


PARTICULARS OF THE EXPERIMENTS PERFORMED

S.No.	EXPERIMENTS	DATE	PAGE	REMARKS
1.	To determine the wavelength of monochromatic light with the help of Newton's rings.	06-08-18	1-6	Tulsi 1/10/2018
2.	To determine the value of Planck's constant h by a photo cell.	13-08-18	7-12	Tulsi 1/10/2018
3.	To measure the velocity of ultrasonic waves in liquids by using ultrasonic ~~infe~~ interferometer.	20-08-18	13-18	Tulsi 1/10/2018
4.	To find the specific resistance of the material of given wire by post office box.	27-08-18	19-24	Tulsi 1/10/2018
5.	To find the length and breadth of a rectangle using a sextant.	24-09-18	25-30	Tulsi 29/10/2018

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PARTICULARS OF THE EXPERIMENTS PERFORMED

S.No.	EXPERIMENTS	DATE	PAGE	REMARKS
6.	To convert a Weston type galvanometer into a voltmeter of given range	01-10-18	31-38	Tulsi 27/10/2018
7.	To verify inverse square law in magnetism using deflection magnetometer	21-10-18	39-46	Tulsi 29/10/2018
8.	To find the refractive index of a material given in the form of a prism using a spectrometer	27-10-18	47-56	Tulsi 29/10/2018
9.	To study variation of magnetic field with distance along axis of circular coil carrying current and to determine radius of coil using the plot.	29-10-18	57-66	Tulsi 12/11/2018
10.	To determine the wavelength of laser light by using transmission grating	29-10-18	67-72	Tulsi 12/11/2018

Dated ....

Serial No. .....1.....

EXPERIMENT NO. 1

AIM

To determine wavelength of monochromatic light with the help of Newton's rings.

APPARATUS

Travelling microscope, 45° inclined glass plate, one optically plane glass plate, plano convex lens, reading lens, lamp, spherometer

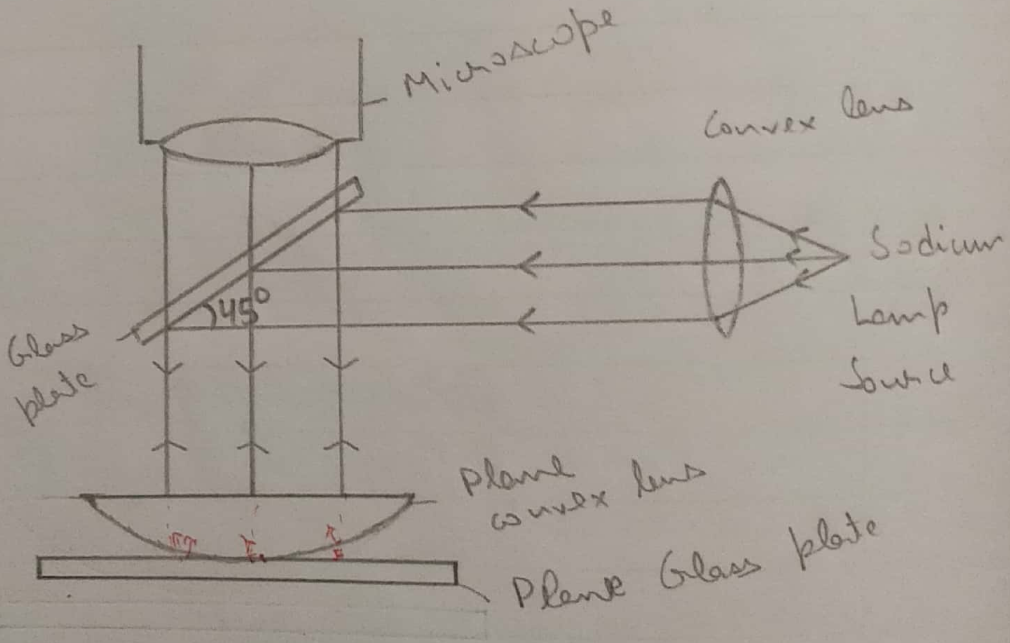

fig.

Signature

Serial No. 2 Dated 06-08-18

EXPERIMENT NO. 1

AIM

To determine the wavelength of monochromatic (sodium) light with help of Newton's rings.

APPARATUS

travelling microscope, 45° inclined glass plate, one optically plane glass plate, plano convex lens, reading lens, lamp, spherometer.

THEORY

When a plane convex lens with its convex surface is placed on a plane glass plate, an air film of gradually increasing thickness is formed between the two. If monochromatic light is allowed to fall normally and viewed as shown in figure, then alternate dark and bright circular fringes are observed. These rings are known as Newton rings. Wavelength of light used is given by

$$\lambda = \frac{D_n^2 - D_m^2}{4R(n-m)}$$

where R is radius of curvature of surface of lens in contact with glass plate, D_n and D_m are diameters of n^{th} and m^{th} dark or bright rings.

PROCEDURE

1. Clean the surface of glass plate and plano convex

Observations

Least count of vernier of travelling microscope = 0.001

Diameter of Rings

n	Microscope Vernier reading						D_n mm (a−b)	D_n^2 mm²	p = 8 $D_{n+p}^2 - D_n^2$ mm²	Mean $D_{n+p}^2 - D_n^2$ mm²
	L.H.S.			R.H.S.						
	M.S mm	V.S mm	Total (a)	M.S. mm	V.S. mm	Total (b)				
20	58	0.46	58.46	53	0.12	53.12	5.34	28.51		
18	58	0.11	58.11	53	0.34	53.34	4.77	22.75	?	
16	57	0.98	57.98	53	0.57	53.57	4.41	19.44		12.31
14	57	0.77	57.77	53	0.75	53.75	4.02	16.16		
12	57	0.58	57.58	54	0.00	54.00	3.58	12.81	16.30	
10	57	0.39	57.39	54	0.15	54.15	3.24	10.49	12.26	
8	57	0.14	57.14	54	0.30	54.3	2.84	8.06	11.38	
6	57	0.04	57.04	54	0.42	54.42	2.62	6.86	9.30	

R = 650 mm

CALCULATIONS

$$\lambda = \frac{D_{n+p}^2 - D_n^2}{4pR} = \frac{16.3 \times 10^{-6}}{4 \times 8 \times 650 \times 10^{-3}}$$

$$\lambda = 7.8 \times 10^{-7} \text{ m}$$

Known value.

RESULT

Wavelength of sodium light is 7.8×10^{-7} m

% error = 30.37 %

Signature

lens with spirit and dry cloth piece.

2. Put the convex side of lens on the glass plate and put this below the 45° inclined glass plate. Switch on the sodium lamp.
3. Focus Ramsden's eyepiece of microscope on cross wire.
4. Focus microscope till sharp circular dark and bright rings are observed. Adjust position of wooden box till rings are uniform in the field of view and also adjust the cross wire.
5. Bring the cross wire at the central ~~wire~~ ring and move it slowly towards left hand side with the help of knob till you reach the 22^{nd} bright ring. Now stop the cross wire tangentially at the 20^{th} ring. Take the reading. Repeat the process for 18^{th}, 16^{th}, . . . , 6^{th} ring.
6. Move further so that cross wire is now at central ring. Move the cross wire to the other side so that it touches 8^{th}, 10^{th} . . . , 20^{th} bright ring and take the observation.

~~7~~

RESULT

Wavelength of sodium light is 7.8×10^{-7} m

Percentage Error = 30.37 %

Serial No. 5

Dated

Error.

ERROR

Actual value = 5893 Å = 5.893×10^{-7} m

$$\% \text{ error} = \frac{\text{Exp. value} - \text{Actual value}}{\text{Actual value}} \times 100$$

$$= \frac{7.8 \times 10^{-7} - 5.983 \times 10^{-7}}{5.983 \times 10^{-7}} \times 100$$

$$= 30.37\%$$

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Serial No. 6 Dated

PRECAUTIONS

1. Glass plate surface and the lens surface must be thoroughly cleaned otherwise the fringes will not be bright and sharp.
2. The microscope's eyepiece must be properly focused on its cross wire.
3. The microscope should be given motion only along one direction to avoid backlash error.

1/10/2018

Serial No. 7 Dated

EXPERIMENT NO. 2

AIM

To determine the value of Planck's constant h by a photo cell

APPARATUS USED

vaccum type photo emissive cell mounted in a wooden box provided with a wide slit, optical bench with uprights, D.C. power supply, resistance box, rheostat, a set of filters, ballistic galvanometer, tapping key, lamp, scale arrangement, connection wires

DIAGRAM

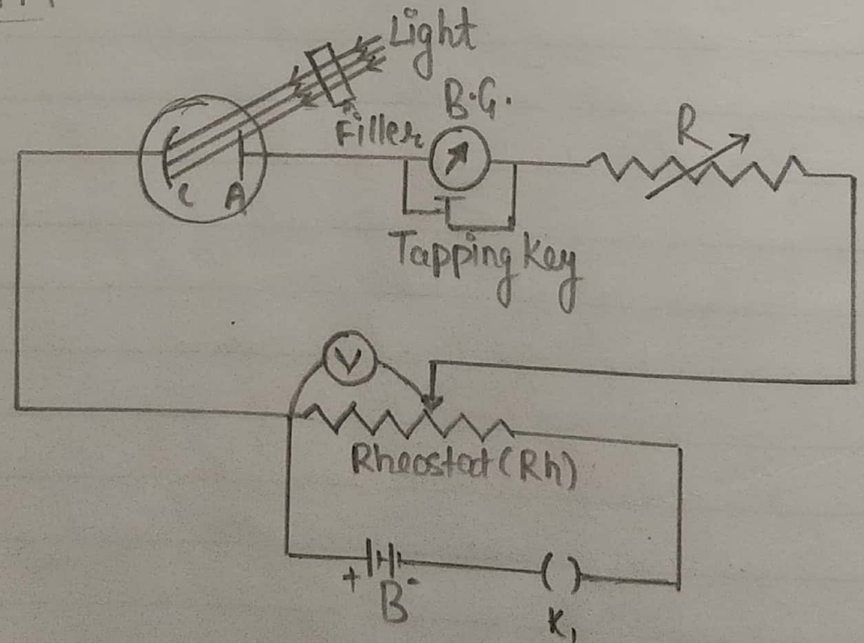

fig.

Signature

Serial No. 8

Dated 13-08-18

EXPERIMENT NO. 2

AIM

To determine the value of Planck's constant h by a photo cell.

APPARATUS USED

vaccum type photo emissive cell mounted in a wooden box provided with a wide slit, optical bench with uprights, D.C. power supply, resistance box, rheostat, a set of filters, ballistic galvanometer, tapping key, lamp, scale arrangement and connection wires

THEORY

Planck's constant, $h = 6.625 \times 10^{-34}$ Js is a fundamental constant and appears at many place at study of quantum physics.

When electromagnetic radiation (light) of suitable high frequency or (low wavelength) is incident on a metal plate (photo sensitive surface of a photocell), electrons are ejected. This phenomenon is called photoelectric effect.

The maximum kinetic energy of the ejected photo electron is given by

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Serial No. 9 Dated

OBSERVATION TABLE

Filter	Wavelength(m)	Stopping potential
Yellow	5780×10^{-10}	0.34
Green	5460×10^{-10}	0.44

CALCULATIONS

We know that

$$h = \frac{e(V_2 - V_1)\lambda_1 \lambda_2}{c(\lambda_1 - \lambda_2)}$$

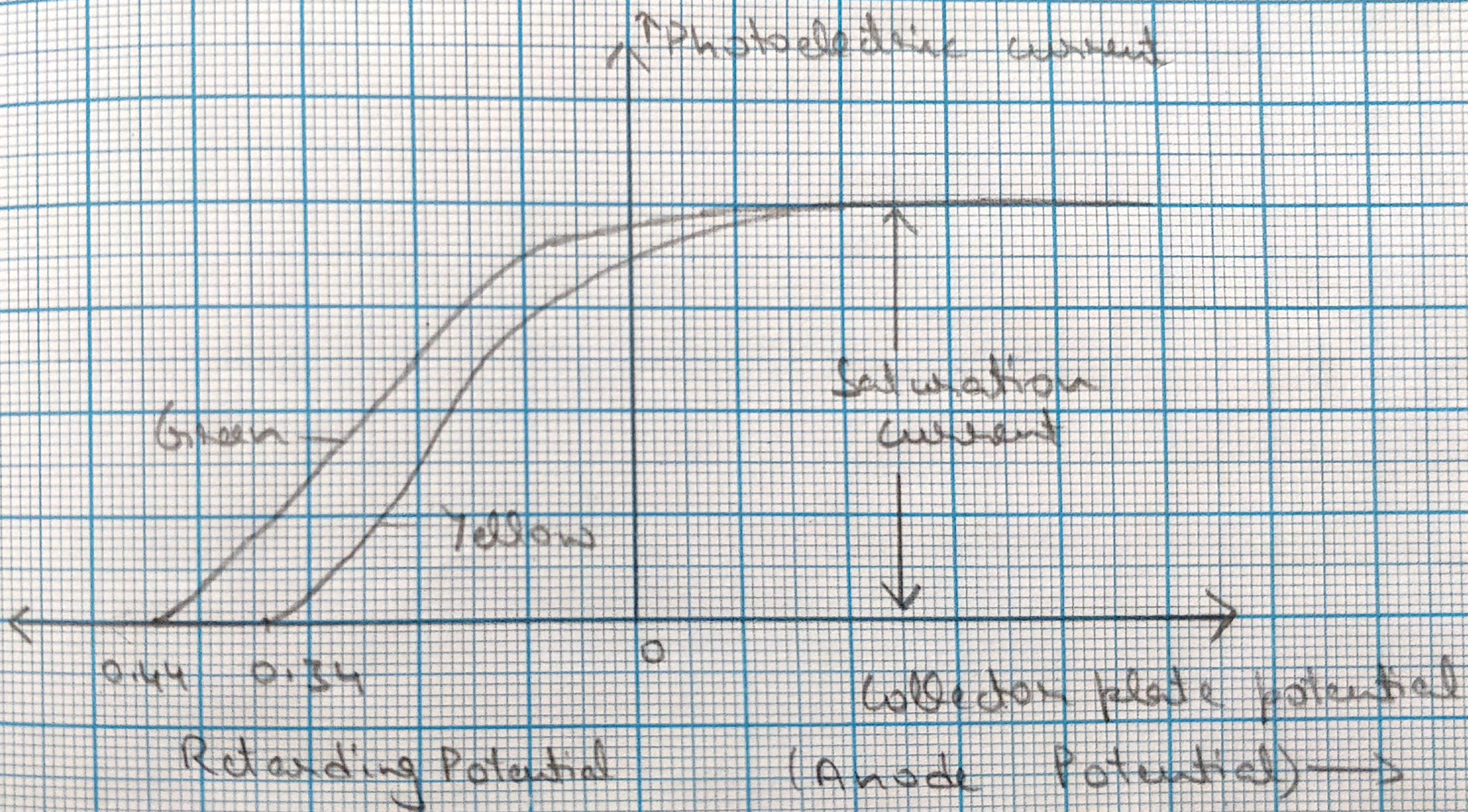
$$h = \frac{1.6 \times 10^{-16} \times (0.44 - 0.34) \times 5780 \times 5460 \times 10^{-20}}{3 \times 10^{8} (5780 - 5460) \times 10^{-10}}$$

