

3.7 Limiting Reactants - Theoretical Yields (1405334)

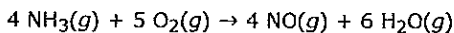
Current Score: 0/13

Question	1	2	3	4	Total
Points	0/3	0/4	0/4	0/2	0/13

1. 0/3 points

BLB11 3.P.074. [970291]

One of the steps in the commercial process for converting ammonia to nitric acid is the conversion of NH₃ to NO.



In a certain experiment, 2.90 g of NH₃ reacts with 4.76 g of O₂.

(a) Which is the limiting reactant?

O₂

NH₃

$$\frac{4.76 \text{ g O}_2}{32.0 \text{ g O}_2} \times \frac{1 \text{ mole O}_2}{5 \text{ mole O}_2} \times \frac{4 \text{ mole NO}}{1 \text{ mole NO}} \times \frac{30.0 \text{ g NO}}{1 \text{ mole NO}} = 3.57 \text{ g NO}$$

$$\frac{2.90 \text{ g NH}_3}{17.03 \text{ g NH}_3} \times \frac{1 \text{ mole NH}_3}{4 \text{ mole NH}_3} \times \frac{4 \text{ mole NO}}{1 \text{ mole NO}} \times \frac{30.0 \text{ g NO}}{1 \text{ mole NO}} = 5.11 \text{ g NO}$$

(b) How many grams of NO form?

3.57119 g

(c) How many grams of the excess reactant remains after the limiting reactant is completely consumed? NH₃

0.873 g

$$\frac{4.76 \text{ g O}_2}{32.0 \text{ g O}_2} \times \frac{1 \text{ mole O}_2}{5 \text{ mole O}_2} \times \frac{4 \text{ mole NH}_3}{1 \text{ mole NH}_3} \times \frac{17.03 \text{ g NH}_3}{1 \text{ mole NH}_3} = 2.027 \text{ g NH}_3$$

$$2.90 - 2.027 = 0.873$$

2. 0/4 points

BLB11 3.P.075. [970284]

Solutions of sodium carbonate and silver nitrate react to form solid silver carbonate and a solution of sodium nitrate. A solution containing 5.25 g of sodium carbonate is mixed with one containing 7.25 g of silver nitrate. How many grams of each of the following compounds are present after the reaction is complete?

sodium carbonate

2.99 g

silver nitrate

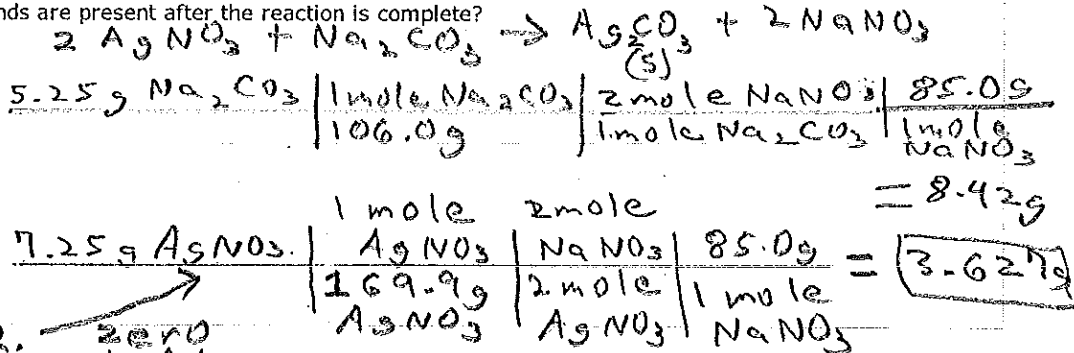
0 g

silver carbonate

5.88 g

sodium nitrate

3.63 g



L.R. zero left

On Back

BLB11 3.P.076. [970271]

3. 0/4 points

Solutions of sulfuric acid and lead(II) acetate react to form solid lead(II) sulfate and a solution of acetic acid. If 5.00 g of sulfuric acid and 5.00 g of lead(II) acetate are mixed, calculate the number of grams of each of the following present in the mixture after the reaction is complete.

