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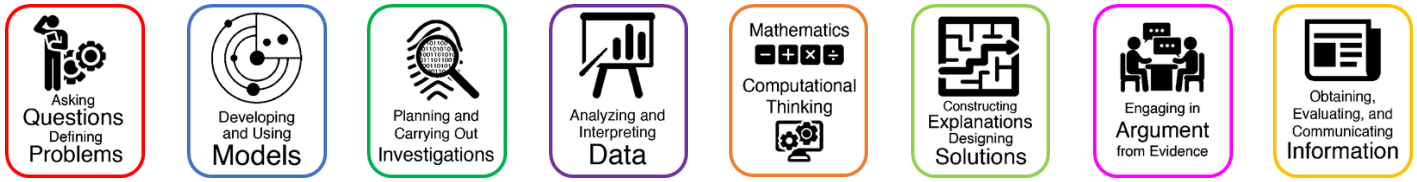
UNIT NARRATIVE

Unit 1 is based on the phenomenon question, “Where does the mass of a tree come from?” or What makes up the majority of the mass a tree.” This phenomenon is a common misconception and lack of understanding by many students and adults as seen in these videos Photosynthesis at MIT The Mass of Trees -- Where Does It Come From? .

Lesson 1 introduces the students to the phenomenon and students will measure the height and diameter at breast height of the tree and then use the measurements to determine the mass of the tree. In lesson 2, students will review pure substances and mixtures and explain by modeling how matter is classified as elements, compounds, homogeneous mixtures, or heterogeneous mixtures. Students will revisit how the physical properties can be used to identify elements on the periodic tables as metals, nonmetals and metalloids in lessons 3 and 4. Lessons 5 and 6 students will review how to distinguish between physical and chemical changes in matter. In lessons 7-9 students will continue to explore chemical reactions and chemical formulas. In lessons 7-9 students will use the periodic table to identify the atoms and the number of each kind within a chemical formula and a chemical equation. Students will review relative density by examining the density of different types of wood and if they will sink or float in various substances. In lessons 11-12 students will investigate how mass and energy are conserved in chemical reactions and relate the conservation of mass to the rearrangement of atoms using chemical equations, including respiration and photosynthesis. Lessons 13-14 will circle back to the phenomenon question and include a practice 3D formative assessment writing task that teachers can use to pre-assess students’ conceptual understanding of the content.

Focus on Disciplinary Literacy

In science, disciplinary literacy is synonymous with the science and engineering practices. The SEPs are the context through which all science concepts should be taught. In the lessons, you will find the Science and Engineering practices icons when the SEPs are being explicitly used by students.



CONTENT STANDARDS

Below are the standards **taught** and **assessed** in this unit.

Readiness Standards
8.6E Investigate how mass is conserved in chemical reactions and relate conservation of mass to the rearrangement of atoms using chemical equations, including photosynthesis 7.6B use the periodic table to identify the atoms and the number of each kind within a chemical formula;
Supporting Standards
7.6C distinguish between physical and chemical changes in matter; 6.6C identify elements on the periodic table as metals, nonmetals, metalloids, and rare Earth elements based on their physical properties and importance to modern life; 6.6D compare the density of substances relative to various fluids 6.6E identify the formation of a new substance by using the evidence of a possible chemical change, including production of a gas, change in thermal energy, production of a precipitate, and color change. 6.8B describe how energy is conserved through transfers and transformations in systems such as ~~electrical circuits, food webs, amusement park rides, or~~ photosynthesis
Other Non-Test Standards Reviewed in this Unit
8.6A Explain by modeling how matter is classified as elements, compounds, homogeneous mixtures, or heterogeneous mixtures. 8.6B Use the periodic table to identify the atoms involved in chemical reactions.

UNDERSTANDINGS AND QUESTIONS

Important big ideas and processes for the unit.

Key Understandings

- When a chemical change occurs in a closed system, the total mass of the materials does not change (nor does the type and number of atoms); the total mass of the reactants is equal to the total mass of the products. (Lesson 02)
- Matter can be classified into two categories: pure substances and mixtures. Pure substances are further classified into elements and compounds. Mixtures are physically combined structures that can be separated into their original components. There are two types of mixture, homogeneous mixtures and heterogenous mixtures. (Lesson 02)
- Elements can be classified into metals, nonmetals, metalloids, and rare Earth elements based on their distinct physical and chemical properties. (Lesson 03 and 04)
- Metals typically exhibit properties such as high electrical and thermal conductivity, malleability, ductility, and a shiny appearance. (Lesson 03 and 04)
- Nonmetals generally have lower conductivity, are brittle in solid form, and may be gases, liquids, or dull solids. (Lesson 03 and 04)
- Metalloids have properties intermediate between metals and nonmetals, often showing mixed characteristics. (Lesson 03 and 04)
- Rare Earth elements possess unique magnetic, luminescent, and electrochemical properties. (Lesson 03 and 04)
- Matter undergoes physical and chemical changes that can be distinguished by their effects on the substance's identity and properties. Physical changes alter the form or appearance of matter without changing its composition, while chemical changes result in the formation of new substances with different properties and compositions. (Lessons 05 and 06)
- Chemical formulas are used to identify elements in compounds and molecules. (Lessons 07 and 08)
- In a compound, subscripts are used only when there are 2 or more atoms of a particular element. Subscripts are not used if a compound contains only 1 atom of an element. (Lessons 07 and 08)
- In a chemical change or reaction, the original substances' chemical composition is changed. The atoms in the original substances, called the reactants, are rearranged to form completely new substances, which are called the products. The properties of the products are different from the properties of the reactants. (Lesson 09)
- Chemical changes occur when bonds between atoms are broken and/or made. We cannot see the actual breaking or formation of the bonds between the atoms, but we can see other evidence of chemical changes. (Lesson 09)
- The density of a substance determines whether it will float or sink into another substance. An object/substance will float if it is less dense than the liquid it is placed in. An object/ substance will sink if it is more dense than the liquid it is placed in. (Lesson 10)
- Matter is neither created nor destroyed in a chemical reaction; it is simply rearranged. The total mass of reactants equals the total mass of products**.** (Lessons 10 and 11)
- During a chemical reaction, atoms of the reactants are rearranged to form new substances in the products, but the total number of each type of atom remains constant. (Lessons 10 and 11)

Key Questions

- How can we measure the height of an object that is inaccessible? (Lesson 01)
- Where does the mass of a tree come from? (Lesson 01)
- What are pure substances? (Lesson 02)

- What are mixtures? (Lesson 02)
- How are elements and compounds different? (Lesson 02)
- How are heterogenous and homogenous mixtures different? (Lesson 02)
- How do the physical properties of metals, nonmetals, metalloids, and rare Earth elements differ? (Lesson 03 and 04)
- What criteria are used to classify an element as a metal, nonmetal, metalloid, or rare Earth element? (Lesson 03 and 04)
- What patterns can be observed in the periodic table regarding the distribution of metals, nonmetals, metalloids, and rare Earth elements? (Lesson 03 and 04)
- How does the arrangement of the periodic table help predict the properties and behavior of elements? (Lesson 03 and 04)
- What defines a physical change and how does it differ from a chemical change? (Lessons 05 and 06)
- How can we identify whether a change in matter is physical or chemical? (Lessons 05 and 06)
- What observable signs indicate a chemical change has occurred? (Lessons 05 and 06)
- What do subscripts in a chemical formula tell us? (Lessons 07 and 08)
- What do coefficients in a chemical formula tell us? (Lessons 07 and 08)
- What happens to the atoms of the reactants in a chemical reaction? (Lesson 09)
- Where do the atoms in the products of a chemical reaction come from? (Lesson 09)
- What is the difference is hardwood and softwood? (Lesson 10)
- Why do somethings sink, and some things float in water? Do those same items float in oil? (Lesson 10)
- What is the Law of Conservation of Mass, and why is it important in chemical reactions? (Lessons 11 and 12)
- How can we demonstrate that mass is conserved during a chemical reaction? (Lessons 11 and 12)
- In what ways does the rearrangement of atoms during a chemical reaction illustrate the conservation of mass? (Lessons 11 and 12)

Common Misconceptions

- Students often believe that pant matter comes from the soil. (Lesson 01)
- Students also often believe that the sun's energy is changed into plant matter during the process of photosynthesis. (Lesson 01)
- Students think that elements and compounds are the same. (Lesson 02)
- Students think that mixtures are compounds and that compounds are mixtures. (Lesson 02)
- Students think that compounds are not pure substances. (Lesson 02)
- Students think the categorization of matter as elements, compounds, or mixtures is permanent and unalterable instead of understanding that the classification of matter is dependent on its composition. (Lesson 02)
- Thinking that metalloids are a form of metal because of their name (Lesson 03 and 04)
- Confusing "malleable" and "ductile" (Lesson 03 and 04)
- Thinking all metals are magnetic (Lesson 03 and 04)
- Confusing the location of metalloids and rare earth metals on the periodic table (Lesson 03 and 04)
- Ignoring all relevant properties and focusing solely on one property (e.g., luster or conductivity) (Lesson 03 and 04)
- Thinking that both physical and chemical changes create a new substance (Lessons 05 and 06)
- Thinking that matter can be created or destroyed (Lessons 05 and 06)
- Thinking that a color change is always evidence of a chemical change, forgetting it can be a sign of a physical change (Lessons 05 and 06)

- Thinking that a change in state (e.g., solid to liquid) is always a chemical change (Lessons 05 and 06)
- Thinking that the formation of a gas automatically signifies a chemical change (Lessons 05 and 06)
- Assuming any change in energy (e.g., heat or light) indicates a chemical change, forgetting both physical and chemical changes can involve energy changes (Lessons 05 and 06)
- Assuming that a rapid change must be a chemical change, and a slow change must be a physical change (Lessons 05 and 06)
- Thinking that chemical symbols with lowercase letters represent more than one type of element (Lessons 07 and 08)
- Thinking that no subscript means something other than the representation of only one atom present (Lessons 07 and 08)
- Thinking that all elements are represented by a capital letter, forgetting they can include upper and lowercase letters (Lessons 07 and 08)
- Not adding atoms of the same element if they are in the same compound (e.g., HOH has two hydrogen atoms and one oxygen atom) (Lessons 07 and 08)
- Confusing the symbols of elements, especially when they are similar [e.g., Carbon (C) and Calcium (Ca)] (Lessons 07 and 08)
- Incorrectly using parentheses in chemical formulas, leading to incorrect interpretations of compound compositions (Lessons 07 and 08)
- Having incomplete knowledge of the trends and how to use the periodic table to find information (e.g., atomic number, atomic mass, and the arrangement of elements) (Lessons 07 and 08)
- Thinking that chemical reactions create new atoms instead of just rearranging them. (Lesson 09)
- Thinking all chemical formulas contain the same number of elements. (Lesson 09)
- Interpreting chemical equations incorrectly, leading to errors in identifying the elements involved. (Lesson 09)
- Not adding atoms of the same element if they are in the same compound (e.g., HOH has two hydrogen atoms and one oxygen atom) (Lesson 09)
- The smaller something is, the less density it has. So smaller objects are less dense than larger objects. (Lesson 10)
- If you cut a piece of wood in half, the density of each piece is now half of the original piece. (Lesson 10)
- Thinking any observable change in the appearance of a substance indicates a chemical reaction (Lessons 11 and Lessons 12)
- Thinking mass is created or destroyed during chemical reactions (Lessons 11 and 12)
- Misinterpreting subscripts and coefficients in chemical equations, leading to mistakes about the number of atoms involved in reactions. (Lessons 11 and 12)
- Thinking the size or volume of a substance is directly proportional to its mass (Lessons 11 and 12)

