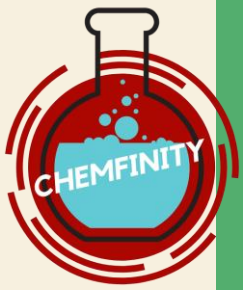
CHEMICAL REACTIONS AND EQUATIONS

CLASS 10TH CHEMISTRY

CHEMFINITY

GLOSSARY

- Physical and Chemical Change
- Chemical Equations
- Balancing a Chemical Equation
- Combination Reactions
- Decomposition Reactions
- Displacement Reactions
- Double Displacement Reactions
- Redox Reactions
- Oxidation → Corrosion and Rancidity



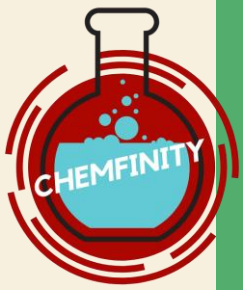
PHYSICAL AND CHEMICAL CHANGES

- The changes that are reversible and in which no new substance is formed are known as physical changes
- For Example → Cutting of Apple, Tearing of Paper

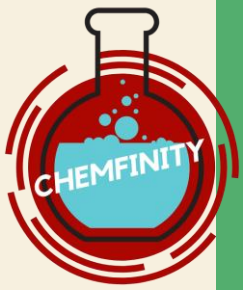
- The changes that cannot be reversed and in which a new substance is formed are known as chemical change
- For Example → Ripening of Mango, Cooking of Food

CHEMICAL REACTIONS

- The reaction between **reactants** to form **products** is known as chemical reaction.
- We can determine whether a chemical reaction has take place or not by observing :
    1. Change in State
    2. Change in Colour
    3. Evolution of a Gas
    4. Change in Temperature
    5. Formation of Precipitate



- **Evolution of Gas :** $Zn + HCl \rightarrow ZnCl_2 + H_2$
- Dil. $HCl + Na_2CO_3 \rightarrow NaCl + CO_2 + H_2O$
- **Formation of PPT.**
- $H_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2HCl$
- $KI + PbNO_3 \rightarrow PbI + KNO_3$
- **Change in Color**
- Potassium dichromate or Potassium Permanganate
- **Change in Temperature** : Quicklime/Lime + Water → Heat + Slaked lime
- $Ba(OH)_2 + NH_4Cl \rightarrow BaCl_2 + NH_3 + H_2O$
- **Change in State**
- Burning of solid camphor/ Melting of ice



CHEMICAL EQUATIONS

- It is the simplest way to write a chemical reaction.
- The substances that are on the left side of equation are reactants and those which are in right side are products.

- The substances that undergoes chemical change are the reactants.
- The new substance which are formed after reaction between reactants are called products.

- Example :

$$Mg + O_2 \rightarrow MgO$$

(Reactants) (Product)

BALANCING A CHEMICAL EQUATION

- Balancing a chemical reaction is necessary so that the mass of reactants became equal to the mass of products as mass can neither be created nor be destroyed.
- For Example for the equation →

$$Mg + O_2 \rightarrow MgO$$

(Reactants) (Product)

- The Balanced equation will be →

$$2Mg + O_2 \rightarrow 2MgO$$

(Reactants) (Product)

Hints to Balancing Chemical Equations

- Adjust the coefficients not the subscripts.
- Even/Odd – Multiply by 2 to make all even.
- Balance polyatomic ions as a whole.
- Check the balanced equation.

Example:

$ZnS + O_2 \Rightarrow ZnO + SO_2$ (O is even on the left and odd on the right)

$ZnS + O_2 \Rightarrow 2ZnO + SO_2$ (multiply by 2 to make O even)

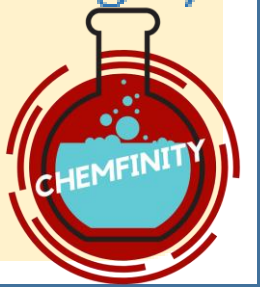
$2ZnS + 3O_2 \Rightarrow 2ZnO + 2SO_2$ (balance the Zn, S and O)

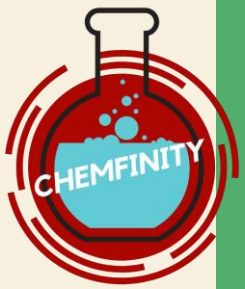
Example:

$Pb(NO_3)_2 + NaCl \Rightarrow NaNO_3 + PbCl_2$ (balance NO_3 as a whole)
(NO_3 is even on the left and odd on the right)

