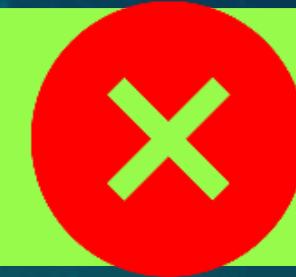


Chemical Reactions and Equations

ONE SHOT



GUN SHOT

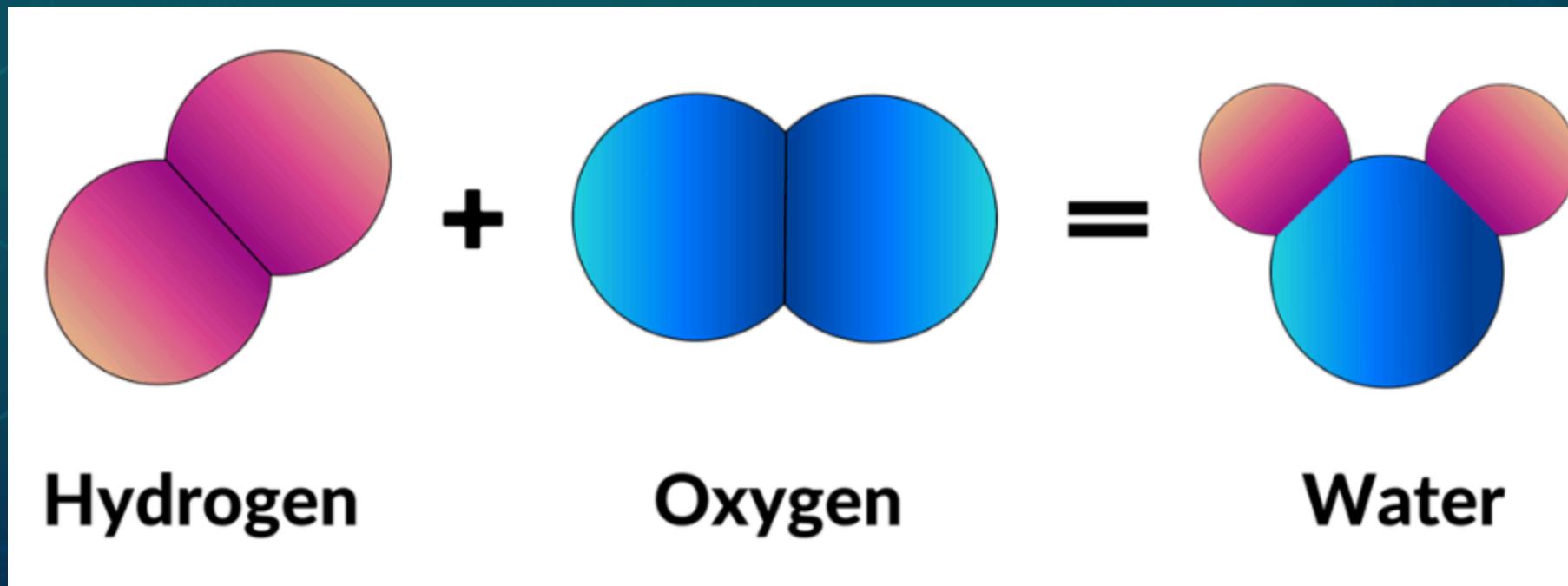


100% Paper yahi se bnega

Ek bhi Q bahar se nahi hogा

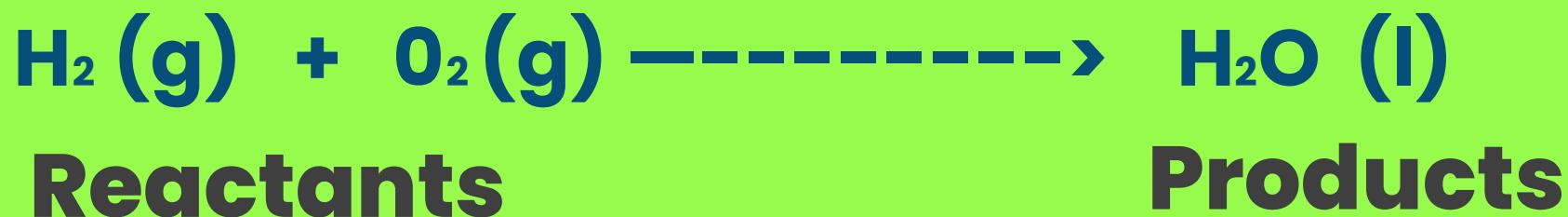
CHEMICAL REACTION

- A process in which **new chemical (s) are formed**
- Hydrogen gas react with oxygen gas to produce water under some condition



CHEMICAL EQUATION

- Simple representation of a chemical reaction with **symbols and formula**.
- Hydrogen gas reacts with oxygen gas to produce water **under some conditions**



CHARACTERISTICS of a Chemical Reaction

F E C T S

**Formation
of
precipitate**

**Evolution
of a gas**

**Colour
change**

**Temperature
change**

**State
change**

BALANCED CHEMICAL EQUATIONS

- Number of Atoms of each element in a chemical equation Should be the same on LHS & RHS



- Why Balance ??
- Conservation of mass – total mass of reactants should be equal to total mass of products

Practice:

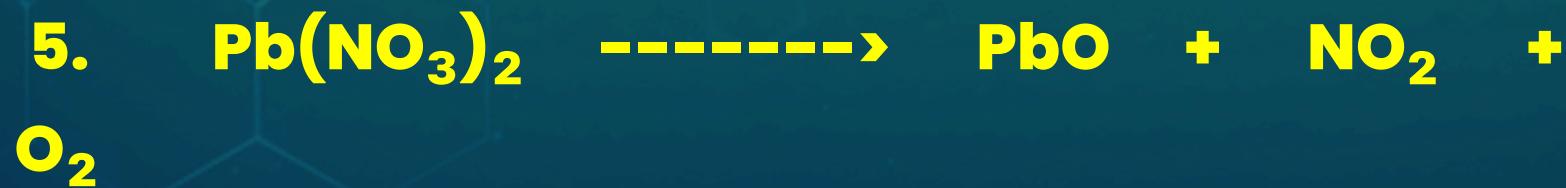
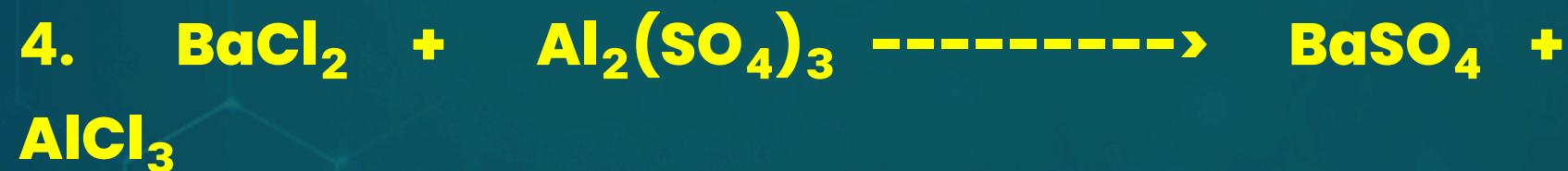


