

Problem package 4

2012-02-10

Course: Environmental science FFY471

Due time: February 22nd at 16.15

Submit by email to bertil.dynefors@chalmers.se or give the answers to Bertil in paper version.

Computer written text is preferred, but hand writing is allowed.

The work is individual. **No text may be copied** or directly taken from any material.

Images, figures and tables may however be copied.

The aim of this problem package 4 is to study the potential of utilizing nuclear energy fuels under optimum conditions

First two “knowledge questions”

- 4A How does the number of protons and neutrons change in a nucleus after a β^+ - decay?
- 4B An radioactive element in a sample has an activity of 20 MBq and a half-life lifetime of 12 years. 0,66 gamma quanta of energy 664 keV are emitted after each decay. 50 % of the gamma radiation is absorbed in the shielding around the radioactive element.
What energy is absorbed in the shielding during the first year? (Present each step in the solution)

Some basic links to the following problems will be given on the homepage on Monday Feb 13.

- 4C What are the possibilities and drawbacks of using thorium as a fuel in nuclear reactors?
- 4D An alternative to the present reactors are molten salt reactors. Describe and explain their function, and in particular, discuss the advantages and problems to use these reactors concerning fuel efficiency, safety of operation and waste production.
- 4E A option to a direct final disposal of spent fuel elements from nuclear reactors is reprocessing of the fuel. What is meant by reprocessing and what are the advantages and disadvantages of reprocessing the fuel elements?

This problem package 4 will be graded F, 3, 4, 5.

Individual and original structure and treatment of the issues and substantial level on the content will be highly estimated in the grading. Do not write in too general terms, try to be specific and substantial.