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Class - 10

Chapter - 1

Chemical Reactions and Equations

Part-4

TYPES OF CHEMICAL REACTIONS

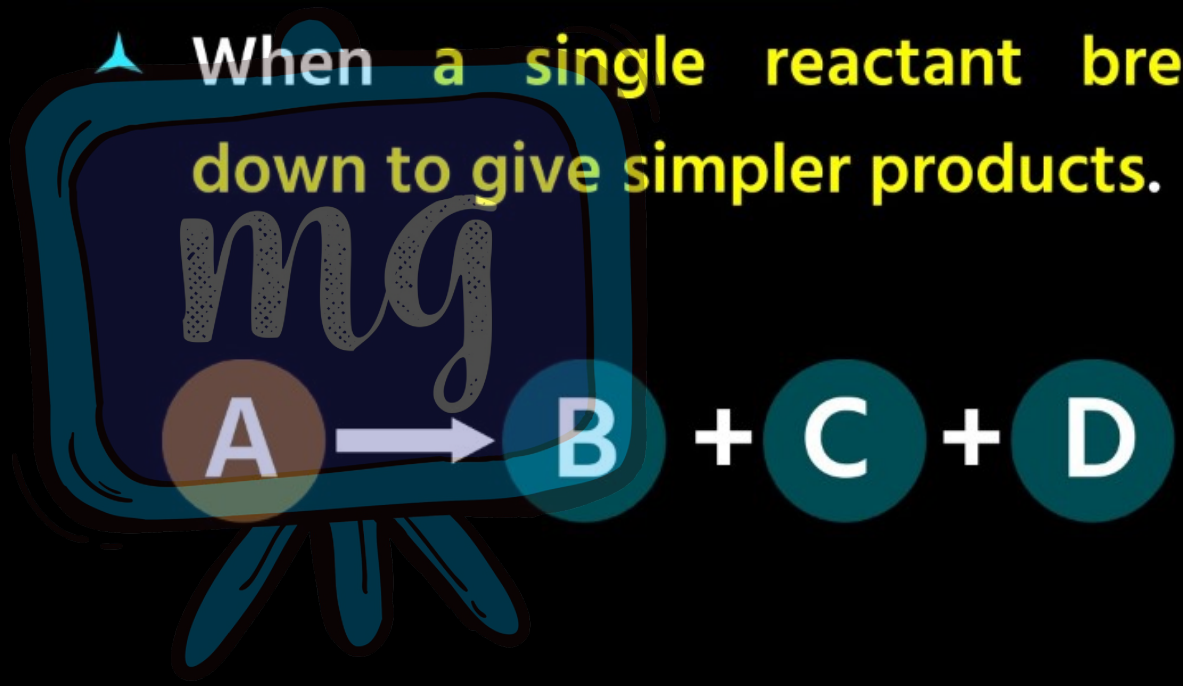
Disha Pamecha

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Decomposition Reaction

- When a single reactant breaks down to give simpler products.



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Types of Decomposition

(i) Thermal decomposition —

- Decomposition reaction is carried out by heating.

$$CaCO_{3(s)} \xrightarrow{\text{Heat}} CaO_{(s)} + CO_{2(g)}$$

(Limestone) (Quick lime)

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- Ferrous sulphate crystals ($FeSO_4 \cdot 7H_2O$) lose water when heated and the colour of the crystals changes.

- It then decomposes to ferric oxide (Fe_2O_3), sulphur dioxide (SO_2) and sulphur trioxide (SO_3).

