Edgenuity

Warm-Up | Solutions and Solubility

Lesson Objectives

By the end of this lesson, you should be able to:

- Describe the dissolving process on the molecular level.
- Identify factors affecting the rate at which a substance dissolves.
- Define solubility and differentiate between saturated, supersaturated, and unsaturated solutions.
- Investigate factors that influence solubility.

Science Practice: Interpret, analyze, and make inferences from solubility graphs.

Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

D rate of dissolution	A. a solution in which the concentration of solute is greater than the maximum possible concentration predicted from the solute's solubility
E solubility	B. a solution in which the concentration of solute is less than the maximum concentration predicted from the solute's solubility
B unsaturated solution	C. a solution in which the concentration of solute is equal to the maximum concentration predicted from the solute's solubility
C saturated solution	D. the rate or speed at which a solid dissolves in a liquid
A supersaturated solution	E. a property relating to the amount of a solute that will dissolve in a given volume of solvent at a given temperature and pressure

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Lesson Question

What factors affect the creation of a solution from matter?

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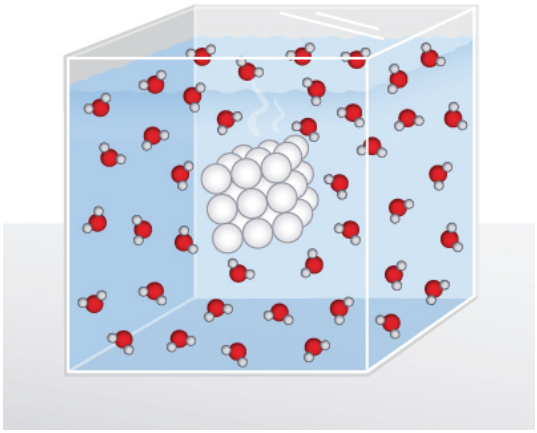
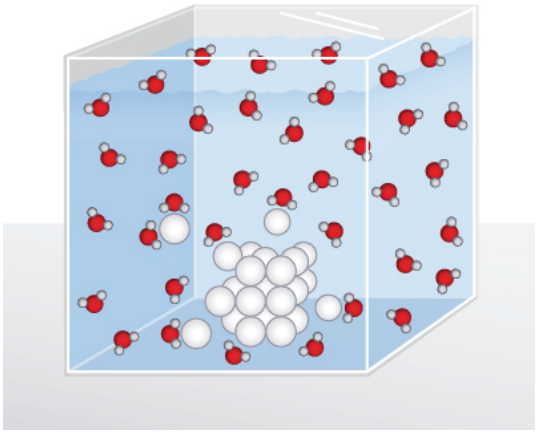
The Dissolving Process

1. [Solvent] molecules are attracted to solute molecules or ions at the surface of the particles.



2. Solvent molecules surround the [solute] molecule.
3. Solvent molecules carry the solute molecule into the solution.



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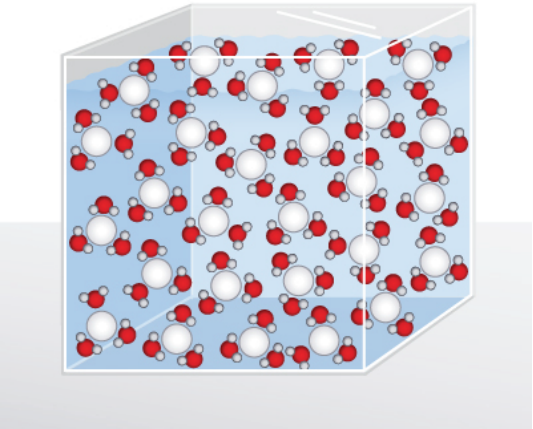
The Dissolving Process

4. The solute [molecule] dissolves in a "[like]" solvent.



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Factors that Affect the Rate of Dissolution

The **rate of dissolution** describes the rate or speed at which a [solid] dissolves in a liquid.

It is affected by:

- [stirring].
- [surface] area.
- temperature.

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Solubility

Solubility is the amount of a solute that will dissolve in a given volume of [solvent] at a given [temperature] and pressure.

It depends on the solute and the solvent.

Solubility ≠ Dissolution [rate]

Solute	Solubility (g/100 g water)
Table sugar, $C_{12}H_{22}O_{11}$	200
Table salt, NaCl	36
Aspirin, $C_9H_8O_4$	0.33
Carbon dioxide, CO_2	0.17

Unsaturated, Saturated, and Supersaturated Solutions

Types of solutions:

- **Unsaturated solution** – the concentration of [solute] is **less than** the maximum concentration predicted from the solute's solubility
- **Saturated solution** – the concentration of solute is [equal] **to** the maximum concentration predicted from the solute's [solubility]; the solute crystallizes at the same rate that it dissolves
- **Supersaturated solution** – the [concentration] of solute is **greater than** the maximum concentration predicted from the solute's solubility

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The Effect of Temperature on Solubility

Increasing temperature:

- increases the solubility of [solids] and liquids.
- decreases the solubility of [gases].

