Seventh Grade Companion Document
7-Unit 2: Physical and Chemical Properties and Changes in Matter

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Introduction to the K-7 Companion Document
An Instructional Framework

Overview

The Michigan K-7 Grade Level Content Expectations for Science establish what every student is expected to know and be able to do by the end of Grade Seven as mandated by the legislation in the State of Michigan. The Science Content Expectations Documents have raised the bar for our students, teachers and educational systems.

In an effort to support these standards and help our elementary and middle school teachers develop rigorous and relevant curricula to assist students in mastery, the Michigan Science Leadership Academy, in collaboration with the Michigan Mathematics and Science Center Network and the Michigan Science Teachers Association, worked in partnership with Michigan Department of Education to develop these companion documents. Our goal is for each student to master the science content expectations as outlined in each grade level of the K-7 Grade Level Content Expectations.

This instructional framework is an effort to clarify possible units within the K-7 Science Grade Level Content Expectations. The Instructional Framework provides descriptions of instructional activities that are appropriate for inquiry science in the classroom and meet the instructional goals. Included are brief descriptions of multiple activities that provide the learner with opportunities for exploration and observation, planning and conducting investigations, presenting findings and expanding thinking beyond the classroom.

These companion documents are an effort to clarify and support the K-7 Science Content Expectations. Each grade level has been organized into four teachable units- organized around the big ideas and conceptual themes in earth, life and physical science. . The document is similar in format to the Science Assessment and Item Specifications for the 2009 National Assessment for Education Progress (NAEP). The companion documents are intended to provide boundaries to the content expectations. These boundaries are presented as “notes to teachers”, not comprehensive descriptions of the full range of science content; they do not stand alone, but rather, work in conjunction with the content expectations. The boundaries use seven categories of parameters:

a. **Clarifications** refer to the restatement of the “key idea” or specific intent or elaboration of the content statements. They are not intended to denote a sense of content priority. The clarifications guide assessment.
b. **Vocabulary** refers to the vocabulary for use and application of the science topics and principles that appear in the content statements and expectations. The terms in this section along with those presented within the standard, content statement and content expectation comprise the assessable vocabulary.

c. **Instruments, Measurements and Representations** refer to the instruments students are expected to use and the level of precision expected to measure, classify and interpret phenomena or measurement. This section contains assessable information.
d. **Inquiry Instructional Examples** presented to assist the student in becoming engaged in the study of science through their natural curiosity in the subject matter that is of high interest. Students explore and begin to form ideas and try to make sense of the world around them. Students are guided in the process of scientific inquiry through purposeful observations, investigations and demonstrating understanding through a variety of experiences. Students observe, classify, predict, measure and identify and control variables while doing "hands-on" activities.
e. **Assessment Examples** are presented to help clarify how the teacher can conduct formative assessments in the classroom to assess student progress and understanding
f. **Enrichment and Intervention** is instructional examples the stretch the thinking beyond the instructional examples and provides ideas for reinforcement of challenging concepts.
g. **Examples, Observations, Phenomena** are included as exemplars of different modes of instruction appropriate to the unit in which they are listed. These examples include reflection, a link to real world application, and elaboration beyond the classroom. These examples are intended for instructional guidance only and are not assessable.
h. **Curricular Connections and Integrations** are offered to assist the teacher and curriculum administrator in aligning the science curriculum with other areas of the school curriculum. Ideas are presented that will assist the classroom instructor in making appropriate connections of science with other aspects of the total curriculum.

This Instructional Framework is NOT a step-by-step instructional manual but a guide developed to help teachers and curriculum developers design their own lesson plans, select useful portions of text, and create assessments that are aligned with the grade level science curriculum for the State of Michigan. It is not intended to be a curriculum, but ideas and suggestions for generating and implementing high quality K-7 instruction and inquiry activities to assist the classroom teacher in implementing these science content expectations in the classroom.

7th Grade Unit 2:
Physical and Chemical Properties and Changes in Matter

Content Statements and Expectations

7 – Unit 2: Physical and Chemical Properties and Changes in Matter

Big Ideas (Key Concepts)

- Matter is made up of atoms and molecules that are represented through models
- Elements are chemical substances that make up all other substances and are composed of one kind of atom.
- Elements are organized on the Periodic Table in families.
- Physical and chemical properties identify substances and determine when a chemical change has occurred.

