

Objective: 8.P.1.4 - Law of Conservation of Matter (Mass)

6. Chemical X has a mass of 5 grams, and chemical Y has a mass of 10 grams. If the two chemicals are mixed and complete chemical reaction takes place, what is **most likely** the mass of the product?
- A. 5 grams
 - B. 10 grams
 - C. 15 grams
 - D. 50 grams

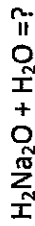
7. After a chemical reaction occurs in an *open test tube*, measurements indicate that the mass of the products remaining in the test tube is *less than the reactants*. What **most likely** explains the measurements?

- A. A gas was produced.
- B. A solid was produced.
- C. The salinity of the reactants was high.
- D. The temperature of the reactants was low.

8. How does the law of conservation of matter (mass) apply to chemical reactions?

- A. Atoms are rearranged, but are neither created nor destroyed.
- B. Only a small amount of matter is lost during every reaction.
- C. Reactant atoms are destroyed, but product atoms are created.
- D. People can use chemical reactions to protect natural resources.

9. The reactants involved in a chemical reaction are shown.



- How many O (oxygen) atoms must be present in the **product** that forms from this reaction?

- A. 1
- B. 2
- C. 3
- D. 4

10. A scientist combines 29.2 grams of hydrogen with 33.8 grams of calcium and an unknown amount of carbon. The mass of the resulting compound is 65.9 grams. What is the mass of the unknown amount of carbon?

- a. 1.8
- b. 2.9

Name: _____

LEQ 9: Law of Conservation of Mass Notes (Day 1)

Question: Can matter be created or destroyed?

➤ **Chemical Reaction (Change): written in a Chemical Equation**

- **Reactants = Products**
- Iron + Oxygen → Iron oxide
- 4Fe + 3O₂ 2Fe₂O₃

- **Coefficient** - # of _____ of a _____ in a chemical reaction. Ex:
- **Subscript** - # of _____. Ex:
- **Reactant** – what is _____ in a chemical reaction Ex:
- **Products** – substances _____ in a chemical reaction Ex:
- _____ – process by which a _____ substance is formed

Label the reactants and product:



*Matter can change states, but number of atoms will stay the same

- Ex: ____ hydrogen gas atoms and ____ oxygen gas atom react to form liquid water, which has ____ hydrogen atoms and ____ oxygen atom

➤ **Law of Conversation of Mass**

- In a chemical _____ atoms are neither _____ nor _____.
 - * We do not get rid of any atoms and we do not make any new atoms
 - In a chemical reaction, we call the materials that are going to react _____.
 - The materials that result from the reaction are called the _____.
 - ALL _____ present in the _____ are also present in the _____!
 - Mass of the _____ = Mass of the _____

➤ **Law of Conversation Lab**

The Law of Conservation of Matter states that matter is never _____ or _____, and that in a chemical reaction, the mass of the _____ is ALWAYS equal to the mass of the _____.

A _____ system is one where nothing can be taken away or added.

An _____ system is one where substances can be taken away or added.

Scientific Question:

Hypothesis:

I think that the mass of the **closed system** will (increase, decrease or stay the same) because the Law of _____ states that _____

Data Tables:

Draw: Before Chemical Reaction	Draw: During Chemical Reaction	Draw: Completing of Chemical Reaction

Mass of closed system Start (g)	Mass of closed system End (g)	Mass of open system (g)
NaHCO ₃ = CH ₃ COOH = Balloon = Total=	Total=	Total=

Analysis and Results:

1) Look at the chemical equation below:



Baking Soda + Vinegar → Sodium Acetate + Water + Carbon Dioxide

a) Name the reactants (what is NEEDED for the reaction; the ingredients):

b) Name the products (what is MADE):

c) Name the gas produced: ~

2) Compare the mass of the **closed** system before and after the reaction. Explain your results.

3) Were any new elements introduced into the closed system? Explain

4) What evidence did you observe to indicate that a chemical reaction took place? (HINT: What happened when you added the baking soda to the vinegar?)

