CCPS Science Unit Plan

Grade	HSPS	**Subject**	Science	**Unit #**	3
Unit Name	Conservation of Matter and Nuclear Energy		**Timeline**	2 ½ weeks	
How to use the Framework	This Framework should be used to implement daily science instruction. The resources and instructional strategies reflected in the Framework will provide a foundation for effective implementation and student mastery of standards. Please see the hyperlinked abbreviation document to ensure understanding of all abbreviations used with this framework.				
Unit Overview	This unit is based on the understanding all matter is made of atoms and mass is conserved during chemical reactions. This unit will allow students to construct models of nuclear fission and fusion, develop persuasive arguments related to advantages and disadvantages of nuclear energy, and illustrate and explain half-life processes and radioactivity. Topics: ● Conservation of Matter ● Nuclear energy ● Fission and fusion ● Radioactive decay ● Half-life				
Lesson Plan guidance document and template	CCPS Lesson Plan Template Day View Lesson Plan Template Week View Department of Science Guidance Document				

3Dimensional Instruction

GSE	Science and Engineering Practices	Crosscutting Concepts
SPS3. Obtain, evaluate, and communicate information to support the Law of Conservation of Matter. SPS3a. Plan and carry out investigations to generate evidence supporting the claim that mass is conserved during a chemical reaction. (Clarification statement: Limited to synthesis, decomposition, single replacement, and double replacement reactions.) SPS3b. Develop and use a model of a chemical equation to illustrate how the total number of atoms is conserved during a chemical reaction.	**Developing and Using Models** Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems. Develop a model to describe unobservable mechanisms. (MS-PS3-2) **Planning and Carrying Out Investigations** Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables	**Scale, Proportion, and Quantity** Proportional relationships (e.g. speed as the ratio of distance traveled to time taken) among different types of quantities provide information about the magnitude of properties and processes. (MS-PS3-1), (MS-PS3-4) **Systems and System Models** Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy and matter flows within systems. (MS-PS3-2) **Energy and Matter**

	(Clarification statement: Limited to chemical equations that include binary ionic and covalent compounds and will not include equations containing polyatomic ions.) SPS4. Obtain, evaluate, and communicate information to explain the changes in nuclear structure as a result of fission, fusion and radioactive decay. SPS4a. Develop a model that illustrates how the nucleus changes as a result of fission and fusion. SPS4b. Use mathematics and computational thinking to explain the process of half-life as it relates to radioactive decay. (Clarification statement: Limited to calculations that include whole half-lives.) SPS4c. Construct arguments based on evidence about the applications, benefits, and problems of nuclear energy as an alternative energy source.	and provide evidence to support explanations or design solutions. Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim. (MS-PS3-4) **Analyzing and Interpreting Data** Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Construct and interpret graphical displays of data to identify linear and nonlinear relationships. (MS-PS3-1) **Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories. Apply scientific ideas or principles to design, construct, and test a design of an object, tool, process or system. (MS-PS3-3) **Engaging in Argument from Evidence** Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). Construct, use, and present oral and written arguments supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon. (MS-PS3-5)	The transfer of energy can be tracked as energy flows through a designed or natural system. (MS-PS3-3) Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion). (MS-PS3-5)

		Connections to Nature of Science **Science Knowledge Is Based on Empirical Evidence** Science knowledge is based upon logical and conceptual connections between evidence and explanations. (MS-PS3-4), (MS-PS3-5)	

NGSS Alignment

NGSS Alignment to Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons.
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.
The repeating patterns of this table reflect patterns of outer electron states.
The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms.
Stable forms of matter are those in which the electric and magnetic field energy is minimized. A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart.

PS1.B: Chemical Reactions

Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.
In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present.
The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.
Mass is conserved during a chemical reaction. The mass of the reactant(s) (prior to a reaction) must equal the mass of the product(s) (after the reaction.
Therefore matter is neither created nor destroyed during a chemical reaction.
Both the reactant and product will contain the same types and quantity of atoms.
Chemical reactions have two components: Reactant and Product
Reactions can be classified as: single (simple) replacement, double replacement, synthesis, or decomposition.

