22.01 Fall 2016, Practice Problem Set 9

December 19, 2016

These questions are meant to give you an example of what sorts of problems will be given on the exam. Try the first one, which has answers from the board, and then try the other two using the same sorts of methodologies.

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1 Design a food irradiation facility. Also design proper shielding to protect workers on the factory floor.

2 Design a proton cancer therapy facility. Also determine how much dose (in a relative sense) a patient's healthy tissue will receive from the treatments.

3 MIT has a sub-critical graphite pile, using hollow rectangular prisms of graphite filled with natural uranium fuel. Develop an expression for the estimated dose to someone standing at the edge of the graphite pile. Assume that the graphite pile is a perfect cube (which it actually is!). Use the two-group homogeneous criticality relation for your answer, and keep things in units of flux (Φ), since we don't give you its power.

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