7 **(a)** A photocell may be used to demonstrate the photoelectric effect. Fig. 7.1 shows a photocell connected to a circuit.

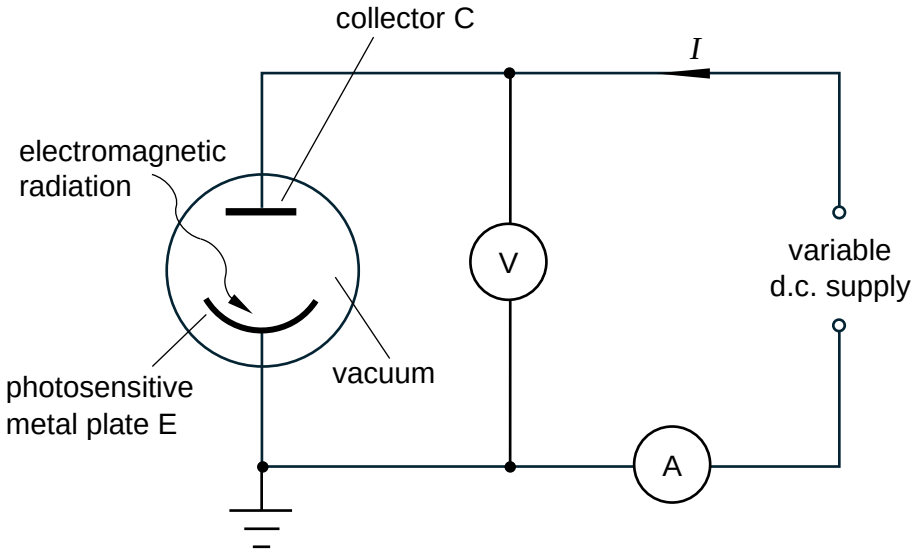

Fig. 7.1

The photocell consists of two metal plates E and C. The metal plate E is sensitive to electromagnetic radiation. The plate E is illuminated by electromagnetic radiation of frequency greater than the threshold frequency. Photoelectrons are emitted towards the collecting plate C. A sensitive ammeter measures the photoelectric current.

Fig. 7.2 shows the variation with potential difference V of the photoelectric current I for radiation of a particular intensity.

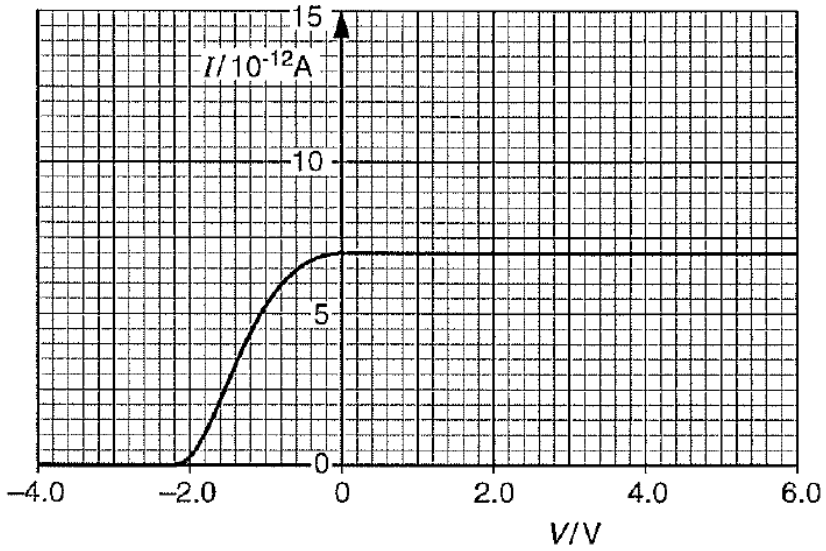

Fig. 7.2

(i) With reference to photoelectrons, explain the significance of the sloping section of the graph for negative values of potential difference.

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……[2]

(ii) Use Fig. 7.2 to determine the maximum speed v_{max} of the photoelectrons. Explain your working clearly.

v_{max} = …… m s^{-1} [3]

(iii) The intensity of the electromagnetic radiation is halved but its frequency is kept constant.
On Fig. 7.2, sketch a graph to show the new $I-V$ characteristic. [2]

(b) In a particular laboratory experiment, a zinc plate has a work function of 5.8 × 10^{-19} J. Ultraviolet light of wavelength 120 nm is incident on the zinc plate. A photoelectric current I is detected.

In order to view the apparatus more clearly, a second lamp emitting light of wavelength 450 nm is switched on. No change is made to the ultraviolet lamp.

Using appropriate calculations, state and explain the effect on the photoelectric current of switching on this second lamp.

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…… [3]

[Total: 10]