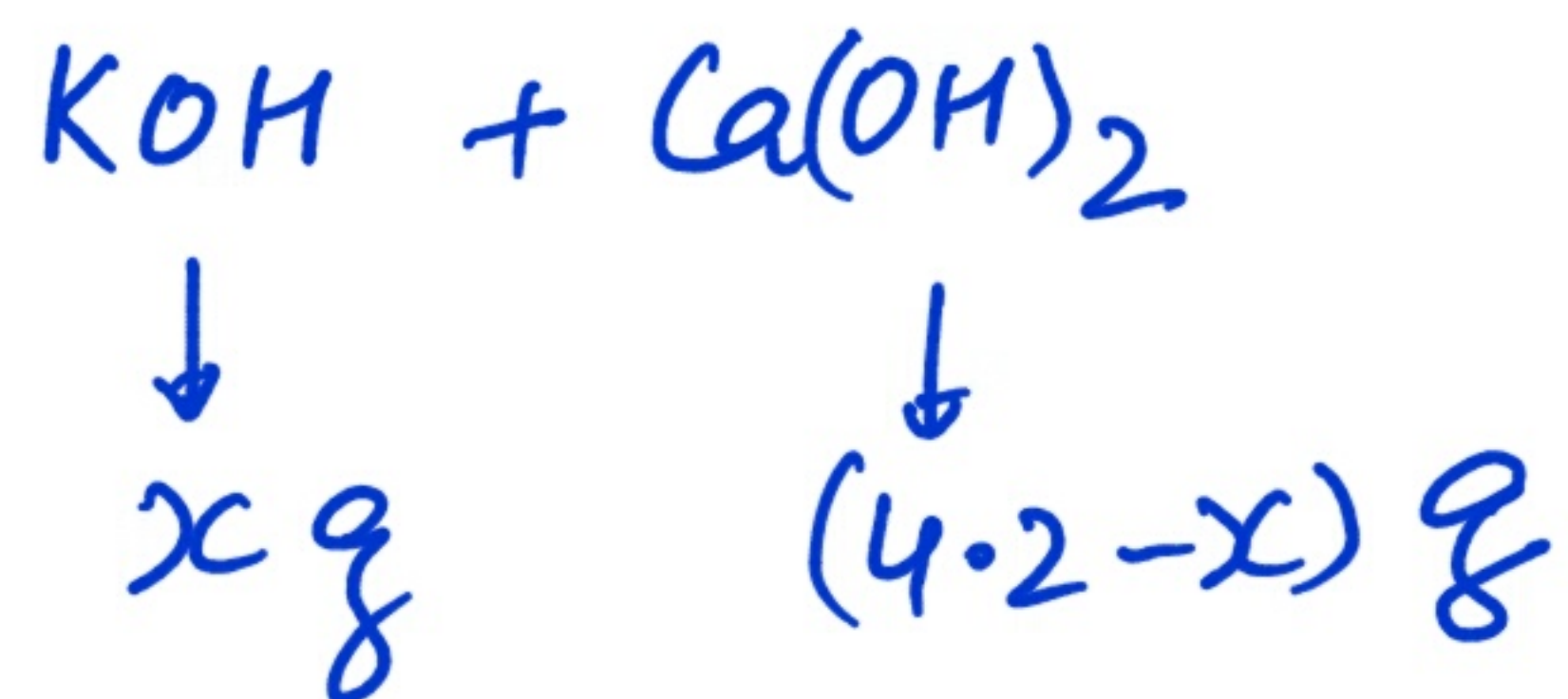


## EXERCISE-S-II

1. A solution containing 4.2g of KOH and  $\text{Ca(OH)}_2$  is neutralized by an acid. It consumes 0.1 equivalent of acid, calculate the percentage composition of the sample.



eq. of base = eq. of acid

$$\therefore, \frac{x}{56} \times 1 + \frac{(4.2 - x)}{74} \times 2 = 0.1$$

$$\therefore, \frac{x}{56} + \frac{4.2}{37} - \frac{x}{37} = 0.1$$

$$\therefore, \frac{x}{37} - \frac{x}{56} = \frac{4.2}{37} - 0.1$$

$$\Rightarrow \therefore, x \left[ \frac{56 - 37}{56 \times 37} \right] = \frac{4.2 - 3.7}{37}$$

