9 Some water becomes contaminated with radioactive iodine-131 ($^{131}_{53}$I).
The activity of the iodine-131 in 1.0 kg of this water is 460 Bq.
The half-life of iodine-131 is 8.1 days.

(a) Define radioactive *half-life.*

....

....

.... [2]

(b) (i) Calculate the number of iodine-131 atoms in 1.0 kg of this water.

number = ... [3]

(ii) An amount of 1.0 mol of water has a mass of 18 g.

Calculate the ratio

$$\frac{\text{number of molecules of water in 1.0 kg of water}}{\text{number of atoms of iodine-131 in 1.0 kg of contaminated water}}.$$

ratio = ... [2]

(c) An acceptable limit for the activity of iodine-131 in water has been set as $170\,Bq\,kg^{-1}$.

Calculate the time, in days, for the activity of the contaminated water to be reduced to this acceptable level.

time = ... days [3]