Notes For Bachelor of Science (TU)

BSC NOTES PDF COLLECTION

PHYSICS PRACTICAL SHEETS

Date ....
Class BSc. Second Year
Roll No. 235
Shift Morning

Amrit Campus

Experiment No. 01
Group PSM
Sub. R
Set A

Object of the Experiment (Block Letter)

TO DETERMINE THE WAVELENGTH OF SODIUM LIGHT BY USING A PLANE DIFFRACTION GRATING.

Apparatus required:
(1) A spectrometer (2) an eye piece (3) a sodium lamp (4) a diffraction grating with clamping arrangement, etc.

Theory:
When a parallel beam of monochromatic light is incident normally on a grating, the transmitted light gives rise to primary maxima in certain directions given by the relation:

$(a+b)\sin\theta_n = n\lambda$

where, 'a' is the width of transparency
'b' is that of an opacity
$\theta_n \rightarrow$ angle of diffraction for the nth order maxima.
$\lambda \rightarrow$ wavelength of the light.

Observations:
30 small division of vernier scale coincides with 29 divisions of main scale.
1 small division of v.s coincides with $\frac{29}{30}$ div. of M.S.
$\therefore$ Vernier Constant (V.C) $= \left(1-\frac{29}{30}\right) \times$ one smallest division of main scale

$= \left(1-\frac{29}{30}\right) \times 0.5^\circ$

$= 0.01667^\circ$

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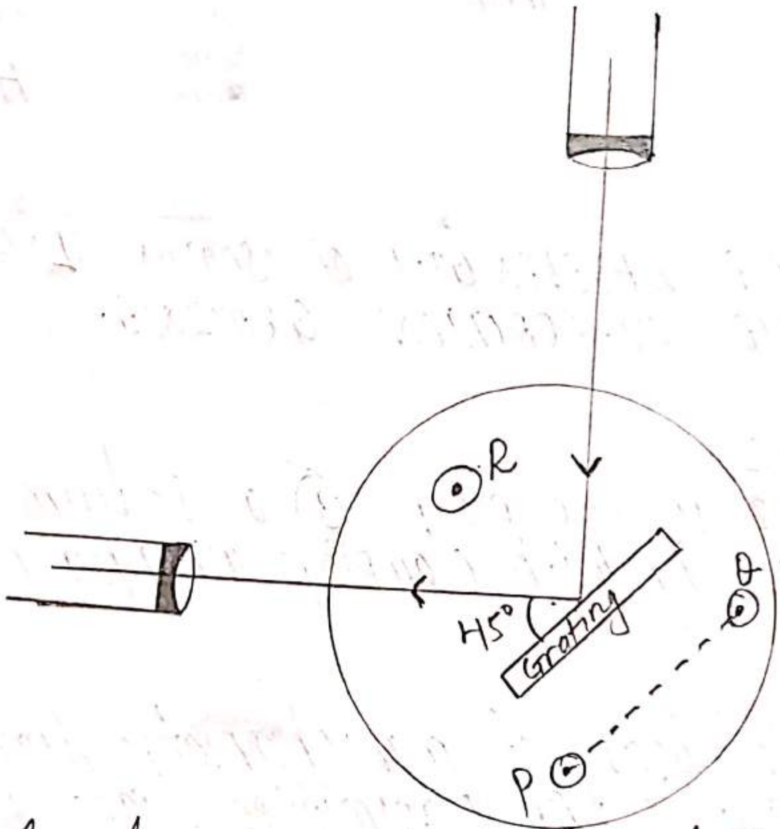

fig: diagram set up for diffraction grating

Number of lines per inch grating (N) = 2540 cm
∴ Grating Element: $(a+b) = \frac{2.54}{N} = 0.001\ cm = 10^{-5}\ m$

Observation Table:

Order of spectrum	Vernier	Telescope Reading Left	Right	Direct	Angle of diffraction Left	Right	Mean
1st order	V1	173.15	180.08	177.12	3.97	2.96	$\theta_1 = 3.95^0$
	V2	357.04	360.01	363.05	6.01	3.07	
2nd order	V1	170.6	184.17	177.12	6.52	7.04	$\theta_2 = 6.775^0$
	V2	350.07	363.68	353.63	3.56	9.80	

Calculation:

1st order spectrum: $\lambda_1 = (a+b)\sin\theta_1$
$= 10^{-5} \times \sin 3.95^0$
$\therefore \lambda_1 = 6.88 \times 10^{-7}\ m$

2nd order spectrum: $\lambda_2 = \frac{(a+b)\sin\theta_2}{2}$

$= \frac{10^{-5} \times \sin 6.775^0}{2}$

$\therefore \lambda_2 = 5.89 \times 10^{-7}\ m$

∴ Mean wavelength $(\lambda) = \frac{\lambda_1 + \lambda_2}{2}$

$= \frac{6.88 \times 10^{-7} + 5.89 \times 10^{-7}}{2}$

$= 6.38 \times 10^{-7}\ m$

Percentage error:
Observed value: $6.38 \times 10^{-7}\ m$
Standard value: $5.9 \times 10^{-7}\ m$

% error = $\left|\frac{5.9\times10^{-7} - 6.38\times10^{-7}}{5.9\times10^{-7}}\right| \times 100\%$

$= 8.13\%$

Result:

Hence, the wavelength of the sodium light was found to be 6.38×10^{-7} m

Precaution:

1. The apparatus must be handled properly.
2. The experiment must be performed in a dark room.
3. The light should fall on the whole of the grating surface.

PHYSICS PRACTICAL SHEETS

Date: 2075/12/21
Class: B.Sc. 2nd year
Roll No.: 235
Shift: Morning
Amrit Campus
Experiment No. 02
Group: PSM
Sub. R
Set: A

Object of the Experiment (Block Letter)

TO STUDY THE COMMON EMITTER CHARACTERISTICS OF A NPN TRANSISTOR.

Apparatus Required:
a) NPN transistor b) a voltmeter c) a potentiometer
d) key e) Connecting wires etc.

Theory:
The main aim of the experiment is to study the relation between:
a) Relation between I_B (base current) and V_{BE} at constant value of the collector voltage. this is known as input characteristics.
b) Relation between I_C (collector current) and V_{CE} (potential difference between collector and emitter) at a constant value of the base current. This is called output characteristics. i.e:

$$I_B = I_E - I_C$$

i.e: $I_E = I_B + I_C$ — eqn (1)

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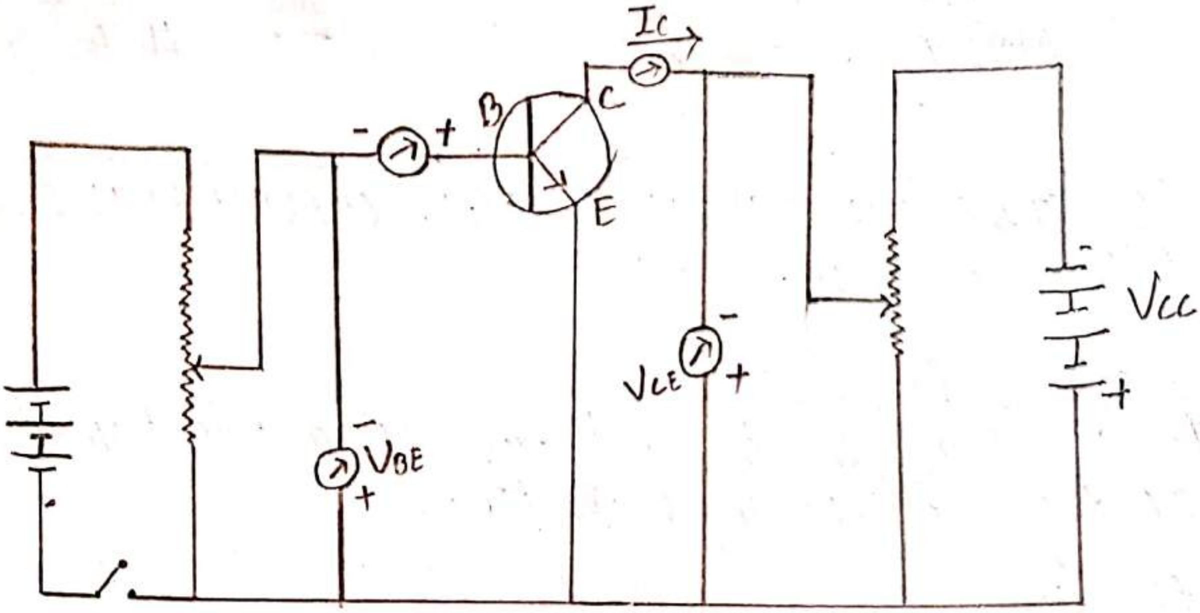

fig: Circuit diagram showing common emitter characteristics of NPN transistor

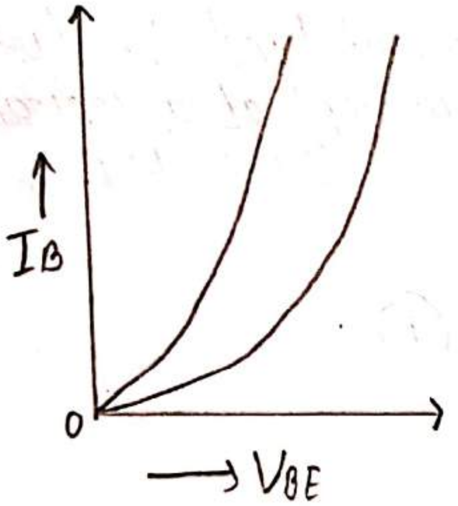

fig: Input characteristics

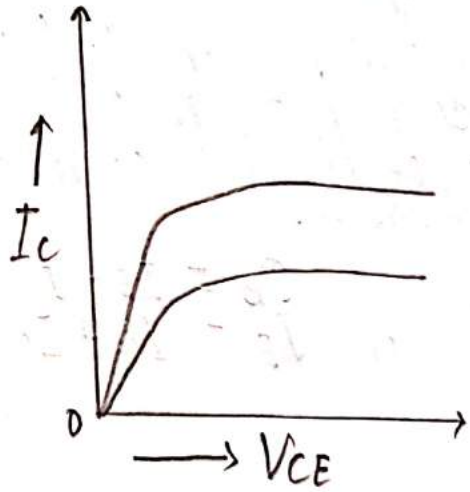

fig: Output characteristics

Observation Table:

Table (1) : Input characteristics (graph betwn I_e and V_{eb})

S.No	Base voltage (V_{be})	Base current		
		$V_{ce} = 1V$	$V_{ce} = 2V$	$V_{ce} = 3V$
1	0.1V	0	0	0
2	0.2V	0	0	0
3	0.3V	0	0	0
4	0.4V	2	0	0
5	0.5V	4	8	0
6	0.6V	20	20	10
7	0.7V	34	35	22
8	0.8V	59	46	40
9	0.9V	78	65	62
10	1V	-	85	78

Table (2): for output characteristics (graph between I_c and V_{ce})

S.No.	Collector voltage (V_{ce})	Collector current (I_C) (µA)	
		$I_b = 60\mu A$	$I_b = 90\mu A$
1	1V	14	20
2	2V	18	26
3	3V	20	30
4	4V	20	30
5	5V	22	32
6	6V	22	34
7	7V	22	34
8	8V	22	34

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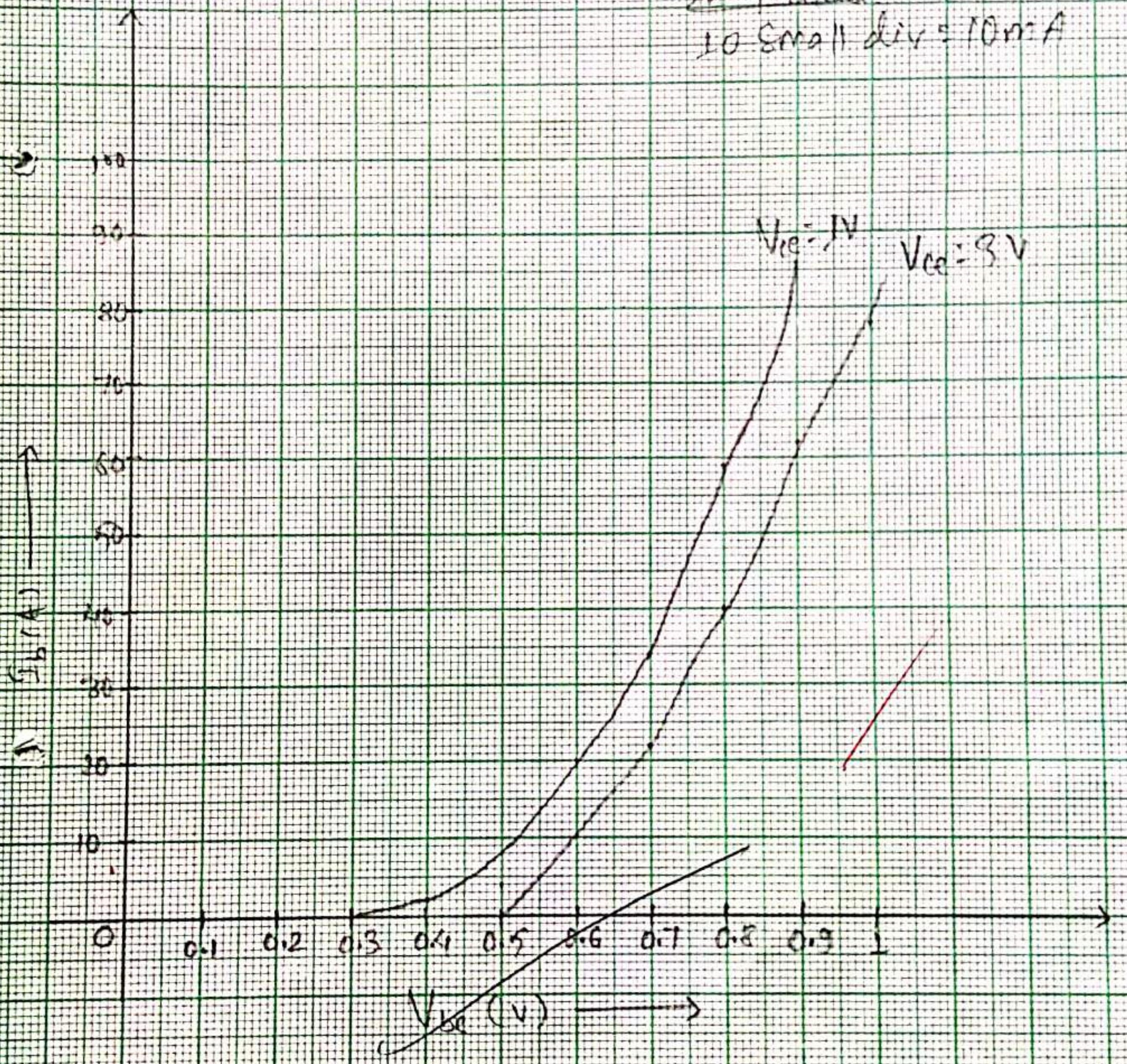
graph for input characteristics

In X-axis:
10 small div = 0.1V
In Y-axis:
10 small div = 10mA



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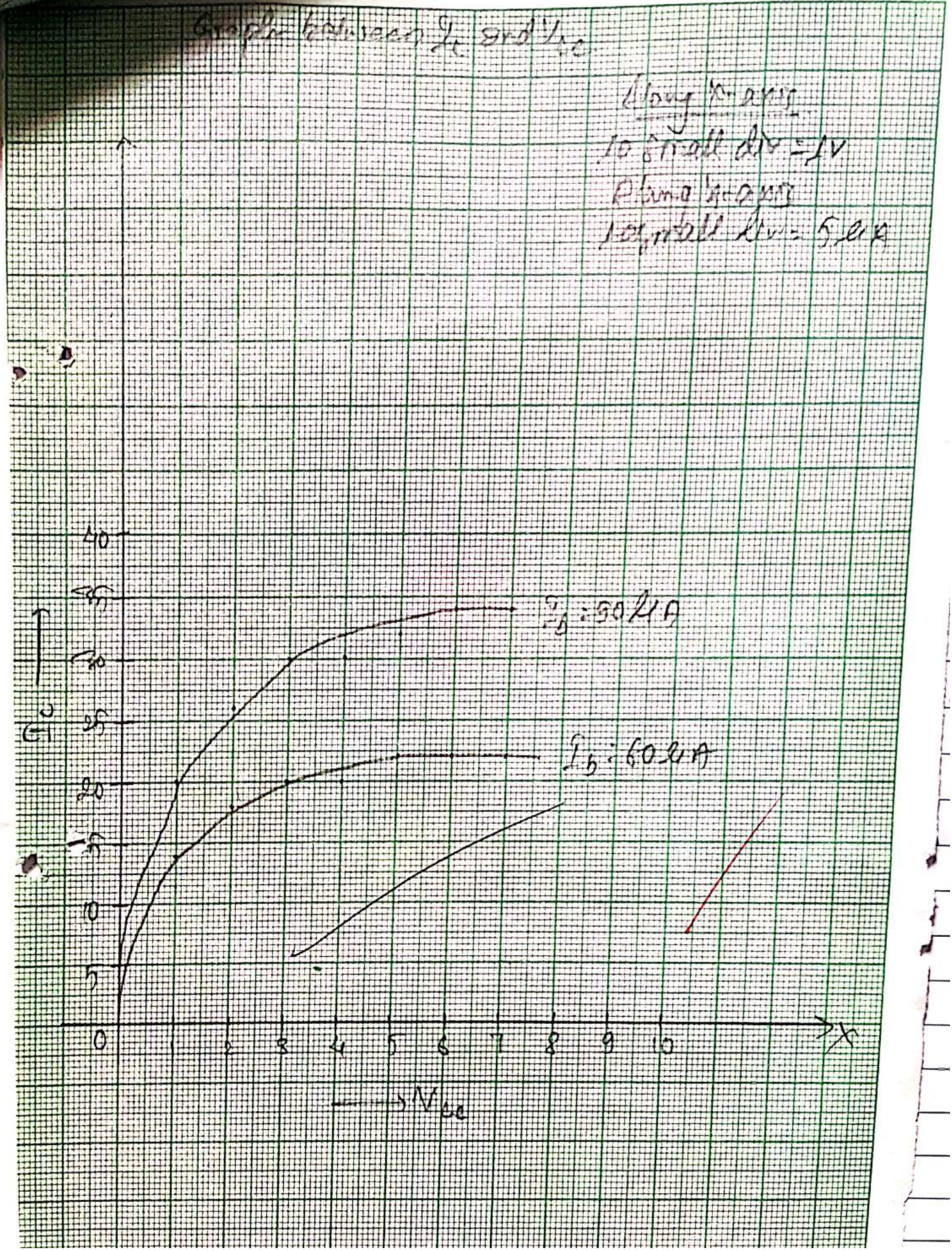
Graph between I_c and V_{ce}



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Result: The input and output characteristics of NPN transistor is studied and the graph was presented.

Precautions:

(a) The apparatus must be handled carefully.
(b) The connection should be done properly.
(c) The datas should be noted properly.

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PHYSICS PRACTICAL SHEETS

Date 2075/12/11 Amrit Campus Experiment No. 3
Class BSc 2nd Year Group PSM
Roll No. 235 Sub. R
Shift Morning Set A

Object of the Experiment (Block Letter)

TO VERIFY THE TRUTH TABLES OF OR AND NOR LOGIC GATES.

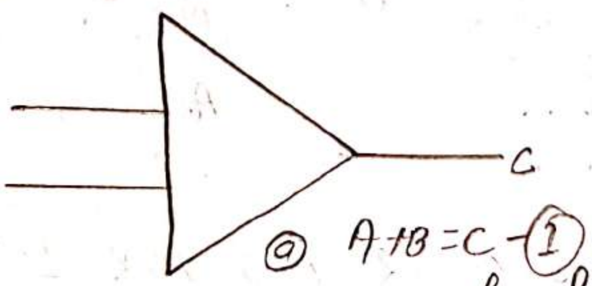
Apparatus required:
OR gate and NOR gate, Resistance, Transistor, Gate kit, wires

Theory:
The electronic symbol for two-input OR gate is shown in fig (a) and equivalent switching circuit in fig (b). The two graphs have been marked as A and B and the output at C. It is worth reminding the reader that as per Boolean algebra the three variables A, B and C can have only one of the two values i.e either 0 or 1.
The Boolean eqn for OR gate is; $A+B \Rightarrow C$ — (I)
In fact, it is a NOR-OR gate. It can be made out of an OR gate by connecting an inverter in its output as shown in fig (c). The output equation is given by;

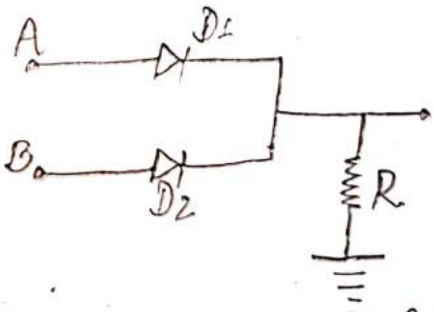
$$C = \overline{A+B} \quad \text{— (II)}$$

Truth table for OR gate:

A	B	Y=A+B
0	0	0
1	0	1
0	1	1
1	1	1

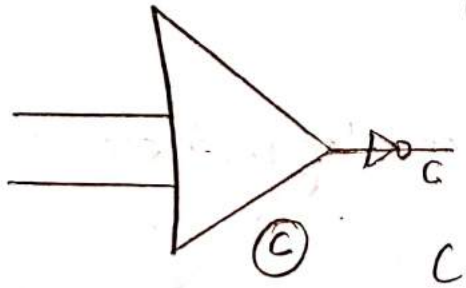


(a) $A+B=C$ — (I)



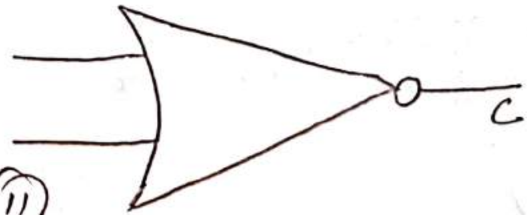
OR Gate

fig: Symbol and Circuit of OR Gate



(c)

$C = \overline{A+B}$ — (II)



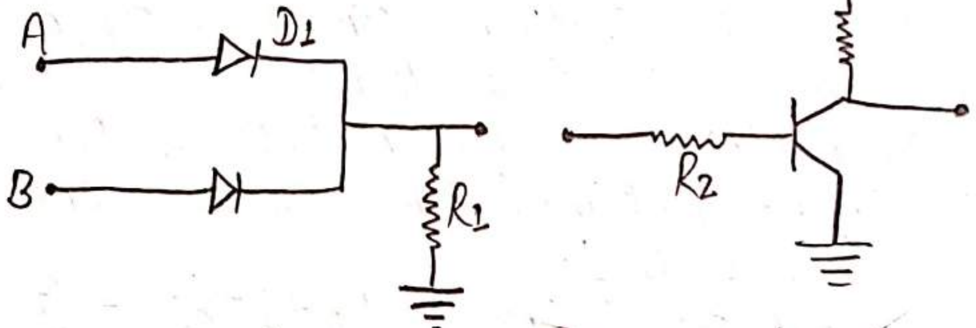


fig: NOR Gate

Truth table for NOR gate:

A	B	$Y = \overline{A+B}$
0	0	1
1	0	0
0	1	0
1	1	0

Observation Table:

For OR Gate:

A	B	$Y = A+B$
0	0	0
5	0	4.5
0	5	4.5
5	5	4.5

For NOR Gate

A	B	$Y = \overline{A+B}$
0	0	2.5
5	0	0.5
0	5	0.5
5	5	0.5

Result:
Hence the truth table for the OR gate and NOR gate were verified.

PHYSICS PRACTICAL SHEETS

Date 2075/12/11 | Amrit Campus | Experiment No. 4
Class BSC. 2nd Year | | Group PSM
Roll No. 235 | | Sub. P
Shift Morning | | Set A

1/12/12

Object of the Experiment (Block Letter)

TO STUDY THE TEMPERATURE DEPENDENCE OF A GIVEN SEMI- CONDUCTOR.

Apparatus required;
(a) A junction diode (b) A micro-ammeter (c) a thermometer
(d) AC power supplier (e) Connecting wires

Theory;
Semi-conductor:
Transistors and diodes are made from a lot of crystals The conductance and insulators are familier examples of semi-conductor. Silicon and Germanium are its examples. The two types of semi-conductor are;
(a) N- type Semi-conductor and
(b) P-type Semi-conductor

The N- type Semiconductor is made by pentavalent impurities atom on a pure semi-conductor and P-type semiconductor is made by trivalent impurities atom on pure semiconductor.

When temperature of semi-conductor increases electron in valence band can exists and current can be conducted through semi-conductor when electric field is applied.

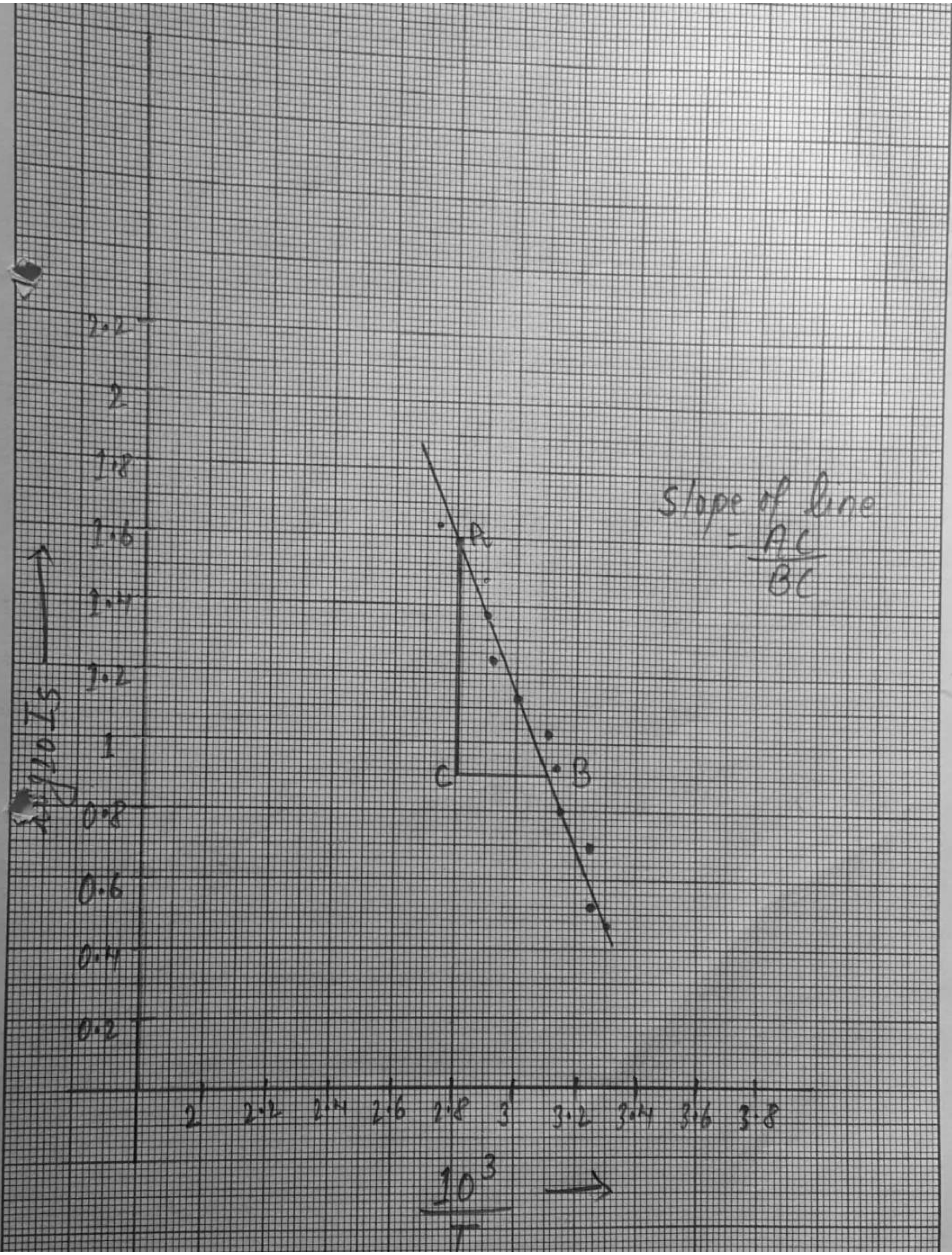
Observations

S.N.	Current (I_s) in (μA)	Temperature ($°C$)	Tempr T K	$\frac{10^3}{T}$	$\log_{10} I_s$
1	37	88	361	2.770	1.57
2	36.5	84	357	2.801	1.56
3	35	80	353	2.833	1.54
4	29	76	349	2.865	1.46
5	26	72	345	2.895	1.41
6	22	68	341	2.933	1.34
7	19	64	337	2.967	1.27
8	17	60	333	3.003	1.23
9	15	56	329	3.039	1.17
10	13	52	325	3.077	1.11
11	11	48	321	3.115	1.04
12	8	44	317	3.155	0.903
13	7	40	313	3.195	0.845
14	6	36	309	3.236	0.778
15	5	32	305	3.279	0.699
16	4	28	301	3.223	0.602
17	3	24	297	3.367	0.477

The slope of the line from graph $= \frac{AC}{BC}$

$$= \frac{1.5 - 0.9}{3.1 - 2.8}$$

$$= 2$$



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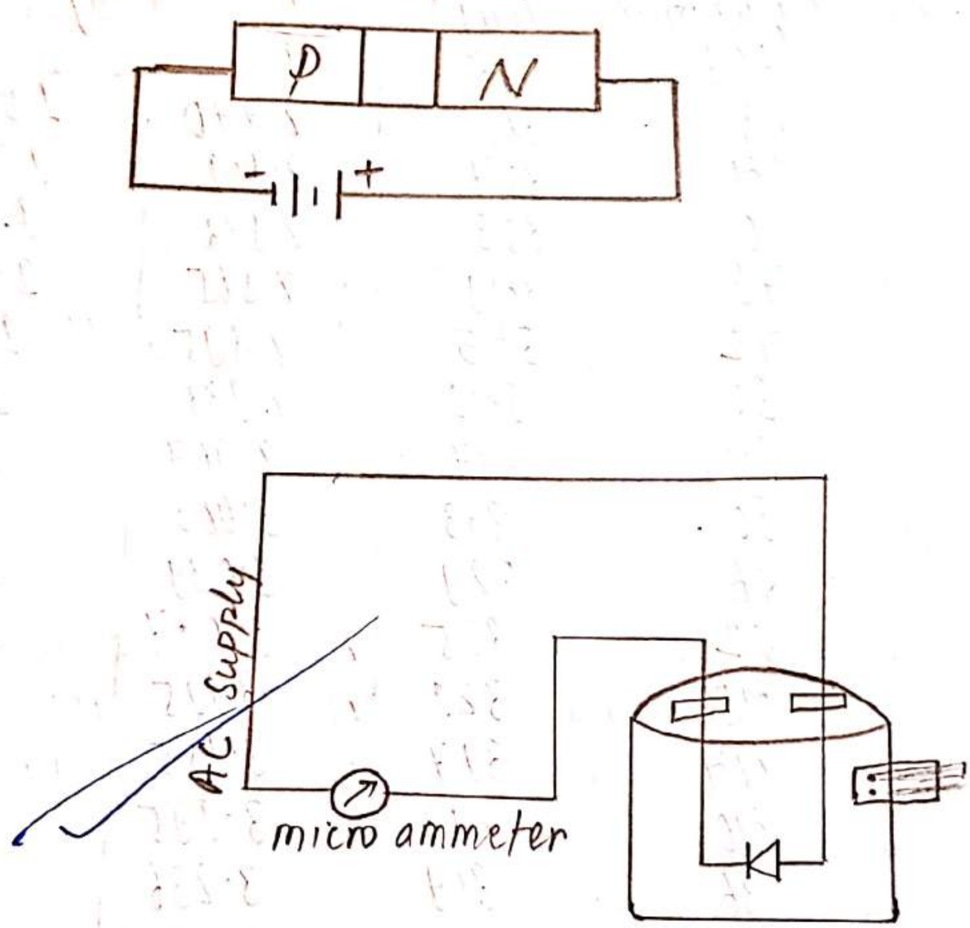

Fig: Band gap of semiconductor and circuit diagram to show tempr dependence of semi-conductors.

