7 (a) (i) State the name of a phenomenon that gives evidence for the particulate nature of electromagnetic radiation.

..... [1]

(ii) State the name of a phenomenon that gives evidence for the wave nature of electromagnetic radiation.

..... [1]

(b) A photocell consists of two electrodes and their connecting wires enclosed in a small glass bulb. There is a vacuum inside the glass bulb. Electromagnetic radiation is incident on the metal electrode, and emitted photoelectrons travel towards the collector electrode. The photocell is connected to a variable power supply and an ammeter as shown in Fig. 7.1.

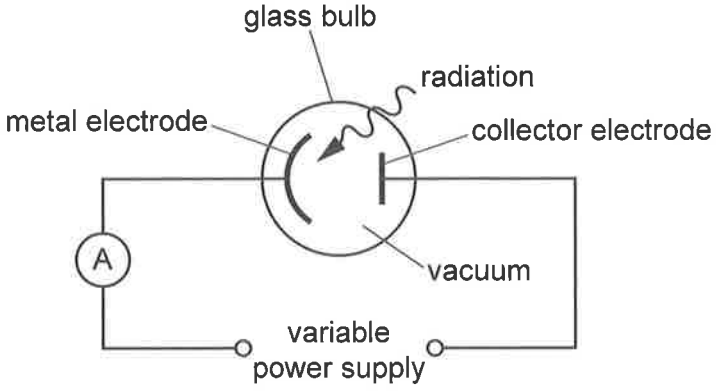

Fig. 7.1

The magnitude of the output of the variable power supply is increased until the ammeter reading just decreases to zero.

(i) On Fig. 7.1, draw a plus sign (+) and a minus sign (–) to indicate the polarity of the power supply. [1]

(ii) The photon energy is 12.4 eV and the work function of the metal surface is 4.2 eV.

Calculate the stopping potential.

stopping potential = ... V [2]

(iii) Explain why the stopping potential is independent of the intensity of the electromagnetic radiation.

.....

.....

.....

.....

..... [3]

(c) For the apparatus in Fig. 7.1, the variation of the ammeter reading I with the potential V of the collector electrode relative to the metal electrode is shown in Fig. 7.2.

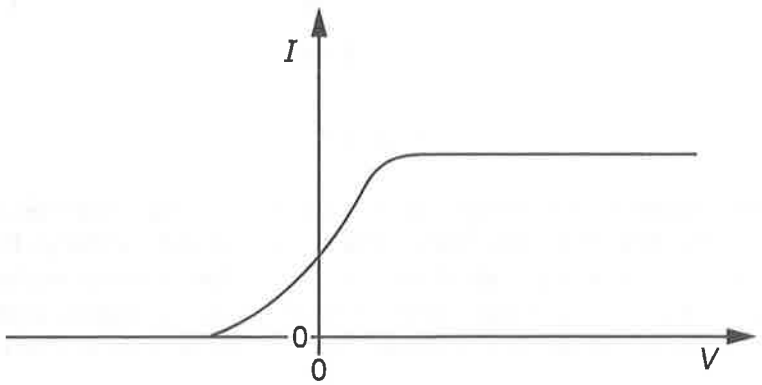

Fig. 7.2

(i) On Fig. 7.2, label the stopping potential V_S. [1]

(ii) The intensity of the electromagnetic radiation incident on the metal electrode is increased.

On Fig. 7.2, sketch a line to show how I now varies with V. [2]

[Total: 11]