

Fall Term 2006

22.02 Introduction to APPLIED NUCLEAR PHYSICS

Problem Set #8

Prof. Molvig

Posted: November 16, 2006

DUE: November 30, 2006

1. Krane, problems 3.9, 3.10 (Also evaluate the B/A values for these nuclides), 3.17
2. Derive the Gamow factor,

$$2G = \frac{2\pi Z_\alpha Z_D e^2}{\hbar v}$$

from the sequence of dimensional, scaling arguments,

$$\begin{aligned} 2G &\approx \kappa r \\ \frac{\hbar^2 \kappa^2}{2\mu} &\simeq Q_\alpha \\ r &\approx \frac{Z_\alpha Z_D e^2}{Q_\alpha} \end{aligned}$$

and use,

$$v = \sqrt{2Q_\alpha/\mu}$$

to express this in final form. What numerical multiplying factor do you need to include to get the exact answer that results from doing the integrals as we discussed in lecture? Write your expression in the form,

$$2G = \sqrt{\frac{E_G}{Q_\alpha}}$$

and derive an expression for, E_G , the *Gamow energy*.

3. Krane, problems 8.3, 8.4, 8.8