B.Sc 20..... 20..... 3RD Semester

2nd Year

Practical Note Book

Name .....

Class B.Sc ..... **Semester/Year** III rd Sem

Roll Number.....

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Expt. No....1..... Page No....1..... Date...../...../.....

Object :— To determine the ballistic constant of amoving coil ballistic galvanometer with a standard condenst of known capacity.

Apparatus used :— Tapping key mource key battery volt meter revosteal, conection wire, standard condensar of know capacity.

Formula Used :— The ballistic constant of moving coil ballistic galvanometer

$$k = \frac{CE}{Q(1+\theta/2)}$$

C = Capacity of Condensar
E = Voltage of the shell used form charging the condensar
Q = First observe through when the condensar is discharged through the glavanometer
θ = logarithmic decrement is given by

$$\frac{2.303}{10} \log_{10}\left(\frac{Q_1}{Q_2}\right)$$

Observation :-

① Capacity of the condensar

2)!- The distance between the galvanometer mirror and the scale is paint 25 cm

Teacher's Signature : .....

Expt. No..... Page No...2..... Date...../...../.....

Table S N	Applied voltage E volt	Diffection of spot of light corresponding to galvometer		d	Mean F
1	0.4	8.5	0.2	0.375	
2	0.5	13.5	0.3	0.3807	0.3736
3	0.8	15.0	0.8	0.2932	

Calculations :—

① for $d_1 = \frac{2.303}{10} \log_{10}\left(\frac{Q_1}{Q_2}\right)$

$= \frac{2.303}{10} \log_{10}\left(\frac{8.5}{0.2}\right)$

$= \frac{2.303}{10} \log_{10}(42.5)$

$= 2303 \log_{10}(42.5)$

$= 2303 \times 1.60284$

$d_1 = 3750$

② for $d_2 = \frac{2.303}{10} \log_{10}\left(\frac{q_1}{q_2}\right)$

$= \frac{2.303}{10} \log_{10}\left(\frac{3.5}{0.3}\right)$

$d_2 = 0.3807$

③ for $d_3 = \frac{2.303}{10} \log_{10}\left(\frac{q_1}{q_2}\right)$

$= \frac{2.303}{10} \log_{10}\left(\frac{15.0}{0.3}\right)$

$= \frac{2.303}{10} \times 1.2730$

$d_3 = 0.29317$

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$$\text{Mean } d = \frac{d_1 + d_2 + d_3}{3}$$

$$= \frac{0.3750 + 0.3807 + 0.29817}{3}$$

$$= \frac{.3750 + .33124}{3}$$

$$d = 0.35$$

Now ballistic constant $K = \frac{CE}{Q(1 + P/2)}$

Calculation :—

$$K_1 = 1 \times 10^{-6} \frac{CE}{Q_1(P + P/2)}$$

$$= \frac{1 \times 10^{-6} \times .4}{8.5(1 + .35/2)}$$

$$= 4 \times 10^{8} \text{ coulomb/cm}$$

$$\text{For } K_2 = \frac{1 \times 10^{-6} \times 0.5}{13.5\left(1 + \frac{0.35}{8}\right)}$$

$$= 3.1 \times 10^{-8} \text{ coulomb/cm}$$

$$\text{For } K_3 = \frac{1 \times 10^{-6} \times 0.8}{15.0\left(1 + \frac{0.35}{8}\right)}$$

$$= 4.5 \times 10^{-9} \text{ coulomb/cm}$$

Teacher's Signature : .....

$$\text{Mean } K = \frac{K_1 + K_2 + K_3}{3}$$

$$= \frac{4\times10^{-8} + 3.7\times10^{-8} + 4.5\times10^{-8}}{3}$$

$$= \frac{4\times10^{-8} + 7.6\times10^{8}}{3}$$

$$= \frac{11.6\times10^{-8}}{3}$$

$$= 3.86\times10^{-8} \text{ coulomb/cm}$$

Precaution :—

①:- The base of the galvanometer should be liquid in such way that the coil should be move in the space between of magnetic poles.

2):- Tapping key should be used a across the galvanometer

Result :— The ballistic constant K is of the galvanometer is 3.86×10^{-8} coulomb/cm.

Teacher's Signature : .....

Expt. No...2..... Page No...5..... Date...../...../.....

Object:— To determine the wave length of Na light (monochromatic source) with the help of Fresnel's Biprism.

Apparatus used:— Optical bench Na lamp biprism convex lamp, slit and micrometer etc.

Formula Used:- The wave length of Na light is given by can biprism experiment

$$\lambda = \frac{\beta \cdot 2d}{D}$$

where β = Fringe Width

$2d$ = distance between the two virtual sources.

D = distance between the slit and ~~source~~ screen.

$$2d = \sqrt{d_1 \cdot d_2}$$

d_1 = distance between the two images formed by the convex lens in one position

d_2 = distance between the two images formed by the convex lens in Second position

Observation:—

① Table for the motion of B list conut of the micrometer source.

