

PRAAYAS

JEE 2026

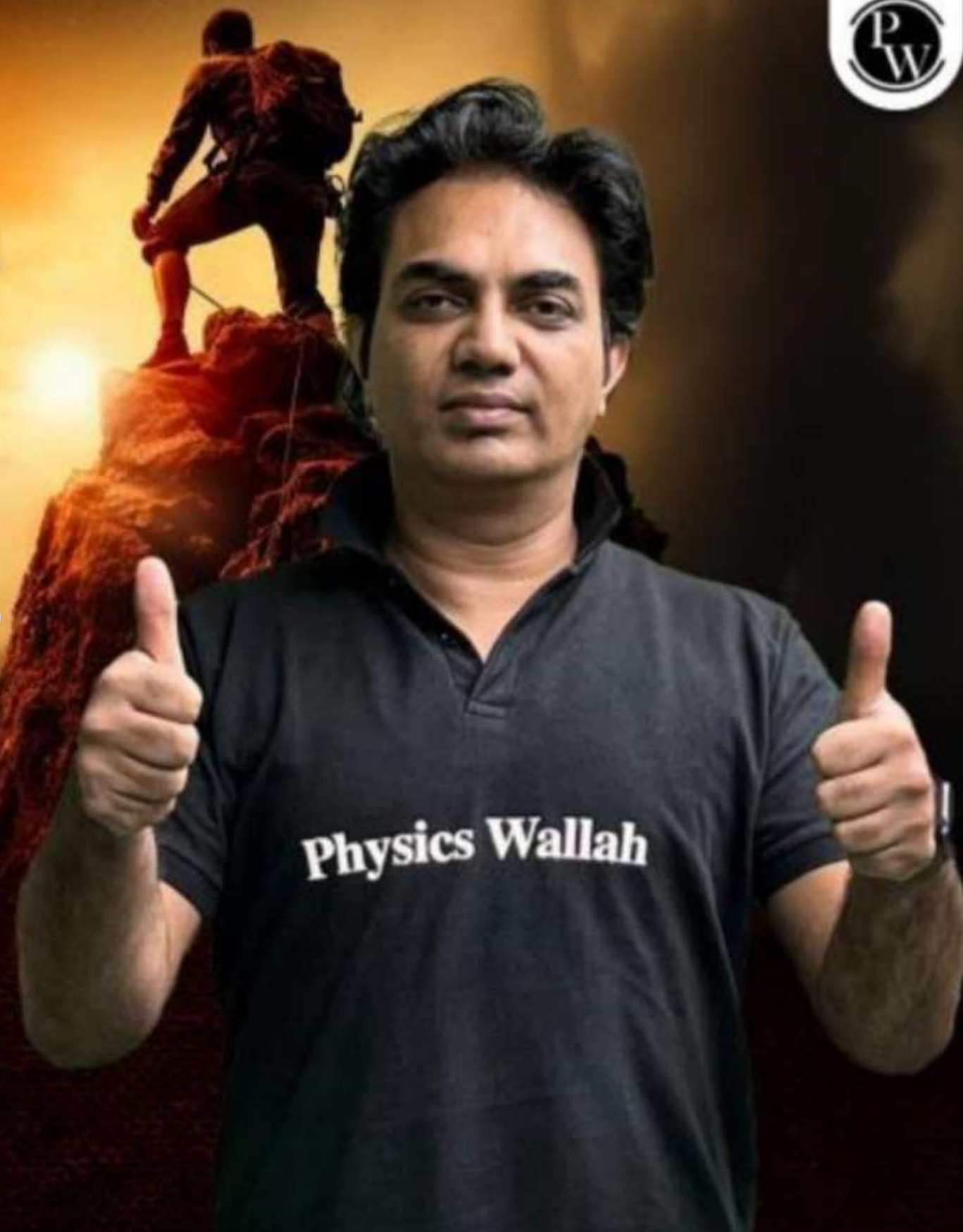
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PHYSICAL CHEMISTRY

Redox Reaction

Lecture – 07

FAISAL RAZAQ





Topics to be covered

A Volume Strength and % Labelling

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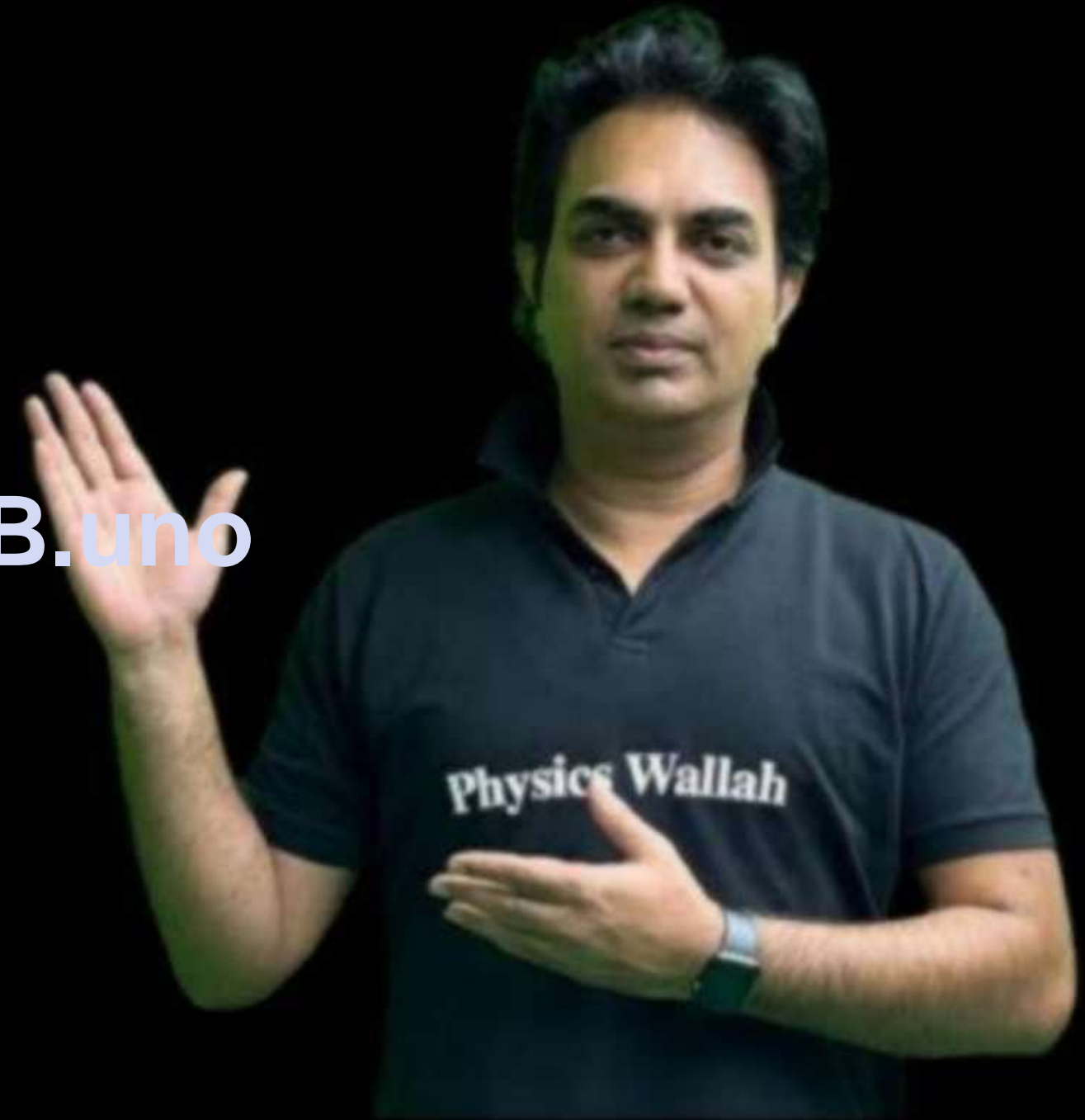