$$h = 5.26 \times 10^{-34} \text{ JA}$$

Plot Graph for stopping potential

Signature

Graph for Stopping Potential



$K_{max} = h\nu - \phi_0$

Also K_{max} is related to stopping potential V_0 by

$eV_0 = K_{max}$

$\therefore \quad V_0 = \left(\frac{h}{e}\right)\nu - \left(\frac{\phi_0}{e}\right)$

Light is allowed to fall on the photo cathode of cell. The resulting photocurrent charge the capacitor which is allowed to discharge through ballistic galvanometer, hence producing a deflection. For different wavelength of light, we get different values of stopping potential.
Thus, we are able to calculate value of h.

FORMULA USED

The value of Planck's constant h is given by

$$h = \frac{e\,(V_2 - V_1)\,\lambda_1 \lambda_2}{c\,(\lambda_1 - \lambda_2)}$$

where e = electronic charge
V_2 = stopping potential corresponding to wavelength λ_2
V_1 = stopping potential corresponding to wavelength λ_1
c = velocity of light.

PROCEDURE

1. Electrical connections are made as shown.
2. Lamp and scale arrangement is adjusted to get a well focussed spot on the zero mark of the scale.

Serial No. 11 Dated

Percentage Error

$$= \frac{|\text{Experimental value} - \text{standard value}|}{\text{Standard value}} \times 100$$

$$= \frac{5.26 \times 10^{-34} - 6.62 \times 10^{-34}}{6.62 \times 10^{-34}} \times 100$$

$$= 20.54\%$$

RESULT

The experimentally obtained value of Planck's constant is 5.26×10^{-34} Js with the percentage error of 20.54 %.

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Serial No. 12 Dated

Photocell and light source is arranged. Light is allowed to fall on cathode and suitable filter is used.

3. Deflection is observed in ballistic galvanometer. Now start applying negative potential to anode of a photo cell so that deflection starts decreasing. Note the stopping voltage when needle points to zero.

4. Experiment is repeated after replacing the filter with another one.

RESULT

The experimentally obtained value of Planck's constant is 5.24×10^{-34} Js with the percentage error of 20.54 %.

PRECAUTIONS

1. While equating the galvanometer reading at zero mark and voltmeter reading at zero, no light should fall on the photo cell.
2. Distance between the mercury lamp and the photo cell should be kept constant during the experiment.
3. When values of negative potential for which the deflection is zero has been reached, parallax error should be avoided while taking reading.

Tulsi 1/10/2018

EXPERIMENT NO. 3

AIM

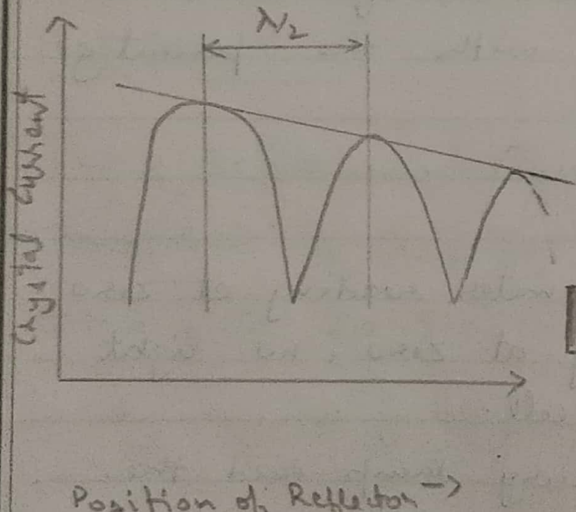
To measure the velocity of ultrasonic waves in liquids by using ultrasonic interferometer.

APPARATUS

Ultrasonic inferometer consists of

1. High Frequency Generator
2. Measuring Cell.

DIAGRAM



Position of reflector v/s crystal current

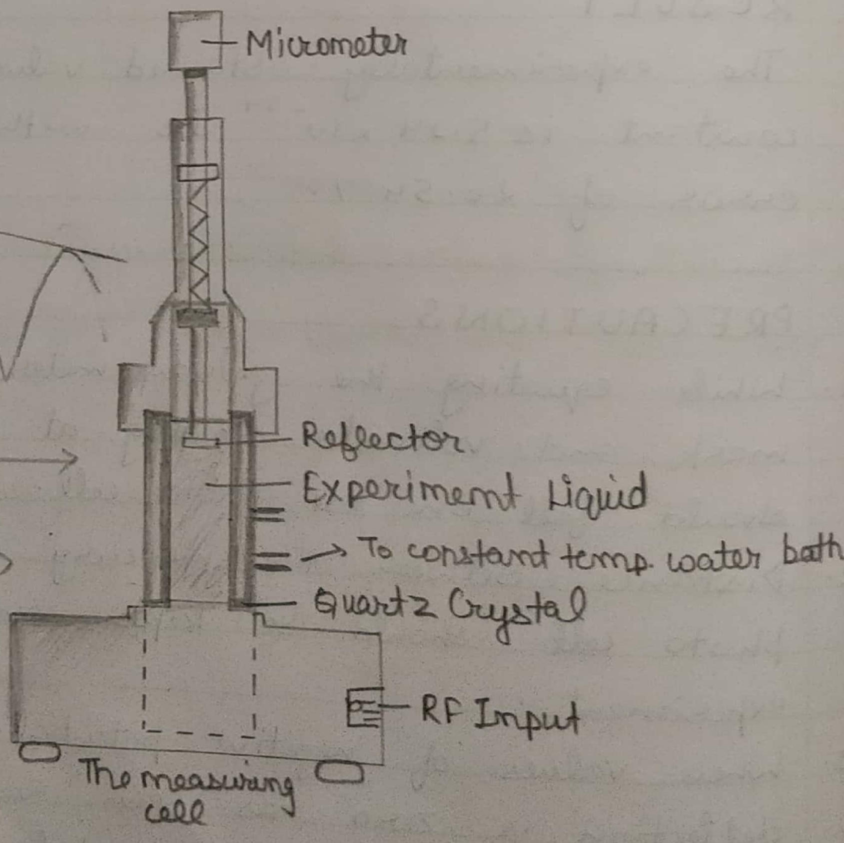


fig.

EXPERIMENT NO. 3

AIM

To measure the velocity of ultrasonic waves in liquids by using ultrasonic interferometer.

APPARATUS

Ultrasonic interferometer consists of
1. High Frequency Generator
2. Measuring Cell

THEORY

An ultrasonic interferometer is a simple and direct device to determine the ultrasonic velocity in liquids with a high degree of accuracy.
The principle used in the measurement of velocity (v) is based on the accurate determination of the wavelength (λ) in the medium. Ultrasonic waves of known frequency (f) are produced by a quartz crystal fixed at the bottom of cell. These waves are reflected by a movable metallic plate kept parallel to the quartz crystal. If the separation between these two plates is exactly a whole multiple of the sound wavelength, standing waves are formed in the medium. This acoustic resonance gives rise to an electrical reaction on

Serial No. 15 Dated

OBSERVATIONS

	Micrometer Reading corresponding to maximum/minimum (in mm)	Difference b/w consecutive maxima and minima ($\lambda/2$)
1.	0.05	0.35
2.	0.40	0.37
3.	0.77	0.55
4.	1.22	0.58
5.	1.80	0.10
6.	1.90	0.39
7.	2.29	0.37
8.	2.66	0.37
9.	3.03	0.39
10.	3.42	0.40
11.	3.82	0.34
12.	4.16	0.39
13.	4.55	0.40
14.	4.95	0.36
15.	5.31	0.37
16.	5.68	0.37
17.	6.05	0.38
18.	6.43	0.43
19.	6.86	0.33
20.	7.19	0.38
21.	7.57	0.38
22.	7.95	0.40
23.	8.35	0.36
24.	8.71	0.37
25.	9.08	0.38
26.	9.46	0.39
27.	9.85	0.35
28.	10.20	0.38
29.	10.58	0.38
30.	10.98	

Signature

the generator ~~dusi~~ driving the quartz crystal and anode current of the generator becomes maximum.

PROCEDURE

1. Unscrew the knurled cap of cell and lift it away from double walled construction of the cell. In the middle portion of it pour experimental liquid and screw the knurled cap. Wipe out excess liquid overflowing from the cell.
2. Invert the cell in the heavy base socket and clamp it with the help of a screw provided on its side.
3. Connect the High Frequency Generator with cell by co axial cable provided with the instrument.
4. Select the desired frequency using frequency selector knob.
5. Move the micrometer slowly in either clockwise or anticlockwise direction till the anode current on the ammeter on the High Frequency Generator shows a maximum or minimum.
6. Note the readings of micrometer corresponding to the maximum or minimum in micro ammeter.
7. Take average of all the differences ($\lambda/_2$)
8. Calculate the velocity (v) in the liquid.

Serial No. 17 Dated ....

Mean $(\lambda/2) = 0.3786 \times 10^{-3}$ m

CALCULATIONS

$\lambda = 0.7572 \times 10^{-3}$ m

$\nu = 2 \times 10^{6}$ Hz

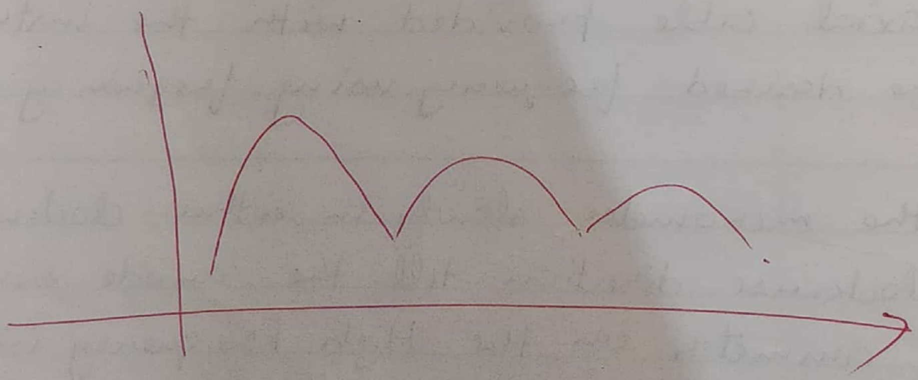
velocity, $v = \nu \lambda$

$v = 2 \times 10^{6} \times 0.7572 \times 10^{-3}$

$v = 1514.4$ m/s

RESULT

Velocity of ultrasonic waves in liquids = 1514.4 m/s



Signature

RESULT

Velocity of ultrasonic waves in liquids = 1514.4 m/s

PRECAUTIONS

1. Do not switch on the generator without filling the experimental liquid in the cell.
2. Remove experimental liquid out of cell after use. Keep it cleaned and dried.
3. Keep micrometer open at 25 mm after use.
4. Avoid sudden rise or fall in temperature of circulated liquid to prevent thermal shock to the quartz crystal.
5. Give your generator 15 seconds warming up time before the observation.
6. While cleaning the cell care should be taken not to spoil or scratch the gold plating on the quartz crystal.

Tulsi
1/10/2018

Dated ....

Serial No. ....19............

EXPERIMENT NO. 4

AIM

To find specific resistance of the material of given wire by post office box.

APPARATUS

post office box, moving coil galvanometer, a coil, a resistance wire of material whose specific resistance is to be found, a screw gauge, meter rod, sand paper, connecting wires.