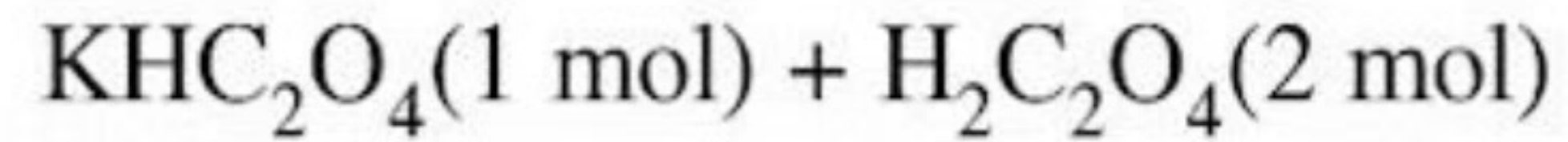
$$\therefore, x = \frac{0.5 \times 56}{19} = 1.474 \text{ g}$$

$$\therefore \% \text{ of KOH} = \frac{1.474}{4.2} \times 100 = \boxed{35\%}$$

$$\% \text{ of Ca(OH)}_2 = \boxed{65\%}$$



2. Calculate volume of 0.4 M  $\text{KMnO}_4$  required to react with following in acidic medium



V liter                  (1+2)=3 mole

$$\text{v.f.} = 5$$

$$\text{v.f.} = 2(4-3) = 2$$

0.4 M

$$\text{eq. of KMnO}_4 = \text{eq of C}_2\text{O}_4^{2-}$$

$$\text{or, } 0.4 \times V \times 5 = 3 \times 2$$

$$\text{or, } V = \frac{6}{2} = \boxed{3 \text{ L}} \text{ Ans.}$$



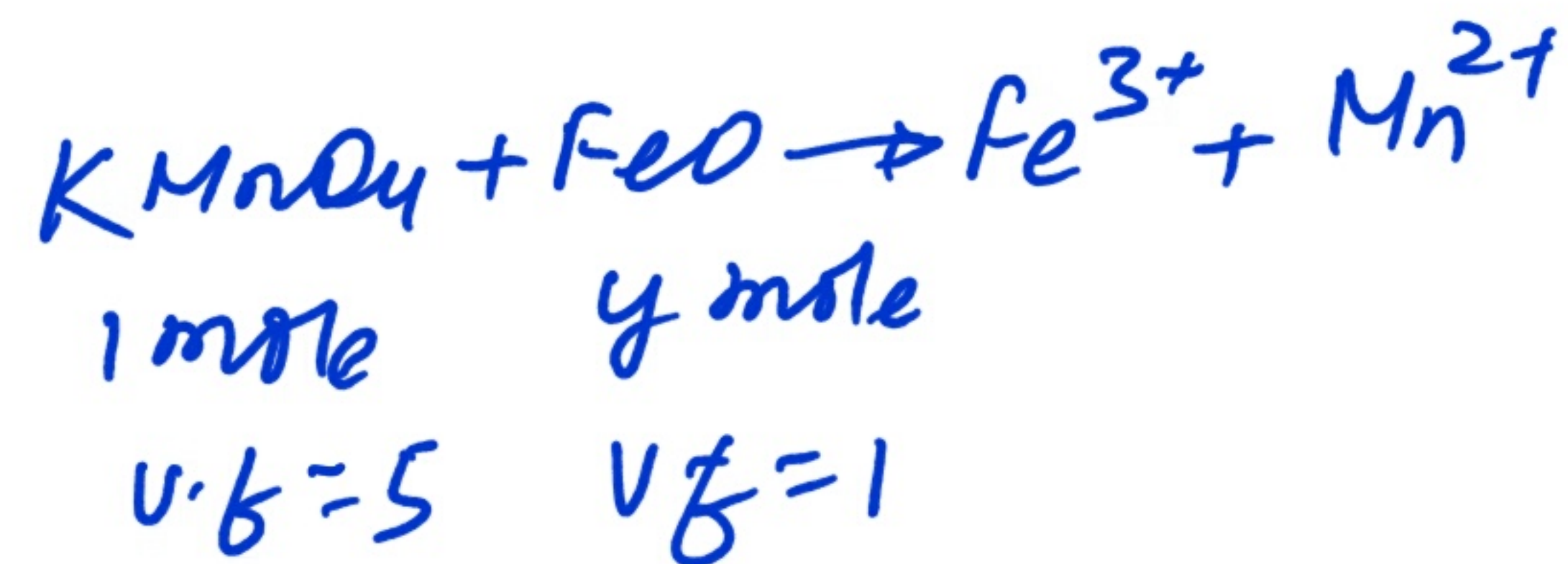
3. 520 gm mixture of  $\text{Fe}_2\text{O}_3$  and  $\text{FeO}$  reacts completely with 158 gm  $\text{KMnO}_4$  in acidic medium. Calculate the mole % of  $\text{Fe}_2\text{O}_3$  in mixture.

