Shantilal Shah Engineering College,

Bhavnagar

General Department

Practical Journal

Subject: Physics

All Branches

Shantilal Shah Engineering College, Bhavnagar

Certificate

This is to certify that Shri/Kum. _____

_____of B.E. semester-1/2 of _____

branch with enrolment number_____

has satisfactorily completed his/her term work of the subject PHYSICS during the academic year_____

and submitted on_____

Date: **Faculty in charge**

Shantilal Shah Engineering College, Bhavnagar

General Department

Physics (All Branches)

List of Experiments and Rubrics for Assessment

Code	Objective	Arrangement (All components arranged in perfect manner without	Reading (Student is able to take reading and keeping record	Calculation (Done all calculations	Graph (Completed Graph with	Understanding/ Conclusion (Excellent understanding	VIVA	Attendance	TOTAL
P_1	Measurement of the Numerical Aperture (NA) of the optical fiber.	10	10	5	0	5	10	10	**50**
P_2 (VLAB)	1. To determine the Hall voltage developed across the sample material. 2. To calculate the Hall coefficient and the carrier concentration of the sample material.	5	10	5	0	10	10	10	**50**
P_3 (VLAB)	Determination of Plank's constant.	5	10	5	0	10	10	10	**50**
P_4 (VLAB)	To determine the wavelength of the given source using Newton's ring.	10	10	5	0	5	10	10	**50**
P_5 (VLAB)	To calculate beam divergence and spot size of the given laser beam.	5	5	5	10	5	10	10	**50**
P_6 (VLAB)	To determine the moment of inertia of the given disc using Torsion pendulum, with identical masses	5	5	10	0	10	10	10	**50**
P_7	Understand the function of CRO and measure the *rms* voltage and frequency of AC signal using CRO.	10	10	5	0	5	10	10	**50**

P_8	**To study V-I Characteristics of P-N junction diode.**	10	5	5	5	5	10	10	**50**
P_9 (VLAB)	**1. To determine the stopping potential from the graph of photocurrent versus applied potential.** **2. To determine the Planck's constant from the graph of kinetic energy versus frequency.** **3. To determine work function of given material.**	5	5	5	10	5	10	10	**50**
P_10 (VLAB)	**To find the Young's modulus of the given wood bar by uniform bending using pin and microscope method.**	10	10	5	0	5	10	10	**50**

Shantilal Shah Engineering College, Bhavnagar

General Department

Physics (Practical)-3110018

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Sr. No.	Code	Objective	Arrangement	Reading	Calculation	Graph	Understanding/ Conclusion	VIVA	Attendance	TOTAL	SIGN
1	P_1	Measurement of the Numerical Aperture (NA) of the optical fiber.	(10)	(10)	(5)	(0)	(5)	(10)	(10)	(50)	
2	P_2 (VLAB)	1. To determine the Hall voltage developed across the sample material. 2. To calculate the Hall coefficient and the carrier concentration of the sample material.	(5)	(10)	(5)	(0)	(10)	(10)	(10)	(50)	
3	P_3 (VLAB)	Determination of Plank's constant.	(5)	(10)	(5)	(0)	(10)	(10)	(10)	(50)	
4	P_4 (VLAB)	To determine the wavelength of the given source using Newton's ring.	(10)	(10)	(5)	(0)	(5)	(10)	(10)	(50)	
5	P_5 (VLAB)	To calculate beam divergence and spot size of the given laser beam.	(5)	(5)	(5)	(10)	(5)	(10)	(10)	(50)	
6	P_6 (VLAB)	To determine the moment of inertia of the given disc using Torsion pendulum, with identical masses.	(5)	(5)	(10)	(0)	(10)	(10)	(10)	(50)	

7	**P_7**	**Understand the function of CRO and measure the *rms* voltage and frequency of AC signal using CRO.**	**(10)**	**(10)**	**(5)**	**(0)**	**(5)**	**(10)**	**(10)**	**(50)**	
8	**P_8**	**To study V-I Characteristics of P N junction Diode**	**(10)**	**(5)**	**(5)**	**(5)**	**(5)**	**(10)**	**(10)**	**(50)**	
9	**P_9 (VLAB)**	**1. To determine the stopping potential from the graph of photocurrent versus applied potential.** **2. To determine the Planck's constant from the graph of kinetic energy versus frequency.** **3. To determine work function of given material.**	**(5)**	**(5)**	**(5)**	**(10)**	**(5)**	**(10)**	**(10)**	**(50)**	
10	**P_10 (VLAB)**	**To find the Young's modulus of the given wood bar by uniform bending using pin and microscope method.**	**(10)**	**(10)**	**(5)**	**(0)**	**(5)**	**(10)**	**(10)**	**(50)**	

Shantilal Shah Engineering College, Bhavnagar

Physics Laboratory Manual

Experiment-1 (P_1)

Code	Objective of the experiment	Course Outcome
P_1	Measurement of the Numerical Aperture (NA) of the fiber.	CO-5

- **Objective**: Measurement of the Numerical Aperture (NA) of the fiber.

- **Instrument Used** : Fiber Optics Trainer (Scientech 2502)

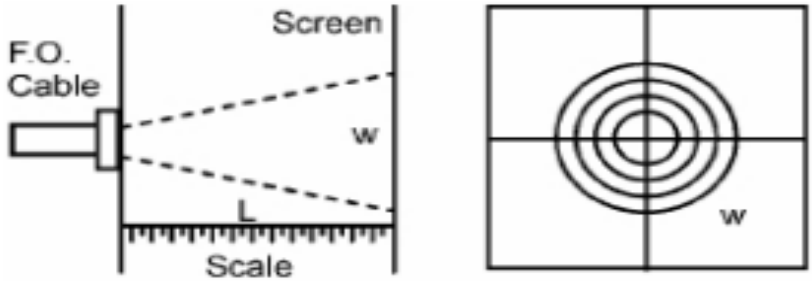
- **Items Required:**

1. ST2502 trainer with power supply cord
2. Optical Fiber cable.
3. Numerical Aperture measurement Jig/Paper & Scale

- **Procedure:**

1. Connect the Power supply cord to mains supply and to the trainer ST2502.
2. Connect the frequency generator's 1 KHz sine wave output to input of emitter 1 circuit. Adjust its amplitude at 5 V pp.
3. Connect one end of fiber cable to the output socket of emitter 1 circuit and the other end to the numerical aperture measurement jig. Hold the white screen facing the fiber such that its cut face is perpendicular to the axis of the fiber.
4. Hold the white screen with 4 concentric circles (10, 15, 20 & 25 mm diameter) vertically at a suitable distance to make the red spot from the fiber coincide with 10 mm circle.
5. Record the distance of screen from the fiber end **L** and note the diameter **W** of the spot.
6. Compute the numerical aperture from the formula: $\mathbf{NA} = \frac{W}{\sqrt{4L^2+W^2}} = \sin\theta_{max}$

❖ Diagram:



Numerical Aperture measurement Jig/Paper & Scale

❖ Observation Table:

Sr. No.	Diameter of the spot (W)	Distance between screen and fibre (L)	Numerical Aperture (NA)
1.	10 mm		
2.	15 mm		
3.	20 mm		
4.	25 mm		

❖ Calculations:

(1) $NA = \frac{W}{\sqrt{4L^2+W^2}}$

(2) $NA = \frac{W}{\sqrt{4L^2+W^2}}$

(3) $NA = \frac{W}{\sqrt{4L^2+W^2}}$

(4) $NA = \frac{W}{\sqrt{4L^2+W^2}}$

❖ **Result:** The N.A. of fiber measured is …… using trigonometric formula.

