(6.7) What is the maximum range in millimeters of β-particles from T, ^{14}C, ^{32}P and ^{90}Sr in a photographic film if its absorption efficiency is assumed to be the same as aluminum? The density of the emulsion is assumed to be 1.5 g cm^{-3}.

$eV := 1.60217733 \cdot 10^{-19} \cdot joule$ $\quad MeV := 10^{6} \cdot eV$

$\rho := 1.5 \cdot \frac{gm}{cm^3}$ The density is common for all the partial questions.

T (=^{3}H): $\quad E_{max} := 0.018 \cdot MeV$

$R_\beta := 8 \cdot 10^{-4} \cdot \frac{gm}{cm^2}$ (from Fig. 6.12) $\quad R_{max} := \frac{R_\beta}{\rho}$ $\quad R_{max} = 5.333 \cdot 10^{-6} \cdot m$

^{14}C: $\quad E_{max} := 0.2 \cdot MeV$

$R_\beta := 4 \cdot 10^{-2} \cdot \frac{gm}{cm^2}$ (from Fig. 6.12) $\quad R_{max} := \frac{R_\beta}{\rho}$ $\quad R_{max} = 0.267 \cdot mm$

^{32}P: $\quad E_{max} := 1.71 \cdot MeV$

$R_\beta := 0.8 \cdot \frac{gm}{cm^2}$ (from Fig. 6.12) $\quad R_{max} := \frac{R_\beta}{\rho}$ $\quad R_{max} = 5.333 \cdot mm$

^{90}Sr: $\quad E_{max} := 0.544 \cdot MeV$

$R_\beta := 0.17 \cdot \frac{gm}{cm^2}$ (from Fig. 6.12) $\quad R_{max} := \frac{R_\beta}{\rho}$ $\quad R_{max} = 1.133 \cdot mm$