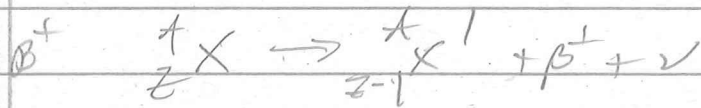


Q value: β^+ , EC decay



in terms of nuclear masses,

$$Q = m_N(A, Z) - m_N(A, Z-1) - m_e - m_\nu \approx 0$$

but we have atomic masses

$$M(A, Z) = m_N(A, Z) + Z m_e - \sum_{i=1}^Z B_i^e$$

so

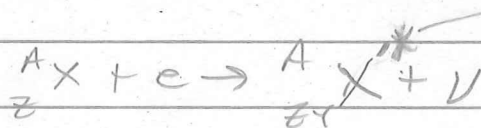
$$Q = M(A, Z) - M(A, Z-1) - m_e = [m_N(A, Z) + Z m_e - \sum_{i=1}^Z B_i^e] - [m_N(A, Z-1) + (Z-1) m_e - \sum_{i=1}^{Z-1} B_i^e] - m_e$$

$$Q = m_N(A, Z) - m_N(A, Z-1) - 2 m_e + \left(\sum_{i=1}^Z B_i^e - \sum_{i=1}^{Z-1} B_i^e \right)$$

1.022 MeV

small-ish

E.C.



Since usually inner electron captured, final atom in excited atomic state

$$Q = m(A, Z) - m(A, Z-1) - m_e + \sum_{i=1}^Z B_i^e - \sum_{i=1}^{Z-1} B_i^e$$

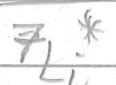
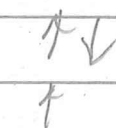
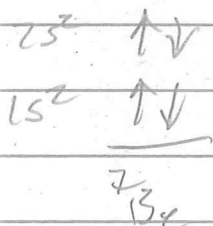
$$= m(A, Z) - m(A, Z-1) + \sum_{i=1}^Z B_i^e - \sum_{i=1}^{Z-1} B_i^e$$

Initial

After Capture

After relaxing

most of the



255eV

Not so small B_e now. Empty K shell fills by cascade, so net diff is B_Kⁱ - B_{Z-1}ⁱ

↑ captured electron
↑ outermost