(15.1) "Reference man" consists of 18%C, 66% H_2O, 0.2% of K per body weight. He may also have accumulated 10 pCi ^{226}Ra in the body; assume 0.3 decay for each of the following 5 daughters. Calculate for a body weight of 70 kg the number of radioactive decays per unit time from ^3H, ^{14}C, ^{40}K and ^{226}Ra. Assume 30 TU in water.

$N_A := 6.022137 \cdot 10^{23} \cdot mole^{-1}$ $\quad Bq := sec^{-1}$ $\quad \rho_{water} := 1.0 \cdot gm \cdot cm^{-3}$

$m_{water} := 70 \cdot \frac{66}{100} \cdot kg$ $\quad m_{carbon} := 70 \cdot \frac{18}{100} \cdot kg$ $\quad m_{potassium} := 70 \cdot \frac{0.2}{100} \cdot kg$

$x_{40K} := 0.0117 \cdot \%$ $\quad TU := 118 \cdot sec^{-1} \cdot m^{-3}$ $\quad M_K := 39.10 \cdot gm \cdot mole^{-1}$

(1) Tritium

$v_{water} := \frac{m_{water}}{\rho_{water}}$ $\quad R_T := 30 \cdot TU \cdot v_{water}$ $\quad R_T = 163.548 \cdot Bq$ $\quad$ Bq of ^3H

(2) ^{14}C

$S_C := \frac{13.56}{60} \cdot sec^{-1} \cdot gm^{-1}$ $\quad R_{14C} := m_{carbon} \cdot S_C$ $\quad R_{14C} = 2.848 \cdot 10^3 \cdot Bq$

(3) ^{40}K

$t_{half40K} := 1.26 \cdot 10^9 \cdot yr$ $\quad \lambda_{40K} := \frac{ln(2)}{t_{half40K}}$

$R_{40K} := \frac{m_{potassium}}{M_K} \cdot N_A \cdot x_{40K} \cdot \lambda_{40K}$ $\quad R_{40K} = 4.398 \cdot 10^3 \cdot Bq$

(4) ^{226}Ra and daughters

$R_{Ra} := 10 \cdot 10^{-12} \cdot 3.7 \cdot 10^{10} \cdot Bq$ $\quad R_{Ra} = 0.37 \cdot Bq$ $\quad$ (this value will be needed in 15.2)

$R_{Ratot} := (1.0 + 5 \cdot 0.3) \cdot R_{Ra}$ $\quad R_{Ratot} = 0.925 \cdot Bq$

$Total := R_T + R_{14C} + R_{40K} + R_{Ratot}$ $\quad Total = 7.41 \cdot 10^3 \cdot Bq$