

NUEN 629, Homework 5

Due Date Dec. 3

Solve the following problem and submit a detailed report, including a justification of why a reader should believe your results. 🤖

1 Clean Fusion Energy 🌱🌿

(100 points) Consider a thermonuclear fusion reactor producing neutrons of energy 14.1 and 2.45 MeV. The reactor is surrounded by FLiBe (a 2:1 mixture of LiF and BeF₂, <https://en.wikipedia.org/wiki/FLiBe>) to convert the neutron energy into heat. All the constituents in the FLiBe have their natural abundances. Using data from Janis (<https://www.oecd-neo.org/janis/>). Assume the total neutron flux is 10^{14} n/cm²·s. Perform the following analyses.

1. (25 points) Write out the depletion (or in this case activation) chains that will occur in the system.
2. (50 points) Over a two-year cycle compute the inventory of nuclides in the system using two methods discussed in class. What is the maximum concentration of tritium?
3. (25 points) After discharging the FLiBe blanket, how long will it take until the material is less radioactive than Brazil nuts (444 Bq/kg, <http://www.ornl.gov/PTP/collection/consumer%20products/brazilnuts.htm>).