

Course Title – MD Physical Science

Implement start year – 2017-2018

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Unit #1 – Matter and its Interactions

Transfer Goal –

Students will be able to independently use their learning to draw evidence-based conclusions in order to evaluate how objects in the world around them are built and interact with each other. (Science 4, Special Education 2)

In this unit...

students will be able to independently investigate and evaluate characteristics of matter and the everyday changes that can occur when elements undergo physical and chemical changes.

Stage 1 – Desired Results

Established Goals

PS1 Matter and Its Interactions

HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms

21st Century Themes

(www.21stcenturyskills.org)

- Global Awareness
- Financial, Economic, Business and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy
- Environmental Literacy

<p>HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties</p> <p>HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs</p> <p>MP.4 HSN-Q.A.1 CCS.ELA-literacy.rh.11-12.7 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-PS1-8)</p> <p>Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.</p>	<p style="text-align: right;"><u>21st Century Skills</u></p> <p><i>Learning and Innovation Skills:</i> <input checked="" type="checkbox"/> Creativity and Innovation <input checked="" type="checkbox"/> Critical Thinking and Problem Solving <input checked="" type="checkbox"/> Communication and Collaboration</p> <p><i>Information, Media and Technology Skills:</i> <input checked="" type="checkbox"/> Information Literacy <input checked="" type="checkbox"/> Media Literacy <input checked="" type="checkbox"/> ICT (Information, Communications and Technology) Literacy</p> <p><i>Life and Career Skills:</i> <input type="checkbox"/> Flexibility and Adaptability <input checked="" type="checkbox"/> Initiative and Self-Direction <input type="checkbox"/> Social and Cross-Cultural Skills <input checked="" type="checkbox"/> Productivity and Accountability <input type="checkbox"/> Leadership and Responsibility</p>
<p><u>Enduring Understandings:</u> <i>Students will understand that . . .</i></p> <p>EU 1 the implementation of proper safety procedures will minimize potential hazards.</p> <p>EU 2 in order to construct and evaluate a valid claim, students must apply conceptual knowledge and physical evidence.</p> <p>EU 3 the properties of any sample of matter are dictated by its structure and composition.</p> <p>EU 4 the periodic table is an organizational tool that can be used for the predication and classification of the trends and properties of elements.</p>	<p><u>Essential Questions:</u></p> <p>EU 1</p> <ul style="list-style-type: none"> • Why is safety important? • How does behavior affect safety? • How does classroom environment influence safety? <p>EU 2</p> <ul style="list-style-type: none"> • How does the scientific method prove or disprove a theory? • How do I know if a scientific claim is valid? <p>EU 3</p> <ul style="list-style-type: none"> • How do you create a model of something you can't see? • How can matter be measured and described? <p>EU 4</p>

<p><i>EU 5</i> matter can undergo different changes that can affect its structure and properties.</p>	<ul style="list-style-type: none"> • What is the most effective way to organize information? • What is the best way to make predictions? • Why is the classification of elements important in science? <p><i>EU 5</i></p> <ul style="list-style-type: none"> • How can one change the properties and/or structure of matter?
<p><u>Knowledge:</u> <i>Students will know . . .</i></p> <p><i>EU 1</i></p> <ul style="list-style-type: none"> • proper safety procedures in the lab. • proper classroom expectations (attire, behavior, procedures, etc.). • the form, function, and safe application of lab equipment. <p><i>EU 2</i></p> <ul style="list-style-type: none"> • the steps of the scientific method. • different methods of displaying data, including charts, graphs, and tables. <p><i>EU 3</i></p> <ul style="list-style-type: none"> • each atom has a charged substructure consisting of a nucleus which is made up of protons and neutrons, surrounded by electrons. (HS-PS1-1) • atoms combine to make molecules. <p><i>EU 4</i></p> <ul style="list-style-type: none"> • the periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. (HS-PS1-1) <p><i>EU 5</i></p> <ul style="list-style-type: none"> • that atoms are conserved and that chemical properties of the elements can be used to describe and predict chemical reactions. (HS-PS1-2) • matter can be combined to form mixtures and compounds. • chemical versus physical properties. • a chemical change versus a physical change. 	<p><u>Skills:</u> <i>Students will be able to . . .</i></p> <p><i>EU 1</i></p> <ul style="list-style-type: none"> • demonstrate proper general lab safety. • demonstrate the proper safety, form and function of lab equipment. • select the appropriate tool for a required task. <p><i>EU 2</i></p> <ul style="list-style-type: none"> • generate, analyze and interpret graphs using either provided data or data collected from their own experiments. • apply the steps of the scientific method. • construct and revise explanations based on validity and from a variety of sources. (HS-PS1-2) • apply scientific principles and evidence to provide explanations and solve problems. (HS-PS1-5) <p><i>EU 3</i></p> <ul style="list-style-type: none"> • build a model of an atom. • apply the rules of the periodic table to describe elements. • use formulas to build molecules out of atoms. <p><i>EU 4</i></p> <ul style="list-style-type: none"> • locate and describe elements on the periodic table. • differentiate between metals, nonmetals, and metalloids. • determine the number of protons and electrons in an atom. • model the relationships between systems and components of a system. (HS-PS1-1) <p><i>EU 5</i></p>

