Where Salt Goes

Model dissolving one particle at a time

CHE.8.2 "Develop and use models (e.g., online simulations, games, or video representations) to explain the dissolving process in solvents on the molecular level."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline descriptions of particle attractions and circle the names of particles that separate. Use your marks to plan a before-and-after model of dissolving.

A Clear Glass, a Closer Look

1. Imagine tipping a spoonful of table salt into a clear glass of water. The grains shrink as you stir, but their matter does not vanish. Each grain is a crystal made of repeating sodium ions, Na^+, and chloride ions, Cl^-, held together by electrical attraction. A useful particle model starts with many of these ions packed in an orderly solid, not with separate salt molecules floating in the glass. Water is made of H_2O molecules. Each water molecule has a slightly negative oxygen end and slightly positive hydrogen ends. These unequal charges matter when water touches the crystal.

2. At the crystal's surface, the oxygen ends of water molecules attract Na^+ ions, while the hydrogen ends attract Cl^- ions. Water molecules crowd around exposed ions and pull some away from the crystal. Once an ion separates, several water molecules surround it, with the appropriate ends facing inward. Stirring moves fresh water past the surface, so more ions can separate. In a model of the mixed glass, show individual Na^+ and Cl^- ions spread through the water, not a vanished crystal or ions changed into new elements. Each released ion stays charged, and the numbers of each kind remain equal.

3. Now imagine two drawings of the same glass, one just before mixing and one after all the salt has dissolved. The first should show a clump of alternating ions beside separate water molecules. The second should show those same ions dispersed among water molecules, with water's oxygen ends near positive ions and hydrogen ends near negative ions. A drawing can simplify a huge number of particles to a few symbols, but it must keep their types and relative counts consistent. Dissolving is not melting: the solid breaks apart into particles dispersed in a solvent, while the water remains liquid. A clear glass can still contain ions.

2 ANSWER WITH EVIDENCE

Use the passage

1. How would you arrange the salt particles in a model before the salt touches water? Explain your choice.

2. In a model after an ion leaves the crystal, which end of a water molecule should face Na^+? Which end should face Cl^-?

3. A model shows the salt crystal becoming a puddle of liquid salt at the bottom of the glass. How would you revise it to show dissolving instead?

4. A student draws the clear glass after mixing with water molecules only. What must be added to make the model accurate, and why?

3 YOUR TURN

Your own words

A different solid, Q, contains neutral Q molecules that attract water and stay intact as they dissolve. In two panels, draw four Q molecules and eight water molecules before and after dissolving; label the particles, then add two sentences explaining what changed and what stayed the same.

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PART 1 · READ AND MARK

Underline descriptions of particle attractions and circle the names of particles that separate. Use your marks to plan a before-and-after model of dissolving. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How would you arrange the salt particles in a model before the salt touches water? Explain your choice.	**Show alternating Na^+ and Cl^- ions packed in an orderly crystal because electrical attraction holds them together.**
2	In a model after an ion leaves the crystal, which end of a water molecule should face Na^+? Which end should face Cl^-?	**The slightly negative oxygen end faces Na^+; the slightly positive hydrogen ends face Cl^-.**
3	A model shows the salt crystal becoming a puddle of liquid salt at the bottom of the glass. How would you revise it to show dissolving instead?	**Show separate Na^+ and Cl^- ions dispersed among liquid water molecules, rather than a puddle of liquid salt.**
4	A student draws the clear glass after mixing with water molecules only. What must be added to make the model accurate, and why?	**Add equal numbers of dispersed Na^+ and Cl^- ions. The salt's matter does not vanish when it dissolves.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Panel 1: Four touching circles labeled Q form a solid clump beside eight separate shapes labeled H_2O. Panel 2: Four separate Q circles are spread among the same eight H_2O shapes, with water shapes near each Q. Caption: Water molecules surrounded the Q molecules and helped separate them from the solid. All four Q molecules stayed intact, and the number of water molecules stayed the same.

Accept different particle symbols if labels and counts are clear. In Part 3, the Q molecules should separate from one another without splitting into ions.