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Subject :- Chemistry Experiment / Tutorial / Assignment No. :- 5 Page :- 1 Date :- / /

DETERMINATION OF λ_{MAX} USING COLORIMETER

- **Aim:**

To determine λmax and concentration of given solution of $KMnO_4$ using Colorimeter.

- **Objectives:**

After performing the practical, the learner will be able to:

PRO 1: Understand the theory behind coloured $KMnO_4$
PRO 2: Understand the colorimeter and glassware.
PRO 3: Determine the λmax of solution.
PRO 4: Infer the relation between absorbance and wavelength graphically.

- **Apparatus:**

→ Colorimeter
→ 250 ml & 100 ml volumetric flask.
→ Cuvette
→ 0.01 N $KMnO_4$ Solution.

Determination of λ_{max} of $KMnO_4$ complex solution by Colorimetery

Observation:

PRO 1:

a] The $KMnO_4$ complex color is: Purple

PRO 2:

a] Instrument used for measuring intensity of coloured solution is called as Colorimeter.

b] Colorimeter uses filter/monochromater as Wavelength selector.

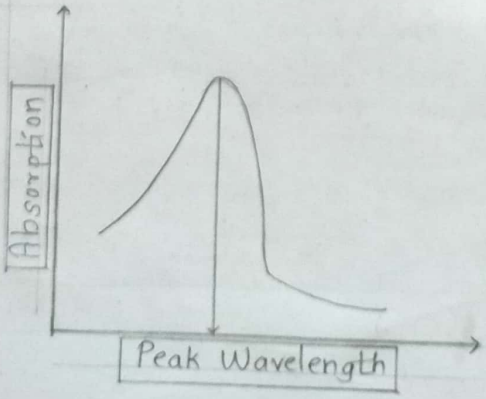
c] Instrument used in this experiment has lowest wavelength filter is 400nm and highest wavelength filter is 680nm.

PRO 3:

Filter No.	Peak Wavelength	Absorbance
1	400	0.03
2	450	0.01
3	490	0.10
4	520	0.17
5	540	0.13
6	570	0.07
7	620	0.01
8	680	0.00

PRO 4:

Nature of Graph:



Result & Discussion :

PRO 1: $KMnO_4$ Solution when incident with Ray of White Light reflects Purple Colour while Absorbing Everything else, Hence to Human eye the solution looks purple. This colour is due to Transitions of charge within the Compound, As on dilution the colour changes from Purple Tint to Pink.

PRO 2: Colorimeter is an Analytical instrument based on Beer-Lambert's Law & is used to Find the Concentration of a solution by Measurement of its Relative Absorption of Light. It consists of a Straight Arrangement of Point Source of Visible Light Passing through Alterable Filters producing Beams of Light of diffrent Wavelength which are incident on a Cleaned Cuvette containing the solutions and a Detector Setup to Analyze the Absorption.

PRO 3: The Absorption of Light by $KMnO_4$ Solution is Obtained by Giving Colorimeter a blank, i.e Distilled Water & then the solution. This procedure is Repeated to find Absorption of all Possible Wavelengths in Colorimeter Precise Handling of the Cuvettes is Required as Fingerprints while Holding can After the Readings.

PRO 4: The Graph of Absorbance vs Wavelength Initially Increases & Later decreases. The Wavelength at which the Absorbance is Found to be the Highest, is called the λmax i.e. Peak Wavelength.

Conclusion:

The $KMnO_4$ Solution shows Highest Value of Absorbance of Light at the Wavelength of 540 nm. Hence the λmax of $KMnO_4$ is 540nm.

Precautions:

While Performing the practical, the learner must:

1. Ensure that Glassware and Chemicals must be handled carefully.
2. Ensure proper cleaning of cuvette after each addition.
3. Ensure use of blank once filter or wavelength is changed.
4. Ensure safe handling of instrument.

Quiz:

1] What is essential part of colorimeter?

⇒ The Most Essential Part of Colorimeter is the Source i.e. A specific Arrangement of an Extended Source, Slit & convex Lens which is used to Produce a single beam of visible Light. As this beam of Light provides a Medium of Analysis in the instrument.

2] How will you adjust the Wavelength?

⇒ The Wavelength of Light can be Adjusted using a Filter by Passing a Beam of Light through it. A Filter only allows a certain wavelength to pass through it and blocks the other wavelength. A standard Colorimeter.

has a setup of 8 Alterable Filters to obtain visible light Rays of Diffrent Wavelength.

3] Path Length of cuvette used in this experiment is 10 mm.

4] Is this technique useful for measuring concentration of highly dark coloured solution as such?

⇒ The use of Colorimeter to find concentration of Highly Park Solution is Definetly useful as the instruments can easily find the correct Concentration of the Solution by its colour Analysis, which cannot be Easily Distinguished with Naked Eyes.

Objective	PRO 1	PRO 2	PRO 3	Total
Weight	20	20	20	Score
Points				
Score				

Earned points (EP)=	Marks in 100 = EP*20
Total score/60 =	=