ROADMAP

AT A Glance: Unit #1: Investigating Chemical Reactions				
Day	**Date**	**Lesson**		**Lesson Title**
1		01	8.6E	What is the Mass?
2		02	8.6A	What is the Matter?
3		03	6.6C	Elements on the Periodic Table Part 1
4		04	6.6C	Elements on the Periodic Table Part 2
5		05	7.6C 6.6E	Physical and Chemical Changes Part 1
6		06	7.6C 6.6E	Physical and Chemical Changes Part 2
7		07	7.6B	Compounds and Chemical Formulas Part 1
8		08	7.6B	Compounds and Chemical Formulas Part 2
9		09	8.6B	Analyzing Chemical Formulas and Equations
10		10	6.6D	Relative Density
11		11	8.6E 6.8B	Law of Conservation of Mass and Energy Part 1
12		12	8.6E 6.8B	Law of Conservation of Mass and Energy Part 2
13		13	All	The Mass of the Tree Formative Task Part 1
14		14	All	The Mass of the Tree Formative Task Part 2
UE1		Unit Exam		TX_Sci_8thScience_F25_UE1 Scanning Deadline: 9/17/2026
FB		FB		Feedback Day. This day is intended to provide feedback on the unit exam. This can be scheduled the day after the exam or when the exam is graded.

Lesson 01: What is the Mass?	Date:

Objective

SWBAT

Measure trees to estimate their mass as part of an exploration of photosynthesis and plant growth by

1. constructing a clinometer and use it to calculate the height of the tree.
2. using a measuring tape to find the diameter at breast height (DBH) of the tree.
3. using the Height and DBH Table to extrapolate the mass of the tree.

Standards

TEKS

Working toward:

8.6E Investigate how mass is conserved in chemical reactions and relate conservation of mass to the rearrangement of atoms using chemical equations, including photosynthesis.

Vocabulary

Clinometer

Science Practices

4. Analyzing and interpreting data
5. Using mathematics and computational thinking

Recurring Themes and Concepts

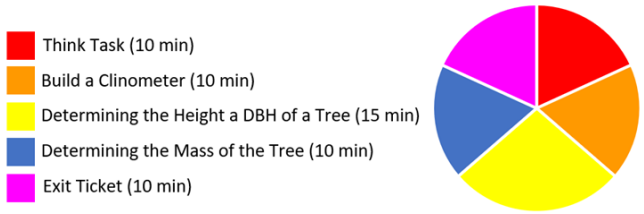
E. Energy and Matter

Instructional Notes

This lesson introduces students to the phenomenon question "Where does the mass of a tree come from?".

- Students will be asked to predict what they think the mass of a tree from the school yard is.
- Students will make a clinometer which is a tool used to measure an inaccessible height.
- Students will measure the height and diameter at breast height of the tree and then use the measurements to determine the mass of the tree.
- Students will write initial explanations of where the mass of the tree comes from.

After this lesson, students will further explore the concepts of chemical changes and conservation of mass. Then, they will revisit the idea of where the mass of the tree comes from a revise their explanations to develop a model to go with their explanations.



Lesson Look Fors

Look for teachers to:

☐ Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.
☐ Promote the use of student groups during the lab activity.
☐ Promote safe practices during field explorations.

Look for students to:

☐ Engage in discourse and productive struggle.
☐ Justify their reasoning and support their ideas with evidence.
☐ Write initial explanations of where the mass of a tree comes from.

Students Do and Know

Do

- Students will make a clinometer.
- Students will use the clinometer to calculate the height of a tree.
- Students will determine the diameter at breast height of the tree.
- Students will use the height and diameter at breast height to estimate the mass of the tree.
- Students will develop an initial explanation to the question "Where does the mass of a tree come from?".

Know

- A clinometer can be used to calculate the height of an inaccessible object.
- The diameter at breast height can be found by measuring the circumference of the tree at 4.5 feet from the ground and dividing it by pi.

Lesson 02: What is the Matter?	Date:

Objective

SWBAT classify matter as elements, compounds, homogenous mixtures, or heterogeneous mixtures by creating models.

Standards

TEKS

8.6A Explain by modeling how matter is classified as elements, compounds, homogeneous mixtures, or heterogeneous mixtures.

Vocabulary

Compounds
Diatomic Element
Elements
Heterogenous Mixture
Homogenous Mixture
Mixture
Pure Substance

Science Practices

2. Developing and using models
8. Obtaining, evaluating, and communicating information

Recurring Themes and Concepts

A. Patterns

Instructional Notes

- Students are asked to draw a model of a mixture created in a lab situation then they work with a group to use their learning from previous grade levels to determine how to separate the mixture using physical properties of matter.
- Students read background information and create concrete models of elements, compounds, homogenous mixtures, and heterogenous mixtures based upon information from the reading.
- Students then move to representational stage of the CRA progression by completing a card sort in which they classify objects into the categories of elements, compounds, homogenous mixtures, and heterogenous mixtures. Students will also justify why objects were classified into the groups in order to show their understanding of the definitions of elements, compounds, homogenous mixtures, and heterogeneous mixtures.
- Students will draw models of elements, compounds, homogenous mixtures, or heterogeneous mixtures.

Thinking Task (10 min)
Modeling Matter (20 min)
Classfying Matter (20 min)
Exit Ticket (10 min)

Lesson Look Fors

Look for teachers to:

☐ Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.
☐ Promote the use of student groups and monitor during the modeling and card sort activity.

Look for students to:

☐ Engage in discourse and productive struggle.
☐ Justify their reasoning and support their ideas with evidence.
☐ Create concrete and abstract models of elements, compounds, homogeneous and heterogeneous mixtures.

Students Do and Know

Do

- Review what they know about physical properties if matter to determine how to separate a mixture.
- Build models of elements, compounds, homogeneous, and heterogenous mixtures.
- Students will complete a card short to categorize elements, compounds, homogeneous, and heterogenous mixtures.
- Students will draw models of elements, compounds, homogeneous, and heterogenous mixtures.

Know

- Elements are the simplest complete chemical substances.
- A compound consists of two or more types of elements held together by bonds.
- A mixture is composed of different types of atoms or molecules that are not chemically bonded.
- A heterogeneous mixture is a mixture of two or more chemical substances where the various components can be visually distinguished.
- A homogeneous mixture is a type of mixture in which the composition is uniform and every part of the solution has the same properties.

Lesson 03: Elements on the Periodic Table Part 1	Date:

Objective

SWBAT identify elements as metals, nonmetals, metalloids, and rare earth metals by investigating their physical properties and identify their importance to modern life and location on the periodic table.

Standards

TEKS

6.6C identify elements on the periodic table as metals, nonmetals, metalloids, and rare Earth elements based on their physical properties and importance to modern life;

Vocabulary

Brittle
Conductivity
Ductility
Insulators
Luster
Malleability
Metal
Nonmetal
Physical Property

Science Practices

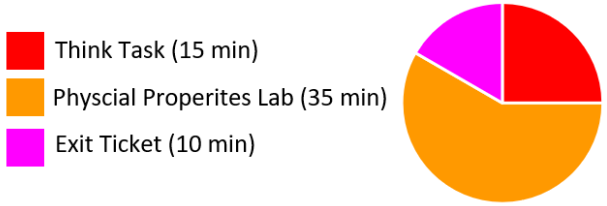
3. ~~Planning and~~ carrying out investigations
4. Analyzing and interpreting data
6. Constructing explanations and designing solutions

Recurring Themes and Concepts

A. Patterns

Instructional Notes

- Students will investigate the physical properties of sample elements and identify the basic characteristics of metals and nonmetals.
- Students will identify the samples as metals or nonmetals based on their characteristics.
- Students will use the physical properties of two unknown element samples and classify the elements as metal or nonmetals.



Lesson Look Fors

Look for teachers to:

☐ ☐ Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.
☐ Monitor students as they are completing the lab.
☐ Lead a class discussion around the properties of metals and nonmetals and stamp the key points AFTER the students have developed a list of properties based on data from the lab.

Look for students to:

☐ Participate in the investigation and discover the physical properties of metals and nonmetals.

Students Do and Know

Do	• Investigate the physical properties of the physical properties of sample elements. • Classify the samples as metals or nonmetals based on their physical properties. • Use the physical properties of unknown element samples and classify the elements as metal or nonmetals.
Know	• Metals typically exhibit properties such as high electrical and thermal conductivity, malleability, ductility, and a shiny appearance. • Nonmetals generally have lower conductivity, are brittle in solid form, and may be gases, liquids, or dull solids.

Lesson 04: Elements on the Periodic Table Part 2	Date:

Objective

SWBAT identify elements as metals, nonmetals, metalloids, and rare earth metals by investigating their physical properties and identify their importance to modern life and location on the periodic table.

Standards

TEKS

6.6C identify elements on the periodic table as metals, nonmetals, metalloids, and rare Earth elements based on their physical properties and importance to modern life;

Vocabulary

Brittle
Conductivity
Ductility
Insulators
Luster
Malleability
Metal
Nonmetal
Physical Property

Science Practices

3. ~~Planning and~~ carrying out investigations
4. Analyzing and interpreting data
6. Constructing explanations and designing solutions

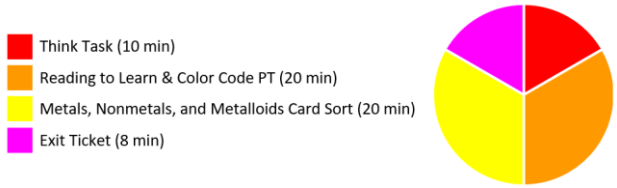
Recurring Themes and Concepts

A. Patterns

Instructional Notes

- Students will analyze properties of metalloids and attempt to classify them.
- Students will engage in a reading to learn activity and color coding of the periodic table to deepen their understanding of metals, nonmetals, and metalloids.
- Students will complete a card sort to identify properties, location on the periodic table, and examples of metals, nonmetals, and metalloids.

