UDAAN

2026

Bharat Mata ki Jai ♡

Lecture 01

Chemical Reactions and Equations

Introduction to Change and Chemical Reactions

BY – PRIYA-PUTRA-SUNIL Sir

TOPICS TO BE COVERED

(i) Introduction to Change ✓

(ii) Physical and Chemical Change ✓

(iii) Characteristics of Chemical Reactions ✓


SUNIL BHAIYA
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PHYSICS WALLAH

Topper Wali Taiyaari
Shuruat Se Karne Ki Baari

- Latest 2025 Solved PYQ
- Chapter-wise Concept Maps
- NCERT & Exemplar
- Competency-Based Questions
- Mock Tests As Per The Latest Pattern

- Rakshak Dua
- Samridhi Sharma
- Sunil Vijay Hingarani

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RIDDLE WALLAH

Simaila, tujhe pata hai Sunil bhaiya ek jagah ja rhe hai 27 April ko baccho se milne jiska naam banta hai chemical symbols of hydrogen, iodine, sulphur and argon se.

HISAr

Yeh kya hai samaj ni aaya yrr. Ruk mre Udaan batch ke friends meri help karenge isme.

CONCEPT POLISH – HOMEWORK DISCUSSION

LET'S PRACTICE

SO_4^{2-}

(i) Barium sulphate

Chemical Symbol → Ba SO_4

Valency → 2 2

$BaSO_4$

CO_3^{2-} → Carbonate

(ii) Sodium carbonate

Chemical Symbol → Na CO_3

Valency → 1 2

Na_2CO_3

INTRODUCTION TO CHANGE

INTRODUCTION TO CHANGE (परिवर्तन)

A process in which the final state of the substance is different from its initial or original state is known as change.

Sunil Bhaiya → THEN

Initial State — Difference — Final State

This process is called change.

Sunil Bhaiya → NOW

CLASSIFICATION OF CHANGE

On the basis of change in chemical composition, i.e. chemical built-up

- YES NO → PHYSICAL
- NO YES → CHEMICAL

SAMAJ AAYA TOH
LIKH DO.
AYE BHAIYA

PHYSICAL AND CHEMICAL CHANGE

(भौतिक)

(रासायनिक)

PHYSICAL CHANGE

Ice $\xrightarrow{\text{melt}}$ Water

$H_2O(s) \rightarrow H_2O(l)$

Chemical composition changes: **No**

Shape/Size/Physical state change: **Yes**

'Physical Properties'

PHYSICAL CHANGE

Cutting a Paper Into Pieces

	I	II
(i) Chemical composition changes	NO	NO
(ii) change in shape & size	YES	YES
(iii) change in physical state	NO	YES

Melting of Ice Cubes

CHEMICAL CHANGE

Chemical composition changes: **Yes**
Shape/Size/Physical state change: **Yes**

Physical properties

→ **CHEMICAL CHANGE**

Burning of Paper

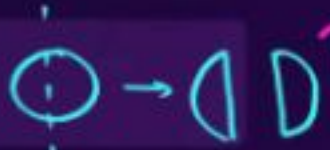
Paper + Oxygen ⟶ Products [Ash + gases] + heat + light

new substances are formed with different chemical composition

The process of chemical change is called a **chemical reaction**.

FUN ACTIVITY

SUNIL SHIKANJI CENTRE

	PHYSICAL/CHEMICAL CHANGE
Cutting a lemon 	Physical
Squeezing a lemon 	Physical
Adding sugar and salt to water	Physical
Digestion of lemonade	Chemical

only shape & size changes

LET'S PRACTICE

QUESTION

'Miss Maddy'

Which of the following is a chemical change?

$H_2O(l) \xrightarrow{heat} H_2O(g)$

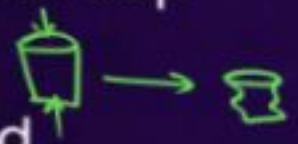
Chemical Composition Changes

A Boiling of water to give water-vapour — NO

B Melting of ice to give water — NO

$H_2O(s) \xrightarrow{heat} H_2O(l)$

C Crushing a paper cup — NO



Reactants

Wood + Oxygen → Product (Ash + Gases) + heat + light

Yes

D Burning of wood

CBSE CFQ

Which of the following is a NECESSARY condition for ALL chemical reactions?

1. The reactants should be in the same state. (×)
2. Energy should be supplied to the reactants. (×)
3. The reactants should be at the same temperature. (×)
4. There should be physical contact between the reactants. (✓)

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Visible indicators that tell whether a chemical rxn has occured or not

CHARACTERISTICS OF CHEMICAL REACTIONS

CHARACTERISTICS OF A CHEMICAL REACTION

(i) Change in colour

Colourless Solution

Colourless Soln

Lead nitrate + Potassium iodide → **Lead iodide** + Potassium nitrate

← Reactants ——————→

Yellow precipitate

(ii) Formation of precipitate → insoluble solid formed after a chemical change

CHARACTERISTICS OF A CHEMICAL REACTION

(iii) Evolution of Gas

Carbon (solid) + Oxygen (gas) → Carbon dioxide (gas) + heat + light

(iv) Change in physical state → (if only this is observed in a process it might be a physical change)

CHARACTERISTICS OF A CHEMICAL REACTION

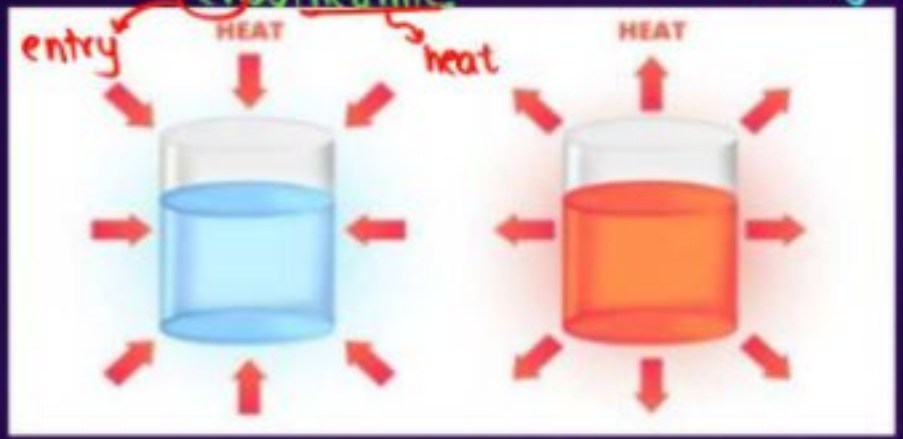
(v) Change in temperature (तापमान)

Heat is released into the surroundings → Temp. of immediate surroundings (↑)

exothermic
- exit
- heat

Heat is given/absorbed from the surroundings → Temp. of immediate surroundings (↓)

endothermic
- entry
- heat



Exothermic and endothermic generally focuses on entry or exit of heat energy but other forms of energies are also considered.

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LIKH DO.
AYE BHAIYA

CONCEPT POLISH - HOMEWORK

QUESTION

H.W

Which of the following is not an example of an exothermic reaction?

A. Burning of natural gas

B. Respiration

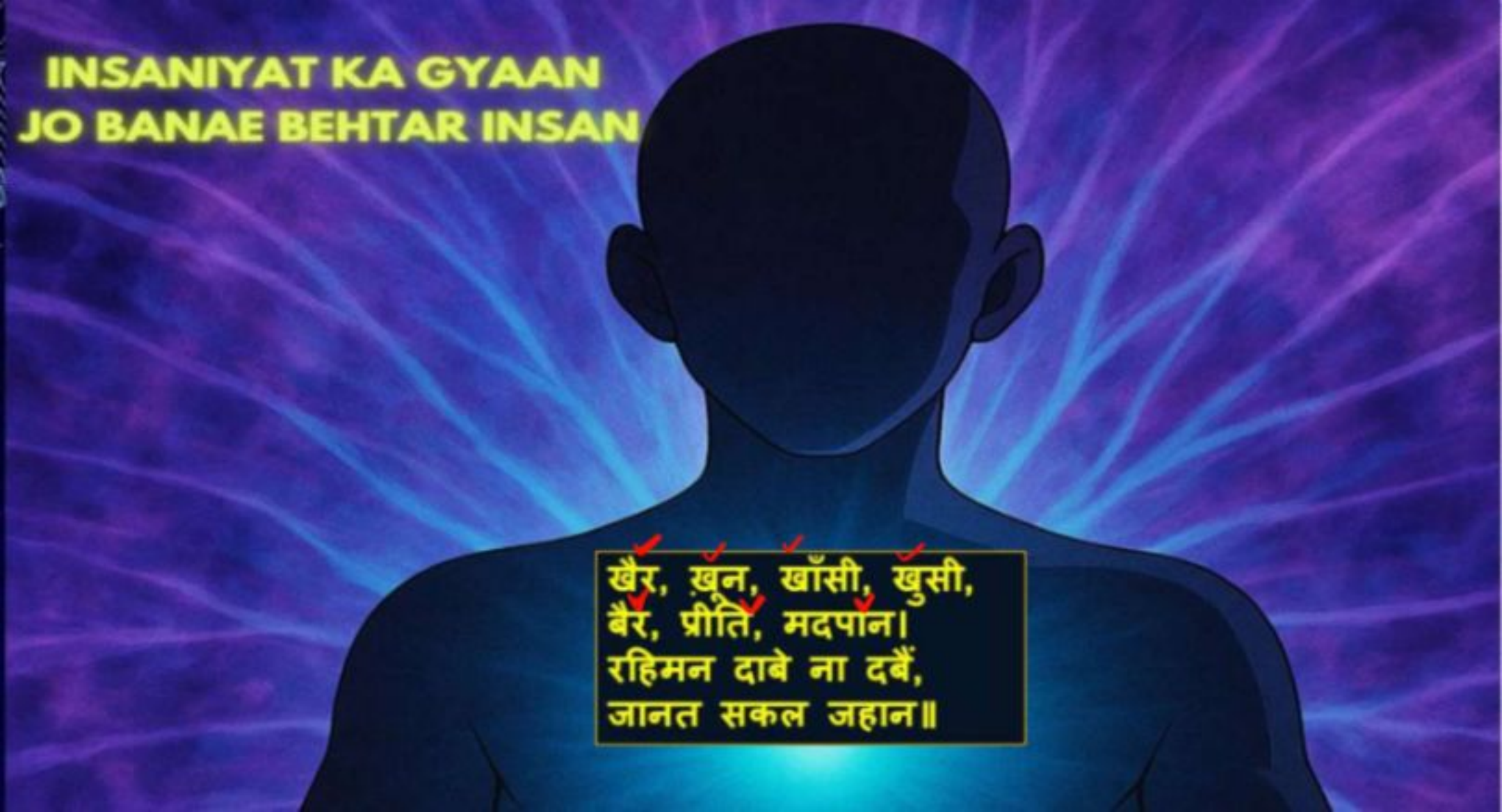
C. Decomposition of vegetable matter into compost

D. Photosynthesis

EFFICIENCY HACKS BY SUNIL BHAIYA

The Eisenhower Decision Matrix

	Urgent	Not Urgent
Important	**Do** ✓ Fixing a critical bug in your software before a presentation.	**Decide** ✓ Planning your marketing strategy for the next quarter.
Not Important	**Delegate** ✗ Forwarding a request that doesn't fall within your expertise.	**Delete** ✗ Unsubscribing from irrelevant emails.


INSANIYAT KA GYAAN
JO BANAE BEHTAR INSAN
खैर, ख़ून, खाँसी, खुसी,
बैर, प्रीति, मदपान।
रहिमन दाबे ना दबैं,
जानत सकल जहान॥

PHYSICS WALLAH

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Shuruat Se Karne Ki Baari

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Latest 2025 Solved PYQ

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SUNIL BHAIYA IS ALWAYS THERE FOR YOU.
#sbsathhai ✓
#pwsathhai ✓

Thank You

UDAAN

2026

Bharat Mata Ki Jai ♡

Lecture 02

Chemical Reactions and Equations

Master the Art of Balancing Chemical Equations

BY – PRIYA-PUTRA-SUNIL Sir

TOPICS TO BE COVERED

(i) Ways to Represent a Chemical Reaction

(ii) Balancing and Need to Balance A Chemical Equation

(iii) Game of Balancing a Chemical Equation


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PHYSICS WALLAH

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RIDDLE WALLAH

Simaila ji, apko Sunil Bhaiya ke ghar ka naam pata hai?

Nahi mujhe nahi pata, aap btaiye Hasmukhlal ji.

Unka naam banta hai chemical symbols of sulphur, uranium, nitrogen, nitrogen and yttrium se.

SUNNY

CONCEPT POLISH – HOMEWORK DISCUSSION

QUESTION

Which of the following is not an example of an exothermic reaction?

A. Burning of natural gas

B. Respiration

C. Decomposition of vegetable matter into compost

D. Photosynthesis

QUESTION

Which of the following is not an example of an exothermic reaction?

exothermic → energy is released majorly in form of heat

A Burning of natural gas → majorly methane (CH_4)

exothermic rx^n

B Respiration

$$C_6H_{12}O_6(aq) + 6O_2(aq) \rightarrow 6CO_2(aq) + 6H_2O(l) + \text{energy}$$

(Glucose)

C Decomposition of vegetable matter into compost → exothermic

D Photosynthesis → endothermic

$$6CO_2(aq) + 12H_2O(l) \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6(aq) + 6O_2(aq) + 6H_2O(l)$$

(Glucose)

WAYS TO REPRESENT A CHEMICAL REACTION

WAYS TO REPRESENT A CHEMICAL REACTION

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

Bacche Be Like

WAYS TO REPRESENT A CHEMICAL REACTION

(अभिकारक)

Reactant(s): Substances that undergo a chemical change or chemical reaction

Product(s): Substances that are formed after a chemical change or chemical reaction.

(उत्पाद)

Way I: Word Equation

→ Using words to shorten the sentence of any chemical rxn

Magnesium + Oxygen → Magnesium oxide

Reactant(s) (L.H.S.)

Product(s) R.H.S.

WAYS TO REPRESENT A CHEMICAL REACTION

Way II: Chemical Equation

A shorter and faster way of representing a chemical reaction in terms of symbols and formulae of the different reactants and products is called a chemical equation.

Reactants → Product

$$Mg + O_2 \longrightarrow MgO$$

GIVE A THOUGHT

$Mg + O_2 \rightarrow MgO$

Is the above chemical equation balanced?

A. Yes

B. No

[no. of atoms on reactant = product]

GIVE A THOUGHT

Is the above chemical equation balanced?

A. Yes

B. No

→ **No!**

This chemical equation is known as **skeletal chemical equation or unbalanced chemical equation**.

↓

no. of atoms on reactant side ≠ product side

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LIKH DO.
AYE BHAIYA

BALANCING AND NEED TO BALANCE A CHEMICAL EQUATION

NEED TO BALANCE A CHEMICAL EQUATION

Follows the law of conservation of mass wherever written or represented.

Antoinne Laurent Lavoisier (1789)

So, we need to balance it while writing or representing it.

Hence,
Number of atoms on reactant = Number of atoms on product

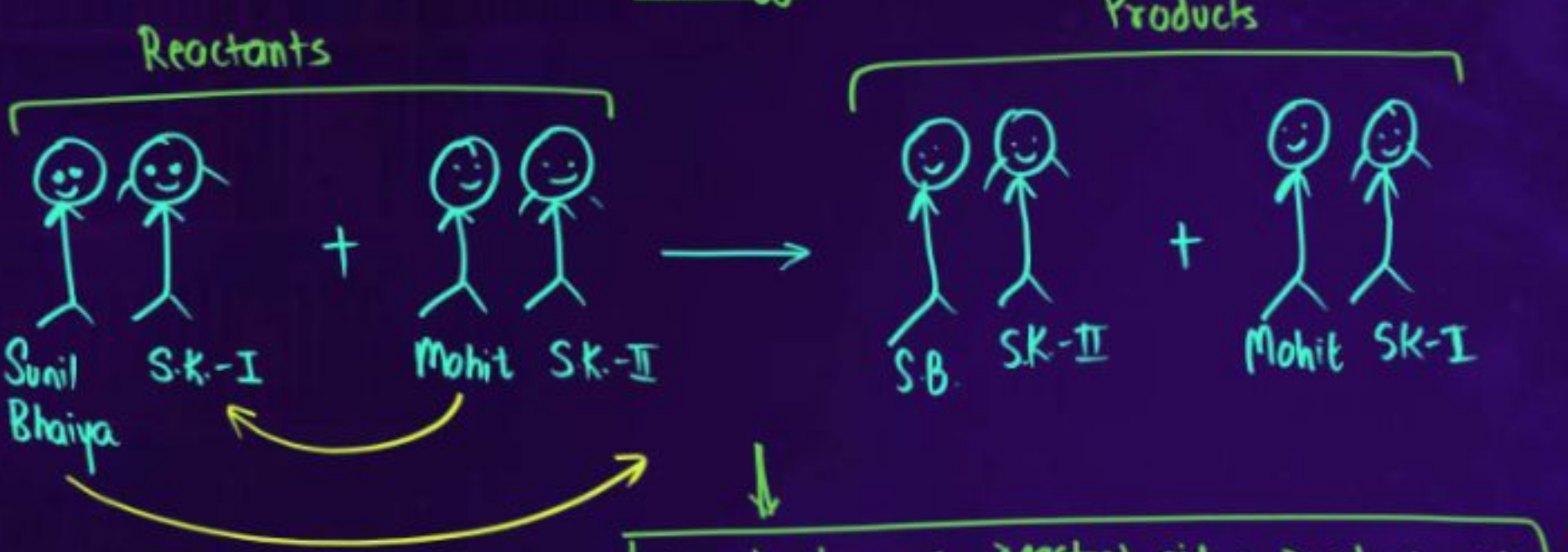
In chemical reactions, mass is neither created nor destroyed, i.e. mass of reactants is always equal to mass of products.

Reactants Products

$AB + CD \rightarrow AD + CB$

Chemical reaction is just a rearrangement of atoms.

