International Baccalaureate
Baccalauréat International
Bachillerato Internacional

Marietta City Schools

2023–2024 District Unit Planner

MARIETTA CITY SCHOOLS

Grade & Course: 9-12 Chemistry	**Topic:** Electrons and Periodicity	**Duration:** 4 weeks

Georgia Standards and Content:

SC1. Obtain, evaluate, and communicate information about the use of the modern atomic theory and periodic law to explain the characteristics of atoms and elements.

c. Construct an explanation based on scientific evidence of the production of elements heavier than hydrogen by nuclear fusion.

e. Construct an explanation of light emission and the movement of electrons to identify elements.

f. 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 (i.e. including atomic radii, ionization energy, and electronegativity).

g. Develop and use models, including electron configuration of atoms and ions, to predict an element's chemical properties.

Narrative / Background Information

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

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

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.

Year-Long Anchoring Phenomena: (LEARNING PROCESS)

Changes to the measurement of chemicals added to Flint Michigan's water supply created dangerous levels of lead contamination in the drinking water.

Unit Phenomena (LEARNING PROCESS)

Astronomers can deduce the elements present in a star's atmosphere by closely examining the patterns of light emission and absorption coming from the star.

MYP Inquiry Statement:

Recurring patterns in elemental properties across the periodic table provide essential insights into the behavior and characteristics of elements.

MYP Global Context:

Scientific and Technical Innovation

Approaches to Learning Skills:

Communication skills
Social skills
Self Management skills
Research skills
Thinking skills

Disciplinary Core Ideas: (KNOWLEDGE & SKILLS)

Modern Atomic Models
Energy Levels and Sublevels
Orbitals
Electron Configuration
Orbital Diagrams
Light Emission
Nuclear Fusion
Periodicity
Effective Nuclear Charge
Shielding
Atomic Radius
Ionization Energy
Electronegativity

Crosscutting Concepts: (KNOWLEDGE & SKILLS)

Systems and System Models
Structure and Function
Stability and Change
Patterns

MYP Key and Related Concepts:

Key Concept: Systems
Related Concepts: Models, Evidence, and Patterns

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Resources, materials, assessments not linked to SGO or unit planner will be reviewed at the local school level.

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

Electrons orbit the nucleus similarly to planets orbiting the sun.
Electrons are fixed on specific energy levels (rings) and do not move between levels.

Key Vocabulary: (KNOWLEDGE & SKILLS)

Modern Atomic Models (Bohr and Quantum)
Energy Levels and Sublevels
Orbitals
Hund's Rule
Aufbau Principle
Pauli Exclusion Principle
Orbital Diagram
Electron Configuration
Noble Gas Configuration
Light Emission
Line Spectra
Ground State
Excited State
Photon
Wavelength
Frequency
Energy
Electromagnetic Spectrum
Nuclear Fusion
Periodicity
Effective Nuclear Charge
Shielding
Atomic Radius
Ionization Energy
Electronegativity

Inquiry Questions:

Factual -

- What occurs when two nuclei undergo nuclear fusion?
- How can we model nuclear fusion with an equation?
- What occurs when an atom absorbs energy from a flame or electricity? How does this result in the emission of light?
- What did the Bohr Model add to our understanding of electrons?
- What did the Quantum Model add to our understanding of electrons?
- How can we use the Periodic Table to determine the energy levels and sublevels that an atom's electrons occupy?
- How can we use the Periodic Table to construct models (Bohr, electron configuration, orbital notation) for atoms and ions?

Conceptual -

- How do the spectra of stars provide scientific evidence of nuclear fusion?
- How can we use observations of light emission to make predictions about the energy of electron transitions occurring within the atom?
- How can models (Bohr, electron configuration, orbital notation) be used to predict chemical properties of atoms and ions?

Debatable -

- Should society have control/approval over nuclear fusion research?

MYP Objectives	Summative assessment	
Sciences **Sciences**	Criterion A: Knowing and Understanding ● Common Summative Assessment Criterion B: Inquiring and Designing Criterion C: Processing and Evaluating ● Laboratory Experience	Relationship between summative assessment task(s) and statement of inquiry: Students will perform tasks and respond to assessment items that will gauge their mastery of atoms and moles as required by the Georgia Standards of Excellence. Mastery of these concepts is necessary to move forward in our study of particulate properties and behavior.

Learning Activities and Experiences	Inquiry & Obtain: (LEARNING PROCESS)	Evaluate: (LEARNING PROCESS)	Communicate: (LEARNING PROCESS)
Week 1: **Georgia Standard(s) of Excellence:** **Construct an explanation based on scientific evidence of the production of elements heavier than hydrogen by nuclear fusion.** **Construct an explanation of light emission and movement of electrons to identify elements.**			
Week 1:	Engage: Thinking about Spectroscopy Explore: What Happens to Its Electrons When Energy Is Added to an Atom? Hands-On Lab: Crime-Solving Spectroscopy	Evaluate: Constructed Response: Spectroscopy	Explain: How does adding energy to an atom affect its electrons and its subsequent characteristic emission and absorption spectra? Elaborate: Applying Spectroscopy
Weeks 2 and 3: **Georgia Standard(s) of Excellence:** **Develop and use models, including electron configuration of atoms and ions, to predict an element's chemical properties.**			
Weeks 2 and 3:	Engage: Thinking about the Arrangement of Electrons in the Atom, Thinking about Electron Representations Explore: What Arrangement of Electrons in an Atom Did Niels Bohr Propose?, What Is the Configuration of Electrons Within an Atom? Hands-On Lab: Hydrogen Spectrum Lab, Investigating the Dual Nature of Light, Electron Configuration and the Periodic Table	Evaluate: Constructed Response: Arrangement of Electrons in the Atom, Constructed Response: Electron Representations	Explain: How is the arrangement of electrons in atoms related to their ability to emit light?, How are electron arrangements described by Lewis structures, orbital diagrams, and electron configurations? Elaborate: Applying the Arrangement of Electrons in the Atom, Applying Electron Representations

Week 4:
Georgia Standard(s) of Excellence:
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 (i.e. including atomic radii, ionization energy, and electronegativity)

Week 4:	Engage: Understanding Periodic Trends Explore: Is there a relationship between the observed chemical reactivity of an element and its position on the periodic table? Hands-On Lab: Periodic Trends	Evaluate: Constructed Response:Periodic Trends	Explain: How do trends in the periodic table help predict the properties of an element? Elaborate: Applying Periodic Trends

Resources (hyperlink to model lessons and/or resources):
Discovery Education Science Techbook
Hands-On Lab: Crime-Solving Spectroscopy
Hands-On Lab: Hydrogen Spectrum Lab
Hands-On Lab: Investigating the Dual Nature of Light
Hands-On Lab: Electron Configuration and the Periodic Table
Hands-On Lab: Periodic Trends

Reflection: Considering the planning, process and impact of the inquiry

Prior to teaching the unit	During teaching	After teaching the unit