Combined science - Physics

Key stage 4 - Atomic Structure

Activity and Half-life (FT)

Mr van Hoek

Basic questions

1. If a radioactive sample has an initial count rate of 600 Bq. What is its count rate after:
   i) 1 half-life?   ii) 2 half-lives   iii) 3 half-lives   iv) 4 half-lives?

2. The half-life of iodine-131 is 13 hours. If a sample of radium-226 has an original activity of 400 Bq, what will its activity be after:

   i) 26 hours?   ii) 39 hours?   iii) 52 hours?

Basic questions

3. Sodium-24 has a half-life of 15 hours. If a sample of sodium-24 has an original activity of 800 Bq, what will

its activity be after:

i)   15 hours?

ii)   30 hours?

iii)   45 hours?

iv)   60 hours?

Medium questions

4. Initially, the activity of a sample of phosphorus-32 was 400Bq. After 84 days the activity of a sample of phosphorus-32 has decreased to 25 Bq.

What is the half-life of phosphorus-32?

Medium questions

5. The half-life of radon-222 is 3.8 days.

What was the original activity if it has an activity of 12 Bq after 15.2 days?
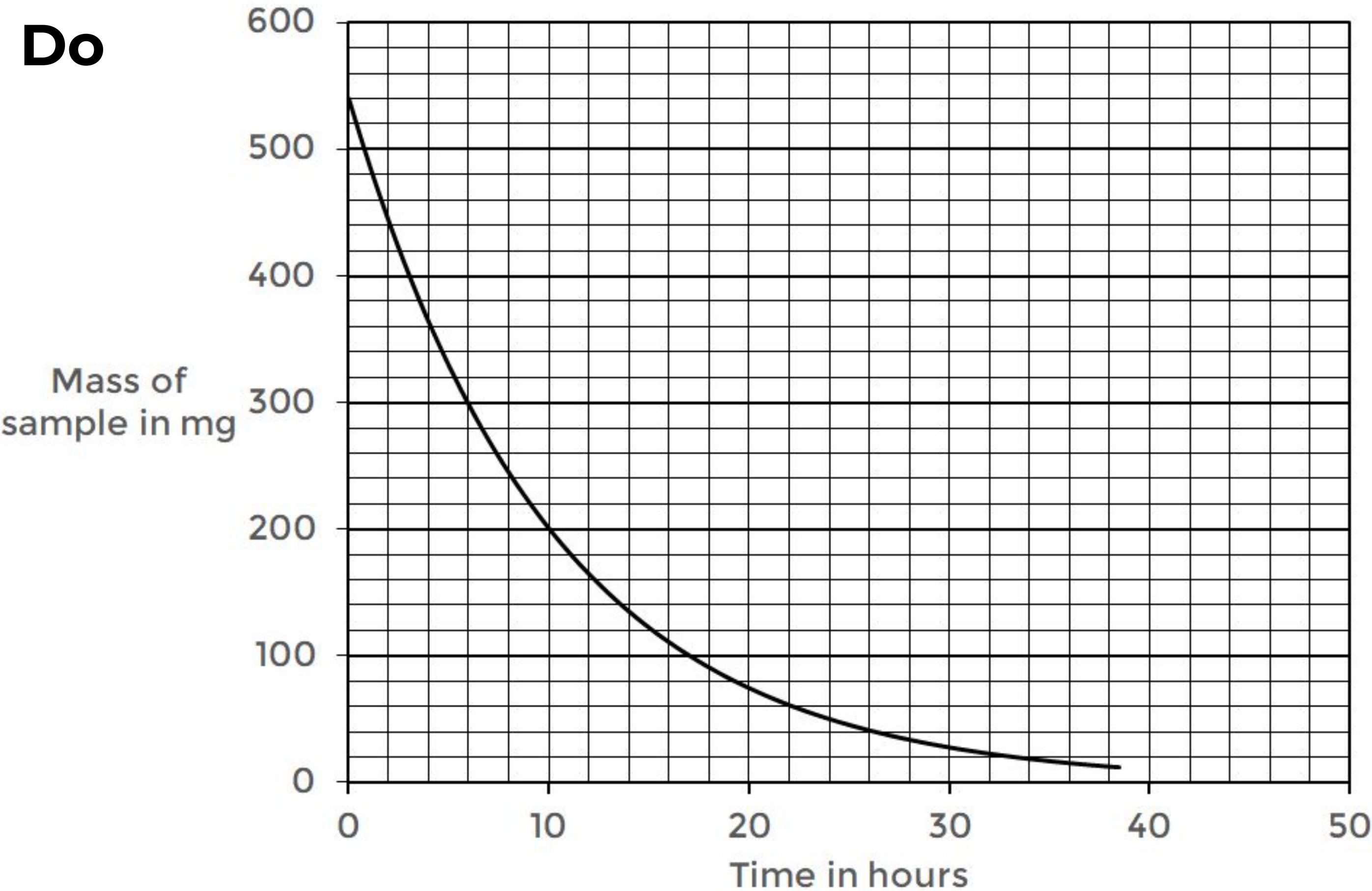
Medium questions

