

Name of the Student: _____

Max. Marks : 27 Marks

Time : 27 Minutes

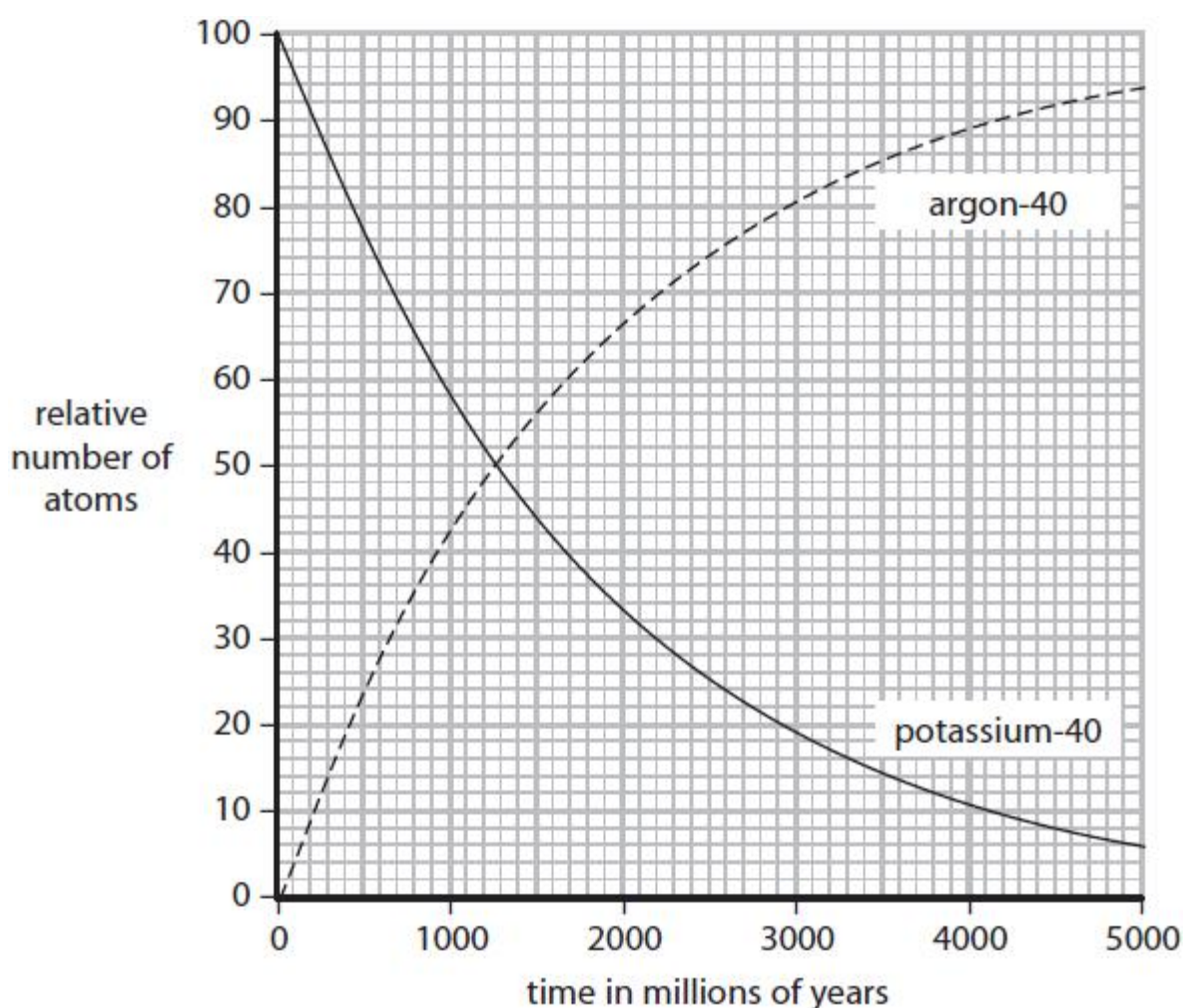
Q1.

Some rocks containing potassium were formed many millions of years ago.