PS2.B: Types of Interactions

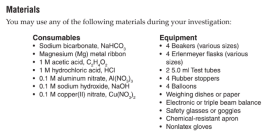
Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.

Weekly Lesson Tasks

Week 1	
GSE: SPS3, SPS3a	**Focused Concept: Law of Conservation of Matter**

Phenomenon: Law of Conservation of Matter			**DQ: What happens to the mass of a whole object if it is separated into small parts?**		
The students will be able to (SWBAT)	SWBAT design an investigation to explain the Law of Conservation of Matter.	SWBAT balance chemical reactions and identify different types of chemical reactions.	SWBAT explain different types of chemical reactions.	SWBAT design an investigation on the Law of Conservation of Matter.	SWBAT design and test an investigation on the Law of Conservation of Matter.
	Day 1	**Day 2**	**Day 3**	**Day 4**	**Day 5**
Opening	Teacher will ask the class: "Have you ever wondered what happens to the mass of substances when they undergo a chemical change?" Teacher will: Show a video clip of Generation Genius Law of Conservation of Matter. (Start at :30 and end at 1:24) Encourage students to share their thoughts and ideas. Teachers will: explain that today's lesson will focus on exploring the Law of Conservation of Matter, which states, "The total mass of substances before and after a chemical reaction remains constant."	Teacher will: -Show a short video clip demonstrating various chemical reactions (e.g., a piece of magnesium ribbon burning, vinegar reacting with baking soda). (Video Link: Chemical Reactions clip 1, clip 2.) -Ask students to describe what they observed in the video. What changes occurred? What signs indicate a chemical reaction?	Teacher will: Provide the following Bellringer question, using a Padlet. "Explain what a chemical reaction is?" and "Can you name any types of chemical reactions?" Teacher will give examples of each type of reaction. a. **Synthesis Reaction** ($A + B \rightarrow AB$) Example: Formation of Water ($H_2 + O_2 \rightarrow H_2O$) (Hydrogen gas reacts with oxygen gas to form water. This is a synthesis reaction where two elements combine to form a single compound.) b. **Decomposition Reaction** ($AB \rightarrow A + B$) Example: Decomposition of Hydrogen Peroxide ($2H_2O_2 \rightarrow 2H_2O + O_2$) (Hydrogen peroxide decomposes into water and oxygen gas. This is a decomposition reaction where a single compound breaks down into two or more simpler substances.) c. **Single Replacement**	Bellringer "What do you think makes a good scientific investigation?" -Students will record their responses on sticky notes or in their notebooks.	Teacher will review the steps of ADI specifically reviewing the Plan and the Do and the Share stages. Students will have the opportunity to ask any clarifying questions. Students will have the opportunity to ask any clarifying questions.

			Reaction (A + BC → AC + B) Example: Zinc and Hydrochloric Acid ($Zn + 2HCl \rightarrow ZnCl_2 + H_2$) (Zinc metal reacts with hydrochloric acid to produce zinc chloride and hydrogen gas. In this single replacement reaction, zinc replaces hydrogen in the compound.) d. **Double Replacement Reaction** (AB + CD → AD + CB) Example: Reaction between Sodium Chloride and Silver Nitrate ($NaCl + AgNO_3 \rightarrow NaNO_3 + AgCl$) (Sodium chloride reacts with silver nitrate to produce sodium nitrate and silver chloride. This double replacement reaction involves the exchange of ions between two compounds to form new compounds.)		
Guided Practice/ Transition	Demonstrating the reaction between iron filings and sulfur powder. Emphasize the visual change that occurs as the reaction proceeds, from the metallic appearance of iron filings to the formation of black iron(II) sulfide. Ask students to observe the reaction and discuss their initial observations and questions. Encourage them to consider whether the total mass of the substances appears to	Teacher will explain the concepts: **Synthesis Reaction:** Two or more simple substances combine to form a more complex substance (A + B → AB). **Decomposition Reaction:** A complex substance breaks down into two or more simpler substances (AB → A + B). **Single Replacement Reaction:** One element replaces another element in a compound (A + BC →	Guide students through the initial steps of the Chemical Changes Gizmo simulation. Guide students to identify and perform specific reactions in the Gizmo for each type of chemical reaction. Teacher will ask students to predict the products of given reactants before running the simulation. Teacher and students will	Introduce the seven stages of ADI and provide a brief overview of each stage. **Task**: Introduce a phenomenon to figure out and the task to complete. **Ideas**: Highlight some ideas that can be used during the investigation. **Plan**: Create, share, and revise a plan for collecting and analyzing data. **Do**: Collect the data needed and make sense of it.	Teacher and students discuss selected claims and procedures and make corrections or adjustments as needed. Teacher will provide groups with the necessary lab materials and discuss next steps in the ADI. Teacher will circulate around the room, providing support as students finalize their investigation plans and asking probing questions to help students refine their

