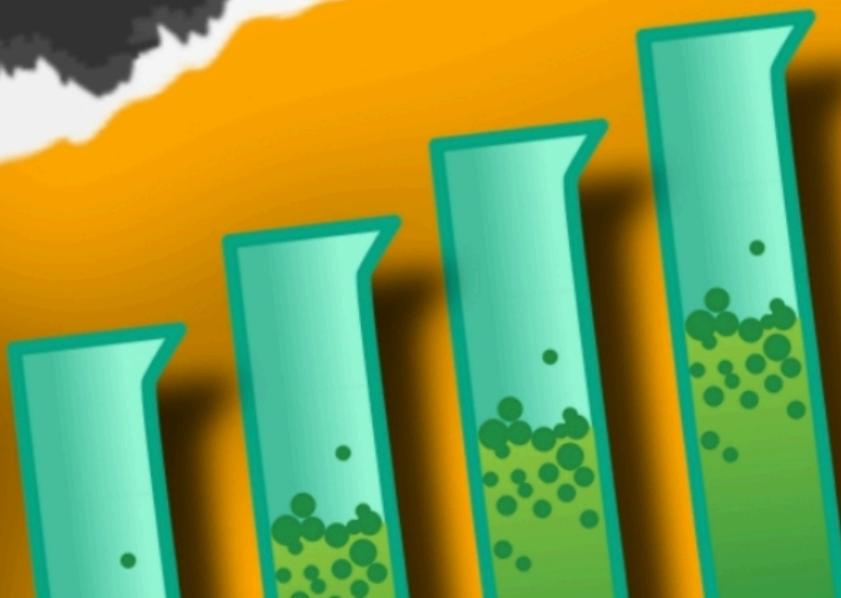




/padhle akshay

PRESENTS

Chemical Reactions & Equations



WHY THESE NOTES?

- ✓ TOUCHES EVERY CORNER OF NCERT
- ✓ INCLUDES NCERT ACTIVITIES (AKQ), BOXES(BKQ) & EXEMPLAR (EKQ)
- ✓ EACH LINE, FLOWCHART & DIAGRAM IS MOTIVATED FROM PYQs
- ✓ APPROVED BY 3 CBSE TOPPERS

SCAN
&
DONATE



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Chemical Reaction

It is the process in which substance react together and form a new substance with new properties.

Reactant

The substance which takes parts in chemical reaction.

Product

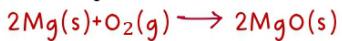
The substance which forms in the chemical reaction.

A.K.Q

Why magnesium is rubbed with sand paper before burning?

To remove the oxide layer from the surface and thus it will allow the ribbon to burn effectively to get the desired result.

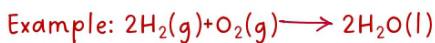
When magnesium ribbon burn in air it react with oxygen and form a product magnesium oxide.



- Magnesium ribbon → Silvery white metal, burn with dazzling white flames
- Magnesium oxide → White powder

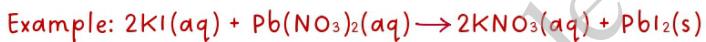
Characteristics of chemical reaction

• Change in state



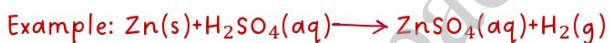
Before reaction the reactant are in gaseous state and after reaction the product formed is in the liquid state

• Change in colour



Before reaction the solution are colourless and after reaction the yellow colour lead iodide is formed

• Evolution of gas



In the reaction the evolution of Hydrogen gas takes place

• Change in temperature



When the Zn react with HCl/H₂SO₄ then a lot of heat released

• Formation of precipitate



In the above reaction the yellow colour of precipitate formed (lead iodide)

Chemical equation

The method of representing a chemical reaction with the symbols and formulae of the substance is known as chemical equation.

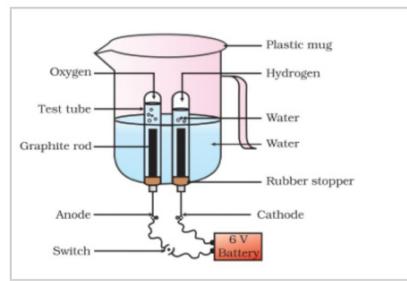
Example: Zinc metal react with dilute sulphuric acid to form zinc sulphate and hydrogen gas.



Balanced chemical equation

A balanced chemical equation has an equal number of atom of each element in the reactant and product side.

- $2\text{H}_2\text{O(l)} \xrightarrow{\text{electricity}} 2\text{H}_2\text{(g)} + \text{O}_2\text{(g)}$
- $2\text{AgCl(s)} \xrightarrow{\text{Sunlight}} 2\text{Ag(s)} + \text{Cl}_2\text{(g)}$
- $2\text{AgBr(s)} \xrightarrow{\text{Sunlight}} 2\text{Ag(s)} + \text{Br}_2\text{(g)}$
(Black and white photography)
- Ferrous sulphate (FeSO_4) - Green colour
- Ferric Oxide (Fe_2O_3) - Brown colour
- Ferrous sulphate crystal ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$)



A.K.Q.