Clarification of Content Expectations

Standard: Properties of Matter

Content Statement—P.PM.M.1

Chemical Properties-Matter has chemical properties. The understandings of chemical properties helps to explain how new substances are formed.

Content Expectation

P.PM.07.11 Classify substances by their chemical properties (flammability, pH, reactivity).

Instructional Clarification:

1. Classify means to arrange or order substances by their chemical properties (flammability, pH, acid-base indicators, reactivity).
2. Substances can be elements, compounds and mixtures.
3. Distinguish between physical properties (color, size, shape, texture, state of matter, density, boiling point, conductivity) and chemical properties (flammability, pH, reactivity)
4. Classify substances by their chemical properties using a variety of substances.

Assessment Clarification:

1. Classify substances by their chemical properties.
2. Distinguish between physical properties (color, size, shape, texture, state of matter, density, boiling point, conductivity) and chemical properties (flammability, pH, reactivity)

Content Statement—P.PM.M.2

Elements and Compounds-Elements are composed of a single kind of atom that is grouped into families with similar properties on the periodic table. Compounds are composed of two or more different elements. Each element and compound has a unique set of physical and chemical properties such as boiling point, density, color, conductivity, and reactivity.

Content Expectations

P.PM.07.21 Identify the smallest component that makes up an element.

Instructional Clarification:
1. Identify means to recognize that the smallest component that makes up an element is an atom.
2. Composition of matter is a logical introduction to this GLCE.
3. Discussion of elements, and their purpose/significance is implied.
4. Distinguish between an atom, molecule, and an element.

Assessment Clarification:
1. Identify the smallest component that makes up an element as an atom.
2. Distinguish between an atom, molecule, and an element.

P.PM.07.22 Describe how the elements within the Periodic Table are organized by similar properties into families (highly reactive metals, less reactive metals, highly reactive nonmetals, and some almost completely non-reactive gases).

Instructional Clarification:
1. Describe means to tell or depict in spoken or written words how the elements within the Periodic Table are organized by similar properties into families.
2. Elements are chemical substances that make up all other substances.
3. Elements are composed of one kind of atom.
4. Every element that is known to exist is organized on the Periodic Table of the Elements.
5. Memorizing the Periodic Table of the Elements is NOT the purpose of this GLCE.
6. Memorizing protons, etc. is NOT the purpose of this GLCE.

Assessment Clarification:
1. Describe how the elements within the Periodic Table are organized by similar properties into families (highly reactive metals, less reactive metals, highly reactive non metals, and some almost completely non-reactive gases)

P.PM.07.23 Illustrate the structure of molecules using models or drawings (water, carbon dioxide, table salt).

Instructional Clarification:

1. Illustrate means to clarify by way of drawings, diagrams, verbally and/or written examples or comparisons the structures of molecules using models or drawings.
2. Models are representations of things that exist in the real world, and can be larger or smaller than the actual object.
3. Matter is made of molecules, which are made of atoms of the same or different elements.
4. Molecular formulas are diagrams of the make-up of molecules and are used to create models of molecules.
5. Elements on the periodic chart are represented by symbols and organized by families according to its atomic weight & properties.
6. Understanding bonds is NOT the focus of this content expectation.

Assessment Clarification:

1. Illustrate the structure of molecules using models or drawings (water, carbon dioxide, table salt).
2. Models are representations of things that exist in the real world, and can be larger or smaller than the actual object.
3. Matter is made of molecules, which are made of atoms of the same or different elements.

P.PM.07.24 Describe examples of physical and chemical properties of elements and compounds (boiling point, density, color, conductivity, reactivity).