Metals → Zn , Fe , Na , Al , Mg , Mn , Cu , Ca , Pb , Ba

Non-Metals → Cl , Br , S , N , C

O
H





Q. To balance the following chemical equation the values of x and y should respectively be (CBSE 2020)



Q. To balance the chemical Equation find a,b,c,d (CBSE 2024)



Q. In order to balance the below chemical equation the value of x, y and z respectively are (CBSE 2023)



TYPES OF CHEMICAL REACTION

Combination Reaction

- Two or More reactant combine to form a single product

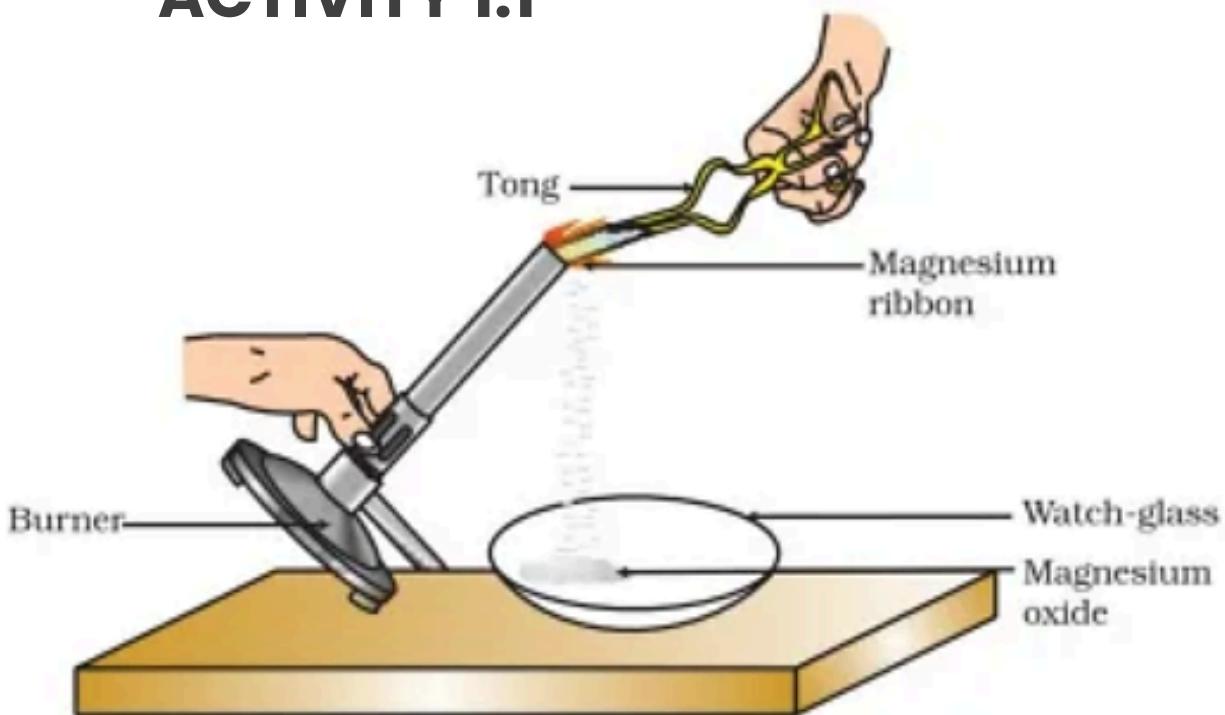




Imp Points

- (i) Mg burns with Dazzling white flame
(Very bright light)
- (ii) A white MgO powder in watch glass
- (iii) Heat energy releases so temperature increases
- (iv) Combination & Exothermic Reaction

ACTIVITY 1.1





Q.1 Why do we rub magnesium with sandpaper?

Ans. To remove any layer of magnesium oxide already present on magnesium ribbon.

Q.2 Why to keep magnesium ribbon away from your eyes?

Ans. Because the reaction is exothermic & it emits dazzling white light so bright that you cannot see for a short time after looking at it.

Q. A metal ribbon X burns in oxygen with a dazzling white flame forming a white ash Y. The correct description of X, Y and the type of reaction are.

(CBSE 2023)

- a) X = Ca ; Y = CaO, Type of reaction = Decomposition
- b) X = Mg ; Y = MgO, Type of reaction = Combination
- c) X = Al ; Y = Al₂O₃, Type of reaction = Thermal decomposition
- d) X = Zn ; Y = ZnO, Type of reaction = Endothermic



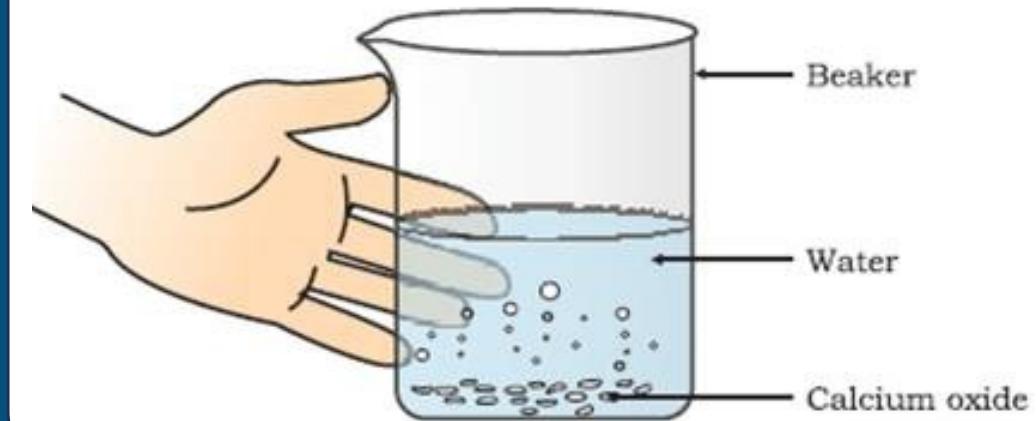
(Quick lime)

(Slaked lime)

Imp Points

- (i) Rise in temperature (exothermic)
- (ii) Quick lime reacts vigorously with water
- (iii) Water added slowly because reaction is exothermic
- (iv) Combination & Exothermic Reaction
- (v) Quicklime used in making cement

ACTIVITY 1.4





Q. Assertion (A) : Reaction of quicklime with water is an exothermic reaction

Reason (R) : Quicklime reacts vigorously with water releasing a large amount of heat **(CBSE 2023)**

- A. Both (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true but (R) is not the correct explanation of (A)
- C. (A) is True but (R) is False
- D. (A) is False but (R) is True

Q. Calcium oxide reacts vigorously with water to produce slaked lime This reaction can be classified as : **(CBSE 2020)**



- A. (A) Combination Reaction (B) Exothermic Reaction
- B. (C) Endothermic Reaction (D) Oxidation Reaction

A. Which of the following is a correct option?

- (a) (A) and (C) (b) (C) and (D)
- (c) (A), (C) and (D) (d) (A) and (B)

Q. The balanced chemical equation showing reaction between quicklime and water is (CBSE 2023)

- A. (a) $2\text{CaO} + \text{H}_2\text{O} \longrightarrow 2\text{CaOH} + \text{H}_2 + \text{Heat}$
- B. (b) $\text{CaO} + \text{H}_2\text{O} \longrightarrow \text{Ca(OH)}_2 + \text{H}_2 + \text{Heat}$
- C. (c) $\text{CaO} + \text{H}_2\text{O} \longrightarrow \text{Ca(OH)}_2 + \text{Heat}$
- D. (d) $2\text{CaO} + 3\text{H}_2\text{O} \longrightarrow 2\text{Ca(OH)}_3 + \text{O}_2 + \text{Heat}$

White Wash Wall



After 2 to 3 days shiny white colour wall



Slaked lime

(from air)

