



Honors Chemistry - Unit 8 - Physical Properties of Solutions

Unit Focus

In this unit, students will focus on the role of intermolecular forces in the dissolving process and the physical properties of the resulting solution. Solubility is presented as an imbalance between solvent-solute bonds and the sum of bonds holding the solute together and the bonds holding the solvent together. Students will characterize physical properties of solutions (such as osmotic pressure, boiling point elevation, freezing point depression, and vapor pressure lowering) in 16 case studies which demonstrate how these properties affect real-life occurrences.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
<p>Next Generation Science <i>High School Physical Sciences: 9 - 12</i></p> <ul style="list-style-type: none"> Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. <i>HS-PS2-1</i> Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. <i>HS-PS2-2</i> Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. <i>HS-PS2-3</i> Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. <i>HS-PS2-4</i> Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. <i>HS-PS2-5</i> Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. <i>HS-PS2-6</i> 	T1 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<p>U1 The chemical and physical properties of materials can be explained by the structure and arrangements of particles and the forces between them.</p>	<p>Q1 Explain what factors affect the solubility of a substance, and how the solubility is affected by each? Q2 How does the concentration affect the properties of a solution?</p>
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
<p>K1 Solutions are homogeneous mixtures of two or more substances. K2 The ease of dissolving a solute in a solvent is governed by intermolecular forces. K3 The concentration of a solution can be expressed as: molarity, molality, mass percent and mole fraction. K4 Increasing temperature usually increases the solubility of solids and liquids and usually decreases the solubility of gases. K5 The solubility of a gas is directly proportional to the partial pressure of the gas over the solution. K6 Understand the nature of the relationships between concentration and the physical properties of solutions</p>	<p>S1 Calculate the amount of solute it would take to create a saturated, unsaturated or supersaturated solution. S2 Calculate the concentration of a solution quantitatively. S3 Solve problems using colligative properties of solutions (boiling point elevation, freezing point depression, osmotic pressure and vapor pressure lowering).</p>	

Stage 1: Desired Results - Key Understandings

Next Generation Science Standards (DCI)

Science: 11

- The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. *PS1.9.A2*
- In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. *PS1.9.B2*

NGSS/NSTA Science & Engineering Practices

NGSS Science & Engineering Practices: 9-12

- Use mathematical, computational, and/or algorithmic representations of phenomena or design solutions to describe and/or support claims and/or explanations. *SE.9-12.5.3*
- Apply techniques of algebra and functions to represent and solve scientific and engineering problems. *SE.9-12.5.4*

Madison Public Schools Profile of a Graduate

Critical Thinking

- Analyzing: Examining information/data/evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)

(concentration is directly proportional to boiling point, osmotic pressure, and inversely proportional to vapor pressure and freezing point).