Problem 1.

What thickness of Pb shielding is needed around a 7.4×10^{13} Bq point source of ^{60}Co to reduce the exposure rate to $10\,\mathrm{mrem\,h^{-1}}$ at a distance of 2 m?

Solution

Problem 2.

The survival of a certain cell line exposed to x-rays is described by $\frac{S}{S_0} = 1-(1-\exp(-0.92D))^2$, with D in Gy.

- What is the RBE for the neutrons (relative to x-rays) for 10% survival of the cells?
- At a lower dose (higher level of survival) is the RBE larger or smaller?

Solution

Problem 3.

An air monitor located in a mine determines the Radon activity in a 100 L sample of air. A mine worker is assumed to work 40 h per week, 50 weeks per year in that environment, and is assumed to breathe at a rate of $0.2\,\mathrm{m^3/min}$. If all of the Radon in the air is assumed to stay in the body once it is inhaled, and if the ARLI for mine workers is $2 \times 10^4\,\mathrm{Bq\,yr^{-1}}$, what is the maximum allowable Radon activity in the 100 L sample of air?

Solution

Problem 4.

An amount of ^{90}Sr equal to 1 µCi is ingested. What is the total committed dose equivalent? Assume that the ^{90}Sr settles into the bone marrow and stays in the body (biological half life $\longrightarrow \infty$). Ignore dose from the gamma rays (you'll see that gamma rays are rarely emitted in the ^{90}Sr decay chain).

Solution

Problem 5.

Using the plot of NASA Q values, determine the dose equivalent from 1 Gy each of 300 MeV nucleon^{-1} protons and ^{12}C.

Solution