1) a $A = \lambda N$ assume 1 kg, $= \frac{\ln 2}{87.7\,yr \times 3.15\times10^{7}\,s/yr} \cdot \frac{1\,kg \times 6.022\times10^{23}/mol}{238.\,g/mol \times 10^{-3}\,kg/g}$

$A = 6.35 \times 10^{14}/s$ $\quad Q_\alpha = \Delta(^{238}Pu) - \Delta(^{234}U) - \Delta(^{4}He) = 5.593\,MeV$

(in one kg) Power = Activity × Energy/decay $= 6.35\times10^{14}/s \times Q_\alpha$

Power $= 6.35\times10^{14}/s \times 5.593\,MeV \times 10^{6}\,\frac{eV}{MeV} \times 1.602\times10^{-19}\,\frac{J}{eV}$

$= 569.\ \frac{J}{s} \Leftrightarrow$ Watt

b mass for 470 W $\Rightarrow \frac{470\,W}{569\,W/kg} = 0.826\,kg$

c mass needed for 470 W if conversion is only 7%

real mass $= \frac{0.826\,kg}{0.07} = 11.8\,kg$ [about 26 lbs]

2 KE = V_c at turning point

$5.4\,MeV = \frac{Z_1 Z_2 e^2}{r} \rightsquigarrow r = \frac{92 \times 2 \times 1.439\,MeV\text{-}fm}{5.4\,MeV}$

$r = 49.\,fm$

3 $R_u \sim 1.2\,fm\,A^{1/3} = 1.2\,(238)^{1/3} = 7.44\,fm$

Ratio $= \frac{r\text{-turning pt.}}{\text{Radius } u} = \frac{49\,fm}{7.44\,fm} = 6.6$