DIAGRAM

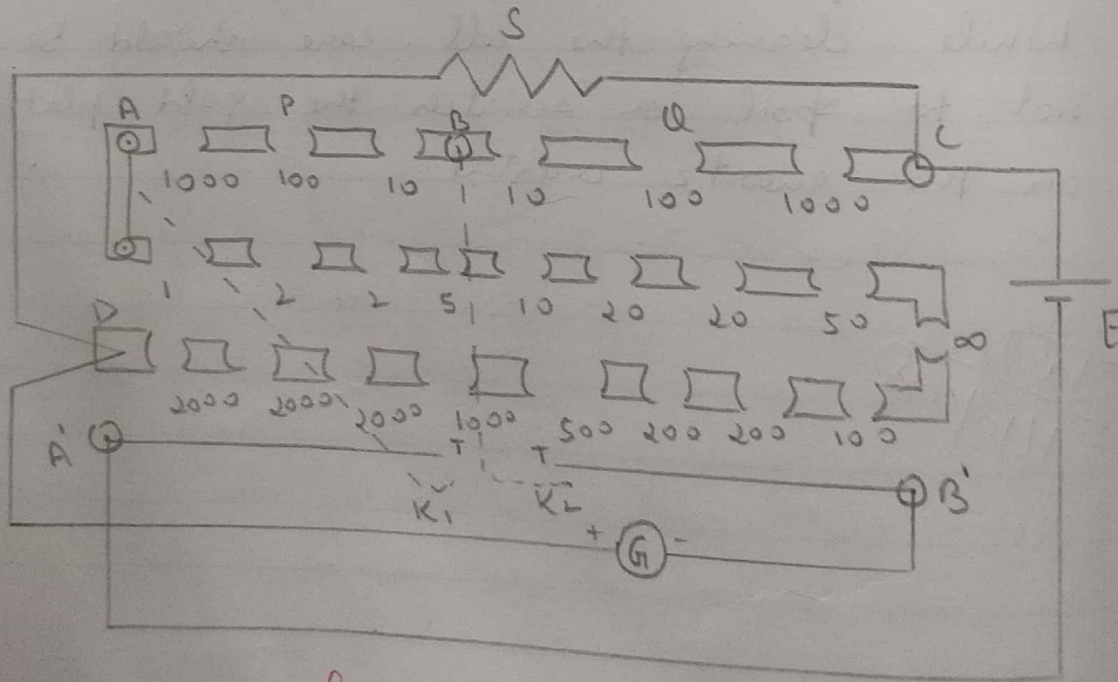


fig.

Signature

Serial No. 20 Dated 27-08-18

EXPERIMENT NO. 4

AIM

To find the specific resistance of the material of given wire by post office box.

APPARATUS

post office box, moving coil galvanometer, a coil, a resistance wire of the material whose specific resistance is to found, a screw gauge, a meter rod, sand paper, connecting wires.

THEORY

From the principle of Wheatstone bridge, the unknown resistance is given by

$$X = R\frac{Q}{P}$$

where Q and P are the constant resistance known as ratio arms and R is variable resistance of known value.

If l is the length of resistance wire and r be the radius, then we have

$$X = \rho\frac{l}{a} = \rho\frac{l}{\pi r^2}$$

where ρ is the specific resistance of the material of the wire, so we have

specific resistance, $\rho = X\frac{\pi r^2}{l}$ ohm cm

Serial No. 21 Dated

OBSERVATIONS

Sr. No	Ratio arms		Variable Resistance (R)	Deflection of galvanometer	Unknown resistance S
	P in ohms	Q in ohms			
1.	10	10	2	Left	S lies b/w 2-3 Ω
	10	10	3	Right	
2.	100	10	22	Left	S lies b/w 2.2 - 2.4 Ω
	100	10	23	No deflection	
	100	10	24	Right	
3.	1000	10	229	Left	S lies b/w 2.29 - 2.31 Ω
	1000	10	230	No deflection	
	1000	10	231	Right	

No deflection point = 230 Ω

$$S = \frac{10}{1000} \times 230 = 2.3 \Omega$$

Length of wire = 50 cm

Diameter (in mm) of wire are 0.40, 0.41, 0.47, 0.43, 0.42, 0.39, 0.37, 0.43

Mean diameter = $\frac{3.32}{8}$ = 0.42 mm

Signature

Serial No. 22 Dated ....

PROCEDURE

1. Draw a diagram showing the scheme of connections as in Fig 3.2 and make the connection accordingly.
2. To test the connections a) Take out 10 ohms plugs from each of the resistance P & Q and keep R zero. Press the battery key K_1 first and then the galvanometer key K_2 and observe the direction of deflection of galvanometer coil.
   b) Take out infinity plug from R and note the direction of deflection as before. If the direction is opposite to that in first case the connections are correct. If not, tighten the plugs.
3. Keeping P and Q each equal to 10 ohms adjust the value of R starting from 0 till an increase of 1 ohm changes the direction of deflection. The resistance X lies between two final values of R. This gives approximate value of unknown resistance.
4. Change P to 100 Ω while keeping Q = 10 Ω. The value of R should now lie between 10 times the value got in previous step. Start from 10 times lower value of 1st observation, adjust R till an increase of 1 Ω again changes direction of deflection. X lies b/w 1/10 of final value.
5. Similarly repeat exp. by making P = 1000 Ω. The result obtained from this value gives the correct value of resistance of wire.

Serial No. 23 Dated ....

CALCULATION

$$\rho = \frac{S\pi D^2}{4L} = \frac{2.3 \times 3.14 \times (0.42)^2 \times 10^{-3}}{4 \times 500}$$

$$\rho = 6.36 \times 10^{-7} \ \Omega m$$

known specific resistance =

Er

RESULT

The specific resistance of the given material of wire from the experiment = 6.36×10^{-7} ohm m

Error.

Signature

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6. Remove resistance wire by cutting at points where it just comes out of terminals and find the length.
7. Take diameter of wire at 7-8 different places with a screw gauge and calculate mean diameter.

RESULT

The specific resistance of the given material of the wire from the experiment $= 6.36 \times 10^{-9}$ ohm cm

Error :-

PRECAUTIONS

1. Care should be taken to press cell key first in order to obtain steady current distribution.
2. The cell key should be pressed only when observations are taken thereby avoiding unnecessary heating of coils in P.O. box.
3. If the plug type P.O. box is used, plugs should be properly inserted in holes to reduce uncertain cont. resistance.

SOURCES OF ERROR

1. The resistance of a coil of wire changes with temperature. So over heating of coils should be avoided.
2. The brass plugs and ~~bar~~ brass pieces used in resistance do not have absolutely 0 resistance.

Tulbi
1/10/2018

Serial No. 25 Dated

EXPERIMENT NO. 5

AIM

To find length and breadth of a rectangle using a sextant.

APPARATUS

a sextant, chalk piece, a rigid clamp stand, measuring tape

DIAGRAM

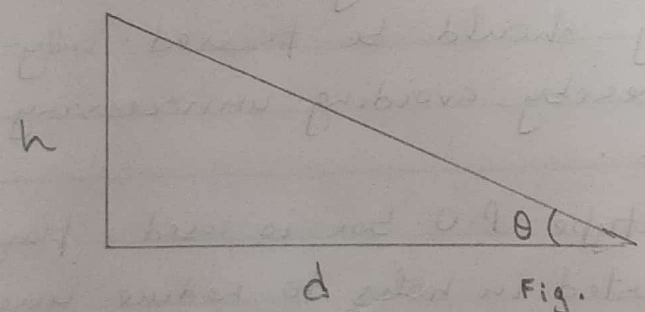

Fig.

h is height from ground

d is distance b/w rectangle & sextant

θ is angular elevation b/w 2 points

Signature

Serial No. 26 Dated 24-09-18

EXPERIMENT NO. 5

AIM

To find horizontal distance between the two lines or to find to the length and breadth of a rectangle using a sextant.

APPARATUS

a sextant, chalk piece, a rigid clamp stand, measuring tape.

FORMULA

$$h = d \tan \theta$$

where h = height of tower

d = distance between square and sextant.

θ = angular elevation between two points.

THEORY

A sextant is a doubly reflecting navigation instrument that measures the angular distance between two visible objects. The sextant basically consists of a telescope, half silvered horizontal mirror and moving arm on which index mirror is fixed with a vernier scale. The main scale is of angle 60°. Mirror and movable arms are adjusted so that two images are obtained, one through lens and other through mirrors.

Serial No. 27

Dated ....

OBSERVATIONS

Least count of the sextant = 12"

d = 415 cm

Length of rectangle

Scale Reading		Difference θ	tan θ	l = d tan θ (cm)
Initial	Final			
2° 14' 12" = 2.23°	4° 34' 36" = 4.57°	2.34°	0.041	17.02

Breadth of rectangle

Scale Reading		Difference θ	tan θ	b = d tan θ (cm)
Initial	Final			
4° 56' 48" = 4.95°	2° 21' 48" 2.36°	2.59°	0.045	18.78

Breadth = 18.78 cm

Length = 17.02 cm

Signature

Serial No. 28

Dated

These images should be mirrored in one line. We can change the image through mirror and find the length or breadth. So, we can find angular elevation.

PROCEDURE

1. Draw a rectangle on the wall.
2. Measure the distance between sextant and the rectangle
3. Adjust the sextant to the level of the square drawn.
4. Look at the rectangle through the sextant. You will see 2 images of the rectangle.
5. Note the angle when one side of the rectangle of 1st image is exactly over the another side of rectangle of the 2nd image. This will the initial reading.
6. Now try to adjust the sextant such that two images coincides. Note the final reading of the angle of arc.
7. Repeat the experiment two or three times with different distances of the sextant from the rectangle.

Actual Length = 19 cm

$$\% \text{ error} = \frac{\text{Actual value} - \text{Exp. value}}{\text{Actual value}} \times 100$$

$$= \frac{19 - 17.02}{19} \times 100$$

$$= 10.4\%$$

Actual Breadth = 19.5 cm

$$\% \text{ error} = \frac{19.5 - 18.78}{19.5} \times 100$$

$$= 3.69\%$$

RESULT

Length of rectangle = 17.02 cm

% error = 10.4 %

Breadth of rectangle = 18.78 cm

% error = 3.69 %

Area = 317.64 cm^2

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Serial No. 30 Dated ....

RESULT

Length of the rectangle = 17.02 cm

Breadth of the rectangle = 18.78 cm

Area = 317.64 cm^2 area.

PRECAUTIONS

1. Telescope should be at the same height from the floor as the bottom of the rectangle.
2. The scale should be vertical and the axis of the telescope horizontal.
3. The two images should overlap and should have the same intensity.

Tulsi
27/10/2018

EXPERIMENT NO. 6

AIM

To convert a Weston type galvanometer into a voltmeter of given range.

APPARATUS REQUIRED

A weston type galvanometer, voltmeter, battery of two cells, two resistance boxes, rheostat, one way key, connecting wires, sand paper, metal rod, screw gauge.

Signature

EXPERIMENT NO. 6

AIM

To convert a Weston type galvanometer into a voltmeter of given range.

APPARATUS

a weston type galvanometer, voltmeter, battery of two cells, two resistance boxes, rheostat, one way key, connecting wires, sand paper, metal rod, screw gauge.

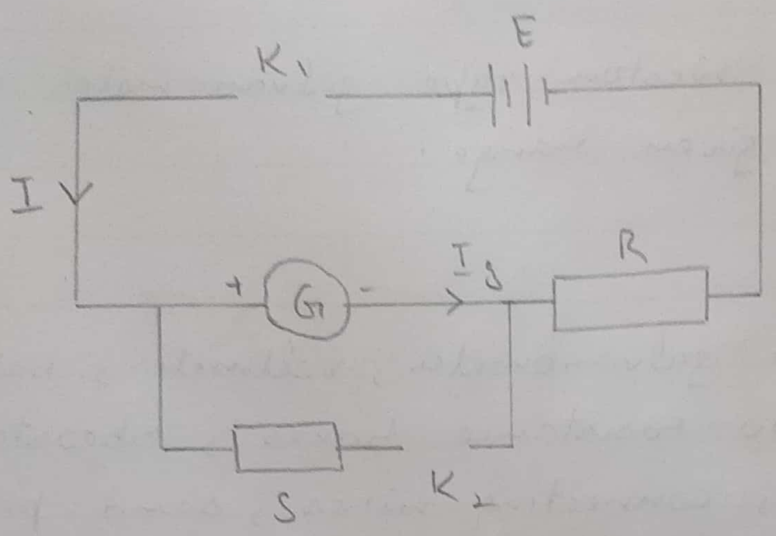
THEORY

Let I_g be the current for maximum deflection in a given galvanometer of resistance G. If this galvanometer is to be converted into a voltmeter to measure a potential difference V, then a high resistance R is required to be placed in series with it such that the current through the galvanometer is I_g. In such a case

$$I_g = \frac{V}{R+G}$$

$$\Rightarrow \quad R = \frac{V}{I_g} - G$$

Serial No. 33 Dated ....



