III BSC SEMESTER-V

MODERN PHYSICS

PHYSICS PRACTICAL MANUAL

(PAPER VI)

2022-2023

(Old Syllabus)

Department of Physics

Sri Y.N.College (A)

Narsapur

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1. Determination of M and H

Aim:

To determine the magnetic moment of the given magnet and the horizontal component of the earth's magnetic field at a plane.

Apparatus:

Deflection magnetometer, vibration magnetometer, magnet, a brass rod whose dimension are same as that the magnet, a stop-watch, vernier calipers and rough balance

Formula:

1) $$M/H = \frac{(d^2 - l^2)}{2d} \tan\theta$$

where, M = magnetic moment of the given magnet

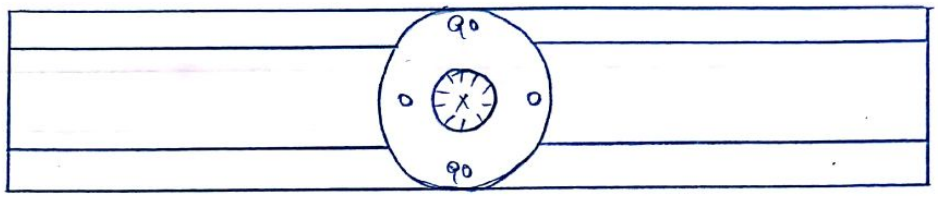
H = horizontal component of earth's magnetic field at a plane

d = distance from the centre of the magnet to the centre of the needle

l = half of the length of the magnet

θ = average deflection of the aluminium pointer

Signature :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S.no	Distance from the centre of the magnet of the centre of the magnetic needle	Deflection of the aluminium pointer								mean θ	Tanθ	$\frac{M}{H} = \frac{(d^2-l^2)}{2d}\tan\theta$
		magnet on the eastern arm				magnet on the western arm						
		direct		reverse		direct		reverse				
		θ_1	θ_2	θ_3	θ_4	θ_1	θ_2	θ_3	θ_4			
1	20	46	46	48	50	50	53	44	45	47.5	1.1009	6173.177
2	22	43	44	35	37	34	35	36	37	37.87	0.776	

2) $MH = \frac{4\pi^2}{T_2^2 - T_1^2} \times I$

where T_1 = period of oscillation of the magnet
T_2 = period of oscillation of the magnet together with the brass rod
I = moment of inertia of the brass rod about the axis of rotation.

$I = \frac{m(a^2+b^2)}{12}$

where, m = mass of the brass rod
a = length of the brass rod
b = breadth of the brass rod

Description:

1. Deflection magnetometer:

The deflection magnetometer comprises a magnetic compass box. The magnetic compass box consists of a very small magnetic needle portal on a sharp support at the centre of a circular scale. The circular scale is graduated in degree and divided into four equal, each gradiant is from 0°- 90°. So that the dimetric opposite points indicate the same reading. A circular plane mirror is fixed just below the pointer which enables to take the readings of the

To determine the breadth (b) of the brass rod (b):

S.no	M.S.R (a) cm	V.C (n)	b=n X L.C	Total reading (a+b) cm
1	1.3	2	0.02	1.32
2	1.3	1	0.01	1.31
3	1.3	3	0.03	1.33

average (b) = 1.32

To determine the length of the brass rod (a):

S.no	M.S.R (a) cm	V.C (n)	b=n X L.C	Total reading (a+b) cm
1	6.6	5	0.05	6.65
2	6.6	7	0.07	6.67
3	6.6	10	0.1	6.7

average (a) = 6.67

pointer with out erro due to parallax. the needle the aluminium pointer and the circular are erased in a circular brass box with a glass top to protect the needle from the do ughts to air.

2. vibration magnetometer:

It consists of a below rectangular wooden box B whose front surface is made of glass two openings. S_1 & S_2 are provided at the top of the box, which are fitted with glass, by means of which the oscillation can be seen. along cylindrical glass tube a torsion rod it is fixed vertically at the middle of the top surface of the box. a light brass strip is suspended by means of an unspan slit thread from the torsion head, H as shown in fig. the torsion head can be rotated to adjust it set into the oscillations.

Procedure:

This experiment is to be performed in two parts.

1) To determine the values of (M/H) using deflection magnetometer:

Place of the deflection magnetometer on the

To determine the values of T_1 & T_2 vibration of magnetometer:

S.no	material	Time taken for 20 oscillations of magnet		mean (t) sec	Time period $T = t/20$ sec	$T_2^2 - T_1^2$
		Trail - I	Trail - II			
1	magnet	41	42	41.5	4.15	12.48
2	magnet brass rod	55	54	54.5	5.45	

wor table and remove all magnets and magnetic materials from the velocity of the magnetometer. Set the deflection magnetometer in the A position for this turn the deflection magnetometer in such a way that the areas of the magnetometer are oriented in east - west direction i.e., the axis of the magnetometer are parallel to the aluminium pointer and ⊥er to the magnetic needle. Rotate the magnetic com--pass box until the ends of the aluminium pointer ends 0-0 on both sides of the circular scale.

Place the given magnet on the easter arms of the magnetometer at a distance d from the centre of the magnetic needle so that the axial line of the magnet pass through the centre of the magnetic needle. note the deflections θ_1 & θ_2 against the ends of the aluminium pointer on the circular scale keeping the magnet at the same distance.

Repeat the experiment by placing the magnet at other distances say (20, 22, 24) cm note the deflections in the table. find the mean value of M/H using formula

2. To determine the time periods T_1 & T_2 using the vibration magnetometer.

Signature :

To determine the length of the magnet (l) :

S.no	M.S.R (a) cm	V.C (n)	b = n×L.C	Total reading (a+b) cm
1	7.7	3	0.03	7.73
2	7.7	4	0.04	7.74
3	7.7	6	0.06	7.76

average (l) = 7.74

place the vibration magnetometer on the work table. level the instruments by means of the leveling screws. So that the thread from the torsion hood H_1 line vertically with out the inner surface of the cylinder. place do given magnet alone on the strip. So that it hangs freely is the direction of the magnet meridian take another magnet and brought it near the box. move the second magnet on the strip is set into oscillations.

Take a brass rod of the same direction as that of the given magnet and then place it in the strip. pump along with the magnet Repeat the above procedure and find the time period T_2 state observations in the table. The moment of inertia I_2 of the brass and can be calculated using the relation.

$$I = \frac{m(a^2+b^2)}{12}$$

Precautions:

1) The suspension thread in the vibration magnetometer should be torsion.
2) deflection should be noted with out parallax b/w the aluminium pointer.

Signature :

calculation :

$l = \frac{5}{12} \times$ length of magnet

$= \frac{5}{12} \times 7.74$

$= 0.4166 \times 7.74 = 3.225$

$l^2 = 10.4006$

$\frac{M}{H} = \frac{(d^2 - l^2)^2}{2d} \tan\theta$

$= \frac{(400 - 10.4006)^2}{2(20)^2}(1.1009)$

$= \frac{151787.69}{40} = 6173.177$

$I = 246.50$

$\frac{M}{H} = \frac{(484 - 10.4006)^2}{44}(0.7776)$

$MH = 778.96$

$= 3963.928$

$M = \sqrt{MH \times \frac{M}{H}}$

$= \sqrt{4031387.52}$

$= 2007.83$

$H = \sqrt{\frac{MH}{M/H}}$

$= \sqrt{0.15015137}$

$= 0.38760951$

Date

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Result:

1) The magnetic moment of the given magnet $M = 2007.83$ C.G.S units

2) The horizontal component of earth's magnetic field $H = 0.38760951$ oersted.

Signature :

Date 22/12/21

Expt. No. 2 Page No. 7

De - Morgan's Theorem

Aim:

To verify De- morgan's - theorem in boolean algebra.

Apparatus:

one OR - gate, one AND - gate, three NOT gates, batteries connecting wires, a bread board and a dc voltmeters.

Formula:

Theorem-1: This theorem states that complement of sum of two (or) more variables is equals to the product of complement of individual variables.

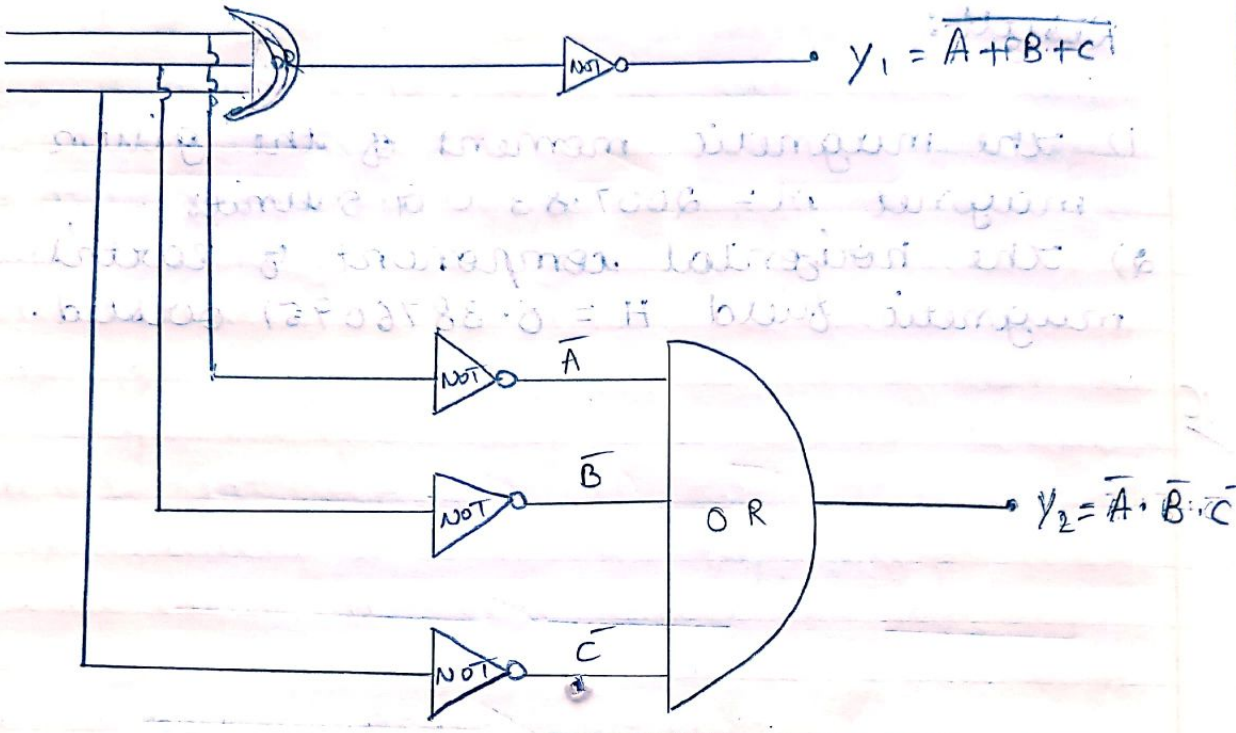
$$\sout{A+B+C}\ \overline{A\cdot B\cdot C} = \bar{A}+\bar{B}+\bar{C}$$

Theory:

The inputs A and B and C are applied to an OR gate followed by a NOT gate give the output $Y_1 = \overline{A+B+C}$. This part of the circuit is called a NOT gate. The same inputs at B & C are applied to 3 NOT gates to yield the outputs $\bar{A}$ & $\bar{B}$ & $\bar{C}$. which are the input of an AND gate. The output of the last AND

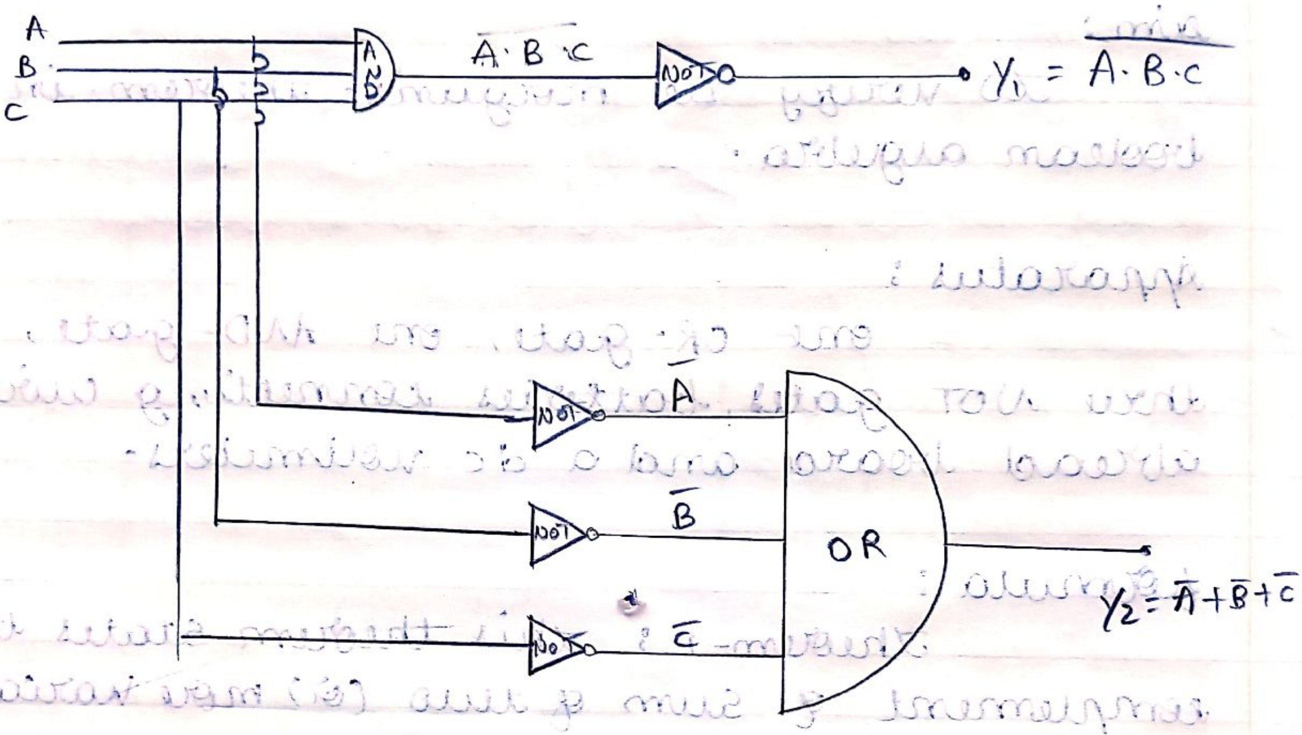
Signature :

circuit diagram for theorem-1



A	B	C	$\overline{A}$	$\overline{B}$	$\overline{C}$	$Y_1 = \overline{A+B+C}$	$Y_2 = \overline{A} \cdot \overline{B} \cdot \overline{C}$
0	0	0	1	1	1	1	1
0	0	1	1	1	0	0	0
0	1	0	1	0	1	0	0
0	1	1	1	0	0	0	0
1	0	0	0	1	1	0	0
1	0	1	0	1	0	0	0
1	1	1	0	0	0	0	0

circuit diagram for theorem 2 :



A	B	C	$\overline{A}$	$\overline{B}$	$\overline{C}$	$Y_1 = \overline{A \cdot B \cdot C}$	$Y_2 = \overline{A} + \overline{B} + \overline{C}$
0	0	0	1	1	1	1	1
0	0	1	1	1	0	1	1
0	1	0	1	0	1	1	1
0	1	1	1	0	0	1	1
1	0	0	0	1	1	1	1
1	0	1	0	1	0	1	1
1	1	1	0	0	0	0	0

gate is $Y_2 = \bar{A} \cdot \bar{B} \cdot \bar{C}$. The purpose of the expe-
-riment is to show that $Y_1 = Y_2$ for various
combinations of A & B & C these verifying
the first statement.

The inputs A & B are fed to an AND
gate followed by a NOT gate to yield the
output $Y_1 = \overline{A+B+C}$ This part of the circuit is
called a NOT-AND (or) a NAND gate. The
same inputs A & B & C are applied to two
NOT circuits to give $\bar{A}$ and $\bar{B}$ and $\bar{C}$ which
are fed to an OR gate. The output of the OR
gate is $Y_2 = \bar{A} + \bar{B} + \bar{C}$. The purpose here is to
show that $Y_1 = Y_2$ for different values of
A & B & C. Thus verifying the second state
-ment.

Procedure:
1) To verify the statement (a) set up on a
bread board the circuit diagram. For
different combinations of high and low
values of the inputs A & B & C measure with
a DC voltmeter are to be measured with res-
-pect to a common reference the value of
an input may be zero volt corresponding
to a short circuit to grand while the high
value of an input may be 5 volt supplied.

by a battery.

Precautions:

1) all the connections should be neat and tight
2) check the power supply.

Result:

1) from the truth table that for different combinations of high and low values of the inputs A & B & C, $Y_1 = Y_2$
De-morgans theorem is verified.
2) Since $Y_1 = Y_2$ for different combinations of high and low values of the inputs A & B & C in the truth table demorgans 2nd theorem is verified.

Date 27/12/21

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Mutual Inductance

Aim:

To determine the coefficient of mutual inductance of a pair of coils by carey fosters null method

Apparatus:

a pair of coils whose mutual inductance is to be determined, an accumulator, standard condenser, a cell, tap key, 3- non-inductive resistance boxes, ballastic galvanometer, or moving coil or spot galvanometer with lamp and scale connecting wires.

Formula:

$$M = CR_2(R_3+S) \text{ henry}$$

where M = mutual inductance of a pair of coils.

C = capacitance of the condenser

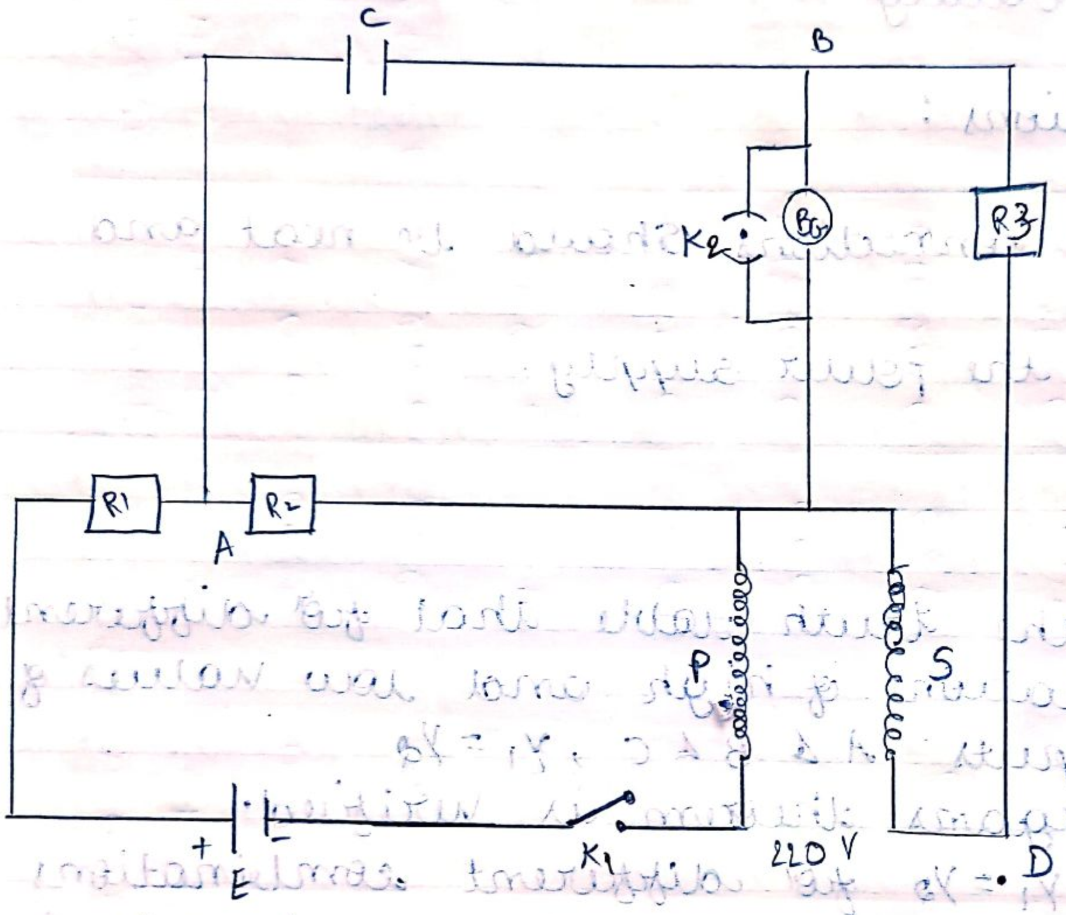
R_2, R_3 = Resistance

S = Resistance of the secondary coil.

Description:

The arrangement for the determi

Signature :



R_1, R_2, R_3 = resistance boxes

B, G = ballastic galvanometer

K_2 = Key (B.G)

P = Primary coil

S = Secondary coil

C = Standard condenser

B = battery

K_1 = tap key

distance b/w the two coils (cm)	trail no	Resistance (ohm)			$M=(R_2(R_3+S)$ henry	average value
		R_1	R_2	R_3		
0	1	50	50	1300	0·0196	0·02189
	2	40	60	1200	0·02175	
	3	30	70	1150	0·02432	
1·2	1	50	50	1050	0·01587	0·18043
	2	40	60	1000	0·01814	
	3	30	70	950	0·02012	
4	1	50	50	900	0·0136	0·0153
	2	40	60	850	0·0154	
	3	30	70	800	0·0169.	

-nation of coefficient of mutual inductance of a pair of coils is shown in fig. P and S are two coils between which the coeffi-cient of mutual inductance is to be determined. The two coils P & S are oriented in such a way to get min linkage flux. A cell E is connected in series with a tap key K_1. R_1, R_2 and R_3 are non - inductive resistance boxes. C is standard condenser. A ballastic galvanometer (B.G) with a key Key K_2 connected shown in fig.

Procedure:

make the connections as shown in fig. R_1 R_2 & R_3 are three non-inductive resistance boxes. P and S are two coils b/w which the mutual inductance is to be determine connected to +ve terminal of the cell to the resistance box, R_1 and the negative terminal of the best tap key K_1. Connect the B.G in series the tap key K_1 is used to make and break the curr-ent in the main circuit. Connect the sta-ndard condenser, C parallel to the non-inductive resistance box R_2 through the B.G before taking the observations.

Signature :

Calculation:

at 0 $T = 1$ = $M = CR_2 (R_3 + S)$

$= (0.3 \times 10^{-6})(50)(1300 + 8.25)$

$= 0.0196$

$T = 2$ = $M = CR_2 (R_3 + S)$

$= 0.02175$

$T = 3$ = $M = (0.3 \times 10^{-6})(30)(1150 + 8.25)$

$= 0.02432$

at 1.2 $T = 1$ = $M = CR_2 (R_3 + S)$

$= 0.3 \times 10^{-6} (50)(1050 + 8.25)$

$= 0.01587$

$T = 2$ = $M = 0.3 \times 10^{-6} (60)(1000 + 8.25)$

$= 0.0184$

$T = 3$ = $M = 0.3 \times 10^{-6} (70)(950 + 8.25)$

$= 0.02012$

at 4 $T = 1$ = $M = CR_2 (R_3 + S)$

$= 0.3 \times 10^{-6} (50)(900 + 8.25)$

$= 0.0136$

$T = 2$ = $M = 0.3 \times 10^{-6} (60)(850 + 8.25)$

$= 0.0154$

$T = 3$ = $M = 0.3 \times 10^{-6} (70)(800 + 8.25)$

$= 0.0169$

To check the balancing condition of the circuit.

1) first break the circuit ABF at the point A and note the direction of deflection in the B.G by pressing the tap key K_1

2) break the circuit BED at the point F and note the direction of deflection in the B.G by pressing the tap key K_1

note the resistance of the secondary coils marked on it. The mutual inductance b/w the two coil can be calculated using the formula :-

Precautions:

1) Before taking the observations premiliary adjustments for the B.G

2) ensure that the discharge through B.G are in the directions

Result :

The mutual inductance b/w the coils :

at 0 (M_0) = 0.02189 henry

at 1.2 $(M_{1.2})$ = 0.18043 henry

at 4 (M_2) = 0.0153 henry

Signature :

Specific charge (e/m) of an Electron - Thomson's method

Aim:

To determine the value of specific charge (e/m) of an electron by thomson's method.

Apparatus:

cathode ray tube with its power supply unit (in which voltmeter is fitted to measure the deflection voltage), pair of bar magnets, compass box, a wooden stand to place the bar magnets on its two arms with CR, tube in the middle

description of CR tube:

It consists of three basic components

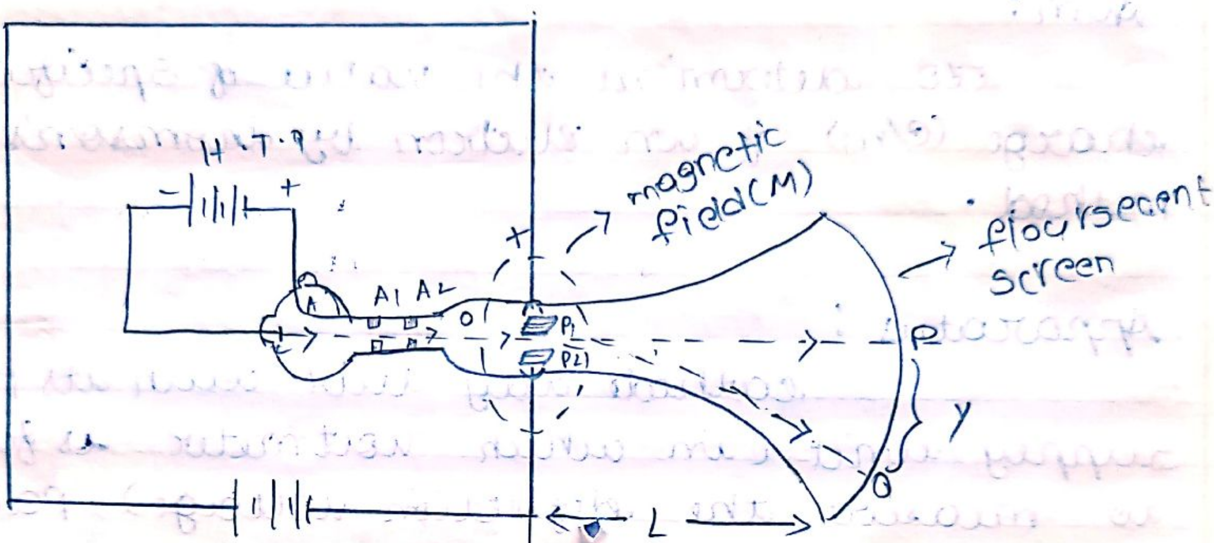
i) electron gun: which produces, accelerates and focuses emitted electrons into a narrow beam

ii) deflecting system: which deflects the electron beam either electrically (or) magnetically

iii) flourescent screen: upon which beam of electrons impinges to produce a visible spot.

$H = 0.38$

Applied potential V	Position of electron beam		Deflection electron beam $y = a - b$	Mean distance of magnets	Deflection in magnetic needle				Mean θ	Tan θ	$H = \frac{H_C}{\tan\theta}$	H^2
	Initial	Final (y)			θ_1	θ_2	θ_3	θ_4				
2	0	0.1	0.1	29.4	17	19	22	22	20.5	0.37	0.1406	0.019
4	0	0.2	0.2	22.5	38	38	36	35	36.7	0.74	0.2812	0.07
6	0	0.3	0.3	19.5	52	51	46	47	49.	1.15	0.437	0.19
8	0	0.4	0.4	16.4	69	70	58	58	63.75	2.02	0.77	0.59
10	0	0.5	0.5	15.85	71	71	60	60	65.5	2.19	0.833	0.69
12	0	0.6	0.6	14.05	79	79	65	65	72	3.077	1.189	1.34



A - anode

C - cathode

A_1, A_2 - diaphragms

P_1, P_2 - metal Plates

formula:

$$\frac{e}{m} = \frac{V \times y \times 10^7}{lLH^2 d} \text{ e.m.u/gm}$$

where, l = length of the deflecting plates
L = distance of the screen from the centre of the plates
d = separation b/w the plates
H = horizontal components of the earth's magnetic field
V = deflecting voltage applied to the plates
y = deflection of the spot on the screen under the magnetic field.
e/m = specific charge of the electron.

Procedure:

→ Draw the north south line using a compass needle. also draw the east-west line place the CRT fitted on the screen.
→ adjust the brightness and focus controls so as to get a sharp bright point spot in the middle of the screen. note the initial position of the spot on the scale fitted on the screen

Signature :

calculation:

$$\frac{e}{m} = \frac{V \times Y \times 10^7}{l L H^2 d}$$

$$l = \frac{10}{10}\,mm = 1\,cm$$

$$L = \frac{130}{10} = 13\,cm$$

$$d = \frac{5}{10}\,mm = \frac{1}{2}\,cm$$

$V = 2$

$$\frac{e}{m} = \frac{2 \times 0.1 \times 10^7}{1 \times 13 \times 0.019 \times 0.5}$$

$$= 1.6194 \times 10^7$$

$V = 4$

$$\frac{e}{m} = \frac{4 \times 0.2 \times 10^7}{1 \times 13 \times 0.07 \times 0.5}$$

$$= 1.758 \times 10^7$$

$V = 6$

$$\frac{e}{m} = \frac{6 \times 0.3 \times 10^7}{1 \times 13 \times 0.19 \times 0.5}$$

$$= 1.457 \times 10^7$$

$V = 8$

$$\frac{e}{m} = \frac{8 \times 0.4 \times 10^7}{1 \times 13 \times 0.59 \times 0.5}$$

$$= 0.834 \times 10^7$$

$V = 10$

$$\frac{e}{m} = \frac{10 \times 0.5 \times 10^7}{1 \times 13 \times 0.69 \times 0.5} = 1.114 \times 10^7$$

Date

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→ Now apply a suitable deflection voltage so that the curious spot is deflection voltage so that the determination spot is deflected by about 0.5 to 0.1 cm.

→ Place the bar magnet symmetrically on the either side of the C.T along the arms of the wooden stand on which the tube is fitted such that their opposite plates face other and their common axis is exactly at right angles of the axis of the CRT adjust the polarity as well as the distance of the magnet.

When the adjustment is perfect not the distance of the magnet on the side nearer to the C.R.T let the distance be r_1 and r_2

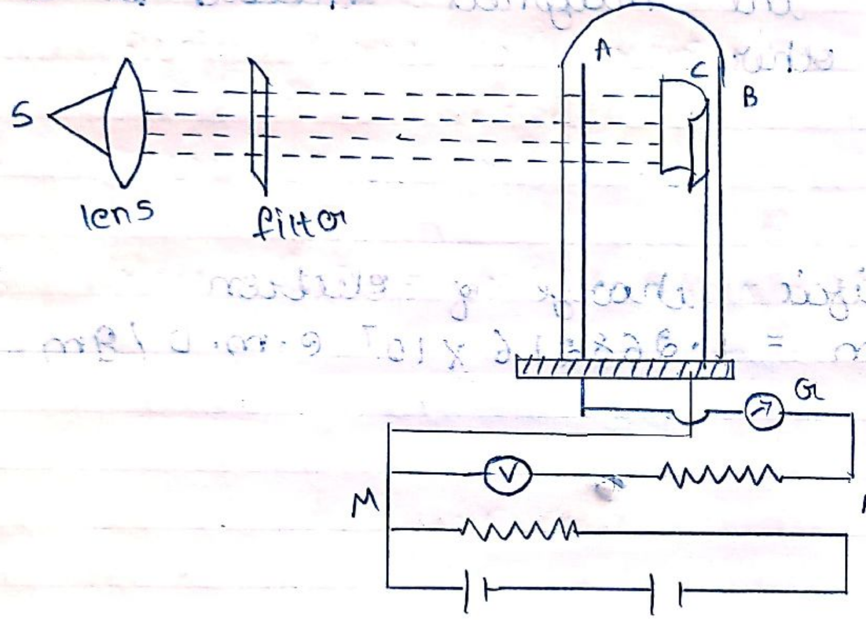
→ Place the magnets exactly in the position r_1, r_2, r_3 & r_4 which gives angle $\theta_1, \theta_2, \theta_3, \theta_4$

→ Take more sets of observations by changing the values of V and hence that the electric field.

Precautions:

1) The magnets should be placed at the

Signature :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A
C
B
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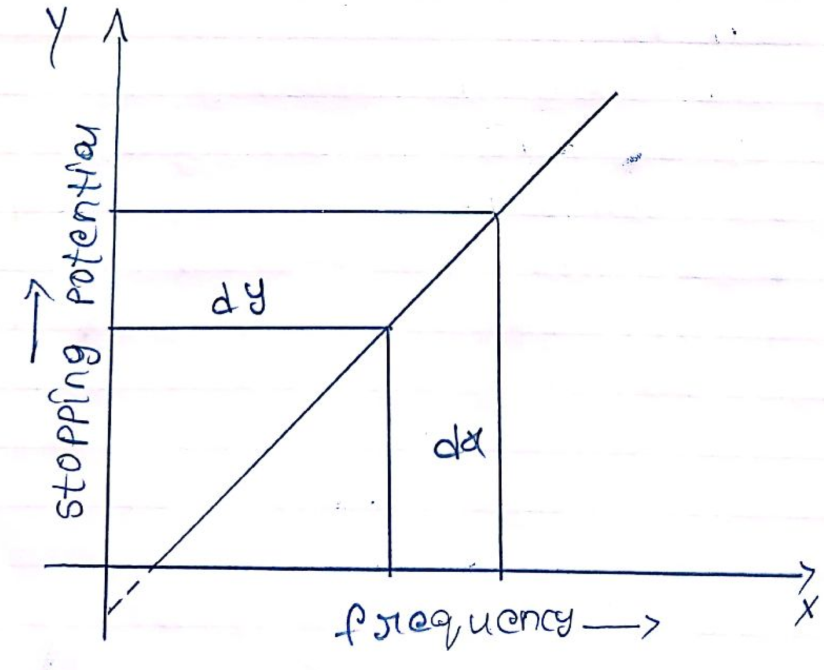

Y
stopping potential ⟶
dy
dx
frequency ⟶
X

Date 3/01/22

Expt. No. 5 Page No. 17

Plank's constant

Aim:

To determine the values of Plank's constant (h) by using stopping potential of different filters.

Apparatus:

The photo electric cell, power-supply, source of light fiters

formula:

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

where,

e = electric charge = 1.6×10^{-19} columbs

c = speed of light = 3×10^{10} cm/sec

V_1 = stopping potential of corresponding to wave columbs with filter - I (v)

V_2 = stopping potential of corresponding to wave length with filter - II (v)

λ_1 = wave length of filters - 1(cm)

λ_2 = wave length of filters - 11 (cm)

Description:

If light is incident on cer-

Signature :

S.no	color of the filter	wave-length λ cm	frequency of incident light ν HZ	stopping potential V_0 (in volts)
1	Red	6443×10^{-8}	4.65×10^{-14}	0.259
2	green	5735×10^{-8}	5.2310×10^{-14}	0.463
3	blue	4945×10^{-8}	6.060×10^{-14}	0.637

Subhodaya

tain metals, electrons are emitted. These electrons are called photo electrons and the metal is known as photo metal. This emission of elements by the actions of light on metal is photo electric effect. The photo electric cell consists of a glass or a quartz bulb B according as it to be used with visible or ultra violet light.

Theory:

according to einstein (light of frequency v consists of a stream of photons each of energy hv. when a photon of frequency imparting kinetic energy to the electron it is the energy spent to extracting the electron from the emitter to which it is found and 1/2 or ~ is the kinetic energy acquired by the electron, then

$$hV = \omega + \frac{1}{2} mv^2$$

Procedure:

The circuit is connected as shown in above fig. MN is the potential divider. The potential applied between C & A measured by a vaccume tube voltmeter

Signature :

Calculation ;

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

$$= \frac{1.6 \times 10^{-19} (0.637 - 0.463)(5735 \times 10^{-8})(4945 \times 10^{-8})}{3 \times 10^{10} (5735 - 4945) \times 10^{-8}}$$

$$= \frac{7895305.68 \times 10^{-35}}{2370 \times 10^{2}}$$

$$= 3331.35261 \times 10^{-37}$$

$$= 3.33135261 \times 10^{-34} \text{ J/sec}$$

VTVM light from a powerful source of light is condensed by a condenser lens incident on the photo metal the value of the potential difference is noted

The experiment is repeated using a number of optical filters and the corres-ponding values of the stopping frequency and corresponding stopping potential.

$h = m \times e$ J·s , h = plank constant

Precautions :

1) The stopping voltage should decrease as wave length increases.
2) The experimental should be performed with at least three filters.

Result :

~~from graph~~

calculated value of planks constant is

$h = 3.33135261 \times 10^{-34}$ J/sec (Practical)

$h = 3.7848 \times 10^{-34}$ J/sec (graph)

Signature :

Energy gap of a Semi conductor

Aim:

To determine the energy band gap of the semi conductor material taken in the form of a p-n junction diode.

Apparatus:

DC power supply, semi conductor diode, thermometer, heating arrangement to heat the diode, volt-meter, micro-ammeter and connecting wires.

Formula:

$$E_g = \frac{\text{Slope of the straight line}}{5.036} \text{ eV}$$

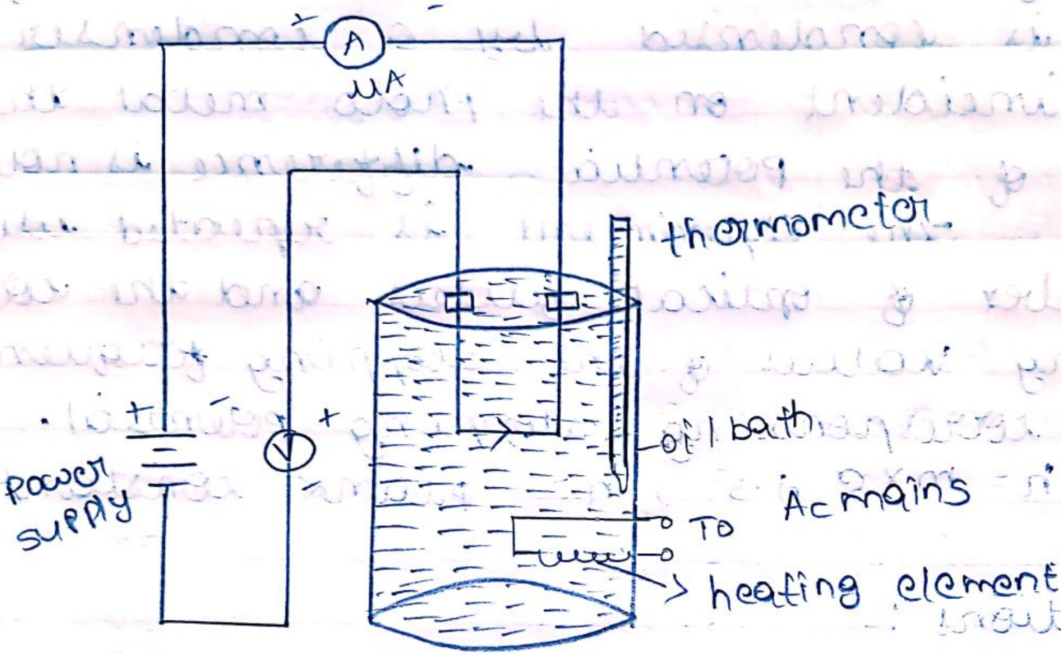
where,

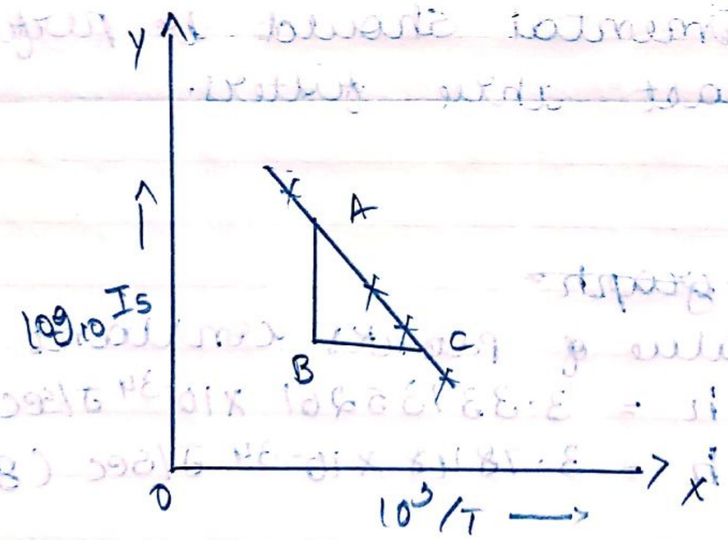
E_g = energy band gap of the given semi conductor diode.

m = slope of the straight line plot obtained for $\log_{10} I_S$ & $10^3/T$

where I_S = reverse saturation current (μA)

T = absolute temperature (°K)


A
μA
thermometer
oil bath
power supply
V
TO
Ac mains
heating element


Y
A
B
C
log10 Is
0
10³/T
X

To determine the reverse saturation current at different temperature:

Temperature		current	$10^3/T$	$\log_{10} I_S$
$t\,^\circ C$	$T = t + 273 (K)$	I_S (μA)	(K^{-1})	
80	353	96.9	2.832	1.986
75	348	65.7	2.873	1.817
70	343	48.5	2.915	1.685
65	338	37.0	2.958	1.568
60	333	28.6	3.003	1.456
55	328	21.9	3.048	1.340
50	323	17.2	3.095	1.235
45	318	13.5	3.1446	1.1303
40	313	10.9	3.194	1.0374

Description:

The Experimental arrangement compass an oil bath which is provi-ded with sockets at its mouth. The sockets are used to insert the thermometer and the semi-conductor diode in the oil bath as shown in fig a heating element is fixed inside the oil bath by connec-ting to the AC main supply. The reverse biasing voltage can be adjusted by means of the volt meter and the reverse saturation current can be measured with the help of a micro ammeter.

Procedure:

Connect the two terminals of the given semi-conductor diod to the DC power supply and micrometer in such away that the diode is reversed biased Immerse the diode in the oil bath. Insert the thermometer in the oil bath at the same level as that the the diode.

Switch on the DC power suply and adjust the reverse bias voltage to till .5 volt. Switch on AC main supply then the thermometer of oil bath gradually increase.

Graph:

draw a graph with $10^3/T$ on x-axis and $\log_{10} I_s$ on y- axis the graph will be straight line as shown in fig. from the graph, find the slope of the straight line. The energy band gap of the given semi- conductor can be calculated by gap of the given semi conductor can be calculated by substituting the value of slope m in given Eq n.

Precautions:

1) The diode and thermometer should be immersed at the same level in the oil bath.

2) The [redacted] and the current should be noted simultaneously.

Result:

The energy band gap of the given semi conductor material is

$E_g =$ ~~2.4~~ 0.47656 eV

Signature :

Plank's constant

Date 3/01/22

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frequency of incident light	stopping potential V_0
4.6	0.25
5.2	0.46
6.0	0.63

Scale:

on X-axis 1cm = 1 unit
on Y-axis 1cm = 0.1 units

calculation:

$$m = \frac{dy}{dx} = \frac{0.44 - 0.6}{5.2 - 5.9}$$

$$= \frac{0.16}{0.7}$$

$$= 0.2285 \times 10^{-14}$$

$$h = me$$

$$= 0.2285 \times 10^{-14} \times 1.6 \times 10^{-19}$$

$$= 3.7848 \times 10^{-34}$$

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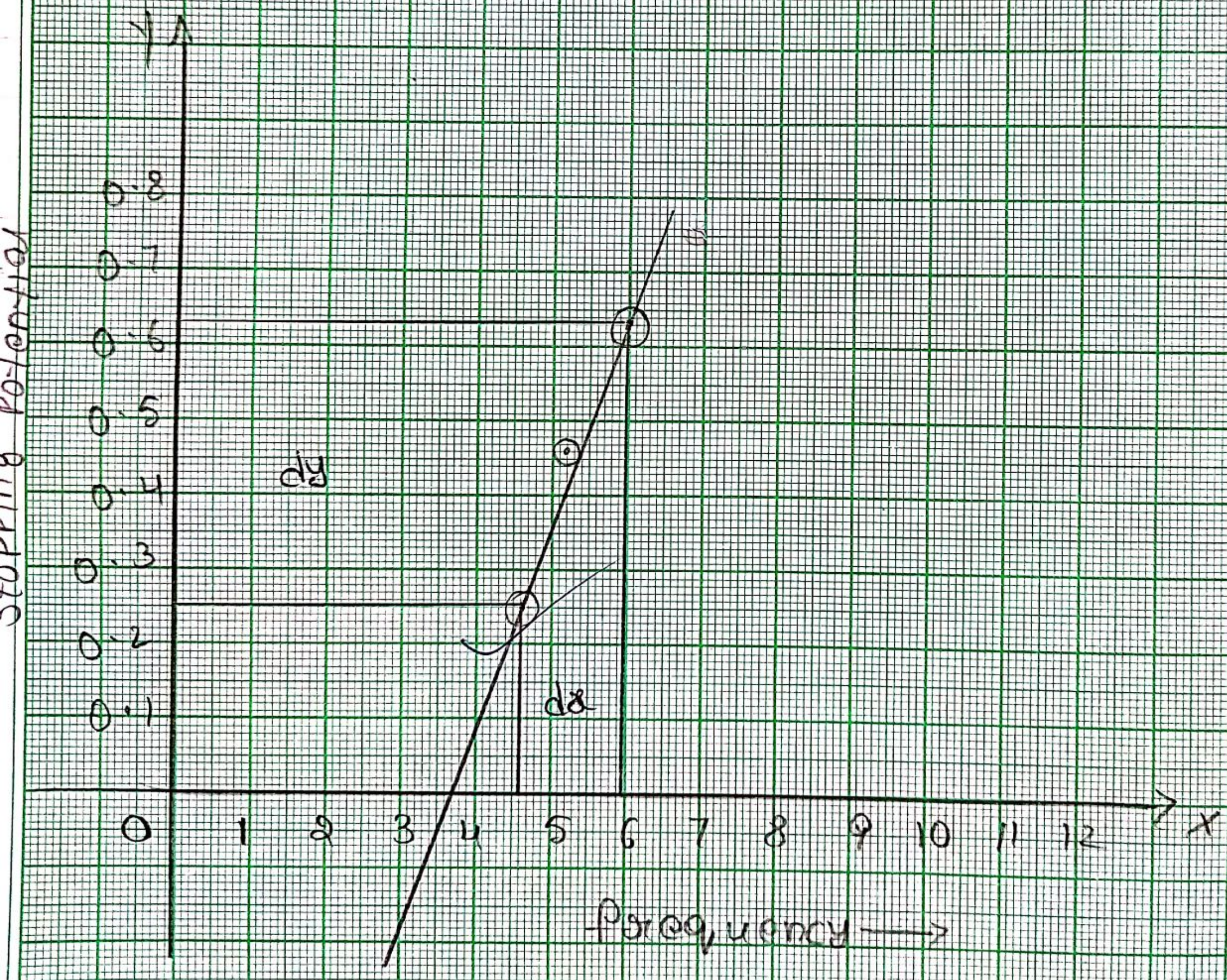

Subhodaya

Energy gap of a Semi conductor

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	$10^3/T$ (K^{-1})	$\log_{10} I_S$
80	2.83	1.98
75	2.87	1.81
70	2.91	1.68
65	2.95	1.56
60	3.00	1.45
55	3.04	1.34
50	3.09	1.23
45	3.14	1.13
40	3.19	1.03

Scale:

on x-axis 1cm = [illegible].1 units

on y-axis 1cm = [illegible].1 units

$$\text{slope} = \frac{AB}{BC}$$

$$= \frac{0.6}{0.25}$$

$$= 2.4$$

Signature :

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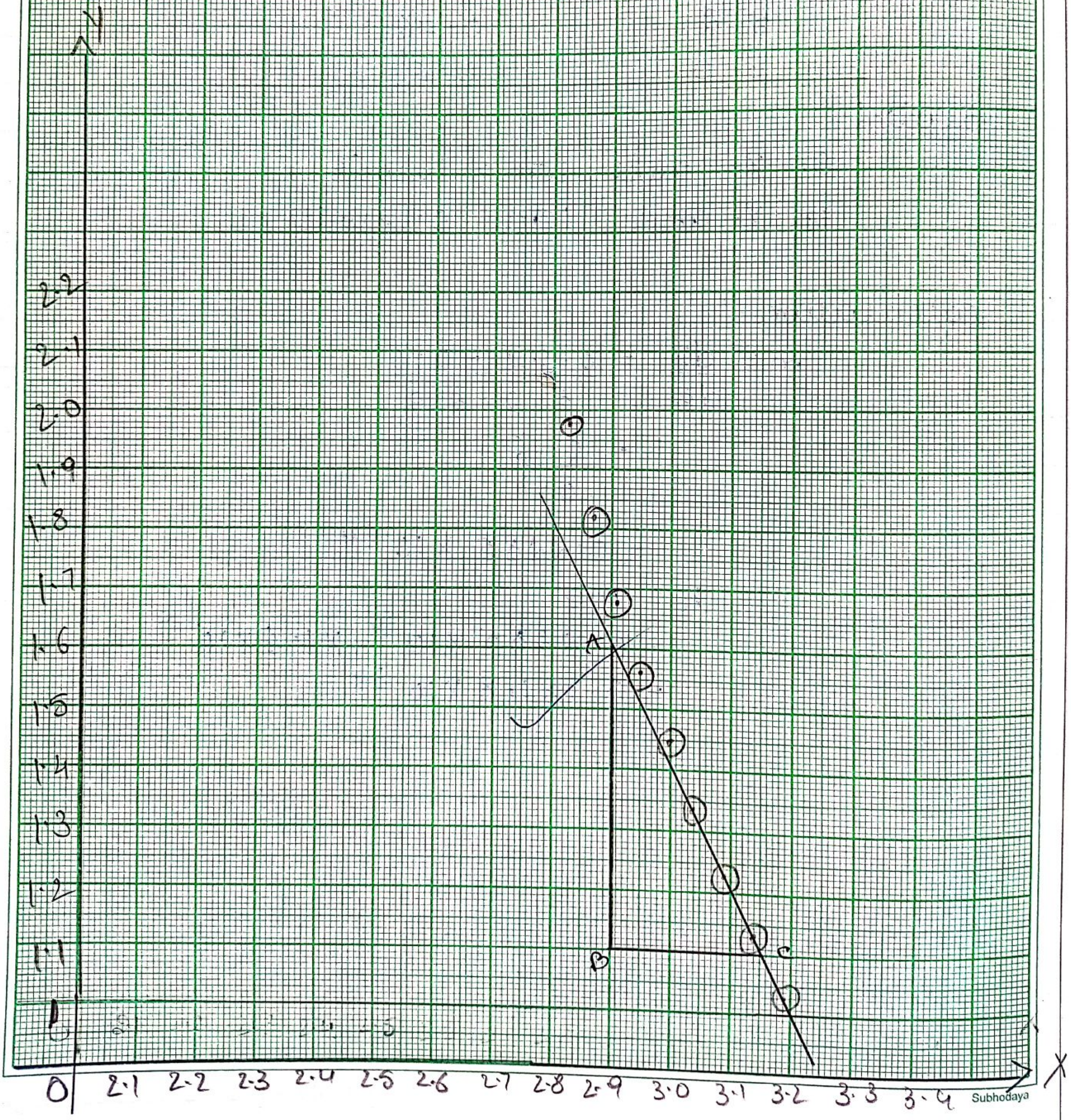
Y
2.2
2.1
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
O
2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4
X
A
B
C