NE 795-014 Advanced Reactor Materials and Materials Performance

Exam 1

1. What are some key differences between high-temperature gas reactors and light water reactors? (6 pts)
2. What are the individual layers in a TRISO particle? What purpose does each layer have? (10 pts)
3. What are the trade-offs between carbide and oxide-based fuel kernels? (10 pts)
4. Why does a TRISO particle become pressurized? (3 pts)
5. How does the nature of irradiation damage accumulation change with irradiation temperature in SiC? (10 pts)
6. Does point defect swelling saturate in SiC? Does void swelling saturate in SiC? (5 pts)
7. How does thermal conductivity change in SiC with irradiation? What are the primary phonon scatterers? Why can someone determine the thermal conductivity from the swelling in SiC? (10 pts)
8. What is the primary fission product of concern for SiC, and why? (5 pts)
9. How does graphite dimensionally change under irradiation? Why does this behavior happen? (12 pts)
10. Why is irradiation creep important for graphite? What is the diffusion/pinning mechanism for irradiation creep in graphite? (8 pts)
11. List at three types of failure mechanisms for TRISO particles. (6 pts)
12. What are some current issues with modern fuel performance simulations on TRISO fuels? (5 pts)
13. Provide one example of an advanced TRISO concept and explain why it is of interest. (10 pts)