$\therefore$ Band gap $\Delta E = \frac{\text{Slope}}{5.036}$

$= \frac{2}{5.036}$

$= 0.39\ eV$

Result:

Hence, the tempr dependence of the given semiconductor is studied in the lab and its band gap was found to be 0.39 eV.

Precautions:

1. Readings of current must be taken when the temp'r is decreasing.
2. Reading of current and tempr must be taken simultaneously.
3. Apparatus must be handled carefully.

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PHYSICS PRACTICAL SHEETS

Date 2075/12/11
Class BSC Second Year
Roll No.
Shift Morning

Amrit Campus

Experiment No. 05
Group PSM
Sub. R
Set B

Object of the Experiment (Block Letter)

TO FIND THE REFRACTIVE INDEX OF MATERIAL OF A PRISM USING A SPECTOMETER.

Apparatus required;
a spectometer, a spirit level, sodium lamp, prism, an eye-piece, an electric lamp, etc.

Theory:
When a ray of light passes through a prism it suffers refraction as shown in figure. If 'EF' is incident ray, 'FG' is the refracted ray and 'GH' the emergent ray, then the angle IDH is the angle of deviation. It is the angle between the direction of incident ray and the emergent ray. The angle of deviation depends upon the angle of incidence; for a certain value of angle of incidence, the angle of deviation is minimum. If D_M denotes the angle of minimum deviation for the given prism of refracting angle A, then the refractive index is given by

$$\therefore \mu = \frac{\sin[(A + D_M)/2]}{\sin A/2}$$

Observations:
30 small divisions of v.s. coincides with 29 divisions of M.S.
1 division of v.s. coincides with 29/30 divisions of M.S.
$\therefore$ vernier constant (V.C.) $= (1 - 29/30) \times 1$ smallest div. of M.S.
$= \left(1 - \frac{29}{30}\right) \times 0.5^\circ = 0.01667^\circ$

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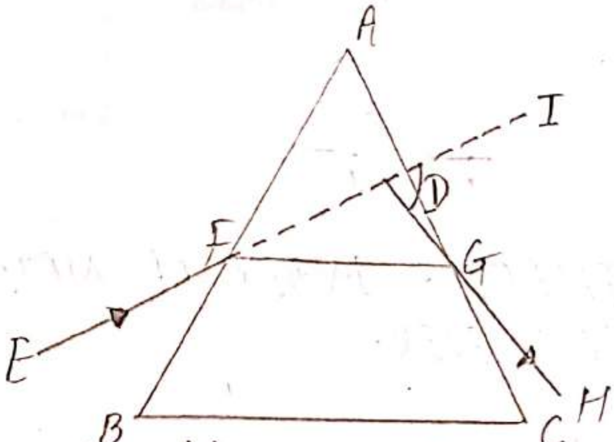

fig: Deviation through prism

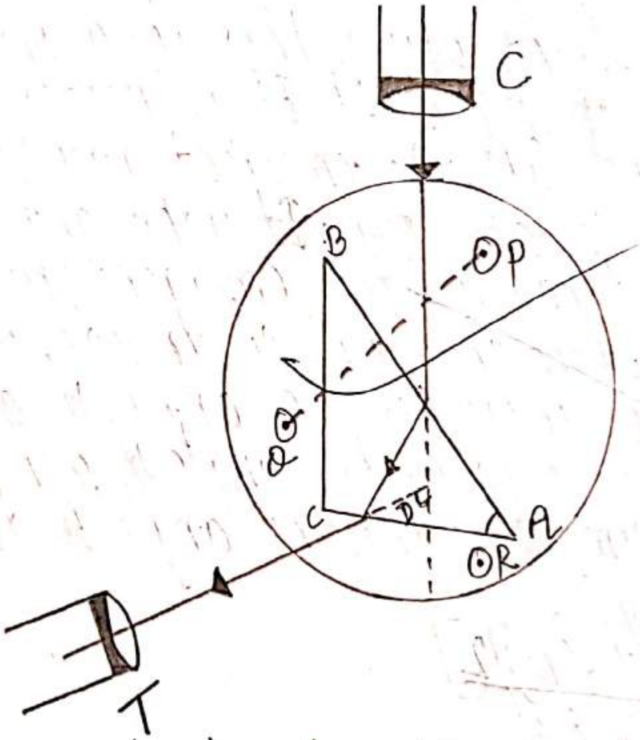

fig: Exp. Showing deviation of light through prism.

Angle of prism :(Table: 1)

Sl.	Vernier V1 Telescope Reading		Difference (θ)	$A=\theta/2$	Vernier V2 Telescope Reading		Difference (θ)	$A=\theta/2$
	1st Face	2nd Face			1st Face	2nd Face		
1	34.683	154.61	119.927	59.96	213.65	334.10	120.45	60.225°
2	35.45	156.23	120.78	60.39	211.12	332.12	121	60.5

Angle of minimum deviation :(Table 2)

Sr.	Vernier V1 Telescope Reading		Difference	Vernier V2 Telescope Reading		Difference
	Min Dev.	Direct	Dm	Min Dev.	Direct	Dm
1	81.24	42.58	38.66	260.66	223.66	37
2	79.36	41.06	38.30	258.73	222.23	36.5

∴ Angle of the prism (A) $= \frac{60.225+60.5+59.96+60.39}{4}$°

$= 60.26°$

∴ Angle of minimum deviation:

$= \frac{38.66+38.30+37+36.5}{4}$

$= 37.61°$

Calculation:

Refractive index of the prism (μ) $= \frac{\sin\left(\frac{A+D_m}{2}\right)}{\sin A/2}$

$= \frac{\sin\left(\frac{60.26+37.6}{2}\right)}{\sin\left(\frac{60.26}{2}\right)}$

or $\mu = \frac{\sin 48.93}{\sin 30.26}$

$\therefore \mu = 1.501$

Result:

Hence the refractive index of the prism was found to be 1.501.

Conclusion:

The refractive index of the prism was found in the labrotary by using spectrometer.

Precautions:

a) The apparatus must be handled properly.
b) The experiment should be performed in the dark room.

Percentage Error:

$\% \text{ error} = \frac{1.501 - 1.5}{1.5} \times 100\%$

$= 0.06\% \text{ error}$

PHYSICS PRACTICAL SHEETS

Date 2075/12/14 Amrit Campus Experiment No. 06
Class BSc 2nd Year Group PSM
Roll No. 235 Sub. R
Shift Morning Set B

Object of the Experiment (Block Letter)

TO STUDY THE VARIATION OF OUTPUT POWER WITH LOAD AND HENCE DETERMINE THE MAXIMUM OUTPUT POWER AND INTERNAL RESISTANCE OF CELL.

Apparatus required:
(1) Resistance Box (2) Copper wire (3) Ammeter (4) Battery (5) key

Theory:
The output power of the source is maximum when the external resistance and internal resistance are equal. This can be proved theoretically as follows;
The output power or the power delivered by a source varies according to the external resistance. The aim of the experiment is to find out the maximum power delivered by the source and calculate its internal resistance.
Power (P) = I X V = I^2R
The variation of output power with the external resistance R, is given by;

$$\frac{d(P_{out})}{dR} = \frac{d(I^2R)}{dR} = \frac{d\left[\left(\frac{E}{R+r}\right)^2 R\right]}{dR}$$

$$= E^2 \frac{d\left[\frac{R}{(R+r)^2}\right]}{dR}$$

$$= E^2 \times \frac{\left[(R+r)^2\frac{dR}{dR} - R\frac{d(R+r)^2}{dR}\right]}{(R+r)^4}$$

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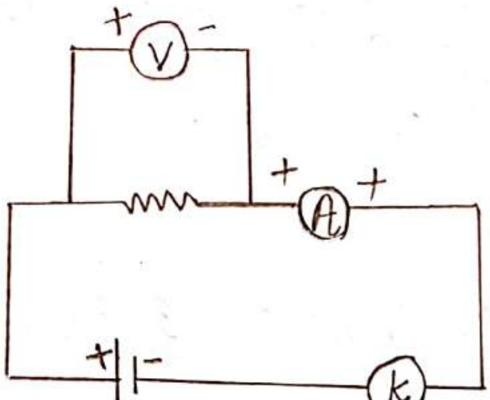

fig: Circuit arrangement

For maximum output power $\frac{dP_{out}}{dR} = 0$

i.e. $E^2 \times \left[\frac{(R+r)^2 - 2R(R+r)}{(R+r)^4} \right] = 0$

or $(R+r)^2 - 2R(R+r) = 0$

or $R+r = 2R$

or $r = R$

Efficiency $(\eta) = \frac{P_{output}}{P_{input}} = \frac{VI}{IE} = \frac{V}{E}$

$= \frac{E - Ir}{E} = 1 - \frac{Ir}{E}$

$= 1 - \frac{E}{R+r} \cdot \frac{r}{E}$

$= 1 - \frac{r}{R+r}$

or $\frac{R+r-R}{R+r} = \frac{R}{R+r}$

$\boxed{\therefore \eta = \frac{R}{R+r}}$

Observations:

10 division of voltmeter = 0.5V

1 division of voltmeter = 0.05V

10 divisions of ammeter = 2mA

1 divisions of ammeter = 0.2mA

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Observation table:

External Resistance ($R\Omega$)	Voltage (V)	Current (I)A	Pout = VI watt	$\eta = \frac{R}{R+r}$	Mean η
200	0.5	3.4×10^{-3}A	1.7×10^{-3}	8.33%	
400	0.8	3.2×10^{-3}A	2.56×10^{-3}	15.38%	
600	1	3×10^{-3}	3×10^{-3}	21.42%	
1000	1.35	2.7×10^{-3}	3.645×10^{-3}	26.67%	
1200	1.45	2.6×10^{-3}	3.77×10^{-3}	31.25%	
1400	1.55	2.5×10^{-3}	3.875×10^{-3}	35.29%	32.903%
1600	1.65	2.44×10^{-3}	4.026×10^{-3}	38.89%	
1800	1.7	2.4×10^{-3}	4.08×10^{-3}	42.105%	
2000	1.75	2.36×10^{-3}	4.13×10^{-3}	45%	
2200	1.8	2.30×10^{-3}	4.14×10^{-3}	47.6%	
2400	1.85	2.12×10^{-3}	4.507×10^{-3}	50%	

From the table $R = r = 2200\,\Omega$ at maximum power

Graphs

1. V vs R 2. I vs R 3. Pout vs R 4. η vs R

Result:

Hence, the internal resistance of the cell is found to be $2200\,\Omega$ and the maximum power in the circuit is $P_{max} = 4.14\times10^{-3}$ watts

Conclusion:

In this way, the variation of output power with the load is studied and the internal resistance of the cell was calculated. Also the maximum power output is determined

Precautions:

1. Reading should be taken properly.
2. Apparatus must be handled safely.

R

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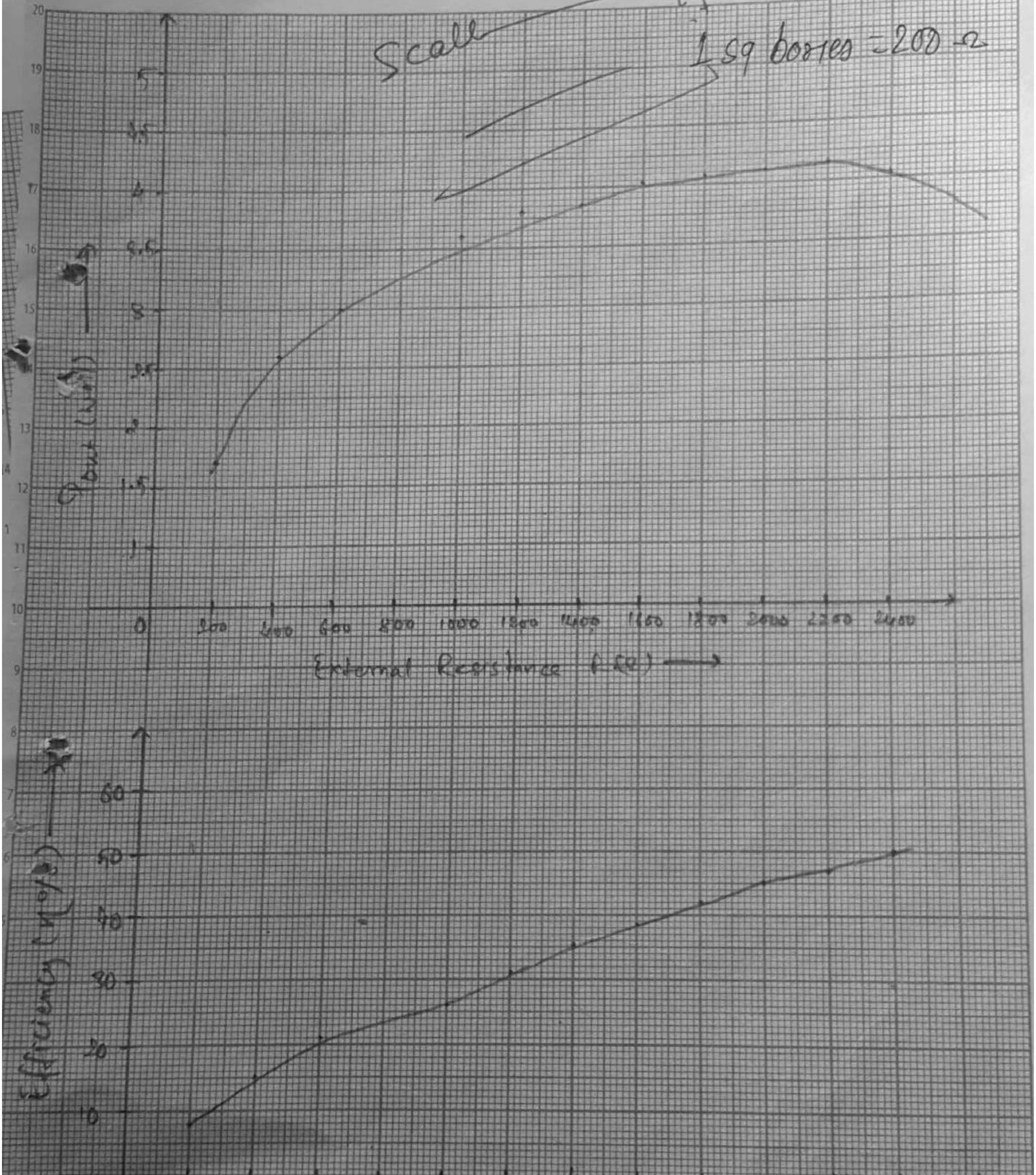

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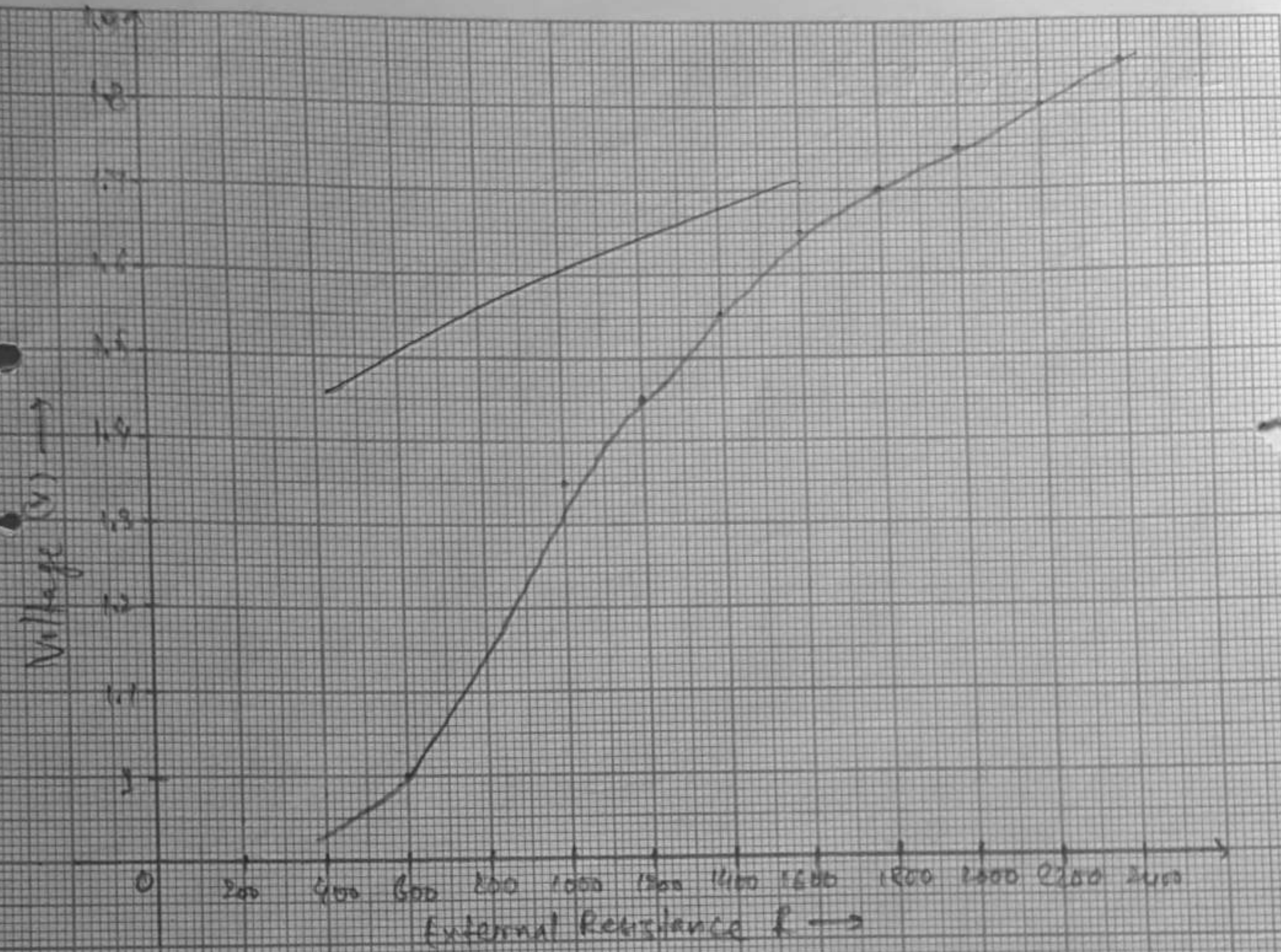


PHYSICS PRACTICAL SHEETS

Date 2075/12/23 Amrit Campus Experiment No. 07
Class BSc 2nd Year Group PSM
Roll No. 235 Sub. R
Shift Morning Set B
Object of the Experiment (Block Letter)

12/28

TO VERIFY THE TRUTH TABLE OF AND and NAND LOGIC GATES.

Apparatus Required:
→ AND and NAND gate, Resistance, Connecting wires, Transistor, Gate kit etc.

Theory: The electronic symbol for two input AND gate is shown in fig (a) and equivalent switching circuit along fig (a). The two graphs between marked as A and B and the output at C. As per Boolean algebra, the three variables have only the two values i.e either 0 or 1.
The Boolean eqn for AND gate is; $A \cdot B \Rightarrow C$ — eqn (I)

In fact, NAND gate is a NOT-AND gate. It can be obtained by connecting a NOT gate in the output of an AND gate as shown in fig. It's Boolean eqn is;
$C = \overline{AB}$ — eqn (II)

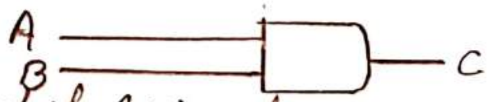
Truth tables

AND GATE

A	B	$C = A \cdot B$
0	0	0
0	1	0
1	0	0
1	1	1

NAND GATE

A	B	$C = \overline{AB}$
0	0	1
0	1	1
1	0	1
1	1	0



Symbol of AND gate

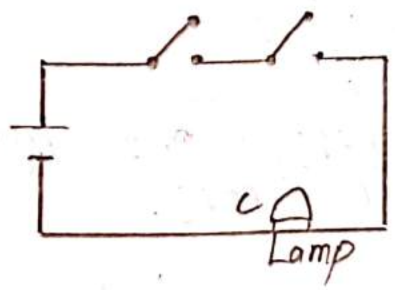
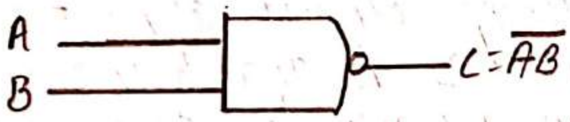


fig (a) Circuit for AND Gate



Symbol of NAND Gate

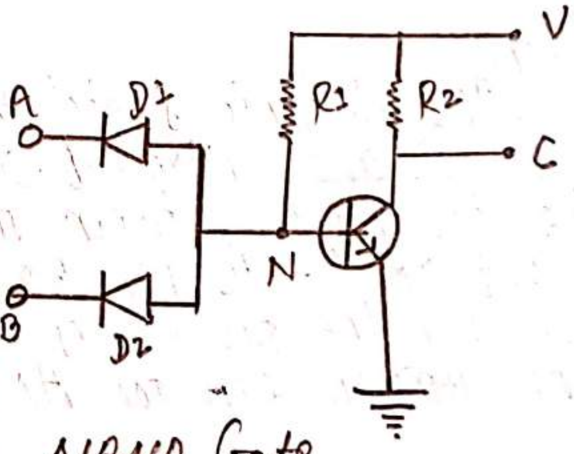


fig (b) Circuit for NAND Gate

Observation table:

For AND gate:

A	B	$Y = A \cdot B$
0	0	0.4
0	4.6	0.4
4.6	0	0.4
4.6	4.6	4.2

For NAND gate:

A	B	$Y = \overline{A \cdot B}$
0	0	3.8
0	4.6	3.8
4.6	0	3.8
4.6	4.6	0

Sudw 12/29

Result:
Hence, the truth tables of AND and NAND logic gates were verified.

PHYSICS PRACTICAL SHEETS

Date 2075/12/19 Amrit Campus Experiment No. 8
Class B.Sc 2nd Year Group PSM
Roll No. 235 Sub. R
Shift Morning Set B

Object of the Experiment (Block Letter)

Yogh 12-12

TO DETERMINE THE DISPERSIVE POWER OF THE MATERIAL OF THE GIVEN PRISM.

Apparatus Required:
A spectometer, A glass prism, An eye-piece, sodium lamp etc.

Theory:
The dispersive power 'ω' for the material of the prism is given by the equation:

Dispersive power $(\omega) = \frac{\mu_v - \mu_r}{\mu - 1}$; $\mu = \frac{\mu_v + \mu_r}{2}$

Where;
μ_v is the refractive index for violet light, μ_r for red light and 'μ' is the mean refractive index. For a source like the hydrogen discharge tube, dispersive power is defined by the eqn

$$\omega = \frac{\mu_F - \mu_C}{\mu_D - 1}$$

where μ_F, μ_C and μ_D are the refractive indices for F(4861 A°) and C(6563 A°) lines of hydrogen spectrum and D (5893 A°)

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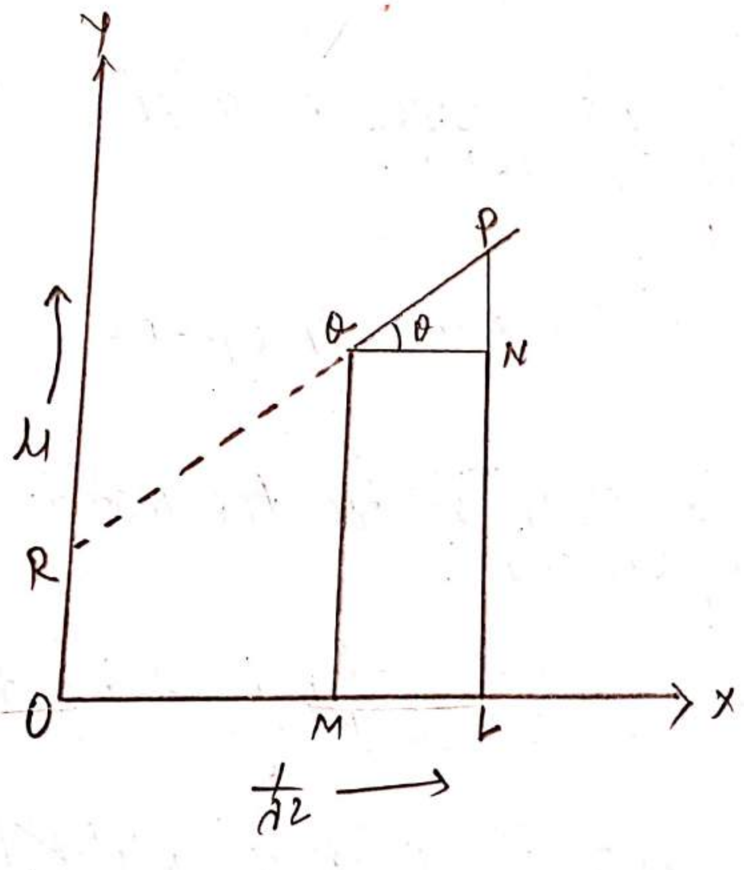

Y
P
Q
θ
N
μ
R
O
M
L
X
1/λ2

Observations:

30 divisions of V.S. coincides with 29 divisions of M.S.
1 division of V.S. coincides with $\frac{29}{30}$ divisions of M.S.

$\therefore$ Vernier constant (V.C.) = $\left(1 - \frac{29}{30}\right)$ x value of smallest div of M.S.

$= \left(1 - \frac{29}{30}\right) \times 0.5^\circ$

$\therefore$ VC = 0.0166°

Observation Table:

For minimum deviation of red and violet light:

Color of spectral line	Vernier (V1) M.S. (a)	V.S. (b)	a+bxV.C.	Mean	Vernier (V2) M.S. (a)	V.S. (b)	a+bxV.C.	mean	Total mean	Min^m deviation
Violet	77.5	8	77.62	92.37	257.5	11	257.67	272.5	182.44	$\delta m(V) = 21.49$
	107	8	107.12		287	20	287.32			
Red	70.5	4	70.57	89.25	250.5	14	250.72	269.4	188.61	$\delta m(V) = 25.31$
	107.5	15	107.74		288	5	288.08			
Direct	113.5	12	113.7	113.7	294	7	294.16	294.16	203.93	

For angle of prism:

S.N.	Vernier (V1) Telescope Reading 1st face	2nd face	Diffn (θ)	$A=\frac{\theta}{2}$	Vernier (V2) Telescope Reading 1st face	2nd face	Diffn (θ)	$A=\theta/2$
1	34.683	154.61	119.927	59.96	213.65	334.1	120.45	60.225
2	35.45	157.08	121.63	60.08	268.39	388.03	119.64	59.82

$\therefore$ Mean (A) = $\frac{59.96 + 60.08 + 60.225 + 59.82}{4}$

$\therefore$ Angle of prism (A) = 60.02°

Refractive index for violet light;

$$\mu_v = \frac{\sin\left(\frac{A + (\delta m)_v}{2}\right)}{\sin\left(\frac{A}{2}\right)} = \frac{\sin\left(\frac{60.02 + 21.49}{2}\right)}{\sin\left(\frac{60.02}{2}\right)}$$

$\therefore \mu_v = 1.30$

$\therefore$ Refractive index for red light

$$\mu_r = \frac{\sin\left(\frac{A + (\delta m)_r}{2}\right)}{\sin\left(\frac{A}{2}\right)} = \frac{\sin\left(\frac{60.02 + 15.31}{2}\right)}{\sin\left(\frac{60.02}{2}\right)}$$

$\therefore \mu_r = 1.22$

$\therefore$ Refractive index for mean light;

$$\mu = \frac{\mu_v + \mu_r}{2} = \frac{1.30 + 1.22}{2}$$

$\therefore \mu = 1.26$

$\therefore$ Dispersive Power of prism (ω) $= \frac{\mu_v - \mu_r}{\mu - 1}$

$$= \frac{1.30 - 1.22}{1.26 - 1}$$

$\therefore \omega = 0.30$

Result: Hence the dispersive power of the prism was found to be 0.30.

27/12/25

Precautions:

1. The apparatus must be handled carefully.
2. The experiment must be conducted in dark room.

PHYSICS PRACTICAL SHEETS

Date 2075/11/09 Amrit Campus
Class BSc Second Year
Roll No. 235
Shift Morning

Experiment No. 09
Group PSM
Sub. P
Set C

Object of the Experiment (Block Letter)

TO DETERMINE THE SPECIFIC ROTATION OF SUGAR SOLUTION USING LAURENT'S HALF SHADE POLARIMETER.

Apparatus required:
Laurent's Half-shade polarimeter, a sodium lamp, sugar, a balance, weight box, graduated cylinder, a funnel, an eye-piece, a glass rod, etc.

Theory:
If 'θ' is the optical rotation produced by 'l' decimetres of a solution and 'c' the concentration in gram per c.c., then specific rotation S at a given temperature 't' and corresponding to a wavelength λ is given by:

$$[S]_\lambda^t = \frac{\theta}{lc} = \frac{\text{Rotation in degrees}}{\text{Length in decimetres} \times \text{concentration in gm/cc}}$$

Observations:

Weight of Sugar = 10 gm

Volume of Solution required $= \frac{m}{20} \times 100\ cc$

$= \frac{10}{20} \times 100\ cc$

$= 50\ cc$

Vernier Constant (V.C) = 0.1°

2075/11/09

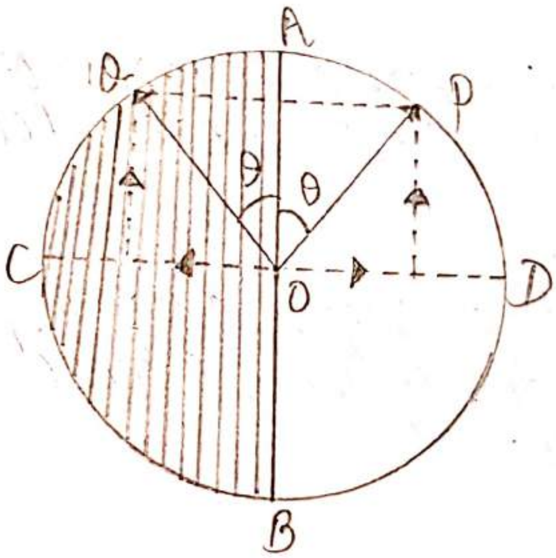


fig: Laurent's half-shade polarimeter

Observation table:

Sr.	strength of soln (gm)		Scale reading through soln		Rotation		Mean	θ/c
	Per 100cc	per 1(cc)	1st position	2nd position	1st pos.	2nd pos.		
1	0	0	64.2	242.2	0	0	0	0
2	20	0.2	312.4	172.2	248.2	70	159.1	795.5
3	10	0.1	283.3	95.4	219.1	146.8	182.95	1829.5
4	5	0.05	269.3	73.9	205.3	168.3	186.8	373.6
5	2.5	0.025	302.5	69.4	238.3	172.8	205.55	8222

$$\text{Mean}(\theta/c) = \frac{0+795.5+1829.5+373.6+8222}{5}$$

$$= 2244.12$$

length of tube = 2 decimetre = 20cm

$\therefore$ Specific rotation $= \frac{\theta}{c} \times \frac{1}{l}$

$$= \frac{2244.12}{20}$$

$$= 112.20 \text{ degree } m^{-1} gm^{-1} cc$$

Yesh
12-12

Result:
Hence the specific rotation of sugar solution was found to be 112.20

Precautions:
a) There should be no air bubble in the glass tube.
b) The reading should be properly taken.

PHYSICS PRACTICAL SHEETS

Date 2075/12/13 Amrit Campus Experiment No. 10
Class BSc 2nd Year Group PSM
Roll No. 235 Sub. R
Shift Morning Set C

Object of the Experiment (Block Letter)

TO STUDY THE CHARACTERISTICS OF G.M. TUBE AND HENCE DETERMINE IT'S WORKING VOLTAGE.

Apparatus Required:
→ a Geiger Mueller counter tube, connecting wires, a scalar unit having arrangement for extra high voltage D.C. supplied with a fitted voltmeter, stopwatch etc.

Theory:
A Geiger Mueller counter tube consist of a glass cylinder 'G' with a metal coating on the inside and coaxial wire anode A suspended along its axis. The cylinder is fitted with the gas such as argon mixed with halogen vapour at a reduced pressure of about 10 cm of Hg. The tube may have a very thin mica and window shielded by a protective gauze P. The metal tube is maintained at a negative potential of about 1000 volt with respect to the wire.

Threshold voltage or G-M. Threshold Potential:
As the voltage across the tube is increased, the counting rate increases rapidly upto point B and then level off to an almost constant value until voltage V2 corresponding to point C is reached. The position BC is known as the Geiger Mueller region. The voltage from B to C is known as the Geiger length of the pleatue. The slope of the pleatue is the average percentage change in the counting rate per unit increment of applied voltage and its known as relative pleatue slope (R.P.S) and is given by;

$$R.P.S = \frac{(N_2 - N_1)/N}{(V_2 - V_1)} \times 100$$

Where ; N_1 = counting rate at V_1 and N_2 that at voltage V_2.

Also ; $N = (N_1 + N_2)/2$

Working voltage $(V) = V_1 + \frac{(V_2 - V_1)}{3}$

Observation Table :

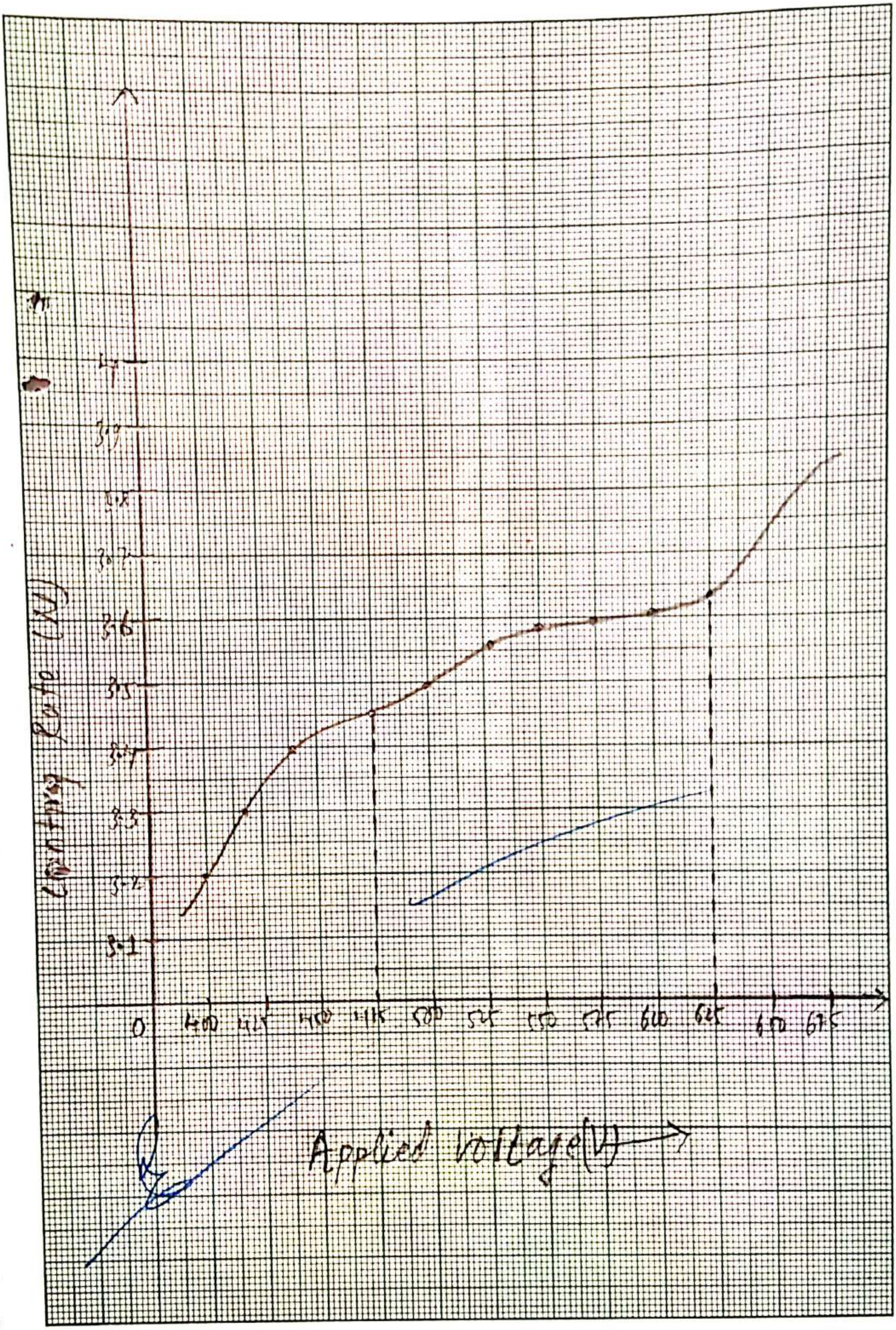
Applied Voltage	Count per 30 sec with source (a)				Background per 30 sec without source (b)	$N' = (a-b)$	Effective count / 30 sec $N = N'/30$
400	117	119	115	117	21	96	3.2
425	120	130	99	116.33	18	98.3	3.27
450	123	123	100	115.33	13	102.3	3.41
475	109	117	138	121.3	17	104.3	3.47
500	111	122	118	121	16	105	3.5
525	117	129	123	121.3	16	105.3	3.51
550	131	119	143	124.3	19	105.3	3.51
575	131	101	127	125	19	106	3.53
600	125	131	131	127.6	21	106.6	3.55
625	122	120	136	124.3	17	107.3	3.57
650	127	114	118	125.6	17	108.6	3.62
675	141	129	124	129.3	18	111.3	3.71
700	130	136	130	130	16	114	3.8

From the graph

Working voltage $(V) = V_1 + \frac{1}{3}(V_2 - V_1)$

$= 475 + \frac{1}{3}(625 - 475)$

$= 525\ V$



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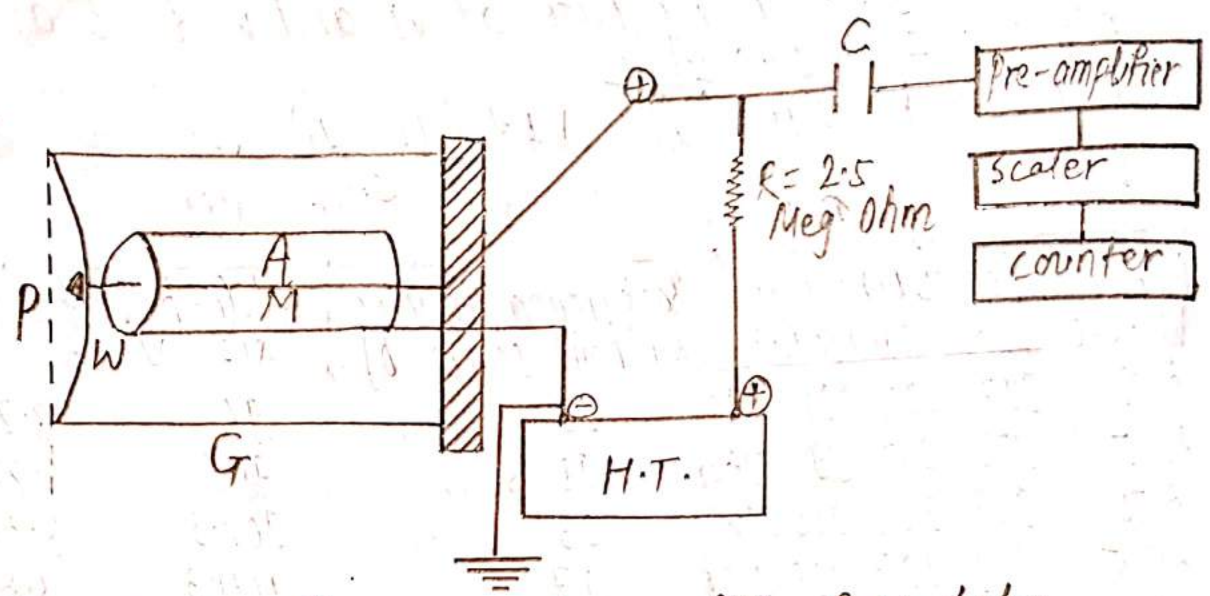
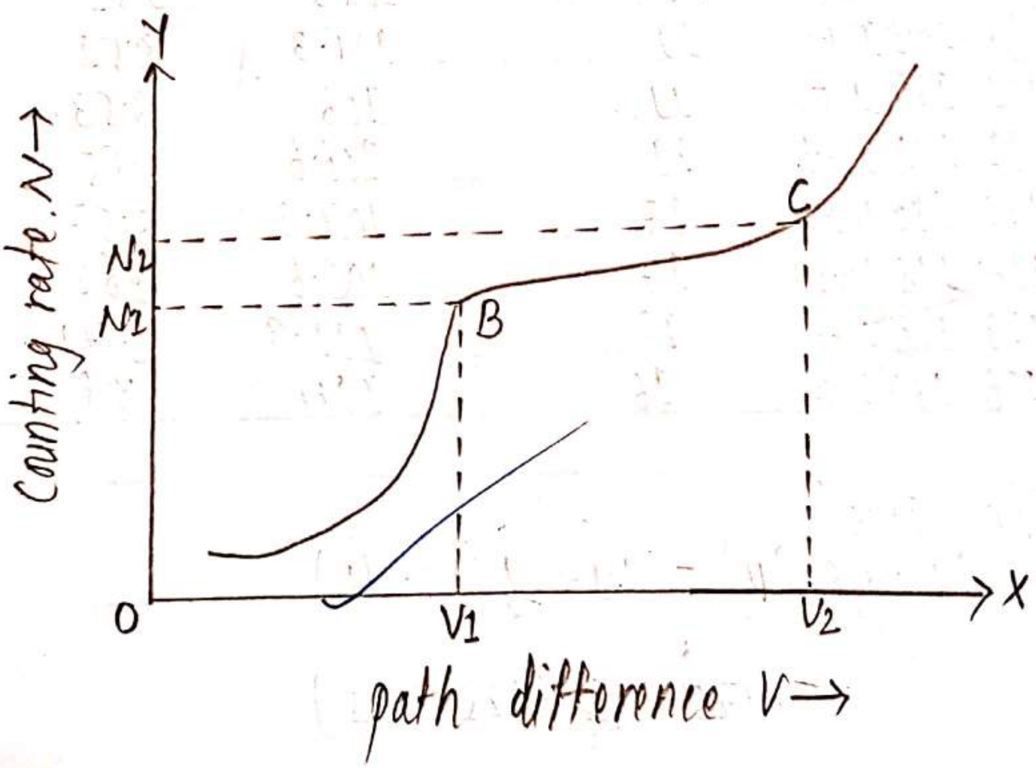


fig; Circuit diagram along with G.M. tube



Result:
Hence, the characteristics of G.M. tube was studied and its working voltage was found to be 525 V.

Precautions:
(1) Apparatus should be handeled carefully.
(2) The radioactive substance must be handeled safely.
(3) Datas must be taken many times to confirm actual count per second of the radioactive substance.

01/11

PHYSICS PRACTICAL SHEETS

Date 2076/01/04 Amrit Campus Experiment No. 11
Class BSc 2nd Year Group PSM
Roll No. 235 Sub. 'R'
Shift Morning Set 'C'

Object of the Experiment (Block Letter)

TO STUDY THE INPUT AND OUTPUT WAVEFORMS OF HALF WAVE RECTIFIER WITH π FILTER OR RC FILTER.

Apparatus Required:

1. A flue wire rectifier with charge o switch to convert into a half wave rectifier.
2. π-types filter circuit consisting of an inductance of 8H and 4.7uf.
3. Volts cathode rays oscillators
4. PCB boards.
5. Diodes
6. Tracing paper
7. Ac sources

Theory:

Rectifier is a diode which convert Ac current to dc current also rectifier is an electronic devices which converse dc input (maybe voltage or currents) to pulsating dc output (voltage or current) rectification are made by using diodes. When the circuit is made in such a way that it can change only half cycle of d.c. input dc output that is called half wave rectifier.

In RC filter (a filter) fitted circuit a capacitor 'c' is connected in the rectified circuit in parallel to the load resistance R_2 as shown in fig.

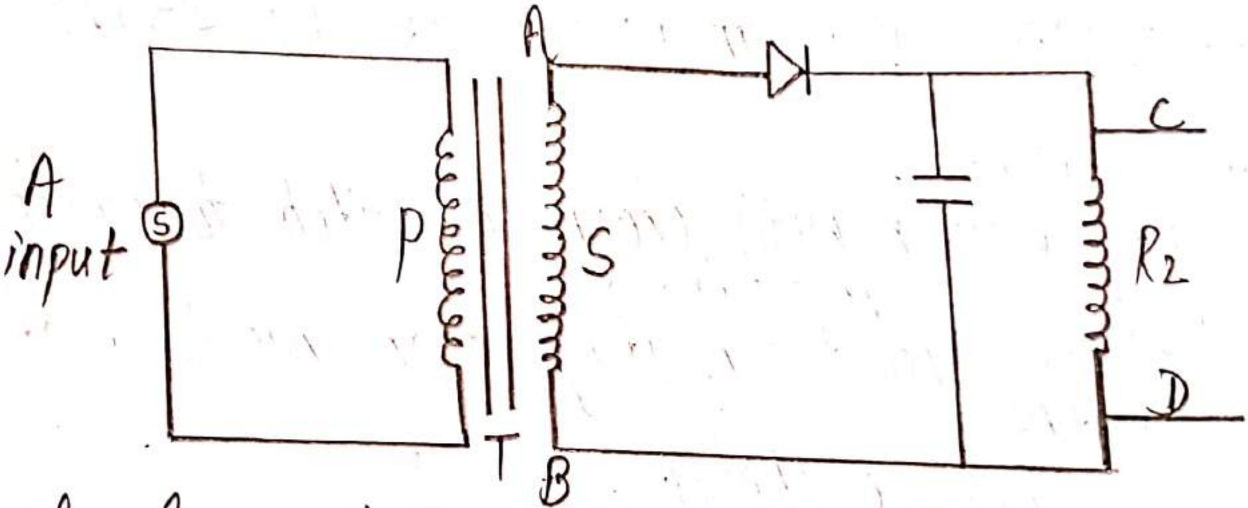
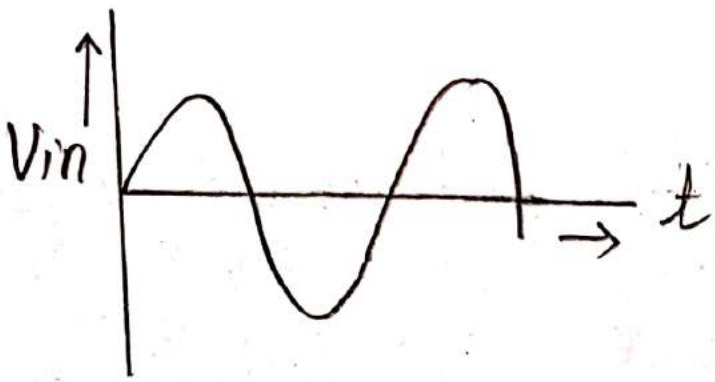


fig: Semi-conductor P-N Junction diode rectifier
halfware rectifier



for the half cycle of a.c. input the diode is forward biased. So the capacitor is charged to voltage (Vm) due to quality i.e in the negligibly equal to zero and output becomes as charged. But for negativity half cycle, the diode is reverse biased. So the capacitor is discharged through R_2 gives output.

The discharging of capacitor is very slow, again charged and for negative half cycles 'c' is discharged and output is given. Then the total output of rectifier along with filter circuit is obtained.

Observation table for half wave; output and input filter.

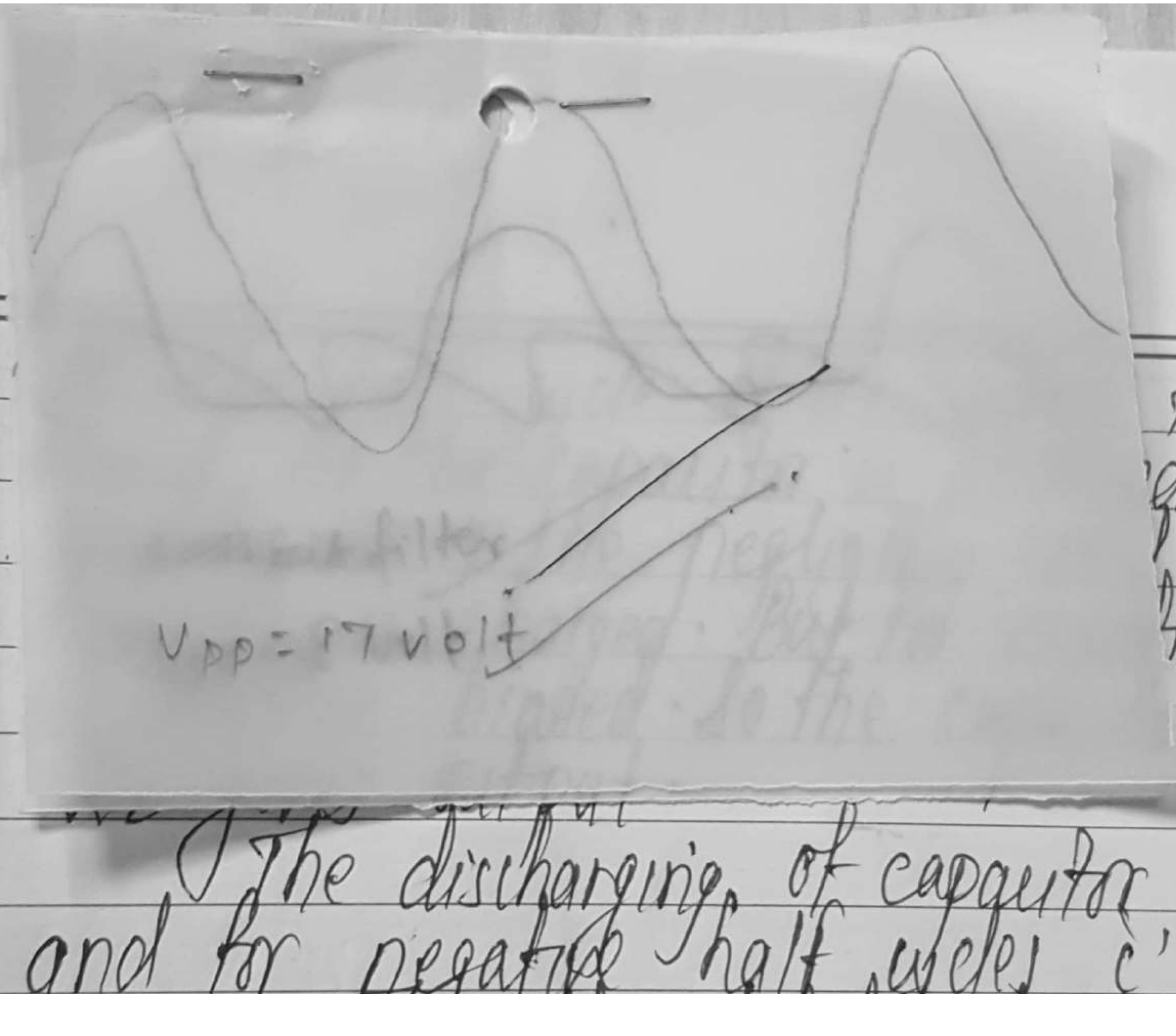
Input	output	filter
17	8	5

Conclusion:

In this way, it was found that the experiment in lab, we can study the input and output waveforms was 3 and 1.5 respectively of half wave with rectifier with π filter of RC filter.

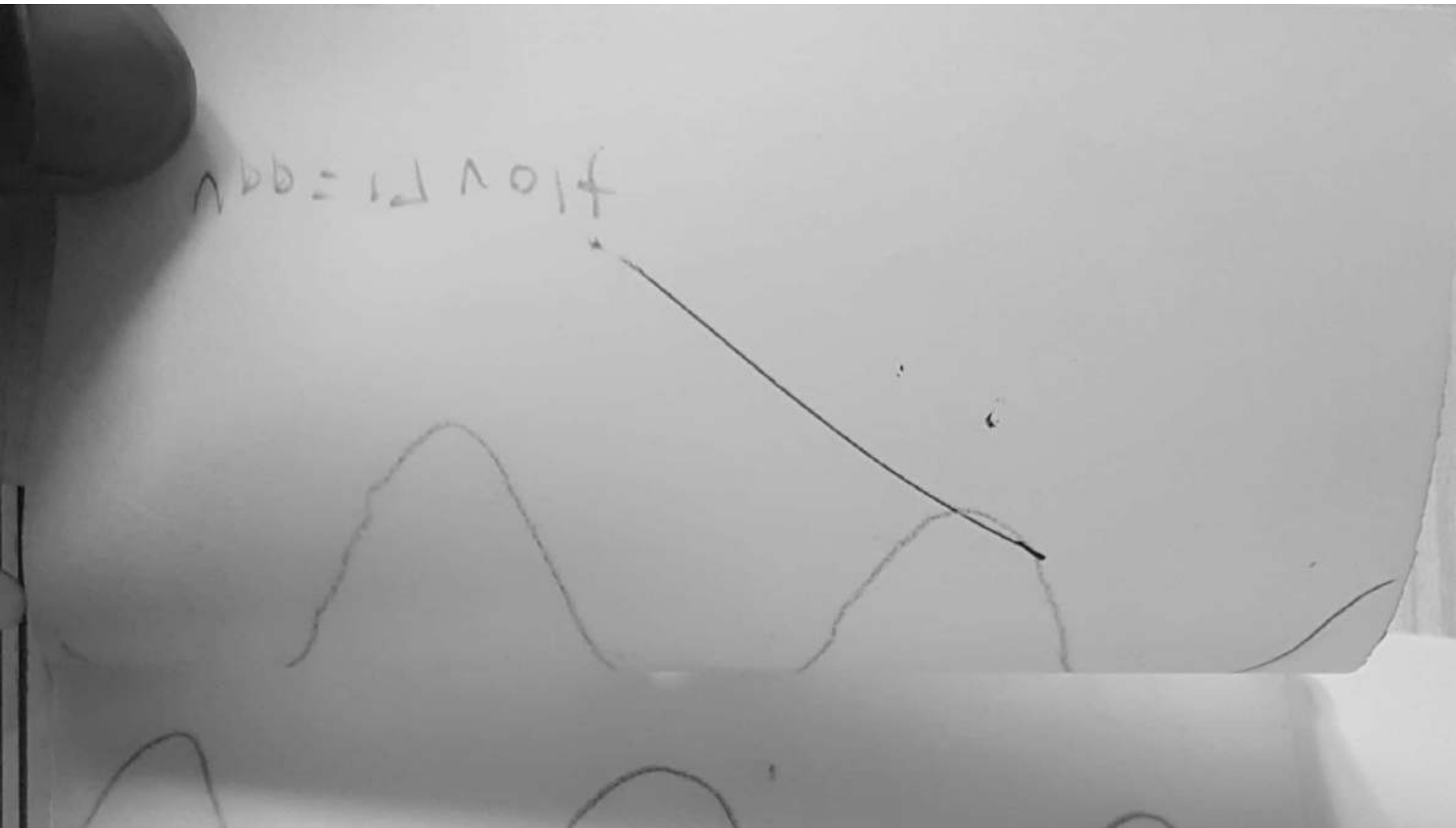
Precautions:

1. The connection must be done properly.
2. The value of voltage must be noted properly
3. The sketch should be traced out best



The discharging of capacitor

and for negative half cycles c'


without filter
Vpp = 8 volt

PHYSICS PRACTICAL SHEETS

Date 2075/12/29
Class BSC 2nd Year
Roll No. 235
Shift Morning

Amrit Campus

Experiment No. 12
Group RSM
Sub. R
Set C

Object of the Experiment (Block Letter)

TO STUDY THE COMMON EMITTER CHARACTERISTICS OF A PNP TRANSISTOR.

Apparatus required:

PNP transistor mounted on a board with three terminal marked e (emitter), base (b) and collector (c) a voltmeter of range 0·3 volt, potentiometer of total resistance of the order.

Theory:

The objective of the experiment is to study the relation between:

1) I_e emitter current and V_{eb} (potential difference between emitter and base at constant value of collector voltage. This is known as input characteristics.

2) Relation between I_c (collector) and V_{cb} (potential difference) between the collector and the base of constant value emitter current. This is known as output characteristics.

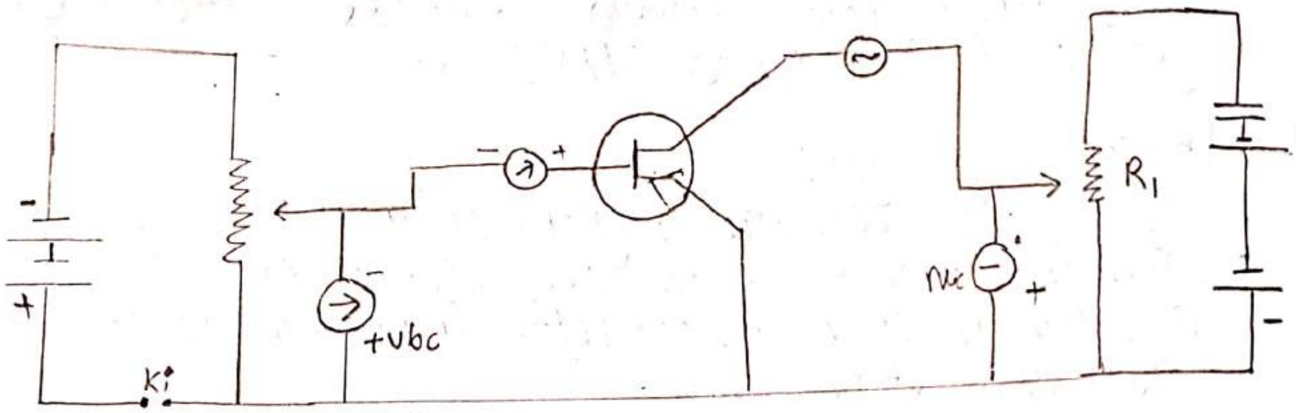


Fig: An arrangement to study the common emitter characteristic of a point transistor

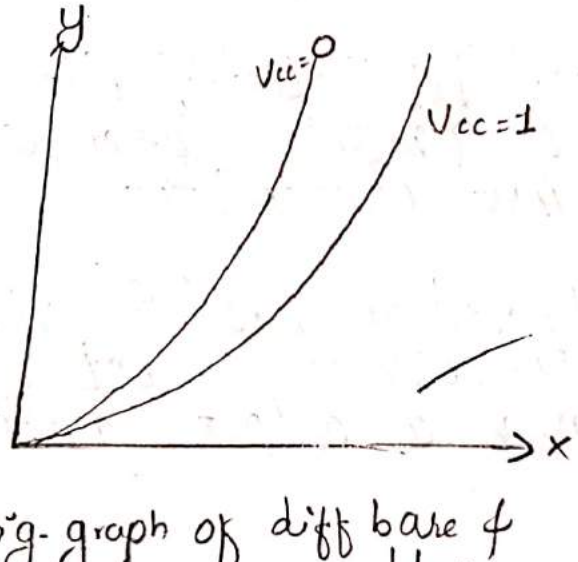


Fig. graph of diff base & emitter voltage and base current (input)
(input)

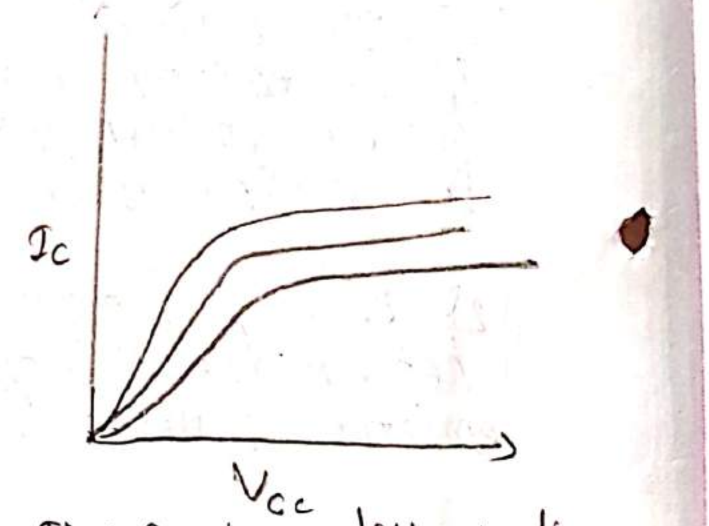


Fig: Graph of diff equation collector and emittor, voltage and collector (output)

Observation Table:

Input characteristics V_{BE} Vs I_B at constant V_C.

S.N.	Base emitted voltage (V_{BE})	Bare V_{ce}	Current $V_{ce} = 2V$
1	0.4	10	4
2	0.5	39	32
3	0.6	92	57
4	0.7	100+	94

Output characteristics V_{CE} Vs I_C at constant i_B

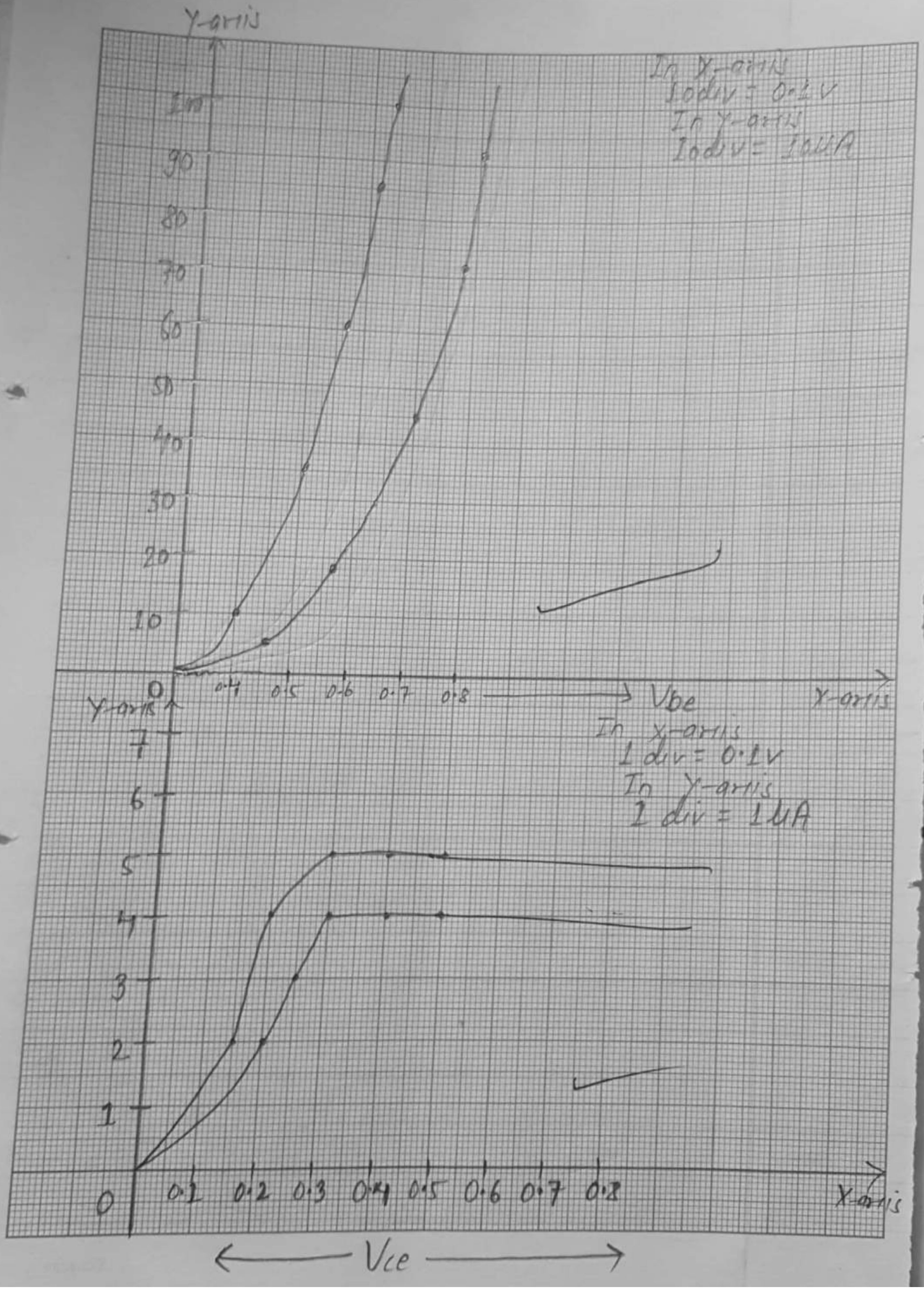
S.N.	collector emitter voltage (V_{ce})	Collector Current	
		$I_B = 0.5$	$I_B = 0.4$
1	0.1	2	1.5
2	0.2	4	3
3	0.3	5	4
4	0.4	5	4
5	0.5	5	4
6	0.6	5	4

DISCUSSION OF THE RESULT:

(1) A study of the input characteristics shows that the basis current I_b rapidly increases as the value of V_{be} is increased zero to the +ve value; The collector voltage V_{ce} has very effect on the value of I_b.

(2) The study of output characteristics show that the collector current I_c depends upon the collector voltage one emitter voltage; Starting from $V_{cc} = 0$, volt. I_c first increases as a collector voltage is sufficient to collect all the majority. Carriers. I_c contains a constant value and becomes

independent of V_{ce} as shown by straight line of the current.



Y-axis
In X-axis
10 div = 0.1 V
In Y-axis
10 div = 10 uA
100
90
80
70
60
50
40
30
20
10
0
0.4
0.5
0.6
0.7
0.8
Vbe
X-axis
Y-axis
In X-axis
1 div = 0.1 V
In Y-axis
1 div = 1 uA
7
6
5
4
3
2
1
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
X-axis
Vce

PHYSICS PRACTICAL SHEETS

Date 2075/12/24   Amrit Campus   Experiment No. '13'
Class BSc 2nd Year   Group PSM
Roll No. 235   Sub. 'R'
Shift Morning   Set D

Object of the Experiment (Block Letter)

TO FIND THE WAVELENGTH OF SODIUM LIGHT BY NEWTON'S RING METHOD.

Apparatus Required:
A travelling microscope, sodium lamp, Newton's ring apparatus, a spherometer, convex lens of short focal length etc.

Theory:
Circular interference fringes produced by enclosing a thin air film of varying thickness between the surface of a convex lens of large radius of curvature and a plane glass plate are known as Newton's rings. The wavelength of monochromatic light which produces these rings is

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

'R' is the radius of curvature of surface of the lens in contact with the glass. 'D_n' and 'D_m', the diameters of the nth and mth dark or bright rings.

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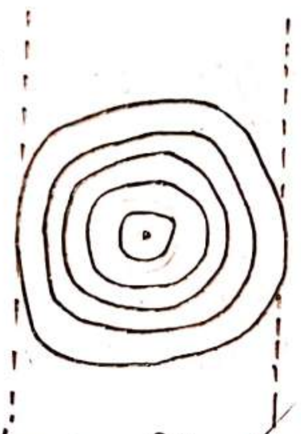

fig: Newton's Ring

Observation :

Vernier Constant = 0·01 mm = 0·001 cm

Radius of curvature of convex surface = R = 0·74 cm

Ring No.	Microscope Reading Left (1)	Microscope Reading Right (2)	Diameter $D_1 = 1 - 1$	Microscope Reading Right (1)	Microscope Reading Left (2)	Diameter $D_2 = 2 - 2$	Mean $D = D_1 + D_2 / 2$
4	47·04	47·05	6·42	53·46	52·34	5·29	5·855
8	46·58	47·53	7·28	53·86	53·77	6·24	6·76
12	46·28	47·13	6·93	53·21	53·19	6·06	6·495
16	46·12	46·81	8·43	54·55	53·47	6·66	7·545
20	46·87	46·55	7·95	54·82	54·82	8·24	8·11

Now;

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

The various combinations of n and m as (20, 12), (16, 8) and (12, 4)

1) For combination of 'n' and 'm' i.e (20, 12)

$$\lambda_1 = \frac{D_{20}^2 - D_{12}^2}{4R(20-12)} = \frac{(8.11)^2 - (6.495)^2}{4 \times 740 \times 8} = 9.96 \times 10^{-4} \text{ mm}$$

2) For combination of (16, 8)

$$\lambda_2 = \frac{D_{16}^2 - D_8^2}{4R(16-8)} = \frac{(7.545)^2 - (6.76)^2}{4 \times 740 \times 8}$$

$$= 4.74 \times 10^{-4} \text{ mm}$$

3) For Combination (12, 4)

$$\lambda_3 = \frac{D_{12}^2 - D_4^2}{4R(12-4)} = \frac{(6.495)^2 - (5.855)^2}{4 \times 740 \times 8}$$

$$= 3.34 \times 10^{-4} \text{ mm}$$

Mean wavelength of sodium light $(\lambda) = \frac{\lambda_1 + \lambda_2 + \lambda_3}{3}$

$$= \frac{9.96 \times 10^{-4} + 4.74 \times 10^{-4} + 3.34 \times 10^{-4}}{3}$$

$$= 6.013 \times 10^{-4} \text{ mm}$$

$$= 6.013 \times 10^{-7} \text{ m}$$

$$= 6013.33 \text{ A}^{\circ}$$

Result:

Hence, the wavelength of sodium light was found to be $6013.33 A^{\circ}$ by Newton's ring method.

Precautions:

1. The experiment must be held in dark room.
2. The readings must be taken carefully.
3. The apparatus must be handeled with care.

PHYSICS PRACTICAL SHEETS

Date 2075/12/24 | Amrit Campus | Experiment No. 14
Class BSC 2nd Year | | Group PSM
Roll No. 235 | | Sub. 'R'
Shift Morning | | Set 'D'

Yogesh 12-26

Object of the Experiment (Block Letter)

TO STUDY THE CHARACTERISTICS OF A ZENER DIODE AND HENCE DETERMINE IT'S KNEE VOLTAGE AND BREAKDOWN VOLTAGE. ALSO CALCULATE IT'S FORWARD AND REVERSE RESISTANCE

Apparatus required:
i) a variable D.C. supply, a zener diode, voltmeter, ammeter, connecting wires, etc.

Theory:
A zener diode is a silicon crystal diode which conducts in the reverse direction at a certain fixed voltage. It is highly dopped, P-N Junction having a high back resistance. It is found that when a reverse bias is applied to a crystal diode a very small reverse current known as leakage current flows through due to high reverse resistance. As the value of reverse bias is increased, a small current due to minority carriers flow in the circuit.

The forward voltage at which the current through the P-N Junction start increasing rapidly is known as knee voltage.

The reverse voltage at which the P-N Junction breakdown occurs is called breakdown voltage.

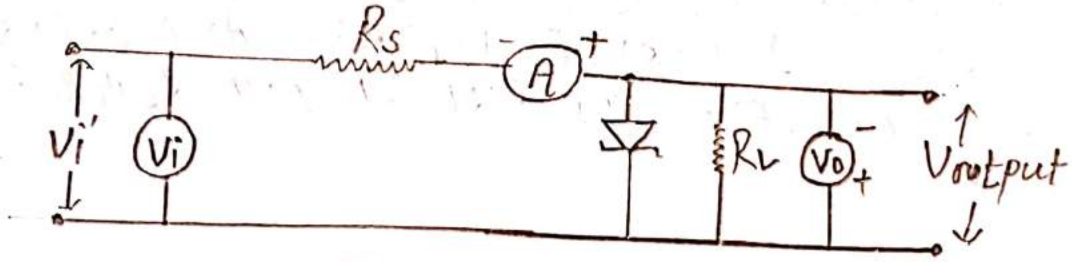

fig (I)

Observation:
For forward bias:
10 div. of voltmeter = 1 volt
∴ 1 div of voltmeter = 0.1 volt
10 division of milliammeter = 20mA
1 division of milliammeter = 2mA
For
reverse bias:
10 division of milliammeter = 20A
∴ 1 division of milliammeter = 2mA

Observation table:

S.N.	Forward Bias Reading		Reverse Bias Reading	
	voltage (V)	current (A)	voltage (V)	current (A)
			0	0
1	0	0	0.5	0
2	0.1	0	1	0
3	0.2	2×10^{-3}	1.5	8×10^{-3}
4	0.3	4×10^{-3}	2	16×10^{-3}
5	0.4	10×10^{-3}	2.5	24×10^{-3}
6	0.5	14×10^{-3}	3	32×10^{-3}
7	0.6	28×10^{-3}	3.5	68×10^{-3}
8	0.7	76×10^{-3}		out of range
		out of range		

Result:
Knee voltage (V_K) = 0.31 V
Breakdown voltage (V_B) = 1.55 V
Forward Resistance (R_F) = 14.11 Ω
Reverse Resistance (R_R) = 48.75 Ω

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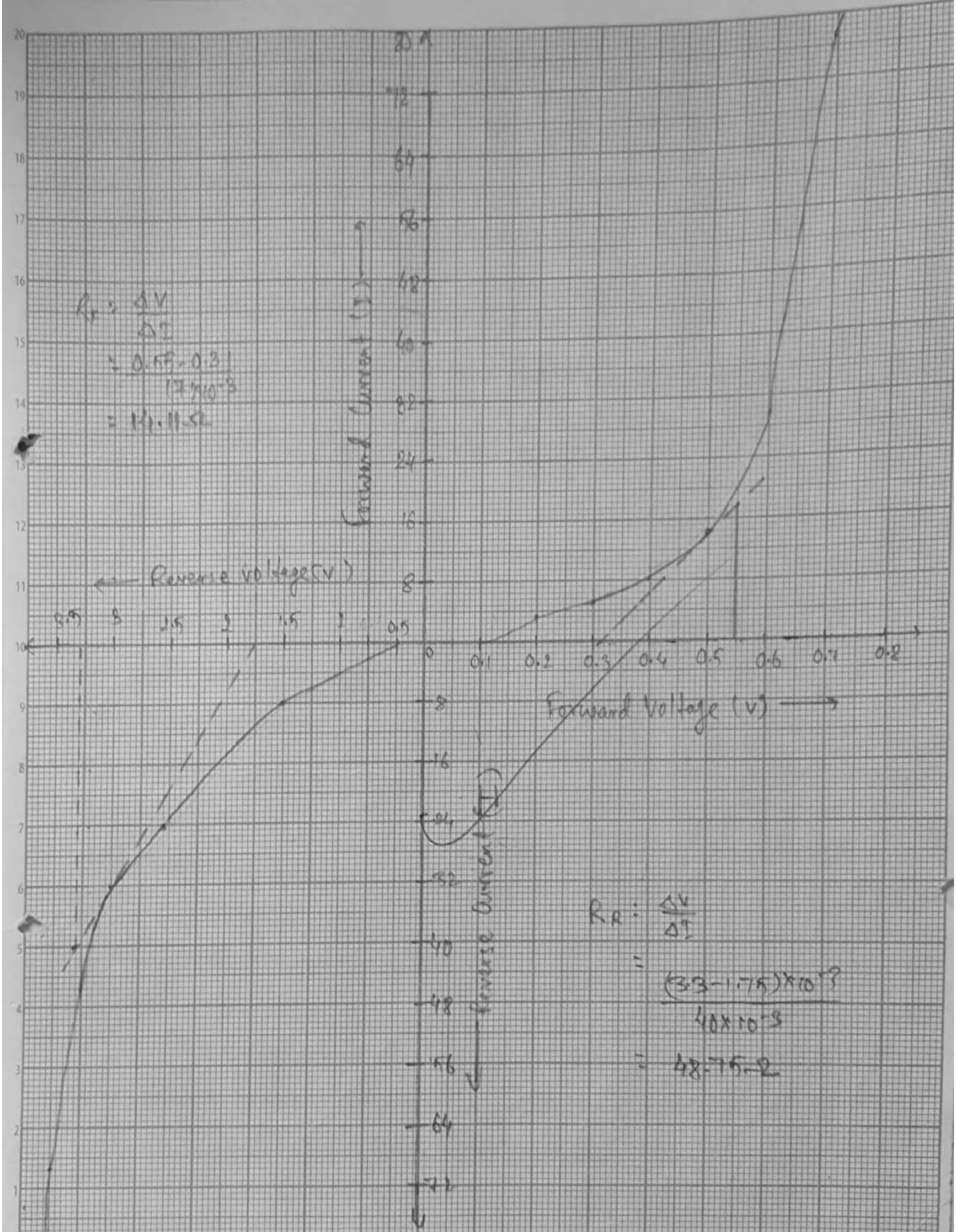
Date



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Conclusion:

Thus, the characteristics of a zener diode, its knee voltage, breakdown voltage, forward resistance and reverse resistance were computed.

Precautions:

1. The apparatus must be handled carefully.
2. The readings should be taken accurately.

PHYSICS PRACTICAL SHEETS

Date 2075/12/23 Amrit Campus Experiment No. 105
Class BSc 2nd Year Group PSM
Roll No. 235 Sub. P
Shift Morning Set D

Object of the Experiment (Block Letter)

TO STUDY THE INPUT AND OUTPUT WAVEFORMS OF FULL WAVE RECTIFIER WITH π FILTER OR RC FILTER.

Apparatus Required:

Two diodes, resistance, an ac supply, connecting wires, capacitor, oscilloscope etc.

Theory:

The rectifier which converts both positive and negative half cycle of input ac signal into pulsating dc is called full wave rectifier.

The process of converting an ac current into unidirectional dc current when a diode wave form takes place simultaneously continuously with no gapping is called full wave rectification.

$$\therefore I_{dc} = \frac{2I_m}{\pi}$$

$$\therefore I_{rms} = \frac{I_m}{\sqrt{2}}$$

Where;

'I_m' is the peak current.

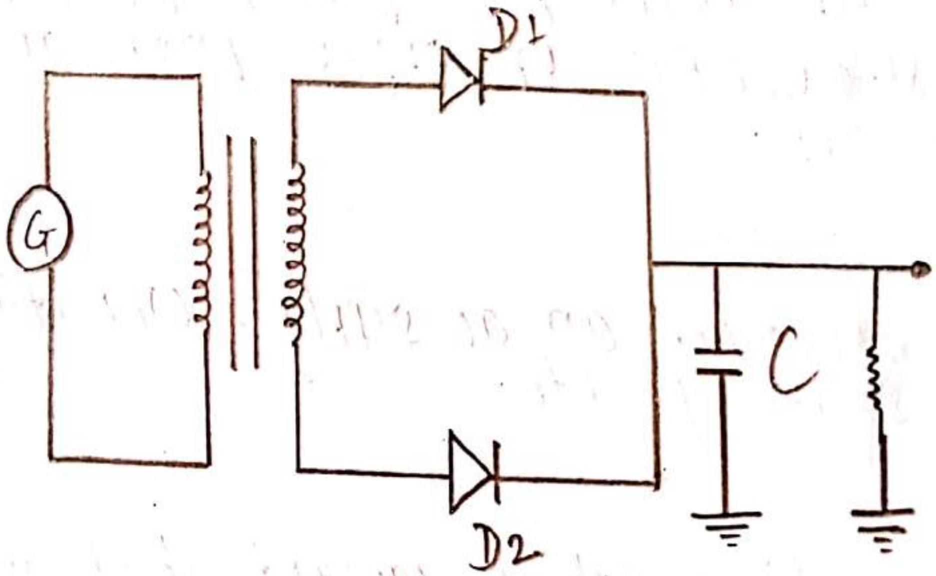


fig: Circuit Diagram of full wave rectifier

Observations:

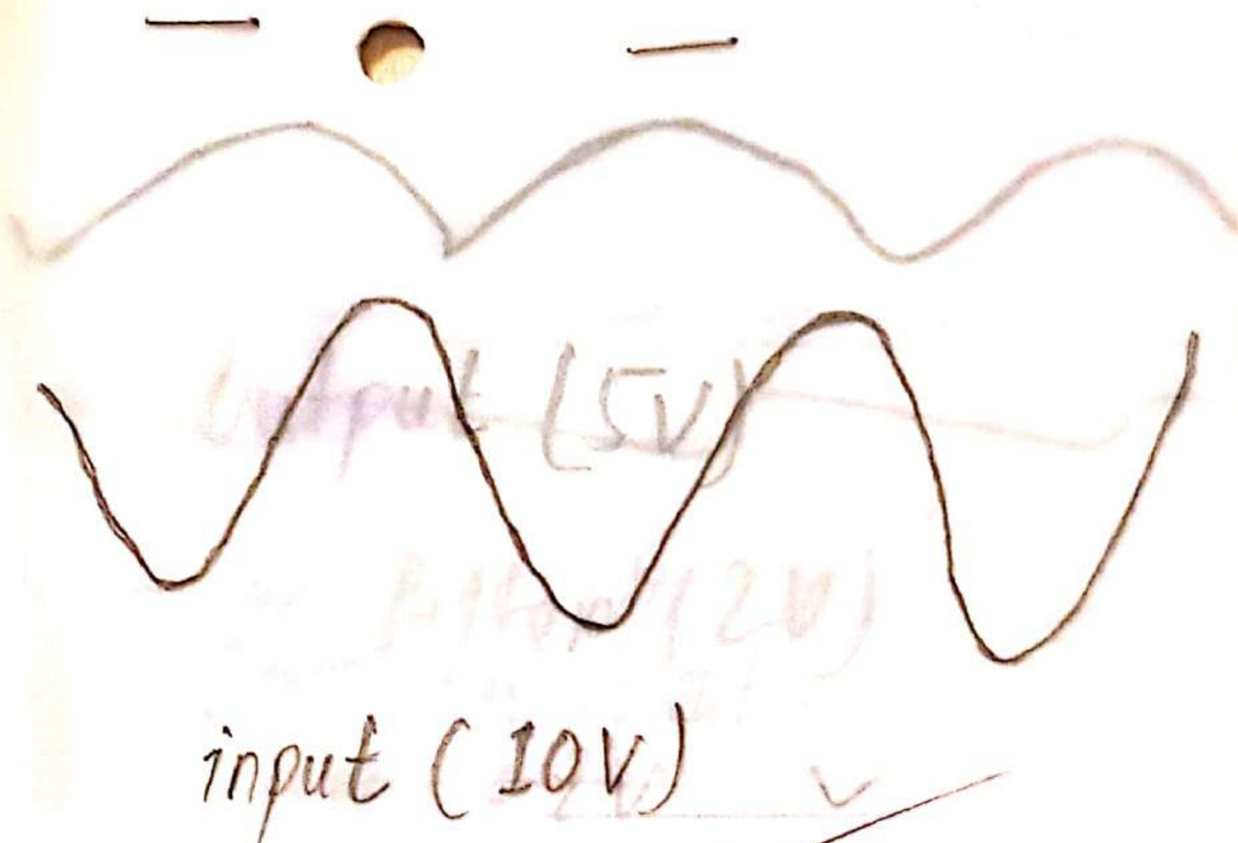
Input voltage, V_{in} = 10 V
Output voltage, V_{out} = 5 V
RC filter = 2 V

Result:

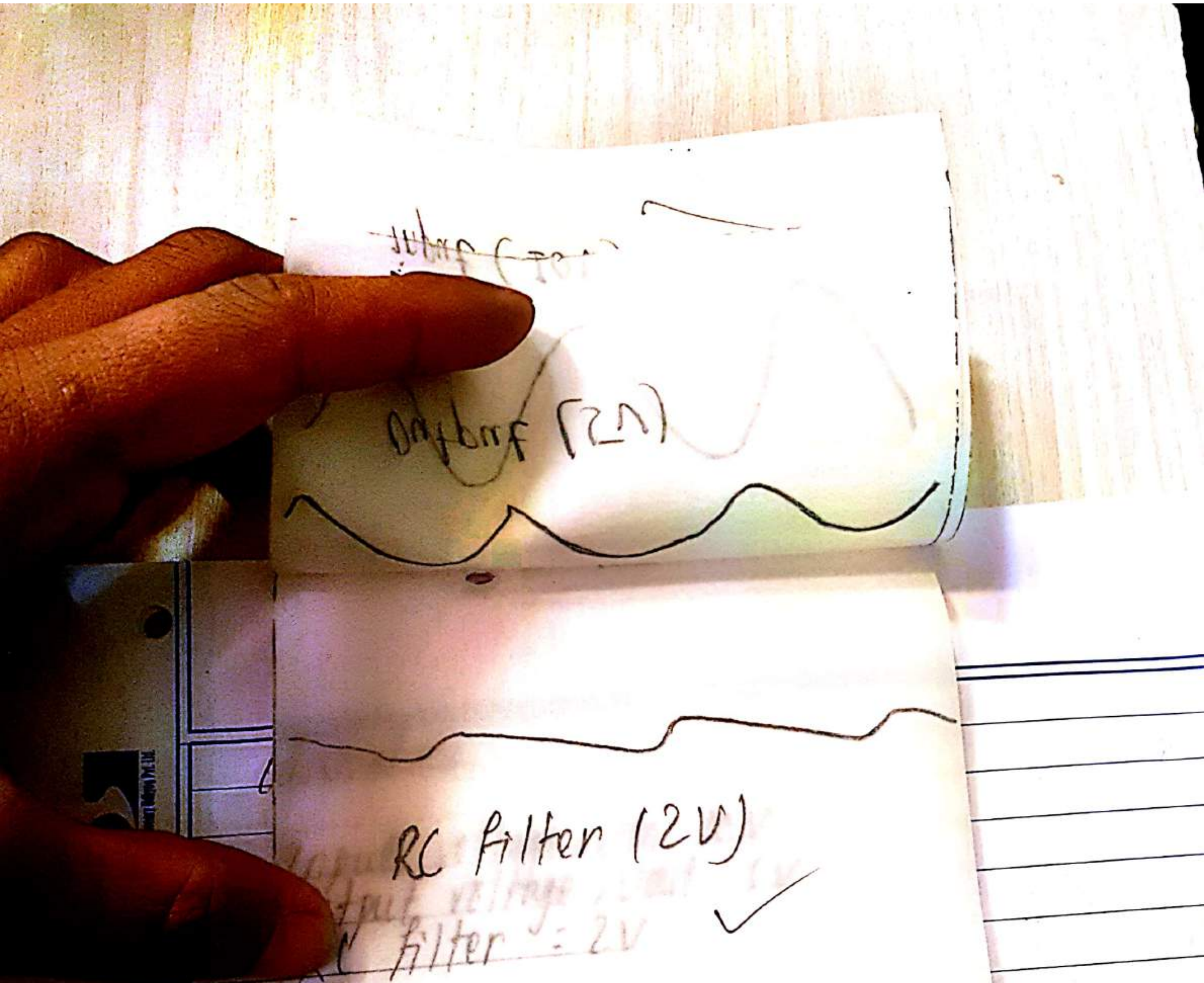
Hence, the input and the output waveforms of full wave rectifier with π filter or RC filter circuit were studied in the laboratory.

Precautions:
1. Apparatus must be handled safely.
2. Readings should be taken properly.

2076/1/17


input (10V)

Output (5V)


RC filter (2V)
Result :
and the output

Sushil 12/29

PHYSICS PRACTICAL SHEETS

Date 2075/12/28 Amrit Campus Experiment No. 16

Class BSc 2nd Year Group PSM

Roll No. 235 Sub. R

Shift Morning Set D

Object of the Experiment (Block Letter)

TO SUPPLY THE RIPPLE FACTOR IN A DC POWER SUPPLY:

Apparatus required:

→ Resistance box, voltmeter, connecting wire, DC power supply, micrometer resistance box.

Theory:

Ripple factor: The current supply by a rectifier and the voltage developed by it across a load resistance is indirectional but its magnitude is constantly fluctuating i.e. the output contain a dc as well as an AC component. The AC component contained in the output of a rectifier is known as ripple factor.

The ratio of the effective value of the alternating component of output current (or voltage) is known as ripple factor.

Voltage ripple factor $\gamma' = \frac{E(A.C.)}{E(D.C)}$

Current ripple factor $\gamma' = \frac{R(A.C.)}{I(D.C.)}$

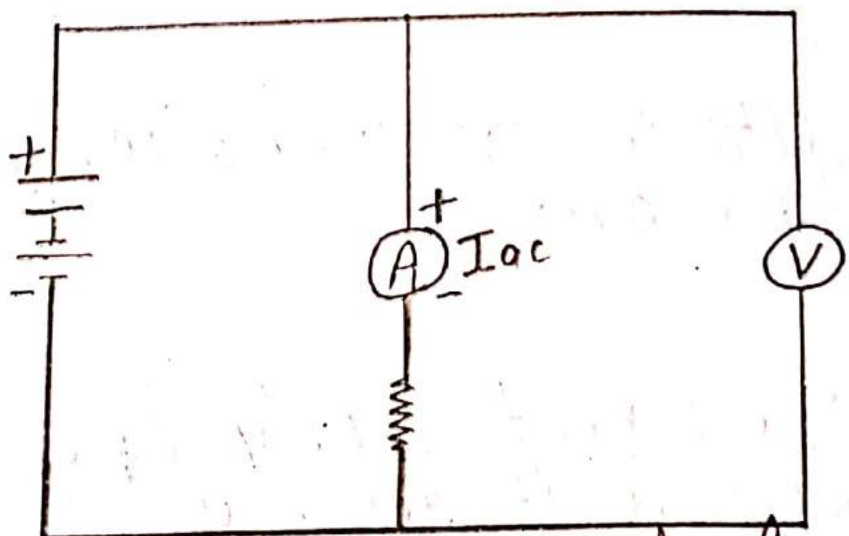


fig: Circuit for ripple factor

ripple factor for mean is $\gamma = \sqrt{\frac{(I_{rms})^2}{(I_{dc})^2} - 1}$

Observation table:

Input voltage	Resistance	Irms	Vdc	$I_{dc} = \frac{V_{dc}}{R}$	Ripple factor $\gamma = \sqrt{\frac{(I_{rms})^2}{I_{dc}} - 1}$	Mean
2 volts	1	8.3	·2	2	4	
	2	5.5	2.02	1.0	5.38	5.4994
	3	4.1	2.10	0.7	5.77	
	4	3.3	2.20	0.55	5.92	
	5	2.7	2.20	0.44	6.05	
4 volts	1	13.3	3	3	4.32	
	2	9	3.2	1.6	5.53	5.017
	3	6.8	3.5	1.67	3.95	
	4	5.4	3.8	0.95	5.59	
	5	4.5	3.9	0.78	5.69	
6 volts	1	18.2	4	4	4.44	
	2	13.2	4.6	2.3	5.65	
	3	10.4	4.5	1.67	6.15	5.96
	4	8.6	5.2	1.30	6.78	
	5	7.4	5.4	1.08	6.78	
8 volts	1	20.3	5.3	5.3	3.69	
	2	15.2	6.4	3.2	4.64	4.814
	3	12.3	2.3	2.3	5.25	
	4	5.7	1.85	1.85	4.59	
	5	8.7	1.56	1.56	5.49	

Calculation:

Hence ripple factor (γ) =

$$= \frac{5.4949 + 5.027 + 5.96 + 4.824}{4}$$

$$= 5.3005$$

Result: The ripple factor was found to be;

$$= 5.3005$$

Conclusion:

The ripple factor in a dc power was studied.

2018 12/1?