PHY 1701 (Engineering Physics)..

Lab Manual and Records

Reg No: 20BDS0405

DATE: 2021/02/04

CLEAN ENERGY

Apparatus Required:

- Solar Cell (p-n junction diode)
- Light source (100 W bulb)
- Ammeter
- Voltmeter
- Load Circuit
- Connecting Wires

SLO:

- To draw the I-V characteristics of a solar cell and to find out the efficiency and fill factor.

The maximum power generated $P_{max} = I_{mp} V_{mp}$ (where I_{mp} and V_{mp} are the current and voltage corresponding to maximum power).

$$FF = \frac{V_{mp} I_{mp}}{V_{oc} I_{sc}}$$

$$\eta = \frac{P_{max}}{A_c \Omega}$$ (where, $A_c \rightarrow$ Area of solar cell, $\Omega \rightarrow$ Incident Intensity).

DATE: 2021/02/04

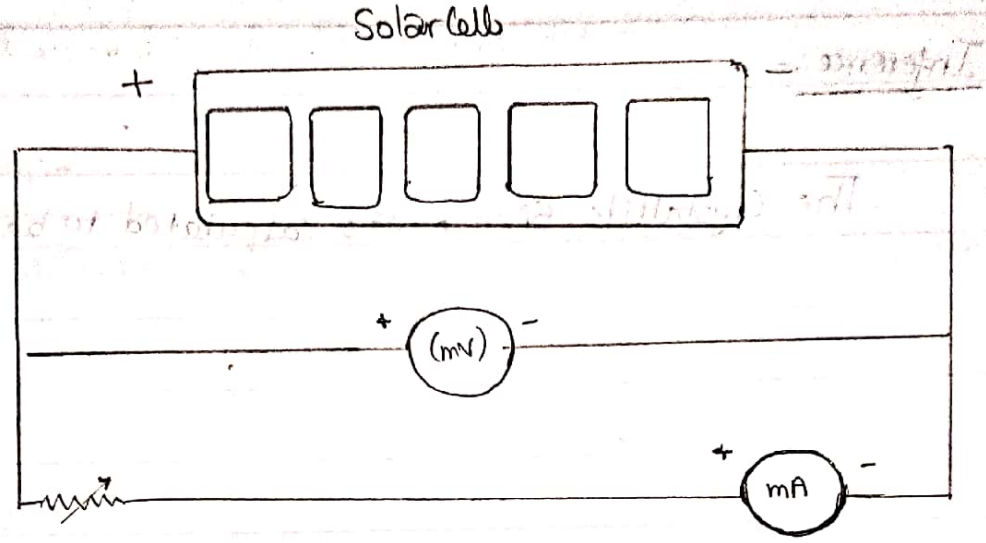


Fig:- Experimental Arrangement of Circuit

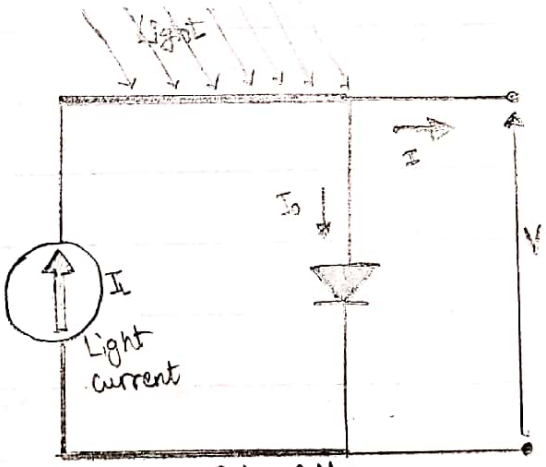


Fig:- Solar Cell

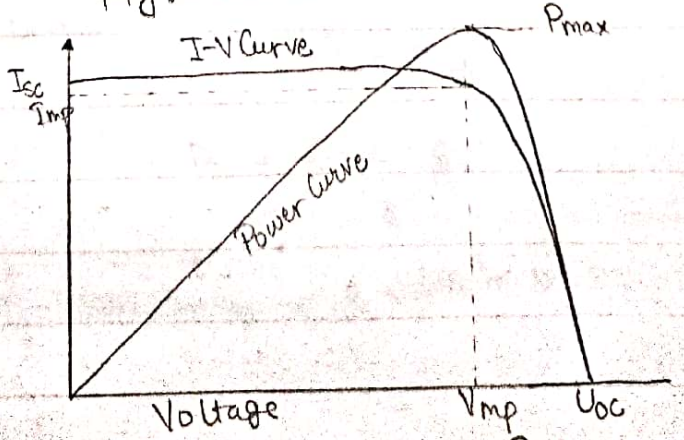


Fig:- Nature of Curve of I and P vs V.

