KARPAGAM ACADEMY OF HIGHER EDUCATION

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(Established Under Section 3 of UGC Act 1956)
COIMBATORE-21
(For the candidates admitted from 2016 onwards)

DEPARTMENT OF PHYSICS

SUBJECT: GENERAL PHYSICS PRACTICALS-I
SEMESTER: I
SUB.CODE:18PHP111 **CLASS: I M.Sc PHYSICS**

ANY TEN EXPERIMENTS

1. Young's Modulus – Elliptical Fringes (Cornu's method).
2. Viscosity of liquid – Mayer's oscillating disc method.
3. Michelson Interferometer – Determination of λ and $d\lambda$.
4. 'e/m' by Thomson's method and Magnetron method.
5. Young's Modulus – Hyperbolic Fringes (Cornu's method).
6. Fresnel's biprism - Determination of Wavelength of monochromatic source.
7. Determination of Plank's constant using Photo cell.
8. Forbe's method – Thermal conductivity.
9. 'e' by Millikan's method.
10. Ferguson's method - Specific heat of a liquid.
11. Faraday effect – Determination of Verdet constant using He-Ne laser.
12. Young's Double slit – Determination of Wavelength of monochromatic source.

SUGGESTED READINGS

1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
2. Singh S.P., 2003, Advanced Practical Physics – 1, 13th Edition, Pragathi Prakashan, Meerut
3. Singh S.P., 2000, Advanced Practical Physics – 2, 12th Edition, Pragathi Prakashan, Meerut
4. Gupta S.L. and V.Kumar, 2002, Practical Physics, 25th Edition, Pragathi Prakashan, Meerut
5. B.L Worsnop & H T Flint,1951,Advanced Practical Physics For Students, 9th revised Edition , Littlehampton Book Services Ltd

List of Experiments

1. Viscosity of liquid – Mayer's oscillating disc method.
2. Michelson Interferometer – Determination of λ and $d\lambda$.
3. 'e/m' by Thomson's method
4. 'e/m' Magnetron method.
5. Young's Modulus – Hyperbolic Fringes (Cornu's method).
6. Fresnel's biprism - Determination of Wavelength of monochromatic source.
7. Determination of Plank's constant using Photo cell.
8. Forbe's method – Thermal conductivity.
9. Faraday effect – Determination of Verdet constant using He-Ne laser.
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Exp. No.

Date:

VISCOSITY OF A LIQUID- MAYER'S OSCILLATING DISC METHOD

Aim

To determine the viscosity of a liquid by Mayer's oscillating disc method

Apparatus required

Metallic circular disc, stand, telescope and scale, mirror, stop clock, weight hanger, liquid (water) and string.

Formula used

$$\text{Viscosity of the liquid, } \eta = \frac{16I^2}{\pi\rho T_0 (r^4+2r^3 d)^2}\left[\frac{\lambda_w-\lambda_a}{\pi}+\frac{(\lambda_w-\lambda_a)^2}{\pi}\right]^2 \text{ Ns/m}^2$$

$$\text{Moment of Inertia, } I = 2M(d_2^2 - d_1^2)\frac{T_1^2}{T_2^2-T_1^2} \text{ kg/m}^2$$

where, M-mass placed on either side of the disc (kg)

r- radius of the disc (m)

d- thickness of the disc (m)

ρ- density of the liquid (kg/m^3)

T_0, T_1 and T_2 – period of oscillation of the disc without and with mass at distance d1 and d2 (s)

λa – logarithmic decrement of air

λw – logarithmic decrement of water

d_1 & d_2 – distance between the center of the disc and the center of the mass placed on either side (m)

Experimental Procedure

A metallic circular disc suspends horizontally with the help of tension free wire in a stand shown in Fig.1. A disc is oscillated and time taken for 10 oscillations has been noted. Place two slotted weights on both sides of the string in a disc and note the time taken for 10 oscillations. Let the distance of the weight from center is taken as d_1. Place the weights on the disc at a distance d_2 and repeat the procedure.

Now remove the weights from the disc, suspend it freely;

1. Fix a mirror on the string.

2. Place a telescope scale horizontally and view the scale in a mirror through the telescope (place it opposite).
3. Gradually oscillate the disc and note down the readings viewed in the mirror. Let it be θ' and θ" of λa.
4. Immerse the disc in water placed in a tub and repeat the procedure. Let it be θ' and θ" of λw.

Thickness of the disc can be obtained with the help of screw gauge.