6. Thorium-227 has a half-life of 19 days. How many days are required for 25% of a sample to remain following radioactive decay?
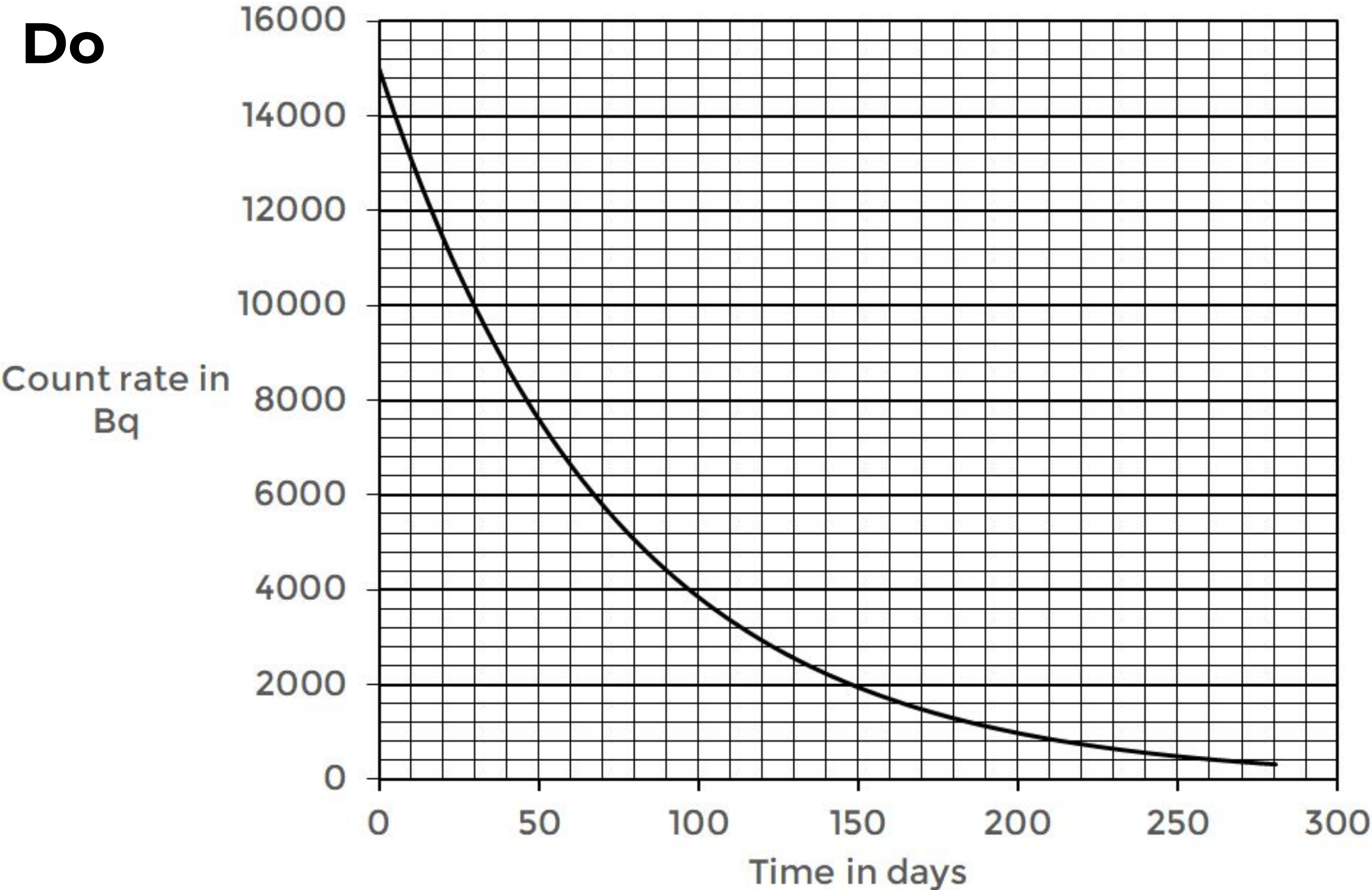
What is the time taken for the mass of the sample to decrease by half?

