

Radiation Biology, Protection and Applications
(PHYS-450)

Quizzz

Week 10

SOLUTIONS

Problem 1:

Radiation energy spectra can be categorized into two main groups: those that consist of one or more discrete energies (line spectra) and those that consist of a broad distribution of energies (continuous spectra). For each of the radiation sources listed below, indicate whether « line » or « continuous » is a better description:

- | | |
|---------------------------|------------|
| a) Alpha particles | LINE |
| b) Beta particles | CONTINUOUS |
| c) Gamma rays | LINE |
| d) Characteristic X-rays | LINE |
| e) Conversion electrons | LINE |
| f) Auger electrons | LINE |
| g) Fission fragments | CONTINUOUS |
| h) Bremsstrahlung | CONTINUOUS |
| i) Annihilation radiation | LINE |

Problem 2:

Which has the higher energy: a conversion electron from the L shell or from the M shell, if both arise from the same nuclear excitation energy?

$$E_e = E_{ex} - E_{\text{binding}}$$

$$E_{\text{binding}}(L) > E_{\text{binding}}(M)$$

$$E_e(L) < E_e(M)$$

Thus, a conversion electron from the M shell will have higher energy than the electron from the L shell, if both arise from the same nuclear excitation energy.

Problem 3:

Determine ${}_Z^AX$ in the following nuclear reactions:

