

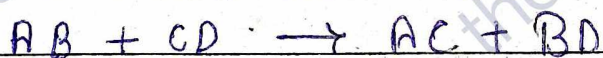
Chapter :- 1

Chemical Reactions and Equations

NOTES :-

* Chemical Reactions :- Is a process in which new substances with different properties are formed.

- In chemical reaction atom of one element don't change into another element.
- Only rearrangement of atoms take place in a chemical reaction.



Reactants $\rightarrow$ Product

- $\rightarrow$ Reactants (s) $\rightarrow$ substances that undergo a chemical reaction or chemical change.
- $\rightarrow$ Product (s) $\rightarrow$ substances formed as a result of chemical change.

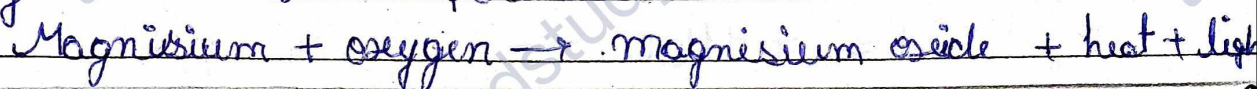
characteristics of Chemical Reaction

- (i) change in colour
- (ii) change in physical state
- (iii) Evolution of gas $\uparrow$
- (iv) Precipitate $\downarrow$
- (v) change in temperature.

*

Burning of Magnesium ribbon

When Magnesium ribbon is strongly heated in the presence of oxygen, it burns with a dazzling white flame and forms white Magnesium oxide powder.



* Why heat and light are not considered as a product

Product $\rightarrow$ substances (Matter / products)

Heat and light are forms of energy.

1st equation is unbalanced / skeletal chemical equation. [No. of atoms in reactant side $\neq$ No. of atoms in product side.]

*

Balanced chemical equations

- Why need of Balance a chemical equation follows the law of conservation of mass whenever written or represented.
- It is given by Antoine Laurent Lavoisier (1789 not nuclear reaction).
- In simple chemical reaction, mass is neither created nor destroyed i.e. mass of reactants is always equal to mass of product.

Balance the Equation - 2. By using Hit & trial



Elements	Reactants	Product
Fe	$1 \times 3 \rightarrow 3$	3
H	$2 \times 4 \rightarrow 8$	$2 \times 4 \rightarrow 8$
O	$1 \times 4 \rightarrow 4$	4



By algebraic method.



Element

$$\text{Fe} = a = 3c \quad (1)$$

$$\text{H} = 2b = 2d \quad (2)$$

$$\text{O} = b = 4c \quad (3)$$

Let $c = 1$ Putting the value in eq 1

$$\text{Fe} = a = 3 \times 1$$

$$a = 3$$

Putting the value of c in eq 3

$$b = 1 \times 4$$

$$b = 4$$

Putting the value of b in eq 2

$$2 \times 4 = 2d$$

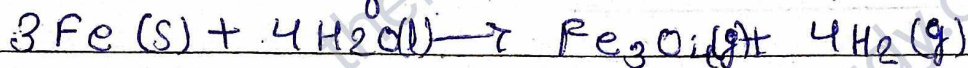
$$\frac{8}{2} = d$$

$$\frac{8}{2} = d = 4 = d$$



Limitation of chemical equation and their removal.

- (i) Word equation
- (ii) Skeletal chemical equation
- (iii) Balanced equation
- (iv) Make it informative



- (v) Concentration conc.
 dilute dil.

(vi) Heat changes Accompanying a Reaction.

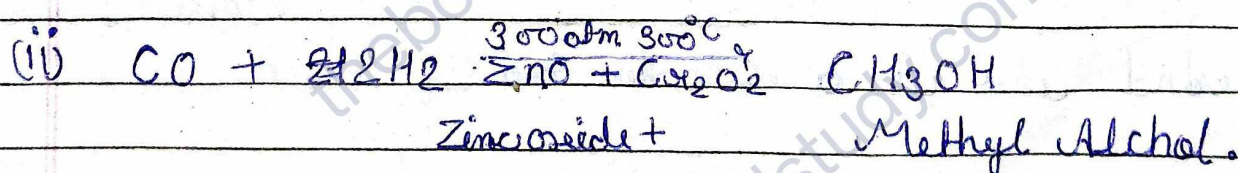
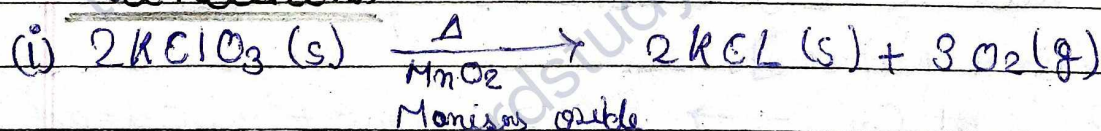
In a chemical reaction heat is released is known as exothermic reaction.