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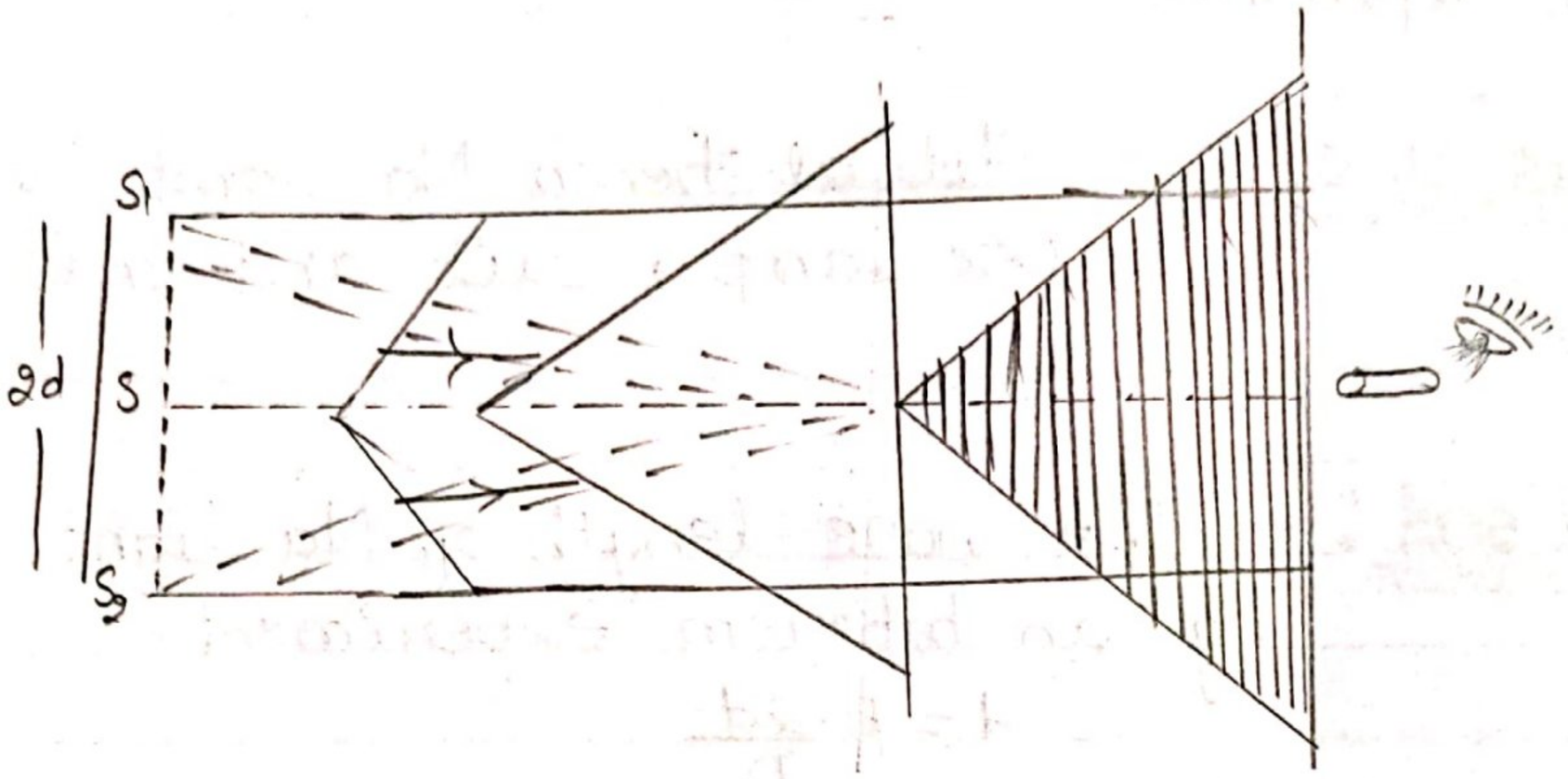

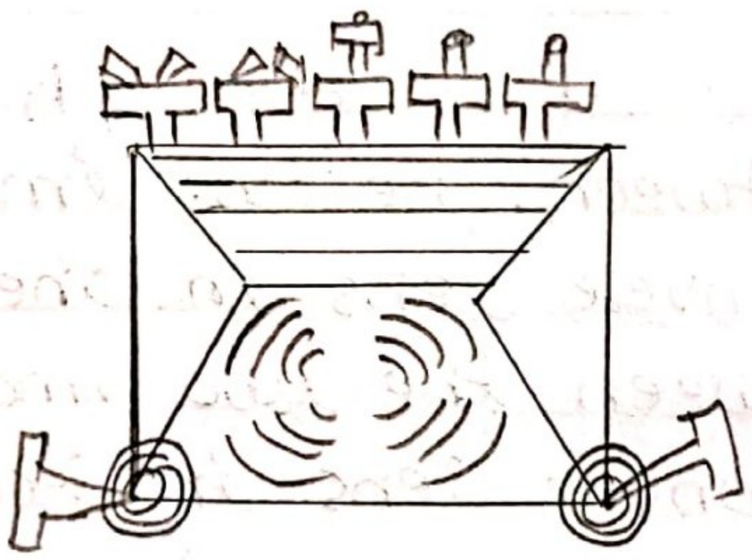

Foresnel's Biprism

Expt. No..... Page No.....6..... Date...../...../.....

S.No	Micrometer reading (a)			No of Fringes	Micrometer reading			Diff.	Mean	B-mean
	M.S	V.S (cm)	Total cm		M.S	V.S	Total cm	erence 20th ring	for fringe	
1.	1.30	0.024	1.324	21	1.85	0.024	1.074	0.550		
2.	1.35	0.028	1.378	22	1.90	0.034	1.934	0.556		
3.	1.40	0.014	1.414	23	1.95	0.018	1.968	0.554		
4.	1.45	0.030	1.480	24	2.00	0.024	2.024	0.544		
5.	1.50	0.030	1.530	25	2.05	0.24	2.074	0.544		0.027
6.	1.55	0.021	1.511	26	2.10	0.014	2.114	0.543	0.58	
7.	1.60	0.018	1.618	27	2.15	0.020	2.170	0.552		
8.	1.65	0.034	1.684	28	2.20	0.026	2.226	0.542		
9.	1.70	0.020	1.720	29	2.25	0.032	2.292	0.562		
10.	1.75	0.025	1.775	30	2.30	0.013	2.317	0.542		

(ii)

Table for determination of 2d.

S.N	Micrometer reading							
	1st position of lens			2nd position of lens			$2d = \sqrt{(d_1 d_2)}$	mean
	I Image	II Image	d_1	I Image	II Image	d_2		
1.	1.362	1.434	0.072	1.514	1.734	0.620	1.26	
2.	1.362	1.436	.072	1.518	1.786	0.260	0.139	0.139
3.	1.362	1.436	.072	1.516	1.826	0.310	0.153	

Calculation :- $d = \beta \frac{2d}{D}$

$\beta = 0.027 \quad 2d = 0.139$

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D= 65.4
d= 0.027

position of the slit = 12cm
position of the eye peice = 77.4cm

D = 77.4 - 12.0

D = 65.4cm

Result :—

Wave length of the Na length = 55.66Å X 160.153
Standard Value = 5893

Error = $\frac{e \times 100}{\text{Standard}}$ = 5.5%

Precaution :—

① :- Slit should be vertical the banch should have Na error
② :- Fringe slit should be removed
③ :- The value of D should be large
④ :- The motion is eyepiece should be the length of bench

Teacher's Signature : .....

Expt. No...3..... Page No.....8..... Date...../...../.....

Object :— To determine the Na light by newton ring method.

Apparatus used :— Newton ring set Na lamp plane glass plane, convex lence, reading lamp lens, lamp, travelling microscope.

Formula Used :— The above length Na light is given by.

$$\lambda = \frac{D_{n+p}^2 - D_n^2}{4pR}$$

where D_{n+p} = diameter of $(n+p)^{th}$ dark ring

$D_{(n+p)} = (n+p)^{th}$

D_n = diameter of n^{th} constant

R = Radius of curvature of plane convex lens.

Observation :—

Slit count of microscopes 0.001 cm table for the determination of

$D_{(n+p)}^2 - D_n^2$

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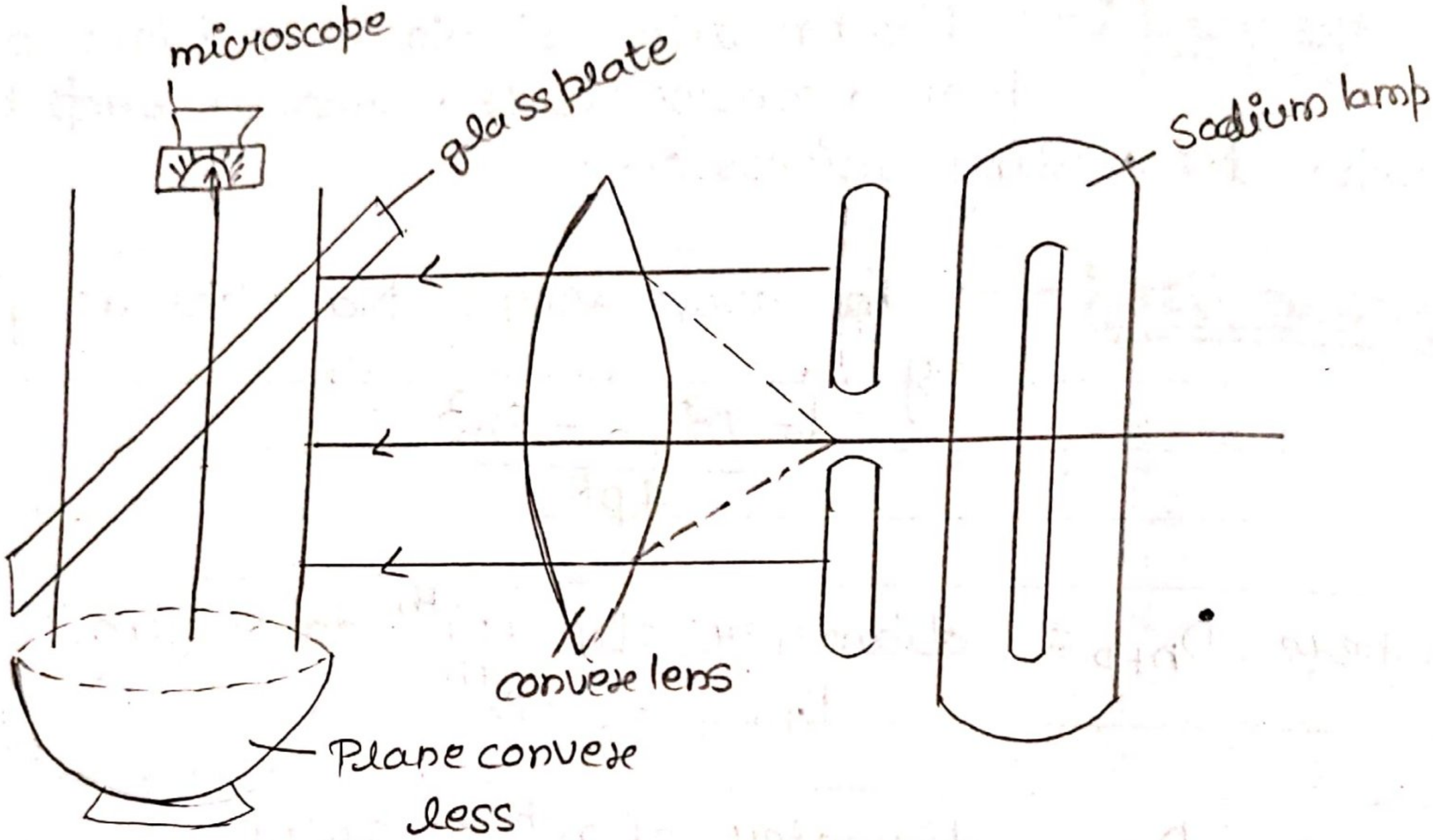

Newton's Ring

Expt. No..... Page No. 9 Date...../...../.....

S.N	No of the ring	Micrometer Reading Left end a cm	Micrometer Reading Right end b cm	Diameter (a-b) or D(b-B)	D^2 $(D^2_{n+p} - D^2_n)$ (n+p) mean		Value of P
1.	20	6.480	5.816	0.664	0.440		
2.	19	6.471	5.831	0.640	0.410		
3.	18	6.464	5.831	5.832	0.400		
4.	17	6.453	5.833	5.833	0.384		
5.	16	6.445	5.834	5.834	0.384		
6.	15	6.432	5.878	5.830	0.375		
7.	14	6.420	5.900	5.900	0.362		
8.	13	6.402	5.907	5.907	0.294	0.207	8
9.	12	6.398	5.921	5.921	0.252		
10.	11	6.372	5.942	5.942	0.228		
11.	10	6.360	5.452	5.456	0.201		
12.	09	6.348	5.456	5.976	0.105		
13.	08	6.334	5.976	5.968	0.154		
14	07	6.321	5.968	5.968	0.199		
15.	06	6.82	5.986	5.986	0.131		
16.	05	6.316	5.994	5.994	0.112		

Radius of curvature of plane convex lens = 100cm

Calculation :— The wave length of sodium light

$$\lambda = \frac{D^2_{(n+p)} - D^2_n}{4PR}$$

$$D^2_{(n+p)} - D^2_n = 0.207$$

$$P = 8$$

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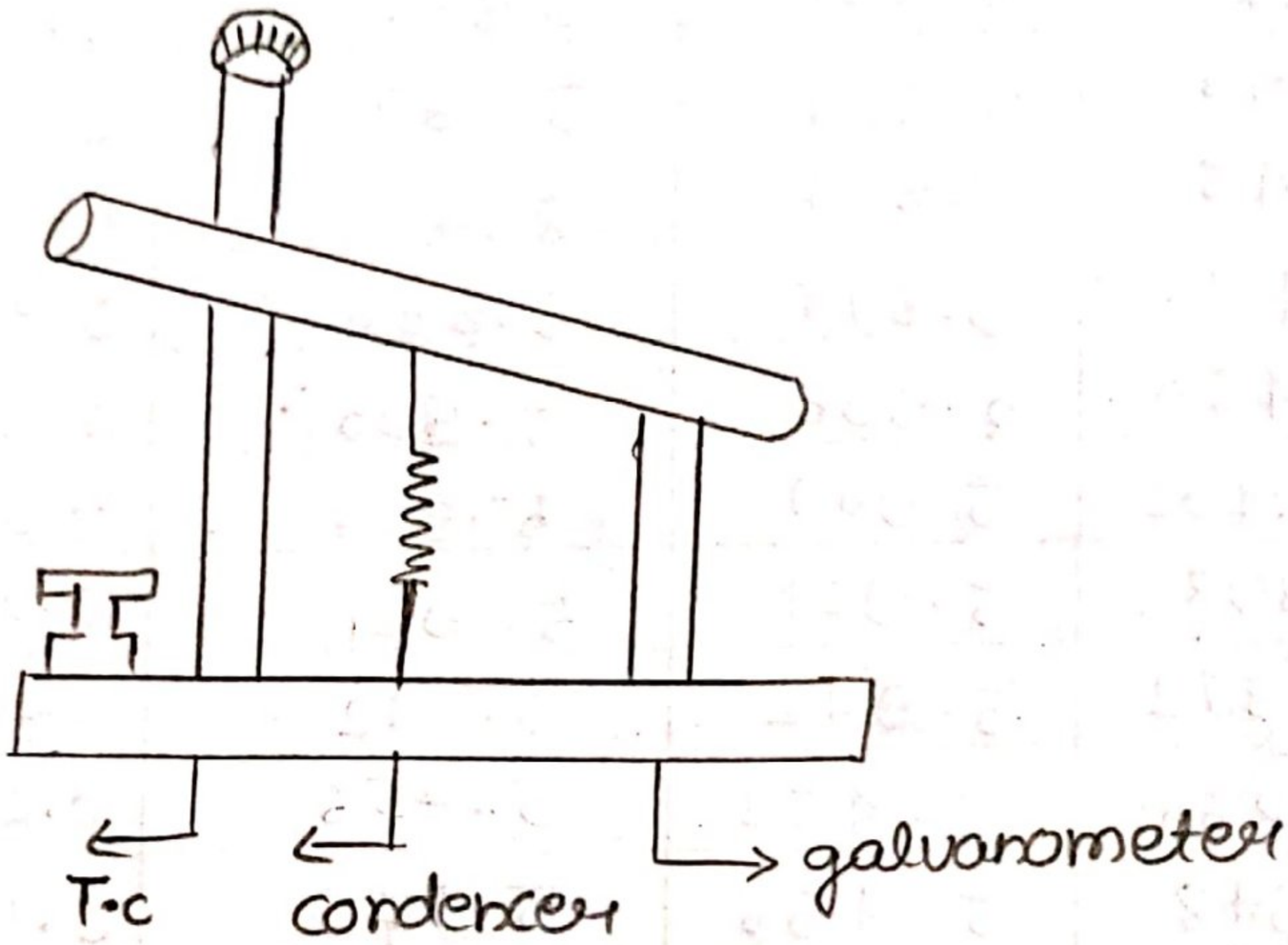
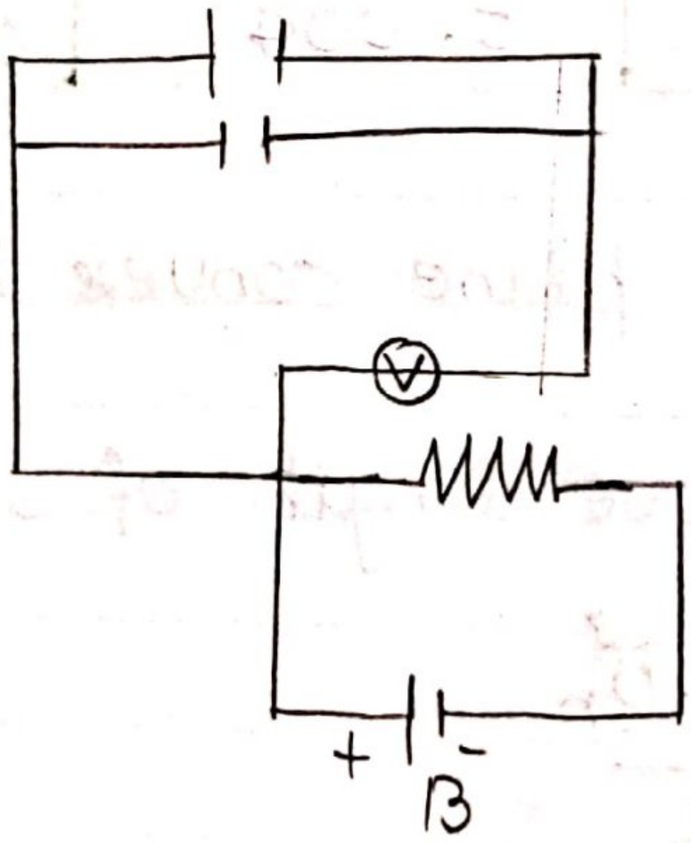

T·c
condenser
galvanometer


+
B
-

$$R = 100$$

$$\lambda = \frac{0.207}{4 \times 8 \times 100}$$

$$\approx 5738 \text{ Å}$$

The wave length sodium light ≈ 6468 Å

Precaution :—

① - Every glass wire should be linear and clean.

