

(3.6) With the semiempirical mass equation (3.8) estimate the binding energy per nucleon for ^{10}B , ^{27}Al , ^{59}Co , and ^{236}U . Compare the results with the observed values in Table 3.1.

Constants from p. 51:

$$a_V := 15.5 \quad a_A := 23 \quad a_C := 0.72 \quad a_S := 16.8 \quad a_d := 34$$

^{10}B : $A := 10 \quad Z := 5 \quad N := A - Z \quad N = 5 \quad u_j := -1$ The u_j parameter controls the last term in eqn. (3.8).

$$EB := \left[a_V \cdot A - a_A \cdot \frac{(N - Z)^2}{A} - a_C \cdot \frac{Z^2}{\frac{1}{A^3}} - a_S \cdot A^{\frac{2}{3}} \right] + u_j \cdot \frac{a_d}{\frac{3}{A^4}} \quad \text{eqn. (3.8)} \quad \frac{EB}{A} = 6.26 \quad \text{MeV/u}$$

^{27}Al : $A := 27 \quad Z := 13 \quad N := A - Z \quad N = 14 \quad u_j := 0$

$$EB := \left[a_V \cdot A - a_A \cdot \frac{(N - Z)^2}{A} - a_C \cdot \frac{Z^2}{\frac{1}{A^3}} - a_S \cdot A^{\frac{2}{3}} \right] + u_j \cdot \frac{a_d}{\frac{3}{A^4}} \quad \frac{EB}{A} = 8.37 \quad \text{MeV/u}$$

^{59}Co : $A := 59 \quad Z := 27 \quad N := A - Z \quad N = 32 \quad u_j := 0$

$$EB := \left[a_V \cdot A - a_A \cdot \frac{(N - Z)^2}{A} - a_C \cdot \frac{Z^2}{\frac{1}{A^3}} - a_S \cdot A^{\frac{2}{3}} \right] + u_j \cdot \frac{a_d}{\frac{3}{A^4}} \quad \frac{EB}{A} = 8.73 \quad \text{MeV/u}$$

^{236}U : $A := 236 \quad Z := 92 \quad N := A - Z \quad N = 144 \quad u_j := 1$

$$EB := \left[a_V \cdot A - a_A \cdot \frac{(N - Z)^2}{A} - a_C \cdot \frac{Z^2}{\frac{1}{A^3}} - a_S \cdot A^{\frac{2}{3}} \right] + u_j \cdot \frac{a_d}{\frac{3}{A^4}} \quad \frac{EB}{A} = 7.49 \quad \text{MeV/u}$$