Students will apply their knowledge of physical properties to classify unknown elements.



Lesson Look Fors

Look for teachers to:

☐ Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.
☐ Engage students in the reading to learn and monitor students as they are color coding the periodic table.

Look for students to:

☐ Analyze physical properties of elements to classify as metals, nonmetals and metalloids.

Students Do and Know

Do

- Use the physical properties of unknown element samples and classify the elements as metal, nonmetals or metalloids.

Know

- Metals typically exhibit properties such as high electrical and thermal conductivity, malleability, ductility, and a shiny appearance. Metals are generally found on the left and center of the periodic table.
- Nonmetals generally have lower conductivity, are brittle in solid form, and may be gases, liquids, or dull solids. Nonmetals are found on the right side of the periodic table.
- Metalloids have properties intermediate between metals and nonmetals, often showing mixed characteristics. Metalloids are located along the staircase line dividing metals and nonmetals.
- Rare Earth elements possess unique magnetic, luminescent, and electrochemical properties. Rare Earth elements are typically found in the f-block (lanthanides and actinides).

Lesson 05: Physical and Chemical Changes Part 1	Date:

Objective

SWBAT distinguish between physical and chemical changes in matter by observing and identifying if the key indicators a chemical change are present.

Standards

TEKS

7.6C distinguish between physical and chemical changes in matter

Vocabulary

Chemical Change
Physical Change
Precipitate

Science Practices

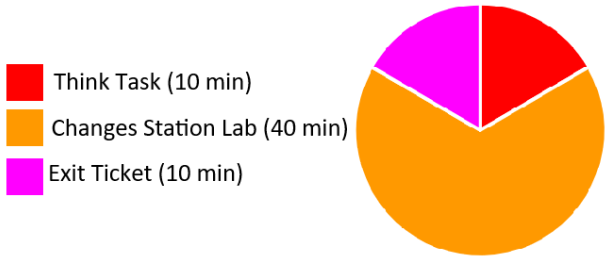
3. Planning and carrying out investigations
7. Engaging in argument from evidence

Recurring Themes and Concepts

B. Cause and Effect

Instructional Notes

- Students will complete an investigation in which they will experience both chemical and physical changes. Students will make observations. During a post-lab discussion, the teacher will highlight the evidence of a chemical change the students observed in the stations.
- Students will engage in argument from evidence to identify if a physical or chemical change has taken place. Students will draw a model to demonstrate a chemical and physical change.



Lesson Look Fors

Look for teachers to:

☐ Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.
☐ Monitor students as they are conducting the lab and ensure safe lab practices
☐ Lead a class discussion post lab and discuss the type of change (physical or chemical) and the evidence to support the identification of the type of changes.

Look for students to:

☐ Participate in the investigation and make observations to obtain evidence of chemical or physical changes.
☐ Engage in argument from evidence to identify physical and chemical changes. Students will provide evidence for their reasoning.

Students Do and Know

Do	• Investigate physical and chemical changes. • Engage in argument from evidence to identify physical and chemical changes. Students will provide evidence for their reasoning.
Know	• Physical changes affect the form or state of a substance but do not alter its chemical composition. Examples include changes in state (melting, freezing, vaporization), shape, size, and texture. • Physical changes affect the form or state of a substance but do not alter its chemical composition. Examples include changes in state (melting, freezing, vaporization), shape, size, and texture

Lesson 06: Physical and Chemical Changes Part 2	Date:

Objective

SWBAT distinguish between physical and chemical changes in matter by observing and identifying if the key indicators a chemical change are present.

Standards

TEKS

7.6C distinguish between physical and chemical changes in matter

Vocabulary

Chemical Change
Physical Change
Precipitate

Science Practices

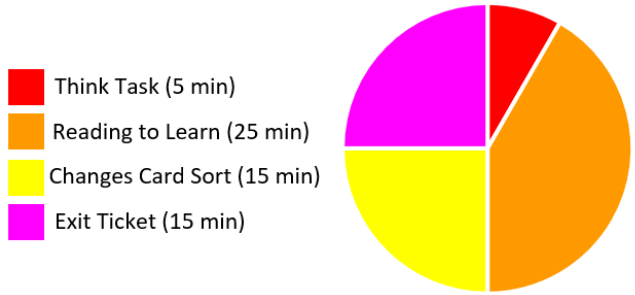
6. Constructing explanations and designing solutions
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Recurring Themes and Concepts

B. Cause and Effect

Instructional Notes

- Students will complete a Reading to Learn to build their conceptual knowledge of physical and chemical changes.
- Students will complete a card sort with images of physical or chemical changes and determine what type of change and provide evidence to support their claims.
- Students will analyze evidence collected during an investigation and make a claim as to whether a physical or chemical change took place. Students will support their claim with evidence from the investigation.



Lesson Look Fors

Look for teachers to:

☐ Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.
☐ Engage students in the reading to learn activity.

Look for students to:

☐ Engage in the reading to learn to deepen their conceptual understanding.
☐ Analyze observations to identify physical or chemical changes and provide evidence to support the claims.

Students Do and Know

Do	• Complete a reading to learn activity to deepen their understanding of physical and chemical changes. • Analyze observations to identify physical or chemical changes and provide evidence to support the claims.
Know	• Matter undergoes physical and chemical changes that can be distinguished by their effects on the substance's identity and properties. • Physical changes alter the form or appearance of matter without changing its composition, while chemical changes result in the formation of new substances with different properties and compositions.

Lesson 07: Compounds and Chemical Formulas Part 1	Date:

Objective

SWBAT identify the name and number of the different atoms in a chemical formula by analyzing the symbols, coefficients, and subscripts in the formula.

Standards

TEKS

7.6B use the periodic table to identify the atoms and the number of each kind within a chemical formula

Vocabulary

Chemical Formula
Coefficient
Formula Unit
Molecule
Particle
Subscript

Science Practices

2. Developing and using models
7. Engaging in argument from evidence

Recurring Themes and Concepts

A. Patterns

Instructional Notes

- Students will complete a PhET simulation to explore molecules. They will also see the use of subscripts and coefficients in chemical formulas.
- Students will determine if a given chemical formula represents an element, a molecule of an element, a molecule of a compound, or a formula unit of a compound.

Think Task (8 min)
PhET Build A Molecule (30 min)
Elements, Molecules Compounds & Formula Units (20 min)
Exit Ticket (8 min)

Lesson Look Fors

Look for teachers to:

☐ Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.
☐ Engage students in the PhET simulation and monitor students as the work.
☐ Lead students in a class discussion and centered around the Elements, Molecules, Compounds, and Formula Units activity.

Look for students to:

☐ Engage in discourse and productive struggle.
☐ Engage in the simulation to build there conceptual understanding of chemical formulas, subscripts and coefficients.

Students Do and Know

Do	• Analyze the symbols, coefficients, and subscripts in a chemical the formula to identify the atoms and number of each atom present in the compound.
Know	• Chemical formulas are used to identify elements in compounds and molecules. • In a compound, subscripts are used only when there are 2 or more atoms of a particular element. Subscripts are not used if a compound contains only 1 atom of an element.

Lesson 08: Compounds and Chemical Formulas Part 2	Date:

Objective

SWBAT identify the name and number of the different atoms in a chemical formula by analyzing the symbols, coefficients, and subscripts in the formula.

Standards

TEKS

7.6B use the periodic table to identify the atoms and the number of each kind within a chemical formula

Vocabulary

Chemical Formula
Coefficient
Formula Unit
Molecule
Particle
Subscript

Science Practices

2. Developing and using models
7. Engaging in argument from evidence

Recurring Themes and Concepts

A. Patterns

Instructional Notes

- Students will analyze models of compounds and match the model to the chemical formulas of the compound.
- Students will engage in a reading to learn activity to deepen their understanding of chemical formulas, including the use of subscripts and coefficients.
- Students will use chemical formulas and models to identify and count the number of atoms present.
- Students will identify and count the number of atoms present in chemical formulas.

Think Task (10 min)
Matching Compound Models and Formulas (15 min)
Analyzing Chemical Formulas (20 min)
Determining Atoms Practice (10 min)
Exit Ticket (5 min)

Lesson Look Fors

Look for teachers to:

☐ Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.
☐ Engage students in the card sort and gallery walk.
☐ Support students during the reading to learn.

Look for students to:

☐ Engage in discourse and productive struggle.
☐ Analyze models of compounds and match the model to the chemical formulas.
☐ Complete the reading to learn to deepen their understanding of chemical formulas.

Students Do and Know

Do

- Complete a card match of models of compounds and chemical formula
- Engage in a reading to learn activity
- Use chemical formulas and models to identify and count the number of atoms present in the formula

Know

- Chemical formulas are used to identify elements in compounds and molecules.
- In a compound, subscripts are used only when there are 2 or more atoms of a particular element. Subscripts are not used if a compound contains only 1 atom of an element.

Lesson 09: Analyzing Chemical Formulas and Equations	Date:

Objective

SWBAT identify the name and number of the different atoms in a chemical equation by analyzing the symbols, coefficients, and subscripts in the equation.

Standards

TEKS

8.6B Use the periodic table to identify the atoms involved in chemical reactions

Vocabulary

Chemical Reaction
Product
Reactants

Science Practices

2. Developing and using models

Recurring Themes and Concepts

E. Energy and Matter

Instructional Notes

- Use a simulation to combine reactants, identify if a chemical reaction has taken place and identify the atoms involved in the chemical reactions.
- Students will model the chemical reaction that takes place during photosynthesis and identify the atoms involved in chemical reactions.
- Students will analyze chemical equations and identify the elements and the number of atoms of each element in the products and reactants of equation.

Think Task (5 min)
Chemical Changes Gizmo (20 min)
Modeling Photosynthesis (20 min)
Interpreting Chemical Equations Practice (10 min)
Exit Ticket (10 min)

Lesson Look Fors

Look for teachers to:

☐ Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.

Look for students to:

☐ Engage in discourse and productive struggle.
☐ Use the explore learning gizmo to model chemical reactions
☐ Use everyday objects to model the chemical reaction that takes place during photosynthesis
☐ Analyze chemical equations and identify the elements and the number of atoms of each element in the products and reactants of equation.

Students Do and Know

Do	• Model the chemicals and identify the atoms involved in chemical reactions. • Analyze chemical equations and identify the elements and the number of atoms of each element in the products and reactants of equation.
Know	• In a chemical change or reaction, the original substances' chemical composition is changed. The atoms in the original substances, called the reactants, are rearranged to form completely new substances, which are called the products. The properties of the products are different from the properties of the reactants.