Code	Experiment	Arrangement (10)	Reading (10)	Calculations (5)	Graph (0)	Understanding /Calculation (5)	viva (10)	Attendance (10)	Total (50)
P_1	NA of Fibre Optic								

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Physics Laboratory Manual

Experiment-2 [P_2 (VLAB)]

Code	Objective of the experiment	Course Outcome
P_2 (VLAB)	1. To determine the Hall voltage developed across the sample material. 2. To calculate the Hall coefficient and the carrier concentration of the sample material	CO-4

⌘ Website link: **http://vlab.amrita.edu/?sub=1**

❖ Objective:

1. To determine the Hall voltage developed across the sample material.
2. To calculate the Hall coefficient and the carrier concentration of the sample material.

❖ Apparatus:

Two solenoids, Constant current supply, four probe, Digital gauss meter, Hall Effect apparatus (which consist of Constant Current Generator (CCG), digital milli voltmeter and Hall probe).

❖ Procedure:

Controls

♦ **Combo box**

- **Select procedure**: This is used to select the part of the experiment to perform.
  1) Magnetic field Vs Current.
  2) Hall Effect setup.
- **Select Material**: This slider activates only if Hall Effect setup is selected. And this is used to select the material for finding Hall coefficient and carrier concentration.

- **Button**

  - **Insert Probe/ Remove Probe**: This button used to insert/remove the probe in between the solenoid.
  - **Show Voltage/ Current**: This will activate only if Hall Effect setup selected and it used to display the Hall voltage/ current in the digital meter.
  - **Reset**: This button is used to repeat the experiment.

- **Slider**

  - **Current:** This slider used to vary the current flowing through the Solenoid.
  - **Hall Current:** This slider used to change the hall current
  - **Thickness:** This slider used to change the thickness of the material selected.

❖ Procedure for doing the simulation:

- **To measure the magnetic field generated in the solenoid**

  - Select **Magnetic field Vs Current from** the procedure combo-box.
  - Click **Insert Probe** button
  - Placing the probe in between the solenoid by clicking the wooden stand in the simulator.
  - Using Current slider, varying the current through the solenoid and corresponding magnetic field is to be noted from Gauss meter.

♦ **Hall Effect apparatus**

- Select **Hall Effect Setup** from the **Select the procedure** combo box
- Click **Insert Hall Probe** button
- Placing the probe in between the solenoid by clicking the wooden stand in the simulator.
- Set "**current slider**" value to minimum.
- Select the material from “Select Material” combo-box.
- Select the Thickness of the material using the slider **Thickness**.
- Vary the Hall current using the sllider **Hall current**.
- Note down the corresponding Hall voltage by clicking “show voltage” button.
- Then calculate Hall coefficient and carrier concentration of that material using the equation

$$R_H = V_H t/(I*B) \quad \text{.....(4)}$$

Where R_H is the Hall coefficient

$$R_H = 1/ne \quad \text{.....(5)}$$

And ***n*** is the carrier concentration

- Repeat the experiment with different magnetic file.

❖ **Observation Table-(1):**

Trial No:	Current through solenoid	Magnetic field generated
1		
2		

❖ **Observation Table-(2):** **Material**: _____

Trial No:	Magnetic Field (Tesla T)	Thickness (t) (m)	Hall current, (mA)	Hall Voltage (mV)	R_H
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

❖ Calculation:

1) For Magnetic Field =..... and thickness =.....

2) For Magnetic Field =..... and thickness =.....

❖ Result:

(1) Hall Coefficient of the material, R_H = ... m^3/C

(2) Carrier concentration of the material, *n* = ... m^{-3}

Code	Experiment	Arrangement (5)	Reading (10)	Calculations (5)	Graph (0)	Understanding /Calculation (10)	viva (10)	Attendance (10)	Total (50)
P_2	Hall Effect								

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Physics Laboratory Manual

Experiment-3 [P_3 (VLAB)]

Code	Objective of the experiment	Course Outcome
P_3 (VLAB)	Determination of Planck's constant	CO-3

⌘ Website link: **http://vlab.amrita.edu/?sub=1**

❖ **Objective:** Determination of Planck's constant.

❖ **Apparatus:**

0-10 V power supply, a one way key, a rheostat, a digital milliammeter, a digital voltmeter, a 1 K resistor and different known wavelength LED's (Light-Emitting Diodes)

❖ **Procedure:**

1. After the connections are completed, click on 'Insert Key' button.

2. Click on the combo box under 'Select LED' button.

3. Click on the 'Rheostat Value' to adjust the value of rheostat to 500 Ω.

4. Corresponding voltage across the LED is measured using a voltmeter, which is the knee voltage.

5. Repeat, by changing the LED and note down the corresponding knee voltage.

6. Calculate h using formula, $h = \frac{e \lambda V}{c}$

❖ Observation Table:

Sr. No.	Colour of LED	Wavelength, λ (nm)	Knee Voltage, V (V)	λV (nm · V)	Average λV
1	Red				
2	Green				
3	Yellow				
4	Blue				

❖ Calculation:

(e = 1.6 × 10^{-19} C, c = 3 × 10^{8} m/s)

- Plank's Constant, $h = \frac{e}{c}(\text{average } \lambda V)$ = …… J s.

❖ Result: Value of Plank's constant is ..... J s.

Code	Experiment	Arrangement (5)	Reading (10)	Calculations (5)	Graph (0)	Understanding /Calculation (10)	viva (10)	Attendance (10)	Total (50)
P_4	Planck's constant								

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Physics Laboratory Manual

Experiment-4 [P_4 (VLAB)]

Code	Objective of the experiment	Course Outcome
P_4 (VLAB)	To determine the wavelength of the given source using Newton's ring.	CO-3

⌘ Website link: **http://vlab.amrita.edu/?sub=1**

❖ **Objective:** To determine the wavelength of the given source using Newton's ring.

❖ **Components:** Start button, Light source, Filter, Microscope, Lens, Medium and Glass plate.

❖ **Equation:** The wavelength of monochromatic light can be determined as

$$\lambda = \frac{D_{m+p}^2 - D_m^2}{4\,p\,R}$$

Where, D_{m+p} is the diameter of the $(m+p)^{th}$ dark ring and D_m is the diameter of the m^{th} dark ring.

