6 **(a)** A light-dependent resistor (LDR) with power rating 0.50 W is placed in parallel with a 600 Ω resistor and connected to a 12.0 V cell of internal resistance 30 Ω, as shown in Fig. 6.1.

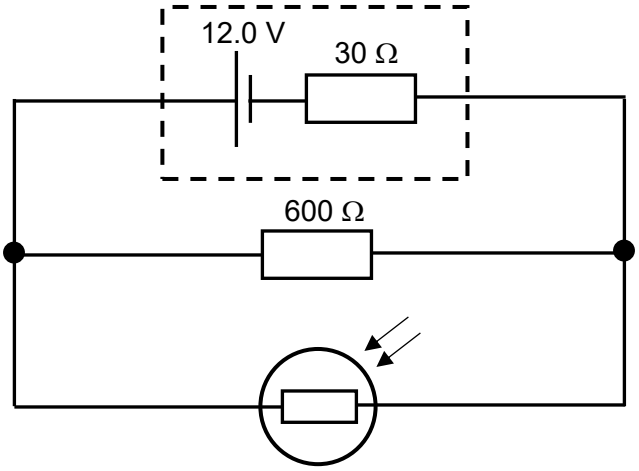

Fig. 6.1

(i) In conditions of low intensity light, the resistance of the LDR is 3000 Ω.

1. Show that the current through the LDR is 3.8 mA.

[2]

2. Hence or otherwise, determine the power dissipated in the LDR.

power = ... W [2]

(ii) Accidentally, the LDR is exposed to sunlight and its resistance falls to 100 Ω. Discuss whether the LDR, which is marked 0.50 W, will be damaged.

……

……

……..…….…… [2]

(iii) The circuit in Fig. 6.1 is used to turn on a light bulb in conditions of low intensity light.

Draw on Fig. 6.1 where the light bulb should be placed in the circuit and explain your answer.

……

……

……

……...…….…… [2]

(b) Fig. 6.2 below shows a simplified structure of a silicon solar cell. When sunlight is incident on the top surface of the cell, loosely bound electrons are liberated, generating current flow to the external circuit.

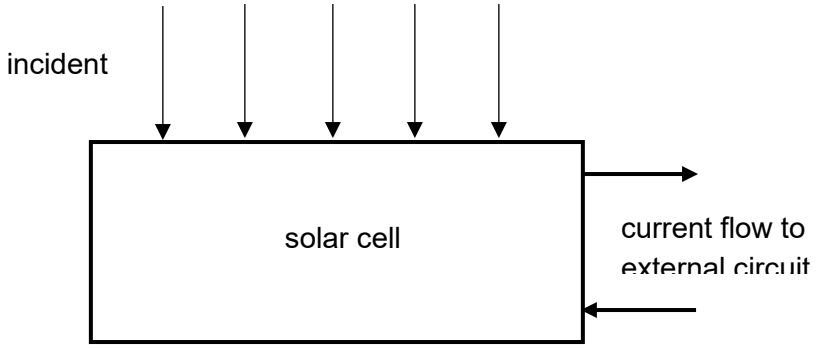

Fig. 6.2

Fig. 6.3 shows the variation with terminal p.d. across the cell of output current for one such solar cell with sunlight of power 90 mW incident on it.