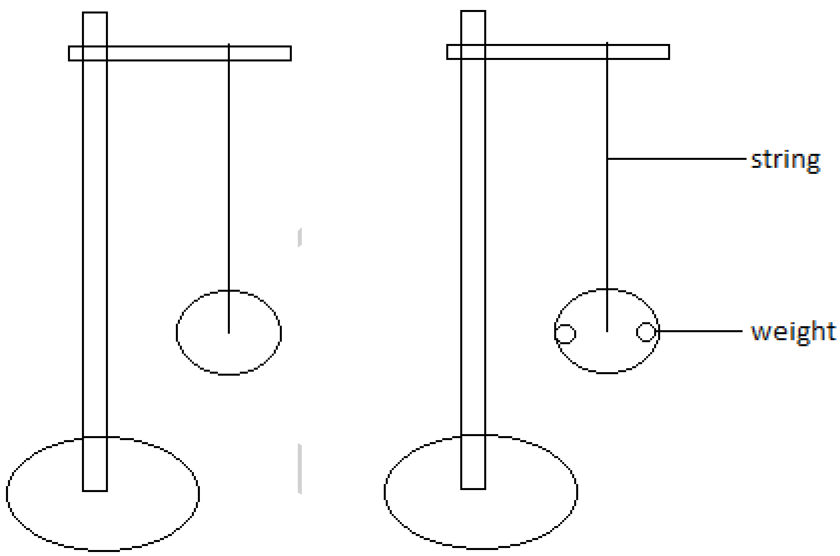


Fig. 1

Tabulation:

Thickness of the disc (d) LC = ………… cm

S.No.	PSR	HSR	HSC = HSR x LC	PSR±HSC	THICKESS d (cm)
1					
2					
3					
4					

POSITION OF MASS	Time for 10 oscillations (s)			Time for one oscillation (s)
	t_1	t_2	mean	
Without mass				
With mass at d_1				
With mass at d_2				

Logarithmic decrement of water

S.No.	θ'	θ"	$\lambda_a=(2.303/10)\log(\theta'/\theta'')$
1			
2			
3			
4			
5			

Logarithmic decreament of water

S.No.	θ'	θ"	$\lambda_a=(2.303/10)\log(\theta'/\theta'')$
1			
2			
3			
4			
5			

Calculations

Circumference, $2\pi r$ = ----------

r = --------- (cm)

$$\eta = \frac{16I^2}{\pi\rho T_0 (r^4+2r^3 d)^2}\left[\frac{\lambda_w - \lambda_a}{\pi} + \frac{(\lambda_w - \lambda_a)^2}{\pi}\right] \text{Ns/m}^2$$

Result

The viscosity of the given liquid using Mayer's disc method is, η = ------------- Ns/m^2.

Viva voce

1. What is coefficient of viscosity?
2. What is the principle of torsion pendulum?
3. Is this method applicable to any other liquid?

Exp. No.

Date:

MICHELSON INTERFEROMETER- WAVELENGTH OF A MONOCHROMATIC SOURCE

Aim

To determine the wavelength of the monochromatic source and to find the difference in wavelength of sodium vapor lamp using Michelson interferometer.

Apparatus Required

Sodium vapor lamp and Michelson interferometer.

Formula used

The wavelength of sodium light is given by $\lambda = 2d/N$ (Å)

The difference in wavelength of d_1 and d_2 lines is given by $\Delta\lambda = \frac{\lambda^2}{2(d_2 - d_1)}$

where, d_1 – initial position of mirror M_1 (cm)

d_2 - final position of mirror M_1 (cm)

N- number of fringes

d- distance between two indistinct positions of mirror (m)

Initial adjustment

(i) The movable mirror M_1 and M_2 has to be moved using drum head to adjust the distance of G_1M_1 and G_2M_2.

(ii) Aluminum sheet with single hole is placed between the monochromatic source and the glass plate. So that four images can be viewed at different position. By adjusting the screws behind the mirror M_1 and M_2, these can be reduced to two images in a same horizontal line.

(iii) Remove the aluminum sheet. Fringes appear in the field of view. To obtain a clear circular fringes gently tilt the mirror with the help of screws.

(iv) The fringes should not converge or diverge. If so, made a small tilt in the mirror M_2.

Experimental Procedure

(i) Let 'x' be the center of fringes. The position of the mirror M1 is adjusted by turning drum head and the readings on the scale is noted.

(ii) The micrometer readings have to be noted for each 30 fringes until x+180.

(iii) To obtain the difference in wavelength, note the readings on micrometer for consonance (d_2) and resonance (d1) of fringes simultaneously. Note three set of readings on each.

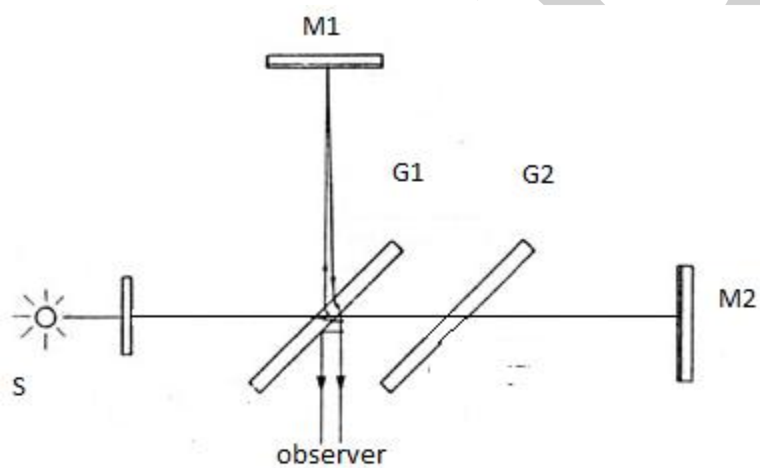


Fig. 1

Tabulation

L.C of rough micrometer screw = 0.001 cm

L.C of fine micrometer screw = 0.00001 cm

No. of fringes	Position of mirror (cm)				Difference (cm)	Mean difference (cm)
	Main scale reading	R.M.S reading	F.M.S reading	Total		
x						
x_1 =x+30						

