EXPT.NO. 01 EXPERIMENT OF Determination of resolving power of a plane diffraction grating.

DATE:

Theory: A plane diffraction grating is an arrangement which is equivalent in action to large number of parallel and equidistance slits of the same width. It is constructed by rulling equi-distance parallel lines on a transparent by rculling equidistance material (such as glass plate) by means of a fine dimond lines act as opeque wires and thus light can not pass through them. Light passes through the space in between the lines. Thus these space act as multiple lines.

When a beam of monochromatic light of wave length λ coming out of the collimeter of a spectrometer falls normally on a plane diffraction grating placed vertically of the prism table, a series of diffraction grating image of the collimeter slit will be seen on both sides of the direct image. If θ be the deviation of the light which forms the nth image, a be the slit width and b be the line width, then it can be written as,

$$(a+b)\sin\theta = n\lambda \quad \text{-------------} \quad (1)$$

Since $(a+b) = 1/N$, where, N is the grating constant that is the number of lines on rulling per cm of the grating surface.

$$\sin\theta = nN\lambda$$

Therefore, $N = \frac{\sin\theta}{n\lambda}$ ------------- (2)

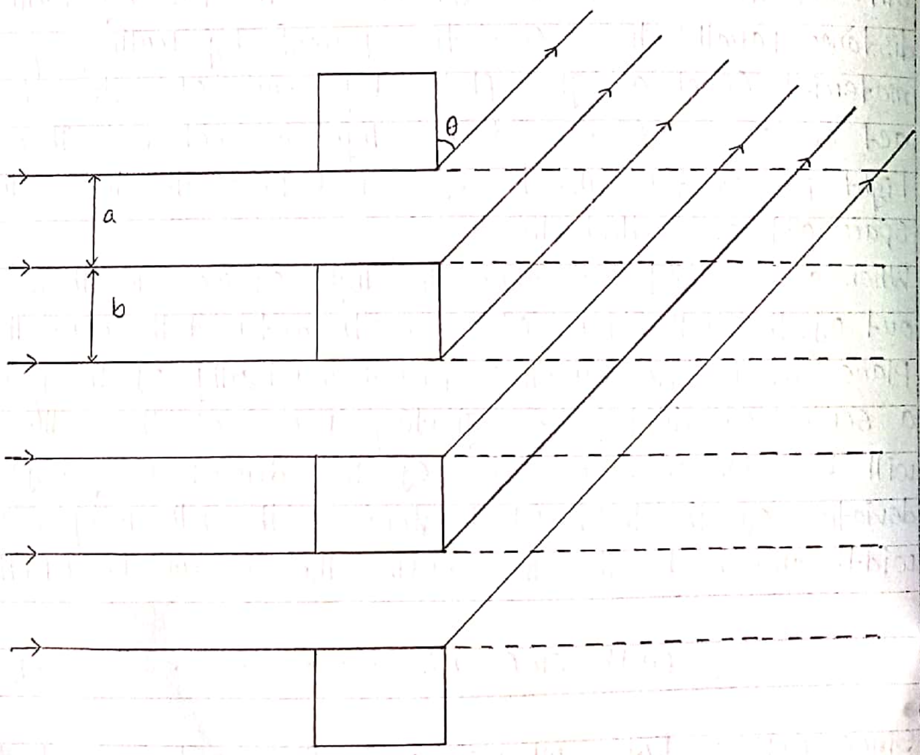

Fig. 1: Experimental setup for determination of resolving power of a plane diffraction grating.

By employing a monochromatic light source (say - Sodium) of known wavelength the value of N can be determined using equ. (2). Resolving power of an optical instrument is defined as the ratio of the wavelength of a spectral of the least difference in wave length of the next spectral line that can just be seen as separated line. Let us suppose two spectral lines of wave length λ and $(\lambda + d\lambda)$ respectively. If these two spectral lines of wave length λ and $(\lambda + d\lambda)$ lines can just be seen as separated by using a plane diffraction grating then the resolving power of the grating then the equal to $\lambda / d\lambda$.

Where, $d\lambda$ is the wave length difference between the two spectral lines. The resolving power of a plane diffraction grating can also be expressed.

$$\therefore R = \lambda / d\lambda = Nn ,$$

Where, N is the total number of rullings on grating surface. Now if l is the effecting length of the grating surface, this equation can be written as,

$$\therefore R = nN \times l \quad \text{.........} \quad (3)$$

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Apparatus :

1. Spectrometer
2. plane diffraction grating.
3. Spirit level.
4. Sodium lamp.

Procedure :

(a) Adjustment of the spectrometer including focussing were performed.

(b) Adjustment of grating :

(i) To make the axis of the telescope perpendicular to the collimator.

(ii) The grating mounted in its holder was placed on the prism table so that its rullings were in the verticle plane and its verticle surface passes through that diameter of the prism table.

(c) The telescope was thew turned to find the position of diffracted images of the first order in one side of the central image.

(d) The telescope was then rotated to observed the image in the other side. The reading were also noted. The differcenee between of the two particular order number.

(e) The angle of diffraction for the second order was also found in the similar way.

Calculations:

No. of rullings per cm in grating.

$$N = \frac{\sin\theta}{n\lambda}$$

For 1st order,

Here, $\theta = 45.03$ deg, $n = 1$, $\lambda = 5893 \times 10^{-8}$ cm

$$N_1 = \frac{\sin(45.03)}{1 \times 5893 \times 10^{-8}}$$

$$= 12005.37 \text{ rullings/cm.}$$

For 2nd order,

Here, $\theta = 65.49$ deg, $n = 2$, $\lambda = 5893 \times 10^{-8}$ cm

$$N_2 = \frac{\sin(65.49)}{2 \times 5893 \times 10^{-8}}$$

$$= 7720.08 \text{ rullings/cm.}$$

$$\therefore N' = \frac{N_1 + N_2}{2} = \frac{12005.37 + 7720.08}{2}$$

$$= 9862.73 \text{ rullings/cm.}$$

$\therefore$ Resolving power, $R = nN'l$

For 1st order,

$l = 3.8$ cm.

$$R_1 = 1 \times 9862.73 \times 3.8$$

$$= 37478.37 \text{ lines.}$$

For 2nd order,

$$R_2 = 2 \times 9862.73 \times 3.8$$

$$= 74956.75 \text{ lines.}$$

Experimental Data:

Table. 1: Data for the diffracted images of yellow colour.

V.C = 0.03 degree.

Obs. order no.	No. of obs.	Reading for the diffracted image in degree: Left side M.S.R				Right side M.S.R				2θ in deg.	θ in deg.	N' in rullings per cm
		M.S.R	V.S.R	Total	Mean	M.S.R	V.S.R	Total	Mean			
01	1	306	10 × 0.03	306.30	306.29	216	10 × 0.03	216.30	216.23	90.06	45.03	12005.37
	2	306	11 × 0.03	306.33		216	8 × 0.03	216.24				
	3	306	8 × 0.03	306.24		216	5 × 0.03	216.15				
02	1	326	20 × 0.03	326.6	326.57	195	20 × 0.03	195.60	195.60	130.97	65.49	7720.08
	2	326	18 × 0.03	326.54		195	18 × 0.03	195.54				
	3	326	19 0.03	326.57		195	22 × 0.03	195.66				

Results:

Resolving power of the grating,

$R_1 = 37478.37$ lines.

