NPRE 247 - Exam 2 Study Guide

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1 Binary Nuclear Reactions

1. Connect concepts of particle collisions and decay to binary reactions
2. Categorize nuclear reactions using standard nomenclature
3. apply conservation of nucleaons to binary nuclear reactions.
4. Formulate Q value equations for binary nuclear reactions
5. Apply conservation of energy and linear momentum to scattering.
6. Apply coulombic threshold.
7. Apply kinematic threshold.
8. Determine when coulombic and kinematic thresholds apply or do not.

2 Radiation Interactions with Matter

1. Define uncollided flux
2. Define lnear interaction coefficient
3. Apply linear interaction coefficients to a slab problem

4. Identify the units of intensity, flux density, fluence, reaction rate
5. Compare linear interaction coefficient and cross section
6. Calculate uncollided flux in a medium
7. Calculate mean free path of a particle in a medium
8. Define the half thickness in a medium
9. Apply the concept of buildup factor to attenuation in a slab
10. Define microscopic cross section
11. Calculate macroscopic cross sections, given a microscopic cross section
12. Calculate the mass interaction coefficients of mixtures
13. Calculate flux density
14. Calculate Reaction Rate Density
15. Recognize the dependence of flux on energy, position, and time
16. Define radiation fluence
17. Calculate uncollided flux density from isotropic point sources
18. Apply the Kelin-Nishina formula to Compton Scattering
19. Compare energy dependence of photon interaction cross sections
20. Describe energy dependence of neutron interaction cross sections

21. Recognize the comparative range of heavy vs. light particles

22. Recognize the comparative range of charged particles

3 Detection and Measurement of Radiation

This section is particularly relevant to my work in isotope identification.

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4 Radiation Dosimetry

5 Neutron Diffusion and Moderation

For this section, read Chapter 5 in Lamarsh textbook

Also, read section 10.1 in Shultis for Neutron Moderation.

6 Criticality

7 6 Factor Formula

This section involves the neutron life cycle in a reactor.
See section 10.4 in Shultis

See chapter 6 in Lamarsh textbook

1. Fast fission factor ϵ
2. Resonance escape probability p
3. Thermal utilization f
4. Thermal fission factor η
5. Thermal non-leakage probability P_{NL}^{th}
6. Fast non-leakage probability P_{NL}^{f}
7. Describe the complete life cycle of neutrons in a reactor.
8. Effective multiplication factor k_{eff}