AP CHEMISTRY • EXERCISE SHEET

3.7 Solutions and Mixtures

Name: _____ Class: _____ Date: _____ **Total: 15 marks**

Objective

Build the skills to answer exam questions on **solutions and mixtures** —concentration and molarity.

You must be able to:

- define **solute** 溶质, **solvent** 溶剂, and **solution** 溶液
- calculate **molarity** 摩尔浓度 $M = \dfrac{\text{mol solute}}{\text{L solution}}$
- find moles or mass from a molarity

1 Worked examples

Study these first. Each one shows the method for a question type used later —follow the steps and you can do the Practice and Exam-style questions yourself.

Solute, solvent, solution

A **solute** dissolves in a **solvent** to make a **solution**. In salt water, salt is the solute and water the solvent.

Molarity

$$M = \frac{\text{moles of solute}}{\text{litres of solution}}.$$

Dissolving 0.5 mol in 2.0 L gives $\dfrac{0.5}{2.0} = 0.25$ M.

Finding moles from molarity

Rearrange: mol $= M \times V(\text{L})$. In 0.50 L of 2.0 M solution there are $2.0 \times 0.50 = 1.0$ mol.

From mass to molarity

Convert mass to moles first ($n = m/M_{\text{molar}}$), then divide by volume. 11.7 g of NaCl ($M_{\text{molar}} = 58.5$) is 0.20 mol; in 0.50 L that is 0.40 M.

2 Practice

Now apply the methods above.

2.1 Find the molarity of 0.40 mol dissolved in 2.0 L. [2]

2.2 How many moles are in 0.25 L of a 1.2 M solution? [2]

2.3 Identify the solute and solvent in a copper sulfate solution. [2]

3 Exam-style questions

3.1 Molarity is defined as [1]

- **A** mol solute per kg solvent
- **B** mol solute per L solution
- **C** g solute per L solution
- **D** L solution per mol solute

3.2 A solution is made by dissolving 0.50 mol of KCl in enough water to make 250 mL.

(a) Find the molarity. [3]

(b) How many moles are in 50 mL of this solution? [2]

3.3 What mass of NaOH ($M_{\text{molar}} = 40.0$ g/mol) is needed to make 500 mL of a 0.20 M

solution? [3]

4 Go further

You are now ready for the real exam questions on this subtopic:

- work through the **3.7 Solutions and Mixtures** lesson on the **Learn** page;
- read the **Solutions and Mixtures** section of the AP Chemistry handout on the **Know** page.

Solutions

2.1 $M = \dfrac{0.40}{2.0} = 0.20$ M.

2.2 mol $= 1.2 \times 0.25 = 0.30$ mol.

2.3 Solute: copper sulfate; solvent: water.

3.1 B —mol solute per litre of solution.

3.2 (a) 250 mL $= 0.250$ L; $M = \dfrac{0.50}{0.250} = 2.0$ M. (b) mol $= 2.0 \times 0.050 = 0.10$ mol.

3.3 mol $= 0.20 \times 0.500 = 0.10$ mol; mass $= 0.10 \times 40.0 = 4.0$ g.