- the Law of Conservation of Mass states for any system closed to all transfers of matter and energy, the mass of the system must remain constant over time, as system mass cannot change quantity if not added or removed.
- the properties of various states of matter.

- use observations and measurements as evidence that a chemical change did or did not occur.
- compare and contrast different states of matter.
- use observations to determine if a physical change did or did not occur.
- manipulate states of matter.
- demonstrate how mixtures and compounds are formed.

Stage 2 – Assessment Evidence

Recommended Performance Tasks:

You are an OSHA inspector. Create a checklist of observable safety practices currently used in the lab. Be sure to include items such as personal protective gear, proper dress, lab equipment safety, and potential hazards. You will then use this checklist to evaluate the lab in a simulated environment which will consist of several unidentified hazards. (EU 1)

You are a teacher in an elementary school classroom and your classroom has been quite noisy lately. A student's lunch bag has been exploding with a large BOOM every day. You need to figure out what is causing the lunch bag to expand and explode. The only clue you have been able to find from the remnants of the explosion is a white powdery substance and a zip lock bag filled with a clear liquid. You must set up an experiment using the scientific method to test your hypothesis of what these 2 ingredients could be that are interacting and causing such a commotion. Conduct some research, perform some experiments and draw conclusions on your results. You will present your findings and data chart to the class in the form of a PowerPoint and include photos of the ingredients you tried. Be sure to include all the steps of the scientific method in your presentation, including hypotheses, materials, procedure, data collection, and results and conclusions (EU2)

Chemical bonding is very similar to two elements that are "dating." You are a cartoonist for the Science Times. Depict a relationship between two people that resembles an ionic bond. Include key features of each person or "element" and the couple or the "compound." This can be done through dialogue, actions, or behaviors that demonstrate the characteristics of an ionic bond. Do the same for a covalent bond. Be sure each cartoon has a title, tells a story, and is accurate to each type of bonding. (EU 3)

Choose one of the following careers: jeweler, electrician, artist, etc. Investigate the types of elements involved in the career that you choose. Prepare a 1-page consumer report that explains why these are the ideal materials for the job based upon their properties, periodic trends, reactivity, etc. (EU 4)

You are a chef on the Rachel Ray cooking show. Your segment is all about the science behind baking bread. You will create a script to explain the changing states of matter, chemical, and physical reactions of the baking process. Your finished product will be the bread, as well as the episode that will be recorded.

You will be judged on how accurate your explanation of the science aspect of baking the bread, including at least one ingredient in each state of matter, one chemical change, and one physical change. (EU 5)

Other Recommended Evidence:

- Tests/quizzes
- Labs and lab reports
- Models, graphs, diagrams (atoms, molecules, physical and chemical changes)
- Student reflection in journal
- Teacher observation during class discussion

Stage 3 – Learning Plan

Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: *Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.*

- List safety procedures in a lab (A)
- Create a lab safety poster (M)
- Define uses of lab equipment (A)
- Follow lab safety checklist during labs (T)
- Identify steps in the scientific method (A)
- Create a poster for each step of the scientific method (M)
- Apply the scientific method to prove or disprove a problem in daily life (T)
- Identify subatomic particles on a diagram of an atom (A)
- Use manipulatives to build models of atom (M)
- Create a poster or visual presentation of molecules in your everyday life (T)
- Color and label a blank template of a periodic table (A,M)
- Venn diagram the characteristics of metals, nonmetals, and metalloids (A,M)
- Create a fact card for assigned elements (A,M)
- T-chart properties of 3 states of matter (A)
- Create a photo collage from magazines photos of examples of 3 states of matter (A,M)
- Debate a given example of change in the environment to be physical or chemical (T)
- Participate in hands on labs to determine if a mixture is heterogeneous or homogenous (M,T)