

Phoenixville Area School District UbD Science Unit Plan

Grade Level: 7th Grade

Unit Name: Matter & Its Interactions

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Stage 1 Desired Results		
	<i>Transfer</i>	
<p>Overarching NGSS & PA Standards:</p> <p>3.2.6-8.A Develop models to describe the atomic composition of simple molecules and extended structures</p> <p>3.2.6-8.E Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.</p> <p>3.2.6-8.F Undertake a design project to construct, test, and modify a device that either releases or absorbs</p>	<p><i>Students will be able to independently use their learning to...</i></p> <ol style="list-style-type: none"> 1. Ask questions and/or define problems 2. Develop and/or use models 3. Plan and/or carry out investigations 4. Analyze and interpret data using computational thinking 5. Obtain, evaluate, and communicate information (supported by evidence) 6. Construct explanations and design solutions 	
	<i>Meaning-Making</i>	
	<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> • Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms • Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals). • Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. • The total number of each type of atom is conserved, and thus the mass does not change. • Some chemical reactions release energy, others store energy. 	<p>ESSENTIAL QUESTIONS <i>Students will keep considering...</i></p> <ul style="list-style-type: none"> • What is a molecule? • How can atoms bond to form different molecules? • What are the chemical properties of matter? • What happens to the mass of atoms during a chemical reaction? • What are the types of chemical reactions?
	<i>Knowledge and Skills Acquisition</i>	
	<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> • Substances are made from different types of atoms. • Atoms form molecules. Molecules consist of two or more atoms and can be made up of the same type (elements) or different types (compounds) of atoms. • Some molecules will bond with each other to form extended structures, and some will not. • Atoms combine to form extended structures such as crystals and metals. 	<p><i>Students will be skilled at...</i></p> <ul style="list-style-type: none"> • Develop a model to predict and/or describe phenomena. • Develop a model to describe

<p>thermal energy by chemical processes.*</p> <p>Which branch(es) of science apply:</p> <p>PS</p>	<ul style="list-style-type: none"> • During a chemical reaction, substances are regrouped into different molecules. • During a chemical reaction, the properties of the products differ from the properties of the reactants (chemical properties). • During a chemical reaction, the number of each type of atom, and therefore the mass, does not change (Law of Conservation of Mass). • Exothermic reactions release energy to their surroundings • Endothermic reactions absorb energy from their surroundings 	<p>unobservable mechanisms.</p> <ul style="list-style-type: none"> • Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. • Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table) • Reason abstractly and quantitatively. • Model with mathematics. • Use ratio and rate reasoning to solve real-world and mathematical problems • Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. 			
<p>KEY VOCABULARY</p>					
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td data-bbox="296 370 737 708" style="vertical-align: top;"> <ul style="list-style-type: none"> • Atom • Proton • Neutron • Electron • Element • Molecule • Compound </td> <td data-bbox="737 370 1161 708" style="vertical-align: top;"> <ul style="list-style-type: none"> • Solid • Liquid • Gas • Chemical properties • Chemical reaction • Reactants • Products </td> <td data-bbox="1161 370 1602 708" style="vertical-align: top;"> <ul style="list-style-type: none"> • Catalyst • Inhibitor • Reaction Rate • Law of Conservation of Mass • Exothermic • Endothermic </td> </tr> </table>			<ul style="list-style-type: none"> • Atom • Proton • Neutron • Electron • Element • Molecule • Compound 	<ul style="list-style-type: none"> • Solid • Liquid • Gas • Chemical properties • Chemical reaction • Reactants • Products 	<ul style="list-style-type: none"> • Catalyst • Inhibitor • Reaction Rate • Law of Conservation of Mass • Exothermic • Endothermic
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		<ul style="list-style-type: none"> Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
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Stage 2 – Evidence

Assessment Evidence

Evaluative Criteria		
	PERFORMANCE TASK(S):	
Molecule Model Rubric	<ol style="list-style-type: none"> Develop and use models to describe substances being made up of molecules, and the behavior of substances depending on their atomic structure. Student models will include: <ol style="list-style-type: none"> Individual atoms Molecules Extended structures with repeating subunits Substances (solids, liquids, and gases at the macro level) 	Differentiation Considerations: <ul style="list-style-type: none"> When grouping students consider matching different skills sets When asking students to describe a model, give them the opportunity to draw or write it, as well. Teacher can scribe written responses for students Teacher can encourage different modes of presentation
Chemical Reaction Model Rubric	<ol style="list-style-type: none"> Develop and use a model, based on the Elephant toothpaste lab, to describe atoms in reactants of a chemical reaction rearranging to form the products of a reaction and how mass is conserved during the reaction. Student models will include: <ol style="list-style-type: none"> Types and number of molecules and types and number of atoms that make up reactants Types and number of molecules and types and number of atoms that make up products The mass of the reactants and mass of the products (Law of Conservation of Mass) 	

<p>Exothermic and Endothermic Solution Rubric</p>	<p>3. Design, construct, test, and modify a device to solve a problem that requires heating or cooling (controlling the transfer of energy to the environment through type and concentration of a substance. Examples: chemical reactions such as dissolving calcium chloride or ammonium chloride). Student solutions will include:</p> <ol style="list-style-type: none"> Features of problem that are to be solved by the device The components within the system to or from the energy will be transferred to solve the problem The chemical reaction(s) and substances used to release or absorb energy via the device How transfer of thermal energy between device and other components will be tracked Constraints of the design (amount/cost of materials, safety, amount of time device must function) 	<ol style="list-style-type: none"> PowerPoint Poster Physical model Other choice <ul style="list-style-type: none"> Students can use notes and other resources during labs and activities Teacher can chunk assignments &/or check lists <p>For labs, consider that some students may wish to:</p> <ul style="list-style-type: none"> explain verbally instead of in a written format draw their responses write in their first language
<p>Content Criteria</p> <p>Content Criteria</p> <p>Graded Quiz</p>	<p style="text-align: center;">OTHER EVIDENCE:</p> <ol style="list-style-type: none"> Molecules and Compounds PHET Simulation <ol style="list-style-type: none"> Identify similarities and differences between molecules and compounds Construct a Venn Diagram with definitions and comparisons Molecules and Compounds Lego Investigation <ol style="list-style-type: none"> Build Lego models of molecules Build Lego models of compounds Explain why all compounds are classified as molecules but not all molecules are classified as compounds. Organizing Matter Quiz Elephant Toothpaste Lab Report: 	<p>Differentiation Considerations:</p> <ul style="list-style-type: none"> Modified quizzes Flexible grouping Guided/Cloze Notes Pictures and videos to support vocabulary Sentence Starters Product modification in place of writing: <ol style="list-style-type: none"> Drawing Verbal explanation

<p>Lab Report Rubric</p>	<ul style="list-style-type: none"> a. Follow the Scientific Method to form a hypothesis, gather evidence, and form a conclusion b. Identify the chemical equation c. Identify the products and reactants d. Identify the catalyst 	
<p>Lab Report Rubric</p>	<p>5. Ziplock Bag Lab</p> <ul style="list-style-type: none"> a. Follow the Scientific method to form a hypothesis, gather evidence, and form a conclusion b. Investigate the type of chemical reaction that occurs when sodium bicarbonate and water are combined, calcium chloride and water are combined, and sodium bicarbonate, calcium chloride, and water are combined c. Identify each part of the investigation as exothermic or endothermic 	
<p>Content Criteria</p>	<p>6. Science Notebook Entries</p> <ul style="list-style-type: none"> a. Concept maps b. Vocabulary/Glossary entries c. Guided Research d. Lab Reports described above e. Daily Journal Entries <p>7. Checklists of collaborative behaviors in labs and activities</p> <p>8. Checklists of collaborative behaviors in class discussions</p> <p>9. Self-assessments for Performance Tasks</p> <p>10. TO CONSIDER FOR LATER: UNIT TEST(S)</p>	