Circuit Diagram

OBSERVATION TABLE

Resistance R	Deflection θ	Shunt Resistance S	Half Deflection $\theta/2$	$G = \frac{RS}{R-S}$
2000	24	20	12	20.2
1900	26	21	13	21.23
1800	27	22	13	22.27

Mean G = 21.23 Ω

Signature

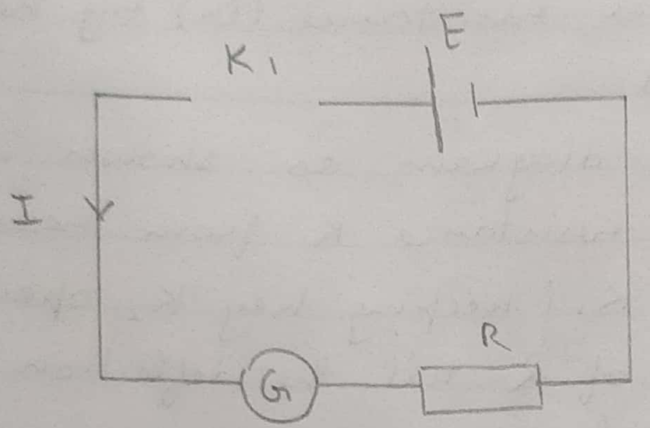
Serial No. 34 Dated ....

PROCEDURE

a) Find Galvanometer resistance (G) by half deflection method

1. Draw a circuit diagram as shown in figure.
2. Introduce a high resistance R from resistance box R, close the key K_1 (keeping key K_2 open) and adjust the value of R till the deflection is within the scale and nearly maximum even number of divisions (θ) say at 20, 22 or 24. All the other resistance keys in the resistance except those taken out should be pressed tightly to avoid any error. Note the deflection as no. of divisions and value of resistance R.
3. With all the keys pressed tightly in resistance box S, close key K_2 and see galvanometer show 0 deflection. Now introduce value of shunt resistance in S by taking out appropriate keys keeping all other tight so that deflection in the galvanometer becomes half the first value observed in step 2 above i.e. 10, 11 or 12.
4. Repeat the procedure three times with one cell and again three times with two cells and record values of R, θ, S and $\theta/2$.

Dated ....



Circuit Diagram

OBSERVATION TABLE

No. of cells	Emf 'E' of cells (V)	Resistance R	Deflection θ	Figure of merit $k = \frac{E}{\theta(R+G)}$
1	0.6	500	23	5×10^{-5}
1	0.6	400	27	5.28×10^{-5}
1	0.6	600	18	5.36×10^{-5}
2	2	1500	25	5.26×10^{-5}
2	2	1800	21	5.22×10^{-5}
2	2	2000	20	4.94×10^{-5}

$k = 5.18 \times 10^{-5}$ A/ div

CALCULATION

$I_g = nk$, $n = 30$, $k = 5.18 \times 10^{-5}$, $V = 2.5V$

$G = 21.23\ \Omega$

$R = \frac{V}{I_g} - G = 1608.75\ \Omega$

Signature

b) Find the figure of merit

1. Make the circuit diagram as given below. Find the e.m.f. E of the cell by a voltmeter. Take out high resistance say 5000 Ω from the resistance box R and see the deflection in the galvanometer. Adjust the value of R so that the deflection is maximum. Note this deflection in the galvanometer. Repeat this step for three values of R and note corresponding values of deflection in the galvanometer.
2. Increase the no. of cells and find their total e.m.f. Again insert R to get deflection of about 22 or 24 and repeat it thrice.

c) Calculation of high resistance

Resistance of Galvanometer, $G = 21.23\ \Omega$

Figure of merit, $k = 5.18 \times 10^{-5}$ amp./div

No. of divisions on galvanometer scale on one side of 0, $n = 30$

Current for full scale deflection in galvanometer,

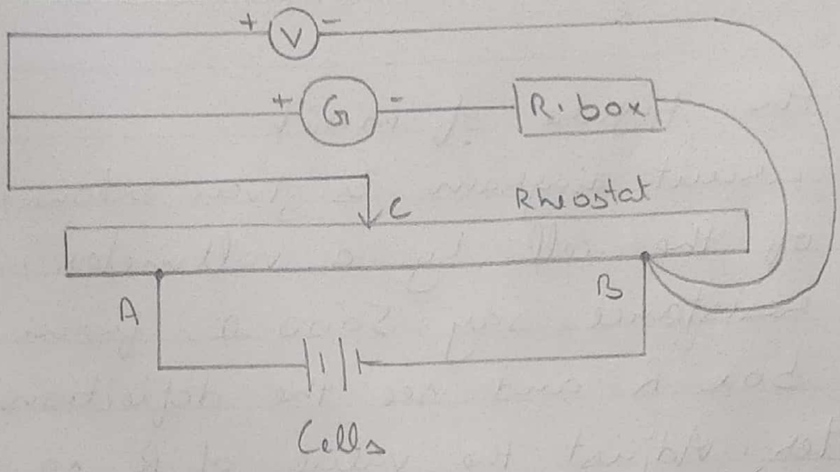
$I_g = nk$

Range for conversion $(0 - 2.5\ V)$, $V = 2.5\ V$

Resistance placed in series in galvanometer

$$R = \frac{V}{I_g} - G = 1608.75\ \Omega$$

Serial No. 37 Dated



Circuit Diagram

OBSERVATION TABLE

Voltmeter Reading (V)	Galvanometer Reading		Difference of voltmeter Reading & galvanometer reading
	Deflection (div)	Potential Difference (V)	
0.5	4	0.4	0.1
1	8	0.8	0.2
1.5	13	1.3	0.2
2	17	1.7	0.3

After conversion one scale division in galvanometer = 0.1 V

RESULT

Weston type galvanometer is converted into a voltmeter of given range.

$G = 21.23\ \Omega$, $k = 5.18 \times 10^{-5}$ amp./div

$R = 1608.75\ \Omega$

Signature

d) Verification

1. Connect the two cells in series through a key across A and B (fixed) terminals of the rheostat. Connect the galvanometer through a resistance box R between a fixed terminal A and the variable terminal C of the rheostat. Also connect the voltmeter between same two terminals so that its positive marked terminal is connected to same fixed terminal of the rheostat to which +ve of battery is connected.
2. Take out calculate resistance R from resistance box and vary movable point on rheostat so that voltmeter reads 0.5V. Note corresponding deflections in the galvanometer.
3. Now vary the rheostat position so that it indicates 1V in voltmeter & note corresponding deflection in galvanometer. Increasing this way, record values corresponding to 0.5, 1, 1.5, 2 & 2.5 V in voltmeter and complete the observation table. If there are 30 divisions in the galvanometer ~~one~~ one side of 0 and conversion range is 3V, then value of one small division = 0.1 V.

RESULT

Weston type galvanometer is converted into a voltmeter of given range.

$G = 21.23\ \Omega$, $R = 1608.75\ \Omega$ R, I_g K. G.

$k = 5.18 \times 10^{-5}$ amp/div.

TW 8i 27/10/2020

EXPERIMENT NO. 7

AIM

To verify inverse square law in magnetism using deflection magnetometer.

APPARATUS

a deflection magnetometer, small bar magnet, a half metre rod and a piece of chalk

DIAGRAM

a deflection magnetometer

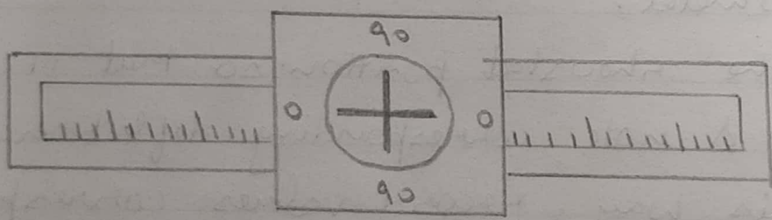


Fig.

EXPERIMENT NO. 7

AIM

To verify inverse square law in magnetism using deflection magnetometer.

APPARATUS

a deflection magnetometer, a small bar magnet, a half metre rod and a piece of ~~chalf~~ chalk.

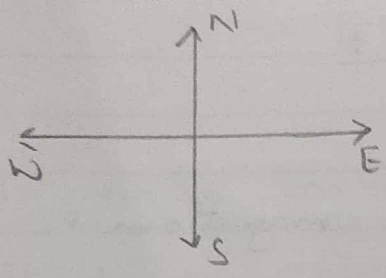
THEORY

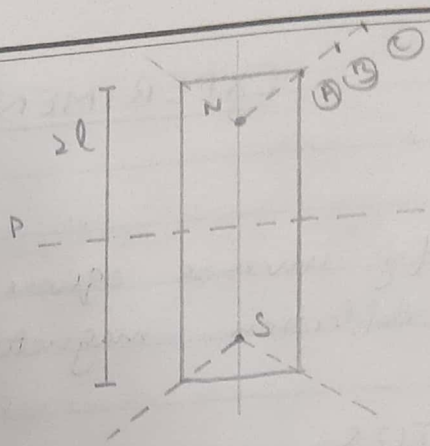
Let θ_1 be the deflection produced by a small magnet in a magnetometer set in the end on position and θ_2, the deflection when the magnet is placed at the same distance in the board side on position, then the inverse square law is verified if $\frac{\tan\theta_1}{\tan\theta_2} = 2$

On actual practice as the length of the magnet is not negligible

$$\frac{\tan\theta_1}{\tan\theta_2} = 2 + \frac{7l^2}{d^2}$$

where l is half the magnetic length and d the distance of the centre of the magnet from the centre of magnetometer box.





NS is measured as magnetic length

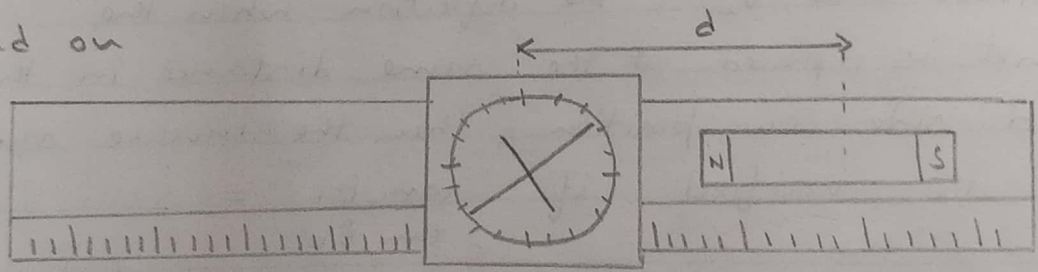
Magnetic length → 2l

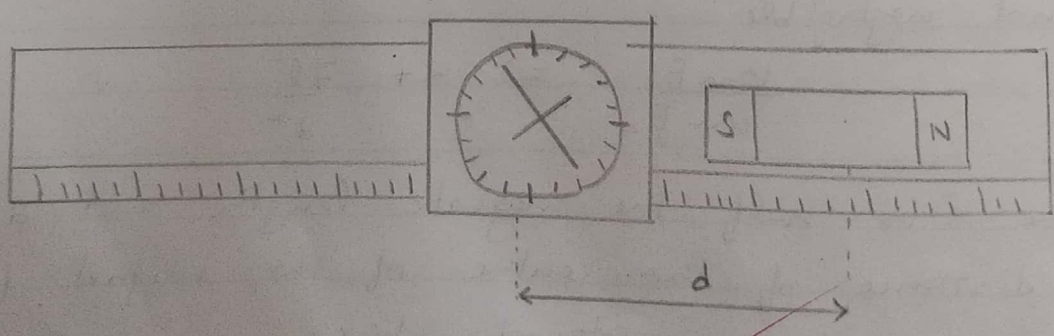
$2l = \frac{7}{8} \times$ Geometric length

$2l = \frac{7}{8} \times 10.3$

$l = 4.50$ cm

End on





PROCEDURE

1. To find the magnetic length :

→ Place the bar magnet with its axis parallel to the magnetic meridian & mark its boundary.

→ Take a point A at one corner of the magnet & place the magnetic compass so that marked point comes below one end of the magnetic needle

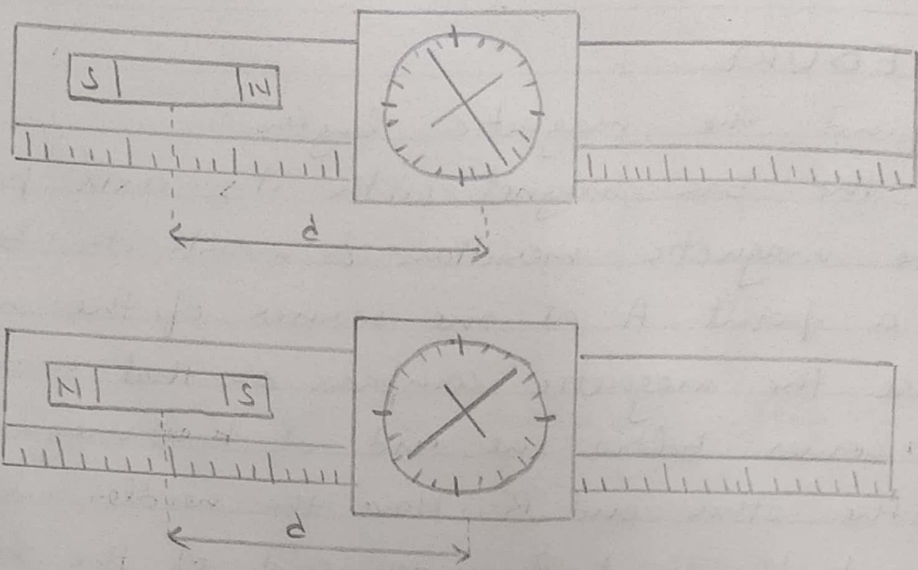
→ Mark the other end B. Move the needle and bring the point the point B under end of the needle & mark a third point as at C. Similarly, mark 3 points at each of the corners. Join the points at each of the two ends of the magnet and produce the lines to meet at N and S respectively.

→ Measure the distance NS which will be the magnetic length.