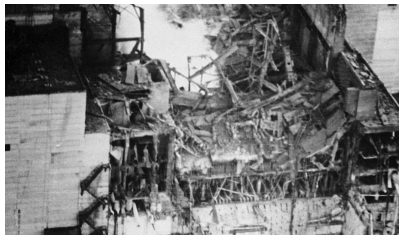
	change during the reaction. Introduce the terms/definitions for chemical reaction, synthesis, decomposition, single replacement, double replacement, reactants and products. Teacher will explain that students will carry out their investigations to generate evidence supporting the claim that mass is conserved during chemical reactions. (Note: They will measure mass changes before and after reactions and analyze their results to confirm the conservation of mass.)	AC + B). **Double Replacement Reaction:** The ions of two compounds exchange places in an aqueous solution to form two new compounds (AB + CD → AD + CB). Chemical Reactions Guided Practice Worksheet	complete the Prior Knowledge and Gizmo Warm-up Questions together. Teacher will use the Mimio board to do Activity A with the class before assigning the daily lesson.	**Share**: Create, share, critique, and revise evidence-based arguments. **Reflect**: Discuss ways to use core ideas and practices in the future. **Report**: Write, share, critique, and revise reports about what they figured. ***Teacher will model the steps of ADI with students using the concept of tying shoe laces.** (Students will use a graphic organizer to list the steps of ADI, if needed).	designs such as "What specific observations will you need to make during your investigation?" "What measurements are critical to ensure you accurately test the Law of Conservation of Matter?" Teacher will ensure students are aware of and follow all safety protocols. Provide necessary materials and equipment.  **Materials** You may use any of the following materials during your investigation: **Consumables** • Sodium bicarbonate, $NaHCO_3$ • Magnesium (Mg) metal ribbon • 1 M acetic acid, $C_2H_4O_2$ • 1 M hydrochloric acid, HCl • 0.1 M aluminum nitrate, $Al(NO_3)_3$ • 0.1 M sodium hydroxide, NaOH • 0.1 M copper(II) nitrate, $Cu(NO_3)_2$ **Equipment** • 4 Beakers (various sizes) • 4 Erlenmeyer flasks (various sizes) • 2 5.0 ml Test tubes • 4 Rubber stoppers • 4 Balloons • Weighing dishes or paper • Electronic or triple beam balance • Safety glasses or goggles • Chemical-resistant apron • Nonlatex gloves
Independent Practice	Students will work in groups to design an investigation for the Law of Conservation of Matter. Students will list the steps of their investigation. Students will work in groups to test their investigation and communicate their results in a chart or graph. (Any or all of these stations can be used based on the number of students and levels of the students in the class.) **Station 1: Baking Soda and Vinegar Reaction (Synthesis)** Station #1-Baking soda (sodium bicarbonate), vinegar (acetic acid), balance (or measuring spoons), containers (e.g.,	Students will complete the Types of Chemical Reactions worksheet.	Students will complete Chemical Changes Gizmo Activity B: Conservation of Matter and Activity C: Types of Reactions	**ADI: Physical Science Lab 4:** **Conservation of Mass:** How does the total mass of the substances formed as a result of a chemical change compare to the mass of the original substance? Lab Handout Students will work in groups to read and annotate the ADI document. Students will collectively develop a claim for the Guided Question and develop for designing an investigation.	**ADI: Physical Science Lab 4:** **Conservation of Mass:** **Guiding Question:** How does the total mass of the substances formed as a result of a chemical change compare to the mass of the original substance? Lab Handout Student groups will design and test an investigation. a. What observations (color change, production of gas, etc.) will you need to make during your investigation? b. What measurements (mass of the reactants, mass of the containers, etc.) will you need to make during your investigation?

