UDAAN

2025

Bharat Mata Ki Jay ♡

CHEMICAL REACTIONS AND EQUATIONS

Balancing of Chemical Equations – Practice

|| Limitations of Chemical Equations

↳ and Their Removal

CHEMISTRY | Lecture - 03

BY: SUNIL BHAIYA

Topics

to be covered

1. Practice Problems on Balancing of Chemical Equations
2. Limitations of Chemical Equations and Their Removal


SUNIL BHAIYA
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Knowledge Ride On

Practice Problems On Balancing of Chemical Equations

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Limitations of Chemical Equations and Their Removal

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Efficiency Hacks by Sunil Bhaiya

Knowledge Ride On

Insaniyat Ka Gyaan

RIDDLE WALLAH

Can you identify the two words of this famous reel 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?

(D) (isotope of hydrogen)

BaDO - BaDI

RIDDLE WALLAH

Can you identify the two words of this famous reel 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?

Chahat Fateh Ali
Khan Be Like

Thanks Sunil Bhaiya!

Concept Polish (गृहकार्य) – Homework Discussion

QUESTION

kya balancing ke steps exam me likhne h? → No

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

$$a\,Fe_2O_3 + b\,CO \longrightarrow c\,Fe + d\,CO_2$$

Element	no. of atom on: Reactant side	Product side
Fe	2	$1 \times 2 = 2$
O	$3 + (1) \times 3 = 6$	$2 \times 3 = 6$
C	$1 \times 3 = 3$	$1 \times 3 = 3$

Fe_2O_3 → Compound with maxm no. of atoms → Oxygen has maxm no. of atoms

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

a = 1, b = 3, c = 2, d = 3

Practice Problems on Balancing of Chemical Equations

NCERT Exemplar

Balance the given chemical equation by identifying the values of stoichiometric coefficents using algebraic method.

$$a\,Mg + b\,O_2 \longrightarrow c\,MgO$$

MgO → Compound → Oxygen [Element]

Element	no. of atoms on: Reactant Side	Product Side
Mg	$1 \times 2 \to 2$	$1 \times 2 \to 2$
O	2	$1 \times 2 \to 2$

$$2\,Mg + 1\,O_2 \longrightarrow 2\,MgO$$

a = 2, b = 1, c = 2

NCERT Exemplar

aye bhaiya ☺

Balance the given chemical equation by identifying the values of stoichiometric coefficents.

$$aCH_4 + bO_2 \longrightarrow cCO_2 + dH_2O$$

CH_4 → Compound with max^m no. of atoms

↓

H element

(A) a=2, b=3, c=3, d=2

(B) a=2, b=2, c=2, d=2

(C) a=1, b=2, c=1, d=2 ✓

(D) a=2, b=1, c=2, d=1

no. of atoms on:

Element	Reactant Side	Product Side
C	1	1
H	4	2×2 = 4
O	2×2 = 4	2 + (1×2) = 4

$a=1 \leftarrow (1)CH_4 + (2)O_2 \longrightarrow (1)CO_2 + (2)H_2O$

b=2 (O₂); c=1 (CO₂); d=2 (H₂O)

NCERT Exemplar

Balance Polyatomic Ions First

CH_3COO^{1-} (acetate ion)

Balance the given chemical equation by identifying the values of stoichiometric coefficents.

Lead(II) acetate — hydrochloric acid — Lead(II) chloride — ethanoic acid / acetic acid

$$a\,Pb(CH_3COO)_2 + b\,HCl \longrightarrow c\,PbCl_2 + d\,CH_3COOH$$

$$1\,Pb(CH_3COO)_2 + 2\,HCl \longrightarrow 1\,PbCl_2 + 2\,CH_3COOH$$

$a = 1$, $b = 2$, $c = 1$, $d = 2$

Balanced Chemical Eqn

	Pb	CH_3COO
Valency	2	1

$Pb(CH_3COO)_2$

Lead(II) acetate

KYA BOLTI PUBLIC

aye
bhaiya ♡

Drawbacks or → कमी क्या है?

Limitations of Chemical Equations and Their Removal

(ii) Physical States of Reactants and Products

(अभिकारक) (उत्पाद)

C-I

Physical state	Symbol
Solid	(s)
Liquid	(l)
Gas	(g) or (↑)
Aqueous solution (Water as solvent)	(aq)
Precipitate	(ppt.) or (↓) or (s)

gas is evolved or released

Insoluble solid formed a ppt

C-II

(i) Word equation

(ii) Skeletal Chemical Equation

[Unbalanced Chemical Eqn]

(iii) Balanced Chemical Equation

(iv) Make it informative

ex:

(i) Zinc + Sulphuric acid → Zinc sulphate + Hydrogen gas

(ii) & (iii) $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

(iv) $Zn(s) + H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$

How to Identify Physical States of Reactant(s) and Product(s)?

