8 One possible nuclear fission reaction is

$$^{235}_{92}\text{U} + {}^{1}_{0}\text{n} \rightarrow {}^{141}_{56}\text{Ba} + {}^{92}_{36}\text{Kr} + 3{}^{1}_{0}\text{n} + \text{energy.}$$

Barium-141 ($^{141}_{56}$Ba) and krypton-92 ($^{92}_{36}$Kr) are both β-emitters.
Barium-141 has a half-life of 18 minutes and a decay constant of $6.4 \times 10^{-4}\,\text{s}^{-1}$.
The half-life of krypton-92 is 3.0 seconds.

(a) State what is meant by *decay constant*.

.....

.....

.....[2]

(b) A mass of 1.2 g of uranium-235 undergoes this nuclear reaction in a very short time (a few nanoseconds).

(i) Calculate the number of barium-141 nuclei that are present immediately after the reaction has been completed.

number = ... [2]

(ii) Using your answer in **(b)(i)**, calculate the total activity of the barium-141 and the krypton-92 a time of 1.0 hours after the fission reaction has taken place.

activity = ... Bq [4]

[Turn over