PRAYAS

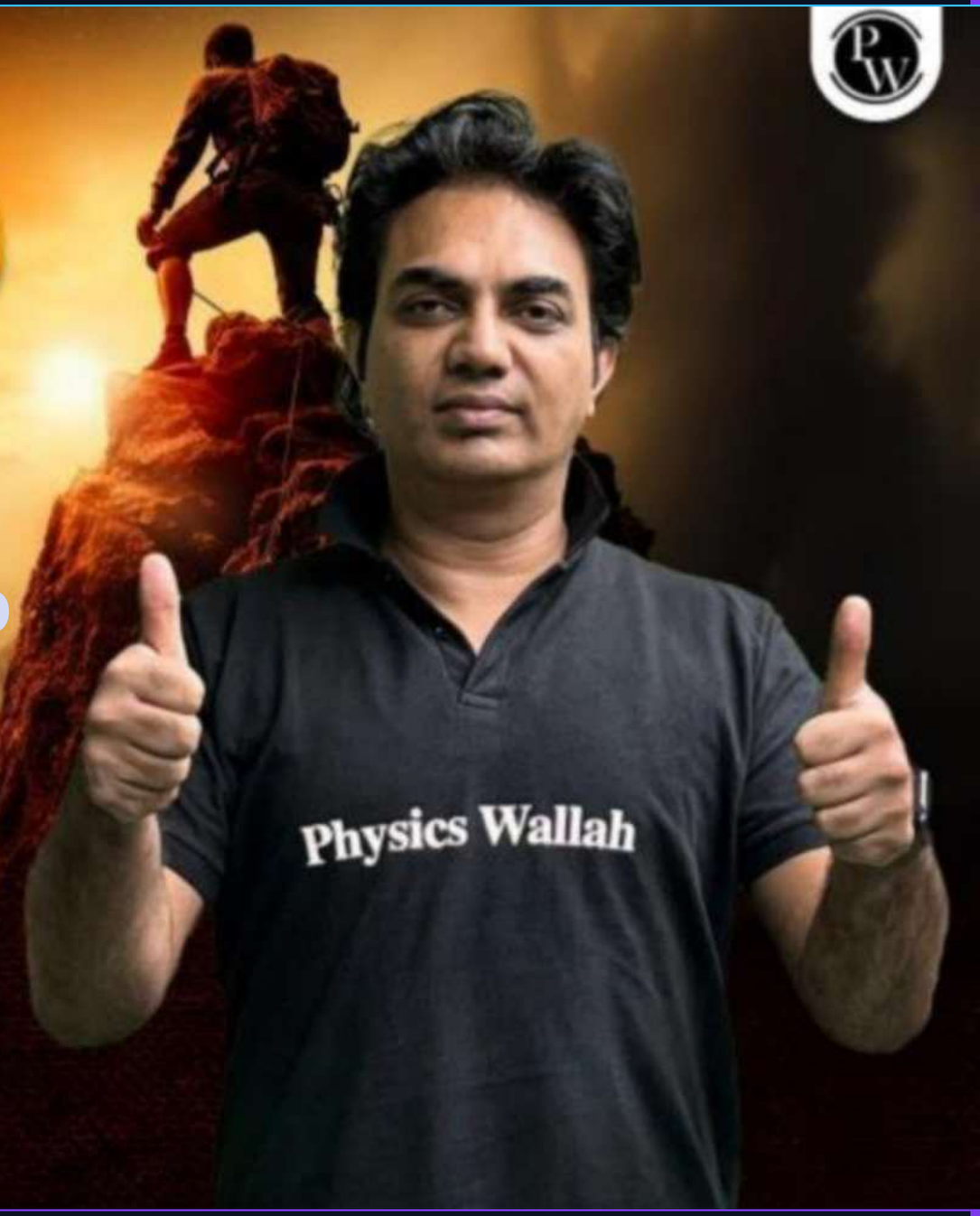
JEE 2026

PHYSICAL CHEMISTRY

REDOX REACTION

Lecture – 04

FAISAL RAZAQ



Topics to be covered

A n-factor Calculations

B law of Equivalence

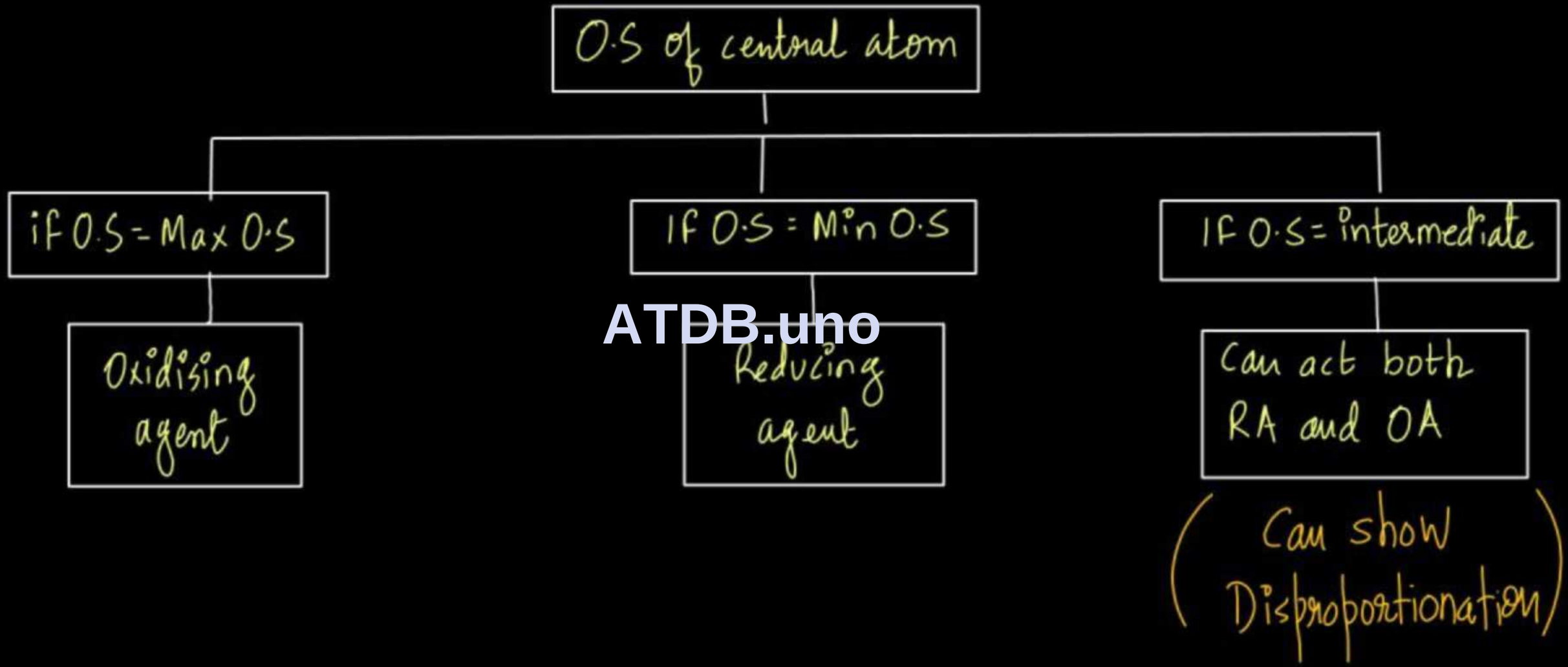
TELEGRAM GROUP BY FAISAL SIR

@FAISALSIRPW

LIST OF IONS

Cl^-	chloride	$C_2O_4^{2-}$	oxalate
Br^-	bromide	NO_3^-	nitrate
F^-	fluoride	N^{3-}	nitride
I^-	iodide	NO_2^-	nitrite
CO_3^{2-}	carbonate	ClO_4^-	perchlorate
CN^-	cyanide	ClO_3^-	chlorate
NC^-	isocyanide	ClO_2^-	chlorite
SO_4^{2-}	sulphate	ClO^-	hypochlorite
SO_3^{2-}	sulphite	CrO_4^{2-}	chromate
$S_2O_3^{2-}$	thiosulphate	$Cr_2O_7^{2-}$	dichromate
S^{2-}	sulphide	MnO_4^-	permanganate
P^{3-}	phosphide	PO_4^{3-}	phosphate

How to identify whether a particular substance is an OA or RA



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H_2O_2 = reduce (electron gain)

In which of the following reactions, hydrogen peroxide acts as an oxidizing agent?