There was no argon-40 in the rocks when they were formed.

When scientists analyse samples of these rocks, they find small amounts of argon-40 trapped inside.

The graph shows how the relative amounts of potassium-40 and argon-40 change over time.



(i) Use the graph to find the half-life of potassium-40.

(1)

half-life = million years

(ii) Scientists analyse a sample taken from inside a rock.

They find that there is exactly 3 times as much argon-40 as there is potassium-40.
Use the graph to find the age of the rock.

(2)

age of rock = million years

Q2.

The activity of a radioactive source is measured as 128 Bq.

This is shown as a point on the graph in Figure 10.

(3)

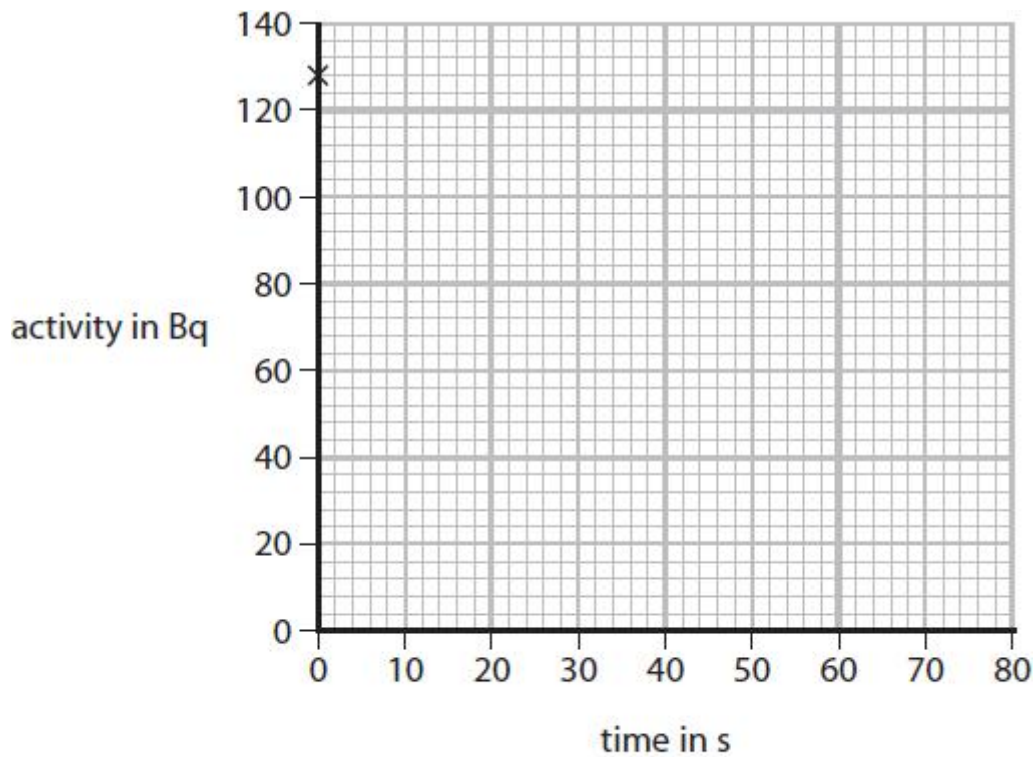


Figure 10

The half-life of this radioactive source is 17 s.

Use this information to plot three more points on the graph grid in Figure 10 to show how the activity of the source changes with time.

(Total for question = 3 marks)

Q3.

(i) State the name of an instrument that can be used to measure radioactivity.

(1)

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(ii) State **two** sources of background radiation.