'Analogy'



no. of atoms on reactant side = product side

mass of reactant = mass of product

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GIVE A THOUGHT

Is the below chemical equation balanced?

$$CH_4 + O_2 \rightarrow CO_2 + H_2O$$

A. Yes

B. No

GIVE A THOUGHT

Is the below chemical equation balanced?

$$CH_4 + O_2 \rightarrow CO_2 + H_2O$$

A. Yes
B. No

No!
The number of atoms are not equal on both the sides and hence, it is an unbalanced chemical equation or a skeletal chemical equation.

'HIT-AND-TRIAL METHOD'

STEP I

Writing the chemical reaction in word form.

Methane + Oxygen → Carbon dioxide + Water vapour

STEP II

Writing the chemical reaction in the form of a skeletal chemical equation. (unbalanced chemical eqn)

$$CH_4 + O_2 \rightarrow CO_2 + H_2O$$

'Not mandatory'

STEP III

Enclosed the chemical symbol(s) and formulae in boxes.

This ensures the subscript of the symbol or formula is not changed in order to make the number of atoms the same on both sides of the chemical equation.

CH_4

H_4O (x)

$2H_2O$ (✓)

STEP IV List the number of atoms of different elements.

$$CH_4 + O_2 \rightarrow CO_2 + H_2O$$

Element	Number of atoms on reactant side	Number of atoms on product side
C	1	1
H	4	2
O	2	2 + 1

STEP V Start balancing the compound (reactant or product) that contains the maximum number of atoms. In that compound, balance the element with the maximum number of atoms.
Following these criteria, the compound will be CH_4 and element will be H.

STEP V

Element	Number of atoms on reactant side	Number of atoms on product side
C	1	1
H	4	$2 \times 2 = 4$
O	$2 \times 2 = 4$	$2 + (1) \times 2 = 4$

Balanced Chemical Equation ←

$$1CH_4 + 2O_2 \longrightarrow 1CO_2 + 2H_2O$$

[Stoichiometric Coefficient]

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LIKH DO.

AYE BHAIYA

LET'S PRACTICE

NCERT Exemplar

Balance the given chemical equation by identifying the values of stoichiometric coefficents using hit and trial method.

$$a\,CO + b\,H_2 \rightarrow c\,CH_3OH$$

Step I → Word Eqⁿ

Carbon monoxide + Hydrogen ⟶ Methanol

Step II → Skeletal Chemical Eqⁿ

$$CO + H_2 \longrightarrow CH_3OH$$

Step IV th → Balancing will start from ↓ CH_3OH ↓ element will be H

$$1CO + 2H_2 \longrightarrow 1CH_3OH$$

Step III rd →

Element	no. of atoms on L.H.S.	no. of atoms on R.H.S.
C	1	1
O	1	1
H	2 × 2 = 4	4

a = 1
b = 2
c = 1

NCERT Theory

Balance the given chemical equation by identifying the values of stoichiometric coefficents using hit and trial method.

$$aFe + bH_2O \rightarrow cFe_3O_4 + dH_2$$

(A) $a = 4, b = 2, c = 2, d = 4$

(B) $a = 1, b = 4, c = 1, d = 2$

(C) $a = 3, b = 4, c = 1, d = 4$

(D) $a = 3, b = 2, c = 2, d = 2$

(f)

Element	no. of atoms on LHS	no. of atoms on RHS
Fe	$1 \times 3 = 3$	3
H	$2 \times 4 = 8$	$2 \times 4 = 8$
O	$1 \times 4 = 4$	4

(f) Balancing will start from → Fe_3O_4 → element will be O

$$3Fe + 4H_2O \rightarrow 1Fe_3O_4 + 4H_2$$

NCERT Theory

Balance the given chemical equation by identifying the values of stoichiometric coefficents using hit and trial method.

$$aC_6H_{12}O_6 + bO_2 \rightarrow cCO_2 + dH_2O \rightarrow (\text{Respiration Rx}^n)$$

Element	Reactant → no. of atoms	Product → no. of atoms
C	6	$1 \times 6 = 6$
H	12	$2 \times 6 = 12$
O	$6 + (2 \times 6) = 18$	$(6 \times 2) + (1 \times 6) = 18$

✦ Balancing will start from → $C_6H_{12}O_6$ → element will be H

$$1C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$$

GAME OF BALANCING A CHEMICAL EQUATION

'PHET'

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LIKH DO.

AYE BHAIYA

CONCEPT POLISH - HOMEWORK

CBSE 2023

$MnO_2 + x\,HCl \rightarrow MnCl_2 + y\,H_2O + z\,Cl_2$ 1

In order to balance the above chemical equation, the values of x, y and z respectively are :

(a) 6, 2, 2
(b) 4, 1, 2
(c) 4, 2, 1
(d) 2, 2, 1

QUESTION

Balance the given chemical equation by identifying the values of stoichiometric coefficents using hit and trial method.

$$a\mathrm{Fe_2O_3} + b\mathrm{CO} \rightarrow c\mathrm{Fe} + d\mathrm{CO_2}$$

EFFICIENCY HACKS BY SUNIL BHAIYA

THE POMODORO TECHNIQUE®

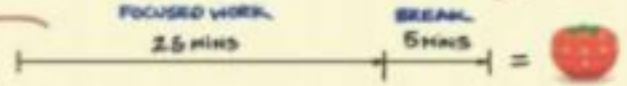
A SIMPLE METHOD TO BALANCE FOCUS WITH DELIBERATE BREAKS

1 PLAN YOUR TASKS
How many pomodoros might you need?

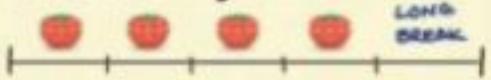
2 DO 1 POMODORO
Time for 25 mins then take a 5 min break.

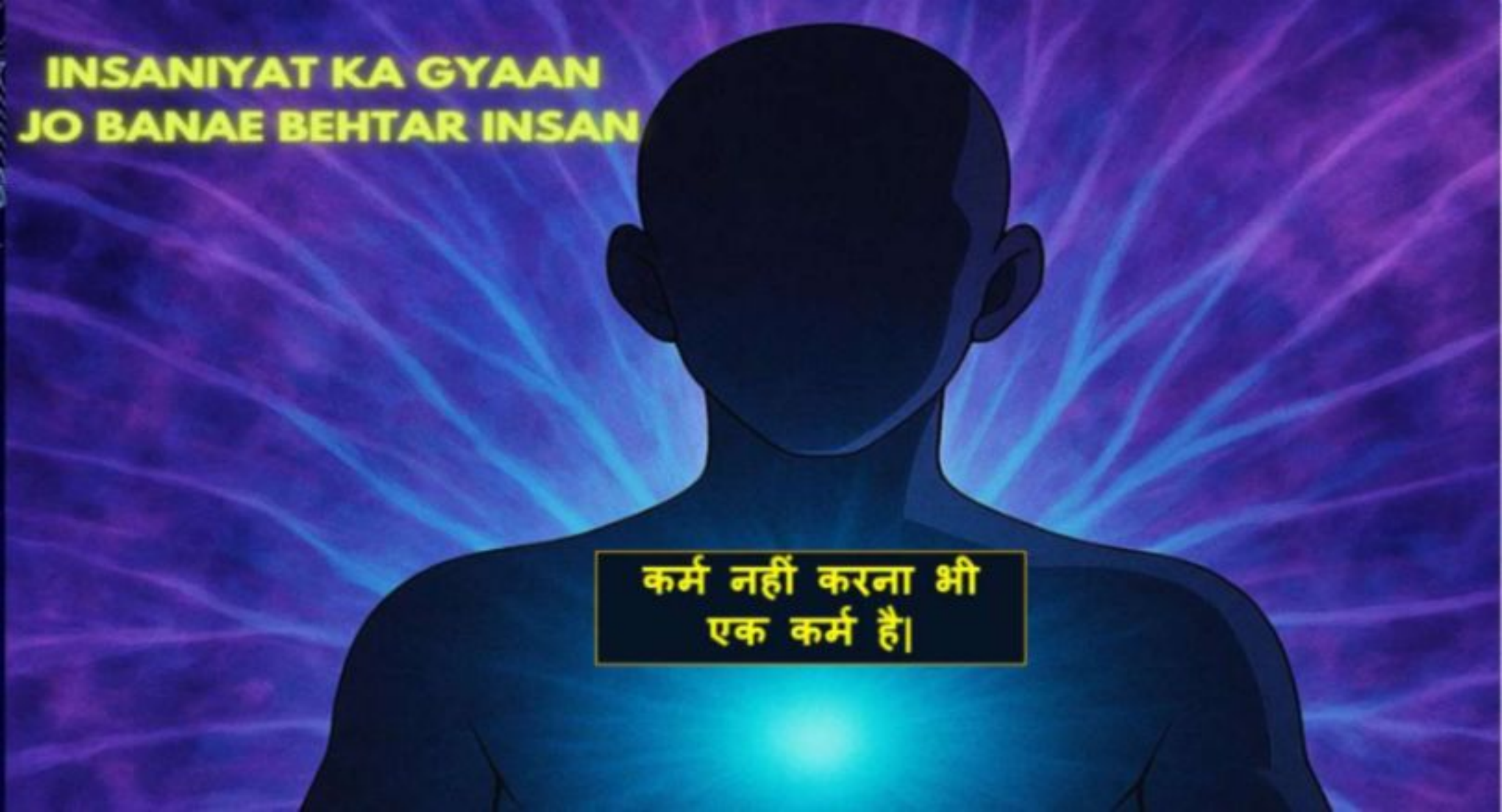
NO SNEAKY MERGING!

PROTECT YOUR POMODORO!



3 REPEAT x 4 POMODOROS
Then take a longer break.




INSANIYAT KA GYAAN
JO BANAE BEHTAR INSAN
कर्म नहीं करना भी
एक कर्म है।

PHYSICS WALLAH

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SUNIL BHAIYA IS ALWAYS THERE FOR YOU.
#sbsathhai
#pwsathhai

Thank You

UDAAN

2026

Bharat Mata Ki Jai ♡

Lecture 03

Chemical Reactions and Equations

LIVE EXPERIMENTS

Limitations of Chemical Equations

Combination Reaction and Its Types

BY – PRIYA-PUTRA-SUNIL Sir

TOPICS TO BE COVERED

(i) Limitations of Chemical Equations and Their Removal ✓

(ii) Combination /Synthesis Reaction and Its Types ✓


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PHYSICS WALLAH

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RIDDLE WALLAH

isotope of hydrogen

Simaila Ji, can you identify this irritating song whose first word is made from chemical symbols of barium, deuterium and oxygen while the second word is made from chemical symbols of barium, deuterium and iodine?

BaDO - BaDI ✓

Udaanians meri team mein hai who btaenge Hasmukhlal Ji.

CHAHAT FATEH ALI KHAN

THANKS SUNIL BHAIYA ✓

CONCEPT POLISH – HOMEWORK DISCUSSION

CBSE 2023

Let's select 'H2O' ← $MnO_2, MnCl_2, H_2O$

$\overline{Mn}O_2 + x\,HCl \rightarrow \overline{Mn}Cl_2 + y\,H_2O + z\,Cl_2$ 1

In order to balance the above chemical equation, the values of x, y and z respectively are :

(a) 6, 2, 2 (b) 4, 1, 2

(c) 4, 2, 1 (d) 2, 2, 1

Compound with maximum no. of atoms → H_2O → H has max^m no. of atoms

Element	L.H.S.	R.H.S.
Mn	1	1
O	2	1 x 2 = 2
H	1 x 4 = 4	2 x 2 = 4
Cl	1 x 4 = 4	2 + 2

$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + 1Cl_2$

QUESTION

Comment mein likho!

Balance the given chemical equation by identifying the values of stoichiometric coefficents using hit and trial method.

$$aFe_2O_3 + bCO \rightarrow cFe + dCO_2$$

Compound with max^m no. of atoms → Fe_2O_3 → Oxygen has max^m no. of atoms

Element	L.H.S.	R.H.S.
Fe	2	$1 \times 2 = 2$
O	$3 + (1 \times 3)$	$2 \times 3 = 6$
C	$1 \times 3 = 3$	$1 \times 3 = 3$

$$1Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$$

Balanced chemical equations don't tell any information about the physical states of reactants or products. They also don't give any information about reaction conditions. So, to remove these limitations we add these informations to make chemical equations informative.

I
II
III Energy changes during a rxn

LIMITATIONS OF CHEMICAL EQUATIONS AND THEIR REMOVAL → 'NCERT Based'

MAKING CHEMICAL EQUATIONS INFORMATIVE

Fe (x) O
4 × 3
Fe_3O_4 → wrong

(1) Physical States of Reactants and Products

Iron (Fe) has variable valencies → '2' & '3'

$FeO.Fe_2O_3$ ← mixed oxide

$$3Fe(s) + 4H_2O(g) \rightarrow Fe_3O_4(s) + 4H_2(g)$$

↓ Water-vapour | steam

or (↑)

Physical state	Symbol
(I) Solid	(s)
(II) Liquid	(l)
(III) Gas	(g) or (↑) → gas evolved is after a rxn
(IV) Aqueous solution (Water as solvent)	(aq) → पानी में घोलने पर
(V) Precipitate	(ppt.) or (↓) or (s)

insoluble solid formed after a chemical rxn

PRACTICE

Formula with physical state at Room temp (25 °C)

① Ammonia → $NH_3(g)$

② Sulphur dioxide → $SO_2(g)$

③ Aq. soln of sodium chloride → $NaCl(aq)$

④ White precipitate of barium sulphate → $BaSO_4(\downarrow)$ or $BaSO_4$(ppt.) or $BaSO_4(s)$

⑤ Iron metal → $Fe(s)$

⑥ Sodium metal → $Na(s)$

⑦ Potassium —"— → $K(s)$

⑧ Mercury —"— → $Hg(\ell)$

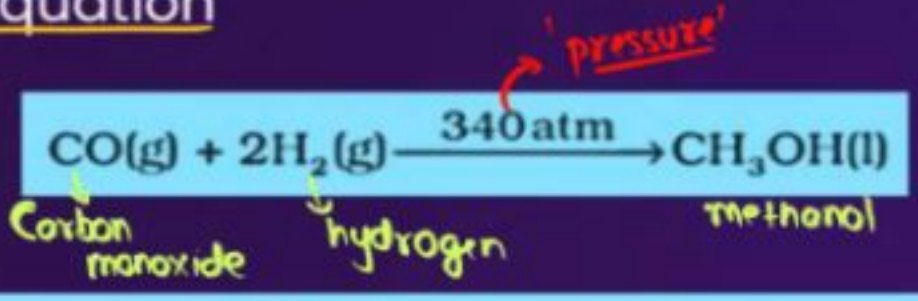
⑨ Water → $H_2O(\ell)$ at room temp.

⑩ Ice → $H_2O(s)$

⑪ Water-vapour / Steam → $H_2O(g)$

MAKING CHEMICAL EQUATIONS INFORMATIVE

(iii) Sometimes the reaction conditions, such as temperature, pressure etc., for the reaction are indicated above and/or below the arrow in the equation



$$6CO_2(aq) + 12H_2O(l) \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6(aq) + 6O_2(aq) + 6H_2O(l)$$

(Glucose)

(iii) Energy changes during a rxn

Endothermic

Reactant(s) + Energy ⟶ Product(s)

OR

Reactant(s) $\xrightarrow{\text{Energy}}$ Product(s)

Exothermic

Reactant(s) ⟶ Product(s) + energy

Extra*

WORD EQUATION (I) — Magnesium + Oxygen → Magnesium oxide

↓

SKELETAL CHEMICAL EQⁿ (II) — $Mg + O_2 \rightarrow MgO$

↓

BALANCED CHEMICAL EQⁿ (III) — $2Mg + O_2 \rightarrow 2MgO$

↓

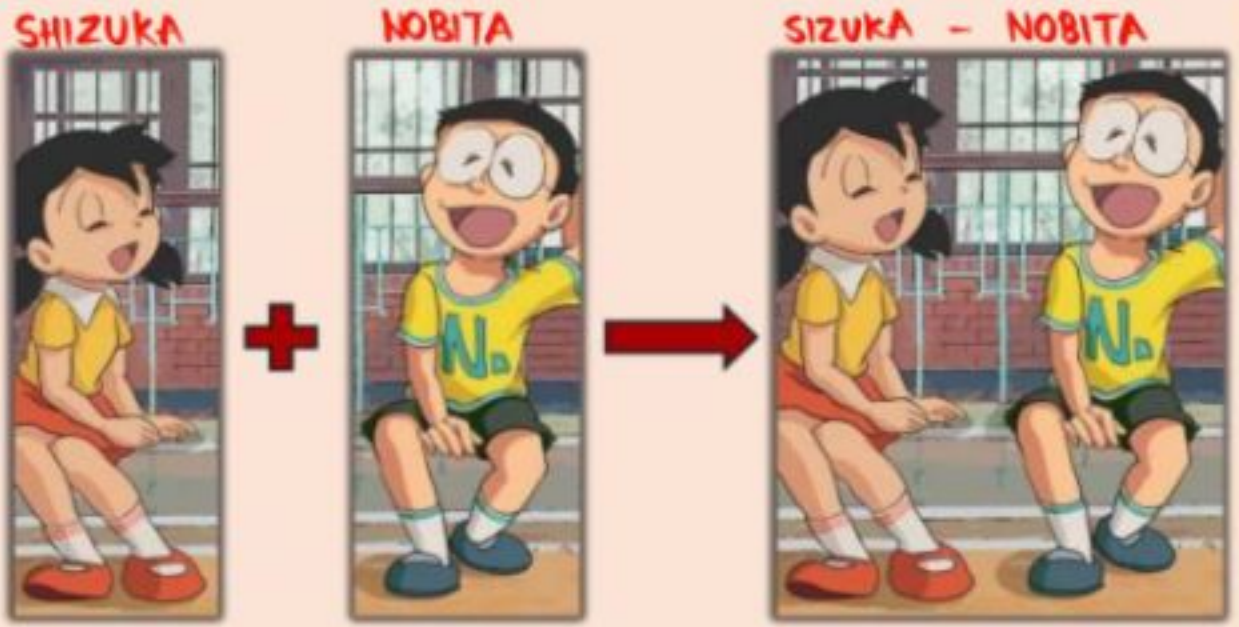
MAKE IT INFORMATIVE (IV) — $2Mg(s) + O_2(g) \longrightarrow 2MgO(s) + \text{heat} + \text{light energy}$

