

II Grade 8 Structure and Properties of Matter G71

Content Area: **Science**
Course(s):
Time Period: **Generic Time Period**
Length: **40 Instructional Days**
Status: **Published**

Stage 1: Desired Results

What are atoms, and what are they made of?

How is the Periodic Table used to classify and provide information about all known elements?

How do elements join together to form chemical compounds?

Is it possible to tell if two substances mixed or if they reacted with each other?

Unit Overview/ Rationale

Students build understandings of what occurs at the atomic and molecular scale. Students apply their understanding that pure substances have characteristic properties and are made from a single type of atom or molecule. They also provide a molecular level accounts to explain states of matter and changes between states. The crosscutting concepts of cause and effect, scale, proportion and quantity, structure and function, interdependence of science, engineering, and technology, and the influence of science, engineering and technology on society and the natural world provide a framework for understanding the disciplinary core ideas. Students demonstrate grade appropriate proficiency in developing and using models, and obtaining, evaluating, and communicating information. Students are also expected to use the scientific and engineering practices to demonstrate understanding of the core ideas.

Standards & Indicators

Develop models to describe the atomic composition of simple molecules and extended structures. **[Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different**

molecules with different types of atoms. The substructure of atoms and the periodic table are learned in high school chemistry.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.] (MS-PS1-1)

Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. [Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrogen chloride.] [Assessment Boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.] (MS-PS1- 2)

MS-PS1-1	Develop models to describe the atomic composition of simple molecules and extended structures.
MS-PS1-2	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.

Big Ideas - Students will understand that...

Within this unit, students will use informational text and models (which can include student-generated drawings, 3-D ball-and-stick structures, or computer representations) to understand that matter is composed of atoms and molecules. These models should reflect that substances are made from different types of atoms. Student models can be manipulated to show that molecules can be disassembled into their various atoms and reassembled into new substances according to chemical reactions. This scientific knowledge can be used to explain the properties of substances. Students will examine and differentiate between physical and chemical properties of matter. They are limited to the analysis of the following characteristic properties: density, melting point, boiling point, solubility, flammability, and odor. This analysis of properties serves as evidence to support that chemical reactions of substances cause a rearrangement of atoms to form different molecules.

Students will also recognize that they are using models to observe phenomena too small to be seen. Students who demonstrate this understanding can develop or modify a model of simple molecules to describe the molecules' atomic composition. Examples of molecules that can be modeled include water, oxygen, carbon dioxide, ammonia, and methanol. Additionally, students will develop and modify a model that describes the atomic composition of an extended structure showing a pattern of repeating subunits. Examples may include sodium chloride and diamonds. Due to the repeating subunit patterns, models can include student-generated drawings, 3-D ball-and-stick structures, and computer representations.

Building upon these experiences, students will analyze and interpret data on the properties of substances in order to provide evidence that a chemical reaction has occurred. They will also analyze and interpret data to determine similarities and differences in findings. Students will recognize that macroscopic patterns are related to the nature of microscopic and atomic-level structure. They will use patterns to identify cause-and-effect relationships and graphs and charts to identify patterns in data.

Essential Questions - What provocative questions will foster inquiry and transfer of learning

Chapter 9 - Understanding the Atom

- What is an atom?
- How would you describe the size of an atom?
- How has the atomic model changed over time?
- What happens during nuclear decay?
- How does a neutral atom change when its number of protons, electrons, or neutrons changes?

Chapter 10 - The Periodic Table

- How are elements arranged on the periodic table?
- What can you learn about elements from the periodic table?
- What elements are metals?
- What are the properties of metals?
- Where are nonmetals and metalloids on the periodic table?
- What are the properties of nonmetals and metalloids?

Chapter 11 - Elements and Chemical Bonds

- How is an electron's energy related to its distance from the nucleus?
- Why do atoms gain, lose, or share electrons?
- How do elements differ from the compounds they form?