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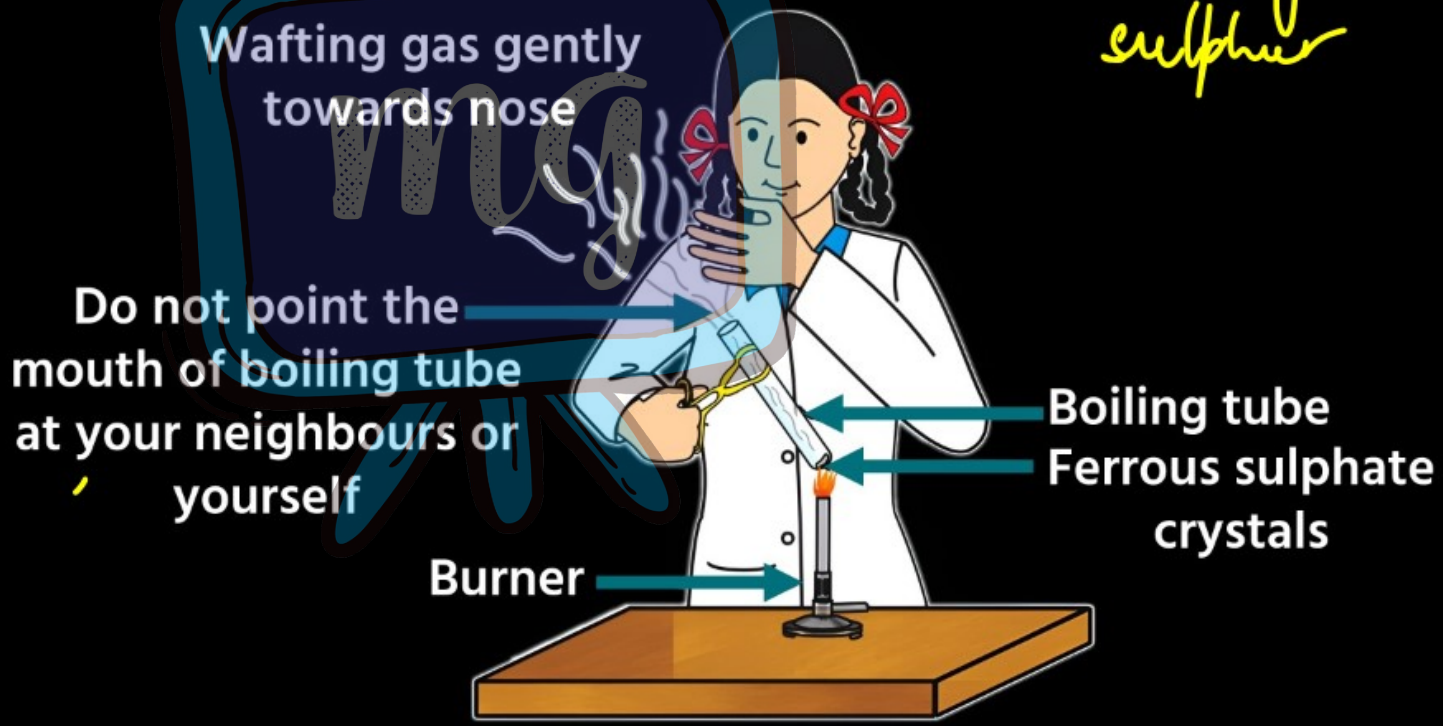
7H₂

$$2FeSO_{4(s)} \xrightarrow{\text{Heat}} Fe_2O_{3(s)} + SO_{2(g)} + SO_{3(g)}$$

(Ferrous sulphate)
(Green Colour)

(Ferric oxide)
(Brown Colour)

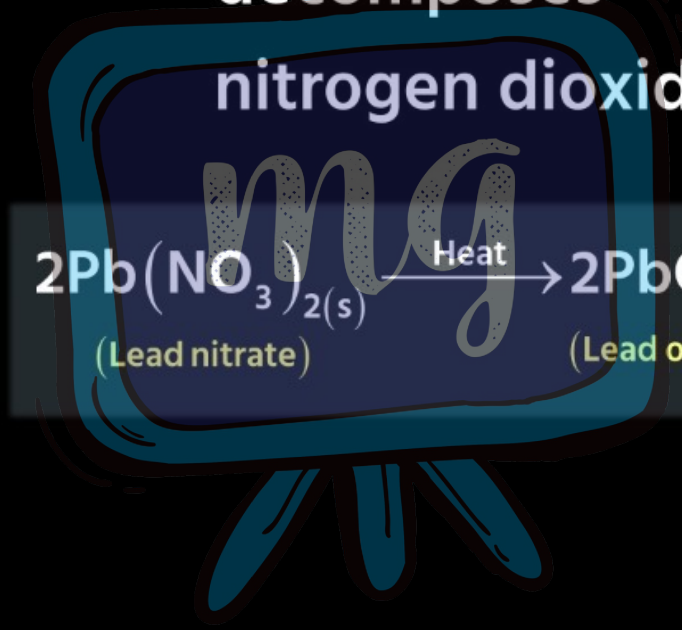
burning sulphur



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- Lead nitrate when heated it decomposes into lead oxide, nitrogen dioxide and oxygen.

