

(7.4) Make a rough estimate of the range in air for a 1 MeV  $\alpha$ , 1 MeV  $H^+$  and 1MeV  $e^-$  using the plot in Fig. 7.6. The energy of an ion pair in air is 14.6 eV but assume that twice as much energy is lost through excitation.

(a) 1 MeV  $\alpha$ :  $n_{\alpha} := 7 \cdot 10^5$  ion pairs/mm air  $E_{ionpair} := 14.6$  eV  
 $E_{loss} := 3 \cdot E_{ionpair}$   $E_{\alpha} := 1 \cdot 10^6$  eV  
 $Range_{\alpha} := \frac{E_{\alpha}}{E_{loss} \cdot n_{\alpha}}$   $Range_{\alpha} = 0.033$  mm

(b) 1 MeV  $H^+$ :  $n_p := 10^4$  ion pairs/mm air  $E_p := 1 \cdot 10^6$  eV  
 $Range_p := \frac{E_p}{E_{loss} \cdot n_p}$   $Range_p = 2.283$  mm

(c) 1 MeV  $e^-$ :  $n_e := 6 \cdot 10^2$  ion pairs/mm air  $E_e := 1 \cdot 10^6$  eV  
 $Range_e := \frac{E_e}{E_{loss} \cdot n_e}$   $Range_e = 38.052$  mm