

# SOLUTION CALCULATIONS

Name ..... Form .....



1) Calculate the number of moles in the following.

- 2 dm<sup>3</sup> of 0.05 mol dm<sup>-3</sup> HCl
- 50 litres of 5 mol dm<sup>-3</sup> H<sub>2</sub>SO<sub>4</sub>
- 10 cm<sup>3</sup> of 0.25 mol dm<sup>-3</sup> KOH

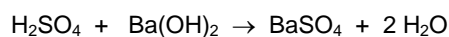
2) Calculate the concentration of the following in **both** mol dm<sup>-3</sup> and g dm<sup>-3</sup>

- 0.400 moles of HCl in 2.00 litres of solution
- 12.5 moles of H<sub>2</sub>SO<sub>4</sub> in 5.00 dm<sup>3</sup> of solution
- 1.05 g of NaOH in 500 cm<sup>3</sup> of solution

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

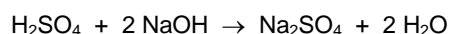
- 0.00500 moles of NaOH from 0.100 mol dm<sup>-3</sup> solution
- 1.00 x 10<sup>-5</sup> moles of HCl from 0.0100 mol dm<sup>-3</sup> solution

4) 25.0 cm<sup>3</sup> of 0.020 mol dm<sup>-3</sup> sulphuric acid neutralises 18.6 cm<sup>3</sup> of barium hydroxide solution.



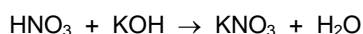
- Find the concentration of the barium hydroxide solution in mol dm<sup>-3</sup>.
- Find the concentration of the barium hydroxide solution in g dm<sup>-3</sup>.

5) 25.0 cm<sup>3</sup> of a solution of sodium hydroxide required 18.8 cm<sup>3</sup> of 0.0500 mol dm<sup>-3</sup> H<sub>2</sub>SO<sub>4</sub>.

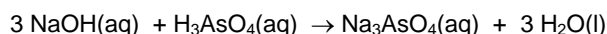


- Find the concentration of the sodium hydroxide solution in mol dm<sup>-3</sup>.
- Find the concentration of the sodium hydroxide solution in g dm<sup>-3</sup>.

6) Calculate the volume of 0.05 mol dm<sup>-3</sup> KOH is required to neutralise 25.0 cm<sup>3</sup> of 0.0150 mol dm<sup>-3</sup> HNO<sub>3</sub>.

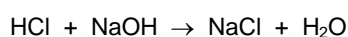


7) 25.0 cm<sup>3</sup> of arsenic acid, H<sub>3</sub>AsO<sub>4</sub>, required 37.5 cm<sup>3</sup> of 0.100 mol dm<sup>-3</sup> sodium hydroxide for neutralisation.

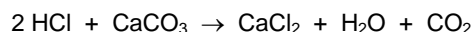


- Find the concentration of the acid in mol dm<sup>-3</sup>.
- Find the concentration of the acid in g dm<sup>-3</sup>.

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



- 9) What volume of  $5.00 \text{ mol dm}^{-3}$  HCl is required to neutralise  $20.0 \text{ kg}$  of  $\text{CaCO}_3$ ?



- 10)  $3.88 \text{ g}$  of a monoprotic acid was dissolved in water and the solution made up to  $250 \text{ cm}^3$ .  $25.0 \text{ cm}^3$  of this solution was titrated with  $0.095 \text{ mol dm}^{-3}$  NaOH solution, requiring  $46.5 \text{ cm}^3$ . Calculate the relative molecular mass of the acid.
- 11) A  $1.575 \text{ g}$  sample of ethanedioic acid crystals,  $\text{H}_2\text{C}_2\text{O}_4 \cdot n\text{H}_2\text{O}$ , was dissolved in water and made up to  $250 \text{ cm}^3$ . One mole of the acid reacts with two moles of NaOH. In a titration,  $25.0 \text{ cm}^3$  of this solution of acid reacted with exactly  $15.6 \text{ cm}^3$  of  $0.160 \text{ mol dm}^{-3}$  NaOH. Calculate the value of  $n$ .
- 12) A solution of a metal carbonate,  $\text{M}_2\text{CO}_3$ , was prepared by dissolving  $7.46 \text{ g}$  of the anhydrous solid in water to give  $1000 \text{ cm}^3$  of solution.  $25.0 \text{ cm}^3$  of this solution reacted with  $27.0 \text{ cm}^3$  of  $0.100 \text{ mol dm}^{-3}$  hydrochloric acid. Calculate the relative formula mass of  $\text{M}_2\text{CO}_3$  and hence the relative atomic mass of the metal M.
- 13) A  $1.00 \text{ g}$  sample of limestone is allowed to react with  $100 \text{ cm}^3$  of  $0.200 \text{ mol dm}^{-3}$  HCl. The excess acid required  $24.8 \text{ cm}^3$  of  $0.100 \text{ mol dm}^{-3}$  NaOH solution. Calculate the percentage of calcium carbonate in the limestone.
- 14) An impure sample of barium hydroxide of mass  $1.6524 \text{ g}$  was allowed to react with  $100 \text{ cm}^3$  of  $0.200 \text{ mol dm}^{-3}$  hydrochloric acid. When the excess acid was titrated against sodium hydroxide,  $10.9 \text{ cm}^3$  of sodium hydroxide solution was required.  $25.0 \text{ cm}^3$  of the sodium hydroxide required  $28.5 \text{ cm}^3$  of the hydrochloric acid in a separate titration. Calculate the percentage purity of the sample of barium hydroxide.