6 **(a)** The isotope cobalt-60 is radioactive and has a half-life of 5.3 years.

(i) State what is meant by radioactive.

.....

.....

..... [2]

(ii) Define half-life.

.....

.....

..... [2]

(b) Fig. 6.1 shows how the activity of an americium-241 source changes with time.

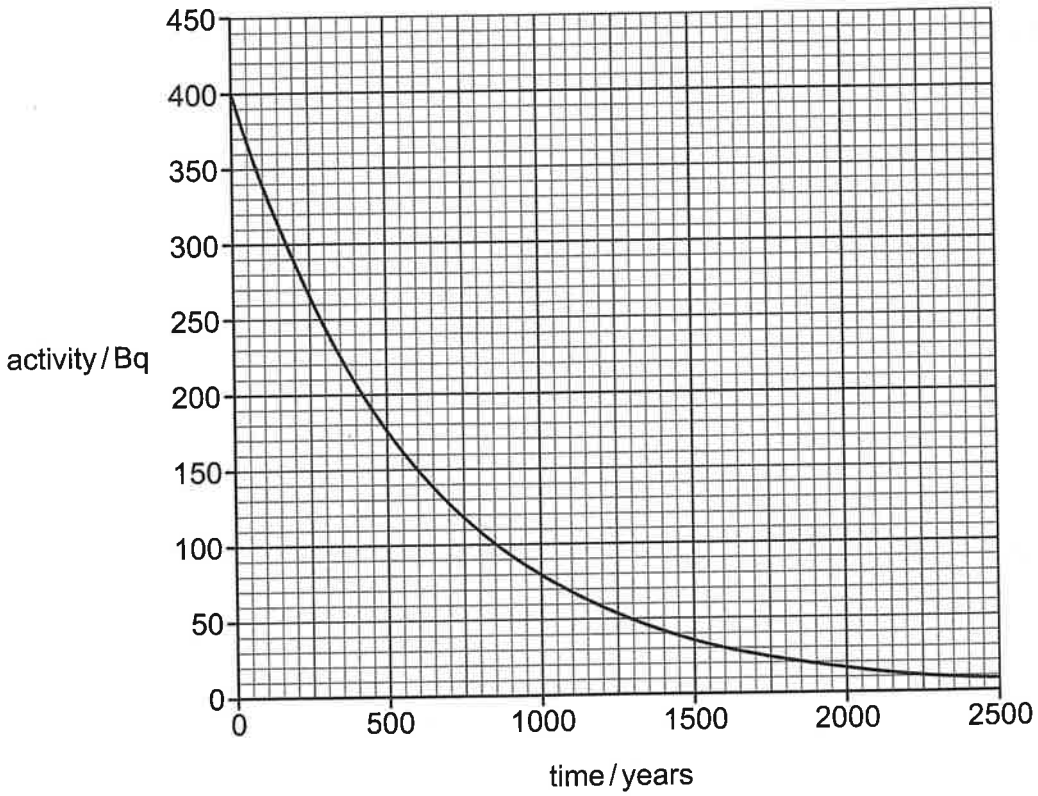

Fig. 6.1

(i) Use Fig. 6.1 to determine the half-life of americium-241.

Show clearly how you have used Fig. 6.1.

half-life = ... years [3]

(ii) On Fig. 6.2, sketch how the activity varies with time for an americium-241 source with double the initial mass of the sample in Fig. 6.1. The line for the sample in Fig. 6.1 is shown.

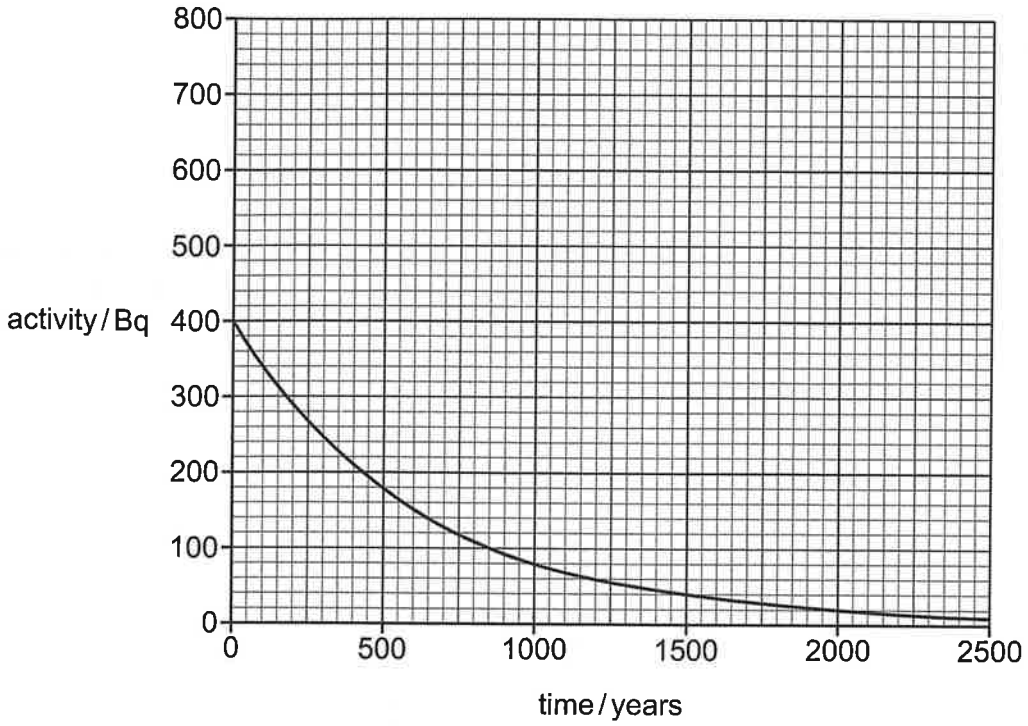

Fig. 6.2

[2]

(c) Living humans take in the isotope carbon-14 from their food.

The half-life of carbon-14 is 5700 years.

12 g of bone from a living human has an activity due to carbon-14 of 270 Bq.

4 g of bone from an ancient human skeleton has an activity due to carbon-14 of 45 Bq.

Calculate the age of the ancient human skeleton.

age = ... years [2]

[Total: 11]