6 In a particular experimental X-ray tube, a copper target is used. Electrons in the tube are accelerated by a potential difference of 10.0 kV before striking the copper target. The first three energy levels of an isolated copper atom and the X-ray spectrum are as shown in Fig. 6.1.

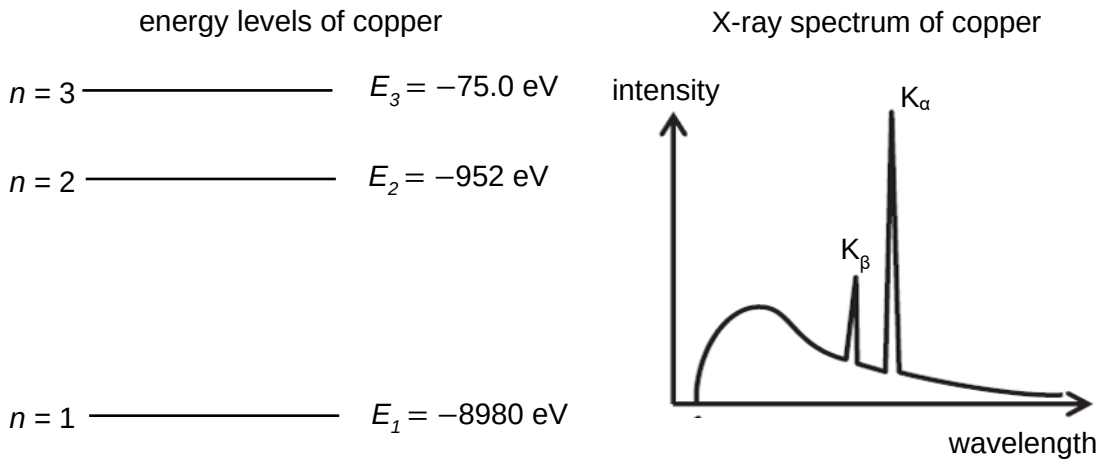

Fig. 6.1

(a) Explain the origin of the continuous background spectrum.

…….

…….

…….

……. [2]

(b) Determine,

(i) the minimum wavelength of the X-ray photons,

wavelength = ... m [2]

(ii) the wavelengths of the K_α and K_β characteristic emissions.

K_α wavelength = …… m

K_β wavelength = …… m [3]

(c) The diameter of a nucleus is in the order of magnitude of 10^{-15} m. Show, using the Heisenberg uncertainty principle, that the electron does not exist inside the nucleus.

[2]

[Total: 9]