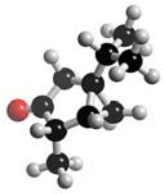
AS.CHEM1.2.011

SOLUTION CALCULATIONS



Name …… Form ……

1) Calculate the number of moles in the following.

a) 2 dm^3 of 0.05 mol dm^{-3} HCl

b) 50 litres of 5 mol dm^{-3} H_2SO_4

c) 10 cm^3 of 0.25 mol dm^{-3} KOH

2) Calculate the concentration of the following in **both** mol dm^{-3} and g dm^{-3}

a) 0.400 moles of HCl in 2.00 litres of solution

b) 12.5 moles of H_2SO_4 in 5.00 dm^3 of solution

c) 1.05 g of NaOH in 500 cm^3 of solution

3) Calculate the volume of each solution that contains the following number of moles.

a) 0.00500 moles of NaOH from 0.100 mol dm^{-3} solution

b) 1.00×10^{-5} moles of HCl from 0.0100 mol dm^{-3} solution

4) 25.0 cm^3 of 0.020 mol dm^{-3} sulphuric acid neutralises 18.6 cm^3 of barium hydroxide solution.

$$H_2SO_4 + Ba(OH)_2 \rightarrow BaSO_4 + 2\,H_2O$$

a) Find the concentration of the barium hydroxide solution in mol dm^{-3}.

b) Find the concentration of the barium hydroxide solution in g dm^{-3}.

5) 25.0 cm^3 of a solution of sodium hydroxide required 18.8 cm^3 of 0.0500 mol dm^{-3} H_2SO_4.

$$H_2SO_4 + 2\,NaOH \rightarrow Na_2SO_4 + 2\,H_2O$$

a) Find the concentration of the sodium hydroxide solution in mol dm^{-3}.

b) Find the concentration of the sodium hydroxide solution in g dm^{-3}.

6) Calculate the volume of 0.05 mol dm^{-3} KOH is required to neutralise 25.0 cm^3 of 0.0150 mol dm^{-3} HNO_3.

$$HNO_3 + KOH \rightarrow KNO_3 + H_2O$$

7) 25.0 cm^3 of arsenic acid, H_3AsO_4, required 37.5 cm^3 of 0.100 mol dm^{-3} sodium hydroxide for neutralisation.

$$3\,NaOH(aq) + H_3AsO_4(aq) \rightarrow Na_3AsO_4(aq) + 3\,H_2O(l)$$

a) Find the concentration of the acid in mol dm^{-3}.

b) Find the concentration of the acid in g dm^{-3}.

8) A 250 cm^3 solution of NaOH was prepared. 25.0 cm^3 of this solution required 28.2 cm^3 of 0.100 mol dm^{-3} HCl for neutralisation. Calculate what mass of NaOH was dissolved to make up the original 250 cm^3 solution.

$$HCl + NaOH \rightarrow NaCl + H_2O$$

9) What volume of 5.00 mol dm^{-3} HCl is required to neutralise 20.0 kg of $CaCO_3$?

$$2\ HCl + CaCO_3 \rightarrow CaCl_2 + H_2O + CO_2$$

10) 3.88 g of a monoprotic acid was dissolved in water and the solution made up to 250 cm^3. 25.0 cm^3 of this solution was titrated with 0.095 mol dm^{-3} NaOH solution, requiring 46.5 cm^3. Calculate the relative molecular mass of the acid.

11) A 1.575 g sample of ethanedioic acid crystals, $H_2C_2O_4.nH_2O$, was dissolved in water and made up to 250 cm^3. One mole of the acid reacts with two moles of NaOH. In a titration, 25.0 cm^3 of this solution of acid reacted with exactly 15.6 cm^3 of 0.160 mol dm^{-3} NaOH. Calculate the value of n.

12) A solution of a metal carbonate, M_2CO_3, was prepared by dissolving 7.46 g of the anhydrous solid in water to give 1000 cm^3 of solution. 25.0 cm^3 of this solution reacted with 27.0 cm^3 of 0.100 mol dm^{-3} hydrochloric acid. Calculate the relative formula mass of M_2CO_3 and hence the relative atomic mass of the metal M.

13) A 1.00 g sample of limestone is allowed to react with 100 cm^3 of 0.200 mol dm^{-3} HCl. The excess acid required 24.8 cm^3 of 0.100 mol dm^{-3} NaOH solution. Calculate the percentage of calcium carbonate in the limestone.

14) An impure sample of barium hydroxide of mass 1.6524 g was allowed to react with 100 cm^3 of 0.200 mol dm^{-3} hydrochloric acid. When the excess acid was titrated against sodium hydroxide, 10.9 cm^3 of sodium hydroxide solution was required. 25.0 cm^3 of the sodium hydroxide required 28.5 cm^3 of the hydrochloric acid in a separate titration. Calculate the percentage purity of the sample of barium hydroxide.