UDAAN

2025

Bharat Mata Ki Jai♡

CHEMICAL REACTIONS AND EQUATIONS

Master the Art of Balancing Chemical Equations

CHEMISTRY | Lecture - 02

BY: SUNIL BHAIYA

Topics

to be covered

1. Ways to Represent a Chemical Reaction (✓)
2. Need of Balancing a Chemical Equation (✓)
3. Hit-and-Trial Method of Balancing Chemical Equations (✓) I II


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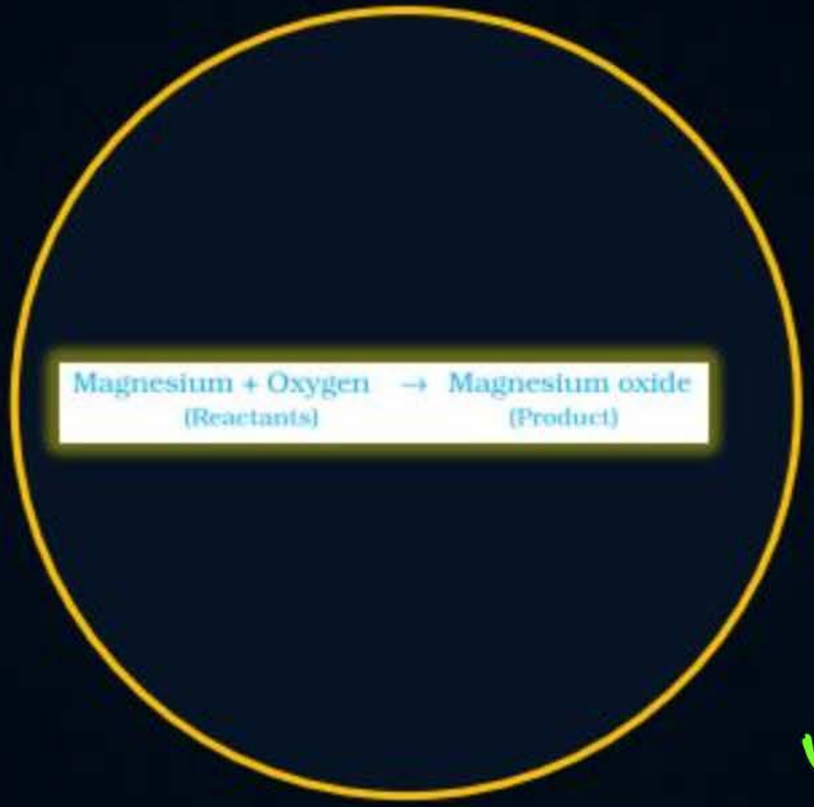
Knowledge Ride On



Ways to Represent a Chemical Reaction

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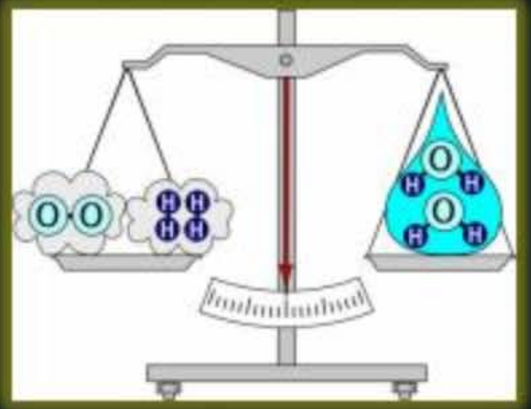

Need of Balancing a Chemical Equation

Knowledge Ride On

Hit-and-Trial Method of Balancing Chemical Equations

Knowledge Ride On

Efficiency Hacks by Sunil Bhaiya

Knowledge Ride On

Insaniyat Ka Gyaan

RIDDLE WALLAH

Can you write the surname of a Chemistry teacher at PW Hindi that is made from chemical symbols of boron, oxygen, radium and silicon?

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Borasi Sir Be Like

Maja Aa Gaya Sunil Sir

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.

Ways to Represent a Chemical Reaction

(अभिकारक)

Reactant(s): Substances that undergo a chemical change. (chemical rxn)

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

(उत्पाद)

writing a chemical rxn through words

Way I: Word Equation

Magnesium + Oxygen ⟶ Magnesium oxide + heat + light energy

L.H.S. [Reactant]

R.H.S. (Product)

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.

$$Mg + O_2 \longrightarrow MgO$$

Give a Thought

no. of atoms on L.H.S. = R.H.S

Is the above chemical equation balanced?

