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| **Chemistry Unit 2 - Finding Patterns (Oct 15 – Dec 14)**  This unit, Finding Patterns, takes an inquiry approach to understanding the patterns of properties that exist among the elements. These patterns in properties are then linked to the wave-mechanics concept of atomic structure and the quantum atom. Beginning with isotopes and average atomic mass, as a way of understanding the importance of the atomic number in the identity of an element, the unit then uses the periodic table, as the ultimate graphic organizer for our knowledge of atomic structure and properties. The trends (patterns) of the periodic table are then connected to electron configuration.  The skills involved in this unit include: calculating average atomic mass of isotopes; graphing and analyzing data for the trends of the periodic table; writing and analyzing electron configurations; describing periodic trends; conducting flame tests to identify elements; performing mole/mass conversions.  Understanding how the body of scientific knowledge has developed through the work and insights of many scientists is central to this unit.  **Learning Targets**  Identify trend/pattern from the periodic table based on numeric data  Predict an element's properties given its placement on the periodic table  Describe most atoms by   * explaining the basics of quantum theory * identifying a hydrogen atom’s energy levels, sublevels, and atomic orbitals   Apply knowledge of atoms to ions and isotopes  Assess the early theories of matter by comparing/contrasting different atomic models (Democritus, Dalton, Thomson, Rutherford, Bohr, Quantum)  Determine electron configurations by   * Constructing student’s own model * Employing Bohr models   Employ electron configuration notation, isotopic notation, and nuclear notation | |
| **Standards**  **Content Standards:**  **SC2. Students will relate how the Law of Conservation of Matter is used to determine chemical composition in compounds and chemical reactions.**  **SC2c.** Apply concepts of the mole and Avogadro’s number to conceptualize and calculate mass, moles and molecules relationships.  **SC3. Students will use the modern atomic theory to explain the characteristics of atoms.**  **SC3b.** Use the orbital configuration of neutral atoms to explain its effect on the atom’s chemical properties.  **SC3d.** Explain the relationship of isotopes to the relative abundance of atoms of a particular element.  **SC3f.** Relate light emission and the movement of electrons to element identification.  **SC4.Students will use the organization of the Periodic Table to predict properties of elements.**  **SC4a.** Use the Periodic Table to predict periodic trends including atomic radii, ionic radii, ionization energy, and electronegativity of various elements.  **SC4b.**Compare and contrast trends in the chemical and physical properties of elements and their placement on the Periodic Table  **Integrated Characteristics of Science Standards**  **SCSh1a,b,c.** Students will evaluate the importance of curiosity, honesty, openness, and skepticism in science.  **SCSh2a,b,c.** Students will use standard safety practices for all classroom laboratory and field investigations.  **SCSh3a,b,c,d,e,f.** Students will identify and investigate problems scientifically.  **SCSh4.a,b.** Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials.  **SCSh6a,b,c,d.** Students will communicate scientific investigations and information clearly.  **SCSh7a,b,c,d,e.** Students will analyze how scientific knowledge is developed.  Students will recognize that:  a. The universe is a vast single system in which the basic principles are the same everywhere.  b. Universal principles are discovered through observation and experimental verification.  c. From time to time, major shifts occur in the scientific view of how the world works.  More often, however, the changes that take place in the body of scientific knowledge are small modifications of prior knowledge. Major shifts in scientific views typically occur after the observation of a new phenomenon or an insightful interpretation of existing data by an individual or research group.  d. Hypotheses often cause scientists to develop new experiments that produce additional data.  e. Testing, revising, and occasionally rejecting new and old theories never ends.  **SCSh8. Students will understand important features of the process of scientific inquiry.**  Students will apply the following to inquiry learning practices:  a. Scientific investigators control the conditions of their experiments in order to produce valuable data.  b. Scientific researchers are expected to critically assess the quality of data including possible sources of bias in their investigations’ hypotheses, observations, data analyses, and interpretations.  d. The merit of a new theory is judged by how well scientific data are explained by the new theory.  e. The ultimate goal of science is to develop an understanding of the natural universe which is free of biases.  f. Science disciplines and traditions differ from one another in what is studied, techniques used, and outcomes sought.  **ELA Reading and Writing Standards (Common Core)**  **ELACC11-12W4:** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience  **ELACC11-12W9:** Draw evidence from literary or informational texts to support analysis, reflection, and research.  **ELACC1SL1-6**  Confirm understandings  Participate in collaborative discussions  Report findings  **ELACC2L1-6**  Study and apply grammar and vocabulary in speaking and writing  **ELACC2W7**  Short research connections  **Math Standards (Common Core)**  **MCC912.N.Q.1**  Use units as a way to understand problems and to guide the solution of multistep problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.  **MCC912.N.Q.2**  Define appropriate quantities for the purpose of descriptive modeling.  **MCC912.N.Q.3**  Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. | **Enduring Understandings**   * Atomic theory has been built on the measurements, observations, discoveries, and interpretations of data by many scientists, and has been modified over the centuries by both major discoveries and small modifications so that our current understanding of atomic structure is best explained by the wave-mechanics model using quantum numbers. * Although different numbers of neutrons exist in different forms (isotopes) of the same element, it is the number of protons that determines the atom’s identity. Average atomic mass reflects the relative abundance of these isotopes. * The periodic table, arranged by atomic number, reveals a tendency for properties to repeat in a periodic pattern (periodicity), and can be used to predict the properties and uses of an element. * These periodic trends exist for many properties of the elements including atomic radii, ionization energy, and electronegativity. * The periodic table, arranged by atomic number, reveals a tendency for properties to repeat in a periodic pattern (periodicity), and can be used to predict the properties and uses of an element. * The periodic table, arranged by atomic number, reveals a tendency for properties to repeat in a periodic pattern (periodicity), and can be used to predict the properties and uses of an element. * These periodic trends exist for many properties of the elements including atomic radii, ionization energy, and electronegativity. * All matter possesses physical and chemical properties that are related to its atomic structure. * The modern atomic theory provides an explanation for the many patterns found in the properties of the elements, including atomic number, electron arrangement, reactivity, and bonding. |
| **Essential Questions**   * How do the colors in fireworks depend on election configuration in the atoms of their elements? * How does average atomic mass reflect the relative abundance of the isotopes of an element? * How is molar mass related to atomic mass? * In what ways does the periodic table organize what we know about the elements? * What trends in chemical and physical properties are revealed by the periodic table? * How has the periodic table been amended over the years to reflect new understandings of atomic structure? * How are electrons arranged in energy levels, sublevels, and orbitals outside the nucleus? * How can electron arrangement be used to identify substances?   + How can flame tests be used to identify metals? | **Key Vocabulary Terms/Language**  atomic number, electron configuration; orbital; isotope; mass number; average atomic mass, electron dot, ionization energy; electronegativity; ionic radius; atomic radius; emission spectrum; octet; calculate |
| **Misconceptions**   * the misconception that all atoms of the same element are identical * the misconception that electrons orbit the nucleus in fixed paths * the misconception that the more mass an atom has the larger it is * the misconception that the elements always exist in nature in their atomic form | **Proper Conceptions**   * Atoms have isotopes. Isotopes are atoms of the same element that have the same number of protons, but different numbers of neutrons * Electrons do not follow a simple circular pattern around the nucleus. They are constantly moving within the electron cloud * The larger the mass of an atom the smaller its size, as the electrons orbit more closely to the nucleus due to a stronger electromagnetic force. * Most elements are found in combination with other elements, never in its pure form |
| **Unit Requirements**   * [GRASP Activity - Apartment Housing Project.doc](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/GRASPs/GRASP%20-%20Apartment%20Housing%20Project.doc) * [Unit 2 Test – Finding Patterns](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/Unit%20Assessment/Unit%202%20Test%20-%20Finding%20Patterns.doc) | |
| **Section 1 – Periodic Table** | |
| **Learner Targeted Objectives and Goals**   * Compare and contrast trends in the chemical and physical properties of elements and their placement on the Periodic Table | **Knowledge and Skills**   * Predict an element's properties given its placement on the periodic table * Apply knowledge of atoms to ions and isotopes |
| **Section 2 – Periodic Trends** | |
| **Learner Targeted Objectives and Goals**   * Use the organization of the Periodic Table to predict properties of elements | **Knowledge and Skills**   * Identify trend/pattern from the periodic table based on numeric data * Identify trends in electronegativity, atomic radii, ionization energy and ionic radii. |
| **Section 3 – Electron Configuration** | |
