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ECE – A

Physics: Electromagnetic Theory, Quantum Mechanics, Waves and Optics- 18PYB101J

EXPERIMENT - VI

04.06.2021

To STUDY THE V-I CHARACTERISTICS OF A LIGHT DEPENDENT RESISTOR (LDR)

AIM:

To measure the photo conductive naturate and the dark resistance of the given light dependent resistor (LDR) and to plot the characteristics of the LDR.

APPARATUS REQUIRED:

LDR, Resistor (1 kΩ), ammeter (0-10 mA), Voltmeter (0-10V), light source, regulated power supply.

FORMULA:

By ohm's Law, $V = IR$ (or) $R = V/I$ ohm.

Where R is the resistance of the LDR (i.e) the resistence when the LDR is closed. V and I represents the corresponding voltage and current respectively.

PRINCIPLE:

The photoconductive device is based on the decrease in the resistance of certain semiconductor materials when they are exposed to both infrared and visible radiation.

The photoconductivity is the result of carrier excitation due to light absorption and the figure of merit depends on the light absorption efficiency. The increase in conductivity is due to an increase in the number of mobile charge carriers in the material.

OBSERVATION:

Distance at 15 cm, 10 cm and 5 cm.

CALCULATION:

Avg $R_R = 0.34$ kΩ

For $d = 15$ cm, $R = V/I$.

1. $R_R = 1/4 \times 10^{-3} = 250\ \Omega$ or 0.25 kΩ.
2. $R_R = 0.33$ kΩ
3. $R_R = 3/10 = 0.3$ kΩ
4. $R_R = 4/12 = 0.33$ kΩ
5. $R_R = 0.36$ kΩ

For d = 10 cm,

1. R_R = 0.125 kΩ
2. R_R = 0.166 kΩ
3. R_R = 3/16 mA = 0.187 kΩ
4. R_R = 4/20 mA = 0.2 kΩ
5. R_R = 5/24 mA = 0.208 kΩ

Avg R_R = 0.177 kΩ

For d = 5 cm,

1. R_R = 1/10 mA = 0.1 kΩ
2. R_R = 2/14 mA = 0.143 kΩ
3. R_R = 3/18 mA = 0.166 kΩ
4. R_R = 4/23 mA = 0.174 kΩ
5. R_R = 5/28 mA = 0.179 kΩ

Avg R_R = 0.152 kΩ

Mean R_R = $\frac{0.314 + 0.177 + 0.152}{3}$ = 0.214.

RESULT:

(i) The Characteristics of LDR were studied and plotted.
(ii) The dark resistance of the given LDR = 0.214. kohm.

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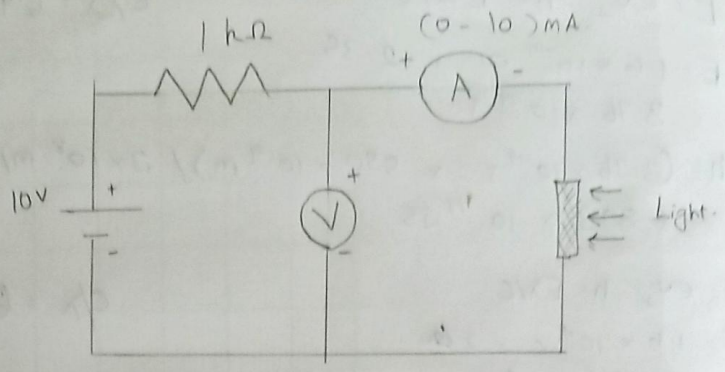
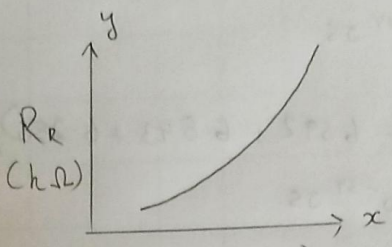