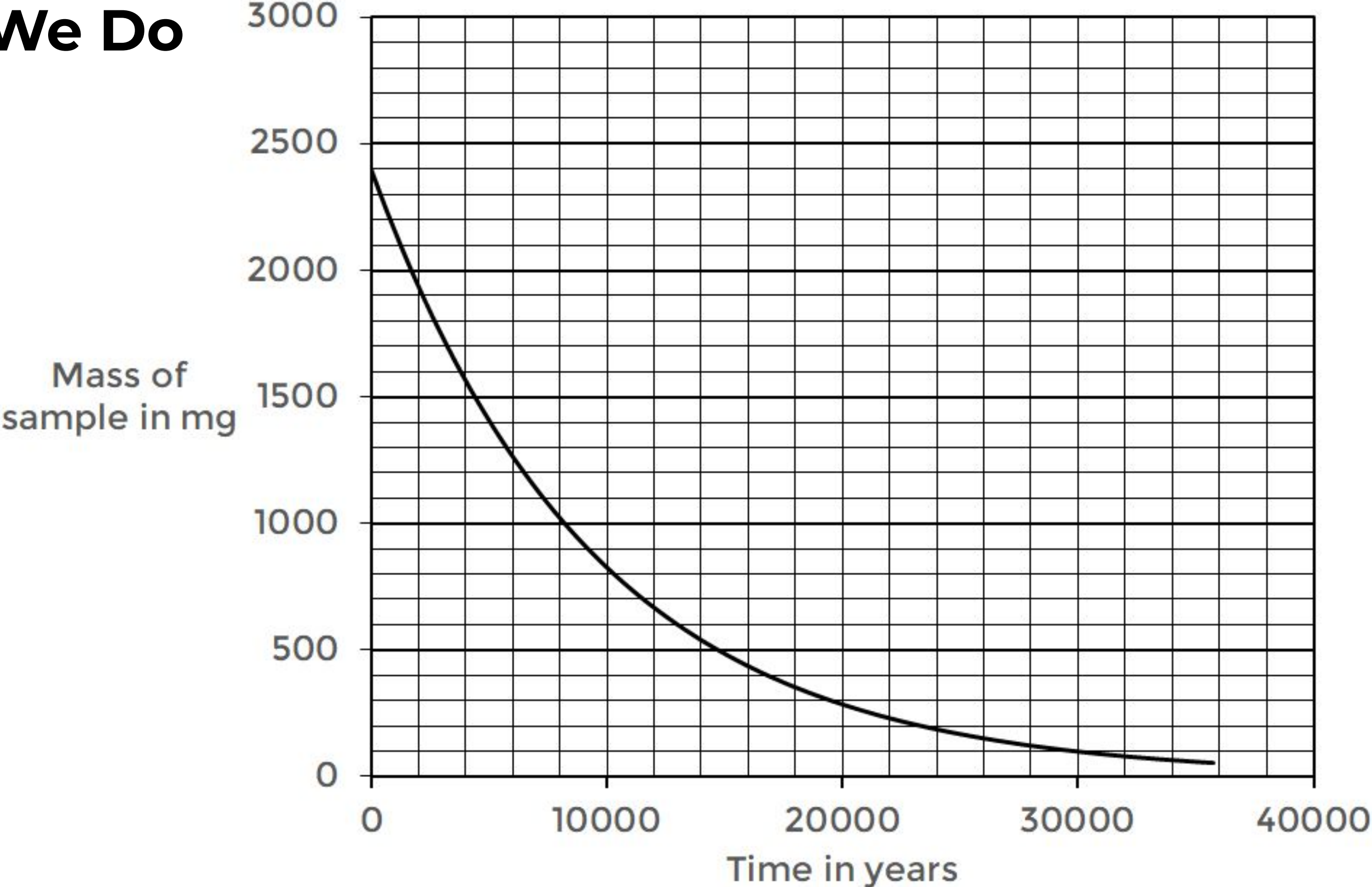What is the half-life?

