

**Title** – High School Science Student Learning Objective

**Content Area** – Chemistry

**Grade Level** – 11<sup>th</sup>

**Students** – 71 across three sections

**Interval of Instruction** – Year

Main Criteria	Element	Description
---------------	---------	-------------

**Essential Question:** What are the most important knowledge/skill(s) I want my students to attain by the end of the interval of instruction?

<b>Priority of Content</b>	<b>Objective Statement</b>	Students will be able to describe the composition, structure, and properties of matter, draw conclusions about the interactions and conservation of matter and energy, and explain why matter and energy can neither be created nor destroyed in a given system and/or reaction.
	<b>Rationale</b>	<p>Chemistry is the study of matter and its composition, structure, and properties. Understanding that matter makes up all substances both living and non-living, how matter interacts, and the concept of conservation of matter are central to this course. These enduring understandings are a bridge between the physical sciences, life science, and earth and space science.</p> <p>This is a worthy focus because it encompasses the key understandings that students should have by the end of this course. Standard PS2-6, the standard on which this objective is based, is embedded throughout the scope and sequence for chemistry. Students will work on connecting one sub-standard to another throughout the course.</p>
	<b>Aligned Standards</b>	<p>This objective is aligned to the RI GSE for Physical Science: PS2 (9-11) INQ + SAE-6: Using information provided about chemical changes, draw conclusions about and explain the energy flow in a given chemical reaction (e.g., exothermic reactions, endothermic reactions).</p> <p>Throughout the school year, students demonstrate an understanding of physical, chemical, and nuclear changes by:</p> <p><b>6a:</b> writing simple balanced chemical equations to represent chemical reactions and illustrate the conservation of matter.</p> <p><b>6aa:</b> using chemical equations and information about molar masses to predict quantitatively the masses of reactants and products in chemical reactions.</p> <p><b>6b:</b> identifying whether a given chemical reaction or a biological process will release or consume energy (endothermic and exothermic) based on the information provided (e.g. given a table of energy values for reactants and products or an energy diagram).</p> <p><b>6bb:</b> using quantitative heat flow or calorimetric investigations to determine the energy released or consumed in the process.</p>

<b>Essential Question:</b> Where are my students now (at the beginning of instruction) with respect to the objective?		
	<b>Baseline Data / Information</b>	<p>In order to gauge students' incoming content knowledge, I administered the Chemical Concepts Inventory during the first week of school. It is a multiple choice instrument composed of one- and two-tiered non-mathematical conceptual questions based on common student misconceptions about general chemistry topics (ex. Does the rust from a completely rusted iron nail weigh more, less, or the same as the nail it came from?). I adapted the inventory from one that was created for first year college students, so I expected student scores to be quite low. Not surprisingly, the average across my three sections of CP Chemistry was 36%. From these results I was able to determine that most students are coming into this course with limited knowledge of concepts central to chemistry as well as some misconceptions about properties of matter, behavior of atoms and molecules, etc. However, I did find that 9 students scored significantly higher than their peers (scores of 60% or better) and that 12 students scored significantly lower than their peers (scores of 10% or lower). Based on this, I have created three groups:</p> <p>Group A = 12 students who scored &lt;10% on chemistry inventory            Group B = students who scored between 11% and 49% on chemistry inventory            Group C = students who scored &gt; 50% on chemistry inventory</p>
<b>Essential Question:</b> Based on what I know about my students, where do I expect them to be by the end of the interval of instruction and how will they demonstrate their knowledge/skills?		
<b>Rigor of Target</b>	<b>Target(s)</b>	<ol style="list-style-type: none"> <li>1) Unit tests:               <ol style="list-style-type: none"> <li>a. Group A = students will pass 4 out of 5 unit tests with a score of 70% or better.</li> <li>b. Group B = students will pass 4 out of 5 unit tests with a score of 80% or better.</li> <li>c. Group C = students will pass 4 out of 5 unit tests with a score of 90% or better.</li> </ol> </li> <li>2) Performance task:               <ol style="list-style-type: none"> <li>a. Group A = students will demonstrate basic proficiency (a score of 3 or better)</li> <li>b. Group B = students will demonstrate proficiency (a score of 4 or better)</li> <li>c. Group C = students will demonstrate advanced understanding (a score of 5 or better)</li> </ol> </li> </ol>
	<b>Rationale for Target(s)</b>	<p>These targets are tiered to reflect students' varying levels of prior knowledge upon entry into CP Chemistry. They are rigorous in that all students are expected to be able to demonstrate basic proficiency on almost every unit test <i>and</i> on the performance task. Based on what I have seen similar students accomplish on similar assessments in past years, I am confident that my students will show significant progress in their understanding of these core chemistry concepts, and be able to demonstrate that understanding, by the end of the interval of instruction.</p>

<b>Quality of Evidence</b>	<b>Evidence Source(s)</b>	<p>1) Unit Tests: Students will complete a written assessment at the end of each unit. Assessments will include multiple choice, short answer, and constructed response items. There are five units in total: Atoms, Molecules and Ions, Chemical Reactions, Calculations with Chemical Formulas and Equations, Ionic and Covalent Bonding, and Solutions. The unit assessments were created in collaboration with members of the Science Department and approved by the Science Department Chairperson.</p> <p>The end-of-unit assessments will be administered in class by the teacher at the conclusion of each unit and scored by the two chemistry teachers, using the scoring guide developed with the assessments. Our Department Chair has agreed to double-score one test from each section of CP Chemistry for each unit (6 per unit, 30 per year).</p> <p>2) <i>Hydrated Salt</i> performance task: This assessment requires students to plan, design, and carry out an experiment to determine the empirical formula for a hydrated salt that will tell students when all of the water has been removed. This task requires students to develop procedures for an investigation and plan for recording and organizing observations and data. It requires students to draw upon their understanding of the crystalline structure of ionic salt, the application of conservation of matter to calculate the coefficient of H<sub>2</sub>O in the empirical formula of the hydrated salt, and making conclusions consistent with the use of chemical equations to predict quantitatively the molar masses of reactants and products in chemical reactions. This task was informed by a performance task designed for grade 9-12 students by the New York State Education Department (NYSED).</p> <p>The performance task will be administered during the final week of classes in June. It is designed to be completed by students individually in an 80-minute block, and it will be scored by the two chemistry teachers on a rubric developed for the task. The Department Chair will co-score 5% of the performance tasks from the 6 sections of CP Chemistry (approximately 8).</p>
----------------------------	---------------------------	---