$x_2 = x_1+30$						

Appearance of fringes (d_1)

Position of mirror (cm)			
Main scale reading	**R.M.S reading**	**F.M.S reading**	**Total (d_1)**

Disappearance of fringes (d_2)

Position of mirror (cm)			
Main scale reading	**R.M.S reading**	**F.M.S reading**	**Total (d_2)**

Calculation

$$\lambda = 2d/N \ (\text{Å})$$

The difference in wavelength of d_1 and d_2 lines is given by $\Delta\lambda = \frac{\lambda^2}{2(d_2 - d_1)}$ (Å)

Result

The wavelength of sodium vapor lamp = ---------Å

The difference in wavelength = ---------Å

Viva Voce

1. What is meant by interferometer?
2. Shall we do this method with mercury lamp?
3. What types of glass is used in this method?

Exp. No.

Date:

e/m (specific charge)–THOMSON METHOD

Aim

To determine the value of e/m of an electron by Thomson method.

Apparatus required

Dc power supply (0-50 V dc), CRT, wooden stand with scale, deflection magnetometer, bar magnets.

Formula used

$$\frac{e}{m} = \frac{Vy}{Lld\,(H^2)} \times 10^7 \text{ emu/gm}$$

Where, e- charge of an electron (1.6×10^{-19}C)

m- mass of an electron (9.1×10^{-31} kg)

L- distance of the screen from plate (in cm)

d- separation between plate (in cm)

l- length of deflection plate (in cm)

H- Magnetic field = $H_e \tan\theta$

H_e- 0.345

y- total deflection of spot on screen (cm)

V- potential difference applied to CRT

Procedure

Place the CRT in the north - south direction in wooden scale (east-west direction) as shown in Fig. 1. Connect CRT and e/m power supply. Switch ON power supply and slowly adjust intensity, focus and X-shift knob to bring the spot in CRT screen. Note down the initial value of the spot and gradually increase the deflection voltage so that the luminous spot is deflected by 0.6 to 1.0 cm. Note down the deflection voltage V and position of the spot. Let the difference be y. On either side of the CRT place the bar magnet on a wooden stand and slowly adjust the polarity and the position of the bar magnet to bring the spot to initial value. Let the distance of the magnet be noted as r_1 and r_2. Remove the bar magnet, switch OFF the power supply and reverse the polarity of the potential difference applied to the magnetic plate with the help of reversing switch. Again, note the initial and final value of the spot and obtain the difference (y). Place the bar magnet on the wooden board and note the distance (r_1') and (r_2').

To obtain the value of magnetic field H, remove the bar magnet and CRT from the wooden scale and place the compass box, such that its center lies exactly at the point whereby the common axis of the bar magnets and axis of CRT intersect. Place the bar magnets at the same distance (r_1 and r_2) and note the readings on the compass box as θ_1 and θ_2 and similarly reverse the magnet and keep at the distance of r1' and r2', then note the angle on compass box as θ_3 and θ_4. The average of the entire angle gives you θ, with these values H and e/m can be calculated.

Fig. 1

Tabulation

S.No.	Applied voltage (V)	Forward direction					Reverse direction				
		Position of spot			Magnet distance(x 10^{-2} m)		Position of spot			Magnet distance(x 10^{-2} m)	
		Intial	Final	y (cm)	r_1	r_2	intial	Final	y (cm)	r_1'	r_2'
1											
2											
3											

Determination of H

Applied voltage (V)	Readings on compass box at distance r_1 and r_2		Readings on compass box at distance r_1' and r_2'		Mean	H=He tan θ
	θ_1	θ_2	θ_3	θ_4		

Calculations

$$\frac{e}{m} = \frac{Vy}{Lld\,(H^2)} \times 10^7 \text{emu/gm}$$

where Lld=6.5 cm

Result

The observed value of e/m = -------------- x 10^7emu/gm

Standard value = 1.76 x 10^7emu/gm

% of error = ----------

Viva voce

1. What is called cathode ray?
2. How to obtain the radius of the circular trace of the electron beam?
3. Give a note on CRT tube?

Exp. No.

Date:

e/m (specific charge)– MAGNETRON METHOD

Aim

To determine the charge to mass ratio by Magnetron method.

Apparatus Required

Magnetron valve, power supply, solenoid, ammeter, voltmeter, rheostat.

