Kjarna- og öreindafræði

Dæmablað 2

Skilafrestur 21. September 2016 kl. 15:00

1. **Stability** (20)

   The numbers of protons and neutrons are roughly equal for stable lighter nuclei; however, the number of neutrons is substantially greater than the number of protons for stable heavy nuclei. For light nuclei, the energy required to remove a proton or a neutron from the nucleus is roughly the same; however, for heavy nuclei, more energy is required to remove a proton than a neutron. Explain these facts, assuming that the specific nuclear forces are exactly equal between all pairs of nucleons.

2. **Stability** (20)
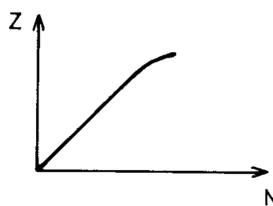
   Stable nuclei have N and Z which lie close to the line shown roughly in the figure above.

   (a) Qualitatively, what features determine the shape of this curve.

   (b) In heavy nuclei the number of protons is considerably less than the number of neutrons. Explain.

   (c) ^{14}O$(Z = 8, N = 6)$ has a lifetime of 71 sec. Give the particles in the final state after its decay.

3. **Nuclei radius** (10)

Use the positron decay of ^{15}O to the ground state of ^{15}N to calculate the radius parameter R_0 in the expression $R = R_0 A^{1/3}$.