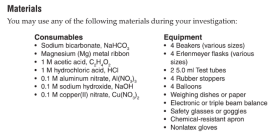
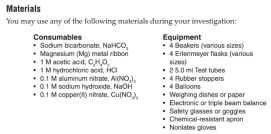
	cups or bowls), safety goggles **Station 2: Hydrogen Peroxide and Yeast Reaction (Decomposition)** Materials: Hydrogen peroxide solution (3% concentration), dry yeast, empty plastic bottle, balloon, balance (or measuring spoons), safety goggles **Station 3: Iron Nail and Copper(II) Sulfate Solution Reaction (Single Replacement)** Materials: Iron nail (or steel wool), copper(II) sulfate solution (available as root killer), balance (or measuring spoons), containers (e.g., cups or bowls), safety goggles **Station 4: Baking Soda and Calcium Chloride Solution Reaction (Double Replacement)** Materials: Baking soda (sodium bicarbonate), calcium chloride solution (e.g., de-icing salt solution), balance (or measuring spoons), containers (e.g., cups or bowls), safety goggles **Station 5: Inquiry Station with Household Items** Materials: Various household items for				Student groups will collect the data using the following questions: • How will you ensure that none of the substances that you create when you mix the reactants together escape during the reaction or once the reaction is complete? • How will you take into account the mass of the containers? • When will you need to make your observations or measurements? • What equipment will you need to collect the data? • How will you make sure that your data are of high quality (i.e., how will you reduce error)? • How will you keep track of the data you collect? • How will you organize your data?

	students to choose from (e.g., vinegar, baking soda, lemon juice, salt, sugar, water, cooking oil), balance (or measuring spoons), containers (e.g., cups or bowls), safety goggles.				
Assessment Summary	Students will answer the following questions in their Science notebooks. 1. What was the main idea or hypothesis of your investigation? Summarize the purpose of your investigation. 2. How did you ensure your investigation would test the Law of Conservation of Matter? Discuss the key steps you included and why they are important. Paragraph 1-Describe the investigation your group designed and tested answering the question, "What was the hypothesis or main idea?" Paragraph 2-Summarize the key steps of your investigation answering the question, "What observations and measurements did you make during the investigation?" Include any relevant data. Paragraph 3-Describe the roles each member played and how you collaborated during the testing phase. "How did your group work	Homework: Complete the Chemical Reactions Worksheet	What kinds of evidence can indicate that a chemical change has taken place? In the "normal setup," why do some chemical reactions seem to lose mass, while others gain mass? For any reaction, does the total mass change if the reaction is done in a closed system? Why or why not?		Student will write a reflection of the activities that they completed in their Science journal as a rough draft for their final lab report.

	together to conduct the investigation?" "What challenges did you encounter during the testing phase?" Explain how you addressed these challenges. Paragraph 4-Communicate Results by answering the questions, "What type of chart or graph did you use to present your results?" Describe why you chose this method of communication. "How did you organize your data in the chart or graph?" Discuss the layout and any labels or units used. Paragraph 5-Analyze and Interpret data by answering questions, "What did your results show about the Law of Conservation of Matter?" Interpret the data and explain whether it supports your hypothesis. "Were there any unexpected results or anomalies?" Discuss any discrepancies and potential reasons for them.				
Small Group Tasks (TBA)					

