CHEMISTRY CALCULATIONS WS 2

Moles & Mass

1 How many moles of hydrogen gas are produced when 0.4 moles of sodium react with excess water?

$$2Na + 2H_2O \rightarrow 2NaOH + H_2$$

2 How many moles of O_2 react with 0.01 mol C_3H_8?

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$

3 How many moles of H_2S are formed when 0.02mol of HCl react with excess Sb_2S_3?

$$Sb_2S_3 + 6HCl \rightarrow 2SbCl_3 + 3H_2S$$

4 How many moles of oxygen are formed when 0.6mol of $KClO_3$ react?

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

5 How many moles of iron are formed when 0.9mol CO react with excess iron oxide?

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

6 a. What is the limiting reactant in each of the following reactions?

0.1 mol Sb_4O_6 reacts with 0.5 mol H_2SO_4

$$Sb_4O_6 + 6H_2SO_4 \rightarrow 2Sb_2(SO_4)_3 + 6H_2O$$

b. 0.20 mol $AsCl_3$ reacts with 0.25 mol H_2O

$$4AsCl_3 + 6H_2O \rightarrow As_4O_6 + 12HCl$$

c. 0.25mol Cu react with 0.50mol dilute HNO_3 according to the equation:

$$3Cu + 8HNO_3 \rightarrow 3Cu(NO_3)_2 + 4H_2O + 2NO$$

d. 0.10mol NaCl reacts with 0.15mol MnO_2 and 0.20mol H_2SO_4

$$2NaCl + MnO_2 + 2H_2SO_4 \rightarrow Na_2SO_4 + MnSO_4 + 2H_2O + Cl_2$$

7 Consider the combustion of butane:

$$2C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(l)$$

10.00g of butane reacts exactly with 35.78g of oxygen to produce 30.28g of carbon dioxide.What mass of water was produced?

8 Consider the reaction of sodium with oxygen:

$$4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$$

a. How much sodium reacts exactly with 3.20 g of oxygen?

b. What mass of Na_2O is produced?

9 The following equation represents the combustion of butane:

$$2C_4H_{10}(g) + 13O_2(g) \rightarrow 8CO_2(g) + 10H_2O(l)$$

If 10.00 g of butane is used, calculate:

a. the mass of oxygen required for the exact reaction

b. the mass of carbon dioxide produced.

10 Boron can be prepared by reacting B_2O_3 with magnesium at high temperatures:

$$B_2O_3 + 3Mg \rightarrow 2B + 3MgO$$

What mass of B is obtained if 0.75 g B_2O_3 is reacted with 0.50 g Mg?

11 Iron(III) oxide reacts with carbon to produce iron:

$$Fe_2O_3 + 3C \rightarrow 2Fe + 3CO$$

What mass of Fe is obtained if 10.0tonnes of Fe_2O_3 is reacted with 1.00 tonne of C?

12 Consider the reaction between magnesium and nitrogen:

$$3Mg(s) + N_2(g) \rightarrow Mg_3N_2(s)$$

10.00g of magnesium is reacted with 5.00g of nitrogen.Which is the limiting reactant?

13 For the reaction:

$$4Fe_2Cr_2O_4 + 8Na_2CO_3 + 7O_2 \rightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$$

there is 100.0g of each reactant available.Which is the limiting reactant?

14 Consider the reaction between magnesium and nitrogen:

$$3Mg(s) + N_2(g) \rightarrow Mg_3N_2(s)$$

10.00g of magnesium is reacted with 5.00g of nitrogen.Which is the limiting reactant?

15 Consider the reaction between sulfur and fluorine:

$$S(s) + 3F_2(g) \rightarrow SF_6(g)$$

10.00g of sulfur reacts with 10.00g of fluorine.

a. Which is the limiting reactant?

b. What mass of sulfur(VI) fluoride is formed?

c. What mass of the reactant in excess is left at the end?

16 Calculate the percentage yield in each of the following reactions.

a. When 2.50 g of SO_2 is heated with excess oxygen, 2.50 g of SO_3 is obtained.

$$2SO_2 + O_2 \rightarrow 2SO_3$$

b. When 10.0g of arsenic is heated in excess oxygen, 12.5 g of As_4O_6 is produced.

$$4As + 3O_2 \rightarrow As_4O_6$$

(c) When 1.20 g ethene reacts with excess bromine, 5.23 g of 1,2-dibromoethane is produced.

$$C_2H_4 + Br_2 \rightarrow CH_2BrCH_2Br$$