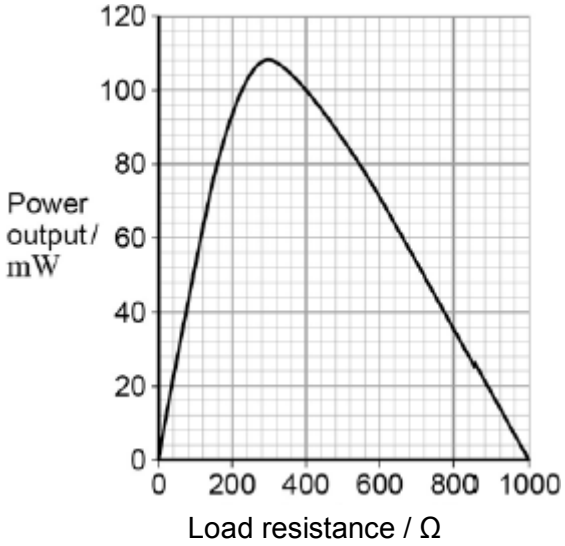
Name of the Student:_____
Max. Marks : 17 Marks **Time :** 17 **Minutes**

Q1.

Figure 1 shows data for the variation of the power output of a photovoltaic cell with load resistance. The data were obtained by placing the cell in sunlight. The intensity of the energy from the Sun incident on the surface of the cell was constant.

Figure 1



(a) Use data from **Figure 1** to calculate the current in the load at the peak power.

(3)

(b) The intensity of the Sun's radiation incident on the cell is 730 W m^{-2}. The active area of the cell has dimensions of 60 mm × 60 mm.

Calculate, at the peak power, the ratio $\frac{\textit{electrical energy delivered by the cell}}{\textit{energy arriving at the cell from the Sun}}$

(3)

(c) The average wavelength of the light incident on the cell is 500 nm. Estimate the number of photons incident on the active area of the cell every second.

(2)

(d) The measurements of the data in **Figure 1** were carried out when the rays from the sun were incident at 90° to the surface of the panel. A householder wants to generate electrical energy using a number of solar panels to produce a particular power output.

Identify **two** pieces of information scientists could provide to inform the production of a suitable system.

_____

_____

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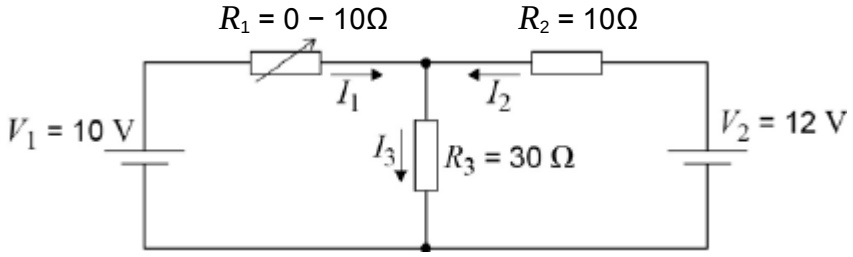
(2)

(Total 10 marks)

Q2.

The cells in the circuit shown in the figure below have zero internal resistance. Currents are in the directions shown by the arrows.



R_1 is a variable resistor with a resistance that varies between 0 and 10 Ω.

(a) Write down the relationship between currents I_1, I_2 and I_3.

_____

(1)

(b) R_1 is adjusted until it has a value of 0 Ω.

State the potential difference across R_3.

potential difference = _____ V

(1)

(c) Determine the current I_2.

current = _____ J

(2)

(d) State and explain what happens to the potential difference across R_2 as the resistance of R_1 is gradually increased from zero.

_____

_____

_____

_____

_____

(3)
(Total 7 marks)