



Marietta City Schools

2024–2025 District Unit Planner

Accelerated Physical Science

Unit title	<i>Atomic Structure and Periodic Table</i>	MYP year	3	Unit duration (hrs)	20 Hours
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Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): *What will students learn?*

GA DoE Standards

Standards

SPS1. Obtain, evaluate, and communicate information from the Periodic Table to explain the relative properties of elements based on patterns of atomic structure.

- Develop and use models to compare and contrast the structure of atoms, ions, and isotopes. (*Clarification statement:* Properties include atomic number, atomic mass and the location and charge of subatomic particles.)
- Analyze and interpret data to determine trends of the following:
 - Number of valence electrons
 - Types of ions formed by main group elements
 - Location and properties of metals, nonmetals, and metalloids
 - Phases at room temperature
- Use the Periodic Table as a model to predict the above properties of main group elements.

MCS Gifted Standards:

- MCS.Gifted.S2A.** Recognize and evaluate how the process of creative thinking improves ideas, products, and solutions to problems.
- MCS.Gifted.S4D.** Respectfully collaborate and effectively communicate exchanges of constructive/critical feedback.
- MCS.Gifted.S2D.** Apply components of creative thinking in finding, solving, and evaluating solutions to authentic real-world problems and dilemmas.

Prior Student Knowledge: (REFLECTION – PRIOR TO TEACHING THE UNIT)

These students have not been exposed to the 8th Science GSE that lays the foundation for the high school Physical Science standards. This includes:

S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter.

- Develop and use a model to compare and contrast pure substances (elements and compounds) and mixtures. (Clarification statement: Include heterogeneous and homogeneous mixtures. Types of bonds and compounds will be addressed in high school physical science.)
- Develop and use models to describe the movement of particles in solids, liquids, gasses, and plasma states when thermal energy is added or removed.
- Plan and carry out investigations to compare and contrast chemical (i.e., reactivity, combustibility) and physical (i.e., density, melting point, boiling point) properties of matter.
- Construct an argument based on observational evidence to support the claim that when a change in a substance occurs, it can be classified as either chemical or physical. (Clarification statement: Evidence could include ability to separate mixtures, development of a gas, formation of a precipitate, change in energy, color, and/or form.)

e. Develop models (e.g., atomic-level models, including drawings, and computer representations) by analyzing patterns within the periodic table that illustrate the structure, composition, and characteristics of atoms (protons, neutrons, and electrons) and simple molecules.

f. Construct an explanation based on evidence to describe conservation of matter in a chemical reaction including the resulting differences between products and reactants. (Clarification statement: Evidence could include models such as balanced chemical equations.)

Concepts/Skills to be Mastered by Students

- Matter
- Structure of atoms and elements
- Periodic Table trends

Key Vocabulary: (KNOWLEDGE & SKILLS)

Atoms, protons, neutrons, nucleus, electron, electron cloud, energy levels, electron shells, valence shell, valence electrons, atomic number, atomic mass, periodic table, metal, nonmetal, metalloid, semiconductor, groups/families, period, representative elements, alkali metals, alkaline earth metals, transition metals, halogens, noble gases, cation, anion, ion, pure substance, element, compound, charge, solid, liquid, gas, Bohr model, Lewis Dot Diagram

Year-Long Anchoring Phenomena: (LEARNING PROCESS)

How does matter and energy interact within the universe?

Unit Phenomena (LEARNING PROCESS)

How can we use our understanding of the organization of the periodic table and atomic structure to determine an element's properties?

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)

Students will often refer to atomic number and average atomic mass by their locations (the top number, number in the corner, bottom number), rather than using the language of the standard.

Students may associate valence electron number with an element's period, rather than its group number.

Students may associate the number of energy levels with an element's group number, rather than the period.

Students may have difficulty identifying the elements along the stair step as metalloids.

Students may have trouble with placing the correct number of electrons in the appropriate energy levels.

Key concept	Related concept(s)	Global context
<p align="center">Relationships</p> <p>Relationships are the connections and associations between properties, objects, people and ideas— including the human community's connections with the world in which we live. Any change in relationship brings consequences—some of which may occur on a small scale, while others may be far reaching, affecting large networks and systems such as human societies and the planetary ecosystem.</p>	<p align="center">Patterns (MYP/CCC) Structure and Function (MYP/CCC)</p>	<p align="center">Scientific and Technical Innovation</p> <p>Students will explore the natural world and its laws; the interaction between people and the natural world; how humans use their understanding of scientific principles; the impact of scientific and technological advances on communities and environments; the impact of environments on human activity; how humans adapt environments to their needs.</p>