Lesson 10: Relative Density	Date:

Objective

SWBAT compare the relative density of substances in various fluids (sink or float and forming layers) by modeling

Standards

TEKS

6.6D compare the density of substances relative to various fluids

Vocabulary

Density

Science Practices

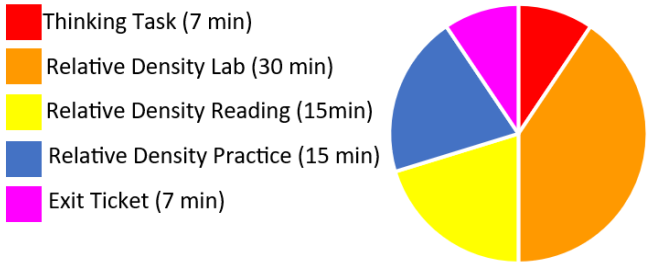
2. Developing and using models
3. Planning and Carrying Out Investigations
8. Obtaining, evaluating, and communicating information

Recurring Themes and Concepts

D. Systems and System Models

Instructional Notes

- Students will engage in activity before content and explore the concept of relative density.
- Students will deepen their understanding of the concept of relative density during a reading to learn activity.
- Students will practice vocabulary, determining if objects will sink or float in different fluids and how different fluids will layer based on density.



Lesson Look Fors

Look for teachers to:

☐ Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.

☐ Promote the use of partners and whole class discussion.

Look for students to:

☐ Engage in discourse and productive struggle

☐ Justify their reasoning and support their ideas with evidence.

Students Do and Know

Do

- Students will determine if substances sink or float and how they will form layers in various fluids based on density.

Know

- The density of a substance determines whether it will float or sink in another substance. An object/substance will float if it is less dense than the liquid it is placed in. An object/ substance will sink if it is more dense than the liquid it is placed in.

Lesson 11: Law of Conservation of Mass Part 1	Date:

Objective

SWBAT describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved by developing and using models.

Standards

TEKS

8.6E Investigate how mass is conserved in chemical reactions and relate conservation of mass to the rearrangement of atoms using chemical equations, including photosynthesis

6.8B describe how energy is conserved through transfers and transformations in systems such as ~~electrical circuits, food webs, amusement park rides, or~~ photosynthesis

Vocabulary

Balanced Equation
Closed System
Conservation of Mass

Science Practices

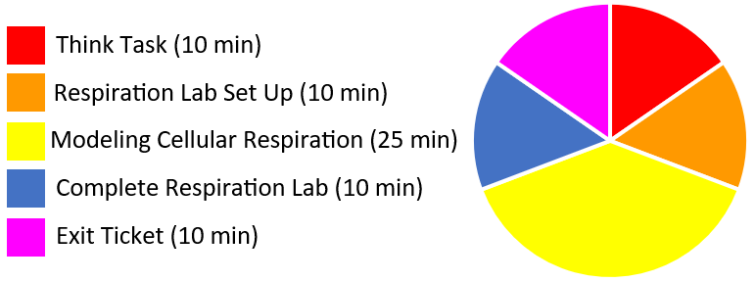
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data

Recurring Themes and Concepts

B. Cause and Effect
E. Energy and Matter

Instructional Notes

- Students will observe the chemical reaction of cellular respiration.
- Students will model the conservation of mass that occurs within the reaction of cellular respiration.
- Students will describe the how number of atoms of each element in a chemical equation should be equal on the reactant side and the product side.



Lesson Look Fors

Look for teachers to:

- ☐ Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.
- ☐ Monitor students for lab safety as they are conducting the investigation.
- ☐ Engage students in the laboratory investigation.
- ☐ Engage students in the modeling activity.

Look for students to:

- ☐ Engage in discourse and productive struggle.
- ☐ Engage in the laboratory investigation
- ☐ Engage in the modeling investigation.

Students Do and Know

Do	• Observe the chemical reaction of cellular respiration. • Model the chemical reaction of cellular respiration and describe the number of atoms of each element in the reactants and the products.
Know	• During a chemical reaction, atoms of the reactants are rearranged to form new substances in the products, but the total number of each type of atom remains constant.

Lesson 12: Law of Conservation of Mass Part 2	Date:

Objective

SWBAT describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved by developing and using models.

Standards

TEKS

8.6E Investigate how mass is conserved in chemical reactions and relate conservation of mass to the rearrangement of atoms using chemical equations, including photosynthesis

6.8B describe how energy is conserved through transfers and transformations in systems such as ~~electrical circuits, food webs, amusement park rides, or~~ photosynthesis

Vocabulary

Balanced Equation
Closed System
Conservation of Mass

Science Practices

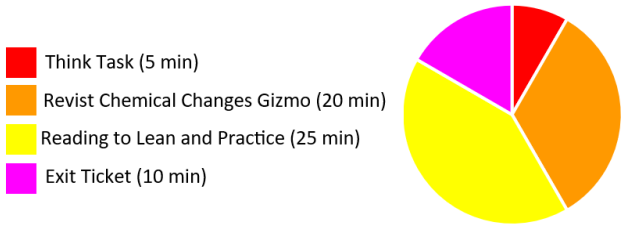
2. Developing and using models
5. Using mathematics and computational thinking
8. Obtaining, evaluating, and communicating information

Recurring Themes and Concepts

E. Energy and Matter

Instructional Notes

- Students will revisit the explore learning gizmo but this time they will be looking for evidence of the conservation of mass.
- Students will engage in a reading to learn to deepen their understanding of the conservation of mass. They will also complete conservation of mass practice problems.
- Students will describe how mass is conserved in chemical reactions and relate conservation of mass to the rearrangement of atoms using chemical equations.



Lesson Look Fors

Look for teachers to:

☐ Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.
☐ Monitor students as they engage in the simulation.
☐ Engage students in the reading to learn.

Look for students to:

☐ Engage in discourse and productive struggle.
☐ Engage in the simulation and the reading to learn.
☐ Describe the conservation of mass in terms of the rearrangement of atoms and mass of reactants and products.

Students Do and Know

Do

- Use a simulation to observe evidence of the conservation of mass.
- Engage in a reading to learn to deepen their understanding of the conservation of mass. They will also complete conservation of mass practice problems.
- Describe how mass is conserved in chemical reactions and relate conservation of mass to the rearrangement of atoms using chemical equations.

Know

- Matter is neither created nor destroyed in a chemical reaction; it is simply rearranged. The total mass of reactants equals the total mass of products.
- During a chemical reaction, atoms of the reactants are rearranged to form new substances in the products, but the total number of each type of atom remains constant.

Lessons 13 and 13: Mass of a Tree Formative Assessment Task	Date:

Objective

SWBAT write a scientific explanation regarding where the mass of a tree comes from by applying the concepts they have learned in this unit.

Standards

TEKS

- 8.6E Investigate how mass is conserved in chemical reactions and relate conservation of mass to the rearrangement of atoms using chemical equations, including photosynthesis
- 7.6B use the periodic table to identify the atoms and the number of each kind within a chemical formula;
- 7.6C distinguish between physical and chemical changes in matter;
- 6.6D compare the density of substances relative to various fluids
- 6.6E identify the formation of a new substance by using the evidence of a possible chemical change, including production of a gas, change in thermal energy, production of a precipitate, and color change.
-
- 6.6C identify elements on the periodic table as metals, nonmetals, metalloids, and rare Earth elements based on their physical properties and importance to modern life;
- 6.8B describe how energy is conserved through transfers and transformations in systems such as ~~electrical circuits, food webs, amusement park rides, or~~ photosynthesis

Instructional Notes

- Students will complete a reading to learn to make the connection between photosynthesis and respiration. The reading also discusses how plants use glucose to build other molecules such as cellulose.
- Students will complete the formative assessment task and apply the knowledge of the concepts they learned in this unit

Suggested Lesson Agenda

Day 1:
Thinking Task: 5 Min
Reading to Learn: 20 min
Mass of a Tree Assessment: 20 min
Exit Ticket: 10 min

Day 2:
Thinking Task: 5 Min
Mass of a Tree Assessment: 45 min
Exit Ticket: 10 min

Lesson Look Fors

Look for teachers to:

☐ Engage students in ABC. (Activity before content) The teacher should stamp key points AFTER students have had the time to engage in the content (productive struggle) and discuss.
☐ Provide scaffolding for the students so that all students can engage in this formative assessment task.

Look for students to:

☐ Engage in discourse and productive struggle.
☐ Complete the formative assessment task and apply the concepts learned in this unit.

Students Do and Know

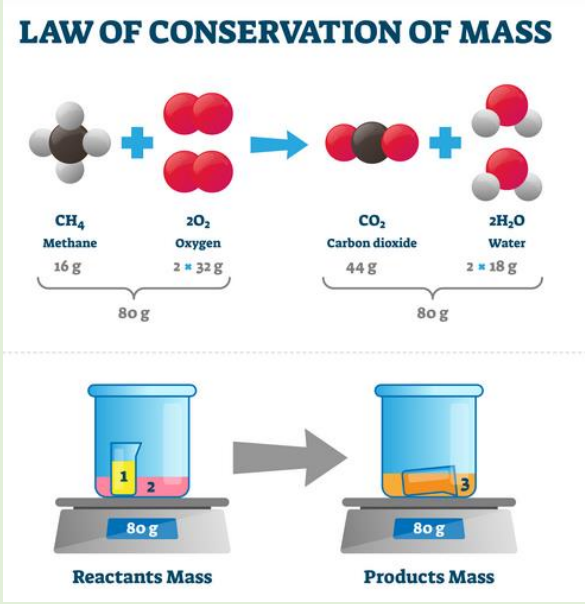
	• Complete the formative assessment task
	• Apply the concepts learned in this unit.

• 8.6A Explain by modeling how matter is classified as elements, compounds, homogeneous mixtures, or heterogeneous mixtures. • 8.6B Use the periodic table to identify the atoms involved in chemical reactions		
Science Practices		
6. Constructing explanations and designing solutions 7. Engaging in argument from evidence 8. Obtaining, evaluating, and communicating information		
Recurring Themes and Concepts		
E. Energy and Matter		

UNPACKED STANDARDS

Focus standards for this unit.

