

Unit Plan Finding Order

Unit Cover Page	
Unit Title: Finding Order	Grade Levels: High School (9-12)
Subject/Topic Areas: Atomic Structure, Energy, Moles	
Key Words: atom, proton, neutron, electron, mole, molar mass, density, chemical property, physical property, mass, volume, significant figures, accuracy, precision, dimensional analysis, Avogadro's number, nuclear fusion, substance, isotope	
Designed by: georgiastandards.org	Time Frame: 3 weeks
School District: Peach County	School: Peach County High School
Brief Summary of Unit (including curricular context and unit goals): Students will explore our current understanding of the organization of matter, based on the accumulated body of knowledge about the structure of the atom and the creation of elements through nuclear fusion.	
Big Ideas:	
Stage 1—Identify Desired Results	
<p>Established Goals:</p> <p>SC1. Students will analyze the nature of matter and its classifications</p> <ol style="list-style-type: none"> a. Relate the role of nuclear fusion in producing essentially all elements heavier than hydrogen. b. Identify substances based on chemical and physical properties. <p>SC2. Students will relate how Law of Conservation of Matter is used to determine chemical composition in compounds and chemical reactions.</p> <ol style="list-style-type: none"> c. Apply concepts of the mole and Avogadro's number to conceptualize and calculate mass, moles, and molecules relationships. <p>SC3 Students will use the modern atomic theory to explain the characteristics of atoms.</p> <ol style="list-style-type: none"> a. Discriminate between 	
<p>What understandings are desired?</p> <p><i>Students will understand that....</i></p> <p style="padding-left: 40px;">Order can be found in atomic structure. Changes in this order are the result of energy changes in the system.</p> <p style="padding-left: 40px;">Matter is composed of a limited number of elements created through nuclear events in the universe involving tremendous amounts of energy.</p> <p style="padding-left: 40px;">Modern atomic theory of the structure and behavior of atoms rests on the combined work of many scientists.</p> <p style="padding-left: 40px;">Properties, which are a result of structure, can be used to identify matter and predict its behavior.</p> <p style="padding-left: 40px;">The fundamental unit for measuring amount of substance is the mole.</p>	
<p>What essential questions will be considered?</p> <p style="padding-left: 40px;"><i>Where did the elements come from?</i></p> <p style="padding-left: 40px;"><i>How has our current understanding of the atom developed over time?</i></p> <p style="padding-left: 40px;"><i>How does our current understanding of the atomic theory explain the characteristics of atoms?</i></p> <p style="padding-left: 40px;"><i>How do chemists deal with the small masses and huge numbers of atoms and molecules?</i></p> <p style="padding-left: 40px;"><i>How is the property of density determined?</i></p> <p style="padding-left: 40px;"><i>How can a physical property be used to identify a substance?</i></p>	

What key knowledge and skills will students acquire as a result of this unit?

Students will know that.....

- Order can be found in atomic structure. Changes in this order are the result of energy changes in the system.
- Matter is composed of a limited number of elements created through nuclear events in the universe involving tremendous amounts of energy.
- Modern atomic theory of the structure and behavior of atoms rests on the combined work of many scientists.
- Properties, which are a result of structure, can be used to identify matter and predict its behavior.
- The fundamental unit for measuring amount of substance is the mole.

Students will be able to.....

- Describe the current atomic theory and the current atomic structure.
- Diagram atoms using Bohr Diagrams and Lewis Structures.
- Explain how elements are made through nuclear fusion.
- Identify elements and its properties simply by its atomic structure.
- Calculate moles of atoms and molecules.

Stage 2—Determine Acceptable Evidence

Other Evidence (quizzes, tests, prompts, observations, dialogues, work samples):

☺ = Will be used in this unit

- Quiz – written ☺
- Quiz – oral
- Test ☺
- Worksheet: _____
- Essay
- Graphic Organizer ☺
- Writing to Learn ☺
- Graph ☺
- Concept Map
- Diagram ☺
- Illustration
- Short Answer
- Bell Work
- Other: Observation / Questioning ☺

Student Self-Assessment and Reflection:

- Journal
- Peer Review
- Summary ☺
- Discussion ☺
- Self Assessment ☺
- Students make up test (Best Test)
- Other: _____

	protons, neutrons, electrons, phase of matter, melting points, boiling points, physical properties, chemical properties, uses for element, draw Bohr diagrams and Lewis Structure)
Day 7 & 8	E.Q. same as 20th Go over Periodic Table Basics Activity from yesterday. Performance Assessment: Atomic Math Quest Assign “Royal Society of Chemists GRASP Task” The work already done on the Atomic Theory Timeline will provide the information needed for this task. This GRASP performance task will be a culminating activity at the end of the unit.
Day 9 & 10	E.Q. How do chemists deal with the small masses and huge numbers of atoms and molecules? Use graphic Organizer from Day 6 to review actual mass of atomic particles. Review and discuss the concept of atomic mass unit and how it relates to the fundamental unit, mole. Performance Task: “How big is big and how small is small?” Activity: Measure a Mole (Lab: Measuring grams of pure substances and then calculating moles.)
Day 11	E.Q. How can a physical property (density) be used to identify a substance? (if needed): How is density determined? Review physical and chemical properties using selected elements. Demonstration: Density Column Learning/Performance Task: “Density of Water” Activity
Day 12	Understandings: This lesson draws on all of the unit understandings. Class time to complete “Royal Society of Chemists Convention” (GRASP Activity) Performance Assessment if needed
Day 13	Understandings: This assessment draws on all of the unit understandings. Unit test: multiple choice, short answer and performance assessment (measuring grams and calculating moles).

Characteristics of Science Addressed	
SCSh1 –	Students will evaluate the importance of curiosity, honesty, openness & skepticism in science <input type="checkbox"/> Exhibit the above traits in their own scientific activities <input type="checkbox"/> Recognize that different explanations can often be given for the same evidence <input type="checkbox"/> Explain that further understanding of scientific problems relies on the design and execution of new experiments which may reinforce or weaken opposing explanations
SCSh2 –	Students will use standard safety procedures in lab and field investigations <input type="checkbox"/> Follow correct procedures for use of scientific apparatus <input type="checkbox"/> Demonstrate appropriate techniques in all laboratory situations <input type="checkbox"/> Follow correct protocol for identifying and reporting safety problems / violations
SCSh3 –	Students will identify and investigate problems scientifically <input type="checkbox"/> Suggest reasonable hypotheses for identifying problems <input type="checkbox"/> Develop procedures for solving scientific problems <input type="checkbox"/> Collect, organize, and record appropriate data <input type="checkbox"/> Graphically compare and analyze data points and/or summary statistics <input type="checkbox"/> Develop reasonable conclusions based on data collected <input type="checkbox"/> Evaluate whether conclusions are reasonable

SCSh4 – Students will use tools and instruments for observing, measuring, and manipulating scientific equipment and materials

- ❑ Develop and use systematic procedures for recording and organizing information
- ❑ Use technology to produce tables and graphs
- ❑ Use technology to develop, test, and revise experimental or mathematical models

SCSh5 – Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations

- ❑ Trace the source on any large disparity between estimated / calculated values to problems
- ❑ Consider possible effects of measurement errors on calculations
- ❑ Recognize the relationship between accuracy and precision
- ❑ Express appropriate numbers of significant figures, using scientific notation where needed
- ❑ Solve scientific problems by substituting quantitative values, using dimensional analysis, and/or simple algebraic formulas as appropriate

SCSh6 – Students will communicate scientific investigations and information clearly

- ❑ Write clear, coherent lab reports related to scientific investigations
- ❑ Write clear, coherent accounts of current scientific issues including possible alternative interpretations of the data
- ❑ Use data as evidence to support scientific arguments and claims in written or oral presentations
- ❑ Participate in group discussions of scientific investigation and current scientific issues

SCSh7 – Students will analyze how scientific knowledge is developed. They will understand that:

- ❑ The universe is a vast single system in which the basic principles are the same everywhere
- ❑ Universal principles are discovered through observation and experimental verification
- ❑ 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 typically occur after the observation of a new phenomenon or an insightful interpretation of existing data by a person or group.
- ❑ Hypotheses often cause scientists to develop new experiments that produce additional data
- ❑ Testing, revising, and occasionally rejecting new and old theories never ends.

SCSh8 – Students will understand important features of scientific inquiry. Students will apply the following to inquiry learning practices:

- ❑ Scientific investigators control the conditions of their experiments in order to produce valuable data
- ❑ 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
- ❑ Scientists use practices such as peer review and publication to reinforce the integrity of scientific activity and reporting.
- ❑ The merit of a new theory is judged by how well scientific data are explained by the new theory
- ❑ The ultimate goal of science is to develop an understanding of the natural universe which is free of biases.
- ❑ Science disciplines and traditions differ from one another in what is studied, techniques used, and outcomes sought.

SCSh9 – Students will enhance reading in all curriculum areas by:

- ❑ Reading in all curriculum areas
- ❑ Discussing books
- ❑ Building vocabulary
- ❑ Establishing context

Reflections on Unit

