

Unit 1 - Introduction to Chemistry: Units and Matter

Content Area: **Science**
Course(s):
Time Period: **Marking Period 1**
Length: **20 Days**
Status: **Published**

Brief Summary of Unit

This opening unit introduces students to foundational concepts crucial to success in chemistry. Part of the foundation includes problem solving techniques and mathematical skills related to the use and manipulation of the SI system which is relevant to both general and chemistry-specific applications. The rest of the foundation is building on the various ways of classifying matter. After all, chemistry *is* the study of matter and its properties. The differences and similarities between homogeneous and heterogeneous matter and ways they can be separated will be considered. The classification of matter as an element, mixture, or compound will be examined in detail. In addition, the behavior of a substance changing from one state of matter to another will be investigated.

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SCI.HS-PS1-1	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.
MA.A-SSE.B	Write expressions in equivalent forms to solve problems
SCI.HS-PS1-2	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.
LA.RST.9-10.7	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.
SCI.HS-PS1-3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
MA.A-CED.A	Create equations that describe numbers or relationships
LA.WHST.9-10.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant sufficient textual and non-textual evidence.
SCI.HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
LA.WHST.9-10.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
SCI.HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
LA.WHST.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LA.WHST.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
LA.WHST.9-10.9	Draw evidence from informational texts to support analysis, reflection, and research.

SCI.HS-PS1-6	Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.
SCI.HS-PS1-7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
WRK.K-12.P.3	Consider the environmental, social and economic impacts of decisions.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.
TECH.9.4.12.CT	Critical Thinking and Problem-solving
TECH.9.4.12.TL	Technology Literacy
TECH.9.4.12.GCA	Global and Cultural Awareness
TECH.9.4.12.IML	Information and Media Literacy
TECH.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

Essential Questions / Enduring Understandings

Essential Questions

How do scientists obtain, record, and publish/present consistent data?

What are the distinctions between matter and energy?

How do the types of substances – elements and compounds – and mixtures differ?

Enduring Understandings

The SI system is preferred due to its simple method of unit conversion and because each unit is defined by a universal constant.

Matter, and all the ways it can be categorized, is defined by the behavior of the particles (atoms or molecules) that it is composed of.

Objectives

Students will know how to obtain measurements and perform calculations using the SI System.

Students will be skilled at identifying similarities and differences between elements and compounds beyond a simple visual observation.

Students will know how to connect the properties of a substance with the behavior of the -particles (atoms of molecules) that make up the substance.

Students will know general laboratory procedures as well as safety precautions and location of specific safety equipment.

Students will be skilled at utilizing the SI system for conversion, measurement and analysis including the appropriate use of

significant figures.

Students will know the difference between precision and accuracy and be skilled at describing data (obtained or provided) as such.

Students will know when to use, and how to write, values in scientific notation and be skilled at converting to and from the decimal form.

Students will know the difference between elements, compounds, and mixtures.

Students will be skilled at identifying materials as elements, compounds, and mixtures.

Students will be skilled at differentiating pure substances vs mixtures, elements vs compounds, and heterogeneous vs homogeneous mixtures.

Students will know that the states of matter are defined by the behavior of the particles (atoms/molecules) they are composed of.

Students will be skilled at applying the Kinetic Molecular Theory (KMT) to describe the properties of the states of matter.

Students will know how matter can change from one state to another.

Students will be skilled at analyzing phase diagrams to identify states of matter, changes of state, and rate of change.

Students will know how to describe physical and chemical properties of substances and that physical changes and chemical changes have different effects on the substance's identity.

Learning Plan

Preview essential questions and connect them to the concepts we will cover in the unit.

Utilize best scientific practices during the introductory "Static Electricity of Scotch Tape" experiment.

Compare the accuracy and precision of measurements as well as the best methods (and units) when recording data.

Utilize scientific notation when most appropriate and convert to and from decimal notation.

Use the properties of substances as a means of identifying them in the Density of Unknown Substances lab.

Accurately obtain and record data to determine the year when the composition of the penny changed.

Organize matter according to its properties in the "matter ladder" (hierarchy).

Identify mixtures based solely on the states of matter of the substances within.

Differentiate between physical and chemical properties and changes via Observation of a Candle Lab.

Develop a model for the behavior of particles to best describe the properties of the states of matter (solid, liquid, gas, plasma).

Use the behavior of a gas to investigate Boyle's Law or Charles' Law.

Predict a "phase diagram" and then perform the Phase Diagram Lab to compare and contrast the prediction to reality.

Assessment

Formative Assessment

Utilize the SI system when obtaining data and performing calculations.

Identifying data as precise and accurate as well as recording it in the most appropriate manner (i.e. scientific notation vs decimal).

Communicate and identify the differences between all of the classifications of matter.

Define the states of matter by the behavior of the particles they are composed of.

Benchmark Assessment

Mid-Term Exam

Obtaining data from experimentation and presenting in the most appropriate manner.

Alternative Assessment

Organize the classifications of matter according to a scheme of broadest to most specific term.

Analyze phase diagrams as well as construct one from data obtained in an experiment.

Summative Assessment

Unit Quizzes

Unit Tests

Materials

Guided notes or teacher handouts

Lab Handouts (Static Electricity of Scotch Tape, Observation of a Candle, Separation of Mixtures, Composition of Pennies, Thickness of Foils, Phase Diagram Analysis. NOTE: Supplies for each lab included on handout.)

Matter Ladder (vocabulary cards)

Density Identification Set (Cubes or Cylinders)

Simulations:

“Collisions: Phase Changes” [<https://app.playmada.com/Collisions/>]

“States of Matter: Basics” [<https://phet.colorado.edu/en/simulation/states-of-matter-basics>]

“States of Matter” [<https://phet.colorado.edu/en/simulation/states-of-matter>]

Safety Supplies (specifics to when they are required included in lab handouts)

Integrated Accommodations and Modifications Spec Ed., ELL, At-Risk, G&T, Career Education, 504s

<https://docs.google.com/spreadsheets/d/1CvoX6NXdGUPtTPcEqPOsnWbqpDLS4Ego1W1eaIrGYTo/>