SAMAJ AAYA TOH
LIKH DO.
AYE BHAIYA

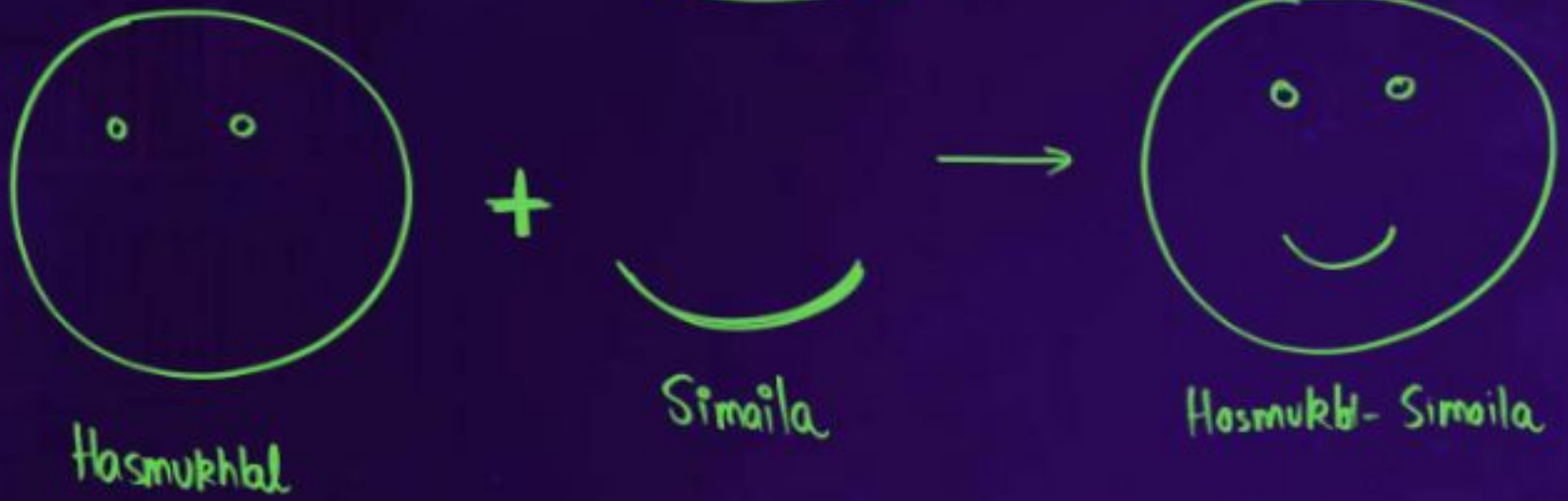
(संयोजन प्रतिक्रिया / अभिक्रिया)

COMBINATION OR SYNTHESIS REACTION AND ITS TYPES

COMBINATION REACTION

TYPE OF REACTION	REACTION ANALOGY
Combination Reaction A chemical reaction in which **two or more elements or compounds (reactants)** react to form **a single compound (product).**	

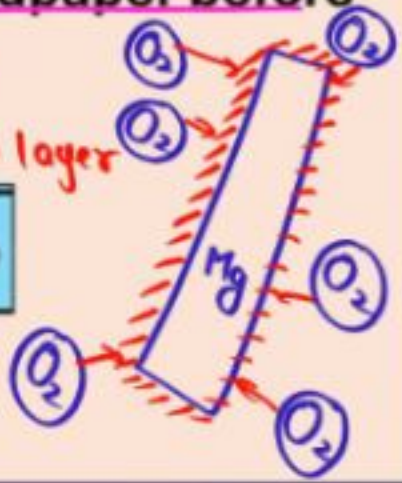
Analogy-II



COMBINATION REACTION

TYPE OF REACTION	TYPES OF COMBINATION REACTIONS
Combination Reaction A chemical reaction in which **two or more elements or compounds (reactants)** react to form **a single compound (product)**.	Three basic types Element-Element Combination Reaction $A + B \rightarrow AB$ (E) (E) (C) Compound-Compound Combination Reaction $AB + CD \rightarrow ABCD$ (C) (C) (C) Element-Compound Combination Reaction $A + BC \rightarrow ABC$ (E) (C) (C)

COMBINATION REACTION

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Combination Reaction A chemical reaction in which **two or more elements or compounds (reactants)** react to form **a single compound (product).** A + B → AB (E) (E) (C) (H) This is an example of an **element-element combination reaction.**	**Important to Remember:** • Magnesium reacts with oxygen present in air to form a white layer of magnesium oxide on its surface. **Hence, it is cleaned with a sandpaper before burning.** → to remove this layer of MgO White layer $2Mg(s) + O_2(g) \rightarrow 2MgO(s)$ (E) (E) (C) 

[Air has 20.95% oxygen]

COMBINATION REACTION

dazzling → bright

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Combination Reaction A chemical reaction in which **two or more elements or compounds (reactants)** react to form **a single compound (product).** **A + B → AB** This is an example of an **element-element** (I) **combination reaction.**	**Important to Remember:** • When magnesium ribbon (is strongly heated in air (oxygen)) ~~burns in air~~, dazzling white light is produced which contain **ultraviolet light** that can cause (a) (pain in eye) **photokeratitis** or (b) **it can permanently damage the eye.** To avoid this it is advised to wear an eye protection. dazzling white flame white powder $2Mg(s) + O_2(g) \rightarrow 2MgO(s) + \text{Heat energy} + \text{Light energy}$ (E) (E) (C) (II) Exothermic Rxn

SAMAJ AAYA TOH
LIKH DO.
AYE BHAIYA

PYQS' WALLAH

CBSE 2020

1. A shining metal 'M' on burning gives a dazzling white flame & changes to a white powder 'N'. Identify 'M' & 'N'
2. Represent the above reaction in the form of a balanced chemical equation.

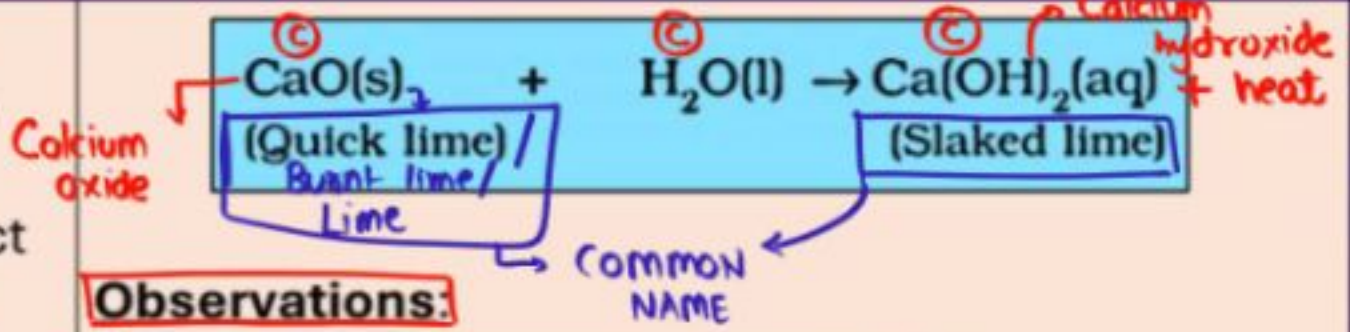
CBSE 2020

1. A shining metal 'M' on burning gives a dazzling white flame & changes to a white powder 'N'. Identify 'M' & 'N'.
2. Represent the above reaction in the form of a balanced chemical equation.

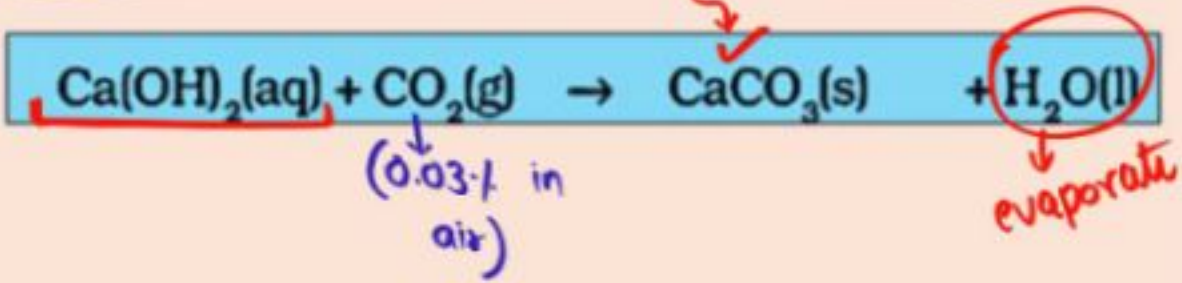
1. M and N: Magnesium and Magnesium oxide

2. $$2Mg(s) + O_2(g) \rightarrow 2MgO(s) + \text{Heat energy} + \text{Light energy}$$

COMBINATION REACTION

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Combination Reaction A chemical reaction in which **two or more elements or compounds (reactants)** react to form **a single compound (product).** **A + B → AB** This is an example of a **compound-compound combination reaction.**	 **Observations:** ✓ It is a very fast reaction (vigorous). ✓ Heat is evolved (exothermic reaction). ✓ Water boils to form steam and produces a hissing sound with bubbles.

COMBINATION REACTION

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Combination Reaction A chemical reaction in which **two or more elements or compounds (reactants)** react to form **a single compound (product).** **A + B → AB**	**Important to Remember:** A solution of slaked lime is used for whitewashing the walls. After 2-3 days of whitewash, a thin layer of calcium carbonate (shiny finish) on the walls. 

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LIKH DO.
AYE BHAIYA

CONCEPT POLISH - HOMEWORK

CBSE 2020

Calcium oxide reacts vigorously with water to produce slaked lime.

$$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$$

This reaction can be classified as:

(A) Combination reaction (B) Exothermic reaction

(C) Endothermic reaction (D) Oxidation reaction

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

EFFICIENCY HACKS BY SUNIL BHAIYA

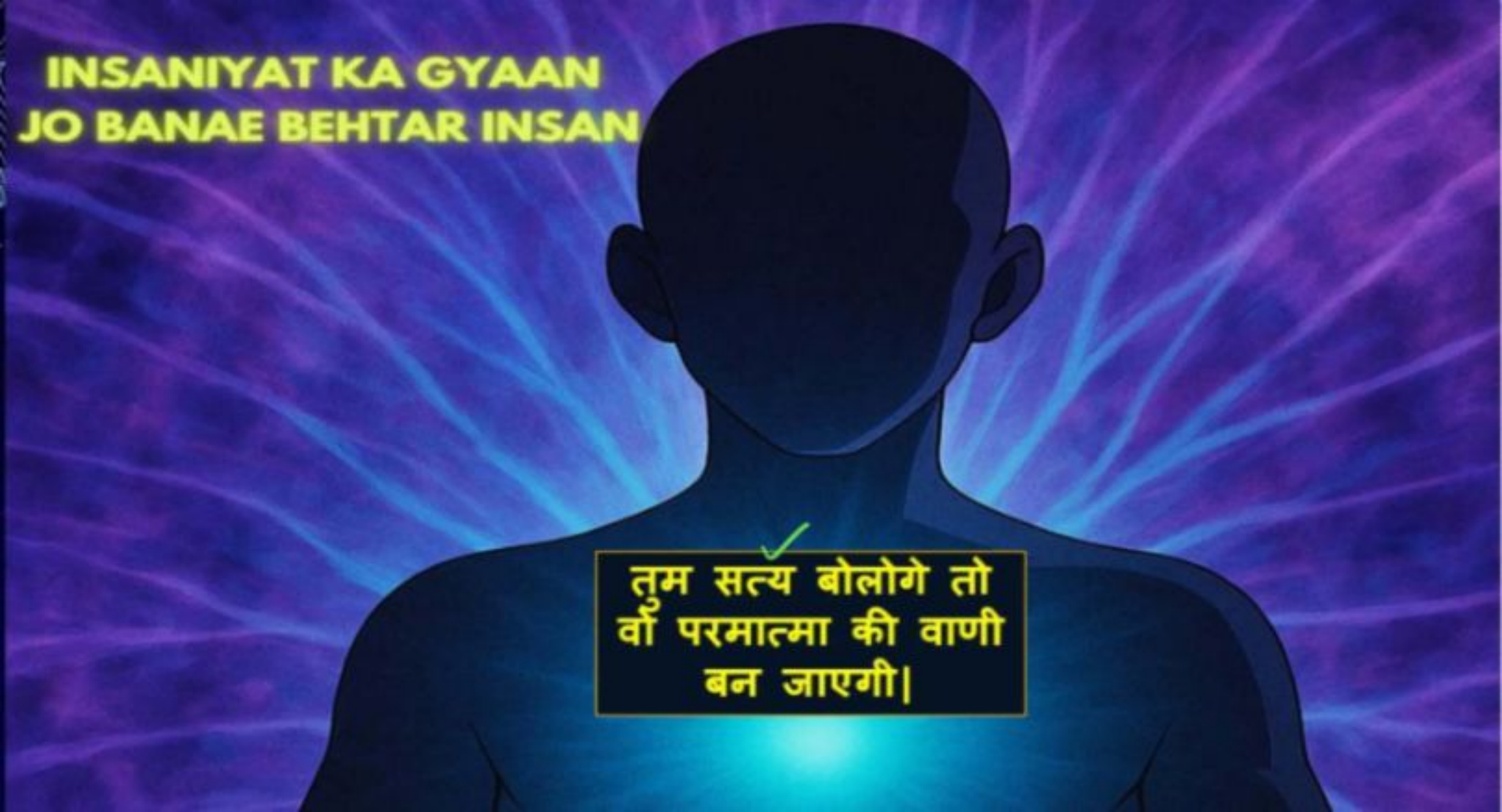
Feynman Technique ✓

(i) Choose a concept.

(ii) Teach it to a child (or in simple words).

(iii) Identify gaps and go back to the source.

(iv) Simplify and use analogies.


INSANIYAT KA GYAAN
JO BANAE BEHTAR INSAN
तुम सत्य बोलोगे तो
वो परमात्मा की वाणी
बन जाएगी।

PHYSICS WALLAH

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#sbsathhai
#pwsathhai

Thank You

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Lecture 04

Chemical Reactions and Equations

Live Experiments

Master Decomposition Reaction and Its Types

BY – PRIYA-PUTRA-SUNIL Sir

TOPICS TO BE COVERED

(i) Master Decomposition Reaction and Its Types ✓


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RIDDLE WALLAH

Simaila Ji, you are ~~made from~~ full of chemical symbols of beryllium, gold and titanium.

Be Au Ti Ful

Udaanians meri team mein hai who btaenge Hasmukhlal Ji mujhe samaj nahi aaya?

WOW

CONCEPT POLISH – HOMEWORK DISCUSSION

CBSE 2020

Calcium oxide reacts vigorously with water to produce slaked lime.

Quicklime $\leftarrow CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$ + heat

↳ Slaked lime

This reaction can be classified as:

(A) Combination reaction (B) Exothermic reaction

(C) Endothermic reaction (D) Oxidation reaction

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

EXTRA KNOWLEDGE [Out of NCERT]

Substance	Common Name
$Ca(OH)_2$ (s)	Slaked Lime (White Powder)
$Ca(OH)_2$(aq) 'Clear solution'	Limewater (Saturated Aqueous Solution)
Suspension of $Ca(OH)_2$ in water	Milk of lime or Limewash or Whitewash (used for whitewashing)
$CaCO_3$ (Calcium carbonate)	Limestone/Chalk/Marble } Part of NCERT

GIVE A THOUGHT

Are all combination reactions exothermic?

A. Yes

B. No

GIVE A THOUGHT

Are all combination reactions exothermic?

A. Yes

B. No

No! Not all combination reactions are exothermic. They can be endothermic too.

Ex: N_2 (g) + O_2 (g) + Heat → 2NO (g)

The above reaction takes place when heat energy is provided through lightning.

