Marietta City Schools

2024 - 2025 District Unit Planner

Science Grade 8

Unit title	*Atomic Structure & Periodic Table*	**MYP year**	*3*	**Unit duration (hrs)**	*25 Hours*

Mastering Content and Skills through INQUIRY (Establishing the purpose of the Unit): *What will students learn?*

GSE Standards

Standards

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

- 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.
- 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. (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, electrons) and simple molecules.

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

Students preview particles during Unit 1: Energy Forms and Transformations, to begin building connections between matter and energy. Students will now relate a particle to an atom.

In fifth grade, students should have mastered:

S5P1. Obtain, evaluate, and communicate information to explain the differences between a physical change and a chemical change.

a. Plan and carry out investigations of physical changes by manipulating, separating, and mixing dry and liquid materials.

b. Construct an argument based on observations to support a claim that the physical changes in the state of water are due to temperature changes, which cause small particles that cannot be seen to move differently.

c. Plan and carry out an investigation to determine if a chemical change occurred based on observable evidence (color, gas, temperature change, odor, new substance produced).

<u>Concepts/Skills to be Mastered by Students</u>

- Matter (structure, composition, properties)
- Chemical and Physical Properties and Changes
- Elements and compounds

Key Vocabulary: (KNOWLEDGE & SKILLS)

pure substance, matter, element, compound, molecule, atom, protons, neutrons, electrons, particle,state, physical property, mass, volume, density, melting point, boiling point, freezing point, chemical properties, reactivity, combustibility, physical change, chemical change, chemical reaction, precipitate, Periodic Table of elements, pattern, structure, composition, atomic

number, atomic mass, mass number, period, group/family, electron shell/orbital/energy level, metal, metalloid, non-metal

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 atomic structure, periodic table, and element's physical and chemical properties to determine which elements would be better to use in creating devices and how they impact our environment?

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

- Students may have difficulty calculating density.
- Students often mistake phase changes for a chemical, rather than physical change.
- Students often confuse melting point and boiling point as chemical properties, rather than physical properties.
- Students may have difficulty recalling the number of electrons that will fill electron shells/orbitals/energy levels.
- Students may confuse Periodic Table groups/families and periods.

Key concept	Related concept(s)	Global context
Relationships (MYP) 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 a relationship brings consequences.	Patterns (MYP/CCC)	**Scientific and technical innovation** How the world works: an inquiry into the natural world and its laws; the interaction between the natural world (physical and biological) and human societies; how humans use their understanding of scientific principles; the impact of scientific and technological advances on society and on the environment.

Statement of inquiry

Scientific and technical advancements enable scientists to understand relationships and patterns that exist related to the structure and function of elements in our natural world.

Inquiry questions

Factual

- What is a physical property and what are some examples of physical properties?
- What are the differences between physical and chemical properties?
- How do I calculate density?
- What are the differences between physical and chemical changes?
- How are atoms structured?
- What are protons, neutrons, and electrons? Where do they belong in atoms and what are their charges?

- What is the difference between an atom's atomic number and atomic mass?
- What are the similarities and differences between metals, non-metals, and metalloids?

Conceptual

- What determines the physical and chemical properties of a substance?
- How can you determine whether a change in a substance is physical or chemical?
- How can I model atomic structure?
- How can the Periodic Table be used to predict the structure, composition, and characteristics of atoms?

Debatable

- How can I uncover the identity of mystery substances?
- How can I use physical and chemical properties to design a water filtration system?
- Is the Periodic Table the most efficient way to group known elements?
- Is the Bohr Model the most accurate model to present the atomic structure of an element?

MYP Objectives	**Assessment Tasks**	
*What specific MYP **objectives** will be addressed during this unit?*	***Relationship** between summative assessment task(s) and statement of inquiry:*	*List of common formative and summative assessments.*
Criterion A: Knowing and Understanding I. describe scientific knowledge Criterion B: Inquiring and Designing I. describe a problem or question to be tested by a scientific investigation Criterion C: Processing and Evaluating I. present collected and transformed data	SOI: Scientific and technical advancements enable scientists to understand relationships and patterns that exist related to the structure and function of elements in our natural world. Throughout the unit, students are tasked with observing, identifying, and distinguishing between both chemical and physical properties and changes. Students are also tasked with asking appropriate questions to determine whether a change that has occurred is physical or chemical in nature. Students will also be required to document and label correct atomic models of elements 1-20 of the Periodic Table. The MYP summative assessment tasks require students to use the Periodic Table in order to model, recognize, and identify atoms and their subatomic particles. In doing so, students are tasked with understanding and using the Periodic Table to make predictions regarding the structure, properties, and uses of the elements in our natural world.	**Formative Assessment(s):** Physical and Chemical Properties and Changes CFA Atomic Structure CFA **Summative Assessment(s):** Unit 3 Assessment (Science A,D)

Ii.interpret data and describe results using scientific reasoning Criterion D: Reflecting on the Impacts of Science Iii. apply scientific language effectively		
Approaches to learning (ATL)		
Category: Thinking **Cluster:** Critical-Thinking Skills **Skill Indicator:** Identify trends and forecast possibilities		

Learning Experiences		
Objective or Content	**Learning Experiences**	**Personalized Learning and Differentiation**
S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter. 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.	● Lab: Observing and Using Physical and Chemical Properties to Identify Mystery Substances (Science B-C) ● Lab: Density of Unknown Objects/ Will it Sink or Float?	● Discovery Education Science Techbook ● NGSS Case Studies for Differentiated Learners ● Next Generation Science Standards: "All Standards, All Students" ● Extensions - Enrichment Tasks/Project All information included by the PLC in the differentiation box is the responsibility and ownership of the local school to review and approve per Board Policy IKB. Task-Specific Differentiation ● Scaffolding ● Leveled Tasks ● Experimental Design Choices ● Mode/Method of Representation/Presentation (text, videos, laboratory investigations)
S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter. 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. (Clarification statement: Evidence could include ability to separate mixtures, development of a gas, formation of a precipitate, change in energy, color, and/or form.)	● Lab Stations: Observing and Identifying Physical vs. Chemical Changes (Science B-C)	
S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter. ● S8P1.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	● Bohr Model Construction ● Build an Atom PhET SIM ● Periodic Table Worksheet (Scavenger Hunt) ● Elements on the Periodic Table (Science A,D)	

of atoms (protons, neutrons, electrons) and simple molecules.		

Content Resources

DE Science Techbook: Unit 1: Matter

Concept 1.2: Characteristics and Properties of Matter
Concept 1.5: Chemical Reactions and Equations

PhET: -Build an Atom

GaDOE Instructional Segment: You Are What You Eat

GaDOE Instructional Segment: Periodic Table

Argument Driven Inquiry in Physical Science Lab 2: Chemical and Physical Changes: What Set of Rules Should We Use to Distinguish Between Chemical and Physical Changes in Matter