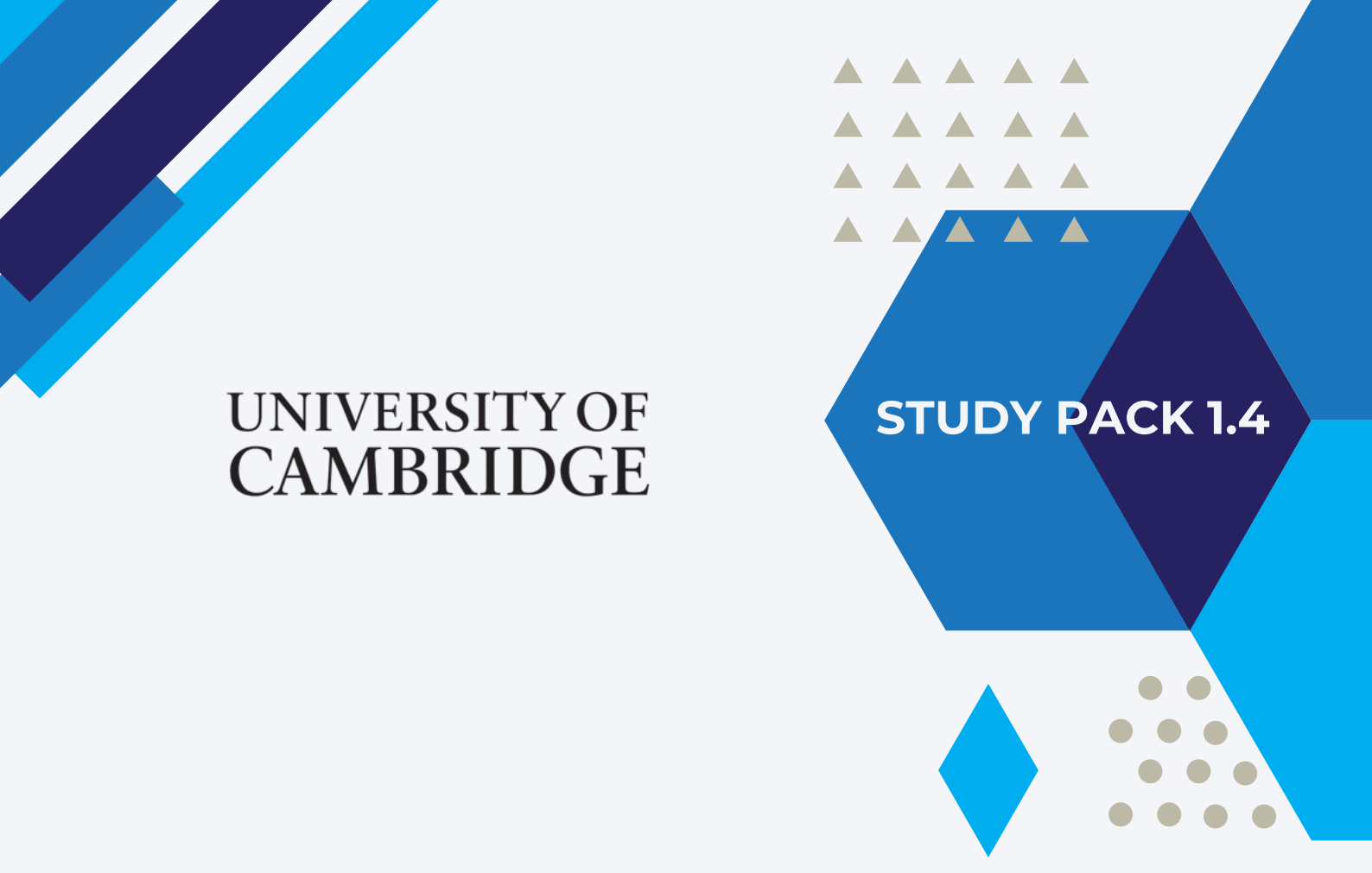
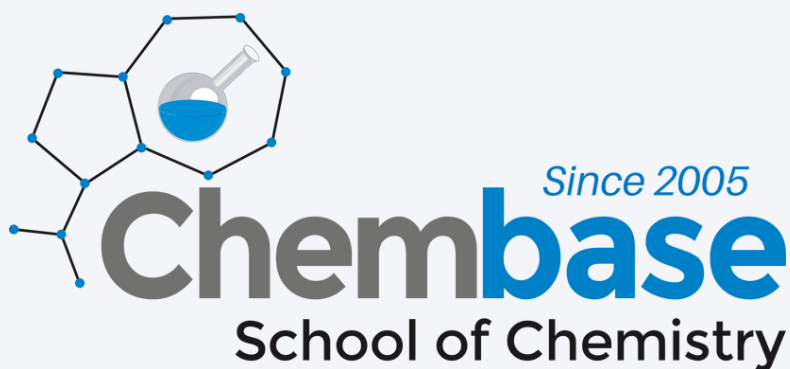
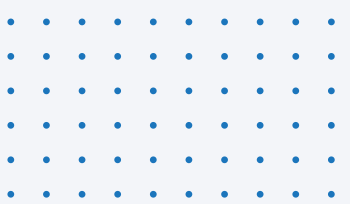




