Unit 2: Structure and Properties of Matter

Content Area: **Science**
Course(s): **Chemistry/Lab Honors**
Time Period: **1st Marking Period**
Length: **6.5 Weeks**
Status: **Published**

Unit Overview

Matter can be understood in terms of the types of atoms present and the interactions both between and within them. Atomic structure and the arrangement of the Periodic Table are the foundation for understanding matter and its interactions.

Transfer

Students will be able to independently use their learning to visualize the various forms of energy and relate changes in energy and matter to everyday circumstances.

Meaning

Understandings

1) Everyday occurrences of changes in matter are related to energy transfer.

2) The classification of matter based on unique properties or characteristics allows for a better understanding of the world around us.

3) In the universe, atoms are the fundamental building blocks of all matter.

4) Electron movement can be explained by the duality of particles and waves.

5) Modern atomic theory suggests that electrons may be located in regions of high probability.

Essential Questions

1) What is energy?
2) How do we classify things in the world around us?

3) How can the classification of matter help us better understand the physical world?

4) How does the current model of the atom explain atomic structure?

5) How are electrons configured around a nucleus?
6) How do current atomic models with electron arrangement compare with scientific evidence from previous models?

Application of Knowledge and Skill

Students will know...

1) The different types, properties and changes of matter and energy

2) The composition of the subatomic particles in atoms and ions

3) The development of the atomic theory and structure

Students will be skilled at...

1) Make systematic observations for the purpose of data collection
2) Use evidence to draw conclusions
3) Prove that the substances identified are classified correctly
4) Design a process to separate a sample mixture

5) Prove the classification of a substance

6) Explain the states of matter
7) Critique a heating curve/cooling curve
8) Translate quantitative data from a heating curve into a visual form for the purpose of representation, analysis, and conclusion
9) Draw conclusions from the data represented on the heating curve

Vocabulary

Academic **Application Vocabulary**

Vocabulary

atom
atomic mass
atomic number
atomic size
average atomic weight
boiling point
chemical property
compound
electron
element
extensitve
heterogeneous
homogeneous
intensive
homogeneous
intensive
ion
isotope
melting point
metal
metalloid
molecule
neutron
non-metal
periodic table
physical property
proton
reactivity
repulsion
valence shell
chromatography
condensation
decant
deposition
dissolve
distillation
evaporation
filtration
freezing
melting
sublimation
tarnish

Learning Goal 1

Students will be able to use their learning to analyze and communicate how matter affects all components of their lives.

Proficiency Scale

- Students will be able to use their learning to analyze and communicate how matter affects all components of their lives.

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.

Target 1

SWBAT analyze the properties of matter for the purpose of classification (pure substance/mixture, element/compound, homogeneous/heterogeneous).

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Target 2

SWBAT differentiate between physical and chemical properties and changes.

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Target 3

SWBAT identify types of separations of mixtures and design a procedure for separating a sample mixture.

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Target 4

SWBAT differentiate between intensive and extensive properties of matter.

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Target 5

SWBAT analyze a solubility chart, and predict whether a solution is saturated, unsaturated or super saturated based on temperature.

- SWBAT analyze a solubility chart, and predict whether a solution is saturated, unsaturated or super saturated based on temperature.

Learning Goal 2

Students will be able to use their learning to analyze and communicate how energy transfer affects all components of their lives.

Proficiency Scale

- Students will be able to use their learning to analyze and communicate how energy transfer affects all components of their lives.

SCI.HS-PS3-3	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
SCI.HS-PS3-2	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).

Target 1

SWBAT connect the effects of energy transfer with the different states of matter and phase changes.

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Target 2

SWBAT translate quantitative data to and from a heating curve for the purpose of representation, analysis, and conclusion.

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Target 3

SWBAT design and build a device that works within given constraints to convert one form of energy into another form of energy.

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Learning Goal 3

Students will be able to transfer their learning of the current atomic model to analyze the relative structure of atoms.

Proficiency Scale

- Students will be able to transfer their learning of the current atomic model to analyze the relative structure of atoms.

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.
SCI.HS-PS4-3	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.
SCI.HS-PS1-8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.

Target 1

SWBAT create an isotope from a given ground state atom and indicate the number of protons, neutrons and electrons present.

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Target 2

SWBAT create an isotope for an ion and indicate the number of protons, neutrons and electrons present.

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Target 3

SWBAT create a Bohr model including sub-atomic particles in their proper location from the name of an element on the periodic table.

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Target 4

SWBAT investigate the subatomic particles in a given atom and relate the number of particles to determine charge, position and relative mass.

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Target 5

SWBAT formulate the average atomic mass of an element given relative abundances of isotopes.

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Formative Assessment and Performance Opportunities

- Group Activities
- Homework and Classwork Activities
- In class discussion
- Lab Reports
- PowerPoints with Notes
- Worksheets

Summative Assessment

Unit Assessment will be created collaboratively and used for every student in the course. In addition, there will be other assessments in the form of lab reports, pen and paper tests, and quizzes. Common Assessment is administered through LinkIt.

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Accommodations/Modifications

All instruction, labs, activities, and assessments will be modified and enhanced to adhere to individual student's IEPs and 504s. As well differentiated classroom management strategies will be utilized as to adhere to these students individual plans as well. These strategies can be but are not limited to the following: Graphic Organizers and Flow Charts to help visulaization of content, Using acronyms and pneumonic devices to assist memorization, Academic Games to practice skills and deepen understanding of topics, Stations and Learning Centers to influence peer tutoring, Utilizing Reviews and Study Guides to reteach complex content before summative and formative assessment, Providing additional resources to students during and outside of school (videos, study guides, teacher notes, web-based resources) .

On Assessments, College Prep Chemistry students will be given the following resources: Average Atomic Mass Formula, Conversion Equivelences for Temperature and Energy, Word Bank for Periodic Table Group Names.

On Assessments, Honors AND College Prep Chemistry students will be given the following resource: Periodic Table of the Elements.

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Unit Resources / Technology

Labs

Mixtures -Matter Lab, Physcial -Chemical Lab, Density Lab of Slid and Liquid, Sink or Float Lab, Solubility Lab Ornament, Solubility Graph Lab, Heating Curve Lab , Cooling Curve Lab , M & M Lab

- Internet Resources
- Lab Equipment
- Laptops
- LCD projector
- Textbooks

21st Century Life and Careers

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to

	issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP9.1	Career-ready individuals consistently act in ways that align personal and community-held ideals and principles while employing strategies to positively influence others in the workplace. They have a clear understanding of integrity and act on this understanding in every decision. They use a variety of means to positively impact the directions and actions of a team or organization, and they apply insights into human behavior to change others' action, attitudes and/or beliefs. They recognize the near-term and long-term effects that management's actions and attitudes can have on productivity, morals and organizational culture.
CRP.K-12.CRP11.1	Career-ready individuals take personal ownership of their own education and career goals, and they regularly act on a plan to attain these goals. They understand their own career interests, preferences, goals, and requirements. They have perspective regarding the pathways available to them and the time, effort, experience and other requirements to pursue each, including a path of entrepreneurship. They recognize the value of each step in the education and experiential process, and they recognize that nearly all career paths require ongoing education and experience. They seek counselors, mentors, and other experts to assist in the planning and execution of career and personal goals.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

Interdisciplinary Connections

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.A-SSE.A.1b	Interpret complicated expressions by viewing one or more of their parts as a single entity.
MA.A-SSE.A.2	Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.
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.K-12.6	Attend to precision. Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the

	meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.
MA.N-Q.A.3	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.
LA.RST.11-12.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
LA.RST.9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
LA.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
LA.RST.9-10.5	Analyze the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
LA.RST.9-10.6	Determine the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.
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.
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
MA.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
MA.A-CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
LA.WHST.11-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
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MA.A-REI.A.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
LA.WHST.9-10.2.D	Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
LA.WHST.11-12.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LA.WHST.9-10.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
LA.WHST.9-10.6	Use technology, including the Internet, to produce, share, and update writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
LA.WHST.11-12.7	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.11-12.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
LA.WHST.11-12.9	Draw evidence from informational texts to support analysis, reflection, and research.
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