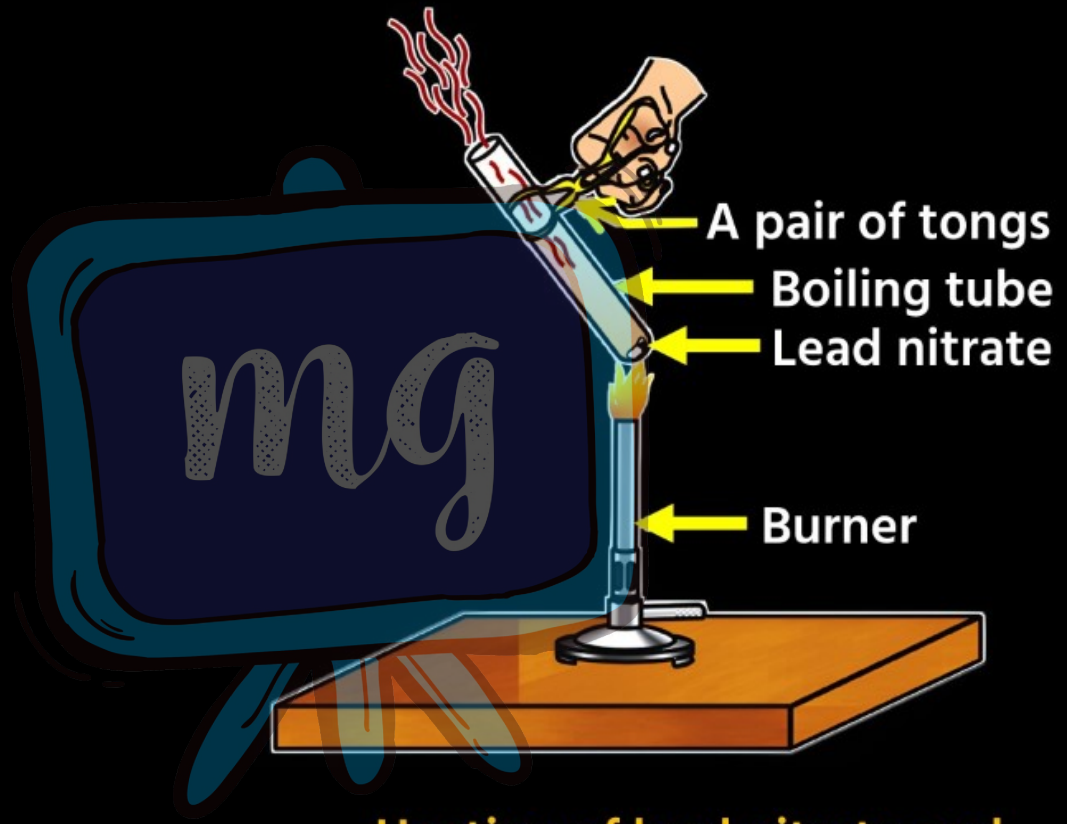


$$2Pb(NO_3)_{2(s)} \xrightarrow{\text{Heat}} 2PbO_{(s)} + 4NO_{2(g)} + O_{2(g)}$$

(Lead nitrate) (Lead oxide) (Nitrogen dioxide) (Brown Fumes) (Oxygen)

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Heating of lead nitrate and
emission of nitrogen dioxide

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Black and white Photography

$AgCl(s) \xrightarrow[\text{sunlight}]{} Ag(s) + Cl_2(g)$

white → grey

change in colour

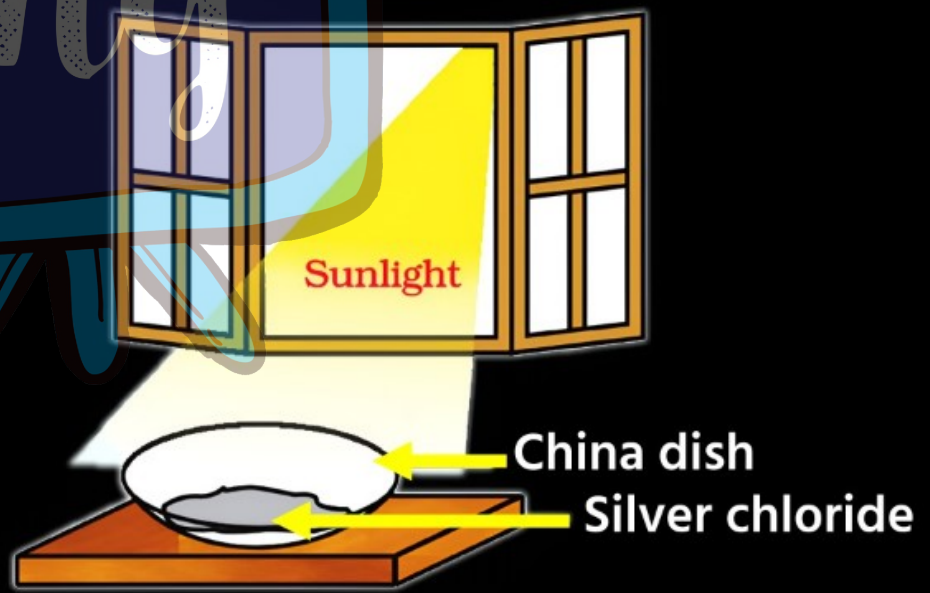
$AgBr(s) \xrightarrow[\text{sunlight}]{} Ag(s) + Br_2$

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(ii) Light decomposition —

- Decomposition reaction is carried out by sun light.



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Decomposition of silver chloride and silver bromide.

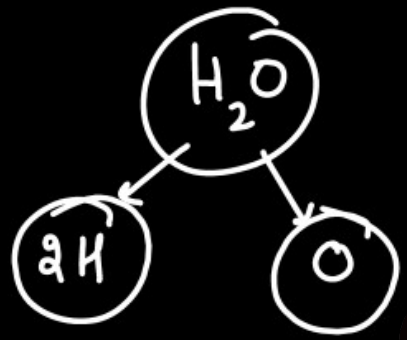
Used in black and white photography.

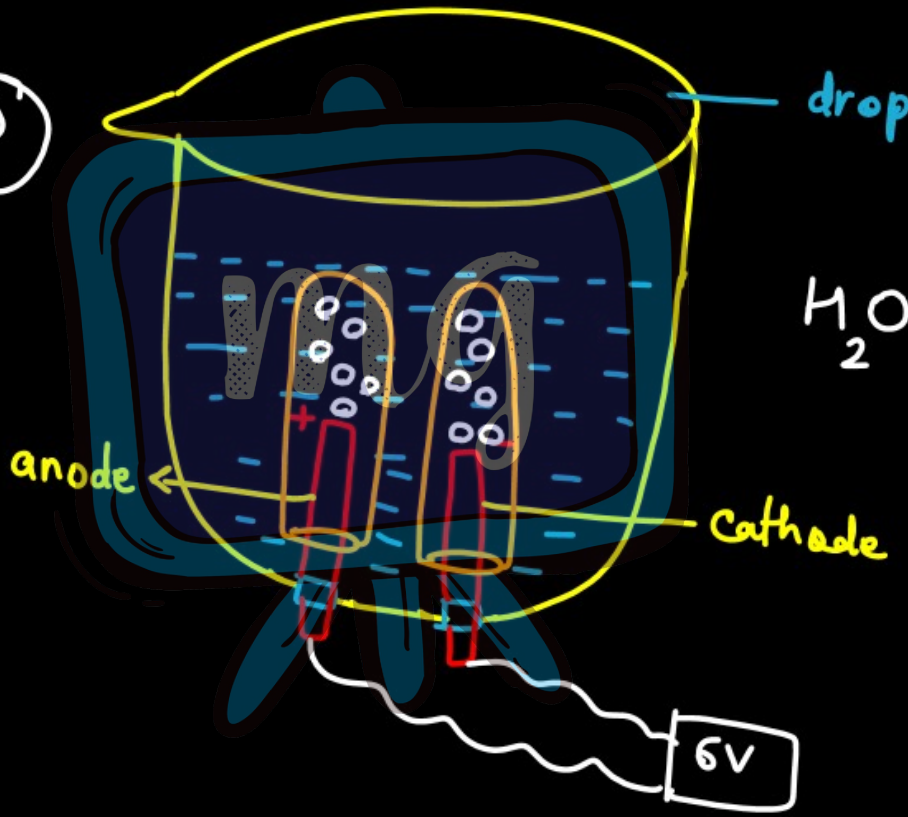
$$2AgCl_{(s)} \xrightarrow{\text{Sunlight}} 2Ag_{(s)} + Cl_{2(g)}$$

$$2AgBr_{(s)} \xrightarrow{\text{Sunlight}} 2Ag_{(s)} + Br_{2(g)}$$

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$$H_2O(l) \rightarrow H_2(g) + O_2(g)$$

