

國立清華大學 103 學年度碩士班考試入學試題

系所班組別：核子工程與科學研究所 甲組(工程組)

考試科目 (代碼)：核工原理(2802)

共 1 頁，第 1 頁 *請在【答案卷、卡】作答

1. Determine the critical mass of a bare spherical homogeneous reactor based on one group diffusion theory with the following parameters:
radius = 50cm $\Sigma_a = 0.02\text{cm}^{-1}$ $\nu = 2.5$ $\sigma_f = 700\text{b}$ $D = 2\text{cm}$
(15%)
2. Xe-135 has half-life about 9 hours and its parent nuclei I-135 has half-life about 6 hours. When does the Xe-135 concentration reach its peak value after reactor shutdown? (15%)
3. In a thermal reactor loaded with enriched uranium fuel, 15% fission neutrons are absorbed in U-238 resonance, 5% leak out of the reactor during slowing down; once reached the thermal region, 80% thermal neutrons are absorbed by fuel, of these 70% are absorbed by U-235. What is the conversion ratio of the reactor? (10%)
4. D₂O has a density of 1.1 g/cm³. If Deuterium is 90% w/o, what is the atomic density of Deuterium? What is the atomic percent (a/o) of Deuterium? Assume the atomic weight for H, D and O are 1, 2 and 16 respectively. (15%)
5. An infinite planar source has an intensity of S/cm²-sec and is placed between infinite slab of graphite and aluminum of thickness a and b respectively. Please derive an expression for the neutron flux in the system. (15%)
6. 問答題
 - (a) 沒有 fissile material 為何不能臨界? (5%)
 - (b) 何謂 diffusion theory 其基本假設為何? 適用/不適用場合為何? (10%)
 - (c) Explain the meaning and the relation between thermal flux and 2200m/s flux? (9%)
 - (d) 決定緩和劑溫度為正或負的因素為何? (6%)