② - Cross wire should be touched negativelly microscope should be move in to dection one only

③ - The radius curvature of plane convex should be large.

Teacher's Signature : .....

Expt. No. 4 Page No. 11 Date ...../...../.....

Object :— To determine the specific rotation of sugar solution with the help of polari-meter.

Apparatus used :— Polarimeter source light source becks, physical wight box, sugar water etc.

Formula Used :— The specific rotation of sugar solution is given by

$$S = \frac{\theta \cdot V}{l \cdot m}$$

where S = Specific of the solution of the rute temperture (like as constant)
l = length of the tube
m = mass of sugar dissolved in Water
V = Volume of sugar solution

Observation :—

To prepandicular of sugar solution
Volume of distile H_2O = 100ml
Constrantion of sugar = 80gm
Sugar Solution = $\frac{80}{100}$ = 0.8 gm
length of polari tube = 1.85cm

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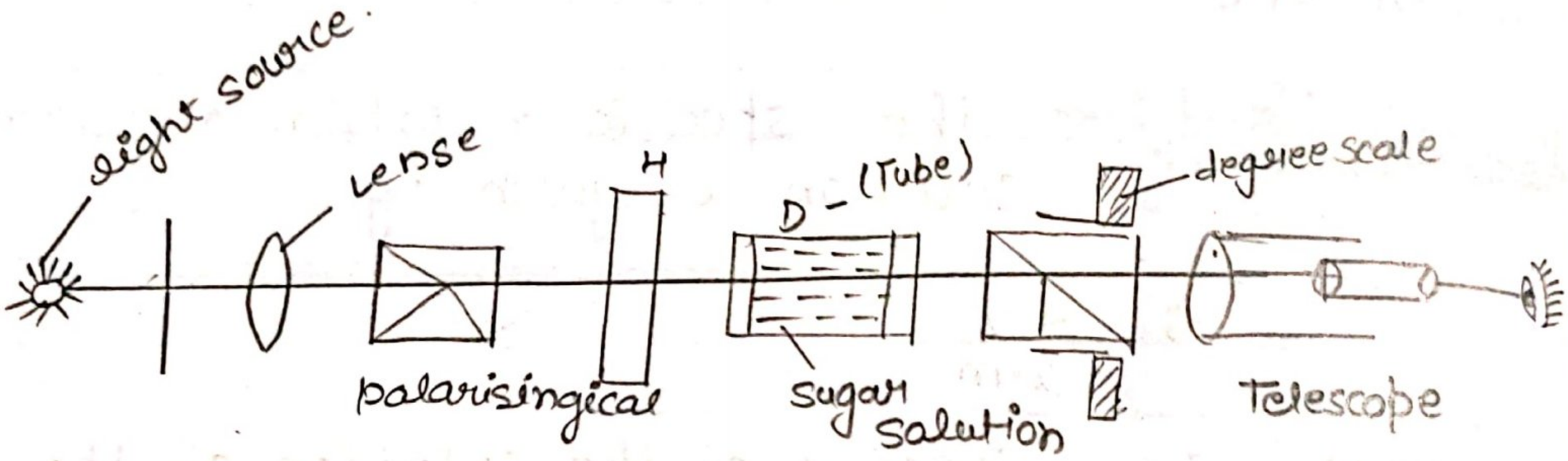

Polarimeter

Expt. No..... Page No.12 Date...../...../.....

Concentration	Analysis first position degree	Reading (0') 2nd position rotation	Degree 0/c	Mean
Water				
20/100	103.40°	28.33°	193.3	122.0
	78.9°	28.7°	168.8	121.9
			(193.3-168.8)	
			= 24.5	
20/200	91.1°	271.10°	181.1	
			(193.3-181.1)	122.0
			= 12.2	
20/400	97.2°	277.70°	(193.3-187.3)	122.0
			= 6	

Calculation :—

$$S = \frac{\theta V}{lm}$$

$$= \frac{12.15}{1.85}$$

$$= 6.56$$

Precaution :— polarimeter tube should will be well cleaned

Sugar solution in polarimeter tube there is new tube the reading should be take at eqully and light is eqully bright position.

Teacher's Signature : .....

Expt. No..... Page No....13..... Date...../...../.....

Result:— The specific at a temperature rotation for sugar ≃ 6.05

Teacher's Signature : .....

Expt. No. 5 Page No. 14 Date ...../...../.....

Object :— To determine the Wave length of by method by a gain source Hg lamp with vaper lamp diffraction grating prism and rating lance.

Apparatus used :— spectro meter differaction melting Hg lamp prism and reading lamp

Formula Used :—

$$d = \frac{g.e \sin\theta}{n}$$

where

d = wave length sepectro line
g.e = grating element
n = order of spectrum
θ = angle of differaction

Observation :—

Telescope reading

		Left		Right		θ	θ/2	
Color	Vernier	V.S	M.S	V.S	M.S			
V	V_1	128°	10°	128°30'	98°10'	98°10'	30°15'	
G	V_2	124°	20°	124°28'	86°10'	86°10'	38°19'	
Y	V_3	122°	30°	123°20'	83°20'	83°20'	40°20'	

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Slit count of mean sprable 30 black = 10'
Slit count of vernier sprable = $\frac{30}{+3} \div 10$

Calculation :—

Total number of lines per inch = $\frac{15000}{\text{gratting element}}$

$= \frac{2.54}{15000}$

For V = $dv = ge \sin\theta$

$= \frac{2.54 \times \sin 150^\circ}{1500}$

$= 43832.45 \times 10^{-9}$

$= 438.32 \times 10^{-11}$

$= 438.32$

For g = $= ge\sin\theta$

$= \frac{12.54}{15000} \times \sin 19^\circ 10^1$

$= \frac{12.54}{15000} \times 0.3272$

$= 55405.86 \times 10^{-9}$

$= 554.05 \times 10^{-1}$

$= 55.405$

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Expt. No..... Page No....16..... Date...../...../.....

