6 **(a)** Fig. 6.1. shows an electrical circuit, which includes a photocell.

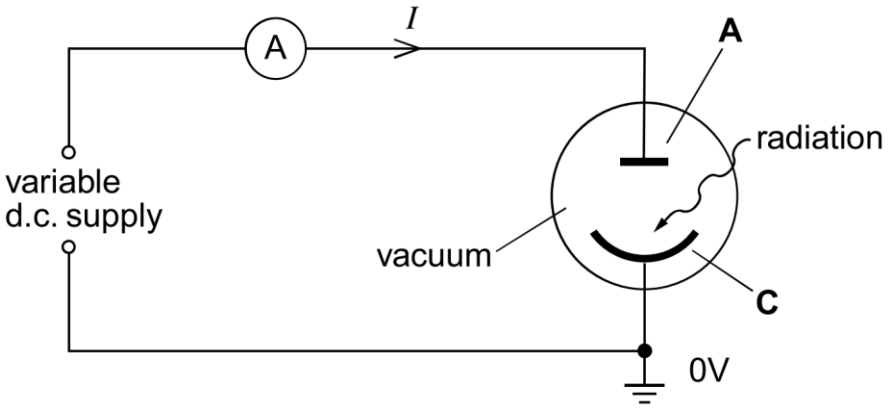

Fig. 6.1

The photocell consists of a metal plate **C** that is exposed to electromagnetic radiation. The photoelectrons emitted travel towards the electrode **A**. A sensitive ammeter measures the current in the circuit.

The plate **C** is illuminated with ultraviolet radiation of constant intensity and of wavelength 2.5×10^{-7} m. Fig. 6.2 shows how the photoelectric current I in the circuit varies with the potential difference V between **A** and **C**.

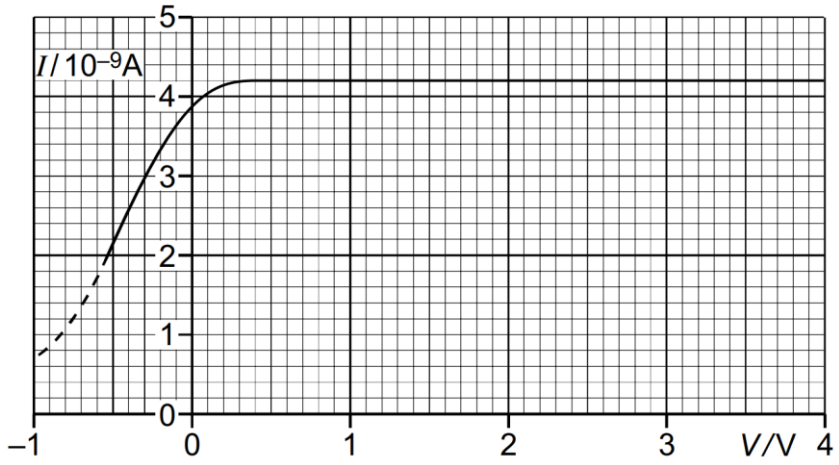

Fig. 6.2

(i) When the potential difference V is 2.0 V, determine the number of electrons per second reaching electrode A.

number of electrons per second = …… s^{-1}[2]

(ii) The intensity of the incident ultraviolet radiation is increased.

1. State how the maximum energy of the photoelectrons emitted from plate **C** is changed.

……

……[1]

2. State and explain how the photoelectric current is changed.

……

……

……

……[2]

(b) The table below shows the work function energies of some metals.

metal	work function energy (eV)
beryllium	5.0
magnesium	3.7
potassium	2.3
silver	4.7
zinc	4.3

(i) Define the *work function energy* of a metal.

……

……[1]

(ii) State and explain which metal has the lowest threshold frequency.

……

……

……

……[2]

(iii) A plate made of magnesium is illuminated with electromagnetic radiation of wavelength 3.2×10^{-7} m. Determine the maximum kinetic energy of the electrons emitted from the surface of the magnesium plate.

maximum kinetic energy = ……. J [2]

(iv) Calculate the de Broglie wavelength of an electron emitted with the maximum kinetic energy.

wavelength = ……. m [2]