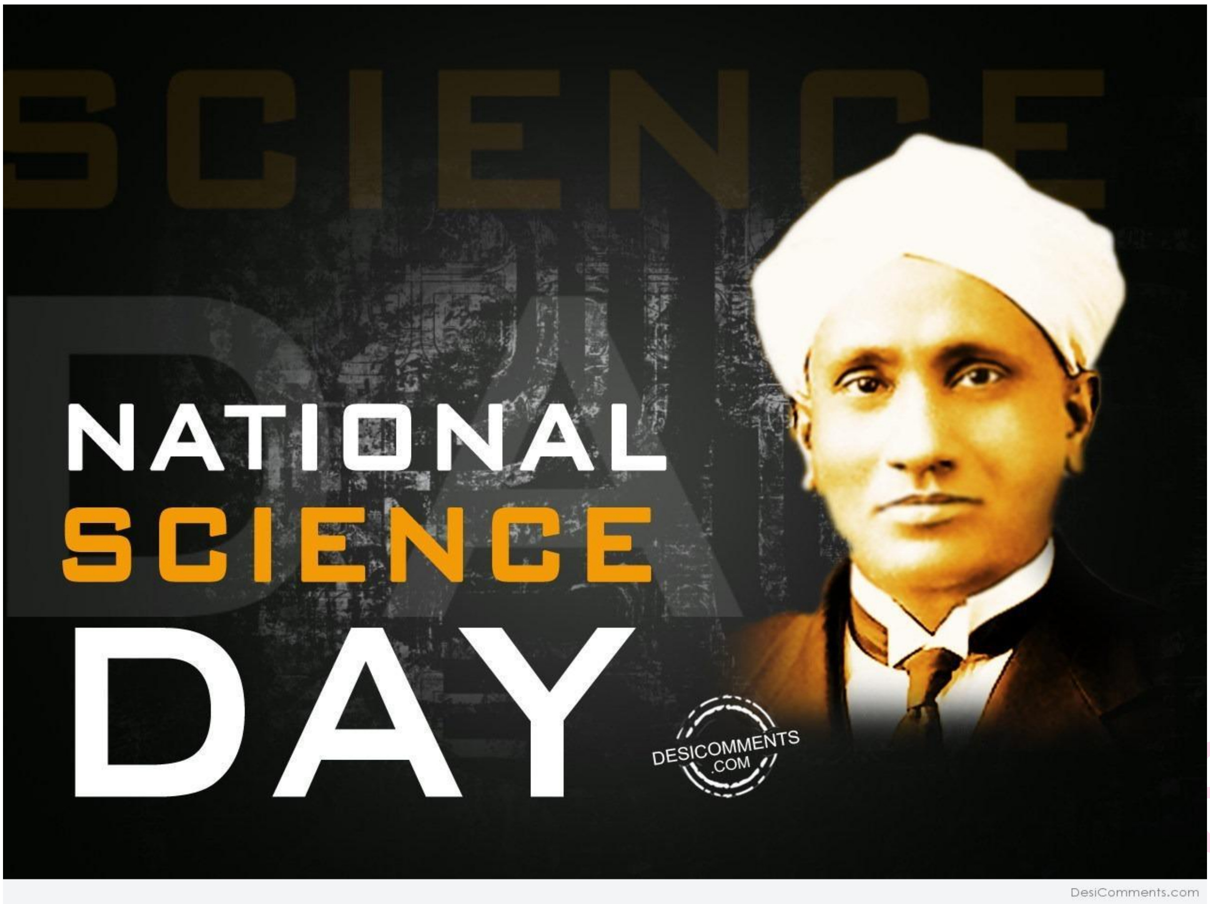
XII STANDARD ENGLISH MEDIUM
PHYSICS PRACTICAL MANUAL



Success can come to you by courageous devotion to the task lying in front of you.

- C.V.Raman

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An experiment is a question which science poses to Nature, and a measurement is the recording of Nature's answer. - Max Planck

EX.NO: **SPECIFIC RESISTANCE OF THE MATERIAL OF THE COIL USING METRE BRIDGE** **DATE:**

AIM: To determine the specific resistance of the material of the given coil using metre bridge.

FORMULA:

$$\rho = \frac{\pi r^2 X}{L} \ (\Omega \text{ m})$$

where, ρ – Specific resistance of the given coil (Ω m)

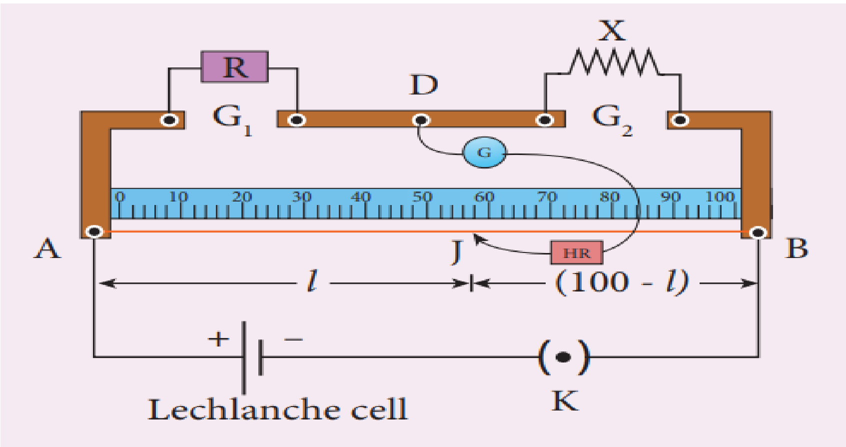
X – Resistance of the given coil (Ω)

R – Known resistance (Ω)

L – Length of the coil (m)

r – Radius of the wire (m)

CIRCUIT DIAGRAM:



R – Known resistance

X – Unknown resistance

G_1 – Gap 1

G_2 – Gap 2

G – Galvanometer

J – Jockey

AB – Metre bridge wire

K – Key

OBSERVATION:

S. No.	Resistance R (Ω)	Before interchanging		After interchanging		Mean
		Balancing length l (cm)	$X_1 = \frac{R(100-l)}{l}$ Ω	Balancing length l (cm)	$X_2 = \frac{Rl}{(100-l)}$ Ω	$X = \frac{X_1+X_2}{2}$ Ω
1						
2						
3						

