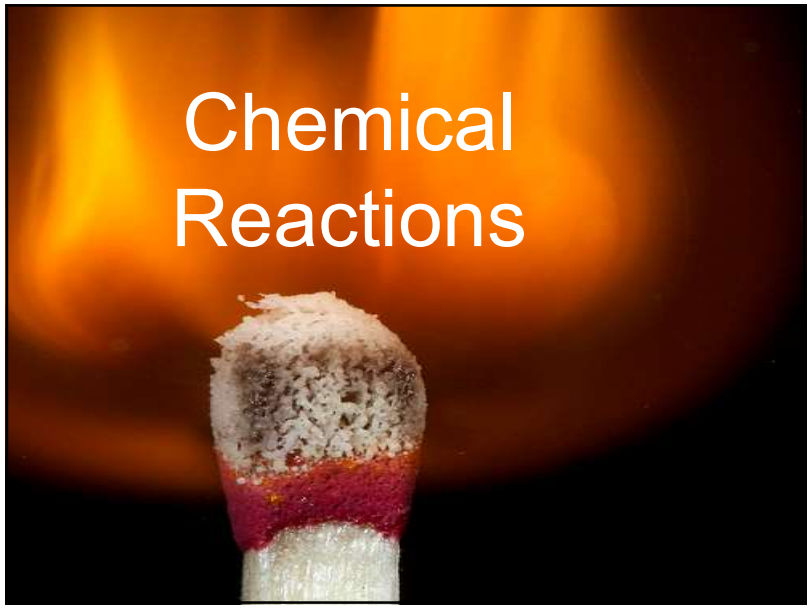
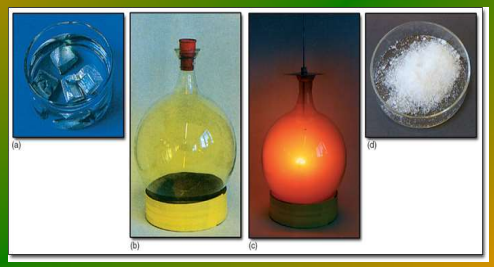


Chemical Reactions

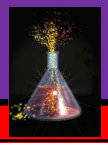
- **It is a change in matter that produces one or more *NEW SUBSTANCES* with different properties**



Chemical Reactions

- Evidence of a chemical reaction
  - Color Change.
  - New phase is made
    - Precipitation
    - Gas or solid formation.
  - Changes in Temperature.
  - Changes in Properties.
  - Energy change

Heat is given off



ENERGY

Chemical Reactions

Parts To A Chemical Reaction

1. Reactants: starting materials of a chemical reaction
2. Products: substances formed at the end

Reactants

$C + O_2$

Yields

Products

CO_2

Counting Atoms

Coefficient: Tells us how many of that entire molecule we have

Subscript: Tells us how many of that one single atom we have

Rules for balancing

1. Make a T-chart
2. Write the correct formulas for all the reactants and products
3. Count the number of atoms of each type appearing on both sides
4. Balance the elements one at a time by adding coefficients (the numbers in front ONLY)
5. Check to make sure it is balanced.

*****REMEMBER: IF YOU CHANGE A COEFFICIENT, ALL ELEMENTS IN THAT COMPOUND ARE AFFECTED.

Photosynthesis Reaction

- Carbon dioxide + water → Glucose (sugar) + oxygen

$$6CO_2 + 6\,H_2O \rightarrow C_6H_{12}O_6 + 6O_2$$

- Count the atoms on each side of the equation.

C : 6	C : 6
O : 18	O : 18
H : 12	H : 12

Balancing Equations

1) Determine number of atoms for each element.

2) Pick an element that is not equal on both sides of the equation.

3) Add a coefficient in front of the formula with that element and adjust your counts.

4) Continue adding coefficients to get the same number of atoms of each element on each side.

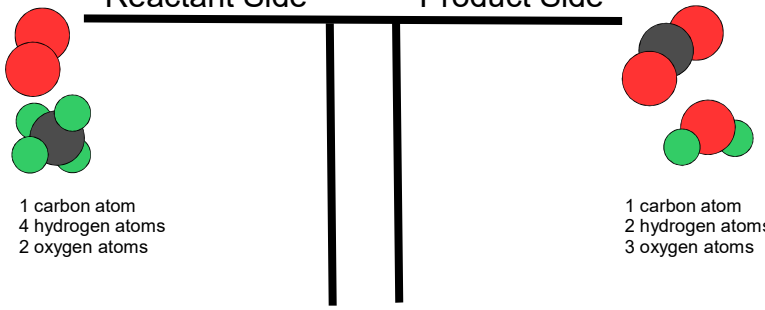
$\square$ Mg + $\square$ O_2 → $\square$ MgO

Mg
O

An Unbalanced Equation

$$CH_4 + O_2 \rightarrow CO_2 + H_2O$$

Reactant Side | Product Side



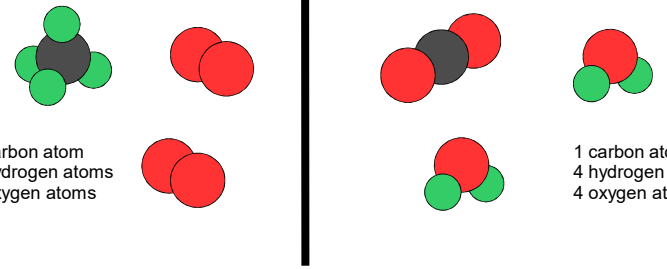
1 carbon atom
4 hydrogen atoms
2 oxygen atoms

1 carbon atom
2 hydrogen atoms
3 oxygen atoms

A Balanced Equation

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

Reactant Side | Product Side



1 carbon atom
4 hydrogen atoms
4 oxygen atoms

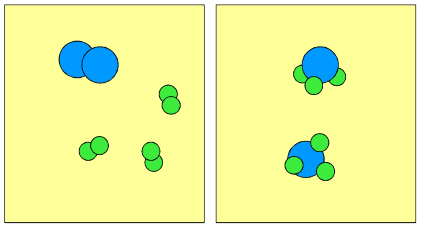
1 carbon atom
4 hydrogen atoms
4 oxygen atoms

Balancing Equations

- Balance the following equation by adjusting coefficients.

