Practice Question Set For GCSE
Subject : Physics
Paper-1 Topic : 6_ Radioactivity

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Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Q1.

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)

Q2.

One isotope of the element potassium is potassium-40.
A nucleus of potassium-40 is represented by:

$$^{40}_{19}K$$

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.
The number of neutrons in a nucleus of potassium-40 is

(1)

☐ **A** 19
☐ **B** 21

☒ **C** 40

☒ **D** 59

(ii) Which of these symbols is correct for the nucleus of a different isotope of potassium?

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

(1)

☒ **A** ☒ **B** ☒ **C** ☒ **D**

(iii) A sample of potassium-40 is left for a long time.

Some of the potassium-40 nuclei will emit gamma radiation as they turn into argon-40 nuclei.
Argon-40 nuclei never change.
Describe what information this gives about the isotope potassium-40.

(2)

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Q3.

The table gives the average dose of radiation a person received from various sources.

radiation source	average radiation dose (arbitrary units)
average yearly background	3000
one chest X-ray	20
one CT scan of the chest	6000
one whole body CT scan	20000
one PET scan	6000

(i) Explain why a CT scan of the chest gives a much higher dose of radiation than a chest X-ray.

(2)

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(ii) Justify the use of medical procedures which give patients large doses of radiation.

(2)

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Q4.

Many different types of radioactive isotope are used for the diagnosis and treatment of medical conditions.

(i) Iodine-123 is used as a radioactive tracer to diagnose thyroid problems.

Complete the sentence by putting a cross (☒) in the box next to your answer.
This tracer must have a half-life of

(1)

☒ **A** a few days

☒ **B** a few hours

☒ **C** less than a second

☒ **D** several weeks

(ii) Pellets which contain radium-223 can be put inside the body to treat cancers.

Radium-223 has a half-life of 11.4 days and emits alpha radiation.
Explain why radium-223 is suitable for use inside the body to treat cancers.

(3)

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Q5.

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

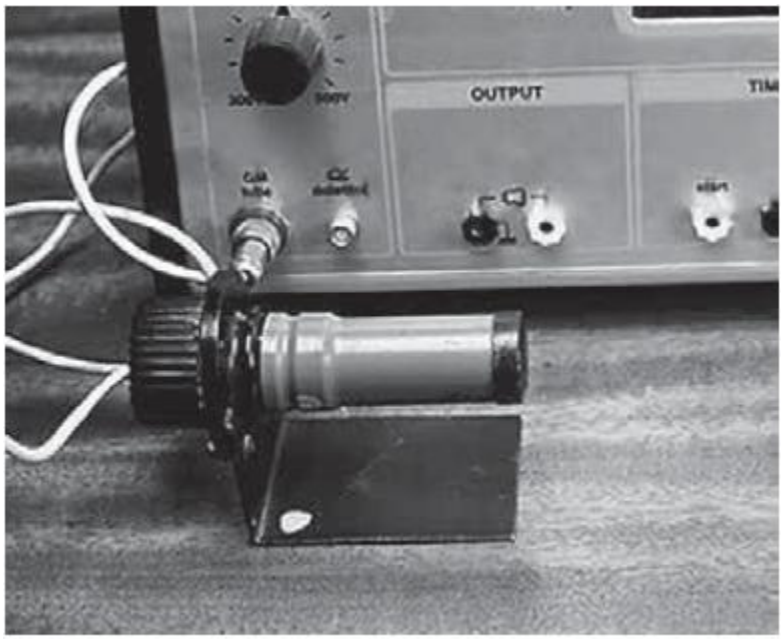

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Figure 4

A hospital uses a radioactive isotope with a half-life of 6 hours.

A technician measures a count rate of 80 counts per minute (cpm) from this isotope.

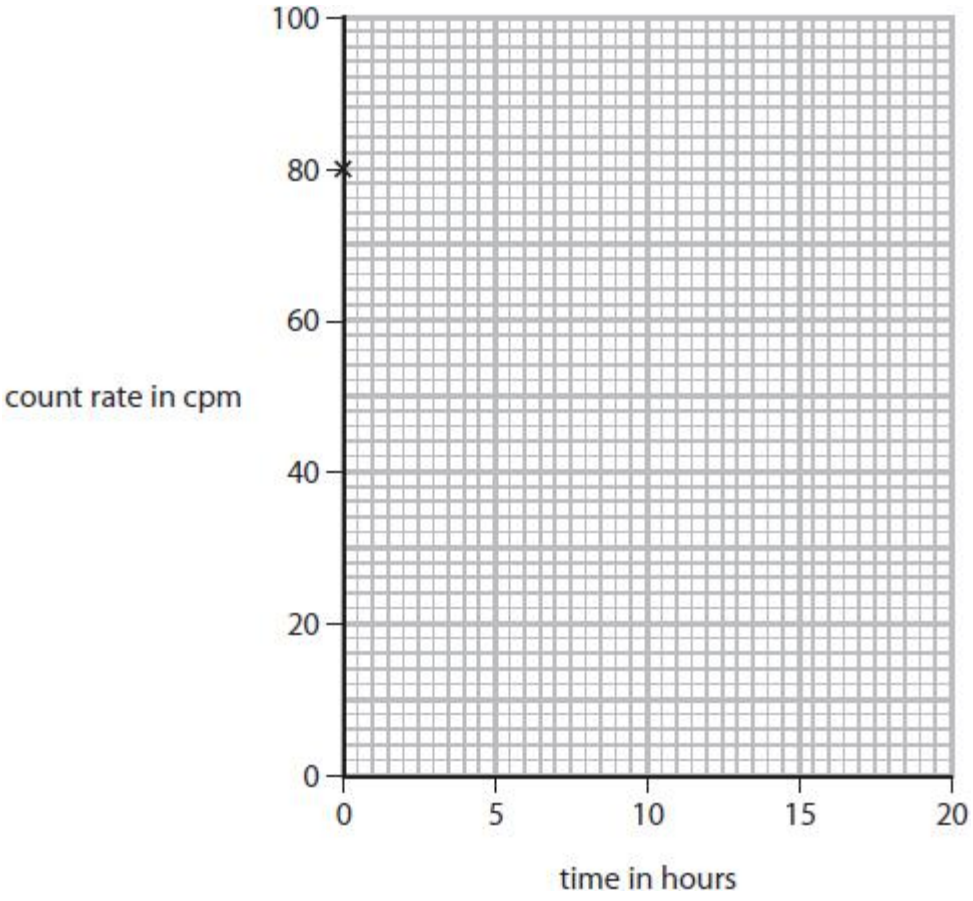

Figure 5

Complete the graph on Figure 5, as accurately as possible, to show how the count-rate from this isotope will change from the time of the first measurement.

The first point is already drawn in Figure 5.

(3)

(Total for question = 3 marks)