$R_2 = 74956.75$ lines.

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Discussion :

We have find the value of resolving power of grating which are,

$R_1 = 37478.37$ lines and

$R_2 = 74956.75$ lines.

There might be some experimental error that happened for the following resons.

(I) The experiment room was not properly dark.
(II) For back-lash error.
(III) We were unable to make the slit as narrow as possible.

Precautions :

(I) All adjustment and setting were made carefully.
(II) The collimeter slit was kept as narrow as possible.
(III) Focusing for parallel rays was done with special attention.

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EXPT. NO. 02

EXPERIMENT OF Determination of specific rotation of a Suger Solution by Polarimeter.

DATE:

Theory: If a solution of length L cm (or $\frac{L}{10}$ decimeter) and at temparature t°c, contains m gm of active substance per c.c. of the solution then it will produce a rotation of the plane of polarization of a plane polarised light of wave length λ incident on it by on amount θ, then θ is given by,

$$\theta = \frac{SLM}{10} \quad \text{-------------} \quad (1)$$

Here S is the specific rotation of the substance and is defined as the rotation produced by a solution of one decimeter in length containing 1 gm of active substance per c.c. of the solution.

If c be the perceentage strength of the solution (i.e. c gm of active substance are precent in 100 c.c of the solution). then,

$$m = \frac{c}{100}$$

Thus from equ. (1)

$$\theta = \frac{SLC}{1000}$$

$$\Rightarrow S = \frac{1000\,\theta}{CL}$$

Apparatus:

(I) Polarimeter.
(II) Sugar.
(III) Balance.
(IV) Measuring glass.
(V) Distrilled water.
(VI) Beaker.

FIGURE NO. 02

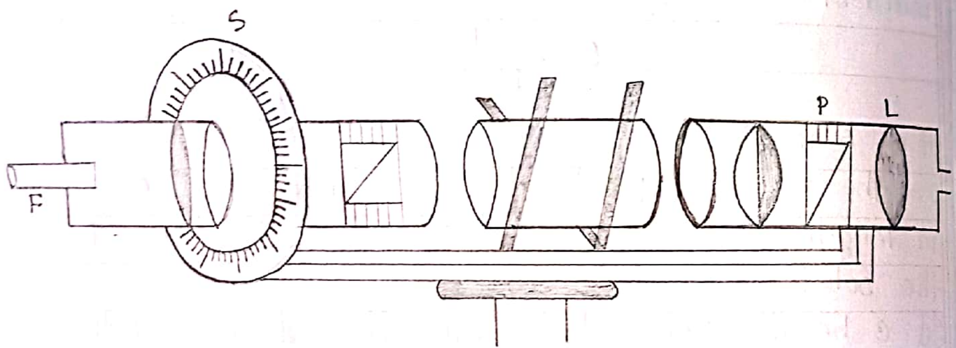

Fig. 1: Experimental setup for the specific rotation of a sugar solution.

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(VII) Funnel.

Procedure:

(i) A 20% sugar solution was prepared first. This was done by dissolving 20 gms of sugar in 100 c.c or 10 gms in 50 c.c. distilled water.
To prepare a solution of 20% first measure 20 gms sugar in a balance and mix this quantity of sugar in distrilled water of quantity a few c.c. less than 100 c.c. and after dissolving the sugar in the solvent, add distilled water to make it 100 c.c. in that measured cylinder.

(ii) The glass tube was filled with distilled water and placed in the cylinder of the polarimeter and reading of the vernier is noted down when the two halves of the half-sade plate are equally bright.

(iii) Water form the tube was then thrown away and by washing its inside several times by the stock solution of 20%, the tube is filled up with the 20% solution taking care that there was no air bubble inside the solution.

(iv) The two halves would be unequally bright due to the rotation. of the incident plane polarised light by the solution. The tube T_2 was then rotated untill the two halves of the shade were again equally bright. The reading of the the circular scale was noted. The angle through which the analyser had been rotated was equal to the rotation of the plane of polarisation by the solution.

(v) The operation was repeated with different concentration of sugar solutions. A curve was plotted taking concentration along X-axis and rotation along Y-axis. The graph would be a straight line as in Fig. 1. Form the graph a point was taken and for this particular point the specific rotation of the sugar solution was calculated.

(vi) Throwing the last solution the tube was filled up with an unknown solution. The rotation θ for the unknown solution was found out. From this graph the concentration of the unknown solution was obtained. The length of the glass tube was measured by a meter scale.

FIGURE NO. ______

Calculations :

We know that,

For table. 1,

$$S_1 = \frac{10 \times \theta_1}{L_1 C_1}$$

$$= \frac{10 \times 25}{20.5 \times \frac{15}{100}}$$

$$= 81.30^\circ$$

Here,

From (θ ∿ C curve

$\theta_1 = 25^\circ$

$C_1 = 15\%$

$L_1 = 20.5$ cm.

