

Q1.

State what is meant by the term 'half-life'.

(1)

.....
.....

(Total for question = 1 mark)

Q2.

Carbon-14 is a radioactive isotope that occurs naturally.
Scientists use carbon-14 to help find the age of old pieces of wood.
This technique is called carbon dating.
It uses the idea of half-life.

Which of these describes half-life?

Put a cross () in the box next to your answer.

- A** the time it takes for half of the undecayed nuclei to decay
- B** the time it takes for all of the undecayed nuclei to decay
- C** half the time it takes for all of the undecayed nuclei to decay
- D** half the time it takes for half of the undecayed nuclei to decay

(1)

Q3.

A sample of a radioactive isotope has a mass of 520 g.

The half-life of the radioactive isotope is 18 days.

(i) Calculate the mass of the original radioactive isotope remaining after 18 days.

(1)

(ii) Calculate the mass of the original radioactive isotope remaining after 54 days.

(2)

mass after 18 days g

mass after 54 days g

(Total for question = 3 marks)

Q4.

This question is about radioactivity.

Radium-223 is a radioactive substance.

Radium-223 is an alpha emitter.

The half-life of radium-223 is 11 days.

A radioactive source contains 1.7×10^{23} nuclei of radium-223.

Calculate the number of radium-223 nuclei remaining in the source after a time of 33 days.

(2)

number of radium-223 nuclei remaining =

(Total for question = 2 marks)

Q5.

Carbon-14 is a radioactive isotope that occurs naturally.
Scientists use carbon-14 to help find the age of old pieces of wood.
This technique is called carbon dating.
It uses the idea of half-life.

A scientist investigates an old wooden comb.



The activity of the carbon-14 in it is 0.55 Bq.

The estimated age of the comb is 11 400 years.

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

(i) Calculate the activity of the carbon-14 in the comb when it was new.

(3)

.....

.....

(Total for question = 3 marks)

Q6.

The half-life of strontium-90 is 29 years.

The table in Figure 4 gives some information about how the mass of a sample of strontium-90 changes with time.

mass of strontium-90 in g	time in years
1600	0
.....	29
400

Figure 4

Complete the table in Figure 4.

(Total for question = 2 marks)

Q7.

Radium-223 is a radioactive substance.

Radium-223 is an alpha emitter.

The half-life of radium-223 is 11 days.

A radioactive source contains 1.7×10^{23} nuclei of radium-223.

Calculate the number of radium-223 nuclei remaining in the source after a time of 33 days.

(2)

number of radium-223 nuclei remaining =

(Total for question = 2 marks)

Q8.

Carbon-14 is radioactive and has a half-life of 5 700 years.

The number of radioactive carbon-14 atoms in a very old piece of wood is found to have decreased from 1 000 000 to 125 000.

Determine the age of the piece of wood.

(2)

age of wood = years

(Total for question = 2 marks)

Q9.

The half-life of cobalt-60 is 5 years.

A school cobalt source had an activity of 38.5 kBq in the year 2000.

Estimate the activity of this source in the year 2020.

(3)

activity = kBq

(Total for question = 3 marks)

Q10.

Plutonium-238 is used in spacecraft to provide heat to power generators.

One of these generators contains 925 g of plutonium-238 when it is manufactured.

One gram of plutonium-238 has a power density of 0.54 W/g.

Plutonium-238 has a half-life of 87.7 years.

Calculate the average energy released per second by the generator after 263 years.

(4)

average energy released per second = (J)

(Total for question = 4 marks)