TELEGRAM GROUP BY FAISAL SIR



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Question

When 30 ml of acid is neutralized by 15 ml of 0.2 N alkali, the acid concentration is _____

A 0.1 N

B 0.2 N

C 0.3 N

D 0.4 N

LOE

Acid + Base \rightarrow

m.eq of acid = m.eq of base

$N_1 V_1 = N_2 V_2$

$$N \times \cancel{30}^2 = 0.2 \times \cancel{15}$$

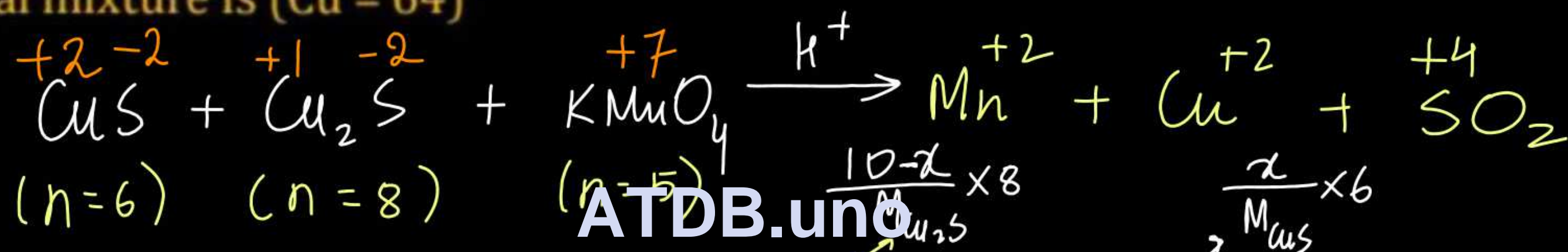
$$N = 0.1 \text{ N}$$

$$\text{eq} = n\text{-factor} \times \text{molarity} \times \text{vol}$$

IIT JEE Adv.



A 10 g mixture of Cu_2S and CuS was treated with 400 ml of 0.4 M - MnO_4^- in acid solution producing SO_2 , Cu^{2+} and Mn^{2+} . The SO_2 was boiled off and the excess of MnO_4^- was titrated with 200 ml of 1 M - Fe^{2+} solution. The percentage of CuS in original mixture is (Cu = 64)



$$\text{Eq. of } \text{KMnO}_4 = \text{Eq. of } \text{Cu}_2\text{S} + \text{Eq. of } \text{CuS}$$

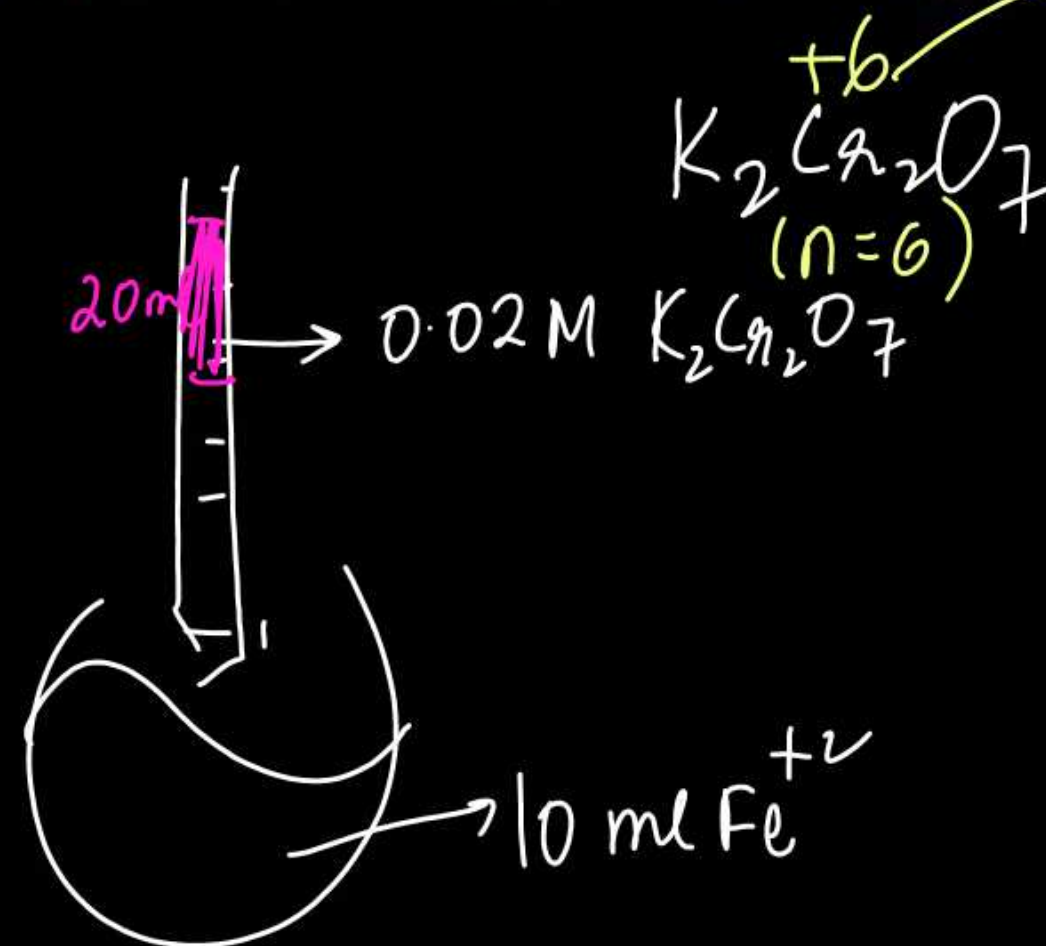
$$\frac{(400 \times 0.4 \times 5) - (200 \times 1 \times 1)}{1000} = \frac{(10-x)}{M_{\text{Cu}_2\text{S}}} \times 8 + \frac{x}{M_{\text{CuS}}} \times 6 \quad \text{--- (1)}$$

