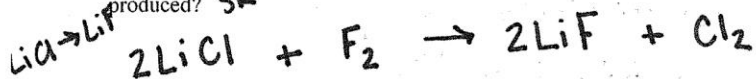


Mole-Mole Problems ①

Name KEY

Write the correct, balanced chemical reaction to solve the following problems. Be sure to also label the type of reaction that is happening.

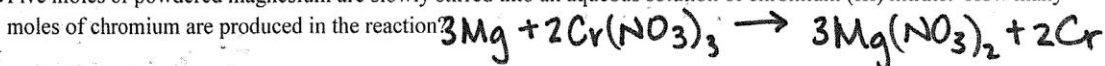
1. Five moles of lithium chloride are reacted with excess gaseous fluorine. How many moles of lithium fluoride are produced? ^{SR}



$$\frac{5 \text{ mol LiCl}}{2 \text{ mol LiCl}} \times 2 \text{ mol LiF}$$

5 mol LiF

2. Five moles of powdered magnesium are slowly stirred into an aqueous solution of chromium (III) nitrate. How many moles of chromium are produced in the reaction?



$$\frac{5 \text{ mol Mg}}{3 \text{ mol Mg}} \times 2 \text{ mol Cr}$$

3.33 mol Cr

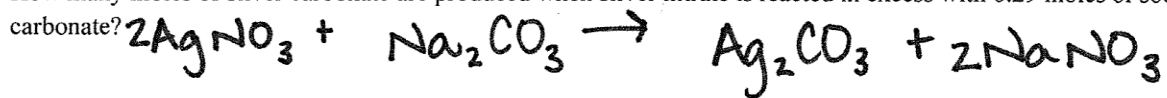
3. How many moles of sulfurous acid (H_2SO_3) are produced from the reaction of 2.5 moles of sulfur dioxide and excess water?



$$\frac{2.5 \text{ mol SO}_2}{1 \text{ mol SO}_2} \times 1 \text{ mol H}_2\text{SO}_3$$

2.5 mol H_2SO_3

- DR 4. How many moles of silver carbonate are produced when silver nitrate is reacted in excess with 6.29 moles of sodium carbonate?



$$\frac{6.29 \text{ mol Na}_2\text{CO}_3}{1 \text{ mol Na}_2\text{CO}_3} \Bigg| \frac{1 \text{ mol Ag}_2\text{CO}_3}{1 \text{ mol Na}_2\text{CO}_3}$$

$$6.29 \text{ mol Ag}_2\text{CO}_3$$

- DR 5. If 4 moles of sodium sulfate are reacted with excess barium hydroxide, how many moles of barium sulfate are produced?



$$\frac{4 \text{ mol Na}_2\text{SO}_4}{1 \text{ mol Na}_2\text{SO}_4} \Bigg| \frac{1 \text{ mol BaSO}_4}{1 \text{ mol Na}_2\text{SO}_4}$$

$$4 \text{ mol BaSO}_4$$

6. Excess potassium hydroxide is reacted with 34 moles of copper (II) sulfate. How many moles of copper (II) hydroxide are produced?



$$\frac{34 \text{ mol CuSO}_4}{1 \text{ mol CuSO}_4} \Bigg| \frac{1 \text{ mol Cu}(\text{OH})_2}{1 \text{ mol CuSO}_4}$$

$$34 \text{ mol Cu}(\text{OH})_2$$

The purpose of these problems is to determine how much you will need of the reactants to get a specific amount of the products.

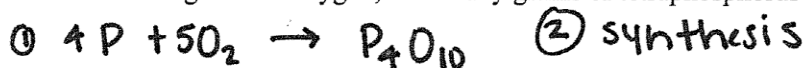
A STEP-BY-STEP METHOD

1. Write the balanced equation with the proper chemical formulas for each substance.
2. List the type of reaction.
3. Change the given amount of grams to moles using the formula mass.
4. Setup the mole ratio between the given and the answer from the balanced chemical equation.
5. Multiply the number of moles by the mole ratio.
6. Change moles of the answer to grams using the formula mass.