For Y = $g e \sin\theta$

$= \frac{2.54}{15000} \times \sin 20^\circ$

$= \frac{2.54}{15000} \times 0.3420$

$= 57912.98 \times 10^{-9}$

$= 579.12 \times 10^{-11}$

Precaution :— ①-Set the spectro meter very slowly if ajestment of will i.e wave asenional

② Grating should be the indent light

③ Grating should not be touched to midical With triangle.

Result :—

Colour	measured value	standard value	
V	438.42	435.83	
G	55.405	446.07	
Y	57.912	576.06	

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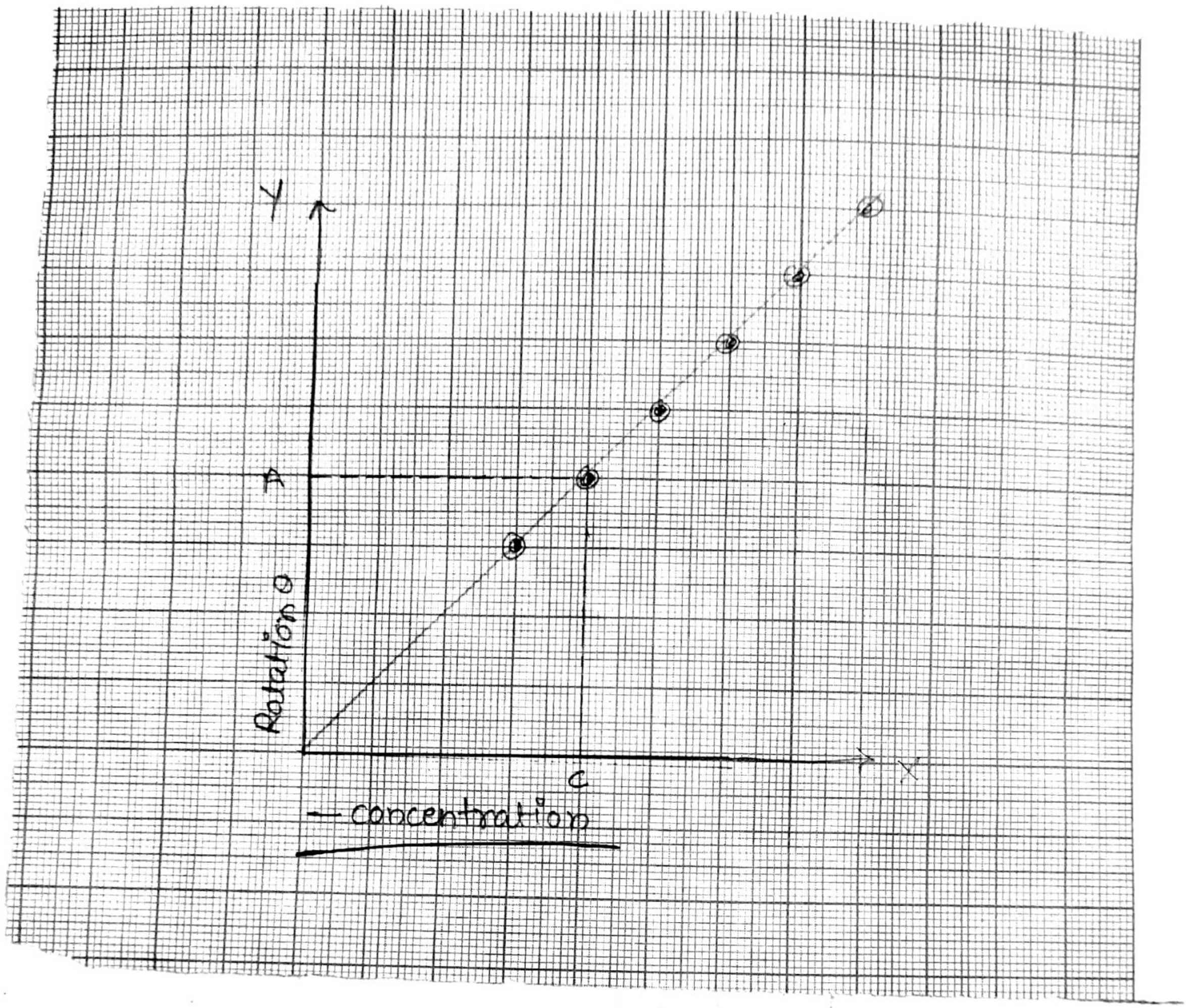
Exp-6



Expt. No.....6..... Page No.....17..... Date...../...../.....

Object :— Plate opray between the constant rotation for varies strength of sugar solution.

