

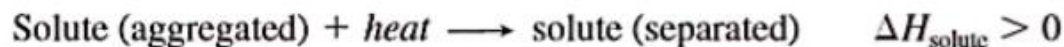
WHY SUBSTANCES DISSOLVE: BREAKING DOWN THE SOLUTION PROCESS

The qualitative macroscopic rule "like dissolves like" is based on molecular interactions between the solute and the solvent. To see why like dissolves like, we'll break down the solution process conceptually into steps and examine each of them quantitatively.

The Heat of Solution and Its Components

Before a solution forms, solute particles (ions or molecules) are attracting each other, as are solvent particles (molecules). For one to dissolve in the other, three steps must take place, each accompanied by an enthalpy change:

Step 1. Solute particles separate from each other. This step involves overcoming intermolecular (or ionic) attractions, so it is endothermic:



SOLUBILITY AS AN EQUILIBRIUM PROCESS

- When an excess amount of solid is added to a solvent, particles leave the crystal, are surrounded by solvent, and move away.
- Some dissolved solute particles collide with undissolved solute and recrystallize, but as long as the rate of dissolving is greater than the rate of recrystallizing, the concentration rises.
- At a given temperature, when solid is dissolving at the same rate as dissolved particles are recrystallizing, the concentration remains constant and undissolved solute is in equilibrium with dissolved solute:



Saturated Solutions