(A) $I_2 + H_2O_2 + 2OH \rightarrow 2I^- + 2H_2O + O_2$

(B) $PbS + 4H_2O_2 \rightarrow PbSO_4 + 4H_2O$

-2 -1 +6 -2 red

RA OA Ox

(C) $2MnO_4^- + 3H_2O_2 \rightarrow 2MnO_2 + 3O_2 + 2H_2O + 2OH^-$

(D) $HOCl + H_2O_2 \rightarrow H_3O^+ + Cl^- + O_2$

Stumper

$2x + 4 = 0$

$x = -2$

$-2 \qquad +n$

$n - (-2) = (n+2)$

One mole of X_2H_4 releases 10 moles of electrons to form a compound Y. What should be the oxidation number of X in the compound Y ?

- A +3
- B −3
- C −6
- D +1

$1\ X_2H_4 \xrightarrow{2(n+2)} X^{n+}$

(Y compound)

$2(n+2) = 10$

$n = +3$

Find out the Eq. wt of $Fe_2(C_2O_4)_3$ in this rxn –

$$O.A + \overset{+3}{Fe}_2\overset{+3}{(C_2O_4)_3} \xrightarrow{1\times 6} \overset{+3}{Fe} + \overset{+4}{CO_2}$$

$(n = 6)$

K.B

$$\overset{-2}{C_2O_4}^{2-} \xrightarrow{[O]} CO_2\uparrow$$

(oxalate ion)

M_1 = mol wt

Find out the eq. wt of Ferric oxalate in the rxn with $KMnO_4$ in acidic medium.

M_2 = mol wt.

$$\left(\text{Eq wt}\right)_{KMnO_4} = \frac{M_2}{5}$$

Fe $\times$ C_2O_4

+3 , −2

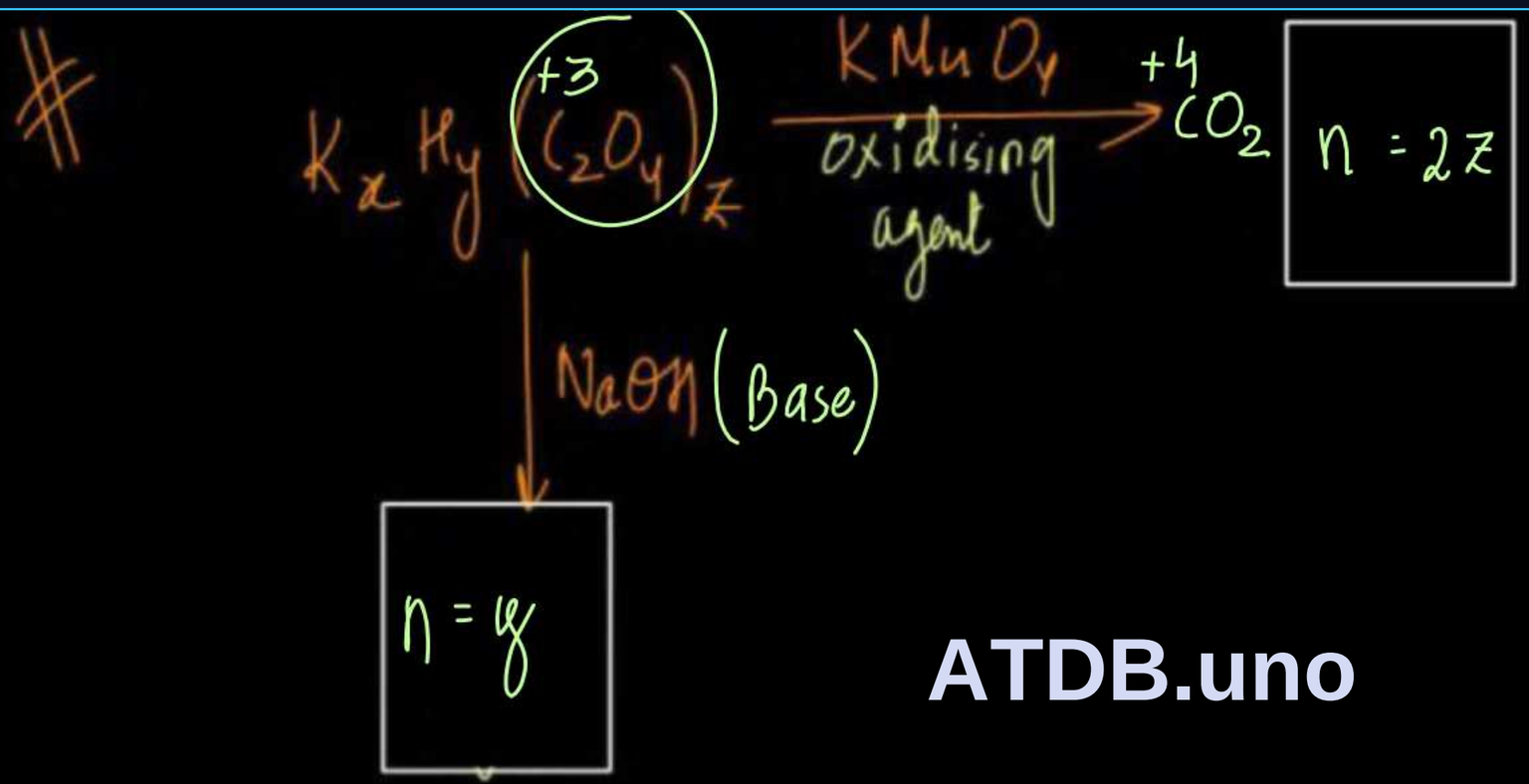
$$\left(\text{Eq wt}\right)_{Fe_2(C_2O_4)_3} = \frac{M_1}{6}$$