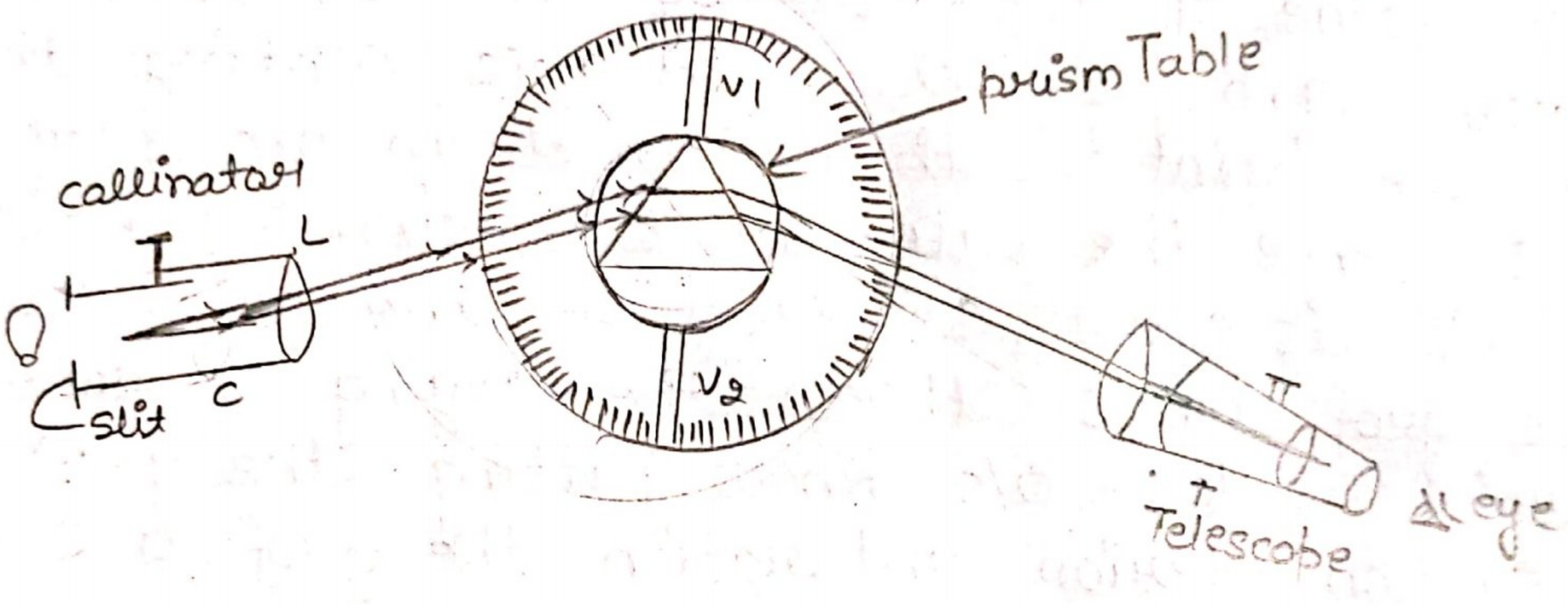
Apparatus Used :— Graph paper sugar solution

Graph Explanation :— To paint of the consionterion the sugar given solution of the take a paint on the by axis Cares pouing to value of θ proused by this solution new drow a, b parallel to H axis conting the grof at the paint b then the draw b, c parpendicular BCI hence the value of carresponding paint c on x axis is the conterion of the given solution the grof paress throw the arging θ slow of grof = BC lθC = θ/c Rnow palting the grof between conison terion and ration the grof a stande line and pass throw the origin.

Result :— Now platting the grof between conison terion and riddion the graff a strande line and pass throw the origin.

Teacher's Signature : .....

Exp-7



Spectrometer

Expt. No. 7 Page No. 18 Date ...../...../.....

Object :- To determine the refractive index of the material of the prism for the given colours (wavelength) of mercury light with the help of a spectrometer.

Apparatus Used :- Spectrometer, prism mercury lamp, reading lamp and reading lens.

Formula Used :- The refractive indese of the material of the prism is given by -

$$\mu = \frac{\sin\left(\frac{A+\delta m}{2}\right)}{\sin\frac{A}{2}}$$

Where

A = Angle of prism

δm = Angle of deviation

Observation :- The value of the one box of main scale = 0.5°

No of boxes on the vernier = 30

least count value of Vernier = $0.5^\circ/30$

$= \frac{0.5 \times 60}{30} = 1$ min

Measurement of Angle of prism - $A = 60^\circ$

Table for angle of minimum deviation -

Teacher's Signature : .....

Expt. No..... Page No....19.... Date...../...../.....

S.No	Vernier	Reading of telescope for reflection from one surface			Reading of Telescope for reflection from second surface			Diff	Average value	Mean
		Reading of main scale	Reading of vernier scale	Total reading a	Reding of main Scale	Reding of vernier scale	Total Reading b	a~b = 2A	2A	A
1.	V_1	86°	22'	86°22'	206°	23'	206°23'	120'		
	V_2	266°	23'	266°23'	26°	23'	26°23'	120'		
									120'	60°30''
2.	V_1	90°	15'	90°15'	210°	16'	210°16'	120°1'		
	V_2	270°	16'	270°16'	+30°	18'	30°18'	120°2'		

Calculation :— (i) Angle of minimum deviation for violet colour spectrum line.

$$\delta_{mv} = 39°36.5'$$

$$A = 60$$

Hence

$$\mu V = \frac{\sin\left(\frac{A+\delta m}{2}\right)}{\sin\left(\frac{A}{2}\right)} = \frac{\sin\left(\frac{60° + 39°36.5'}{2}\right)}{\sin\left(\frac{60°}{2}\right)}$$

$$= \sin\left(\frac{49°40.25'}{\sin(30°)}\right) = \frac{0.7649}{0.5}$$

$$\mu V = 1.530$$

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(ii)- Angle of minimum deviation for green colour spectrum line.

$$S_{mg} = 39°7'$$

$$A = 60°$$

$$\mu_g = \frac{\sin\left(\frac{60° + 39°7'}{2}\right)}{\sin\left(\frac{60°}{2}\right)} = \frac{\sin(49°33.5')}{\sin 30°}$$

$$= \frac{0.76105}{0.5} = 1.522$$

$$\boxed{\mu_g = 1.522}$$

(iii)- Angle of minimum deviation for Yellow colour spectrum line.

$$S_{m_Y} = 38°37'$$

$$A = 60°$$

$$\mu_y = \frac{\sin\left(\frac{60° + 38°37'}{2}\right)}{\sin\left(\frac{60°}{2}\right)} = \frac{\sin(49°18.5')}{\sin(30°)}$$

$$= \frac{0.7582}{0.5} = 1.516$$

$$\boxed{\mu_y = 1.516}$$

Teacher's Signature : .....

Expt. No..... Page No. 21 Date...../...../.....

