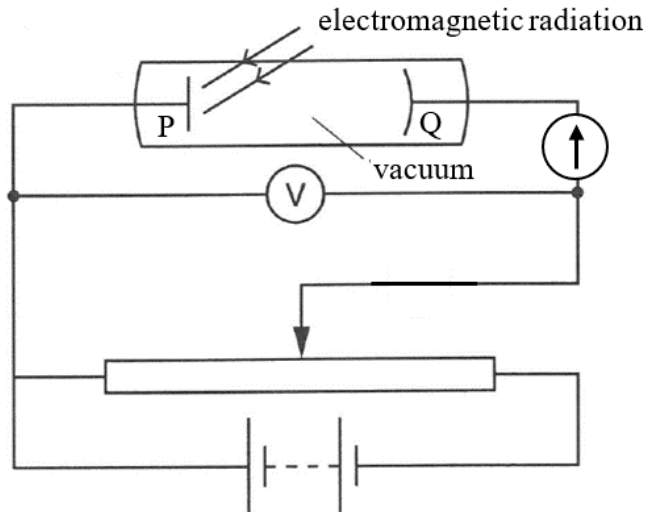


5 A circuit used to investigate the photoelectric effect is shown in **Fig. 5.1**.



**Fig. 5.1**

A potential divider circuit is connected to two metal electrodes P and Q enclosed in an evacuated glass tube.

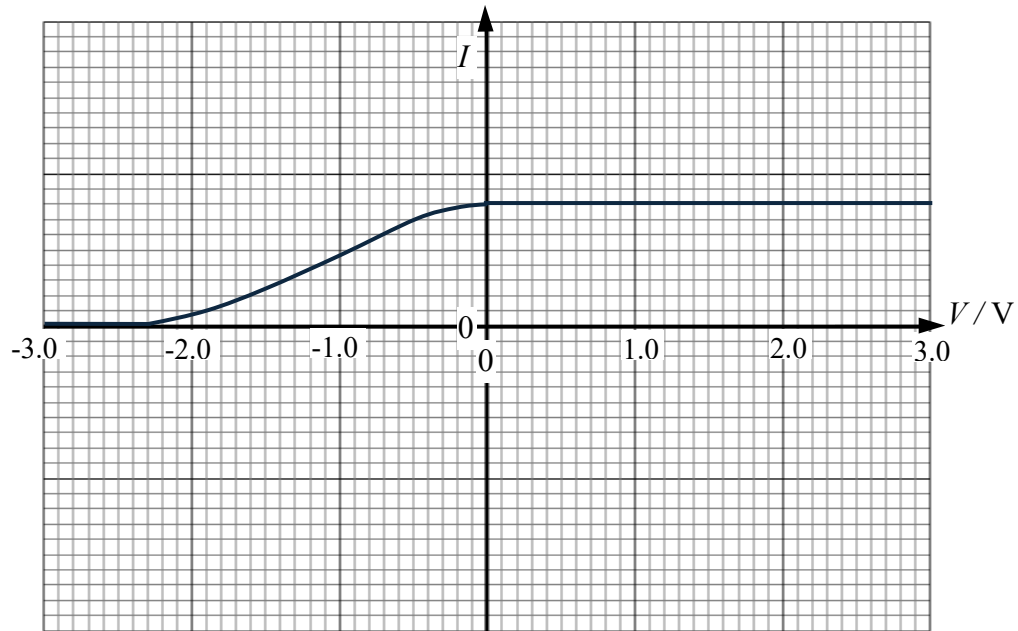
The electromagnetic radiation incident on P is of a single frequency and constant intensity.

The voltmeter measures the potential difference  $V$  between the electrodes and a sensitive meter measures the current  $I$  between the electrodes. The potential difference applied across P and Q can be changed from positive to negative by reversing the battery terminals.

(a) Explain the energy transformation that occurs during photoelectric emission.

.....  
.....  
.....  
..... [2]

The variation with potential difference  $V$  of current  $I$  is shown in **Fig. 5.2**.



**Fig. 5.2**

**(b)** The work function of metal P is 2.0 eV. Use **Fig. 5.2** to calculate

**(i)** the maximum kinetic energy of the photoelectrons.

Maximum KE = ..... J[2]

**(ii)** the frequency of the electromagnetic radiation.

frequency = ..... Hz [2]

**(c)** The frequency of the electromagnetic radiation is kept constant as its intensity is doubled. Sketch on **Fig. 5.2** the variation with  $V$  of  $I$  for this increased intensity. Label this graph A. [2]

- (d) The same electromagnetic radiation in (c) is now incident on Q in **Fig. 5.1**. Given that the stopping potential for photoelectric emission from metal Q is 1.8 V, sketch on **Fig. 5.2** the variation with  $V$  of  $I$  when the electromagnetic radiation is incident on Q. Label this graph B.

[2]