For table 2,

$$S_2 = \frac{10 \times \theta_2}{L_2 C_2}$$

$$= \frac{10 \times 15.0}{10.5 \times \frac{18.5}{100}}$$

$$= 77.22^\circ$$

Here

From (θ ∿ C) curve

$\theta_2 = 15.0^\circ$

$C_2 = 18.5\%$

$L_2 = 10.5$ cm

$$\therefore S = \frac{S_1 + S_2}{2}$$

$$= \frac{81.30^\circ + 77.22^\circ}{2}$$

$$= 79.26^\circ$$

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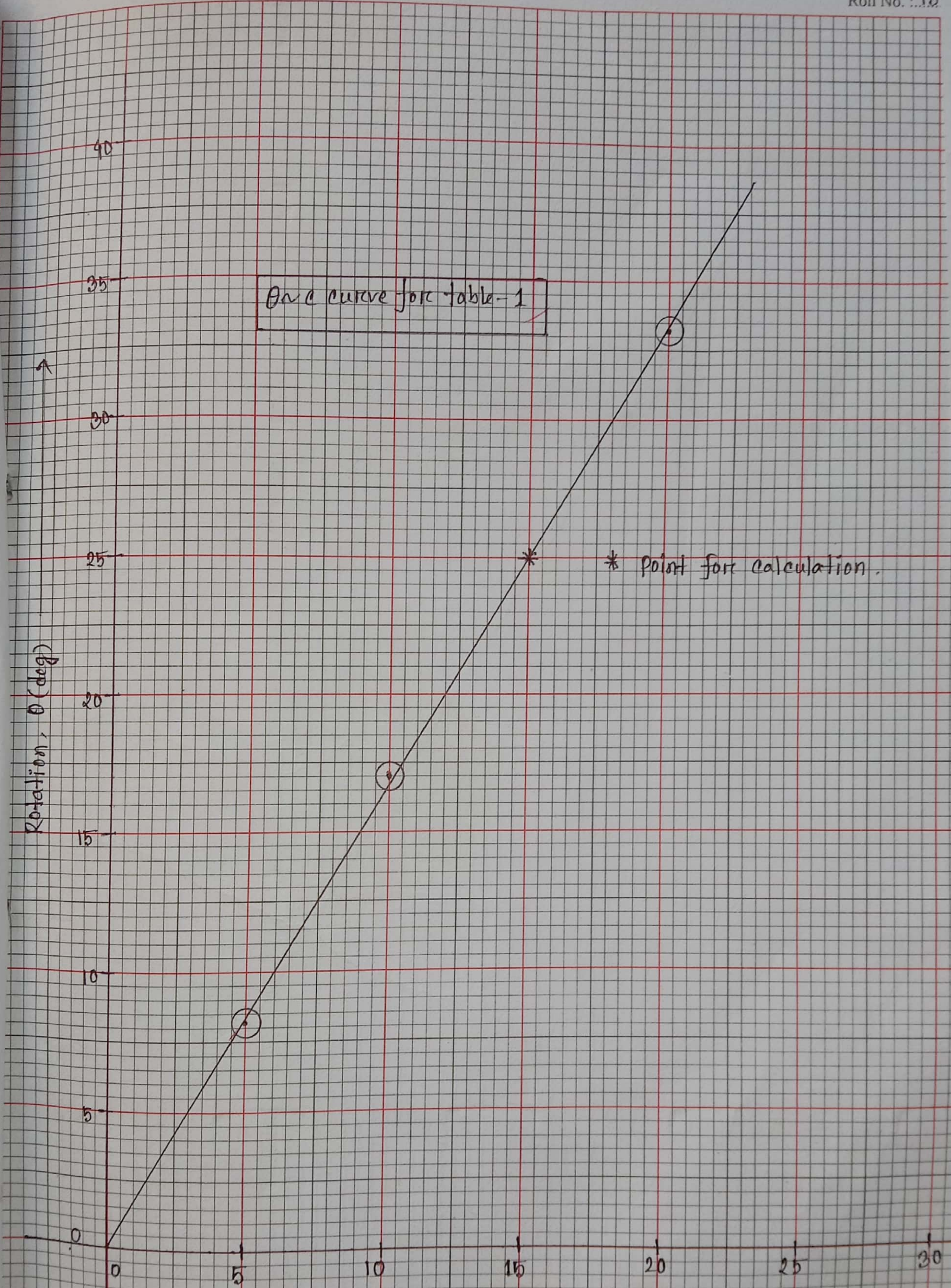
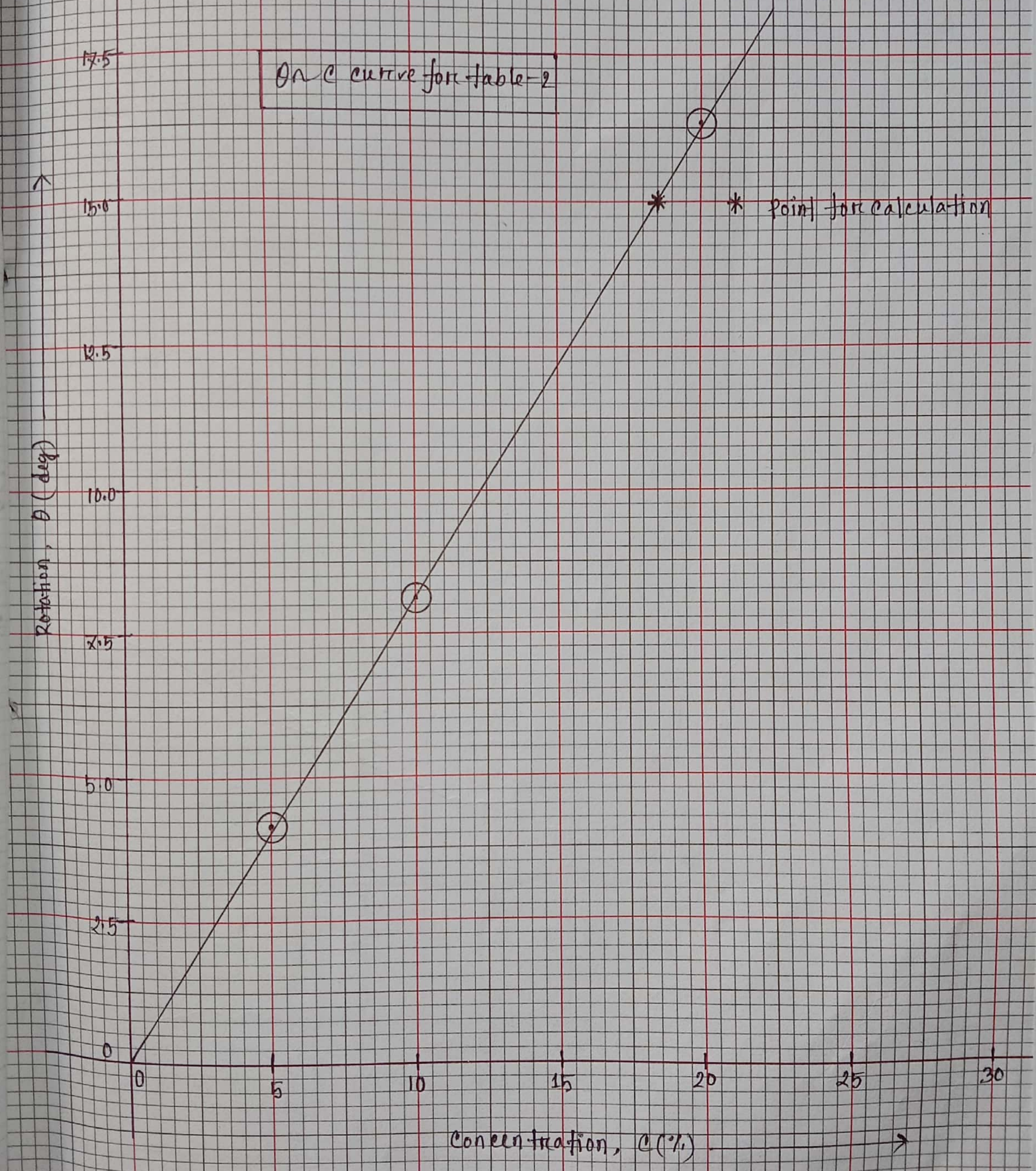

θ~c curve for table-1
* point for calculation.
Rotation, θ (deg)
Concentration, c (%)
0
5
10
15
20
25
30
35
40

Roll No. : 1807



8 Inch x 10 Inch

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Experimental Data:

Table. 1: Data for specific rotation.

Table no.	Strength of sugar solution	Obs. no.	First reading with water e(deg.)	Second reading with sugar solution θ. (deg.)	Angular rotation (θ−e) degree	Mean angular rotation θ(deg.)	Specific rotation S. (deg.)
		1.	0	33.1	33.1		
	20%	2.	0	33.0	33.0	33.1	
		3.	0	33.2	33.2		
		1.	0	17.1	17.1		
1.	10%	2.	0	16.9	16.9	17.0	81.30
		3.	0	17.0	17.0		
		1.	0	8.1	8.1		
	5%	2.	0	8.0	8.0	8.1	
		3.	0	8.2	8.2		
		1.	0	16.2	16.2		
	20%	2.	0	16.3	16.3	16.3	
		3.	0	16.4	16.4		
		1.	0	8.0	8.0		
2.	10%	2.	0	8.2	8.2	8.1	77.22
		3.	0	8.1	8.1		
		1.	0	4.0	4.0		
	5%	2.	0	4.2	4.2	4.13	
		3.	0	4.2	4.2		

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Result:

Specific rotation of a sugar solution, $S = 79.26^\circ$

Discussion:

(i) The rotation depends on the temparature of the solutions.
(ii) The rotation also depends on wave length.
(iii) The maximum intensity of the light was observed at x° and also observed at $(180+x)^\circ$, so to get actual value, we repeated the experiment using different concentration and different path length.