A. Yes

B. No

$$Mg + O_2 \longrightarrow MgO$$

	L.H.S. (Reactant)	R.H.S. (Product)
Mg	1	1
O	2	1

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 eqn.

no. of atoms on L.H.S. (reactant) ≠ no. of atoms on R.H.S. (product)

Aau Khilau Tmhe Balancing Ka Khel

Need to Balance a Chemical Equation

Need to Balance a Chemical Equation

(Antoinne Laurent Lavoisier)

(Follows the *law of conservation of mass* (wherever written or represented.))

Balanced whenever

Mass of reactant = Mass of product

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

(not nuclear reactions)

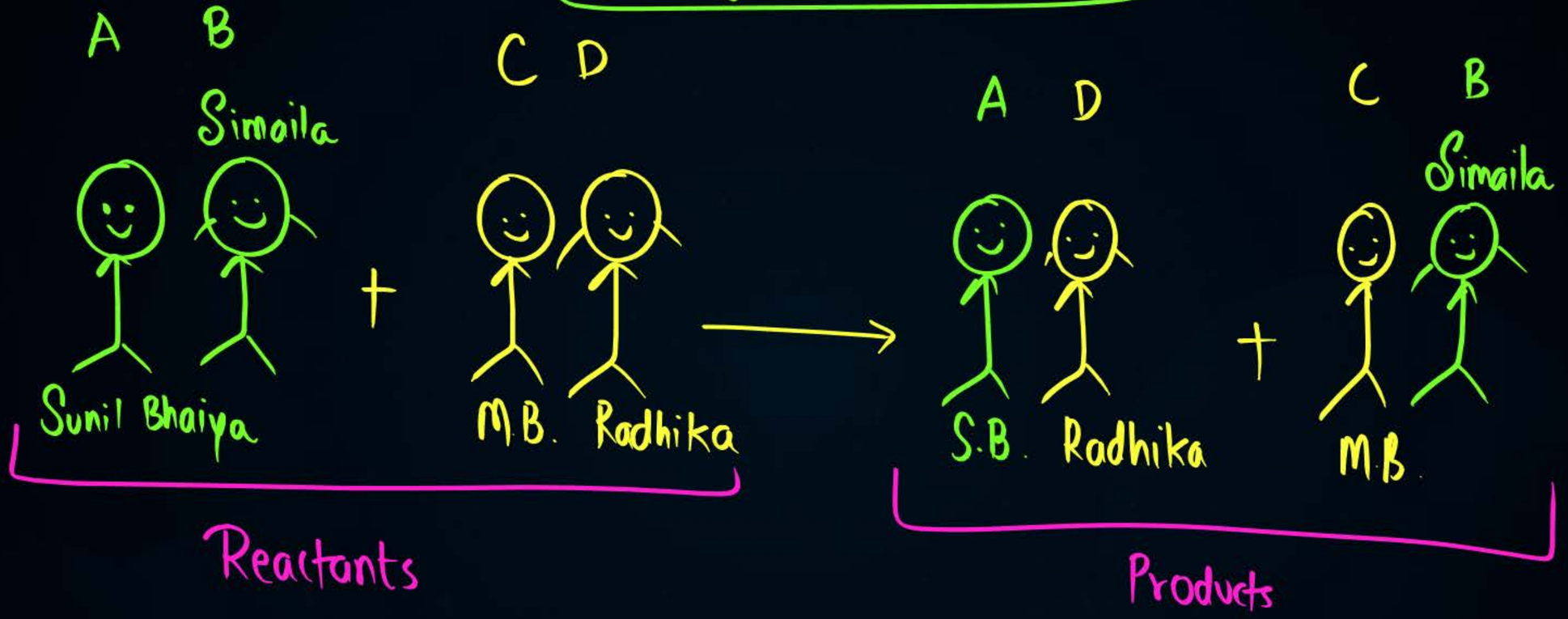
In simpler chemical reactions, mass is neither created nor destroyed, i.e. (mass of reactants is always equal to mass of products.)

next slide

AB + CD → AD + CB

Chemical reaction is a rearrangement of atoms.

Analogy to Chemical Rxn



Give a Thought

Is the below chemical equation balanced?

$$Fe + H_2O \rightarrow Fe_3O_4 + H_2$$

A. Yes

B. No

Let's balance the below chemical equation through hit-and-trial method.