PHY 1701 (Engineering Physics) Lab Manual and Records

Reg No:- 20BDS0405

Date:- 2021/02/04

Table:- IV characteristics

Distance (x) = 7cm Intensity of light = 217 W/m² Area of the Solar cell = 22.75×10^{-4} m²			I_{sc} = 14mA V_{oc} = 1.74V
Load Resistance (ohms)	Current (mA)	Voltage (V)	Power (mW)
10	14	0	0
22	14	0.15	2.1
33	14	0.35	4.9
47	14	0.7	9.8
68	14	0.85	11.9
82	12	0.9	10.8
100	12	1.15	13.8
150	10	1.3	13
220	7	1.5	10.5
470	3	1.6	4.8

Calculation:-

$$\text{Fill factor (FF)} = \frac{V_{mp} I_{mp}}{V_{oc} I_{sc}}$$

$$= \frac{1.15 \times 11.8 \times 10^{-3}}{14 \times 10^{-3} \times 1.74}$$

$$= 0.557$$

$$\text{Efficiency } (\eta) = \frac{P_{max}}{A \Omega} = \frac{1.357 \times 10^{-2}}{22.75 \times 10^{-4} \times 217}$$

$$= 0.0275$$

$$= 2.7\%$$

PHY 1701 (Engineering Physics) Lab Manual and Records

Reg No: 20BDSC4105

Date:- 2021/02/04

Observations :-

1) For distance ($x_1 = 7cm = 7 \times 10^{-2} m$)

$I_{mp} = 11.8 mA = 11.8 \times 10^{-3} A$

$V_{mp} = 1.15$ Volts

$P_{max} = I_{mp} \times V_{mp} = 11.8 \times 1.15 \times 10^{-3} = 1357 \times 10^{-2}$

$\Omega = 217 Wm^{-2}$

$A_c = 22.75 \times 10^{-4} m^2$

Results:

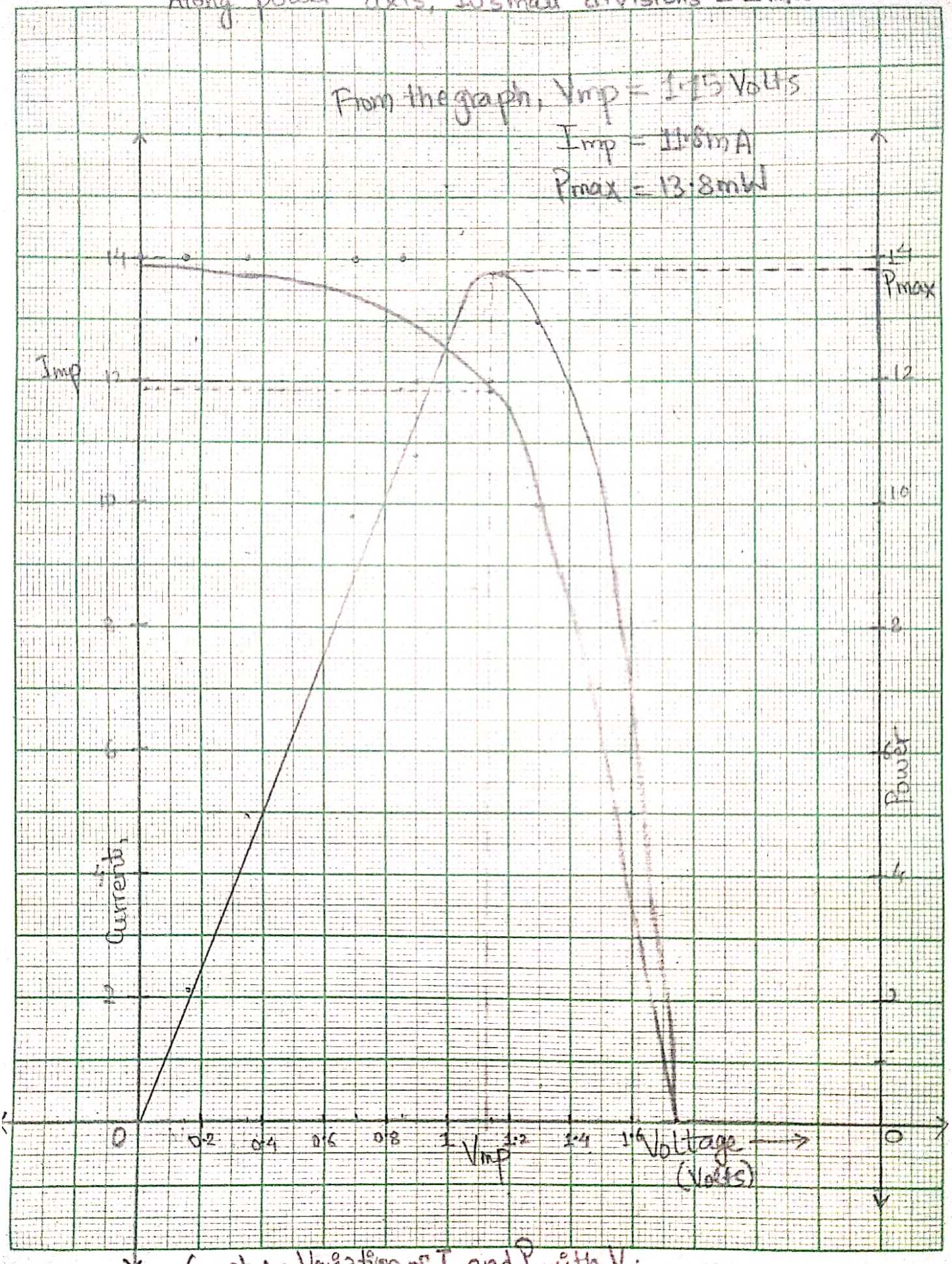
I-V characteristics of the solar cell were studied and the maximum power generated; FF and efficiency were calculated for two different source-cell distances.

For, $x_1 = 0.07 m$

Efficiency, $\eta = 2.75\%$

$FF = 0.557$

Along Voltage axis, 10 small divisions = 0.2 volt
Along Current axis, 10 small divisions = 1 mA
Along power axis, 10 small divisions = 1 mW



Graph:- Variation of I and P with V.