1. Metals are found in solid state at room temperature (25 °C) except mercury (Hg) which is found in liquid state.

Some e.g.: Li(s), Na(s), Mg(s), Al(s), K(s), Ca(s), Fe(s), Ag(s), Au(s), Cu(s), Hg(l) Zn(s), Pb(s) etc.

How to Identify Physical States of Reactant(s) and Product(s)?

2. Non-metals are found in all three physical states at room temperature (25 °C). (अधातु)

Some e.g.: $O_2(g)$, $N_2(g)$, $H_2(g)$, $F_2(g)$, $Cl_2(g)$, $Br_2(l)$, $I_2(s)$, $C(s)$ etc.

reddish-brown liquid

Only non-metal found in liquid state at room temperature

How to Identify Physical States of Reactant(s) and Product(s)?

यौगिक

3. Some compounds are found in solid state at room temperature (25 °C). When we heat and melt them they are converted to liquid state. Also, if they are soluble in water they form aqueous solutions.

For e.g.:

Sodium chloride (NaCl) →

(I) at Room temp. (25 °C)
Solid, NaCl(s)

(II) $NaCl(s) \xrightarrow{800^\circ C} NaCl(l)$, molten/fused NaCl

(III) $NaCl(s) \xrightarrow{\text{dissolve in } H_2O} NaCl(aq)$, Aqueous soln of NaCl/ Brine soln

How to Identify Physical States of Reactant(s) and Product(s)?

4. Some compounds are found in liquid state or gaseous state at room temperature (25 °C).

Some e.g.: $H_2O(l)$, $CO_2(g)$, $NH_3(g)$, $SO_2(g)$, $H_2S(g)$ etc.

- $H_2O(l)$ → Water
- $CO_2(g)$ → Carbon dioxide gas
- $NH_3(g)$ → Ammonia gas
- $SO_2(g)$ → Sulphur dioxide gas
- $H_2S(g)$ → Hydrogen sulphide gas

How to Identify Physical States of Reactant(s) and Product(s)?

5. Some compounds are insoluble in water which are formed after a chemical reaction and hence, form insoluble solid, i.e. precipitate.

Some e.g.: $BaSO_4(s)$, $PbI_2(s)$, $CaCO_3(s)$, $AgCl(s)$, $CuS(s)$ etc.

Colour of precipitate: White, Yellow, White, Black

6.

Sulphuric acid , $\rightarrow H_2SO_4(aq)$

Nitric acid , $\rightarrow HNO_3(aq)$

Carbonic acid , $\rightarrow H_2CO_3(aq)$

Hydrochloric acid , $\rightarrow HCl(aq)$

Let's Practice

Which symbol should be used after $ZnSO_4$ if it is soluble in water?

(A) (s)

(B) (l)

(C) (aq)

(D) (↓)

$ZnSO_4(aq)$

↓

water is solvent

$$Zn(s) + H_2SO_4(aq) \longrightarrow ZnSO_4(aq) + H_2(\uparrow \text{ or } g)$$

(ii) Concentration of an Acid / Base

Acid / Base	Symbol
Concentrated →	conc.
Dilute →	dil.

Metal + dil. Acid → Salt + Hydrogen gas

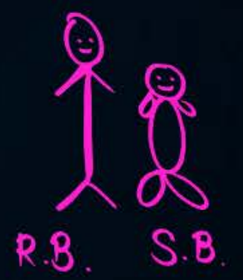
$Zn(s) + \text{dil.}\ H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g)$ or (↑)

Concentrated acid / base → more no. of particles of acid / base in a particular volume of solvent than diluted acid / base.

Relative Terms

Analogy

कौन मोटा है?



S.B.

Sh.B.