EXTRA

Basic

Compound with oxygen → valency = 2

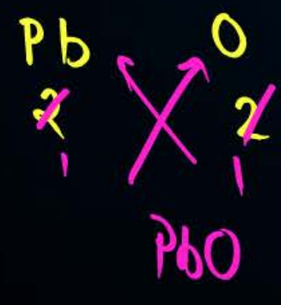
Valencies

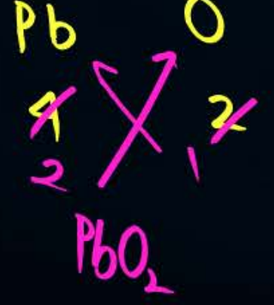
Iron (Fe) → 2 → FeO
→ 3 → Fe_2O_3

Copper (Cu) → 1 → Cu_2O
→ 2 → CuO

Lead (Pb) → 2 → PbO
→ 4 → PbO_2

Valency





Mixed oxide

$FeO.Fe_2O_3$ or Fe_3O_4 → Magnetite

↳ Iron का ऐसा oxide जिसमें Fe^{2+} & Fe^{3+}

$2PbO.PbO_2$ or Pb_3O_4

EXTRA

Nomenclature of compounds having elements of variable valency

Valency		IUPAC	Common Name
(2)	FeO →	Iron(II) oxide	Lower valency → '...ous' Ferrous oxide
(3)	Fe_2O_3 →	Iron(III) oxide	higher valency → '...ic' Ferric oxide
2, 3	Fe_3O_4 →	Iron(II, III) oxide	Ferrous ferric oxide
1	Cu_2O →	Copper(I) oxide	Cuprous oxide
2	CuO →	Copper(II) oxide	Cupric oxide
2	PbO →	Lead(II) oxide	Plumbous oxide
4	PbO_2 →	Lead(IV) oxide	Plumbic oxide

Hit-and-Trial Method of Balancing a

Chemical Equation

Aye bhaiya ☺

STEP I Writing the chemical reaction in word form or word eqⁿ

Iron + Steam → Magnetite + Hydrogen gas

STEP II Writing the chemical reaction in the form of a skeletal chemical equation. or unbalanced chemical eqⁿ

$$Fe + H_2O \rightarrow Fe_3O_4 + H_2$$

or $(FeO.Fe_2O_3)$

Optional

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.*

$Fe_3(x)$ $Fe + H_2O \longrightarrow Fe_3O_4 + H_2$

$3Fe$

STEP IV List the number of atoms of different elements.

Element	Number of Atoms (L.H.S.) (Reactant(s))	Number of Atoms (R.H.S.) (Product(s))
Fe	1	3
H	2	2
O	1	4

$Fe + H_2O \longrightarrow Fe_3O_4 + H_2$

Crucial & Imp.

STEP V Start balancing the compound (यौगिक) (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 Fe_3O_4 and element will be O.

STEP V

Element	Number of Atoms (L.H.S.)	Number of Atoms (R.H.S.)
Fe	$1 \times 3 = 3$	3
H	$2 \times 4 = 8$	$2 \times 4 = 8$
O	$1 \times 4 = 4$	4

Balanced chemical eqn

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

Stoichiometric Coefficient

No. of atoms on L.H.S. = R.H.S.

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Let's Practice

PW Ka ChemStar!

QUESTION

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

$$aCO + bH_2 \longrightarrow cCH_3OH$$

Compound → CH_3OH ↓ element will be H

Step Ist → WORD EQ^n

Carbon monoxide gas + Hydrogen gas ⟶ Methanol

Step IInd → SKELETAL CHEMICAL EQ^n

$CO + H_2 \longrightarrow CH_3OH$

Step IIIrd →

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

$(1)CO + (2)H_2 \rightarrow (1)CH_3OH$

↓ Balanced chemical eqn

a=1, b=2, c=1

QUESTION

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

Glucose

$$aC_6H_{12}O_6 + bO_2 \longrightarrow cCO_2 + dH_2O$$

Compound → $C_6H_{12}O_6$ → element Hydrogen (H)

Element	Reactant	Product
C	6	$1 \times 6 = 6$
H	12	$2 \times 6 = 12$
O	$6 + (2) \times 6$	$(6 \times 2) + (1 \times 6)$

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

a = 1, b = 6, c = 6, d = 6

QUESTION

Hit-and-Trial → Method 2

Find the stoichiometric coefficients for the given chemical equation in 15 seconds.

$$a\,FeCl_3 + b\,NH_4OH \longrightarrow c\,Fe(OH)_3 + d\,NH_4Cl$$

→ Balance the polyatomic ions

NH_4^{1+} → ammonium ion

OH^{1-} → hydroxide ion

$$1FeCl_3 + 3NH_4OH \longrightarrow 1Fe(OH)_3 + 3NH_4Cl$$

QUESTION

Find the stoichiometric coefficients for the given chemical equation in 15 seconds.

$$a\,Fe_2(SO_4)_3 + b\,NH_4OH \longrightarrow c\,Fe(OH)_3 + d\,(NH_4)_2SO_4$$

$$Fe_2(SO_4)_3 + 6\,NH_4OH \longrightarrow 2\,Fe(OH)_3 + 3\,(NH_4)_2SO_4$$

PYQ's Wallah

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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

