Student’s Lesson at a Glance

Lesson Summary
This lesson contains two activities. These activities are designed to emphasize the Law of Conservation of Mass. Following a brief Connecting Activity with the teacher demonstration of burning paper, students use simulations to gather data so that they are able to calculate molar mass and moles of compounds.

SWBAT (Student will be able to)
- Know that chemical changes cause atoms in the reactants rearrange to form products with different properties and that physical changes do not result in new substances
- Identify how the Law of Conservation of Mass applies to chemical reactions

Essential Vocabulary
Keep a list of all important words from this lesson. This list, in addition to the lists from other lessons, will make studying easier and improve scientific communication skills. The essential vocabulary from the unit is in bold. Additional words that will expand your scientific vocabulary are in italics.
**CCC Reminder**

- Many questions will ask you “what you think” or “to make predictions.” The only answer that is wrong is the answer that is left blank.
- Use the vocabulary section and note section to take good notes so that studying for tests and quizzes will be easier.
- Supporting claims with evidence is not only a skill that scientists use, but a skill that will help you in other classes and everyday life.
- Show all your calculations. Include labels on all numbers. These two steps will make checking your work easier.
- Ions are charged particles that show up with a grey halo in the simulations. Ions make up ionic compounds. Use the periodic table to determine the charge of an ion.
- The coefficients indicate how many moles of a substance are present in a reaction.

**Notes**

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**Homework**

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**Upcoming Quizzes / Tests**

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Activity 1: Connecting

1. When atoms are rearranged in a chemical reaction, what do you think happens to the mass of the atoms?

2. When baking soda and vinegar react the mass of the reactants changes. Does this indicate that the Law of Conservation of Mass has been violated?

Recall that mass (or matter) can neither be created nor destroyed; this law is called the Law of Conservation of Mass. In a chemical reaction, the reactants are converted into new products when the atoms are rearranged. As you learned in the last lesson, chemical equations are balanced in accordance to the Law of Conservation of Matter; mass is conserved as reactants convert to products. During a chemical reaction, the atoms involved must retain the same mass. Thus, the Law of Conservation of Mass accounts for the fact that the total mass of the products formed in a reaction is always equal to the total mass of the reactants. To demonstrate the Law of Conservation of Mass, your teacher will measure the mass before and after burning a piece of paper in a combustion reaction. Paper is made up of cellulose, which has a chemical formula of $C_{6}H_{10}O_{5}$ organized in long chains.

3. What is the initial mass of the paper?

4. What do you think happens to the long chains of cellulose molecules on the submicroscopic level when paper burns?

5. What was needed for the paper to burn?

6. What is the final mass of the paper?
7. What do you think are the products of the combustion of paper?

8. Was mass conserved in the reaction?

**Activity 2: Simulating the Law of Conservation of Mass**

In this next activity, you will calculate the mass and moles of the reactants and products of the reaction.

**Demonstration:** Use Simulation 1, Set 10

\[ \text{AgNO}_3 \text{(aq)} + \text{NaCl (aq)} \rightarrow \text{AgCl (s)} + \text{NaNO}_3 \text{(aq)} \]

- Set up the reaction, push the START/STOP button, and run the reaction until about the 30 second mark.
- Using the crosshairs on the plot, record the masses of each substance and calculate the molar mass and moles at time = 0 seconds (page 33).
- After the reaction is complete, using the crosshairs on the plot, record the masses of each substance and calculate the molar mass and moles around time = 30 sec (page 34).
### Time = 0 Seconds

<table>
<thead>
<tr>
<th>Name</th>
<th>Formula</th>
<th>Molecule</th>
<th>Mass from Plot</th>
<th>Calculate Molar Mass (show calculations)</th>
<th>Calculate Moles (show calculations)</th>
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### Reactions - Lesson 3: Conserving Mass in Reactions

**Time = 30 seconds**

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<tr>
<th>Name</th>
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<th>Calculate Moles (show calculations)</th>
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<td>NaNO₃</td>
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Lesson Reflection Questions

10. A student balances an equation for a chemical reaction that was performed in lab. The student discovers the products have twice as much mass as the reactants. The student does not think this is correct and thinks that she balanced the equation improperly. If the wrong coefficients are added to a chemical equation while the equation is being balanced, how would this effect the Law of Conservation of Matter?

11. A student balances an equation for a chemical reaction that was performed in lab that explored the following chemical reaction:

\[ \text{Cu(NO}_3\text{)}_2 + 2 \text{NaOH} \rightarrow \text{Cu(OH)}_2 + 2 \text{NaNO}_3 \]

The student reacted 30g of copper nitrate with 12.8g of sodium hydroxide. How much copper hydroxide and sodium nitrate should have been produced in this reaction? Balance the chemical equation and determine the mass of each of the products that the student should have at the end of the reaction.

12. If the student predicted that there should have been 55.5g of sodium nitrate, would the Law of Conservation of Mass be upheld? Explain your answer.
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