(11.4) Calculate the macroscopic cross-section for reaction of natural uranium with thermal neutrons. See Figures 14.1 and 19.5.

$N_A := 6.022137 \cdot 10^{23} \cdot mole^{-1}$ $M_U := 238.03 \cdot gm \cdot mole^{-1}$ $barn := 10^{-28} \cdot m^2$

$x_{234} := \frac{0.055}{100}$ $x_{235} := \frac{0.7200}{100}$ $x_{238} := 1 - x_{234} - x_{235}$ $x_{238} = 0.992$

$\rho_U := 19 \cdot gm \cdot cm^{-3}$ $\sigma_{234} := 100.2 \cdot barn$ $\sigma_{235} := (99 + 582) \cdot barn$ $\sigma_{238} := 2.7 \cdot barn$

$N_v := \frac{\rho_U}{M_U} \cdot N_A$

$S_{macr} := N_v \cdot \left( x_{234} \cdot \sigma_{234} + x_{235} \cdot \sigma_{235} + x_{238} \cdot \sigma_{238} \right)$

$S_{macr} = 36.713 \cdot m^{-1}$