JEE Main 27 July 2022 Shift-1

Mohr Salt
 Fe^{+2} 

20 mL of 0.02 M $K_2Cr_2O_7$ solution is used for the titration of 10 mL of Fe^{2+} solution in the acidic medium. The molarity of Fe^{2+} solution is 24 $\times 10^{-2}$ M. (Nearest Integer)

$$3 \times 2 = 6$$

LOE

$$m.\text{eq. of } K_2Cr_2O_7 = m.\text{eq. of } Fe^{+2}$$

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$$6 \times 0.02 \times 20 = 1 \times M \times 10$$

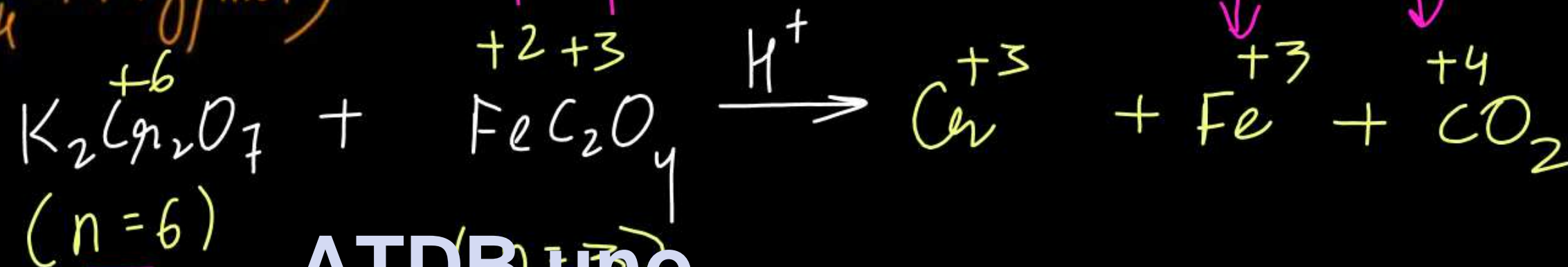
$$M = 0.24 \text{ M}$$

JEE Main 5 Sep 2020 Shift-2



The volume, in ml, of 0.02 M $K_2Cr_2O_7$ solution required to react with 0.288 g of ferrous oxalate in acidic medium is _____.

(Molar Mass of $FeC_2O_4 = 144 \text{ g/mol}$)



LOE

$$Eq \text{ of } K_2Cr_2O_7 = Eq \text{ of } FeC_2O_4$$

$$6 \times 0.02 \times V = \frac{0.288}{144/3}$$

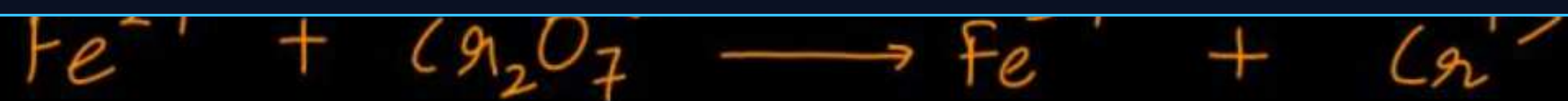
$$V = 50 \text{ ml}$$

Balancing Redox Reaction



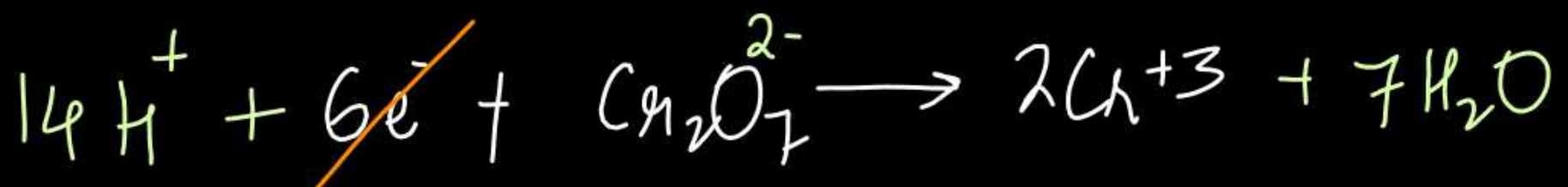
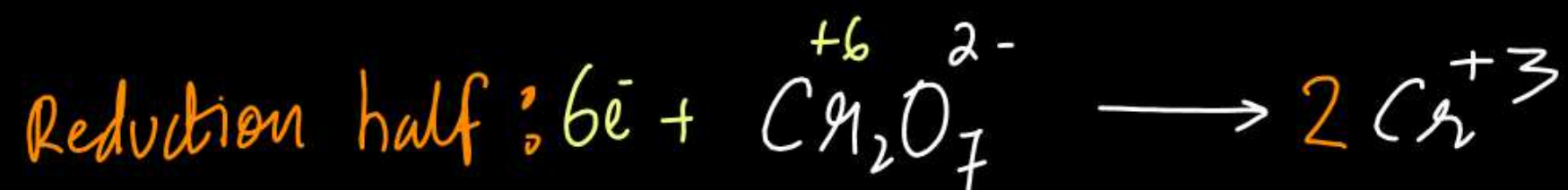
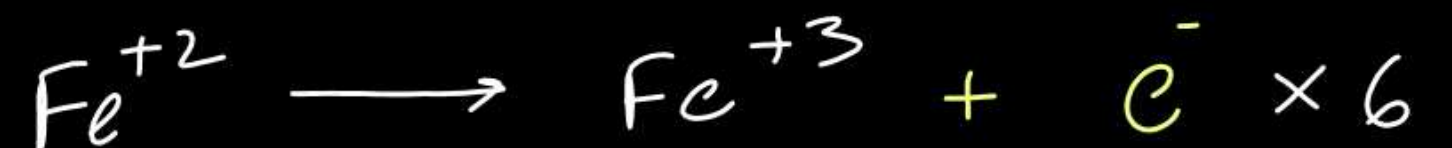
- 17 ✓ Balance all the atoms other than O and H. ✓
- 27 ✓ Find change in oxidation number in reduction and oxidation and equate them.
- 37 Balance charge on both the sides.
- 47 Balance O and H with water.