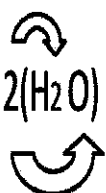
Name: _____

Balancing chemical equations (Day2)

➤ PAM

P-Paranthesis Step one: $2(\text{H}_2\text{O}) + \text{O} \rightarrow \text{H}_4 + \text{O}_3$

A- Arrows Step two: $2(\text{H}_2\text{O}) + \text{O} \rightarrow \text{H}_4 + \text{O}_3$



M- Multiply! Step three: $2 \times 2 = 4$ atoms of hydrogen

$2 \times 1 = 2$ atoms of oxygen

Balancing equations:

- $4\text{Fe} + 3\text{O}_2 \rightarrow$ _____
 1. How many atoms of Iron are there in the reactant? _____
 2. How many atoms of Iron are there in the product? _____
 3. How many atoms of Oxygen are there in the reactant? _____
 4. How many atoms of Oxygen are there in the product? _____
 5. What do you notice about these numbers?

- $\text{N}_2 + 3\text{H}_2 \rightarrow$ _____
 1. How many atoms of Nitrogen are in the reactant?
 2. How many atoms of Nitrogen should be in the product?
 3. How many atoms of Hydrogen are in the reactant?
 4. How many atoms of Hydrogen should be in the product?

- _____ $\rightarrow 2\text{Al}_2\text{O}_3$
 1. How many atoms of Oxygen are in the product?
 2. How many atoms of Aluminum are in the product?
 3. How many atoms of Oxygen should be in the reactant?
 4. How many atoms of Aluminum should be in the product?

- $2\text{Na} + 2\text{H}_2\text{O} \rightarrow$ _____
 1. How many atoms of Hydrogen are in the reactant?
 2. How many atoms of Hydrogen should be in the product?

- _____ $\rightarrow \text{H}_2 + \text{MgCl}_2$
 1. How many atoms of Chlorine are in the product?
 2. How many atoms of Chlorine should be in the reactants?

5) After the gas was released, what happened to the mass of the system and why?

6) Restate the law of conservation of mass into your own words. Do your results support this statement? Why/Why Not?

Conclusion: Explain the law of conservation of matter in your own words, including an example. Then, fill in the missing number in the following chemical equations.

Baking Soda + Vinegar \rightarrow Carbon Dioxide + Water + Sodium Acetate

10g 13g 5g _____ 11g

Knowledge: Write the definitions

1. What is the Law of Conservation of Mass?
2. What are reactants?
3. What are products?
4. In a chemical reaction, the mass of the reactants equals the mass of the _____.

Comprehension: Fill in the blanks

5. 2.0 g of Aluminum react with 4.5 g of Chlorine, to produce _____ g of Aluminum Chloride.
6. 7 g of salt are produced when 5 g of Sodium react with _____ g of Chlorine.
7. 19 g of Hydrogen react with _____ g of Oxygen to produce 37 g of Hydrogen Peroxide.
8. 45.5 g of Hydrogen react with 7.8 g of Fluorine to produce _____ g of Hydrogen Fluoride.
9. _____ g of Magnesium react with 16.7 g of Oxygen to produce 21.3 g of Magnesium Oxide.
10. 53 g of Mercury Oxide breaks apart into 24.5 g of Mercury and _____ g of Oxygen.

- **Analysis:** Balance the following equations. You must show your work!!!



- How many atoms of Aluminum are there in the reactant? _____
- How many atoms of Aluminum are there in the product? _____
- How many atoms of Oxygen are there in the reactant? _____
- How many atoms of Oxygen are there in the product? _____
- What do you notice about these numbers?

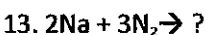


How many atoms of Sodium are there in the product?

How many atoms of Sodium SHOULD there be in the reactant? _____ Why?

How many atoms of Nitrogen are there in the product? _____

- Why is this true?



- How many atoms of Sodium are there in the reactant? _____
- How many atoms of Sodium SHOULD there be in the product? _____ Why?

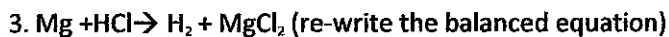
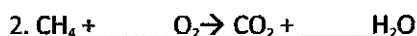
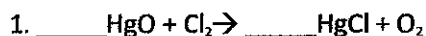
- How many atoms of Nitrogen are there in the reactant? _____

- How many atoms of Nitrogen SHOULD there be in the product? _____ Why?

- **Synthesis:** Formulate your answer to the following question using what you learned today.