(2)

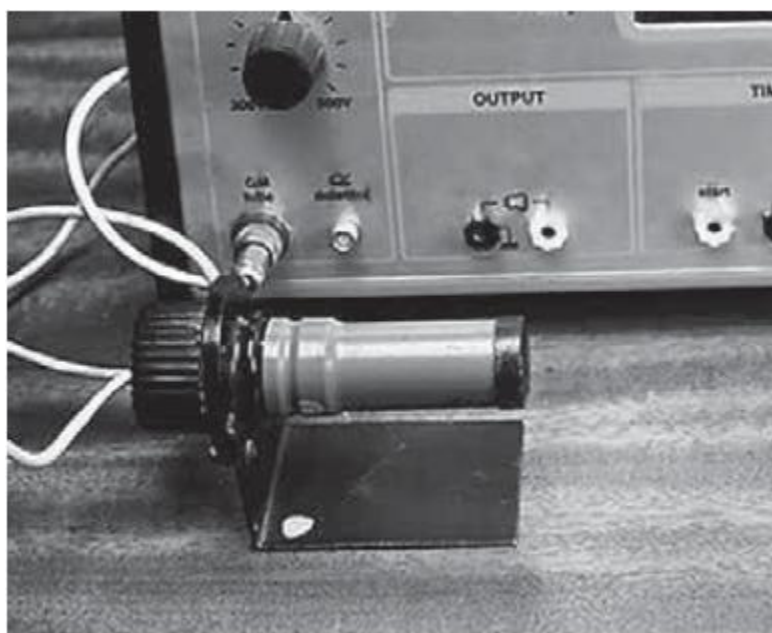
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2

(Total for question = 3 marks)

Q4.

Figure 4 shows a Geiger-Müller (GM) tube used for measuring radioactivity.



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Figure 4

Describe how a teacher should use a Geiger-Müller (GM) tube to compare the count-rates from two different radioactive rocks.

(4)

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(Total for question = 4 marks)

Q5.

The following descriptions describe waves from different parts of the electromagnetic spectrum.

Complete each description by adding the name of the wave.

Use the name of each wave only once. Each description refers to a different part of the electromagnetic spectrum.

(4)

Description 1

used in cooking

used in short-range communication

typical wavelength 900 nm

name of wave

Description 2

used in cooking

used in communication

typical wavelength 150 mm

name of wave

Description 3

used in communication

produced by oscillations in electrical circuits

typical wavelength 150 m

name of wave

Description 4

used in medical scanning

is emitted by the nucleus of an atom

typical wavelength 2.0×10^{-3} nm

name of wave

(Total for question = 4 marks)

Q6.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☐ and then mark your new answer with a cross ☐.

Which of these describes isotopes of an element?

(1)

☒ A	same atomic number	different number of neutrons
☒ B	same atomic number	different number of protons
☒ C	same mass number	different number of neutrons
☒ D	same mass number	different number of protons

(Total for question = 1 mark)

Q7.

Figure 1 is a diagram of three atoms.

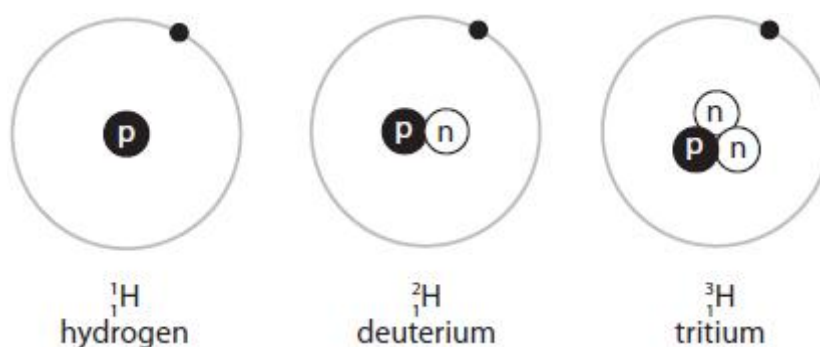


Figure 1

Give reasons why these atoms are isotopes.

(2)

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(Total for question = 2 marks)

Q8.

Figure 3 shows a Geiger–Muller (G–M) tube attached to a counter.
The G–M tube is used to measure the activity of a source of beta (β) radiation.
There is an aluminium sheet between the beta source and the G–M tube.
The counter is switched on and after 1 minute shows a count of 268.