Instructional Clarification:

1. Describe means to tell or depict in spoken or written words examples of physical and chemical properties of elements and compounds.
2. Physical properties are observable properties, such as size, shape, texture, mass, and color.
3. Chemical properties are the properties that are determined by the arrangement of atoms in the molecules making up the object.
4. Students should be able to distinguish between elements and compounds, and understand that they are both made of atoms.
5. Because of their unique composition, elements and compounds have unique properties; by changing even one atom, the properties change.
6. Students should be able to differentiate between physical and chemical properties.
7. Several different examples should be given. One way to explore properties is to have students determine the properties and then attempt to identify the item by using its properties.
8. Students should be able to calculate density. $D = m/v$
9. Memorizing chemical and physical property values is NOT the purpose of this GLCE (i.e. Students do not need to memorize the boiling point of various elements, but they DO need to know that boiling point is a property that distinguishes one element from another, along with other properties)

Assessment Clarification:
1. Describe examples of physical and chemical properties of elements and compounds.
2. Properties that distinguish one element from another include density, boiling point, color, conductivity, and reactivity.

Standard: Changes in Matter

Content Statement: P.CM.M.2

Chemical Changes-Chemical changes occur when elements and/or compounds react or decompose to produce new substances. These new substances have different physical and chemical properties than the original elements and/or compounds. During the chemical change, the number and kind of atoms in the reactants are the same as the number and kind of atoms in the products. Mass is conserved during chemical changes. The mass of the reactants is the same as the mass of the products.

Content Expectations

P.CM.07.21 Identify evidence of chemical change through color, gas formation, solid formation, and temperature change.

Instructional Clarification:
1. Identify means to recognize evidence of chemical change through color, gas formation, solid formation, temperature change, and light.
2. One of the best methods of identifying evidence is through actual experimentation; allow students to complete investigations that enable them to observe evidence of chemical changes.
3. Caution students regarding bubbles in a phase change; boiling water is NOT a chemical change, even though a gas is formed. Remind students that they must look for evidence, and cross check their conclusion with the other factors that must be in place for a chemical change to occur (a new substance was formed with a new molecular formula)
4. Chemical change of a substance is a change in the chemical make-up of the substance and a new substance is created.

Assessment Clarification:
1. Identify evidence of chemical change through color, gas formation, solid formation, and temperature change.
2. Chemical change of a substance occurs when there is a change in the number or kind of atoms that are bonded together.

P.CM.07.22 Compare and contrast the chemical properties of a new substance with the original after a chemical change.

Instructional Clarification:

1. Compare and contrast means to note similarities and differences between the chemical properties of a new substance with the original after a chemical change.
2. An understanding of "properties" would be an appropriate introduction to this GLCE.
3. Distinguish a chemical property from a physical property.
4. An important cross check to determine if a chemical change has occurred is to observe the properties before and after a change. If the properties have changed, then a chemical change has occurred. Other evidence such as color change, gas formation, solid formation, and temperature change, of course, should accompany this.

Assessment Clarification:

1. Compare and contrast the chemical properties of a new substance with the original after a chemical change.

P.CM.07.23 Describe the physical properties and chemical properties of the products and reactants in a chemical change.

Instructional Clarification:

1. Describe means to tell or depict in spoken or written words the physical properties and chemical properties of the products and reactants in a chemical change.
2. Reactants are what react together (what you start with) in a chemical reaction, and Products are what is produced (what you end with) in a chemical reaction.
3. The purpose here is NOT to write chemical formulas and/or balance equations.
4. An understanding of physical and chemical properties is necessary before addressing this GLCE.
5. Students should very clearly understand that if the chemical properties change, then a chemical change has occurred. A deeper understanding of properties, will allow students to quickly identify if a chemical change has occurred.

Assessment Clarification:

1. Describe the physical properties and chemical properties of the products and reactants in a chemical change.

Inquiry Process, Inquiry Analysis and Communication, Reflection and Social Implications

