

QUESTION 5

You are the Radiation Safety Officer at a decommissioning project where Sr-90 was used to manufacture radioisotopic thermoelectric generators (RTG) for offshore buoys. During the project, a worker inadvertently handles and is exposed to a high-activity component. Exposure readings are taken with an ionization chamber instrument.

GIVEN

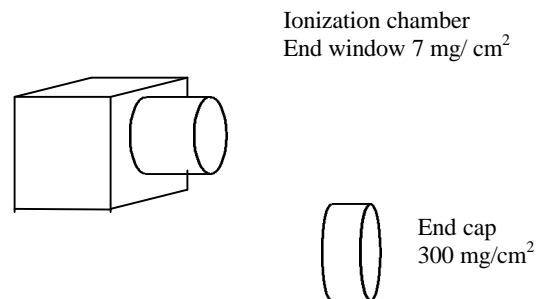
- The component is a moisture trap about the size of a baseball.
- The beta reading is 800 rad per hour on contact and 200 rad per hour at 18 inches. The instrument used had a 7 mg/cm² window.
- Gamma readings are 3 R/hr at contact and 2 R/hr at 18 inches. The instrument used had a 300 mg/cm² window.
- The monitoring instrument used for contact readings was protected by a plastic bag.
- The worker hand-carried the trap for 2 minutes at 18 inches from the body.
- The worker was wearing 2 pairs of rubber gloves, a set of coveralls, and a respirator with a hood.

And,

$$f_b = e^{-0.00435 (x)}$$

Where f_b is the beta reduction factor for Sr/Y-90 energies, and “x” is the density thickness of the material in mg/cm²

Material	Density thickness (mg/cm ²)
Coveralls	29
1 pair rubber gloves	39
Respirator facepiece	250
Plastic bag	15

**POINTS**

- 22 A Calculate the dose to the lens of the eye. Disregard any field reduction by air. **Show all work.**
- 8 B What are the annual limits for the skin, lens of the eye, whole body, and extremity?
- 4 C At what tissue depth is skin dose evaluated?

- 4 D At what tissue depth is deep dose equivalent evaluated?
- 12 E A whole-body TLD with filters for skin and eye dose was worn on the chest under the coveralls during the incident. List 4 factors to consider when comparing the TLD dose to the calculated dose. **Number your responses. Only the first four responses will be graded.**