Answer on Question #68388, Physics / Atomic and Nuclear Physics

A student is carrying out an experiment with a cobalt-60 source of labelled activity 0.3 MBq. She holds the source in tongs 25 cm long for the duration of the experiment which is 6 minutes. Calculate the maximum dose and the maximum dose equivalent that she could receive. (The relevant exposure rate constant is 0.35 μSv/ MBq h at 1m).

Solution:

The maximum dose:

$\mathrm{H} = \mathrm{k}\times\lambda\times\mathrm{A}\times\mathrm{t}$ (1), where k is the coefficient, λ is the relevant exposure rate constant, A is the activity of source, t is the time

Of (1) $\Rightarrow \mathrm{H} = 4\times0.35\frac{\mu\mathrm{Sv}}{\mathrm{MBq}}\times0.3\ \mathrm{MBq}\times360\ \mathrm{s} = 151.2\ \mu\mathrm{Sv}\times\mathrm{s}$

The maximum dose equivalent:

$\mathrm{H_T} = \mathrm{k}\times\lambda\times\mathrm{A}$ (2), where k is the coefficient, λ is the relevant exposure rate constant, A is the activity of source

Of (2) $\Rightarrow \mathrm{H_T} = 4\times0.35\frac{\mu\mathrm{Sv}}{\mathrm{MBq}}\times0.3\ \mathrm{MBq} = 0.42\ \mu\mathrm{Sv}$

Answer:

$151.2\ \mu\mathrm{Sv}\times\mathrm{s}$

$0.42\ \mu\mathrm{Sv}$