

Forming Solutions

Objectives

1. To understand the process of dissolving
2. To learn why certain substances dissolve in water
3. To learn qualitative terms describing the concentration of a solution
4. To understand the factors that affect the rate at which a solid dissolves

Forming Solutions

What is a solution?

- **Solution** – homogeneous mixture
 - **Solvent** – substance present in largest amount
 - **Solutes** – other substances in the solution
 - **Aqueous solution** – solution with water as the solvent

Forming Solutions**Table 15.1****Various Types of Solutions**

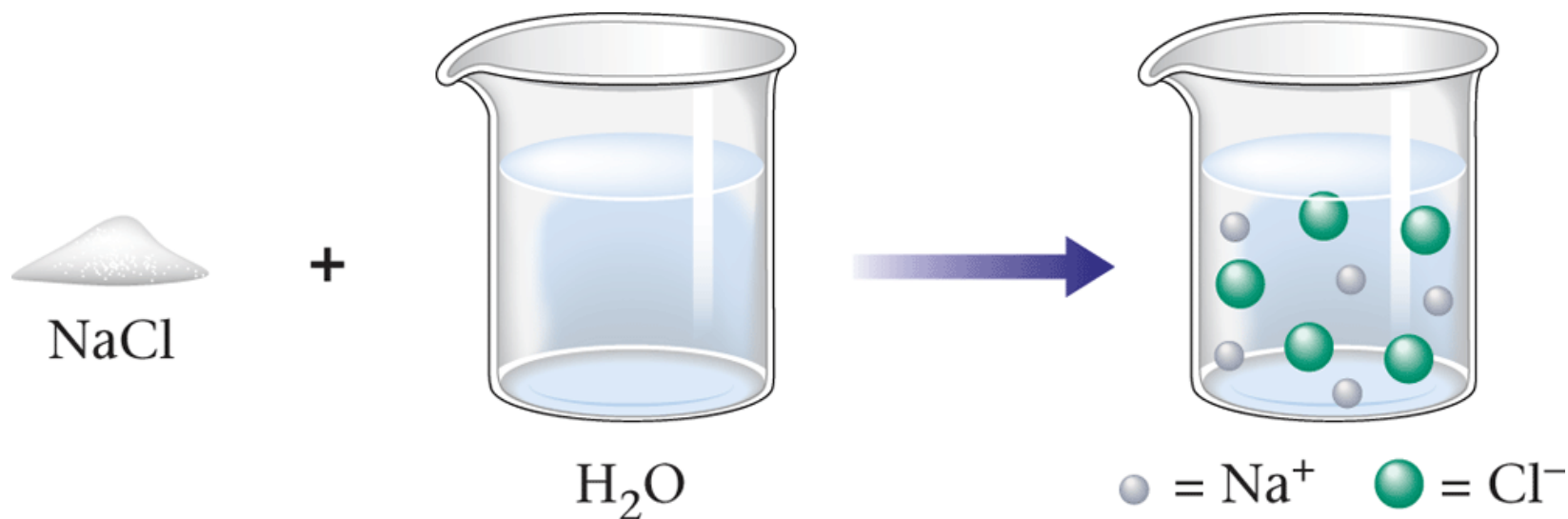
Example	State of Solution	Original State of Solute	State of Solvent
air, natural gas	gas	gas	gas
antifreeze in water	liquid	liquid	liquid
brass	solid	solid	solid
carbonated water (soda)	liquid	gas	liquid
seawater, sugar solution	liquid	solid	liquid

