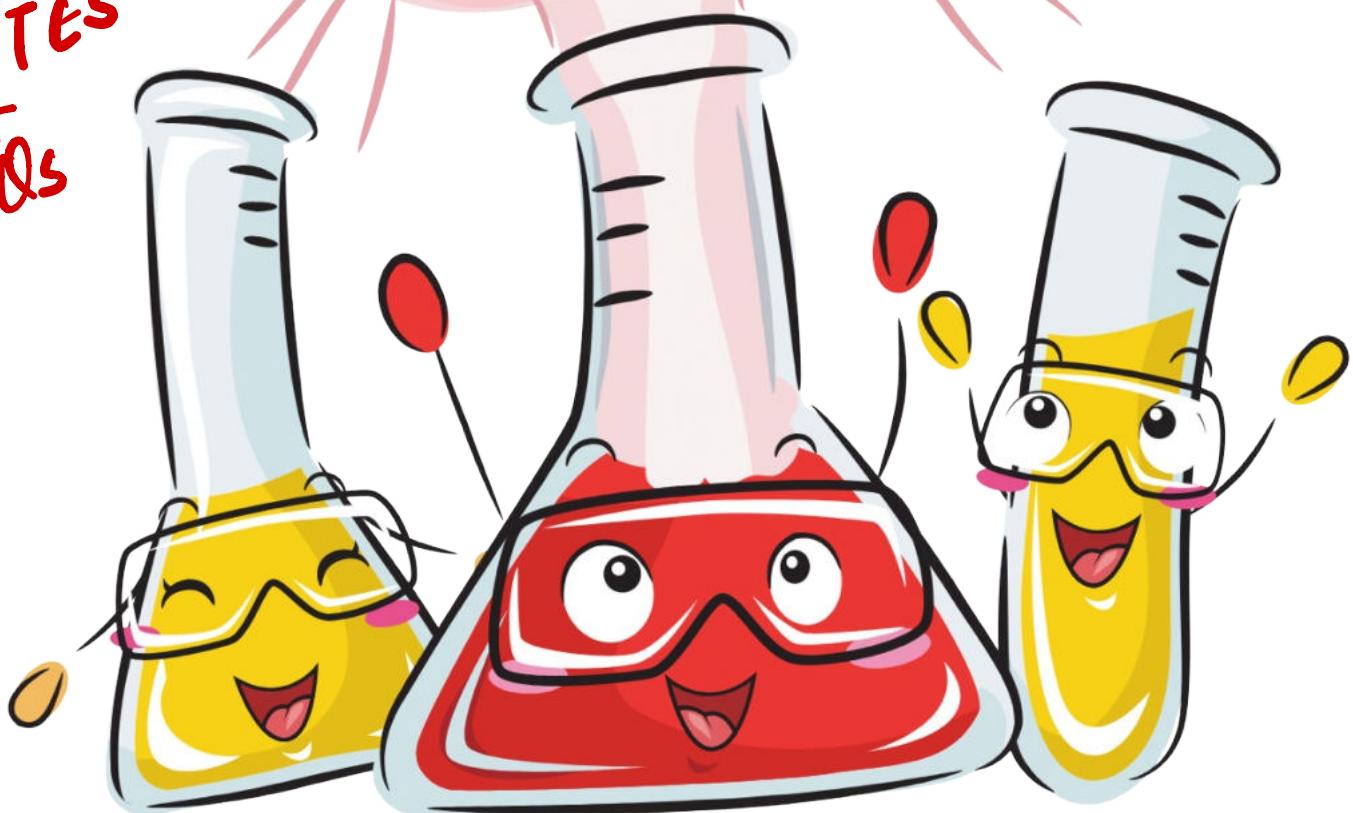
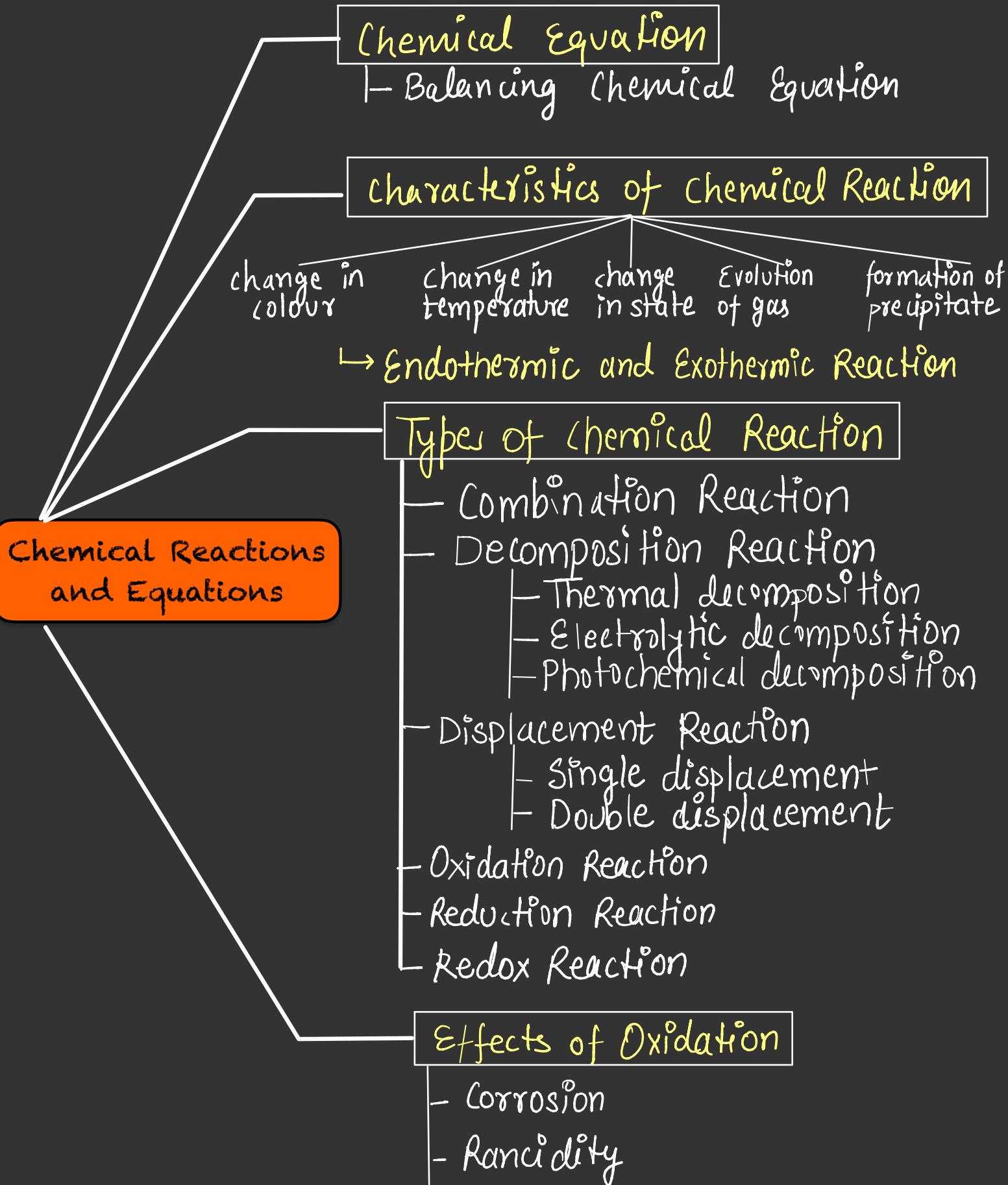


Chemical Reactions and Equations

BEST
NOTES
+
PQs



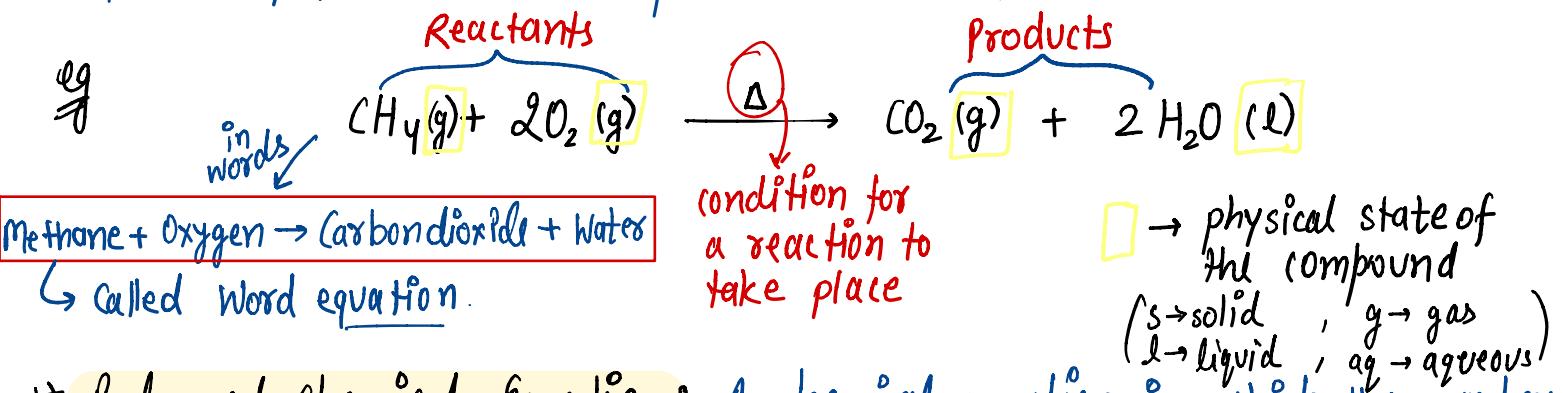


Chemical Reactions

A process in which one or more substances react to form new substance(s) with new chemical identity and property.

Chemical Equation

A chemical equation is the symbolic representation of a chemical reaction. Symbols and formulae of the reactants and products are used for the same.



Balanced Chemical Equation :- A chemical equation in which the number of atoms of each element on reactant side is equal to that of product side. Balancing of chemical equation is done to follow the Law of conservation of Mass ('mass can neither be created nor be destroyed during a chemical reaction')

The method used for balancing chemical equations is called hit and trial method (i.e. Jugaad) as we make trials to balance the equation by using the smallest whole number coefficient.

LP: Balance : $\text{Fe} + \text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + \text{H}_2$

Sol: Step 1: Check the number of atoms of each elements on the reactant and products side of the equation.

Elements	No. of atoms in Reactants side	No. of atoms in Products side
Fe	1	3
H	2	2
O	1	4

(भिन्बिनीय difference oxygen valence case नहीं हो पहले और Balance करते हैं।)

Step 2: First of all, to balance oxygen atom we multiply H_2O molecules by 4.



⊗ H_2O पूरा एक compound है तो पूरा ही 4 से multiply होगा (i.e. $\text{H}_2\text{O} \rightarrow \text{H}_2\text{O}$ करते हैं।)

Step 3: Once again check the number of atoms of each elements on both sides.

Elements	LHS	RHS
Fe	1	3
H	8	2
O	4	4

(अब H में diff. बहुत आया।)

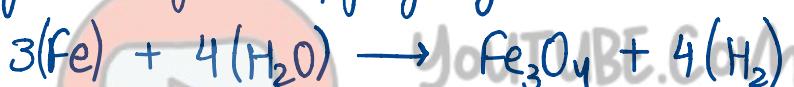
Step 4: Balancing Hydrogen atom by multiplying H_2 with 4 ($\because 4H_2 \rightarrow 8\text{ atoms}$)



Now,

Elements	LHS	RHS
Fe	1	3
H	8	8
O	4	4

Step 5: Balancing Fe by multiplying by 3 on LHS.



We can see

Elements	LHS	RHS
Fe	3	3
H	8	8
O	4	4

} Balanced
BY SHOBHIT NIRWAN

L.P. 5: Some equations you should practice balancing: (Most Likely equations)

- (i) $\text{Zn(O}_3\text{)} \longrightarrow \text{ZnO} + \text{CO}_2$
- (ii) $\text{Pb(NO}_3\text{)}_2 + \text{KI} \longrightarrow \text{KNO}_3 + \text{PbI}_2$
- (iii) $\text{CO(g)} + \text{O}_2\text{(g)} \longrightarrow \text{CO}_2\text{(g)}$
- (iv) $\text{FeSO}_4\text{(s)} \longrightarrow \text{Fe}_2\text{O}_3\text{(s)} + \text{SO}_2\text{(g)} + \text{SO}_3\text{(g)}$
- (v) $\text{Al} + \text{H}_2\text{SO}_4 \longrightarrow \text{Al}_2\text{(SO}_4\text{)}_3 + \text{H}_2$
- (vi) $\text{Zn} + \text{HNO}_3 \longrightarrow \text{Zn(NO}_3\text{)}_2 + \text{H}_2\text{O} + \text{N}_2\text{O}$

