RESOURCES **COMMON CORE** **SCIENCE CENTER** **PACING GUIDE**

Topic(s) of Study: Thinking and Working like a Scientist & Atomic Structure ***(Fusion Unit# 1-Lesson# 1)***

Bodies of Knowledge: Nature of Science**,** Physical Science

Big Idea(s): 1: Practice of Science, **2:** The Characteristics of Scientific Knowledge **3:** The Role of Theories, Laws, Hypothesis and Models **4**: Science and Society **5:** Properties of Matter

Essential Questions: What are the characteristics of science? **(1-1)** How do scientists develop explanations?**(1-2)** How do scientists discover things? **(1-3)** How do scientists show the results of investigations? **(1-4)** How do science and society work together? **(1-5)** What properties define matter? **(6-1)** What are the physical and chemical properties of matter? **(6-2)**

Vocabulary: science, empirical evidence, pseudoscience, theory, evidence, experiment, observation, hypothesis, independent matter, volume, mass, density, weight, physical and chemical property, electrical conductivity, solubility, boiling point, thermal conductivity, melting point, malleability

Common Inquiry Labs:

- **SC.8.N.1.1/SC.8.N.1.2**- Growing Bacteria Colonies Fusion Lab Manual pg. 16 **(1-3)**
- **SC.8.N.1.3/SC.8.N.3.2**-Create a Time Line of a Theory Fusion Lab Manual pg. 11**(1-2)**
- **SC.8.N.1.4**-Revising Your Hypothesis Fusion Lab Manual pg. 18**(1-3)**
- **SC.8.N.1.5/SC.N.1.6**- Models of Types of Solids Fusion Lab Manual pg. 25**(1-4)**
- **SC.8.N.2.1/SC.8.N.2.2**-Science-Based Commercials Fusion Lab Manual pg. 47**(1-1)**
- **SC.8.N.3.1**-Modeling the Expanding Universe Fusion Lab Manual pg. 57**(2-1)**
- **SC.8.N.4.1**-Science in the News Fusion Lab Manual pg. 28**(1-5)**
- **SC.8.N.4.2**-Science of Product Design Fusion Lab Manual pg. 32 **(1-5)**
- **SC.8.P.8.2** How much Mass Fusion Manual pg. 245 **(6-1)**
- **SC.8.P.8.3** Comparing Buoyancy Fusion Manual pg. 302 **(6-1)**
- **SC.8.P.8.4** Identifying Unknown Samples Fusion Manual pg. 317 **(6-2)**

	Technology Links:	
Lab Assistance: *Scientific Methods Skills* *Writing in the Sciences* *Cooperative Learning Activities*	**Science Links:** *Vocabulary Strategies* *Graphic Organizers and Reading Strategies* *Fold Notes* *Rubrics and Integrated Assessments* *Test Taking Strategies*	**Science Fair Assistance:** *Math in Science* *Planning for Science Fair and Competitions* *Lessons for Substitutes*