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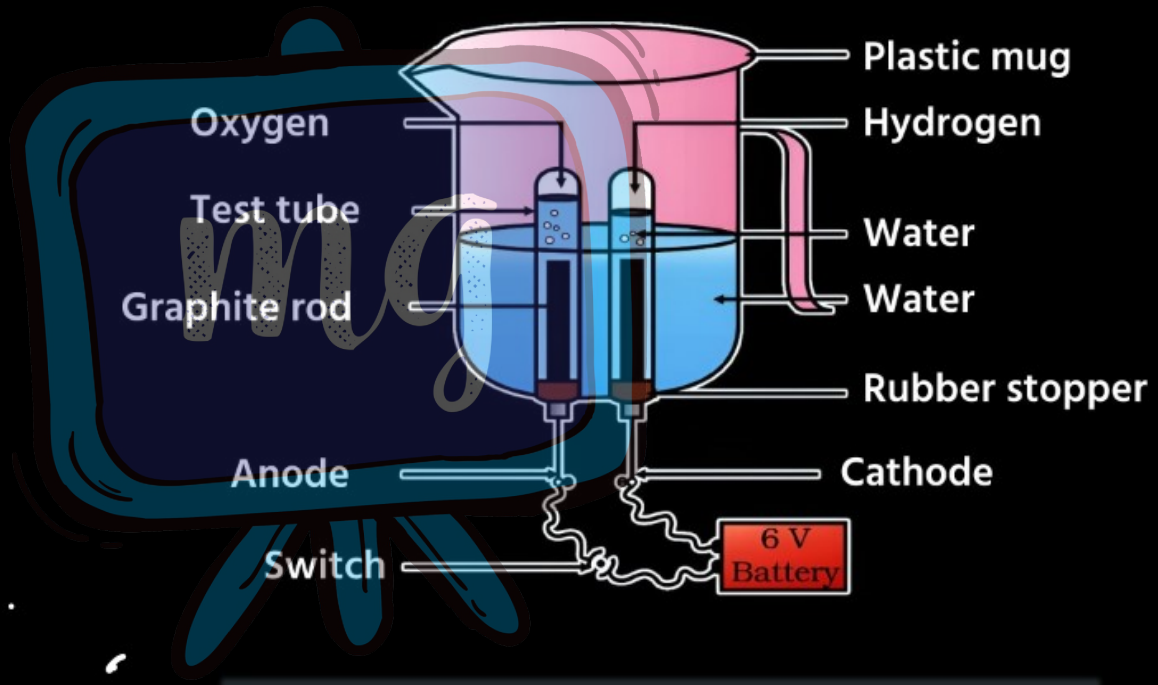
(iii) Electrolytic Decomposition —

- Compounds decompose into simpler compounds because of passing of electricity.
- This is also known as **Electrolysis.**

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Electrolysis of water :



$$2H_2O \xrightarrow{\text{Electricity}} 2H_2 + O_2$$

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Observation :

- Formation of bubbles at both the electrodes.
- Bubbles displace water in the test tubes.
- Volume of the gas collected are different in both the test tubes.

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Select from the following a decomposition reaction in which source of energy for decomposition is light.

(2024)

(A) $2FeSO_4 \rightarrow Fe_2O_3 + SO_2 + SO_3$

(B) $2H2O \rightarrow 2H_2 + O_2$

(C) $2AgBr \rightarrow 2Ag + Br_2$

(D) $CaCO_3 \rightarrow CaO + CO_2$

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A metal X is obtained from its chloride salt by exposure to sunlight.

(a) In which section of the reactivity series of metals: top, middle or bottom, is it likely to be placed? Justify your answer.

H.W.

(b) Identify the type of reaction the chloride salt of metal X undergoes on exposure to sunlight.

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A single displacement reaction is represented below.

$$PQ + R \longrightarrow PR + Q$$

Which of the following is true about the reactants and products?

Option	Type of ion of R in product	Stability of PR as compared to PQ
A	cation	more stable
B	cation	less stable
C	anion	more stable
D	Anion	less stable

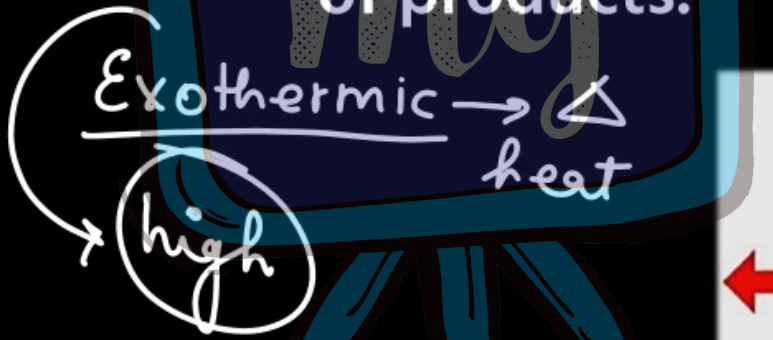
(A) A (B) B
(C) C (D) D

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Exothermic Reactions:

Reactions in which heat is released along with the formation of products.





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$$CaO + H_2O \longrightarrow Ca(OH)_2 + \triangle$$



→ Exothermic Reaction

Heat release : △

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Examples of exothermic reactions are –

(i) Burning of natural gas

$$CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(g)} + \Delta$$

(ii) Respiration is an exothermic process

- We need energy to stay alive.
- We get this energy from the food we eat.

