chem580 exam 1

Binding Energy

$$B = 15.56A - 17.23A^{2/3} - 0.72Z^2 A^{-1/3} - 23.285 \left(A - 2Z\right)^2 A^{-1} + 11A^{-1/2} \tag{1}$$

$$B = 931 \left(1.00783Z + 1.00867N - M\right) \tag{2}$$

Nuclear Radius

$$R(\text{cm}) = 1.4 \times 10^{-13} A^{1/3} \tag{3}$$

Magic Numbers

2, 8, 20, 28, 50, 82, 126 (also 118 for p^+)

AMU

1 u=931 MeV

Coulomb Barrier

$$E_C = 1.11 \frac{(A + A')}{A} \frac{ZZ'}{\left(A^{1/3} + A'^{1/3}\right)} \tag{4}$$

Specific Activity

A is mass number, T is half-life in days

$\dfrac{\text{mCi}}{\text{mg}}$

$\dfrac{1.3 \times 10^8}{AT}$

$\dfrac{\text{MBq}}{\text{mg}}$

$\dfrac{4.8 \times 10^6}{AT}$

Beta Recoil

$$E_{Max} = E_m \frac{m_e}{m_e + M_D} \tag{5}$$