Calcium carbonate

OTHER EXAMPLES OF COMBINATION REACTION

1. Burning of Coal



2. Formation of water from H₂(g) and O₂(g)

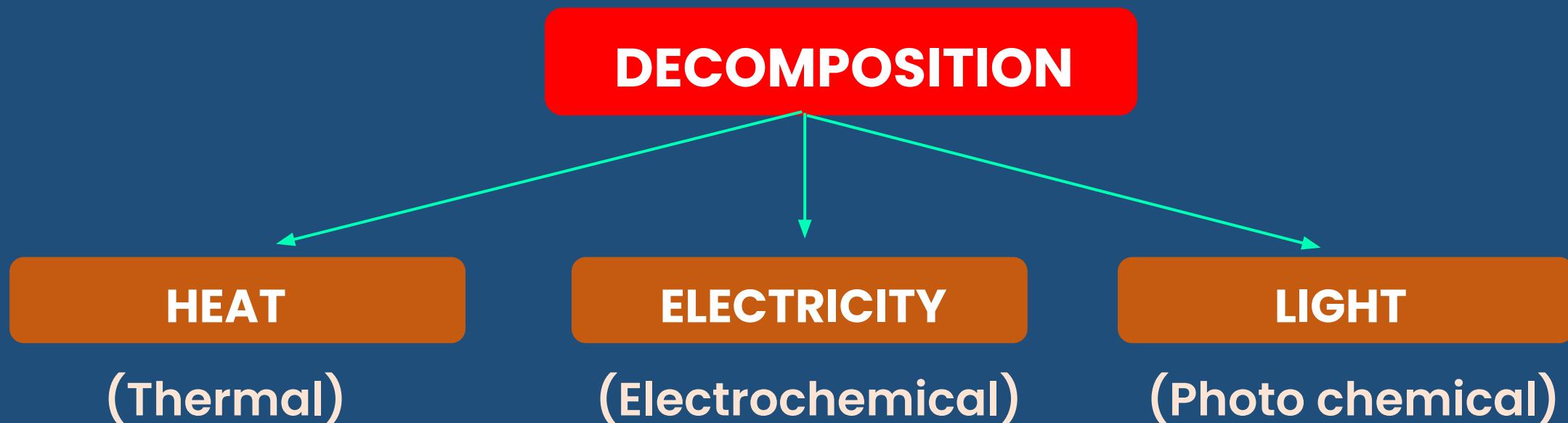


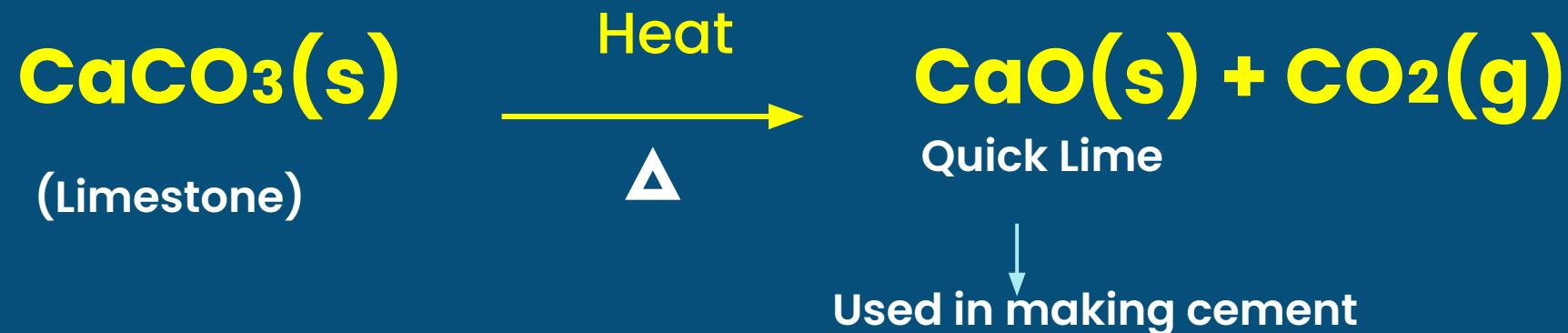
Q. Select from the following a process in which a combination reaction is involved (CBSE 2024)

- A. Black and White photography
- B. Burning of coal
- C. Burning of methane
- D. Digestion of food

DECOMPOSITION REACTION

Reverse of combination ; one reactant breaks into 2 or more products





**Q. Identify the product 'X' obtained in the following chemical reaction
(CBSE 2024)**

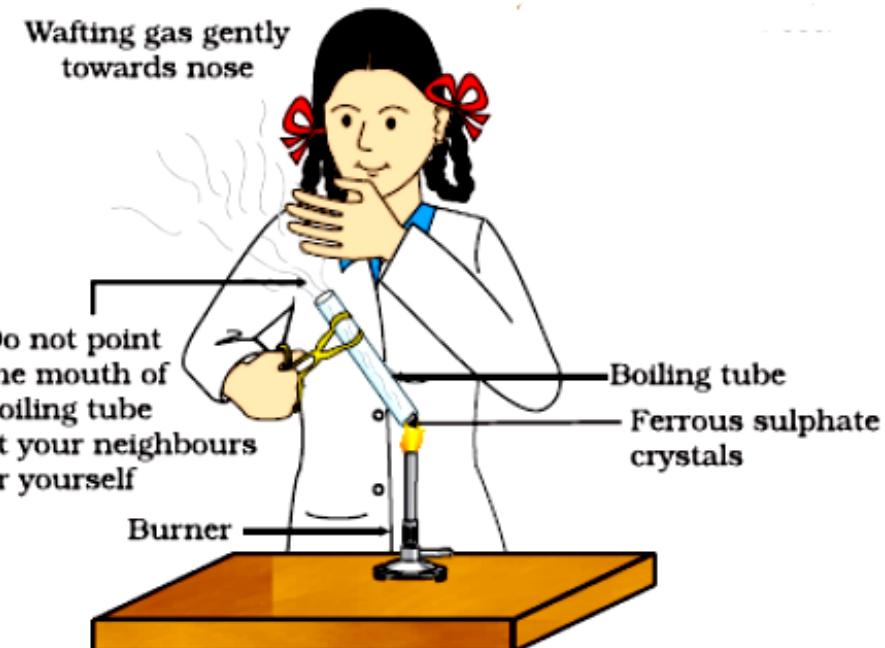


- A. Quick lime
- B. Gypsum
- C. Lime stone
- D. Plaster of Paris

THERMAL DECOMPOSITION - Thermolysis



ACTIVITY 1.5



Imp Points



Green



Dirty White



Brown

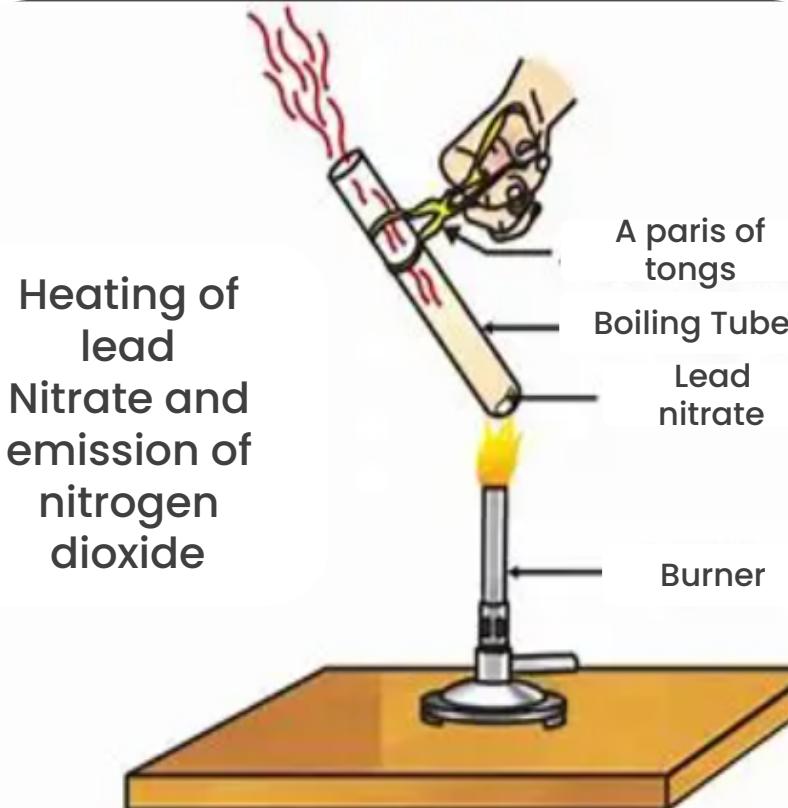
- Smell of burning sulphur (matchstick) → Smell of $\text{SO}_2(\text{g})$ (Suffocating Odour)
- $\text{SO}_2(\text{g})$ & $\text{SO}_3(\text{g})$ are air pollutant & acidic in nature