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Respiration

Energy

During digestion, food is broken down into simpler substances.

Glucose combines with oxygen in the cells of our body and provides energy.

$$C_6H_4O_6(aq) + 6O_{2(aq)} \rightarrow 6CO_{2(aq)} + 6H_2O_{(l)} + \text{energy}$$

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(iii) The decomposition of vegetable matter into compost is also an example of an exothermic reaction.

Energy Release

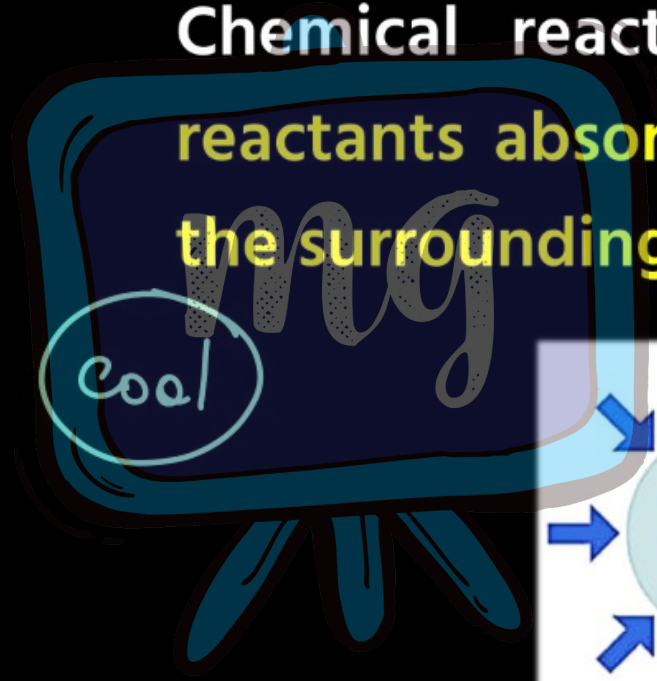


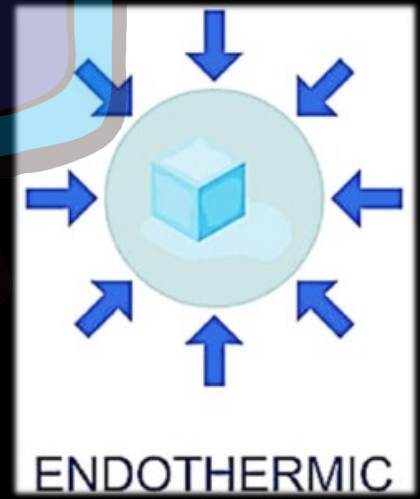
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Endothermic reactions:

Chemical reactions in which the reactants absorb heat energy from the surroundings to form products.





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(i) Dissolving ammonium chloride in water.

(ii) Mixing water and ammonium nitrate.

(iii) Photosynthesis

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$$NH_4Cl + H_2O \longrightarrow NH_4OH + HCl$$

