(7.7) 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}.

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

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

$R_\beta := 8 \cdot 10^{-4} \cdot \frac{gm}{cm^2}$ (from Fig. 7.12) $R_{max} := \frac{R_\beta}{\rho}$ $R_{max} = 5.333 \cdot 10^{-4} \cdot cm$

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

$R_\beta := 4 \cdot 10^{-2} \cdot \frac{gm}{cm^2}$ (from Fig. 7.12) $R_{max} := \frac{R_\beta}{\rho}$ $R_{max} = 0.027 \cdot cm$

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

$R_\beta := 0.8 \cdot \frac{gm}{cm^2}$ (from Fig. 7.12) $R_{max} := \frac{R_\beta}{\rho}$ $R_{max} = 0.533 \cdot cm$

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

$R_\beta := 0.17 \cdot \frac{gm}{cm^2}$ (from Fig. 7.12) $R_{max} := \frac{R_\beta}{\rho}$ $R_{max} = 0.113 \cdot cm$