Answers: (i) Already balanced (L.P. 1)

- (ii) $\text{Pb(NO}_3\text{)}_2 + 2\text{KI} \longrightarrow 2\text{KNO}_3 + \text{PbI}_2$
- (iii) $2\text{CO(g)} + \text{O}_2\text{(g)} \longrightarrow 2\text{CO}_2\text{(g)}$
- (iv) $2\text{FeSO}_4\text{(s)} \longrightarrow \text{Fe}_2\text{O}_3\text{(s)} + \text{SO}_2\text{(g)} + \text{SO}_3\text{(g)}$
- (v) $2\text{Al} + 3\text{H}_2\text{SO}_4 \longrightarrow \text{Al}_2\text{(SO}_4\text{)}_3 + 3\text{H}_2$
- (vi) $4\text{Zn} + 10\text{HNO}_3 \longrightarrow 4\text{Zn(NO}_3\text{)}_2 + 5\text{H}_2\text{O} + \text{N}_2\text{O}$

Precipitate: an insoluble substance is called precipitate (ppt).

Characteristics of a Chemical Reaction

3

- Change in
 - colour
 - temperature
 - state
 - Evolution of gas.
 - formation of precipitate
 - Endothermic Reactions:** Reactions in which energy is absorbed.
 (in) (उत्तर) *Photosynthesis
 also endothermic
 - Exothermic Reactions:** Reactions in which heat is released along with the formation of products. (Digestion is also an exothermic)
 (उत्तर (exit))

, eg: $\text{Fe} + \text{CuSO}_4 \xrightarrow{\text{blue}} \text{FeSO}_4 + \text{Cu}$ blue green

, eg $\text{CaO} + \text{H}_2\text{O} \longrightarrow \text{Ca(OH)}_2 + \text{Heat}$

, eg $\text{H}_2(g) + \text{O}_2(g) \longrightarrow \text{H}_2\text{O(l)}$
 $\text{gas} \xrightarrow{\text{to}} \text{liquid}$

eg $\text{Zn(s)} + \text{H}_2\text{SO}_4(aq) \longrightarrow \text{ZnSO}_4(aq) + \text{H}_2(g)$

eg $\text{Pb(NO}_3)_2(aq) + \text{KI(aq)} \longrightarrow \text{PbI}_2(s) + \text{KNO}_3(aq)$
 \uparrow yellow solid ppt

eg $\text{CaCO}_3 + \text{heat} \longrightarrow \text{CaO} + \text{CO}_2$
 or, $\text{CaCO}_3 \xrightarrow{\Delta} \text{CaO} + \text{CO}_2$ ($\Delta \rightarrow$ heat symbol)

eg $\text{CaO} + \text{H}_2\text{O} \longrightarrow \text{Ca(OH)}_2 + \text{Heat}$

K^{3B} It is not always necessary to mention the physical states and reaction conditions in a balanced chemical equation. So, we can leave this step until it is asked in the question.

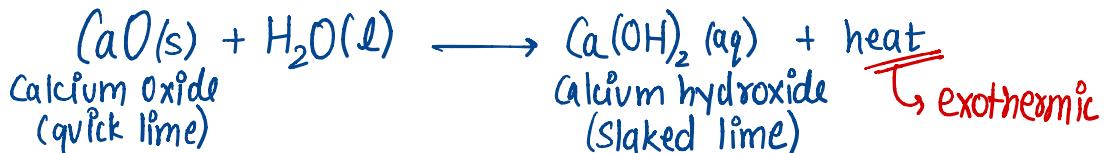
Types of Chemical Reactions

[ਜਿਤੇ ਭੀ example reactions ਨੂੰ ਗੋ ਸਥ ਆਪ ਕਣੀ ਨਾ।]

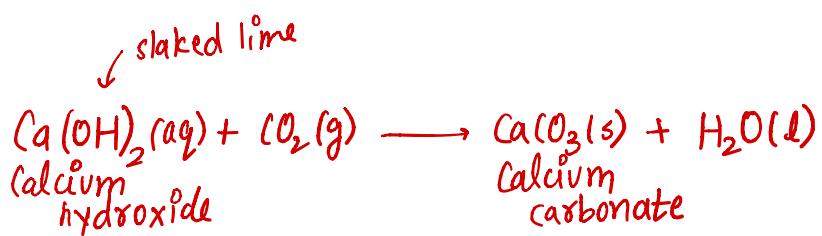
- #1) COMBINATION REACTION: In a combination reaction, two or more reactants combine to give a single product.

