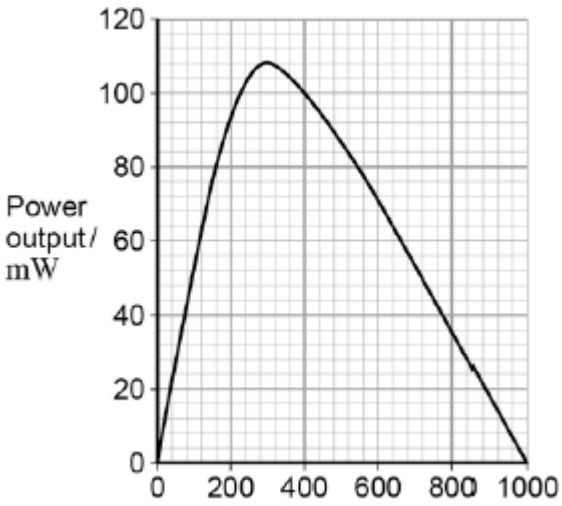
1. **Figure 1** shows data for the variation of the power output of a photovoltaic cell with load resistance. The data were obtained by placing the cell in sunlight. The intensity of the energy from the Sun incident on the surface of the cell was constant.

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)

2. A load of 50 N is suspended from a wire that has an area of cross-section of 1 mm^2.

The stress in the wire, in Pa, is between

A 10^0 and 10^3 ⬭

B 10^3 and 10^6 ⬭

C 10^6 and 10^9 ⬭

D 10^9 and 10^{12} ⬭

(Total 1 mark)

3. What is the approximate average kinetic energy of a cyclist in a race?

A 10 J ⬭

B 10 kJ ⬭

C 10 MJ ⬭

D 10 TJ ⬭

(Total 1 mark)