Standard:	8.6E Investigate how mass is conserved in chemical reactions and relate conservation of mass to the rearrangement of atoms using chemical equations, including photosynthesis

Specificity	**Content Builder**
Cognition: Investigate Content: How mass is conserved in chemical reactions Including, but not limited to: • Law of conservation of mass – Matter is not created nor destroyed, but it can be changed from one form to another. • Chemical reaction – a change caused by the interaction of two or more substances (reactants) resulting in the formation of new substances (products) • Investigate – include conducting chemical reactions in a beaker while on a scale o Including chemical reactions involving the production of a gas; capturing the gas can show conservation of mass. Cognition: Relate Content: Conservation of mass to the rearrangement of atoms using chemical equations. Including, but not limited to: • Chemical equation – a representation of a chemical reaction using chemical symbols, numbers, and a symbol → o Conservation of mass and chemical equations • The number of atoms of each element are equal in the reactants (left side of the arrow) and the products (right side of the arrow) of a chemical equation. o Possible ways to relate the conservation of mass to the rearrangement of atoms to include: ▪ Use objects, such as math cubes or gram stackers, to represent atoms. ➢ Count atoms of each element in reactants and compare to products. ➢ Calculate the number of atoms of each element in a chemical equation and determine if they are equal on each side of the equation. ▪ Use a scale to compare the mass of the representations of the reactants and products. ▪ Model the conservation of mass using the chemical equation for photosynthesis. ➢ Photosynthesis – a process that converts carbon dioxide and water into sugar and oxygen ➢ $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$	Chemical reactions produce observable changes such as production of a gas, change in thermal energy, production of a precipitate, and color change. Scientists study these changes in controlled experiments to confirm the formation of new substances. In chemical reactions, atoms rearrange while keeping their total mass. Mass conservation is a key principle: total mass remains constant during physical or chemical changes. This standard explores mass conservation, its connection to atomic rearrangements in chemical equations, and its importance in photosynthesis. Students may struggle when trying to understand chemical equations in the context of mass conservation. All chemical equations must follow the law of conservation of mass, which states that mass is neither created nor destroyed in a nonnuclear reaction. Therefore, the total mass of the reactants must equal the total mass of the products. **Modeling Conservation of Mass** Chemical equations are written to represent the chemical changes that occur during chemical reactions. A chemical equation consists of the formulas for the starting substances (the reactants) and the formulas for the substances formed in the chemical reaction (the products). The two are separated by an arrow symbol (→) which means yields. Individual chemical formulas are separated from others by a plus sign. 

Instructional Implications

When you teach this concept, remember to:

- Use models, visual aids, and interactive simulations to help students see how atoms rearrange in chemical equations.
- Encourage students to create concept maps or flowcharts to visualize the sequence of events during a chemical reaction.
- Conduct investigations that produce changes in color, gas formation, or the creation of precipitates to observe the changes that occur. Encourage them to record their observations and discuss the evidence of new substance formation.
- Conduct investigations to demonstrate mass conservation in reactions. Students can measure and compare reactant and product masses to understand mass preservation.
- Provide practice in reading and interpreting chemical equations, focusing on mass conservation.
- Link mass conservation to stoichiometry, which deals with the quantitative relationship between reactants and products in reactions.
- Helps students see the Recurring Theme and Concept of *cause and effect* in this standard.

Student Misconceptions

- Thinking any observable change in the appearance of a substance indicates a chemical reaction
- Thinking mass is created or destroyed during chemical reactions
- Misinterpreting subscripts and coefficients in chemical equations, leading to mistakes about the number of atoms involved in reactions
- Thinking the size or volume of a substance is directly proportional to its mass

Notes

- Review evidence of a chemical change from the Grade 6 TEKS 6.6E: color change, gas production, solid forms, and temperature / energy change.

Possible STAAR Stimuli

Investigation	Demonstration	Chart/Table	Diagram
Visual/Image/Illustration	Model	Formula/Equation	

Standard:	7.6B use the periodic table to identify the atoms and the number of each kind within a chemical formula;

Specificity

Cognition: Identify
Content: The atoms and the number of each kind within a chemical formula using the Periodic Table of Elements.

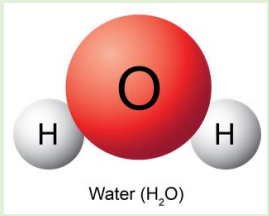
Including, but not limited to:

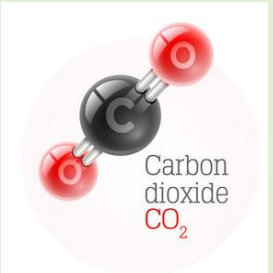
- Chemical formula – identifies the elements in a compound and the proportions or ratios of the elements
  - Each type of element in the compound is represented by its chemical symbol.
    - The periodic table of elements can be used to look up the name of an element using its chemical symbol.
      - CO – carbon monoxide
        - C = carbon
        - O = oxygen
      - NaCl – sodium chloride
        - Na = sodium
        - Cl = chlorine
  - The proportion (ratio) of each element in a compound is constant.
    - The number of atoms represented by specific ratios as determined by subscripts
    - If there is no subscript present, a single atom of that element is present in the molecule.
      - CO_2 – carbon dioxide
        - C = one carbon atom
        - O_2 = two oxygen atoms
      - H_2O – water
        - H_2 = two hydrogen atoms
        - O = one oxygen atom
      - $C_6H_{12}O_6$ – glucose
        - C_6 = six carbon atoms
        - H_{12} = twelve hydrogen atoms
        - O_6 = six oxygen atoms

Content Builder

To use the periodic table to identify the atoms and the number of each kind within a chemical formula, look for the chemical symbols of the elements in the formula. The chemical symbols are usually one or two letters representing each element. Then, use the subscripts in the formula to determine the number of atoms of each element present. The subscript next to the chemical symbol indicates how many atoms of that element are present in one molecule of the compound. Students may struggle to grasp the relationship between the symbols representing elements and the formulas indicating the composition of compounds.

Chemical formulas, such as H_2O and CO_2, are used to provide information about the type and number of atoms present in a substance. The subscript numbers after each element indicate the number of atoms of that element in the formula. If there is no number after the element, then there is only one atom of that element in the formula. For example, the chemical formula for H_2O has two hydrogen atoms and one oxygen atom. CO_2 has one carbon atom and two oxygen atoms.





Instructional Implications

- Help students understand that chemical symbols represent specific elements. Provide examples and exercises where they can practice matching chemical symbols to corresponding elements on the periodic table.
- Explain that subscripts in a chemical formula represent the number of atoms of each element in the compound.
- Provide opportunities for students to practice using the periodic table to identify the atoms and the number of each kind within a chemical formula.
- Provide students with molecular model kits or other hands-on tools to physically construct and visualize atoms and molecules. This will help them understand how atoms bond together to form molecules in compounds and how elements consist of single atoms.
- Introduce real-world examples of elements and compounds in everyday life to make the concept more relatable.

	• Engage students in exercises to identify chemical symbols and interpret chemical formulas. Vary the complexity of chemical formulas, including subscripts and parentheses. • Help students see the Recurring Theme and Concept of *patterns* in reading the periodic table.
	Student Misconceptions
	Students may make the following mistakes: • Thinking that chemical symbols with lowercase letters represent more than one type of element • Thinking that no subscript means something other than the representation of only one atom present • Thinking that all elements are represented by a capital letter, forgetting they can include upper and lowercase letters • Not adding atoms of the same element if they are in the same compound (e.g., HOH has two hydrogen atoms and one oxygen atom) • Confusing the symbols of elements, especially when they are similar [e.g., Carbon (C) and Calcium (Ca)] • Incorrectly using parentheses in chemical formulas, leading to incorrect interpretations of compound compositions
	Notes
	7.6(B) is eligible for assessment on Grade 8 STAAR. (Note: Standards designated as "readiness" are essential for success in the current grade. Standards may have a different designation when assessed on Grade 8 STAAR.)
	Possible STAAR Stimuli

Investigation	Chart/Table	Diagram
Model	Visual/Image	Formula/Equation

Standard:	7.6C distinguish between physical and chemical changes in matter;
Specificity	**Content Builder**

Cognition: Distinguish
Content: Between physical and chemical changes in matter
 	
Including but not limited to:
• Physical properties – color, texture, odor, conductivity, insulator, magnetic, buoyancy, solubility, boiling and melting point, mass, and luster
• Physical change – change which alters the physical properties of a substance without changing its identity
  ○ Possible examples of physical changes in matter:
  ▪ Freezing, melting, or boiling water
  ▪ Shredding paper
	Physical changes in matter are changes that do not alter the chemical composition of a substance. They only affect a substance's physical properties such as shape, size, state (solid, liquid, gas), or phase transitions (melting, freezing, vaporization). Examples of physical changes include melting ice, boiling water, and crushing a can.
	Chemical changes, on the other hand, involve a rearrangement of atoms and result in the formation of new substances with different chemical properties. Examples of chemical changes include burning wood to produce ash and smoke, rusting of iron, and baking a cake where the ingredients undergo a chemical reaction to form a new product. Students may struggle recognizing the formation of new substances with different chemical properties, especially if the change is subtle or not readily observable.

	Instructional Implications

- Melting ice cream
- Breaking glass
- Dissolving sugar

- Chemical properties – reactivity, flammability, toxicity, and corrosivity
- Chemical change – a change in matter that produces a new substance
  - Signs of a chemical change:
    - Production of a gas
      - ➢ Odor
      - ➢ Bubbling
    - Change in temperature
    - Production of a precipitate
      - ➢ Precipitate – the formation of solids from a solution
    - Color change (permanent)
    - Production of light energy
    - Production of sound energy
  - Possible examples of chemical changes in matter:
    - Burning wood
    - Rusting of metal
    - Photosynthesis

Possible STAAR Stimuli

Investigation	Demonstration	Chart/Table
Visual/Image/Illustration	Model	Informational Text/List

When you teach this concept, remember to:

- Clearly define each type of change and highlight the key differences between them. Discuss everyday situations where these changes occur (e.g., melting ice, cutting paper, cooking food, burning wood, or rusting of metal).
- Conduct hands-on experiments and demonstrations that showcase both physical and chemical changes. Allow students to observe and record their observations during these demonstrations.
- Engage students in critical thinking activities where they analyze scenarios and determine whether a physical or chemical change occurred. Encourage them to explain their reasoning and evidence.

Student Misconceptions

- Thinking that both physical and chemical changes create a new substance
- Thinking that matter can be created or destroyed
- Thinking that a color change is always evidence of a chemical change, forgetting it can be a sign of a physical change
- Thinking that a change in state (e.g., solid to liquid) is always a chemical change
- Thinking that the formation of a gas automatically signifies a chemical change
- Assuming any change in energy (e.g., heat or light) indicates a chemical change, forgetting both physical and chemical changes can involve energy changes
  Assuming that a rapid change must be a chemical change and a slow change must be a physical change

Notes

7.6(C) is eligible for assessment on Grade 8 STAAR. (Note: Standards designated as "readiness" are essential for success in the current grade. Standards may have a different designation when assessed on Grade 8 STAAR.)

Standard:	6.6C identify elements on the periodic table as metals, nonmetals, metalloids, and rare Earth elements based on their physical properties and importance to modern life

Specificity

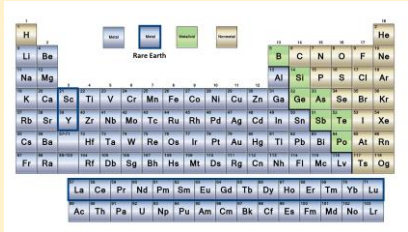
Cognition: Identify
Content: elements on the periodic table as metals, nonmetals, metalloids, and rare Earth elements

Including, but not limited to:

- Periodic table – an organized table of all the chemical elements in order of increasing atomic number
- Element – a pure substance composed of the same type of atom throughout and cannot be broken down into simpler substances

Content Builder

- Elements are organized on the periodic table based on their physical properties.