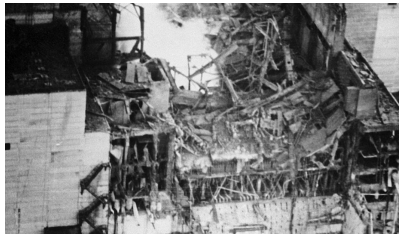
Week 2	
GSE: SPS3a, SPS3b	**Focused Concept:Conservation of Matter, Nuclear energy**
Phenomenon: Chernobyl Disaster 1986: What really happened?	**DQ: How do the processes of fission, fusion, and radioactivity work, and what are the benefits and disadvantages of using nuclear energy as an alternative energy**

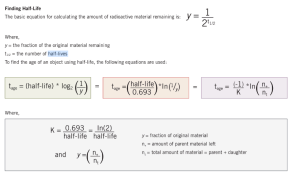
			**source?**		
The students will be able to (SWBAT)	SWBAT create a chart or graph and analyze data from an investigation on the Law of Conservation of Matter.	SWBAT explain the data/findings for the investigation to justify the results.	SWBAT create a model to explain reactants and products in the Law of Conservation of Matter.	SWBAT complete interactive labs to distinguish between fission, fusion, and radioactivity	SWBAT use lab simulations and hands-on labs to explain half-life.
	Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
Opening	Teacher will review the steps of ADI specifically reviewing the Share, Reflect and the Report stages. Students will have the opportunity to ask any clarifying questions.	Teacher will review the steps of ADI specifically reviewing the Reflect and the Students will have the opportunity to ask any clarifying questions.	Begin the lesson with the baking soda, vinegar, and balloon producing carbon dioxide gas phenomenon. Ask students to observe the phenomenon and discuss their observations. Prompt them to think about what is happening at the molecular level during the reaction. Introduce the concept of conservation of atoms and explain that the total number of atoms in the reactants equals the total number of atoms in the products.	Teacher will introduce the lesson by showing the video, Nuclear Energy Movie. Students will make a 3 column chart with the terms, fusion, fission, and radioactive decay. Students will write down key details for each term as they watch the video and learn new information during the lesson. Teacher will show students the video, How Does Fusion Power the Sun? and students are to answer the question, “What do you think is happening at the atomic level during these reactions?" Teacher will explain that students will be completing a PHet lab to gauge a better understanding of fission, fusion and radioactivity. At the end of the lab students	Guiding question/Bell ringer: How can radiation cause and cure cancer? Students will record their answers on an index card for the teacher to take up and read aloud with no names. These cards will be categorized based on student responses. (**Student partners for the independent practice will be chosen based on these cards**). Teacher will show a time-lapse video of a radioactive substance decaying over time. Video Clip: Radioactive Decay (Stop the video at 1:50) Teacher will explain that students will learn about radioactive decay and half life.