R is radius of curvature of lens used

❖ **Variable region:**

- Choose Medium Combo box helps you to choose the type of medium that the simulation have to perform.
- Radius Slider helps to change the radius of curvature of lens.
- The wavelength slider helps to change the wavelength of light used.

❖ **Measurement region:**

- The start button will help to play the simulation.
- The variation in the rings can be seen when the medium, wavelength of light or the radius of the lens changes.

❖ Procedure:

- Click on the "light on" button.
- Select the lens of desirable radius.
- Adjust the microscope position to view the Newton rings.
- Focus the microscope to view the rings clearly.
- Fix the cross-wire on 20^{th} ring either from right or left of the centre dark ring and take the readings.
- Move the crosswire and take the reading of 18^{th}, 16^{th}.....2^{nd} ring.
- You have to take the reading of rings on either side of the centre dark ring.
- Enter the readings in the tabular column.
- Calculate the wavelength of the source by using the given formula.

❖ Observations:

- **To find Least Count**
  1. One main scale division= ..... cm
  2. Number of divisions on Vernier = ...
  3. L.C = One main scale division/ Number of division on vernier =.....
  4. R = Radius of lens = …….

❖ Observation Table:

Sr. No.	Order of ring	Microscopic Reading (cm)		Diameter *D* (cm)	D^2 (cm^2)	$D^2_{m+p} - D^2_m$ (cm^2)
		Left	Right			
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

❖ Calculation:

➢ Mean value of $D^2_{m+p} - D^2_m$ = ... cm^2

Wavelength of light, $\lambda = \frac{D^2_{m+p} - D^2_m}{4\,p\,R}$

$\therefore \lambda$ = ...nm

❖ Result:

Wavelength of light from the given source is found to be = ... nm

Code	Experiment	Arrangement (10)	Reading (10)	Calculations (5)	Graph (0)	Understanding /Calculation (5)	viva (10)	Attendance (10)	Total (50)
P_4	Newton's ring (Wavelength of light)								

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Physics Laboratory Manual

Experiment-5 [P_5 (VLAB)]

Code	Objective of the experiment	Course Outcome
P_5	To calculate the beam divergence and spot size of the given laser beam.	CO-3

⌘ Website link: **http://vlab.amrita.edu/?sub=1**

❖ **Objective:** To calculate the beam divergence and spot size of the given laser beam.

❖ **Apparatus:** A laser source, An ammeter, Micrometer Screw gauge

❖ **Procedure:**

1. The experimental arrangement is shown in the simulator. A side view and top view of the setup is given in the inset.
2. The start button enables the user to start the experiment.
3. From the combo box, select the desired laser source.
4. Then fix a detector distance, say 100 cm, using the slider Detector distance, z. The z distance can be varied from 50 cm to 200 cm.
5. For a particular z distance, change the detector distance x, from minimum to maximum. Using the slider detector distance, x, The micrometer distances and the corresponding output currents are noted. The x distances can be read from the zoomed view of the micrometer and the current can be note from the digital display of the output device.
6. Draw the graph and calculate the beam divergence and spot size using the steps given above.

❖ Observations:

To find the Least Count of Screw gauge:

- One pitchscale division (*n*) = ... mm
- Number of divisions on head scale (*m*) = ...
- Least Count (L.C) = n/m = ... mm

❖ Observation Table:

For Z_1 = ... cm			For Z_2 = ... cm		
Sr. No.	**Distance, x (mm)**	**Current, I (mA)**	**Sr. No.**	**Distance, x (mm)**	**Current, I (mA)**
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		

❖ Calculation:

From Graph-1

- $1/e^2$ of maximum intensity (Current), I_e = ... mA
- Diameter of the beam corresponds to I_e, d_1 = ...mm

From Graph-2

- $1/e^2$ of maximum intensity (Current), I_e = ... mA
- Diameter of the beam corresponds to I_e, d_2 = ...mm

Divergence angle (θ)

$$\theta = \frac{d_2 - d_1}{z_2 - z_1} = \ldots\ldots\ldots\ldots\text{m rad}$$

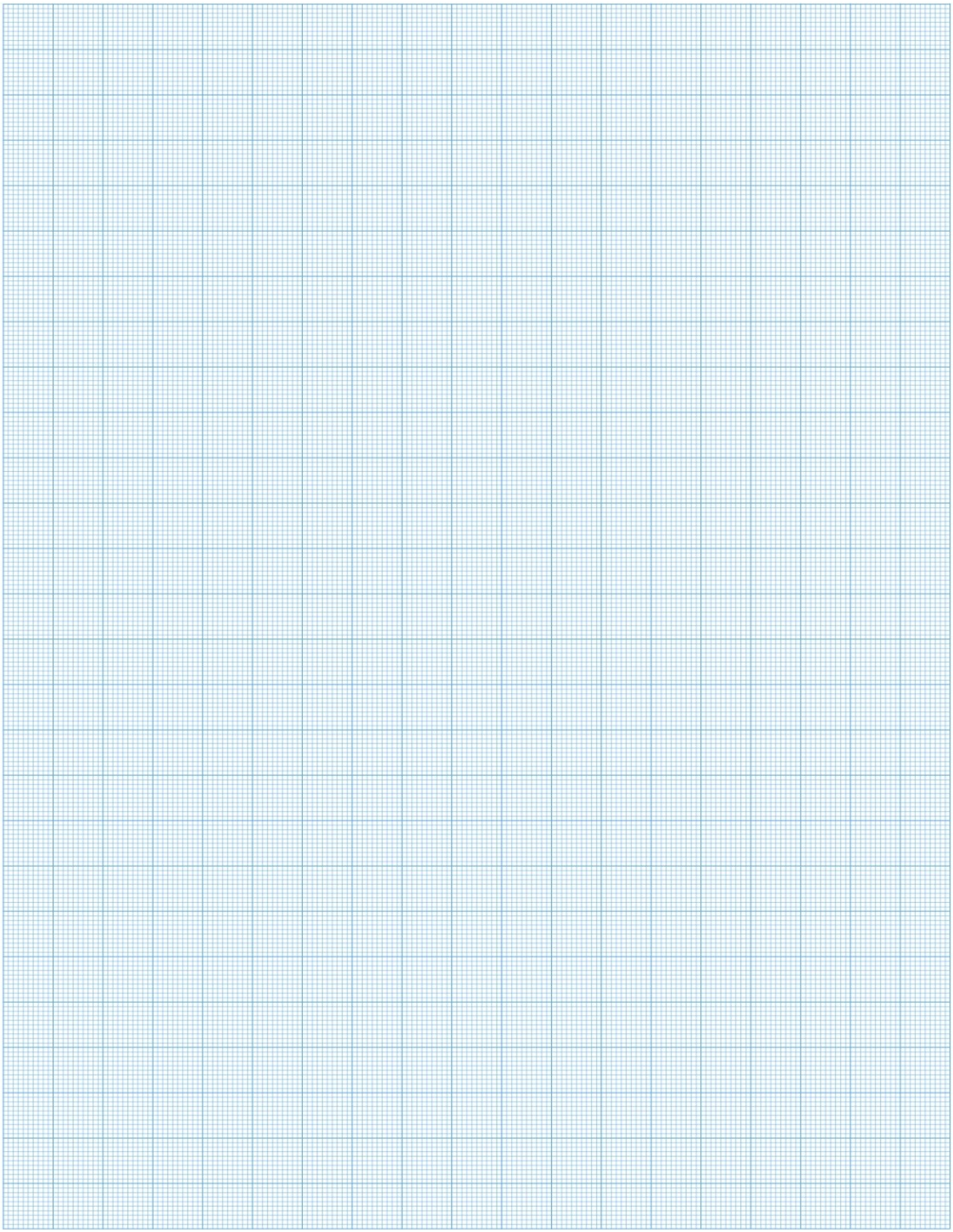
❖ Result: Beam divergence of the given laser beam is ..... m rad.