$Pb(NO_3)_2 + NaCl \Rightarrow 2NaNO_3 + PbCl_2$ (multiply by 2 to make NO_3 even)

$Pb(NO_3)_2 + 2NaCl \Rightarrow 2NaNO_3 + PbCl_2$ (balance the Na)

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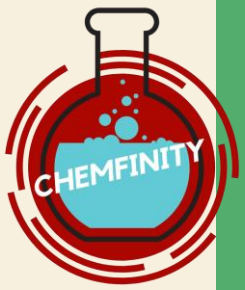
NATURE OF REACTIONS

- Endothermic Reactions : The reactions in which heat is absorbed. These are generally bond-breaking reactions.
- Example : $CaCO_3$ + Heat → CaO + CO_2

- Exothermic Reactions : The reactions in which heat is evolved/released along the products. These are geneally bond-forming reactions.
- Example : CaO + H_2O → $Ca(OH)_2$ + Heat

TYPES OF REACTIONS

- Combination Reactions
- Decomposition Reactions
- Displacement Reactions
- Double Displacement Reactions
- Redox Reactions

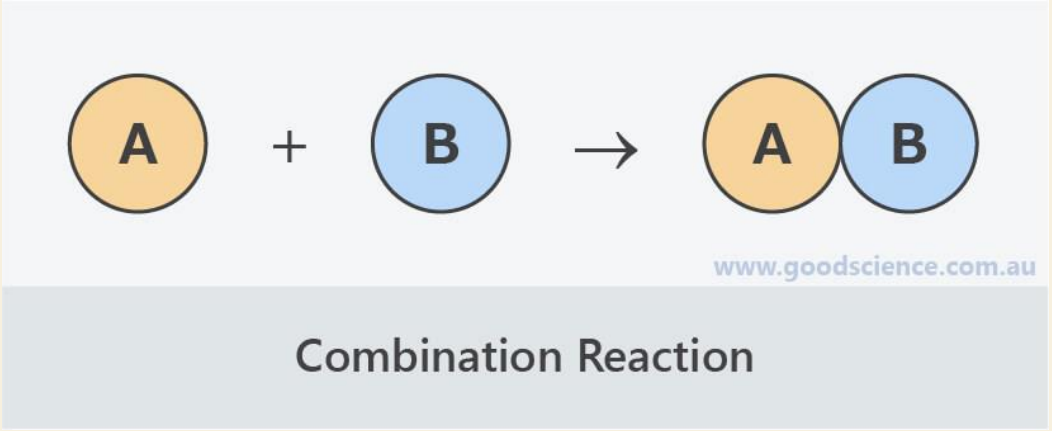


COMBINATION REACTIONS

- The reactions in which two or more reactants combines to form single product are known as combination reactions

- For Example : $C(s) + O_2(g) \rightarrow CO_2(g)$
  (Carbon) (Oxygen) (Carbon Dioxide)

$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$
(Calcium Oxide) (Water) (Calcium Hydroxide)



DECOMPOSITION REACTIONS

- The reaction in which a single reactant breaks to give simpler products.
- For Example :

$2H_2O \xrightarrow{\text{Electricity}} 2H_2 + O_2$ (Electric Decomposition)

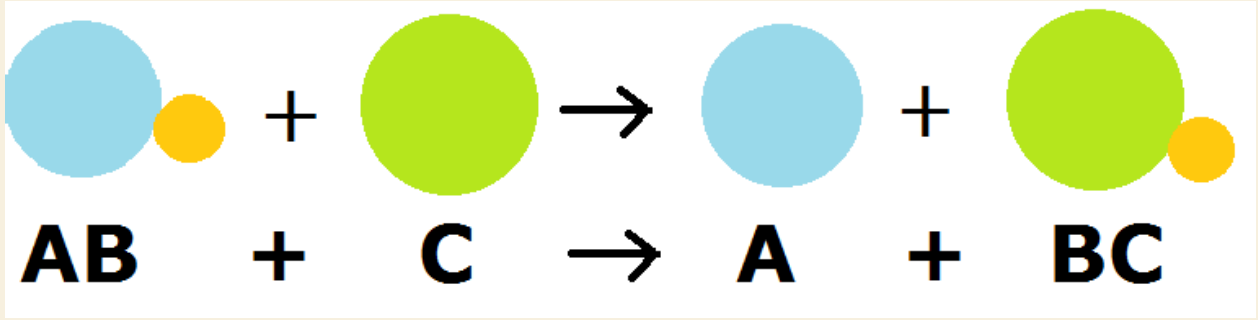
$2Pb(NO_3)_2 \xrightarrow{\text{Heat}} 2PbO + 4NO + O_2$ (Thermal Decomposition)

