Chemistry 210 – Stoichiometry 2

1. Consider the reaction of 10.0 g of zinc nitrate with excess sodium phosphate in aqueous solution. What mass of precipitate could be formed?

$$3\ Zn(NO_3)_{2\,(aq)} + 2\ Na_3PO_{4\,(aq)} \rightarrow Zn_3(PO_4)_{2\,(s)} + 6\ NaNO_{3\,(aq)}$$

10.0 g — ? = g

189.40 g/mol — 386.11 g/mol

$$\frac{10.0\,g}{} \left| \frac{1\ mol\ Zn(NO_3)_2}{189.40\,g} \right| \frac{1\ mol\ Zn_3(PO_4)_2}{3\ mol\ Zn(NO_3)_2} \left| \frac{386.11\,g}{1\ mol} \right. = 6.80\,g\ Zn_3(PO_4$$

2. Phosphine, an extremely poisonous and highly reactive gas, will react with oxygen to form tetraphosphorus decaoxide and water.

34.00 g/mol — 283.89 g/mol

$$4\ PH_3(g) + 3\ O_2(g) \rightarrow P_4O_{10}(s) + 6\ H_2O(g)$$

575 g ← (desired amt.)

Calculate the mass of PH_3 required to react with excess oxygen and to produce 575 g of tetraphosphorus decaoxide.

$$\frac{575\,g\ P_4O_{10}}{} \left| \frac{1\ mol\ P_4O_{10}}{283.89\,g} \right| \frac{4\ mol\ PH_3}{1\ mol\ P_4O_{10}} \left| \frac{34.00\,g\ PH_3}{1\ mol\ PH_3} \right. = 275\,g\ PH_3$$

3. Potassium chlorate (used in fireworks, flares and safety matches) forms oxygen and potassium chloride when heated.

122.5 g/mol — 32.00 g/mol

$$2\ KClO_3(s) \rightarrow 2\ KCl(s) + 3\ O_2(g)$$

26.4 g — TY = ?

What is the theoretical yield of oxygen when 26.4 g of potassium chlorate is heated?

$$\frac{26.4\,g\ KClO_3}{} \left| \frac{1\ mol\ KClO_3}{122.5\,g\ KClO_3} \right| \frac{3\ mol\ O_2}{2\ mol\ KClO_3} \left| \frac{32.00\,g\ O_2}{1\ mol\ O_2} \right.$$

$$= \boxed{10.3\,g\ O_2}$$