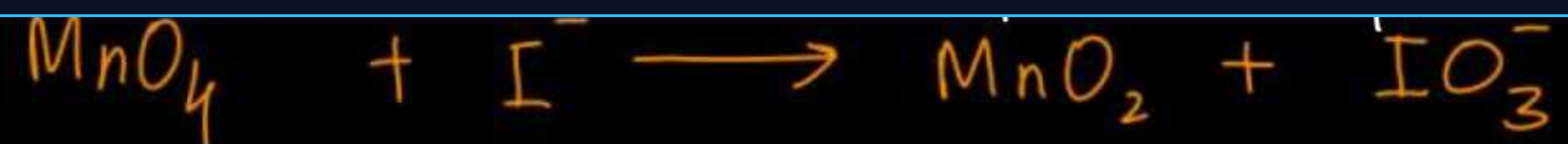
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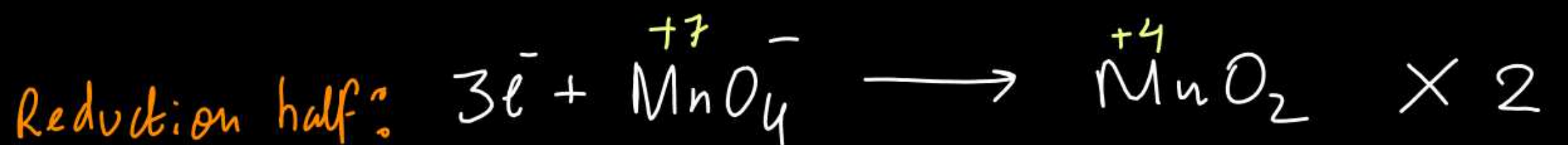
Balance in acidic Medium.

Oxidation half:



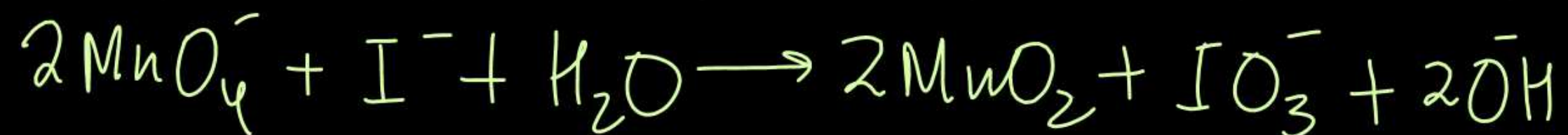


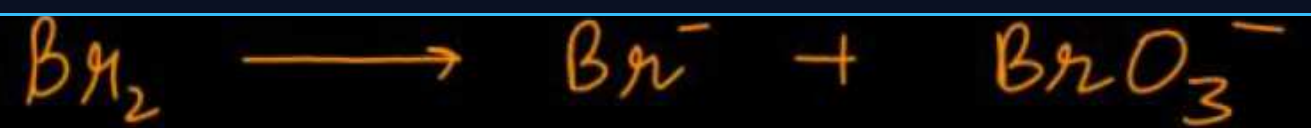
Balance in basic medium.



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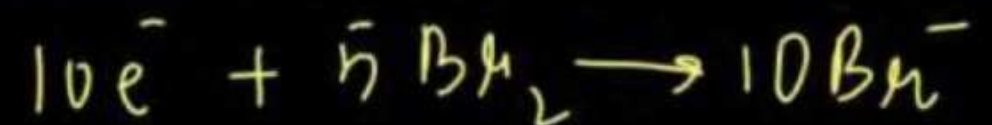
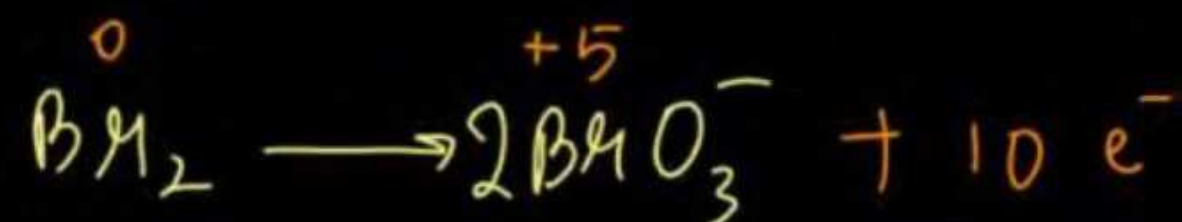
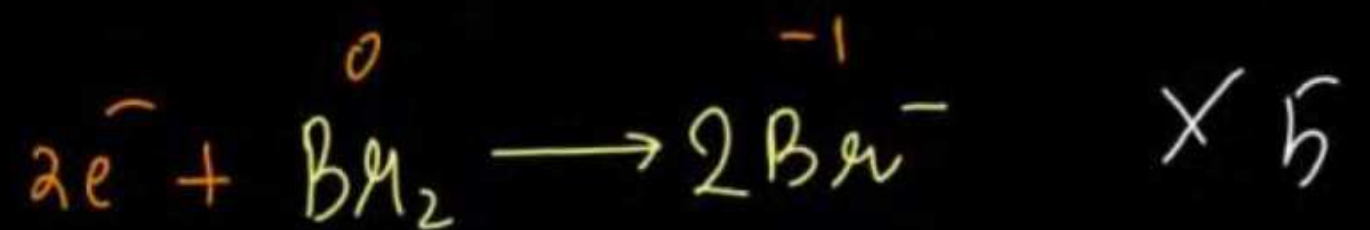
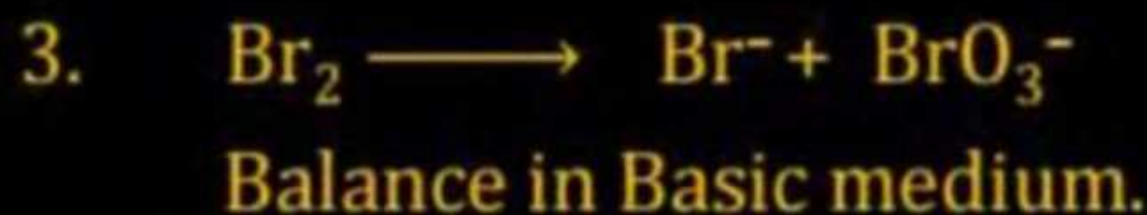
after two steps



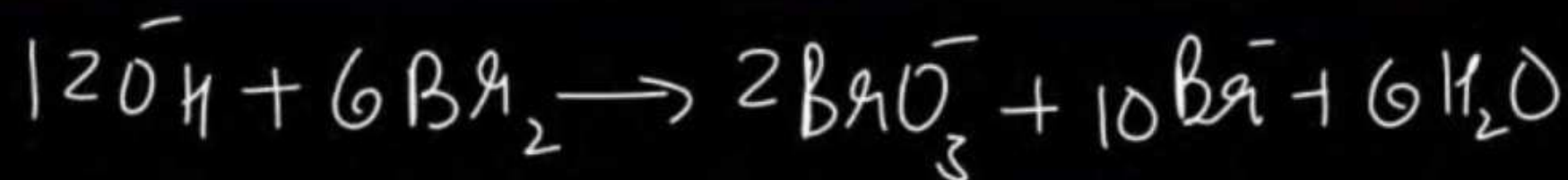
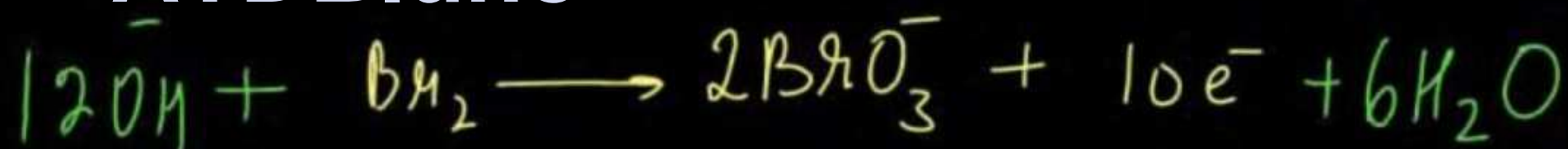


Balance in basic medium.

