7 One property of α-particles is that they produce a high density of ionisation of air at atmospheric pressure. In this ionisation process, a neutral atom becomes an ion pair. The ion pair is a positively-charged particle and an electron.

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(a) State

(i) what is meant by an α-particle,

.....

.....[1]

(ii) an approximate value for the range of α-particles in air at atmospheric pressure.

range = ... cm [1]

(b) The energy required to produce an ion pair in air at atmospheric pressure is 31 eV. An α-particle has an initial kinetic energy of 8.5×10^{-13} J.

(i) Show that 8.5×10^{-13} J is equivalent to 5.3 MeV.

[1]

(ii) Calculate, to two significant figures, the number of ion pairs produced as the α-particle is stopped in air at atmospheric pressure.

number = ...[2]

(iii) Using your answer in **(a)(ii)**, estimate the average number of ion pairs produced per unit length of the track of the α-particle as it is brought to rest in air.

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number per unit length = ...[2]

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