Chemistry - Unit 1 - Classification and Properties of Matter

Unit Focus

Students are introduced to Chemistry through the study and classification of matter and its properties at the macroscopic level. Students will become familiar with the language of the course, various laboratory techniques, safety etiquette, elements of the Periodic Table and basic chemical compounds. Students will perform laboratory investigations and observe chemical phenomena allowing the students to distinguish between chemical and physical changes. Students will make precise measurements and use both qualitative and quantitative observations to process experimental data.

Stage 1: Desired Results - Key Understandings

Standard(s)

NGSS/NSTA Science & Engineering Practices
NGSS Science & Engineering Practices: 9-12

- 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. (SE.9-12.4.1)
- 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 ratios, rates, percentages, and unit conversions in the context of complicated measurement problems involving quantities with derived or compound units (such as mg/mL, kg/m3, acre-feet, etc.). (SE. 9-12.5.6)

Next Generation Science Standards
Performance Expectations: High School Physical Sciences

- Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. (HS-PS1-2)

Next Generation Science Standards (DCI)
Science: 11

- 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. (PS1.9.B3)
- 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. (PS2.9.B1)

Transfer

Students will be able to independently use their learning to...
T1 Use the scientific process to generate evidence that addresses the original questions.
T2 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions.
T3 Evaluate scientific claims and analyze issues to verify the credibility of the source, data, and/or approach.
T4 Communicate effectively based on purpose, task, and audience to promote collective understanding and/or recommend actions.

Meaning

Understanding(s)

Students will understand that...
U1 A physical change does not change the identity of a substance, but a chemical change does change the identity of a substance.
U2 Compounds are composed of elements bonded together and their structure can only be changed through chemical means.
U3 Mixtures may be separated based on the physical property differences of the components of the mixture.
U4 Scientists examine evidence to formulate interesting questions and solve problems.

Essential Question(s)

Students will keep considering...
Q1 When an object changes, can it be changed back?
Q2 How can you demonstrate that atoms are conserved during a chemical reaction?
Q3 What do the results tell me? What patterns do I see or what conclusions can I draw?

Acquisition of Knowledge and Skill

Knowledge

Students will know...
K1 Macroscopic vs. microscopic domain
K2 How to separate mixtures

Skill(s)

Students will be skilled at...
S1 Differentiate between compounds and elements (pure) and mixtures

Stage 1: Desired Results - Key Understandings		
Madison Public Schools Profile of a Graduate • Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2) • Collective Intelligence: Working respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. (POG.3.1)	**K3** Pure substances have definite proportions **K4** Compounds can only be broken down chemically **K5** Indicators of chemical reaction **K6** Chemical and physical changes can absorb or release heat energy. **K7** Density is the ratio of mass to volume for a given substance. **K8** Vocabulary: heterogeneous, homogeneous, pure substance, element, compound, mixture, solution, endothermic, exothermic.	**S2** Identify chemical and physical changes and properties **S3** Apply both precision and accuracy in recording experimental data.