

Experiment-6

CONCENTRATION DETERMINATION OF KMnO_4 SOLUTION USING COLORIMETRY

Aim:- Construction of absorbance vs Concentration.
Plot of various solutions using digital Colorimeter, and determination of unknown concentration.

Procedure:- ① Calibrate the Colorimeter with distilled water at any particular wavelength ' λ '.

② prepare a 4 ml 0.01M solution of KMnO_4 (2ml of distilled water + 2ml of prepared 0.2M KMnO_4 solution) in a test tube.

③ put the tube in colorimeter and find the absorbance ' A ' at the calibrated wavelength.

④ change the λ to the next value. and repeat step ① & ③

⑤ Fill up the table-1 with λ at corresponding ' A ' values.

⑥ choose the wavelength with minimum transmittance. (or) maximum absorbance for iodine solution. Assign it as ' λ_{max} '.

⑦ calibrate the colorimeter at λ_{max} .

⑧ prepare 5 iodine solutions of strengths.
0.005, 0.01, 0.015, 0.02, 0.025, 0.03M.

⑨ Record the absorbance of these solutions in table-2

⑩ Repeat the experiment with KMnO_4 Solutions.

Observations and tables:

Table-1:

Sl.No	Wavelength	Absorbance
1	400	0.03
2	430	0.05
3	500	0.35
4	520	0.39
5	540	0.46
6	580	0.28
7	600	0.16
8	620	0.09
9	680	0.04

Table-2:

S.NO	Concentration	Absorbance
1	0.1	0.14
2	0.2	0.30
3	0.3	0.46
4	0.4	0.67
5	0.5	0.82
6	Unknown	0.53

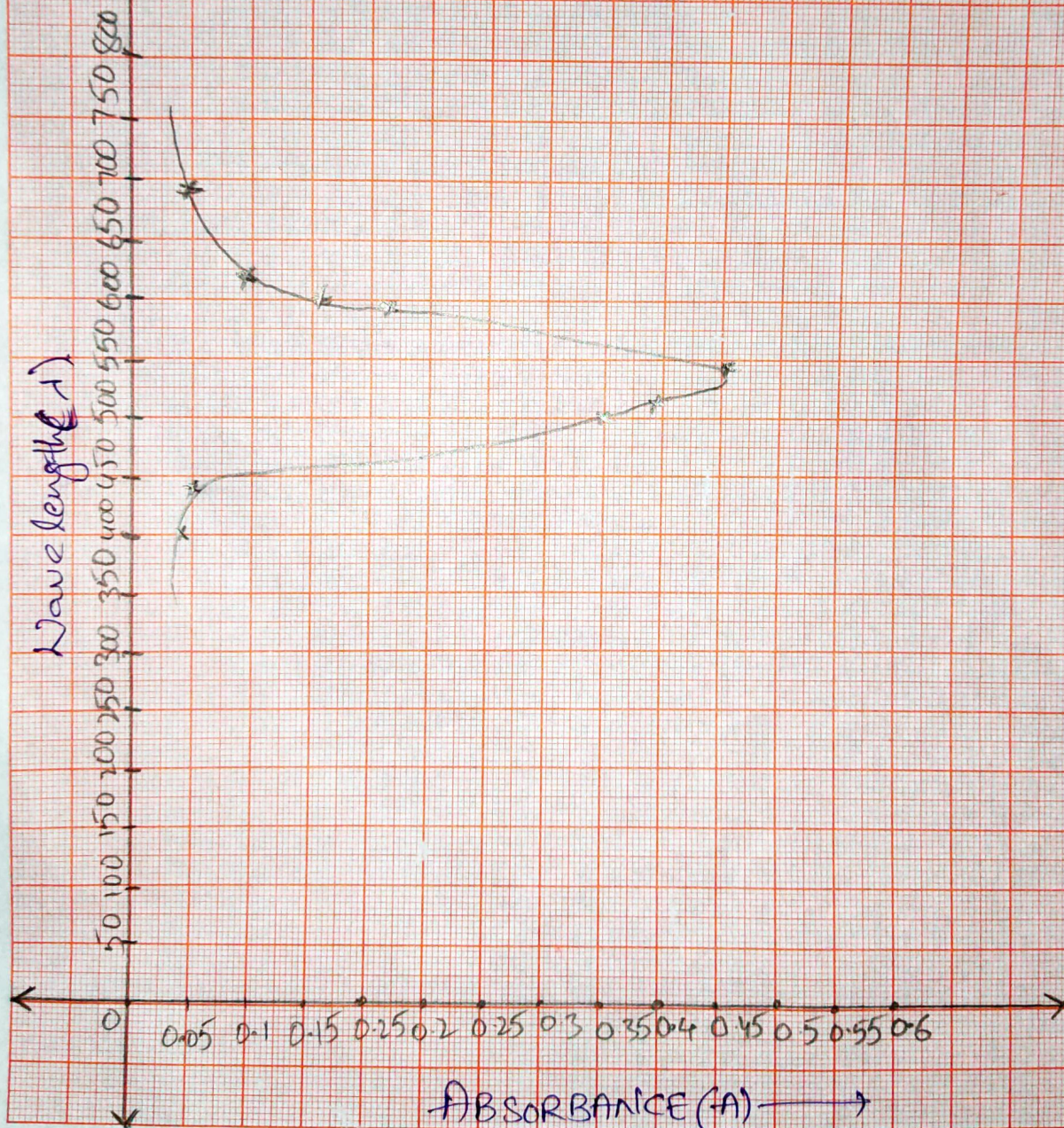
Graph for Table-1

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Scale.