Above Level On Level Below Level

NGSSS	Outline of Content	Targets
SC.8.N.1.3 Use phrases such as "results support" or "fail to support" in science, understanding that science does not offer conclusive 'proof' of a knowledge claim. **(1-2)** **SC.8.N.1.4** Explain how hypotheses are valuable if they lead to further investigations, even if they turn out not to be supported by the data. **(1-3)** **SC.8.N.1.5** Analyze the methods used to develop a scientific explanation as seen in different fields of science**. (1-2)** **SC.8.N.1.6** Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence. **(1-3, 1-4)** **SC.8.N.2.1** Distinguish between scientific and pseudoscientific ideas**.(1-1)** **SC.8.N.2.2** Discuss what characterizes science and its methods. **(1-1)** **SC.8.N.4.1** Explain that science is one of the processes that can be used to inform decision making at the community, state, national, and international levels. **(1-5)** **SC.8.N.4.2** Explain how political, social, and economic concerns can affect science, and vice versa.	**Unit 1 Lesson 1** **Science and Scientific Explanations** 1. Define science and empirical evidence. 2. Evaluate the strengths and limitations of science in terms of scope, topic, and explanations. 3. Describe the nature of and evaluate scientific explanations. **Traits of Scientists** 1 .List the traits people use when they engage in science, assessing how each aids in advancing science. 2. Recognize that science requires both logic and imagination in the collection and evaluation of empirical evidence. **Science and Pseudoscience** 1.Define pseudoscience 2. Distinguish between scientific and pseudoscientific claims. **Unit 1 Lesson 2** **Scientific Knowledge** **Developing Explanations** 1. Describe different methods scientists may use to run investigations and develop scientific explanation. **Supporting Theories** 1. Identify a scientific theory and assess the evidence that supports it. 2. 2. Describe the evidence that caused scientists to modify the theory. 3. Understand that a scientific theory is based on scientific evidence that supports an explanation **Evaluating Evidence** 1. Distinguish between reliable and unreliable scientific sources. **Unit 1 Lesson 3** **Scientific Investigations** **Conducting a Scientific Experiment** 1. Define hypothesis, independent and dependent variables,	• Explain why scientific investigations should be replicable, by using an example such as cold fusion, as proposed by Fleischmann-Pens announcement which was not replicable. • Justify conclusions based upon all the available evidence, not on expressed opinions such as the difference between geocentric and heliocentric models of the solar system . • Develop a hypothesis with one independent variable (tested variable), and document it in your science journal. • Explain the difference between an experiment and other types of scientific investigations such as fieldwork, surveys, and models using tools such as, a T chart. • Describe the creative means scientists must use to design an investigation, by explaining a historical example, such as, the Wright Brothers airplane designs. • Recognize that scientists who make contributions to scientific knowledge come from all kinds of backgrounds and possess varied talents, interests, and goals by examining several historical figures in science. • Recognize systematic inference as one form of scientific investigation by completing a series of inferences about the weather. • Use appropriate reference materials to support scientific investigations of various types, such as systematic

(1-5)	observation and data. 2. Explain the major processes involved in conducting a scientific investigation. **Types of Scientific Investigations** 1. Define experiment. 2. Differentiate between experiment and other scientific investigations 3. Describe the benefits and limitations of experiments and other types of scientific investigations **Characteristics of Good Scientific Investigations** 1. List some characteristics of good scientific investigations 2. Evaluate the quality of scientific information from different sources. **Unit 1 Lesson 4** **Representing Data** **Tables** 1. Define independent and dependent variables. 2. Construct tables 3. Interpret data in tables. **Graphs** 1. Construct graphs 2. Interpret data in graphs **Models** 1. Define model. 2. Use models to represent aspects of the natural world 3. Select appropriate models to relate scientific data 4. Identify advantages and limitations of models. **Unit 1 Lesson 5** **Science and Society** **Impact of Science on Society** 1. Describe how scientific thought and investigation have had a tremendous impact on society throughout history 2. Identify made important scientists who have contributions	observation or experiments by citing sources in a bibliography format. • Conduct, discuss, and compare similar investigations by working cooperatively in groups and display and present data using charts, tables and graphics. • Distinguish the difference between a scientific law and theory vs. a societal law by using a Venn Diagram. • Give examples of how advances in technology have affected scientific theories and laws. • Compare and contrast the terms that describe examples of scientific knowledge such as: theory, law, hypothesis, and model by exhibiting examples of each. • Distinguish science from other activities involving thought by listing characteristics specific to science (refer to the scientific thinking handbook). • Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered by using an example such as development of scientific technology. • Explain why models are used in science to observe processes that happen too slowly, too quickly, or are too small or vast for direct observation. • Give examples of visual/physical, mathematical, and conceptual models as used in science. • Explain that science is based on evidence based facts, ex. the difference between