Thermal Decomposition & Endothermic Reaction





ACTIVITY 1.6



Imp Points

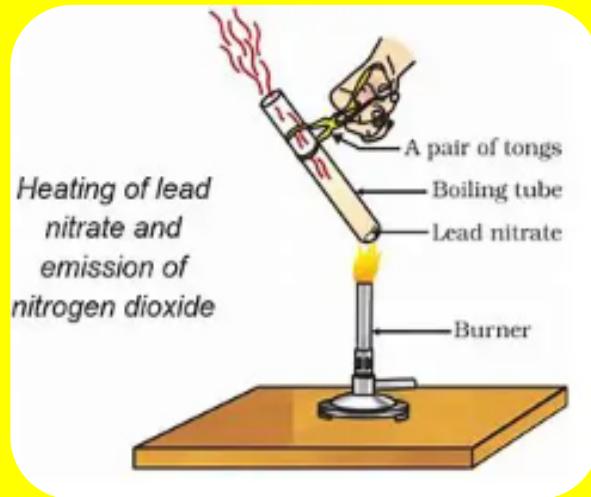
- I. Cracking sound
- II. Brown fumes $\rightarrow \text{NO}_2(\text{g})$ – irritating smell
- III. Yellow solid residue $\rightarrow \text{PbO}(\text{s})$
- IV. NO_2 gas is acidic in nature & turns moist blue litmus red

*Thermal Decomposition &
Endothermic Reaction*



Q. The emission of brown fumes in the given experimental setup is due to:

(CBSE 2023)



Q. The products obtained when lead nitrate is heated in a boiling tube are:

(CBSE 2024)

(a) $\text{PbO}, \text{N}_2\text{O}$ and O_2

(c) $\text{Pb}(\text{NO}_2)_2$ and O_2

(b) NO , PbO and O_2

(d) NO_2 , PbO and O_2

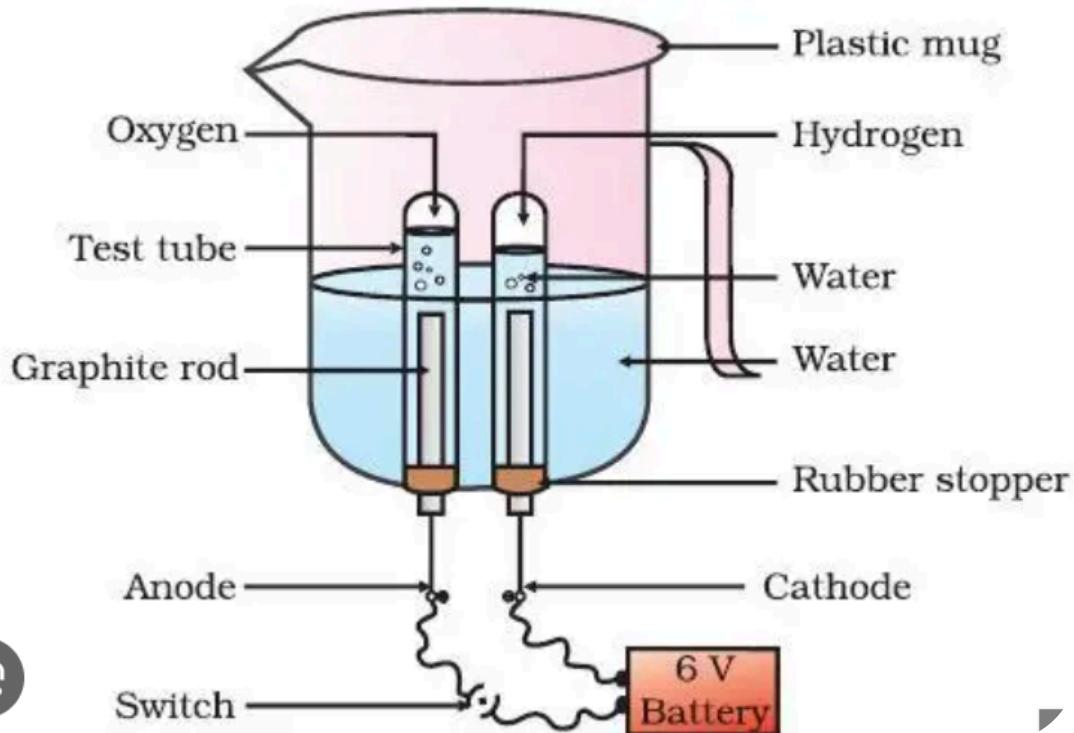
ELECTROLYTIC DECOMPOSITION / ELECTROLYSIS



Electric Current
→



ACTIVITY 1.7



P A O

Imp Points

i) Volume of gas $H_2 : O_2 = 2 : 1$

(ii) Burning candle near

$H_2(g)$

- i) Pop sound & candle extinguish
- ii) Combustible but not supporter of combustion

$O_2(g)$

- i) Candle burns more brightly
- ii) Not Combustible but supporter of combustion

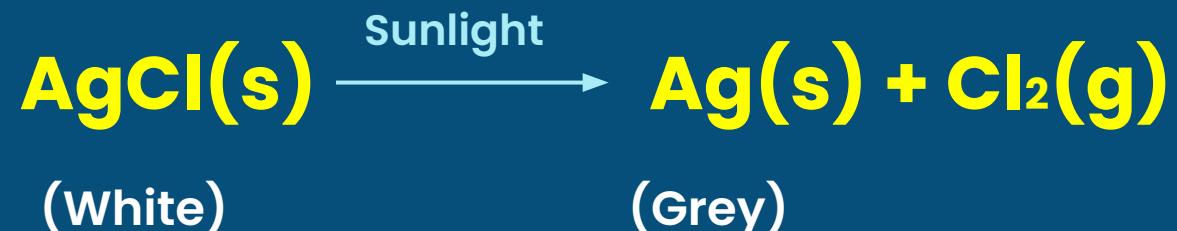
(iii) Pure water is poor conductor of electricity so a few drop of acids is added, which acts as electrolyte & conducts electricity

Q. While electrolysing water before passing the current some drops of an acid are added. Why? Name the gases liberated at cathode and anode. Write the relationship between the volume of gas collected at anode and the volume of gas collected at cathode.

