

## Course Title: Integrated Science

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## Unit #1 - Matter and Its Interactions

### Transfer Goal –

Students will be able to independently use their learning to make informed decisions regarding common chemical phenomena based on types of matter and interactions.

## Stage 1 – Desired Results

### Established Goals

#### Next Generation Science Standards

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.

HS-PS1-2 Construct an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic

### 21<sup>st</sup> Century Themes

( [www.21stcenturyskills.org](http://www.21stcenturyskills.org) )

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

**21<sup>st</sup> Century Skills**

*Learning and Innovation Skills:*

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration

*Information, Media and Technology Skills:*

- Information Literacy
- Media Literacy
- ICT (Information, Communications and Technology) Literacy

*Life and Career Skills:*

- Flexibility and Adaptability
- Initiative and Self-Direction
- Social and Cross-Cultural Skills
- Productivity and Accountability
- Leadership and Responsibility

<p><b><u>Enduring Understandings:</u></b>  <i>Students will understand that . . .</i></p> <p><i>EU 1</i>  the subatomic particles and their interactions are the primary factors that determine the properties and bonding of atoms.</p> <p><i>EU 2</i>  the periodic table is an organizational tool that can be used for the prediction and classification of the trends and properties of elements.</p> <p><i>EU 3</i>  when a chemical reaction occurs, matter is always conserved while atoms rearrange to create new products.</p> <p><i>EU 4</i>  atoms can release energy when the number of subatomic particles change in its nucleus.</p>	<p><b><u>Essential Questions:</u></b></p> <p><i>EU 1</i></p> <ul style="list-style-type: none"> <li>● How might we use our understanding of subatomic particles to draw conclusions about how atoms react to form new types of matter?</li> </ul> <p><i>EU 2</i></p> <ul style="list-style-type: none"> <li>● How could we use the periodic table to predict atomic properties?</li> <li>● How are Periodic Trends useful?</li> </ul> <p><i>EU 3</i></p> <ul style="list-style-type: none"> <li>● What does the way atoms bond to create new substances reveal about the nature of chemical reactions?</li> <li>● How do the products of a chemical reaction differ from the elements from which they are made? How are they the same?</li> <li>● How can the Law of Conservation of Matter be applied to common chemical processes such as burning a log, digestion, baking, or a rusting nail?</li> </ul> <p><i>EU 4</i></p> <ul style="list-style-type: none"> <li>● How might we use the energy released when the amount of subatomic particles change in the nucleus of an atom?</li> </ul>
<p><b><u>Knowledge:</u></b>  Students will know . . .</p> <p><i>EU 1</i></p> <ul style="list-style-type: none"> <li>● each element has its own unique structures of subatomic particles found in the nucleus and the area surrounding the nucleus. (HS-PS1-1)</li> </ul>	<p><b><u>Skills:</u></b>  <i>Students will be able to . . .</i></p> <p><i>EU 1</i></p> <ul style="list-style-type: none"> <li>● determine mass, location and charge of each particle.</li> <li>● determine the # of protons, electrons and neutrons of each atom.(HS-PS1-1)</li> <li>● calculate the neutrality of an atom/isotope and the charge of an ion. (HS-PS1-1)</li> <li>● build models of atoms, ions and isotopes by using the information represented on the Periodic Table. (HS-PS1-1)</li> <li>● name and show the correct symbol/formula for elements and compounds</li> <li>● draw Lewis dot diagrams for simple elements and compounds.</li> </ul>

*EU 2*

- the Periodic Table orders elements horizontally by the number of protons in the atom's nucleus. (HS-PS1-1)
- the columns of elements are based on similar electron orientation. (HS-PS-1)
- how the size of an atom changes as they compare elements across the periodic table and also going down the periodic table. Also ionic size and speed of reaction will also be compared. (HS-PS1-2)

*EU 3*

- that the unique structure of an atom's electron orientation will determine its properties and types of reactions possible. (HS-PS1-2)
- that a chemical equation is written showing that the reactants are rearranged to create new products with both having the same mass.
- 5 simple chemical reactions types: combination, decomposition, single replacement, double replacement, and combustion.

