

# Stuff for Monday, May 7, 2012

- PS #11 due up front; See me to go over midterm.
- Schedule this week back to usual:
  - 1094 session on Wednesday, PS#12 due Thursday
  - Quiz #6 on Friday on Q12–Q15
  - Unit T starts on Thursday

Binding energy and decay rates:

- Binding energy  $E_b \equiv E_{\text{parts}} - E_{\text{system}}$ ,  $\Delta m \equiv m_{\text{parts}} - m_{\text{sys}} = E_b/c^2$ 
  - nucleus:  $\Delta m = Zm_H + Nm_n - m_{\text{atom}}$  where  $m_H = 1.007825 \text{ u}$
  - $m_p = 1.007277 \text{ u}$   $m_n = 1.008665 \text{ u}$   $m_e = 0.0005486 \text{ u}$
- Decays: alpha, beta (neutron  $\beta^-$ , proton  $\beta^+$ , EC)  $\implies \nu$  or  $\bar{\nu}$ , gamma
- A radioactive sample's activity is  $\lambda N$ , which is decays per second
- 1 becquerel = 1 Bq  $\equiv$  1 decay per second; 1 curie = 1 Ci =  $3.7 \times 10^{10}$  Bq
- $\frac{dN}{dt} = -\lambda N \implies \lambda \approx -\frac{\Delta N}{N\Delta t} \implies N(t) = N_0 e^{-\lambda t}$  where  $N_0 \equiv N(t=0)$
- half-life  $t_{1/2}$  related to  $\lambda$  by  $\lambda = \ln 2/t_{1/2}$