LAB Experiment - 4

Aim :- To determine the wavelength of the given light emitting diodes (LEDs)

Apparatus :-

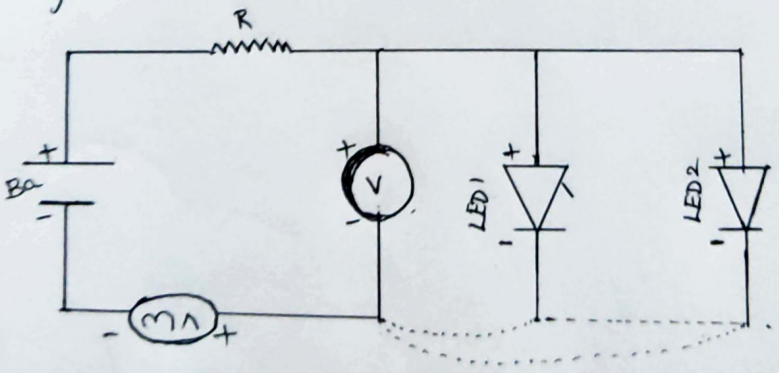
1. Power Supply
2. LED's
3. Multi Meter
4. Milli ammeter
5. Patch Cords etc

Formula :-

* Energy of the Photon, $E = h\nu = \frac{hc}{\lambda} = eV$
* The wavelength of LED is $\lambda = \frac{hc}{eV_K}$ nm

where, h = Planck's Constant = 6.63×10^{-34} JS
c = Speed of light = 3×10^8 ms^{-1}
e = charge on the electron = 1.602×10^{-19} C
V_K = knee Voltage in Volt the LED

Diagram :-



Tabular form :-

S.NO	Colour of LED	Wavelength (nm)
1	Blue	497
2	Red	710
3	Yellow	710

S.NO	LED 1		LED 2		LED 3	
	Colour: Blue		Colour: Red		Colour: Yellow	
	Voltage V	Current MA	Voltage V	Current mA	Voltage V	Current mA
1	0	0	0	0	0	0
2	0.25	0	0.25	0	0.25	0
3	0.50	0	0.50	0	0.50	0
4	0.75	0	0.75	0	0.75	0
5	1.00	0	1.00	0	1.00	0
6	1.25	0	1.25	0	1.25	0
7	1.50	0	1.50	0	1.50	0
8	1.75	0	1.75	0.1	1.75	0.5
9	2.00	0	2.00	2.6	2.00	3.4
10	2.25	0	2.25	5	2.25	5
11	2.50	0.1	2.50	-	2.50	-
12	2.75	0.9	2.75	-	2.75	-
13	3.00	3.4	3.00	-	3.00	-

Calculations :-

(1) For Blue light :-

$$\lambda = \frac{hc}{eV_K}$$

V_K for Blue light = 2.5 V

$$\therefore \lambda = \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{1.6 \times 10^{-19} \times 2.5}$$

$$= 4.97 \times 10^{-7}$$

$$= 497 \times 10^{-9} \text{ m}$$

$$\lambda = 497 \times 10^{-9} \text{ m}$$

(2) For Red light :-

$$\lambda = \frac{hc}{eV_K}$$

ν_k for Blue light = 2.5 V

$$\therefore \lambda = \frac{6.63 \times 10^{-34} \times 3 \times 10^{8}}{1.6 \times 10^{-19} \times 2.5}$$

$$= 4.97 \times 10^{-7}$$

$$= 497 \times 10^{-9} \text{ m}$$

$$\boxed{\lambda = 497 \times 10^{-9} \text{ m}}$$

(2) for Red light :-

$$\lambda = \frac{hc}{e\nu_k}$$

ν_k for red light = 1.75 V

$$\lambda = \frac{6.63 \times 10^{-34} \times 3 \times 10^{8}}{1.6 \times 10^{-19} \times 1.75}$$

$$= 7.10 \times 10^{-7}$$

$$= 710 \times 10^{-9} \text{ m}$$

$$\boxed{\lambda = 710 \times 10^{-9} \text{ m}}$$

(3) For Yellow Light :-

$$\lambda = \frac{hc}{e\nu_k}$$

ν_k for yellow light = 1.75 V

$$\lambda = \frac{6.63 \times 10^{-34} \times 3 \times 10^{8}}{1.6 \times 10^{-19} \times 1.75}$$

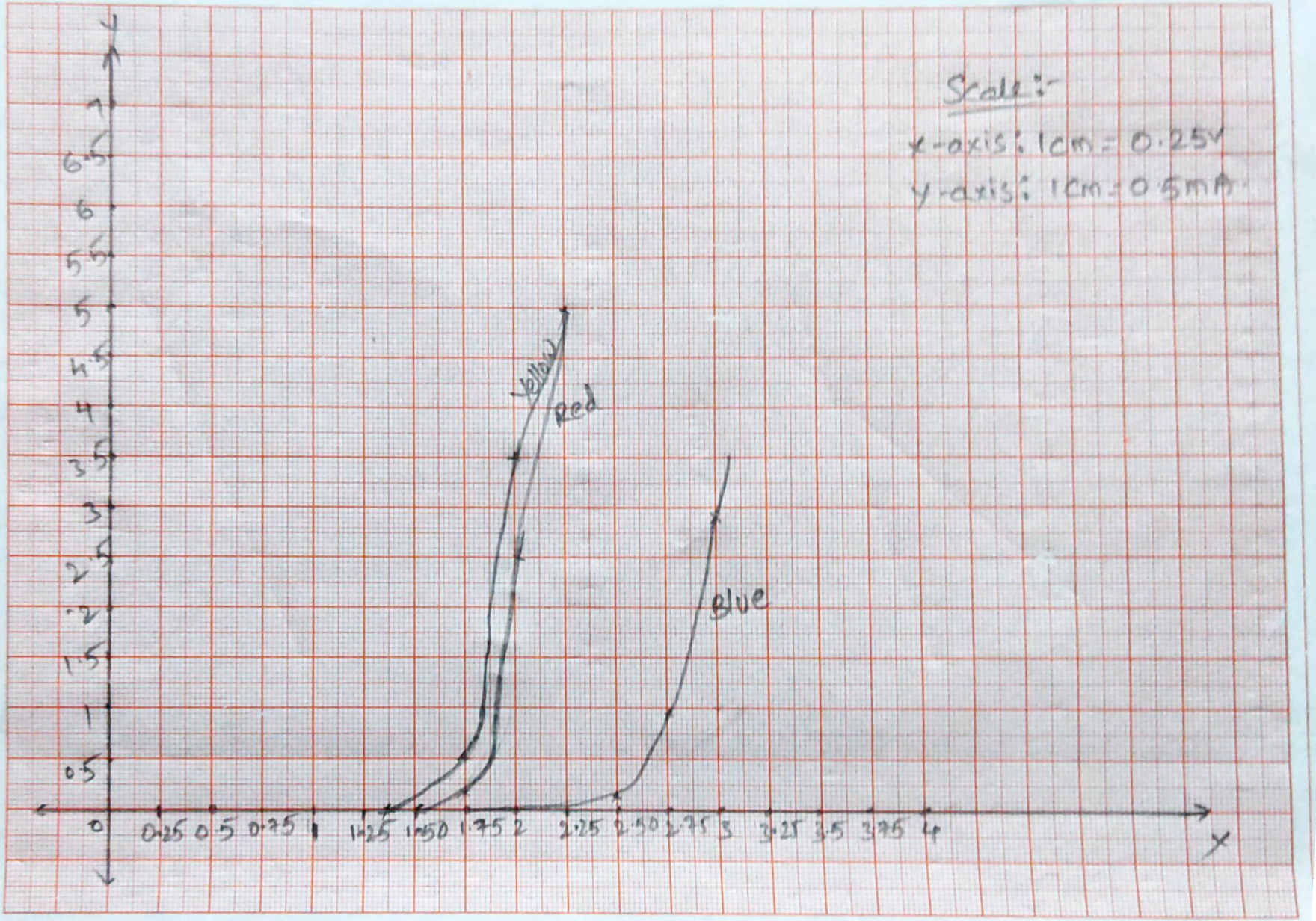
$$= 7.10 \times 10^{-7}$$

$$= 710 \times 10^{-9} \text{ m}$$

$$\boxed{\lambda = 710 \times 10^{-9} \text{ m}}$$

Result :- ① Wave length of Blue LED = 497 nm
② Wave length of Red LED = 710 nm
③ Wave length of yellow LED = 710 nm

Lab-4


Scale:-
x-axis: 1cm = 0.25V
y-axis: 1cm = 0.5mA
Yellow
Red
Blue
0
0.25
0.5
0.75
1
1.25
1.50
1.75
2
2.25
2.50
2.75
3
3.25
3.5
3.75
4
X
Y