Inquiry Processes
S.IP.07.11 Generate scientific questions on physical and chemical properties and changes in matter based on observations, investigations, and research.
S.IP.07.12 Design and conduct scientific investigations on physical and chemical properties and changes in matter.
S.IP.07.13 Use tools and equipment (spring scales, stop watches, meter sticks and tapes, models, hand lens, thermometer, models, sieves, microscopes, hot plates, pH meters) appropriate to scientific investigations on physical and chemical properties and changes in matter.
S.IP.07.14 Use metric measurement devices in an investigation dealing with physical and chemical properties and changes in matter.
S.IP.07.15 Construct charts and graphs from data and observations dealing with physical and chemical properties and changes in matter.
S.IP.07.16 Identify patterns in data regarding physical and chemical properties and changes in matter
Inquiry Analysis and Communication
S.IA.07.11 Analyze information from data tables and graphs to answer scientific questions concerning physical and chemical properties and changes in matter
S.IA.07.12 Evaluate data, claims, and personal knowledge through collaborative science discourse on physical and chemical properties and changes in matter
S.IA.17.13 Communicate and defend findings of observations and investigations about physical and chemical properties and changes in matter
S.IA.07.14 Draw conclusions from sets of data from multiple trials of a scientific investigation to draw conclusions on physical and chemical properties and changes in matter
S.IA.07.15 Use multiple sources of information on physical and chemical properties and changes in matter to evaluate strengths and weaknesses of claims, arguments, or data.
Reflection and Social Implication
S.RS.07.11 Evaluate the strengths and weaknesses of claims, arguments, and data regarding physical and chemical properties and changes in matter
S.RS.07.12 Describe limitations in personal and scientific knowledge regarding physical and chemical properties and changes in matter.
S.RS.07.13 Identify the need for evidence in making scientific decisions about physical and chemical properties and changes in matter.
S.RS.07.14 Evaluate scientific explanations based on current evidence and scientific principles dealing with physical and chemical properties and changes in matter
S.RS.07.15 Demonstrate scientific concepts through various illustrations to depict physical and chemical properties and changes in matter.
S.RS.07.16 Design solutions to problems to physical and chemical properties and changes in matter using technology.
S.RS.07.17 Describe the effect humans and other organisms have on the balance of the natural world through chemical reactions, and choices humans make as far as using elements for various purposes.
S.RS.07.18 Describe what science and technology can and cannot reasonably contribute to society when dealing with physical and chemical properties and changes in matter.
S.RS.07.19 Describe how science and technology concerning physical and chemical properties and changes in matter have advanced because of the contributions of many people throughout history and across cultures.

Vocabulary

Critically Important – State Assessable	Instructionally Useful
atom atomic arrangement chemical change chemical properties of compounds chemical reaction closed system molecule nonmetal reactive gases chemical properties of elements products reactants density boiling point conductivity pH paper/meter	classification of substances conservation of Mass graduated cylinder physical properties of elements physical properties of compounds

Common Misconceptions (Naïve Understandings)

- Atoms and Elements are the same
- Atoms change in number, size, or composition in a chemical change
- Mass changes in a chemical change
- A phase change is a chemical change (when students see bubbles (gas) in boiling they can attribute that as evidence of a chemical change, which is incorrect).

Instructional Framework

The following Instructional Framework is an effort to clarify possible units within the K-7 Science Grade Level Content Expectations. The Instructional Framework provides descriptions of instructional activities that are appropriate for inquiry science in the classroom and meet the instructional goals. Included are brief descriptions of multiple activities that provide the learner with opportunities for exploration and observation, planning and conducting investigations, presenting findings, and expanding thinking beyond the classroom. The Instructional Framework is ***NOT*** *a step-by-step instructional manual, but a guide intended to help teachers and curriculum developers design their own lesson plans, select useful and appropriate resources and create assessments that are aligned with the grade level science curriculum for the State of Michigan.*

Instructional Example

Elements and Compounds: P.PM.07.21, P.PM.07.22, P.PM.07.23, P.PM.07.24

Objectives

- Identify elements as the chemical substances that make up all other substances and are composed of one kind of atom.
- Elements are organized on the Periodic Table in families.
- Describe examples of physical and chemical properties of elements and compounds

Engage and Explore

- Show students a copy of the Periodic Table of the elements. Have students create a T chart with one side labeled “Everyday Elements” and the other side “Never Used Elements” and give them a few minutes to fill out the T Chart using the Periodic Table. Have students “stand up/pair up” with another student and share their list. (P.PM.07.22)
- Create a matchbook of an element. On the outside of the matchbook students should write the symbol of the element and the name of the element. On the inside, there should be a picture of where the element would be found in the world (either from a magazine, the internet, or a drawing) Extension can be to use these matchbook and create a classroom Periodic Table of the Elements that covers one wall of the classroom (P.PM.07.22)