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Precautions:

(i) Tubes were cleaned carefully.
(ii) The equality of brightness of the two halves were carefully judged.
(iii) The substance was dissolved in water.
(iv) There was not any air bubble inside the liquid.
(v) The water and the solution of the substance were made dust free.
(vi) Wherever a solution was changed, we rinsed the table with new solution.
(vii) Temparature of both known and unknown solution were maintained constant during the experiment.
(viii) The cap of the tube was tightend beyond a limit as it might strain the glass. Strain glass may produce elliptically polarized light which might interfere with the setting.

EXPT.NO. 03

EXPERIMENT OF Determination of thermal Conductivity of a bad Conductor by Lee's method.

DATE:

Theory: When the steam is passed through A.C will be warmed up by the heat conducted through S. After some time, a steady state is reached when the rate of flow of heat through S equals the heat lost from C by radiation and convection.

If Q is the heat conducted through S per sec. It is given by,

$$Q = \frac{kA(\theta_1 - \theta_2)}{d} \quad \text{-------------} (1)$$

Where,

θ_1 = temperature of B indicated by T_1 in the steady-state.
θ_2 = temperature of C indicated by T_2 in the steady-state.
A = the surface area of the sheet S which is the experimental material.
k = thermal-conductivity of the material of the specimen and
d = thickness of the sheet S.

In the steady state, this heat Q is radiated per sec from the lower disc C. If m and s be the mass and specific heat of C and $\frac{d\theta}{dt}$ be its rate of cooling at this temperature θ_2 then the heat radiated per second from C is,

$$Q = ms\frac{d\theta}{dt} \quad \text{-------------} (2)$$

From (1) and (2) we get,

$$k = \frac{ms\frac{d\theta}{dt}\cdot d}{A(\theta_1 - \theta_2)} \quad \text{-------------} (3)$$

FIGURE NO. 03

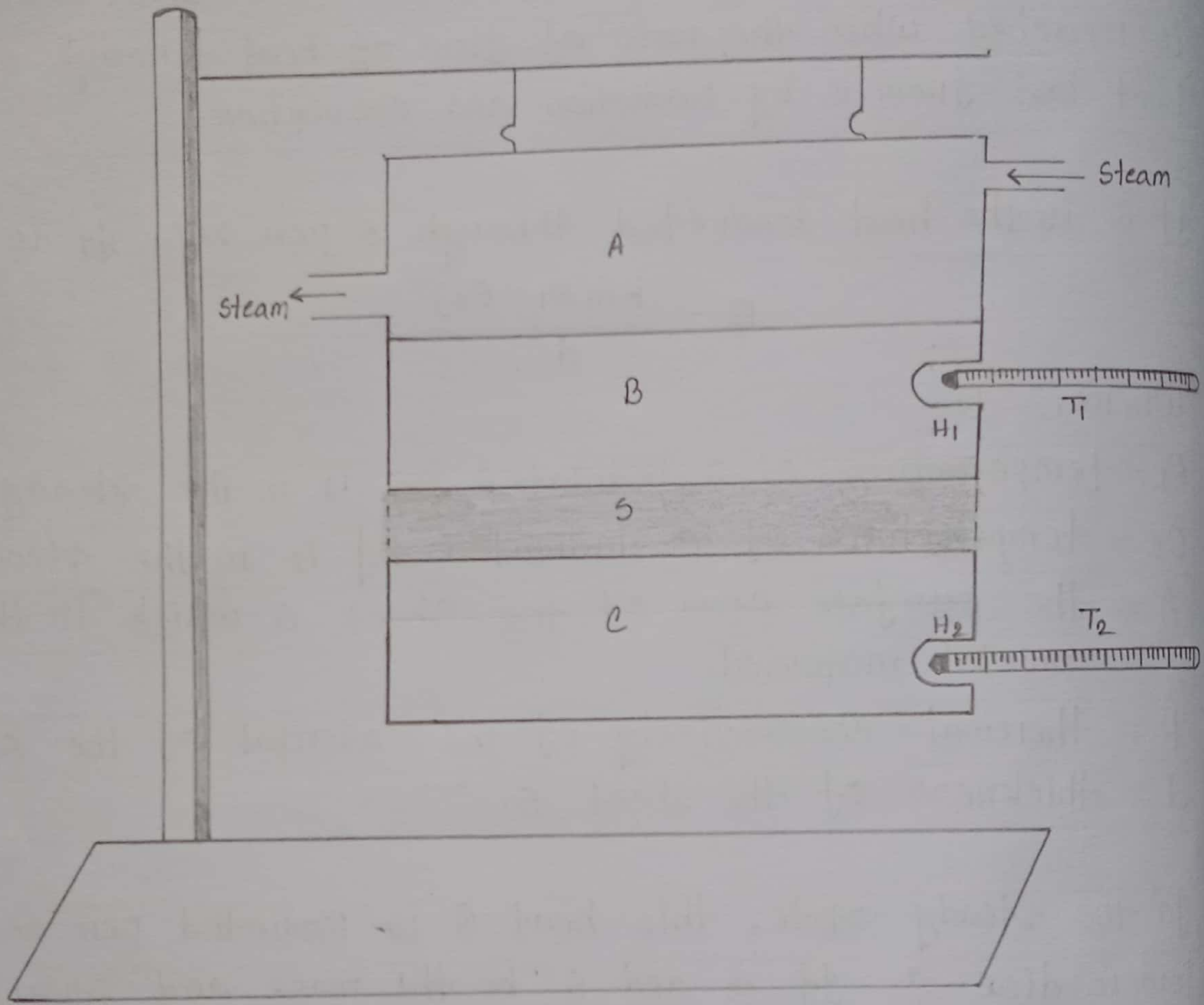

Fig. 1: Experimental setup to determine thermal-conductivity

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DATE :

Apparatus :

(i) Lee's apparatus
(ii) Slide cap calipers.
iii) Screw - gauge.
iv) Spirit · lamp.
v) Thermometer.
vi) Stop - watch.
vii) Rough balance.

Procedure :

1. The mass (m) of the disc C was determined by a rough balance and its specific heat (s) was found out from the table.

2. The diameter (2r) of the sheet (S) was measured by a slide & calipers and its area $A = \pi r^2$ was calculated.

3. The thickness of d of the disc S was determined by screw gauge.

4. The temperatures θ_1 and θ_2 of B and C respectively were made to be noted at intervals of 4 minutes, untill they remain steady for at least 3 consecutive intervals i.e 15 minutes.