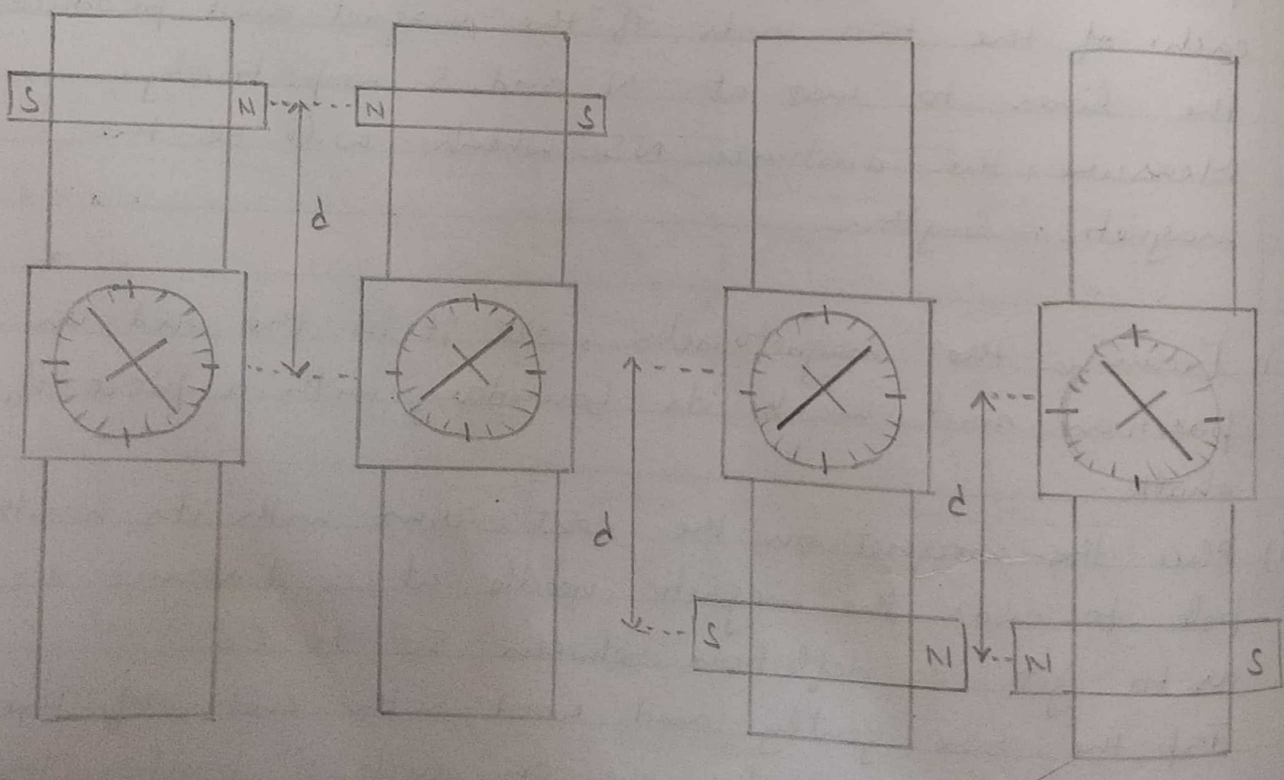
2. i) Examine the magnetometer, set it in the end on position and mark its boundary with a piece of chalk.

ii) Place the magnet on the east arm with its north pole towards the magnetic needle at a distance so as to get a deflection between 50° to 60°.

Tap the box gently and read both ends of the pointer by placing the eye on such a position that the pointer cover its image in the mirror.



Broad side on



iii) Reverse the magnet in its own position and read both ends of the pointers again.

iv) Place the magnet on the west arm with its centre at the same distance with its north pole towards the magnetic ~~m~~ needle and read both ends of the pointer.

v) Reverse the magnet in its own position and again read both ends of the pointer. Find the mean of these 8 observations and let it be θ_1

vi) Take atleast 3 such observations by changing the distance of the magnet.

3 i) Now, set the magnetometer in the broad side on position and mark its boundary.

ii) Place the magnet on the north arm such that its centre lies at the same distance as in the first observation in previous case & read both ends of pointer.

iii) Reverse the position of the magnet & read both sides of pointer.

iv) Place the south arm with its inner edge at the same distance and take readings.

v) Reverse the magnet in its position and again read both ends of the pointer. Find the mean & let it be θ_2.

vi) Take 3 such observations by placing the magnet at the same distance as in previous case.

Serial No. 45 Dated ....

OBSERVATION TABLE

S. No.	Position	Distance d	DEFLECTIONS 1	2	3	4	5	6	7	8	Mean	$\frac{\tan\theta_1}{\tan\theta_2}$	$2+\frac{7l^2}{d^2}$
1.	End on	18	56	56	56	56	57	57	54	54	55.75	1.96	2.42
	Broad side on		39	39	38	38	34	34	36	36	36.75		
2.	End on	18.5	55	55	53	53	53	53	52	52	53.25	2.04	2.41
	Broad side on		35	35	33	33	32	32	33	33	33.25		
3.	End on	19	52	52	52	52	53	53	54	54	52.75	2.21	2.38
	Broad side on		30	30	29	29	31	31	33	33	30.75		

VERIFICATION

Since $\frac{\tan\theta_1}{\tan\theta_2} \approx 2 + \frac{7l^2}{d^2}$

Hence inverse square law in magnetism is verified

Signature

VERIFICATION

Since $\dfrac{\tan\theta_1}{\tan\theta_2} = 2 + 7\dfrac{l^2}{d^2}$

Hence inverse square ~~law~~ of magnetism is verified.

PRECAUTIONS

1. No magnet or magnetic substance should lie on the working table. Even the given magnet should be kept at a safe distance while setting the magnetometer.
2. See that the ~~m~~ needle of the magnetometer rotates freely and the arms are not shaky.
3. The boundary of the magnetometer should be marked.
4. The deflection should lie between 50° to 60° in the end on position.
5. The box should be tapped every time gently before noting the reading of the pointer.
6. The middle point of the magnet should be marked and distance should be measured from this marked point.
7. While noting the observations keep the eye in such a position that the pointer lies over its image in the mirror below to avoid error due to parallax.
8. When the magnetometer is set in broad side on position the magnet should be placed breadthwise on the ~~arm~~ so that the magnetic needle lies on its equatorial line.

Tulsi
29/10/2018

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Serial No. 47 Dated

EXPERIMENT NO. 8

AIM

To find the refractive index of a material given in the form of a prism using spectrometer.

APPARATUS

spectrometer, mercury source, spirit level, prism, magnifier, reading lamp.

DIAGRAM

For Angle of prism

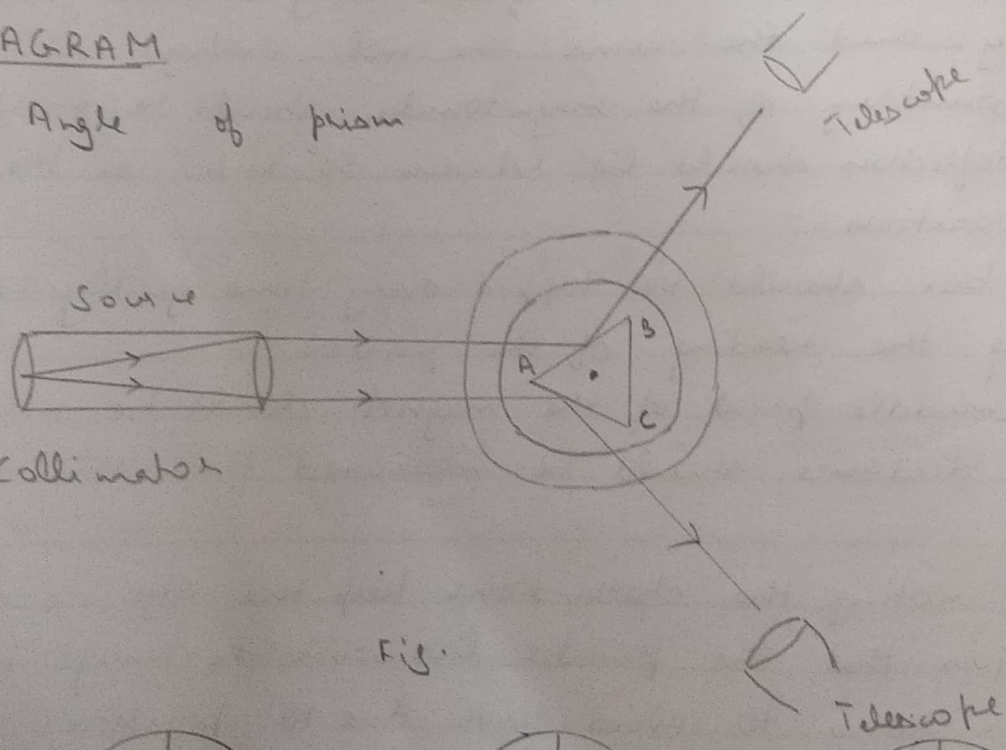
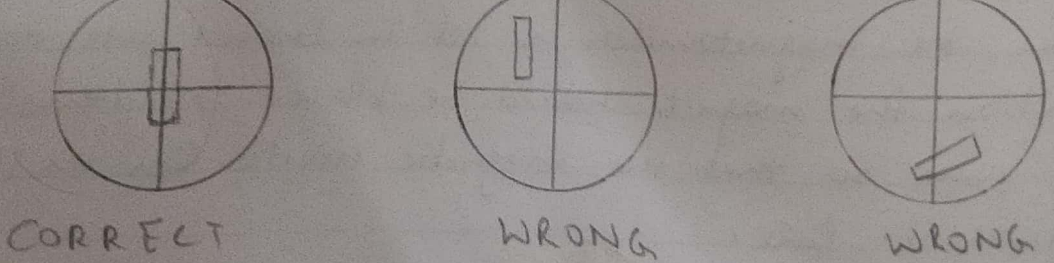


Fig.



Signature

EXPERIMENT NO. 8

AIM

To find the refractive index of a material given in the form of a prism using a spectrometer

APPARATUS

spectrometer, mercury source, spirit level, prism, magnifier, reading lamp.

THEORY

Spectrometer is an optical instrument with the help of which a pure spectrum can be obtained. This is employed for finding the values of angles A and δm. The spectrometer is also used to determine the dispersive power of a material of a given prism and the wavelength of a given given source of light by using a plane transmission diffraction grafting. Spectrometer mainly consists of 3 parts:

1. The Telescope
2. Collimator
3. Prism Table.

1. Telescope - It consists of 2 lens: eyelens the objective and Ramsden's eyepiece
The objective is fixed at one end of a metal tube

For angle of minimum deviation :

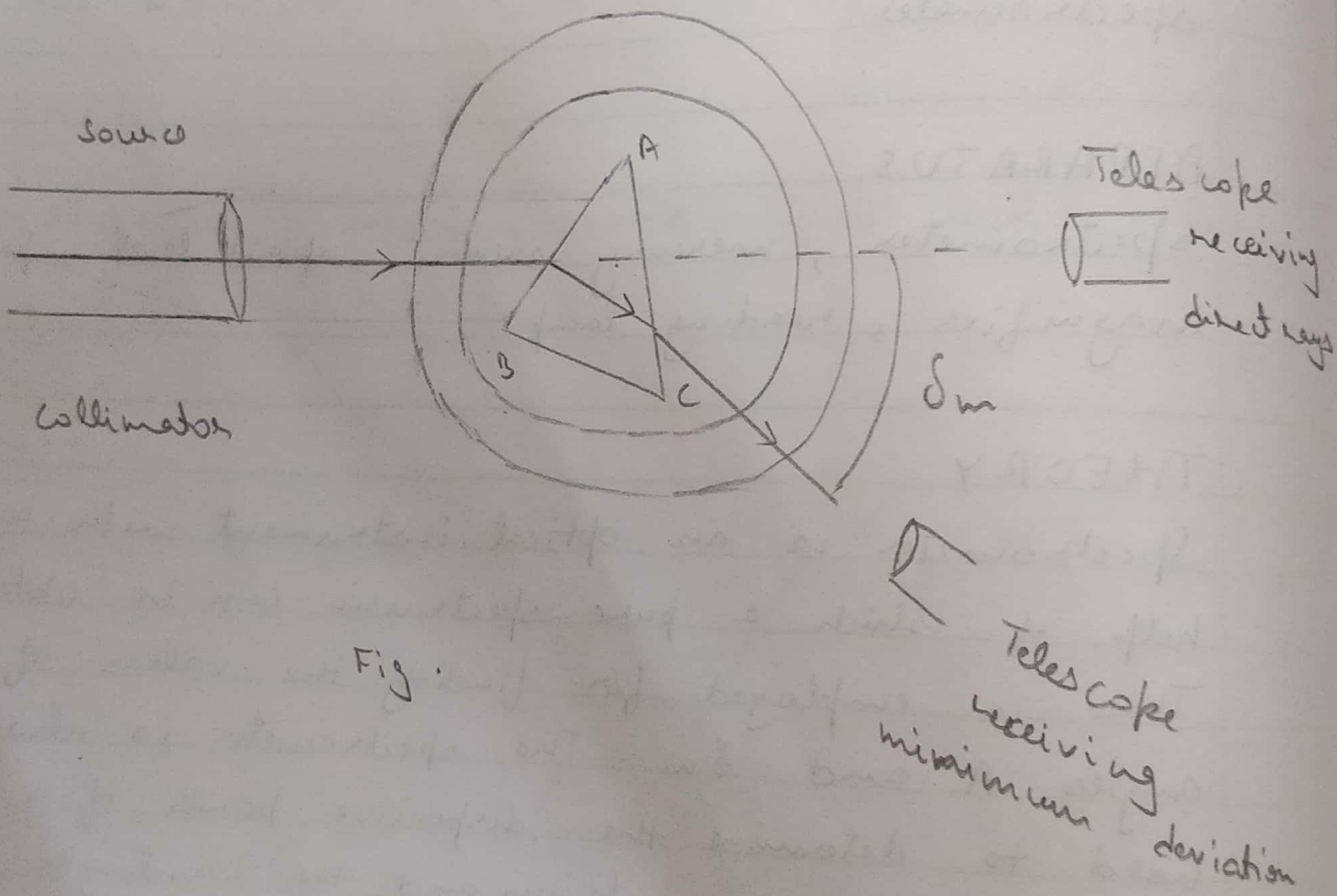


Fig.

and lies towards the prism table while the eye piece can slide in the tube. When a parallel beam of light coming out of the prism falls on the objective, the spectrum produced is viewed through the eyepiece. The angular movement of the telescope is noted with the help of two verniers V_1 and V_2, these verniers are diametrically opposite to each other.

