Nuclear Engineering 150 – Discussion Section
Extra problems to save for review/backup

More relevant

Problem

A reactor is operating for a long time at some known power density P_0. Then, it instantaneously changes power to some power density P_1. One fission product of interest is ^{135}Xe, though it has a neglible yield from the initial fission reaction. ^{135}Xe precursors ^{135}Te and ^{135}I are produced with a combined yield of approximately 6%, before decaying via β^- decay to ^{135}I and ^{135}Xe respectively. Find the number density of ^{135}Xe as a function of time after the power change. (Your solution may be left as variables)

Nucleus	Half-life	Thermal σ_a
^{135}Te	19.0 s	~ 0
^{135}I	6.6 hr	~ 0
^{135}Xe	9.2 hr	2.6×10^6 barns

Walkthrough of neutron slowing down
(1) Generate a neutron from fission-neutron energy spectrum
(2) Find cross section at that point
(3) Determine if more likely to scatter/absorb; choose higher prob ((hopefully scatter))
(4) Decrease by average energy loss
(5) Repeat steps 2/3 until absorbed
Identify interaction points on fission cross section plot... show "skipped resonances"

Less relevant

Problem

Recall from mechanics that centripetal force is $F_{\text{cent}} = -\frac{mv^2}{r}$ and recall from E&M that the Coulombic force is $F_{\text{coul}} = -\frac{Ze^2}{r^2}$. Solve for the Bohr radius of the orbit of an electron on hydrogen, assuming the angular momentum $L = mvr$ is quantized multiples of $\hbar$ ($1\hbar$, $2\hbar$, $3\hbar$, etc). Compare this to the measured value of $5.2917721067(12) \times 10^{11}$ Å , the most probable distance between an electron in the ground state and the nucleus of a hydrogen atom.