6 **(a)** State what is meant by the term *threshold frequency* as applied to the photoelectric effect.

.....

..... [1]

(b) In a typical set-up of the photoelectric experiment, a metal surface is illuminated with radiation of wavelength 450 nm, causing the emission of photoelectrons which are collected at an adjacent electrode.

(i) Calculate the energy of a photon incident on the surface.

energy = ... J [2]

(ii) The intensity of the incident radiation is 2.7×10^3 W m^{-2} and the area of the metal surface is 3.0 cm^2.

Calculate the number of photons incident per second on the surface.

number per second = ... [2]

(iii) Fig. 6.1 shows a graph of how the photoelectric current I varies with the potential difference V between the electrodes.

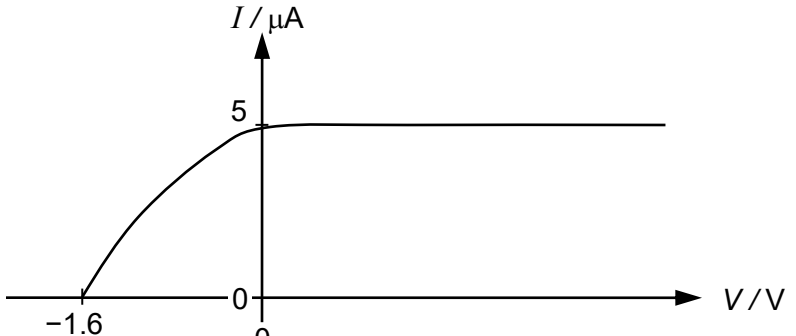

Fig. 6.1

Calculate the threshold wavelength of the metal.

wavelength = ... m [3]

(c) The X-ray spectrum is first produced by an X-ray tube with tungsten (atomic number, Z = 74). Another X-ray spectrum is produced using barium (atomic number, Z = 56) and both spectrums are as shown in Fig. 6.2.

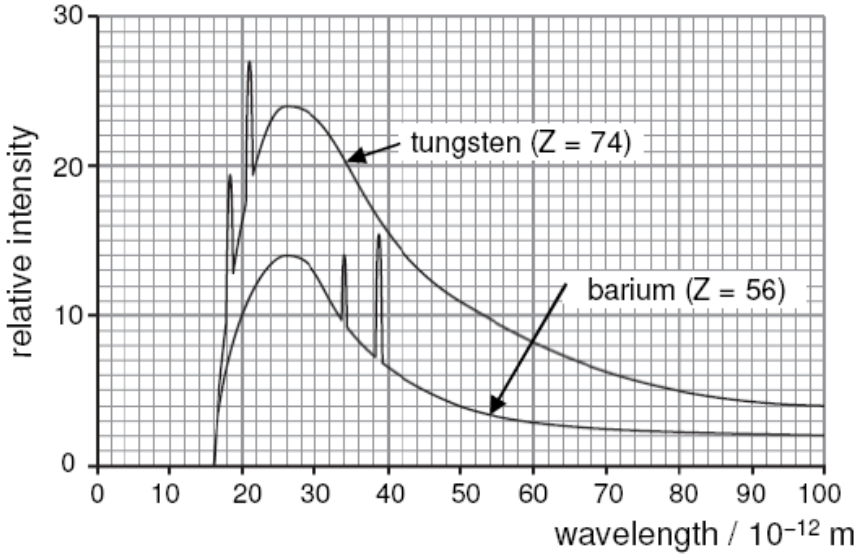

Fig. 6.2

(i) The accelerating potential used to produce the X-ray spectra using tungsten and barium are the same.

State a feature in Fig. 6.2 that shows how this can be deduced.

……

…… [1]

(ii) Determine the accelerating potential.

accelerating potential = ... V [2]

BLANK PAGE