



Chemistry - Unit 5 - Chemical Quantities

Unit Focus

In Unit 5, students begin to take an in depth look at chemical quantities in order to begin developing a better understanding of the quantitative properties of matter and eventually chemical reactions. Students begin by learning mathematical approach to problem solving. From there, students will complete simple conversions between moles, mass, and particles of a certain substance. Based on the concept of the mole, students will be able to determine the percent composition of a substance and deduce the empirical and molecular formula of an unknown hydrate.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
NGSS/NSTA Science & Engineering Practices NGSS Science & Engineering Practices: 9-12 - Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between components of a system. (SE.9-12.2.3) - Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/ or solve problems. (SE.9-12.2.6) - 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) Next Generation Science Standards - Disciplinary Core Ideas: High School The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (HSPS1-2) (Note: This Disciplinary Core Idea is also addressed by HS-PS1-1.) (HS.PS1.A.1) Madison Public Schools Profile of a Graduate - Analyzing: Examining information/data/ evidence from multiple sources to identify possible	<i>Students will be able to independently use their learning to...</i> T1 Understand and describe relationships to solve problems. T2 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions. T3 Use the scientific process to generate evidence that addresses the original questions. T4 Apply models to solve problems.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 The mole provides a direct relation between the observable macroscopic properties and the submicroscopic atoms that are not visible. U2 Matter of any type can be subdivided into particles that are too small to see. U3 Scientists examine evidence to formulate interesting questions and solve problems. U4 Atoms are so small they are difficult to study directly, and therefore we learn through macroscopic data collected during experimentation.	<i>Students will keep considering...</i> Q1 How can we measure what we can't see? Q2 How can we use models to represent structure of matter? Q3 How can you use molar mass to convert between grams and moles of a substance? Q4 What is a mole and why do chemists use the mole concept?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 One mole of a substance contains Avogadro's Number of particles and has mass equal to the atomic mass of the element on the Periodic Table in grams. K2 Chemical Formulas describe the ratio of elements in a compound.	<i>Students will be skilled at...</i> S1 Make conversions among particles, mass, and moles of any substance

Stage 1: Desired Results - Key Understandings

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 Relate individual particles to grams of a substance to moles of a substance K4 Avogadro's number relates the mass of a sample to the number of representative particles. K5 Vocabulary: mole, atom, molecule, formula unit, representative particle, molar mass, percent composition, empirical formula, molecular formula, Avogadro's number	S2 Calculate percent composition of compounds and determine empirical and molecular formulas S3 Describe a sample in terms of mass, moles, and number of representative particles.
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