6 W is a long straight wire of length 1.2 m. A beam of electrons is projected with a speed of 2.1×10^7 m s^{-1} parallel to W at a distance of 20 cm from it, as shown in Fig. 6.1.

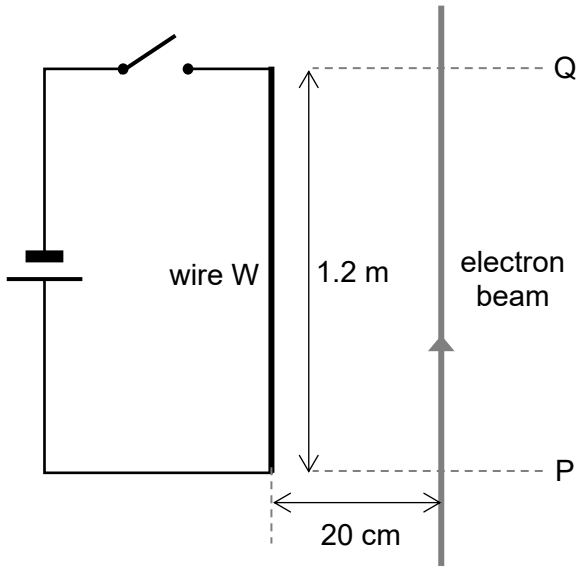

Fig. 6.1

(a) When the switch is closed, the electron beam is deflected laterally by the current in W. Sketch the appearance of the deflected beam in Fig. 6.1. [1]

(b) The current in W is 1.8 A. Calculate the flux density due to the current at a distance of 20 cm from W.

flux density = ... T [2]

(c) Assuming that the lateral deflection of the electron beam is much less than 20 cm, show that the deflected path has a radius of 66 m.

[2]

(d) Calculate the lateral deflection of the beam at Q in mm.

deflection = ... mm [3]

[Total: 8]