Representation: Reactants $\rightarrow$ Product + Heat or Energy.

In a chemical reaction heat is absorbed is known as endothermic reaction.

Representation: Reactants + Heat $\rightarrow$ Product.

Conditions



Types of chemical reaction

- (i) Combination reaction.
- (ii) Decomposition reaction
- (iii) Displacement reaction
- (iv) Double Displacement reaction.

Combination chemical reaction

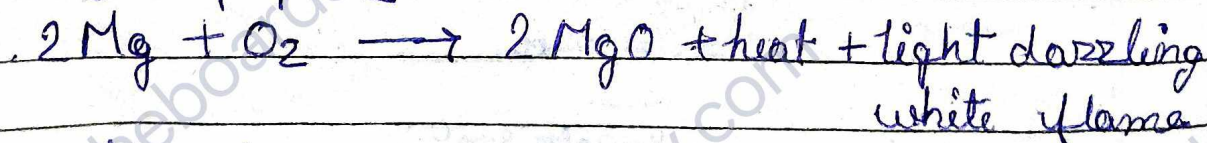
A chemical reaction in which two or more elements or compound react to form a single compound.

There are three types of combination reaction possible.

- (i) combination of two elements to form a compound
- (ii) combination of two compound to form a compound
- (iii) combination of an element and a compound to form a compound.

- (i) Element + Element $\rightarrow$ Compound $[A + B \rightarrow AB]$

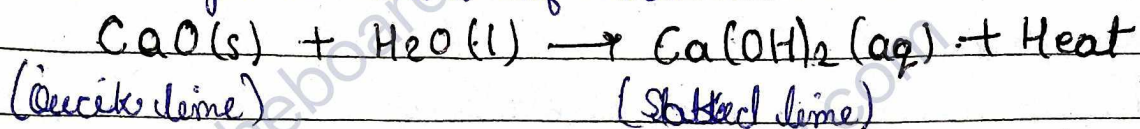
At room temperature 25°C . Burning of Mg ribbon on heating. [before burning removal MgO with sand paper.]



And this is a another ex. of exothermic.

- (ii) Compound + Compound $\rightarrow$ Compound
Sodium oxide reacts vigorously with water to

produce slaked lime (calcium hydroxide) releasing a large amount of heat.



(iii)

Decomposition Reaction

A single compound breaks down into two or more elements or compounds.

When the energy is supplied in the form of heat, electricity or sunlight. [Inverse of combination reaction]



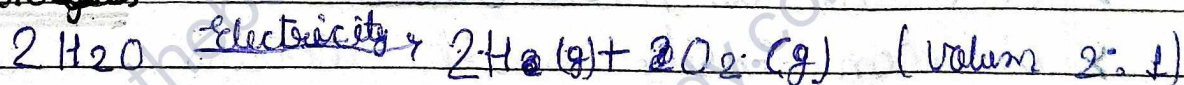
Three Types of Energy supplied in Decomposition Reaction.

(i) Heat (ii) Electricity (iii) Sunlight
Thermolysis/Thermolytic Electrolysis/Electrolytic Photolysis/Photolytic.

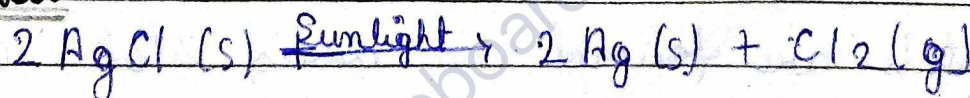
(i) Thermolysis



(ii) Electrolysis



(iii) Photolysis



Displacement reaction / Replacement reaction

A chemical reaction in which a more active or reactive element forms its compound.

These reactions are generally found to occur in the solution.

