Nuclear Physics Formula Sheet

1. Number of Neutrons

$$N = A - Z$$

where A is the mass number (nucleons), Z is the number of protons.

2. Mass Deficiency

$$\Delta m = \left(Z \cdot m_p + N \cdot m_n\right) - m_{\text{nuclide}}$$

3. Binding Energy

$$E_b = \Delta m \cdot u$$

4. Binding Energy per Nucleon

$$E_{b,\text{per nucleon}} = \frac{E_b}{A}$$

5. Fragmentation Energy

a) Per mole

$$E_f = n_{\text{mol}} \cdot N_A \cdot E_{\text{nuclear}}$$

b) Per gram

$$E_f = \left(\frac{m_g \cdot N_A}{A}\right) \cdot E_{\text{nuclear}}$$

6. Radioactive Decay Time

$$t = \frac{-\ln(N) \cdot T_{1/2}}{\ln(2)}$$

7. Decay Constant

$$\lambda = \frac{\ln(2)}{T_{1/2}}$$

8. Mean Lifetime

$$\tau = \frac{1}{\lambda}$$