BARC OCES 2025

CHEMISTRY

MEMORY BASED

PAPER DISCUSSION

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Q.

C_{3v}	E	$2C_3$	$3\sigma_v$
Γ_1	1 ✓	1	1
Γ_2	1 ✓	1	-1
Γ_3	x ✓	y	z

x, y, z = ?

x = 2

x, y, z = 2, -1, 0

GOT ✓

$\Sigma d_i^2 = h$

$1^2 + 1^2 + 2x^2 = 6$

$x^2 = 6 - 2$

$x = \pm 2$

dimension = +2

$2^2 + 2y + 3z = 0$

$2 + 2y - 3z = 0$

$2y + 3z = -2$

$2y - 3z = -2$

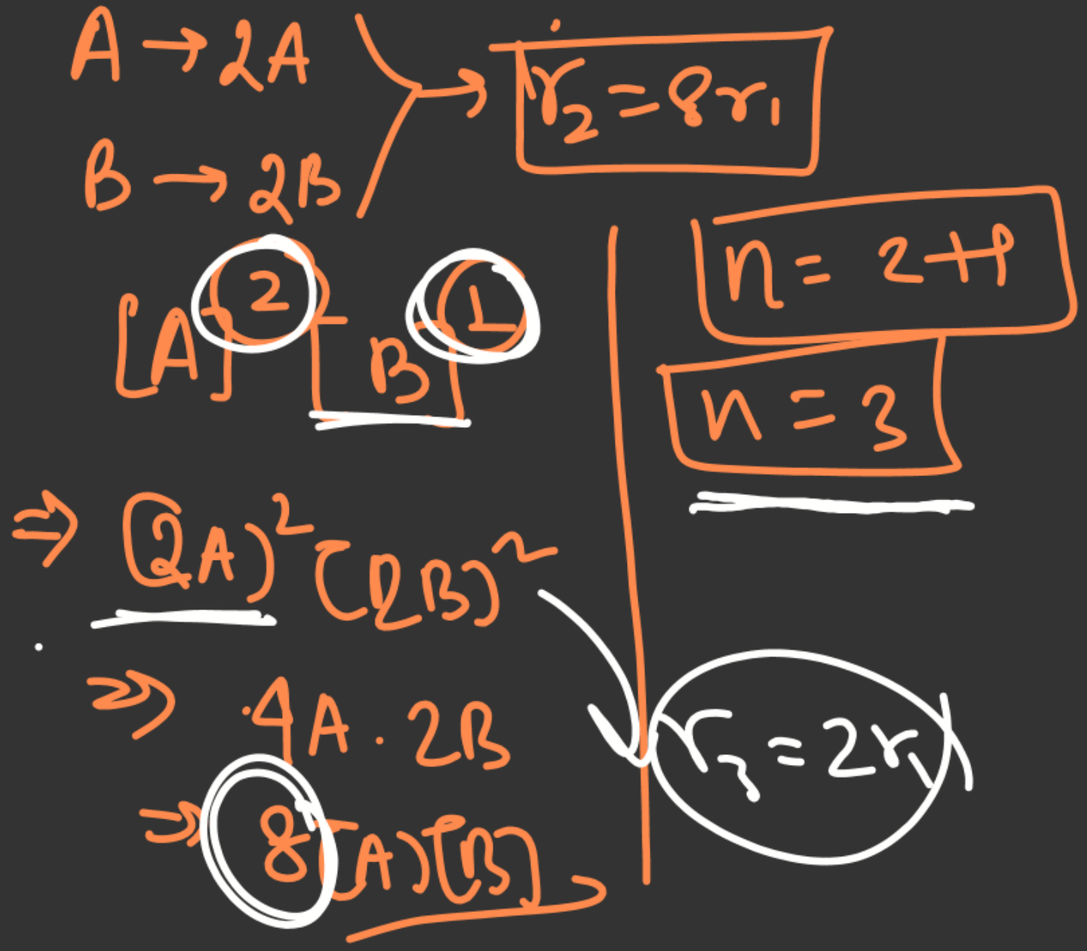
$4y = -4$

$y = -1$

$z = 0$

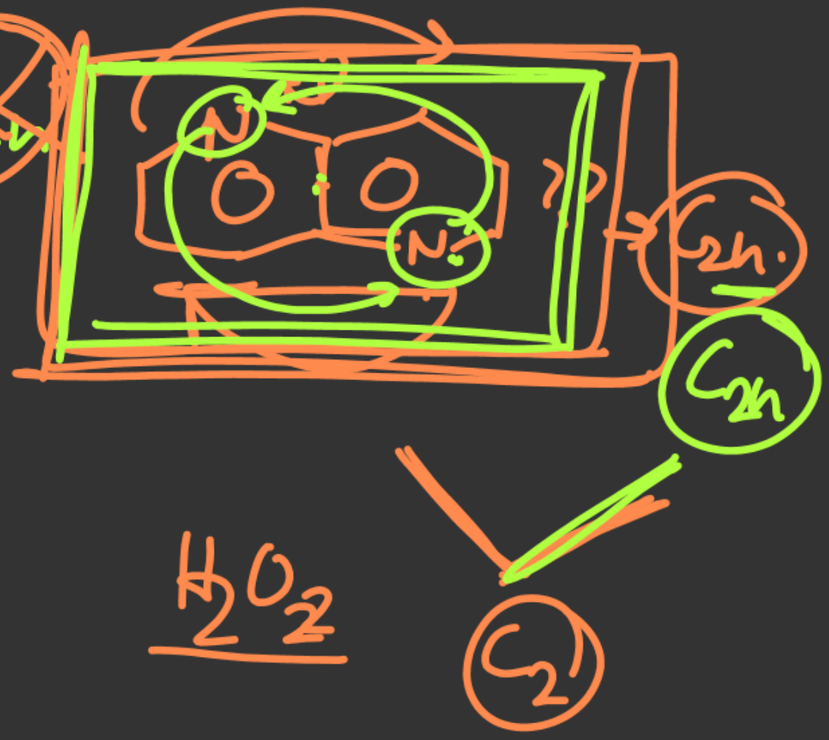
(a) $A + B \longrightarrow C$.

$r = k[A]^x[B]^y$, $n = ?$



(24) naphthalene point group → D_{2h}

(25) 3D Cubic box $E = \frac{27h^2}{8mL^2}$



H_2O_2

Degeneracy = ??

D = 4

$(n_x^2 + n_y^2 + n_z^2)\frac{h^2}{8mL^2} = 27$

511, 333

3 + 1 = 4

25 + 1 + 1 = 27.

511
151
115
3

Q.1 1D box G.S. = E.

2nd excited state = ? E = ?

n = 1, G.S. $= E = \frac{1^2 h^2}{8mL^2}$

n = 2, 1st e.s.

n = 3, 2nd E.S. $= \frac{3^2 h^2}{8mL^2} =$ 9.E

150-160 ✓

$K = \frac{1}{t}\left(\frac{1}{[A]} - \frac{1}{[A]_0}\right)$

$= \frac{1}{10}\left(\frac{100}{75} - \frac{100}{100}\right)$

$= \frac{1}{10}\left(\frac{4}{3} - 1\right)$

$K = \frac{1}{30}$.

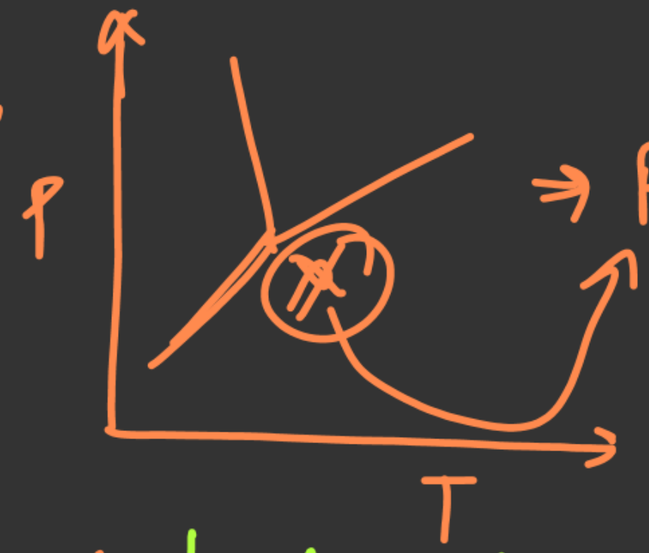
$t = \frac{1}{K}(2-1)$

$= 30$ min

Q. 2nd order → 25% complete → 10 min

50% complete → ?? min | 30.

Q.