2. Collimator - The collimator is the device for obtaining a beam of parallel rays from the source of light. It consists of an achromatic lens at the end towards the prism table. At the other end of the metal tube a fine edge slit is placed towards the source. The width of the slit can be adjusted by means of a screw. Collimator is permanently fixed & cannot be rotated like a telescope.

3. Prism Table - It is a small circular metal disc carried over another metal from with the help of three levelling screw. The table can be rotated about a vertical axis & its axis coincides with the axis of rotation of the telescope. Some concentric circles & some parallel lines are marked on the surface of ~~correct~~ prism table which helps in correct placing of

OBSERVATION

Angle of prism

	Telescope on Left Hand side			Telescope on Right Hand side			a-b
	M.S.	V.S.	Total a	M.S.	V.S.	Total b	
V_1	140	55	140.46	253	0	253	112.54
V_2	220	30	220.25	97	2	97.02	123.23

Mean (2A) = 117.89°

A = 58.94°

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the prism. It also consists of prism holder and grating holder.

PROCEDURE

(A) Setting of spectrometer

1. Setting of the telescope

a) The telescope is first turned towards some white wall, the eye piece is shifted w.r.t. the cross wires till a ~~sha~~ sharp image of the cross wires is obtained. The eye piece is now fixed w.r.t. the cross wires

b) The telescope is focussed on a distant object and the parallel ~~lens~~ between the image and cross wires is removed. Thus, telescope is set for parallel rays.

2. c) Setting of collimator

The position of lens of the collimator is adjusted such that a sharp and well defined image is seen through telescope.

3. Setting of prism table

The prism table is first made perfectly horizontal with the help of spirit level and levelling screws. The height of the prism table must be on the axis of collimator and telescope.

Serial No. 53

Dated

Min. Deviation

Yellow	Telescope receiving direct rays			Telescope in min. deviation			c − d
	M.S.	V.S.	Total c	M.S.	V.S.	Total d	
V_1	151.5	57	151.98	108	33	108.28	43.7
V_2	330.5	37	330.81	289	49	289.41	41.4

Mean $\delta_m = 42.55^\circ$

$\delta_m = 42.55^\circ$

Signature

B) Determination of angle A of the prism:

1. The prism is mounted on the prism table with the edge A at the centre of the prism table & base BC perpendicular to axis of collimator.
2. The rays from the collimator fall on the faces AB & AC of the prism from which these rays get reflected in direction R_1 & R_2.
3. The telescope is turned to receive the reflected rays R_1. The image of the slit is made to coincide exactly with the vertical cross wire.
4. The main scale & vernier scale V_1 & V_2 are taken.
5. Now the telescope is turned towards the right to receive the ray R_2 & again image of the slit is made to coincide exactly with the vertical cross wires.
6. The M.S. and V.S. readings are again noted.
7. From the readings we get 2A.
8. Half of 2A gives A, the angle of prism.

C) Determination of Angle of Minimum Deviation δ_m

1. Telescope is placed in front of collimator and obtain the direct image of the slit in the telescope without placing the prism.
2. Coincide the image of the slit with vertical cross wires noting use of clamping screw and tangent screw.

Serial No. 55 Dated

CALCULATIONS

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

$$\mu = \frac{\sin(50.745)}{\sin(29.47)}$$

$$\mu = 1.57$$

RESULT

The refractive index of the given material is found to be 1.57

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3. Note readings of V_1 and V_2.
4. Now place the prism centrally on the prism table. So that the light incident from the collimator falls on face AB.
5. Turn the telescope to receive the emergent ray with which get dispersed from the face AC of prism.
6. Bring the ray of that particular colour in the field of view for which μ has to be formed and coincide it with vertical cross wire.
7. Note the readings of M.S. and V.S.

RESULT

The refractive index of the given material is found to be 1.57

PRECAUTIONS

1. The spectrometer must be set for parallel rays before starting the experiment.
2. The readings of both the verniers should be taken
3. For reading magnifiers should be used.
4. The image must be made fine so that a sharp line image is seen.
5. The prism must be placed in the current position.

Tulsi
29/10/2018

Serial No. 57

Dated

EXPERIMENT NO. 9

AIM

To study variation of magnetic field with distance along the axis of a circular coil carrying current and to determine the radius of coil using the plot.

APPARATUS

stewart and gee type tangent galvanometer, ammeter, battery eliminator, rheostat, spirit level, reversing key or a commutator, plug key, sand paper, connecting wires.

Signature

EXPERIMENT NO. 9

AIM

To study the variation of magnetic field with distance along the axis of a circular coil carrying current and to determine the radius of coil using the plot.

APPARATUS

stewart and gee type tangent galvanometer, ammeter, battery eliminator, rheostat, spirit level, reversing key or a commutator, plug key, sand paper, connecting wires.

THEORY

If a current 'I' units be flowing through 'l' length wire bent into an arc of 'r' radius, the magnetic field intensity (F) at the centre of arc is given by

$$F = \frac{\mu_0}{4\pi} \frac{Il}{r^2}$$ where $\mu_0 = 4\pi \times 10^{-7}$ W/Am i.e. permeability of free space.

If the wire forms one complete circle

$$l = 2\pi r$$

$$F = \frac{\mu_0}{4\pi} \frac{I(2\pi r)}{r^2} = \frac{\mu_0 I}{2r}$$

For a circular coil carrying n turns

$$F = \frac{n \mu_0 I}{2r} = \cancel{2\mu_0} \frac{2\pi n I}{r \times 10^7}$$

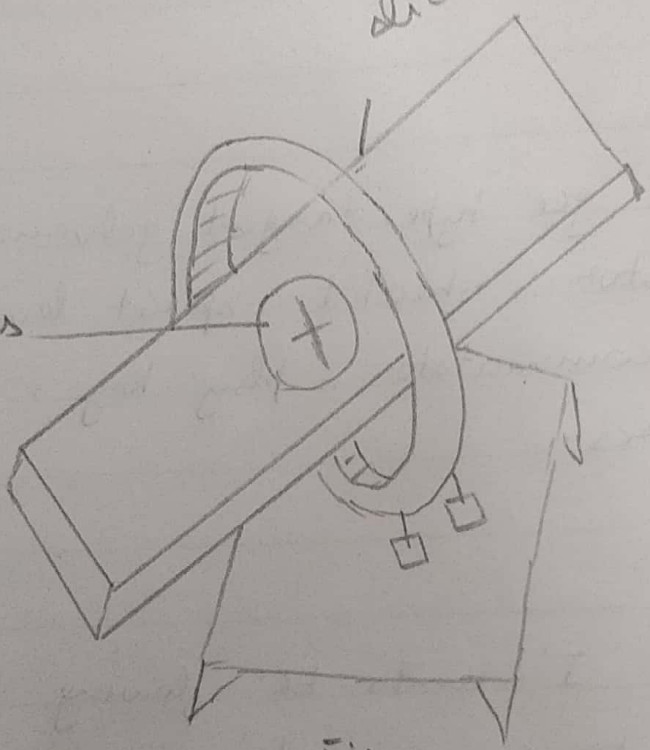

Fig
stewart and gee tangent galvanometer

Signature

Hence, $F \propto n$

$\propto I$

In order to study the effect of n and I on the magnetic field intensity F, the coil is placed in the magnetic meridian, the magnetic field due to current 'I' flowing in the coil is ⊥ to the H (horizontal component of earth's magnetic field) and magnetic needle is acted upon by two uniform magnetic fields F and H which are ⊥ to each other.

The field F along the axis of a coil is given by

$$F = \frac{2\pi n r^2 I}{10^7 (x^2+r^2)^{3/2}}$$

where x is the distance of the point from the centre of the coil.

when $x = 0$ i.e. at the centre

$$F = \frac{2\pi n r^2 I}{10^7 \, r^3} = \frac{2\pi n I}{10^7 \times r}$$

Let the magnetic needle makes an angle θ with H in the equilibrium position. Acc. to tangent law

$$F = H \tan\theta$$

$$\frac{2\pi r^2 I}{10^7 (x^2+r^2)^{3/2}} = H \tan\theta$$

Since H is const. at the place of experiment

$$\tan\theta = \frac{2\pi r^2 n I}{H (x^2+r^2)^{3/2}} \quad 10^{-7}$$

erial No. 61 Dated

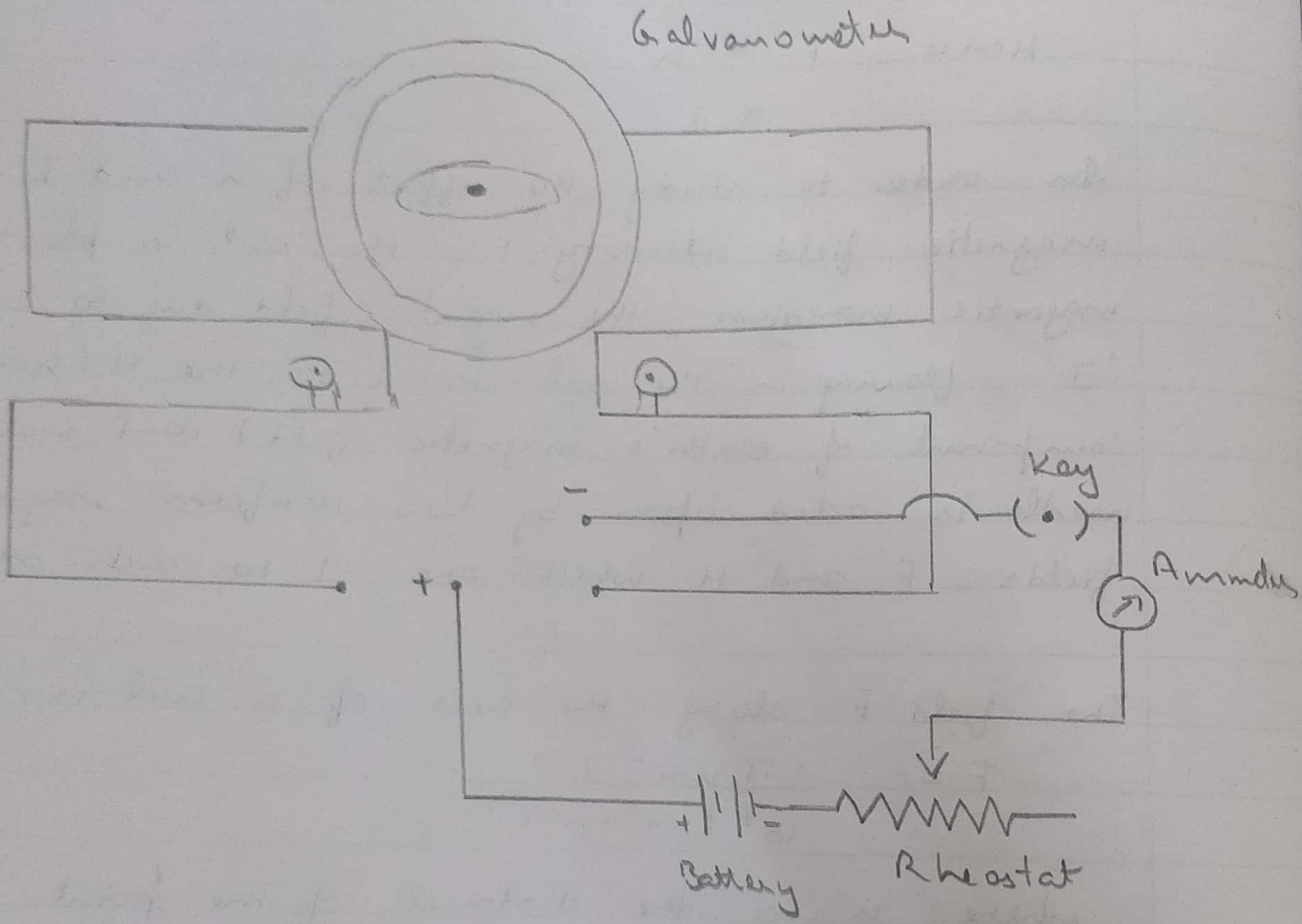

Fig.