Salt water

mg

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Displacement Reaction

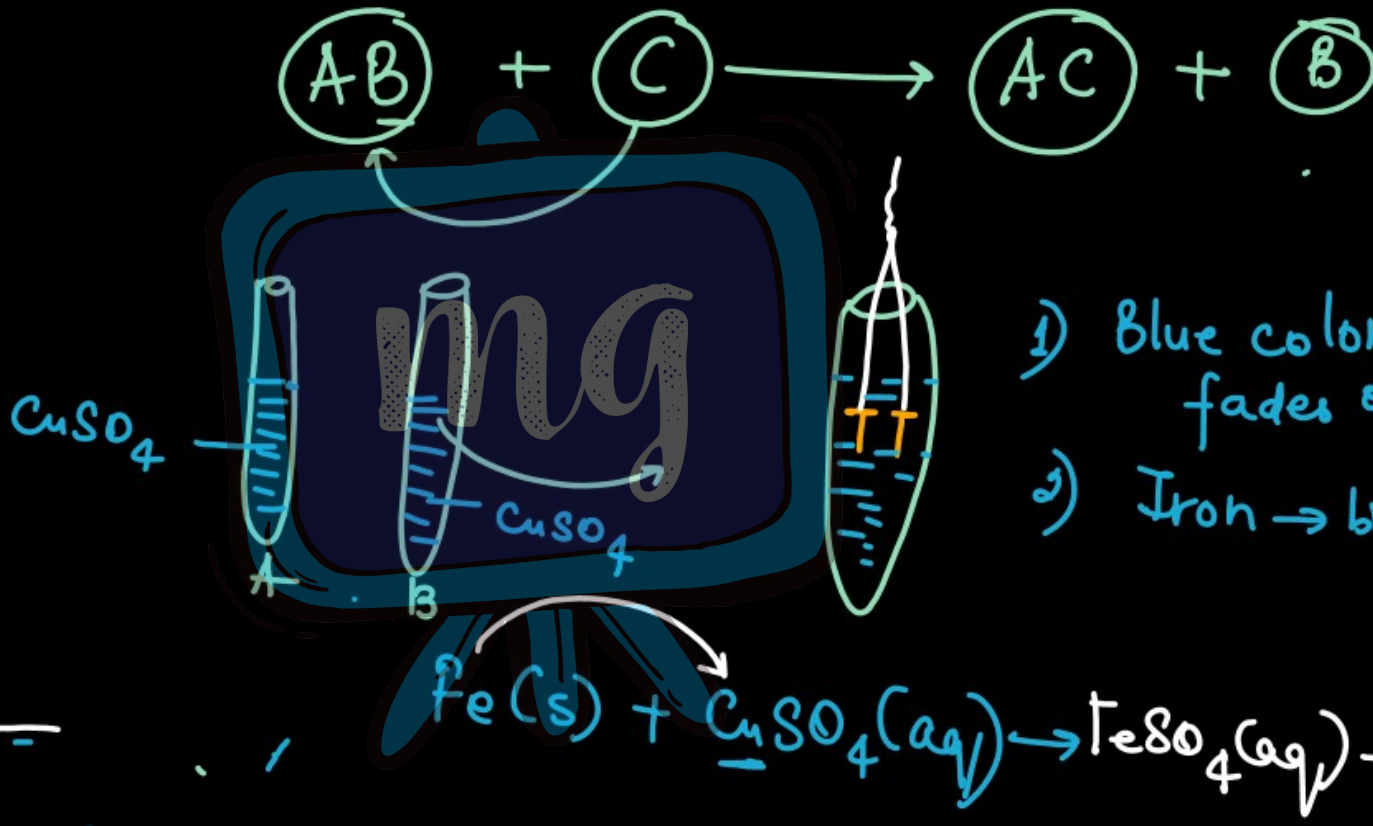
- Chemical reaction in which a more reactive element displaces a less reactive element from its compound.

note:

- Both metals and non-metals take part in displacement reactions.

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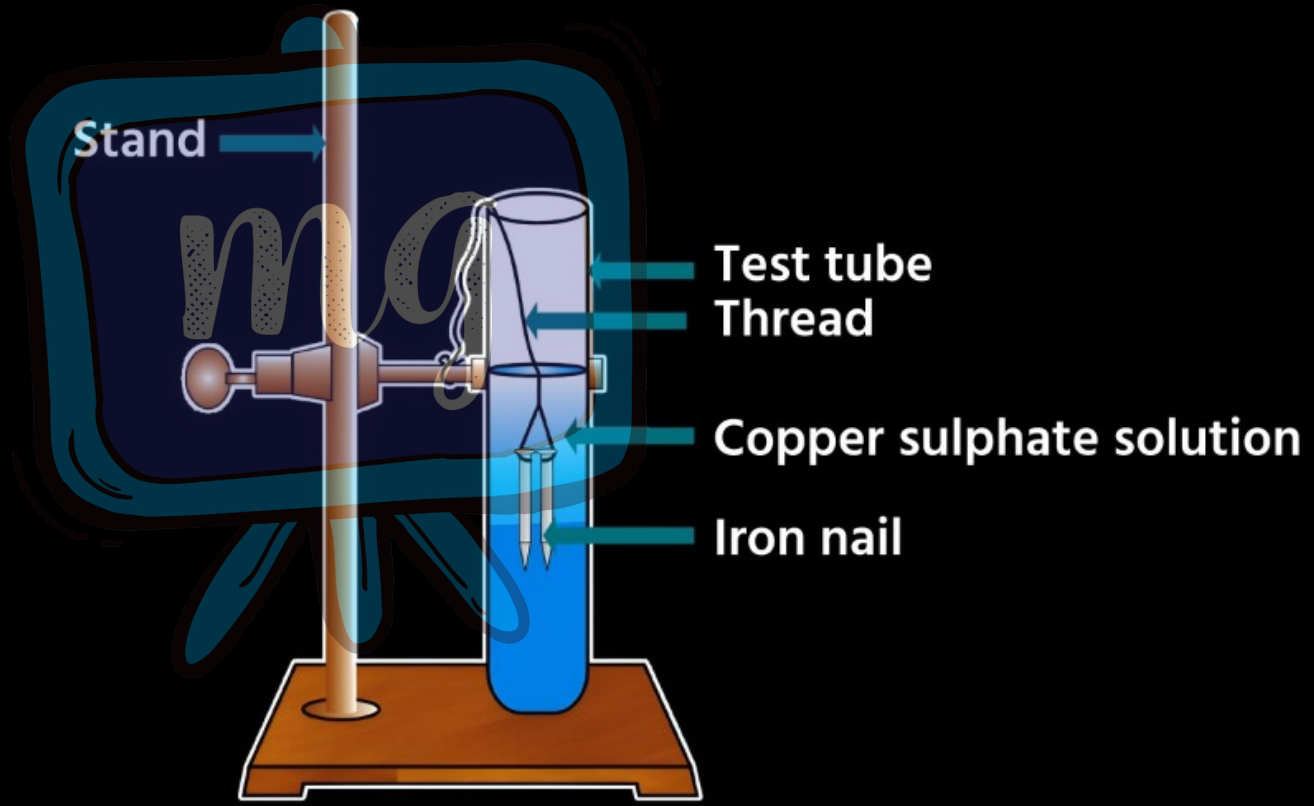
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Activity



