13.7 g lithium carbonate is produced in the lab, what is the percent yield?

$$\% \text{ yield} = \frac{A}{T} = \frac{13.7 \text{ g Li}_2\text{CO}_3}{14.8 \text{ g Li}_2\text{CO}_3} = \boxed{92.6\%}$$

4. Iron (III) nitrate reacts with calcium phosphate.

a. Write the balanced equation for this reaction.



b. What type of reaction is this?

DR

c. You perform this reaction using 3.0 g iron (III) nitrate and 6.2 g calcium phosphate. What is your percent yield if you produce 2.9 g iron (III) phosphate in the lab?

$$\frac{3.0 \text{ g Fe}(\text{NO}_3)_3 \mid 1 \text{ mol Fe}(\text{NO}_3)_3 \mid 2 \text{ mol FePO}_4 \mid 150.82 \text{ g FePO}_4}{241.88 \text{ g Fe}(\text{NO}_3)_3 \mid 2 \text{ mol Fe}(\text{NO}_3)_3 \mid 1 \text{ mol FePO}_4} = \boxed{\begin{matrix} \text{TY} \\ 1.9 \text{ g} \\ \text{FePO}_4 \end{matrix}}$$

$$\frac{6.2 \text{ g Ca}_3(\text{PO}_4)_2 \mid 1 \text{ mol Ca}_3(\text{PO}_4)_2 \mid 2 \text{ mol FePO}_4 \mid 150.82 \text{ g FePO}_4}{270.10 \text{ g Ca}_3(\text{PO}_4)_2 \mid 1 \text{ mol Ca}_3(\text{PO}_4)_2 \mid 1 \text{ mol FePO}_4} = 6.9 \text{ g FePO}_4$$

$$\% \text{ yield} = \frac{A}{T} = \frac{2.9 \text{ g FePO}_4}{1.9 \text{ g FePO}_4} = \boxed{150\%}$$

Uh oh! something went wrong in the lab!