PROCEDURE

1. Draw a circuit diagram showing the scheme of connections.
2. Keep the compass box on the sliding bench so that its magnetic needle is ~~not~~ at the centre of the coil. Level the base of the coil with the help of a spirit level and levelling screws.
3. By placing the eye a little above the coil, rotate the instrument in the horizontal plane in such a way that the coil, the magnetic needle and its image in the ~~above~~ plane mirror, placed show the needle in the compass box, all lie in the same vertical plane. This adjustment puts the coil roughly in magnetic meridian.
4. Using the commutator, flow the current in one direction and note down the deflection of needle. Now reverse the direction of current and again note down deflections. If both the deflections are equal that means coil is in magnetic meridian, if not then move apparatus and adjust pointer ends.
5. With the help of rheostat, adjust the current in the coil to that the deflection in the magnetic needle is of the order 60° - 70°. Note down the reading of both sides of pointer. Reverse the direction of the current and again read both ends of pointer.

Serial No. 63 Dated ....

OBSERVATION TABLE

Distance from compass (cm)	Deflection on east axis: Direct current θ_1	Direct current θ_2	Reverse current θ_1	Reverse current θ_2	Mean	Tan θ	Deflection on west axis: Direct current θ_1	Direct current θ_2	Reverse current θ_1	Reverse current θ_2	Mean	Tan θ
0	67	67	66	66	66.5	2.2	66	66	64	64	65	2.21
1.5	65	65	64	64	64.5	2.1	65	65	63	63	64	2.05
3	63	63	61	61	62	1.88	62	62	61	61	61.5	1.84
4.5	60	60	60	60	60	1.73	60	60	59	59	59.5	1.7
6	55	55	55	55	55	1.43	56	56	56	56	56	1.48
7.5	50	50	49	49	49.5	1.17	50	50	49	49	49.5	1.17
9	43	43	41	41	42	0.9	41	41	42	42	41.5	0.88
10.5	36	36	35	35	35.5	0.71	35	35	35	35	35	0.7
12	30	30	31	31	30.5	0.59	33	33	32	32	32.5	0.64
13.5	25	25	24	24	24.5	0.46	28	28	26	26	27	0.51

Diameter = 17 cm
Radius = 8.5 cm

RESULT

The graph shows variation of magnetic field along the axis of a circular coil carrying current

Radius of coil = 8.5 cm

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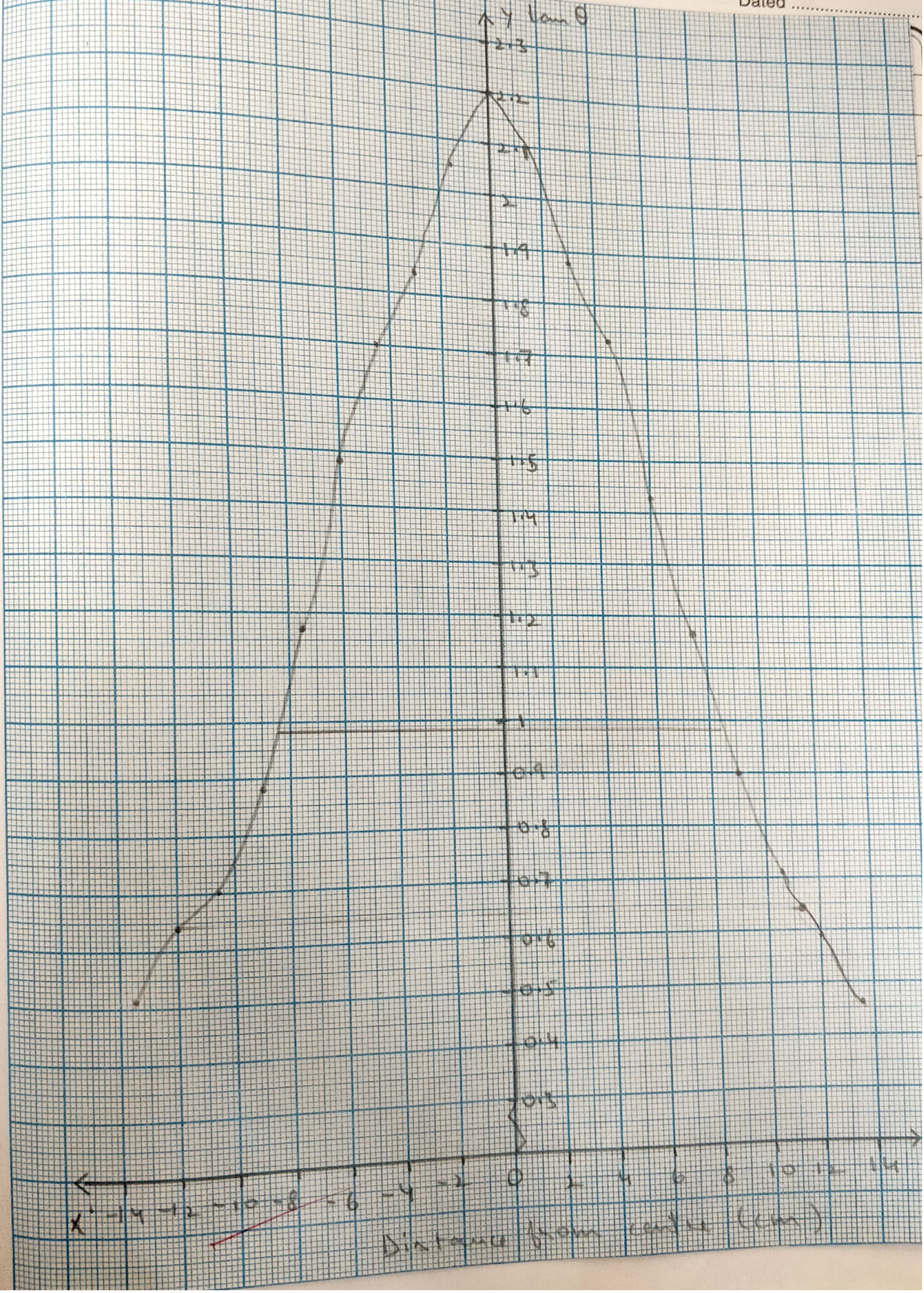

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Dated

6. Now, move the compass needle through 1.5 cm. Note down the deflection. Again move through 2.5 cm and continue to take reading till the compass box reaches the end of the bench.
7. Repeat the procedure for other side of the bench.
8. Now calculate θ according to the observation table and determine tan θ.
9. Plot a graph taking x along X-axis and tan θ along Y-axis
10. Mark the points inflexion on the curve. The distance between the two points will be the diameter of the coil.

RESULT

The graph shows the variation of magnetic field along the axis of a circular coil carrying current. Radius of coil = 8.5 cm

PRECAUTIONS

1. Clean the ends of the connecting wires with sand paper. Connections should be clean & tight.
2. Always use a key in the battery circuit and remove the plug key while making connections as well as after each reading is taken.
3. The coil should be adjusted properly in the magnetic meridian.

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4. The apparatus must be at considerable distance from current carrying conductors and magnetic materials.
5. The positive marked terminal of the ammeter should always be connected to the positive of the battery.
6. While reading the deflection, avoid error due to parallax.
7. Readings of both ends of pointer should be taken.

Tulsi
12/11/2018

Dated ....

Serial No. 67

EXPERIMENT NO. 10

AIM

To determine the wavelength of laser light by using transmission grating.

APPARATUS

He - Ne laser, transmission grating, measuring scale, screen

DIAGRAM

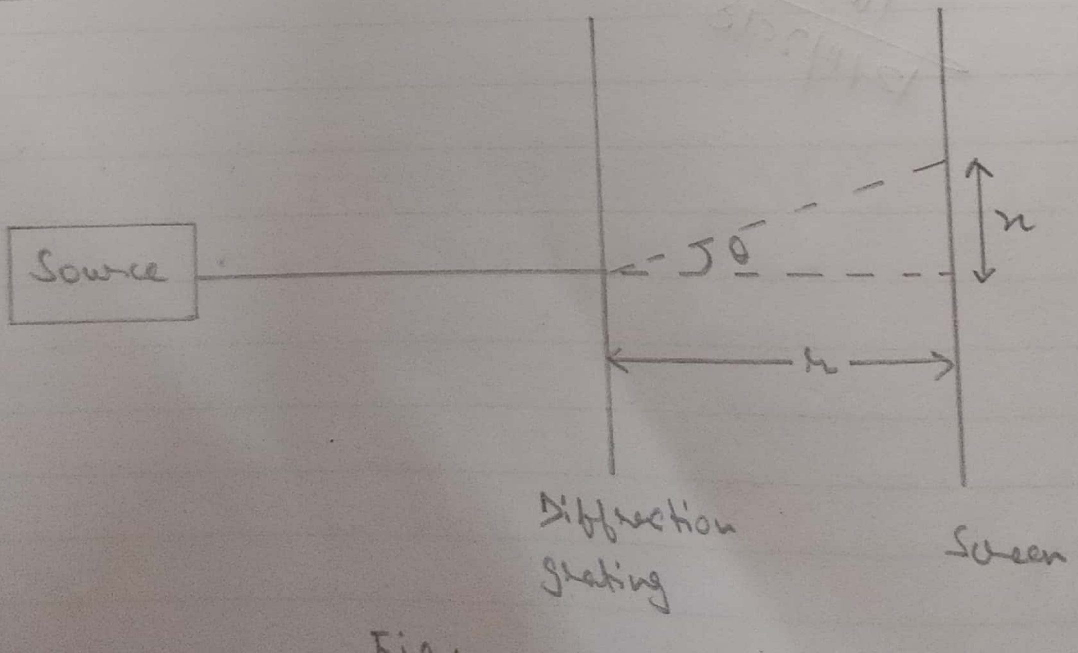


Fig.

Signature

Serial No. 68

Dated 29-10-18

EXPERIMENT 10

AIM

To determine the wavelength of laser light by using transmission grating.

APPARATUS

a He Ne laser, transmission grating, measuring scale, screen

THEORY

Laser light when passed through transmission grating produces spectrum of light due to diffraction and mathematically,

$$d \sin \theta = n \lambda$$

where d is reciprocal of no. of lines per cm,
θ is the angle between the central maxima and first maxima,
λ is the wavelength of laser light used and
n is integral multiple.

$$\% \text{ error} = \left| \frac{\lambda_{experimental} - \lambda_{actual}}{\lambda_{actual}} \right| \times 100$$

Actual Wavelength of He-Ne laser = 6328 Å

Serial No. 69

Dated

OBSERVATION TABLE

S. No.	d (lines/cm)	Dist. b/w central and 1st maxima x (cm) X_1	X_2	Mean X	Dist. b/w screen & grating, h (cm)	$\theta = \frac{x}{h} \times \frac{180}{\pi}$	Sin θ	$\lambda = d \sin\theta$
1.	1/800	0.8	0.8	0.8	15.5	2.96	0.052	6500 Å
2.	1/3200	3.3	3.2	3.25	15.5	12.01	0.21	6562 Å
3.	1/6000	6.9	7	6.95	15.5	25.69	0.43	7167 Å

Mean λ = 6743 Å

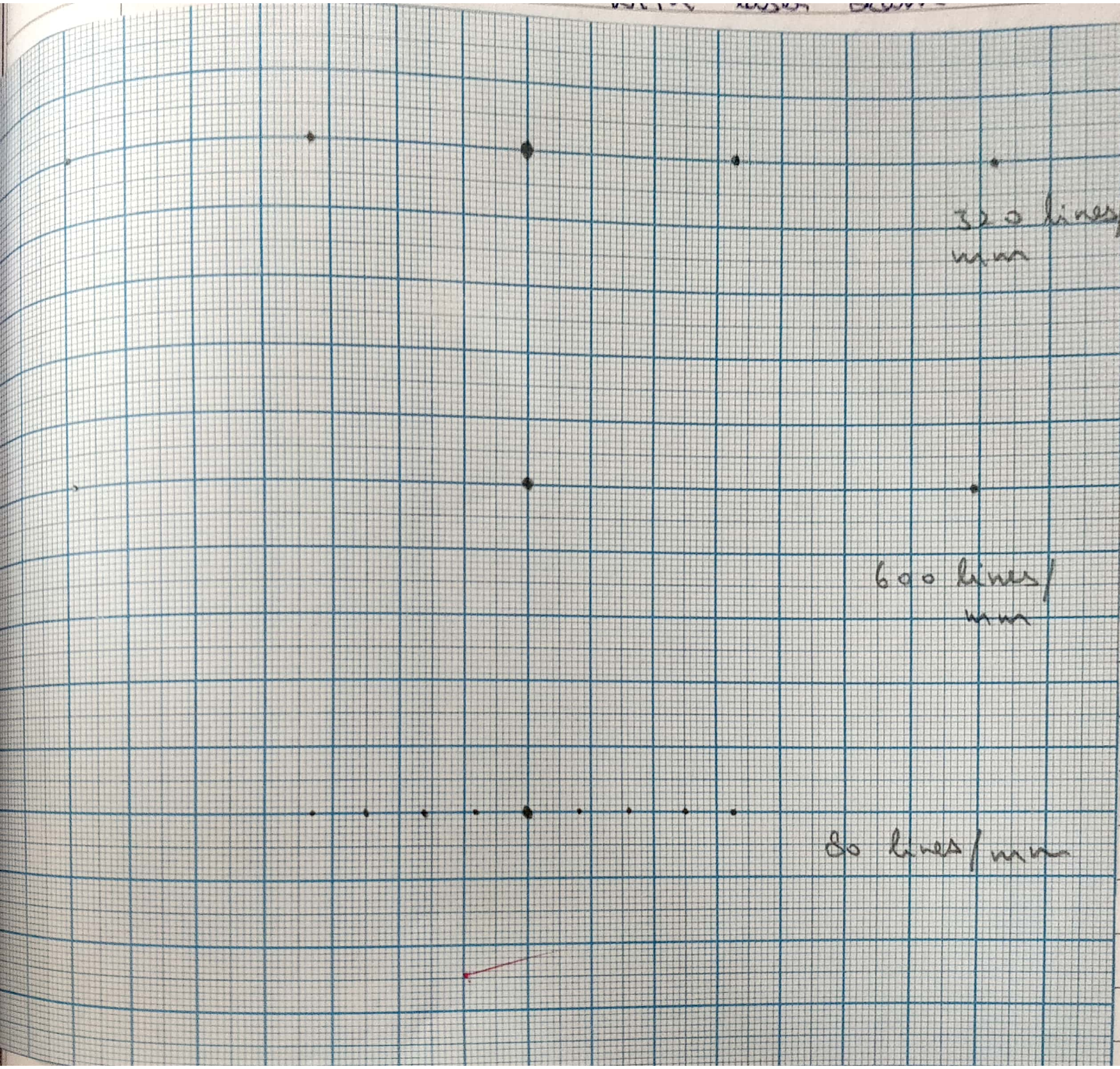
CALCULATIONS

$$\% \text{ error} = \frac{|\text{Experimental value} - \text{Actual value}|}{\text{Actual value}} \times 100$$