Problems

1. Phosphorus + oxygen \rightarrow tetraphosphorus decoxide

Given 64 grams of oxygen, how many grams of tetraphosphorus decoxide is produced?



③ $\frac{64g O_2}{32g O_2} \times \frac{1mol O_2}{2mol O_2} = \frac{1mol P_4O_{10}}{5mol O_2}$

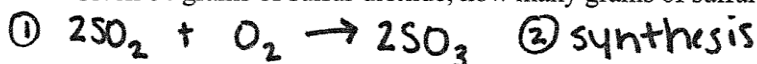
$\cdot \frac{4mol P_4O_{10}}{1mol P_4O_{10}}$

④ $\frac{4mol P_4O_{10}}{1mol} \times 283.88g$

$113.55g P_4O_{10}$

2. Sulfur dioxide + oxygen \rightarrow sulfur trioxide

Given 64 grams of sulfur dioxide, how many grams of sulfur trioxide are produced?



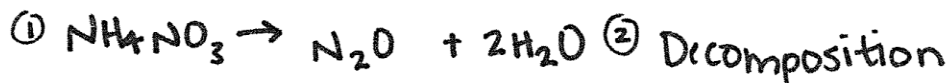
③ $\frac{64g SO_2}{64g SO_2} \times \frac{1mol SO_2}{1mol SO_2} = \frac{2mol SO_3}{2mol SO_2}$

$\frac{1mol SO_3}{1mol} \times 80.07g$

$80.07g SO_3$

3. Ammonium nitrate \rightarrow dinitrogen monoxide + water

Given 64 grams of ammonium nitrate, how many grams of water are made?



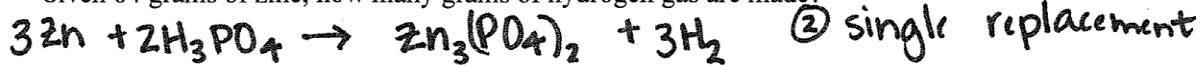
③ $\frac{64g NH_4NO_3}{80.06g} \times \frac{1mol NH_4NO_3}{1mol NH_4NO_3} = \frac{2mol H_2O}{1mol NH_4NO_3}$

④ $\frac{1.6mol H_2O}{1mol} \times 18.02g H_2O$

$28.83g H_2O$

4. Zinc + phosphoric acid → zinc phosphate + hydrogen

Given 64 grams of zinc, how many grams of hydrogen gas are made?



(3) $\frac{64\text{g Zn}}{65.39\text{g}} \bigg| \frac{1\text{mol Zn}}{1\text{mol Zn}} =$ (4) $\frac{.98\text{mol Zn}}{3\text{mol Zn}} \bigg| \frac{3\text{mol H}_2}{3\text{mol Zn}} = .98\text{mol H}_2$

$\frac{.98\text{mol H}_2}{1\text{mol}} \bigg| \frac{2.02\text{g}}{1\text{mol}}$

1.98g H₂

5. How much sodium sulfate will be produced if 6 grams of sodium chloride is reacted with excess sulfuric acid?

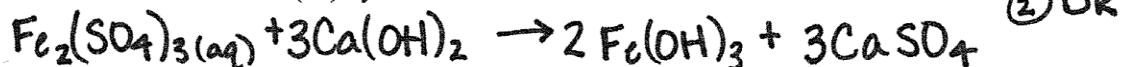


(3) $\frac{6\text{g NaCl}}{58.44} \bigg| \frac{1\text{mol NaCl}}{1\text{mol NaCl}} =$ (4) $\frac{.103\text{mol NaCl}}{2\text{mol NaCl}} \bigg| \frac{1\text{mol Na}_2\text{SO}_4}{1\text{mol NaCl}} = .052$

$\frac{.052\text{mol Na}_2\text{SO}_4}{1\text{mol}} \bigg| \frac{142.05\text{g}}{1\text{mol}}$

7.39g Na₂SO₄

6. Ten grams of iron (III) sulfate is dissolved in water and mixed with a solution of calcium hydroxide. How much iron (III) hydroxide is formed from the reaction?

