

Chemistry 30

Review of Chemistry 20 Workbook

Review of Nomenclature

	Formula	IUPAC Name
1.	$\text{NaHCO}_3(\text{s})$	sodium hydrogen carbonate
2.	$\text{Na}_2\text{SiO}_3(\text{s})$	sodium silicate
3.	$\text{HgS}(\text{s})$	mercury(II) sulfide
4.	$\text{Na}_2\text{SO}_4 \cdot 4\text{H}_2\text{O}(\text{s})$	sodium sulfate tetrahydrate
5.	$\text{H}_2\text{SO}_4(\text{aq})$	sulfuric acid
6.	$\text{C}_{12}\text{H}_{22}\text{O}_{11}(\text{s})$	sucrose
7.	$\text{Fe}_2\text{O}_3(\text{s})$	iron(III) oxide
8.	$\text{Mg}(\text{OH})_2(\text{s})$	magnesium hydroxide
9.	$\text{NaHSO}_4(\text{s})$	sodium hydrogen sulfate
10.	$\text{O}_2(\text{g})$	oxygen
11.	$\text{NaHSO}_3(\text{s})$	sodium hydrogen sulfite
12.	$\text{FeCO}_3(\text{s})$	iron(II) carbonate
13.	$\text{H}_2\text{S}(\text{aq})$	hydrosulfuric acid
14.	$\text{N}_2\text{O}_4(\text{g})$	dinitrogen tetroxide
15.	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}(\text{s})$	calcium sulfate dihydrate
16.	$\text{CH}_3\text{OH}(\text{l})$	methanol
17.	$\text{Cl}_2(\text{g})$	chlorine
18.	$\text{NH}_4\text{H}_2\text{PO}_4(\text{s})$	ammonium dihydrogen phosphate
19.	$\text{CH}_3\text{COOH}(\text{aq})$	acetic acid
20.	$\text{CCl}_4(\text{l})$	carbon tetrachloride
21.	$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}(\text{s})$	magnesium sulphate heptahydrate
22.	$\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}(\text{s})$	sodium thiosulfate pentahydrate
23.	$\text{C}_2\text{H}_6(\text{g})$	ethane
24.	$\text{SO}_2(\text{g})$	sulfur dioxide
25.	$\text{Ca}_3(\text{PO}_4)_2(\text{s})$	calcium phosphate
26.	$\text{H}_3\text{PO}_4(\text{aq})$	phosphoric acid

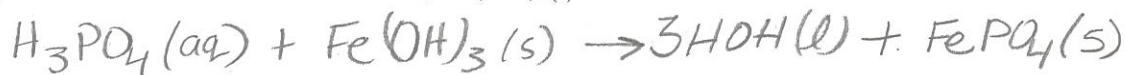
Review of Chemical Reactions

For each of the following questions, identify the reaction type and write out a balanced chemical reaction including the states of matter.

1. Propane gas is burned in a camp stove.



2. Phosphoric acid is used to remove rust, $\text{Fe}(\text{OH})_3(\text{s})$.



3. The cap is removed from a carbonated beverage. The carbonic acid in the beverage decomposes to produce carbon dioxide and water.



4. A nickel strip placed in a copper (II) sulphate solution becomes plated with copper.



5. Baking soda (sodium hydrogen carbonate) is used to neutralize a spill of car battery acid (sulphuric acid). The products are sodium hydrogen sulphate, carbon dioxide and water.



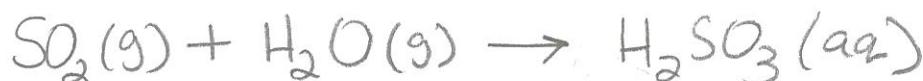
6. Mercury (II) oxide is decomposed into its elements.



7. Iron rusts, producing iron (III) oxide trihydrate, in moist air (water and oxygen) causing millions of dollars of damage each year.