5

$$\overset{+3}{Fe}_2\overset{+3}{(C_2O_4)_3} \xrightarrow[H^+]{\overset{+7}{KMnO_4}} \overset{+3}{Fe} + \overset{+4}{CO_2} + \overset{+2}{Mn}$$

$1\times 6 = 6$

$(n = 6)$



SALTS THAT REACT IN A MANNER THAT TWO TYPE OF ATOMS IN THE SALT UNDERGO CHANGE IN OXIDATION STATE (BOTH THE ATOMS ARE EITHER GETTING OXIDISED OR REDUCED).

K.B

1) Both are getting oxidised

n = Total moles of e^- lost by per mol of salt

iron oxalate

⇓

FeC_2O_4

⇓

ferrous oxalate

$$\overset{+2\ +3}{FeC_2O_4} \xrightarrow{[O]} \overset{+3}{Fe} + \overset{+4}{CO_2}$$

1 × 2 = 2

(n = 1 + 2 = 3)

$C_2O_4^{2-}$

$2x - 8 = -2$

$x = +3$

$$\text{Eq. wt} = \frac{M}{3}$$

Question What is the equivalent wt of Cu_2S in this reaction?

M

$[Cu = 63.5, S = 32]$

$$\overset{+1\ \ -2}{Cu_2S} \xrightarrow{[O]} \overset{+2}{Cu} + \overset{+4}{SO_2}$$