(CBSE 2023)

PHOTOCHEMICAL DECOMPOSITION / Photolysis

ACTIVITY 1.8



This is why AgCl & AgBr are kept in Black colour bottles to protect from sunlight

(used in black and white Photography)

Q. Select the following a decomposition reaction in which source of energy for decomposition is light: **(CBSE 2024)**

- (a) $2\text{FeSO}_4 \longrightarrow \text{Fe}_2\text{O}_3 + \text{SO}_2 + \text{SO}_3$
- (b) $2\text{H}_2\text{O} \longrightarrow 2\text{H}_2 + \text{O}_2$
- (c) $2\text{AgBr} \longrightarrow 2\text{Ag} + \text{Br}_2$
- (d) $\text{CaCO}_3 \longrightarrow \text{CaO} + \text{CO}_2$

**Q. What is observed when silver chloride is exposed to sunlight?
Give the type of reaction involved:** **(CBSE 2023)**

Q. Silver chloride kept in a china dish turns grey in sunlight

A. Write the colour of silver when it was kept in the china dish

(CBSE 2023)

B. Name the type of chemical reaction taking place and write the chemical equation for the reaction

C. State one use of reaction . Name one more chemical which can be used for the same purpose

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

(CBSE 2018)

DISPLACEMENT REACTION:

More reactive element replaces a less reactive element from its compound



REACTIVITY SERIES

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

An orange downward-pointing arrow is positioned vertically through the center of the table, pointing from the most reactive elements at the top to the least reactive elements at the bottom.



K
Na
Ca
Mg
Al
Zn
Fe
Pb
H
Cu
Hg
Ag
Au



ACTIVITY 1.9

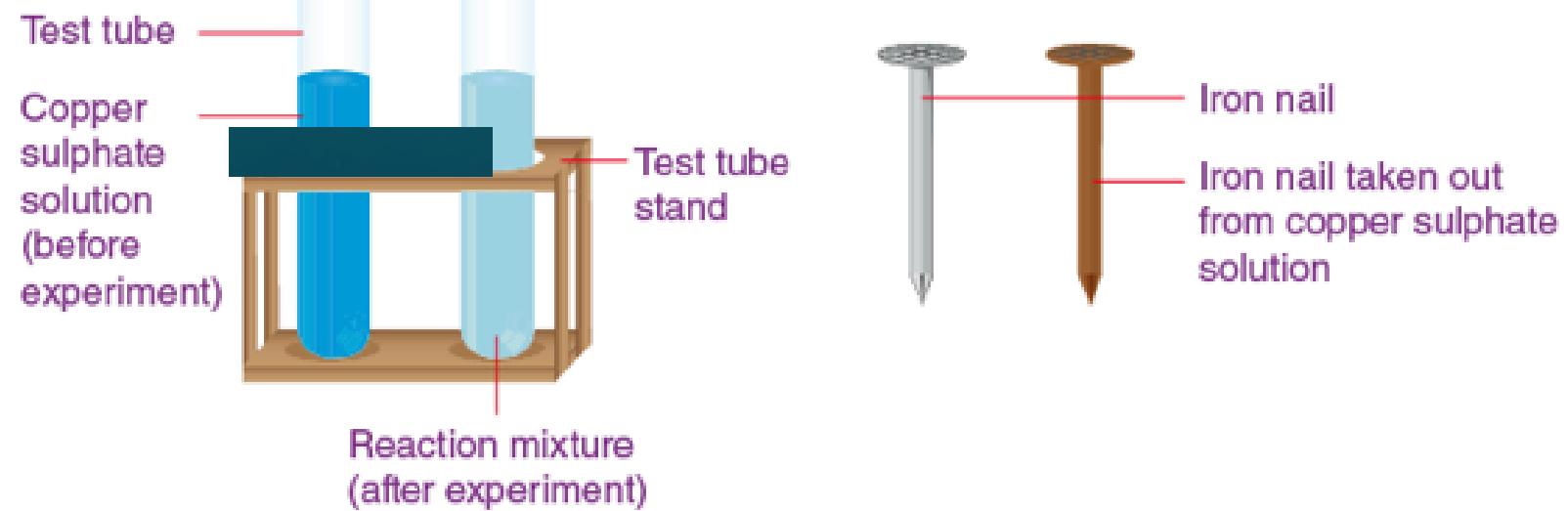
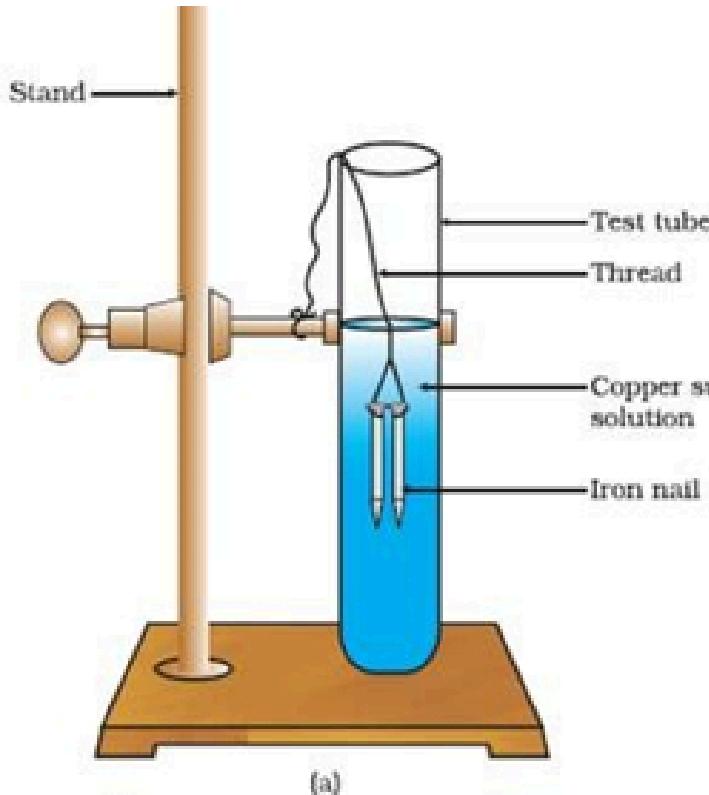
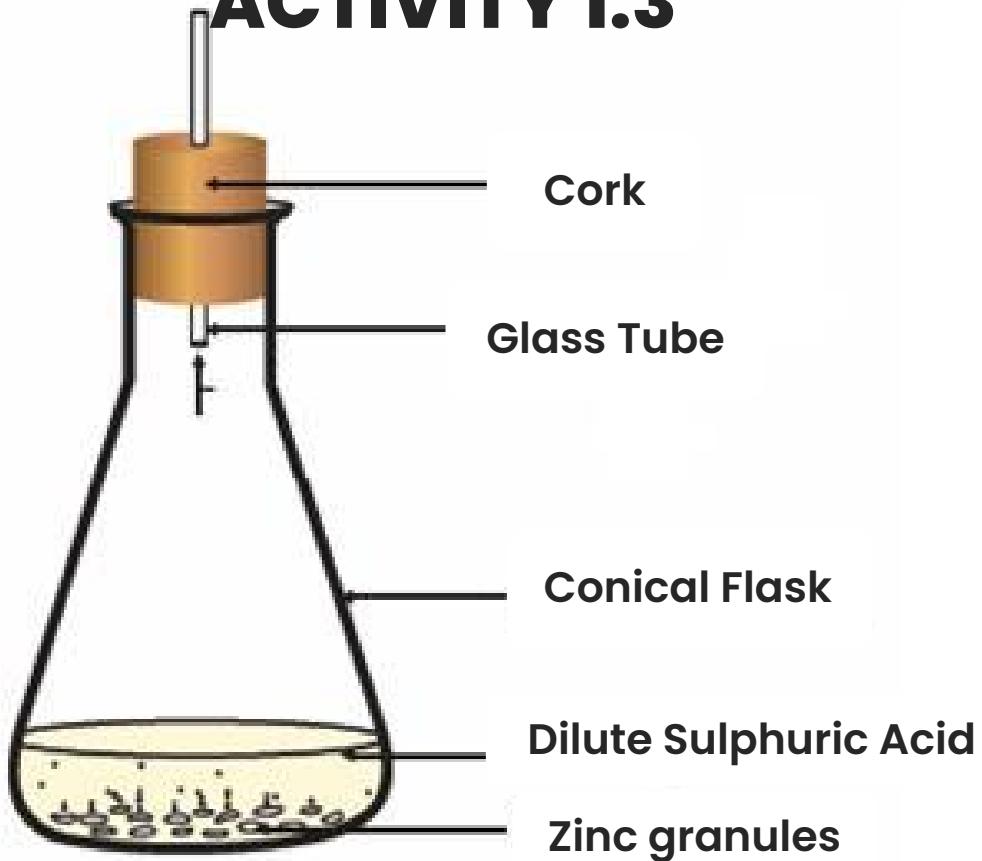


Fig: Single displacement reaction – Iron nails with copper sulphate solution





ACTIVITY 1.3



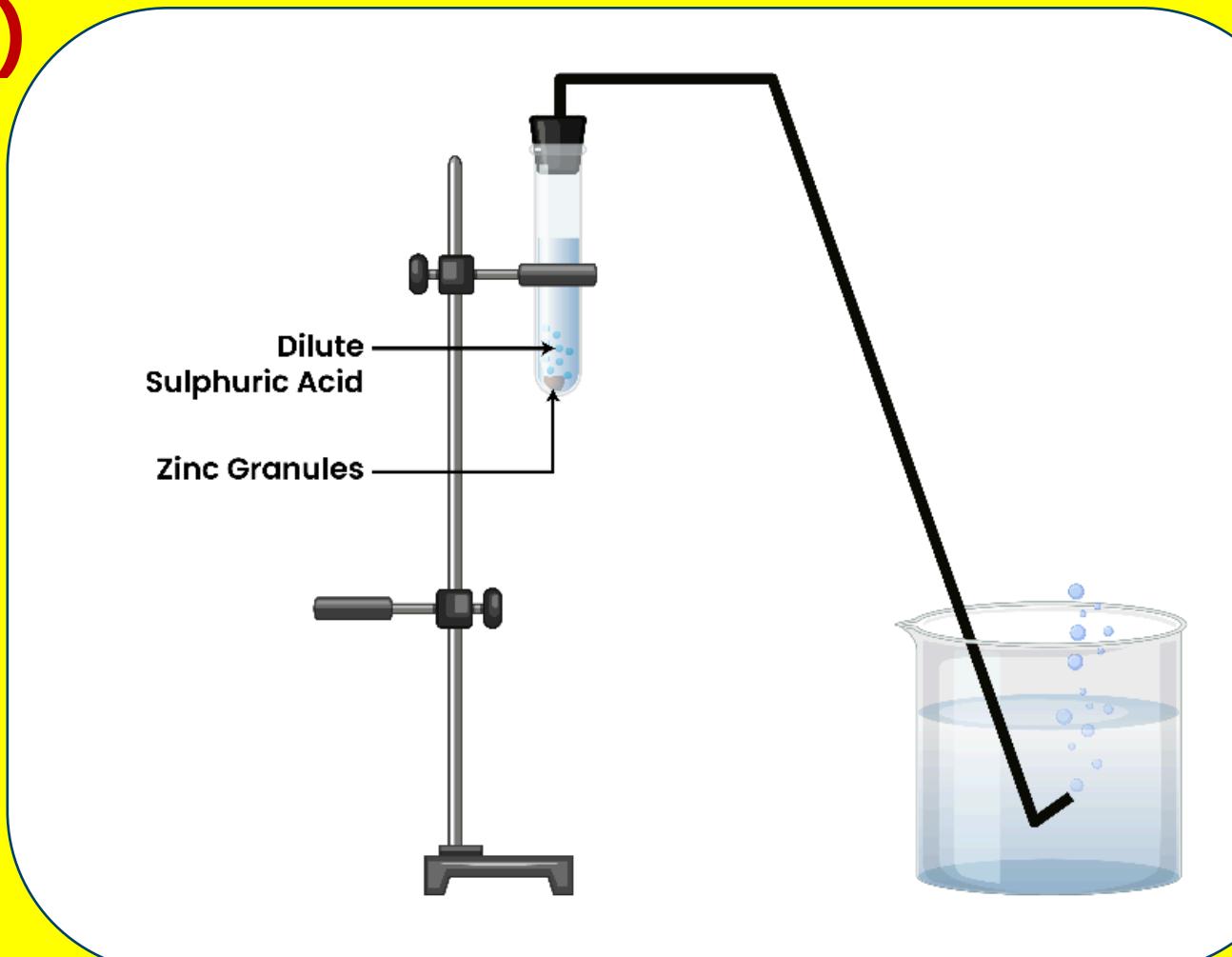
OBSERVATIONS

- (i) H₂ gas is colorless & odorless, burn with pop sand & extinguishes burning candle
- (ii) Temp increases, reaction is highly exothermic
- (iii) Dilute acid is used as reaction is highly exothermic and conc acid can lead to more exothermic and dangerous reaction

K
Na
Ca
Mg
Al
Zn
Fe
Pb
H
Cu
Hg
Ag
Au

Q. Study the diagram given below and identify the gas formed in the reaction (CBSE 2022)

- A. Carbon dioxide which extinguishes the burning candle
- B. Oxygen due to which the candle burns more brightly
- C. Sulphur dioxide which produces a suffocating smell
- D. Hydrogen which while burning produces a popping sound



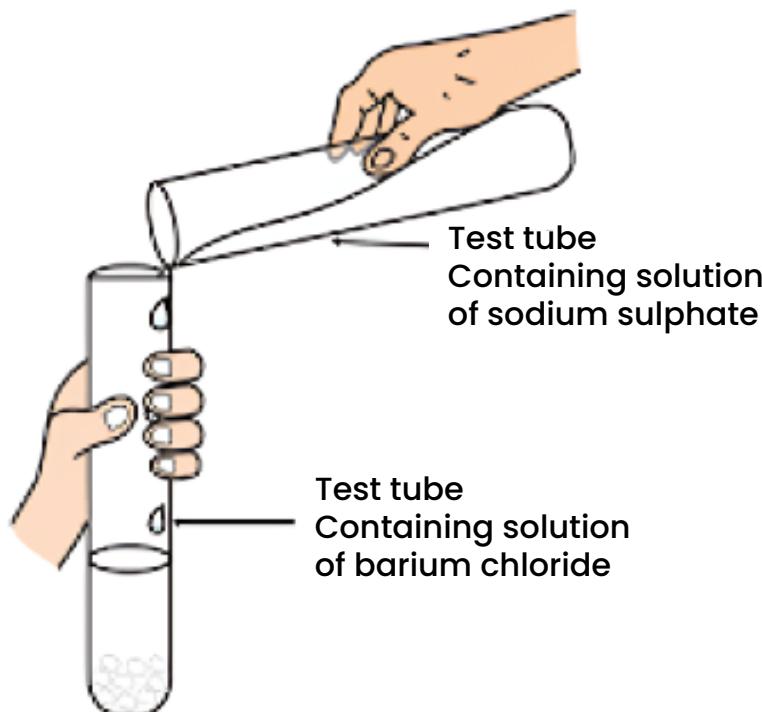
DOUBLE DISPLACEMENT REACTION

Exchange of ions between reactants





ACTIVITY 1.10



OBSERVATIONS

- (i) **White insoluble substance (precipitate) of BaSO₄ is formed.**
- (ii) **Double Displacement & precipitation reaction.**