- What are some common properties of a covalent compound?
- Why is water a polar compound?
- What is an ionic compound?
- how do metallic bonds differ from covalent and ionic bonds?

Content - Students will know...

- Substances are made from different types of atoms.
- Atoms are the basic units of matter.
- Substances combine with one another in various ways.
- Molecules are two or more atoms joined together.
- Atoms form molecules that range in size from two to thousands of atoms.
- Molecules can be simple or very complex. • Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).
- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
- Substances react chemically in characteristic ways.
- In a chemical process, the atoms that make up the original substances are regrouped into different molecules; these new substances have different properties from those of the reactants.
- The analysis of data on the properties of products and reactants can be used to determine whether a chemical process has occurred.
- Density, melting point, boiling point, solubility, flammability, and odor are characteristic properties that can be used to identify a pure substance.
- Macroscopic patterns are related to the nature of the atomic-level structure of a substance.

Skills - Students will be able to...

- Develop a model of a simple molecule.

- Use the model of the simple molecule to describe its atomic composition.
- Develop a model of an extended structure.
- Use the model of the extended structure to describe its repeating subunits.
- Analyze and interpret data to determine similarities and differences from results of chemical reactions between substances before and after they undergo a chemical process.
- Analyze and interpret data on the properties of substances before and after they undergo a chemical process.
- Identify and describe possible correlation and causation relationships evidenced in chemical reactions.
- Make logical and conceptual connections between evidence that chemical reactions have occurred and explanations of the properties of substances before and after they undergo a chemical process

Stage 2: Assessment Evidence

Assessment

End of Unit Assessments (multiple-choice and constructed responses.)

Mini-Lab Performance-based Assessments

Essential Question Responses

Page Keeley Science Probes (formative assessments)

Stations Labs Tasks

Stage 3: Learning Plan

Learning Activities

Academic Vocabulary Activities: journals, e-flash cards, puzzles, e-games

Mini-Labs (student engagement)

Launch Labs (teacher and/or student led)

Inquiry Labs (use of inquiry skills)

Interactive technology: classroom presentations, science videos, transparencies, interactive whiteboard activities, online assessments

Language arts strategies: make tables, answer guiding questions, organizing ideas, illustrating ideas, outlines, infer meaning, compare and contrast, make connections

Accommodations for students with IEPs and learning difficulties:

-Visual sentence frames using academic vocabulary for discussion

-Use visuals to show important vocabulary for students to make connections

-Have students share their text to text, text to world, and text to self-connections

-One on one teacher support for comprehension and fluency

- Modeling and scaffolding to highlight specific moments, vocabulary, and figurative language, and using context clues to use inference skills

-Show and discuss exemplar writing pieces before students being their own

-Close reading chapters/chunks

- Re-reading key sections for fluency and comprehension
- Colored overlays and reading windows to reduce visual distractions
- Sentence starters for writing assignments
- Vocabulary word banks and strategies (Say it, Define it, Act it)
- Think aloud and Think-Pair-Share

For ELL students:

- Visuals for vocabulary
- Word wall
- Additional word work such as illustrating vocabulary and playing vocabulary games
- Partner reading
- Choral reading

-Think-aloud while modeling writing

-Analyze sample summaries before writing

-Color-coded sticky notes for close reading to identify which sticky notes pertain to vocabulary

-Questions about text, etc.

-When students make an error in speaking, answer or restate what they said using the correct form without drawing attention to the mistake.

For gifted students:

-Have students complete extended research projects on a related issue of their choice as it pertains to a content area

-Students perform a written/oral debate on topics related to content

Resources

Glencoe iScience, McGraw Hill, 2012

Online resource website: **connected.mcgraw-hill.com**

Paige Keeley Science Probes

BrainPop shorts

"What's Science Got to Do With It" video segments

Kesler's 5E Lessons and Station Labs

Unit Reflections & Teacher Notes