1 | 1x2 | 6x1

$(n = 2 + 6 = 8)$

$$\text{Eq. wt} = \frac{M}{8}$$

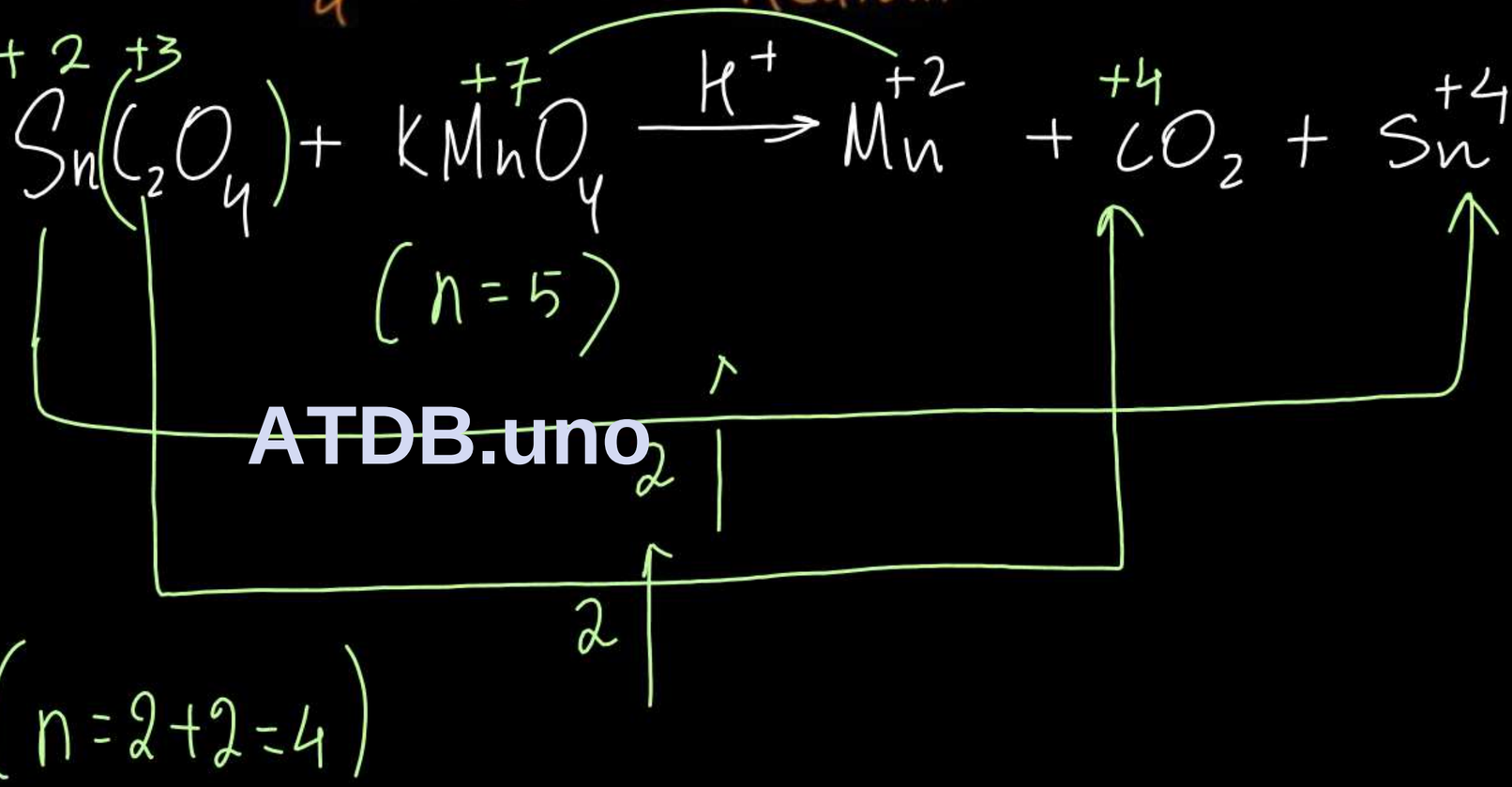
Question Find out the equivalent weight of SnC_2O_4 in the reaction with $KMnO_4$ in acidic Medium.