Result:— Refractive index of prism for given light (Experimental Value)

for violet — $\mu_V = 1.530$
for Green — $\mu_g = 1.522$
for Yellow — $\mu_Y = 1.516$

Standard Value —

$\mu_V = 1.523$
$\mu_g = 1.518$
$\mu_y = 1.517$

% error —

$\mu_V = -98.9\% = -98.9$
$\mu_g = -98.5 = -98.5$
$\mu_y = -98.4 = -98.4$

Precautions and Sources of Error :—

1) :- The telescope and the callimator should be set for parallel rays.

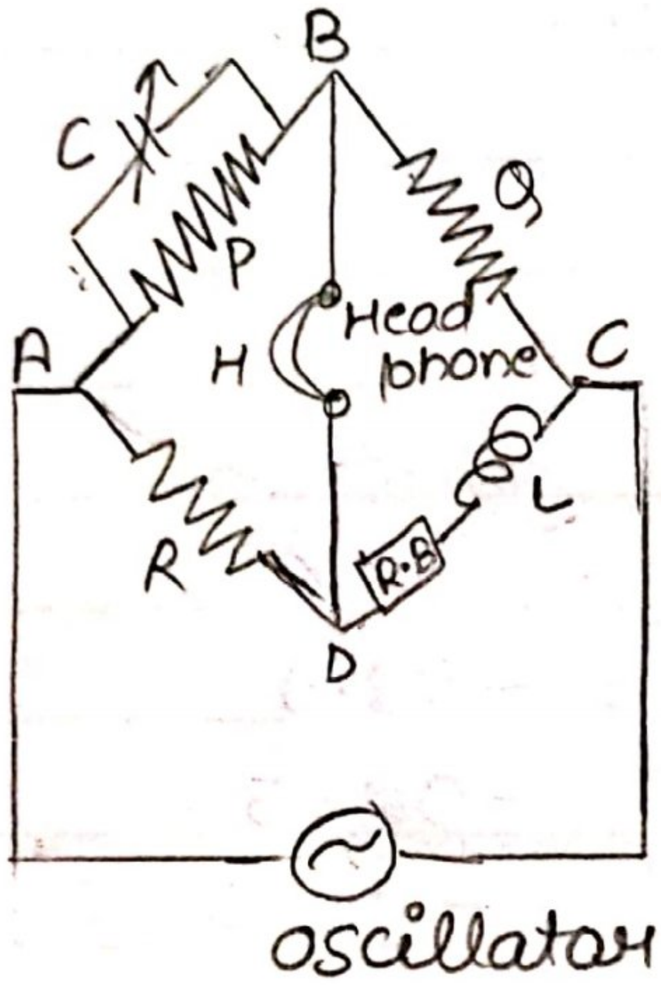
2) :- Slit should be narrow as posible.

3) :- The prism should be properely placed on the prism table for the measurment of angle of prism and angle of minimum deviation

4) :- Reading of bath the varrier should be taken.

Teacher's Signature : .....

Exp-8



Maxwell L/C Bridge

Expt. No. 08 Page No. 22 Date ...../...../.....

Object :— To determine self-inductance by Maxwell's L/c bridge.

Apparatus Used :— Post office box, three resistance boxes of the range of 0 to 1000 ohm, galvanometer, audio oscillator, headphone, battery, plug keys, inductance coil, variable standard capacitor and connection wires.

Formula Used :—

(i) For D.C. balance

The unknow resistance, S, of the inductance is given by

$$S = \frac{RQ}{P}$$

Where P and Q = Resistances in the two ratio arms of the post office box

R = Resistance introduced in the third arm of the post office box.

(ii) for A.C. balance

The inductance L of the coil is given by

$$L = QRC$$

Where C = capacity of the standard capacitor used when the bridge is balanced for A.C.

Teacher's Signature : .....

Calculation :—

$$L = Q \cdot RC$$

$$L = 1000 \times 94 \times 0.54 \times 10^{-6} = 50.76 \times 10^{-3} H$$

$$L = 1000 \times 82 \times 0.81 \times 10^{-6} = 50.02 \times 10^{-3} H$$

$$L = 1000 \times 74 \times 0.67 \times 10^{-6} = 49.58 \times 10^{-3} H$$

$$L = 1000 \times 72 \times 0.64 \times 10^{-6} = 49.68 \times 10^{-3} H$$

$$L_1 = \frac{L + L + L + L}{4}$$

$$= \frac{50.76 \times 10^{-3} + 50.02 \times 10^{-3} + 49.58 \times 10^{-3} + 49.68 \times 10^{-3}}{4}$$

$$= 50.01 \times 10^{-3} H$$

and $L_2 = 97.65 \times 10^{-3} H$

Expt. No..... Page No....23.... Date...../...../.....

Observation:— Table for inductance (L_1)

S.N	P(ohm)	Q(ohm)	R(ohm)	$C \times 10^{-6}$	$L \times 10^{-8}$	
1	1000	1000	94	0.54	50.76	
2	1000	1000	82	0.61	50.02	
3	1000	1000	74	0.67	49.54	
4	1000	1000	72	0.69	49.64	

$L_1(H) = 50.01 \times 10^{-3} H$

Table for (L_2)

S.N	P(ohm)	Q(ohm)	R(ohm)	$C \times 10^{-6}$	$L \times 10^{-3}$	$L_2 H$
1	1000	1000	314	0.45	96.30	
2	1000	1000	314	0.31	97.39	$\frac{97.65}{1000}$
3	1000	1000	414	0.24	99.36	
4	1000	1000	514	0.19	97.96	

Result:— The self induction of given coil

$L_1 = 50.01 \times 10^{-3}$ Henry

The self induction of given coil

$L_2 = 97.65 \times 10^{-3}$

$= 97.65$ mH

Precautions:— 1):- While obtaining D.C balance, galvanometer Key K_2 should be pressed after the battery key K_1

2):- While obtaining the condition of A.C. balance the condition of D.C balance should remain satisfied.

3):- The standard variable condenser used should be of small capacity.

Teacher's Signature : .....