Explain and Define

- Define *elements* as chemical substances that make up all other substances and are composed of one kind of atom. (P.PM.07.21)

- Use a literacy strategy such as an anticipatory set, (questions before teacher choice reading and then return to the questions after reading) KWL, or semantic features analysis to explore facts about elements. (P.PM.07.21)
- Use a particular family (for example, highly reactive metals), to illustrate how the Periodic Table is organized; focus on how the classification is determined. (P.PM.07.22)

Elaborate and Apply

- Create models of elements to emphasize that elements are composed of one type of atom. (P.PM.07.23)
- Give molecular formulas for various compounds, and have students create or simply identify the number/type of elements. (P.PM.07.23)
- Have students make a list of 5 items that surround them in the classroom (desk, pencil, chalkboard, people, book, fish tank, etc.). Once this list is created, have students determine/research what elements are in each item and share their results with the class. (S.IA.07.13)
- Have students discover what elements make up the human body, and then create a graphical representation. (S.IA.07.12, S.IA.07.13, S.IP.07.15)

Evaluate Student Understanding

Formative Assessment Examples
- Stand Up, Pair Up
- Matchbook of the elements (See Engage and Explore)
- Literacy strategies (KWL, anticipatory set)
- Models- Illustrate the structure of molecules using models or drawings (water, carbon dioxide, salt)
- "Book of Elements"

Summative Assessment Examples
- Write a scientific explanation: Does an element's position on the Periodic Table of the Elements give us important information? (Must include claim, and at least 3 pieces of evidence)
- Create a T chart with physical and chemical properties of elements and compounds (boiling point, density, color, conductivity, reactivity)
- Students create an "Alphabook of the Elements" for a younger audience, that
  a. Explains the importance of elements in our lives, and gives an explanation of how the Periodic Table of the Elements is organized, and features 1 or more elements, or
  b. Details one element in detail (perhaps by turning it into a cartoon character), or
  c. Has one page for each element

Enrichment

- Students complete a research report on one of the elements by focusing on the year of discovery, the person credited with discovery, the common uses of the element, and their opinion of the significance of the element in their life.
- Creative Writing: Pretend that you are Dmitri Mendeleev, the father of the periodic table. Write a 1 page or longer (typed, double-spaced) autobiography of your life and your work in researching the patterns of the elements.

Intervention

- Use various internet sites that are designed to teach about elements and the Periodic Table of the Elements
- Video about Elements and the Periodic Table of the Elements from various suppliers, youtube.com, or teachertube.com.
- "The Most Common Elements Project" Have students complete research on only the most common elements which includes what makes them the most common, its symbol, where it sits on the Periodic Table and why.
- Students can create a song about an element or the Periodic Table of the Elements or the teacher can find one and play it (there are several available on the internet)

Examples, Observations, and Phenomena (Real World Context)

Elements are the building blocks of our world. Everything around us is made of elements. Mostly our everyday observations involve unseen elements that are combined to create objects we can see. However there are some elements that we can observe in their pure form such as Gold, Neon, Iron, Aluminum, and Copper.

Instructional Example

Chemical Properties: P.PM.07.11
Chemical Changes: P.CM.07.21, P.CM.07.22, P.CM.07.23

Objectives

- Identify evidence of a chemical change through color, gas formation, solid formation, and temperature change.
  - Compare and contrast the properties of reactants and products in a chemical change, using those properties as evidence of the chemical change. *(implied: define chemical properties)*
  - Illustrate the structure of molecules using models or drawings.
  - Demonstrate that in a chemical change mass is conserved.

