12 Iodine-131 ($^{131}_{53}$I) is a radioactive isotope with a decay constant of $9.9 \times 10^{-7}\,\text{s}^{-1}$.

(a) State what is meant by:

(i) *radioactive*

....

....

.... [2]

(ii) *decay constant.*

....

....

.... [2]

(b) Some water becomes contaminated with iodine-131.
The activity of the iodine-131 in 1.0 kg of water is 560 Bq.

Determine the number of iodine-131 atoms in 1.0 kg of water.

number = ... [2]

(c) Regulations require that the activity of iodine-131 in 1.0 kg of water is to be less than 170 Bq.

Calculate the time, in days, for the activity of the contaminated water in **(b)** to be reduced to 170 Bq.

time = ... days [3]

[Total: 9]

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