19. Why is it necessary to balance chemical equations?

*****CHALLENGE FOR FAST FINISHERS***: Balance the following equations.**



Chemical Reactions and the Conservation of Mass: (pages 33-35 in your EOG Coach Book)

In a chemical reaction, we call the materials that are going to react, are known as the **reactants**. The materials that result from the reaction are called the **product**. There will be the same amount of each type of element before the reaction as after the reaction. For example, the chemical formula for water is H₂O. All "H₂O" means is that you have 2 atoms of hydrogen (H) chemically bound to 1 atom of oxygen (O). If we were to look at this combination as a mathematical equation, it might look like this: H + H + O = HHO. If we look at this as a **chemical equation**, we write it a little differently, adding **coefficients** to the symbols. If an element is represented by only 1 atom, there is no need to write in a coefficient of 1. So, 2 atoms of hydrogen react with one atom of oxygen to form 1 molecule of water is shown by this chemical equation:



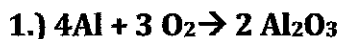
On the left side of the arrow are the reactants; on the right side are the products.

The Law of Conservation of Mass states that in a chemical reaction, matter cannot be created or destroyed. This means that you end up with as many atoms of each element at the end of a chemical reaction as you had before the reaction took place. Nothing is gained. Nothing is lost. The way the atoms are arranged (what atoms are bonded together) simply changes. In a chemical equation, we must show that the number of atoms of each element does not change, so chemical equations must be "balanced." The mass (total grams) of the reactant must be equal to the mass (total grams) of the product.

Search & Rescue Directions: Cut out the following boxes on the dotted lines. You will need to number your paper #1-7. You will need to write the appropriate answer to the correct number in your notebook.

# 1 Question: What are reactants?	Answer: 3 grams of water
Question: What does the chemical formula for water tell us?	Answer: They are located on the left side of the arrow of the chemical reaction, it's known as the result from a reaction happening.
Question: What is the Law of Conservation of Mass?	Answer: It shows use that there is 1 atom of oxygen and two atoms of hydrogen.
Question: Why must chemical equations be balanced?	Answer: Matter cannot be created or destroyed.
Question: Stephanie reacts 2 grams of Hydrogen with 1 gram of Oxygen. What is the total mass of the water produced?	Answer: 34
Question: What are products?	Answer: The materials that are going to react in a chemical reaction.
Question: Total mass of reactants = 34 What is the total mass of the products?	Answer: The number of atoms of each element never changes, making it "balanced" all the time.

Chemistry #2: Chemical reactions & balancing equations! For each of the following reactions, complete each analysis question under the reaction. Write the # and the entire reaction out in your notebooks, then write your answers underneath each reaction.



1. What are the Reactants in this reaction?
2. What are the Products in this reaction?
3. What is the Coefficient for Al (aluminum) in the products?
4. What is the Coefficient for O (oxygen) in the reactants?
5. What is the subscript O (oxygen) in the reactants?
6. How many molecules of Al_2O_3 are in the products?
7. How many atoms of Oxygen are in 3O_2 ?

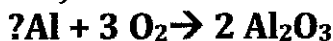


1. What are the Reactants in this reaction?
2. What are the Products in this reaction?
3. What is the Coefficient for Na (sodium)?
4. What is the Coefficient for Cl in the reactants?
5. What is the subscript Cl in the reactants?
6. How many molecules of Sodium are in the reactants?
7. How many total atoms of Chlorine are in the products?

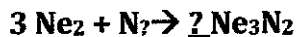


1. What are the Reactants in this reaction?
2. What are the Products in this reaction?
3. What is the Coefficient for Na (sodium) in the reactants?
4. What is the subscript for Na in the reactants?
5. How many atoms of Sodium are there in the reactants?
6. How many atoms of Sodium are there in the product?
7. Is this equation balanced? How do you know?

6.) Balance the following equation (remember, to balance an equation you must have the SAME number of atoms on EACH side of the arrow!):



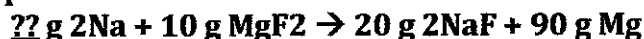
7.) Balance the following equation (be careful, don't forget you must distribute your coefficient to BOTH subscripts on the right side!):



8.) Balance the following equation:



9.) Balance the following equation:



10.) Balance the following:

