9 **(a)** Define activity of a radioactive sample.

.....

..... [1]

(b) Explain why the variation with time of the activity of a radioactive sample is exponential in nature.

.....

.....

.....

.....

..... [3]

(c) A sample contains a single radioactive isotope that decays to form a stable isotope.

The sample has an activity of 180 Bq at time $t = 0$.
At a time 8.4 minutes later, the activity is 120 Bq.

(i) Determine the decay constant, in min^{-1}, of the radioactive isotope.

decay constant = ... min^{-1} [2]

(ii) Use your answer in **(c)(i)** to determine the half-life, in min, of the radioactive isotope.

half-life = ... min [1]

(iii) On Fig. 9.1, sketch the variation of the activity A of the sample with t for values of t between $t = 0$ and $t = 24$ min.

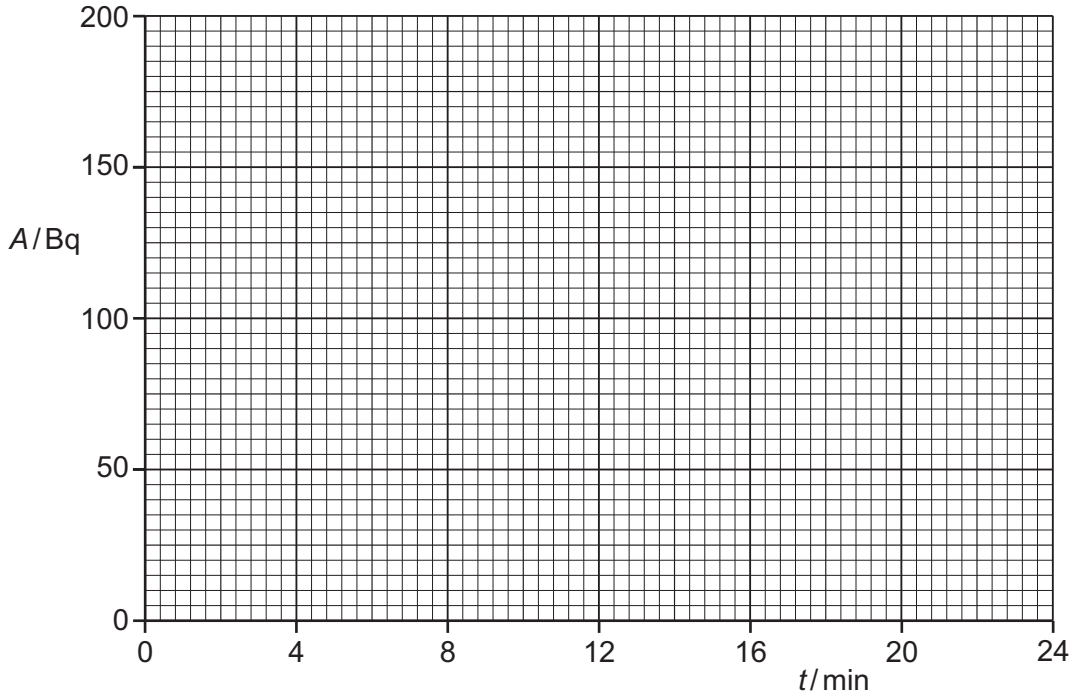

Fig. 9.1

[3]

[Total: 10]