Unit 01: Matter and Measurement

Content Area: **Science**
Course(s):
Time Period: **Marking Period 1**
Length: **2-3 Weeks**
Status: **Published**

Brief Summary of Unit

In this unit, chemistry as the study of the composition, structure, and properties of matter and the changes it undergoes, will be introduced. Students will explore states and properties of matter, physical versus chemical changes, and pure substances vs mixtures as well as separation methods for mixtures. Separation techniques of mixtures will be discussed as a critical tool to our economy and standard of living. Students will also utilize scientific notation, SI units and prefixes, unit conversion in dimensional analysis, data analysis, and significant figures both in a laboratory setting and with data calculations. The SI system of measurement will be explored and dimensional analysis will be utilized with conversions. Students will also learn proper laboratory techniques and safety behavior while implementing the scientific method. Quantitative data collected in the lab will be organized both graphically and in tabular form. This data will then be analyzed in terms of precision and accuracy and the importance of significant figures will be addressed.

Revised June 2022

Standards

SCI.HS-PS1	Matter and Its Interactions
LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
MA.N-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
MA.N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
LA.K-12.NJSLSA.R8	Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.
LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.K-12.NJSLSA.W4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
LA.K-12.NJSLSA.W6	Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
LA.K-12.NJSLSA.W8	Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
WRK.9.2.12.CAP.5	Assess and modify a personal plan to support current interests and post-secondary plans.
TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
	Critical thinkers must first identify a problem then develop a plan to address it to effectively solve the problem.

Essential Questions

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How can one explain the structure, properties, and interactions of matter?

How is the separation of mixtures critical to our economy and standard of living?

How can we analyze data with more precision and accuracy?

Enduring Understandings

Matter can be classified by a hierarchy beginning with pure substance vs mixture.

Significant figures play an important role in a lab setting as well as with quantitative data.

Students Will Know/Students Will be Skilled At

Students will know how to distinguish between different states of matter based on properties, kinetic molecular theory, and energy.

Students will be skilled at classifying matter and distinguishing between physical and chemical properties/changes of matter.

Students will know which separation technique is used for the different types of mixtures.

Students will know how separation techniques can be used as a tool for our economy and standard of living.

Students will know why intensive properties of matter are more useful than extensive properties.

Students will be skilled at solving calculations with density.

Students will know how scientists obtain and record consistent data.

Students will know how to differentiate between accuracy and precision.

Students will know how to differentiate between quantitative data and qualitative data.

Students will be skilled at graphing quantitative data and obtaining relationships such as the density from the slope of the graph.

Students will be skilled in proper lab techniques with regard to SI units and significant figures.

Students will know how to apply significant figures when calculating data.

Students will be skilled at utilizing dimensional analysis as a logical method of problem-solving and converting between units.

Learning Plan

Preview the essential questions and content for learning throughout the unit.

Present safety rules for laboratory procedures.

Introduce states of matter in terms of kinetic molecular theory and energy.

Introduce the hierarchy of matter, pure substance vs. mixtures, as a way to classify matter.

Differentiate between physical and chemical properties/changes of matter.

Complete worksheet applying classification of matter and properties.

Review the scientific method, scientific notation, and the SI system.

Distinguish between accuracy and precision.

Present and apply the rules of significant figures with data calculations.

Complete assigned practice in CHEMFILE: MINI GUIDE TO PROBLEM-SOLVING HOLT 1999.

Model how to obtain correct significant figures based on the measuring tool used.

Model how to utilize dimensional analysis as a problem-solving technique, specifically for prefix/unit conversions.

Complete assigned practice in CHEMFILE: MINI GUIDE TO PROBLEM-SOLVING HOLT 1999.

Complete Thickness of Aluminum foil lab.

Review density calculations, graphing data, and calculate slope.

Complete practice test.

Unit Test

Labs:

Observation of a Candle

Separation of a mixture (distillation)

Density of Pennies

The thickness of Aluminum foil

Evidence/Performance Tasks

Formative

Completed worksheet on classifying matter, physical/chemical changes, intensive/extensive properties

Completed in class and suggested practice on significant figures and conversions using dimensional analysis

Determining the thickness of aluminum foil based on the application of significant figures in a lab setting and with quantitative data

Assigned homework problems in CHEMISTRY 11 ED. CHANG MCGRAW HILL 2013

Summative

Unit Quizzes and Tests

Lab Analysis in Density of Pennies Lab and/or Separation of a Mixture

Benchmark

Midterm Exams

Alternative

Lab Report or CER for Density of Pennies Lab and/or Separation of a Mixture

Research project on the application of separation techniques

Materials

CHEMISTRY 11 ED. CHANG MCGRAW HILL 2013

CHEMFILE: MINI GUIDE TO PROBLEM SOLVING HOLT 1999

Approved Textbook Link

In addition to general lab and safety equipment as noted in lab handouts:

hot plate

balance

lime water

laptop

Suggestions Strategies for Modification

FOR SPECIAL EDUCATION STUDENTS , ELL, AT RISK AND STUDENTS GIFTED STUDENTS

https://docs.google.com/spreadsheets/d/1pQwsQoD_QLot65BTdHFEHN5dXIiqS54iQ5iDL8C4q6o/edit?usp=sharing