1. Americium-241 ($^{241}_{95}Am$) is an isotope of americium.

(a) Which of the isotopes given in the table below is **not** an isotope of americium?

Isotope	Mass number	Atomic number
A	243	95
B	243	94
C	242	95

Isotope _____

Give a reason for your answer.

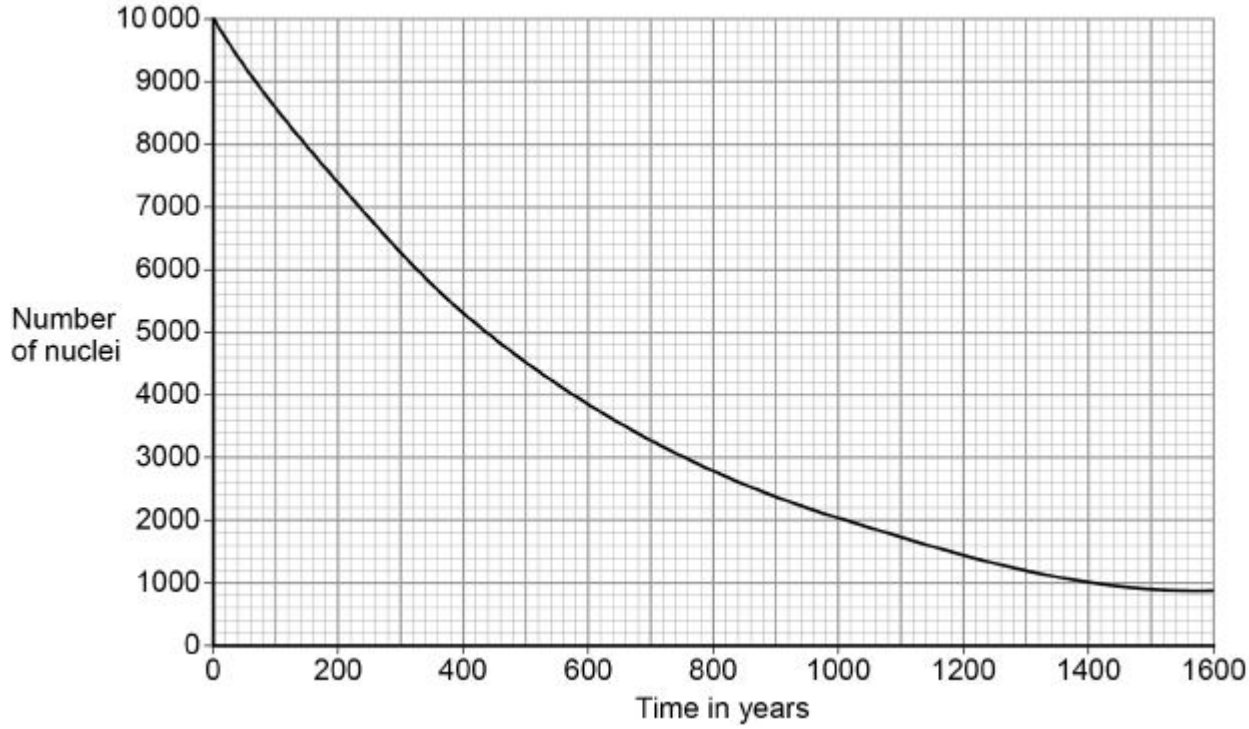
_____

_____

_____

(2)

The graph below shows how the number of americium-241 nuclei in a sample changes with time.



(b) How many years does it take for the number of americium-241 nuclei to decrease from 10 000 to 5000?

Time = _____ years

(1)

(c) What is the half-life of americium-241?

Half-life = _____ years

(1)

(Total 4 marks)

2. A teacher used a Geiger-Muller tube and counter to measure the number of counts in 60 seconds for a radioactive rock.

(a) The counter recorded 819 counts in 60 seconds. The background radiation count rate was 0.30 counts per second.

Calculate the count rate for the rock.

_____

_____

_____

_____

Count rate = _____ per second

(3)

(b) A householder is worried about the radiation emitted by the granite worktop in his kitchen.

1 kg of granite has an activity of 1250 Bq. The kitchen worktop has a mass of 180 kg.

Calculate the activity of the kitchen worktop in Bq.

