5 In a photoelectric emission experiment setup shown in Fig. 5.1, ultraviolet radiation of wavelength 265 nm and intensity 150 W m^{-2} is incident on a rhodium surface S in an evacuated tube, so that an area of 14 mm^2 is illuminated. Electrons are ejected from the rhodium surface S and collected by a collector cup C.

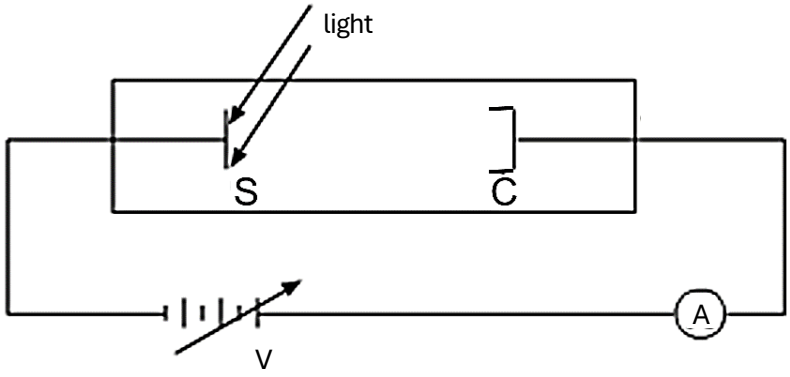

Fig. 5.1

When a potential difference V is set up between rhodium surface S and collector cup C, the graph A in Fig. 5.2 illustrates how photocurrent i changes with the potential difference V.

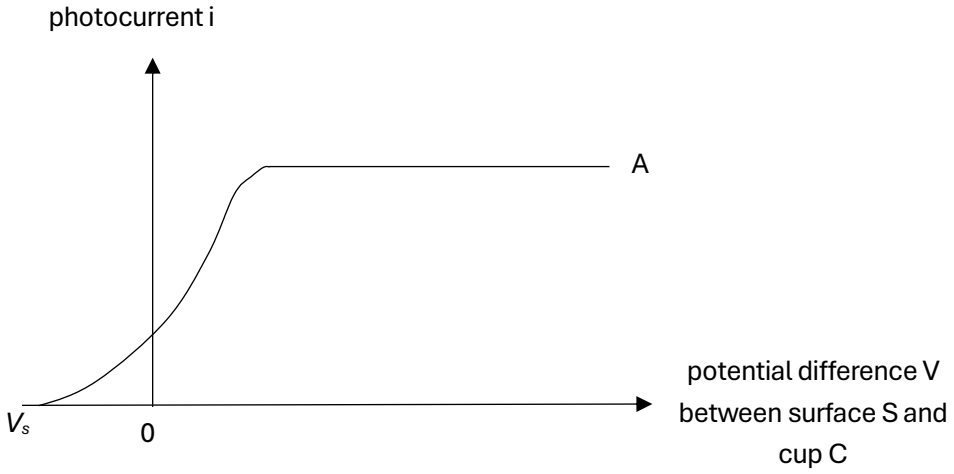

Fig. 5.2

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

……

……

…… [2]

(b) Calculate the energy of an incident photon.

energy of incident photon = …….. eV [2]

(c) **(i)** State and explain the term *work function.*

……..……...

……..……... [1]

(ii) Explain using conservation of energy how the minimum potential difference V_s will change when light of higher wavelength is used to illuminate the rhodium surface S.

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……..……... [3]

(d) Explain why the photoelectric current in graph A reaches a maximum value no matter how large V is.

……..……....

……..……....

……..……....

……..……..... [2]

(e) Using the original ultraviolet radiation of wavelength of 265 nm, the intensity of illumination is then increased and the experiment repeated. In Fig. 5.2, draw the new graph that would be obtained and label it as B. [2]

[Total: 12]

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Section B

Answer **one** question from this section in the spaces provided.