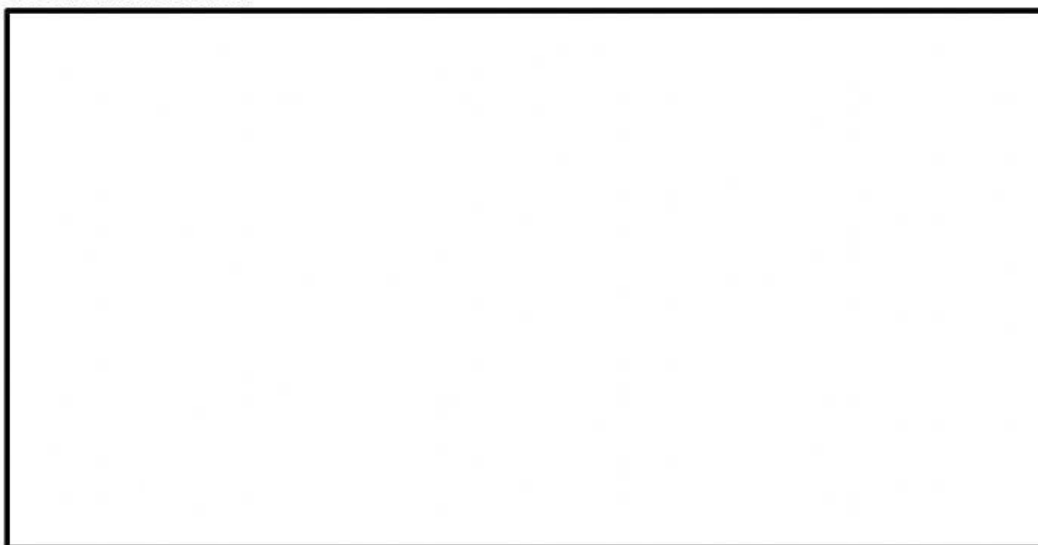


Id No : \_\_\_\_\_  
Name : \_\_\_\_\_  
Class : \_\_\_\_\_  
Date : \_\_\_\_\_

### What is a Chemical Reaction?

- In a chemical reaction, the atoms and molecules that interact with each other are called *reactants*.
- In a chemical reaction, the atoms and molecules produced by the reaction are called *products*.
- In a chemical reaction, only the atoms present in the reactants can end up in the products. No new atoms are created, and no atoms are destroyed. This is called The Law of Conservation of Mass.

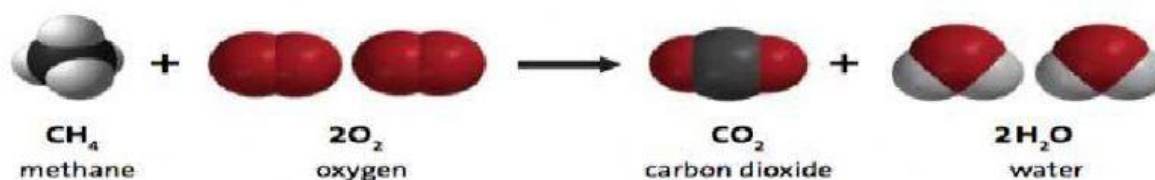


After watching the demonstration with the burning of magnesium ribbon, answer the following questions:

1. You know that in the burning of a magnesium ribbon, there is a chemical reaction. What are the reactants in this chemical reaction?

2. What are the products in this chemical reaction?

3. Write the word equation for this reaction.



Q. Where do the atoms come from that make the carbon dioxide and the water on the right side of the equation?

### Activity

#### Question to Investigate

Where do the atoms in the products of a chemical reaction come from?

### Procedure

#### Prepare the Atoms

1. Color the carbon atoms black, the oxygen atoms red, and leave the hydrogen atoms white.
2. Use scissors to carefully cut out the atoms.

#### Build the Reactants

3. On a sheet of paper, place the atoms together to make the molecules of the reactants on the left side of the chemical equation for the combustion of methane.
4. Write the chemical formula under each molecule of the reactants. Also draw a + sign between the reactants.

#### Build the products

5. Draw an arrow after the second oxygen molecule to show that a chemical reaction is taking place.
6. Rearrange the atoms in the reactants to make the molecules in the products on the right side of the arrow.
7. Write the chemical formula under each molecule of the products. Also draw a + sign between the products.