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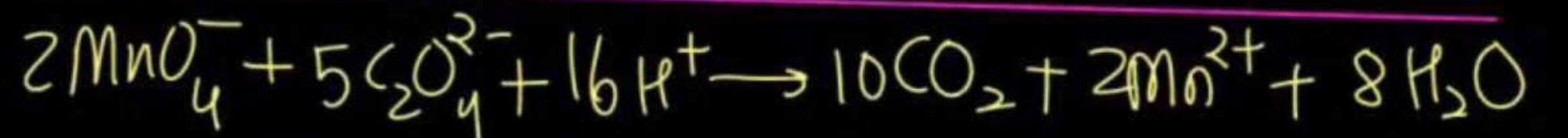
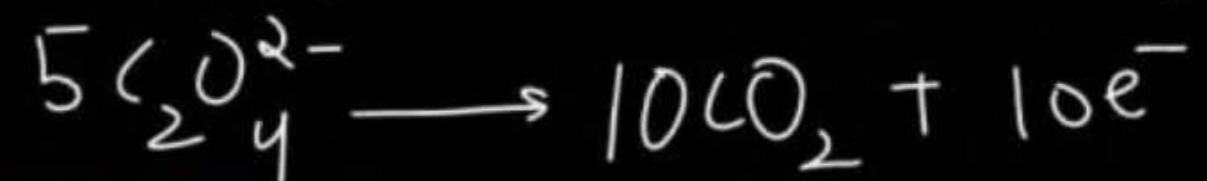
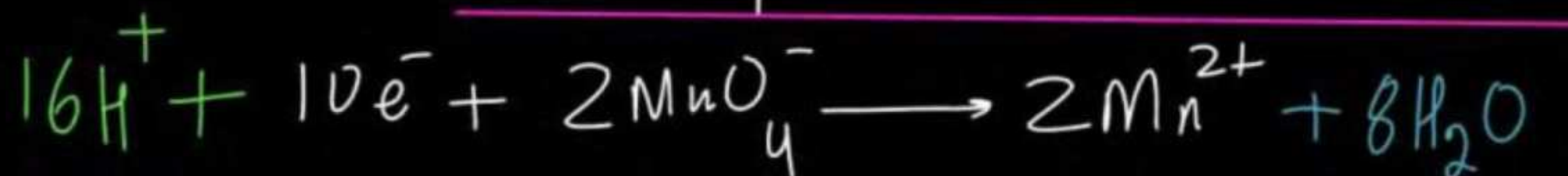
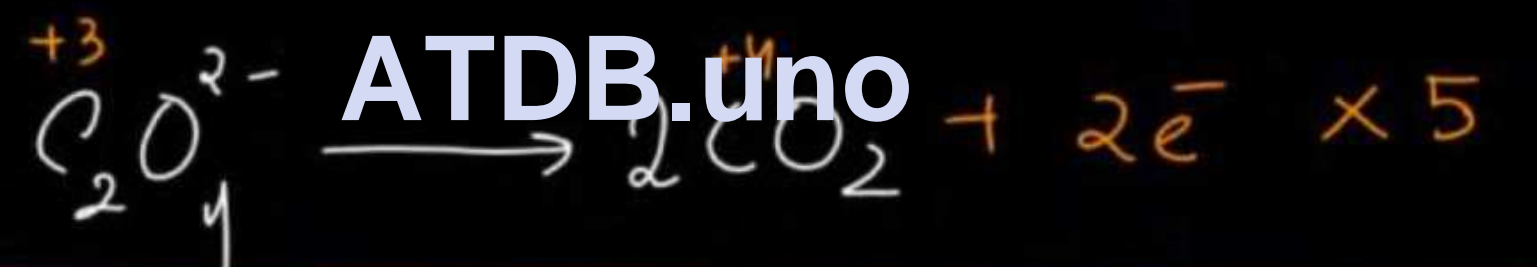
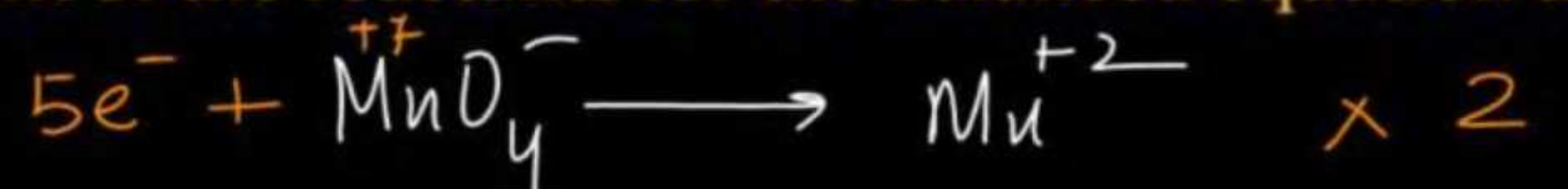