$N_2 + 3\,H_2 \rightarrow 2NH_3$

	reactants	products
N	2	2
H	6	6

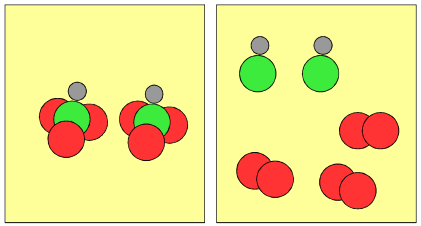


Balancing Equations

- **Balance the following equation by adjusting coefficients.**

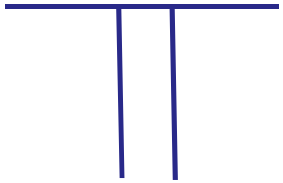
$2KClO_3 \rightarrow 2\,KCl + 3O_2$

	reactants	products
K	2	2
Cl	2	2
O	6	6



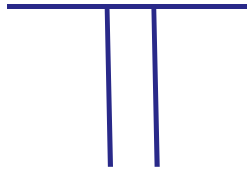
Balancing Equations Practice

1. $Mg + N_2 \rightarrow Mg_3N_2$
2. $P + O_2 \rightarrow P_4O_{10}$
3. $Na + H_2O \rightarrow H_2 + NaOH$



Balancing Equations Practice

7. $CO + Fe_2O_3 \rightarrow Fe + CO_2$
8. $CS_2 + Cl_2 \rightarrow CCl_4 + S_2Cl_2$
9. $CH_4 + Br_2 \rightarrow CH_3Br + HBr$



BrINClHOF Brothers!

Bromine, Iodine, Nitrogen, Chlorine, Hydrogen, Oxygen, Fluorine are *always* going to be diatomic.

Br_2 I_2 N_2 Cl_2 H_2 O_2 F_2

A. Magnesium + Oxygen (g)⟶ Magnesium Oxide

Write and Balance the following equation

B. Hydrogen plus oxygen yield water.

Write and Balance the following equation

C. Aluminum bromide plus chlorine yield aluminum chloride and bromine.

Write and Balance the following equation

D. Nitrogen gas plus oxygen gas react and form dinitrogen pentoxide.

More Balancing Equations Practice

E. Potassium iodide reacts with bromine forming potassium bromide plus iodine.

Types of reactions

Synthesis A+ B → AB

Decomposition AB → A + B

Single displacement AC +B →BC + A

Double displacement AC + BD → AD + BC

Combustion Ex: $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

Synthesis Reaction

- Two or more substances (reactants)
- Combine to form only one (new) substance (product)
- Also known as Addition

$K + Cl_2 \rightarrow KCl$

$Mg + O_2 \rightarrow MgO$

$Fe + O_2 \rightarrow Fe_2O_3$

Decomposition Reaction

- One substance (reactant) combine forms 2 or more substances (products)

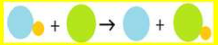
$$AB \longrightarrow A + B$$

- Compounds are broken down into two or more smaller compounds

$$H_2CO_3 \rightarrow H_2O + CO_2$$

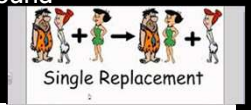
$$MClO_3 \rightarrow MCl + O_2$$

Single displacement

- **One element and one compound (in reactants)** 
- **Produces one element and one compound (in Products)**

One element replaces another in a compound

$AC + B \rightarrow BC + A$



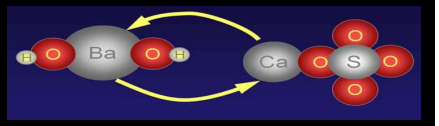
$Zn + CuSO_4 \text{ --> } Cu + ZnSO_4$

$F_2 + 2KI \rightarrow I_2 + 2KF$

Double displacement

- **2 compounds (in reactants) produce**
- **2 compounds (in products)**

- Elements switch places

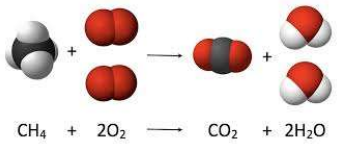


$AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$

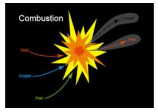
$Na_2CO_3 + CaCl_2 \text{ ------> } CaCO_3 + 2NaCl$

Combustion Reaction

- A reaction in which a carbon compound and oxygen burn.
- Water, carbon dioxide and energy are common product



- Carbon cmpd + O_2 → CO_2 + H_20 + energy!
- $C_2H_6 + 7\ O_2 \rightarrow 4\ CO_2 + 6\ H_20$
  - But don't forget that ENERY is a product too (heat, light, etc)…



Classifying Reaction Practice

A. $S_8 + 8O_2 \rightarrow 8SO_2$ + energy

Synthesis

B. $6CO_2 + 6H_20 \rightarrow C_6H_{12}O_6 + 6O_2$

Synthesis

C. $2NaHCO_3 \rightarrow Na_2CO3 + H_2O + CO_2$

Decomposition

D. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

Single-displacement