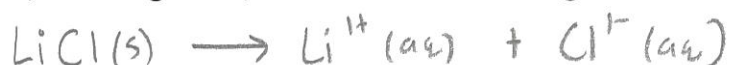
8. Sulphur dioxide emissions from industries combines with water vapour in the atmosphere to produce acid rain, sulphurous acid.



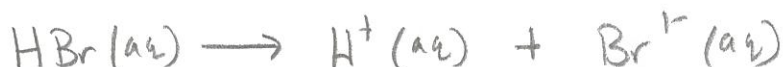
Review of Dissociation Equations (p.197)

Write the dissociation equation, including states, for each of the following soluble substances:

1. lithium chloride



2. hydrobromic acid

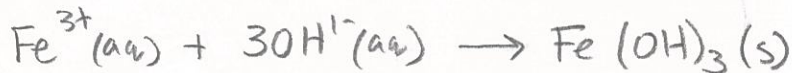
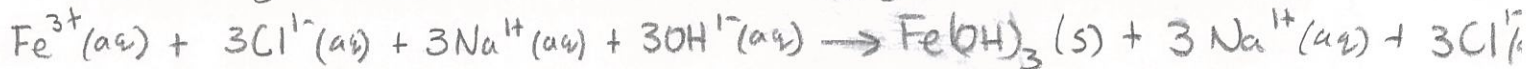


3. sodium hydroxide $\text{NaOH}(s) \rightarrow \text{Na}^+(aq) + \text{OH}^-(aq)$
4. potassium acetate $\text{KCH}_3\text{COO}(s) \rightarrow \text{K}^+(aq) + \text{CH}_3\text{COO}^-(aq)$
5. sodium fluoride $\text{NaF}(s) \rightarrow \text{Na}^+(aq) + \text{F}^-(aq)$
6. sodium dichromate $\text{Na}_2\text{Cr}_2\text{O}_7(s) \rightarrow 2\text{Na}^+(aq) + \text{Cr}_2\text{O}_7^{2-}(aq)$
7. copper (II) sulphate pentahydrate
 $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}(s) \rightarrow \text{Cu}^{2+}(aq) + \text{SO}_4^{2-}(aq) + 5\text{H}_2\text{O}(l)$
8. lithium hydroxide $\text{LiOH}(s) \rightarrow \text{Li}^+(aq) + \text{OH}^-(aq)$
9. ammonium phosphate $(\text{NH}_4)_3\text{PO}_4(s) \rightarrow 3\text{NH}_4^+(aq) + \text{PO}_4^{3-}(aq)$
10. potassium carbonate $\text{K}_2\text{CO}_3(s) \rightarrow 2\text{K}^+(aq) + \text{CO}_3^{2-}(aq)$

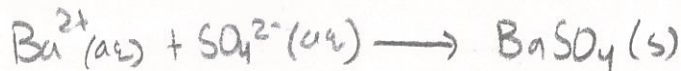
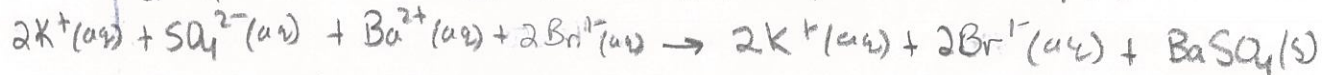
Review of Net Ionic Equations

For each of the following, write the non ionic, total ionic and net ionic equations.

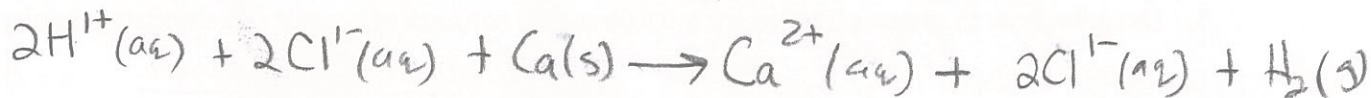
1. A solution of iron (III) chloride is tested for the presence of iron (III) ions by the addition of dilute sodium hydroxide. A red precipitate indicates a positive result.



2. Aqueous solutions of potassium sulphate and barium bromide are mixed.



3. Hydrochloric acid reacts with calcium metal.



- $$\begin{aligned} \text{Na}_2\text{CO}_3(\text{aq}) + \text{MgSO}_4(\text{aq}) &\longrightarrow \text{MgCO}_3(\text{s}) + \text{Na}_2\text{SO}_4(\text{aq}) \\ 2\text{Na}^+(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) + \text{Mg}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) &\longrightarrow \text{MgCO}_3(\text{s}) + 2\text{Na}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \\ \text{Mg}^{2+}(\text{aq}) + \text{CO}_3^{2-}(\text{aq}) &\longrightarrow \text{MgCO}_3(\text{s}) \end{aligned}$$

- $$\text{Ca(s)} + 2\text{HOH(l)} \rightarrow \text{Ca(OH)}_2\text{(s)} + \text{H}_2\text{(g)}$$
- $$\text{Ca(s)} + 2\text{H}^+\text{(aq)} + 2\text{OH}^-\text{(aq)} \rightarrow \text{Ca(OH)}_2\text{(s)} + \text{H}_2\text{(g)}$$

$$M_{\text{Cu}(\text{NO}_3)_2} = 187.57 \text{ g/mol}$$

$$\frac{187.57g}{1 \text{ mol}} = \frac{230g}{x \text{ mol}} \quad x = 1.226 \text{ mol}$$

$$\frac{1.226 \text{ mol}}{4 \text{ L}} = 0.307 \text{ mol/L}$$

- $$M_{H_2SO_4} = 98.09 \text{ g/mol}$$

$$\frac{98.09 \text{ g}}{1 \text{ mol}} = \frac{x \text{ g}}{1.40 \text{ mol}} \quad \boxed{x = 137 \text{ g}}$$

$$\frac{0.400 \text{ mol}}{1 \text{ L}} = \frac{x \text{ mol}}{3.50 \text{ L}}$$

$$x = 1.40 \text{ mol}$$

- $$M_{\text{NaHSO}_4} = 120.07 \text{ g/mol}$$

$$\frac{120.07g}{1 \text{ mol}} = \frac{6.60g}{x \text{ mol}}$$

$$x = 0.0549 \text{ mol}$$

$$\frac{0.500 \text{ mol}}{1 \text{ L}} = \frac{0.0549 \text{ mol}}{x}$$

$$x = 0.110 \text{ L}$$

$$= 110 \text{ mL}$$

- $$M_{\text{NaOH}} = 40.00 \text{ g/mol}$$

$$\frac{40.00 \text{ g}}{1 \text{ mol}} = \frac{x \text{ g}}{0.015}$$

$$X = 0.600g$$

$$\frac{0.150 \text{ mol}}{1 \text{ L}} = \frac{x \text{ mol}}{0.100 \text{ L}} \quad x = 0.0150 \text{ mol}$$

Then procedure !

- $$M_{CuSO_4 \cdot 5H_2O} = 249.72 \text{ g/mol}$$

$$\frac{249.72 \text{ g}}{1 \text{ mol}} = \frac{x \text{ g}}{0.0250 \text{ mol}}$$

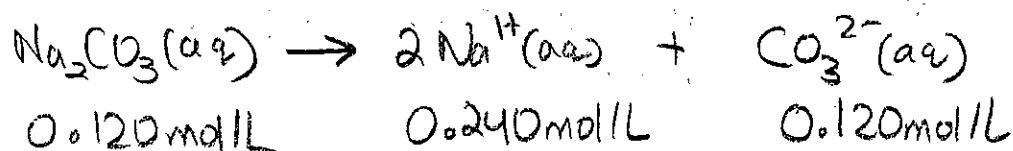
$$\frac{0.100 \text{ mol}}{14} = \frac{x \text{ mol}}{0.250} \quad x = 0.0250 \text{ mol}$$

Then procedure!

