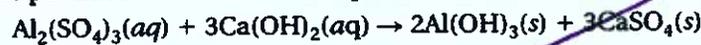




## E. Additional Problems

Solve the following problems in the space provided. Show your work.

24. A  $5.00 \times 10^2$  g sample of  $\text{Al}_2(\text{SO}_4)_3$  is made to react with 450 g of  $\text{Ca}(\text{OH})_2$ . A total of 596 g of  $\text{CaSO}_4$  is produced. The balanced equation is:



- a. What is the limiting reagent in this reaction?

$$\frac{500 \text{ g Al}_2(\text{SO}_4)_3}{342 \text{ g Al}_2(\text{SO}_4)_3} \times \frac{1 \text{ mol Al}_2(\text{SO}_4)_3}{1 \text{ mol Al}_2(\text{SO}_4)_3} \times \frac{2 \text{ mol Al}(\text{OH})_3}{1 \text{ mol Al}_2(\text{SO}_4)_3} = 2.92 \text{ mol Al}(\text{OH})_3$$

- b. How many moles of excess reagent are unreacted?

$$\frac{450 \text{ g Ca}(\text{OH})_2}{74.08 \text{ g Ca}(\text{OH})_2} \times \frac{1 \text{ mol Ca}(\text{OH})_2}{1 \text{ mol Ca}(\text{OH})_2} \times \frac{2}{3} = 4.05 \text{ mol}$$

$$\frac{2.92 \text{ mol Al}(\text{OH})_3}{2 \text{ mol Al}(\text{OH})_3} \times 3 \text{ mol Ca}(\text{OH})_2 = 4.38 \text{ mol Ca}(\text{OH})_2$$

25. How many liters of  $\text{O}_2$  are needed to react completely with 10.0 L of  $\text{H}_2\text{S}$  at STP according to the following reaction?



$$\frac{10.0 \text{ L H}_2\text{S}}{22.4 \text{ L H}_2\text{S}} \times \frac{1 \text{ mol H}_2\text{S}}{2 \text{ mol H}_2\text{S}} \times \frac{3 \text{ mol O}_2}{2 \text{ mol H}_2\text{S}} \times 22.4 \text{ L O}_2 = 15 \text{ L O}_2$$

6.07 mol  
4.05 mol

2.02 mol  
of  $\text{Ca}(\text{OH})_2$   
is excess

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26. The decomposition of potassium chlorate gives oxygen gas according to the reaction:



How many grams  $\text{KClO}_3$  are needed to produce 5.00 L of  $\text{O}_2$  at STP?

$$\frac{5.00 \text{ L O}_2}{22.4 \text{ L O}_2} \times \frac{1 \text{ mol O}_2}{3 \text{ mol O}_2} \times \frac{2 \text{ mol KClO}_3}{1 \text{ mol O}_2} \times 122.6 \text{ g KClO}_3 = 18.24 \text{ g KClO}_3$$

27. Suppose that the reaction described in question 26 produces 4.80 L of  $\text{O}_2$  in the laboratory. What is the percent yield?

$$100 \times \frac{4.80 \text{ L O}_2}{5.00 \text{ L O}_2} = 96\%$$

## Things to think about for Test :

- Molarity equation
- Balancing chemical reactions
- 1 mol of any gas = 22.4 L of that gas
- Study for practical
- Calculating Molar Mass

# Station 1

When 1.00 g of Zinc metal is placed in

25 mL of 0.250 M lead (II) nitrate solution,

$\text{Pb}(\text{NO}_3)_2$ , crystals of lead form on the corroding zinc. The other product is zinc nitrate,  $\text{Zn}(\text{NO}_3)_2$ .

Which is the limiting reactant? How many grams of lead will be formed?



## Station 2

How many grams of sodium sulfate will be formed if you start with 200g sodium hydroxide and you have an excess of sulfuric acid?



## Station 3

A 2 gram sample of ammonia is mixed with 4.00 g of oxygen. Which is the limiting reactant and how ~~many~~ much excess reactant remains?



Station 1 Answer:



$$\frac{1.00 \text{ g Zn} \left| \frac{1 \text{ mol Zn}}{65.38 \text{ g Zn}} \right| \frac{1 \text{ mol Pb}}{1 \text{ mol Zn}}}{1} = 0.015 \text{ mol Pb}$$

$$\frac{25 \text{ mL} \left| \frac{1 \text{ L}}{1000 \text{ mL}} \right| \frac{0.250 \text{ mol Pb}(\text{NO}_3)_2}{1 \text{ L}} \left| \frac{1 \text{ mol Pb}}{1 \text{ mol Pb}(\text{NO}_3)_2} \right|}{1} = 0.00625 \text{ mol Pb}$$

$\text{Pb}(\text{NO}_3)_2$  is limiting

$$\frac{0.00625 \text{ mol Pb} \left| \frac{207.2 \text{ g Pb}}{1 \text{ mol Pb}} \right|}{1} = \boxed{1.295 \text{ g Pb}}$$

Station 2 Answer:



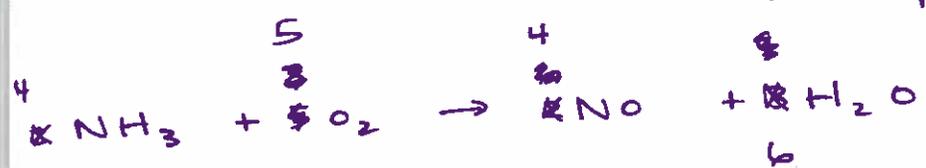
$$\frac{200 \text{ g NaOH} \left| \frac{1 \text{ mol NaOH}}{40 \text{ g NaOH}} \right| \frac{1 \text{ mol Na}_2\text{SO}_4}{2 \text{ mol NaOH}} \left| \frac{142.05 \text{ g Na}_2\text{SO}_4}{1 \text{ mol Na}_2\text{SO}_4} \right|}{1}$$

$$= 355.125 \text{ g Na}_2\text{SO}_4$$

Which is limiting?

How much excess!

Station 3



2g NH <sub>3</sub>	1 mol NH <sub>3</sub>	4 mol NO	= 0.12 mol NO
17g NH <sub>3</sub>	4 mol NH <sub>3</sub>		

4g O <sub>2</sub>	1 mol O <sub>2</sub>	4 mol NO	= 0.10 mol NO
32g O <sub>2</sub>	5 mol O <sub>2</sub>		

O<sub>2</sub> is limiting

0.10 mol NO	4 mol NH <sub>3</sub>	17g NH <sub>3</sub>	= 1.7g used
4 mol NO	1 mol NH <sub>3</sub>		

2g -  $\frac{0.39 \text{ g}}{1.7}$  = 0.3g NH<sub>3</sub> leftover

= 0.3g NH<sub>3</sub>