

FYS3520 - Problem set 7

Spring term 2017

Problem 1 – in class

- a) What is the standard picture for α -decay? Why is the α particle so prominent? Are there also other decay modes, e.g. ${}^3\text{He}$, ${}^9\text{Be}$ or ${}^{14}\text{C}$ or ${}^{24}\text{Na}$?
- b) What is the relative biological effect of the different kinds of radiation? Why can I hold an α source in my hand without necessarily suffering a lot of radiation damage?

Problem 2 General aspects of the α -decay

1. What are the requirements for spontaneous decay from a parent to daughter nucleus? What terms in the liquid drop model lead to α -decay of a proton (/neutron) rich nucleus?
2. What determines the α -decay probability? Why is the cluster decay usually strongly suppressed?
3. How does the energy spectrum of the α -particle from an α -decay look like? Why does the energy of the α -particle deviate from the Q -value of the decay?