5. A and S were then removed, only the disc C was the heated

uniformly, until its temperature rises 10°c above its steady temperature θ_2. C was then allowed to cool. The fall of temperature of C was then recorded at intervals of 1 min, untill its temperature falls below θ_2 by about 10°c.

6. A graph was then plotted taking time of cooling (t) as abscissa and the temperature (θ) as ordinate. A tangent was drawn to the curve at p at which the value of the ordinate was θ_2 i.e $PN = \theta_2$. If this tangent makes an angle ϕ with the time axis then $d\theta/dt$ at θ_2 was given by,

$$\frac{d\theta}{dt} = \tan\phi = \frac{PN}{NL}$$

Experimental Data:

Table. 1: Data for diameter of the disc.

V.C = 0.05 mm

Obs. no.	M.S.R (cm)	V.S.R (cm)	Error (cm)	Total (cm)	Mean (cm)
01.	11	0.06	0	11.06	
02.	11	0.05	0	11.05	11.06
03.	11	0.06	0	11.06	

Calculations:

Mass of the lower disc $(m) = 900$ gm.

Specific heat of the material of the lower disc,

$$S = 0.38 \ J/g\,^\circ c$$
$$= (0.38 \times 0.24) \ cal/g\,^\circ c$$
$$= 0.0912 \ cal/g\,^\circ c.$$

Diameter of the specimen, $2r = 11.06$ cm.

$$\therefore r = 5.53 \text{ cm.}$$

$$\therefore A = \pi r^2 = 3.1416 \times (5.53)^2 \ cm^2$$
$$= 96.07 \ cm^2$$

Thickness of the specimen,

$$d = 0.255 \text{ cm}$$

Here, $(\theta_1 - \theta_2)^\circ c = (93 - 75)^\circ c = 18^\circ c$

From graph,

$$PN = 17.5$$
$$NL = 7.8$$

$$\therefore \frac{d\theta}{dt} = \tan\phi = \frac{PN}{NL} = \frac{17.5}{7.8}$$
$$= 2.24\,^\circ c/\text{min}$$
$$= 0.037\,^\circ c/\text{sec}$$

Roll No. :...........................

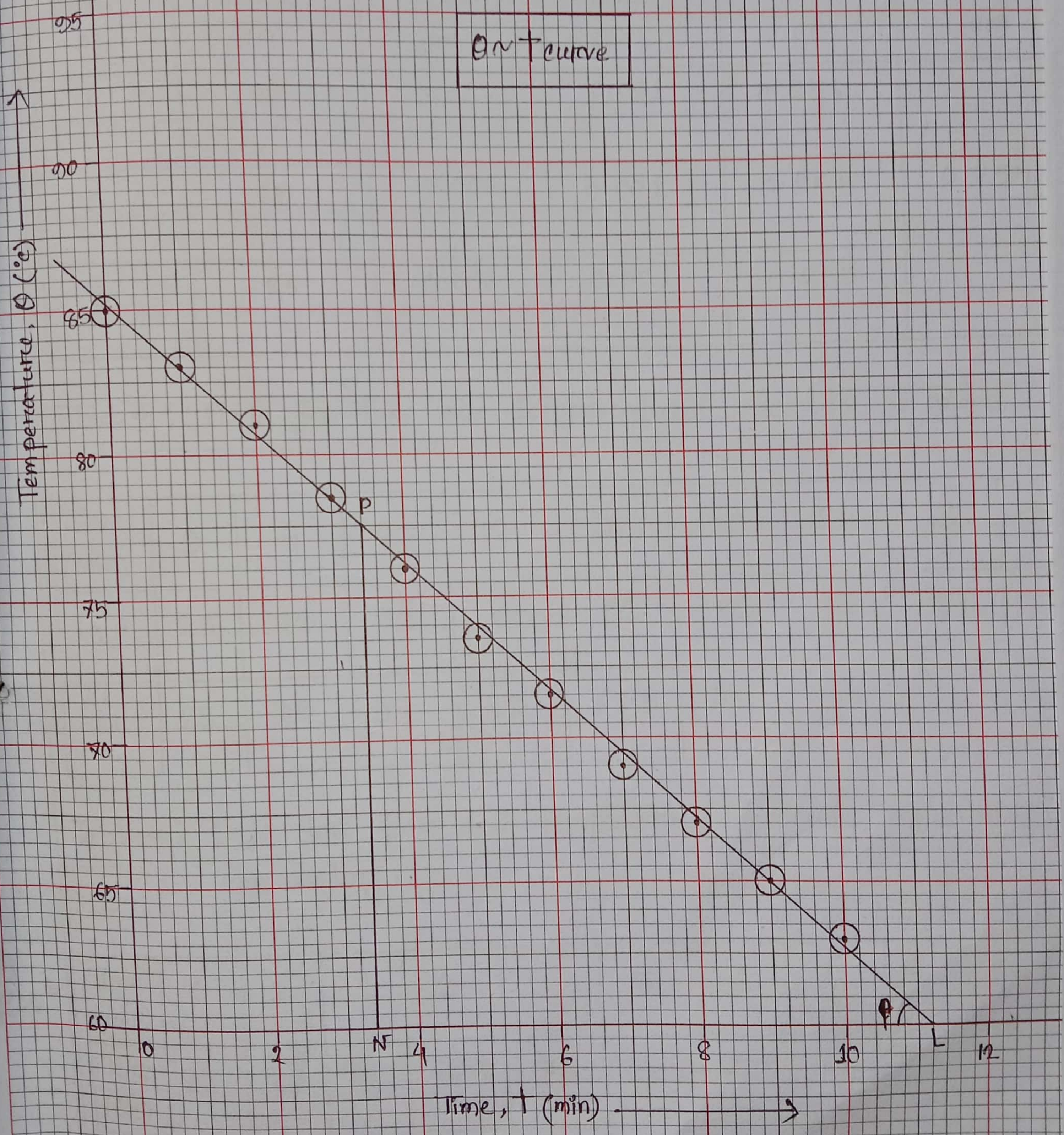

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Table 2: Data for thickness of the disc.

L.C = 0.01 mm

Obs. no.	L.S.R (cm)	C.S.R (cm)	Error (cm)	Total (cm)	Mean (cm)
1.	.25	0.007	0.001	0.256	
2.	.25	0.006	0.001	0.255	0.255
3.	.25	0.006	0.001	0.255	

Table 3: Data for time and temperature records B and C.

Time (min)	0	4	8	12	16	20	24	28	32
θ_1°C	25	93	93	93	93	93	93	93	93
θ_2°C	25	39	54	63	68.5	72	74	75	75

Table 4: Data for time and temperature records of C during its cooling.