Engage and Explore

- Show students some common and some less common examples of chemical changes, (rusting on a bike, Alka Seltzer and water, road salt + *phenopthalein*, flash paper) pictures of fireworks, the sun, and/or hair treatments. Compare and contrast the chemical properties of a new substance with the original after a chemical change. (P.CM.07.22)
- Have students Think-Pair-Share their explanation of what happened (write an explanation, pair up with a neighbor, and each person shares their thoughts) (S.IA.07.12, S.IA.07.13)
- Give students several different materials and have them explore different combinations and make a determination as a team if they believe a chemical reaction has occurred (this is BEFORE an official definition is given). Materials to explore with could include drink mix, water, baking soda, etc. (S.IP.07.11, S.IP.07.12, S.IA.07.11, S.IA.07.13, S.RS.07.13)
- Create a T-chart that is labeled, “properties before” and “properties after”. Have students complete their T chart as they investigate the various combinations. (P.CM.07.22)
- Give students several mystery substances and have them classify them by their chemical properties (P.PM.07.11)

Explain and Define

- Define Reactants as the “before” items, and Products as the “after”. (P.CM.07.22, P.CM.07.23)
- Students brainstorm the term chemical change and what makes it different than a phase change (something new/different; various signs/indicators) (P.CM.07.21, P.CM.07.22, P.CM.07.23)
- Students present their ideas to the class and collectively the class makes sense of chemical changes and their indicators, as evidenced in reactants and products. (P.CM.07.21, P.CM.07.22, P.CM.07.23)

- Identify evidence of a chemical change through color, gas formation, solid formation, and temperature change. (P.CM.07.21)
- Define chemical properties (flammability, pH, acid-base indicators, reactivity) (P.PM.07.11, P.CM.07.21)
- Students should brainstorm situations where chemical properties would have significance both for safety, and for classification. (P.PM.07.11)

Elaborate and Apply

- Students generate questions regarding chemical change, and then design and conduct investigations to prove that a chemical change occurred. (P.CM.07.21, P.CM.07.22, P.CM.07.23, S.IP.07.11, S.IP.07.12, S.IP.07.13, S.IA.07.13)
- Show some examples of phase changes that may give the illusion of being a chemical change because they "produce" gas (bubbles are seen), etc. (P.CM.07.21, P.CM.07.22, P.CM.07.23)
- Use molecular models to demonstrate the atoms rearranging in a chemical change, which allows something "new" to be created, while the atoms themselves are not new*. (Chemical formulas of reactants and products would need to be provided.)* (P.CM.07.22, P.CM.07.23)
- Emphasize the number and types of atoms involved, and have students discuss the question, "How does anything new come into existence?" (P.CM.07.22, P.CM.07.23)
- Students complete research on various "new" substances, and share with the class either through oral, visual, or written presentations. (P.CM.07.21, P.CM.07.22, P.CM.07.23, S.IA.07.13)
- Ask students about the mass in a chemical change; is there a change? Students discuss their thoughts, and then design and conduct investigations to determine if mass is conserved. (P.CM.07.21, P.CM.07.22, P.CM.07.23, S.IA.07.11, S.IA.07.13)
- Students do a presentation to share their findings. Teacher would introduce the concept of "open" and "closed" systems, and allow students to re-design their experiment to prove Conservation of Mass. (P.CM.07.21, P.CM.07.22, P.CM.07.23, S.IA.07.11, S.IA.07.13, S.IP.07.11, S.IP.07.12)
- Students once again should create and examine molecular models as a piece of evidence for Conservation of Mass (in a chemical change, the atoms rearrange, but do not increase or transform, so the mass is conserved). (P.CM.07.22, P.CM.07.23)
- Students set up a museum tour with stations containing either chemical changes or phase changes, with molecular models. The "visitors" must determine what change has occurred, and cite at least 3 pieces of evidence. (P.CM.07.21, P.CM.07.22, P.CM.07.23, S.IA.07.13, S.RS.07.11, S.RS.07.13, S.RS.07.15)
- Students should be able to classify substances by their chemical properties either by determining the properties themselves, and then referencing a key, or using data (P.PM.07.11, S.IA.07.11, S.IA.07.13, S.RS.07.11, S.RS.07.13)

Evaluate Student Understanding

- Have students classify substances by their chemical properties (flammability, pH, acid-base indicators, reactivity) (P.PM.07.11)
- Give students the molecular formula for some "mystery" reactants and have them create models of some possible products. Students should be able to identify the type and number of elements in the reactants and the products, as well as proving conservation of mass in their equation. In addition, students should be able to use the information from the Periodic Table of the Elements to make some inferences about how the elements behave based on their family. Students should also be able to communicate this model to the class, and provide examples of what to look for to determine if a chemical change had occurred. (P.PM.07.22, P.PM.07.22, P.PM.07.23, P.PM.07.24, P.CM.07.21, P.CM.07.22, P.CM.07.23, S.IA.07.12, S.IA.07.13, S.RS.07.11, S.RS.07.13, S.RS.07.15)