Precipitation Reaction – When two aqueous soluble soluble solutions react to form a semi soluble / insoluble salt , the salt is called precipitate & such reaction is called precipitation reaction

Q. In a double displacement reaction such as the reaction such as the reaction between sodium sulphate solution and barium chloride solution

(CBSE 2023)

- (A) Exchange of atoms takes place
- (B) Exchanges of ions takes place
- (C) A precipitate is produced
- (D) An insoluble salt is produced

The correct option is

- (A) B and D
- (b) A and D
- (B) (c) Only B
- (d) B, C and D

Q. Which of the following reactions is different from the remaining three?

(CBSE 2024)

- A. $\text{NaCl} + \text{AgNO}_3 \longrightarrow \text{AgCl} + \text{NaNO}_3$
- B. $\text{CaO} + \text{H}_2\text{O} \longrightarrow \text{Ca(OH)}_2$
- C. $\text{KNO}_3 + \text{H}_2\text{SO}_4 \longrightarrow \text{KHSO}_4 + \text{HNO}_3$
- D. $\text{ZnCl}_2 + \text{H}_2\text{S} \longrightarrow \text{ZnS} + 2\text{HCl}$

Lead nitrate(aq) + Potassium iodide(aq)



- (i) Yellow insoluble substance (precipitate) of PbI₂ is formed.**
- (ii) Double Displacement & precipitation reaction.**

Q. When aqueous solutions of potassium iodide and lead nitrate are mixed, an insoluble substance separates out. The chemical equation for the reaction involved is:

(CBSE 2023)

- A. $\text{KI} + \text{PbNO}_3 \longrightarrow \text{PbI} + \text{KNO}_3$
- B. $2\text{KI} + \text{Pb}(\text{NO}_3)_2 \longrightarrow \text{PbI}_2 + 2\text{KNO}_2$
- C. $\text{KL} + \text{Pb}(\text{NO}_3)_2 \longrightarrow \text{PbI} + \text{KNO}_3$
- D. $\text{KL} + \text{PbNO}_3 \longrightarrow \text{PbI}_2 + \text{KNO}_3$

Q. When potassium iodide solution is added to a solution of lead (II) nitrate in a test tube, a precipitate is formed

(CBSE 2019)

- (i) What is the colour of this precipitate? Name the compound precipitated.
- (ii) Write the balanced chemical equation for this reaction.
- (iii) List two types of reactions in which this reaction can be placed.

HEAT in REACTIONS

A + B → C + Heat

EXOTHERMIC

EXAMPLES:

1. Respiration



Carbohydrates



Glucose



2. Burning Of Natural Gas :



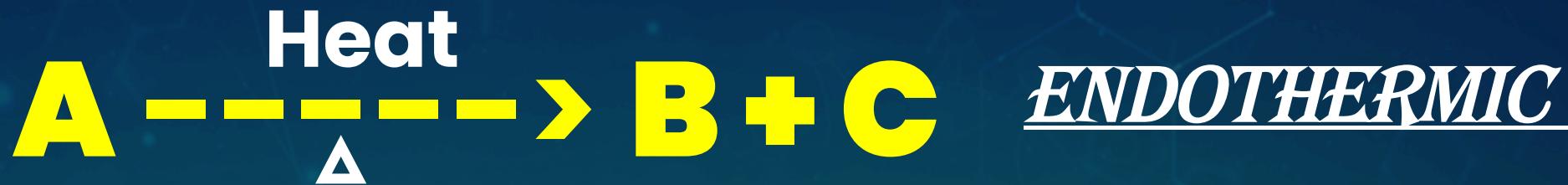
3. Decomposition of vegetable into compost

4. Burning of Mg Ribbon



5. Quick lime with water





EXAMPLES:

Decomposition of:

FeSO₄ Crystal



CaCO₃ (s)



Pb(NO₃)₂(s)



AgCl (s)



AgBr (s)



H₂O(l)



(CBSE 2022)



The above reaction is a/an

- A. Displacement reaction
- B. Endothermic reaction
- C. Exothermic reaction
- D. Neutralization reaction

Q. Select endothermic reaction from the following:

(CBSE 2023)

- A. Decomposition of vegetable matter into compost.
- B. Decomposition of calcium carbonate to form quick lime and carbon dioxide.
- C. Burning of a candle.
- D. Process of respiration.

OXIDATION & REDUCTION

Oxidation: If a chemical (A)

- Gains oxygen
- Loses Hydrogen

It is called oxidation of A.
A is said to be oxidised.

Reduction: If a chemical (B)

- Gains Hydrogen
- Loses Oxygen

It is called reduction of B.
B is said to be reduced.



REDOX REACTIONS



- A. MnO_2 is oxidised and HCl is reduced.
- B. HCl is oxidised.
- C. MnO_2 is reduced.
- D. MnO_2 is reduced and HCl is oxidised

Q. Which of the following statements about the reaction given below are correct?

(CBSE 2022)



- i) HCl is oxidised to Cl₂
- ii) MnO₂ is reduced to MnCl₂
- iii) MnCl₂ , acts as an oxidizing agent
- iv) HCl acts as an oxidizing agent

(a) (ii), (iii) and (iv)

(c) (i) and (ii) only

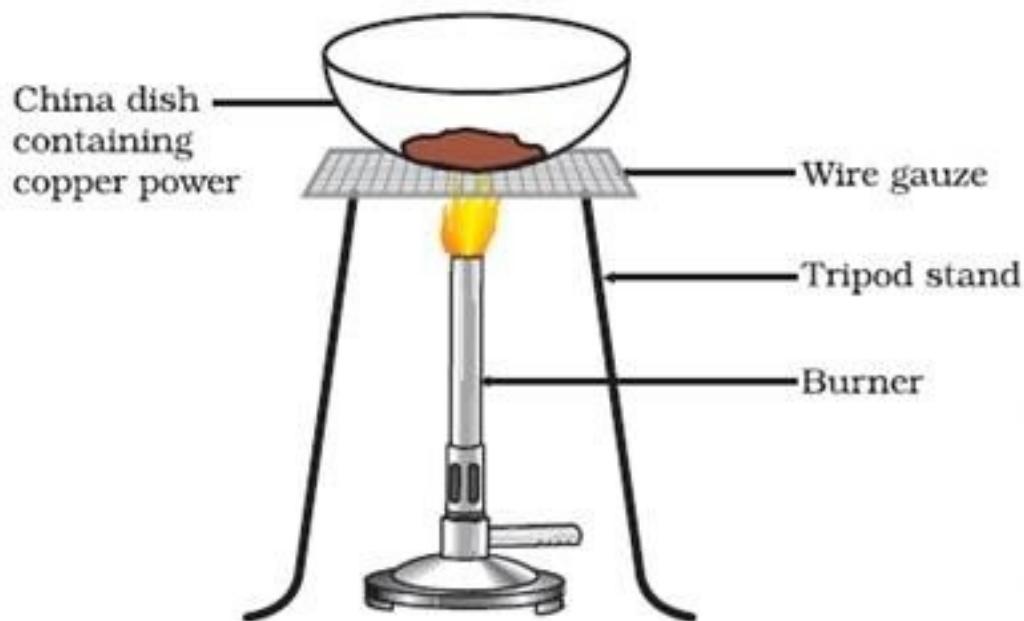
(b) (i), (ii) and (iii)

(d) (iii) and (iv) only

Oxidation Of Copper



ACTIVITY 1.11



OBSERVATIONS

- (i) Reddish/Brownish copper metal changes to black colour CuO(s)
- (ii) If H₂(g) is passed over CuO, black colour changes to brown.

