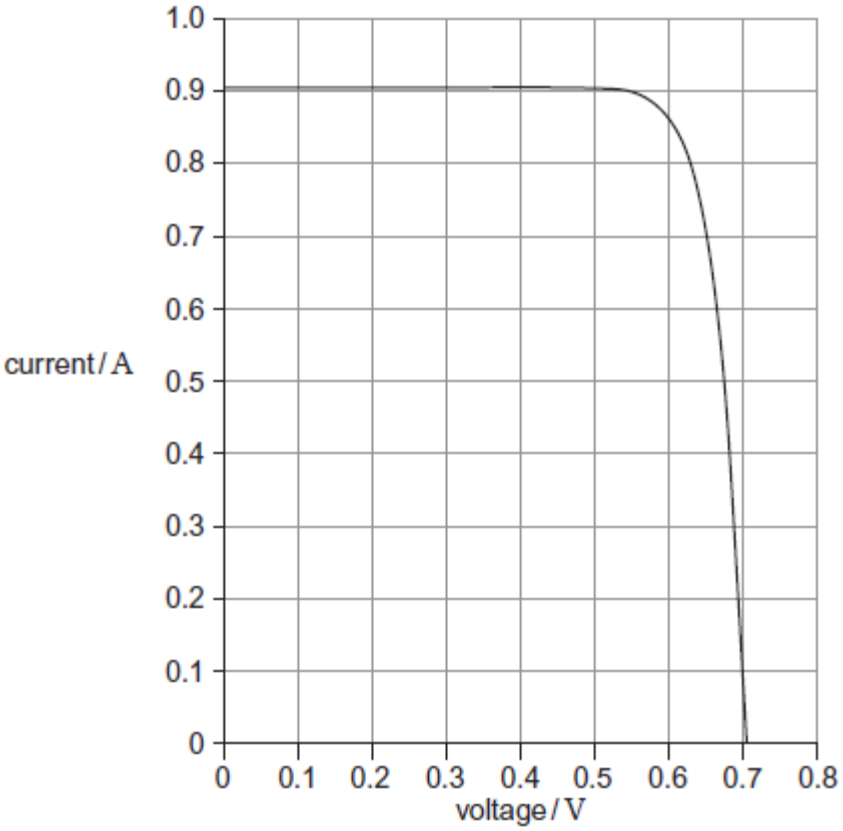
Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

The graph shows the current−voltage characteristic of the output from a solar cell when light of intensity 450 W m^{-2} is incident on it.

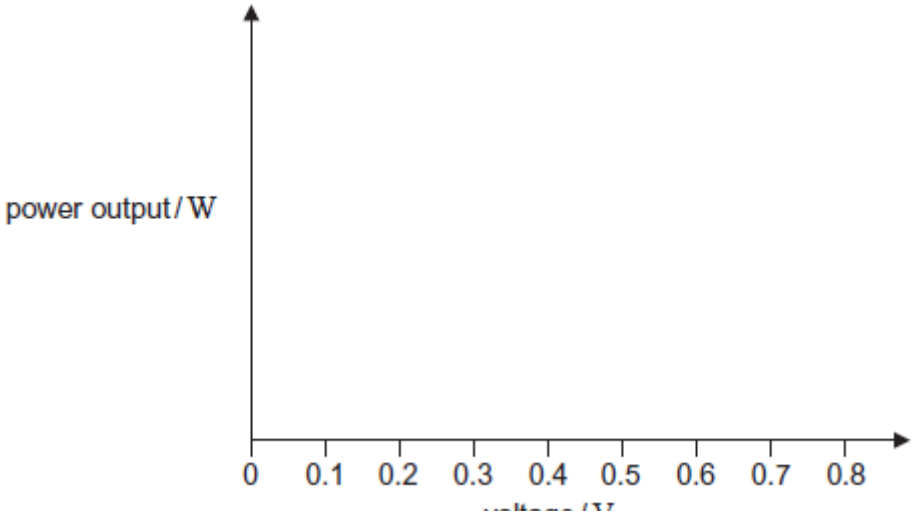


(a) (i) Using data from the graph above estimate the **maximum** power output from the solar cell.

maximum power _____ W

(2)

(ii) Sketch, on the axes below, a graph to show how the power output varies with voltage for this solar cell for the same incident light intensity.



(2)

(iii) When the light intensity is 450 W m^{-2} the cell has an efficiency of 0.15 at the maximum power.

Calculate the area of the solar cell.

area _____ m^2

(3)

(b) A manufacturer has a supply of solar cells that each have an electromotive force (emf) of 0.70 V and an internal resistance of 0.78 Ω when delivering maximum power.

(i) Explain what is meant by an emf of 0.70 V.

_____

_____

(1)

(ii) The manufacturer uses a number of these solar cells in an array to make a power supply that has an emf of 14 V and an internal resistance of 3.9 Ω when delivering maximum power.

Describe and explain the arrangement of cells the manufacturer has to use in this array. Go on to calculate the number of cells the manufacturer needs to make the power supply.

_____

_____

_____

_____

number of cells _____

(4)

(c) Communications satellites use solar cells to generate electrical power.
Discuss why solar cells are appropriate for this task.

Your answer should refer to:

- any additional features that would be needed to ensure that the satellite's electrical systems operate continuously
- whether solar cell arrays are appropriate for space probes that travel to the edge of the solar system.

The quality of your written communication will be assessed in your answer.

(6)

(Total 18 marks)