SAMAJ AAYA TOH
LIKH DO.
AYE BHAIYA

(Breakup Reaction)

(अपघटन प्रतिक्रिया)

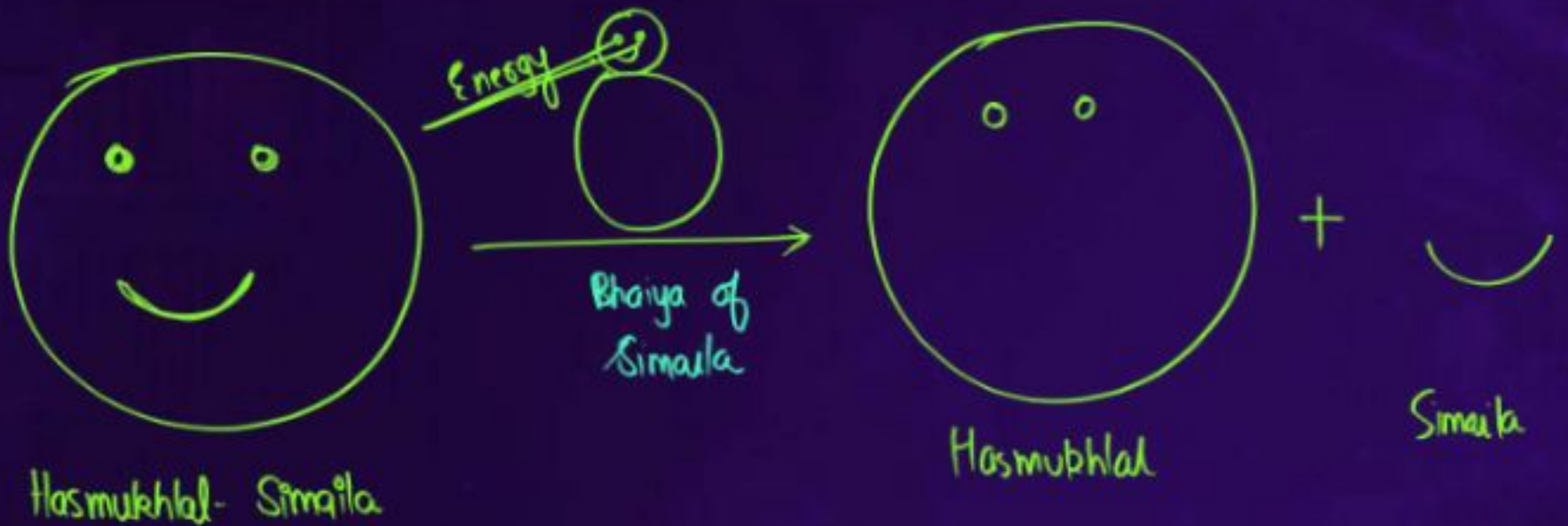
DECOMPOSITION REACTION AND ITS TYPES

DECOMPOSITION REACTION

(Inverse or reverse of combination rxn)

TYPE OF REACTION	REACTION ANALOGY
Decomposition Reaction A chemical reaction in which 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.** $AB \xrightarrow{\text{Energy}} A + B$ Basic representation of rxn	

Analogy


Energy
Bhaiya of Simaila
Hasmukhlal - Simaila
Hasmukhlal
+
Simaila

LET'S THINK

(C-I)

Cations	Valency
Fe^{2+}	2 → lower valency
Fe^{3+}	3 → higher valency

- Chemical Symbol
- Valency
- Formula
- Common Name
- IUPAC Name

Fe^{2+} SO_4^{2-}

Fe SO_4

$FeSO_4$

Ferrous sulphate

Iron(II) sulphate

lower valency → 'ous'

higher valency → 'ic'

Suffix

(C-II)

What is the meaning of $FeSO_4.7H_2O$? (it contains water molecules)

Common Name: Hydrated ferrous sulphate or Green vitriol

IUPAC Name: Iron(II) sulphate heptahydrate

(c-III)

$FeSO_4 \cdot 7H_2O$ → water of crystallisation

(i) Provides crystal-like structure to $FeSO_4$

→ Fixed Geometrical Shape

(ii) provides pale green colour to crystals

GIVE A THOUGHT

What will be the formula of Iron(III) sulphate? (III) → valency of Fe

A. $Fe_2(SO_4)_3$

B. $Fe_2(SO_4)_2$

	Fe	SO_4
Valency	3	2

$Fe_2(SO_4)_3$

Common Name: Ferric sulphate

THERMOLYSIS/THERMOLYTIC DECOMPOSITION REACTION

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Decomposition Reaction A chemical reaction in which 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.** $AB \rightarrow A + B$	$2FeSO_4(s) \xrightarrow{Heat} Fe_2O_3(s) + SO_2(g) + SO_3(g)$ (Ferrous sulphate) (Ferric oxide) The above reaction is an example of **thermolytic decomposition reaction or thermolysis.** Observations: (a) Ferrous sulphate crystals lose water and colour changes from pale green ($FeSO_4.7H_2O$) to white ($FeSO_4$) on heating. (b) Further heating decomposes $FeSO_4$ to Fe_2O_3 (reddish-brown), SO_3 and SO_2 gas (smell similar to the smell of burnt matches).

PYQS' WALLAH

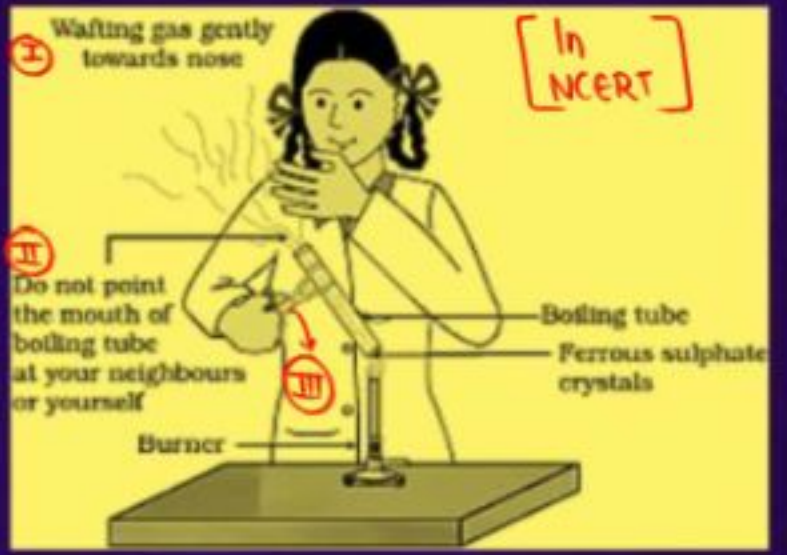
CBSE 2020

A student wants to study a decomposition reaction by taking ferrous sulphate crystals. Write two precautions he must observe while performing the experiment.

CBSE 2019

A student wants to study a decomposition reaction by taking ferrous sulphate crystals. Write two precautions he must observe while performing the experiment.

(i) Do not point the mouth of the boiling tube at your neighbours or yourself.
(ii) Waft the gases – Don't sniff them.
This is done to confirm the presence of sulphur dioxide and sulphur trioxide gases released. → smell of burnt matches
(iii) Always use a test tube holder while heating the test tube.

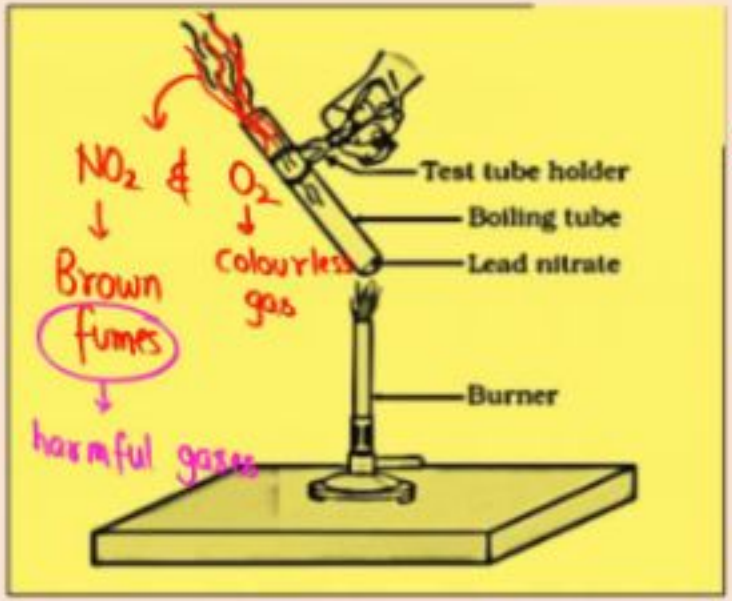


THERMOLYSIS/THERMOLYTIC DECOMPOSITION REACTION

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Δ → Delta to represent heat	The below reaction is an example of **thermolytic decomposition reaction or thermolysis.** Lime kiln (चूना भट्टी) Calcium carbonate II $CaCO_3(s) \xrightarrow[\text{or } \Delta]{\text{Heat}} CaO(s) + CO_2(g)$ (Limestone) 'Compound' — (Quick lime) / Burnt lime / lime — Compound — Compound CaO has many uses – one is in the manufacture of cement.

'Residue'
↓
product left after a rxn (majorly in solid state)

THERMOLYSIS/THERMOLYTIC DECOMPOSITION REACTION

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
	Both reactions are example of **thermolytic decomposition reaction or thermolysis.**

(III) $2Pb(NO_3)_2(s) \xrightarrow[\text{or } \Delta]{\text{Heat}} 2PbO(s) + 4NO_2(g) + O_2(g)$

(Lead nitrate) 'white' → (Lead oxide) (yellow residue) + (Nitrogen dioxide) (Oxygen)

Brown fumes

escape from boiling tube

Observations: #1

(i) A crackling sound is heard while thermal decomposition of lead nitrate and this process is known as decrepitation.

(ii) Brown fumes of nitrogen dioxide are evolved.

(iii) A yellow residue of lead oxide is left behind in the test tube.

SAMAJ AAYA TOH
LIKH DO.
AYE BHAIYA

PYQS' WALLAH

CBSE 2024

Identify the product 'X' obtained in the following chemical reaction :

$$CaCO_3 \xrightarrow{\Delta} \text{'X'} + CO_2$$

(A) Quick lime

CaO (quicklime/ burnt lime/ lime)

(B) Gypsum

(C) Lime Stone

(D) Plaster of Paris

CBSE 2024

The products obtained when Lead nitrate is heated in a boiling tube.

(A) PbO, N_2O and O_2

(B) NO, PbO and O_2

(C) $Pb(NO_2)_2$ and O_2

(D) NO_2, PbO and O_2

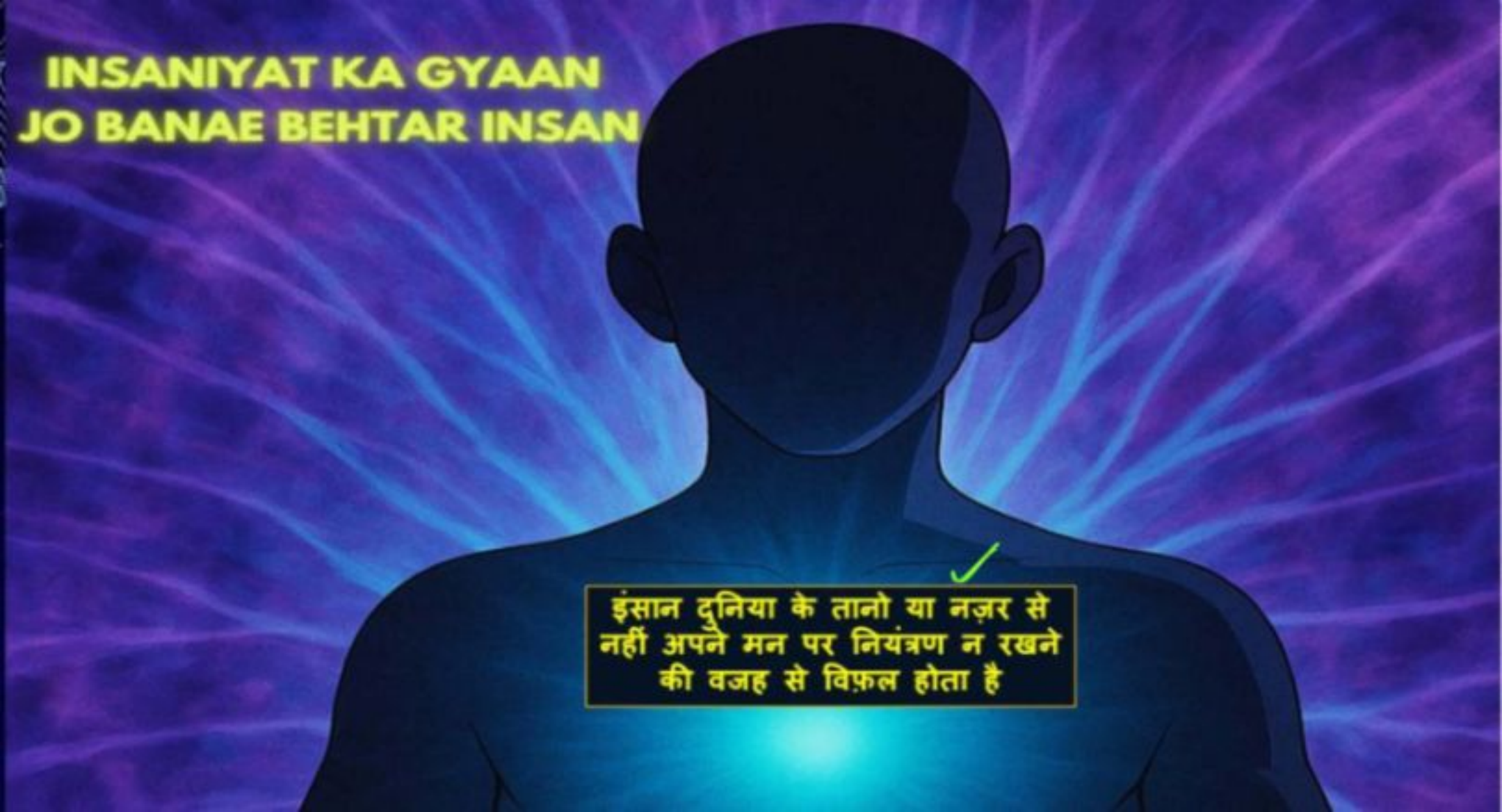
CONCEPT POLISH - HOMEWORK

(I) Try heating sugar crystals at home

↓

'Send your video at any place'

(II) Search reason & what is happening?


INSANIYAT KA GYAAN
JO BANAE BEHTAR INSAN
इंसान दुनिया के तानो या नज़र से
नहीं अपने मन पर नियंत्रण न रखने
की वजह से विफ़ल होता है

PHYSICS WALLAH

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#pwsathhai

Thank You

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Lecture 05

Chemical Reactions and Equations

Decomposition Reaction (Contd.) and Displacement Reactions

BY – PRIYA-PUTRA-SUNIL Sir

TOPICS TO BE COVERED

(i) Decomposition Reactions (Contd.)

(ii) Displacement Reaction


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RIDDLE WALLAH

Hasmukhlal's and Simaila's, can you decode the below element?

Bar

+ IUM = Barium (Ba)

CONCEPT POLISH – HOMEWORK DISCUSSION

QUESTION

'OUT-OF-NCERT'

What happens during thermal decomposition of sugar?

'Sugar' → Molten Sugar

$[C_{12}H_{22}O_{11}(s) \xrightarrow{heat} C_{12}H_{22}O_{11}(l)]$ ⟶ Physical Change

$[C_{12}H_{22}O_{11}(l) \xrightarrow[or\ \Delta]{heat} 12C(s) + 11H_2O(g)]$ ⟶ Chemical Change → 'Thermal Decomposition Rxn'

molten sugar

SUGAR CHARCOAL (Black Residue)

Water vapour

SAMAJ AAYA TOH
LIKH DO.

AYE BHAIYA

DECOMPOSITION REACTIONS (CONTD.)

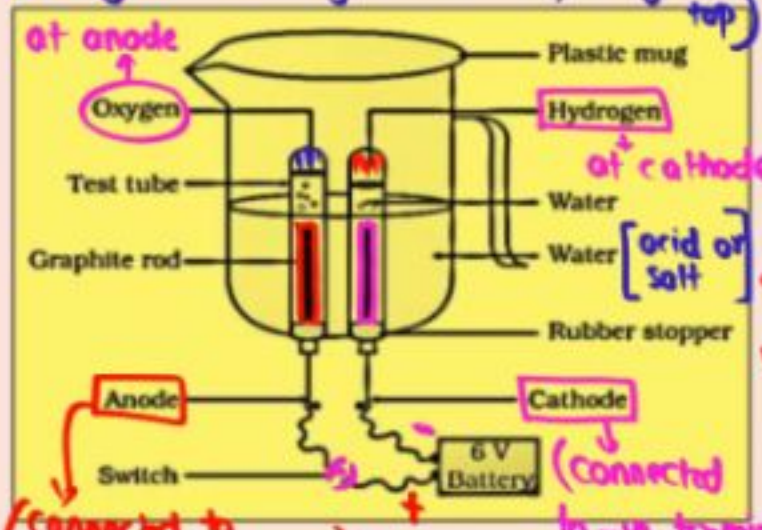
electrical energy

breakdown

ELECTROLYSIS/ELECTROLYTIC DECOMPOSITION REACTION

TYPE OF REACTION

(3) (H_2 & O_2 being less soluble in H_2O & having less density than H_2O, stays at top)



REACTION DETAILS AND EXAMPLES

The below reaction is an example of **electrolytic decomposition reaction or electrolysis.**

Electricity, CATHODE, ANODE

(I) $2H_2O(l) \rightarrow 2H_2(g) + 1O_2(g)$

water — Hydrogen gas — Oxygen gas

Important to Remember:

(II) Volume ratio of H_2 and O_2 gas produced will be **2:1**.

(IV) Here small amount of acid or table salt (acts as electrolyte that dissociates into ions and conducts electricity) is added to water before starting its electrolysis because water is a poor conductor of electricity but these electrolytes speeds-up the electrolysis process.

Question

(NCERT Activity)

What will happen if a burning candle is brought closer to the mouth of test tubes from where hydrogen and oxygen gases are evolved?

H_2 → Combustible but not a supporter of combustion

When we bring a **glowing candle close** to the mouth of one of the test tubes, the gas in the test tube ~~takes fire~~ extinguishes candle flame and **burns** with a **pop** sound, showing the presence of **hydrogen** in the test tube. 'small explosion'

When we bring a burning candle closer to the mouth of another test tube, the candle starts to **burn brightly**, showing that the test tube **contains oxygen**.

O_2 → not combustible but a supporter of combustion

PYQS' WALLAH

CBSE 2024 2025

In electrolytic decomposition of water two gases are liberated at the electrodes. Give the mass ratio of the gas liberated at the cathode and at the anode.

	GAS	VOLUME RATIO	MASS RATIO
Cathode →	Hydrogen	2	1 4u
Anode →	Oxygen	1	8 32u

1:8

$H_2 \rightarrow 2u$

$2H_2 \rightarrow 4u$

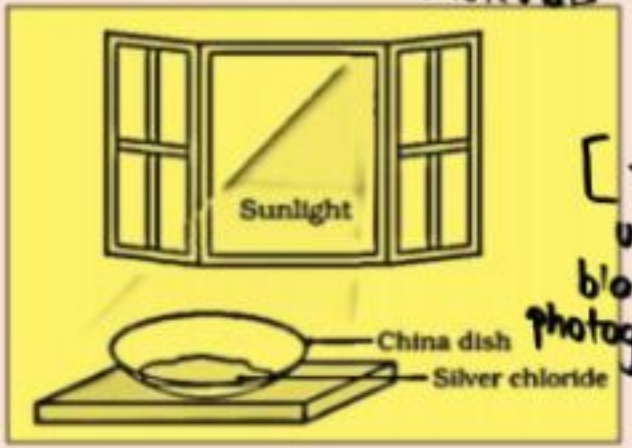
$1O_2 \rightarrow 32u$

SAMAJ AAYA TOH
LIKH DO.
AYE BHAIYA

Light / Sunlight

breakdown

PHOTOLYSIS/PHOTOLYTIC DECOMPOSITION REACTION

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
AgCl & AgBr → Photosensitive materials  These are used in black & white photography	The below reaction is an example of **photolytic decomposition or photolysis.** I. $2AgCl(s) \xrightarrow[\text{or light}]{\text{Sunlight}} 2Ag(s) + Cl_2(g)$ → GREENISH-YELLOW GAS WHITE → SILVERY GREY II. $2AgBr(s) \xrightarrow[\text{or light}]{\text{Sunlight}} 2Ag(s) + Br_2(g)$ → REDDISH-BROWN VAPOUR [Gas] YELLOW → SILVERY GREY

Bromine (Br_2) is a liquid at room temp. (25 °C) → here it is in gaseous form so it is called vapour.