I Do

What is the time taken for the count rate to decrease by half?
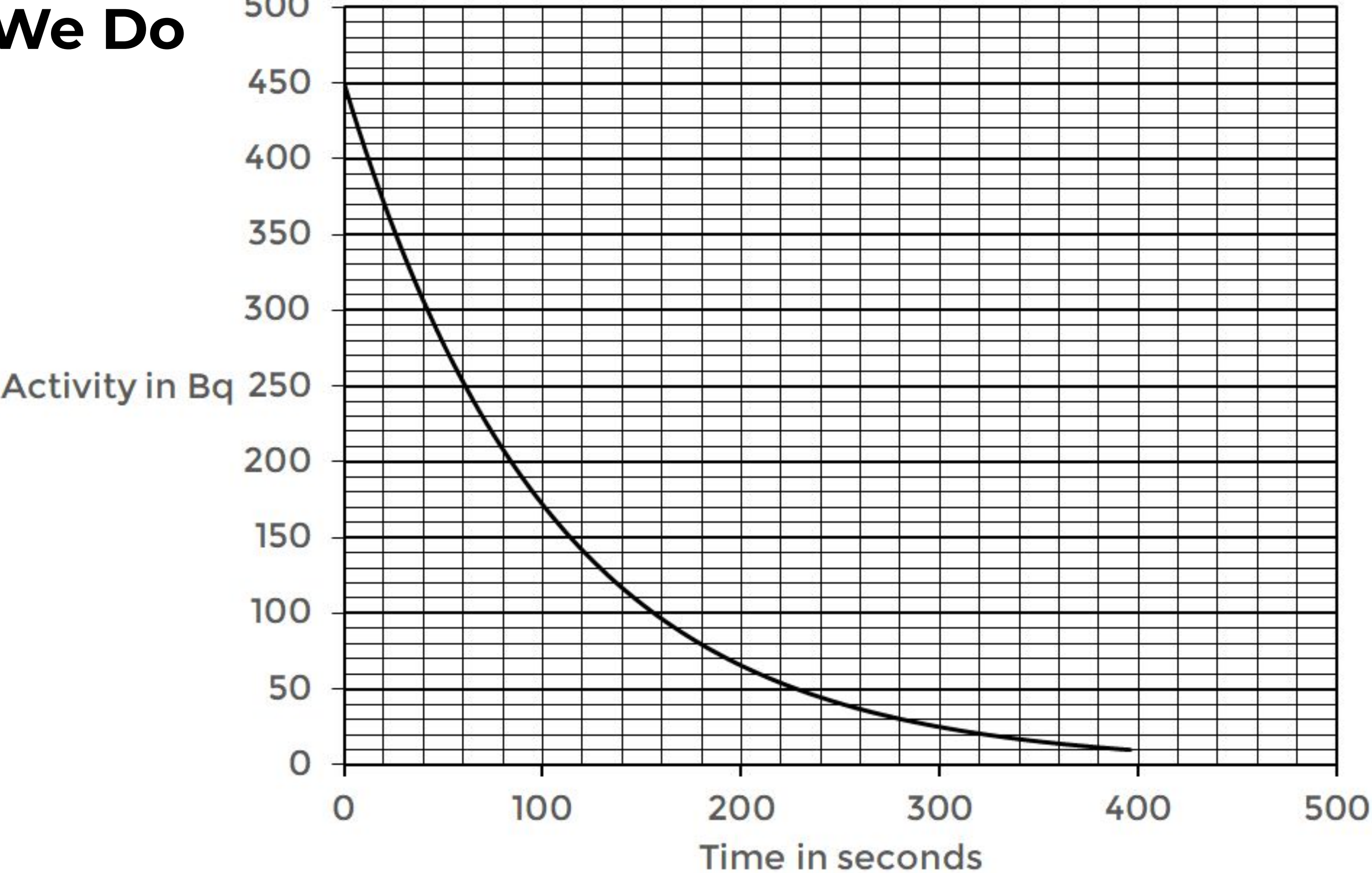
What is the half-life?