Code	Experiment	Arrangement (5)	Reading (5)	Calculations (5)	Graph (5)	Understanding/ Calculation (10)	viva (10)	Attendance (10)	Total (50)
P_5	LASER DIVERGENCE								

SIGN

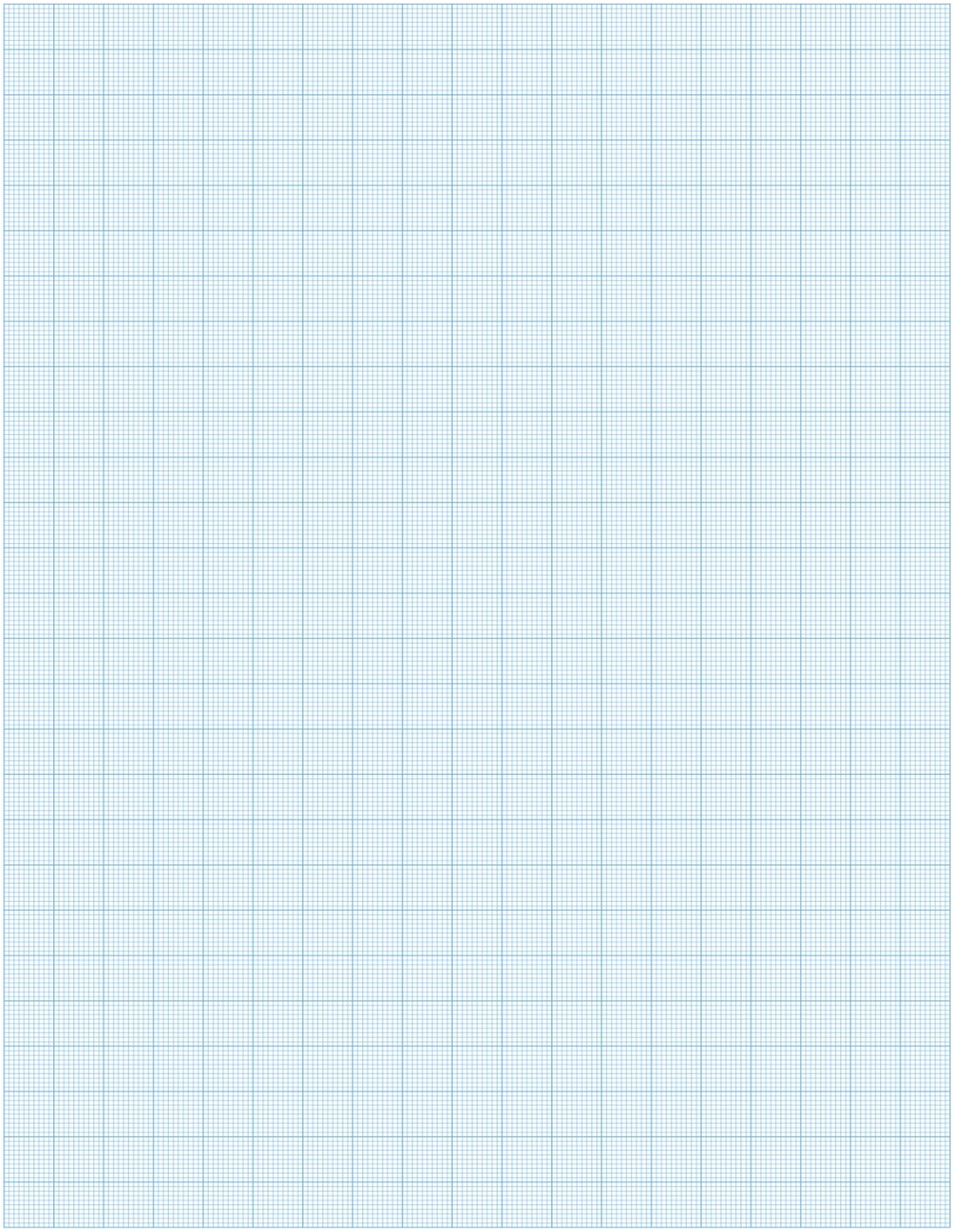
Scale: **X-axis: 1 cm = …….**

Y-axis: 1 cm = …….



Scale: **X-axis: 1 cm = …….**

Y-axis: 1 cm = …….



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Physics Laboratory Manual

Experiment-6 [P_6 (VLAB)]

Code	Objective of the experiment	Course Outcome
P_6	To determine the moment of inertia of the given disc using Torsion pendulum, with identical masses	CO-1

⌘ Website link: **http://vlab.amrita.edu/?sub=1**

❖ **Objective:** To determine the moment of inertia of the given disc using Torsion pendulum, with identical masses.

❖ **Components:** The given torsion pendulum, two identical cylindrical masses, stop watch, metre scale, etc.

❖ **Procedure:**

1. The radius of the suspension wire is measured using a screw gauge.
2. The length of the suspension wire is adjusted to suitable values like 0.3 m, 0.4 m, 0.5 m, ...0.9 m, 1 m etc.
3. The disc is set in oscillation. Find the time for 20 oscillations twice and determine the mean period of oscillation ' T_0 '.
4. The two identical masses are placed symmetrically on either side of the suspension wire as close as possible to the centre of the disc, and measure d_1 which is the distance between the centres of the disc and one of the identical masses.
5. Find the time for 20 oscillations twice and determine the mean period of oscillation T_1.

6. The two identical masses are placed symmetrically on either side of the suspension wire as far as possible to the centre of the disc, and measure d_2 which is the distance between the centres of the disc and one of the identical masses.