Formula used

$$\frac{e}{m} = \frac{8V}{B_c^2 R_a^2} C/kg$$

Where, Va – anode potential (V)

Bc – critical value of the magnetic field produced by current

r_a- radius of the valve (m)

$$Bc = \frac{4\pi NIc}{10} \quad \text{oersted}$$

Where, N- number of turns on solenoid

Ic – critical value of current in solenoid (mA)

Experimental Procedure

(i) Place the valve at the center of the solenoid and connect it to the power supply.

(ii) Made the plate voltage as constant and increase the solenoid current from 0 A. Some deflection is observed on plate current (mA).

(iii) Plot a graph between solenoid current and plate current. Sudden fall will appear and noted as critical current (Ic).

(iv) Repeat the process for different plate voltage.

Tabulation

Solenoid current (A)	Plate voltage (V)	Plate current (mA)	Critical current (A)	e/m (C/kg)
	0.2			
	0.4			
	0.6			

Observations

Radius of the valve …….. cm

No. of turns per cm on solenoid ------------

Calculations

Ic = ………

$$Bc = \frac{4\pi N Ic}{10} \quad \text{oersted}$$

Bc = ------------

$$\frac{e}{m} = \frac{8V}{B_c^2 R_a^2} \, C/kg$$

Result

The value of e/m = ………..C/kg

Standard value = 1.76 x 10^{11} C/kg

Percentage of error = ………

Viva Voce

1. Define magnetic field.
2. What is called critical magnetic field?
3. What is meant by solenoid?
4. What is called magnetron valve?

Exp. No.

Date:

YOUNG'S MODULUS- CORNU'S METHOD

Aim

To determine the elastic constant of the glass by Cornu's method.

Apparatus Required

Sodium vapor lamp, weight hanger, travelling microscope, glass beam, small glass plate in a stand and inclined at 45^o, screw gauge, vernier caliper.

Formula Used

The Young's modulus of the glass is given by $Y=\frac{(W-W')d}{bt^3\left(\frac{1}{R_l}-\frac{1}{R_l'}\right)}$ N/m^2

where, W & W'-different weights on glass beam (gm)

d- distance of the hanger from knife edge (m)

t-thickness of the beam (m)

R_l – longitudinal radius of curvature of the beam due to weight W (m)

R_l' – longitudinal radius of curvature of the beam due to weight W' (m)

$$R_l = \frac{(X_n^2-X_1^2)}{4\eta(n-1)}$$

X_1^2- distance between first pair of fringes in longitudinal direction (m)

Xn^2- distance between n^{th} pair of fringes in longitudinal direction (m)

$$\text{Similarly, } R_l' = \frac{(X_n'^2-X_1'^2)}{4\eta(n-1)}$$

Theory

A uniform glass beam is placed over two knife edges. Two weight hangers are added to a glass beam on both sides of the knife edges at a distance. A glass plate is placed at the center of the beam. Light from the sodium vapor lamp is slowed to fall over the glass plate P through a glass plate inclined at an angle 45^o. The hyperbolic fringes observe through the travelling microscope.

Experimental Procedure

(i) The distance between 1^{st} and n^{th} pair of fringes is noted using microscope which is taken as $X_1$and Xn.

(ii) By increasing or decreasing weight different set (X and Xn) of readings are noted.

(iii) The breadth and thickness of the glass beam is measured using vernier caliper and screw gauge.

(iv) The distance between knife edge and weight hanger is taken as d.

Tabulation

Weight (kg)	No. of fringes	Distance (cm)			Distance (X^2) cm^2
		Left	Right	Difference (X)	
W	1				
	n				
W+100	1				
	n				
W+200	1				
	n				

Breadth of the beam (vernier caliper)

L.C. = ------------ cm

S.No.	MSR cm	VSR cm	Total Reading cm	Mean (b) cm
1				
2				

3				
4				
5				

Thickness of the beam (screw gauge)

L.C. = ------------ cm

S.No.	PSR cm	HSR cm	Total Reading cm	Mean (t) cm
1				
2				
3				
4				
5				

Calculations

$$R_l = \frac{(X_n^2 - X_1^2)}{4\eta(n-1)}$$

$$R_l' = \frac{(X_n'^2 - X_1'^2)}{4\eta(n-1)}$$

$$Y = \frac{(W - W')d}{bt^3\left(\frac{1}{R_l} - \frac{1}{R_l'}\right)}$$

Calculate for different weights.

Result

Young's modulus of glass = ------------- x 10^{11} N/m^2

Note:

To obtain elliptical fringes, convex lens has to be used instead of glass plate

Exp. No.

Date:

FRESNEL'S BIPRISM - WAVELENGTH OF A MONOCHROMATIC SOURCE

Aim

To determine the wavelength of a monochromatic source using Fresnel's biprism.

