

QUESTION 3

You are a graduate assistant on the Radiation Safety staff of Ground State University. You are involved in planning an activation experiment. It has been decided to examine the thermal neutron activation of Manganese.

The buildup and decay characteristics of this source require your attention.

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- Thermal neutron absorption cross-section for Mn-56 = 13.3 barns for the Mn-55 (n, γ) Mn-56 reaction.
- Atomic weight of manganese = 55
- Half life of Mn-56 = 2.58 h
- Mn-56 decay gamma rays
 - Gamma 1 = 0.847 MeV @ 100%
 - Gamma 2 = 1.81 MeV @ 27%
 - Gamma 3 = 2.11 MeV @ 14%
- Density of air at STP = 0.00129g cm⁻³

POINTS

- 25 A. What is the flux in neutrons per square centimeter per second which will produce 0.31 mCi of Mn-56 at saturation in a thin manganese target of 1 g in weight. Assume no attenuation in target material. **Show all work.**
- 25 B. What is the unshielded, gamma dose equivalent rate (in air) to a student standing one-half meter from the 0.31 mCi Mn-56 source, one hour after the irradiation ends? **Show all work.**