

Date _____
Page _____

Aim: verify Lambert Beer law and determine the concentration of unknown KMnO_4 sol.
Molecular wt = 159 g/mol

Apparatus Required: Colorimeter, two burettes
Standard solution of KMnO_4 of conc n $2 \times 10^{-4} \text{ M}$

Theory: - Lambert Beer law

Given by Lambert If there is a medium which absorbs radiation of I_0 then after passing through there is decrease in intensity I_0 is with distance travelled in a medium

$$-dI \propto I$$

$$-dI = k' I$$

$$\int_{I_0}^I \frac{dI}{I} = \int_0^l -k' dx$$

$$-\ln \frac{I}{I_0} = k'l \quad \Rightarrow \quad \ln \frac{I_0}{I} = k'l$$

Taking antilog on both sides

$$\ln \frac{I_0}{I} = k'l \quad \Rightarrow \quad \boxed{I = I_0 e^{-k'l}}$$

changing to
logarithm

$$R = 2.303 \times k'l$$
$$\frac{I}{I_0} = 10^{-k'l}$$

Beer said that decrease in intensity of radiation also depends upon concⁿ of solution

$$\frac{I}{I_0} = 10^{-kcl}$$

$$A = kcl$$

Procedure $\rightarrow 2 \times 10^{-4} M$ concⁿ of $KMnO_4$ is given by labstab

Take 50 ml of $2 \times 10^{-4} M$ $KMnO_4$ & add 50 ml water in a standard flask

Mix them. concⁿ of $KMnO_4$ $1 \times 10^{-4} M$.

Fill the burette with concⁿ of $1 \times 10^{-4} M$ $KMnO_4$ solution. In second burette

take H_2O . After this take 1 ml of $KMnO_4$ from burette & 9 ml of H_2O from second burette = $1 \times 10^{-5} M$ in "f & tube".

In 2nd test tube take 2 ml $KMnO_4$ solⁿ & 8 ml H_2O . concⁿ $2 \times 10^{-5} M$.

9th ml $KMnO_4$ + 1 ml H_2O = $9 \times 10^{-5} M$

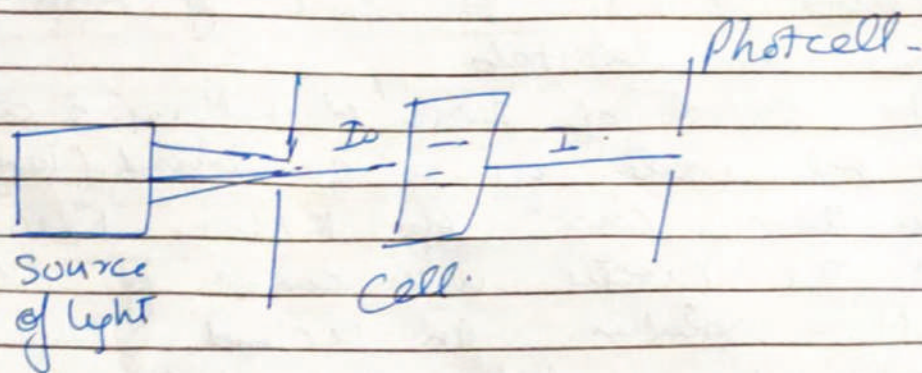
This is series of solution

Colorimeter was new ——— mi hrs before the practical so Wil — get warmed up.

In the colorimeter there are filters of different λ from 400 nm to 700 nm. The highly concentrated

KMnO_4 solution is selected & with that the transferred into cuvette. The filter are adjusted & whichever gives highest absorbance that filter is selected

After that $\% \text{ Tube } 1^{\text{st}} \text{ to } 9^{\text{th}}$ absorbance is calculated or detected



Sl. No.	Concn	wavelength	Absorbance
1	9×10^{-5}	470	0.1
2	9×10^{-5}	520	0.2
3	"	540	0.3
4	"	600	0.7
5	"	620	0.5
6	"	680	0.4
7	"	700	0.1
8			

$\lambda = 600 \text{ nm}$ is selected

S.No	Hzo	KMnO_4	Absorbance
1		9	0.7
2		8	0.6
3		7	0.5
4		6	0.4

5	5	5	0.3
6	6	4	0.2
7	7	3	0.1
8	8	2	0.0
9	9	1	0.0

Plot a graph between concⁿ & Absorbance