Apparatus

Optical bench, Biprism, slit, Micrometer eyepiece, Monochromatic source of light (sodium lamp), Convex lens

Formula

Wavelength λ of the sodium light, $\lambda = \beta(2d)/D$ (Å).

$$2d = \sqrt{(d_1 d_2)} \text{ m}$$

where ,β = fringe width (m)

d = distance between the two virtual sources (m)

D = distance between the slit and screen or eyepiece where the fringes are observed and measured (m)

d_1- distance between two images found by convex lens in first position (m)

d_2- distance between two images found by convex lens in second position (m)

Experimental Procedure

(i) The optical bench is leveled by a sprit level and the leveling screws.

(ii) Light source and slit are arranged in order to get the maximum light incident on the slit.

(iii) The center of slit, biprism and eyepiece is arranged at the same height.

(iv) The slit and biprism edge are made vertical and in a line parallel to the bench.

(v) Observe the interference fringes with eye piece. For clear fringe pattern adjust the edge of biprism by rotating screw.

(vi) If the line joining the slit and the central edge of the biprism is not parallel to the length of the bench, fringes would shift laterally as the eyepiece is moved. To remove this, the biprism moves a small distance transversely to the bench in a direction opposite to the direction of the shift till this lateral shift vanishes (Figure).

(vii) Now measure the position of fringes by putting the cross wire in mid position of each bright fringe.

(viii) For measurement of d, a lens of short focal length is inserted between the slit and the eyepiece.

(ix) The eyepiece is moved away from the slit so that the distance between the slit and the eyepiece is greater than four times the focal length of the convex lens used for the measurement of 'd'.

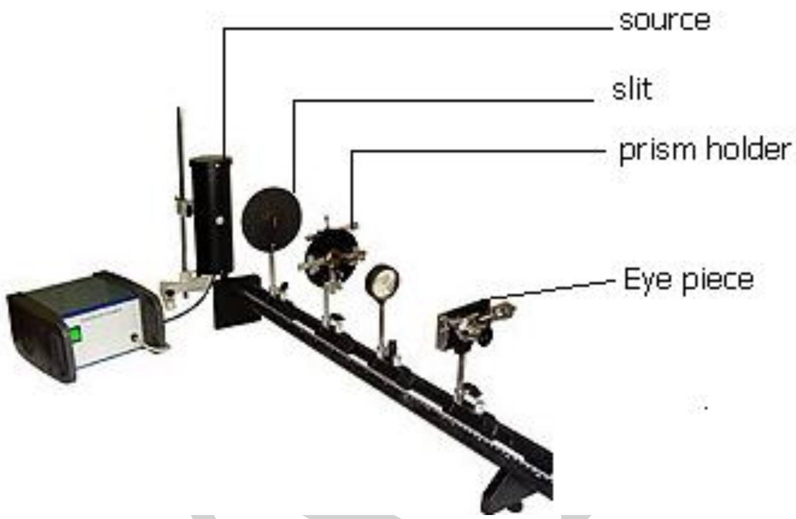


Fig. 1

Measurement of β

The cross-wire is set at the center of the first bright fringe and the reading of the micrometer screw is taken. The screw is then moved in one direction so that the wire falls in succession at the centers of the bright fringes and the corresponding readings are taken. From these readings, the width of a number of fringes is calculated after taking the mean, fringe width β for one fringe is calculated.

Measurement of d

Without changing the position of the slit, biprism and the eyepiece; a convex lens is mounted on the optical bench between the latter two. The distances d_1 and d_2 between the well-defined images of the two virtual slits S_1 and S_2 is measured with the micrometer screw for the two positions. Then the distance between S_1 and S_2 is given by

$$2d = \sqrt{(d_1 d_2)}$$

Tabulation

No. of fringes	Microscope reading (cm)			Difference(cm)	Mean Difference (cm)	β (cm)
	MSR	VSR	TR			
n						
n+3						
n+6						
n+9						
n+12						

To measure 2d

Microscope reading x 10^{-3}m						$2d=\sqrt{(d_1 d_2)}$ x 10^{-3}m
I positon			II positon			
I image	II image	d_1	I image	II image	d_2	

Calculations

$$2d=\sqrt{(d_1 d_2)}\ \text{m}$$

$$\lambda= \beta(2d)/ D\ \ \text{Å}.$$

Result

The wave length of the monochromatic source =-------- Å.

Viva voce

1. What is called biprism?
2. What is called coherent source?
3. What is the purpose of using biprism?
4. What is fringe width?
5. How to measure 2d?

Exp. No.

Date:

PLANK'S CONSTANT

Aim

To determine the Plank's constant using Plank's constant set up and calculate the percentage of error.

Apparatus required

Photo cell, lamp, Color Filters, Plank constant apparatus and connecting wires.

Formula

$$h= \frac{e(V2-V1)\lambda1\,\lambda2}{C(\lambda1-\lambda2)}\ JS$$

where, h – plank's constant (joule-second)

e- charge of an electron (1.6 x 10^{-19} coulomb)

c- velocity of light (m)

V_1 & V_2 – stopping potential of corresponding color filters (volt).

λ_1 & λ_2 – wavelength of corresponding color filters (Å).