Example:

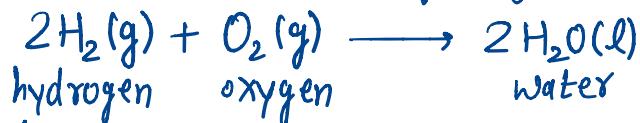
(i) Quick lime reacts with water to form slaked lime.



K³B ⇒ Solution of calcium hydroxide (slaked lime) is used for white washing walls. Calcium hydroxide reacts slowly with CO₂ in air to form a thin layer of calcium carbonate, on the walls which gives a shiny appearance to the walls. Finally after 2 to 3 days of white washing, calcium carbonate is formed:-



e.g(ii) formation of water from hydrogen gas & oxygen gas:



Eg (iii) Burning of coal:

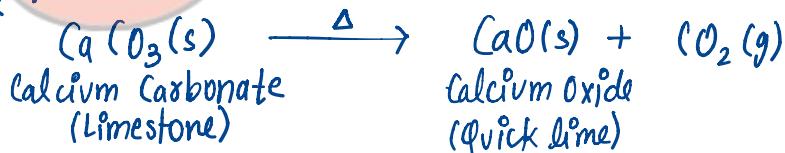


#2) Decomposition Reaction: In a decomposition reaction, a single reactant breaks down into two or more simpler products. (basically opposite of combination reaction).
Decomposition reaction are of 3 types:

(ii) **Thermal Decomposition**: These reactions use the energy in the form of heat for decomposition of the reactant.
Examples:

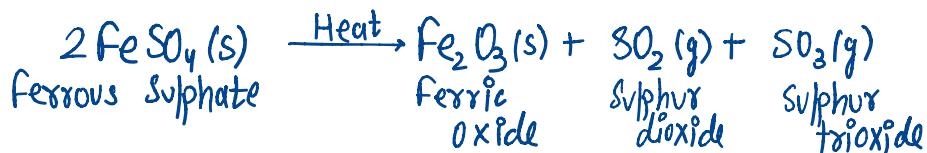
Examples:

(a) Calcium carbonate on heating, decomposes to give calcium oxide and carbon dioxide:

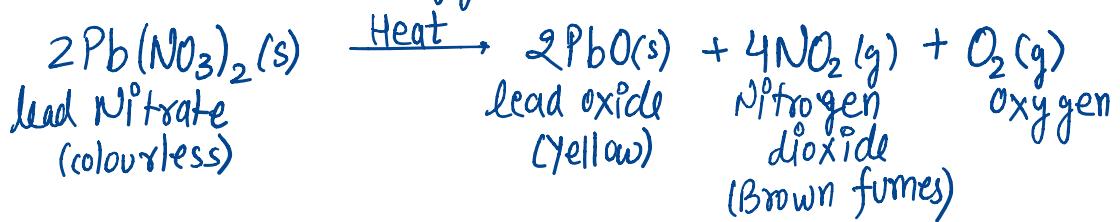


④ → Calcium oxide is used for manufacturing of cement.

(b) Ferrous sulphate, the green colour crystals $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ on heating lose water of crystallisation and forms dehydrated FeSO_4 , which on decomposition gives ferric oxide, sulphur dioxide, SO_2 and sulphur trioxide, SO_3 . Ferric oxide is a solid, while SO_2 and SO_3 are gases.



(c) On heating lead nitrate, it decomposes to give yellow lead monoxide, nitrogen dioxide and oxygen gas.



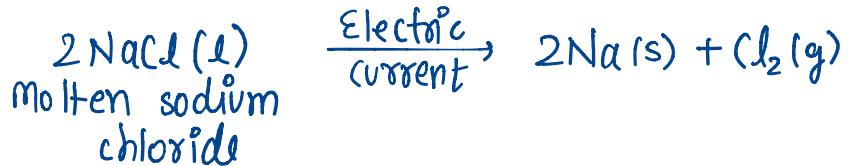
(ii) **Electrolytic Decomposition** or **Electrolysis**: These reactions involve the use of electrical energy for the decomposition of the reactant molecules.