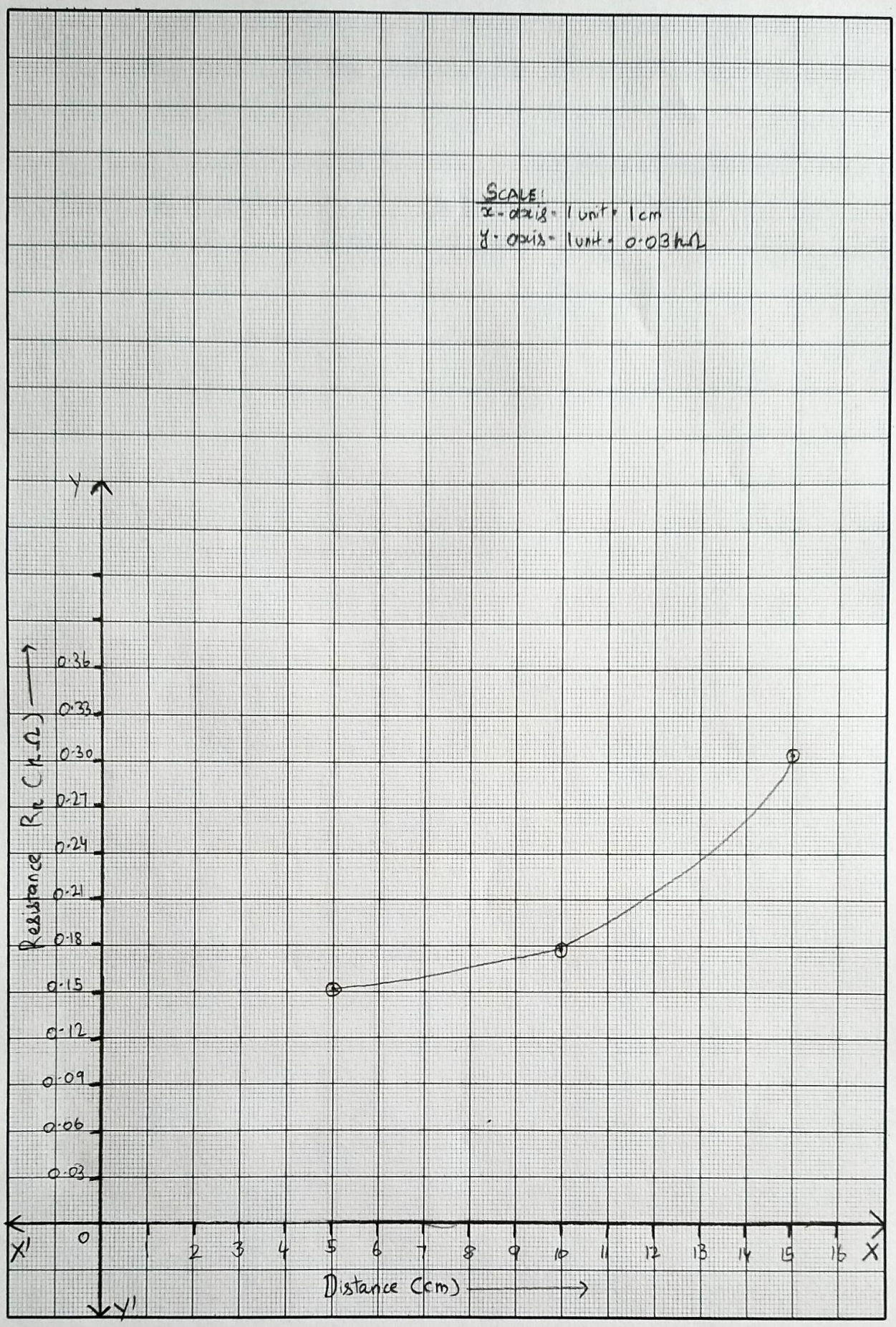
Circuit Diagram



Model Graph

Table: To determine the resistances of LDR at different distances.

S.No	Distance (cm)	Voltmeter Reading V (volt)	Ammeter Reading I (mA)	R_R (kΩ)
1.	A = 15 cm	1	4	0.25
2.		2	6	0.33
3.		3	10	0.3
4.		4	12	0.33
5.		5	14	0.36
				Avg R_R = 0.314
1.	B = 10 cm	1	8	0.125
2.		2	12	0.166
3.		3	16	0.187
4.		4	20	0.2
5.		5	24	0.208
				Avg R_R = 0.177
1.	C = 5 cm	1	10	0.1
2.		2	14	0.143
3.		3	18	0.166
4.		4	23	0.174
5.		5	28	0.179
				Avg R_R = 0.152
				Mean R_R = 0.214


SCALE:
x-axis - 1 unit = 1 cm
y-axis - 1 unit = 0.03 kΩ
Y
Y'
X
X'
Resistance R (kΩ)
0.36
0.33
0.30
0.27
0.24
0.21
0.18
0.15
0.12
0.09
0.06
0.03
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
Distance (cm)