- Physical property – a feature of matter that can be observed or measured to describe and differentiate between samples of matter
  - Luster – the ability to reflect light
  - Conductivity – ability to conduct thermal and / or electric energy
  - Malleability – the ability to be hammered into thin sheets
  - Ductility – the ability to be pulled into wire
  - Magnetism – the ability to interact with a magnet
  - States of matter – the form that the matter is existing in
  - Density (relative) – ability of an element to sink or float in water
- Metals
  - Largest number of elements that are mostly solids at room temperature, have luster, and are good conductors of heat and electricity
  - The metals are on the left-hand side of the periodic table and separated from nonmetals by the zigzag line in the periodic table.
  - Physical Properties
    - High luster; shiny
    - Metals are good conductors of thermal energy and conductivity.
    - Metals are malleable.
    - Metals are ductile.
    - Only iron, nickel, and cobalt are magnetic.
    - Most metals are solids at room temperature, except for mercury (Hg); a liquid at room temperature.
    - Denser than water, with a few exceptions
  - Important to modern life
    - Copper wire for electrical circuits and HVAC units
    - Important vitamins in our foods; magnesium, calcium, and potassium
    - Used for manufacturing and industry; iron
- Nonmetals
  - Elements that are mostly liquids and gases at room temperature and bad conductors of heat and electricity
  - Found on the right side of the periodic table of elements; there are 20 nonmetal elements
  - Physical Properties
    - Low luster; dull
    - Nonmetals are not good conductors of thermal energy and conductivity.
    - Nonmetals are not malleable; brittle
    - Nonmetals are not ductile.
    - Nonmetals are not magnetic.
    - Most nonmetals are gasses; however, some are solids and liquids at room temperature.

- Metals, nonmetals, and metalloids can be classified by comparing physical properties such as luster, conductivity, ductility, magnetism, density, state of matter and malleability**.**
- To identify elements on the periodic table based on their physical properties, look for traits such as conductivity, malleability, ductility, and appearance. Metals are good conductors with a lustrous appearance, while nonmetals lack metallic properties. Metalloids have intermediate traits, and rare Earth elements share unique electronic configurations. Metals, nonmetals, and metalloids are classified based on a combination of properties, not just one.
- To identify elements based on their importance to modern life, consider their applications in technology, electronics, manufacturing, and energy production. Metals are essential for construction and electrical uses, nonmetals are employed in various chemical processes, metalloids are used in semiconductor devices, and rare earth elements play a crucial role in advanced technologies such as electronics, magnets, and green energy solutions.

Instructional Implications

- Students may find it challenging to comprehend and apply new properties such as luster, malleability, and ductility.
- When you teach this concept, remember to:
  - Conduct hands-on activities to explore the physical properties of various elements such as appearance, conductivity, malleability, ductility, and hardness.
  - Group elements based on their similar physical properties and discuss the patterns that emerge in the periodic table.
  - Use visual aids such as color-coded periodic tables or interactive apps to help students distinguish between metals, nonmetals, and metalloids.
  - Provide real-life examples of each category, emphasizing their applications in everyday items or industries (e.g., metals in electrical conductors, nonmetals in plastics, metalloids in semiconductors).
  - Investigate the applications of rare earth elements in advanced technologies such as smartphones, electric vehicles, renewable energy, and magnets.

Student Misconceptions

Students may make the following mistakes:

- Thinking that metalloids are a form of metal because of their name
- Confusing “malleable” and “ductile”
- Thinking all metals are magnetic
- Confusing the location of metalloids and rare earth metals on the periodic table
- Ignoring all relevant properties and focusing solely on one property (e.g., luster or conductivity)

Possible STAAR Stimuli

Investigation	Demonstration	Chat/Table

- Denser than water, with a few exceptions
  - Important to modern life
    - Living organisms that need oxygen (O) to breathe
    - All living organisms are carbon (C) based.
- Metalloids – seven elements
  - 7 elements that border between the metals and the nonmetals along a zigzag line on the periodic table of elements
  - These elements have characteristics of both metals and nonmetals.
  - Physical Properties
    - High luster; shiny
    - Referred to as semiconductors because they are both good and poor conductors of electricity, depending on the temperature of the sample
    - They are hard, but brittle.
    - Some are ductile, and some are not.
    - Metalloids are not magnetic.
    - They are solid at room temperature.
    - Less dense than metals but denser than nonmetals.
  - Important to modern life
    - Semiconductors for electronics; computers, tablets, and mobile phones
    - Pyrotechnics (fireworks)
    - Cosmetics
- Rare earth metals – 17 metallic elements
  - Located in the middle of the periodic table (atomic numbers 21, 39, and 57–71)
  - Physical Properties
    - High luster
    - Good conductors of thermal and electrical energy
    - They are soft and malleable.
    - Most are ductile.
    - Some are magnetic.
    - They are solid at room temperature.
    - Denser than metals and water.
  - Important to modern life
    - Screens for smart phones, TVs, and computers
    - Batteries of hybrid and electric cars
- Periodic table of elements – a conceptual model in which the elements are classified and organized according to their properties; often displayed as a chart
- Elements – a pure substance composed of the same type of particle (atom)
  - Properties can be used to identify different elements.
  - Organized on the periodic table of elements based on properties
  - Building blocks of matter
  - Helium, lithium, and gold

Visual/Image/Illustration	Model	Information Text/List

Notes

- Focus of learning is on learning to use the properties and location of the periodic table to identify if an element is a metal, nonmetal, metalloid, or rare earth metal.
- Memorization of element names and symbols is not required.
- Discussion of atomic radii, and relative reactivity and chemical bonding will be introduced in high school.

Standard:	6.6D compare the density of substances relative to various fluids

Specificity

Cognition: Compare
Content: the density of substances relative to various fluids
Including but not limited to:

- Relative density – ability of a material (not an object) to sink or float in various fluids (liquids or gases)
  - Use common fluids like cooking oil and / or corn syrup.
  - Test by placing the sample in a container of the reference liquid that is deeper and wider than the sample.
    - Identify matter as less dense or more dense than the reference liquid.
      - Less dense than – liquids or objects that float to or near the surface of the reference liquid
        - ✓ A Styrofoam ball floats in oil; therefore, Styrofoam is less dense than oil.
      - More dense than – liquids or objects that sink below the surface of the reference liquid
        - ✓ A glass marble sinks in corn syrup; therefore, the marble is more dense than corn syrup.
  - Compare substances to multiple fluids.
    - Vegetable oil is more dense than rubbing alcohol, but less dense than water.

Content Builder

The density of substances relative to various fluids determines whether they sink or float in those fluids. Substances with a density greater than the fluid will sink, while those with a density lower than the fluid will float. Students may struggle with this concept since they have only compared densities of objects to water.

Instructional Implications

When you teach this concept, remember to:

- Plan investigations that use a variety of fluids for students to test relative density of substances.
- Provide opportunities for students to plan and test ways to compare the densities of a variety of substances.
- Use diverse visuals and scenarios (e.g., diagrams, models, graphs, videos, real-life examples) to engage students in interpreting density-related phenomena.
- Help students remember and practice calculating for volume when it is not provided.

Vocabulary

Density	Mass	meniscus
Relative density	Volume	

Student Misconceptions

Students may make the following mistakes:

- Thinking larger objects will always sink while smaller objects will always float
- Thinking all solids have a higher density than liquids

Possible STAAR Stimuli

Investigation	Demonstration	Chart/Table
Visual/Image/ Illustration	Model	

Standard:	6.6E identify the formation of a new substance by using the evidence of a possible chemical change, including production of a gas, change in thermal energy, production of a precipitate, and color change.

Specificity

Cognition: Identify
Content: the formation of a new substance by using the evidence of a possible chemical change, including production of a gas, change in thermal energy, production of a precipitate, and color change.

Including but not limited to:

- A chemical change always results in the formation of a new substance.
  - Identify chemical changes and their evidence in different scenarios.
    - Production of gas
      - Presence of bubbles
      - An odor (visible or not) that is observed
    - Change in temperature
      - Increase in temperature
      - Decrease in temperature
    - Production of a precipitate (solid formed due to a chemical reaction of liquids)
      - Clogged drains in plumbing due to hard water
    - Color change
      - A chemical reaction when two clear liquids are combined to produce a solution with color
    - Other evidence of chemical changes
      - Light production
      - Sound production

Vocabulary

chemical change	Chemical Property	Chemical Reaction
Corrosion	Physical Property	Precipitate

Content Builder

Recognizing signs of a potential chemical change helps students distinguish between alterations in physical properties and the creation of new substances. This knowledge serves as a basis for recognizing and differentiating between physical changes and chemical reactions in matter.

To identify the formation of a new substance, look for evidence of a possible chemical change such as the production of a gas, change in thermal energy, production of a precipitate, and color change during a chemical reaction. These observable changes indicate that the original substances have undergone a chemical transformation, resulting in the creation of a new substance. Students may face challenges with this concept because chemical changes occur at the molecular level, making direct observation difficult. Emphasize that while the actual chemical reactions are not directly visible, the effects or evidence of the chemical change can be observed and studied. Encourage students to focus on the cause-effect relationship between the reactants and the resulting changes.

All the evidence is from unexpected changes. For example, the change of color must be unexpected. An expected color change is not evidence for a chemical change. For example, if we add red food coloring to a glass of water, we expect the water to turn red. This is not a chemical change. However, if we add one colorless liquid to another colorless liquid and the resulting color is yellow, then that is an unexpected change in color and evidence of a chemical change.

Instructional Implications

When you teach this concept, remember to:

- Provide opportunities for students to observe and describe chemical changes that create new substances and justify their findings with evidence.
- Identify the formation of a new substance by production of a gas, change in thermal energy, production of a precipitate, and color change.
- Clarify that not all bubbles are indicative of a chemical reaction. Some bubbles can arise from physical processes such as agitation or changes in temperature.
- Create opportunities for students to observe how a substance or combination of substances changes into a new substance(s) with different properties.
- Help students see the Recurring Themes and Concepts of stability and change and cause and effect in this standard.

