Chemistry - Unit 2 - Problem Solving and Precise Measurement in Chemistry

Unit Focus

In this unit, students learn how to make precise quantitative measurements as well as the importance of units and their relevance to scientific calculations. Students will develop the necessary mathematical skills for scientific study of data. Students develop an understanding of the meaning of exponents of ten and become proficient in calculations involving scientific notation as well as reviewing metric prefixes. Students are introduced to significant figures while using instrumentation in a chemistry lab followed by the rules for handling of significant figures in calculations. Students will then learn to solve problems using dimensional analysis, a problem-solving method that will be used throughout the year. Application of mathematical skills to the physical property of density is the basis for the culminating performance task.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer
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* • 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*	*Students will be able to independently use their learning to...* **T1** Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions.

Meaning

Understanding(s)	Essential Question(s)
Students will understand that... **U1** Scientific numeracy includes the ability to use universal mathematical operations and procedures to calculate, analyze and present scientific data and ideas.	*Students will keep considering...* **Q1** How does a scientist communicate the degree of uncertainty in a measured or calculated value? **Q2** How can multiple units be used to express the same quantity, and how can proportional relationships be used to understand how quantities are related?

Acquisition of Knowledge and Skill

Knowledge	Skill(s)
Students will know... **K1** Significant figures in a measurement include all known digits plus one estimated digit. **K2** Significant figures rules govern how to round off an answer to a calculation. **K3** Density is the ratio of mass to volume for a given substance. **K4** The metric system is used for scientific investigations.	*Students will be skilled at...* **S1** Apply both precision and accuracy in recording experimental data. **S2** Use significant figures in measurements and calculations. **S3** Solve problems using dimensional analysis. **S4** Design and conduct a lab experiment.

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)

Self-Awareness: Examining current performance critically to identify steps/strategies to persist. (POG.4.1)