$2AgBr \xrightarrow{\text{Sunlight}} 2Ag + Br_2$ (Photo Decomposition)

DISPLACEMENT REACTIONS

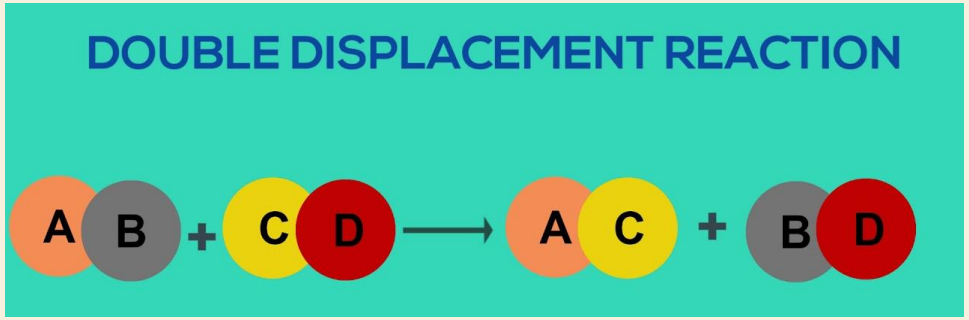
- One element displaces another element from its salt/compound.
- Not all the elements do; Only the reactive ones.
- $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$
- $Pb + CuCl_2 \rightarrow PbCl_2 + Cu$

Li
K
Na
Mg
Al
Zn
Fe
Ni
Pb
H
Cu
Hg
Ag
Au
Pt



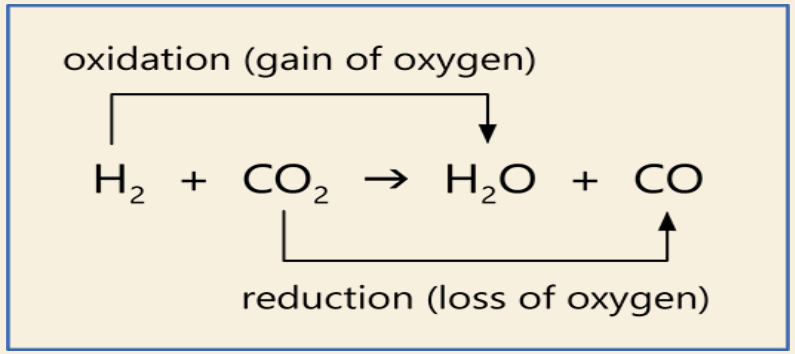
DOUBLE DECOMPOSITION REACTIONS

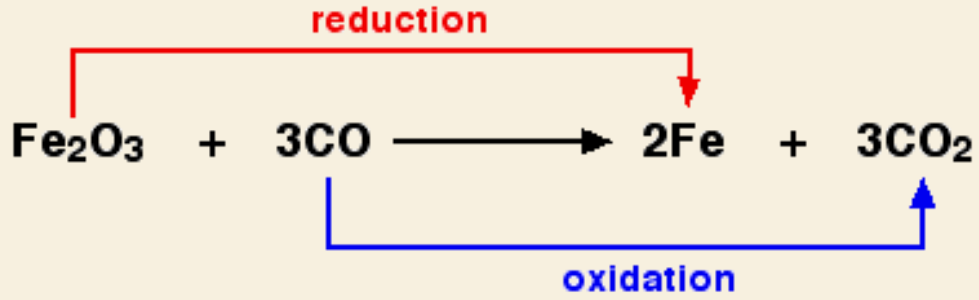
- Each of the two elements displace each other from their salts.
- $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$
- Displacement of two ions therefore is called double displacement reaction.



REDOX REACTIONS

- One compound/element gets oxidised while simultaneously the other gets reduced.





OXIDATION → CORROSION & RANCIDITY

- The gradual destruction of a metal surface due to its interaction with environment is referred to as corrosion.
- Corrosion of iron is called rusting.
- $Fe + O_2 \rightarrow Fe_2O_3$; $Fe_2O_3 + x\ H_2O \rightarrow Fe_2O_3.x\ H_2O$
- Expensive.
- Galvanisation. Application of layer of oil. Sacrificial Protection. Absence of any of these: Moisture, Acidic environment, O_2 => No corrosion.

RANCIDITY

- Oxidation of fats and oils contained in food materials marked by unpleasant smell and taste.
- Prevention: Antioxidants(BHT, BHA) or absence of light or Lower Temperatures or using air tight containers or N_2 .