



Chemistry for Health Science - Unit 1 - Water and Solutions

Unit Focus

An introduction to solution chemistry, Unit 1 will focus on the characteristics of water and solutions. Students will explore the polarity of water and its relevance to body chemistry, electrolytes, diffusion and osmosis, osmotic pressure (isotonic, hypertonic, and hypotonic solutions for intravenous application), and ionization. Emphasis will be on the importance of ions in the body and units of concentration used in medications and intravenous solutions (percent, parts per million, and molarity). As a culminating experience, students will research the application of solutions, diffusion, and osmosis in the human body and/or medical field and present their findings to the class.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
<p>Next Generation Science Standards (DCI) <i>Science: 11</i></p> <ul style="list-style-type: none"> Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. <i>LS1.9.A4</i> The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. <i>PS1.9.A2</i> Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. <i>PS2.9.B1</i> 	<p>T1 Make observations and ask questions to define a problem based on prior knowledge and curiosity that stimulates further exploration, analysis, and discovery.</p> <p>T2 Communicate effectively based on purpose, task, and audience to promote collective understanding and/or recommend actions.</p>	
	Meaning	
	Understanding(s)	Essential Question(s)
	<p>U1 The structure and interactions of matter are determined by electrical forces within and between atoms.</p> <p>U2 The human body has feedback mechanisms that work to maintain homeostasis (a constant internal environment).</p> <p>U3 Preparing and using osmotic solutions to treat patients in various circumstances.</p> <p>U4 Proper preparation of solutions is critical to maintain homeostasis in the body.</p>	<p>Q1 How do the properties of water affect human health?</p> <p>Q2 Why is the concentration of solutions used for medications important?</p> <p>Q3 What role do ions play in the properties of solutions in the medical field?</p>
Acquisition of Knowledge and Skill		
<p>Madison Public Schools Profile of a Graduate <i>Critical Thinking</i></p> <ul style="list-style-type: none"> Analyzing: Examining information/data/evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2) 	Knowledge	Skill(s)
	<p>K1 Water is a polar molecule. Polar and many ionic substances (salts) dissolve in water.</p> <p>K2 Ions such as Na⁺, Ca²⁺, Fe²⁺, K⁺, Cl⁻, Mg²⁺, and HCO₃⁻ play a key role in the body.</p>	<p>S1 Performing calculations involving the concentration of a solution, using percent (percent mass, percent volume, and percent mass by volume), molarity, and milliequivalents per liter.</p>

Stage 1: Desired Results - Key Understandings

Collaboration/Communication

- Product Creation: Effectively use a medium to communicate important information. (POG.3.2)

K3 Acids are substances that donate hydrogen ions in an aqueous solution. Hydrochloric acid is necessary for the proper digestion of proteins in the stomach.

K4 Bases are substances that accept hydrogen ions. Calcium hydroxide and magnesium hydroxide are bases that are used as antacid.

K5 Buffer solutions are found in all body fluids and are responsible for maintaining the proper pH of those fluids.

K6 Vocabulary; diffusion, osmosis, hypertonic, hypotonic, isotonic, electrolyte.

S2 Preparing solutions of desired concentrations (including dilutions).

S3 Describing the process of osmosis, and the relevance of isotonic, hypertonic, and hypotonic solutions.

S4 Calculating the pH of a solution given the concentration of hydrogen ion, or vice versa.

S5 Explaining the role of water and feedback mechanisms as related to a selected health condition.