

$$m(x^A)c^2 =$$

$$[Z m(^4H') + Nm_n]c^2 - BE$$

$$= Zm_Hc^2 + Nm_nc^2 -$$

$$a_v A + a_s A^{2/3} +$$

$$a_c \frac{Z(Z-1)}{A^{1/3}} + a_{sym} \frac{(A-2Z)^2}{A}$$

for min. mass energy for a given  $A$ ,  $Z$  can be obtained by cond<sup>n</sup>:

$$\frac{d(mc^2)}{dZ} = 0$$



$$\frac{d(mc^2)}{dz} = m_H c^2 - m_N c^2 + \frac{a_c}{A^{1/3}} (2z-1)$$

$$+ \frac{a_{sy}}{A} 2(A-2z)(-2) = 0$$

then;

$$z \left[ \frac{2a_c}{A^{1/3}} + \frac{8a_{sym}}{A} \right] =$$

$$m_N c^2 - m_H c^2 + \frac{a_c}{A^{1/3}} + \frac{4a_{sym}}{A}$$



$$Z = \frac{(m_n - m_H)c^2 + \frac{a_c}{A^{1/3}} + 4a_{sym}}{\frac{2a_c}{A^{1/3}} + 8 \frac{a_{sym}}{A}}$$

$$Z = \frac{0.7824 \text{ MeV} + \frac{0.72 \text{ MeV}}{A^{1/3}} + 4 \times 23 \text{ MeV}}{\frac{2 \times 0.72}{A^{1/3}} + 8 \frac{23 \text{ MeV}}{A}}$$

$$Z \approx \frac{4a_{sym}}{\frac{2a_c}{A^{1/3}} + 8 \frac{a_{sym}}{A}} = \frac{4a_{sym}}{2a_c A^{2/3} + 8a_{sym}}$$

$$= \frac{4A}{2Q_c A^{2/3} + 8}$$

$$= \frac{A}{2} \left( \frac{1}{1 + \frac{1}{4} \frac{Q_c}{Q_{sym}} A^{2/3}} \right)$$

$$= \frac{A}{2} \left[ \frac{1}{1 + \left( \frac{0.72}{4 \times 2.5} \right) A^{2/3}} \right]$$

$$= \frac{A}{2} \left[ \frac{1}{1 + 0.0078 A^{2/3}} \right]$$

for  $A < 10$

$$Z \approx \frac{A}{2}$$

But for  $A > 10$

$$Z < A/2$$



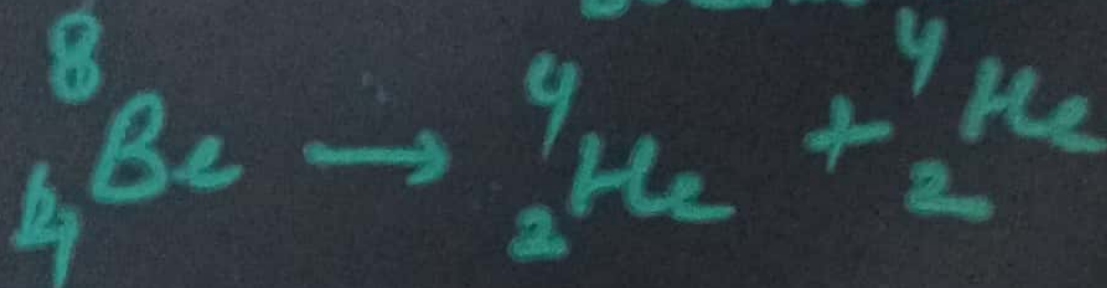
Example : -

①

$$A = 8,$$

$$\text{then } Z = 4 \quad - \quad {}_4^8\text{Be}$$

Highly unstable  
breaks into 2  $\alpha$



②  $A = 100$

$$\text{then } Z = 42$$

③  $A = 235$

$$\text{then } Z = 90$$

