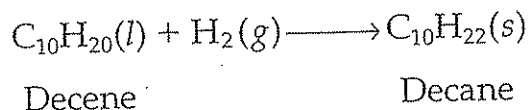


Stoichiometry Practice 2

"Theoretical Yield"

"Percent Yield"

- 4.97 Various members of a class of compounds called alkenes (Chapter 11), react with hydrogen to produce a corresponding alkane (Chapter 10). Termed hydrogenation, this type of reaction is used to produce products such as margarine. A typical hydrogenation reaction is



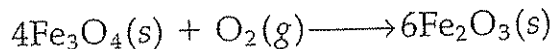
How much decane can be produced in a reaction of excess decene with 1.00 g hydrogen?

- 4.98 A Human Perspective: Alcohol Consumption and the Breathalyzer Test (Chapter 12), describes the reaction between the dichromate ion and ethanol to produce acetic acid. How much acetic acid can be produced from a mixture containing excess of dichromate ion and 1.00×10^{-1} g of ethanol?
- 4.99 A rocket can be powered by the reaction between dinitrogen tetroxide and hydrazine:



An engineer designed the rocket to hold 1.00 kg N_2O_4 and excess N_2H_4 . How much N_2 would be produced according to the engineer's design?

- 4.100 A 4.00-g sample of Fe_3O_4 reacts with O_2 to produce Fe_2O_3 :

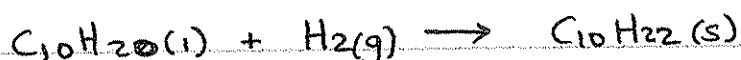


Determine the number of g of Fe_2O_3 produced.

- 4.101 If the actual yield of decane in Problem 4.97 is 65.4 g, what is the % yield?
- 4.102 If the actual yield of acetic acid in Problem 4.98 is 0.110 g, what is the % yield?
- 4.103 If the % yield of nitrogen gas in Problem 4.99 is 75.0%, what is the actual yield of nitrogen?
- 4.104 If the % yield of Fe_2O_3 in Problem 4.100 is 90.0%, what is the actual yield of Fe_2O_3 ?

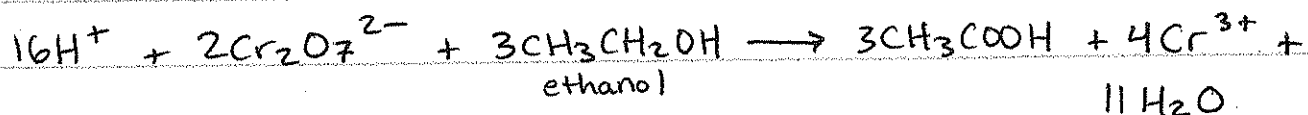
Stoichiometry 2 - Theoretical Yield

4.97



$$\frac{1.00 \text{ g H}_2}{2.02 \text{ g H}_2} \times \frac{1 \text{ mol H}_2}{1 \text{ mol H}_2} \times \frac{1 \text{ mol C}_{10}\text{H}_{22}}{1 \text{ mol C}_{10}\text{H}_{22}} \times \frac{142.32 \text{ g C}_{10}\text{H}_{22}}{1 \text{ mol C}_{10}\text{H}_{22}} = \boxed{70.5 \text{ g C}_{10}\text{H}_{22}}$$

4.98



$$\frac{0.100 \text{ ethanol}}{46.08 \text{ g ethanol}} \times \frac{1 \text{ mol ethanol}}{3 \text{ mol ethanol}} \times \frac{3 \text{ mol acetic acid}}{1 \text{ mol acetic acid}} \times \frac{60.06 \text{ g acetic acid}}{1 \text{ mol acetic acid}} = \boxed{0.130 \text{ g acetic acid}}$$

4.99



$$\frac{1.00 \text{ kg N}_2\text{O}_4 \rightarrow 1000 \text{ g N}_2\text{O}_4}{92.02 \text{ g N}_2\text{O}_4} \times \frac{1 \text{ mol N}_2\text{O}_4}{1 \text{ mol N}_2\text{O}_4} \times \frac{3 \text{ mol N}_2}{1 \text{ mol N}_2} \times \frac{28.02 \text{ g N}_2}{1 \text{ mol N}_2} = \boxed{913 \text{ g N}_2}$$

4.100



Fe: 55.845

$$\frac{4.00 \text{ g Fe}_3\text{O}_4}{231.535 \text{ g Fe}_3\text{O}_4} \times \frac{1 \text{ mol Fe}_3\text{O}_4}{4 \text{ mol Fe}_3\text{O}_4} \times \frac{6 \text{ mol Fe}_2\text{O}_3}{1 \text{ mol Fe}_2\text{O}_3} \times \frac{159.69 \text{ g Fe}_2\text{O}_3}{1 \text{ mol Fe}_2\text{O}_3} = \boxed{4.14 \text{ g Fe}_2\text{O}_3}$$

4.101

$\text{C}_{10}\text{H}_{22}$

AY = 65.4 g

TY = 70.5 g

$$\frac{\text{AY}}{\text{TY}} \times 100\% = \frac{65.4 \text{ g}}{70.5 \text{ g}} \times 100 = \boxed{92.8\%}$$

4.102
Acetic acid

$$\begin{aligned} AY &= 0.110\text{g} \\ TY &= 0.130\text{g} \end{aligned}$$
$$\frac{AY}{TY} \times 100\% = \frac{0.110\text{g}}{0.130\text{g}} \times 100\% = \boxed{84.6\%}$$

4.103
 N_2

$$\begin{aligned} AY &= ? \\ TY &= 913\text{g N}_2 \end{aligned}$$
$$\frac{AY}{TY} \times 100\% = 75.0\%$$

$$\frac{AY}{913\text{g}} = 0.75$$

$$\boxed{AY = 685\text{g N}_2}$$

4.104
 Fe_2O_3

$$\begin{aligned} AY &= ? \\ TY &= 4.14\text{g} \end{aligned}$$
$$\frac{AY}{4.14\text{g}} \times 100 = 90.0\%$$
$$AY = \boxed{3.73\text{g Fe}_2\text{O}_3}$$