

Quiz-4 on Chapters 5, 6, and 7 (May 28, 2001)

Problem 4-1 Explain the biological effects of radiation which are categorized as follows:

- somatic effects
- hereditary effects
- in-utero effects
- acute effects
- delayed (or chronic) effects
- stochastic effects
- deterministic effects
- detrimental effects
- hormesis effects

Problem 4-2 Compute ALI and DAC of I-131 through inhalation

data: SEE(thyroid ← thyroid) = 10 MeV/kg/t (controlling)
 f_{thy} = fractional uptake to the thyroid after inhalation (= 0.2)
radiological half-life of I-131 = 8.05 days
biological half-life of iodine in the thyroid = 138 days

Problem 4-3 Explain the adaptive responses of low-level radiation on the activity of the **DNA damage control biosystem**.

Problem 4-4 BF_3 counter which is filled with 99% enriched $B^{10}F_3$ gas. The pressure is 20 mmHg at 20°C. When a thermal neutron counting is 500 counts per minute, what is the thermal neutron flux? The absorption X-section of B-10 for 0.0253 eV neutron is 4,010 barns.

Problem 4-5 5 measurements taken. Gross for 5-minute and background for 20 minutes for each measurement. Measurements are as follows:

Measurement	Gross counts	Background counts
1	230	220
2	229	210
3	228	200
4	227	190
5	234	230

Find the net count rate (cpm) with standard deviation.