$\rightarrow F = C - P + 2$

$= 1 - 3 + 2$

$= 0.$

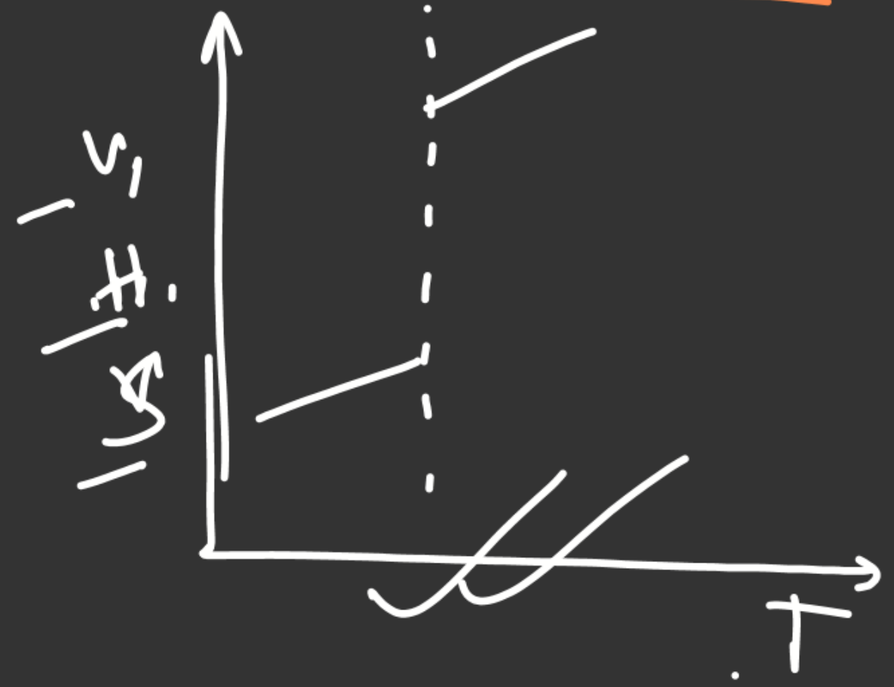
Q. Salt bridge diagram; ?

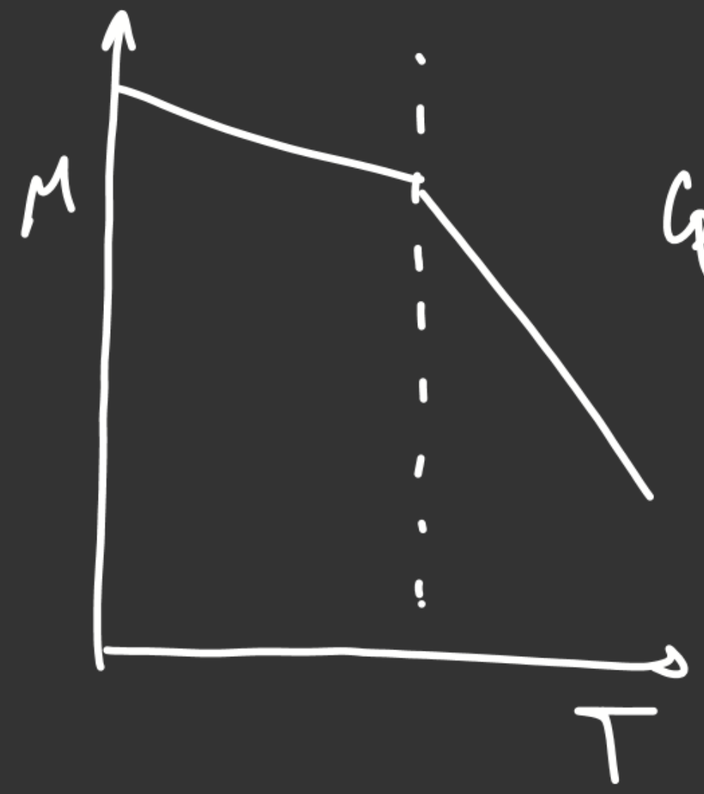
Q. Graph of kinetics ($k_1 << k_2$) ?? options

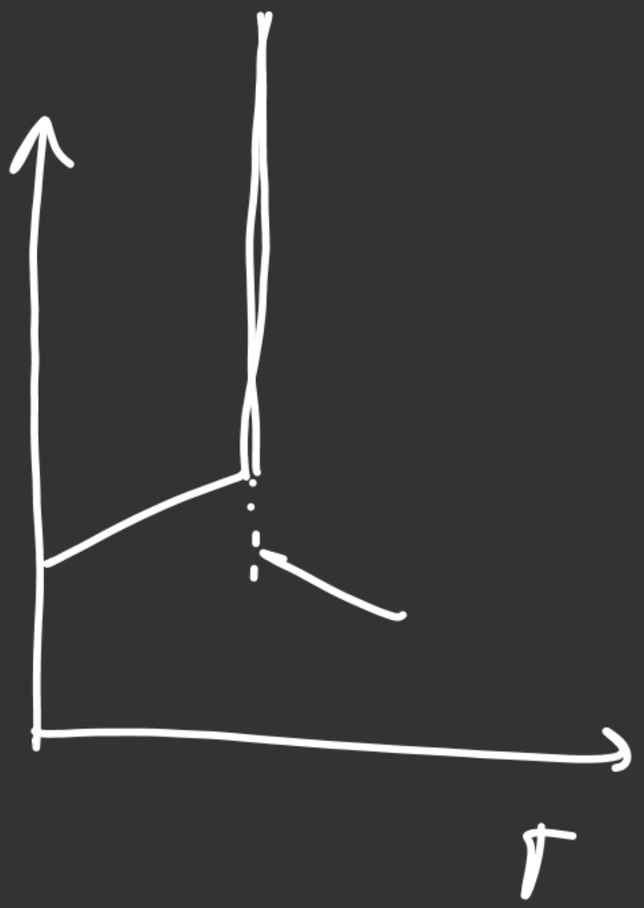
??

⊛ 1st order phase transition:

graph.







Q. ΔH = value

ΔS = value at equilibrium, T = ?

$\boxed{\Delta G = 0}$ at equilibrium,

$\boxed{T = \frac{\Delta H}{\Delta S}}$

$\Delta G = \Delta H - T\Delta S$

T↑

$T\Delta S$↑

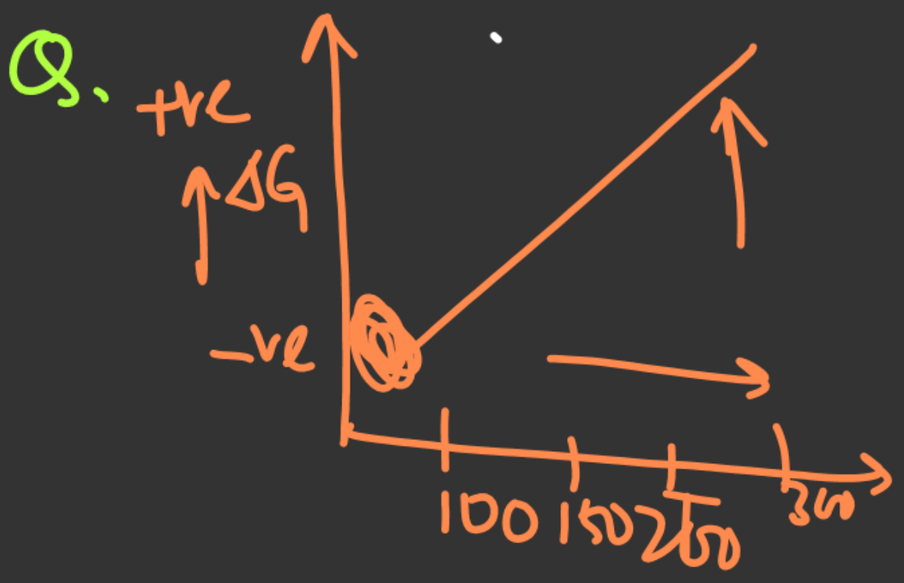
ΔH −ve

$T\Delta S$ −ve

$T\Delta S$ = +ve

ΔG +ve

Q.



$\Delta V = 0$ | $q = 0$

$\Delta H < 0$ or $\Delta H > 0$

$\Delta S < 0$

$\Delta S > 0$

$\Delta H < 0$

$\Delta S < 0$.

isochoric $dv = 0$.

adiabatic, $q = 0$.

$$\Delta U = q + w$$

$$= q - p\,dv$$

$$= 0 - 0$$

$$= 0$$

Q. 2 isotonic solutions :-

$C_1 = C_2$

0.17% sucrose.