| **Learner Targeted Objectives and Goals**   * Use the modern atomic theory to explain the characteristics of atoms | **Knowledge and Skills**   * Describe most atoms by   + explaining the basics of quantum theory   + identifying a hydrogen atom’s energy levels, sublevels, and atomic orbitals * Assess the early theories of matter by comparing/contrasting different atomic models * Determine electron configurations by   + Constructing student’s own model   + Employing Bohr models * Employ electron configuration notation, isotopic notation, and nuclear notation |
| **Mandatory Activities & Performance Tasks**  [Labs](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/Labs)   * Lab – Intro to PTE * Lab – Graphing Periodic Trends   [Writing Assignment](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/Writing%20Assignment)   * Unit Two Writing Assignment.doc * Writing Rubric - Glencoe   [Literature Review](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/Literature%20Review) – Gems Make Their Own Way  [Case Study](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/Case%20Study)   * Light and Matter Case Study Teacher Notes * Light and Matter Answer Key | **Supplemental Resources**   * [Textbook Correlations](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/Textbook%20Correlations.doc) - *Glencoe Chemistry,2008*   + **SC2c** - pgs. 318 – 356, 366– 390, 452 – 456, 460   + **SC3b** – pgs. 161, 182-185, 204-247, 412, 678 -698   + **SC3d** – pgs. 117, 120, 121, 325   + **SC3f** – pgs. 141, 144, 145, 147, 164   + **SC4a** – pgs. 115, 160, 162, 172-196, 207 – 209, 211, 212, 218, 219, 221, 222, 224, 265-268, 294, 412, 678– 688, 745, 757, 758, 789, 866   + **SC4b** – pgs. 136, 137, 175, 176, 180 – 185, 187 – 194, 196, 207 – 209, 211, 218, 219, 226, 294, 412 * [Chem Bellringers - Unit 2.ppt](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/Bell%20Ringers/Chem%20Bellringers%20-%20Unit%202.ppt) * [PowerPoints](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/PowerPoints)   + CMC Chapter 04.ppt   + CMC Chapter 05.ppt   + CMC Chapter 06.ppt   + Periodic Table Basics WkstKey2.ppt * [Glencoe](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/Glencoe)   + glencoe chem solving problems.pdf   + glencoe chem suplemental problems.pdf   + glencoe small.scale.chem.lab.manual.pdf   + glencoe.lab. manual.pdf   + Honors Planning Guide.pdf * [Videos](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/Videos)   + Alkali Metals Explosive reactions   + Alkaline Earth Metal   + Bohr   + Bohr's model, simplistic   + Chemistry of Fireworks   + Chemistry Tutorial 5.04a Converting Mass To Moles   + Forged in the stars   + Halogens - YouTube   + Metals, Nonmetals and Metalloids   + Periodic Table   + quantum.   + The Colors of Light * Case Study – Scientist |
| **Suggested Activities and Performance Tasks**  [Labs](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/Labs)   * Average Atomic Mass * Copper chloride-Aluminum foil * Electron Spectroscopy * Metal, Nonmetal, or Metalloid * Properties of the Periodic Table – Glencoe p. 41   [Handouts and Assignments](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/Handouts%20and%20Assignments)   * Atomic Time Line * Average Atomic Mass Analogy * Chapter Survey * Cooperative Test Questions * Draw an Atom Learning Task * Element Silent Roundtable Task * GRASP - The Periodic Table Salesman * GRASP - Toxitown * Modern Lighting * Periodic Table * PERIODIC TRENDS PUZZLE * Periodicity * The Elements Forged in Stars Assignment * WebQuest - The Junkyard of Ideas | **Common Assessments**  [Mini Assessments](https://ccpsshare.clayton.k12.ga.us/academicpath/Documents/Science/Chemistry/Unit%202-%20FINDING%20PATTERNS-Organizing%20Chemical%20Knowledge%20on%20the%20Periodic%20Table/2nd-%20Unit%20Overview%20and%20Scope%20and%20Sequence/Mini%20Assessments)   * Electron Configuration Quiz * Periodic Table Quiz |
| **Differentiation**  Strategies DES and ESOL  **Vocabulary**  Categorize Vocabulary, Explain Key Concepts, Interactive Word Walls, Vocabulary with Context Clues, Word Banks, Vocabulary Journal  **Grasp Activities**  Pre-writing: Dictionary, Writing Sample, Use graphic organizer strategies such as diagrams, decision trees, flowcharts, Venn diagrams and webbing to assist with idea organization. Allow students to give short answer responses, Ask Specific Questions, Give the student a peer tutor to help compose written work and to help edit, Grade on knowledge of content rather than linguistic skills, Let students write in short phrases and simple sentences.  **Classroom Activities and Labs**  Flexible Grouping, Peer Tutoring, Small Group, One on One with Instructor, Modified Worksheets, Adjusted Length, Use Videos/Films/CD ROM/DVD check for student understanding through demonstration (reciprocal teaching, student interview, pictorial, chart, diagram, project etc.), Games, Group Reports/Projects, Interactive Website Assignments.  **Testing**  Help students on tests by identifying key words (highlighting), giving word banks, and have questions and answer read aloud to them, small group setting, modify length, Explain or paraphrase questions.  \*Teachers should follow Individual Educational Plans for DES and ESOL students.  **Gifted Learners**  Activities: Complete research on specified topic, create analogies for vocabulary, compare and contrast concepts, build three dimensional models, investigate various theories and report findings, create educational videos demonstrating knowledge of a learned concept, create concept for a lab, create a science newsletter after each unit depicting various learned concepts. | |