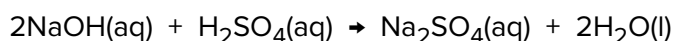


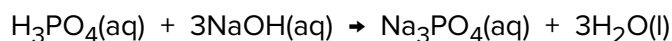
CHEMISTRY CALCULATIONS WS 3

Moles & Solutions

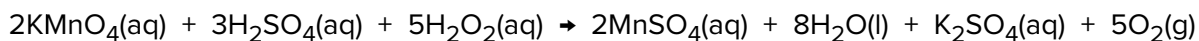
- 1 If 10.00 g of NaOH is dissolved in water and the volume is made up to 200.0 cm³, calculate the concentration in mol dm⁻³ and g dm⁻³.
- 2 Calculate the number of moles of HCl present in 50.0 cm³ of 2.00 mol dm⁻³ hydrochloric acid.
- 3 Calculate the number of moles of chloride ions present in 50.0 cm³ of a 0.0500 mol dm⁻³ solution of iron(III) chloride (FeCl₃) and the total concentration of all the ions present.
- 4 Sulfuric acid is titrated against 25.00 cm³ of 0.2000 mol dm⁻³ sodium hydroxide solution; 23.20 cm³ of sulfuric acid is required for neutralisation. Calculate the concentration of the sulfuric acid.



- 5 For neutralisation, 25.00 cm³ of phosphoric(V) acid (H₃PO₄) requires 28.70 cm³ of NaOH of concentration 0.1500 mol dm⁻³. What is the concentration of the phosphoric(V) acid?



6 Acidified potassium manganate(VII) oxidises hydrogen peroxide to produce oxygen:



If 45.00 cm^3 of $0.020 \text{ mol dm}^{-3}$ KMnO_4 is reacted with excess H_2O_2 and H_2SO_4 , calculate the volume of O_2 produced (at RTP).

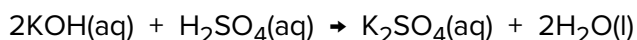
7 Work out the numbers of moles present in the following solutions:

a. 20.0 cm^3 of $0.220 \text{ mol dm}^{-3}$ $\text{NaOH}(\text{aq})$

b. 27.8 cm^3 of $0.0840 \text{ mol dm}^{-3}$ $\text{HCl}(\text{aq})$

c. 540 cm^3 of $0.0200 \text{ mol dm}^{-3}$ $\text{KMnO}_4(\text{aq})$

8 If 29.70 cm^3 of sulfuric acid of concentration $0.2000 \text{ mol dm}^{-3}$ is required for neutralisation of 25.00 cm^3 of potassium hydroxide solution, calculate the concentration of the potassium hydroxide solution.



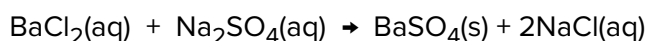
9 Calcium carbonate is reacted with 50.0 cm^3 of $0.500 \text{ mol dm}^{-3}$ hydrochloric acid.



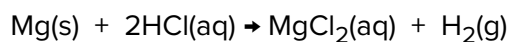
a. What mass of calcium carbonate is required for an exact reaction?

b. What volume of CO₂, measured at RTP, will be produced?

10 What volume (in cm³) of 0.0100 mol dm⁻³ barium chloride must be reacted with excess sodium sulfate to produce 0.100g of barium sulfate?



11 If 0.100g of magnesium is reacted with 25.00cm³ of 0.200 mol dm⁻³ hydrochloric acid, calculate the volume of hydrogen gas produced at RTP.



12 When 2.56 g hydrated magnesium sulfate (MgSO₄·xH₂O) is heated, 1.25 g of anhydrous magnesium sulfate (MgSO₄) is formed. Determine the value of x in the formula.

- a. If 10.00g of hydrated copper sulfate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) is dissolved in water and made up to a volume of 250.0 cm^3 , what is the concentration of the solution?
- b. What mass of anhydrous copper sulfate would be required to make 250.0 cm^3 of solution with the same concentration as in a?
- 13** A 3.92 g sample of hydrated sodium carbonate ($\text{Na}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$) was dissolved in water and made up to a total volume of 250.0 cm^3 . Of this solution, 25.00 cm^3 was titrated against $0.100 \text{ mol dm}^{-3}$ hydrochloric acid, and 27.40 cm^3 of the acid was required for neutralisation. Calculate the value of x in $\text{Na}_2\text{CO}_3 \cdot x\text{H}_2\text{O}$.
- 14** Limestone is impure calcium carbonate (CaCO_3): 2.00 g of limestone is put into a beaker and 60.00 cm^3 of $3.000 \text{ mol dm}^{-3}$ hydrochloric acid is added. They are left to react and then the impurities are filtered off and the solution is made up to a total volume of 100.0 cm^3 . Of this solution, 25.00 cm^3 requires 35.50 cm^3 of $1.000 \text{ mol dm}^{-3}$ sodium hydroxide for neutralisation. Work out the percentage CaCO_3 in the limestone (assume that none of the impurities reacts with hydrochloric acid).

- 15 A 25.0cm³ sample of a solution of copper(II) nitrate is added to 10.0cm³ of 1mol dm⁻³ potassium iodide. The iodine produced is titrated against 0.0200 mol dm⁻³ sodium thiosulfate solution using starch indicator near the end point. 22.50 cm³ of the sodium thiosulfate solution was required for the titration. Calculate the concentration of the copper(II) nitrate solution.