PYQS' WALLAH

CBSE 2024

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

(a) $2FeSO_4 \xrightarrow{heat} Fe_2O_3 + SO_2 + SO_3$

(b) $2H_2O \xrightarrow{electricity} 2H_2 + O_2$ → Electrolysis

(c) $2AgBr \xrightarrow{Sunlight} 2Ag + Br_2$ → Photolysis

(d) $CaCO_3 \xrightarrow{heat} CaO + CO_2$

(a) & (d) → Thermolysis

"most of the decomposition rxn are endothermic

Generally, decomposition rxn are endothermic.

(A) Yes

(B) No

because energy is given in form of heat, electricity or sunlight.

For ex: Decomposition of vegetable matter into compost → EXOTHERMIC

SAMAJ AAYA TOH
LIKH DO.

AYE BHAIYA

DISPLACEMENT REACTION AND ITS TYPES

(विस्थापन प्रतिक्रिया/अभिक्रिया)

What do you mean by 'reactivity' in terms of 'metals' & 'non-metals'?

→ 'A' is more reactive metal than 'B' if 'A' can lose electron(s) EASILY as compared to B.

→ 'A' is more reactive non-metal than 'B' if 'A' can gain electron(s) EASILY as compared to 'B'.

DISPLACEMENT/REPLACEMENT REACTION

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Displacement Reaction A chemical reaction in which a **more active or reactive element displaces a less active or reactive element** from its compound. These reactions are generally found to occur in the solution. → aqueous soln of compound. $A + BC \rightarrow AC + B$ (Reactivity of A > B)	Analogy  Hasmukhlal +  Mohit – Radhika  Hasmukhlal – Radhika +  Mohit

DISPLACEMENT/REPLACEMENT REACTION

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Displacement Reaction A chemical reaction in which a **more active or reactive element displaces a less active or reactive element** from its compound. These reactions are generally found to occur in the solution. A + BC → AC + B	(Reactivity / Activity Series of metal) [K Kudi → Potassium] → Most Reactive Na Noal → Sodium Ca Car → Calcium Mg Maango → Magnesium Al Alto → Aluminium Zn Zisko → Zinc → Fe Fir → Iron Pb Lekar → Lead H Hum Hydrogen → Cu Chale → Copper Hg Mathura → Mercury Ag Sath → Silver Au Ghumne → Gold Pt Prateek → Platinum Reactivity (↓) it is a non-metal but placed here because it can lose an e⁻ like metals

→ metal-metal displacement rxn (Major discussion in our syllabus)
↓
more reactive metal will displace less –"— from its compound

DISPLACEMENT/REPLACEMENT REACTION

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Displacement Reaction A chemical reaction in which a **more active or reactive element displaces a less active or reactive element** from its compound. These reactions are generally found to occur in the solution. $A + BC \rightarrow AC + B$ metal-metal displacement rxn	(I) $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$ (Copper sulphate) (Iron sulphate) Silvery grey iron nail; BLUE soln; PALE GREEN soln; Reddish brown Cu deposits on Fe nail (II) $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$ (Copper sulphate) (Zinc sulphate) Silvery grey metal; BLUE soln; COLOURLESS soln; Reddish-brown Cu deposits on Zn (III) $Pb(s) + CuCl_2(aq) \rightarrow PbCl_2(aq) + Cu(s)$ (Copper chloride) (Lead chloride) BLUE-GREEN soln; COLOURLESS soln; Reddish brown Cu deposits on Pb

Is the below chemical rxn possible?

$$Cu + FeSO_4 \longrightarrow CuSO_4 + Fe$$

(A) Yes

(B) No

because reactivity of Cu < Fe so it can't displace Fe from $FeSO_4$

$$Cu + FeSO_4 \not\longrightarrow CuSO_4 + Fe$$

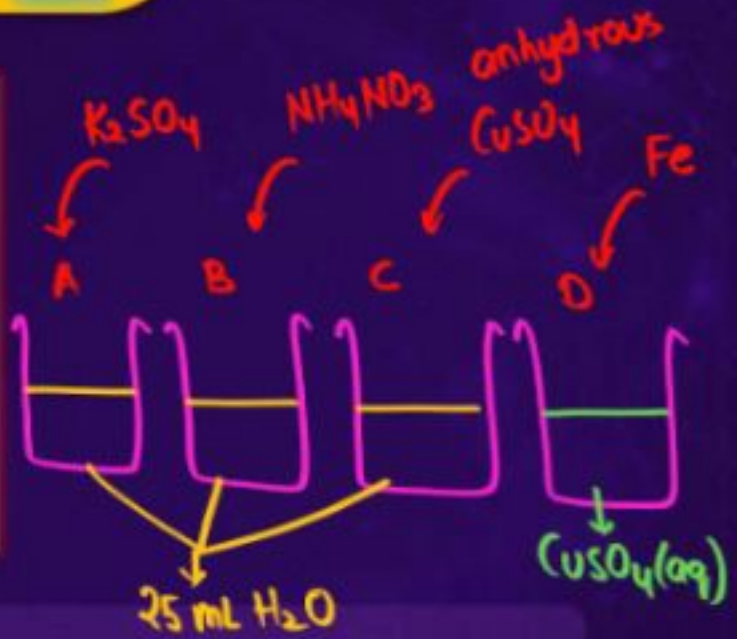
GIVE A THOUGHT

Group Activity

Perform the following activity.

- Take four beakers and label them as A, B, C and D.
- Put 25 mL of water in A, B and C beakers and copper sulphate solution in beaker D.
- Measure and record the temperature of each liquid contained in the beakers above.
- Add two spatulas of potassium sulphate, ammonium nitrate, anhydrous copper sulphate and fine iron fillings to beakers A, B, C and D respectively and stir.
- Finally measure and record the temperature of each of the mixture above.

Find out which reactions are exothermic and which ones are endothermic in nature.



CONCLUSION

A and B: Endothermic

C: Exothermic

D: Displacement reactions are generally exothermic.

$$Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s) + \text{heat}$$

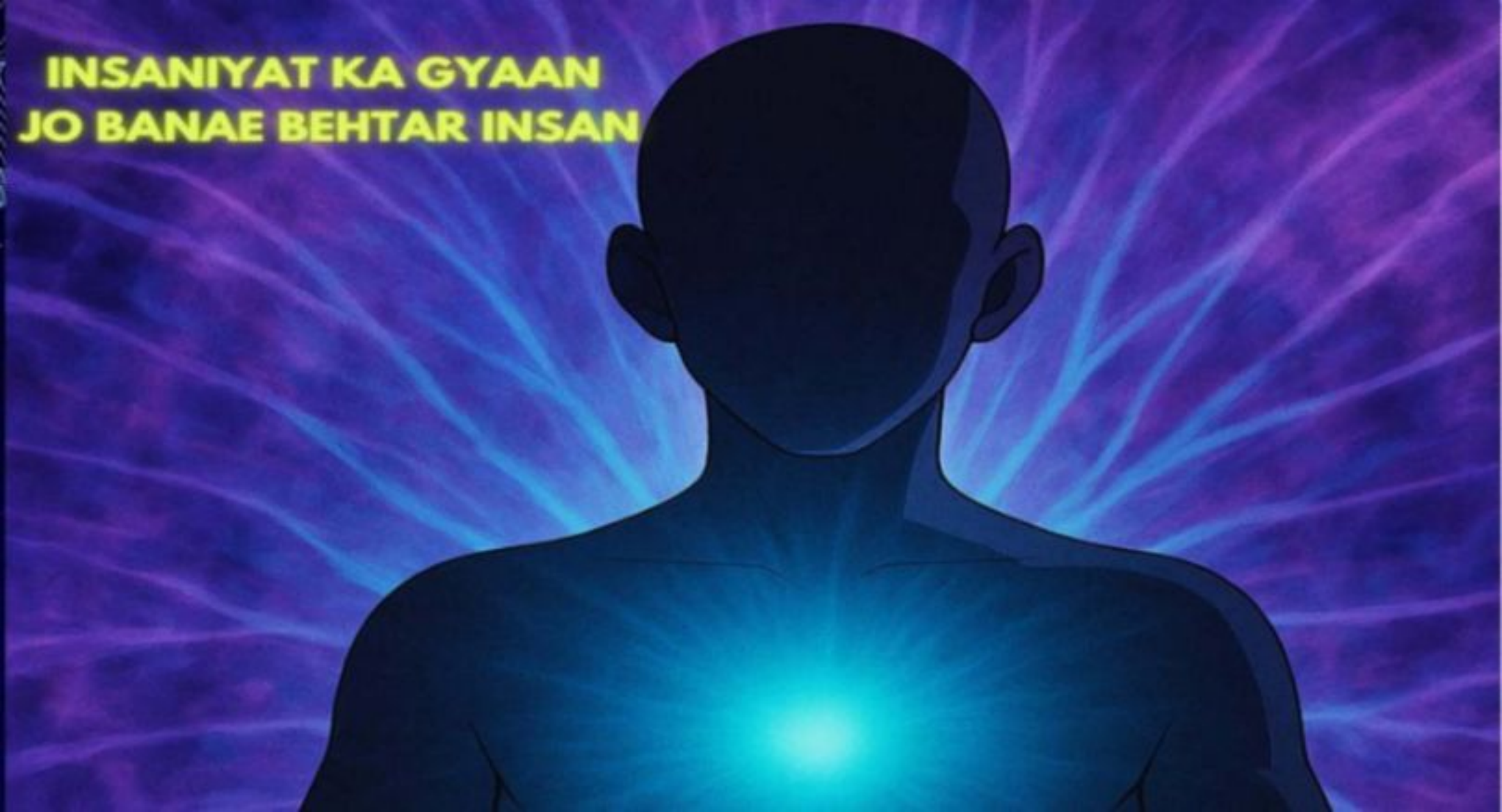
SAMAJ AAYA TOH
LIKH DO.
AYE BHAIYA

CONCEPT POLISH - HOMEWORK

CBSE OFFICIAL CFQ

Which of the following is an example of simple displacement?

1. the electrolysis of water
2. the burning of methane
3. the reaction of a metal with an acid
4. the reaction of two salt solutions to form a precipitate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Thank You

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Lecture 06

Chemical Reactions and Equations

Doubts, PYQs', Double Displacement Reactions and Its Types

BY – PRIYA-PUTRA-SUNIL Sir

TOPICS TO BE COVERED

(i) Double Displacement Reaction and Its Types ✓

(ii) CBSE Previous Year Questions ✓

(iii) Live Doubt Solving ✓


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RIDDLE WALLAH

Can you identify the name of 'Nalayak Beta'?

Papa Says: Mere nalayak bete ka naam banta hai chemical symbols of protactinium, potassium, iodine, sulphur, tantalum and nitrogen.

PaKISTaN

BHArAt

Papa ka naam
↓
chemical symbols of boron, hydrogen, argon & astatine.

CONCEPT POLISH – HOMEWORK ✓ DISCUSSION

CBSE OFFICIAL CFQ

Which of the following is an example of simple displacement?

1. the electrolysis of water
2. the burning of methane
3. the reaction of a metal with an acid
4. the reaction of two salt solutions to form a precipitate

Metal + dil. acid ⟶ Salt + Hydrogen Gas

(Reactivity of metal > hydrogen of acid)

$Zn + 2\,dil.\,HCl \longrightarrow ZnCl_2 + H_2$

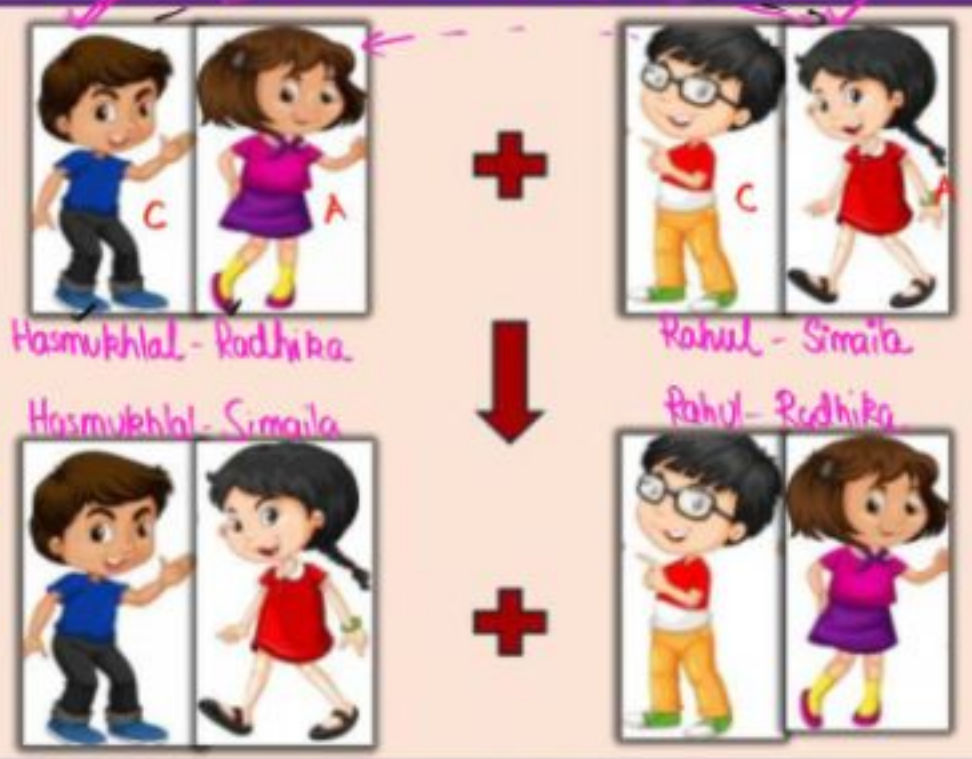
Zn: metal; HCl: non-metal

Metal-nonmetal displacement rxn

SAMAJ AAYA TOH
LIKH DO.
AYE BHAIYA

DOUBLE DISPLACEMENT/METATHESIS REACTION AND ITS TYPES

DOUBLE DISPLACEMENT REACTION

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Double Displacement Reaction A chemical reaction in which there is an exchange of ions, i.e. **cations and anions between reactants.** $AB + CD \rightarrow AD + CB$ Represent C A C A C A C A **Types of Double Displacement Reaction:** (a) Precipitation Reaction (In this chapter) (b) Neutralisation Reaction (Acid, Bases & salts) (c) Gas Forming Reaction	

DOUBLE DISPLACEMENT REACTION

Cation
Na^{1+} ✓
Ba^{2+} ✓

Anion
SO_4^{2-} ✓
Cl^{1-} ✓

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Precipitation Reaction The reaction in which (a) aqueous solutions of two ionic compounds or (b) a gas and an aqueous solution of ionic compound react to form an insoluble solid, i.e. precipitate. **AB + CD → AD + CB**	(I) $Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$ (Sodium sulphate) (Barium chloride) (Barium sulphate) (Sodium chloride) Colourless Soln WHITE INSOLUBLE SOLID / White precipitate Colourless Soln Colourless Soln (II) $2KI(aq) + Pb(NO_3)_2(aq) \rightarrow PbI_2(s) + 2KNO_3(aq)$ Lead iodide Potassium nitrate Colourless Soln YELLOW INSOLUBLE SOLID / Yellow precipitate Potassium iodide Lead nitrate

DOUBLE DISPLACEMENT REACTION

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Precipitation Reaction The reaction in which aqueous solutions of two ionic compounds or a gas and an aqueous solution of ionic compound react to form an insoluble solid, i.e. precipitate. **AB + CD → AD + CB**	III aq. soln of ionic compound, Gas $Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$ Colourless soln of limewater WHITE INSOLUBLE SOLID White precipitate of $CaCO_3$ OBSERVATION Colourless soln of $Ca(OH)_2$ turns milky / turbid due to formation of $CaCO_3$.

$$Ca(OH)_2 + CO_2 \longrightarrow CaCO_3 + H_2O$$

Bhaiya yahan par ions ka exchange nahi hua?

$$H_2O + CO_2 \rightarrow H_2CO_3$$

$$\underset{C\ \ A}{Ca(OH)_2}\ (aq) + \underset{C\ \ A}{H_2CO_3} \longrightarrow CaCO_3 + 2H_2O$$

$CaCO_3$ ↓ White insoluble solid

GIVE A THOUGHT

H.W.

NCERT Book

Take about 2 g barium hydroxide in a test tube. Add 1 g of ammonium chloride and mix with the help of a glass rod. Touch the bottom of the test tube with your palm. What do you feel? Is this an exothermic or endothermic reaction?

Research
(Using chatGPT)

LET'S PRACTICE

OFFICIAL CFQ

H.W → Research → 'chatGPT'

Trupti mixes an aqueous solution of sodium sulphate (Na_2SO_4) and an aqueous solution of copper chloride ($CuCl_2$).

Will this lead to a double displacement reaction? Justify your answer.

CBSE Previous Year Questions

CBSE 2024

Consider the following chemical equation :

$$a\,Al_2O_3 + b\,HCl \longrightarrow c\,AlCl_3 + d\,H_2O$$

$$1Al_2O_3 + 6HCl \longrightarrow 2AlCl_3 + 3H_2O$$

In order to balance this Chemical equation, the values of a, b, c and d must be

(A) 1, 6, 2 and 3

(B) 1, 6, 3 and 2

(C) 2, 6, 2 and 3

(D) 2, 6, 3 and 2

CBSE 2024

"The type of reactions in which (I) calcium oxide is formed, and (II) calcium hydroxide is formed are opposite reactions to each other." Justify this statement with the help of chemical equations.