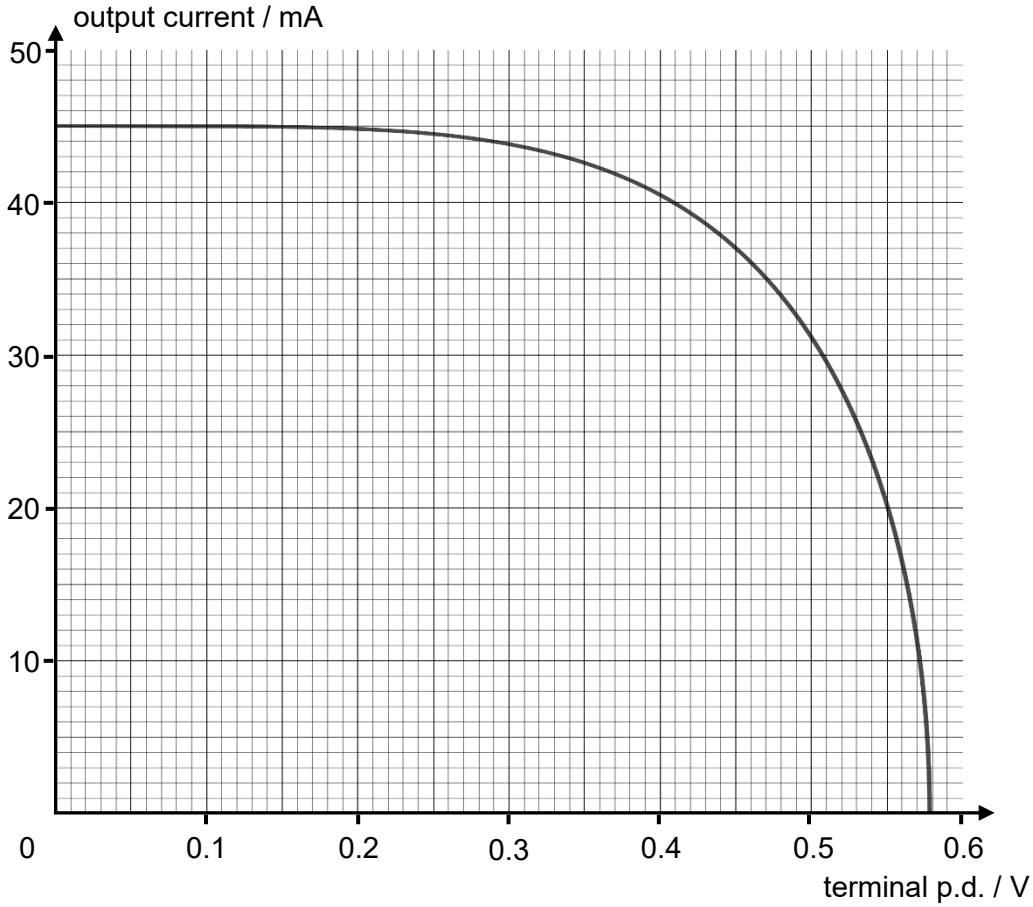

Fig. 6.3

(i) Draw a labelled diagram of an electrical circuit which could be used to obtain the graph in Fig. 6.3.

[2]

(ii) For the incident power of 90 mW, calculate

1. the e.m.f. of the solar cell *E*,

E = …….. V [1]

2. the resistance of the external circuit *R* when the output current is 20 mA,

R = …….. Ω [1]

3. the internal resistance of the cell *r* when the output current is 20 mA.

r = …….. Ω [2]

(c) Fig. 6.4 shows an electrical circuit in which the internal resistance of the cell is negligible.

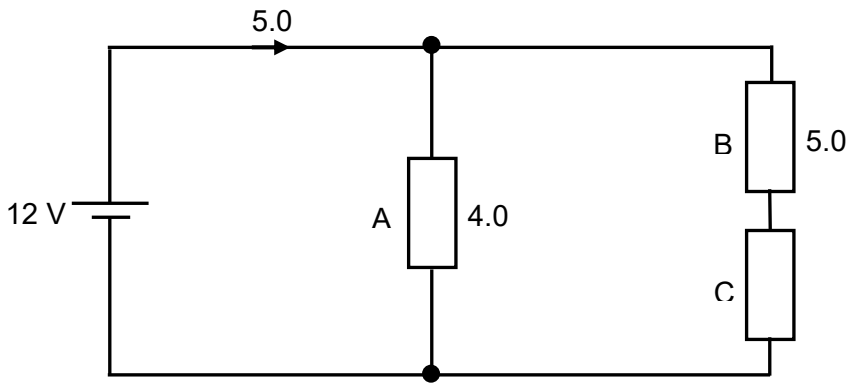

Fig. 6.4

(i) Complete Fig. 6.5 by giving the electrical quantities for each of the components in the circuit.

circuit component	**A**	**B**	**C**	**whole circuit**
potential difference / V across the component				12
current / A through the component				5.0
resistance / Ω of the component	4.0	5.0		

Fig. 6.5

[4]

(ii) If circuit components A, B and C were filament lamps, discuss the brightness of A and B compared to Fig. 6.4 when there is a short circuit through C.

……....

……....

……

…….. [2]

End of Paper