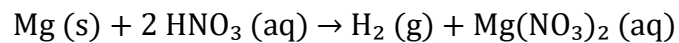## Theoretical and Percent Yield

Question One

If the reaction below is started with 40. grams of magnesium and an excess of nitric acid according to the equation below, what is the theoretical yield of hydrogen?

$$Mg \ (s) + 2 \ HNO_3 \ (aq) \rightarrow H_2 \ (g) + Mg(NO_3)_2 \ (aq)$$

If 1.7 grams of hydrogen is actually produced, what was the percent yield of hydrogen?

Molar Masses

Mg 24.30 g/mol
HNO_3 63.01 g/mol
H_2 2.02 g/mol
$Mg(NO_3)_2$ 148.30 g/mol

Question Two $C_6H_6 + Cl_2 \rightarrow C_6H_5Cl + HCl$
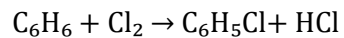
a. What is the theoretical yield of C_6H_5Cl if 45.6 g of benzene (C_6H_6) reacts with excess chlorine gas?

b. If the actual yield is 63.7 g of chlorobenzene, calculate the percent yield.

Molar Masses	
C_6H_6	78.11 g/mol
Cl_2	70.91 g/mol
C_6H_5Cl	112.56 g/mol
HCl	36.46 g/mol

Question Three

Solid copper reacts with silver nitrate solution according to the equation below.

$$Cu(s) + 2\,AgNO_3(aq) \rightarrow 2\,Ag(s) + Cu(NO_3)_2\,(aq)$$
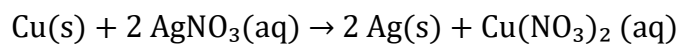
If 5.0 grams of copper and excess silver nitrate react, 12 grams of solid silver is produced. What is the percent yield of the reaction?
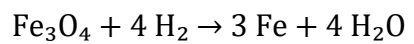
Molar Masses	
Cu	63.55 g/mol
$AgNO_3$	169.87 g/mol
Ag	107.87 g/mol
$Cu(NO_3)_2$	187.56 g/mol

Question Four

If, in the reaction below, 49 grams of Fe_3O_4 produces a 78.25 % yield of Fe. How many grams of Fe are produced?

$$Fe_3O_4 + 4\,H_2 \rightarrow 3\,Fe + 4\,H_2O$$
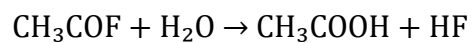
Molar Masses

Fe_3O_4	231.53 g/mol
H_2	2.02 g/mol
Fe	55.85 g/mol
H_2O	18.02 g/mol

Question Five

If, in the reaction below, 28 grams of H_2O produces a 79.59 % yield of HF. How many grams are produced?

$$CH_3COF + H_2O \rightarrow CH_3COOH + HF$$

Molar Masses

CH_3COF	62.04 g/mol
H_2O	18.02 g/mol
CH_3COOH	60.06 g/mol
HF	20.01 g/mol