$$= \frac{6743 - 6328}{6328} \times 100$$

$$= 6.56 \%$$

Signature


320 lines/mm
600 lines/mm
80 lines/mm

PROCEDURE

1. Mount the grafting on stand.
2. Illuminate it well with laser beam.
3. The beam, on passing through the grating produces several spots due to diffraction. The brightest spot is the central maxima. On both sides of it, are bright spots of diminishing intensity which shows different order of diffraction.
4. Measure the separation between central maxima and first spot (say X_1 on one side, X_2 on other & X be their mean)
5. Also, measure the separation of screen from grafting (say r cm)

Then $\theta = x/r$ radians

$$\theta = \frac{x}{r} \times \frac{180}{\pi} \text{ degrees}$$

6. Now, we use

$$\lambda = d \sin \theta$$

where d is the reciprocal of no. of lines per cm.

Dated

Serial No. 71

RESULT

Hence we have calculated the wavelength, λ i.e. 6743 Å and % error is 6.56 %.

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RESULT

Hence we have calculated the wavelength, λ i.e. 6743Å and % error is 6.56 %.

PRECAUTIONS

1. Never stare the laser beam directly.
2. Avoid parallax errors on taking measurements.

Tulsi
12/11/2018

1. n	Microscope reading						D_n (a-b) (mm)	D_n^2 (mm^2)	$D_{n+p}^2 - D_n^2$ p = 8
	L.H.S.			R.H.S.					
	M.S.	V.S.	a	M.S.	V.S.	b			
20	58	0.46	58.46	53	0.12	53.12	5.34	28.51	
18	58	0.11	58.11	53	0.34	53.34	4.77	22.75	
16	57	0.98	57.98	53	0.57	53.57	4.41	19.44	
14	57	0.77	57.77	53	0.75	53.75	4.02	16.16	
12	57	0.58	57.58	54	0.00	54.00	3.58	12.81	16.30
10	57	0.39	57.39	54	0.15	54.15	3.24	10.49	12.26
8	57	0.14	57.14	54	0.30	54.30	2.84	8.06	11.38
6	57	0.04	57.04	54	0.42	54.42	2.62	6.86	9.30

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

$$\lambda = \frac{16.3 \times 10^{-6}}{4 \times 8 \times 650 \times 10^{-3}}$$

$$\lambda = 7.8 \times 10^{-7}\ m$$

24/04/19

Signature

24/04/19

Serial No. .... Dated ....

2.

Filter	λ (m)	Stopping potential
Yellow	5780×10^{-10}	0.34
Green	5460×10^{-10}	0.44

$$h = \frac{1.6 \times 10^{-19} (0.44 - 0.34)\ 5780 \times 5460 \times 10^{-10}}{3 \times 10^{8} \times 0320}$$

$$h = 5.26 \times 10^{-34} \text{ Js}$$

% = ?

% error = 20.54%

Serial No. .... Dated ....

3.

	Micrometer Reading (mm)	Difference b/w consecutive maxima & minima ($\lambda/2$)
1.	0.05	
2.	0.40	0.35
3.	0.77	0.37
4.	1.22	0.55
5	1.80	0.58
6.	1.90	0.10
7.	2.29	0.39
8.	2.66	0.37
9.	3.03	0.37
10.	3.42	0.39
11.	3.82	0.40
12.	4.16	0.34
13	4.55	0.39
14.	4.95	0.40
15.	5.31	0.36
16	5.68	0.37
17	6.05	0.37
18.	6.43	0.38
19	6.86	0.43
20.	7.19	0.33
21.	7.57	0.38
22.	7.95	0.38
23.	8.35	0.40
24.	8.71	0.36
25	9.08	0.37
26.	9.46	0.38
27	9.85	0.39
28.	10.20	0.35
29.	10.58	0.38
30.	10.98	0.38

$\lambda/2 = 0.38$ mm

24/07/18

Serial No. ....

Dated ....

4.

Sr. No.	Ratio arms P in ohms	Q in ohms	Variable Resistance R (Ω)	Deflection of galvanometer	Unknown resistance S
1.	10	10	2	Left	S lies b/w 2-3 Ω
	10	10	3	Right	
2.	100	10	22	Left	S lies b/w 2.2 - 2.4 Ω
	100	10	23	No deflection	
	100	10	24	Right	
3.	1000	10	229	Left	S lies b/w 2.29 - 2.31 Ω
	1000	10	230	No deflection	
	1000	10	231	Right	

No deflection point = 230 Ω

$$S = \frac{10}{1000} \times 230 = 2.3\ \Omega$$

Length = 50 cm

Diameter (mm) of wire = 0.40, 0.41, 0.47, 0.43, 0.42, 0.39, 0.37, 0.43

Mean = 0.42 mm

$$\rho = 6.36 \times 10^{-7}\ \Omega\,m$$

24/09/18

Signature

Serial No. Exp. 5.

$d = 415$ cm

Dated ....

Length

S.No.	Scale Reading Initial	Final	Difference θ	$\tan\theta$	$l = d\tan\theta$
	$2°14'12''$	$4°34'36''$			l
	$2.23°$	$4.57°$	$2.34°$	0.041	$= 17.02$ cm

Breadth

Scale Reading Initial	Final	Difference θ	$\tan\theta$	$l = d\tan\theta$
$4°56'48''$	$2°21'48''$			$b =$
4.95	2.36	2.59	0.045	18.78 cm

24/09/2018

$L = 17.02$ cm

$B = 18.78$ cm

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Serial No. Exp 6

Dated

Resistance R	Deflection θ	Shunt Resistance S	Half Deflection θ_2	$G = \frac{RS}{R-S}$
2000	24	20	12	20.20
1800	27	22	13.5	22.27
1900	26	21	13	21.23

$G = 21.23\Omega$

Table 2

No. of cells	Emf E (V)	Resistance R	Deflection θ	Figure of merit $k = \frac{E}{\theta(R+G)}$
2	2	1500	25	
2	2	1800	21	
2	2	2000	20	
1	0.6	500	23	
1	0.6	400	27	
1	0.6	600	18	

Signature

Serial No. Exp-6

Dated ....

Resistance R	Deflection θ	Shunt Resistance S	Half Deflection $\theta/2$	$G = \frac{RS}{R-S}$
2000	24	20	12	20.2
1900	26	21	13 ~~8~~	21.23
1800	27	22	13.5	22.27

$G = 21.23\ \Omega$

No. of cells	Emf E	Resistance R	Deflection θ	Figure of merit $k = \frac{E}{\theta(R+G)}$
2	2	1500	25	5.26×10^{-5}
2	2	1800	21	5.22×10^{-5}
2	2	2000	20	4.94×10^{-5}
1	0.6	500	23	5.00×10^{-5}
1	0.6	400	27	5.28×10^{-5}
1	0.6	600	18	5.36×10^{-5}

$k = 5.18 \times 10^{-5}$

	Voltmeter Reading (V)	Galvanometer Reading: Deflection (Div)	Galvanometer Reading: Pot. Difference (V)	Difference of voltmeter reading & Galvanometer reading
	0.5	4	0.4	0.1
	1	8	0.8	0.2
	1.5	13	1.3	0.2
16.08.75	2	17	1.7	0.3

~~$I_g = 30 \times 5.18 \times 10^{-5}$~~

$R = 1587.52$

$V = 3$

$I_g = 30 \times 5.18 \times 10^{-5}$

$R = 2 - 5$

$R = 1587.52\ \Omega$

01/10/18

Serial No. Exp. 7 Dated ....

No.	Position	Distance (cm)	Deflection 1	2	3	4	5	6	7	8	Mean	$\frac{\tan\theta_1}{\tan\theta_2}$
1.	End on	18.5	55	55	53	53	53	53	52	52	53.25	~~1.653~~
4	Broad side on		~~40~~	~~40~~	~~42~~	~~42~~	~~38~~	~~38~~	~~36~~	~~36~~	~~39~~	
			35	35	33	33	32	32	33	33	33.25	2.04
2.	End on	19	52	52	52	52	53	53	54	54	52.75	~~1.5805~~
	Broad side on		~~40~~	~~40~~	~~38~~	~~38~~						
			~~44~~	~~44~~	~~40~~	~~40~~	~~36~~	~~36~~	~~39~~	~~39~~	~~38.25~~	
			30	30	29	29	31	31	33	33	30.75	2.21
3.	End on	18	56	56	56	56	57	57	54	54	55.75	
	Broad side on	18					34	34	36	36		
			39	~~35~~ 39	38	38	~~56~~	~~56~~	~~45~~	~~45~~	36.75	1.96

No.	Position	Distance (cm)	Deflection 1	2	3	4	5	6	7	8	Mean	$\frac{\tan\theta_1}{\tan\theta_2}$
1.	End on	18	56	56	56	56	57	57	54	54	55.75	
	Broad side on		39	39	38	38	34	34	36	36	36.75	1.96
2.	End on	18.5	55	55	53	53	53	53	52	52	53.25	
	Broad side on		35	35	33	33	32	32	33	33	33.25	2.04
3.	End on	19	52	52	52	52	53	53	54	54	52.75	
	Broad side on		30	30	29	29	31	31	33	33	30.75	2.21

24/10/2018

Signature

Serial No. Exp. 8

Dated ....

For angle A   Least count 30''

6.

	Telescope L.H.S.			Telescope R.H.S.				Mean
	M.S.	V.S.	Total a	M.S.	V.S.	Total b	a-b	2A
1. V_1	140	55	140.46	253	0	253	112.54	56
V_2	220	30	220.25	97	2	97.02	123.23	117.89

$A = 58.94°$

For minimum deviation δm

	Telescope receiving direct rays			Telescope in min deviation			c-d	Mean δm
	M.S.	V.S.	Total c	M.S.	V.S.	Total d		
V_1	151.5	57	151.98	108	33	108.28	43.7	42.55
V_2	330.5	37	330.81	289	49	289.41	41.4	

27/10/2018

$\delta_m = 42.55°$

Distance from centre	Left side magnetometer				Right side magnetometer			
	Direct		Reversed		Direct		Reversed	
	one end 1	2	3	4	1	2	3	4
0	67	67			66	66	64	64
1.5	65	65			65	65		
3	63	63	61	61				
4.5	60	60						
6	55	55			56	56	56	56
7.5	50	50					49	49
9	43	43	41	41				
10.5	36	36					35	35
12	30	30			33	33		
Exp. 9 13.5	25	25	24	24	28	28	26	26

Distance	L. Side Magnetometer				R. Side Magnetometer			
	Direct		Reversed		Direct		Reversed	
	one end 1	2	3	4	1	2	3	4
0	67	67	66	66	66	66	64	64
1.5	65	65	64	64	65	65	63	63
3	63	63	61	61	62	62	61	61
4.5	60	60	60	60	60	60	59	59
6	55	55	55	55	56	56	56	56
7.5	50	50	49	49	50	50	49	49
9	43	43	41	41	41	41	42	42
10.5	36	36	35	35	35	35	35	35
12	30	30	31	31	33	33	32	32
13.5	25	25	24	24	28	28	26	26

29/10/15

Signature

Exp. 10

Dated

d	Dist. x dist. b/w central & 1st max.			a dist. b/w ~~screen~~ & grating	$\theta = \frac{x}{a} \times \frac{180}{\pi}$	$\sin\theta$	$\lambda = d \sin\theta$
	x_1 (cm)	x_2 (cm)	x_{mean}				
1/800	0.8	0.8	0.8	15.5	2.96	0.052	6500 Å
1/3200	3.3	3.2	3.25	15.5	12.01	0.21	6562 Å
1/6000	6.9	7	6.95	15.5	25.69	0.43	7167 Å

~~Mean = 6743 Å~~

Mean = 6743 Å

Actual = 6328 Å

$\% \text{ error} = \frac{6743 - 6328}{6328} \times 100$

$= 6.56\%$

12/11/18

5