M.W = 342 / 34.2 g.

$$\frac{n_1}{V_1} = \frac{n_2}{V_2}$$

$$\frac{\frac{1.8}{M}}{0.1} = \frac{\frac{0.17}{34.2}}{0.1}$$

$$\frac{18}{M} = \frac{0.17}{34.2} \quad \Big| \quad M = 3621.17\,g.$$

Q. Residual entropy?

$S = R \ln W$

W = given

Q. Principle & N.

$2n^2$ ✓

Q. $V_{rms} = \sqrt{\frac{3RT}{M}}$

$\frac{V_{O_2}}{V_{H_2}} = \sqrt{\frac{M_{H_2}}{M_{O_2}}} = \sqrt{\frac{2}{32}}^{\frac{1}{16}}$

$= 1:4$

Q. P.E effect:

$K.E. = h\nu - h\nu_0$

$\frac{1}{2}mv_2 = h\nu - h\nu_0$

Q. ABCABC packing.

↓

FCC | closed packed structure

Q. Pure rotational spectrum (8B)

B = ____

B = 4

$\bar{\nu}_{as} = \bar{\nu}_{ex} + 6B$ (x24) → 1st Anti stokes line

18797 cm

Stokes → $\bar{\nu}_{ex} - 6B$

18821

Q. Most Stable nuclei –

n: even even, Odd

p: even odd, odd odd

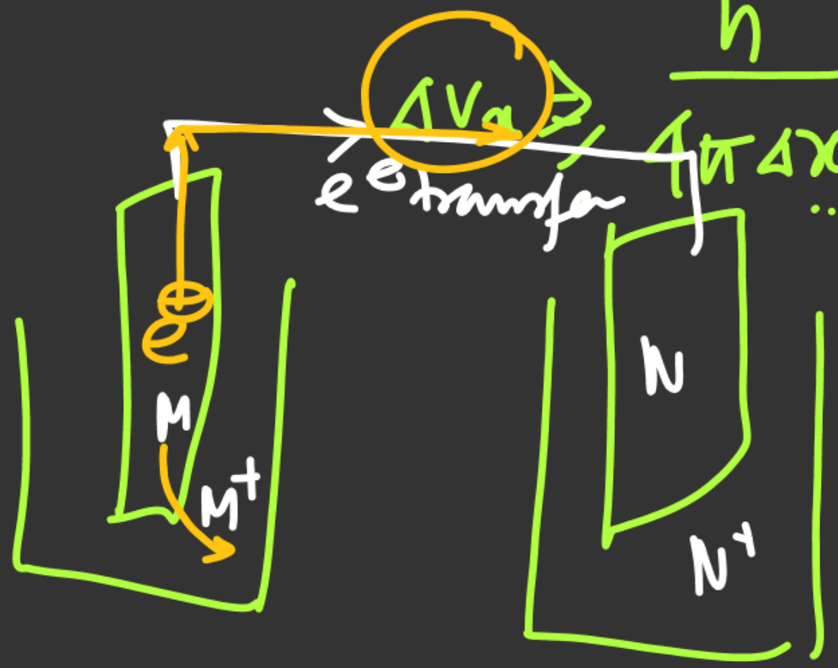
odd even

even even

Q. HUP → $\Delta x \cdot \Delta p_x \geq \frac{h}{4\pi}$

$\Delta V_x = ?$

$\frac{h}{4\pi \Delta x \cdot m}$



Q.

$h = 6.626 \times 10^{-34}$

$m = 9.1 \times 10^{-31}$

$\Delta x =$

a) M is oxidised.

b)

c)

d)

HCP
ABAB

FCC
ABCABC

Q. Solute A = 0.80

vapour.

Solute B = 0.60

vap. pre

mole fraction of (B)

total P = ??

$P = P_A + P_B$

$P = x_A \cdot P_A^{\circ} + x_B P_B^{\circ}$

$P = (1 - x_B) P_A^{\circ} + x_B \cdot P_B^{\circ}$

Q.

Q $C_aH_b + O_2 \rightarrow (a)\,CO_2 + (b/2)\,H_2O$.

C_aH_b

$a = ?$

$b = ?$

0.7 g CO_2 0.2 g H_2O.

$n_{CO_2} = 0.7/44 = a$. $n_{H_2O} = b/2 = 0.2/18$

$a/b = ?$

Q. 50ml 0.2M HCl + 50ml 0.1M NaOH, pH=?

pH = 1.30

no of H^+ = 0.2 × 50 = 10

no of OH^- = 0.1 × 50 = 5

remaining no. of H1 = 5

$[H^+] = \frac{5}{50+50} = \frac{5}{100}$

$-\log[H^+] = -\log 1/20$

$= \log 20$

$= 1.30$

$pH = 1.30$

Q. 1.0056 → significant figure

5

1.3 pH

$_{Z}^{A}X$ → $_{b}^{a}X$ $\xrightarrow{+1\beta^0}$ ___ $\xrightarrow{3\,{}_2^4He}$ ___ $\xrightarrow{2\,{}_{+1}\beta^0}$ $_{d}^{c}X$