x-axis = 1cm = 50 units

y-axis = 1cm = 0.05 units



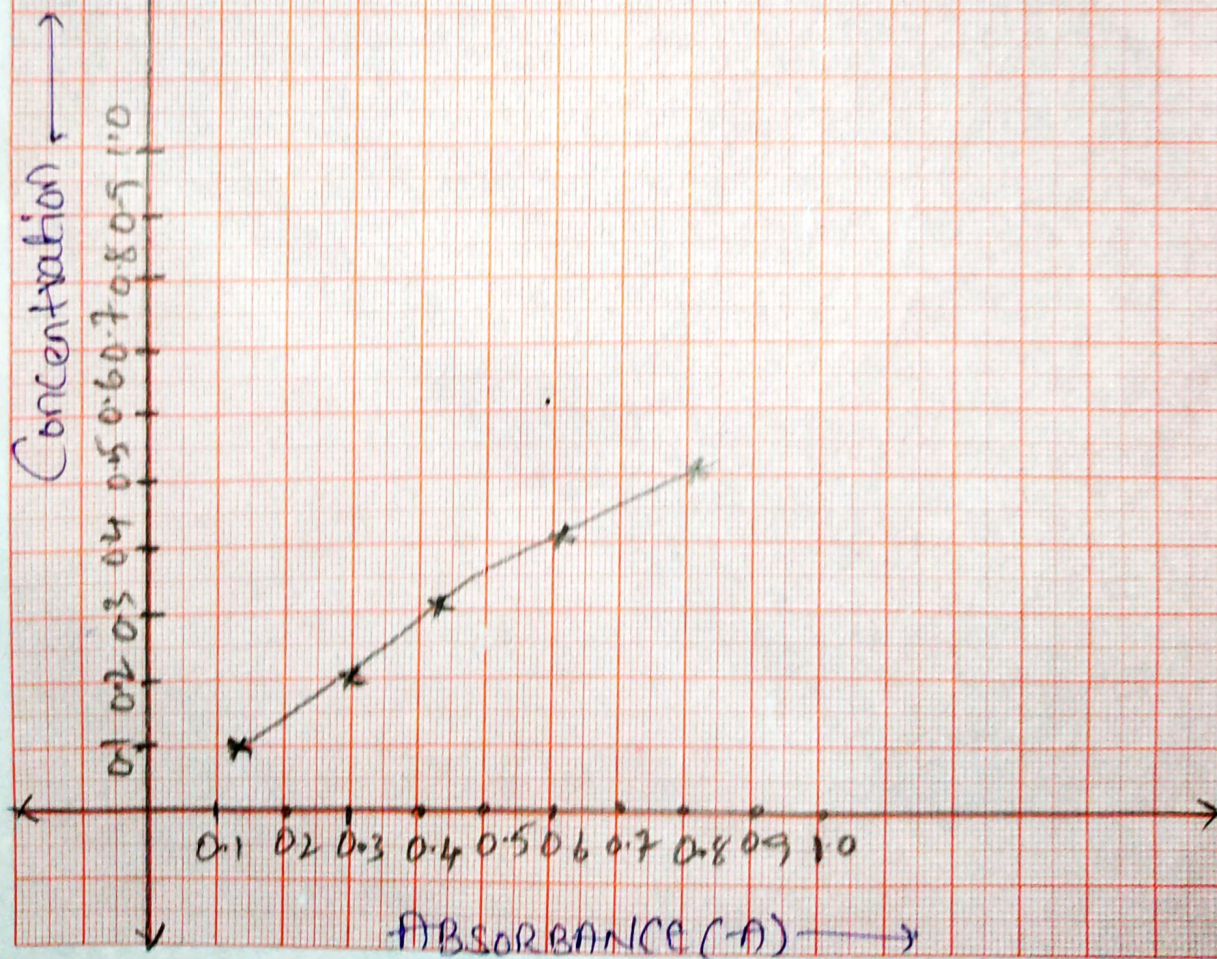
Graph for table-2

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Scale:

X-axis - 1cm = 0.1 unit

Y-axis - 1cm = 0.1 unit



Results—

* $\rightarrow \lambda_{\text{max}} = 540 \text{ nm}$

* \rightarrow slope of the plot = 1.6

* \rightarrow concentration of solution (unknown) = 0.33 (mm)

Answer to the Questions—

① The absorbance is directly proportional to the concentration of solution sample used in the experiment. The absorbance is directly proportional to the length of light path, which is equal to width of cuvette.

② Absorbance is the quantity of light absorbed by the solution. Transmittance is the quantity of light that passes through a solution. Absorbance and Transmittance are often used in Spectrophotometry and can be expressed by the following equation.

$$A = \log \frac{I_0}{I}$$

③ VIBGYOR