	throughout history **Science and Decision Making** 1. Describe how science and scientific thinking can help inform decision making at the community, state, national, and international levels. 2. Explain that political, social, and economic concerns can affect science and scientific investigations, and vice versa.	science and pseudoscience, by comparing astronomy and astrology. • Distinguish between a scientific theory and a general claim by using a Venn Diagram. • Distinguish between laws and theories by understanding that laws describe *the what* and theories explain *the why by comparing and contrasting using a Venn Diagram*.
SC.8.P.8.2 Differentiate between weight and mass, recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional, to mass. **(6-1)Cognitive Complexity: Moderate** **SC.8.P.8.3** Explore and describe the densities of various materials through measurement of their masses and volume **(6-1) Cognitive Complexity: Moderate** **SC.8.P.8.4** Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measures: for example, density, thermal or electrical conductivity solubility, magnetic properties, melting and boiling points and know that these properties are independent of the amount of the sample**.(6-2) Cognitive Complexity: Moderate** **SC.912.P.8.2 :** Differentiate between physical and chemical properties and physical and chemical changes of matter. **Cognitive Complexity: Moderate**	**Unit 6 Lesson 1 (P.8.2/8.3/8.4)** **Introduction to Matter** **Matter** 1. Define Matter **Mass and Weight** 1. Define mass and weight 2. Distinguish between amass and weight 3. Describe how to measure the mass and the weight of an object. **Volume** 1. Define volume 2. Determine the volume of a rectangular solid. 3. Determine the volume of an object using displacement. **Density** 1. Define density 2. Describe how mass, volume, and density are related. 3. Calculate density, mass or volume given two of the three variables. **Unit 6 Lesson 2 (P.8.4)** **Properties of Matter** **Physical Properties** 1. Define physical property. 2. List common physical properties of matter **Chemical Properties** 1. Define chemical property 2. List common chemical properties of matter	• Recognize that similar fluids of different densities (air and/or water) will usually remain separated by calculating the densities then having students combine fluids to justify their mathematical conclusions. • Demonstrates that most substances can exist as a solid, liquid, or gas, depending on temperature by conducting a lab that takes at least 2 substances through the three phases while tracking the temperature during each phase and then compiling the data on a graph (explain why scientific investigations should be replicable). • Determines the physical properties of an object using quantitative observations such as freezing point, boiling point, melting point by creating a data table of those properties and distinguishing the differences between qualitative and quantitative data at a later date and then reaching a class consensus. • Explores the relationship between mass and volume of

	Comparing Physical and Chemical Properties 1. Distinguish physical properties from chemical properties. **Using Properties to Indentify Unknown Substances.** 1. List some characteristics properties of matter 2. Use characteristic properties to identify substances.	various objects through measurements by calculating the density (using mass/volume) of various substances. I • Compares the densities of various substances to the density of water (1 g/ml) by using the density formula to predict whether substances will sink or float.
SC.8.N.1.1 Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions. **(1-1, 2, 3)** **SC.8.N.1.2** Design and conduct a study using repeated trials and replication**. (1-3)**	**Lab Safety** **ScienceSaurus Handbook pages 021-045** **Fusion Lab Manual pages xi-xxii** **Lab Equipment** **ScienceSaurus Hand Book pages 045-052** **I Lab Equipment** A. What are examples of lab equipment in your science class? B. What is the lab equipment used for? **II Lab Safety** A. TEACHER NOTE: download and refer to safety contract on resource page. B. Identify and discuss lab safety equipment in classrooms. C. Lab Safety Plan (refer to objective. **III Science Fair** A. Refer to ISEF (International Science and Engineering Fair) forms on resource page.	• Define a scientific problem or question from the eighth grade curriculum, and document them in your science journal. • Distinguish between dependent (measured variable) and independent variables (tested variable) and controls in a variety of activities, such as concept maps, laboratory manual activities. • Collect and organize data in charts, tables, and graphics. • Cite examples of scientific laws • Present individual or group data after a scientific investigation, analyze the evidence, and reach a class consensus. • Recognize, identify and know how to safely and accurately use lab equipment: • Explain appropriate science lab behavior (no playing or pushing, no food/drink, no running, do not touch anything until told, etc…) • Describe the importance of following all written or oral directions of the teacher • Identify protective clothing worn in the lab: safety goggles, aprons, gloves

		• Recognize that different types of wastes are disposed of in specific ways • Create a lab safety plan for the classroom
MA.6.S.6.2 Select and analyze the measures of central tendency or variability to represent, describe, analyze, and/or summarize a data set for the purposes of answering questions appropriately. **Cognitive Complexity: High** **MA.6.4.2.2** Construct and analyze tables, graphs and equations to describe linear functions and other simple relations using both common language and algebraic notation. **(1-4)** **LA.6.4.2.2** The student will record information (e.g., observations, notes, lists, charts, legends) related to a topic, including visual aids to organize and record information and include a list of sources used. **(1-2) (1-4)** **MA.6.A.3.6** Construct and analyze tables, graphs and equations to describe linear functions and other simple relations using both common language and algebraic notation**.(6-1)(6-2)** **LA.8.2.2.3** The student will organize information to show understanding or relationships among facts, ideas, and events (e.g., representing key points within text through charting, mapping, paraphrasing, summarizing, or comparing/contrasting). **(6-1)(6-2)**		