Theory

Photo voltaic cell is based on the principle of inner photo electric cell. This is called true cell because it generates emf without the application of any external potential difference. It consists of semiconductor layer formed on the surface of the metal plate by either heat treatment or cathode sputtering. When light is incident on this semiconductor, electrons are emitted which flow in a direction opposite to light rays, due to thin semi-transparent metal coated over the semiconductor. This type of cell is widely used in photographic exposure meter, photometers and illumination meters. The negative minimum potential applied to plate which makes current zero is called stopping potential.

Experimental Procedure

Connections are made as shown in Fig.1. The +ve terminal of the power supply is connected to cathode (K) of photocell; Anode (A) of photocell is connected to + ve terminal of micro ammeter and – ve terminal is connected to –ve terminal of power supply using patch cords. Before switch ON the voltage should be 0 volts. The lamp and photocell must be placed in wooden plank set up facing each other and adjust the position and distance to obtain sufficient current. Insert the filter in photocell and note down the microammeter reading for corresponding volt. At a particular voltage the microammeter reading will be zero, which is called as a stopping potential. Repeat the process with different filter. Plot a graph between the voltage and current for different filters.

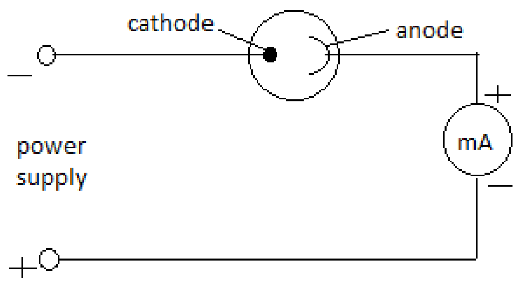
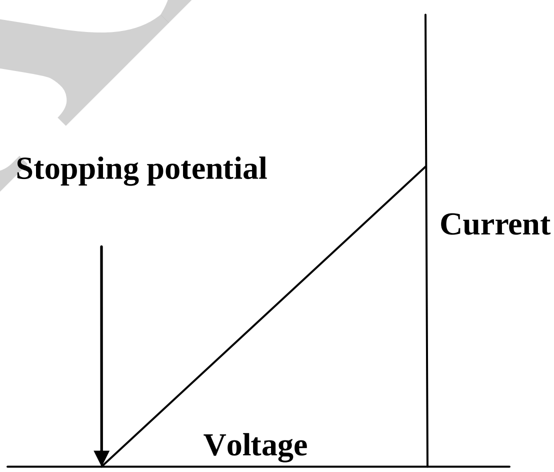


Fig.1

Tabulation

S.No.	RED		BLUE		YELLOW	
	Voltage (V)	Current (µA)	Voltage (V)	Current (µA)	Voltage (V)	Current (µA)
1						
2						
3						
4						
5						

Model Graph



Observations

Wavelength of red = 6233 Å

Wavelength of blue = 4250 Å

Wavelength of yellow =5890 Å

Stopping potential of red = -----V

Stopping potential of blue = -----V

Stopping potential of yellow = -----V

Calculations

$$h = \frac{e(V2 - V1)\lambda1\ \lambda2}{C(\lambda1 - \lambda2)}\ JS$$

Result

Plank's constant, h = --------- JS

Standard value of Plank's constant, h = 6.625×10^{-34}JS

% of error = ----------

Viva voce

1. What is called stopping potential?
2. What is the principle of Plank's constant?
3. What is called photocell?
4. Define semi conductor?

Exp. No.

Date:

FORBES METHOD- THERMAL CONDUCTIVITY OF GOOD CONDUCTOR

Aim

To determine the thermal conductivity of a good conductor using Forbe's method.

Apparatus required

A long rod of uniform cross section with 4 or 5 grooves at equal distance, specimen of same material (rod~10 cm), thermometer, stop clock, water heater, conical shaped boiler with rubber tube and cork.

Formula used

The thermal conductivity is given by $$\mathbf{K} = \frac{\rho s \int \left(\frac{d\theta}{dx}\right) dx}{\left(\frac{d\theta}{dt}\right)_B} \ Wm^{-1}K^{-1}$$

Where, K = Thermal Conductivity of the material ($Wm^{-1}K^{-1}$)

ρ –density of the material (kg/m^3)

S- Specific heat capacity of the material ($Jkg^{-1}/^oC$)

$\left(\frac{d\theta}{dt}\right)_B$ - temperature gradient at B

∫ dx = Area of ABCD (obtained from the graph)

Description

The apparatus consists of a polished rectangular shaped rod of about 1 m length, fixed horizontally on the wooden board with one inlet and an outlet. ¾ of the conical shaped boiler were filled with water which is connected to the rod. The top surface of the rod is provided with a groove at equal intervals. To ensure good conduct, small amount of mercury is poured into the groove.

