



Conceptual Chemistry - Unit 1 - The Study of Matter

Unit Focus

The study of matter and the periodic table are the focus of this first unit in Conceptual Chemistry. Students will understand how matter is classified and the role of the periodic table in the organization of matter. Students will understand how matter is organized using Bohr models and Lewis structures. Students will explore how chemical formulas are derived and named. Students will use the periodic table as a reference to calculate molar mass. Students will engage in a variety of activities that will emphasize scientific inquiry skills such as collecting, analyzing, and communicating data with tables and graphs as well as making claims that are supported with data and evidence.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Next Generation Science Standards Performance Expectations: High School Physical Sciences - Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. (HS-PS1-1) - Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. (HS-PS1-7) Next Generation Science Standards (DCI) Science: 12 - In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. (PS1.9.B2) Science: 9 - Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (PS1.9.A1) - The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (PS1.9.A2) - 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. (PS1.9.A3) - A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart. (PS1.9.A4)	<i>Students will be able to independently use their learning to...</i> 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 Understand and describe relationships to solve problems.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Everything is made of matter. U2 Different kinds of matter exist and many of them can be either solid or liquid, depending on the temperature. Matter can be described by its observable properties. U3 Matter of any type can be subdivided into particles that are too small to see. U4 Substances can be identified by their physical and chemical properties. U5 Matter is made up of different types of atoms which can combine to form molecules.	<i>Students will keep considering...</i> Q1 What does matter look like? Q2 What information do you need to predict the property of an element? Q3 What happens to the mass of substances when they change form or react?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 The periodic table is a tabular arrangement of chemical elements, organized based on their atomic number, electron configurations, and recurring chemical properties. K2 Elements are arranged in rows (called periods) and columns (called groups or families) to reflect patterns in their properties.	<i>Students will be skilled at...</i> S1 Know how to find and interpret an element's atomic number and atomic mass. S2 Use the periodic table to determine how electrons are arranged in an atom's electron shells.

Stage 1: Desired Results - Key Understandings

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- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)

K3 Elements in the same group share similar chemical and physical properties because they have the same number of valence electrons.

K4 Elements in the same period have the same number of electron shells, with properties gradually changing across the period.

K5 The table is divided into metals (which are typically on the left and center), nonmetals (on the right), and metalloids (which lie between metals and nonmetals and have properties of both).

K6 The periodic table shows trends in properties such as atomic radius, ionization energy, electron affinity, and electronegativity.

K7 The periodic table is a fundamental tool in chemistry and provides a framework for understanding chemical behavior and relationships among elements.

K8 A Bohr model describes the structure of an atom, where electrons orbit the nucleus in discrete energy levels or shells.

K9 A Lewis dot structure, is a diagram that represents the valence electrons of atoms within a molecule. These diagrams are used to show the bonding between atoms and any lone pairs of electrons that may exist.

K10 The molar mass of a substance is defined as the mass of one mole of that substance, typically expressed in grams per mole (g/mol).

S3 Recognizing the difference between groups (vertical columns) and periods (horizontal rows).

S4 Categorize elements as metals, nonmetals, or metalloids based on their location in the table.

S5 Recognizing trends such as electronegativity across periods and groups.

S6 Determining the number of valence electrons based on an element's group.

S7 Recognize element families such as alkali metals, alkaline earth metals, halogens, and noble gases.

S8 Use the periodic table to understand that elements can have different isotopes with varying numbers of neutrons.

S9 Solve simple stoichiometry problems using mole ratios and molar mass.

S10 Calculate the molar mass of common chemical substances.