

## 3.7 Solutions and Mixtures

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Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 15 marks

KEY WORDS solution • molarity • solute • solvent

### Objective

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

You must be able to:

- define **solute** , **solvent** , and **solution**
- calculate **molarity**  $M = \frac{\text{mol solute}}{\text{L solution}}$
- find moles or mass from a molarity

### 1 Key knowledge and worked examples

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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  $\frac{0.5}{2.0} = 0.25$  M.

#### ■ Finding moles from molarity

Rearrange:  $\text{mol} = M \times V(\text{L})$ . 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

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Now apply the methods above.

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

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

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

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## 3 Exam-style questions

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**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 ( $M_{\text{molar}} = 40.0 \text{ g/mol}$ ) is needed to make 500 mL of a 0.20 M solution? [3]