Section 15.1

Forming Solutions

A. Solubility

Solubility of Ionic Substances

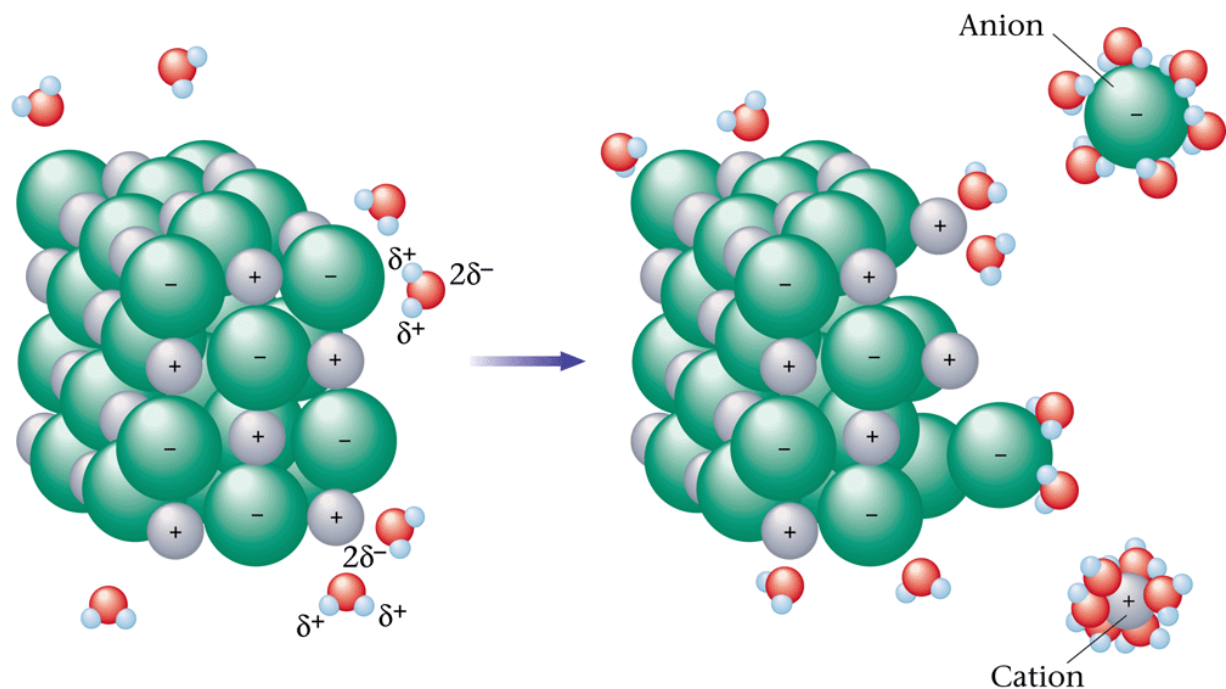


- Ionic substances breakup into individual cations and anions.

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A. Solubility

Solubility of Ionic Substances

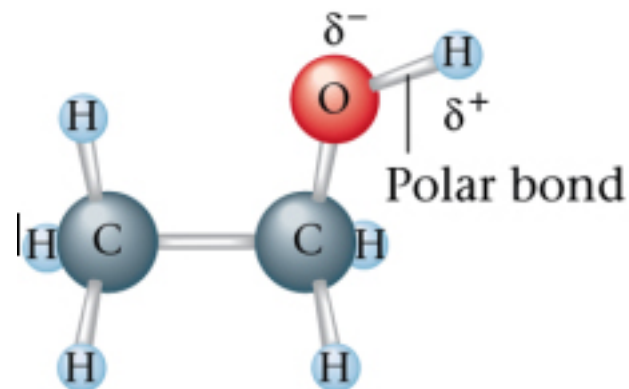


- Polar water molecules interact with the positive and negative ions of a salt.

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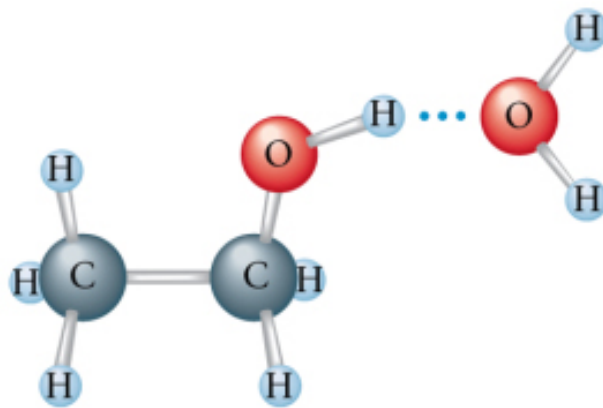
A. Solubility

Solubility of Polar Substances



(a)

- Ethanol is soluble in water because of the polar OH bond.

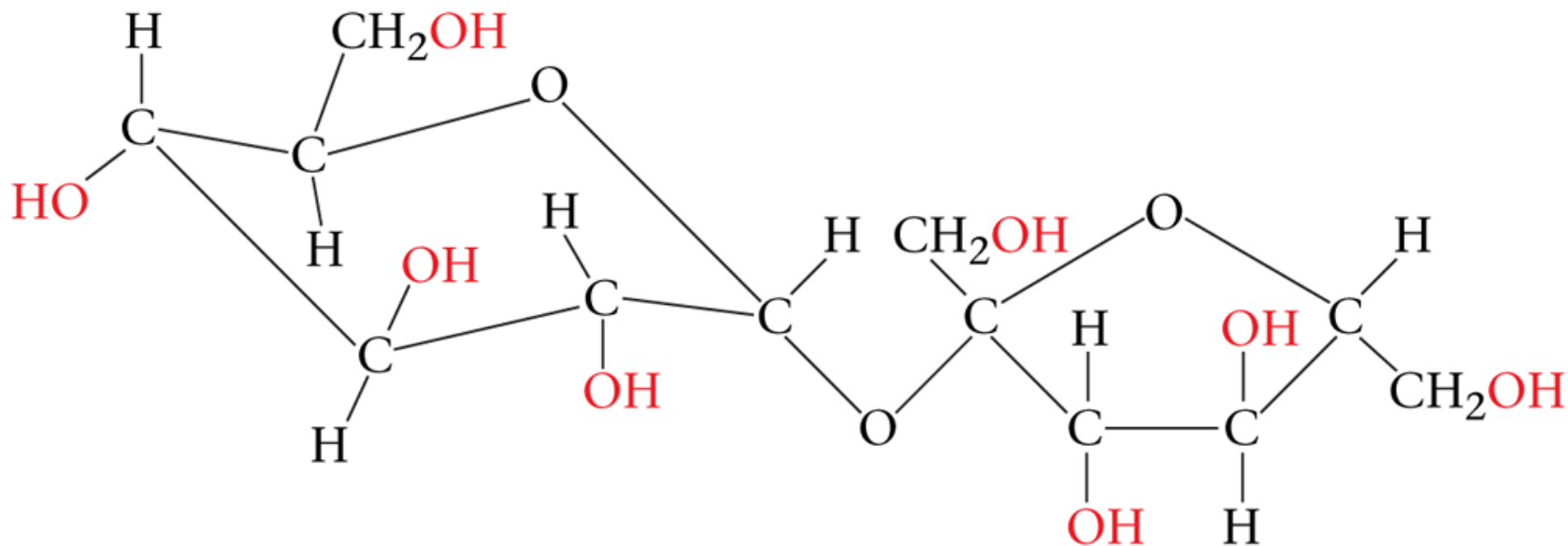


(b)

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A. Solubility

Solubility of Polar Substances

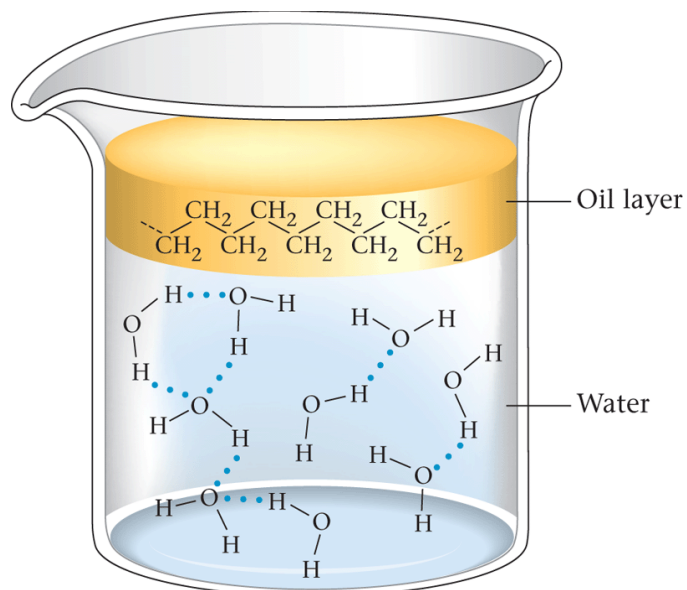


- Why is solid sugar soluble in water?

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A. Solubility

Substances Insoluble in Water



- Nonpolar oil does not interact with polar water.
- Water-water hydrogen bonds keep the water from mixing with the nonpolar molecules.

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A. Solubility

How Substances Dissolve

- A “hole” must be made in the water structure for each solute particle.
- The lost water-water interactions must be replaced by water-solute interactions.
- “like dissolves like”

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B. Solution Composition: An Introduction

- The solubility of a solute is limited.
 - **Saturated solution** – contains as much solute as will dissolve at that temperature
 - **Unsaturated solution** – has not reached the limit of solute that will dissolve

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B. Solution Composition: An Introduction

- **Supersaturated solution** – occurs when a solution is saturated at an elevated temperature and then allowed to cool but all of the solid remains dissolved
 - Contains more dissolved solid than a saturated solution at that temperature
 - Unstable – adding a crystal causes precipitation

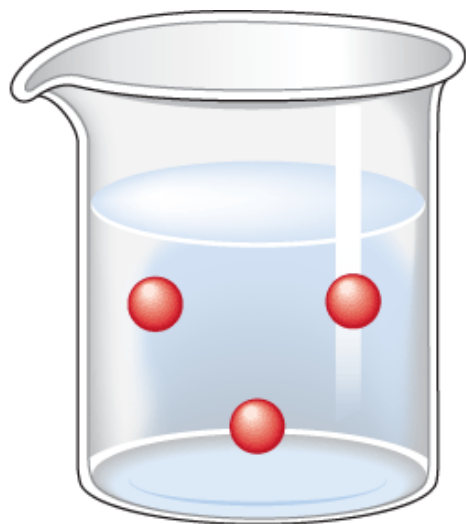
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B. Solution Composition: An Introduction

- Solutions are mixtures.
- Amounts of substances can vary in different solutions.
 - Specify the amounts of solvent and solutes
 - Qualitative measures of concentration
 - **concentrated** – relatively large amount of solute
 - **dilute** – relatively small amount of solute

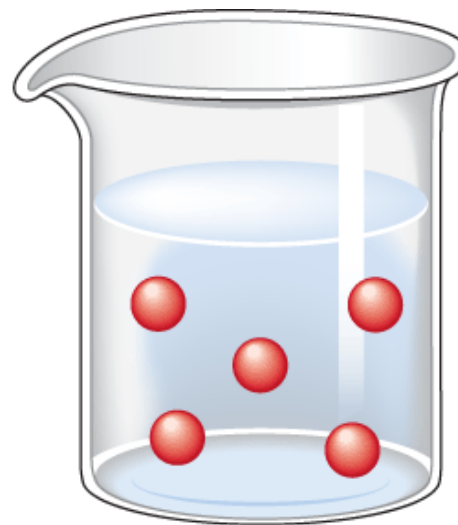
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B. Solution Composition: An Introduction



Solution A

Volume = 1.0 L



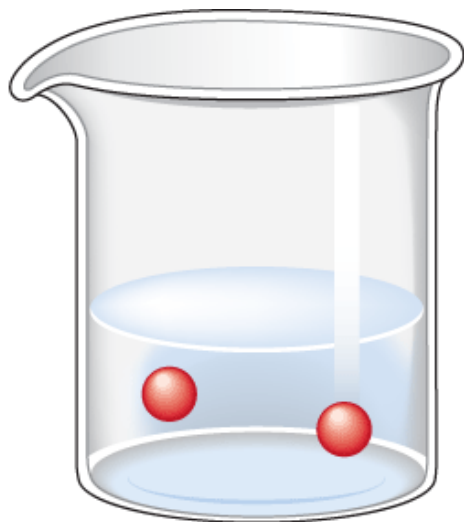
Solution B

Volume = 1.0 L

Which solution is more concentrated?

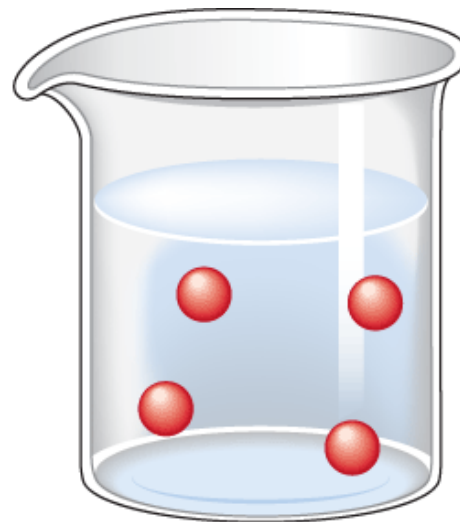
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B. Solution Composition: An Introduction



Solution X

Volume = 1.0 L



Solution Y

Volume = 2.0 L

Which solution is more concentrated?

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C. Factors Affecting the Rate of Dissolving

- Surface area
- Stirring
- Temperature