Name: _____ Class: _____ Date: _____ ID: A

Percent Yield (Last Modified 04/10/04)

Problem

1. (brown94) Adipic Acid, $H_2C_6H_8O_4$, is a material used for the production of nylon. It is made commercially by controlled reaction between cyclohexane.$2C_6H_{12} + O_2 \rightarrow 2H_2C_6H_8O_4 + 2H_2O$ a. Assume that you carry out this reaction starting with 25.0g of cyclohexane, and that cyclohexane is the limiting reactant. What is the theoretical yield of Adipic acid? b. If you obtain 33.5g of Adipic acid from your acid from the reaction, what is the % yield of Adipic acid?

C_6H_{12} 84g/mol $H_2C_6H_8O_4$ = 146g/mol

$25g \cdot \frac{1\ mol}{84\ g} \cdot \frac{2}{2} \cdot \frac{146g}{1\ mol} = 43g$

% yield $\frac{33.5}{43.5} \times 100$ 81.6%

2. (brady109)One of the forms in which copper occurs in nature is copper(I) sulfide. How many grams of copper metal can theoretically be obtained from 10.0grams of this compound.

$CuS \rightarrow Cu + S$

10g ?

external method % mass

$10g \cdot \frac{1\ mol}{95\ g} \cdot \frac{1}{1} \cdot \frac{63.5g}{1\ mol} = 6.68g\ Cu$

3. (brady136)A Chemist set up a synthesis of phosphorus trichloride by mixing 12.0g P with 35.0g Cl2 and obtained 42.4g of PCl3. Calculate the percent yield of this compound. $2P(s) + 3Cl2(g) \rightarrow 2PCl3(l)$

(137.3g/mol)

$2P + 3Cl_2 \rightarrow 2PCl_3$

I .38 .49

S -.32 -.49 + +.32

E -.06 0

Convert to moles

$12.0g \cdot \frac{1\ mol}{30.97\ g} = 0.38mol$

$35g \cdot \frac{1\ mol}{70.8\ g} = .49mol$

$.49\ Cl_2 \cdot \frac{2\ P}{3\ Cl_2} = 0.32\ mol$ Needed

$.49 \cdot \frac{2}{3} =$

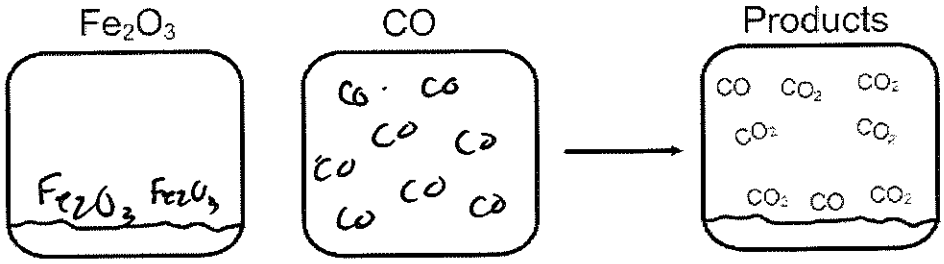
$.32\ mol \cdot \frac{137\ ^1}{1\ mol} = 43.8g$

$\frac{42.4}{43.8} \times 100 = 96.5\%$

$Fe_2O_3 + 3CO \rightarrow 3CO_2 + Fe$

	8		0	
+3	-2		+6	
0	2		6	

b. Complete the following models. (each box requires something added)



3. Pure iron will eventually return back to an oxidized form.

$$2Fe + 3O_2 \rightarrow Fe_2O_3$$

A sample of Iron (III) oxide is measured to be 110g.

a. How many atoms of iron are present in the sample?

$Fe_2O_3 = 159.7 g/mol \rightarrow$ less 1 $\rightarrow Fe$ more than 1 ×2

b. What is the mass of the original mass of Fe?

$69.9\% Fe \cdot 110 = 76.8 g$

c. What is the volume of air needed to complete this reaction if air is 20% O_2 at STP.

d. Complete the following model. (show your work)

$Fe + 3O_2 \rightarrow Fe_2O_3$

	10	15	
+5	-5	-15	+5
	5	0