



# Honors Chemistry - Unit 3 - Reactions in Aqueous Solutions

## Unit Focus

Students will explore three types of reactions occurring in water (the universal solvent); acid-base reaction, precipitation reactions, and oxidation-reduction reactions. Students will understand how to write and balance chemical reactions that take place in aqueous solutions, and how to predict and identify precipitates. Students will conduct several experiments to learn to recognize which specific groups of particles are involved in each reaction type. Titration experiments and gravimetric analysis experiments will be used to determine quantities of reactants and products involved in these reactions. The culminating PBA requires students to work with their lab partners to identify eight unknown solutions, based on analyzing the different reactions that occur when the unknown solutions are mixed with each other.

## Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer		
<p><b>Next Generation Science</b> <i>High School Physical Sciences: 9 - 12</i></p> <ul style="list-style-type: none"> <li>Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. <i>HS-PS1-7</i></li> </ul> <p><b>Next Generation Science Standards (DCI)</b> <i>Science: 11</i></p> <ul style="list-style-type: none"> <li>The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. <i>PS1.9.B3</i></li> </ul> <p><b>NGSS/NSTA Science &amp; Engineering Practices</b> <i>NGSS Science &amp; Engineering Practices: 9-12</i></p> <ul style="list-style-type: none"> <li>Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. <i>SE.9-12.4.1</i></li> </ul> <p><b>Madison Public Schools Profile of a Graduate</b> <i>Critical Thinking</i></p>	<b>T1</b> Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions.		
	<b>Meaning</b>		
	<b>Understanding(s)</b>	<b>Essential Question(s)</b>	
	<p><b>U1</b> Changes in matter involve the rearrangement and/or reorganization of atoms and/or the transfer of electrons.</p> <p><b>U2</b> The fact that atoms are conserved can be used to describe and predict chemical reactions.</p>	<p><b>Q1</b> How can we predict the products of an aqueous chemical reaction?</p> <p><b>Q2</b> How do different substances interact?</p>	
	<b>Acquisition of Knowledge and Skill</b>		
	<b>Knowledge</b>	<b>Skill(s)</b>	
<p><b>K1</b> A chemical change may be represented by a molecular, ionic, or net ionic equation.</p> <p><b>K2</b> Quantitative information can be derived from stoichiometric calculations that utilize the mole ratios from the balanced chemical equations.</p> <p><b>K3</b> In redox reactions, there is a net transfer of electrons. These include synthesis, decomposition, single-displacement and combustion reactions.</p> <p><b>K4</b> In a neutralization (acid-base) reaction, protons are transferred from an acid to a base.</p> <p><b>K5</b> Strong electrolytes are substances that undergo 100% ionization in an aqueous solution. Weak electrolytes</p>	<p><b>S1</b> Use general rules about solubilities of ionic compounds to predict whether a precipitate will form in a reaction.</p> <p><b>S2</b> Use oxidation numbers to balance redox reactions.</p> <p><b>S3</b> Use gravimetric analysis data to determine the identity of a compound and/or the concentration of a solution by measuring mass.</p> <p><b>S4</b> Analyze neutralization (acid-base titration) data to determine the concentration of an unknown solution.</p> <p><b>S5</b> Balance equations and predict the products of reactions, including states of matter.</p>		

## Stage 1: Desired Results - Key Understandings

<ul style="list-style-type: none"><li>Analyzing: Examining information/data/evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)</li></ul> <p><i>Collaboration/Communication</i></p> <ul style="list-style-type: none"><li>Collective Intelligence: Working respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. (POG.3.1)</li></ul>	undergo partial ionization in solutions. Nonelectrolytes do not undergo ionization in aqueous solution. <b>K6</b> Vocabulary relating to titration: titration, standard solution, equivalence point, indicator, acid, base, neutralization	<b>S6</b> Classify reactions as: precipitation, acid-base, single displacement, synthesis, decomposition, combustion and/or redox.
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