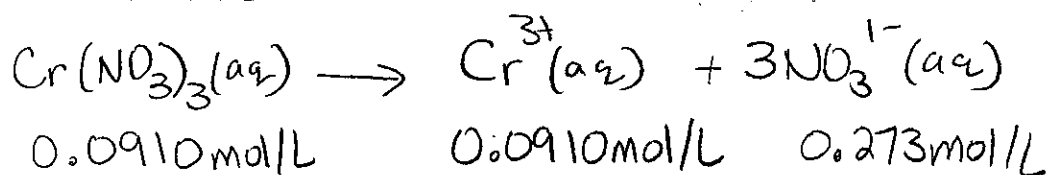
Review of Concentration of Ions in Solution

For each of the following, show the dissociation equation and calculate the concentration of each ion:

1. 0.120 mol/L $\text{Na}_2\text{CO}_3(\text{aq})$



2. 0.0910 mol/L $\text{Cr}(\text{NO}_3)_3(\text{aq})$



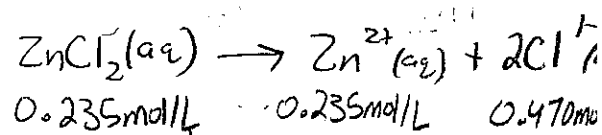
3. 8.00 g of zinc chloride is dissolved in 250 mL of water

$$\frac{136.31\text{ g}}{1\text{ mol}} = \frac{8\text{ g}}{x\text{ mol}}$$

$$x = 0.0586\text{ mol}$$

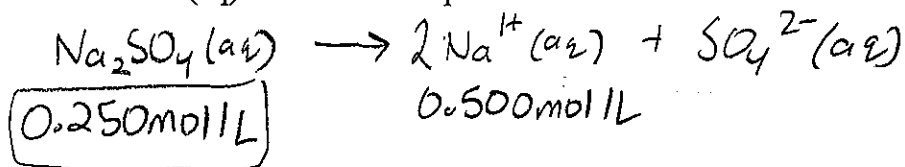
$$\frac{0.0586\text{ mol}}{0.250\text{ L}}$$

$$= 0.235\text{ mol/L}$$

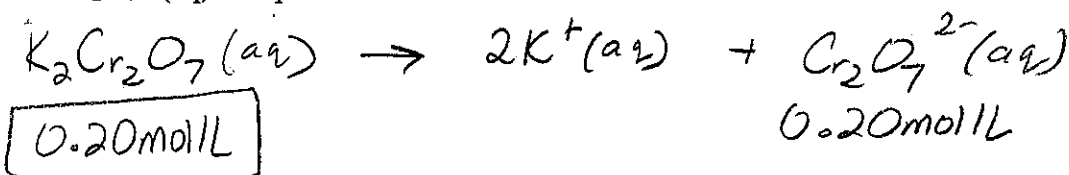


For each of the following, show the dissociation equation and calculate the concentration of the solution:

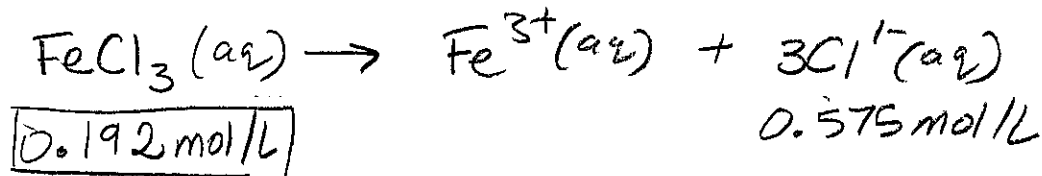
4. 0.500 mol/L $\text{Na}^+(\text{aq})$ in a sodium sulphate solution.



5. 0.20 mol/L $\text{Cr}_2\text{O}_7^{2-}(\text{aq})$ in a potassium dichromate solution.