7. Find the time for 20 oscillations twice and determine the mean period of oscillation T_2.

8. Find the moment of inertia of the disc using the given formulae.

❖ Observations:

1. Mass of the disc, m = **1 kg**
2. Radius of the suspension wire = **0.0004 m**
3. Mass of each identical masses = **50×10^{-3} kg**
4. d_1 = **1.5×10^{-2} m**
5. d_2 = **4×10^{-2} m**

❖ Observation Table:

Length of the suspension wire *l* (*m*)	**Time for 20 oscillations (in seconds)**									**Period of oscillations (in seconds)**			$\frac{T_0^2}{(T_2^2 - T_1^2)}$
	Without mass			**With masses at d_1**			**With masses at d_2**			$T_0/20$	$T_1/20$	$T_2/20$	
	1	**2**	**Mean (T_0)**	**1**	**2**	**Mean (T_1)**	**1**	**2**	**Mean (T_2)**				
0.3	56.71	56.99	**56.85**	56.9	57.3	**57.1**	56.76	56.89	**56.82**	2.842	2.855	2.841	
0.4													
0.5													
0.6													

❖ Calculations:

Moment of inertia of the given disc, $I_0 = 2\ m\ (d_2^2 - d_1^2)\ \frac{T_0^2}{(T_2^2 - T_1^2)}$ = **1.39×10^{-3} kg m²**

❖ Result:

The moment of inertia of the given disc is …… kg-m^2

Code	Experiment	Arrangement (5)	Reading (5)	Calculations (10)	Understanding/ Calculation (10)	viva (10)	Attendance (10)	Total (50)
P_6	Torsional Pendulum							

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Experiment-7 (P_7)

Code	Objective of the experiment	Course Outcome
P_7	Understand the function of CRO and measure the *rms* voltage and Frequency of AC signal using CRO.	CO-4

- **Objective:** Understand the function of CRO and measure the *rms* voltage and Frequency of AC signal using CRO.

- **Components:** CRO, Function Generator

- **Procedure:**
  - Switch on the CRO and Function Generator.
  - Study and understand the function of every knob on CRO and function generator.
  - Set function generator to any frequency with a particular peak to peak voltage (V_P)
  - Connect the output of function generator to any channel of CRO.
  - Adjust CRO so that stable and full signal is viewed.
  - Measure V_P using formula-(1). Determine V_P & V_{rms}.
  - Determine the frequency of the same signal.
  - Repeat for different signals.

❖ Observation Table:

1. Measurement of AC voltage:

Sr. No.	Signal no.	Division on Y-axis	Volt/div.	V_P	V_{rms}
1	Signal-1				
2	Signal-2				
3	Signal-3				

2. Measurement of AC frequency:

Sr. No.	Signal no.	Division on X-axis	Time/div.	Time Period (*T*)	Frequency (*f*)
1	Signal-1				
2	Signal-2				
3	Signal-3				

❖ Calculation:

1. Signal-1

- Voltage (V_P) = (Division on Y-axis) (volt/division) = ...
- V_{rms} = 0.707 V_P =.....
- Time period (*T*) = (Division on X-axis) (time/division) = ...
- Frequency (*f*) =.....

2. Signal-2

- Voltage (V_P) = (Division on Y-axis) (volt/division) = ...
- V_{rms} = 0.707 V_P =.....
- Time period (T) = (Division on X-axis) (time/division) = ...
- Frequency (f) =.....

3. Signal-3

- Voltage (V_P) = (Division on Y-axis) (volt/division) = ...
- V_{rms} = 0.707 V_P =.....
- Time period (T) = (Division on X-axis) (time/division) = ...
- Frequency (f) =.....

❖ Result:

With the help of CRO one can determine the *rms* voltage and frequency of AC signal.

Code	Experiment	Arrangement (10)	Reading (10)	Calculations (5)	Graph (0)	Understanding/ Calculation (5)	viva (10)	Attendance (10)	Total (50)
P_7	CRO								

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Physics Laboratory Manual

Experiment-8 (P_8)

Code	Objective of the experiment	Course Outcome
P_8	To study V-I Characteristics of P N junction Diode	CO-2

- **Objective:** To study V-I Characteristics of P N junction Diode
- **Instrument Used:** Diode Characteristics Trainer (NV6501)
- **Items Required:**
  1. Semiconductor Diode, Regulated Power Supply
  2. Connecting wire
- **Procedure:**

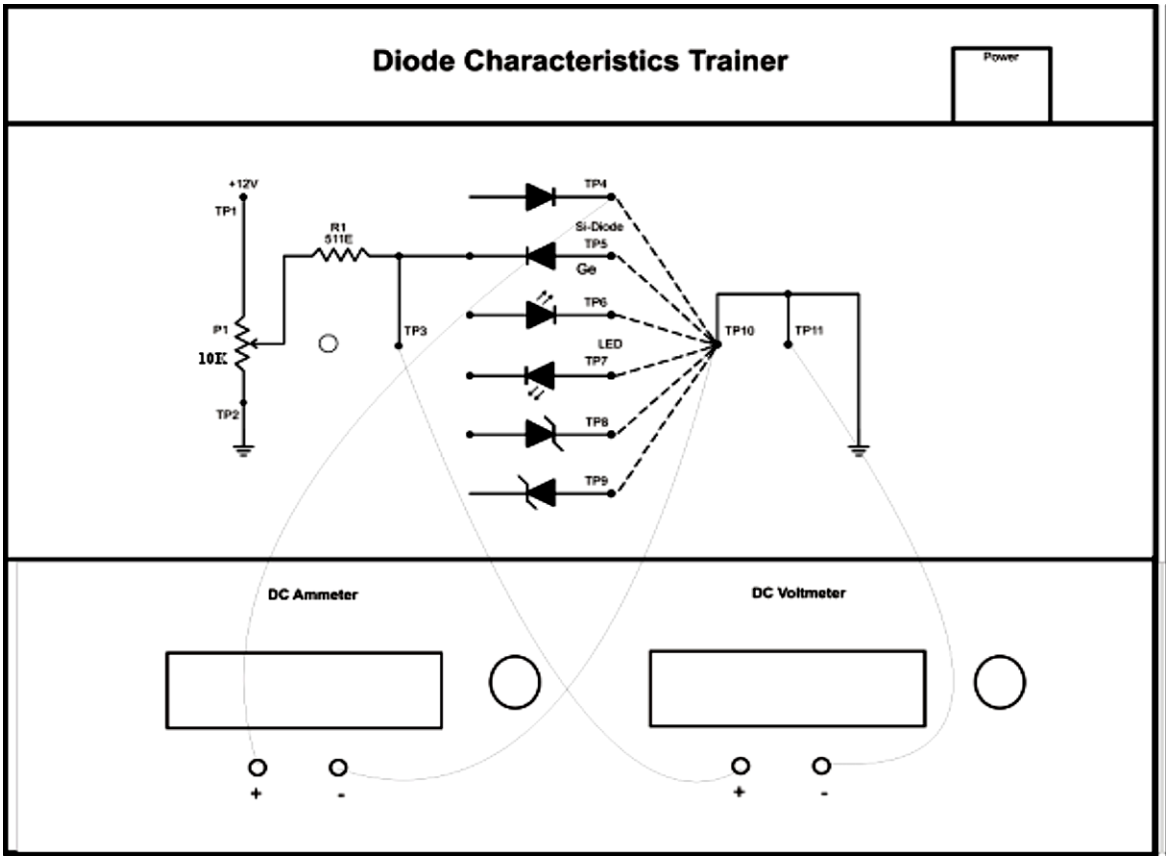
Study of Forward bias characteristics

1. Before switch 'On' the supply rotate potentiometer P1 fully in CCW (counter clockwise direction).
2. Connect Ammeter between **TP4** and **TP10**, to measure diode current I_F (mA) & set Ammeter at **200 mA range** (as shown in fig. 1).
3. Connect Voltmeter across **TP3** and **TP11**, to measure diode voltage V_F & set Voltmeter at **20 V range**.
4. Switch 'On' the power supply.
5. Vary the potentiometer P1 so as to increase the value of diode voltage V_D from 0 to 1 V (0.83 V) in steps and measure the corresponding values of diode current I_D in mA and note down in the Observation Table-(1).
6. Switch 'Off' the supply.

Study of Reverse bias characteristics

7. Before switch 'On' the supply rotate potentiometer P1 fully in CCW (counter clockwise direction).
8. Connect Ammeter between **TP5** and **TP10**, to measure diode current I_R (µA) & set Ammeter at **200 µA** range (as shown in fig. 1).
9. Connect Voltmeter across **TP3** and **TP11**, to measure diode voltage V_R & set Voltmeter at **20 V** range.
10. Switch 'On' the power supply.
11. Vary the potentiometer P1 so as to increase the value of diode voltage V_R from 0 to 15 V in steps and measure the corresponding values of diode current I_R in µA and note down in the Observation Table-(2).
12. Switch 'Off' the supply.
13. Plot a curve between diode voltage V_D/ V_R and diode current I_D/ I_R using suitable scale, with the help of Observation Table. This curve is the required characteristics curve of Si diode.

❖ Circuit Diagram:



❖ Observation Table-1:

Sr. No.	Forward Bias Voltage, V_F (volt)	Forward Bias Current, I_F (mA)	Static Resistance R = V/I (Ohm)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			

❖ Calculation:

- From the graph:

Dynamic Resistance of diode is, $R_d = \frac{\Delta V_F}{\Delta I_F}$

❖ **Observation Table-2:**

Sr. No.	Reverse Bias Voltage, V_R (volt)	Reverse Bias Current, I_R (μA)
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

❖ **Graph:** *I* v/s *V* graph is shown on page no_____.

❖ **Result:**

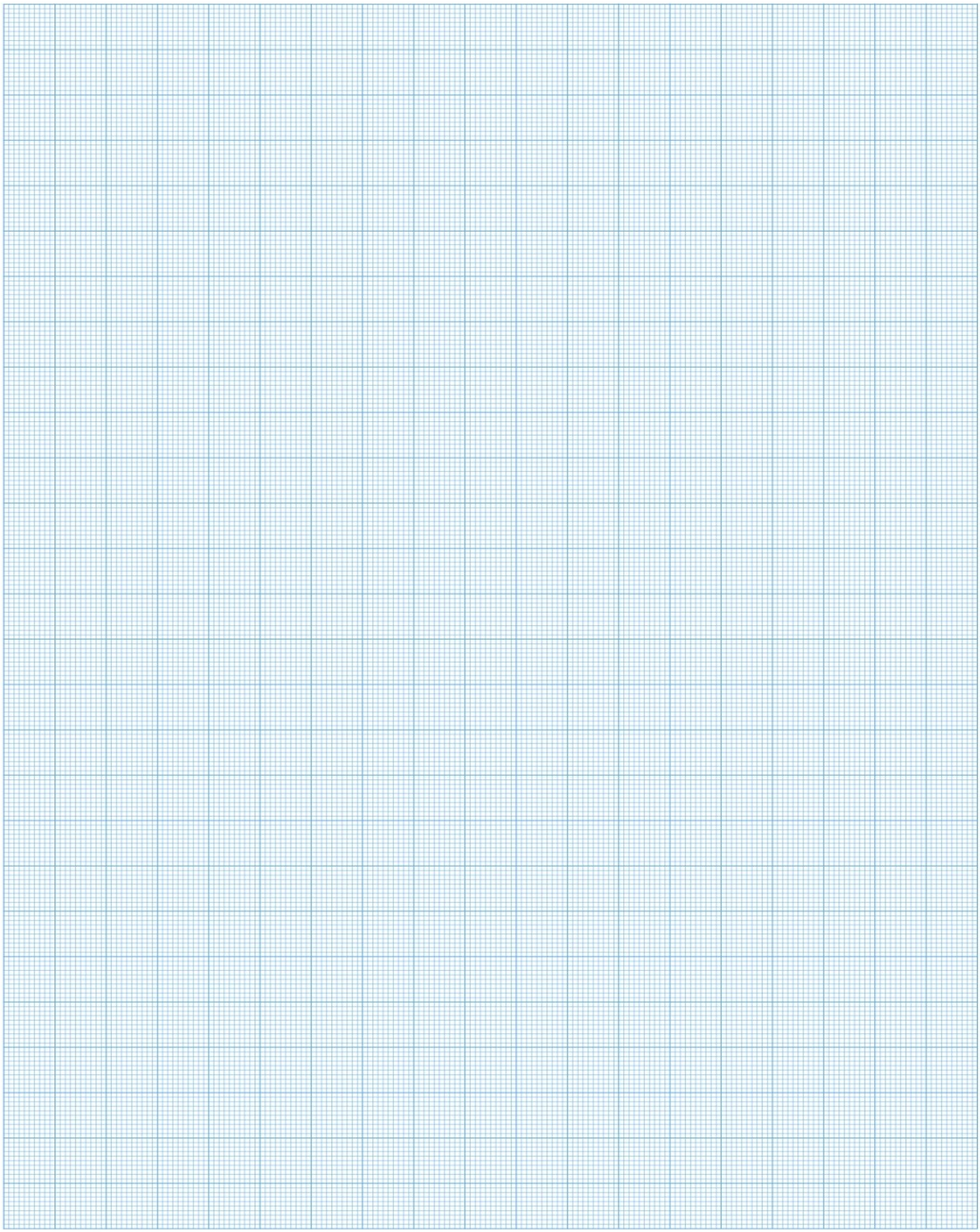
1) The dynamic resistance of the diode, R_d = …….. Ohm.
2) The static resistance of the diode is …… ohm with value of current ……. mA and value of voltage is …….. volt.
3) Breakdown voltage for the diode is …….. volt.

Code	Experiment	Arrangement (10)	Reading (5)	Calculations (5)	Graph (5)	Understanding /Calculation (5)	viva (10)	Attendance (10)	Total (50)
P_1	p-n junction diode								

SIGN

Scale: **X-axis: 1 cm = …….**

Y-axis: 1 cm = …….



Shantilal Shah Engineering College, Bhavnagar

Physics Laboratory Manual

Experiment-9 [P_9 (VLAB)]

Code	Objective of the experiment	Course Outcome
P_9 (VLAB)	1. To determine the stopping potential from the graph of photocurrent versus applied potential. 2. To determine the Planck's constant from the graph of kinetic energy versus frequency. 3. To determine work function of given material.	CO-3

⌘ Website link: **http://vlab.amrita.edu/?sub=1**

❖ Objectives:

1. To determine the stopping potential from the graph of photocurrent versus applied potential.
2. To determine the Planck's constant from the graph of kinetic energy versus frequency.
3. To determine work function of given material.

❖ Apparatus:

Battery, Rheostat, Voltmeter, Ammeter, Photosensitive metal, Collector, Source of light

❖ Procedure:

1. Select the material for studying photoelectric effect.
2. Select area of the material, wavelength, intensity of incident light.
3. Switch on the light source.
4. Measure the reverse current for various reverse voltages.
5. Plot the current-voltage graph and determine the threshold voltage.
6. Repeat the experiment by varying the wavelength for a particular intensity of incident light and note down stopping potential for each wavelength.

❖ Observations:

(1) Photosensitive material = …….

(2) Area of the plate = ……. cm^2

(3) Intensity of incident light = ……. W/m^2

❖ Observation Table:

Sr. No	Wavelength (*nm*)	Voltage (Volt)	Current (μA)
1			
2			
3			
4			
5			
6			
7			
8			

Sr. No	Wavelength (*nm*)	Voltage (Volt)	Frequency (Hz)	Kinetic Energy (eV)
1				
2				
3				
4				
5				
6				

❖ Calculation:

($e = 1.6 \times 10^{-19}$ C, $c = 3 \times 10^{8}$ m/s)

- Work function, $\phi = h f_0$ = …… J.
- Work function, $\phi = h f_0 / e$ = …… eV.

❖ Graphs:

(1) Photocurrent vs Applied Potential

(2) Kinetic Energy of electron vs Frequency on incident light

❖ Result:

(1) The value of stopping potential from the current vs voltage graph is ……. V.

(2) The value of Plank's constant from the graph of Kinetic Energy vs frequency is …….. J s.

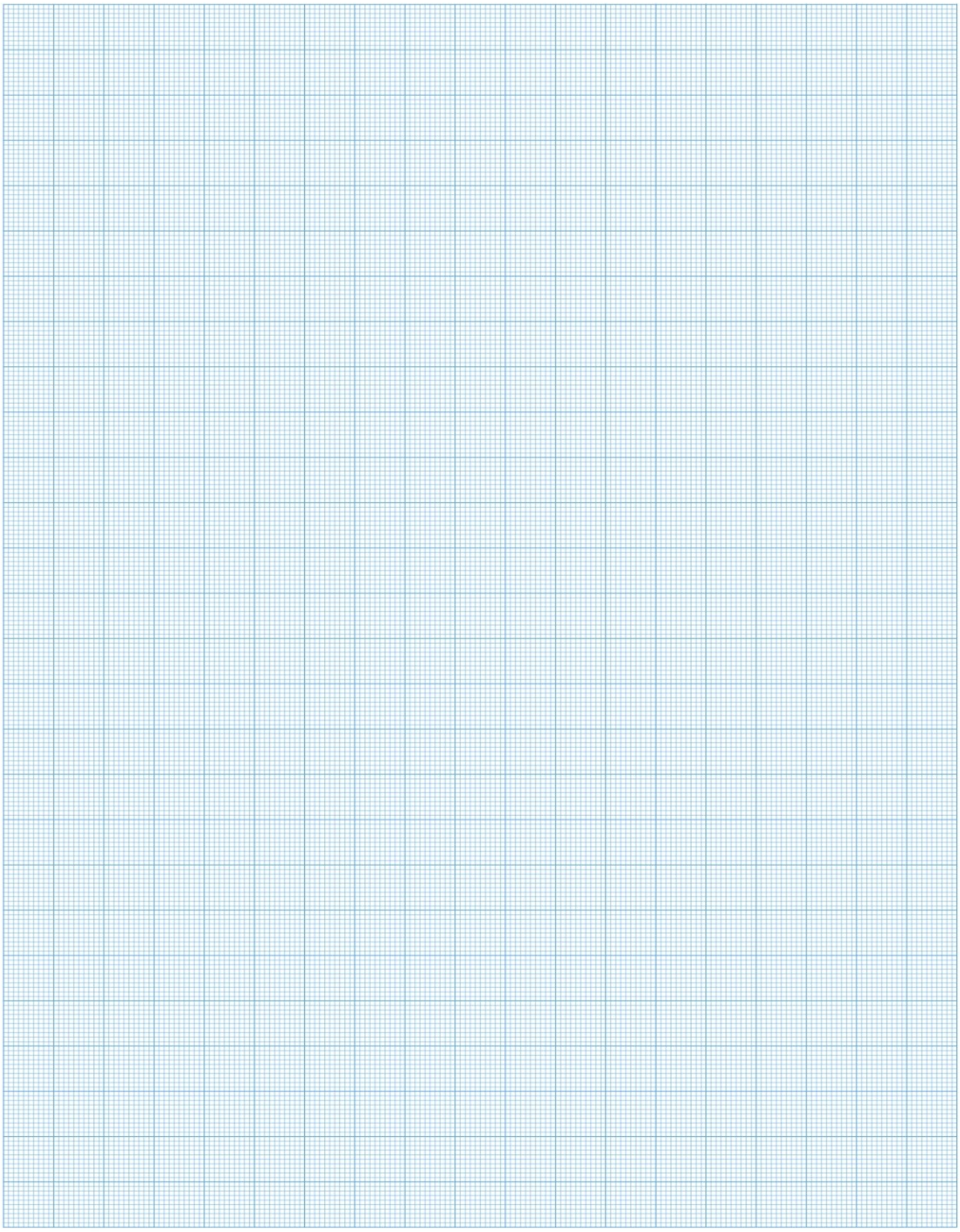
(3) The work function of _____ = …….. eV

Code	Experiment	Arrangement (5)	Reading (5)	Calculations (5)	Graph (10)	Understanding /Calculation (5)	viva (10)	Attendance (10)	Total (50)
P_9	Photoelectric Effect								

SIGN

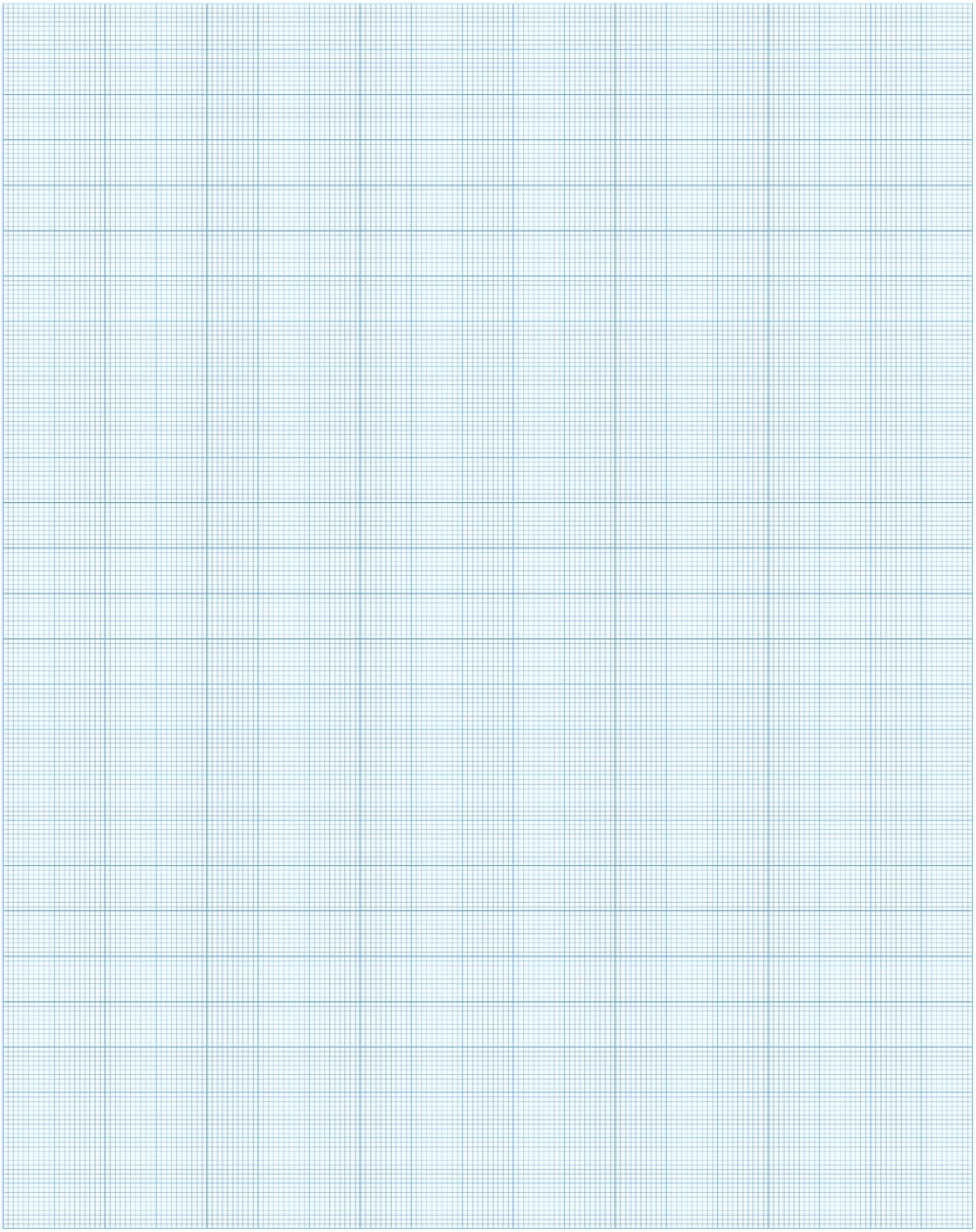
Scale: **X-axis: 1 cm = …….**

Y-axis: 1 cm = …….



Scale: **X-axis: 1 cm = ……**

Y-axis: 1 cm = ……



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Physics Laboratory Manual

Experiment-10 [P_10 (VLAB)]

Code	Objective of the experiment	Course Outcome
P_10 (VLAB)	To find the Young's modulus of the given wood bar by uniform bending using pin and microscope method.	CO-1

⌘ Website link: https://vlab.amrita.edu/?sub=1&brch=280&sim=550&cnt=2

❖ **Objective:** To find the Young's modulus of the given wood bar by uniform bending using pin and microscope method.

❖ **Components:** Pin and Microscope arrangement, Scale, Vernier callipers, Screw gauge, Weight hanger, Material bar or rod.

❖ **Equation:**

In uniform Bending, the young modulus of the material of the bar is given by

$$Y = \frac{3mgpl^2}{2bd^3e}$$

m - Mass at each end of the bar (for which elevation of bar is e)

g - Acceleration due to gravity.

p - Distance between the point of suspension of the mass and nearer knife edge.

I - the length of the bar between the knife edges.

b – breadth of the wood bar

d – thickness of the wood bar

e - Elevation of the midpoint of the bar for a mass m at each end.

❖ **Procedure:**

- Select the environment and material for doing experiment.
- Adjust length, breadth and thickness of the material bar using sliders on the right side of the simulator. Adjust the parameters as per observations.

- Fix the distance between knife edges and weight hangers using sliders.
- Focussing the microscope using focussing knob and adjusting the tip of the pin coincides with the point of intersection of the cross wires using left and top knobs on microscope respectively.
- Readings are noted using the microscope reading for 50 g. Zoomed part of microscope scale is available by clicking the centre part of the apparatus in the simulator.
- Weights are added one by one say 100g, then pin moves downwards while viewing through microscope. Again, adjust the pin such that it coincides exactly with the cross wire.
- Note the microscope reading in observation table and repeat for 10 reading by increasing and decreasing the weights.
- **The total reading of the microscope is given by the formula: (MSR) + (VSR * LC).**
- **MSR (Main Scale Reading) is the value on the main scale that coincides exactly with the zero of the vernier scale. VSR (Vernier Scale Reading) is the division on the vernier scale that aligns precisely with a division on the main scale. LC is the least count of the microscope.**

❖ Observations:

1. Distance between two consecutive division on main scale = ... cm
2. Number of divisions on Vernier scale = ...
3. L.C = Distance between two consecutive division on main scale/Number of divisions on vernier scale = ...cm
4. Acceleration due to gravity ***g = 980 cm/s²***
5. Breadth of the wood bar ***b = 1 cm***
6. Thickness of the wood bar ***d = 0.4 cm***
7. Distance between the point of suspension (Weight hangers' distance)

   p = **6*0 cm***
8. The length of the bar between the knife edges (Knife edge distance)

   l **= 20 cm**

❖ Observation Table:

Sr. No.	Mass of weight hanger (Load) gm	Telescope Reading (cm)							Elevation for Load m = 100 gm e (cm)	Mean e cm	l^2/e
		Loading			Unloading			Mean of Total Reading			
		MSR	VSR	Total Reading	MSR	VSR	Total Reading				
1	**50**										
2	**100**										
3	**150**										
4	**200**										
5	**250**										
6	**300**										
7	**350**										
8	**400**										
9	**450**										
10	**500**										

❖ Calculation:

The young modulus of the wood bar is given by, Y = $\frac{3\ m\ g\ p\ l^2}{2\ b\ d^3 e}$

Result:

Young's modulus of the given wood bar Y = ... N/m^2

Code	Experiment	Arrangement (10)	Reading (10)	Calculations (5)	Graph (0)	Understanding /Calculation (5)	viva (10)	Attendance (10)	Total (50)
P_10	Yong Modulus (by bending of beam)								

SIGN