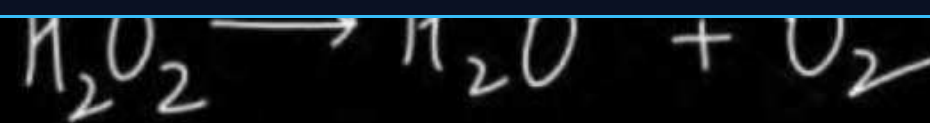
For the redox reaction



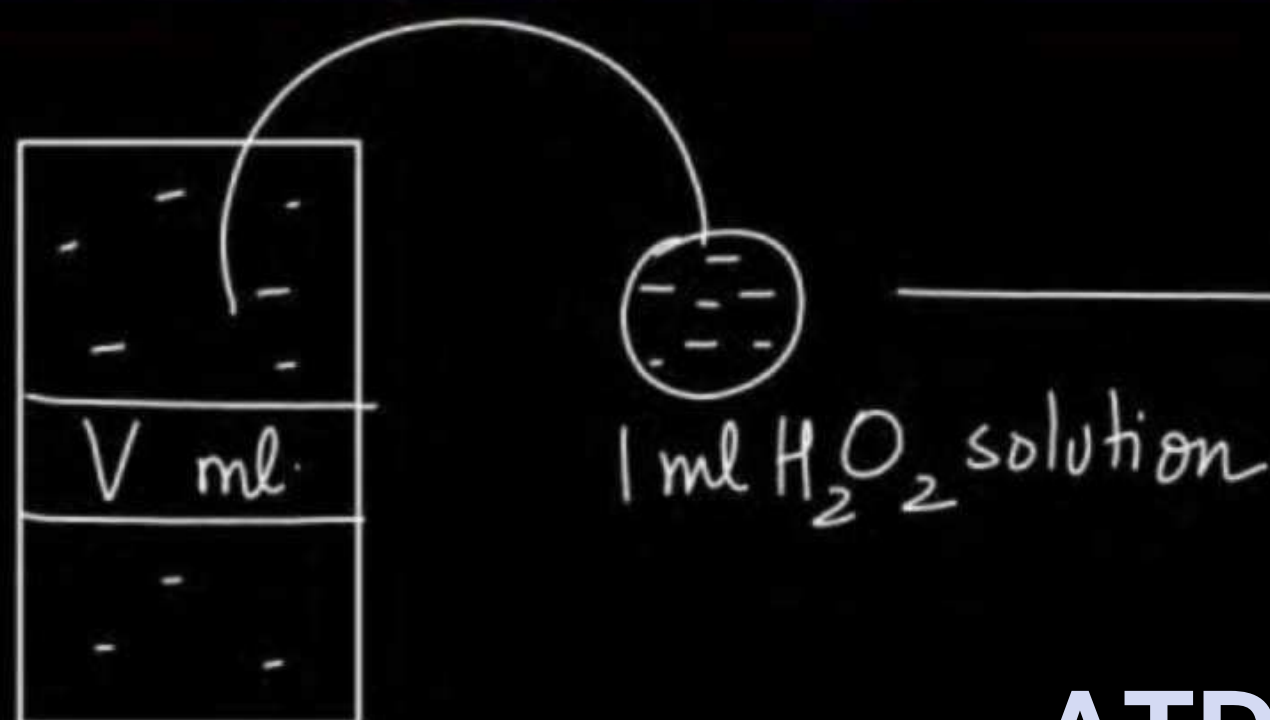
the correct coefficient of the reactants for the balanced equation are



Volume Strength of H_2O_2



$$1 \text{ c.c.} = 1 \text{ cm}^3 = 1 \text{ ml}$$



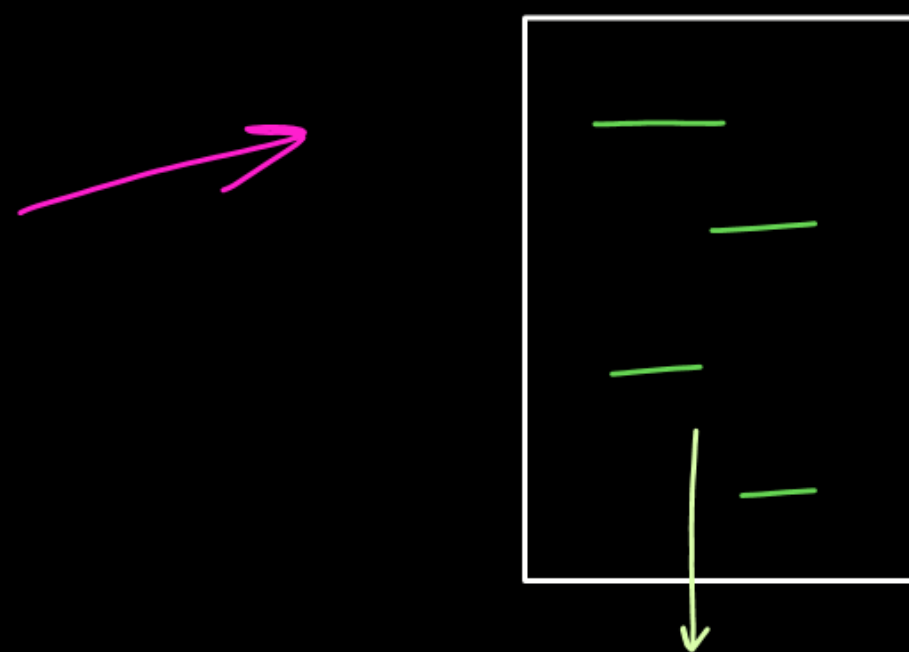
$V \text{ ml } O_2 \text{ at STP}$ $\frac{9}{40}$!

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Volume of O_2 gas produced at STP by the decomposition of 1 ml H_2O_2 solution is known as volume strength of that H_2O_2 solution.



Normality = N

⊗

$$\text{Volume strength} = 5.6 \times N$$
$$V.S = 11.2 \times N$$

IIT-JEE 1992



The volume strength of 1.5 N H_2O_2 solution is

- A 4.8
- B 8.4
- C 3.0
- D 8.0

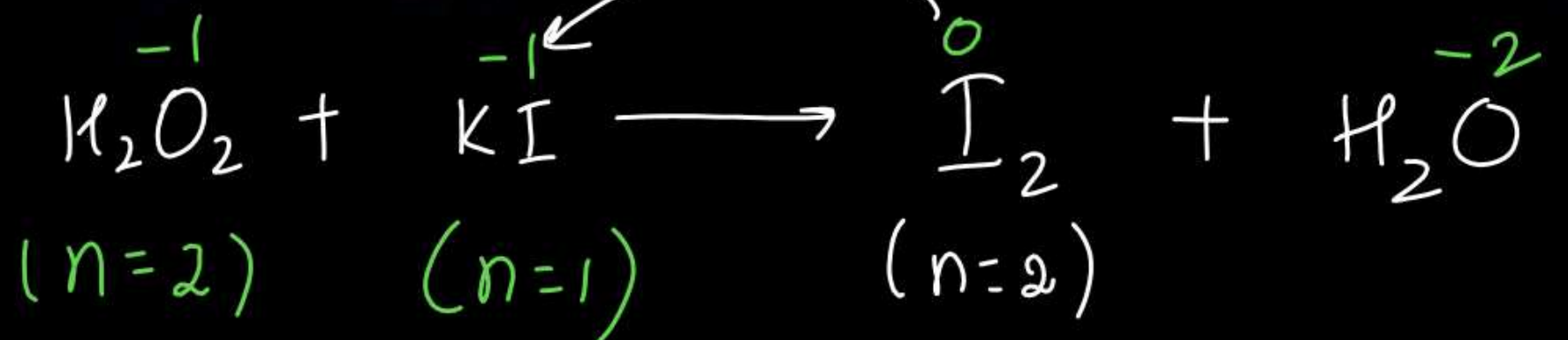
$$\begin{aligned} V.S &= 5.6 \times 1.5 \\ &= 8.40 \end{aligned}$$

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IIT-JEE 1995



A 5.0 cm³ solution of H₂O₂ liberates 0.508 g of iodine from an acidified KI solution. Calculate the strength of H₂O₂ solution in terms of volume strength at STP.



