

3.8 Representations of Solutions

Name: _____ Class: _____ Date: _____ **Total: 10 marks****KEY WORDS** particle diagram 微粒图 • strong electrolyte 强电解质 • solution 溶液 • solute 溶质

Objective

Build the skills to answer exam questions on **representations of solutions** — the particle-level picture.

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

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.

■ 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.

■ 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^- .

■ 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.

■ 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.

2 Practice

Now apply the methods above.

2.1 What ions form when KBr dissolves? [1]

2.2 How many ions are released per formula unit of Na_2SO_4 ? [1]

2.3 Does a sugar solution conduct electricity? Give a reason. [2]

3 Exam-style questions

3.1 A particle diagram of dissolved NaCl should show [1]

A	B
C	D

A NaCl units floating together

B separate Na^+ and Cl^- ions

C Na and Cl atoms

D Cl_2 molecules

3.2 0.20 mol of CaCl_2 is dissolved in water.

(a) Write the dissociation and the moles of each ion. [2]

(b) Find the total moles of ions in solution. [1]

3.3 Explain why a solution of NaCl conducts electricity but a solution of glucose does not. [2]