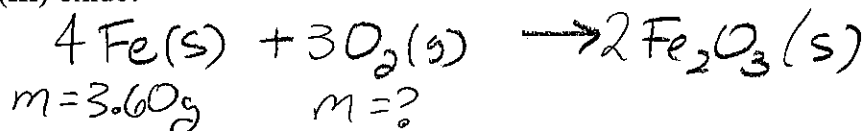


6. 0.575 mol/L $\text{Cl}^-(\text{aq})$ in an iron (III) chloride solution.



Review of Stoichiometry

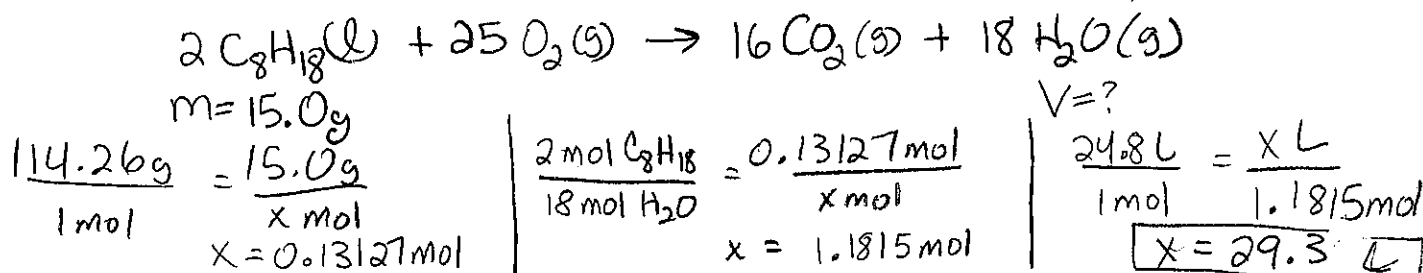
1. What mass of oxygen is required to completely oxidize 3.60 g of steel wool (pure iron) to produce iron (III) oxide?



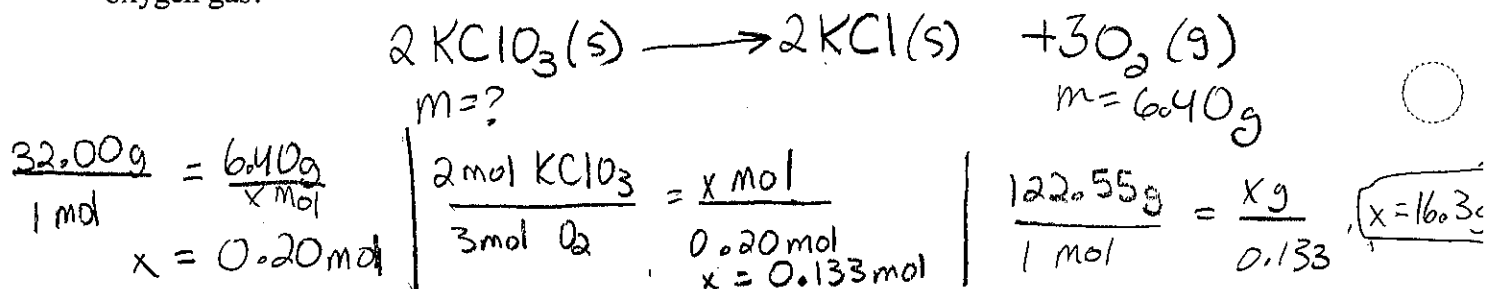
$$\frac{55.85\text{g}}{1\text{mol}} = \frac{3.60\text{g}}{x\text{mol}} \quad \left| \quad \frac{4\text{mol Fe}}{3\text{mol O}_2} = \frac{0.064458\text{mol Fe}}{x\text{mol O}_2} \quad \left| \quad \frac{32.00\text{g}}{1\text{mol}} = \frac{x\text{g}}{0.0483\text{mol}}$$

