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<tr><td>Strand 8.1: Matter and energy interact in the physical world</td><td colspan="2">The physical world is made of atoms and molecules. Even large objects can be viewed as a combination of small particles. Energy causes particles to move and interact physically or chemically. Those interactions create a variety of substances. As molecules undergo a chemical or physical change, the number of atoms in that system remains constant. Humans use energy to refine natural resources into synthetic materials.</td></tr>
<tr><td>Standard: 8.1.6<br><br>(MS-PS1-5.)</td><td colspan="2">Develop a model to describe how the total number of atoms does not change in a chemical reaction, indicating that <u>matter</u> is conserved. Emphasize demonstrations of an understanding of the law of conservation of matter. Balancing equations and stoichiometry will be learned at the high school level.</td></tr>
<tr><td></td><td>Developing and Using Models<br>Develop a model to describe unobservable mechanisms.</td><td><u>Energy and Matter</u><br>Matter is conserved because atoms are conserved in physical and chemical processes.</td></tr>
<tr><td>DCI</td><td colspan="2">PS1.B: Chemical Reactions<ul><li>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.</li><li>The total number of each type of atom is conserved, and thus the mass does not change.</li></ul></td></tr>
<tr><td>Student Friendly Objective</td><td colspan="2">I can develop a model that shows the total number of atoms does not change in a chemical reaction.</td></tr>
<tr><td>Anchor Phenomena</td><td colspan="2">In a chemical reaction the mass of the reactants is equal to the mass of the products<br>What happens to the mass of an egg when boiled and why?</td></tr>
<tr><td rowspan="2">Vertical Learning Progression</td><td>Previous Science Content<br>(Discussed in K-7 Standards)</td><td>Future Science Content<br>(Discussed in 9-12 Standards)</td></tr>
<tr><td><ul><li>Chemical reactions that occur produce different substances but the total mass remains the same.</li></ul></td><td><ul><li>Balancing chemical equations.</li><li>The terms: coefficients, subscripts</li></ul></td></tr>
<tr><td>What students will be doing this year:</td><td colspan="2">Components of the model<br>a. To make sense of a given phenomenon, students develop a model in which they identify the relevant components for a given chemical reaction, including:<br>i. The types and number of molecules that make up the reactants.<br>ii. The types and number of molecules that make up the products.<br>Relationships<br>a. In the model, students describe relationships between the components, including:<br>i. Each molecule in each of the reactants is made up of the same type(s) and number of atoms.<br>ii. When a chemical reaction occurs, the atoms that make up the molecules of reactants rearrange and form new molecules (i.e., products).<br>iii. The number and types of atoms that make up the products are equal to the number and types of atoms that make up the reactants.<br>iv. Each type of atom has a specific mass, which is the same for all atoms of that type.<br>Connections<br>a. Students use the model to describe that the atoms that make up the reactants rearrange</td></tr>
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| | and come together in different arrangements to form the products of a reaction.<br>b. Students use the model to provide a causal account that mass is conserved during chemical reactions because the number and types of atoms that are in the reactants equal the number and types of atoms that are in the products, and all atoms of the same type have the same mass regardless of the molecule in which they are found. |