Experimental Procedure

(i) Static Part

Consider 4 grooves and insert thermometer into each groove. The inlet of the rod is connected to the boiler and steam is allowed to flow. As a result the rod gets heated and the temperature on the thermometer starts to rise. After a certain time the steady state is reached in all the thermometers, which has to be recorded without parallax error and also note down the corresponding distance of the groove from the hot end. The difference between room temperature and the temperature noted will give an excess temperature. A graph is plotted for distance versus excess temperature. A slope is drawn at a convenient point and noted as ($d\theta/dx$). The slope region will give the area (ABCD)

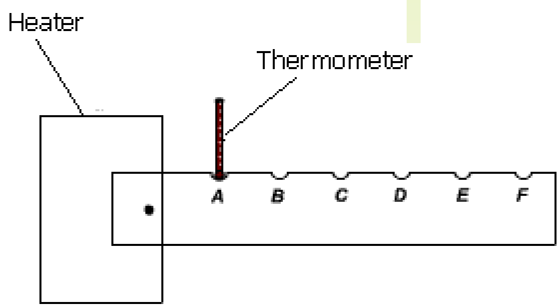


Fig.1

(ii) Dynamic Part

The specimen rod is directly heated in heater for a few minutes and hangs it freely on a stand. The rod is allowed to cool down, simultaneously a sensitive thermometer is inserted into the rod and temperature is noted down for each one minute till it reaches the temperature 30°C. The excess temperature is calculated. A graph is drawn between time and excess temperature to obtain a cooling curve. A slope is determined for different points and the average is taken as $(d\theta/dt)_B$.

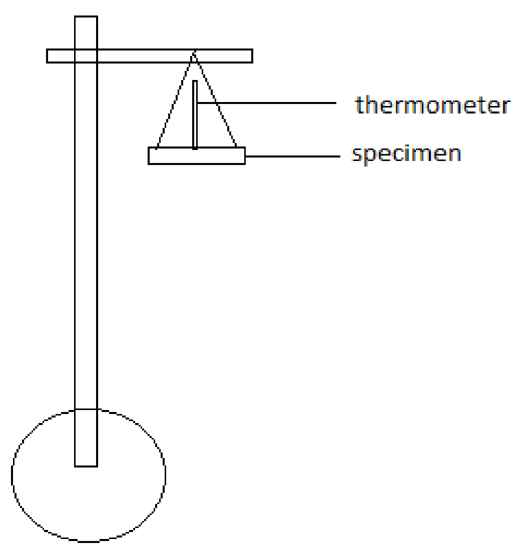


Fig. 2

Tabulation

Room temperature = °C

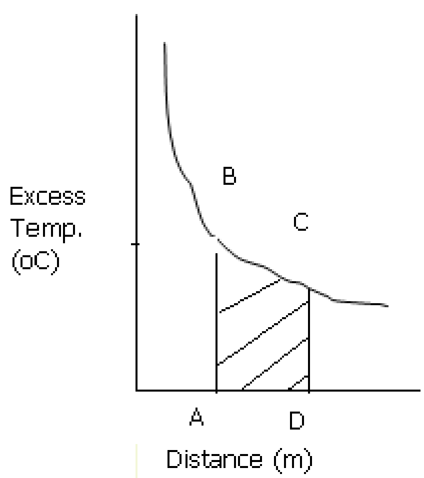
(i)Static Part

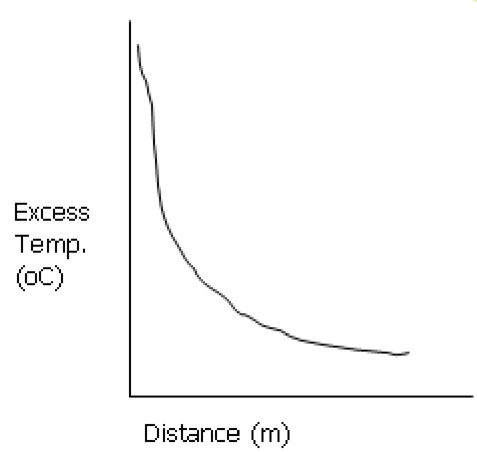
S.No.	Distance (m)	Temperature (°C)	Excess Temperature (°C)
1			
2			
3			
4			

(ii) Dynamic Part

S.No.	Time (min.)	Temperature (°C)	Excess Temperature (°C)
1			
2			
3			
.			
.			

Model Graph





(i)Static **(ii) Dynamic**

Observations

Specific heat capacity of the material = ------------ $Jkg^{-1}/^{o}C$

Density of the material = ----------------- kg/m^3

Calculation

$$K = \frac{\rho s \int \left(\frac{d\theta}{dx}\right) dx}{\left(\frac{d\theta}{dt}\right)_B}$$

Result

The thermal conductivity of the given material is obtained as ________ ($Wm^{-1}K^{-1}$)

Viva voce

1. Define coefficient of thermal conductivity?
2. What are the dimensions of thermal conductivity?
3. What is called temperature gradient?
4. What is called steady state and dynamic state?
5. Which material is best conductor of heat?

Exp. No.

Date:

FARADAY'S EFFECT – He-Ne LASER

Aim

To determine the Verdet constant of a crystal by Faraday's effect.