Let  $\text{Fe}_2\text{O}_3$  and  $\text{FeO}$   
 $\downarrow$   $\downarrow$   
 $x$  mole  $y$  mole

$$\therefore x \times 160 + y \times 72 = 520 \quad \text{--- (1)}$$

$$\text{KMnO}_4 = 158 \text{ g} = 1 \text{ mole}$$

$\text{KMnO}_4$  will oxidise  $\text{FeO}$  to  $\text{Fe}^{3+}$ .



$$\text{eq. of FeO} = \text{eq. of KMnO}_4$$

$$\therefore y \times 1 = 1 \times 5 \Rightarrow y = 5 \text{ mole}$$

$$\therefore \text{from (1)} \quad x \times 160 + 360 = 520 \Rightarrow x = 1 \text{ mole}$$

$$\therefore \text{mole \% of Fe}_2\text{O}_3 = \frac{x}{(x+y)} \times 100 = \frac{1}{(1+5)} \times 100 = \frac{50}{3} = \boxed{16.67\%}$$



4. One gm of impure sodium carbonate is dissolved in water and the solution is made up to 250 ml. To 50 ml of this made up solution, 50 ml of 0.1N – HCl is added and the mix after shaking well required 10 ml of 0.16 N – NaOH solution for complete titration. Calculate the % purity of the sample.

$$\text{Na}_2\text{CO}_3 \text{ sample} = 1 \text{ g}$$

$$\rightarrow x \text{ gram pure.}$$

$$\therefore \frac{x}{106} \text{ mole. (in 250 ml)}$$

$$\therefore \frac{x \times 50}{106 \times 250} \text{ mole (in 50 ml)}$$

$$\text{Eq. of HCl} = \text{Eq. of Na}_2\text{CO}_3 (\text{v.f.} = 2) + \text{Eq. of NaOH}$$

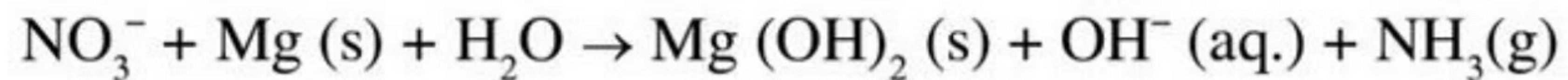
$$\text{or, } 0.1 \times 50 \times 10^{-3} = \frac{x \times 50}{106 \times 250} \times 2 + 0.16 \times 10 \times 10^{-3}$$

$$\text{or, } 0.005 - 0.0016 = \frac{x}{53 \times 5} \Rightarrow x = 0.901 \text{ g}$$

$$\therefore \% \text{ purity} = \frac{0.901}{1} \times 100 = \boxed{90.1\%}$$



5.. Mg can reduce  $\text{NO}_3^-$  to  $\text{NH}_3$  in basic medium.



A 25.0 mL sample of  $\text{NO}_3^-$  solution was treated with Mg. The  $\text{NH}_3$  (g) was passed into 100 mL of 0.15 N HCl. The excess of HCl required 32.10 mL of 0.10 N NaOH for neutralization. What was the molarity of  $\text{NO}_3^-$  ions in the original sample ?

Let molarity of  $\text{NO}_3^- = M$ . Vol = 25 mL.