(*) $CaCO_3(s) \xrightarrow[\text{or } \Delta]{\text{heat}} CaO(s) + CO_2$; Decomposition Rxn (Thermal decomposition)

(*) $CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq) + \text{heat}$; Combination Rxn

These are opposite reactions / inverse reactions to each other.

CBSE 2020

When hydrogen sulphide gas is passed through a blue solution of copper sulphate, a black precipitate of copper sulphide is obtained and the sulphuric acid so formed remains in the solution.

The reaction is an example of a:

(a) Combination reaction
(b) Displacement reaction
(c) Decomposition reaction
(d) Double displacement reaction

precipitation rxn → type of

Gas — Aqueous soln of ionic compound

$\underset{C\ A}{H_2S} + \underset{C\ A}{CuSO_4} \longrightarrow H_2SO_4 + CuS$ → black precipitate of copper sulphide

CBSE 2023

When aqueous solutions of potassium iodide and lead nitrate are mixed, an insoluble substance separates out. The chemical equation for the reaction involved is : 1

(a) $KI + PbNO_3 \longrightarrow PbI + KNO_3$

(b) $2KI + Pb(NO_3)_2 \longrightarrow PbI_2 + 2KNO_3$ → yellow precipitate

(c) $KI + Pb(NO_3)_2 \longrightarrow PbI + KNO_3$

(d) $KI + PbNO_3 \longrightarrow PbI_2 + KNO_3$

CBSE 2024

Write chemical equation for the chemical reaction which occurs when the aqueous solutions of barium chloride and sodium sulphate react together. Write the symbols of the ions present in the compound precipitated in the reaction.

$$\underset{C\ A}{BaCl_2}(aq) + \underset{C\ A}{Na_2SO_4}(aq) \longrightarrow \underset{\downarrow}{BaSO_4}(\downarrow) + 2NaCl(aq)$$

white insoluble solid / white ppt.

Ba^{2+}, SO_4^{2-} ⟶ ions present in precipitated compound

SAMAJ AAYA TOH
LIKH DO.
AYE BHAIYA

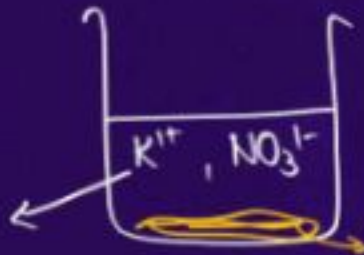

LIVE DOUBT SOLVING

Detailed explanation

$$2KI(aq) + Pb(NO_3)_2(aq) \longrightarrow PbI_2(s) + 2KNO_3(aq)$$

Before reaction

→ mix the reactants



In Solution ions of K^{1+} & NO_3^{1-} remains there

Yellow ppt. of PbI_2

→ NCERT Exemplar → Last Class of Chapter

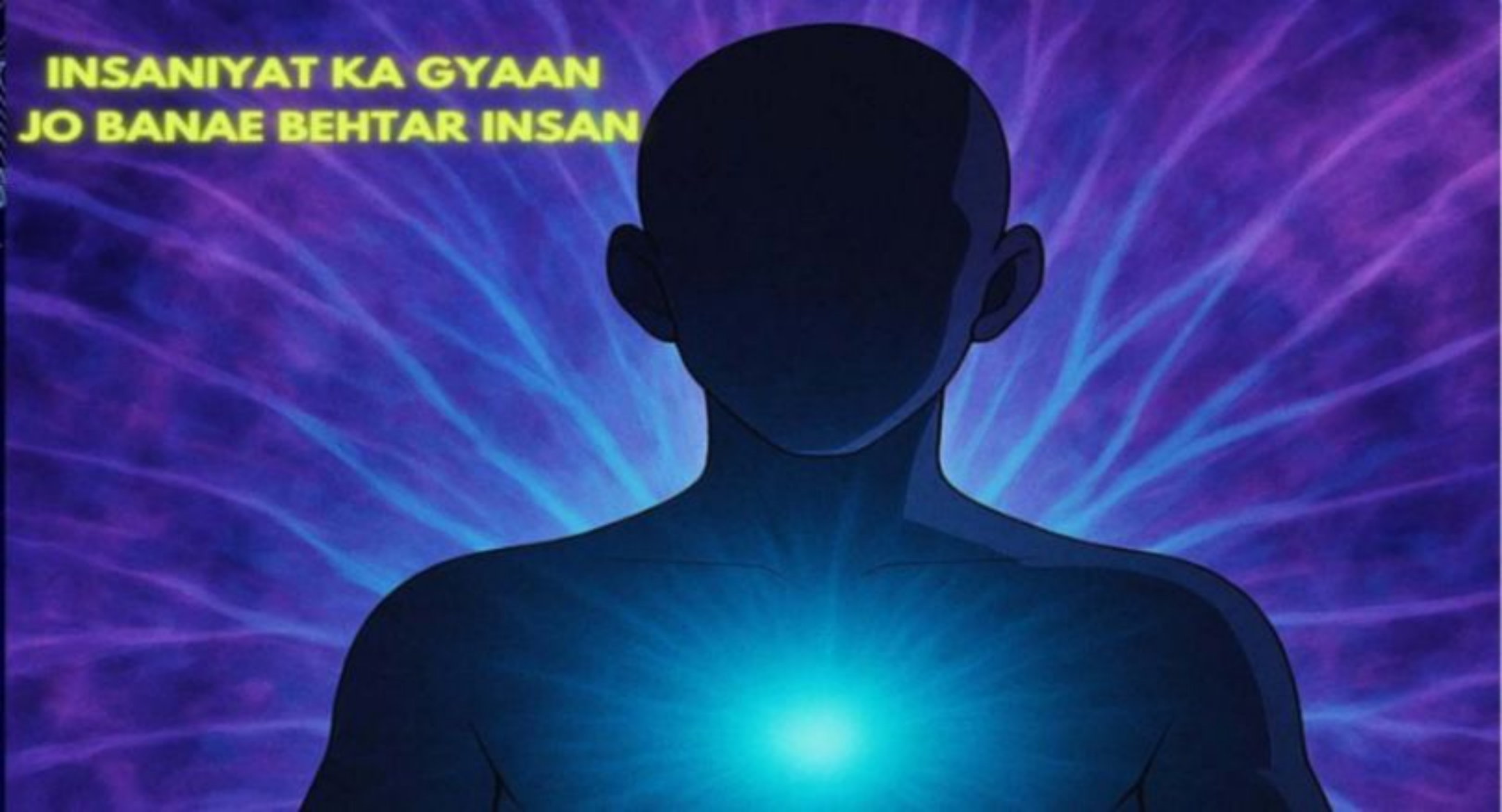
→ Redox Rxn → next lecture

→ Rancidity & Corrosion → next lecture

	White ppt.	Yellow ppt.	White ppt.	Black ppt.	White ppt.
→	$BaSO_4$	PbI_2	$CaCO_3$	CuS	$AgCl$
Cation →	Ba^{2+}	Pb^{2+}	Ca^{2+}	Cu^{2+}	Ag^{1+}
Anion →	SO_4^{2-}	I^{1-}	CO_3^{2-}	S^{2-}	Cl^{1-}

Valency

CONCEPT POLISH - HOMEWORK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Lecture 07

Chemical Reactions and Equations

Master Redox Reactions and Effects of Oxidation in Daily Life

BY – PRIYA-PUTRA-SUNIL Sir

TOPICS TO BE COVERED

(i) Redox Reactions ✓

(ii) Types of Redox Reactions – Effects in Daily Life ✓


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RIDDLE WALLAH

Decode the below chat!

_HI_ _ _ [Chemical symbols of hydrogen and iodine]

HeY_ _ [Chemical symbols of helium and yttrium]

You are a _NICe_ _ _ (Chemical symbols of nitrogen, iodine and cerium) human being.

_Ok_ _ [Chemical symbols of oxygen and potassium]

Beat Your Brains Out! 'Extra'

Can double displacement rxn happen when reactants are in solid state?

(A) Yes ✓

(B) No

↓

In video, we have taken $Pb(NO_3)_2(s)$ & $KI(s)$ & then they are shaken which provides energy for rxn to happen.

Products formed: $PbI_2(s)$ & $KNO_3(s)$

Type of rxn: Mechanochemical Rxn [Double displacement rxn]

CONCEPT POLISH – HOMEWORK DISCUSSION

GIVE A THOUGHT

actual eqn

$$Ba(OH)_2 \cdot 8\,H_2O(s) + 2\,NH_4Cl(s) \rightarrow BaCl_2 \cdot 2\,H_2O(s) + 2\,NH_3(aq) + 8\,H_2O(l)$$

'NCERT'

Take about 2 g barium hydroxide in a test tube. Add 1 g of ammonium chloride and mix with the help of a glass rod. Touch the bottom of the test tube with your palm. What do you feel? Is this an exothermic or endothermic reaction?

for sake of understanding →

$$\underset{C\ A}{Ba(OH)_2} + \underset{C\ A}{NH_4Cl} + \text{heat (from surroundings)} \longrightarrow BaCl_2 + NH_4OH \rightarrow NH_3 + H_2O$$

Video: Water between wooden block and beaker freezes and that's why beaker got stuck with the wooden block. Hence, it is a/an:

- ✓ Endothermic reaction
- ✓ Solid-solid double displacement reaction

OFFICIAL CFQ

$\underset{C\ A}{Na_2SO_4}(aq) + \underset{C\ A}{CuCl_2}(aq) \longrightarrow$ no chemical rxn is happening!

Trupti mixes an aqueous solution of sodium sulphate (Na_2SO_4) and an aqueous solution of copper chloride ($CuCl_2$).

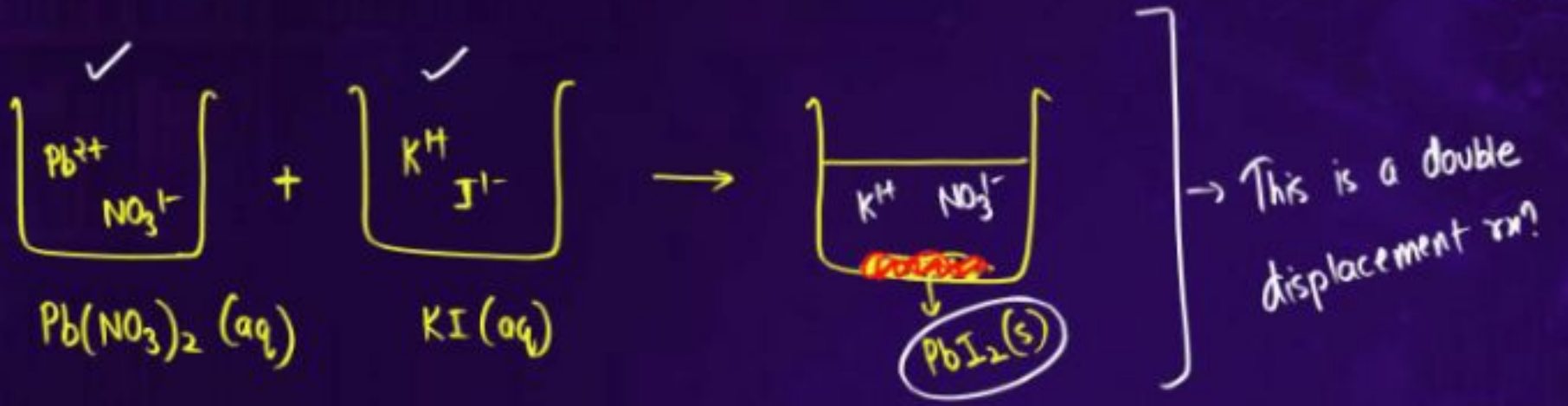
Will this lead to a double displacement reaction? Justify your answer.

cbse.nic.in → Handbooks → CBSE 2022-23 → CFQ Book → Q.7.

NO!

→ when an insoluble solid is formed → Precipitation Rxn
→ a gas is formed → Gas forming rxn
→ salt & water are formed → Neutralisation rxn

same ions as reactants remain in the solution & no new products are formed


Pb^{2+}
NO_3^{1-}
K^{1+}
I^{1-}
K^{1+} NO_3^{1-}
$PbI_2(s)$
$Pb(NO_3)_2$ (aq)
KI (aq)
→ This is a double displacement rxn?

SAMAJ AAYA TOH
LIKH DO.
AYE BHAIYA

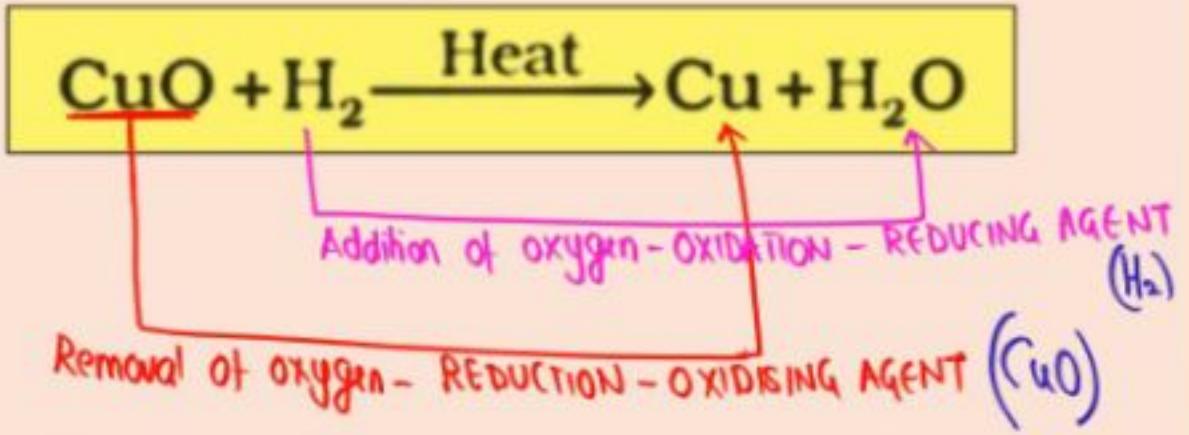
REDOX REACTIONS

Reduction Oxidation

REDOX REACTION

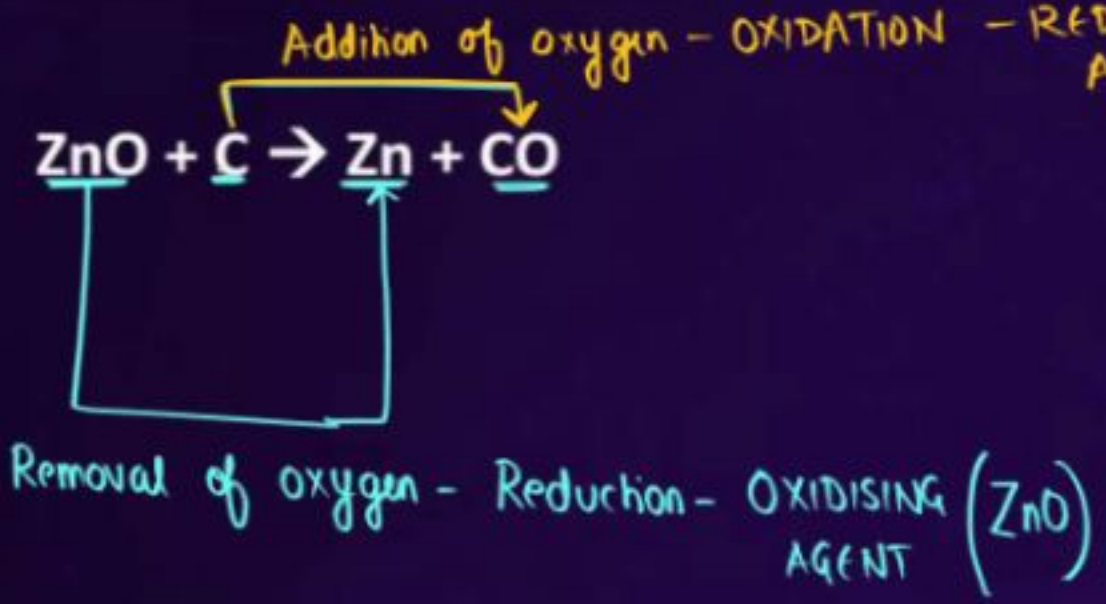
TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Redox Reaction A chemical reaction in which **reduction** and **oxidation** take place simultaneously. एक साथ हो रहे होंगे। **Oxidation:** • Addition of oxygen ✓ • Removal of hydrogen ✓ • Both ✓ **Reduction:** • Addition of hydrogen ✓ • Removal of oxygen ✓ • Both ✓	REDDISH BROWN SHINY BROWN — REDUCTION — BLACK (I) $2Cu(s) + O_2(g) \xrightarrow{Heat} 2CuO(s)$ (from air) Combination Rxn as well addition of oxygen - OXIDATION • Cu oxidised to CuO • O_2 reduced to CuO Black — shiny brown or reddish brown addition of oxygen → OXIDATION (II) $CuO(s) + H_2(g) \xrightarrow{Heat} Cu(s) + H_2O(g)$ Removal of oxygen - REDUCTION • CuO reduced to Cu • H_2 oxidised to H_2O

REDOX REACTION

TYPE OF REACTION	REACTION DETAILS AND EXAMPLES
Redox Reaction A chemical reaction in which **reduction** and **oxidation** take place simultaneously. **Oxidation:** • Addition of oxygen • Removal of hydrogen • Both **Reduction:** • Addition of hydrogen • Removal of oxygen • Both	• **Oxidising Agent/Oxidant:** One that gets reduced • **Reducing Agent/Reductant:** One that gets oxidised 

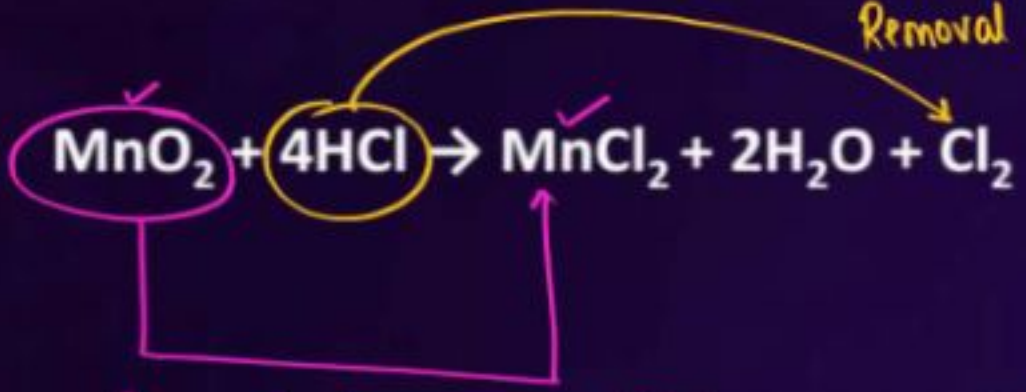
Let's analyse the below reaction!