$x = 0.064458\text{mol}$ $x = 0.0483\text{mol O}_2$ $m = 1.55\text{g}$

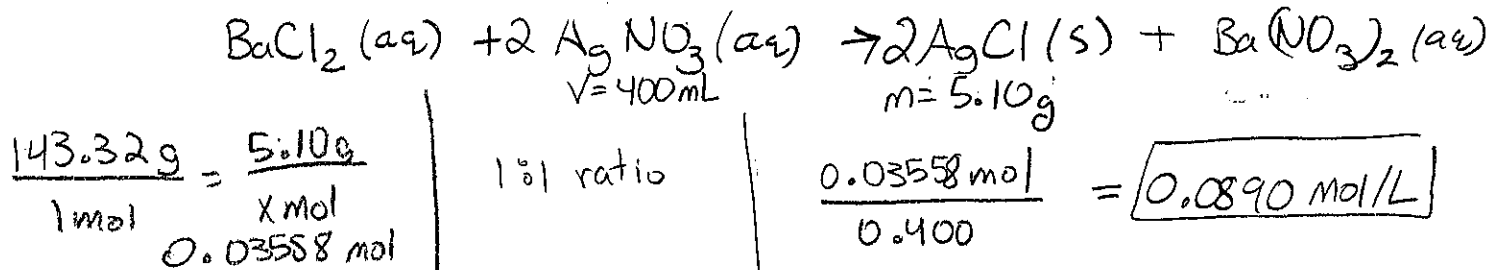
2. When gasoline, $\text{C}_8\text{H}_{18}(\text{l})$, burns in an engine, water vapour is produced. What volume of water vapour would be produced from the complete combustion of 15.0 g of octane at SATP?



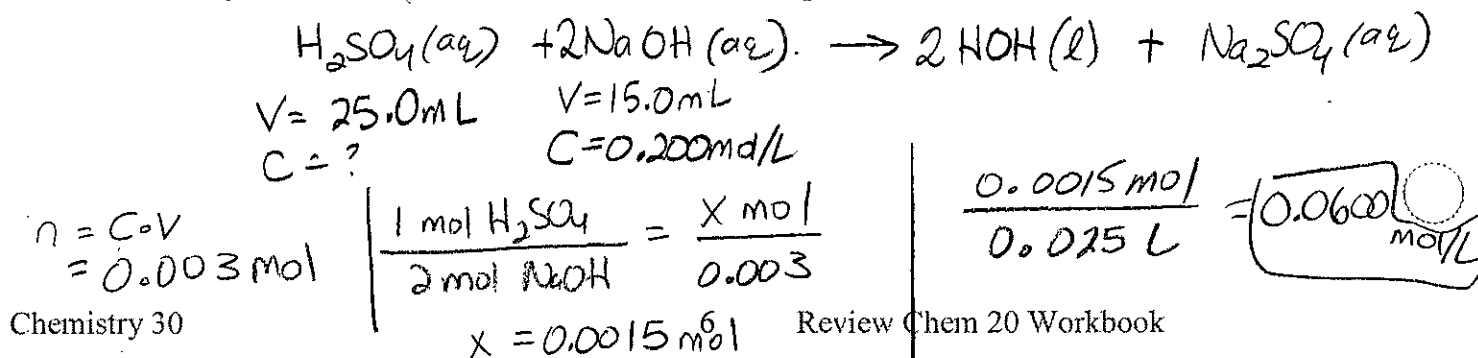
3. In the laboratory preparation of oxygen, potassium chlorate is heated. The products are potassium chloride and oxygen. What mass of potassium chlorate must be decomposed to produce 6.40 g of oxygen gas?



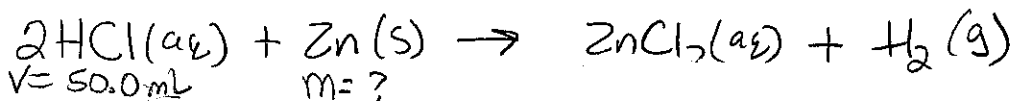
4. An excess of barium chloride solution was added to 400 mL of silver nitrate solution and 5.10 g of precipitate was produced. What was the concentration of the silver nitrate solution?