Compound → MnO_2, $MnCl_2$, H_2O

H_2O

element → H

Element	Reactant	Product
Mn	1	1
O	2	1×2 → 2
H	1×4	2×2 → 4
Cl	1	2+2

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

4 → x

2 → y

1 → z

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Concept Polish (गृहकार्य)

QUESTION

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

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

EFFICIENCY HACKS BY SUNIL BHAIYA

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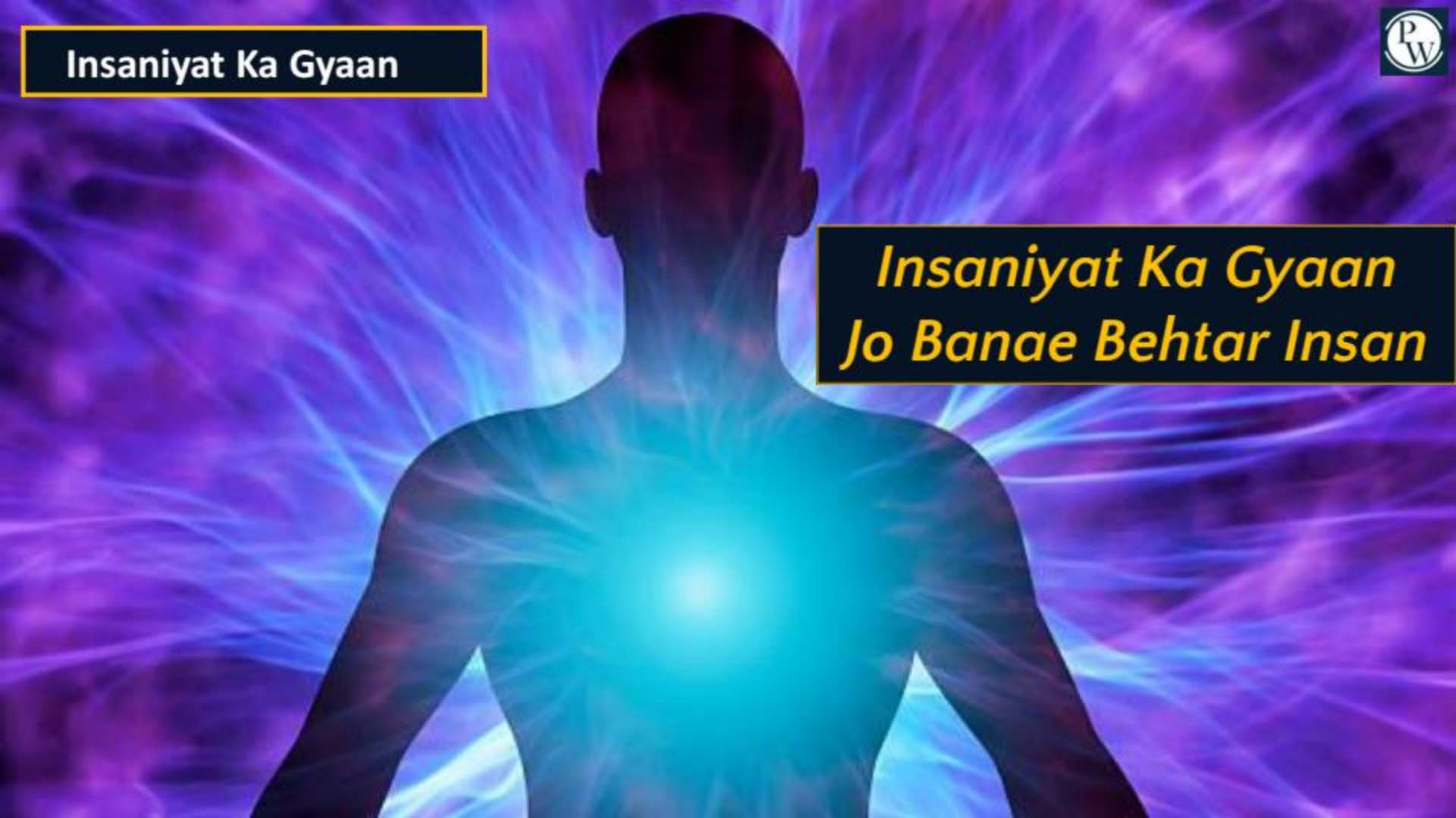
(i) Theory: NCERT (✓)

(ii) Question Practice: NCERT Intext, (✓)
Exercise, Exemplar and PYQs' (✓) (✓) (✓)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THANK YOU