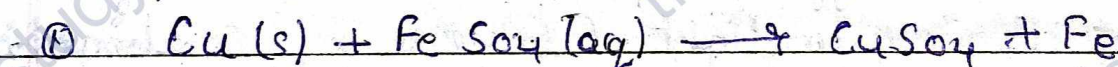
Three types of Displacement reaction

- (i) Metal - Metal Displacement (ii) Metal - Non Metal Displacement (iii) Nonmetal - Non-Metal Displacement

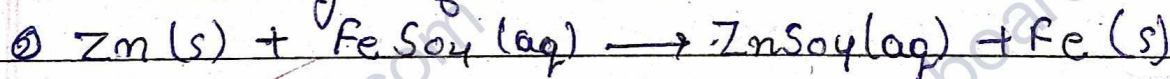
Metal - Metal Displacement reaction

Representation $\rightarrow A + BC \rightarrow AC + B$

(where, A is Metal; B is Metal, C is non metal)



$\therefore$ Reactivity of Fe > Cu



All Displacement reactions are exothermic and exothermic reaction.

What is the meaning of reactivity in terms of metals and non metals?

- > A is more reactive than B or A can easily donate electrons as compared to B.
- > A Metal is more reactive than non metal B
- > A can easily accept electrons as compared to B and react faster.

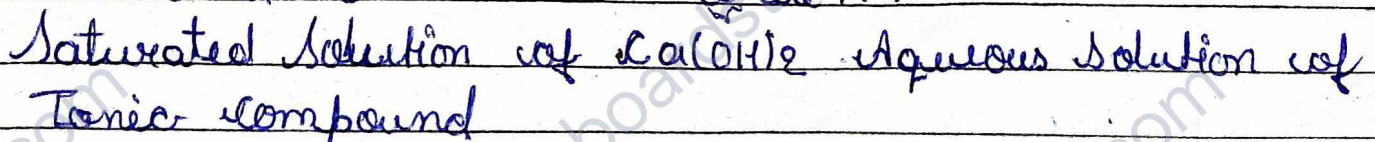
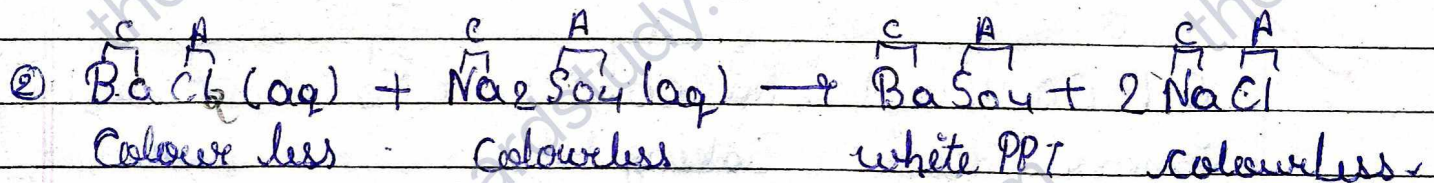
> Metals are found in solid state at room

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 Page _____

There are three types of Double Displacement rxn.

- (i) Precipitation reaction.

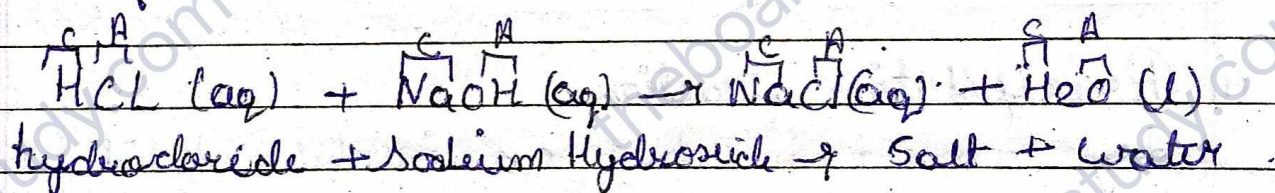
$$① \quad \underset{\substack{\boxed{c} \\ \text{colorless}}}{\text{Pb}} \overset{\text{A}}{\text{NO}_3} (\text{aq}) + 2 \underset{\substack{\boxed{c} \\ \text{colorless}}}{\text{KI}} (\text{aq}) \longrightarrow \underset{\substack{\boxed{c} \\ \text{yellow}}}{\text{Pb}} \overset{\text{A}}{\text{I}_2} (\downarrow) + 2 \underset{\substack{\boxed{c} \\ \text{colorless}}}{\text{K}} \overset{\text{A}}{\text{NO}_3} (\text{aq})$$


Some Important Precipitates formed and their colours.