(iii) Heat Changes Accompanying a Reaction

Chemical reaction	Heat energy (Energy)	Representation (if Energy released is heat energy)
Exothermic →	Released	Reactant(s) → Product(s) + Heat
Endothermic →	Absorbed / Given	Reactant(s) + Heat → Product(s)

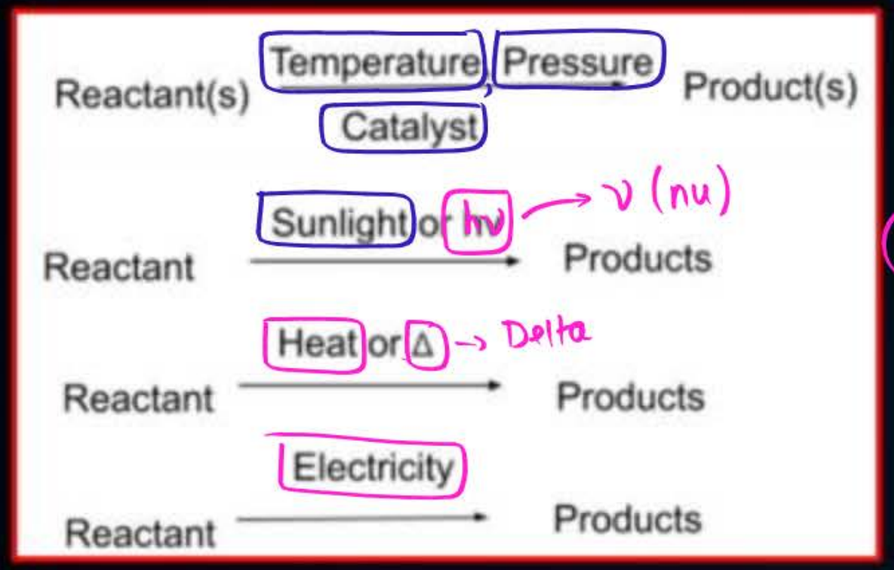
OR Reactant(s) $\xrightarrow{\text{heat}}$ Product(s)

(i) $Zn(s) + dil.H_2SO_4(aq) \rightarrow ZnSO_4(aq) + H_2(g) + Heat$ → Exothermic Rxn

(ii) $N_2(g) + O_2(g) + Heat \rightarrow 2NO(g)$ OR $N_2(g) + O_2(g) \xrightarrow{\text{heat}} 2NO(g)$

(given due to lightning)

(iv) Optimum Conditions to Yield a Product → (वो conditions जिसपर max^m product बनता)



(i) WORD EQ^n

Nitrogen gas + Hydrogen gas ⟶ Ammonia gas

(ii) Skeletal chemical Eq^n

$N_2 + H_2 \longrightarrow NH_3$

(iii) Balanced Chemical Eq^n

$N_2 + 3H_2 \longrightarrow 2NH_3$

(iv) Make balanced chemical eq^n informative

$$N_2(g) + 3H_2(g) \xrightarrow[Fe]{500\,^\circ C,\ 200\ atm} 2NH_3(g)$$

Concept Polish (गृहकार्य)

QUESTION

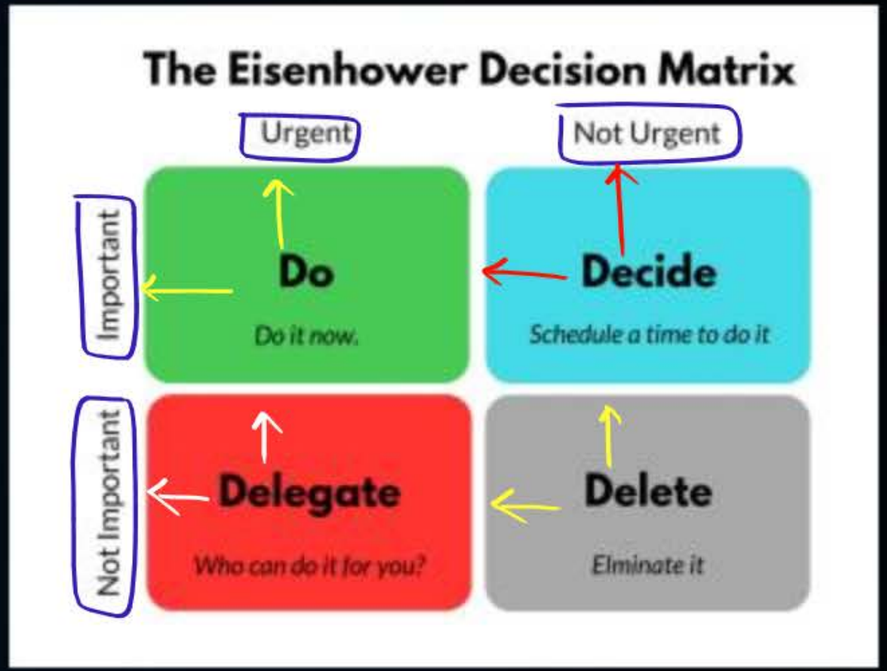
Make the below chemical equation informative.