Formative Assessment Examples

- Use the student discussions (Think-Pair-Share, etc.) to assess the students' ability to describe chemical changes and indicators of chemical change.
- T-Chart
- Molecular models
- Experiment design and conclusions
- Museum Tour and the "visitor" reports

Summative Assessment Examples

- Write a scientific explanation: Are bubbles always an indicator of a chemical change? (Must include a claim and at least 3 pieces of evidence to support your claim)
- Choose the possible product/s for the molecular model shown here. (There would be a molecular model of at least 2 reactants)
- Create a chart with "properties before" and "properties after" and have students determine if a chemical change has taken place by examining the data.

Enrichment

- Students may be given a more complex chemical formula and construct a molecular model or give a molecular model and asked to break it down into its formula and identify.

- Students are given different examples of substances that are classified as one substance, but behaves as another, i.e. salt is a solid, but behaves like a liquid, and have them explain to a peer why

Intervention

- Give students different colored circles of paper to “talk their way” through the chemical change. (i.e. as the Alka Seltzer bubbles – move the atom to its new bond – this leads to the E & D step of reactants and products.
- Use everyday common examples, have students list what they did to get ready for school and then list, which were chemical or physical changes and how they know.

Examples, Observations, and Phenomena (Real World Context)

Chemical changes are around us everyday, from baking a cake, to rusting of a bicycle, to fireworks. Some chemical changes are beneficial such as digestion in our stomachs. Some chemical changes can be harmful such as bombs or explosions. Some chemical changes can be both beneficial and harmful such as the combustion of fossil fuels (allows humans to travel and create heat; can be detrimental to the environment). Some evidence of chemical changes such as color, gas formation, solid formation, and temperature change are easily observable, while changes to the chemical properties of a new substance may be more complex to discover, but are still valid.

Literacy Integration

Reading

R.WS.07.01 explain and use word structure, sentence structure, and prediction to aid in decoding and understanding the meanings of words encountered in context.

R.WS.07.07 in context, determine the meaning of words and phrases including regional idioms, literary and technical terms, and content vocabulary using strategies including connotation, denotation, and authentic content-related resources.

R.CM.07.01 connect personal knowledge, experiences, and understanding of the world to themes and perspectives in text through oral and written responses.

R.CM.07.03 analyze global themes, universal truths and principles within and across texts to create a deeper understanding by drawing conclusions, making inferences, and synthesizing.

R.CM.07.04 apply significant knowledge from grade-level science, social studies, and mathematics texts.

Writing

W.GN.07.02 write a research report using a wide variety of resources that includes appropriate organizational patterns (e.g., position statement/supporting evidence, problem statement/solution, or compare/contrast), descriptive language, and informational text features.

W.GN.07.03 formulate research questions using multiple resources, perspectives, and arguments/counter-arguments to develop a thesis statement that culminates in a final presented project using the writing process.

W.PR.07.02 apply a variety of pre-writing strategies for both narrative (e.g., graphically depict roles of antagonist/protagonist, internal/external conflict) and informational writing (e.g., position statement/supporting evidence, problem statement/solution, or compare/contrast).

Speaking

S.CN.07.01 adjust their use of language to communicate effectively with a variety of audiences and for different purposes by using specialized language related to a topic and selecting words carefully to achieve precise meaning when presenting.

S.DS.07.04 plan a focused and coherent informational presentation using an informational organizational pattern (e.g., problem/solution, sequence); select a focus question to address and organize the message to ensure that it matches the intent and the audience to which it will be delivered.

Mathematics Integration

A.PA.07.01 Recognize when information given in a table, graph, or formula suggests a directly proportional or linear relationship.

A.RP.07.02 Represent directly proportional and linear relationships using verbal descriptions, tables, graphs, and formulas, and translate among these representations.