Examples:

(a) When electric current is passed through water, it decomposes to give oxygen and hydrogen.



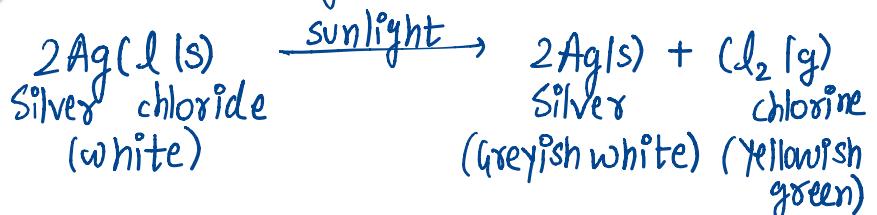
(b) When electric current is passed through molten sodium chloride, it decomposes to give sodium metal and chlorine gas.



(iii) Photo Decomposition or Photolysis or Photochemical decomposition:
These reactions involve the use of light energy for the purpose of decomposing an

decompose Examples:

(a) When silver chloride is exposed to sun light, it decomposes to give silver metal and chlorine gas.



(b) Similarly, silver bromide gives silver metal and bromine gas in the presence of sunlight.

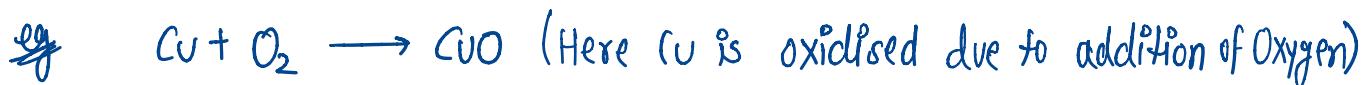


→ These reactions of Silver Halides are used in black and white photography.

#3) Displacement Reaction: The reactions in which more reactive element displaces a less reactive element from its compound, it is called displacement reaction. This reaction is of two types:

(i) **Single displacement Reaction**: It is a type of chemical reaction where an element reacts with a compound and takes the place of another element in that compound is called single displacement.

#4) **Oxidation:** A substance (in reactant side) is said to be oxidised if Oxygen is added OR Hydrogen is removed to it after the reaction and process is called oxidation.



#5) **Reduction:** A substance (in reactant side) is said to be reduced if Oxygen is removed OR Hydrogen is added to it after the reaction and process is called reduction.



#6) **Redox Reaction:** Reaction in which oxidation and reduction both takes place simultaneously.

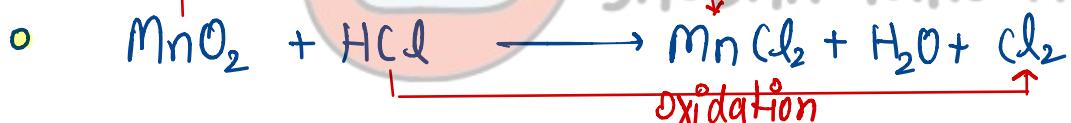
Also,

In a redox reaction substance getting oxidised is called Reducing agent.

And, the substance getting reduced is called Oxidising agent.

Examples:

Reduction



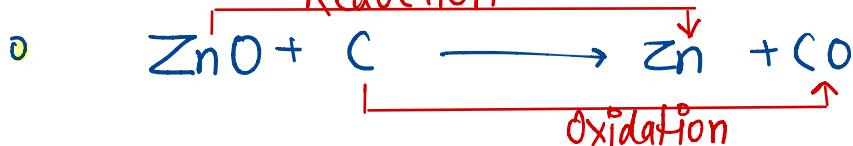
here, MnO₂ is reduced to MnCl₂ (removal of oxygen)

HCl is oxidised to Cl₂ (removal of Hydrogen)

MnO₂ is oxidising agent.

HCl is reducing agent.

Reduction



ZnO is reduced to Zn (removal of oxygen)

C is oxidised to CO (addition of oxygen)

ZnO is oxidising agent.

C is reducing agent.

Effects of Oxidation

#1) **Corrosion:** (जँगलग जाना लौटे में) When a metal is attacked by substances around it such as moisture, acid, air, water etc. It is said to be corrode & this process is called corrosion.

eg:- Rusting of metal, blackening of silver, green coating on copper. It causes damage to bridges, iron railings, ships, car bodies and all objects made of metals (specially those which are made up of iron)

#2) **Rancidity:** Oxidation of fat and oils in the food items result in change in the taste and smell. We say that food items are rancid and the process is called rancidity.