Student Misconceptions

Students may make the following mistakes:

- Thinking that all bubbles are a result of the production of a gas
- Thinking a change in state of matter is a chemical change
- Assuming that no reaction occurs if no visible change is observed

Possible STAAR Stimuli

Investigation	Demonstration	Chart/table
Visual/Image/ Illustration	Model	

Standard:	6.8B describe how energy is conserved through transfers and transformations in systems such as ~~electrical circuits, food webs, amusement park rides, or~~ photosynthesis

Specificity

Cognition:

Content:

Including but not limited to:

- The law of conservation of energy
  - Energy cannot be created or destroyed; it can only change form.
  - Total energy in the entire universe is constant.
- Energy transfer
  - Energy is taken from one place to another place (e.g., energy from a producer is transferred to a consumer).
  - Energy is conserved during transfers since the amount of energy transferred stays the same.
  - Energy transfers occur in:
    - ~~Electrical circuits~~
      - ~~Electrical energy is passed through wires from one point to another.~~
    - ~~Food webs~~
      - ~~Radiant energy (light energy) is used by green plants for photosynthesis.~~
      - ~~Chemical energy from plants is transferred to animals.~~
      - ~~Note: Sometimes energy is transferred to heat and lost from the system.~~
    - ~~Amusement park rides~~
    - ~~Kinetic energy is transferred to gravitational potential energy and vice versa in many rides.~~
  - Photosynthesis
    - Radiant energy from the sun is transferred to the plant and absorbed by chlorophyll.
  - ~~Other examples:~~
    - ~~Sound energy is transferred from one place to another via particles in matter.~~
    - ~~Thermal energy is transferred by conduction, convection, and radiation.~~
    - ~~Kinetic energy of air particles in wind is transferred to movement of leaves~~.
    - Note: Some energy is lost in each step of the transfer, but the total energy of the system stays the same.
- Energy transformation (conversion)
  - The process of energy changing from one form to another.
  - Energy is conserved during energy transformations since energy is not lost in the entire system.
  - Energy transformation occurs in:
    - ~~Electrical circuits~~
      - ~~Electrical energy may be converted to light (light bulb), heat (wires get heated), sound (buzzer or bell), or kinetic energy (fan) in a circuit.~~

Content Builder

Energy is conserved in various systems through transfers and transformations. In electrical circuits, energy is transferred as electrical current and transformed into other forms such as light or heat. In food webs, energy moves through the ecosystem as organisms consume and are consumed, maintaining the overall energy balance. Amusement park rides transform potential energy to kinetic energy, conserving the total energy of the system. In photosynthesis, solar energy is transformed into chemical energy stored in glucose molecules, ensuring energy conservation within the biological system. Students may struggle to grasp the concept of energy conservation and how it applies to different systems.

Instructional Implications

When you teach this concept, remember to:

- Allow students to explore different energy transformations and begin to describe where the energy goes.
- Demonstrate energy transformations involving different forms of energy. Show examples where energy is transformed from one type to another, including chemical, thermal, light, mechanical, and electrical energy.
- Provide opportunities for students to apply the law of conservation of energy in various scenarios, including how electrical circuits function, analyzing energy flow in food webs or ecosystems, examining the transformation of potential energy to kinetic energy in amusement park rides, and investigating how energy is transformed and stored during photosynthesis.
- Have students create flow charts or diagrams representing energy transfers and changes in everyday situations to help them develop a deeper understanding of energy pathways and transformations. Provide opportunities for students to describe their understanding both verbally and in writing.

Vocabulary

Energy	Energy transfer	Energy transformation
Law of conservation	Photosynthesis	

Possible STAAR Stimuli

Investigation	Demonstration	Diagram
Visual/Image/ Illustration	Model	Visual/Image/ Illustration

~~▪ Food webs~~ ~~➢ Green plants convert radiant (light) energy from the sun into chemical energy (glucose), and decomposers convert chemical potential energy into heat energy.~~ ~~▪ Amusement park rides~~ ~~➢ Potential energy of the roller coaster converting to kinetic energy and vice versa throughout the ride~~ ▪ Photosynthesis ➢ Radiant energy from the sun is converted into chemical potential energy. ~~▪ Other examples:~~ ~~➢ When a light is switched on, electrical energy is converted into light and heat energy.~~ ~~➢ In a hydroelectric dam, the kinetic energy of moving water is converted into electrical energy.~~ ~~➢ When a human being runs, chemical potential energy gets converted into kinetic energy.~~	**Student Misconceptions** Students may make the following mistakes: • Thinking that energy cannot be transformed into more than one type of energy • Thinking that energy can be created or destroyed • Thinking that the same type of energy cannot transfer to another object without transforming into another type of energy • Thinking that sources of energy such as batteries continuously generate energy rather than serving to store or transfer energy • Assuming all energy transformations are perfectly efficient, leading to the misconception that there are no losses during energy conversions

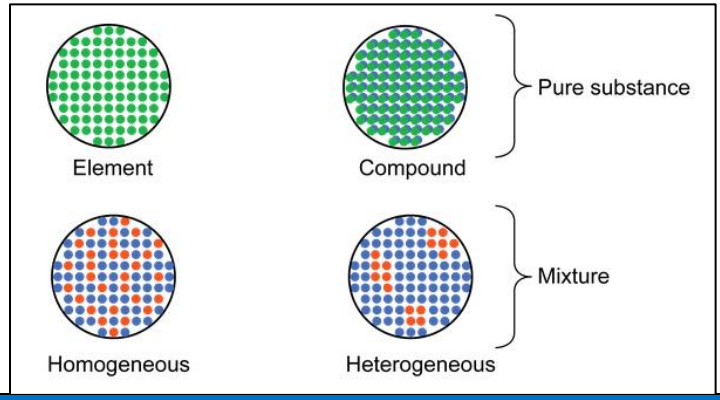
Standard:	8.6A Explain by modeling how matter is classified as elements, compounds, homogeneous mixtures, or heterogeneous mixtures.
Specificity	**Content Builder**
Cognition: Model Content: To explain how matter is classified Including but not limited to: • Elements – a pure substance composed of a single type of atom ○ Gold ○ Silver ○ Helium ○ Criteria of model: ▪ Represents micro level ▪ A collection of a single type of identical particles ➢ A single type of atom without subatomic particles - 2D or 3D representations - Labeled with chemical symbols • Compounds – a pure substance composed of two or more atoms of different elements that are joined together ○ Table salt – NaCl ○ Water – H2O ○ Criteria of model: ▪ Represents micro level	Matter is categorized into elements, compounds, homogeneous mixtures, and heterogeneous mixtures. Students may struggle to visualize and model these classifications as it requires a strong understanding of the arrangement and interaction of particles at the microscopic level. **Elements** are made of a single kind of atom and are pure substances that cannot be broken down into any other substances by chemical or physical means. Only a few elements exist in nature as pure elements. Examples of this include nitrogen gas (N_2), oxygen gas (O_2), gold (Au), carbon (C), silver (Ag), and copper (Cu). All 118 elements are listed on the Periodic Table of Elements. **Compounds** are formed when elements chemically combine with other elements in fixed proportions. For example, water (H_2O) is formed when two hydrogen atoms combine with one oxygen atom. Water is a pure substance because it is uniform throughout and chemically combined. Compounds have unique properties that differ from the properties of the elements that make them up. A **homogeneous mixture**, also called a solution, has an even distribution of its parts. A solution is always homogeneous. This type of mixture is usually more difficult to separate because you cannot always see the separate parts. Consider drinking a glass of lemonade. Each sip you take is the same. It is not extremely sour one sip and only sweet the next.

- A collection of a single type of identical particles
  - ➢ A single type of molecule
    - Atoms joined together in an identical ratio
  - ➢ Maybe:
    - 2D or 3D representations
    - Labeled with a chemical formula
- Homogeneous mixtures (solutions) – a mixture of one kind of particles (atoms, molecules) dissolved in another different type of particles (atoms, molecules)
  - Salt water
  - Sugar water
  - Criteria of model:
    - Represents micro level
    - A collection of two types of identical particles
      - ➢ In a regularly spaced and repeating pattern
      - ➢ May be a combination of atoms and molecules:
        - One type of atoms + second type of atoms
        - One type of atoms + one type of molecules
        - One type of molecules + second type of molecules
      - ➢ Maybe:
        - 2D or 3D representations
        - Labeled with chemical symbols and chemical formulas
- Heterogeneous mixtures -- a combination of two or more substances in a random arrangement
  - Salt and sand
  - Water and oil
  - Criteria of model:
    - Represents micro level
    - A collection of different types of particles in a random order
    - Any number of atoms and molecules
      - ➢ 2D or 3D representations
      - ➢ Labeled with chemical symbols and chemical formulas

Lemonade is homogeneous. Other examples of homogeneous mixtures include milk, air, vanilla ice cream, gelatin, mouthwash, and tomato soup.

Heterogeneous mixtures have an uneven distribution of parts and are physically separate. The parts are easily seen and easily separated. Think about eating trail mix. Each handful you grab will not have the same amount of peanuts, raisins, or chocolate. Each bite will not be uniform. This makes trail mix a heterogeneous mixture. Some other examples of heterogeneous mixtures include cereal, pizza, salad, Italian salad dressing, and vegetable soup. In all of these, you can pick out the pieces. In the case of the salad dressing, the oil sits on top of the water, and you can pour it off.

Elements	Compounds	Homogeneous Mixtures (Solutions)	Heterogeneous Mixtures
pure substance	pure substance	combination of substances	combination of substances
one type of atom, simplest form of matter	two or more different types of atoms (elements)	uniform throughout	visible variations in composition
	chemically combined (bonded) in fixed ratios	physically combined and can be separated	physically combined and can be separated



Instructional Implications

When you teach this concept, remember to:

- Provide clear and simple definitions for each classification using relatable examples.
- Use models, diagrams, or illustrations to show the differences between classifications.
- Conduct investigations with different substances to let students directly experience the distinctions.
- Encourage students to compare and contrast the properties, composition, and behavior of different classifications.