UNIVERSITY OF
CAMBRIDGE

STUDY PACK 1.4

CONCENTRATION & TITRATIONS



Calculations based on concentrations in solution

Calculate the number of moles of the underlined species in the volume of solution stated.

1 25 cm³ of 1.0 mol dm⁻³ HCl

2 50 cm³ of 0.5 mol dm⁻³ HCl

3 250 cm³ of 0.25 mol dm⁻³ HCl

4 500 cm³ of 0.01 mol dm⁻³ HCl

5 25 cm³ of 1.0 mol dm⁻³ NaOH

6 50 cm³ of 0.5 mol dm⁻³ KOH

7 50 cm³ of 0.25 mol dm⁻³ HNO₃

8 100 cm³ of 0.1 mol dm⁻³ H₂SO₄

9 25 cm³ of 0.05 mol dm⁻³ KMnO₄

10 25 cm³ of 0.2 mol dm⁻³ FeSO₄

Calculate the mass of material in the given volume of solution

11 25 cm³ of 1 mol dm⁻³ HCl

12 50 cm³ of 0.5 mol dm⁻³ NaCl

13 100 cm³ of 0.25 mol dm⁻³ NH₄NO₃

14 100 cm³ of 0.1 mol dm⁻³ AgNO₃

15 25 cm³ of 1 mol dm⁻³ BaCl₂

16 50 cm³ of 0.2 mol dm⁻³ H₂SO₄

17 20 cm³ of 0.1 mol dm⁻³ NaOH

18 50 cm³ of 0.1 mol dm⁻³ K₂CrO₄

19 25 cm³ of 0.02 mol dm⁻³ KMnO₄

20 25 cm³ of 0.1 mol dm⁻³ Pb(NO₃)₂

What is the concentration in moles dm^{-3} of the following?

21 3.65 g of HCl in 1000 cm^3 of solution

22 3.65 g of HCl in 100 cm^3 of solution

23 6.62 g of $\text{Pb}(\text{NO}_3)_2$ in 250 cm^3 of solution

24 1.00 g of NaOH in 250 cm^3 of solution

25 1.96 g of H_2SO_4 in 250 cm^3 of solution

26 1.58 g of KMnO_4 in 250 cm^3 of solution

27 25.0 g of $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ in 250 cm^3 of solution

28 25.0 g of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in 250 cm^3 of solution

29 4.80 g of $(\text{COOH})_2 \cdot 2\text{H}_2\text{O}$ in 250 cm^3 of solution

30 10.0 g of $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ in 250 cm^3 of solution

31 240 cm^3 of $\text{NH}_3(\text{g})$ dissolved in 1000 cm^3 of solution

32 480 cm^3 of $\text{HCl}(\text{g})$ dissolved in 100 cm^3 of solution

33 120 cm^3 of $\text{SO}_2(\text{g})$ dissolved in 250 cm^3 of solution

34 24 cm^3 of $\text{HCl}(\text{g})$ dissolved in 200 cm^3 of solution

35 100 cm^3 of $\text{NH}_3(\text{g})$ dissolved in 10 cm^3 of solution

Answers

Simple volumetric calculations

In this series of calculations you should start by writing the equation for the reaction taking place then generate the molarity/volume ratio. In some cases you will need to calculate the molarity of the solutions before you start the main part of the question.

For questions 1–10 calculate the molarity of the first named solution from the data below.

1	25 cm ³ of sodium hydroxide	reacts with	21.0 cm ³ of 0.2 mol dm ⁻³ HCl
2	25 cm ³ of sodium hydroxide	reacts with	17.0 cm ³ of 0.1 mol dm ⁻³ H ₂ SO ₄
3	20 cm ³ of hydrochloric acid	reacts with	23.6 cm ³ of 0.1 mol dm ⁻³ NaOH
4	20 cm ³ of hydrochloric acid	reacts with	20.0 cm ³ of a solution of NaOH containing 40 g dm ⁻³ of NaOH
5	25 cm ³ of nitric acid	reacts with	15 cm ³ of a solution of 0.2 mol dm ⁻³ NH ₄ OH
6	25 cm ³ of a solution of barium chloride	reacts with	20 cm ³ of a solution of 0.05 mol dm ⁻³ sulphuric acid
7	25 cm ³ of a solution of NaCl	reacts with	10 cm ³ of a 0.02 mol dm ⁻³ silver nitrate
8	10 cm ³ of a solution of AlCl ₃	reacts with	30 cm ³ of 0.01 mol dm ⁻³ silver nitrate
9	25 cm ³ of H _x A	reacts with	25 cm ³ of 0.2 mol dm ⁻³ NaOH to give Na ₂ A
10	25 cm ³ of H ₃ PO ₄	reacts with	100 cm ³ of 0.1 mol dm ⁻³ NaOH to give NaH ₂ PO ₄

-
- 11 25 cm³ of a solution of 0.1 mol dm⁻³ NaOH reacts with 50 cm³ of a solution of hydrochloric acid. What is the molarity of the acid?
-
- 12 25 cm³ of a solution of 0.2 mol dm⁻³ KOH reacts with 30 cm³ of a solution of nitric acid. What is the concentration of the acid in moles dm⁻³?
-
- 13 In a titration 25 cm³ of ammonia solution react with 33.30 cm³ of 0.1 mol dm⁻³ HCl. What is the concentration of the ammonia solution in g dm⁻³?
-
- 14 In the reaction between iron(II) ammonium sulphate and potassium manganate(VII) solution. 25 cm³ of the Fe²⁺ solution reacted with 24.8 cm³ of 0.020 mol dm⁻³ KMnO₄ solution. What is the molarity of the iron(II) ammonium sulphate solution?
-
- 15 10 cm³ of a solution of NaCl react with 15 cm³ of 0.02 mol dm⁻³ silver nitrate solution. What is the concentration of the NaCl solution in g dm⁻³?
-
- 16 25 cm³ of a solution of an acid H_xA containing 0.1 mol dm⁻³ of the acid in each 1000 cm³ of solution reacts with 75 cm³ of a solution of 0.1 mol dm⁻³ NaOH. What is the value of x?
-
- 17 25 cm³ of a solution of sodium carbonate react with 10 cm³ of a 0.1 mol dm⁻³ HCl. What is the concentration of the sodium carbonate?
-
- 18 What volume of 0.1 mol dm⁻³ HCl will be needed to react with 25 cm³ of 0.2 mol dm⁻³ NaOH?
-
- 19 What volume of 0.05 mol dm⁻³ H₂SO₄ will be needed to react with 25 cm³ of 0.2 mol dm⁻³ NaOH?
-
- 20 What volume of 0.02 mol dm⁻³ KMnO₄ will be needed to react with 25 cm³ of 0.1 mol dm⁻³ FeSO₄ solution?
-

Answers

Answers