? Is the volume of the gas collected the same in both the test tubes?

No, because water is composed of 2 parts of Hydrogen (H_2) and 1 part of oxygen O_2 .

? Test these gases one by one by bringing a burning candle close to the mouth of the test tubes.

-what happens in each case?

-which gases are present in each test tube?

Case 1

Less gas volume test tube

Burn rapidly with yellow flame due to presence of oxygen gas

Reason: O=O means O_2 is unsaturated compounds burn with yellow flame.

Case 2

More gas volume test tube

Burn with a blue flame and makes a pop sound due to presence of hydrogen gas.

Reason: H-H means H_2 is saturated compounds burn with clean flame.



Displacement reaction

Those reactions in which one element takes the place of another element in a compound.

Example:

- $\text{Fe(s)} + \text{CuSO}_4\text{(aq)} \longrightarrow \text{FeSO}_4\text{(aq)} + \text{Cu(s)}$
- $\text{Zn(s)} + \text{CuSO}_4\text{(aq)} \longrightarrow \text{ZnSO}_4\text{(aq)} + \text{Cu(s)}$
- $\text{Pb(s)} + \text{CuCl}_2\text{(aq)} \longrightarrow \text{PbCl}_2\text{(aq)} + \text{Cu(s)}$
- CuSO_4 (Blue)
- FeSO_4 (Brownish green)

displacement reaction
reactivity series ke
hisab se hota hai
jo reactivity series me
upar hoi vo niche wale
ko displace kar deتا
hai

K (Potassium)
Na (Sodium)
Ca (Calcium)
Mg (Magnesium)
Al (Aluminium)
Zn (Zinc)
Fe (Iron)
Pb (Lead)
H (Hydrogen)
Cu (Copper)
Hg (Mercury)
Ag (Silver)
Au (Gold)

Double Displacement reaction

Those reactions in which two compounds react by an exchange of ions to form two new compounds.

Example:

- $\text{Na}_2\text{SO}_4\text{(aq)} + \text{BaCl}_2\text{(aq)} \longrightarrow \text{BaSO}_4\text{(s)} + 2\text{NaCl(aq)}$
- $\text{Pb(NO}_3)_2\text{(aq)} + 2\text{KI(aq)} \longrightarrow \text{PbI}_2\text{(s)} + 2\text{KNO}_3\text{(aq)}$
- $\text{AgNO}_3\text{(aq)} + \text{NaCl(aq)} \longrightarrow \text{AgCl(s)} + \text{NaNO}_3\text{(aq)}$
(White ppt.)

ionic exchange
ho jate hain

On the basis of heat released or absorbed

Exothermic reaction (Heat ya energy feel ho)

The reaction in which heat is evolved is known as exothermic reaction.

Example:

- Burning of Natural Gas :
 $\text{CH}_4\text{(g)} + 2\text{O}_2\text{(g)} \longrightarrow \text{CO}_2\text{(g)} + 2\text{H}_2\text{O(g)}$
- $\text{C}_6\text{H}_{12}\text{O}_6\text{(aq)} + 6\text{O}_2\text{(g)} \longrightarrow 6\text{CO}_2\text{(aq)} + 6\text{H}_2\text{O(l)} + \text{energy}$
- Decomposition of vegetable matter into compost is also an example of an exothermic reaction.

endothermic reaction (Jaha heat/energy Supply karna paide)

Those reaction in which heat is absorbed are known as endothermic reactions.

Example:

- $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) + \text{Heat} \rightarrow 2\text{NO}(\text{g})$
- All the decomposition reaction are endothermic reaction.

Oxidation and Reduction (Redox)

Oxidation

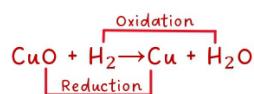
Oxidation is a process which involves the addition of oxygen or any electronegative element or the removal of hydrogen or any electro positive element.

Reduction

Reduction is the process which involves the addition of hydrogen or any electropositive element or the removal of oxygen or any electronegative element.

Example

- Substance Oxidised - H_2
- Substance Reduced - CuO
- Oxidising agent - CuO
- Reducing agent - H_2

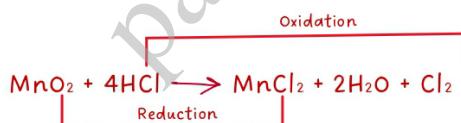


jo reduce ho jaye vo
oxidising agent
jo oxidise ho jaye vo
reducing agent

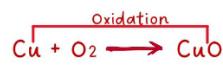
- Substance oxidised - C
- Substance reduced - ZnO
- Oxidising agent - ZnO
- Reducing agent - C



- Substance Oxidised - HCl
- Substance reduced - MnO_2
- Oxidising Agent - MnO_2
- Reducing agent - HCl



- Substance Oxidised - Cu



★ All displacement reactions are redox reactions but reverse is not true.