$c = a - 12$

$d = b - 5$

X_{b-1}^{a}

X_{b-7}^{a-8}

$1\alpha = {}_{b-2}^{a-4}X$

X_{b-5}^{a-12}

5s

$n = 0$

$5 - 1 - 1$

$= 5 - 0 - 1$

$= 4$

5f

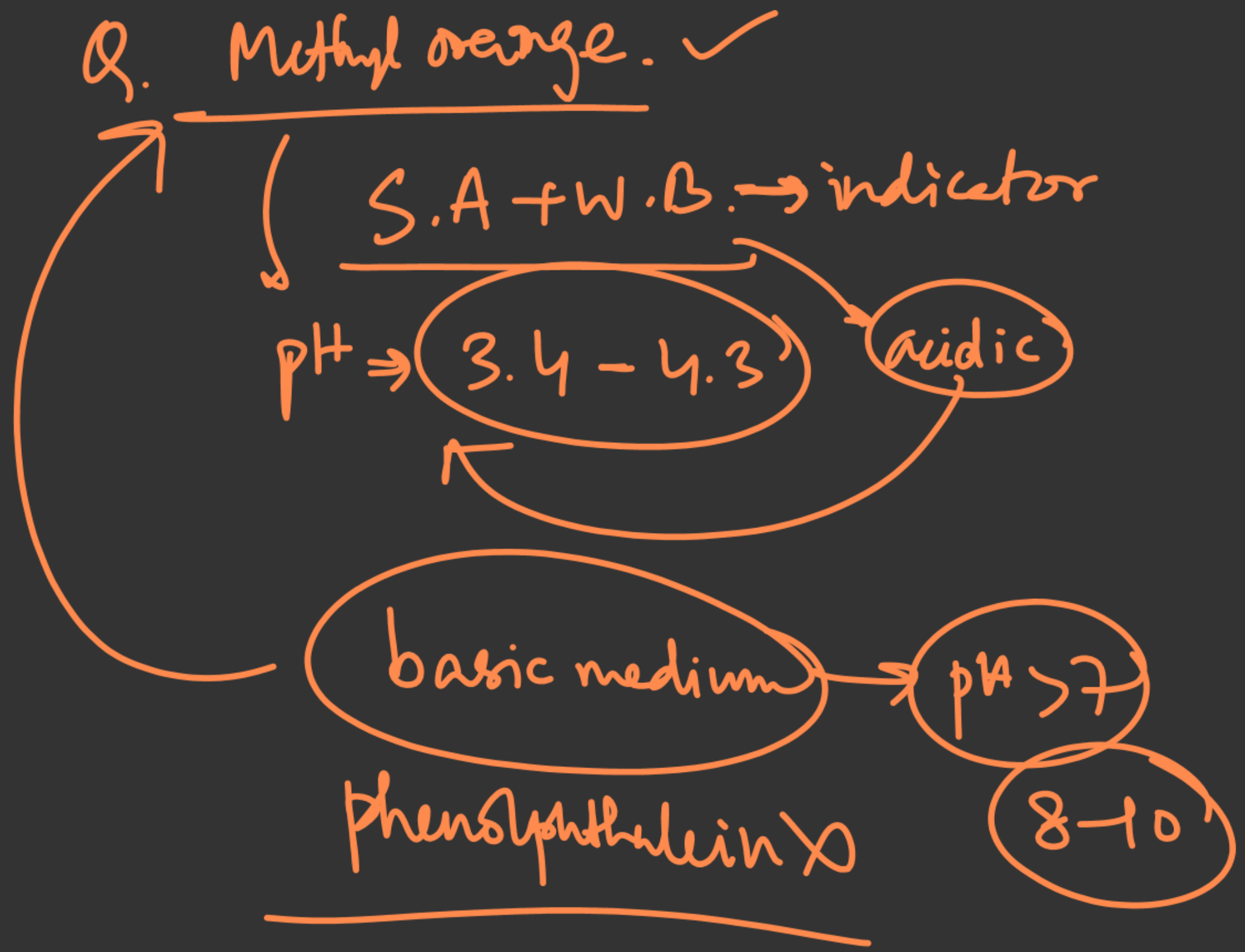
$l = 3$

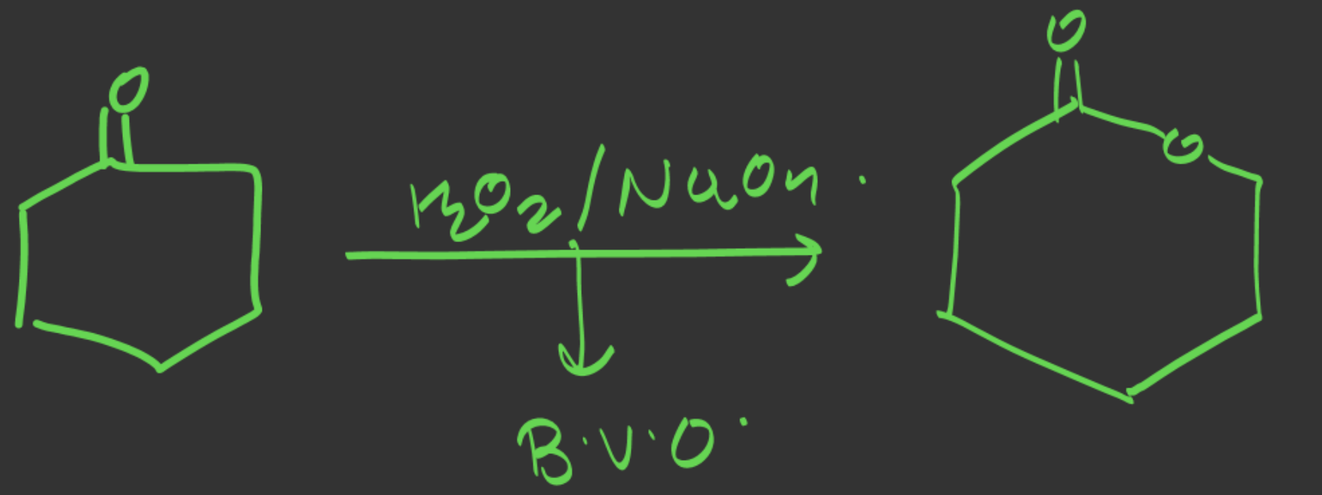
$5 - 3 - 1$

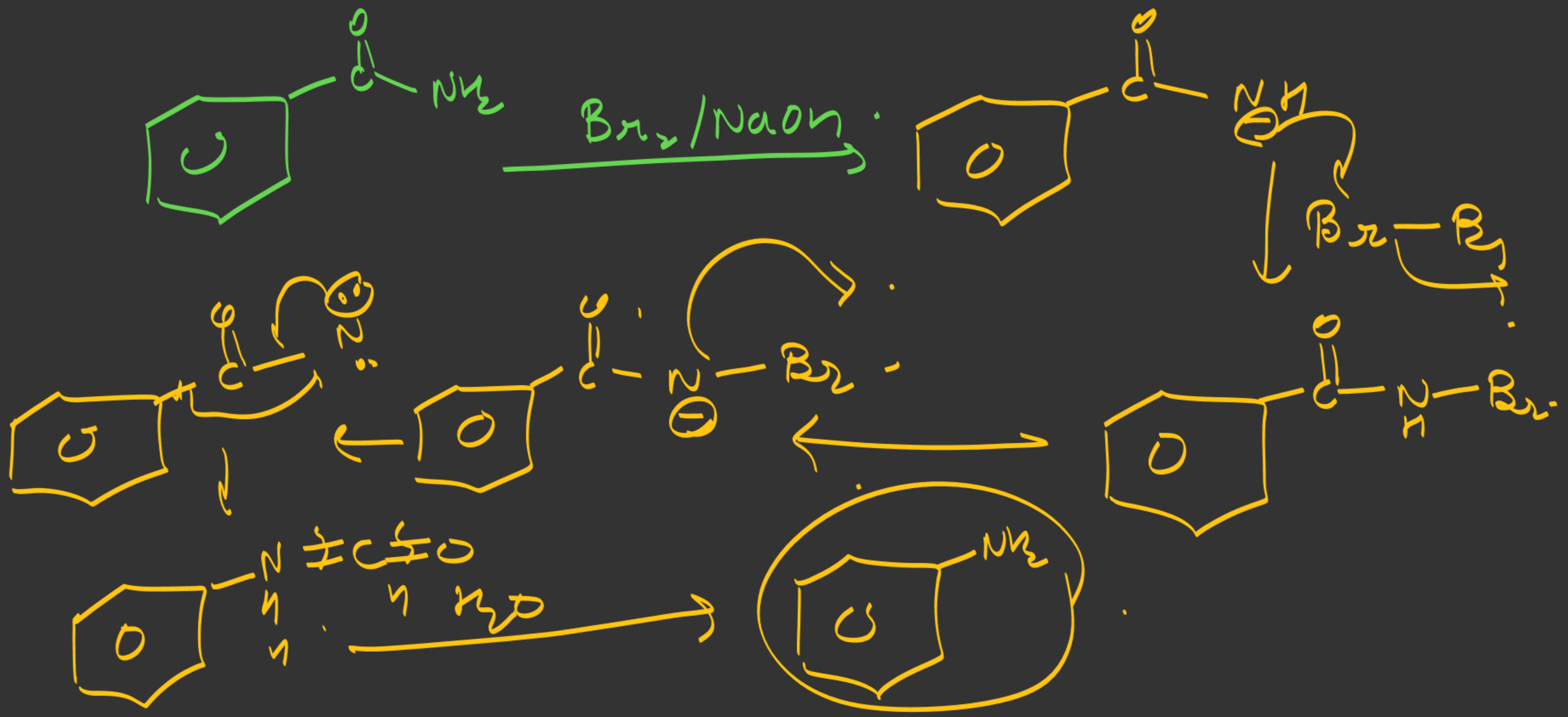
$\Rightarrow 1$

$4NH_3 + 7O_2 \rightarrow 4NO_2 + 6H_2O$

$NH_3 + O_2 \rightarrow NO_2 + H_2O$


Q. Methyl orange. ✓
S.A + W.B. → indicator
pH ⇒ 3.4 - 4.3
acidic
basic medium
pH > 7
8-10
phenolphthalein ✗


H2O2/NaOH
B.V.O.


Br2/NaOH
NH2
Br2
N=C=O
H2O
NH2

18 e⁻ Rule -

(a) ✓ $(\eta^5\text{-}C_5H_5)\text{-}Ru(\eta^6\text{-}C_6H_6) \Rightarrow 5+7+6=18$.

(b) $(\eta^5\text{-}C_5H_5)Fe(CO)_2$ - $5+8+4=17$.

(c) $(\eta^5\text{-}C_5H_5)Mo(CO)_3$ - $5+6+6=17$.