Time (min)	0	1	2	3	4	5	6	7	8	9	10
Temp. (θ°C)	85	83	81	78.5	76	73.5	71.5	69	67	65	63

FIGURE NO. ____________

We know that,

$$k = \frac{ms \frac{d\theta}{dt} \cdot d}{A(\theta_1 - \theta_2)}$$

$$= \frac{900 \times 0.0912 \times 0.037 \times 0.255}{96.07 \times 18}$$

$$= 4.478 \times 10^{-4} \text{ cal } \cancel{gm^{-1}}\ cm^{-1}\ {}^{0}c^{-1}\ sec^{-1}$$

$$\therefore\ k = 4.5 \times 10^{-4} \text{ cal } \cancel{gm^{-1}}\ cm^{-1}\ {}^{0}c^{-1}\ sec^{-1}.$$

Percentage of Error:

$$\text{Error} = \frac{|\text{Experimental data} - \text{Exact value}|}{\text{Exact value}} \times 10$$

$$= \frac{|4.5 \times 10^{-4} - 4.2 \times 10^{-4}|}{4.2 \times 10^{-4}} \times 100\%$$

$$= 7.1\%$$

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Result: The thermal conductivity of the material of the bad conductor =

$$k = 4.5 \times 10^{-4} \text{ cal cm}^{-1} \, {}^{\circ}C^{-1} \text{ sec}^{-1}$$

Precautions:

1. The diameter of the disc S was made equal to those of A and B.

2. The surface of A and B were nickel plotted to ensure an uniform and a good conductor.

3. The disc A, B, and S we tightly pressed together so that there is no air film between A and S between B and S.

4. Temperature θ_1 and θ_2 were noted until they remain steady for at least 15 minutes.

5. The temperature at the lower disc C, during cooling were noted after an interval of one minute.

6. The corkhead of the water jar from where steam was emitted shuted perfectly otherwise water will fall by the pressure of steam.

EXPT.NO. 04

DATE: ?

EXPERIMENT OF Determination of the refractive index of the material of a thick prism by spectrometer.

Theory: The refractive index of the material of a prism for the light of a given colour is given by the relation,

$$\text{Refractive index, } \mu = \frac{\sin\frac{A+\delta m}{2}}{\sin\frac{A}{2}}$$

Where, A be the angle of the prism. and δm be the minimum deviation of a monocromatie light refracted through the principle selection of the prism.

Let, a ray be incident on the first face of the prism and after pass through the principle section of the prism finally emerge out in the direct RS.

Let, θ and ϕ be the respective angle of incident and refraction at the first face of the prism angle θ' and ϕ' be the corresponding quantities for the second phase of the prism; Now the deviation of the ray given by the angle SOT is equal to $(\theta-\phi)+(\theta'-\phi')$. But in the position of minimum deviation, the ray passes symmetrically through the prism so that, $\theta=\theta'$ and $\phi=\phi'$. Therefore, the angle of minimum deviation,

$$\delta m = 2(\theta-\phi) \quad \text{-------- (1)}$$

From Fig. it can be shown that $\angle LMR$ is equal to the angle (A) of the prism and also equal to $(\phi+\phi')$, Therefore,

$$\therefore \angle LMR = \angle A = (\phi+\phi') = \phi+\phi = 2\phi \quad [\because \phi=\phi']$$

$$\text{i.e., } \phi = \frac{A}{2} \quad \text{-------- (2)}$$

FIGURE NO. 04

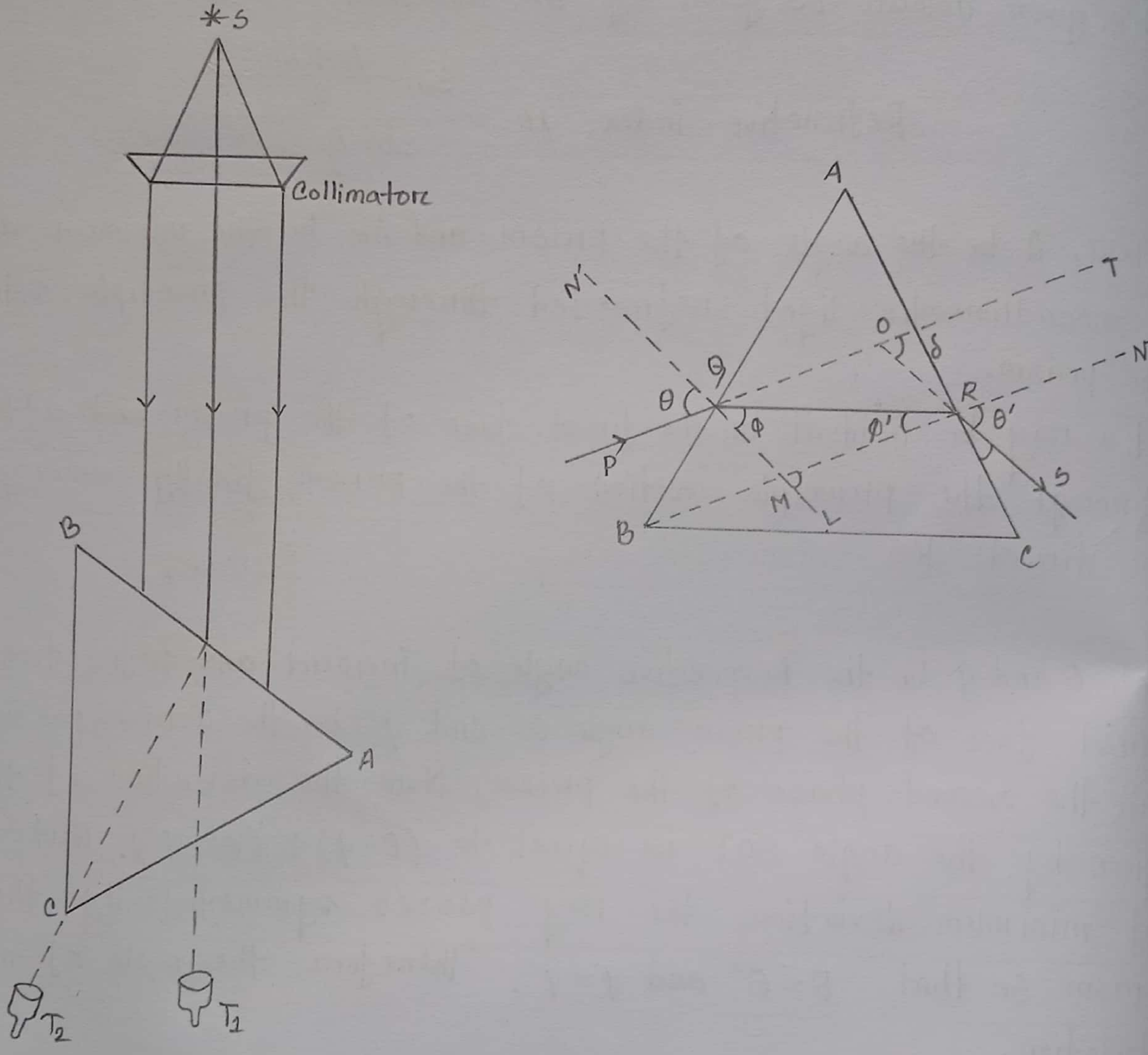

Fig. 1: Experimental setup for refractive index.

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From equ. ① and ② we get,

$$\theta = \frac{A+\delta m}{2} \quad \text{------------} \quad (3)$$

Hence, refractive index,

$$\mu = \frac{\sin\theta}{\sin\phi} = \frac{\sin\frac{A+\delta m}{2}}{\sin\frac{A}{2}} \quad \text{-----} \quad (4)$$

Apparatus: Spectrometer, prism, sodium lamp, reading lens and spirit level.