5. If 25.0 mL of a sulphuric acid solution reacts completely with 15.0 mL of a 0.200 mol/L solution of sodium hydroxide, what is the concentration of the sulphuric acid solution?



6. What mass of zinc would be needed to completely react with 50.0 mL of 6.00 mol/L hydrochloric acid?



$$V = 50.0 \text{ mL}$$

$$C = 6.00 \text{ mol/L}$$

$$m = ?$$

$$n = V \cdot C$$

$$= 0.050(6.00)$$

$$= 0.300 \text{ mol}$$

$$2:1$$

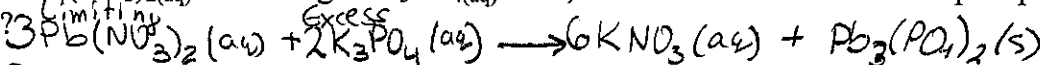
$$0.150$$

$$\frac{65.41 \text{ g}}{1 \text{ mol}} = \frac{x \text{ g}}{0.150 \text{ mol}}$$

$$x = \boxed{9.81 \text{ g}}$$

Review of Limiting and Excess Reagents

1. If 10.0 g of $\text{Pb}(\text{NO}_3)_2(\text{aq})$ and 10.0 g of $\text{K}_3\text{PO}_4(\text{aq})$ react, what is the mass of the solid precipitate produced?



$$\frac{331.22 \text{ g}}{1 \text{ mol}} = \frac{10 \text{ g}}{x \text{ mol}}$$

$$0.03019 \text{ mol}$$

$$\frac{212.27 \text{ g}}{1 \text{ mol}} = \frac{10 \text{ g}}{x \text{ mol}}$$

$$0.0471 \text{ mol}$$

$$\frac{3 \text{ mol Pb}(\text{NO}_3)_2}{1 \text{ mol Pb}_3(\text{PO}_4)_2} = \frac{0.03019 \text{ mol}}{x}$$

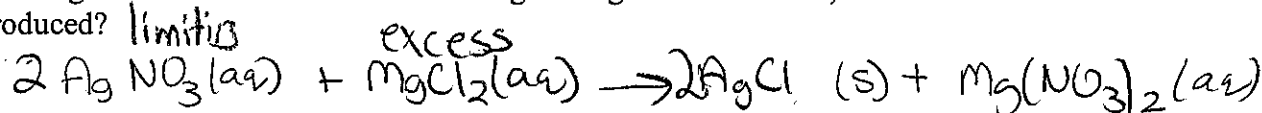
$$x = 0.01006 \text{ mol}$$

$$\frac{811.54 \text{ g}}{0.01006 \text{ mol}} = \boxed{8.17 \text{ g}}$$

$$\frac{3 \text{ mol Pb}}{2 \text{ mol K}} = \frac{0.03109}{x}$$

$$x = 0.02012 \text{ Required}$$

2. If 20.0 g of silver nitrate reacts with 10.0 g of magnesium chloride, what is the mass of the solid produced?



$$\frac{169.88 \text{ g}}{1 \text{ mol}} = \frac{20 \text{ g}}{x \text{ mol}}$$

$$x = 0.117730 \text{ mol}$$

$$\frac{95.21 \text{ g}}{1 \text{ mol}} = \frac{10 \text{ g}}{x \text{ mol}}$$

$$0.10503 \text{ mol}$$

$$m = ?$$

$$\frac{143.32}{1 \text{ mol}} = \frac{x \text{ g}}{0.117730}$$

$$x = \boxed{16.9 \text{ g}}$$

$$\frac{2 \text{ mol Ag}}{1 \text{ mol Mg}} = \frac{0.117730}{x \text{ mol}}$$

$$x = 0.0588 \text{ Required}$$