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The Effect of Pressure on Solubility

Increasing pressure:

- increases the solubility of gases.
- has little effect on the solubility of solids and liquids.

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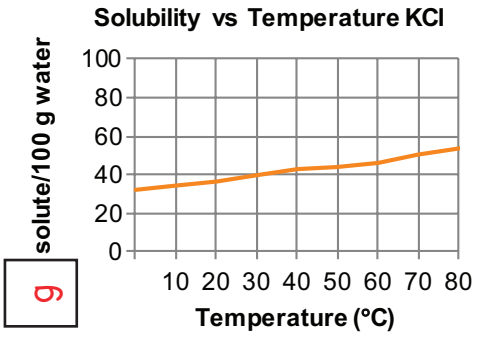
Solubility Graphs

Solubility graphs:

- show how solubility changes with temperature.
- are determined experimentally.
- predict solubility at a given temperature.
- show if a solution is saturated, unsaturated, or supersaturated.

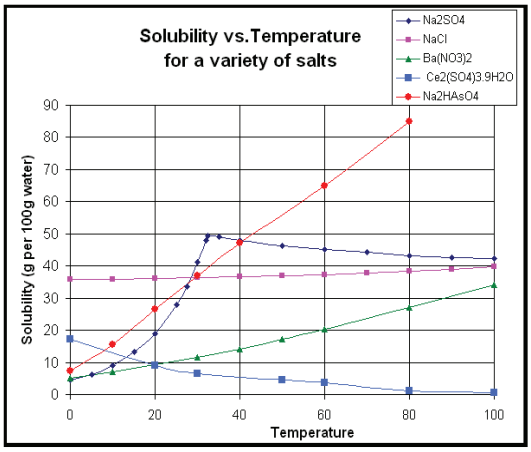


Slide 11

Solubility Graphs

Solubility graphs:

- show how solubility changes with temperature.
- are determined experimentally.
- predict solubility at a given temperature.
- show if a solution is saturated, unsaturated, or supersaturated.
- are different for different solutes.



Summary | Solutions and Solubility

Lesson Question

What factors affect the creation of a solution from matter?

Answer

(Sample answer) The formation of solution depends on the nature of solute and solvent. Polar solutes tend to dissolve in polar solvent, and nonpolar solutes tend to dissolve in nonpolar solvent. Other factors that affect preparation of solution are temperature and pressure.

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The Dissolving Process

- A solute dissolves as the solute molecules or ions are carried into the solution by solvent molecules.
- The rate of dissolution describes how fast a [solute] dissolves.
- Solubility is a measure of how much solute will dissolve in a given amount of solvent.
- Solutions may be [unsaturated], saturated, or supersaturated.

Summary | Solutions and Solubility

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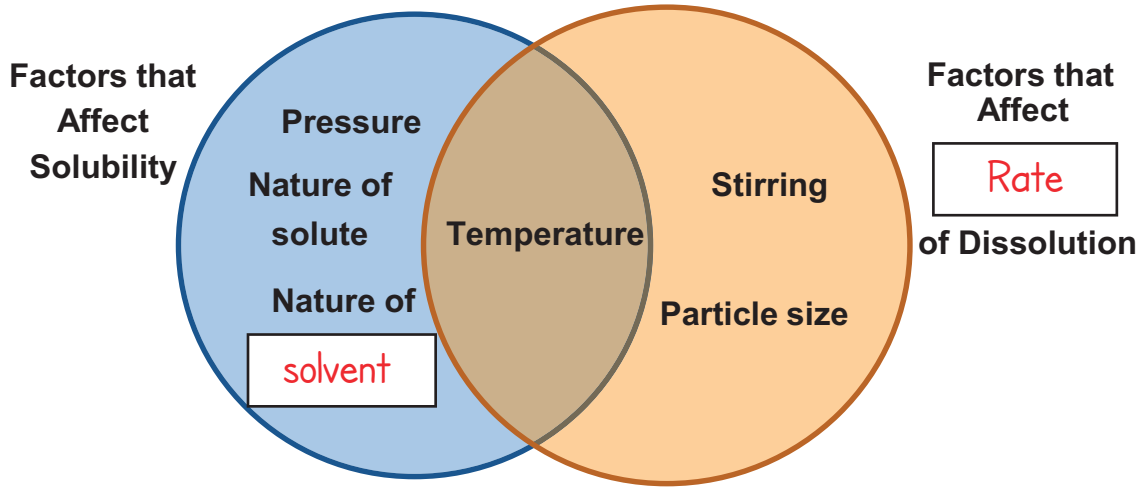
Factors that Affect Solubility and Rate of Dissolution



Use this space to write any questions or thoughts about this lesson.