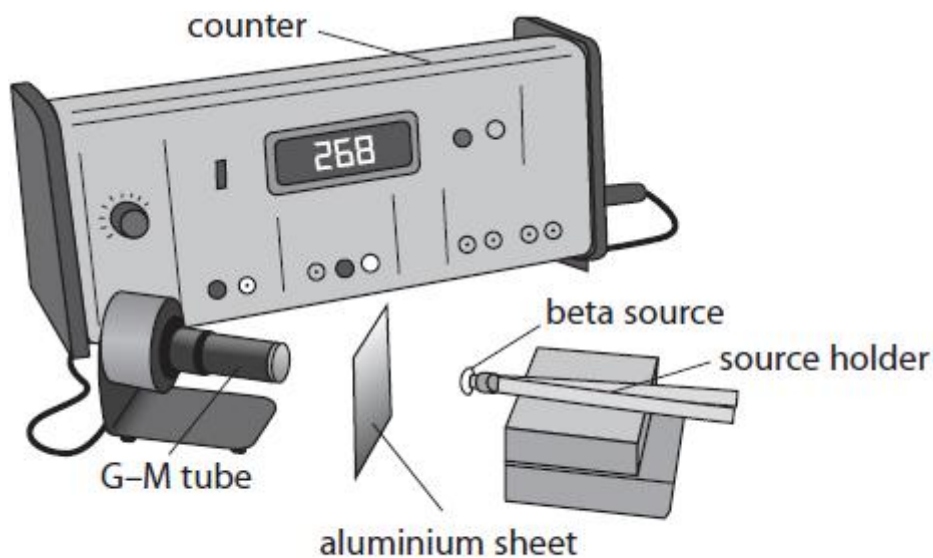


Figure 3

- (i) The aluminium sheet is taken away.
The counter is reset to zero and then switched on again.
A new count is taken for 1 minute.

Explain why the new count is greater than 268.

(2)

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- (ii) The beta source is then also taken away.
The counter is reset to zero and switched on again.
A new count is taken for 1 minute.

Give a reason why there would now be a reading on the counter.

(1)

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- (iii) State the SI unit for the activity of a radioactive source.

(1)

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(Total for question = 4 marks)

Q9.

A teacher determines the background radiation count rate in a laboratory.
Explain how to determine a value for the background radiation count rate.

(3)

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(Total for question = 3 marks)

Q10.

Early in the twentieth century, scientists fired a beam of alpha particles at thin gold foil.

Figure 2 shows the main parts of their experiment with some results.

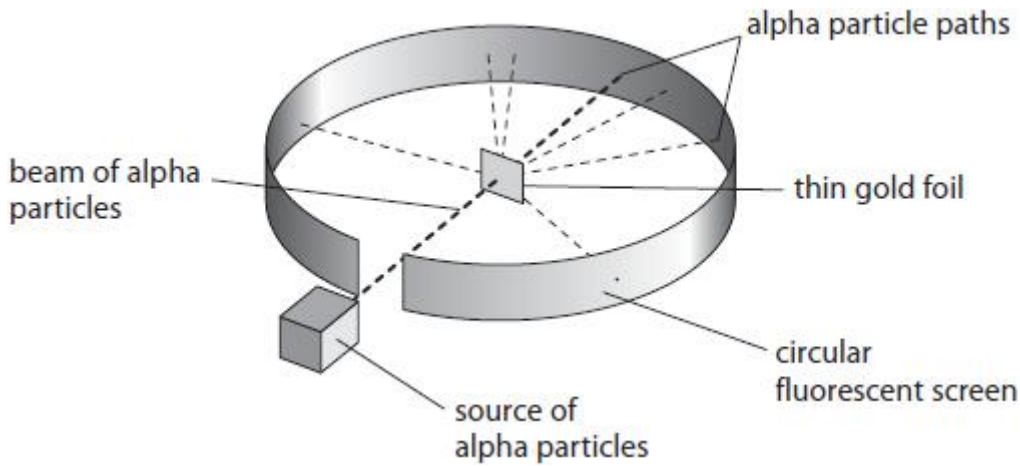


Figure 2

Explain how the results of the experiment shown in Figure 2 support the nuclear model of an atom.

(3)

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(Total for question = 3 marks)