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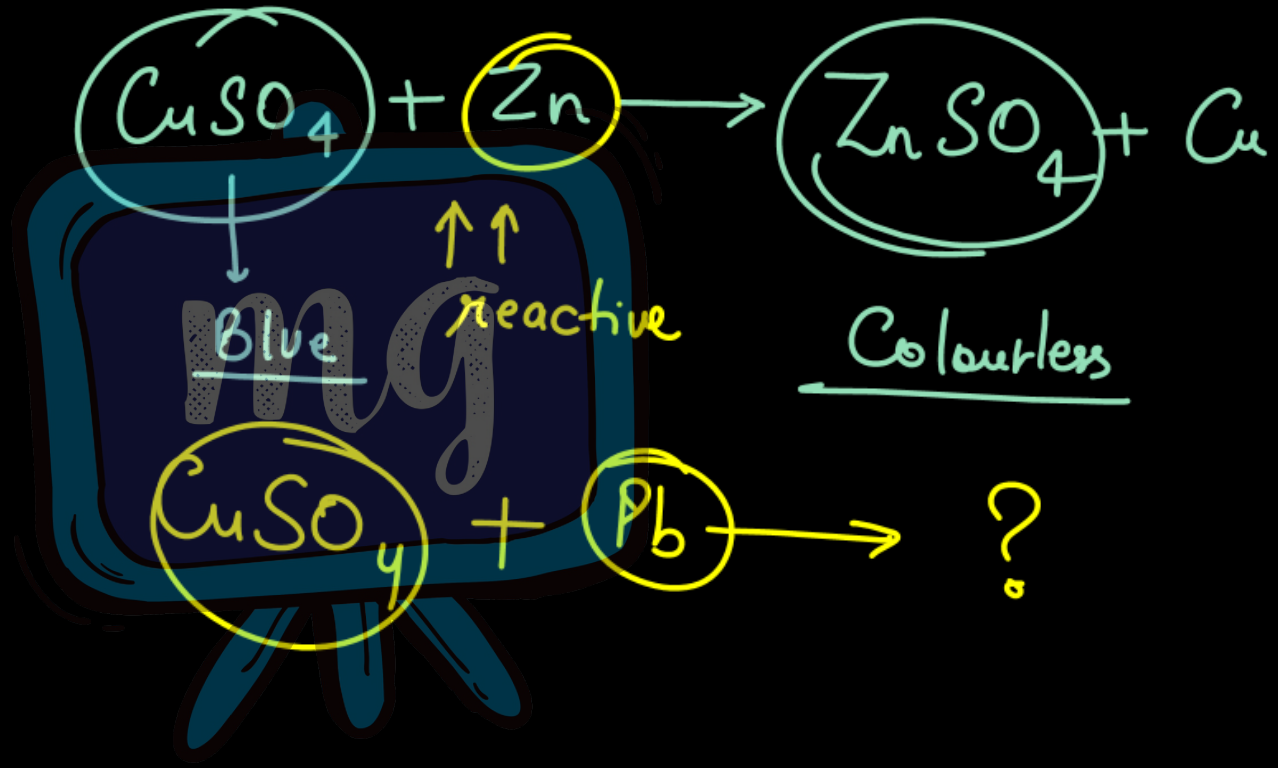
Observation :

- Iron nail become brownish in colour,
- The blue colour of copper sulphate solution fades.

$$Fe_{(s)} + \underset{\text{(Copper sulphate)}}{CuSO_{4(aq)}} \rightarrow \underset{\text{(Iron sulphate)}}{FeSO_{4(aq)}} + Cu_{(s)}$$

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