Methods to prevent Rancidity:

- o Packing of food items like potato wafers etc in packets containing nitrogen gas instead of air. (e.g. Packed chips)
- o Avoid keeping the cooked food and food materials in direct sunlight.
- o Keeping food materials in air-tight containers.
- o Refrigeration of cooked food

Imp PYQs

2020

15. Lead Nitrate solution is added to a test tube containing potassium iodide solution.

(a) Write the name and colour of the compound precipitated.

(b) Write the balanced chemical equation for the reaction involved.

(c) Name the type of this reaction justifying your answer.

OR

What happens when food materials containing fats and oils are left for a long time? List two observable changes and suggest three ways by which this phenomenon can be prevented.

Ans:- a) Name and colour of the compound precipitated:-
Lead Iodide (PbI_2) colour is yellow.
b) Equation: $Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$
c) It is double displacement reaction.

OR

Pg-⑧ of notes.

2019

11. 2 g of ferrous sulphate crystals are heated in a dry boiling tube.

(a) List any two observations.

(b) Name the type of chemical reaction taking place.

(c) Write balanced chemical equation for the reaction and name the products formed.

OR

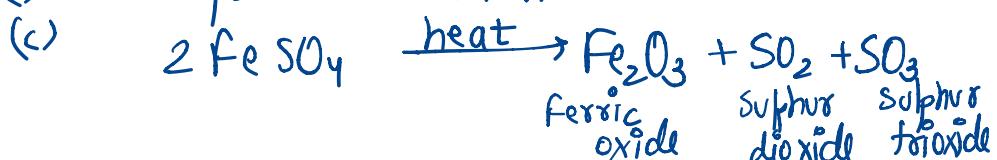
You might have noted that when copper powder is heated in a china dish, the reddish brown surface of copper powder becomes coated with a black substance.

- (a) Why has this black substance formed ?
- (b) What is this black substance ?
- (c) Write the chemical equation of the reaction that takes place.
- (d) How can the black coating on the surface be turned reddish brown ?

Ans:- (a) Two observations are:

- (i) colour changes from green to white.
- (ii) formation of reddish brown Ferric oxide (Fe_2O_3 or evolution of SO_2/SO_3 gas).

(b) Decomposition Reaction



OR

- (a) When copper is heated in air, oxidation takes place.
- (b) This black substance is CuO (copper Oxide)
- (c) The balanced chemical equation for the reaction



(d) the black coating on the surface be turned reddish brown by passing hydrogen gas over the heated material.

2018

6. Decomposition reactions require energy either in the form of heat or light or electricity for breaking down the reactants. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricitiy.

22. A student added few pieces of aluminium metal to two test tube A and B containing aqueous solution of iron sulphate and copper sulphate. In the second part of her experiment, she added iron metal to another test lube C and D containing aqueous solution of aluminium sulphate and copper sulphate. In which test tube or test tubes will she observe colour change ? On the basis of this experiment state which one is the most reactive metal and why?

23. What is observed when a solution of sodium sulphate is added to a solution of barium chloride in a test tube ? Write equation for the chemical reaction involved and name the type of reaction in this case.

Ans 6 :- Thermal decomposition \longrightarrow Pg(4) of Notes.

Ans 23 :- She will observe colour change only in test tube A and B from

green to colourless in A, because aluminium is more reactive than iron it will displace iron. She will observe colour change from blue to colourless in test tube B. Since aluminium displaces all the other 3 metals, it is the most reactive metal.

ans 23 :- It is an example of double displacement reaction.



$\text{Na}_2\text{SO}_4 \rightarrow$ Sodium Sulphate
 $\text{BaCl}_2 \rightarrow$ Barium chloride
 $\text{BaSO}_4 \rightarrow$ Barium Sulphate
 $\text{NaCl} \rightarrow$ Sodium chloride.

[before 2018 no question from all India cbse*)

HELP US TO BRING MORE QUALITY
CONTENT FOR YOU GUYS



SCAN QR CODE TO DONATE

or enter UPI ID : q07733562@ybl
(You can Donate from any UPI App)

Even a small bit of help will be appreciable :)

In notes ko padhkar is
Saal Kon 95%+ laaega?