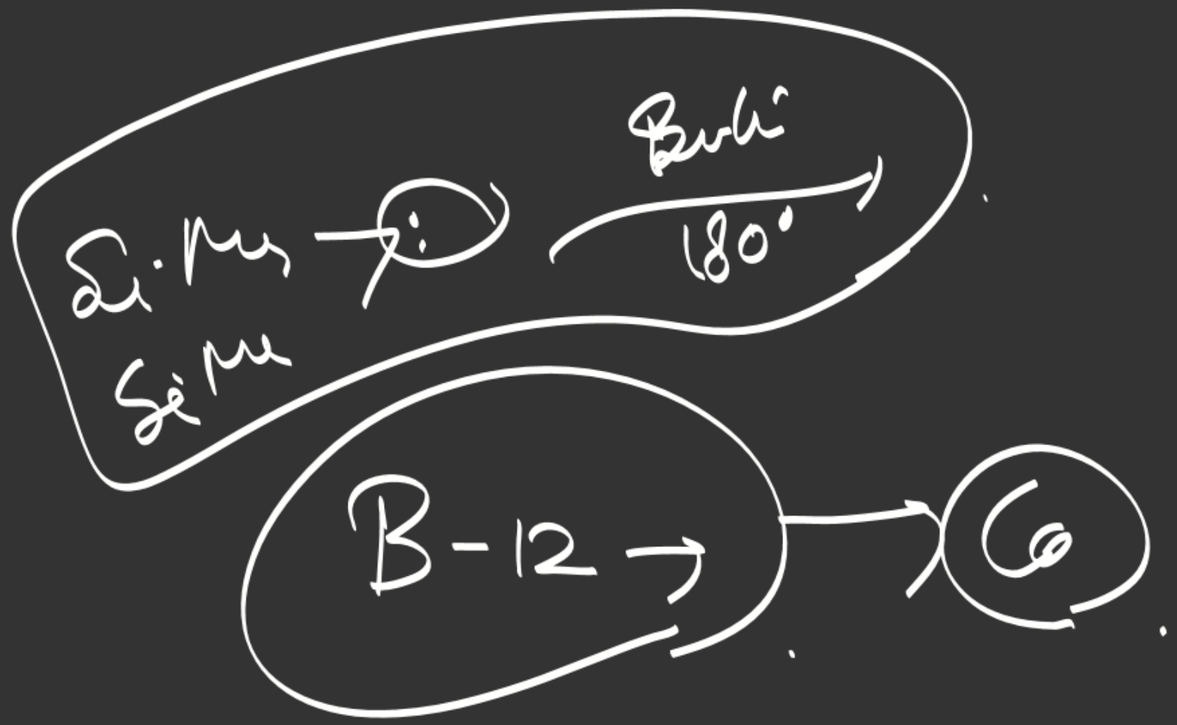
$[Co(H_2O)_6]^{2+}$

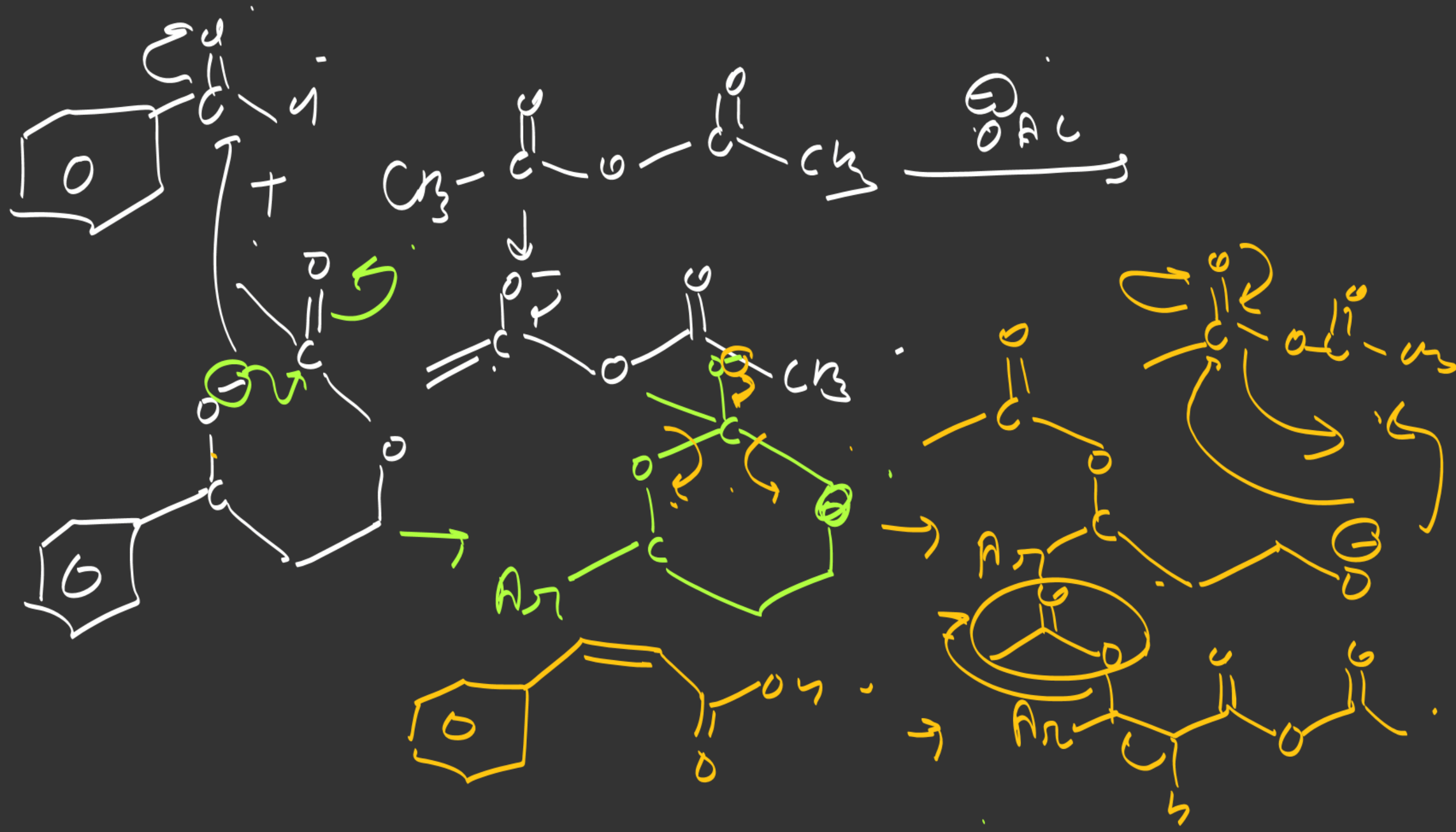
M.M: $\mu = \sqrt{n(n+2)}$ BM

n = 3

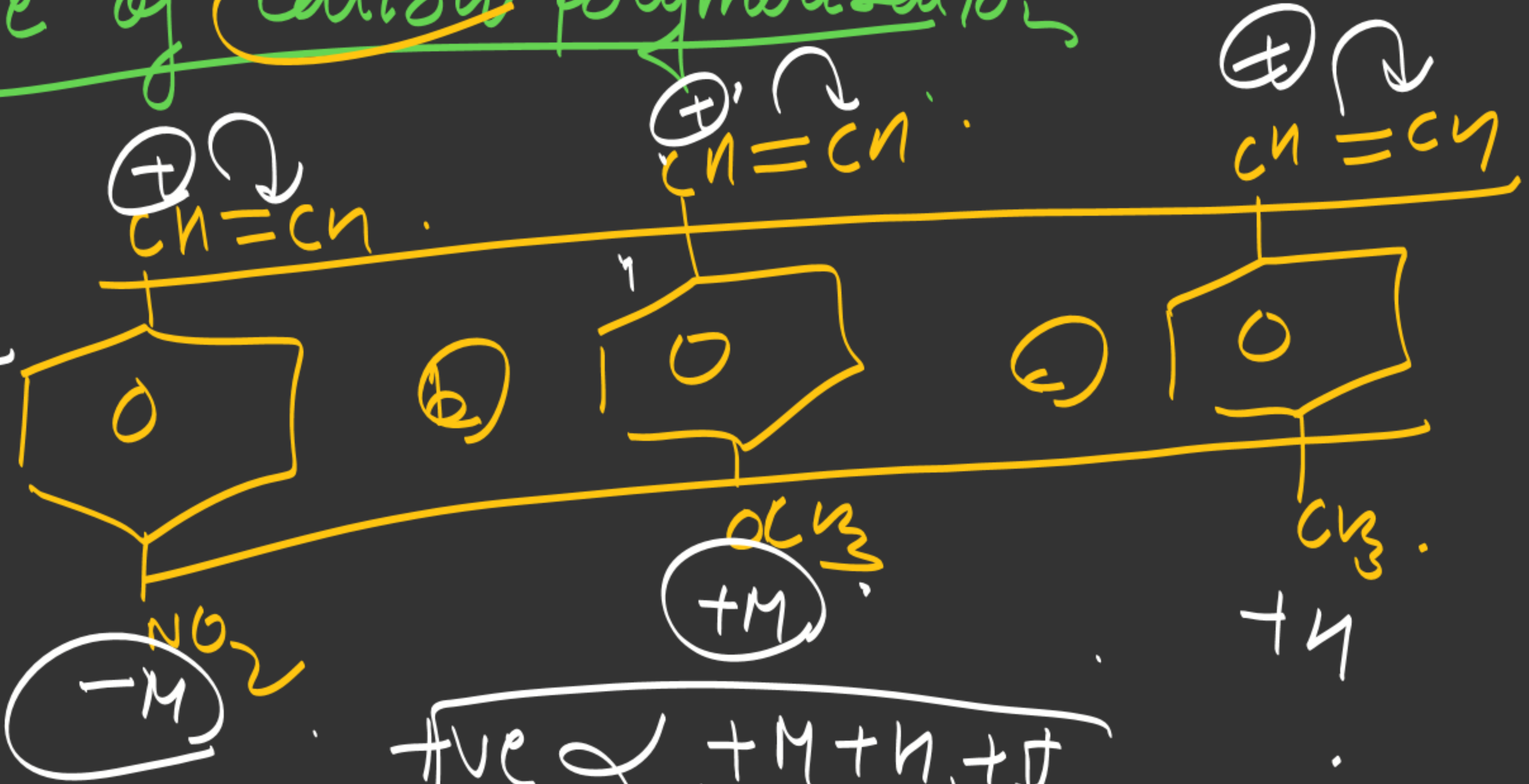
$= \sqrt{3(3+2)}$

$= \sqrt{15} = 3.877$ BM


Burki
180°
B-12 →
G



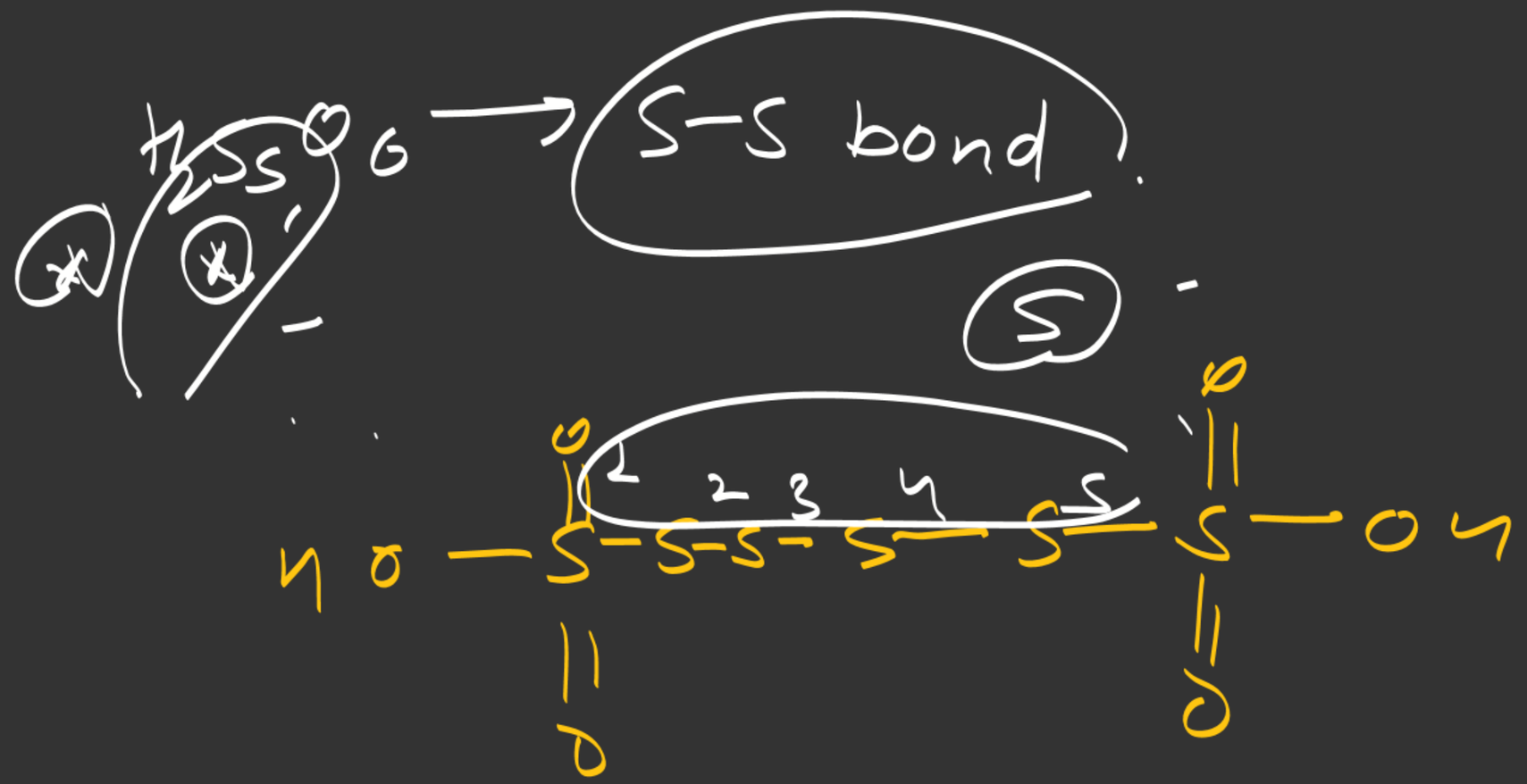
Rate of Cation polymerisation

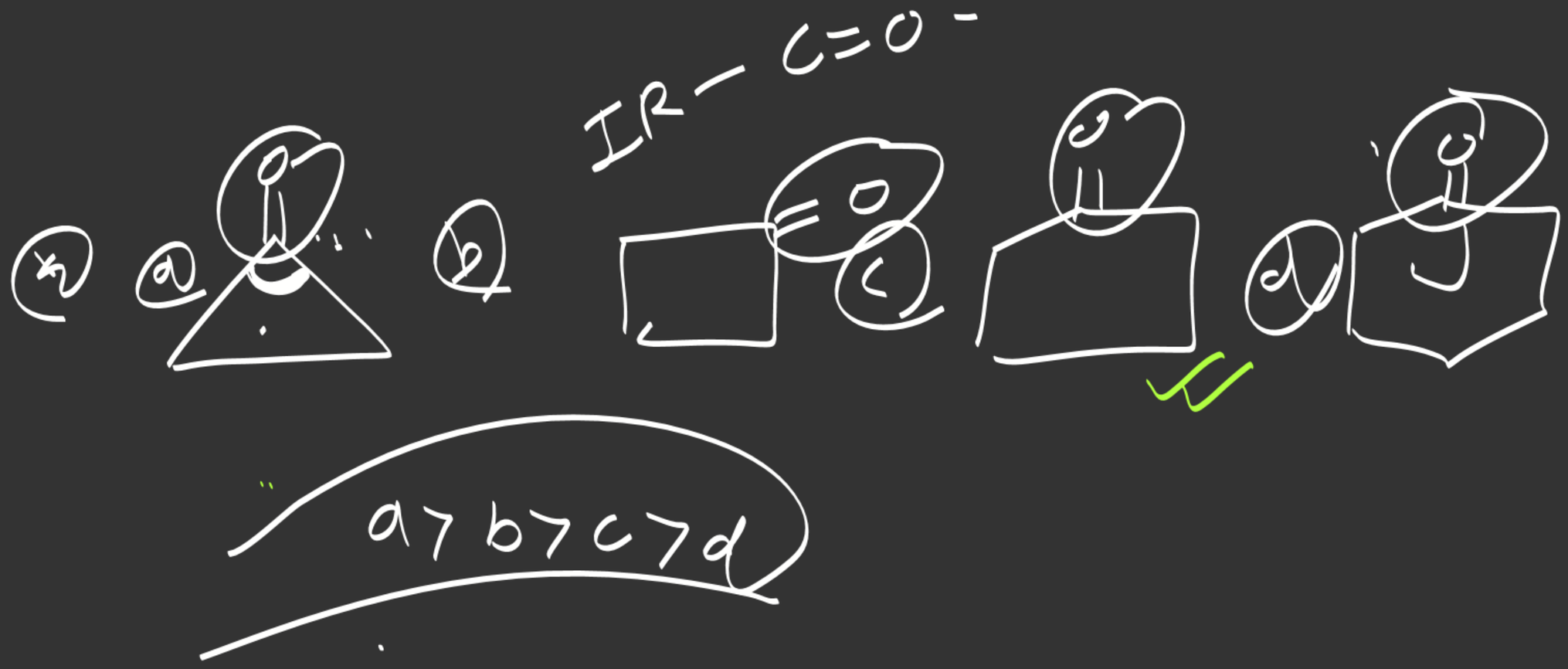