- ① $\text{BaSO}_4(\text{s})$ (Barium Sulphate) white PPT
- ② PbNO_3 (Lead Nitrate) Yellow PPT
- ③ CaCO_3 (Calcium Carbonate) white PPT
- ④ AgCl (Silver chloride) white PPT
- ⑤ CuO (Copper oxide) Black PPT

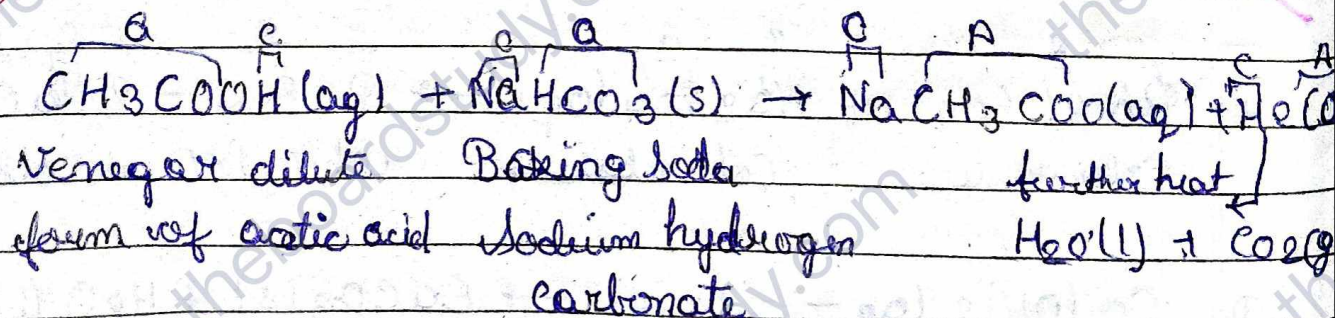
(ii) Neutralisation Reaction

A reaction in which an acid reacts with a base to form salt and water.



(iii) Gas forming Reaction

A reaction in which a gas is produced as a product from the reaction not in the gaseous state.



Oxidation and Reduction Reactions

Oxidation

- (i) The addition of oxygen to a substance is called oxidation.
- (ii) The removal of hydrogen from a substance is also called oxidation.

Reduction

- (i) The addition of hydrogen to a substance is called reduction.
- (ii) The removal of oxygen from a substance is also called reduction.

> The process of reduction is just the opposite of oxidation. Moreover, oxidation and reduction occur together. It is also called redox reaction.

> Oxidation of copper to copper oxide.



Shiny Brown

Black

Cu oxidised to CuO, O₂ Reductant, CuO

> Reduction of copper oxide to copper.



Black shiny

Shiny Brown

CuO reduced to Cu

H₂ oxidised to H₂O

Oxidising agent and Reduction agent

Oxidising agent

- (i) The substance which gives oxygen for oxidation

is called oxidising agent.

- (ii) The substance which removes hydrogen is also called an oxidising agent.

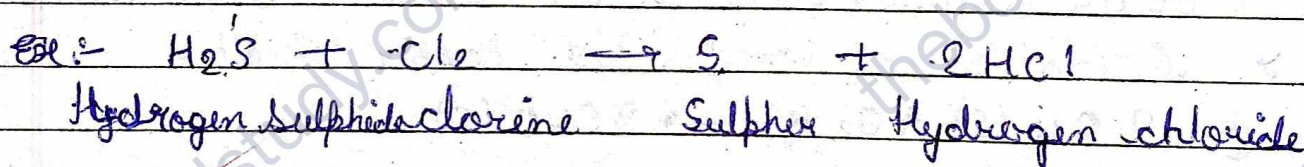
Reducing agent

- (i) The substance which gives ^{hydrogen} oxygen for oxidation-reduction is called a reducing agent.
- (ii) The substance which removes oxygen is also called a reducing agent.

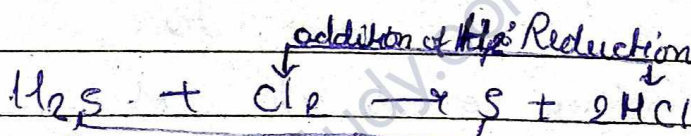
* TRICK *

In case of oxygen & hydrogen
Jiska hoga reduction wo khalaiga oxidising agent.