Procedure:

1. The spectrometer was levelled in the usual manner so that, (a) the axis of rotation of the telescope and the collimator was become horizontal, and (b) the top of the prism table was made horizontal.

2. The slit was made vertical and narrow.

3. The telescope and the collimator were adjusted for parallel by Schuster's method.

4. The vernier constant of the collimator scale was determined.

5. The angle of the prism had then measured. Measurement of the angle of the prism and had shown separately.

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6. The angle of minimum deviation had measured in the following way. The prism had placed on the prism table with one of the faces directed towards the collimator and the centre of the prism coinciding with the centre of the table. On looking from the other face of the prism, the refracted image of the slit will be observed. The prism table had then rotated in a proper directed untill this refracted image (first seen with the eye) approaches as near to the direct rays through the collimator as possible. That position the prism had the minimum deviation for the prism, Then the observation had been made by the telescope, which had to be brought to the prism position of the eye to make the centre of the cross-wire coincident with eye edge of the slit image. The readings of the both verniers had noted for three different settings of the telescope for minimum deviation. The mean of the three readings corresponding to each vernier had determined. The prism had with drawn and the direct light had arrived by the telescope. The readings for each vernier had noted and the mean of three readings given the direct readings.

7. The difference between the mean readings for the minimum deviation rays had determined separately for each vernier and the mean of three difference gives the minimum deviation, δm. The knowing A, δm and μ can be calculated from the equ. (4).

FIGURE NO.__________

Calculations:

Angle of minimum deviation,

$\delta m = 51.82$ degree

and, $A = 59.98$ degree.

We know that,

$$\mu = \frac{\sin \frac{A+\delta m}{2}}{\sin \frac{A}{2}}$$

$$\Rightarrow \mu = \frac{\sin \left(\frac{59.98^\circ + 51.82^\circ}{2} \right)}{\sin \frac{59.98^\circ}{2}}$$

$$\therefore \mu = 1.65$$

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DATE :

Expercimental Data :

Table. 1 : Data for angle of the prism.

V.C = 0.03 degree

Obs. no.	Reading for image in deg. for left direction.			Reading for image in deg. for right direction.			Difference θ degree	$A = \frac{\theta}{2}$ degree
	M.S.R	V.S.R	Total	M.S.R	V.S.R	Total		
1.	142	5X 0.03	142.15	22	7X0.03	22.21	119.94	
2.	142	6X 0.03	142.18	22	8X0.03	22.24	119.94	59.98
3.	142	7X 0.03	142.21	22	8X0.03	22.24	119.97	

Table. 2 : Data for angle of minimum deviation.

V.C = 0.03 degree

Obs. no.	Reading for the minimum deviation position (degree)				Reading for the direct position (degree)				Angle of minimum deviation
	M.S.R	V.S.R	Total	Mean	M.S.R	V.S.R	Total	Mean	δm(deg.)
1.	134.5	29X 0.03	135.37		83	19X 0.03	83.57		
2.	134.5	28X 0.03	135.34	135.37	83	18X 0.03	83.54	83.55	51.82
3.	134.5	30X 0.03	135.40		83	18X 0.03	83.54		

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Result: Refractive index of the material of the prism,

$$\mu = 1.65$$

Discussion:

1. The exact value of the refractive index of the material of the prism is 1.5. But we have got the value of the refractive index is 1.65 which may be happened for the followings.

i) For back-lash error.
ii) The experimental room was not completely dark.
iii) We were unable to make the slit as narrow as possible.

Precautions:

1. The reading was taken on the both verniers scale.
2. The width of the slit was taken as narrow as possible.
3. known spectral lines were identified properly.
4. While measuring the angle of prism, the prism was placed at the centre of the prism table.
5. While measuring the minimum deviation the centre of the prism was placed at the centre of the prism table.
6. Focusing and leveling of spectrometer was made with care.

28.12.2021

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EXPT.NO. 05

EXPERIMENT OF Calibration of a thermocouple and hence determination of unknown temperature and thermoelectric power.

DATE: 29.12.21

Theory: Thermocouple are made of two dissimilar metals joining at two ends. When one junction of thermocouple is maintained for a higher temperature θ_H°C. Then a thermocouple electromotive force is developed. If the circuit is closed this e.m.f. will cause a current flow in the circuit. The direction of e.m.f can be calculated by balancing it against a voltmeter.

$$P = \frac{dE}{d\theta} \quad \text{-------} \quad (1)$$

The thermoelectromotive force developed a given temperature different temperature of the junction. A curve known as calibration curve can be plotted with the temperature difference between the junction of the thermocouple as the axis (x-axis) and the e.m.f as the ordinate (Y-axis). As unknown temperature can be measured using the calibration curve by knowing the e.m.f developed of that temperature.

Apparatus: Thermocouple, thermometer, beaker, water, heater, and multimeter.

FIGURE NO. 05

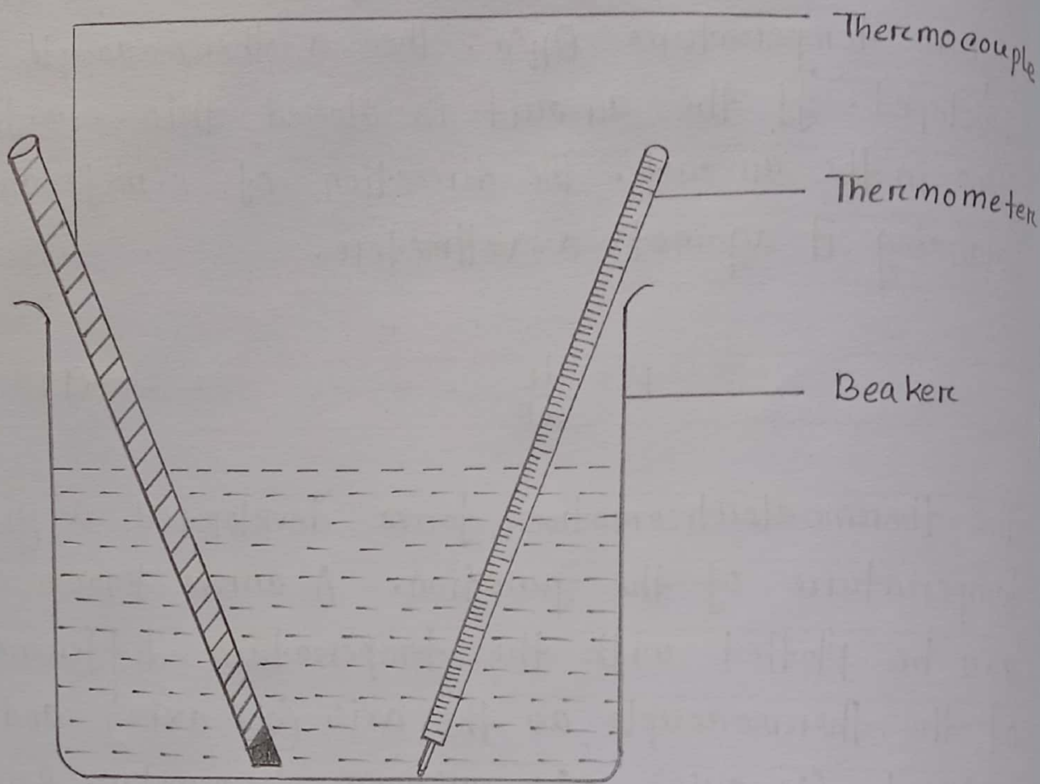


Fig. 1: Experimental setup for thermocouple.