8

We Do

What is the time taken for the mass of the sample to decrease by half?
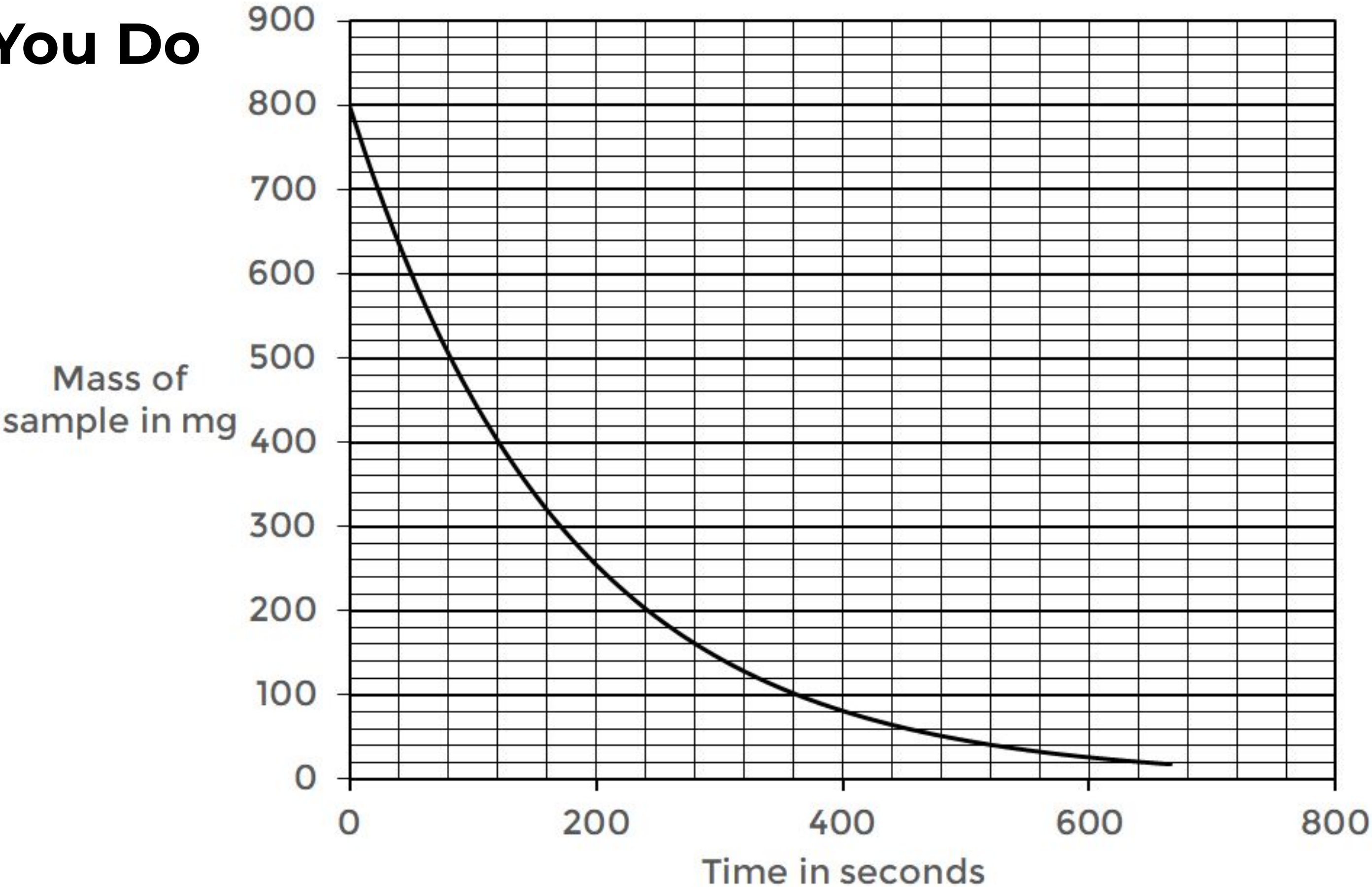
What is the half-life?

We Do

What is the time taken for the activity to decrease by half?

What is the half-life?