	• Provide real-world examples that connect to students' everyday experiences. • Teach students how to analyze a substance to determine its classification based on its composition, behavior, and properties.
	Student Misconceptions
	• Thinking that mixtures are compounds • Confusing mixtures and solutions • Thinking the categorization of matter as elements, compounds, or mixtures is permanent and unalterable instead of understanding that the classification of matter is dependent on its composition
	Possible STAAR Stimuli (When tested)
	Investigation | Demonstration | Chart/Table Diagram | Visual/Image/Illustration | Model
	Notes
	This TEKS in not tested on STAAR for 2024-2025

Standard:	8.6B Use the periodic table to identify the atoms involved in chemical reactions.
Specificity	**Content Builder**
Cognition: Identify Content: Atoms involved in a chemical reaction using the periodic table Including but not limited to: • Chemical reaction -- the explanation of how the particles of matter (atoms, molecules) are combined during a chemical change resulting in the formation of new substances • Chemical formula ‑ identifies the elements in a compound and the proportions or ratios of the elements ○ Each type of element in the compound is represented by its chemical symbol. ▪ The periodic table of elements can be used to look up the name of an element using its chemical symbol. ▪ CO ➢ C = carbon ➢ O = oxygen ○ The proportion (ratio) of each element in a compound is constant. ▪ The number of atoms represented by specific ratios as determined by subscripts ▪ If there is no subscript present, a single atom of that element is present in the molecule.	The periodic table organizes elements based on their properties. This organization helps to understand how different atoms behave, which is essential in comprehending chemical reactions. By using the periodic table, we can identify the atoms involved in these transformations. Students may struggle to associate the elements involved in a reaction with their corresponding symbols. **Instructional Implications** When you teach this concept, remember to: • Introduce the periodic table early to familiarize students with its structure and organization. • Demonstrate real-world applications of the periodic table in identifying atoms in everyday reactions, using examples from various fields. • Provide access to reliable online tools for interactive exploration of the periodic table. • Conduct investigations and demonstrations showcasing the role of the periodic table in identifying atoms during chemical reactions. • Offer periodic table-based exercises with a mix of simple and complex reactions for students to identify elements in chemical reactions. This enhances their proficiency in using the periodic table to identify elements in various chemical contexts. **Student Misconceptions**

- $C_6H_{12}O_6$ -- glucose
  - C_6 = six carbon atoms
  - H_{12} = twelve hydrogen atoms
  - O_6 = six oxygen atoms
- Coefficients are numbers that appear before a chemical formula to tell how many of the molecules are present.
  - $2C_2H_6$ = C_2H_6 + C2H6 or two C2H6
- When there is no coefficient before a formula, there is only one molecule present.
  - In H_2O = there is only one molecule of H_2O
- Coefficients can also tell how many atoms are in the molecules in a chemical formula.
  - 6CO = 6 carbon atoms and 6 oxygen atoms
- When both coefficients and subscripts are present in a formula, the numbers can be multiplied to determine the number of atoms before and after the chemical change.
  - $2C_2H_6$ = 4C and 12H atoms

- Chemical equation – a representation of a chemical reaction using chemical symbols, numbers, and a symbol →
  - Chemical equations show what happens to the atoms and molecules during a chemical reaction or chemical change.
  - The symbol → = "yields" or "produces"
  - In chemical equations, coefficients and subscripts are used in the same way they are used in chemical formulas to find the number of molecules.
    - $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ is saying before the chemical reaction (change), there was ____ and after the reaction there were ____:
      - Before -- 6 molecules of carbon are combined with 2 oxygens and 6 molecules of hydrogen combined with 6 oxygens
      - After -- 1 molecule of 6 carbons and 12 hydrogens combined with 6 oxygens
  - In chemical equations, coefficients and subscripts are used in the same way they are used in chemical formulas to find the number of atoms.
    - $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ is saying before the chemical reaction (change), there was ____ and after the reaction there were ____:
      - Before -- 6 carbon atoms with 18 oxygen atoms and 6 hydrogens combined with 6 oxygens
      - o After -- 6 carbon atoms and 12 hydrogen atoms combined with 18 oxygen atoms

- Thinking all chemical formulas contain the same number of elements
- Using atomic mass instead of atomic number to identify elements, leading to errors in determining the involved atoms
- Interpreting chemical equations incorrectly, leading to errors in identifying the elements involved

Possible STAAR Stimuli (When tested)

Chart/Table	Diagram	Visual/Image/Illustration
Model	Formula/Equation	

Notes

This TEKS in not tested on STAAR for 2024-2025

VERTICAL STANDARDS

For complete vertical alignment visit: K-8 Science Vertical Alignment 2021 TEKS

(TEKS that are shaded in green are readiness standards tested on STAAR and TEKS that are shaded in yellow are supporting standards testing on STAAR.)

6th Grade	7th Grade	8th Grade
6.6C identify elements on the periodic table as metals, nonmetals, metalloids, and rare Earth elements based on their physical properties and importance to modern life;	7.6C distinguish between physical and chemical changes in matter;	8.6B use the periodic table to identify the atoms involved in chemical reactions;
6.8B describe how energy is conserved through transfers and transformations in systems such as ~~electrical circuits, food webs, amusement park rides, or~~ photosynthesis;		8.6E investigate how mass is conserved in chemical reactions and relate conservation of mass to the rearrangement of atoms using chemical equations, including photosynthesis.
6.6E identify the formation of a new substance by using the evidence of a possible chemical change, including production of a gas, change in thermal energy, production of a precipitate, and color change.		
6.6A Compare solids, liquids, and gases in terms of their structure, shape, volume, and kinetic energy of atoms and molecules;	7.6A compare and contrast elements and compounds in terms of atoms and molecules, chemical symbols, and chemical formulas;	8.6A explain by modeling how matter is classified as elements, compounds, homogeneous mixtures, or heterogeneous mixtures;
	7.6B use the periodic table to identify the atoms and the number of each kind within a chemical formula;	
6.6D compare the density of substances relative to various fluids		

VOCABULARY GLOSSARY

Domain-specific words and definitions for this unit.

Key Content Vocabulary
List and define key vocabulary terms
Balanced Equation: an equation where the number of atoms of each type in the reaction is the same on both reactants and product sides (Lessons 11 and 12) **Brittleness**: when something is easy to break or snap (Lesson 03 and 04) **Chemical change:** is a process in which one or more substances are altered into one or more new and different substances. In other words, a chemical change is a chemical reaction involving the rearrangement of atoms (Lessons 05 and 06) **Chemical Formula:** show the elements found in a particular chemical substance and how many of each atom are present (Lessons 07 and 08) **Chemical Reaction:** a process in which one or more substances, the reactants, are converted to one or more different substances, the products. (Lesson 09)

Clinometer: a tool used to measure the height of an inaccessible object. (Lesson 01)
Closed System: a physical system that does not allow transfer of matter in or out, although energy can flow into and out of the system (Lessons 11 and 12)
Coefficient: number that precedes a chemical formula that denotes how many molecules or formula units are present (Lessons 07 and 08)
Compound: pure substances that are composed of two or more different elements that are chemically combined (bonded). (Lesson 02)
Conductivity: ability to conduct electrical current or thermal energy (Lesson 03 and 04)
Conservation of Mass: in chemical changes, the total mass of the materials does not change (nor does the type and number of atoms); the total mass of the reactants is equal to the total mass of the products (Lessons 11 and 12)
Density – the amount of mass in a given volume. (Lesson 10)
Diatomic Element: a molecule composed of two of the same atoms (Lesson 02)
Ductility: the ability to be stretched into a wire without breaking (Lesson 03 and 04)
Elements: is a substance that contains only one type of atom (Lesson 02)
Formula unit: The smallest unit of a compound that contains a metal. (Lessons 07 and 08)
Heterogenous Mixture: a mixture that is not uniform in their composition and are made of different substances that remain physically separate (Lesson 02)
Homogenous Mixture: a mixture with uniform composition and the same properties throughout. (Lesson 02)
Insulator: a substance or object that does not allow energy to flow through it easily (Lesson 03 and 04)
Luster: the way the surface of metal reflects (Lesson 03 and 04)
Malleability: when something can be hammered or pressed permanently out of shape without breaking or cracking light (Lesson 03 and 04)
Metal: substances that have the physical properties of luster, conductivity, and malleability; may appear in all states of matter (Lesson 03 and 04)
Mixture: substances that are composed of two or more different elements or compounds that are not chemically combined. (Lesson 02)
Molecule: multiple nonmetal atoms connected by a chemical bond (Lessons 07 and 08)
Nonmetal: substances that have the physical properties of being dull, insulators and brittle; may appear in all states of matter (Lesson 03 and 04)
Particle: an extremely small part of matter that exerts a force (Lessons 07 and 08)
Physical property: property of matter that can be observed without changing the composition or identity of the matter. (Lesson 03 and 04)
Physical change: change in the physical properties of a substance, as size or shape. (Lessons 05 and 06)
Precipitate: a solid formed by a change in a solution (Lesson 05 and 06)
Products: are substances that are produced in the reaction. (Lesson 09)
Pure Substance: a substance that has one type of molecule throughout, either a single element or a single compound. (Lesson 02)
Reactants: are substances that start a chemical reaction. (Lesson 09)
Subscript: number in a chemical formula that denotes how many atoms of a particular element are present (Lesson 07 and 08)

UNIT SUPPLY LIST

Consumable Materials and Lab Supplies for Unit 1 (1 per group of 3-4 students unless noted)

Lesson	Consumable	Lab Supplies
01: What is the Mass?	• String • Straw • Clear tape • String • Thumbtack	• Protractor • Weight such a metal nut or washer • Measuring tape • Calculator
02: What's the Matter?	• Set of pop beads for each group • Resealable baggies	
03: Elements on the Periodic Table Part 1	• Teacher to make conductivity tester: • String of holiday lights (1 per teacher) • Copper wire- 1 roll • 9-volt battery- 1 per lab group • Electrical tape- 1 role • Physical Properties Station Lab (1 sample for the stations) • aluminum can • Iron filings or pieces of iron pipe • Sample of sulfur • Copper wire or pipe • Charcoal • Lead fishing weight • 1 flashlight per group (small pen light works well) • 1 magnet per group • 1 conductivity tester (see above)	
04: Elements on the Periodic Table Part 2	Markers and map pencils	
05: Physical and Chemical Changes Part 1	• Lemon Juice • Baking Soda • Calcium carbonate (Tums) tablets • Food Coloring	• 6 beakers • 6 graduated cylinders • 1 spoon • water
06: Physical and Chemical Changes Part 2	• Resealable bags	
07: Compounds and Chemical Formulas Part 1		•Computer for PhET simulation.
08: Compounds and Chemical Formulas Part 1	• Resealable bags	
10: Relative Density	• water • dish soap	• 500 mL beaker • Graduated cylinder

	• honey • food coloring (green and red) • isopropyl alcohol • various hardwood samples (obtain for free at Home Depot or Lowes. See note on advanced prep)	• Aluminum tray
09: Analyzing Chemical Formulas and Equations	• Resealable bags • 12 white paper clips • 18 yellow paper clips • 6 red paper clips Or • 12 orange candies (skittles) • 18 yellow candies (skittles) • 6 red candies (skittles)	• Computer or laptops for Gizmos simulation
11: Law of Conservation of Mass Part 1	• 1 9-inch balloon • Dry yeast • Sugar • 12 clothes pins • 2 colors of yarn (cut into 96" and 48") • 3 colors of beads (18 yellow, 12 white, and 6 red)	• Empty water bottle • Warm water • Spoon • Balance • Funnel
12: Law of Conservation of Mass Part 2	Same lesson 10	Same as Lesson 10
13: The Mass of the Tree Formative Task Part 1	None	None
14: The Mass of the Tree Formative Task Part 2	None	None