A.Q.Q.

When copper powder is heated in a china dish the surface of the copper powder becomes coated with a black colour substance. Why has this black coloured substance formed? What is that black substance? Write the chemical equation of the reaction.

When the copper powder is heated in a china dish the copper powder surface becomes coated with black colour substance due to the formation of copper oxide by surface oxidation.

The black colour is due to the formation of this copper (II) oxide as the copper comes in contact with the air.
$$2\text{Cu}(\text{s}) + \text{O}_2(\text{g}) \rightarrow 2\text{CuO}(\text{g})$$

corrosion

It is the process in which metals are eaten up by the action of air, moisture, or a chemical on their surface.
Example: Rusting of iron (reddish brown) $\{Fe_2O_3 \cdot XH_2O\}$ black coating on silver $\{Ag_2S\}$, green coating on copper. $\{CuCO_3 \cdot Cu(OH)_2\}$



prevention

- Use non-corrosion metals, such as stainless steel or aluminium
- Make sure the metal surface stay clean and Dry
- Use drying agent
- Use a coating or barrier product such as grease, oil, paint or carbon fibre coating
- Use a sacrificial anode to provide a cathodic protection system

Rancidity

The condition produced by aerial oxidation of fats and oils in food marked by unpleasant smell and taste.

prevention

- Adding anti-oxidants to foods containing fats and oils
Butylated hydroxyanisole (BHA)
Butylated hydroxytoluene (BHT)
- Packing fat and oil containing foods in nitrogen gas
- Keeping food in refrigerator
- Storing food in air tight container

(Nitrogen
gas filled)



Yours Father →



E.K.Q.

On heating blue coloured powder of copper (II) nitrate in a boiling tube, copper oxide (black), oxygen gas and a brown gas X is formed

(a) Write a balanced chemical equation of the reaction.

(b) Identify the brown gas X evolved.

(c) Identity the type of reaction.

(d) What could be the pH range of aqueous solution of the gas X?

Ans-(a) Balanced chemical equation:



(b) The brown gas X evolved is nitrogen dioxide (NO).

(c) This is a decomposition reaction.

(d) Nitrogen dioxide is an oxide of non-metal so it dissolves in water to form acidic solution. Thus, pH of this solution is less than 7.

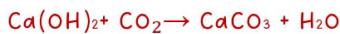
Give the characteristic tests of the following gases

(a) CO (b) O₂

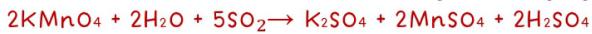
(b) SO₂ (d) H₂

Ans- The characteristic tests:

(a) Carbon dioxide (CO) gas turns lime water milky when passed through it due to the formation of insoluble calcium carbonate.



(b) Sulphur dioxide (SO) gas when passed through acidic potassium permanganate solution (purple in colour) turns it colourless because SO is a strong reducing agent.



(c) The evolution of oxygen (O₂) gas during a reaction can be confirmed by bringing a burning candle near the mouth of the test tube containing the reaction mixture. The intensity of the flame increases because oxygen supports burning.

(d) Hydrogen (H₂) gas burns with a pop sound when a burning candle is taking near it.

Write the balanced chemical equations for the following reactions and identify the type of reaction in each case.

(a) Nitrogen gas is treated with hydrogen gas in the presence of a catalyst at 773 K to form ammonia gas.

(b) Sodium hydroxide solution is treated with acetic acid to form sodium acetate and water.

(c) Ethanol is warmed with ethanoic acid to form ethyl acetate in the presence of concentrated H₂SO₄.

(d) Ethene is burnt in the presence of oxygen to form carbon dioxide, water and releases heat and light.

Ans- (a) N₂(g) + 3H₂(g) $\xrightarrow{773\text{K}}$ 2NH₃ (Combination reaction)

(b) NaOH(aq) + CH₃COOH(aq) \longrightarrow CH₃COONa(aq) + H₂O(l)

Double displacement reaction/Neutralisation reaction

(c) C₂H₅OH + CH₃COOH + conc. H₂SO₄ \longrightarrow CH₃COOCH₂CH₃ + H₂O

Double Displacement reaction/Esterification reaction

(d) C₂H₄(g) + 3O₂(g) \rightarrow 2CO₂(g) + 2H₂O(g) + Heat + Light (Exothermic reaction)

Grapes hanging on the plant do not ferment but after being plucked from the plant can be fermented. Under what conditions do these grapes ferment? Is it a chemical or a physical change?

Ans. Grapes when attached to the plants are living and therefore their own immune system prevents fermentation. The microbes can grow in the plucked grapes and under anaerobic conditions these can be fermented. This is a chemical change.



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