

QUESTION 2

You are using an open-air ion chamber (specifications given below) to perform surveys at a food irradiation facility. Your ion chamber was calibrated to give the correct response at a temperature of 20 °C and at an atmospheric pressure of 760 mm of Hg. The facility uses a 100 Ci ^{137}Cs source. Assume negligible humidity.

GIVEN

- Active volume of 235.5 cm³ (5 cm radius, 3 cm deep)
- $\rho_{\text{air}} = 1.29 \text{ kg m}^{-3}$

POINTS

- 10 A. What current is generated by an exposure rate of 1 R/hr?
- 20 B. A measurement of 12.6 R/h is taken on a hot day of 35 °C and 740 mm of Hg. Calculate the correct exposure rate. **Show all work.**
- 20 C. You are surveying a shielding wall for radiation leakage. You discover a 1 cm wide crack in the shielding giving a detector response of 20 mR/hr when the active volume of the ion chamber is centered over the crack. Assuming that the crack length exceeds the dimensions of the ion chamber, provide an estimate of the true exposure rate. Assume electronic equilibrium and the following measurement conditions: 20 °C and 760 mm of Hg. **Show all work. Specify the detector orientation you are assuming.**