You Do

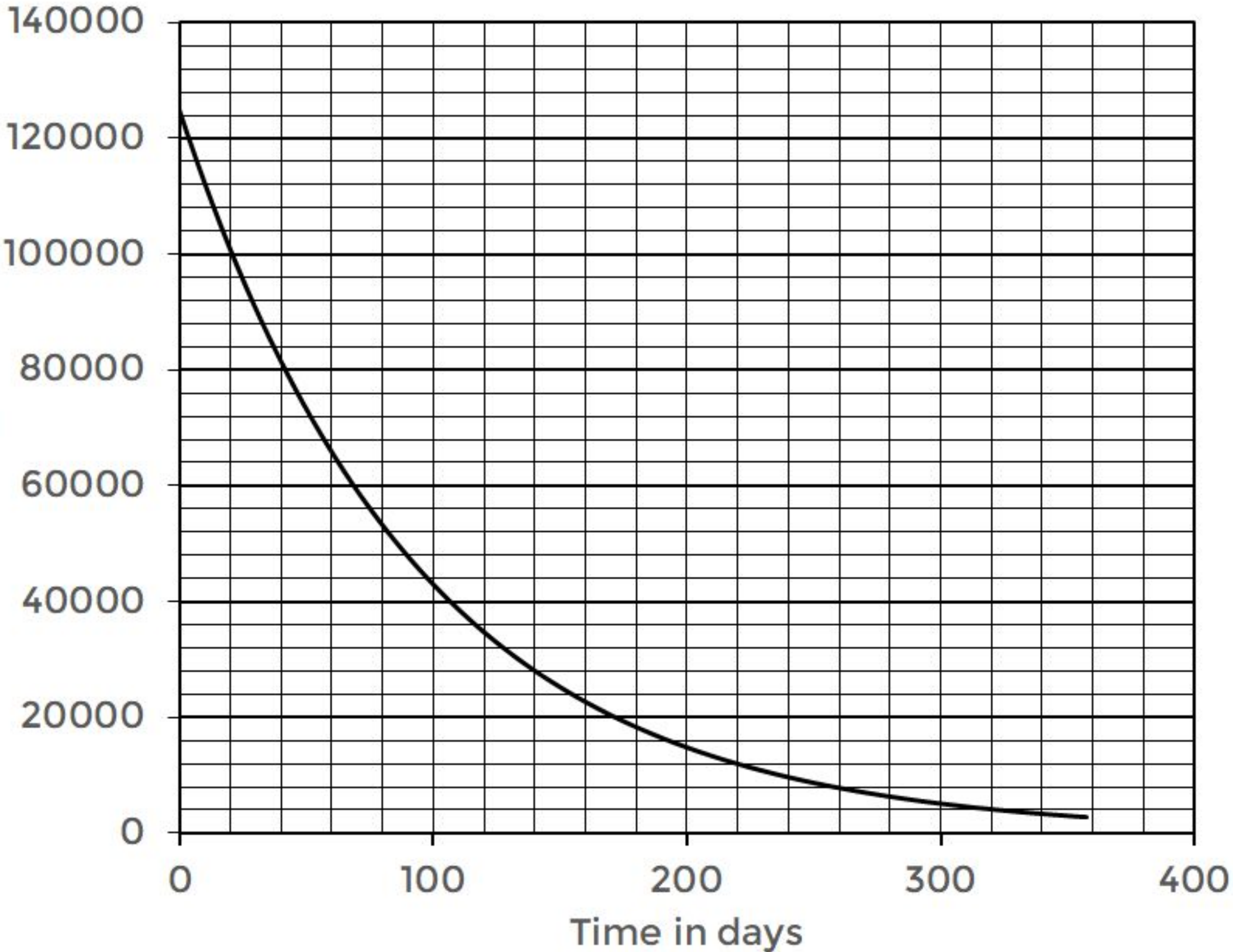What is the time taken for the mass of the sample to decrease by half?

What is the half-life?

You Do

What is the time taken for the number of nuclei to decrease by half?

What is the half-life?

I do

When the Earth was originally formed the amount of radioactive isotopes found within the Earth's crust was much higher. Uranium-238 is an isotope is found in the Earth's crust. Uranium-238 has a half-life of 4.46 billion years.

Scientist have calculated that the amount of Uranium-238 found in uranium deposits was 7.2g per kilogram in the oldest parts of the Earth's crust. The current amount of Uranium-238 is 3.6g per kilogram.

Use this data to show that the oldest parts of the Earth's crust are about 4.5 billion years old.

We do

All living organisms take in the radioactive isotope carbon-14, either within carbon dioxide for plants, or within food for animals.
After the death of the organism, the proportion of carbon-14 in the remains of the organism can be used to tell how long it is since the organism was living.

Carbon-14 has a half-life of 5730 years.

A living piece of wood contains 800 mg of carbon-14. A piece of wood of the same mass from a buried sailing boat discovered in an ancient burial ground contains 50 mg of carbon-14. Calculate the age of the sailing boat.

