

(4.6) With the semiempirical mass equation (4.15) estimate the binding energy per nucleon for ^{10}Be , ^{27}Al , ^{59}Co , and ^{236}U . Compare the results with the observed values in Table 4.1.

Constants from below eqn (4.15):

$$a_v := 15.5 \quad a_a := 23 \quad a_c := 0.72 \quad a_s := 16.8 \quad a_d := 34$$

$$^{10}\text{Be}: \quad A := 10 \quad Z := 5 \quad N := A - Z \quad N = 5 \quad u_j := -1$$

$$EB := \left[a_v \cdot A - a_a \cdot \frac{(N - Z)^2}{A} - a_c \cdot \frac{Z^2}{\frac{1}{A^3}} - a_s \cdot A^{\frac{2}{3}} \right] + u_j \cdot \frac{a_d}{A^{\frac{3}{4}}} \quad \text{eqn. (4.15)}$$

$$\frac{EB}{A} = 6.262 \quad \text{MeV/u}$$

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

$$EB := \left[a_v \cdot A - a_a \cdot \frac{(N - Z)^2}{A} - a_c \cdot \frac{Z^2}{\frac{1}{A^3}} - a_s \cdot A^{\frac{2}{3}} \right] + u_j \cdot \frac{a_d}{A^{\frac{3}{4}}}$$

$$\frac{EB}{A} = 8.366 \quad \text{MeV/u}$$

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

$$EB := \left[a_v \cdot A - a_a \cdot \frac{(N - Z)^2}{A} - a_c \cdot \frac{Z^2}{\frac{1}{A^3}} - a_s \cdot A^{\frac{2}{3}} \right] + u_j \cdot \frac{a_d}{A^{\frac{3}{4}}}$$

$$\frac{EB}{A} = 8.734 \quad \text{MeV/u}$$

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

$$EB := \left[a_v \cdot A - a_a \cdot \frac{(N - Z)^2}{A} - a_c \cdot \frac{Z^2}{\frac{1}{A^3}} - a_s \cdot A^{\frac{2}{3}} \right] + u_j \cdot \frac{a_d}{A^{\frac{3}{4}}}$$

$$\frac{EB}{A} = 7.489 \quad \text{MeV/u}$$