NCERT



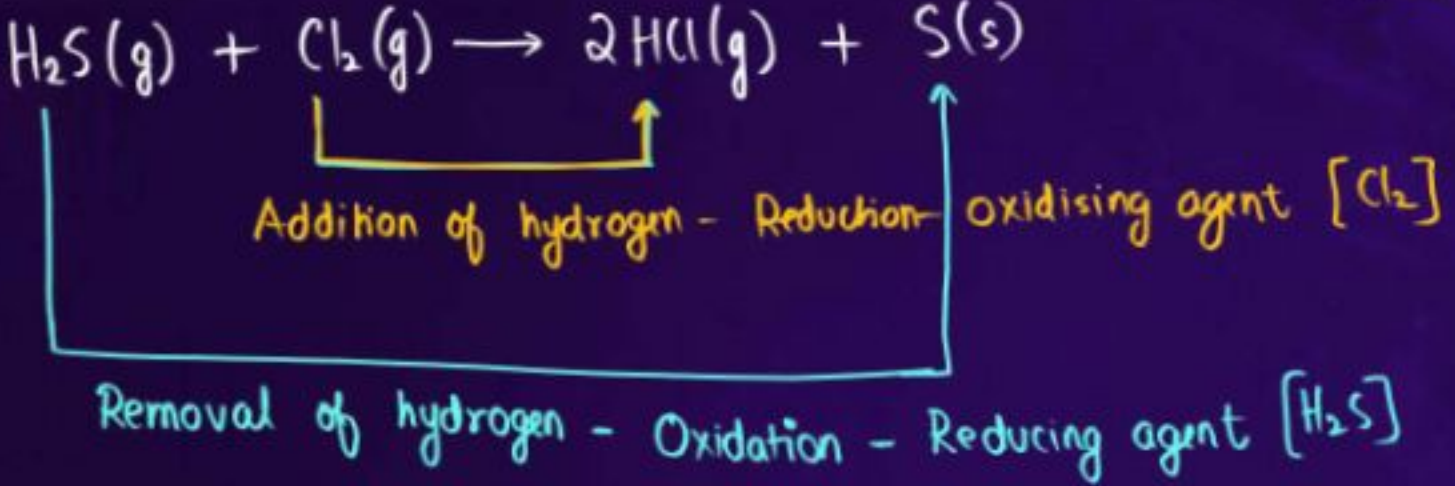
Let's analyse the below reaction!

NCERT



[Let's Try]

Which is reduced, oxidised, oxidising agent & reducing agent?



Is it right to say that [generally (I) displacement rxn are exothermic] while [all displacement rxn are redox (II)]?

(A) Yes

(B) No

PYQS' WALLAH

CBSE 2024

Which of the following is a redox reaction, but ***not*** a combination reaction ?

(A) $C + O_2 \rightarrow CO_2$ → Combination Rx^n

(B) $2\,H_2 + O_2 \rightarrow 2\,H_2O$

(C) $2\,Mg + O_2 \rightarrow 2\,MgO$

(D) $Fe_2O_3 + 3\,CO \rightarrow 2\,Fe + 3\,CO_2$

Removal of oxygen
↓
Reduction
↓
Oxidising agent
↓
Fe_2O_3

Addition of oxygen
↓
OXIDATION
↓
REDUCING AGENT → CO

CBSE 2020

In the reaction:

$MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$

(a) Name the compound (i) oxidised (ii) reduced.

(b) Define oxidation and reduction on its basis.

(a) Hydrogen is removed from HCl to form Cl_2. Hence, HCl has been oxidised to Cl_2 and it is obvious that MnO_2 has been reduced.

(b) Oxidation is a process in which there is a removal of hydrogen from a substance while reduction is a process in which there is a removal of oxygen from a substance.

SAMAJ AAYA TOH
LIKH DO.

AYE BHAIYA

TYPES OF REDOX REACTIONS – EFFECTS IN DAILY LIFE

In ncert, it is mentioned effects of oxidation in daily life but reduction also happens!

TYPES OF REDOX REACTION

(विकल्पात्मक)

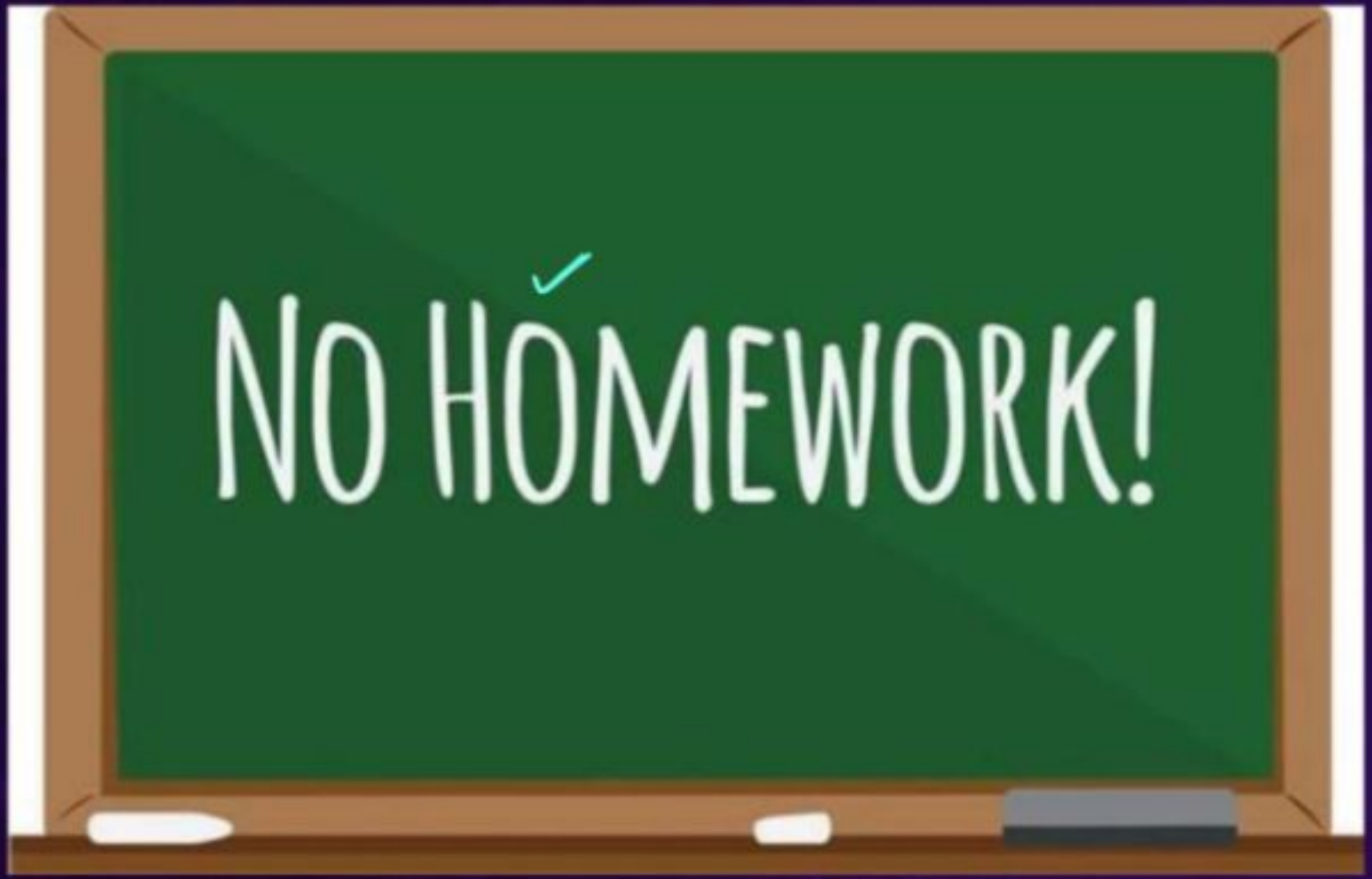
TYPES OF REDOX REACTIONS	OTHER DETAILS
(I) **Rancidity/Rancidification** Oxidation of oil/fat containing food items resulting in (bad smell and taste) in syllabus Types of rancidity (i) Oxidative (because of O_2) (✓) (ii) Water (✓) (iii) Micro-organisms (✓)	**Ways to Prevent Rancidity** (*) Addition of antioxidants (Vitamin C, Vitamin E etc.) that inhibit the oxidation. (*) Filling of nitrogen/helium gas like in chip packets that are placed in place of air. (contains O_2) (*) Refrigeration of food items lowers down the speed of oxidation of food items

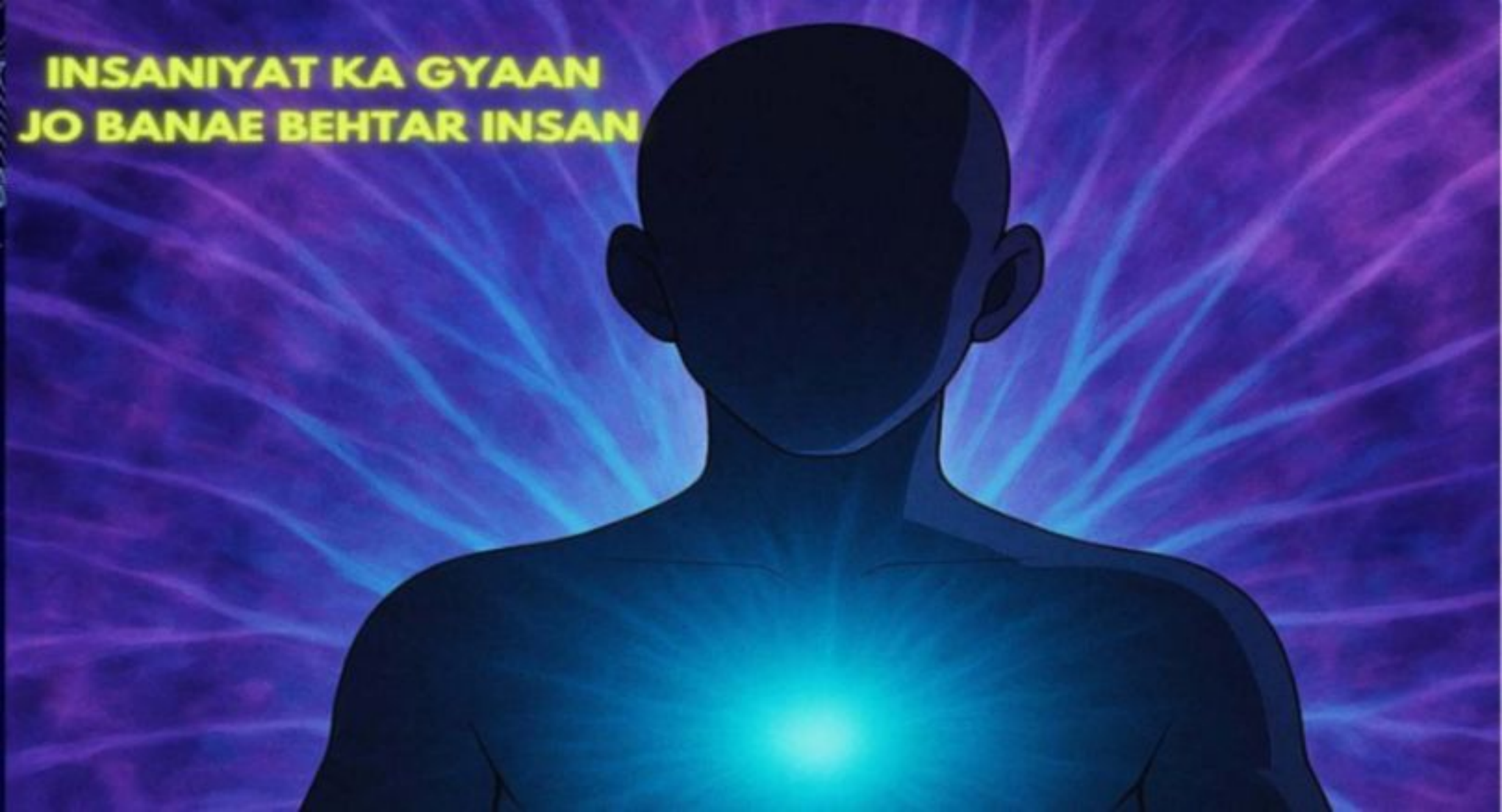
oxidative
ascorbic acid
unreactive gases

SAMAJ AAYA TOH
LIKH DO.

AYE BHAIYA

CONCEPT POLISH - HOMEWORK


NO HOMEWORK!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Thank You

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Chemistry **Lecture 08**

Chemical Reactions and Equations

Important NCERT and NCERT Exemplar Problems

BY – PRIYA-PUTRA-SUNIL Sir

TOPICS TO BE COVERED

(i) Types of Redox Reactions – Effects in Daily Life – Part II ✓

(ii) Some Important NCERT Problems ✓

(iii) Some Important NCERT Exemplar Problems ✓


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RIDDLE WALLAH

Which is your favourite movie?

Name is made from chemical symbol of Potassium-Aluminium Hydrogen-Oxygen Sodium Hydrogen-Oxygen

KAl HO Na HO

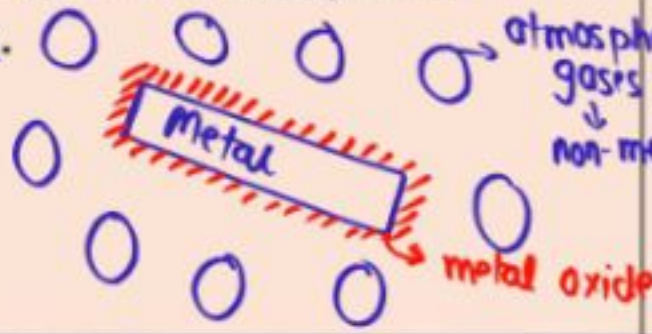
Yeh kya bol dia?

Udaanians btaenge Hasmukhlal ji...

TYPES OF REDOX REACTIONS – EFFECTS IN DAILY LIFE – PART II

TYPES OF REDOX REACTION

Cons → Statement not in favour of

TYPES OF REDOX REACTIONS	OTHER DETAILS
Corrosion (संक्षारण) It is a surface deterioration (degradation) process of metals in which they convert to a more stable form, i.e. oxides, sulphides, carbonates and more, due to the attack of atmospheric gases.  	**Types of Corrosion - Rusting** Happens in iron and a reddish-brown layer is formed on iron which is called **rust.** Iron + Oxygen + Water-vapour → Rust **Cons of Corrosion - Rusting** • Rust is a flaky (non-sticky) layer that is very brittle and peels-off. It then exposes the fresh iron layer to moisture and oxygen. This continuous cycle makes iron objects weak and can collapse buildings and bridges, break oil pipelines and more.

TYPES OF REDOX REACTION

TYPES OF REDOX REACTIONS	OTHER DETAILS
Corrosion It is a surface deterioration process of metals in which they convert to a more stable form, i.e. oxides, sulphides, carbonates and more, due to the attack of atmospheric gases. 	**Types of Corrosion - Tarnishing** • Tarnishing: Happens in copper, silver etc. and a green layer is formed on copper while a black layer is formed on silver. This protective layer is called **patina**. statement in favour of **Pros of Corrosion - Tarnishing** • Patina seems to be helpful for some of the metals like Copper (Cu), which on oxidation forms an impervious protective layer that protects further corrosion (here tarnishing) of metal.

TYPES OF REDOX REACTION

RUSTING OF IRON

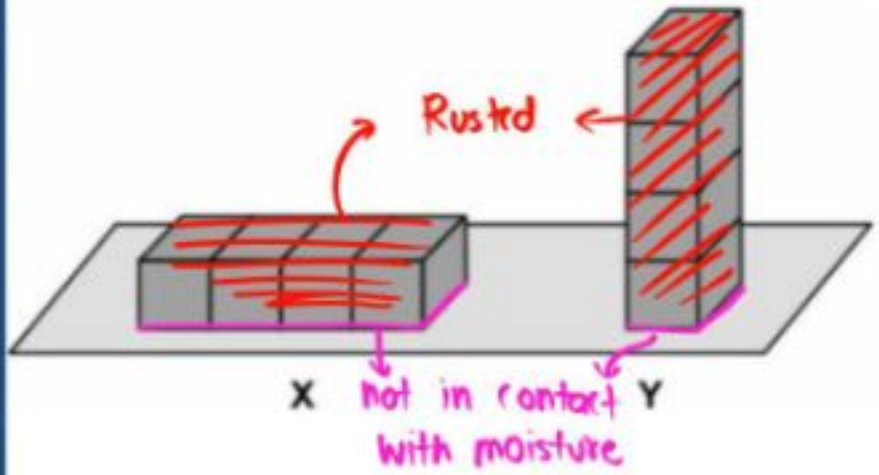
TARNISHING OF SILVER

TARNISHING OF COPPER

LET'S PRACTICE

OFFICIAL CFQ

Eight identical, iron blocks are placed on the ground in the two arrangements X and Y as shown below. The block arrangements are kept moist by sprinkling water every few hours



Y will get more rusted!

Which of the arrangements is likely to gather more rust after ten days? Justify your answer.

SAMAJ AAYA TOH
LIKH DO.
AYE BHAIYA

They are a bit different!

all problems of NCERT are imp

SOME IMPORTANT NCERT INTEXT AND EXERCISE PROBLEMS

NCERT Intext, P.N. 10, Question 01

A solution of a substance 'X' is used for white washing.

(i) Name the substance 'X' and write its formula.

(ii) Write the reaction of the substance 'X' named in (i) above with water.

(i) X: Solution of CaO (Quicklime/Burnt lime) is used for whitewashing.