A) M/2

B) M/3

C) M/1

D) M/4 ✓



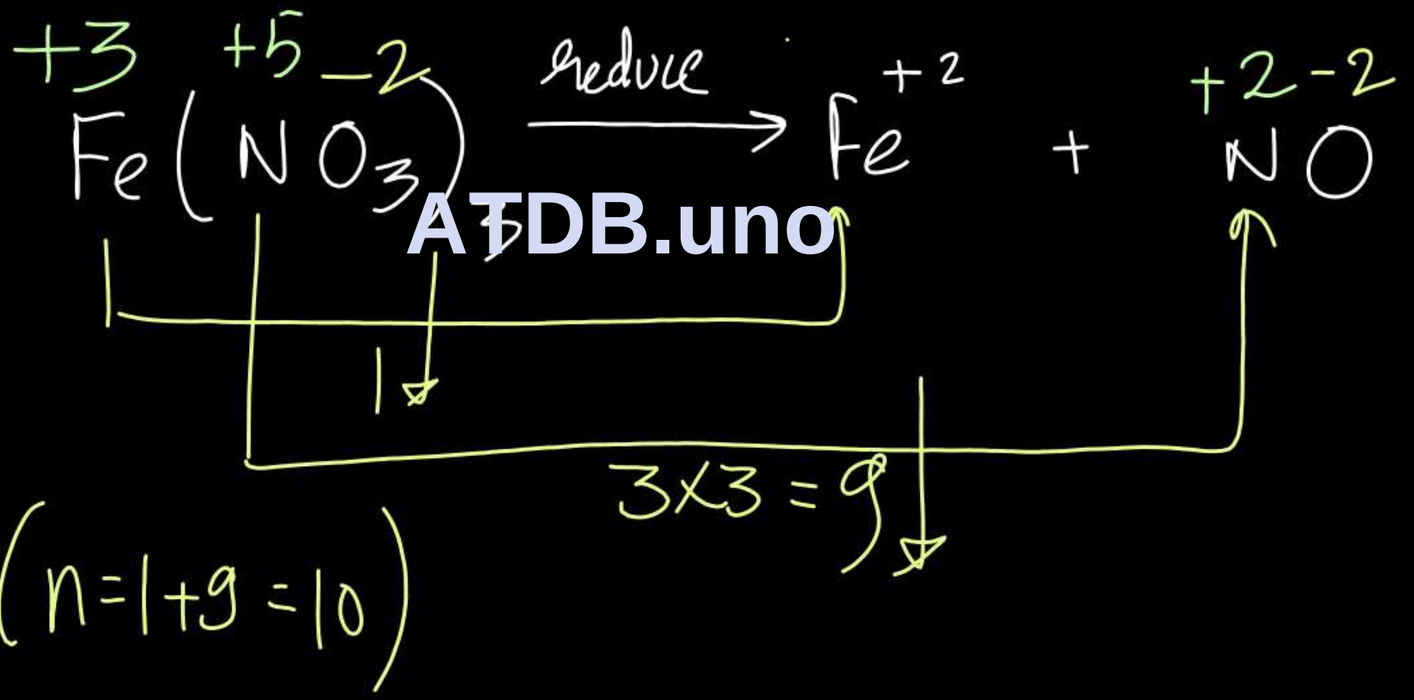
27 More than one atoms are getting reduced

n = Total moles of electron gained by per mol of salt

NO_3^-

$x - 6 = -1$

$x = +5$



$(n = 1 + 9 = 10)$

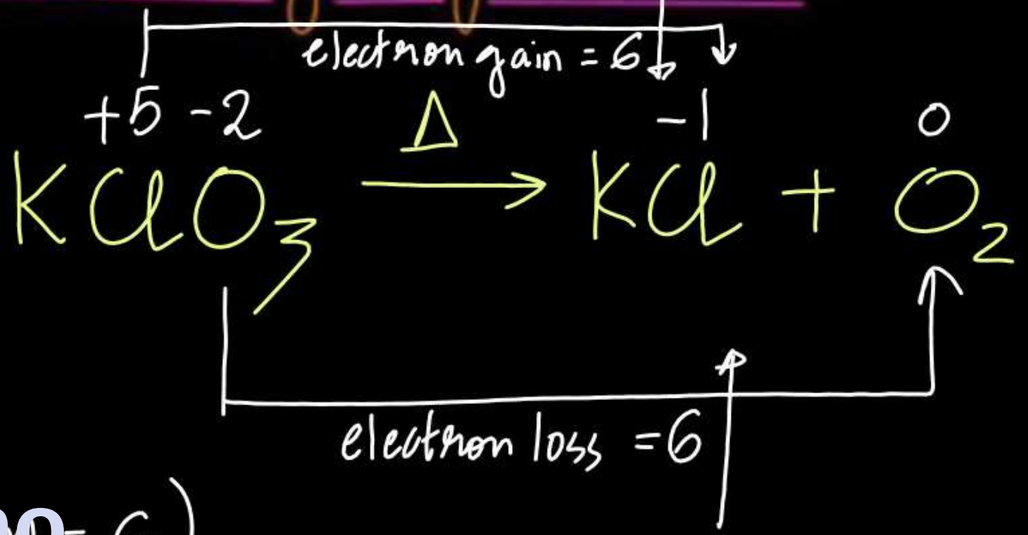
3) some are getting oxidised and some are getting reduced

if gain = loss

n = gain or loss

if gain ≠ loss

n = |gain − loss|



(n = 6)

$A + KClO_3 \longrightarrow KCl + O_2 + \ldots$

Behaviour of A ?

i) Reducing agent

ii) Oxidising agent

iii) Both

iv) None ✓

Question

Adv.

