(18.4) With the information in exercise 18.1, calculate annual doses received from (a) ^{40}K, and (b) ^{226}Ra and daughters. Assume $w_R(\alpha) = 20$.

First constants, units, and data:

$Gy := joule \cdot kg^{-1}$ $Sv := joule \cdot kg^{-1}$ $\mu Sv := 10^{-6} \cdot Sv$ $m_{body} := 70 \cdot kg$

Data from the text:

$t_{irr} := 1 \cdot yr$ $w_{R\alpha} := 20$ $w_{R\beta\gamma} := 1$

Calculations:

$R_{40K} := 4.398 \cdot 10^{3} \cdot sec^{-1}$

$E_{40K} := 6.25 \cdot 10^{-14} \cdot joule$ $D_{40K} := t_{irr} \cdot R_{40K} \cdot E_{40K} \cdot m_{body}^{-1}$

$R_{226Ra} := 0.925 \cdot sec^{-1}$

$E_{226Ra} := 4.689 \cdot 10^{-12} \cdot joule$ $D_{226Ra} := t_{irr} \cdot R_{226Ra} \cdot E_{226Ra} \cdot m_{body}^{-1}$

$D_{40K} = 1.239 \cdot 10^{-4} \cdot Gy$ $H_{40K} := w_{R\beta\gamma} \cdot D_{40K}$ $H_{40K} = 124 \cdot \mu Sv$

$D_{226Ra} = 1.955 \cdot 10^{-6} \cdot Gy$ $H_{226Ra} := w_{R\alpha} \cdot D_{226Ra}$ $H_{226Ra} = 39 \cdot \mu Sv$

Answers: (a) 124 μSv/y (b) 39 μSv/y