LEAVE MARGIN BLANK

## SECTION A NUCLEAR INSTABILITY

Answer **all** parts of the question.

**1** The radioactive isotope of sodium $^{22}_{11}Na$ has a half life of 2.6 years. A particular sample of this isotope has an initial activity of $5.5 \times 10^5$ Bq (disintegrations per second).

(a) Explain what is meant by the *random nature* of radioactive decay.

You may be awarded marks for the quality of written communication provided in your answer.

.....

.....

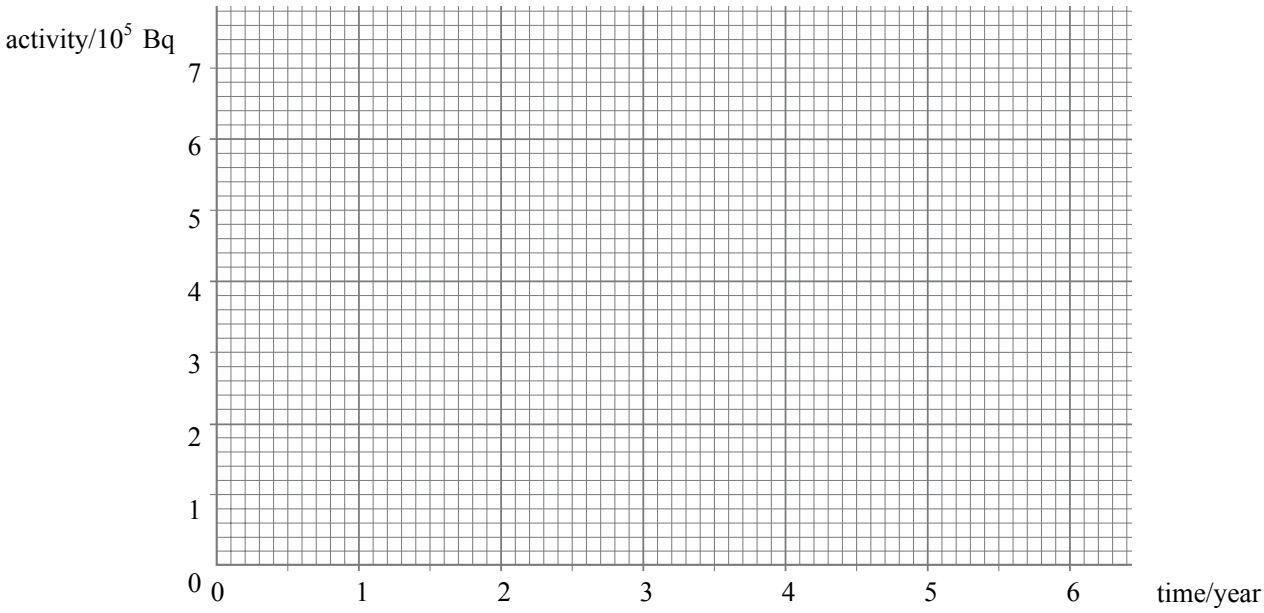
.....

.....

.....

*(2 marks)*

(b) Use the axes to sketch a graph of the activity of the sample of sodium over a period of 6 years.




*(2 marks)*

(c) Calculate

(i) the decay constant, in $s^{-1}$, of $^{22}_{11}Na$,
1 year = $3.15 \times 10^7$ s

.....

.....

.....

.....

(ii) the number of atoms of $^{22}_{11}Na$ in the sample initially,

.....

.....

.....

.....

(iii) the time taken, in s, for the activity of the sample to fall from $1.0 \times 10^5$ Bq to $0.75 \times 10^5$ Bq.

.....

.....

.....

.....

*(6 marks)*

10

**TURN OVER FOR THE NEXT QUESTION**