*EU 4*

- the nuclear processes of fission, fusion, and radioactive decay(HS-PS1-8)
- current uses of the 3 nuclear processes in everyday life.

*EU 2*

- identify elements based on similar properties to a given element and provide a rationale for their choice. (HS-PS1-1)
- predict properties of an element based on its position on the periodic table. (HS-PS1-1)

*EU 3*

- draw lewis dot diagrams of reactant(s) and the product(s) formed when a reaction occurs (HS-PS1-1)
- use a chemical equation model to show reactants and predicted products of a chemical reaction (HS-PS1-2)
- identify 5 general equations that explain 5 general reaction types.

*EU 4*

- describe the similarities and differences of fusion reactions and fission reactions.
- model radioactive decay that occurs in an atom's nucleus, by using models of the subatomic particles. (HS-PS1-8)
- describe how the 3 nuclear processes are used in everyday life.

## Stage 2 – Assessment Evidence

### Recommended Performance Tasks:

You are a patient advocate in a hospital. One of your jobs is to explain certain medical procedures to patients in terms that they can understand. Research Radiation Therapy. Design a pamphlet that includes an easy to understand explanation on how Radiation Therapy is being used to treat certain types of cancer and include simple diagrams or illustrations. The criteria for success will be a rubric which has a 1-4 scale based on the detail of their explanation and how well their diagrams help to illustrate the concepts of the procedures necessary for Radiation Therapy (EU 1,4)

NASA sent a Mission Rover to Mars. During 5 days of exploring soil samples, the rover found a never before described element. As a member of NASA's primary geological team, it is up to you to identify this element. Having been told the # of protons and neutrons of this new element, your goal is to describe its physical and chemical properties, name this element and place it properly on the current periodic table. You will prepare a presentation to present to the American Chemistry Society. Your presentation must include a 3 dimensional atomic structure of your element that shows the correct number of protons, electrons, and neutrons. This should be done on a powerpoint presentation, brochure, or poster that will explain the properties, show the structure, diagram its placement on the periodic table, and the name that you have picked for it. (EU2)

You are an Environmental Engineer working for a coal burning power plant. The company is building a power plant and the local homeowners are concerned about air pollution in their town. You will need to put together a powerpoint presentation to show the homeowners that your company is very responsible towards keeping the air clean. Include in your powerpoint a flowchart illustrating how scrubbers remove sulfur and nitrogen oxides from the power plant emissions. You need to write equations for any chemical reactions involved, and classify each reaction. You will present the power point to the class. You will be graded on the presentation of the flowchart, the correctness of the chemical reactions involved and on how well you respond to questions from the homeowners (EU 3)

### Other Recommended Evidence:

- Tests/Quizzes
- Informal lab investigations
- Formal lab write ups
- Checked homework
- Class discussion
- Labeled diagrams
- Summarizers

### 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.*

- Graphic Organizers that represent the states of matter (A, M)
- Chart describing the particle, definition, and details/charges for the subatomic particles (A, M)
- Periodic Table Puzzle: using clues that were available during Mendeleev's time period - build his version of the periodic table. (A, M)
- Discussion using What it is and What it's not organizer to promote understanding of what is matter based on its 2 basic properties and what is not matter (A, M)
- Reading Tool: Front-Load the Words - Vocabulary exercise using differentiated instruction with definition, characteristics, examples, and illustration(A, M)
- Model building for Atomic Structure. (M)
- Teacher-led discussion: What do you know about the Periodic Table? What information can you find from it? (A)
- Teacher-led discussion: Noble gases and stability: "How do other elements become stable?" (A)
- Adopt an Element Student Presentation (A,M)
- 5 General Rxn - Single Replacement, Double Replacement, Decomposition, Synthesis, and Combustion Lab (M, T)
- Demonstration of Rxn Types through Videos or actual demo's in the classroom when possible.(M)