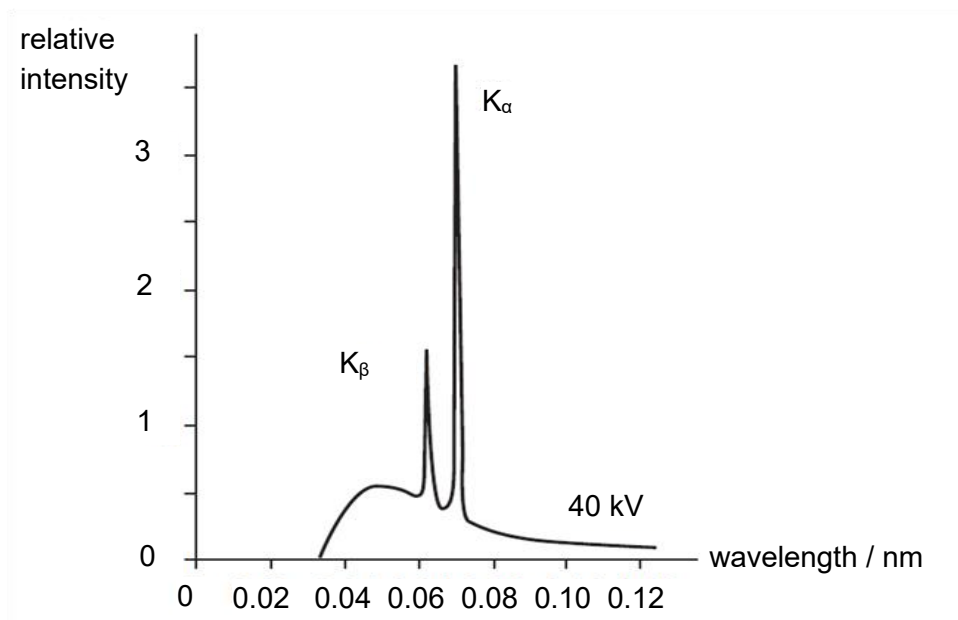


- 7 Fig. 7.1 shows an X-ray spectrum produced by a medical X-ray tube operating at an accelerating potential of 40 kV.



**Fig. 7.1**

- (a) (i) Using Fig. 7.1, estimate the highest energy of the X-rays emitted by the tube.

highest energy = ..... J [2]

- (ii) Calculate the maximum velocity of the high energy electrons hitting the target atom when the tube operates at 40 kV.

maximum velocity = .....  $\text{m s}^{-1}$  [2]

- (iii) Hence calculate the de Broglie wavelength of the electrons at maximum velocity.

de Broglie wavelength = ..... m [2]

**(b)** Explain how the characteristic X-ray lines  $K_\alpha$  and  $K_\beta$  are produced in Fig. 7.1.

.....

.....

.....

.....[2]

### Section B

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