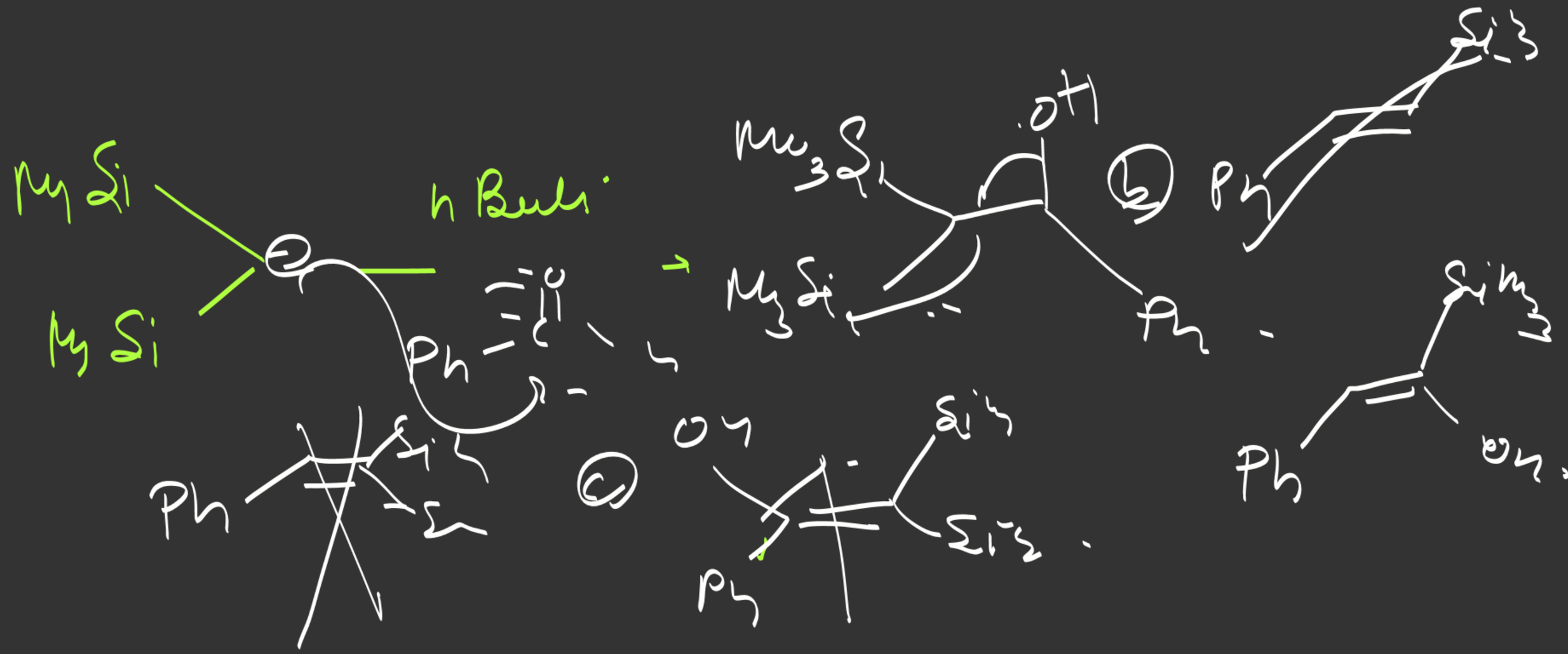
b > c > a

+ve ∝ +M +H, +I

+ve ∝ $\frac{1}{-M \; -I \; -H}$


S-S bond
S
1 2 3 4 5


IR- C=O-
a
b
c
d
a7b7c7d


Me3Si
SiMe3
nBuLi
OH
Ph
SiMe3
Me3Si
Ph
Ph
SiMe3
OH
Ph
OH
SiMe3
SiMe3
Ph

Q. $A = -\log 24$?

$$A = -\log 0.24$$

$$-\log T = A$$

$$T = 10^{-A}$$

$T \rightarrow$ multiplicative

