SCIENCE (CHEMISTRY)

CHEMICAL CALCULATION USING MOLE (VIII) - Calculating number of mole

Name:_____( ) Class:_____ Date:_____

Notes

e.g. Calculate the mass of water produced when 4.0g of methane is completely burnt in oxygen.

$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

Solution

Step 1 Write the chemical equation.

$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

Step 2 Change the mass of methane into moles of methane.

$$\text{No. of moles} = \frac{\text{mass in grams}}{M_r \text{ of methane in grams}}$$

= 4/16

= 0.25 mol

From the equation, find the ratio of the number of moles of H_2O to the number of moles of CH_4.

CH_4	H_2O
1 mol	2 mol

Step 3 Use the ratio to find the number of moles of H_2O produced when 0.25 mol of methane is burnt.

No. of moles of H_2O = 2 x no. of moles of CH_4

= 2 x 0.25

= 0.5 mol

Step 4 Multiply the number of moles by M_r of H_2O in grams to obtain the mass of H_2O in grams

Mass of H_2O in grams = no. of moles x M_r of H_2O in grams

= 0.5 x 18g

= 9g

Exercise

1. Propane, C_3H_8, burns in oxygen according to the equation

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

   Calculate the mass of water produced when 0.2 mol of propane is burnt

2. .Ammonia reacts with hot copper(II) oxide according to the equation

   $2NH_3 + 3CuO \longrightarrow 3Cu + N_2 + 3H_2O$

   Calculate the mass of copper(II) oxide, CuO, that reacts with 3.4g of ammonia, NH_3.

3. The following equation represents the reaction between sodium carbonate and hydrochloric acid to give carbon dioxide.

   $Na_2CO_3 + 2HCl \longrightarrow 2NaCl + CO_2 + H_2O$

   Calculate the mass of sodium chloride that can be formed from 0.1 mol of sodium carbonate.

4. Sulphuric acid and sodium hydroxide can react as follows:

$$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$$

(a) How many moles of sodium sulphate can be formed from 2 mol of sodium hydroxide?

(b) How many grams of sodium sulphate can be formed from 40 grams of sodium hydroxide?

5. Iron (III) oxide reacts with carbon monoxide to give iron.

$$Fe_2O_3\ (s) + 3CO\ (g) \longrightarrow 2Fe\ (s) + 3CO_2\ (g)$$

(a) How many moles of iron are formed when 2 moles of iron (III) oxide react with an excess of carbon monoxide?

(b) How many moles of iron(III) oxide, Fe_2O_3 will produce 40g of iron?

6. When aluminium is heated with iron (III) oxide, iron is formed according to the equation:

$$2Al + Fe_2O_3 \longrightarrow Al_2O_3 + 2Fe$$

What mass of aluminium is needed to react completely with 8g of iron(III) oxide?

7. Aqueous silver nitrate reacts with aqueous sodium chloride producing insoluble silver chloride. The equation for the reaction is

$$AgNO_3\,(aq) + NaCl(aq) \longrightarrow AgCl(s) + NaNO_3\,(aq)$$

What mass of silver chloride can be formed from 23g of sodium chloride?