sulfuric acid

3.49 g

lead(II) acetate

0 g

lead(II) sulfate

4.66 g

acetic acid

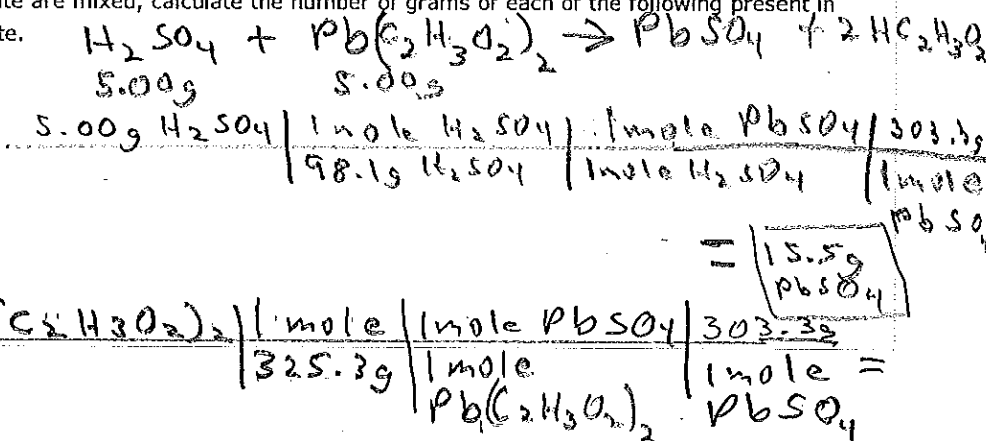
1.85 g

98.1

325.3

303.3

60.5



(2) (Cont)

$$\frac{7.25 \text{ g AgNO}_3}{169.9 \text{ g AgNO}_3} \times \frac{1 \text{ mole AgNO}_3}{2 \text{ mole AgNO}_3} \times \frac{1 \text{ mole Na}_2\text{CO}_3}{1 \text{ mole Na}_2\text{CO}_3} \times 106.0 \text{ g} = 2.26 \text{ g used}$$

Started 5.26 g Na₂CO₃

Used 2.26 g Na₂CO₃

Remains → 3.00 g Na₂CO₃

$$\frac{7.25 \text{ g AgNO}_3}{169.9 \text{ g AgNO}_3} \times \frac{1 \text{ mole AgNO}_3}{2 \text{ mole AgNO}_3} \times \frac{1 \text{ mole Ag}_2\text{CO}_3}{1 \text{ mole Ag}_2\text{CO}_3} \times 275.8 \text{ g}$$

$$= \span style="border: 1px solid black; padding: 5px;">5.88 \text{ g Ag}_2\text{CO}_3$$

4. 0/2 points

When ethane (C_2H_6) reacts with chlorine (Cl_2) the main product is C_2H_5Cl ; but other products containing Cl (chlorine), such as $C_2H_4Cl_2$, are also obtained in small quantities. The formation of these other products reduces the yield of C_2H_5Cl . In a certain experiment 170. g of C_2H_6 reacts with 230. g of Cl_2 .

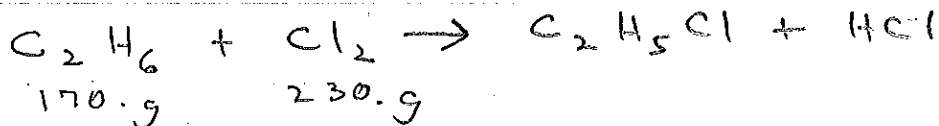
(a) Assuming that C_2H_6 and Cl_2 react only to form C_2H_5Cl and HCl , calculate the theoretical yield of C_2H_5Cl .

209 g

(b) Calculate the percent yield of C_2H_5Cl if the reaction produced 176 g of C_2H_5Cl .

84.1 %

Assignment Details



(A)

$$170 \text{ g } C_2H_6 \left| \frac{1 \text{ mole } C_2H_6}{30.07 \text{ g } C_2H_6} \right| \frac{1 \text{ mole } C_2H_5Cl}{1 \text{ mole } C_2H_6} \left| \frac{64.51 \text{ g}}{1 \text{ mole } C_2H_5Cl} \right| = 364.71 \text{ g}$$

$$230. \text{ g } Cl_2 \left| \frac{1 \text{ mole } Cl_2}{70.91 \text{ g } Cl_2} \right| \frac{1 \text{ mole } C_2H_5Cl}{1 \text{ mole } Cl_2} \left| \frac{64.51 \text{ g}}{1 \text{ mole } C_2H_5Cl} \right| = \boxed{209.2 \text{ g}}$$

$$\text{(3) } \% \text{ yield} = \frac{\text{actual yield}}{\text{theoretical yield}} = \frac{176 \text{ g}}{209.2 \text{ g}} \times 100\% = \boxed{84.1 \%}$$