ASSIGNMENT-5 EXPERIMENT-5

DETERMINATION OF PLANCK'S CONSTANT

AIM:

To determine Planck's constant by measuring the turn-on voltage of several LEDs

APPARATUS:

Planck's kit

FORMULA:

$h = E\lambda/C$ Js

$E = eV$ joule

h-Planck's Constant (Js)

E-Energy (Joule)

C-Velocity of Light (m/s)

λ-Wavelength of Different colour of LED (m)

V-Turn on Voltage (Volt)

e - Charge of electron (C)

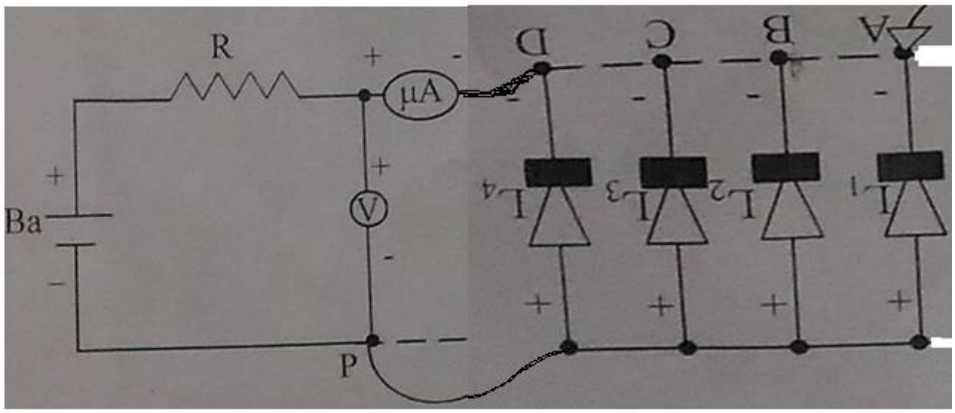


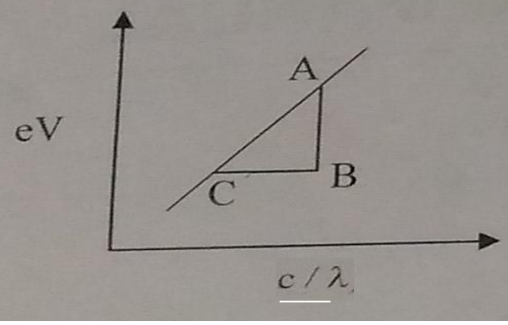
Fig. 5.1. Planck's Constant set up

PROCEDURE

Circuit connections are made as shown in the circuit diagram as on panel. The wavelengths of the given LED's are noted in the tabular column. The terminal P is connected to LED L_1 . The supply voltage is varied slowly by varying the fine voltage knob of the regulated power supply. The voltmeter reading is noted down when the LED just glows this is the turn on voltage (V_o) for the LED L_1. The same procedure is repeated for the other LEDs L_2,L_3 and L_4 by connecting the respective terminal. In each case the turn on voltage V_o is noted. *A graph of energy ($E = eV_o$) along Y-axis and frequency ($\gamma = c / \lambda$) along X-axis is plotted.*

The slope of the graph gives the Planck's constant.

Graph



$$h = \frac{AB}{BC}$$

S.NO	LED COLOUR	WAVELENGTH (λ)nm	Voltage (V)	E=eV	h=Eλ/C
1	**RED**	650	1.81	?	?
2	**Orange**	600	2.06	?	?
3	**Green**	550	2.35	?	?
4	**Blue**	450	2.62	?	?
				Mean h	?

Observation:

Charge of Electron e = 1.6×10^{-19} C

Velocity of Light C = 3×10^{8} m/s

Assignment Question:

1. From the Turn on Voltage (V) calculate the value of E by using the formula (E=eV) and enter the same in the respective coloum in four decimal points.

2. By using the values of E, C and wavelength of particular colour, calculate the Planck's constant and enter same in the respective coloum. Also calculate the mean value of same.

3. Draw the graph between C/λ along the X-axis and eV along the Y-axis. Also find out the Planck's constant by calculating the slope as shown in the model graph.

4. Write the result in the following order

RESULT:

Planck's constant = (i) By Theory ……. Js

(ii) By Graph …….Js

Finally, submit the scanned copy of your observation note book in GCR on (or) before THREE working days from the date of experiment.