$$\begin{aligned}
 \text{Eq wt} &= \frac{\text{Mol wt}}{n} \\
 &= \frac{254}{2} \\
 &= 127
 \end{aligned}$$

LOE

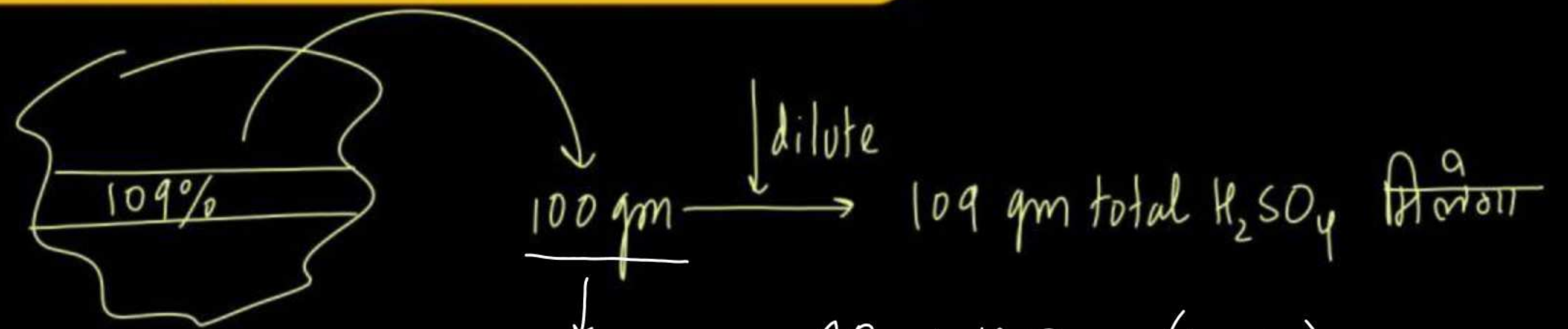
$$\text{m.eq of H}_2\text{O}_2 = \text{m.eq of I} = \text{m.eq of I}_2 = 127$$

$$5 \times N = \frac{0.508}{127} \times 1000$$

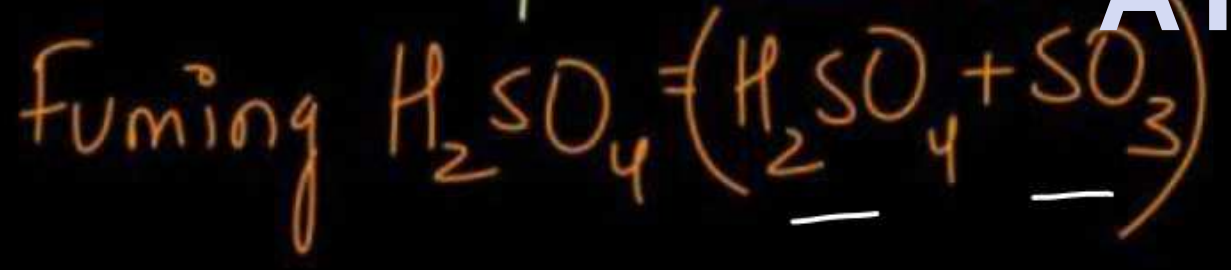
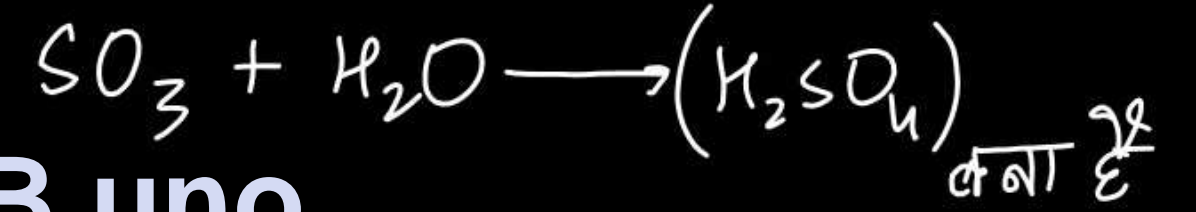
$$N = \frac{4}{5} = 0.8 \text{ N}$$

$$\begin{aligned}
 \text{V.S} &= 5.6 \times N = 5.6 \times 0.8 \\
 &= 4.48
 \end{aligned}$$

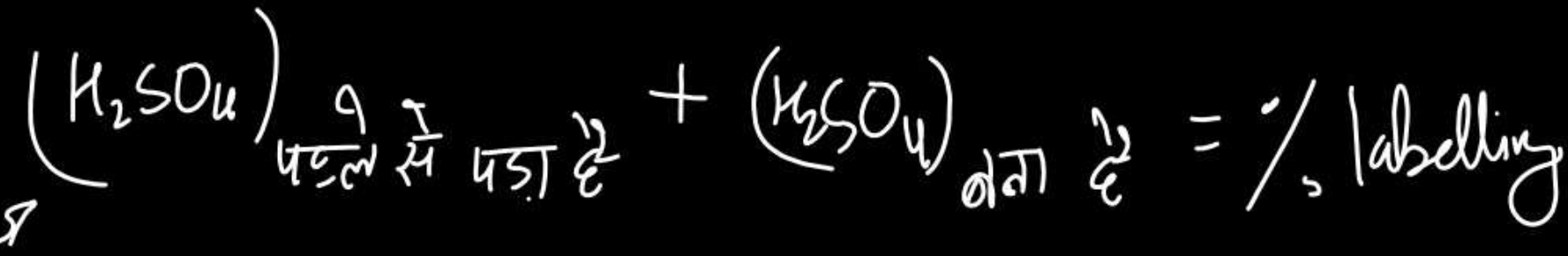
Percentage Labelling of Oleum



Oleum sample



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Question Find out the percentage of free SO_3 in 10g oleum.



Let the sample of oleum = 100g

$\begin{cases} \rightarrow x \text{ g } \text{SO}_3 \\ \rightarrow (100-x) \text{ g } \text{H}_2\text{SO}_4 \text{ (नएल से ए)} \end{cases}$



$x \text{ g}$

↓

$\frac{x}{80}$

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$$(100-x) + \left(\frac{x \times 98}{80} \right) = 100$$