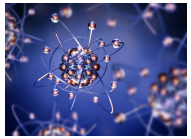
				will revise their answer to the guiding question if needed.	
Guided Practice/Transition	Teachers instruct students on how to analyze their data to determine if it supports the Law of Conservation of Matter. Provide examples of how to construct a scientific argument, including claims, evidence, and reasoning. Teacher will also help students organize group presents their tentative argument and encourage peer feedback and questions.  **Materials** You may use any of the following materials during your investigation: **Consumables** • Sodium bicarbonate, $NaHCO_3$ • Magnesium (Mg) metal ribbon • 1 M acetic acid, $C_2H_4O_2$ • 1 M hydrochloric acid, HCl • 0.1 M aluminum nitrate, $Al(NO_3)_3$ • 0.1 M sodium hydroxide, NaOH • 0.1 M copper(II) nitrate, $Cu(NO_3)_2$ **Equipment** • 4 Beakers (various sizes) • 4 Erlenmeyer flasks (various sizes) • 2 5.0 ml Test tubes • 4 Rubber stoppers • 4 Balloons • Weighing dishes or paper • Electronic or triple beam balance • Safety glasses or goggles • Chemical-resistant apron • Nonlatex gloves	Teacher will ask students to reflect on their investigation process and the argument session. Teacher will provide guiding questions for reflection: "What did you learn from the investigation and argument session?" "How can you improve your investigation or argument?" Teacher will help students revise their investigation procedures and arguments based on reflection and feedback.  **Materials** You may use any of the following materials during your investigation: **Consumables** • Sodium bicarbonate, $NaHCO_3$ • Magnesium (Mg) metal ribbon • 1 M acetic acid, $C_2H_4O_2$ • 1 M hydrochloric acid, HCl • 0.1 M aluminum nitrate, $Al(NO_3)_3$ • 0.1 M sodium hydroxide, NaOH • 0.1 M copper(II) nitrate, $Cu(NO_3)_2$ **Equipment** • 4 Beakers (various sizes) • 4 Erlenmeyer flasks (various sizes) • 2 5.0 ml Test tubes • 4 Rubber stoppers • 4 Balloons • Weighing dishes or paper • Electronic or triple beam balance • Safety glasses or goggles • Chemical-resistant apron • Nonlatex gloves	Guide students through the PHeT Lab, Reactants, Products and Leftovers Sandwich. (Teacher will go through a series of examples. Allow students to give explanations of how the activity relates to chemical reactions and the conservation of matter.)	Teacher will guide students on how fusion works. Directions here. Teacher will demonstrate how fission works using marbles. Teacher will use the Mimio board to walk through a model of a nucleus undergoing fission. Explain the process of a heavy nucleus splitting into smaller nuclei, releasing energy and neutrons. Repeat the process for fusion, using diagrams to show how light nuclei combine to form a heavier nucleus, releasing energy	Show students the clip. How can we use radiation to our advantage? How can radiation be used to find and cure cancer? Make a list of what you know about radiation technologies and applications and what you would like to know. Teacher will ask, "What do you think is happening to the substance over time? How do you think scientists measure this change?" Teacher will show students a clip of half-life explained. Teacher and students will practice.
Independent Practice	**ADI: Physical Science Lab 4:** **Conservation of Mass:** **Guiding Question:** How does the total mass of the substances formed as a result of a chemical change compare to the mass of the original substance? Lab Handout Students will analyze the data and create a chart or graph using the following questions; • What type of calculations will you need to make?	**ADI: Physical Science Lab 4:** **Conservation of Mass:** **Guiding Question:** How does the total mass of the substances formed as a result of a chemical change compare to the mass of the original substance? Lab Handout Students will conduct peer reviews and an argumentative session in class to give feedback to peers. Students will revision their information based on the feedback from	Students will work in groups to complete one of the following assignments. a. Create an artifact that represents a product model and a reactant model of o $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2OCH_4 + 2O_2 \rightarrow CO_2 + 2H2_2O$ using colored beads (Guided worksheet for differentiation if needed). b. Create models using craft items with assorted craft supplies (e.g., construction paper, cardboard, modeling clay, pipe cleaners, markers, scissors, glue)	Students will work in groups to complete one of the assignments then create an anchor chart to share with other groups through a jigsaw. Fission Fusion and Radioactivity A Fission Fusion and Radioactivity B Fission Fusion and Radioactivity C Students will complete the Phet Nuclear Fission Simulation Lab Students work in pairs to	Students will read pages 337-341 in the Inspire Textbook Complete Picture This! on pg. 337, Applying Math on pg. 338, Get It on pg. 339 and 340. Students will have a choice of completing one of the labs. 1. PhET Simulation: Radioactive Dating Game 2.Hands-On Lab: Understanding Radioactive Decay 3. Hands-On Lab:

	• What type of table or graph could you create to help make sense of your data? • How will you determine if the total mass of the reactants and the products is the same or different?	their peers. • How did you collect your data? Why did you use that method? Why did you collect those data? • What did you do to make sure the data you collected are reliable? What did you do to decrease measurement error? • How did your group analyze the data? Why did you decide to do it that way? Did you check your calculations? • Is that the only way to interpret the results of your analysis? How do you know that your interpretation of your analysis is appropriate? • Why did your group decide to present your evidence in that way? • What other claims did your group discuss before you decided on that one? Why did your group abandon those alternative ideas? • How confident are you that your claim is valid? What could you do to increase your confidence?	c. Create a digital representation of reactants and products that demonstrate the Law of Conservation of Matter.	develop their models illustrating the changes in the nucleus during fission and fusion. They use diagrams and annotations to explain the processes.	Understanding Half-Life with M&M's
Assessment/Summary		Student will write a reflection of the activities that they completed in their Science journal as a rough draft for their final lab report. **Homework** Students will complete a	Have the students explain in their own words how this activity demonstrated the conservation of atoms in a chemical reaction. (**They should understand that this principle is a fundamental concept in chemistry and applies to**	Students will add a sticky note to each of the activities that they were not a part of with something they learned today. Students will use what they have learned to make revisions to their original	Students will complete a 3-2-1 writing activity. 3 new things you learned 2 explanations of the graph that was analyzed 1 question that you still have.

		typed report with any diagrams, figures, or tables embedded into the document.The report should be in two pages or less and answer the following questions. 1. What question were you trying to answer and why? 2. What did you do to answer your question and why? 3. What is your argument?	**all chemical reactions.**) Student will write a reflection of the activities that they completed in their Science journal as a rough draft for their final lab report.	answer to the question "What do you think is happening at the atomic level during these reactions?"	Students will use the conclusion part of the lab to complete a lab report for the selected lab.
Small Group Tasks (TBA)					

Week 3					
GSE:SPS3b, SPS4a, SPS4b		**Focused Concept: Fission and fusion, Radioactive decay, Half-life**			
Phenomenon: Chernobyl Disaster 1986: What really happened? 			**DQ: How do the processes of fission, fusion, and radioactivity work, and what are the benefits and disadvantages of using nuclear energy as an alternative energy source?**		
The students will be able to (SWBAT)	SWBAT evaluate benefits and disadvantages of nuclear energy.	SWBAT review standards for Unit Assessment.	SWBAT demonstration mastery of the Unit standards by completing an assessment.		
	Day 11	**Day 12**	**Day 13**	**Day 14**	**Day 15**
Opening	Teacher will review radioactive decay/half-life with students. Teacher will remind students of the clip of half-life explained.	Review Day for Unit Assessment	Unit Assessment Day		

	Teacher will explain that students will learn how to use real-world scenarios to explain half-life mathematically. Teacher will show a video clip of a nuclear power plant and a clip of Chernobyl Nuclear Disaster Students will answer the question, "What are your initial thoughts on nuclear energy? What potential benefits and problems do you think are associated with it?"				
Guided Practice/Transition	Teacher will use the Mimio board to demonstrate. Teacher will explain that students will be completing a research assignment on the principles of nuclear energy and its applications. Students will evaluate the benefits and problems associated with nuclear energy. Students will construct evidence-based arguments regarding the use of nuclear energy as an alternative energy source. Teacher will conduct a simulation or interactive PhET simulation to model nuclear reactions. PhET Simulation: Nuclear Fission  Finding Half-Life The basic equation for calculating the amount of radioactive material remaining is: $y = \frac{1}{2^{t_{hl}}}$ Where, y = the fraction of the original material remaining t_{hl} = the number of half-lives To find the age of an object using half-life, the following equations are used: $t_{hl} = (\text{half-life}) * \log_2\left(\frac{1}{y}\right) = t_{hl} = \left(\frac{\text{half-life}}{0.693}\right) * \ln(y) = t_{hl} = \frac{(-1)}{K} * \ln\left(\frac{n_1}{n_0}\right)$ Where, $K = \frac{0.693}{\text{half-life}} = \frac{\ln(2)}{\text{half-life}}$ and $y = \left(\frac{n_1}{n_0}\right)$ y = fraction of original material n_1 = amount of parent material left n_0 = total amount of material = parent + daughter Teacher and students will	Teacher will demonstrate how to access Quizizz and Blooket and take online review assessments.			