Statement of inquiry		
Scientific and technical advancements have enabled scientists to understand relationships and patterns that exist related to the structure and function of elements in our natural world.		
Inquiry questions		
<p>Factual What are atoms? What information does the Periodic Table provide? What are the types of subatomic particles, what are their charges, and where are they located within an atom?</p> <p>Conceptual How can models be used to demonstrate the similarities and differences between atoms, ions, and isotopes? What trends can be found in the periodic table (# of valence electrons, types of ions formed, location and properties of metals/nonmetals/metalloids, phases at room temperature)? How can the periodic table be used to predict the properties of elements based on atomic structure patterns? How can I determine an element's atomic number and atomic mass, and what do these numbers represent?</p> <p>Debatable How can information about patterns of atomic structure and properties of matter guide device construction and assembly within specified design constraints?</p>		
MYP Objectives	Assessment Tasks	
<i>What specific MYP objectives will be addressed during this unit?</i>	<i>Relationship between summative assessment task(s) and statement of inquiry:</i>	<i>List of common formative and summative assessments.</i>
Science A: Knowing and Understanding i. describe scientific knowledge iii. analyze information to make scientifically supported judgments. Science C: ii. interpret data and describe results using scientific reasoning	SOI: Scientific and technical advancements have enabled scientists to understand relationships and patterns that exist related to the structure and function of elements in our natural world. Students are required to demonstrate their understanding of SPS1, which includes the identification of interactions, patterns, and relationships of atoms based upon the periodic table, through the completion of a multiple-choice, standards-aligned unit assessment that mimics the GA Milestones. Additionally, students will complete a constructed-response portion of the assessment that requires them to make a claim regarding the patterns seen in the Periodic Table and include evidence and reasoning to support their claim. Students will also be tasked with modeling an atom using nothing but an element square from the Periodic Table.	<p><u>Formative Assessment(s):</u> Atomic Modeling CFA Chemical and Physical Properties and Changes CFA</p> <p><u>Summative Assessment(s):</u> Atomic Structure & Periodic Table Unit Assessment Paper I and Paper II</p>

Science D: Reflecting on the Impacts of Science iii. apply scientific language effectively		
Approaches to learning (ATL)		
Category: Communication Cluster: Communication Skills Skill Indicator: Organize and depict information logically.		

Learning Experiences

Add additional rows below as needed.

Objective or Content	Learning Experiences	Personalized Learning and Differentiation
<p>S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter.</p> <p>c. Plan and carry out investigations to compare and contrast chemical (i.e., reactivity, combustibility) and physical (i.e., density, melting point, boiling point) properties of matter.</p> <p>d. Construct an argument based on observational evidence to support the claim that when a change in a substance occurs, it can be classified as either chemical or physical. (<i>Clarification statement</i>: Evidence could include ability to separate mixtures, development of a gas, formation of a precipitate, change in energy, color, and/or form.)</p>	<p>Chemical and Physical Properties and Changes Stations</p>	<ul style="list-style-type: none"> ● Discovery Education High School Chemistry Science Techbook ● NGSS Case Studies for Differentiated Learners ● Next Generation Science Standards: “All Standards, All Students” ● Extensions – Enrichment Tasks/Projects
<p>SPS1. Obtain, evaluate, and communicate information from the Periodic Table to explain the relative properties of elements based on patterns of atomic structure.</p> <p>a. Develop and use models to compare and contrast the structure of atoms, ions, and isotopes. (<i>Clarification statement</i>: Properties include atomic number, atomic mass and the location and charge of subatomic particles.)</p>	<p>Evolution of an Atom Comparison CER Parts of an Atom: Discovery Education/PhET Simulation Investigating Mendeleev’s Table</p>	<p>All information included by PLC in the differentiation box is the responsibility and ownership of the local school to review and approve per Board Policy IKB.</p> <p>Task-Specific Differentiation</p> <ul style="list-style-type: none"> ● Modeling ● Small Group ● Multiple Means of Engagement ● Multiple Means of Content Representation ● Multiple Means of Action and Expression
<p>SPS1. Obtain, evaluate, and communicate information from the Periodic Table to explain the relative properties of elements based on patterns of atomic structure.</p> <p>b. Analyze and interpret data to determine trends of the following:</p> <ul style="list-style-type: none"> ● Number of valence electrons ● Types of ions formed by main group elements ● Location and properties of metals, nonmetals, and metalloids ● Phases at room temperature 	<p>Parts of an Atom: Discovery Education/PhET Simulation Evaluating Periodic Table Groups Investigating Mendeleev’s Table Lewis Dot and Charges Activity</p>	<p>All information included by PLC in the differentiation box is the responsibility and ownership of the local school to review and approve per Board Policy IKB.</p> <p>Task-Specific Differentiation</p> <ul style="list-style-type: none"> ● Modeling ● Small Group ● Multiple Means of Engagement ● Multiple Means of Content Representation ● Multiple Means of Action and Expression

<p>SPS1. Obtain, evaluate, and communicate information from the Periodic Table to explain the relative properties of elements based on patterns of atomic structure.</p> <p>c. Use the Periodic Table as a model to predict the above properties of main group elements.</p>	<p>Parts of an Atom: Discovery Education/PhET Simulation Analyzing Periodic Table Groups Investigating Mendeleev's Table</p>	
Content Resources		
<ul style="list-style-type: none"> ● Discovery Education High School Chemistry Science Techbook ● 4.3 Parts of the Atom ● 4.4 Arrangement of Electrons in the Atom ● 5.1 Structure of the Periodic Table ● 5.2 Development of the Periodic Table ● 5.3 Periodic Trends ● Holt Science Spectrum Chapters 2, 4, and 5 ● The Periodic Table of Elements ● Build an Atom PhET/Discovery Education Exploration 		