EXPT.NO. EXPERIMENT OF

DATE :

Procedure :

1. The connection of thermocouple were made up as like figure.

2. The hot junction was heated by a heater and the e.m.f were recorded corresponding to the temperature developed in the hot junction.

3. The step-2 was replaced for different temperature by increasing the temperature of the hot junction.

4. The graph was plotted by the temperature difference $\theta = \theta_H - \theta_R$ between the two junction as the abscissa (x-axis) and the corresponding e.m.f as the ordinate (Y-axis), thus the calibration curve were made for the given temperature.

5. By putting the value of e.m.f corresponding to the temperature of the hot junction of water, the unknown temperature were increased from the calibration curve.

FIGURE NO.

Calculations:

From $E \sim \theta$ curve,

The thermo e.m.f, $dE = OQ = 0.39$ mv.

Temperature difference, $d\theta = OP = 10°c$

$\therefore$ Thermoelectric power, $P = \frac{dE}{d\theta}$

$= \frac{0.39}{10}$

$= 0.039 \text{ mv}°c^{-1}$

$\therefore$ Thermo e.m.f., $E = 1.47$ mv

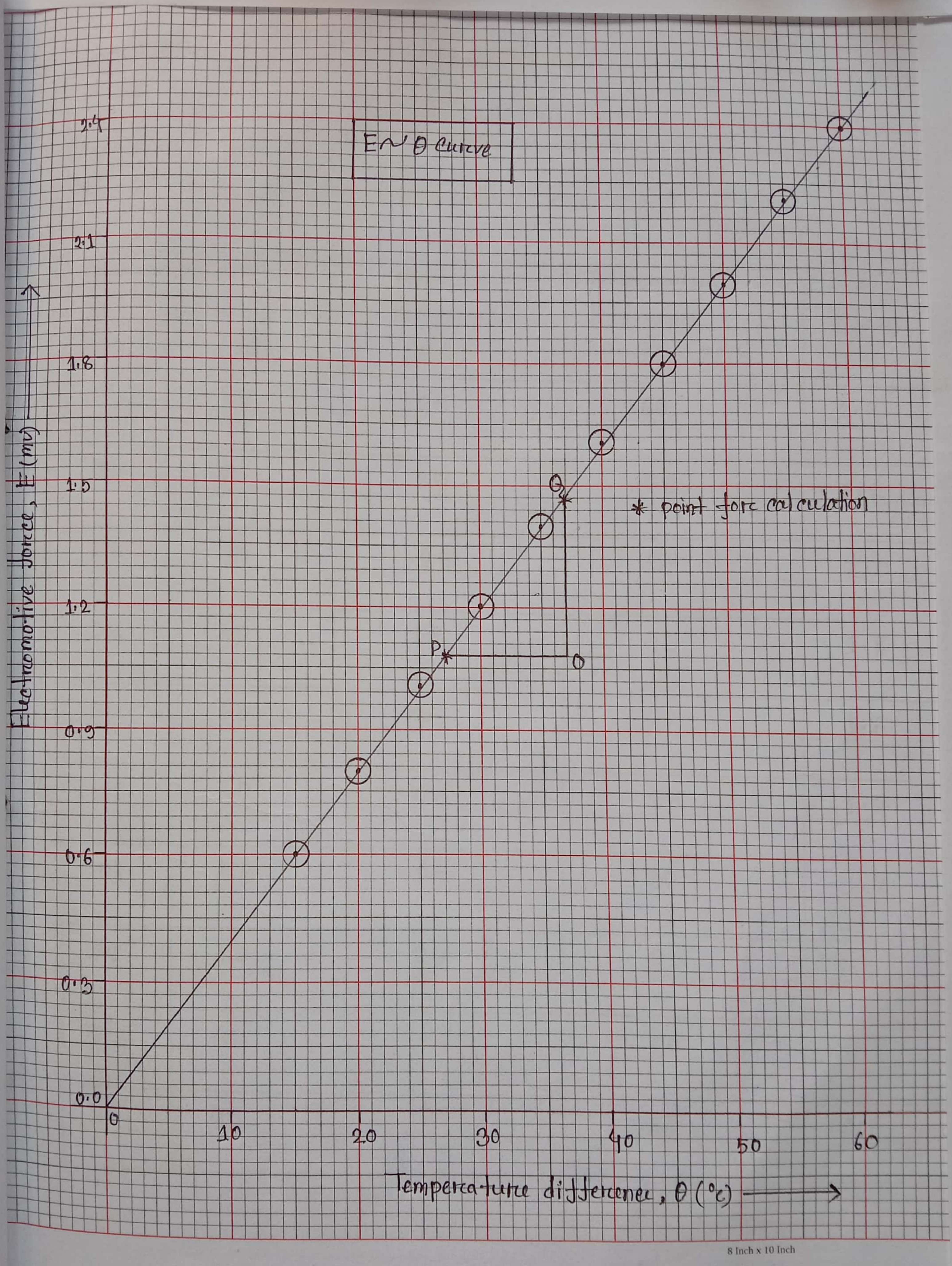
Boiling point of temperature, $\theta = 37°c$

$\therefore$ The unknown temperature,

$$\theta_u = (\theta + \theta_R)°c$$

$$= (37° + 25)°c$$

$$= 62°c$$



8 Inch x 10 Inch

EXPT.NO. EXPERIMENT OF

DATE:

Experimental Data:

Table.1: Data for the temperature and e.m.f.

Obs. no.	Temperature of the hot junction (θ_H°c)	Room Temperature (θ_R°c)	Temperature difference $\theta = (\theta_H - \theta_R)$°c	E.m.f E (mv)
01.	85	25	60	2.4
02.	80	25	55	2.2
03.	75	25	50	2.0
04.	70	25	45	1.8
05.	65	25	40	1.6
06.	60	25	35	1.4
07.	55	25	30	1.2
08.	50	25	25	1.0
09.	45	25	20	0.8
10.	40	25	15	0.6

EXPT.NO. EXPERIMENT OF

DATE :

Results:

1. The calibration of thermocouple was shown by the Calibration curve.
2. The unknown temperature is $\theta_\mu = 62°c$
3. The thermoelectric power, $p = 0.039$ mv °c^{-1}
4. Thermo electromotive force, $E = 1.47$ mv.

Discussion:

1. From this experiment we can see that a thermocouple is used to measure unknown temperature with respect to known temperature like linearly between voltage change and temperature difference for the thermocouple.
2. Many thermocouple arrangement determines wheather the device is used for multi-temperature points or for very sensitive measurements. Also thermocouple are used devices due to its simplicity and linearity for a wide range of temperature difference.

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Precautions:

1. The thermometer was Placed inside the beaker with conciously.
2. The experiment was done whithin a small range of temperature because the (E~θ) curve is almost straight line.
3. The temperature of the water may kept constant for sometime by heated slowly.
4. All the readings of the experiment were taken very carefully.
5. All the readings were taken with regarding interval.