6 In a photoelectric emission experiment, ultra-violet (UV) radiation of wavelength 254 nm is incident on a metal made of silver. The metal has a surface area of 12 mm^2. The intensity of the light incident on the surface is 210 W m^{-2}.

A maximum photocurrent of 4.80×10^{-10} A is collected at an adjacent electrode.

(a) (i) Explain what is meant by a *photon*.

……....

……....

……... [2]

(ii) Show that the rate of incidence of UV photons on the silver surface is 3.2×10^{15} s^{-1}.

[2]

(iii) The photoelectric quantum yield is defined as

$$\frac{\text{rate of photoelectrons emitted from surface}}{\text{rate of photons incident on surface}} \times 100\% .$$

Calculate the photoelectric quantum yield.

quantum yield = ... % [2]

(b) The potential difference between the electrodes is adjusted to decrease the current until there is zero current in the circuit. The experiment is then repeated for different frequencies of UV radiation.

Fig. 6.1 shows the variation of frequency f of the UV radiation with the potential difference V_S for zero current.

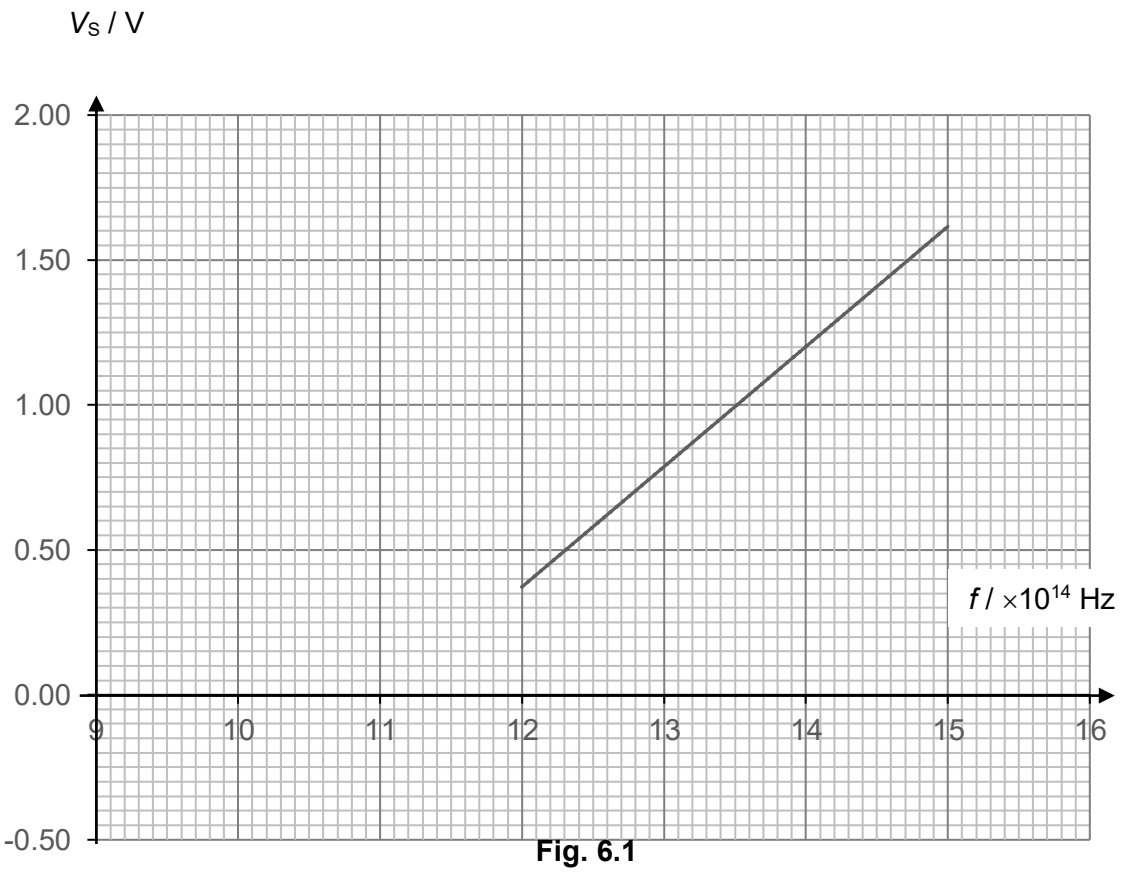

Fig. 6.1

Use Fig. 6.1 to determine

(i) the Planck constant,

Planck constant = …… J s [3]

(ii) the work function of silver.

work function = …….. eV [2]

[Total: 11]