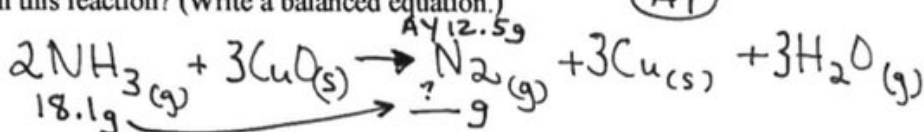


Stoichiometry Problems 4 (Percent Yield)

given (do the rxn) $\frac{AY}{TY} \times 100 = \%Y$
 (stoch)

Na

1. Nitrogen gas can be prepared by passing gaseous ammonia (NH_3) over solid copper oxide at high temperatures. The other products of the reaction are solid copper and water vapor. When a chemist reacts 18.1 grams of NH_3 is reacted with an excess CuO , 12.5 grams of nitrogen gas are produced. What is the percent yield of N_2 in this reaction? (Write a balanced equation.)

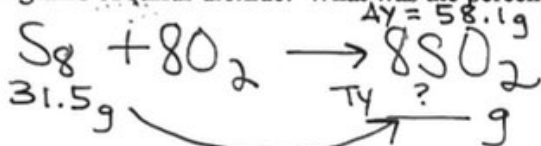


18.1g NH_3	1 mol NH_3	1 mol N_2	28.02g N_2	= 14.9g N_2
1	17.04g NH_3	2 mol NH_3	1 mol N_2	

TY

$$\%Y = \frac{12.5}{14.9} \times 100 = 83.9\%$$

2. Sulfur (S_8) reacts with oxygen to produce sulfur dioxide. A chemist completely reacts 31.5 grams of sulfur and produces 58.1 grams of sulfur dioxide. What was the percent yield of the reaction? (Write a balanced equation.)

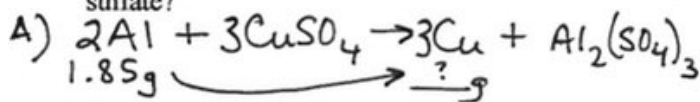


31.5g S_8	1 mol S_8	8 mol SO_2	64.06g SO_2	= 62.9g SO_2
1	256.48g S_8	1 mol S_8	1 mol SO_2	

TY

$$\%Y = \frac{58.1}{62.9} \times 100 = 92.4\%$$

3. A. The reaction of solid aluminum with aqueous copper(II) sulfate is known to have a 56.6% yield. If 1.85 g of Al reacts with excess copper (II) sulfate, what mass of copper is produced? (Write a balanced equation.) B. If one wishes to produce 100.00 g of copper, what mass of aluminum should be reacted with excess copper(II) sulfate?



1.85g Al	1 mol Al	3 mol Cu	63.55g Cu	= 6.54g Cu
1	26.98g Al	2 mol Al	1 mol Cu	

TY

$$56.6\% = \frac{AY}{6.54g} \times 100$$

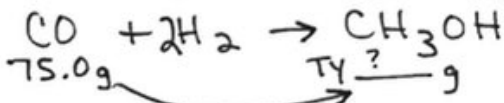
$$.566 = \frac{AY}{6.54g} \Rightarrow AY = 3.70g \text{ Cu}$$

B) $56.6\% = \frac{100.0g}{TY} \times 100$

177g Cu	1 mol Cu	2 mol Al	26.98g Al	= 50.1g Al
1	63.55g Cu	3 mol Cu	1 mol Al	

needed

4. Methanol (CH_3OH) can be produced through the reaction of CO and H_2 in the presence of a catalyst. If 75.0 g of CO reacts with an excess of hydrogen gas to produce 68.4 g of CH_3OH , what is the percent yield of CH_3OH ? (Write a balanced equation.)



75.0g CO	1 mol CO	1 mol CH_3OH	32.05g CH_3OH	= 85.8g CH_3OH
1	28.01g CO	1 mol CO	1 mol CH_3OH	

TY

$$\%Y = \frac{68.4g}{85.8g} \times 100 = 79.7\%$$

nope

5. Solid lithium hydroxide is used in space vehicles to remove exhaled carbon dioxide from the living environment to form solid lithium carbonate and liquid water. The balanced equation for the reaction is shown below. If two astronauts are going to be aboard a space craft for exactly 5 days, what mass of lithium hydroxide must be carried on the space craft to absorb all the carbon dioxide exhaled by the astronauts? Each astronaut exhales 2.3 pounds of CO₂ per day. The reaction is known to have an 88.5% yield.



5 days	2.3 lb CO ₂	454 g CO ₂	= 5221 g CO ₂	x 2 =	10,442 g CO ₂
1	1 day	1 lb CO ₂			

astronauts

$$\%Y = \frac{AY}{TY} \times 100$$

$$88.5 = \frac{10,442}{TY} \times 100$$

$$.885 = \frac{10,442}{TY}$$

$$TY = 11,799 \text{ g CO}_2$$

using a
REACTANT!

11,799 g CO ₂	1 mol CO ₂	2 mol LiOH	23.95 g LiOH	= 12841.90 g LiOH
1	44.01 g CO ₂	1 mol CO ₂	1 mol LiOH	

— OR —

10,442 g CO ₂	1 mol CO ₂	1 mol Li ₂ CO ₃	73.89 g Li ₂ CO ₃	= 17531.46 g Li ₂ CO ₃
1	44.01 g CO ₂	1 mol CO ₂	1 mol Li ₂ CO ₃	

$$\%Y = \frac{AY}{TY} \times 100$$

$$.885 = \frac{17531.46}{TY}$$

$$TY = 19809.55 \text{ g Li}_2\text{CO}_3$$

This needs to be
AY if all the
CO₂ is used!

19809.55 g Li ₂ CO ₃	1 mole Li ₂ CO ₃	2 mol LiOH	23.95 g LiOH	= 12841.76 g LiOH
1	73.89 g Li ₂ CO ₃	1 mol Li ₂ CO ₃	1 mol LiOH	