

Exercise walk-through

Representations of Solutions ■ 3.8

eXercise

You must be able to

- draw/interpret a **particle diagram** 微粒图 of a dissolved ionic compound
- show that a **strong electrolyte** 强电解质 dissolves into separate ions
- distinguish a solution of ions from a solution of molecules

Method — Ionic compounds dissolve into ions

When NaCl dissolves, it separates into Na^+ and Cl^- ions, each surrounded by water molecules (**hydrated**). A correct particle diagram shows **separate** $+$ and $-$ ions, not NaCl units.

Method — Counting ions

One formula unit of CaCl_2 gives **three** ions in solution: one Ca^{2+} and two Cl^- . So 0.1 mol CaCl_2 releases 0.1 mol Ca^{2+} and 0.2 mol Cl^- .

Method — Molecular solutes stay whole

A molecular solute like sugar or ethanol dissolves as **whole molecules** — no ions form, so the solution does **not** conduct electricity.

Method — Electrolytes vs non-electrolytes

A **strong electrolyte** (soluble ionic compound, strong acid) fully separates into ions and conducts; a **non-electrolyte** (sugar) stays molecular and does not conduct.

Practice 2.1 ■ 1 mark

What ions form when KBr dissolves?

Solution 2.1

Worked steps

K^+ and Br^- **B1**.

Practice 2.2 ■ 1 mark

How many ions are released per formula unit of Na_2SO_4 ?

Solution 2.2

Method: Counting ions

Worked steps

Three (two Na^+ and one SO_4^{2-}) **B1**.

Practice 2.3 ■ 2 marks

Does a sugar solution conduct electricity? Give a reason.

Solution 2.3

Method: Molecular solutes stay whole

Worked steps

No — sugar dissolves as neutral molecules, so there are no free ions to carry charge

M1 A1.

Exam-style 3.1 ■ 1 mark

A particle diagram of dissolved NaCl should show

- A** NaCl units floating together
- B** separate Na^+ and Cl^- ions
- C** Na and Cl atoms
- D** Cl_2 molecules

Solution 3.1

Method: Ionic compounds dissolve into ions

A NaCl units floating together

B separate Na^+ and Cl^- ions



C Na and Cl atoms

D Cl_2 molecules

Worked steps

B — separate hydrated Na^+ and Cl^- ions.

Exam-style 3.2 ■ 2 marks

0.20 mol of CaCl_2 is dissolved in water.

- (a) Write the dissociation and the moles of each ion.
- (b) Find the total moles of ions in solution.

Solution 3.2

Method: Counting ions

Worked steps

(a) $\text{CaCl}_2 \rightarrow \text{Ca}^{2+} + 2 \text{Cl}^-$; 0.20 mol Ca^{2+} and 0.40 mol Cl^- **M1** **A1**. (b) $0.20 + 0.40 = 0.60$ mol ions **B1**.

Exam-style 3.3 ■ 2 marks

Explain why a solution of NaCl conducts electricity but a solution of glucose does not.

Solution 3.3

Method: Molecular solutes stay whole

Worked steps

NaCl separates into mobile ions that carry charge; glucose stays as neutral molecules with no ions, so it cannot conduct **M1** **A1**.