You do

Carbon-14 $^{14}_{6}C$ is a radioactive isotope of carbon with a half-life of 5730 years.

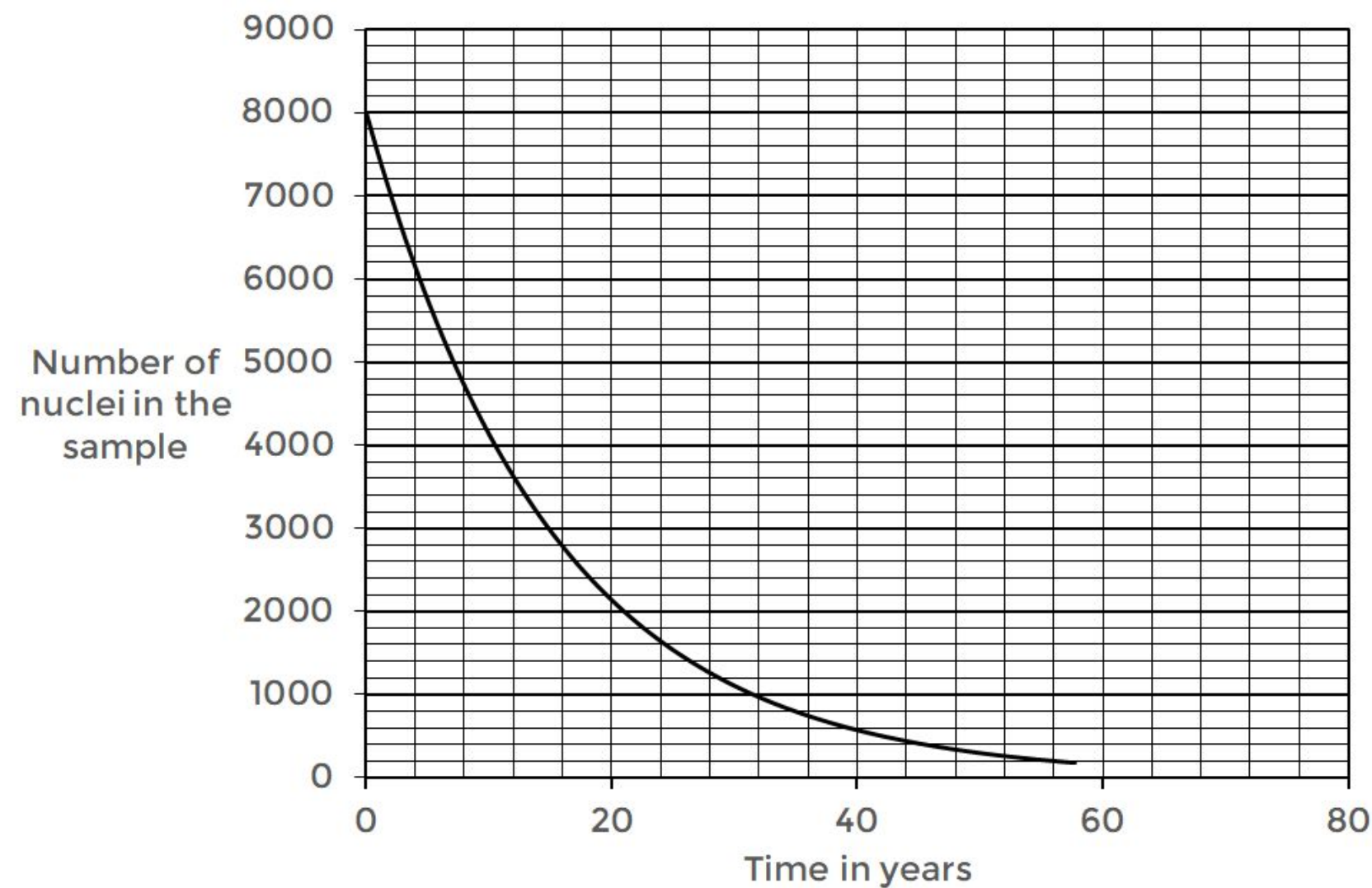A fossilised fern leaf is estimated to have died 23,920 years ago and contains Carbon-14

The original activity in the carbon-14 was 960 Bq.

Determine the current activity of the carbon-14 in the leaf.