(ii) $CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq) + \text{heat}$

(Quick lime) / Burnt lime / lime — (Slaked lime)

NCERT Intext, P.N. 13, Question 03

Identify the substances that are oxidised and the substances that are reduced in the following reactions.

(i) $4Na(s) + O_2(g) \rightarrow 2Na_2O(s)$

(ii) $CuO(s) + H_2(g) \rightarrow Cu(s) + H_2O(g)$

(i) Na: It has been oxidised and hence, it acts as a reducing agent.

O_2: If sodium has been oxidised then oxygen has been reduced and it acts as an oxidising agent.

(ii) CuO: Removal of oxygen takes place from copper oxide; it has been reduced and hence, it acts as an oxidising agent.

H_2: Addition of oxygen takes place on hydrogen; it has been oxidised and hence, it acts as a reducing agent.

NCERT Exercise, Question 05

Translate the following statements into chemical equations and then balance them.

(a) Hydrogen gas combines with nitrogen to form ammonia.

(b) Hydrogen sulphide gas burns in air to give water and sulpur dioxide.

[oxygen, 20.95 % in air]

(a) $3H_2(g) + N_2(g) \longrightarrow 2NH_3(g)$ or (↑)

(b) $2H_2S(g) + 3O_2(g) \longrightarrow 2H_2O(l) + 2SO_2(g)$ or (↑)

NCERT Exercise, Question 05

SO_4^{2-} → sulphate (polyatomic ion)

Translate the following statements into chemical equations and then balance them.

(c) Barium chloride reacts with aluminium sulphate to give aluminium chloride and a precipitate of barium sulphate.

(d) Potassium metal reacts with water to give potassium hydroxide and hydrogen gas.

(c) $3BaCl_2(aq) + Al_2(SO_4)_3(aq) \longrightarrow 2AlCl_3(aq) + 3BaSO_4(\downarrow)$ or (s) or (ppt.)

$BaCl_2$ → Colourless Soln

$AlCl_3$ → Colourless Soln

$BaSO_4$ → White ppt.

(d) $2K(s) + 2H_2O(l) \longrightarrow 2KOH(aq) + H_2(\uparrow)$ or (g)

SOLUTION

Official answers

i. $3H_{2(g)} + N_{2(g)} \longrightarrow 2NH_{3(g)}$

Hydrogen Nitrogen Ammonia

ii. $2H_2S_{(g)} + 3O_{2(g)} \longrightarrow 2H_2O_{(l)} + 2SO_{2(g)}$

Hydrogen sulphide; Oxygen; Water; Sulphur dioxide

iii. $3BaCl_{2(aq)} + Al_2(SO_4)_{3(aq)} \longrightarrow 2AlCl_{3(aq)} + 3BaSO_{4(s)}\downarrow$

Barium chloride; Aluminium sulphate; Aluminium chloride; Barium sulphate

iv. $2K_{(s)} + 2H_2O_{(l)} \longrightarrow 2KOH_{(aq)} + H_{2(g)}$

Potassium; Water; Potassium hydroxide; Hydrogen

NCERT Exercise, Question 08

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

(a) Potassium bromide(aq) + Barium iodide(aq) → Potassium iodide(aq) + Barium bromide(s)

(b) Zinc carbonate(s) → Zinc oxide(s) + Carbon dioxide(g)

Colourless Soln

white ppt.

(a) $2\underset{C}{K}\underset{A}{Br}(aq) + \underset{C}{Ba}\underset{A}{I_2}(aq) \longrightarrow 2KI(aq) + BaBr_2(s)$ or (↓) or (ppt.)

Double displacement rxn [Precipitation Rxn]

(b) $ZnCO_3(s) \xrightarrow[\text{or } \Delta]{\text{heat}} ZnO(s) + CO_2(g)$ or (↑)

Thermal decomposition rxn

SOLUTION

Official answer

i. $2KBr_{(aq)} + BaI_{2(aq)} \longrightarrow 2KI_{(aq)} + BaBr_{2(s)}$

Potassium bromide	Barium iodide	Potassium iodide	Barium bromide

It is a double displacement reaction.

ii. $ZnCO_{3(s)} \longrightarrow ZnO_{(s)} + CO_{2(g)}$

Zinc carbonate	Zinc oxide	Carbon dioxide

It is a decomposition reaction.

NCERT Exercise, Question 08

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

(c) Hydrogen(g) + Chlorine(g) → Hydrogen chloride(g)

(d) Magnesium(s) + Hydrochloric acid(aq) → Magnesium chloride(aq) + Hydrogen(g)

(c) $H_2(g) + Cl_2(g) \xrightarrow[\text{or heat}]{\text{Sunlight}} 2HCl(g)$

Combination Rxn
[Element - element]

(d) $Mg(s) + 2\text{dil.}HCl(aq) \longrightarrow MgCl_2(aq) + H_2(\uparrow)$

Displacement Rxn
[metal - nonmetal]

SOLUTION

iii. $H_{2(g)} + Cl_{2(g)} \longrightarrow 2HCl_{(g)}$

Hydrogen Chlorine Hydrogen chloride

It is a combination reaction.

iv. $Mg_{(s)} + 2HCl_{(aq)} \longrightarrow MgCl_{2(aq)} + H_{2(g)}$

Magnesium Hydrochloric acid Magnesium chloride Hydrogen

It is a displacement reaction.

NCERT Exercise, Question 10

Why is respiration considered an exothermic reaction? Explain.

During aerobic respiration the following reaction takes place:

$$\underset{\text{(Glucose)}}{C_6H_{12}O_6(aq)} + 6O_2(aq) \rightarrow 6CO_2(aq) + 6H_2O(l) + \text{energy}$$

Energy is released and hence, it is an exothermic reaction!

NCERT Exercise, Question 17

A shiny brown coloured element 'X' on heating in air becomes black in colour. Name the element 'X' and the black coloured compound formed.

- X: Copper (Cu)
- On heating copper reacts with oxygen to form a black coloured oxide of CuO. The following reaction takes place:

$$2\,Cu(s) + O_2(g) \rightarrow 2CuO(s)$$

Cu: shiny brown/reddish-brown

CuO: Black

NCERT Exercise, Question 19

Oil and fat containing food items are flushed with nitrogen. Why?

or helium

air → (contains 20.95% O_2)

In chip packets, the ~~oxygen gas~~ is replaced with nitrogen to prevent the oxidation of chips. Moreover, nitrogen does not react with the chips to change their odour and taste. Hence, the chips retain their original taste and odour.

or helium

(II) Also, vacuum packing can't be done because chips or other oily / fat containing food items will break during transportation.

↓

That's why we flush nitrogen or helium gas which provides cushion to food items so they don't break during transportation.

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different ones

all are imp.

SOME IMPORTANT NCERT EXEMPLAR PROBLEMS

QUESTION ★★★ CBSE PYQ

↳ reductant → oxidised in rxn

Identify the reducing agent in the following reactions.

(a) $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

Addition of hydrogen – Reduction – Oxidant

Addition of oxygen, Removal of hydrogen – Oxidation – Reductant

(b) $H_2O + F_2 \rightarrow HF + HOF$

↓ Reductant

Addition of hydrogen – Reduction – oxidant

(c) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

Addition of oxygen – oxidation – reductant

Removal of oxygen – Reduction – Oxidant

(d) $2H_2 + O_2 \rightarrow 2H_2O$

addition of oxygen – Oxidation – reductant

↳ oxidant

SOLUTION

(a) Ammonia (NH_3)

(b) Water (H_2O) as F_2 is getting reduced to HF

(c) Carbon monoxide (CO)

(d) Hydrogen

QUESTION

Balance the following chemical equations and identify the type of chemical reaction.

(a) $Mg(s) + Cl_2(g) \rightarrow MgCl_2(s)$ → Combination Rxn [Element - element]

(b) $2HgO(s) \xrightarrow{Heat} 2Hg(l) + O_2(g)$ → Thermal decomposition rxn

(c) $2Na(s) + S(s) \xrightarrow{Fuse} Na_2S(s)$ → Combination Rxn [Element - element]

(d) $TiCl_4(l) + 2Mg(s) \rightarrow Ti(s) + 2MgCl_2(s)$ → Displacement Rxn

(e) $CaO(s) + SiO_2(s) \rightarrow CaSiO_3(s)$ → Combination Rxn [Compound - Compound]

Silicon dioxide Calcium silicate

(f) $H_2O_2(l) \xrightarrow{UV} H_2O(l) + O_2(g)$ → Photolytic decomposition rxn

Hydrogen peroxide

SOLUTION

(a) Balanced; Combination reaction

(b) $2HgO\ (s) \xrightarrow{Heat} 2Hg\ (l) + O_2\ (g)$; Decomposition reaction

(c) $2Na\ (s) + S\ (s) \xrightarrow{Fuse} Na_2S\ (s)$; Combination reaction

(d) $TiCl_4\ (l) + 2Mg\ (s) \longrightarrow Ti\ (s) + 2MgCl_2\ (s)$; Displacement reaction

(e) Balanced; Combination reaction

(f) $2H_2O_2\ (l) \xrightarrow{UV} 2H_2O\ (l) + O_2\ (g)$; Decomposition reaction

QUESTION

Why do we store silver chloride/hydrogen peroxide/ (H_2O_2) in dark coloured bottles? ($Ag^{(1)}$) Silver bromide ($AgBr$)

SOLUTION

Why do we store silver chloride/hydrogen peroxide in dark coloured bottles?

They block the flow of light inside the bottle.

This in turns prevents the photolytic decomposition of photosensitive materials like silver chloride/hydrogen peroxide. / silver bromide

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CONCEPT POLISH - HOMEWORK

QUESTION

'Homework'

Identify the oxidising agent (oxidant) in the following reactions

(a) $Pb_3O_4 + 8HCl \longrightarrow 3PbCl_2 + Cl_2 + 4H_2O$

(b) $2Mg + O_2 \longrightarrow 2MgO$

(d) $V_2O_5 + 5Ca \longrightarrow 2V + 5CaO$

QUESTION

Identify the oxidising agent (oxidant) in the following reactions

(e) $3Fe + 4H_2O \longrightarrow Fe_3O_4 + 4H_2$

(f) $CuO + H_2 \longrightarrow Cu + H_2O$

SOLUTION

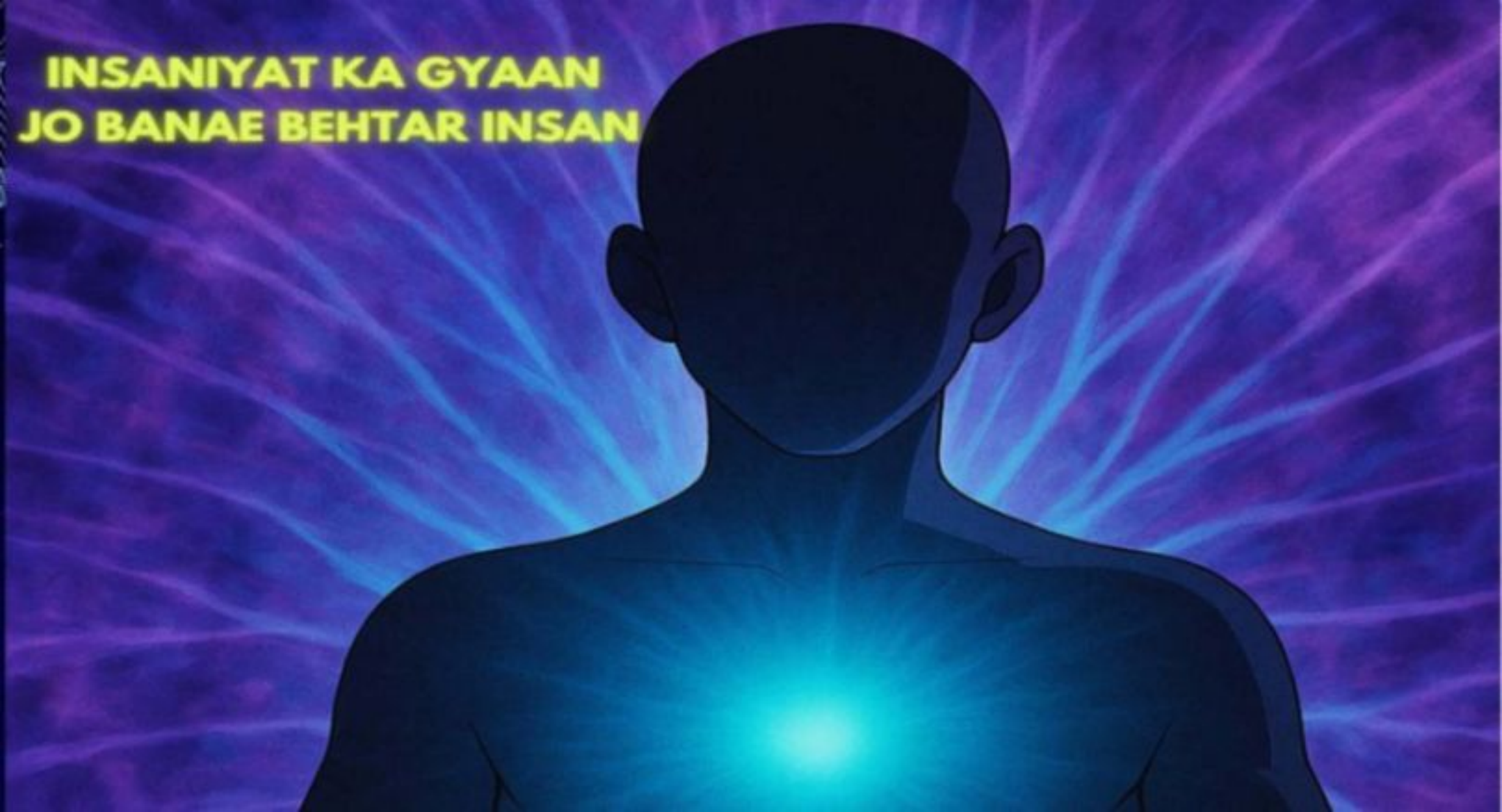
(a) Pb_3O_4

(b) O_2

(d) V_2O_5

(e) H_2O

(f) CuO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Thank You

CHEMICAL REACTIONS AND EQUATIONS

1. Chemical changes / Chemical reactions:

(i) Changes in which new substances are formed with entirely new properties are called chemical changes/ chemical reactions.

(ii) Chemical reactions are characterised by some easily observable features like evolution of a gas, formation of precipitate and change in colour, temperature or state.

2. Thermodynamics of chemical reactions:

The reactions in which heat is evolved are known as exothermic reactions while the reactions in which heat is absorbed are known as endothermic reactions.

3. Chemical Equation:

(i) A balanced chemical equation is an equation which has equal number of atoms of each element on both reactant and product sides.

(ii) A chemical equation can be made more informative by mentioning physical states of the substances involved, heat changes involved in the reaction and conditions under which the reaction takes place.

4. Types of chemical reactions:

Combination Reaction

The reaction in which two or more reactants combine together to form a single product is called combination reaction.

Generally, in all combination reactions, heat is evolved i.e., almost all combination reactions are exothermic.

For example: $C(s) + O_2(g) \longrightarrow CO_2(g)$

Decomposition Reaction

The reaction in which a single reactant breaks down to give two or more simpler products is called a decomposition.

For decomposition reactions, energy must be supplied either in the form of heat, light or electricity i.e., decomposition reactions are generally endothermic in nature.

For example: $CaCO_3(s) \xrightarrow{\Delta} CaO(s) + CO_2(g)$

THERMAL DECOMPOSITION REACTION

$AgCl(s) \xrightarrow{\text{Sunlight}} Ag(s) + Cl_2(g)$

$H_2O(l) \xrightarrow{\text{Electricity}} H_2(g) + \frac{1}{2} O_2(g)$

Displacement Reaction

The reaction in which a more reactive element displaces a less reactive element from its salt solution is called displacement reaction.

For example: $Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s)$

Double Displacement Reaction

The reaction in which two compounds react by an exchange of ions to form two new compounds is called a double displacement reaction.

For example: $BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4\downarrow + 2NaCl(aq)$

Acid-Base neutralization reactions are double displacement reactions.

Oxidation is defined as:

(a) Addition of oxygen
(b) Removal of hydrogen
(c) Loss of electron

Reduction is defined as:

(a) Removal of oxygen
(b) Addition of hydrogen
(c) Gain of electron

Redox reaction

A reaction in which both oxidation and reduction occur simultaneously is Known as redox reaction.

For example: $CuO + H_2 \xrightarrow{\Delta} Cu + H_2O$

Here, CuO is getting reduced to Cu

H_2 is getting oxidised to H_2O

→ Oxidizing Agent

A substance that oxidises other chemical substance and reduces itself.

→ Reducing Agent

A substance that reduces other chemical substance and oxidises itself.

For example:

$$SO_2 + 2H_2S \longrightarrow 2H_2O + 3S$$

Here, SO_2 is reduced to sulphur,
So it is an oxidizing agent.
H_2S is oxidized to sulphur,
So it is a reducing agent.

For example:

$$Fe_2O_3(s) + 2Al(s) \longrightarrow 2Fe(l) + Al_2O_3(s)$$

Here, Fe_2O_3 is reduced to Fe,
So it is an oxidizing agent.

Al is oxidized to Al_2O_3,
So it is a reducing agent.

5. Redox Reactions in everyday life:

(i) Some common effects of oxidation reactions observed in our daily life are corrosion and rancidity.

(ii) Corrosion is the slow degradation of metal surfaces by the action of air, moisture, or a chemical on their surface.

(iii) Some of the examples of corrosion are the development of green coating on copper, tarnishing of silver, and rusting of iron.

(iv) Formation of brown material on the surface of iron objects is called rusting and the brown material is called Rust.

Rust is mainly the hydrated ferric oxide.

Its general formula is $Fe_2O_3.xH_2O$.

Rusting of iron occurs in the presence of both moisture and air. Rusting does not occur in dry air or water free from air.

(v) Rusting can be prevented or the metal can be protected from rusting by Galvanisation, electro-plating, tin plating, alloy formation, application of paint, and grease.

(vi) Rancidity is the aerial oxidation of fat/oil-containing food materials indicated by unpleasant smell and taste.