$A^{\swarrow} + (SCN)^{\ominus} \longrightarrow SO_4^{2-} + (CN)^{\ominus}$

Behaviour of A —

$\overset{-1}{\underset{-1}{(}}\overset{+1}{\underset{+3}{S}}\overset{}{\underset{}{-}}\overset{-3}{\underset{}{C\equiv N}}\overset{}{\underset{}{)^{-}}} \longrightarrow \overset{+6}{SO_4^{2-}} + \overset{-1}{\underset{+3}{(}}\overset{}{\underset{}{C}}\overset{-3}{\underset{}{\equiv N}}\overset{}{\underset{}{)^{-}}}$

-2 +4 -3 +6 +2 -3

8

2

i) RA

ii) ~~OA~~

iii) Both

iv) Hume Nahi Pata!

$(n = 8 - 2 = 6)$

6 mole of electrons are available for A. by per mol $(SCN)^-$.

n-Factor Calculation in a Disproportionation Reaction

A redox reaction in which a same element present in a particular compound in a definite O.S is oxidised as well as reduced.

One of the reactant in a disproportionation reaction always contain an element that can exist in an atleast three oxidation state.

Some example of disproportionation Rxn

H_2O_2

XO^-

$a - 2 = -1$

$a = +1$

i) $\overset{-1}{H_2O_2} \longrightarrow \overset{-2}{H_2O} + \overset{0}{O_2}$

Ox

Red

H.W ii) $\overset{0}{X_2} + \overset{-}{OH} \longrightarrow \overset{-1}{X^-} + \overset{+1}{XO^-}$

Red. (dil)

Ox

H.W iii) $\overset{0}{X_2} + \overset{-}{OH}$ (conc) $\longrightarrow \overset{-1}{X^-} + \overset{+5}{XO_3^-}$

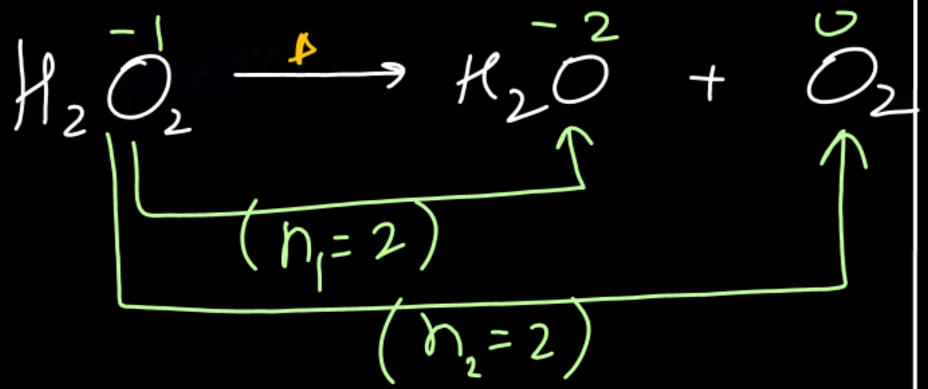
iv) $S_8 + \overset{-}{OH} \longrightarrow S^{2-} + S_2O_3^{2-} + H_2O$

v) $KClO_3 \longrightarrow KClO_4 + KCl$

$$E_{net} = E_1 + E_2$$

$$\frac{M}{n_{net}} = \frac{M}{n_1} + \frac{M}{n_2}$$

$$\frac{1}{n_{net}} = \frac{1}{n_1} + \frac{1}{n_2}$$



$$\frac{1}{n_{net}} = \frac{1}{2} + \frac{1}{2}$$

$$n_{net} = 1$$

KB

H_2O_2 as an OA or RA the n-factor is always 2.

But in decomp. n×n the n-fact. is 1.

decomp = disprop.

$A + (NH_4)_2Cr_2O_7 \longrightarrow N_2 + Cr_2O_3 + H_2O + \cdots$

Behaviour of A —

i) O.A

ii) R.A

iii) Both

iv) None

v) Mujhe kya pata

H.W.

Question

$$I_2 + Na_2S_2O_3 \longrightarrow NaI + Na_2S_4O_6$$

E_1 E_2

Find out E_1 and E_2 in terms of M_1 and M_2.

H.W.