6 In an X-ray tube, electrons are produced from a filament heated by an electric current as shown in Fig. 6.1. A large accelerating potential difference is set up between the filament and the target material. The electrons are accelerated from the filament and hit the target material to emit X-ray photons.
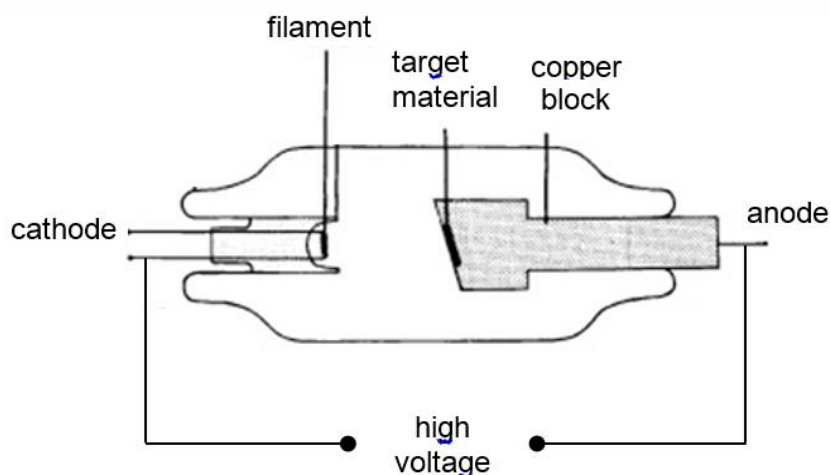

Fig. 6.1

A graph of intensity against wavelength of the emitted radiation is plotted as shown in Fig. 6.2 when the X-ray tube is operated at a voltage of 50 kV.
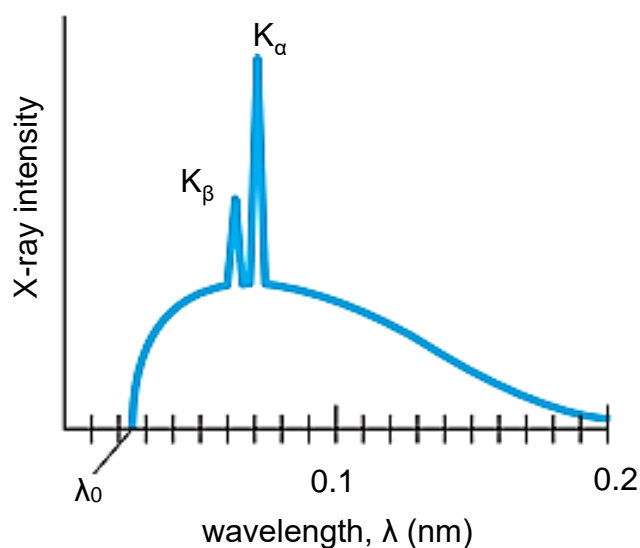

Fig. 6.2

(a) Explain why there is a minimum wavelength λ_0 for the emitted X-rays.

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_____

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_____

_____ [2]

(b) Show that λ_0 equals to 0.024 nm.

[1]

(c) Sketch on Fig. 6.2 a graph to show the intensity variation with wavelength if the accelerating potential difference is reduced to one-quarter of its original value. [2]

[Total: 5]

[Turn over