	discuss the simulation results and how they relate to the operation of nuclear power plants. Teacher will provide students with Group Research Questions: How do nuclear power plants generate electricity? What are the key benefits of using nuclear energy? What are the main problems and risks associated with nuclear energy? How is nuclear technology used in fields other than energy production? Highlight the safety measures and technologies used to manage nuclear reactions and minimize risks.				
Independent Practice	Students will work in groups to complete real-life scenario half-life problems in groups. Students will create a whiteboard explanation of the answers to their problems and present them to the class. Half-life Group Problems Teacher will divide students into groups and assign each group a specific aspect of nuclear energy to research: a. How nuclear power plants work b. Benefits of nuclear energy (e.g., low carbon emissions, high energy output)	Blooket SPS3. Law of Conservation of Matter Go to play.blooket.com and enter Game ID: 6543665 Physical Science EOC SPS3  EOC Practice SPS3 SPS4 Kahoot SPS4 Kahoot SPS4 Half-life, Nuclear energy, and Fission and Fusion			

	c.Problems and risks of nuclear energy (e.g., radioactive waste, nuclear accidents) d. Alternative uses of nuclear technology (e.g., medicine, space exploration) Provide each group with access to research materials (articles, videos) and guided questions to help direct their research. Each group presents their findings to the class, highlighting key points about their assigned topic. Students will take notes during each presentation, focusing on evidence supporting the benefits and problems of nuclear energy. Students work in pairs to construct an argument for or against the use of nuclear energy as an alternative energy source, using the evidence gathered from the research and simulation activities. Students should include: A clear claim (e.g., "Nuclear energy should be used as an alternative energy source because...") Supporting evidence (facts, statistics, examples) Reasoning that explains how the evidence supports the claim. Students exchange their arguments with a partner for feedback. Encourage constructive criticism and suggestions	SPS4 a Fission/Fusion 2 B			

	for improvement.				
Assessment/Summary	Students will present their results to the class. Students will write a brief summary of their research in their Science notebooks.	Students must show at least 75% or better on assessments. Assignments for remediation/reteaching will be provided in Progress Learning.			
Small Group Tasks (TBA)					

Assessment Prep

Prepare students for assessment by reviewing the following Assessment Prep Presentation.

Unit 3 Review Assessment

Provide the following guidance:
Ask the students to use what they know about the tasks completed to answer the provided assessment prep question.

- What is the question asking you?
- What do you know about the vocabulary or concept in the question?
- Is this question similar to any investigations or tasks we've completed?
- How can what you've done help you answer this question?
- Just view the assessment question: What is the question asking you?

Guide students to think about how their experience connects to the question.
Using the answer choices provided, ask the students the following:

- Identify a wrong answer: How do I know this answer is incorrect?
- Identify the right answer: How do we know this answer is correct?

Allow the students time to discuss in collaborative groups.

TEACHER NOTE: If students struggle with the question, review it the next day. Do not rush to the next question; instructional time is the only time they have to prepare for the end-of-year assessment.

Labs / Investigations		
Mandatory Labs	**Explore Learning Gizmo**	**Pivot Interactives/Phet**

ADI: Physical Science Lab 4: Conservation of Mass	**Chemical Changes Gizmo:** **https://gizmos.explorelearning.com/find-gizmos/launch-gizmo?resourceId=1060**	**Radioactivity Dating:** **https://phet.colorado.edu/en/simulations/radioactive-dating-game** **PhET: Balancing Chemical Equations:** https://phet.colorado.edu/en/simulation/balancing-chemical-equations
Additional Resources/Tasks		
Supplemental Resources	**Nuclear Powered Learning:** http://archive.constantcontact.com/fs008/1102261797598/archive/1108082715904.html **Half-Life:** http://nuclearconnect.org/in-the-classroom/for-teachers/half-life-of-paper-mms-pennies-or-puzzle-pieces **Balancing Equations:** https://middleschoolscience.com/2017/03/05/balancing-equations-a-hands-on-activity/ **Balancing Equations II:** https://www.brighthubeducation.com/middle-school-science-lessons/61186-balancing-equation-activities/ **Fission Demonstration:** http://nuclearconnect.org/in-the-classroom/for-teachers/what-is-fission **Nuclear Energy Basics:** https://www.energy.gov/ne/information-resources/stem-resources **ADI Documents**	