#### Represent the chemical equation

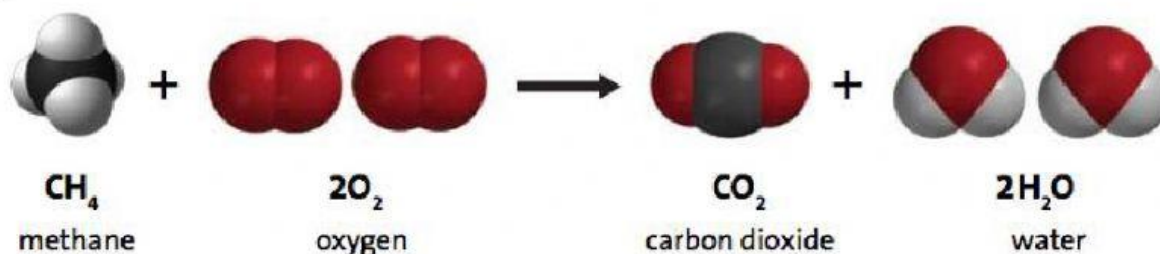
8. Use your remaining atoms to make the reactants again to represent the chemical reaction as a complete chemical equation.
9. Glue or tape the atoms to the paper to make a more permanent chemical equation of the combustion of methane.

#### Explain it With Atoms & Molecules

In a chemical equation, like the one below, you will notice that there are regular sized numbers in front of some of the molecules and small numbers after certain atoms within a molecule. The little number is called the subscript and tells how many of a certain type of atom are in a molecule. The

bigger number is called the coefficient and tells how many of a particular type of molecule there are.

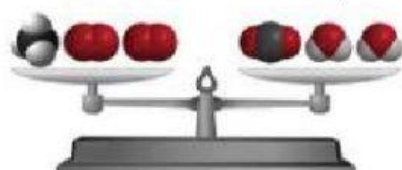
If there is a coefficient in front of the molecule and a subscript after an atom, multiply the coefficient and the subscript to get the number of atoms. For example, in the products of the chemical reaction there are two water molecules, or  $2\text{H}_2\text{O}$ . The coefficient means that there are two molecules of water. The subscript means that each water molecule has two hydrogen atoms. Since each water molecule has 2 hydrogen atoms and there are two water molecules, there must be 4 ( $2 \times 2$ ) hydrogen atoms.



3. Count up the number of atoms on each side of the equation below and write this in the chart.

| $\text{CH}_4 + 2\text{O}_2 \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O}$ |               |              |
|---|---------------|--------------|
| Atom  | Reactant side | Product side |
| Carbon  |               |              |
| Hydrogen  |               |              |
| Oxygen  |               |              |

4. Are atoms created or destroyed in a chemical reaction? How do you know?



5. In a physical change, like changing state from a solid to a liquid, the substance itself doesn't really change. How is a chemical change different from a physical change?

### Take it Further

Molecules made up of only carbon and hydrogen are called hydrocarbons. The candle and the hydrocarbons listed below react with oxygen in a chemical reaction called combustion.



**CH<sub>4</sub>**  
methane

Fuel in gas stoves  
in many home  
kitchens



**C<sub>3</sub>H<sub>8</sub>**  
propane

Fuel in outdoor  
gas grills

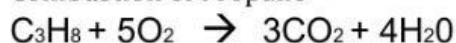


**C<sub>4</sub>H<sub>10</sub>**  
butane

Fuel in disposable  
lighters

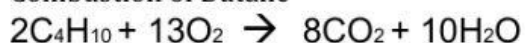
8. Count the number of carbon, hydrogen, and oxygen atoms in the reactants and products of each equation to see if the equation is balanced. Record the number of each type of atom in each chart.

Combustion of Propane



| <b>C<sub>3</sub>H<sub>8</sub> + 5O<sub>2</sub> → 3CO<sub>2</sub> + 4H<sub>2</sub>O</b> |                      |                     |
|--|----------------------|---------------------|
| <b>Atom</b>  | <b>Reactant side</b> | <b>Product side</b> |
| Carbon   |                      |                     |
| Hydrogen   |                      |                     |
| Oxygen   |                      |                     |

Combustion of Butane



| $2\text{C}_4\text{H}_{10} + 13\text{O}_2 \longrightarrow 8\text{CO}_2 + 10\text{H}_2\text{O}$ |               |              |
|---|---------------|--------------|
| Atom  | Reactant side | Product side |
| Carbon  |               |              |
| Hydrogen  |               |              |
| Oxygen  |               |              |

