

Chemical Reactions : Notes/W.S.-120

A **chemical reaction** is a reaction in which new compounds are formed.

In a **physical reaction**, the state (gas, liquid, solid) of a substance changes, but no new substances are formed.

The burning of paper is a chemical reaction. The charred paper cannot be changed back into white paper.

The boiling of water is a physical reaction. The steam is still water. If it is cooled, it will become liquid water again.

Things that indicate a chemical reaction has taken place

There are several ways to see that a chemical reaction has taken place and new compounds formed. There may be;

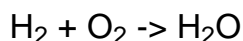
a color change, heat or light given off, bubbles forming, new substances appearing, substances disappearing.

Note: Some of the above changes may be observed in a physical reaction, but in any physical reaction, new substances are not formed.

Writing Chemical Equations

In a chemical reaction, the **reactants** combine to form new compounds called **products**.

Example: Hydrogen gas and oxygen gas can combine to form water. The equation is:

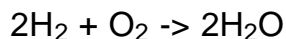


The reactants are hydrogen gas and oxygen gas. The product is water. Heat is given off.

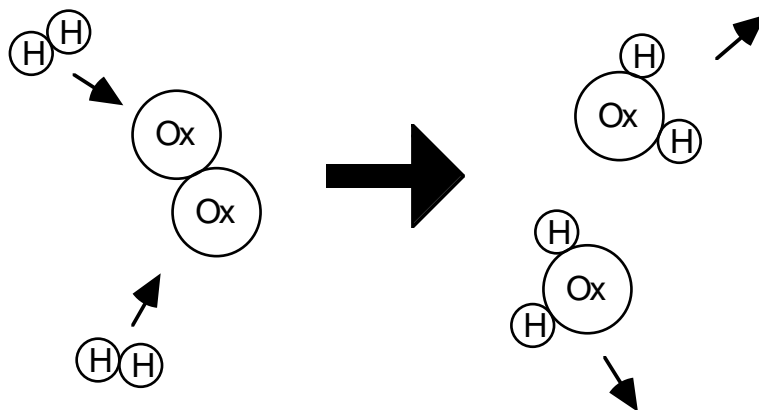
In any chemical reaction, the atoms are conserved. This means that the number of atoms of each type, on either side of the yield sign (->) are equal. This is necessary so mass is conserved.

The **Law of Conservation of Mass** states that: "In any chemical reaction, the mass of the reactants equals the mass of the products". This law was discovered by Lavoisier.

The above equation must be balanced. The correct equation is:



There are four hydrogen atoms and two oxygen atoms on each side of the yield sign, so atoms (and mass) are conserved. This equation says that two molecules of hydrogen, combine with one molecule of oxygen to form two molecules of water. This can be seen in the diagram below.



Problems:

- 1) What is a chemical reaction?
- 2) What is a physical reaction?
- 3) Label the following reactions as physical (P) or chemical (C).
 - a) ice melts
 - b) bread is baked
 - c) iron rusts
 - d) salt dissolves in water
 - e) zinc dissolves in acid
- 4) Give four ways you would know that a chemical reaction has taken place.

5) What is the "Law of Conservation of Mass"?

6) An example of a chemical reaction is: $\text{N}_2 + \text{H}_2 \rightarrow \text{NH}_3$

- a) Name the reactants
- b) Name the products
- c) Balance the equation.

Answers: 1) It is a reaction in which new compounds are created., 2) It is a reaction in which there is a change of state., 3)a) P, b) C, c) C, d) P, e) C, 4) color change, heat/light given off, bubbles form, substances appear/disappear, 5) In a chemical reaction, the mass of the reactants equals the mass of the products., 6)a) hydrogen gas and nitrogen gas, b) ammonia (NH_3), c) $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$.