**Unit 3: The Periodic Table

Content Area: **Science**
Course(s):
Time Period: **December**
Length: **10 Blocks**
Status: **Published**

Unit Summary

The periodic table evolved over time as scientists discovered more useful ways to compare and organize the elements (history of the periodic table up through Mosely). Elements are organized into different blocks (SPDF), in the periodic table, according to their electron configuration. Trends in the periodic table include metallic character (metals, metalloids, and nonmetals), atomic and ionic radius, electronegativity, and ionization energy.

Enduring Understanding

The Periodic Table is a patterned system of organized groups of related elements.

Manipulation and graphing data help to recognize and identify patterns.

Understanding of regularities and patterns in the periodic table allows for predictions of interactions among the elements.

Essential Questions

How can the Periodic Table be used to explain and predict the properties of elements?

How and why was the periodic table developed and what is the basis of the arrangement of the elements?

Student Learning Objectives (PE, SEP, DCI, CCC) & Aligned Standards

Performance Expecations

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. [Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.] [Assessment Boundary: Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.]

HS-PS2-6.Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.* [Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically

conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.] [*Assessment Boundary: Assessment is limited to provided molecular structures of specific designed materials.*]

Concepts & Formative Assessment

Write the electron configuration of elements.

Explain how atomic radii, ionization energy, and electronegativities vary within a group and within a period on the PT.

Predict the charge of an ion given its position on the periodic table and its electron configuration.

Explain why chemists use the periodic table.

Explain how elements are organized in a periodic table.

Compare early and modern periodic tables.

Identify three broad classes of elements.

Describe the information in a periodic table.

Describe trends among the elements from atomic size.

Resources

Path to Periodic Table: This investigation provides students with the opportunity to make sense of how and why the periodic table is organized the way that it is. Students will re-create the thought process that Dmitri Mendeleev and Julius Lothar Meyer went through to devise their early periodic tables.

Periodic Table Trends: This is a virtual investigation of the periodic trends.

Assessment

Assessments will be aligned to the Performance Expectations and will include a variety of assessment types such as labs, writing prompts, and projects.

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Connecting with English Language Arts Literacy and Mathematics

Connections to English Language Arts/Literacy-

- Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations showing that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy to enhance understanding of findings, reasoning, and evidence and to add interest.
- Cite specific textual evidence to support the concept that changing the temperature or concentration of the reacting particles affects the rate at which a reaction occurs.
- Develop an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples.
- Construct short as well as more sustained research projects to answer how to increase amounts of products at equilibrium in a chemical system. Synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Connections to Mathematics-

- Represent an explanation that atoms, and therefore mass, are conserved during a chemical reaction symbolically and manipulate the representing symbols. Make sense of quantities and relationships about the conservation of atoms and mass during chemical reactions symbolically and manipulate the representing symbols.
- Use units as a way to understand the conservation of atoms and mass during chemical reactions; choose and interpret units consistently in formulas representing proportional relationships between masses of atoms in the reactants and products and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale; choose and interpret the scale and origin in graphs and data displays representing the conservation of atoms and mass in chemical reactions.
- Define appropriate quantities for the purpose of descriptive modeling of the proportional relationships between masses of atoms in the reactants and products and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale.
- Choose a level of accuracy appropriate to limitations on measurement when reporting quantities representing proportional relationships between masses of atoms in the reactants and products and the translation of these relationships to the macroscopic scale using the mole as the conversion from the

atomic to the macroscopic scale.

- Use a mathematical model to explain how the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy, and map their relationships using tools. Analyze those relationships mathematically to draw conclusions, reflecting on the results and improving the model if it has not served its purpose.
- Represent an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs symbolically and manipulate the representing symbols. Make sense of quantities and relationships about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs symbolically and manipulate the representing symbols.
- Use units as a way to understand an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. Choose and interpret units consistently in formulas representing the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. Choose and interpret the scale and the origin in graphs and data displays representing the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
- Choose a level of accuracy appropriate to limitations on measurement when reporting quantities representing the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
- Use a mathematical model to explain how to increase amounts of products at equilibrium in a chemical system. Identify important quantities in the cycling of matter and flow of energy among organisms in an ecosystem, and map their relationships using tools. Analyze those relationships mathematically to draw conclusions, reflecting on the results and improving the model if it has not served its purpose.