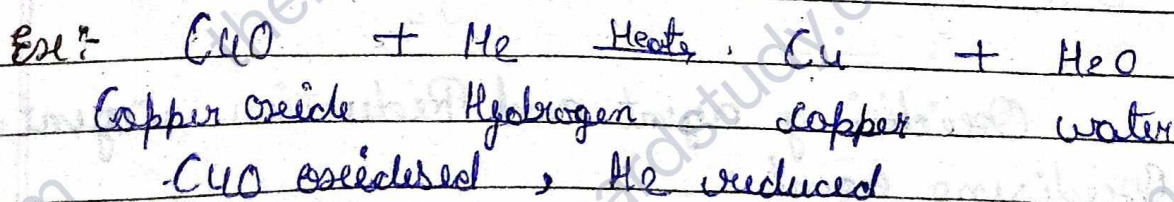
Jiska hoga oxidation wo khalaiga reducing agent.



H_2S oxidised, Cl_2 reduced



Cl_2 oxidising agent, H_2S reducing agent





addition of O_2 : Oxidation

CuO oxidising agent, H_2 Reducing agent.

This is another concept of oxidation and reduction in terms of Metals and non-metals.

- (i) The addition of non metallic Element (or removal of metallic element) is called oxidation.
- (ii) The addition of metallic element (or removal of non metallic element) is called reduction.

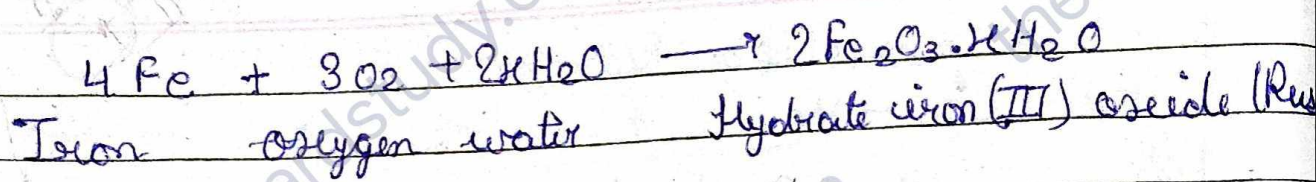
Corrosion

Corrosion is the process in which metals are eaten up gradually by the action of air, moisture or a chemical (such as an acid) on their surface.

Rusting of iron is the most common form of corrosion.

When an iron object is left in damp air for a considerable time, it gets covered with a red-brown flaky substance called 'rust'. This is called rusting of iron.

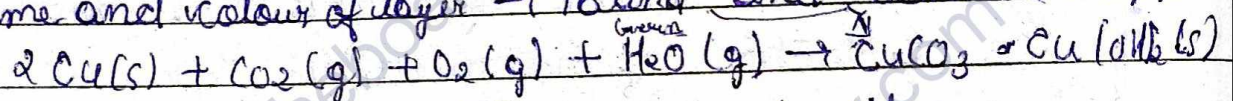
During the corrosion of iron (or rusting of iron), iron metal is oxidised by the oxygen of air in the presence of water (moisture) to form hydrate iron (III) oxide called rust:



> The rusting of iron is a redox reaction

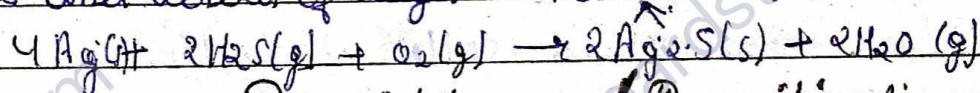
① Types of corrosion $\rightarrow$ Tarnishing of copper

Name and colour of layer $\rightarrow$ Patina and Green (In copper)



② Types of corrosion $\rightarrow$ Tarnishing of silver

Name and colour of layer $\rightarrow$ Patina and Black (In steel)



Rancidity and Rancification

It is the oxidation of oil or fat containing food items when they are kept in the open for a long time, resulting in an unpleasant odour (smell) and taste.

Oxidative rancidity ($\therefore$ of oxygen)

Microbes (e.g. Bread mould etc)

Hydrolytic ($\therefore$ of water)

Combustion reaction



flame $\leftarrow$ Burning $\leftarrow$

glow $\leftarrow$ Smouldering $\leftarrow$

① React with moist carbon dioxide gas in air to form copper carbonate.

② Silver reacts with hydrogen sulphide gas present in the air to form silver sulphide.

Anand
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