Marietta City Schools

District Unit Planner

Everything on the unit planner must be included on the unit curriculum approval statement.

Accelerated Physical Science

Unit title	*Principles of Atomic Bonding*	**MYP year**	*3*	**Unit duration (hrs)**	*15 Hours*

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

GSE 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.

a. Develop and use models to compare and contrast the structure of atoms, ions, and isotopes.

SPS2. Obtain, evaluate, and communicate information to explain how atoms bond to form stable compounds.

a. Analyze and interpret data to predict properties of ionic and covalent compounds. (Clarification statement: Properties are limited to types of bonds formed, elemental composition, melting point, boiling point, and conductivity.)
b. Develop and use models to predict formulas for stable, binary ionic compounds based on balance of charges.
c. Use the International Union of Pure and Applied Chemistry (IUPAC) nomenclature for translating between chemical names and chemical formulas. (Clarification statement: Limited to binary covalent and binary ionic, containing main group elements, compounds but excludes polyatomic ions.)

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

These students have not been exposed to the 8th Science GSE that lay the foundation for the high school Physical Science standards. This is the first time they will be exposed to ionic and covalent compounds, principles of atomic bonding, and bonding nomenclature.

Concepts/Skills to be Mastered by Students

- Structure of atoms and elements
- Periodic Table trends
- Compounds: properties, bonds, and naming

Key Vocabulary: (KNOWLEDGE & SKILLS)

Ion, cation, anion, Lewis dot diagrams, ionic, covalent, binary ionic, binary covalent, mono-, di-, tri-, tetra-, penta-; hexa-; hepta-; octa-, nona-; -ide
atom, element, molecule, compound, protons, neutrons, nucleus, electron, electron cloud, energy levels, electron shells, valence shell, valence electrons, atomic number, atomic mass, periodic table, metal, nonmetal, metalloid, groups/families, period, representative elements, alkali metals, alkaline earth metals, halogens, noble gases, melting point, boiling point, conductivity

Year-Long Anchoring Phenomena: (LEARNING PROCESS)
Operation of a car and/or rocket.

Unit Phenomena (LEARNING PROCESS)
Why is NaCl so different from Na and Cl?

Possible Preconceptions/Misconceptions: (REFLECTION – PRIOR TO TEACHING THE UNIT)
Students may confuse Group # with an ion's charge.
Students may have difficulty understanding the relationship between an element's Group # and the resulting charge of the atom when it ionizes.
Students may have difficulty combining elements in the appropriate ratio to form compounds.
Students may confuse the naming rules for ionic and covalent compounds.

Key concept	Related concept(s)	Global context
Relationships 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.	Interactions (MYP)	**Scientific and Technical Innovation** 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.

Statement of inquiry

Scientific and technical advancements enable scientists to understand the relationships and interactions between elements that are necessary for the creation of compounds.

Inquiry questions

Factual
What are ions? What are compounds?

What information does the Periodic Table provide?
What are the properties/characteristics of ionic and covalent compounds? How are they different from one another?

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)?
How can I use the periodic table to predict an atom's charge when it forms an ion?
What determines how two elements combine to form a compound?
How can I predict the formula for a stable, binary ionic compound?
How can I predict the name for a stable, binary ionic or covalent compound?

Debatable
What compounds might be appropriate to provide thrust in rocket launches?

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 Iii. describe how to manipulate the variables, and describe how data will be collected Criterion C: I. present collected and transformed data	SOI: Scientific and technical advancements have enabled scientists to understand the relationships and interactions between elements that are necessary for the creation of compounds. In the summative assessment for this unit, students will demonstrate their ability to use IUPAC nomenclature to correctly identify, name, and write formulas for ionic and covalent compounds. Students will also use the Periodic Table as a tool for developing models that demonstrate ionic and covalent bonding through compound/molecular construction. Students will use trends uncovered by scientific investigation to determine whether compounds are ionic or covalent. Additionally, students will be tasked with using what they have learned to complete a CER that explains why Na, Cl, and NaCl have different physical and chemical properties.	**Formative Assessment(s):** CFA: Ion Formation + Ionic Compound Naming and Formula Writing **Summative Assessment(s):** Principles of Atomic Bonding Unit Assessment Paper I and Paper II (Science A, D)

Ii. interpret data and describe results using scientific reasoning Criterion D: Iii. apply scientific language effectively		
Approaches to learning (ATL)		
Category: Self-Management **Cluster:** Affective **Skill Indicator:** Practice focus and concentration.		

Learning Experiences Add additional rows below as needed.		
Objective or Content	**Learning Experiences**	**Personalized Learning and Differentiation**
SPS2. Obtain, evaluate, and communicate information to explain how atoms bond to form stable compounds. a. Analyze and interpret data to predict properties of ionic and covalent compounds.	Dissolving & Melting Mystery Substances (Science B,C)	• 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 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. Task-Specific Differentiation • Modeling • Station Teaching • Multiple Means of Engagement • Multiple Means of Content Representation • Multiple Means of Action and Expression
SPS2. Obtain, evaluate, and communicate information to explain how atoms bond to form stable compounds. b. Develop and use models to predict formulas for stable, binary ionic compounds based on balance of charges.	Compound Modeling (Ball & Stick Models)	
SPS2. Obtain, evaluate, and communicate information to explain how atoms bond to form stable compounds. c. Use the International Union of Pure and Applied Chemistry (IUPAC) nomenclature for translating between chemical names and chemical formulas.	Ionic Compound Naming and Formula Writing Practice Covalent Compound Naming and Formula Writing Practice	
Content Resources		
Discovery Education Science Chemistry Techbook: Chapter 4: Chemical Bonding		

-Concept 4.2: Ion Formation

-Concept 4.3: Ionic Bonding

-Concept 4.4: Covalent Bonding

Chapter 5: Representing Chemical Substances

-Concept 5.1: Chemical Formulas

-Concept 5.2: Nomenclature

PhET: Build a Molecule; Molecule Shapes (Basics); Build an Atom (Ion Formation)