$\therefore \text{NO}_3^- = 25M \text{ mmole} \Rightarrow \text{NH}_3 = 25M \text{ mmole}$  (By applying POAC on N atom)

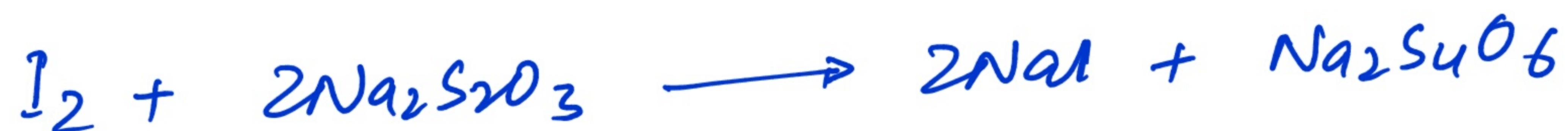
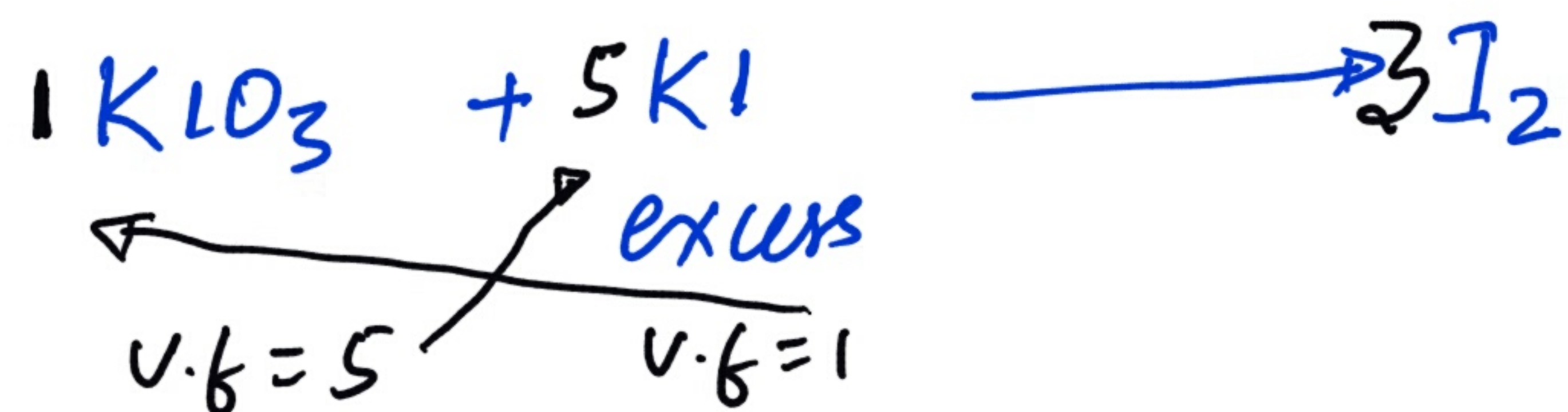
$\text{meq. of HCl} = \text{meq. of NH}_3 + \text{meq. of NaOH}$

or,  $0.15 \times 100 = 25M \times 1 + 0.1 \times 32.1$

or,  $15 = 25M + 3.21 \Rightarrow 25M = 11.79 \Rightarrow M = \frac{11.79}{25} = \boxed{0.4716M}$



6. An aqueous solution containing 0.10 g  $\text{KIO}_3$  (formula wt. 214.0) was treated with an excess of KI solution. The solution was acidified with HCl. The liberated  $\text{I}_2$  consumed 45.0 mL of thiosulphate solution to decolourise the blue starch – iodine complex. Calculate the molarity of the sodium thiosulphate solution. [JEE 1998]



$$\text{KIO}_3 = \frac{0.1}{214} \text{ mole} \quad \therefore \text{ moles of } \text{I}_2 \text{ formed} = \frac{3 \times 0.1}{214} \text{ (from 1st rxn)}$$

$$\therefore \text{Na}_2\text{S}_2\text{O}_3 \text{ required} = \frac{2 \times 3 \times 0.1}{214} \text{ mole}$$

$$\text{or, } 45 \times M \times 10^{-3} = \frac{0.6}{214} \Rightarrow M = \frac{600}{214 \times 45} = \boxed{0.0623 \text{ M}}$$

Ans.