STOICHIOMETRY

1. Oxygen is prepared by heating $KClO_3$:

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

a) How many grams of O_2 are obtained from 3.00 g $KClO_3$?

b) How many grams of KCl are obtained if 6.00 g of O_2 are formed?

c) How many grams of $KClO_3$ are needed to prepare 16.0 g O_2?

2. Sodium thiosulfate, photographer's hypo, reacts with unexposed silver bromide in the emulsion to form sodium bromide and a soluble compound of formula $Na_3[Ag(S_2O_3)_2]$.

$$2\ Na_2S_2O_3(aq) + AgBr(s) \rightarrow NaBr(aq) + Na_3[Ag(S_2O_3)]_2(aq)$$

a) How many grams of $Na_2S_2O_3$ are needed to dissolve 1.0 mg of AgBr?

b) Calculate the mass of AgBr that will produce 1.00 g of $Na_3[(S_2O_3)]_2$?

3. The camel stores the fat tristearin, $C_{57}H_{110}O_6$, in its hump. As well as being a source of energy, the fat is also a source of water because, when its used, the following reaction takes place.

$$2\ C_{57}H_{110}O_6(s) + 163\ O_2(g) \rightarrow 114\ CO_2(g) + 110\ H_2O(l)$$

a) What mass of water is available from 2.5 kg of this fat?

b) What mass of O_2 is needed to react with 2.5 g of this fat?

4. Commercial sulfuric acid has, a density of 1.45 g/mL and is 55.1% H_2SO_4 by mass ,is used for the production of H_2 by the reaction:

$$2\ Al(s) + 3\ H_2SO_4(aq) \rightarrow Al_2(SO_4)_3 + 3\ H_2$$

What mass and volume of this commercial acid are needed for the production of 50.0 g of H_2?

5. If 3.50 g of $FeBr_3$ and 6.4 g of Na_2S are combined in a solution, how many grams of Fe_2S_3 can be made by the following reaction?

$$2\ FeBr_3(aq) + 3\ Na_2S(aq) \rightarrow Fe_2S_3(s) + 6\ NaBr(aq)$$

6. Calcium carbide, CaC_2, reacts with water to form calcium hydroxide and flammable gas acetylene, C_2H_2. The reaction is:

$$CaC_2(s) + 2\ H_2O(l) \rightarrow Ca(OH)_2(aq) + C_2H_2(g)$$

a) Which is the limiting reactant when 100.0 g of water reacts with 100.0 g of calcium carbide?

b) What mass of acetylene can be produced?

c) What mass of reactant remains after reaction is complete?

7. A mixture of 7.45 g of iron(II) oxide and 3.00 g of Al are heated and the reaction takes place:

$$3\ FeO(s) + 2\ Al(s) \rightarrow 3\ Fe(l) + Al_2O_3(s)$$

a) Which is the limiting reactant?

b) Calculate the maximum amount of iron that can be produced.

c) Calculate the mass of excess reactant remaining.

8. When aqueous solution of $Ca(NO_3)_2$ and H_3PO_4 are mixed the reaction is

$$3\ Ca(NO_3)_2(aq) + 2\ H_3PO_4(aq) \rightarrow\ Ca_3(PO_4)_2(s) + 6\ HNO_3(aq)$$

How many grams of the solid can be formed from 206 g of calcium nitrate and 150 g of phosphoric acid?