Mean resistance, X = …………….. Ω

Length of the coil L = ……………………… cm

Mean diameter 2 r = ………………….. mm Radius of the wire r = ……………………… mm

r = ………………………….. m

CALCULATION:

1. $X = \frac{X_1 + X_2}{2} =$

2. $X = \frac{X_1 + X_2}{2}$

3. $X = \frac{X_1 + X_2}{2} =$

Mean $X = \frac{X_1 + X_2}{2} =$

Specific resistance of the coil $\rho = \frac{\pi r^2 X}{L}$ (Ω m)

PROCEDURE:

1. Circuit connections are made as shown in the diagram.
2. With a suitable resistance included in the resistance box, the circuit is switched on.
3. Jockey is moved on the wire. Balance point is noted where the galvanometer shows null deflection.
4. AJ = l is noted. The unknown resistance $X_1 = \frac{R(100 - l)}{l}$
5. The experiment is repeated for different values of R.
6. After interchanging R and X, the unknown resistance is found by $X_2 = \frac{R\,l}{(100 - l)}$
7. Experiment is repeated. The mean value of X_1 and X_2 is found.
8. By using radius r and length L, the specific resistance of the material is determined by the formula $\rho = \frac{\pi r^2 X}{L}$

RESULT:

The specific resistance of the material of the given coil = ……………………………… Ω m

EX. NO: HORIZONTAL COMPONENT OF EARTH'S MAGNETIC FIELD USING TANGENT GALVANOMETER DATE:

AIM: To determine the horizontal component of the Earth's magnetic field using tangent galvanometer.

FORMULA:

$$B_H = \frac{\mu_0 \, n \, k}{2r} \text{ (tesla)} \qquad k = I / \tan\theta \text{ (A)}$$

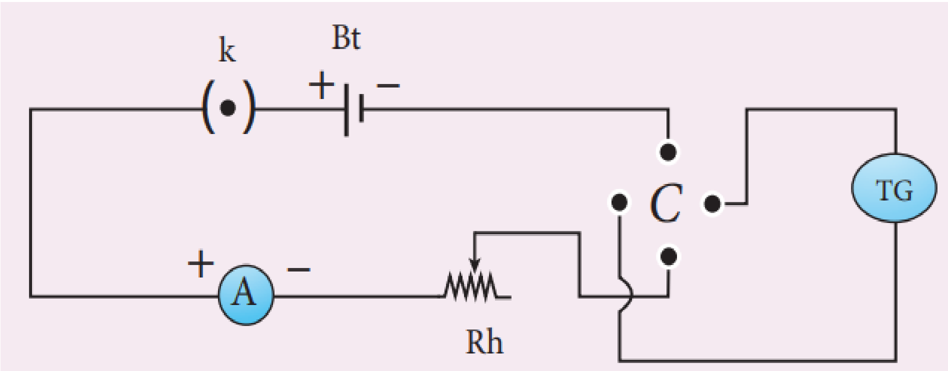
Where, B_H – Horizontal component of the Earth's magnetic field (T)

μ_0 – Permeability of free space ($4\pi \times 10^{-7}$ H m^{-1})

n – Number of turns of TG in the circuit (no unit)

k – Reduction factor of TG (A) r – Radius of the coil (m)

CIRCUIT DIAGRAM:



Bt – Battery
K – Key
A – Ammeter
Rh – Rheostat
C – Commutator
TG – Tangent Galvanometer

OBSERVATION:

Number of turns of the coil = Circumference of the coil ($2\pi r$) =

Radius of the coil r =

S.No.	Current I (A)	Deflection in TG (Degree)				Mean θ	Tan θ	k = I / tan θ
		θ_1	θ_2	θ_3	θ_4			
1								
2								
3								
4								

Mean

CALCULATION:

1) $k = \frac{I}{\tan\theta} =$

2) $k = \frac{I}{\tan\theta} =$

3) $k = \frac{I}{\tan\theta} =$

4) $k = \frac{I}{\tan\theta} =$

Mean $k = \frac{I}{\tan\theta} =$

Horizontal component of Earth's magnetic field is $B_H = \frac{\mu_0\, n\, k}{2r}$

$B_H =$

PROCEDURE:

1. Preliminary adjustments are carried out. Circuit connections are made.
2. A suitable current is allowed to pass through the circuit, the deflections θ_1, θ_2 are noted.
3. The direction of current is reversed using commutator C, the deflections θ_3, θ_4 are noted. Mean value θ is found.
4. The reduction factor $k = I / \tan\theta$ is found for each case and it is noted that k is a constant.
5. The experiment is repeated for various currents and the readings are noted and tabulated.
6. The radius of the circular coil is then found. By using the values of r, n and k the value of horizontal component of earth's magnetic field is found by using the formula

$B_H = \frac{\mu_0\, n\, k}{2r}$ (tesla)

RESULT: The horizontal component of earth's magnetic is found to be = ……………….. T.

EX. NO: **VERIFICATION OF TRUTH TABLES OF LOGIC GATES USING INTEGRATED CIRCUITS** **DATE:**

AIM: To verify the truth tables of AND, OR, NOT, EX-OR, NAND and NOR gates using IC's.

BOOLEAN EXPRESSIONS:

(i) AND gate $Y = A . B$ (ii) OR gate $Y = A + B$

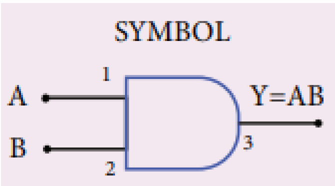
(iii) NOT gate $Y = \bar{A}$ (iv) EX – OR gate $Y = A \oplus B = \bar{A}B + A\bar{B}$

(v) NAND gate $Y = \overline{A.B}$ (vi) NOR gate $Y = \overline{A + B}$

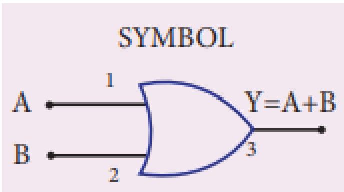
Where A and B are inputs. Y is the output.

LOGIC SYMBOLS:

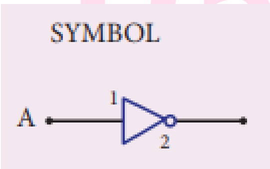
1. AND Gate:



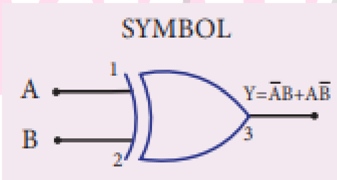
2. OR Gate:



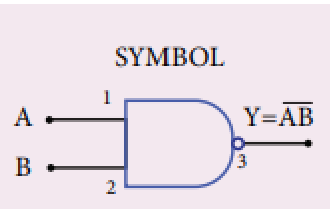
3. NOT Gate:



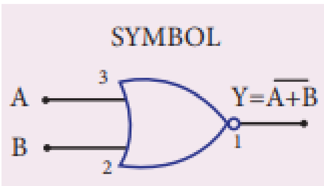
4. EX-OR Gate:



5. NAND Gate:



6. NOR Gate:



TRUTH TABLES:

1. AND Gate:

A	B	Y = A . B
0	0	0
0	1	0
1	0	0
1	1	1

2. OR Gate:

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

3. NOT Gate:

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

4. EX – OR Gate:

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

5. NAND Gate:

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

6. NOR Gate:

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

CALCULATION:

1. AND Gate:

A	B	Y = A. B
0	0	Y = 0 . 0 = 0
0	1	
1	0	
1	1	

2. OR Gate:

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

3. NOT Gate:

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

4. EX-OR Gate:

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

5. NAND Gate:

A	B	$Y = \overline{A.B}$
0	0	$Y = \overline{0.0} = 1$
0	1	
1	0	
1	1	

6. NOR Gate:

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

PROCEDURE:

1. To verify the truth table of a logic gate, the suitable IC is taken and the connections are given.
2. For all the ICs, 5 V is applied to pin 14 while the pin 7 is connected to the ground.
3. The logical inputs of the truth table are applied and the corresponding output is noted.
4. Similarly the output is noted for all other combinations of inputs.
5. In this way, the truth table of a logic gate is verified.

RESULT: The truth table of logic gates OR, AND, NOT, EX-OR, NOR and NAND gates using integrated circuits is verified.

EX.NO: VOLTAGE – CURRENT CHARACTERISTICS OF A PN JUNCTION DIODE DATE:

AIM: To draw the V- I characteristics of the PN junction diode and to determine its knee voltage and forward resistance.

FORMULA:

$$R_F = \frac{\Delta V_F}{\Delta I_F} \ (\Omega)$$

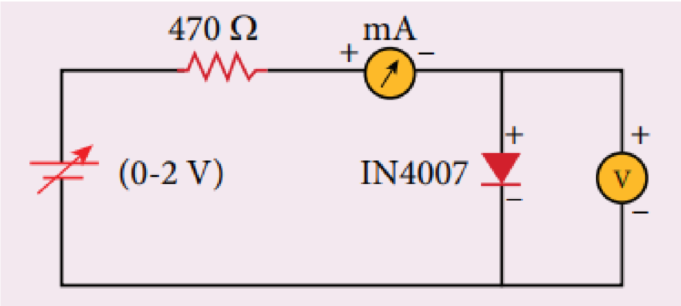
where, R_F – Forward resistance of the diode (Ω)

ΔV_F - The change in forward voltage (volt)

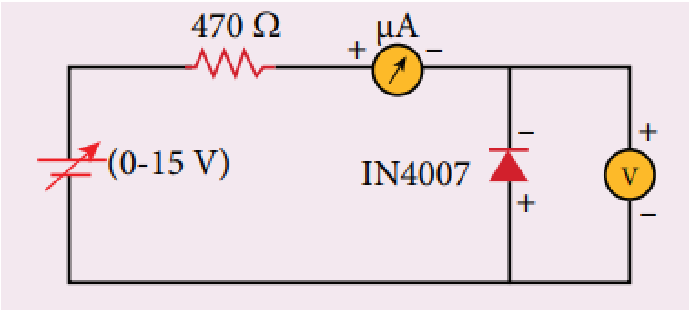
ΔI_F - The change in forward current (m A)

CIRCUIT DIAGRAM:

FORWARD BIAS



REVERSE BIAS



OBSERVATION:

FORWARD BIAS CHARACTERISTIC CURVE **REVERSE BIAS CHARACTERISTIC CURVE**

S.No.	Forward bias voltage V_F(volt)	Forward bias current I_F (m A)		S.No.	Reverse bias voltage V_R (volt)	Reverse bias current I_R (μ A)
1				1		
2				2		
3				3		
4				4		
5				5		
6				6		
7				7		
8				8		

CALCULATION:

Forward resistance of the PN junction diode is

$$R_F = \frac{\Delta V_F}{\Delta I_F} =$$

Knee voltage of the P-N junction diode =

PROCEDURE:

FORWARD BIAS:

1. The connections are made as in the circuit.
2. The voltage across the diode can be varied with the help of variable DC power supply.
3. The forward voltage (V_F) is increased from 0.1 V to 0.8 V in suitable equal steps.
4. The corresponding current (I_F) is noted from milli ammeter. V_F and I_F are positive.
5. A graph is drawn by taking V_F along X-axis and I_F along Y-axis.
6. From the forward characteristic curve, knee voltage is marked and noted. The reciprocal of the slope gives the forward resistance of the diode.

REVERSE BIAS

1. The connections are made as in the circuit.
2. The voltage across the diode can be varied with the help of variable DC power supply.
3. The reverse voltage (V_R) across the diode is increased from 1 V in steps of 1 V upto V
4. The corresponding current I_R is noted from the micro ammeter. V_R and I_R are negative.
5. A graph is drawn by taking V_R along negative X-axis and I_R along negative Y-axis.

RESULT:

The V – I characteristics of the PN junction diode are studied.

i) Knee Voltage of the PN junction diode = ………………. V

ii) Forward resistance of the diode = ………………. Ω

NOTE: In the circuit diagram, the diode should be named as 1 N 4007 instead of IN 4007.

EX.NO. **REFRACTIVE INDEX OF THE MATERIAL OF THE PRISM** **DATE:**

AIM:

To determine the refractive index of the material of a prism using spectrometer.

FORMULA:

$$\mu = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

where, μ – Refractive index of the material of the prism (No unit)

A - Angle of the prism (degree) D – Angle of minimum deviation (degree)

OBSERVATION:

TABLE 1: To find the angle of the prism (A)

Image	Vernier A (Degree)			Vernier B (Degree)		
	MSR	VSC	TR	MSR	VSC	TR
Reflected Image from face 1						
Reflected Image from face 2						
Difference 2A						

Mean 2 A =

Mean A =

PROCEDURE:

1. Initial adjustments are made. 2. The slit is illuminated by sodium vapour lamp.
3. Prism is placed on the prism table with its refracting edge facing the collimator.
4. Light is getting reflected from both reflecting faces of the prism.
5. The telescope is rotated to left to obtain reflected image of the slit. Vernier A and B readings are noted. 6. Telescope is then rotated to right to obtain the other reflected image of the slit. Vernier readings are noted.
7. The difference between the two readings gives 2A from which the angle of the prism A is calculated.

CALCULATION: To find the value of A:

TABLE 2: To find the angle of minimum deviation (D)

Image	Vernier A (Degree)			Vernier B (Degree)		
	MSR	VSC	TR	MSR	VSC	TR
Refracted image						
Direct image						
Difference D						

Mean D =

PROCEDURE:

1. Prism is placed on the prism table so that light is incident on one of the refracting faces.
2. Telescope is turned to view the refracted image.
3. Keeping the telescope fixed, prism table is rotated so that the image moves towards the direct ray.
4. At a particular position, the refracted ray begins to retrace its path. – POSITION OF MINIMUM DEVIATION.
5. Vertical cross wires are made to coincide with the ray. Vernier readings are noted.
6. After removing the prism, direct ray is made to coincide with the vertical cross wires. Direct ray readings are noted.
7. Difference between the two readings gives the angle of minimum deviation D. From the values of A and D, the refractive index of the material of the prism is determined.

CALCULATION: To find the value of D:

CALCULATION: To find the value of μ:

RESULT:

1. Angle of the prism (A) = ………………………………. degree

2. Angle of minimum deviation of the prism (D) ……………………… degree

3. Refractive index of the material of the prism (μ) = ………………….. (no unit)

EX.NO: **VOLTAGE-CURRENT CHARACTERISTICS OF A ZENER DIODE** **DATE:**

AIM: To draw the V-I characteristic curves of a Zener diode and to determine its knee voltage, forward resistance and reverse breakdown voltage.

FORMULA:

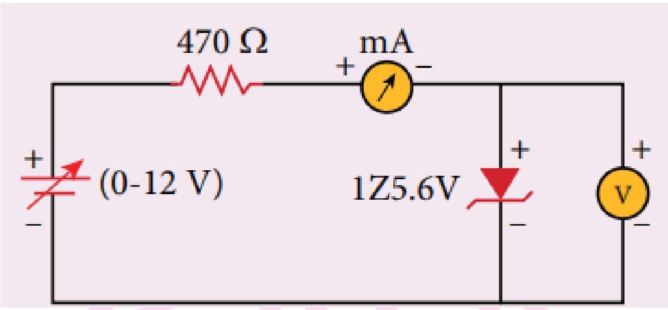
$$R_F = \frac{\Delta V_F}{\Delta I_F} \ \Omega$$

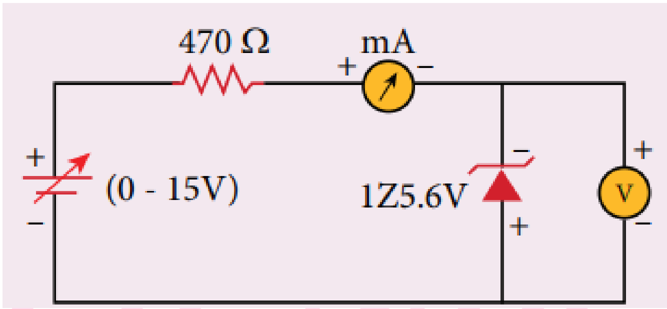
where, R_F - Forward resistance of the diode (Ω)

ΔV_F – Change in forward voltage (volt)

ΔI_F – Change in forward current (m A)

CIRCUIT DIAGRAM:





OBSERVATION

FORWARD BIAS CHARACTERISTICS

S.NO.	Forward bias voltage V_F (V)	Forward bias current I_F (mA)
1		
2		
3		
4		
5		
6		

REVERSE BIAS CHARACTERISTICS

S.NO.	Reverse bias voltage V_R (V)	Reverse bias current I_R (mA)
1		
2		
3		
4		
5		
6		

CALCULATION:

Forward resistance of the diode $R_F = \frac{\Delta V_F}{\Delta I_F}$

Knee voltage = …………………………… volt

Breakdown voltage of the Zener diode V_Z = ……………. Volt

PROCEDURE:

FORWARD BIAS CHARACTERISTICS

1. The connections are given as per the circuit.
2. The voltage can be varied with the help of variable DC power supply.
3. V_F is increased from 0.1 V upto 0.6 V and the corresponding current I_F is noted.
4. V_F and I_F are taken as positive.
5. V_F is taken along X-axis and I_F is taken along Y-axis.
6. The voltage corresponding to the dotted line gives knee voltage. A slope is drawn and the reciprocal of the slope gives R_F.

REVERSE BIAS CHARACTERISTICS

1. The connections are given as per the circuit.
2. The voltage can be varied with the help of variable DC power supply.
3. V_R is increased from 1 V upto 6 V and the corresponding current I_R is noted.
4. V_R and I_R are taken as negative.
5. V_R is taken along negative X-axis and I_R is taken along negative Y-axis.
6. Zener breakdown occurs at a particular voltage. It is determined from the graph drawn.

RESULT:

i) Forward resistance R_F = Ω

ii) Knee voltage = volt

iii) Breakdown voltage of the Zener diode V_Z = volt

EX.NO: CHARACTERISTICS OF A NPN-JUNCTION TRANSISTOR DATE:

IN COMMON EMITTER CONFIGURATION

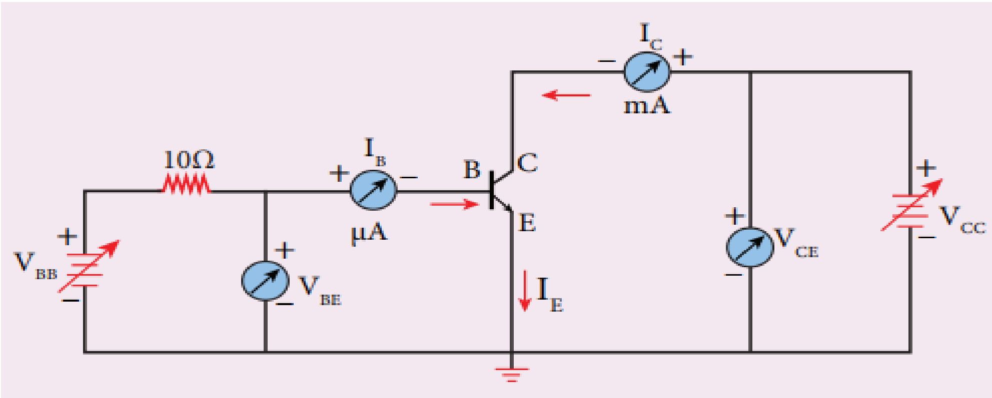
AIM: To study the input characteristics and to determine the current gain of a NPN junction transistor in CE configuration.

FORMULA:

Input impedance $r_i = \left[\frac{\Delta V_{BE}}{\Delta I_B}\right]_{V_{CE}}$ **Ω**

Current gain $\beta = \left[\frac{\Delta I_C}{\Delta I_B}\right]_{V_{CE}}$ **(No unit)**

CIRCUIT DIAGRAM:

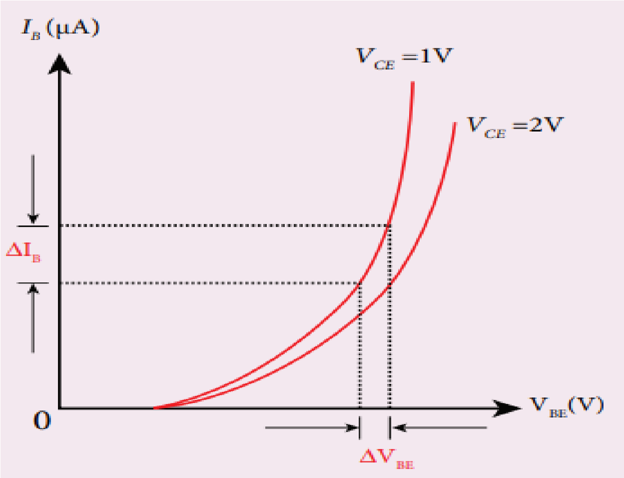


OBSERVATION:

TABLE 1: INPUT CHARACTERISTIC CURVE: V_{BE} vs I_B (V_{CE} constant)

S.NO.	V_{CE} = 1 V		V_{CE} = 2 V	
	V_{BE} (V)	I_B (μ A)	V_{BE} (V)	I_B (μ A)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

CALCULATION:

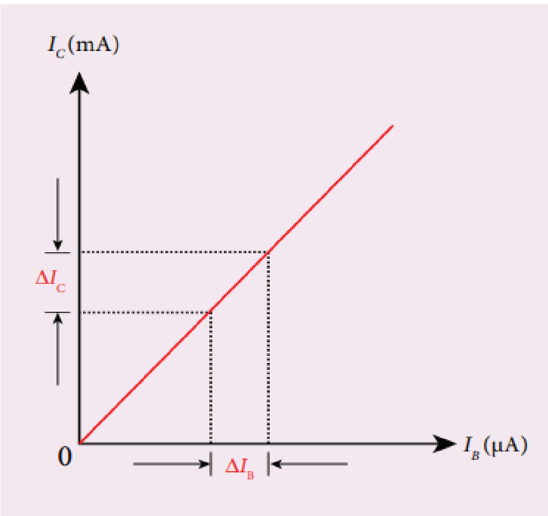


Slope = $\frac{\Delta I_B}{\Delta V_{BE}}$

Input impedance = $\frac{1}{slope}$ = [$\frac{\Delta V_{BE}}{\Delta I_B}$]

TABLE 2: TRANSFER CHARACTERISTIC CURVE: I_B vs I_C (V_{CE} constant)

S.No.	V_{CE} = 1 V		V_{CE} = 2 V	
	I_B (μ A)	I_C (m A)	I_B (μ A)	I_C (m A)
1				
2				
3				
4				
5				
6				
7				



CALCULATION:

Slope = $\frac{\Delta I_C}{\Delta I_B}$ Current gain = slope

PROCEDURE:

INPUT CHARACTERISTICS:

1. V_{CE} is kept constant.
2. V_{BE} is varied in steps of 0.1 V and the corresponding I_B is noted.
3. The same procedure is repeated for different values of V_{CE}.
4. V_{BE} is taken along X-axis and I_B is taken along Y-axis.
5. The curves obtained are called the input characteristics.
6. The reciprocal of the slope of these curves gives input impedance of the transistor.

TRANSFER CHARACTERISTICS:

1. V_{CE} is kept constant.
2. I_B is varied in steps of 10 μA and the corresponding I_C is noted.
3. The readings are tabulated.
4. I_B is taken along X-axis and I_C is taken along Y-axis.
5. The slope of the characteristic curve gives current gain β.

RESULT:

i) The input and transfer characteristics of the NPN junction in CE mode are drawn.

ii) a) Input impedance = ………………………… Ω

b) Current gain β = ………………………….. (no unit)

EX.NO: CHARACTERISTICS OF A NPN-JUNCTION TRANSISTOR DATE:

IN COMMON EMITTER CONFIGURATION

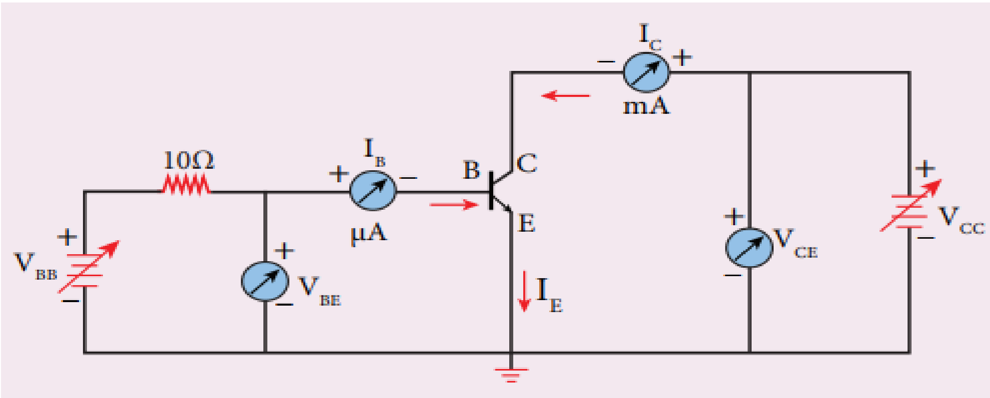
AIM: To study the output characteristics and to determine the current gain of a NPN junction transistor in CE configuration.

FORMULA:

Output impedance $r_o = \left[\frac{\Delta V_{CE}}{\Delta I_C}\right]_{I_B}$ Ω

Current gain $\beta = \left[\frac{\Delta I_C}{\Delta I_B}\right]_{V_{CE}}$ (No unit)

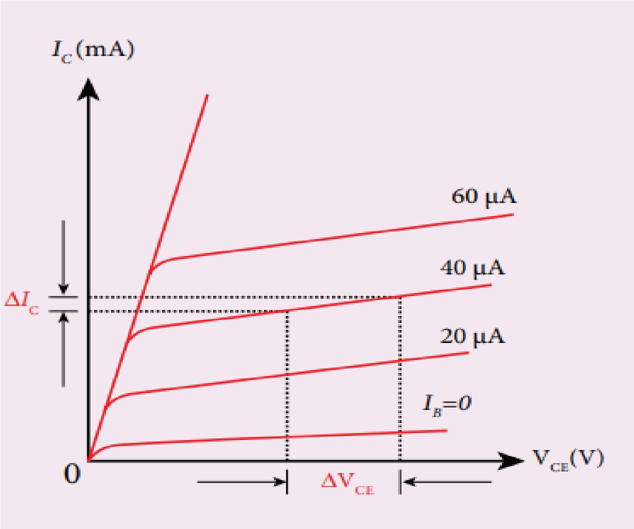
CIRCUIT DIAGRAM:



OBSERVATION:

TABLE 1: OUTPUT CHARACTERISTIC CURVE: V_{BE} vs I_B (V_{CE} constant)

S.NO.	I_B = 20 µA		I_B = 40 µA	
	V_{CE} (V)	I_C (m A)	V_{CE} (V)	I_C (m A)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				



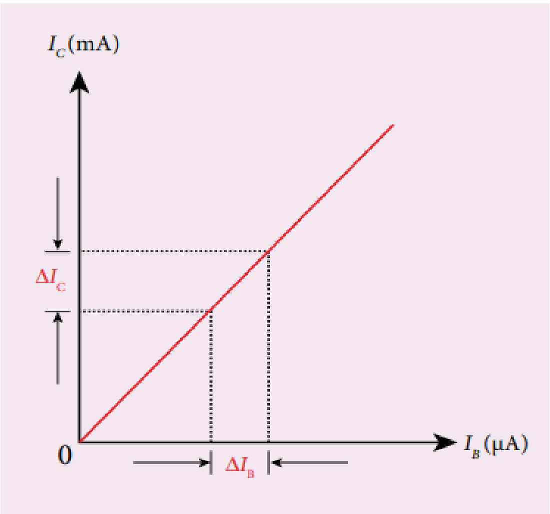
CALCULATION:

Slope = $\frac{\Delta I_C}{\Delta V_{CE}}$

Output impedance = $\frac{1}{slope}$ = $\left[\frac{\Delta V_{CE}}{\Delta I_C} \right]$

TABLE 2: TRANSFER CHARACTERISTIC CURVE: I_B vs I_C (V_{CE} constant)

S.No.	V_{CE} = 1 V		V_{CE} = 2 V	
	I_B (μ A)	I_C (m A)	I_B (μ A)	I_C (m A)
1				
2				
3				
4				
5				
6				
7				



CALCULATION:

Slope = $\frac{\Delta I_C}{\Delta I_B}$ Current gain = slope

PROCEDURE:

OUTPUT CHARACTERISTICS:

1. I_B is kept constant.
2. V_{CE} is varied in steps of 1 V and the corresponding I_C is noted.
3. The same procedure is repeated for different values of I_B.
4. V_{CE} is taken along X-axis and I_C is taken along Y-axis.
5. The curves obtained are called the output characteristics.
6. The reciprocal of the slope of these curves gives output impedance of the transistor.

NOTE: The collector current which is noted at I_B is at zero is called

REVERSE SATURATION CURRENT I_{CRO}

TRANSFER CHARACTERISTICS:

1. V_{CE} is kept constant.
2. I_B is varied in steps of 10 μA and the corresponding I_C is noted.
3. The readings are tabulated.
4. I_B is taken along X-axis and I_C is taken along Y-axis.
5. The slope of the characteristic curve gives current gain β.

RESULT:

i) The input and transfer characteristics of the NPN junction in CE mode are drawn.

ii) a) Input impedance = ………………………… Ω

b) Current gain β = ………………………….. (no unit)

EX. NO: **COMPARISON OF EMF OF TWO CELLS USING POTENTIOMETER** **DATE:**

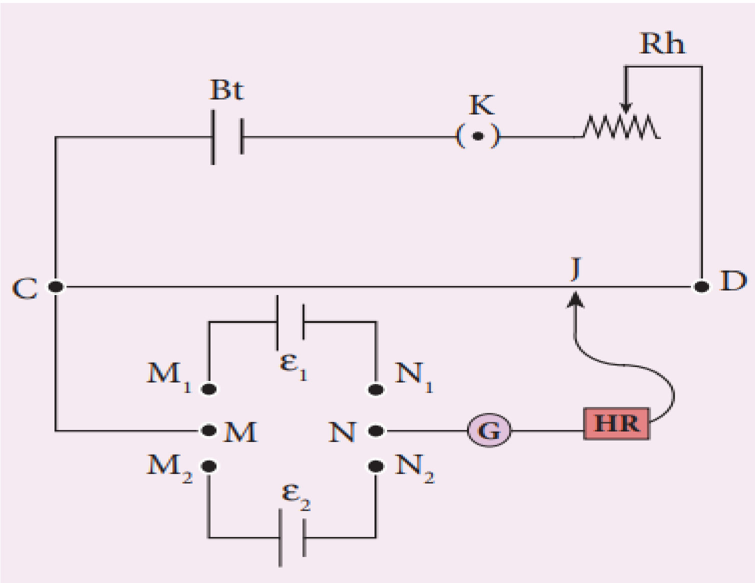
AIM: To compare the emf of the given two cells using a potentiometer.

FORMULA: $\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2}$ **(no unit)**

where, ε_1 and ε_2 are the emf of Lechlanche and Daniel cells respectively (V)

l_1 and l_2 are the balancing lengths for Lechlanche and Daniel cells respectively (cm)

CIRCUIT DIAGRAM:



Bt - Battery **K – Key**

Rh – Rheostat

C D – Potentiometer wire

M_1 M M_2 N_1 N N_2 – DPDT switch

G – Galvanometer

HR - High Resistance

J - Jockey

OBSERVATION:

S. No.	Balancing length for Lechlanche cell l_1 (cm)	Balancing length for Daniel cell l_2 (cm)	$\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2}$
1.			
2.			
3.			
4.			
5.			
6.			

Mean $\frac{\varepsilon_1}{\varepsilon_2} =$

CALCULATION:

1. $\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2} =$

2. $\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2} =$

3. $\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2} =$

4. $\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2} =$

5. $\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2} =$

6. $\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2} =$

Mean $\frac{\varepsilon_1}{\varepsilon_2} =$

PROCEDURE:

1. The circuit connections are made as shown in the diagram.
2. Primary circuit: Potentiometer wire is connected to a battery, key and rheostat in series.
3. Secondary circuit: The positive poles of the cells are connected to terminals M_1 and M_2 and the negative poles to terminals N_1 and N_2 of the DPDT switch.
4. The potentiometer is connected to the common terminals M and N as shown in the circuit.
5. Using the two way key, Lechlanche cells is included in the circuit. By sliding the jockey on the potentiometer wire, the balancing length is found and the corresponding balancing length is measured.
6. Similarly, the balancing length is found by including Daniel cell in the circuit.
7. The experiment is repeated for different sets of balancing lengths by adjusting the rheostat.
8. From different values of l_1 and l_2, the ratio of emf of the two cells is calculated using the formula $\frac{\varepsilon_1}{\varepsilon_2} = \frac{l_1}{l_2}$.

RESULT: Ratio of emf of the given two cells is = …………………. (no unit)

EX.NO: VERIFICATION OF DE MORGAN'S THEOREMS DATE:

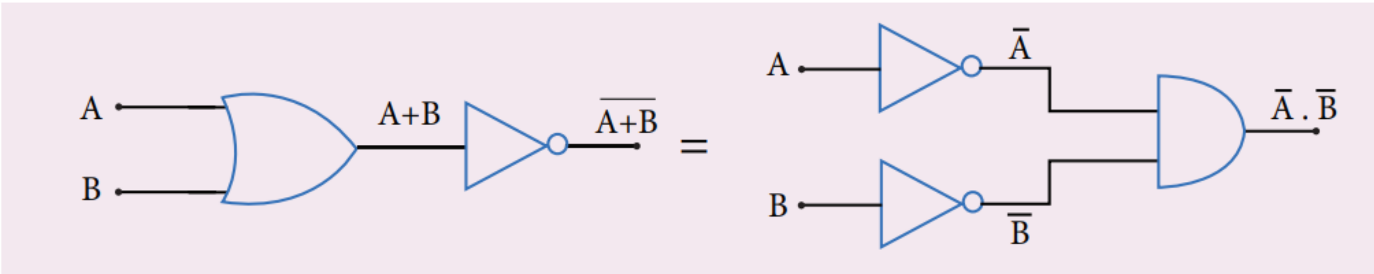
AIM: To verify De Morgan's first and second theorems.

FORMULA: De Morgan's theorems: Theorem I: $\overline{A+B} = \bar{A}\,.\,\bar{B}$

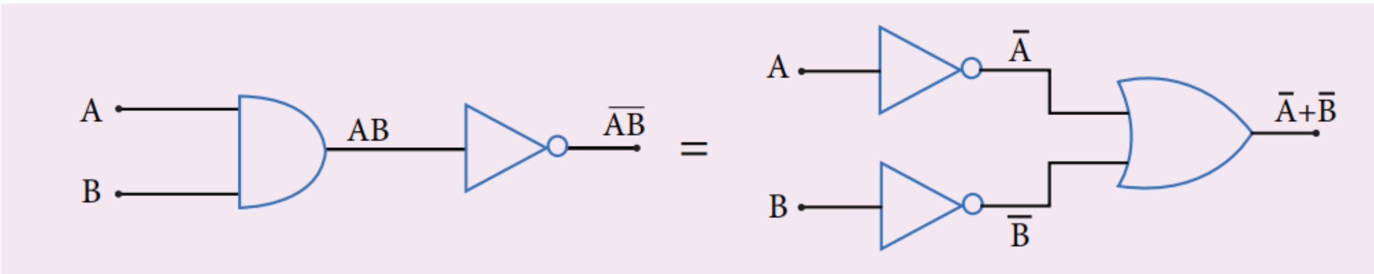
Theorem II: $\overline{A.\ B} = \bar{A} + \bar{B}$

CIRCUIT DIAGRAM:

De Morgan's first theorem



De Morgan's second theorem



OBSERVATION:

De Morgan's first theorem: TRUTH TABLE

A	B	$\overline{A+B}$	$\bar{A}\,.\,\bar{B}$
0	0		
0	1		
1	0		
1	1		

De Morgan's second theorem: TRUTH TABLE

A	B	$\overline{A.B}$	$\bar{A} + \bar{B}$
0	0		
0	1		
1	0		
1	1		

CALCULATION:

Theorem I:

A	B	$\overline{A+B}$	A	B	$\bar{A} . \bar{B}$
0	0	$\overline{0+0} = \bar{0} = 1$	0	0	$\bar{0}.\bar{0} = \bar{0} = 1$
0	1				
1	0				
1	1				

Calculation: Theorem II:

A	B	$\overline{A.\ B}$	A	B	$\bar{A} + \bar{B}$
0	0	$\overline{0.0} = \bar{0} = 1$	0	0	$\bar{0}.\bar{0} = \bar{0} = 1$
0	1				
1	0				
1	1				

PROCEDURE:

Theorem I:

1. The connections are made for *LHS* ($\overline{A+B}$) using appropriate IC's.
2. The output is noted and tabulated for all combinations of logical inputs of the truth table.
3. The same procedure is repeated for RHS ($\bar{A} . \bar{B}$) of the theorem.
4. From the truth table, it can be shown that

$$\overline{A+B} = \bar{A} . \bar{B}$$

Theorem II:

1. The connections are made for *LHS* ($\overline{A.\ B}$) using appropriate IC's.
2. The output is noted and tabulated for all combinations of logical inputs of the truth table.
3. The same procedure is repeated for RHS ($\bar{A} + \bar{B}$) of the theorem.
4. From the truth table it can be shown that

$$\overline{A.\ B} = \bar{A} + \bar{B}$$

RESULT: De Morgan's first and second theorems are verified.

EX.NO: WAVELENGTH OF THE CONSTITUENT COLOURS OF A LIGHT USING DIFFRACTION GRATING AND SPECTROMETER DATE:

AIM: To find the wavelength of the constituent colours of a composite light using diffraction grating and spectrometer.

FORMULA:

$$\lambda = \frac{\sin\theta}{n\,N} \quad \text{Å}$$

where, λ – Wavelength of the constituent colours of a composite light (Å)

N – Number of lines per metre length of the grating (no unit) (Given)

n – Order of diffraction (no unit)

θ – Angle of diffraction (degree)

PROCEDURE:

1. Initial adjustments are made. The slit of the spectrometer is illuminated by mercury vapour lamp.

2. The telescope is brought in line with the collimator. Undispersed white image is obtained.

3. The vernier disc alone is rotated till the vernier scale reads 0^0 – 180^0 and is fixed. This is the reading for direct ray.

4. The diffraction grating is placed on the table.

5. On either side of the direct image, diffracted images of the slit are observed.

6. The telescope is turned to left side to observe first order diffracted image.

7. The vertical cross wire is made to coincide with the colours blue, green, yellow and red. Readings both vernier scales are noted.

8. Similarly, on the right side the same procedure is repeated and the vernier readings are noted.

9. The difference between these two readings gives the value of 2 θ from which θ is calculated.

10. From the values of N, n and θ, the wavelength of the prominent colours of the mercury spectrum are found using the formula given.

CALCULATION:

(i) BLUE : $\lambda = \frac{\sin\theta}{n\,N}$

(ii) GREEN: $\lambda = \frac{\sin\theta}{n\,N}$

(iii) YELLOW: $\lambda = \frac{\sin\theta}{n\,N}$

(iv) RED: $\lambda = \frac{\sin\theta}{n\,N}$

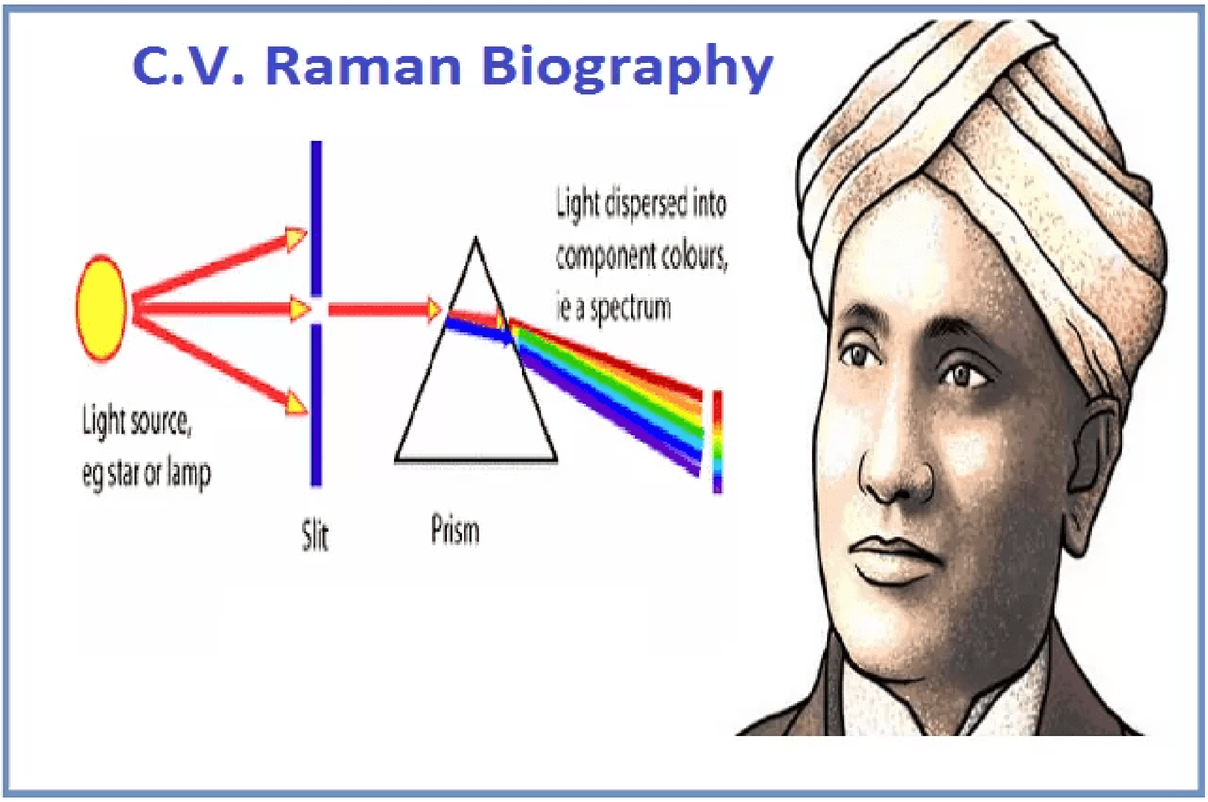
RESULT:

(i) The wavelength of blue line = ……………………….. Å

(ii) The wavelength of green line = ………………………Å

(iii) The wavelength of yellow line = ……………………Å

(iv) The wavelength of red line = ………………………..Å



Important Contributions of RAMAN

- Blue Colour of the Sea Water (1921)
- Discovery of RAMAN Effect (1928)
- Raman-Nath Theory (1934-1936)
- Studies on Brillouin Scattering (1933-40)
- Discovery of the Soft Mode (1938-40)
- Other contributions: Optical & Magnetic anisotropy, Acoustics & Indian Classical Music, Crystal Dynamics, Physiology of Colour and Vision.

THE REAL GROWTH OF A COUNTRY IS IN THE HEARTS, MINDS, BODIES AND SOULS OF YOUNG MEN AND WOMEN OF THE COUNTRY.

- C.V.Raman