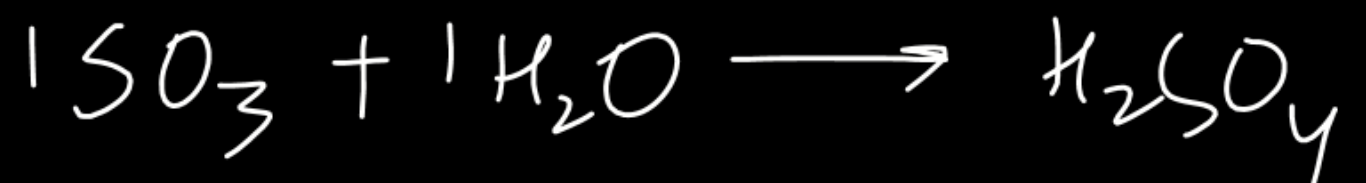
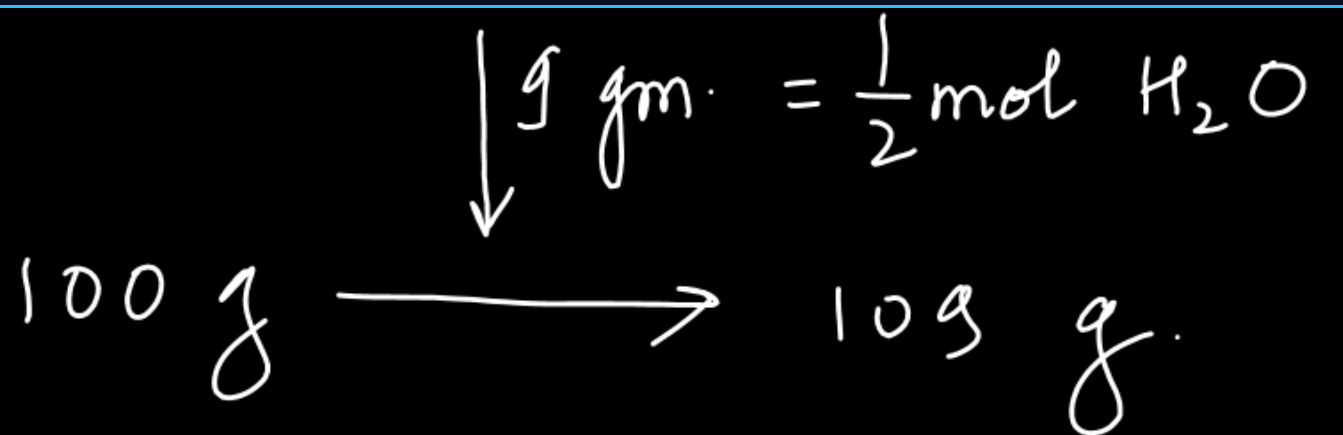
$$x = 40$$

$\left(\frac{x}{80} \times 98 \text{ g} \right)$

नएल से ए

$\% \text{SO}_3 = 40\%$

Ans



$\frac{1}{2}$ mol water reacts with $\frac{1}{2}$ mol $\text{SO}_3 = (40 \text{ g})$

$$\% \text{ SO}_3 = 40\%$$

Question find out the labelling of oleum sample having 40% free SO₃.



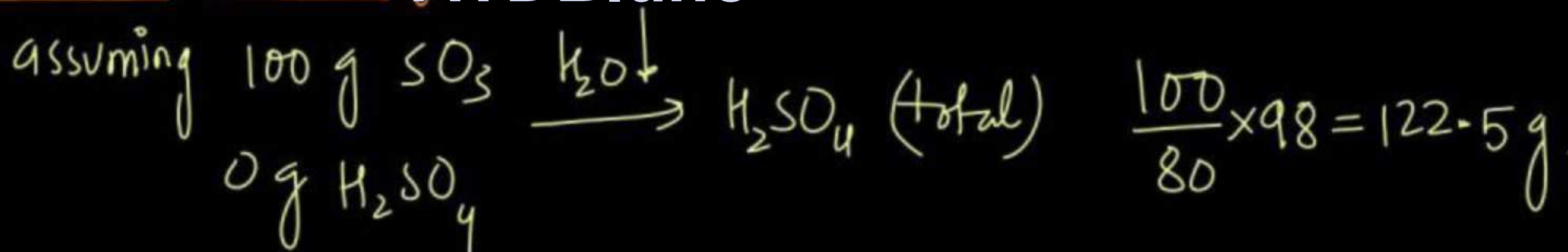
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Minimum labelling of devm = greater than 100%



For maximum labelling ज्यादा से ज्यादा H₂O add करना चाहिए।

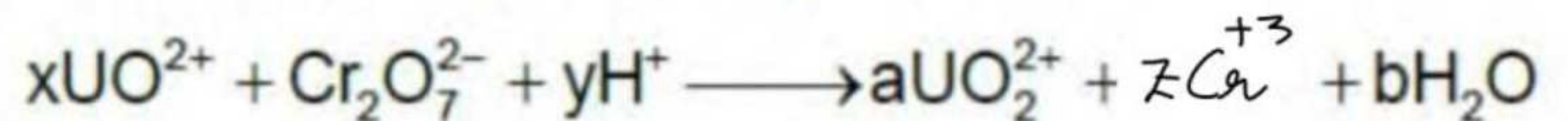


 $SO_3 = 0$ $SO_3 = 100\text{ g}$

$100\% < \text{oleum labelling} < 122.5\%$

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In the following redox equation,



the values of coefficients x, y and z respectively,

(1) 3, 8, 2

(2) 3, 8, 7

(3) 3, 2, 4

(4) 3, 1, 8

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Question



0.3 g of an oxalate salt was dissolved in 100 mL solution. The solution required 90 mL of N/20 KMnO_4 for complete oxidation. The % of oxalate ion in salt is

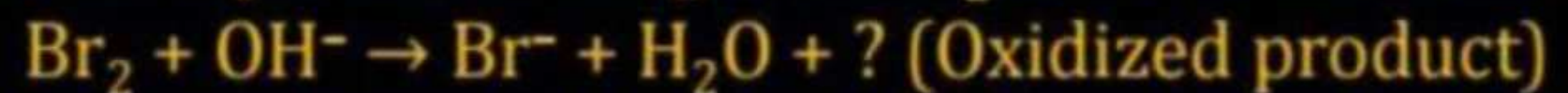
- A 33%
- B 66%
- C 70%
- D 40%

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Question



The equivalent weight of Br_2 is 96 in the following disproportionation reaction.



The oxidation state of Br in the oxidized product is (Br = 80)

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IIT JEE Adv.



A solution of 0.2 g of a compound containing Cu^{2+} and $\text{C}_2\text{O}_4^{2-}$ ions on titration with 0.02M KMnO_4 in presence of H_2SO_4 consumes 22.6 ml. of the oxidant. The resultant solution is neutralized with Na_2CO_3 , acidified with dil. acetic acid and treated with excess KI. The liberated iodine requires 11.3 ml of 0.05M $\text{Na}_2\text{S}_2\text{O}_3$ solution for complete reduction. Find out the molar ratio of Cu^{2+} to $\text{C}_2\text{O}_4^{2-}$ in the compound.

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JEE Adv. 1998



An aqueous solution containing 0.10 g KIO_3 (formula weight = 214.0) was treated with an excess of KI solution. The solution was acidified with HCl. The liberated I_2 consumed 45.0 mL of thiosulphate solution to decolourise the blue starch-iodine complex. Calculate the molarity of the sodium thiosulphate solution.

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Module - H.w.



Prarambh : 28 to 40

Prabal : 1 to 36

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THANK
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YOU