$A \rightarrow$ Additive

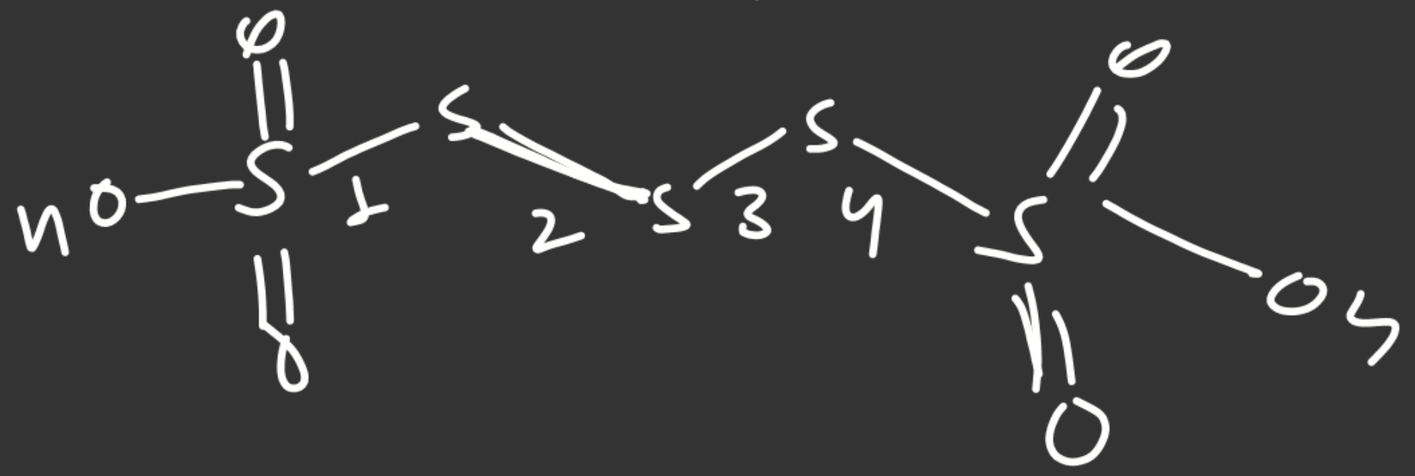
$A_1 + A_2 \Rightarrow T_1 \times T_2$

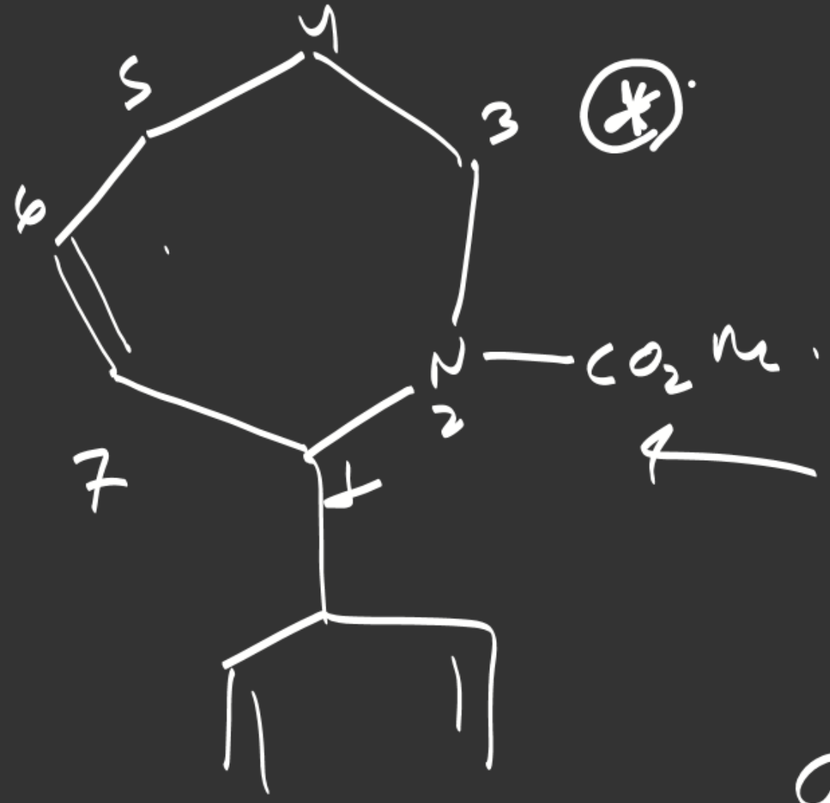
$$\frac{60}{100} \times \frac{40}{100}$$

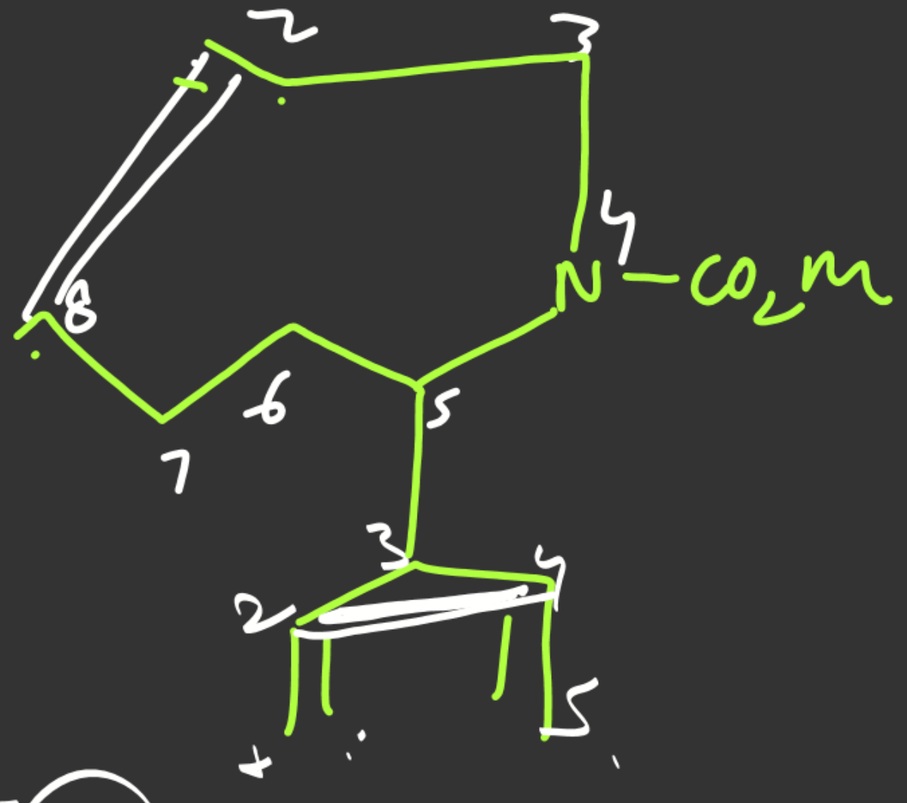
$$= \frac{2400}{10000} = 24\%$$

$H_2S_5O_6$: 4 S–S bond

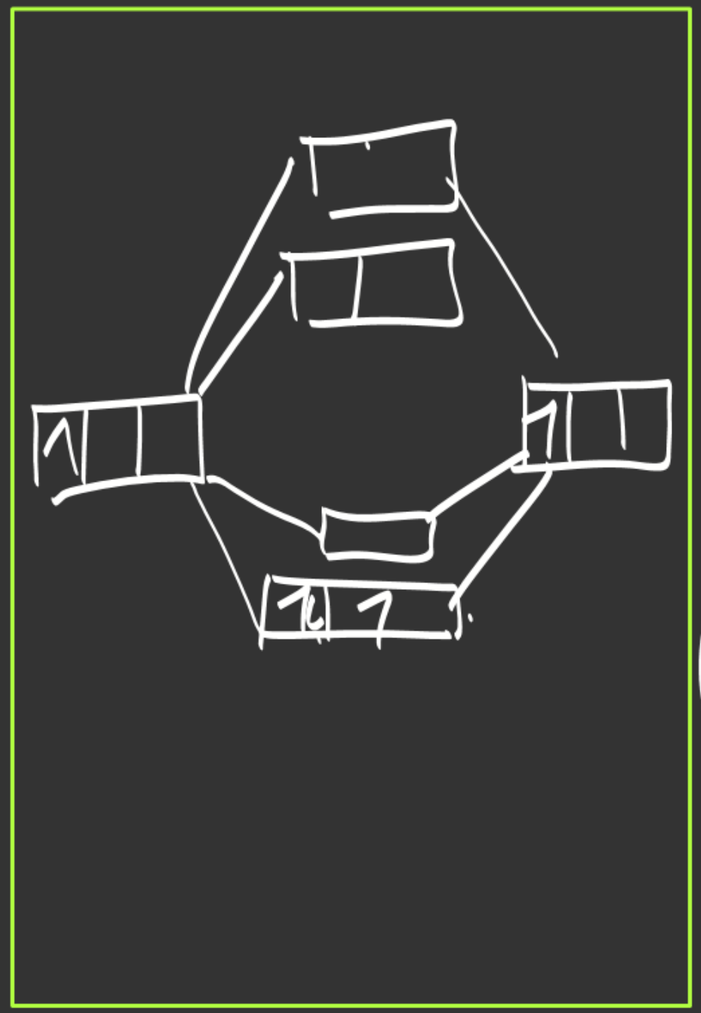
H_2S_6O .