Exam question

The graph shows how a sample of barium-133, a radioactive isotope with a long half-life, decays with time.
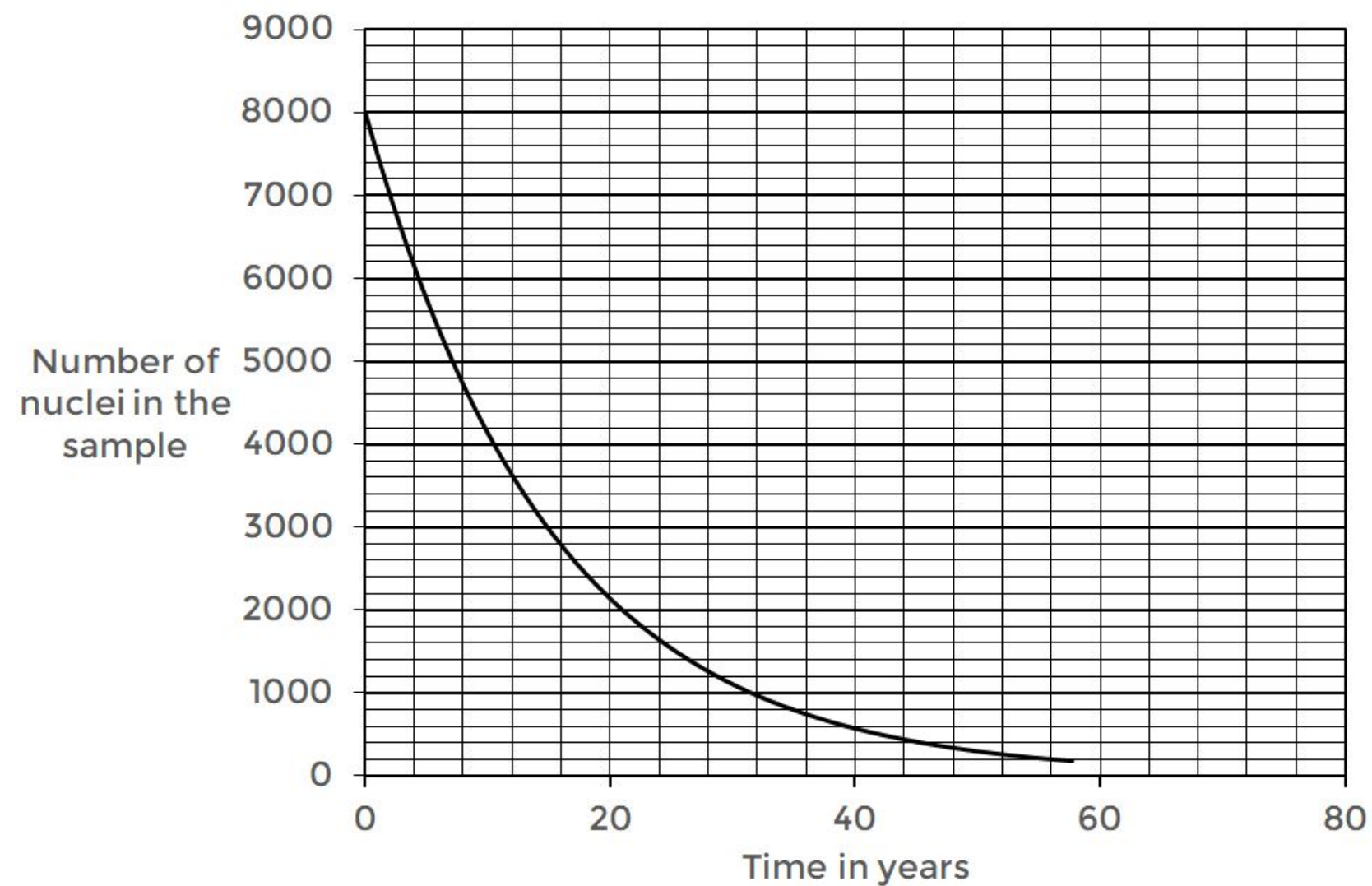

a) What is meant by the term half-life?

b) What is meant by the term isotope?

Exam question

The graph shows how a sample of barium-133, a radioactive isotope with a long half-life, decays with time.

c) Use the graph to find the half-life of barium-133.

Exam Question

This question is about nuclear radiation.

Radioactive materials decay naturally.

The half-life is a measure of how quickly the radioactive materials decay.

Look at the data below about the activity of some radioactive isotopes.

Which isotope has the shortest half-life

Choose from   **A B C D**

Explain your answer