(16.8) A cardiac pacemaker contains 150 mg of ^{238}Pu. What is its heat output? Use data from the isotope chart.

$^{238}Pu(\alpha)^{234}U$

First known data, constants, and units:

$MeV := 1.6021773 \cdot 10^{-13} \cdot joule$ $\quad N_A := 6.022137 \cdot 10^{23} \cdot mole^{-1}$

$M_{238Pu} := 238 \cdot gm \cdot mole^{-1}$ $\quad M_{234U} := 234 \cdot gm \cdot mole^{-1}$

$E_\alpha := 5.499 \cdot MeV$ From Fig. 16.1.

$t_{half} := 87.7 \cdot yr$ $\quad \lambda := \frac{ln(2)}{t_{half}}$

Data given in the text:

$m_{Pu} := 150 \cdot mg$

Calculations:

$A_{Pu} := \frac{m_{Pu}}{M_{238Pu}} \cdot N_A \cdot \lambda$ Eqn. (4.40b) $\quad Q_\alpha := E_\alpha \cdot \frac{M_{238Pu}}{M_{234U}}$ Eqn. (4.16)

$P_{tot} := Q_\alpha \cdot A_{Pu}$ $\quad P_{tot} = 0.085 \cdot watt$