

Materials Question – May 2015

- (a) Describe the characteristics of how electrons, protons, neutrons, gamma, and heavier nuclides **interact with** and **damage** materials. What are the potential artefacts of using ion accelerators to mimic radiation damage of materials in LWRs? What are the steps one should take to try to minimize such artefacts?
- (b) For a Pb-Sn alloy system which forms a eutectic:
- 1) Draw a typical phase diagram, indicating all single and two-phase regions.
 - 2) Draw five vertical lines on the phase diagrams as solidification pathways from the liquid. One should pass through the eutectic point. What do you expect the microstructures to look like pictorially?
 - 3) What is the thermodynamic origin of this eutectic point? Why don't some binary phase diagrams have one?
 - 4) Draw a complete free energy diagram for the Pb-Sn system at its eutectic temperature.