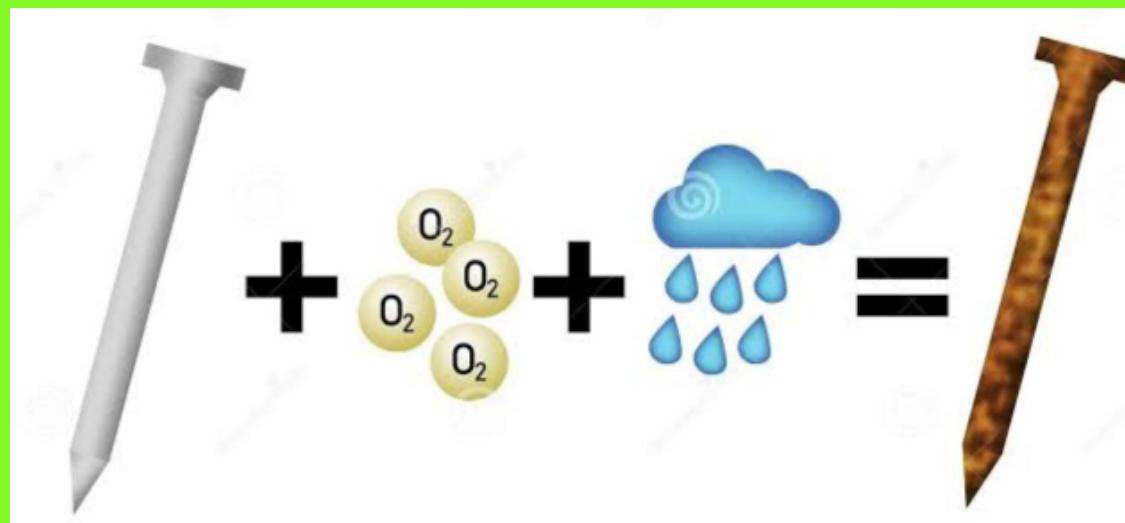


Corrosion :

When a **metal is attacked** by substances around it such as moisture (water vapour + oxygen) , acid etc., it is said to corrode and this process is called corrosion.

Examples –

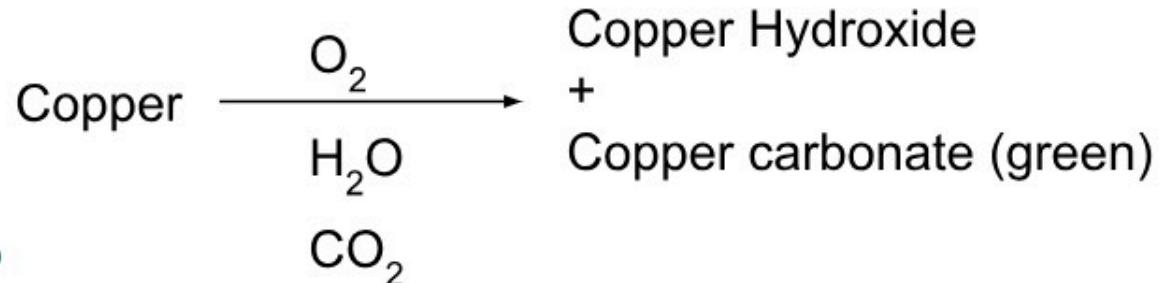
1) Rusting of Iron



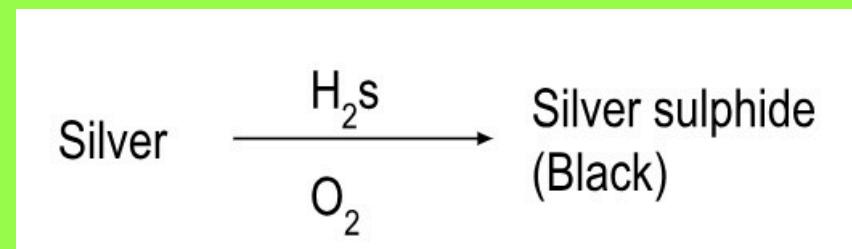
Iron

Hydrated (Reddish Brown)
Iron oxide (Rust)

2) Tarnishing of copper



3) Tarnishing of silver



NOTE : CORROSION is an example of Oxidation

Rancidity:

The taste or smell of **food material containing fat/oil** changes when it is left exposed to air for a long time.

Oxidation Of Fat / Oil present in food material causes Rancidity

→ Prevention:



Antioxidants



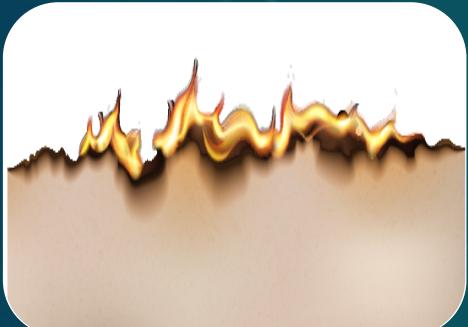
Air tight container



Bag of chips
(Flushed with Nitrogen gas)

CHEMICAL CHANGE

- A **chemical reaction** happened.
- **Shape, size, color, etc. may also change.**
- **New chemicals are formed.**



Burning Of Paper



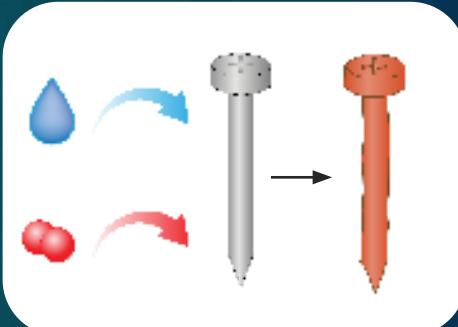
Fermentation of grapes



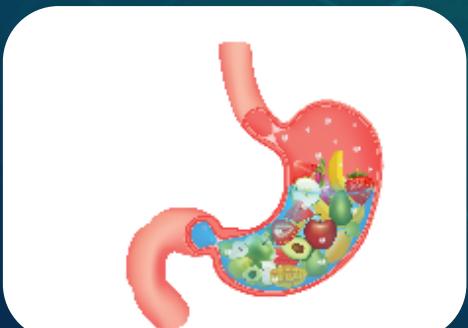
Souring Of Milk



Curd from milk is left in a room during summer



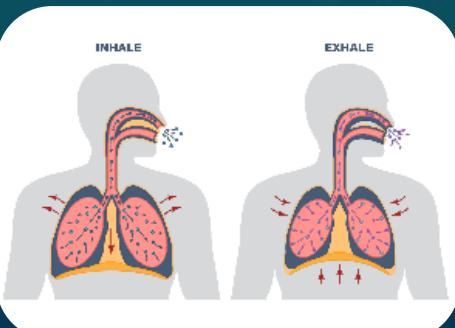
Rusting of iron



Food Digestion



Food Cooking



Respiration



Chemical Battery Usage



Baking a cake

PHYSICAL CHANGE

- No chemical reaction happens.
- Shape, size, state, etc. may change.
- No new chemical is formed.



Boiling water from
the evaporating dish



Melting of ice to
give water



Melting of wax



Crushing a paper cup



Crystallization

1. Which of the following is a physical change? (CBSE 2020)

- A. Formation of curd from milk
- B. Ripening of fruits
- C. Getting Salt from sea water
- D. Burning of wood