Name_____

CONSERVATION OF MATTER

Directions: Read the information below.

Chemical Reactions

When you eat food, it mixes with your digestive fluids and begins to break down into nutrients and energy that your body can use. What cannot be used is turned into waste. The food is still there, but it changes form with the help of your digestive system. Your bloodstream does not have carrots floating through it; rather, the food breaks down into the smaller components, like Vitamin A. This is only one example of the conservation of matter. In chemistry, here are some of the basic types of chemical reactions.

Synthesis Reactions:

Synthesis reactions are the combining of two or more elements to form a new compound. The most basic example in chemistry is water. If there is Hydrogen (H_2) and Oxygen (O), they can synthesize, or combine, to form H_2O. We know this by its more common name: water.

Decomposition Reactions:

A decomposition reaction is where one compound breaks apart into its elements. One way to visualize it is to imagine taking a chocolate chip cookie and removing all of its chips. You are left with two things instead of one: a pile of chips and a pile of cookie crumbs.

In chemistry, an example of this is hydrogen peroxide, used to help disinfect cuts. Hydrogen peroxide is made up of two molecules of two hydrogen atoms and two oxygen atoms each ($2H_2O_2$). When decomposed, an oxygen atom leaves each molecule, which causes there to be only two water molecules ($2H_20$)and one O_2 molecule remaining. All the same atoms are present; they are just broken off into new components.

Displacement Reactions:

There are two types of displacement reactions: single and double. It takes at least two elements to form a compound. Think about single displacement reactions like a sandwich. You probably like a lot of toppings on your sandwich, but for the sake of this text we will keep it simple. A grilled cheese sandwich is made up of bread and cheese. Pretend you have a grilled cheese sandwich sitting on a plate in front of you, with a piece of lettuce on the side. There is the bread and cheese together (elements A and B, respectively). Now, you decide you don't want the cheese and instead want a lettuce sandwich. The lettuce is element C. You switch the cheese and lettuce, and now you have element A, the bread, with element C, the lettuce. The cheese, element B, is now on its own sitting off to the side. You switched one of the ingredients, which made one new sandwich. The switch created a single new product, because cheese on its own doesn't make a sandwich. This is single displacement. The product of the reaction is only a single new compound — the lettuce sandwich.

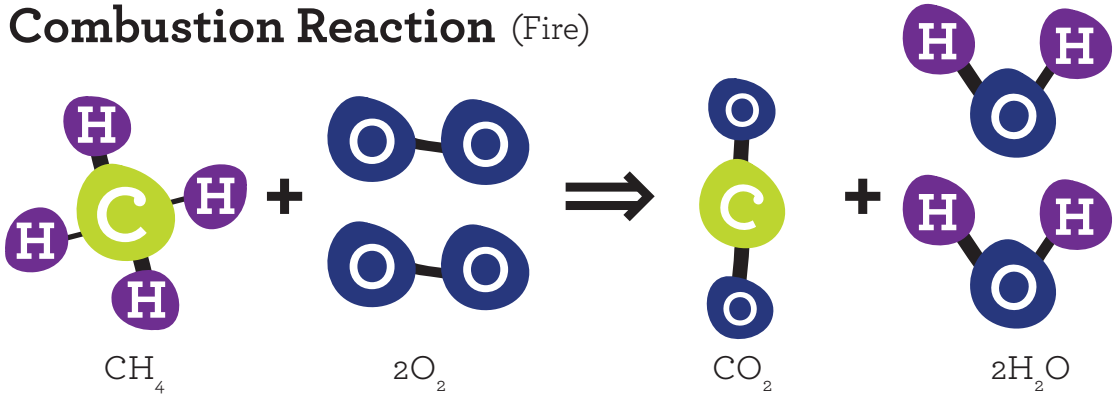
Visualize double displacement reactions in terms of professional sports teams. Players often spend their career playing for multiple teams, like in football. When a football team trades a player with another team, it's like a double displacement reaction. Two players were traded, but the key idea is that two new teams were essentially formed. Team 1 may have started with players A and B where Team 2 had players C and D. After trading, Team 1 has players A and C, and Team 2 has players B and D. Both teams have new combinations. This is different from single displacement because no team is left on its own with a single player. It takes two players to form a team, thus two new teams are formed.

Combustion Reactions:

You may associate the word combustion with explosions. This is partially correct, except combustion reactions don't always result in large explosions. An example of this type of reaction is fire, like on a candle. Candles certainly don't explode every time you light a wick. All combustion reactions have one thing in common: Oxygen. When oxygen is added to certain chemical mixtures, it produces an exothermic reaction, meaning it gives off heat. That's why sitting by a fireplace warms us up — fire's exothermic properties help keep us warm during winter.

The next time you see a magician perform a trick, making something disappear, remember that your eyes may be fooling you. Matter cannot be created or destroyed. Odds are, that magician is just cleverly hiding something.

Combustion Reaction (Fire)

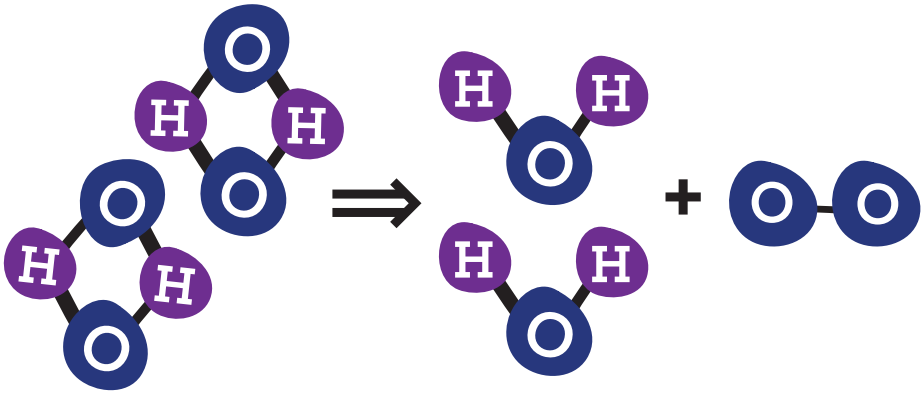


CH_4 $2O_2$ CO_2 $2H_2O$

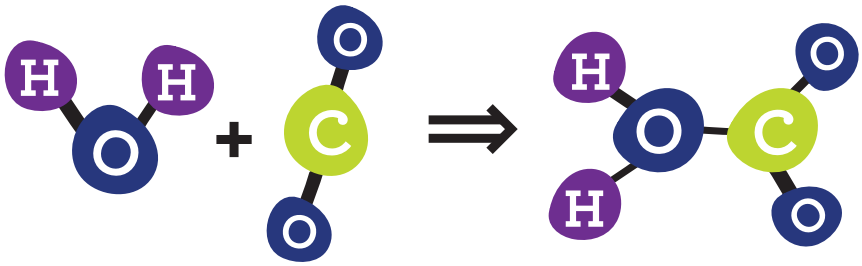
Single Displacement Reaction

Double Displacement Reaction

Decomposition Reaction (Hydrogen Peroxide)



Synthesis Reaction



Directions: Read the information below.

1. What is the difference between single and double displacement reactions? Describe an example of this you might find in real life (not necessarily at the molecular level).

2. If you have a pot of boiling salt water, and all the water evaporates leaving only salt. Which type of chemical reaction occurred?

3. For each type of chemical reaction, draw a simplified picture of what that reaction looks like:

   Synthesis:

   Single displacement:

   Double displacement:

   Decomposition:

   Combustion: