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Title of the Experiment:-

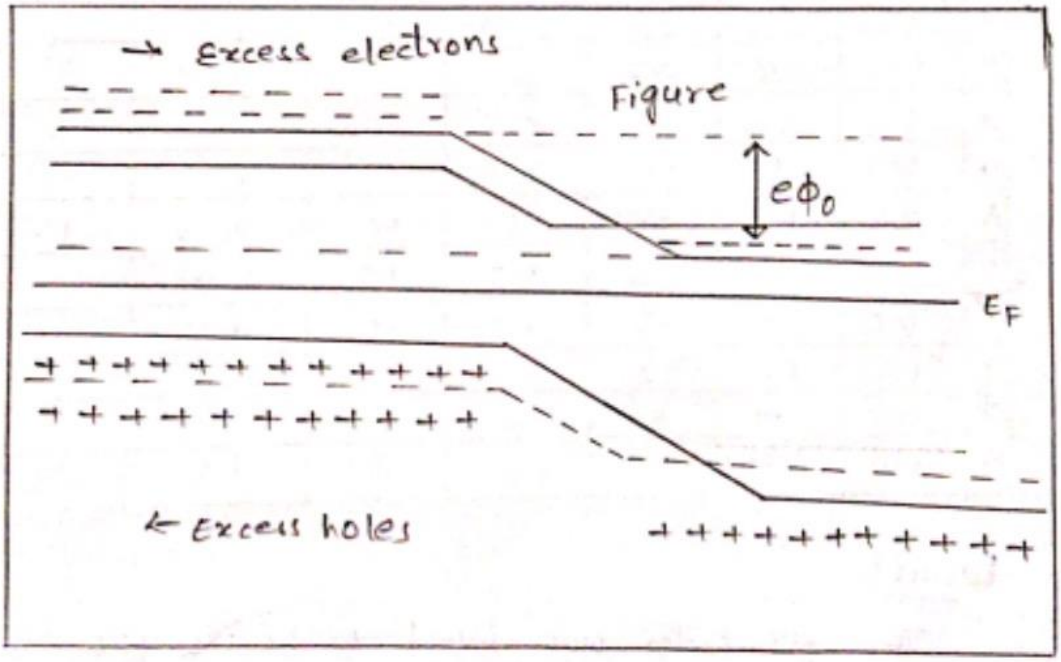
Solar cell: I-V characteristics and determination of efficiency.

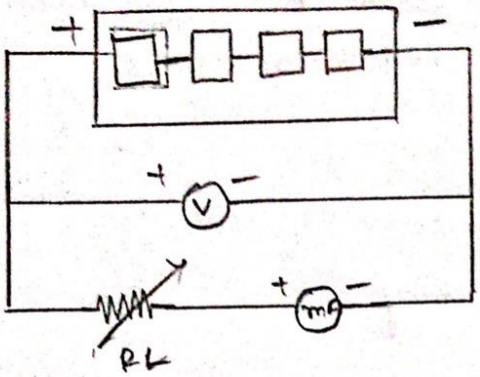
Objective:-

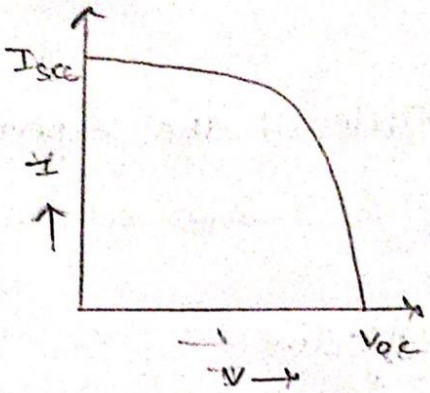
To draw the I-V characteristic of a solar cell

Equipment List:-

1. Lamp
2. Solar cell
3. Measuring scale
4. Circuit board.







Precautions:-

1. See that the light from the source falls vertically on the solar cell.
2. Make sure that connections are made properly and ensure good contact.
3. Solar cell should not be short circuited for longer duration while taking down the reading I_{sc} otherwise the cell will have damaged permanently.

Formula:-

Fill factor (FF) = $V_{max} I_{max} / V_{oc} I_{sc}$

Tabular column:-

S.No.	Variable Load Resistance RL (Ω)	12cm		15cm		18cm	
		$V_{oc} = 2$	$I_{sc} = 22$	$V_{oc} = 1.95$	$I_{sc} = 17$	$V_{oc} = 1.85$	$I_{sc} = 13$
		Voltage V(volts)	current I (mA)	voltage V(volts)	current I (mA)	voltage V (volts)	current I (mA)
1	10	0.5	22	0.25	17	0.2	13
2	22	0.6	22	0.5	17	0.4	13
3	33	0.8	21	0.6	17	0.6	13
4	47	1	21	0.75	16	0.65	12
5	68	1.3	20	1	16	0.8	12
6	82	1.55	20	1.2	16	0.95	12
7	100	1.7	18	1.5	15	1.15	12
8	150	1.8	12	1.7	11	1.6	12
9	220	1.9	8	1.8	8	1.7	8
10	470	1.95	3	1.9	3	1.8	3

Calculation:-

For 12cm,

$$FF = \frac{V_{max} \cdot I_{max}}{V_{oc} \cdot I_{sc}} = \frac{1.55 \times 20}{2 \times 22} = \frac{31}{44}$$

$$= 0.704$$

For 15cm,

$$FF = \frac{V_{max} \cdot I_{max}}{V_{oc} \cdot I_{sc}} = \frac{1.5 \times 15}{1.95 \times 17} = \frac{22.5}{33.15}$$

$$= 0.678$$

For 18 cm,

$$FF = \frac{V_{max} \cdot I_{max}}{V_{oc} \cdot I_{sc}} = \frac{1.6 \times 12}{1.85 \times 13} = \frac{19.2}{24.05}$$

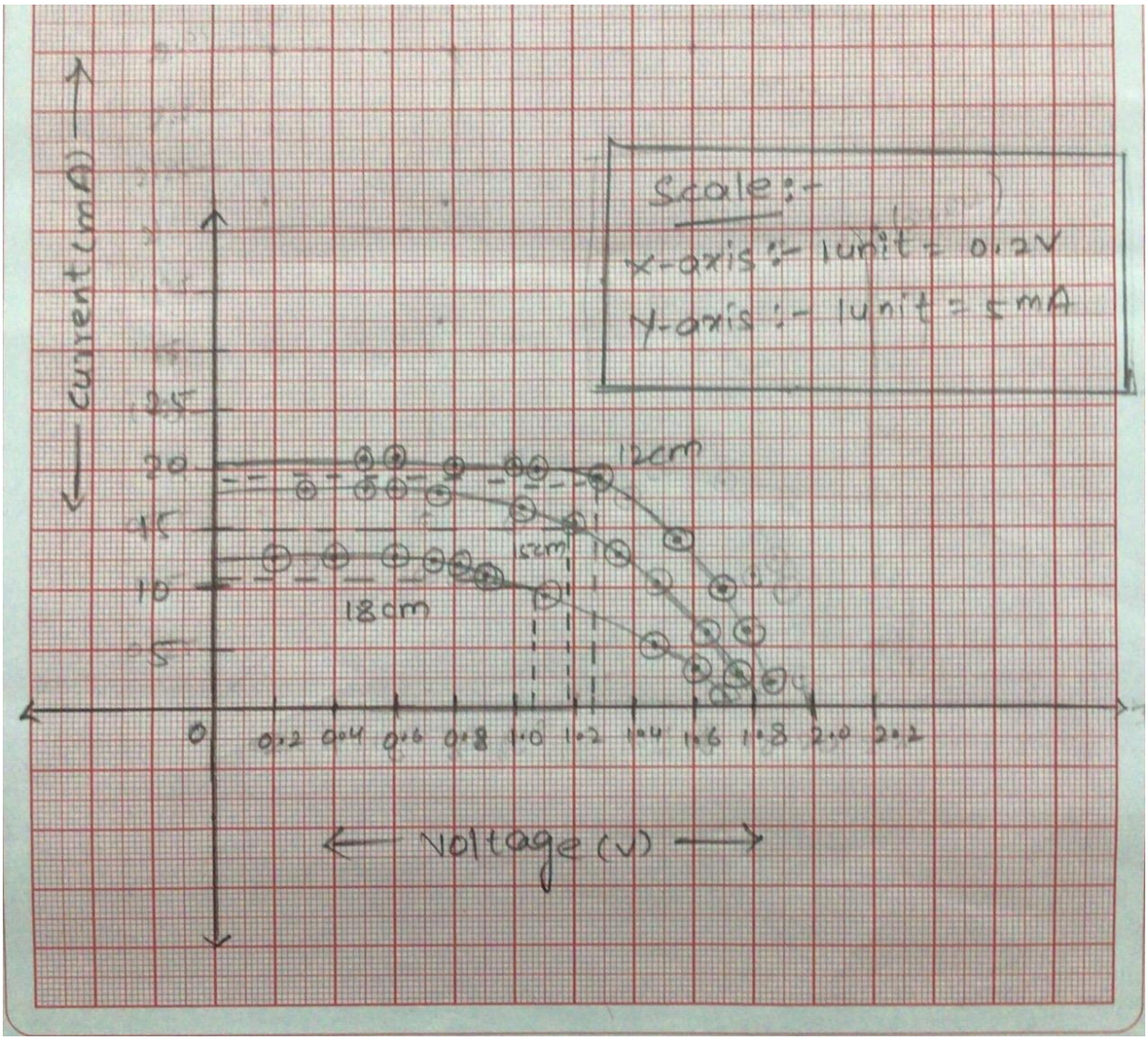
$$= 0.798$$

$$\text{Average of Fill Factor} = \frac{0.704 + 0.678 + 0.798}{3}$$

$$= 0.726$$

Result:-

The fill factor was found to be: 0.726


Scale :-
x-axis :- 1unit = 0.2V
y-axis :- 1unit = 5mA
Current (mA)
25
20
15
10
5
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
12cm
8cm
18cm
Voltage (V)