Apparatus Required

He-Ne laser, polarizer, analyzer, power supply, crystal, solenoid and detector.

Formula

$$V=\frac{\theta-\theta_1}{INL} \text{ deg/oesterd}$$

Where, V- Verdet constant

H- magnetic field

N- number of turns

L- length of the crystal (m)

Theory

When a polarized beam passes through an isotropic medium placed in longitudinal magnetic field H, its plane of vibration is observed.

Procedure

A Laser is allowed to fall on a polarizer and allowed to pass through an analyzer. Polariser and analyzer is rotated so that it becomes almost in crossed position with polarizer. No current is applied to the crystal. Light falling on the detector and make it minimum. The angle (θ) is noted. Switch ON the power supply and magnetic field is developed on the crystal. Vary the current over the crystal and note down the angle on the analyzer for minimum intensity of the laser. Repeat the process for different current.

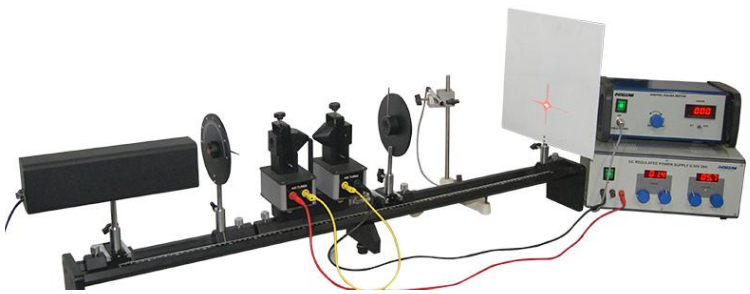


Fig. 1

Tabulation

Current I (A)	Magnetic field, H= NI	With field (θ)	Difference $\theta' = \theta - \theta_1$	Verdet Constant $V = \frac{\theta - \theta_1}{INL}$ deg/oesterd
0.5				
1				
1.5				
2				
2.5				

Observations

Length of the crystal = ------- cm

No. of turns = --------

θ_1 minimum angle Without field=

Calculation

$$V = \frac{\theta - \theta_1}{INL} \text{ deg/oersted}$$

Result

The Verdet constant of the given crystal using Faraday's effect is = ----------

Viva voce

1. What is Verdet constant?
2. What is the difference between analyzer and polarizer?

Exp. No.

Date:

YOUNG'S DOUBLE SLIT

Aim

To determine the wavelength of the monochromatic source using double slit.

Apparatus required

He-Ne laser, double slit, screen, travelling microscope and meter scale.

Formula used

The wavelength is given by $\lambda = \frac{\beta d}{D}$ Å

Where, β- fringe width (m)

d- width of the slit (m)

D-distance between the slit and cress (m)

Experimental Procedure

(i) Place the double slit frame in front of the He-Ne laser at certain distances.

(ii) Switch on the laser and gradually open the window of the double slit, so that the fringes can be viewed in the screen.

(iii) Adjust the distance between screen and double slit to obtain clear and number of fringes.

(iv) Record the fringes viewed in screen in the graph sheet for the number of fringes.

(v) Remove the double slit with altering the width of the slit.

(vi) Using microscope measure the slit width.

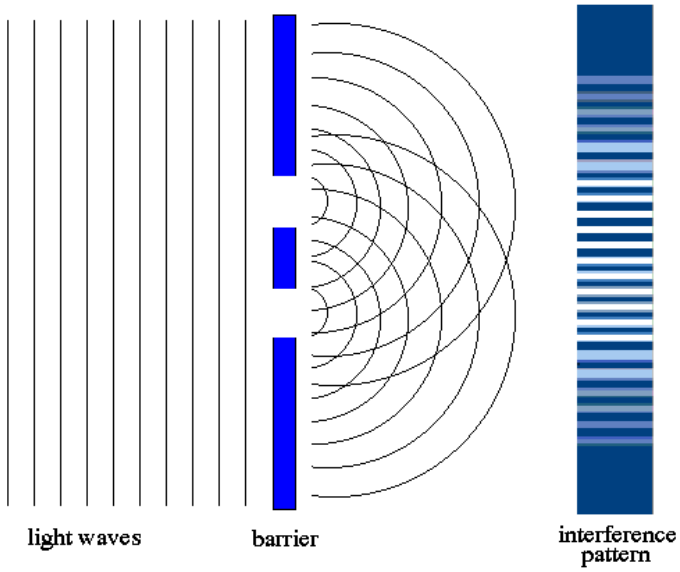


Fig. 1

Tabulation

Order of fringes	Distance between the fringes (mm)	Width of the three fringes (mm)	Fringe width
n n+1 n+2 . . . n+9			

To find d

Position on double slit	Microscope reading (m)			AD (m)	BC (m)	d= (AD+BC)/2 (m)
	MSR	VSR	TR			
A B C D						

Calculation

Result

The wavelength of the monochromatic source is ---------- Å

Viva voce

1. What is the wavelength of He-Ne laser?
2. What is double slit?
3. What is the principle of this method?