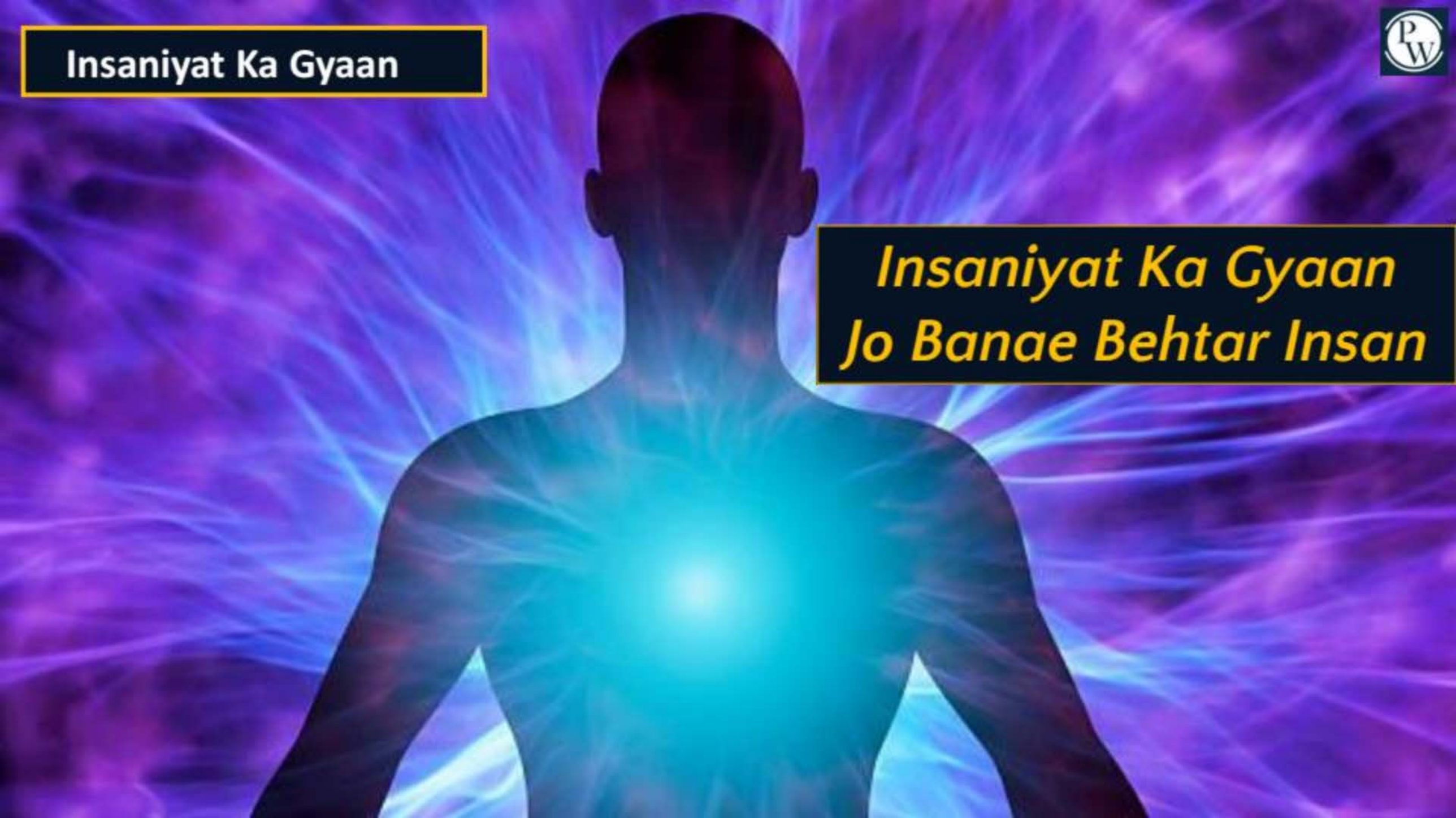
$$a\mathrm{CH_4} + b\mathrm{O_2} \longrightarrow c\mathrm{CO_2} + d\mathrm{H_2O}$$

EFFICIENCY HACKS BY SUNIL BHAIYA

Eisenhower Matrix to Increase Productivity

Eisenhower Matrix is a simple decision-making tool that helps you make the distinction between tasks that are important, not important, urgent, and not urgent.

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Jo Banae Behtar Insan


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THANK YOU