_____

_____

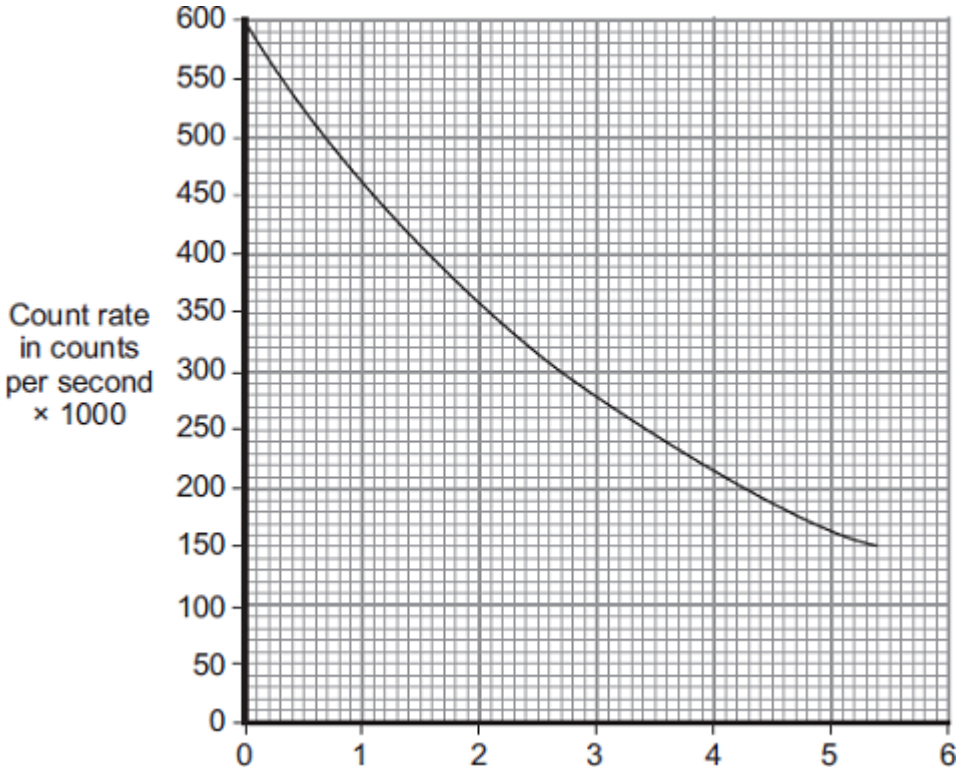
_____

_____

Activity = _____ Bq

(2)

(b) The graph shows how the count rate from a sample of gold-198 changes with time.



Use the graph to calculate the half-life of gold-198.

Show clearly on the graph how you obtain your answer.

_____

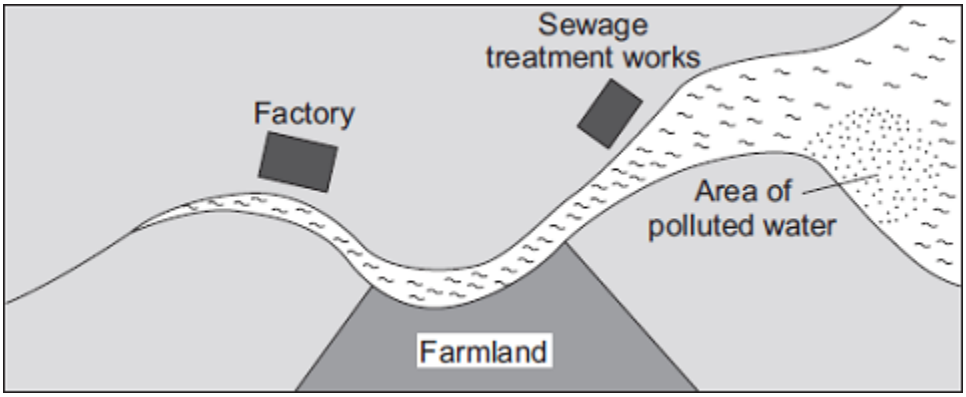
_____

Half-life = _____ days

(2)

(c) The diagram shows a map of a river and the river estuary.

Environmental scientists have found that water flowing into one part of the river estuary is polluted. To find where the pollution is coming from, the scientists use a radioactive isotope, gold-198.



The gold-198 is used to find where the pollution is coming from.

Explain how.

_____

_____

_____

_____

(2)

(Total 7 marks)