

Exercise walk-through

3.7

Solutions and Mixtures

AP Chemistry

Solutions and solubility

A **solution** : **solute** dissolved in **solvent** .

Molarity and dilution

$$M = \frac{n}{V}, \quad M_1 V_1 = M_2 V_2$$

“Like dissolves like”: polar in polar,
nonpolar in nonpolar.



Solute and solvent make a solution

Drawing a particulate diagram of a solution

what it shows

the **solute** and **solvent** particles, at the particle level

an ionic solute

show it fully **dissociated** into **separate ions**, each surrounded by solvent molecules

the orientation

water's δ^- oxygen faces the cations, its δ^+ hydrogens face the anions

a molecular solute

show whole molecules, not fragments – sugar does not dissociate

a strong acid

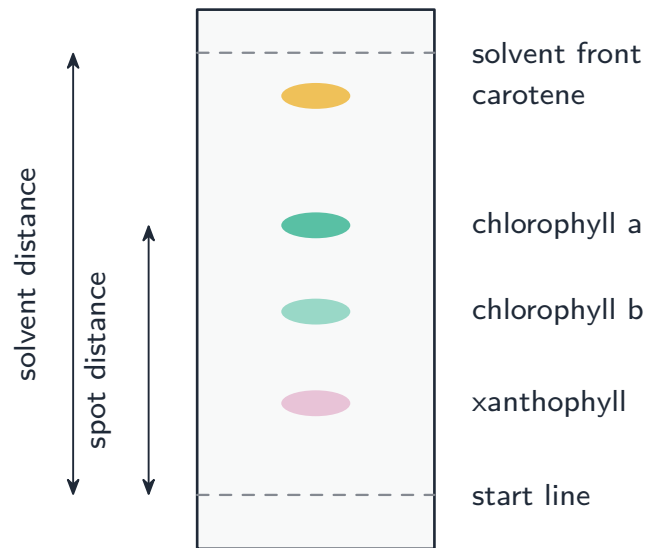
fully ionised: no intact HCl molecules should appear

the marks

come from correct **ratio**, **dissociation** and **orientation**, not from artistic quality

Count the particles you draw. A diagram showing the wrong stoichiometric ratio loses the mark however neat it is.

Separation of Solutions and Mixtures



Paper chromatography separates a mixture as the solvent rises up the paper

Exercises 2.1-2.3

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]

Exercises 2.1-2.3

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

[2]

2.1

- $$M = \frac{0.40}{2.0} = 0.20 \text{ M}$$

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

[2]

2.2

- $$\text{mol} = 1.2 \times 0.25 = 0.30 \text{ mol}$$

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

[2]

2.3

- Solute: copper sulfate; solvent: water

Exercise 3.1

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

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[1]

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D L solution per mol solute

3.1 B

- mol solute per litre of solution

Exercise 3.2 (a)

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]

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(a) Find the molarity. [3]

(a)

- $250 \text{ mL} = 0.250 \text{ L}; M = \frac{0.50}{0.250} = 2.0 \text{ M}$

Exercise 3.2 (b)

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

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

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

(b)

- $\text{mol} = 2.0 \times 0.050 = 0.10 \text{ mol}$

Exercise 3.3

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]

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3.3

- $\text{mol} = 0.20 \times 0.500 = 0.10 \text{ mol}$; $\text{mass} = 0.10 \times 40.0 = 4.0 \text{ g}$