12 **(a)** Radioactive decay is both random and spontaneous.

State what is meant by:

(i) *random*

.....

..... [1]

(ii) *spontaneous*.

.....

..... [1]

(b) A sample of radioactive material contains atoms of an unstable nuclide X. The activity of the sample due to the atoms of X is A. The variation with time t of ln A is shown in Fig. 12.1.

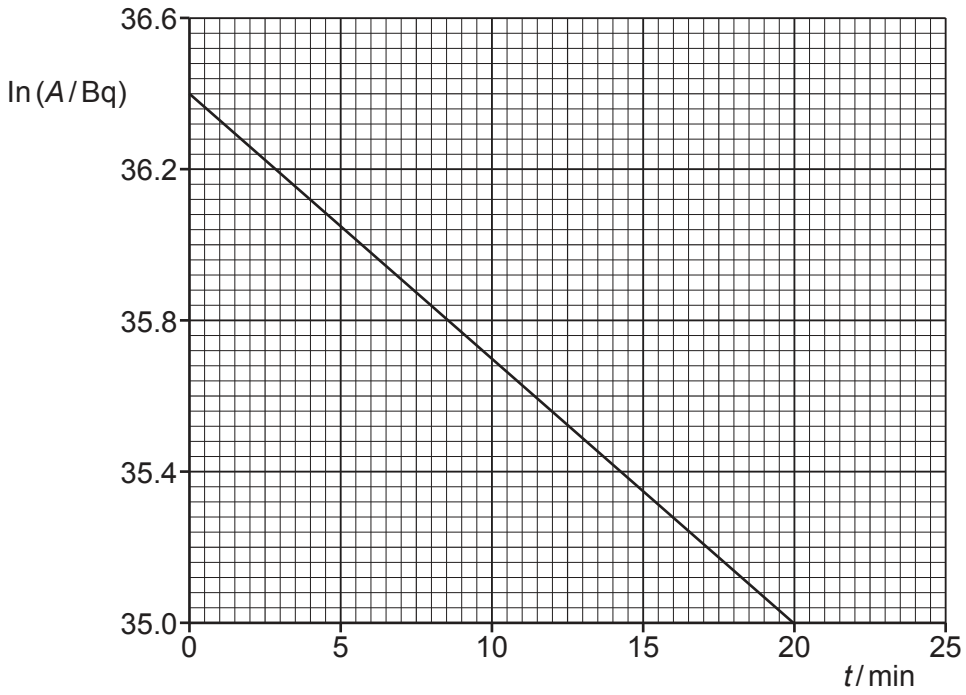

Fig. 12.1

(i) Use Fig. 12.1 to determine the half-life, in minutes, of nuclide X.

half-life = ... min [3]

(ii) At time $t = 0$, the mass of the atoms of X in the sample is 5.66×10^{-7} kg.

Determine the nucleon number of X.

nucleon number = ... [3]

[Total: 8]

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