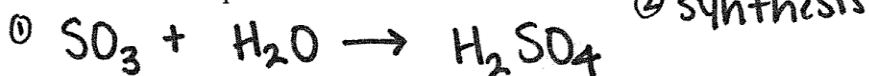


(3) $\frac{10\text{g Fe}_2(\text{SO}_4)_3}{399.91\text{g}} \bigg| \frac{1\text{mol}}{1\text{mol}} =$ (4) $\frac{.025\text{mol Fe}_2(\text{SO}_4)_3}{1\text{mol Fe}_2(\text{SO}_4)_3} \bigg| \frac{2\text{mol Fe}(\text{OH})_3}{1\text{mol Fe}_2(\text{SO}_4)_3}$

$\frac{.05\text{mol Fe}(\text{OH})_3}{1\text{mol}} \bigg| \frac{106.88\text{g}}{1\text{mol}}$

5.34g Fe(OH)₃

7. If 15 grams of sulfur trioxide is bubbled through excess water, how many grams of sulfuric acid are produced?



(3) $\frac{15\text{g SO}_3}{80.07\text{g}} \bigg| \frac{1\text{mol}}{1\text{mol}} =$ (4) $\frac{.187\text{mol SO}_3}{1\text{mol SO}_3} \bigg| \frac{1\text{mol H}_2\text{SO}_4}{1\text{mol SO}_3} = .187\text{mol H}_2\text{SO}_4$

$\frac{.187\text{mol H}_2\text{SO}_4}{1\text{mol}} \bigg| \frac{98.09\text{g H}_2\text{SO}_4}{1\text{mol}}$

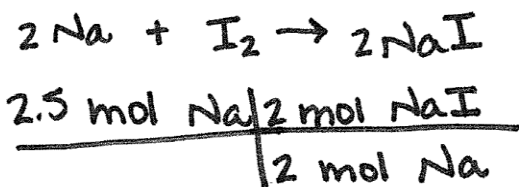
18.34g H₂SO₄

Mass - Mole Problems

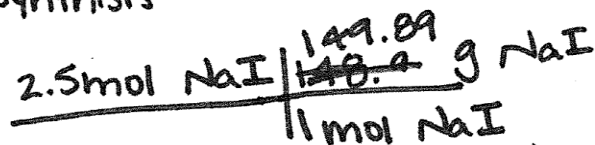
Write the correct, balanced equation for the reactions listed. Identify the type of reaction that is taking place. Answer the questions based on the information given in each problem.

8. Sodium + Iodine → Sodium iodide

How many grams of sodium iodide are produced from 2.5 moles of sodium?



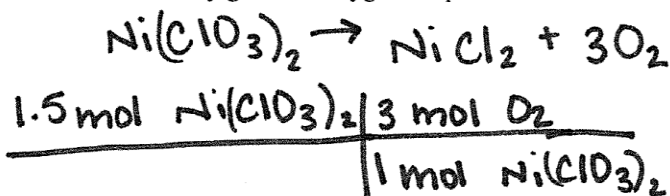
synthesis



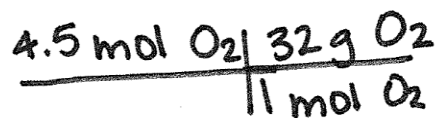
$$\boxed{374.73 \text{ g NaI}}$$

9. Nickel (II) chlorate → nickel (II) chloride + oxygen

How many grams of oxygen are produced from 1.5 moles of nickel (II) chlorate?



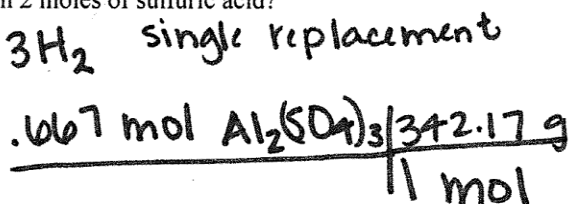
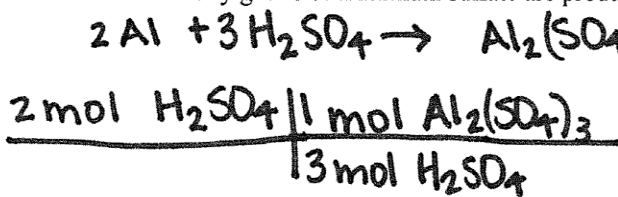
Decomposition



$$\boxed{144 \text{ g O}_2}$$

10. Aluminum + sulfuric acid → aluminum sulfate + hydrogen

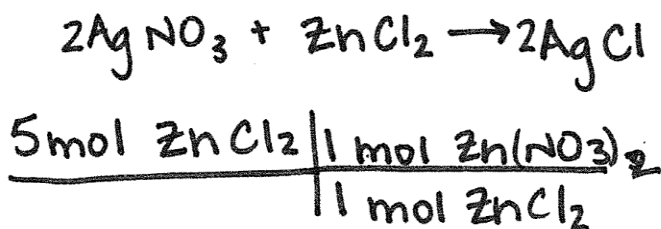
How many grams of aluminum sulfate are produced from 2 moles of sulfuric acid?



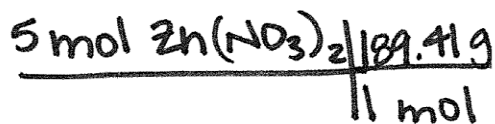
$$\boxed{228.23 \text{ g Al}_2(\text{SO}_4)_3}$$

11. Silver nitrate + zinc chloride → silver chloride + zinc nitrate

How many grams of zinc nitrate are produced from 5 moles of zinc chloride?

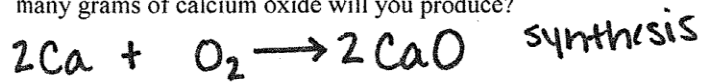


double replacement



$$\boxed{947.05 \text{ g Zn}(\text{NO}_3)_2}$$

12. Calcium reacts with oxygen to form calcium oxide. If you start with 3 moles of calcium, how many grams of calcium oxide will you produce?



$$\frac{3\text{mol Ca} | 2\text{mol CaO}}{2\text{mol Ca}}$$

$$\frac{3\text{mol CaO} | 56.08\text{g}}{1\text{mol CaO}}$$

$$\boxed{168.24\text{g CaO}}$$

13. Iron (II) sulfate reacts with ammonium sulfide. If you start with 2.5 moles of ammonium sulfide, how many grams of iron sulfide would be produced? *Double Replacement*

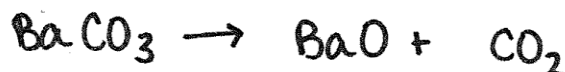


$$\frac{2.5\text{mol } (\text{NH}_4)_2\text{S} | 1\text{mol FeS}}{1\text{mol } (\text{NH}_4)_2\text{S}}$$

$$\frac{2.5\text{mol FeS} | 87.92\text{g}}{1\text{mol}}$$

$$\boxed{219.8\text{g FeS}}$$

14. Barium carbonate decomposes into barium oxide and carbon dioxide gas. How many grams of barium oxide are produced if 44 moles of CO_2 were also produced? *Decomposition*

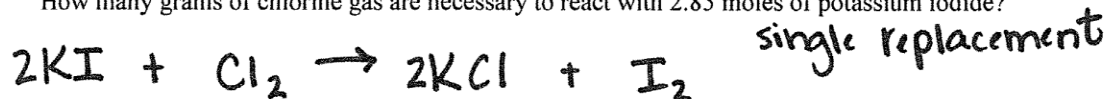


$$\frac{44\text{mol CO}_2 | 1\text{mol BaO}}{1\text{mol CO}_2}$$

$$\frac{44\text{mol BaO} | 153.33\text{g}}{1\text{mol BaO}}$$

$$\boxed{6746.52\text{g BaO}}$$

15. Potassium iodide will react with chlorine gas to produce solid iodine and potassium chloride. How many grams of chlorine gas are necessary to react with 2.85 moles of potassium iodide?



$$\frac{2.85\text{mol KI} | 1\text{mol Cl}_2}{2\text{mol KI}}$$

$$\frac{1.425\text{mol Cl}_2 | 70.9\text{g}}{1\text{mol Cl}_2}$$

$$\boxed{101.03\text{g Cl}_2}$$