7 **(a)** **(i)** Describe the *photoelectric effect* in terms of energy.

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.....[2]

(ii) Explain one way in which the photoelectric effect provides evidence for the particulate nature, and not wave nature, of electromagnetic radiation.

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.....[2]

(b) The graph drawn in Fig. 7.1 shows how the maximum kinetic energy E_k of a photoelectron from a particular material varies with the frequency f of the electromagnetic radiation that causes the emission of photoelectrons.

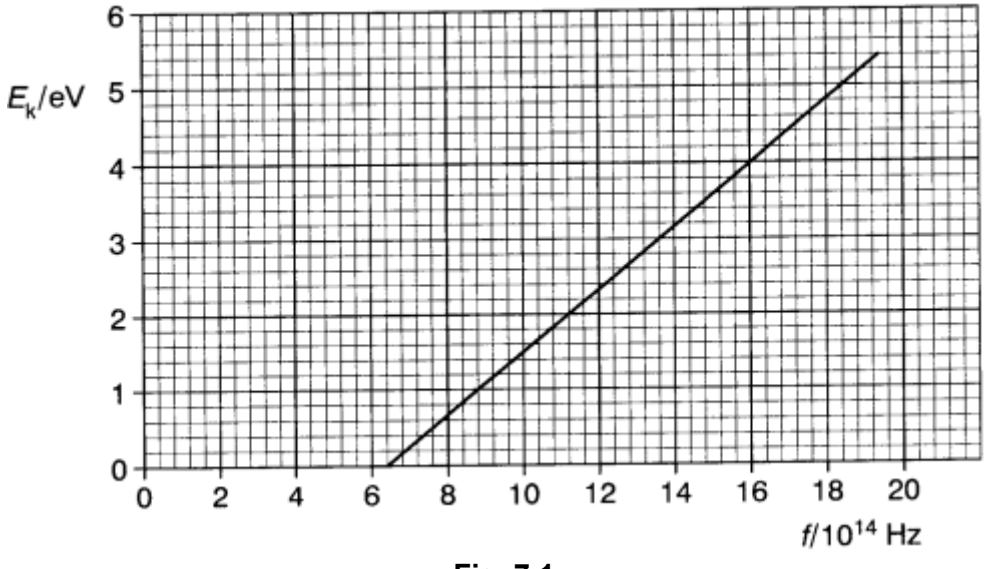

Fig. 7.1

(i) Use the graph to determine

1. the threshold frequency for this material,

threshold frequency = ... Hz [1]

2. the maximum kinetic energy of photoelectrons from this material when it is illuminated with electromagnetic radiation of frequency 18.0×10^{14} Hz.

maximum kinetic energy = ... J [2]

(ii) Determine the minimum potential difference between the electrodes in the photoelectric experiment that is needed to reduce the photocurrent to zero.

minimum potential difference = ... V [2]

(c) Electromagnetic waves have a wave nature as well as a particulate nature. This is known as the wave-particle duality. Describe an experiment in which particles exhibit wave nature.

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.....[1]

[Total: 10]