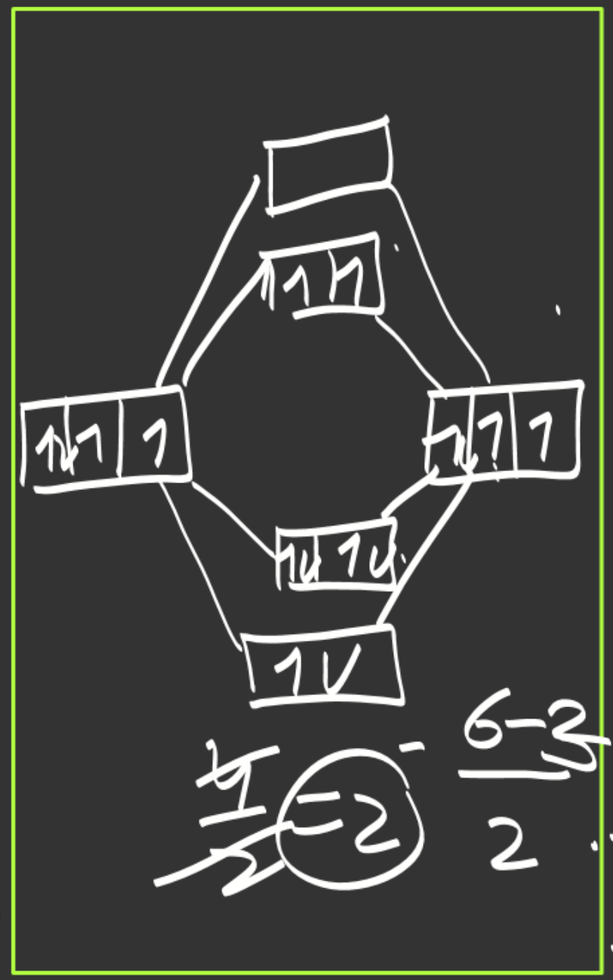


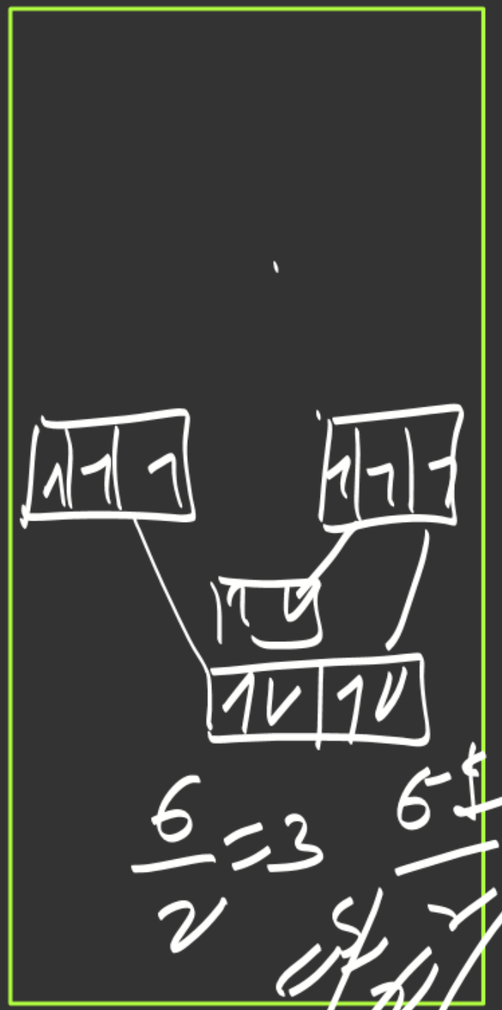




$9 - 2 = 7$







(7) Pu → isotope

Pu^{239} → Nuclear.

(8) U^{235}, U^{238}

Q. h = 6 X - subgroup, order

1, 2, 3, 4.

C_{3v} IE $2C_3$ $3\sigma_v$. (4)

$Na_2S_2O_3^{2-}$

Q. $E_{Fe^{3+}/Fe^{2+}} = ?$

NET GATE

BARC

IIT JAM

CUET

$E_{Fe^{3+}/Fe} = -0.04V$

$E_{Fe^{2+}/Fe} = -0.44V$

$K_2Cr_2O_7$ ②

MW / 6

Salt — n = ?

$Fe^{3+} + 3e \longrightarrow Fe$ — ①

$Fe^{2+} + 2e \longrightarrow Fe$ — ②

$Fe^{3+} + e \longrightarrow Fe^{2+}$

$$E_3 = \frac{n_1 E_1^\circ - n_2 E_2^\circ}{n_3}$$

$$= \frac{3 \times (-0.04) - (2 \times 0.44)}{1}$$

$$= -0.12 + 0.88$$

$$= 0.76\ V.$$

Kohlrausch's law of infinite dilution

$$Ag_2C_2O_4 \rightarrow 2Ag^+ + C_2O_4^{2-}$$

$$2(s) \qquad s$$

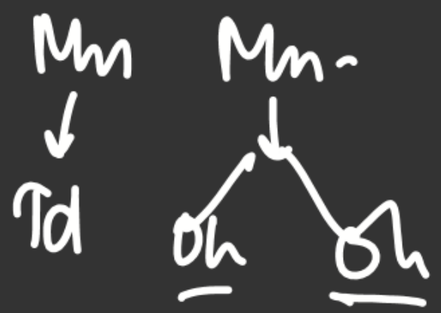
$$K_{sp} = (2s)^2 \cdot s$$

$$= 4s^3$$

$$s = (2.2 \times 10^{-4})$$

⑧ Mn_3O_4 → Td, Oh

$\frac{1}{8}$ $\frac{2}{4} = \frac{1}{2}$



160 ↑

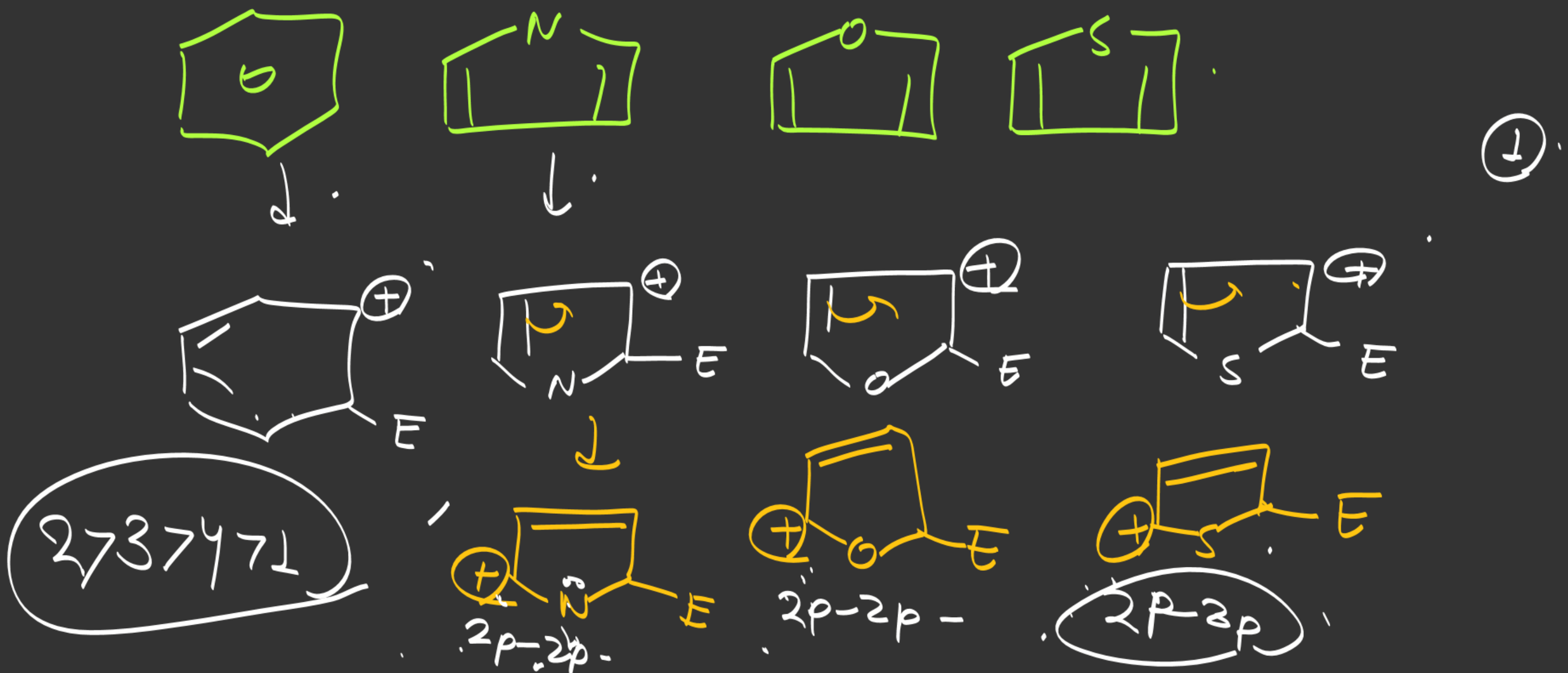
Q. $AgNO_3 + KCl - KNO_3 = AgCl$.

$Ag^+ + NO_3^- + K^+ + Cl^- - K^+ - NO_3^-$

NaCl + δ ↑ yellow

F-centre

Farbe centre


O
N
O
S
1
E
N
E
O
E
S
E
2737471
N
E
2p-2p
2p-2p
O
E
2p-2p
S
E

Electrophilicity order of halogen cations

F^+, Cl^+, Br^+, I^+

Pb

$F^+ > Cl^+ > Br^+ > I^+$