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

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Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Q1.

A G-M tube is connected to a counter.
A teacher places the G-M tube near to a radioactive source.
A student starts the counter and clock at the same time and writes down the readings shown on the counter every 15 s.

The student plots the readings with a line of best fit, as shown in Figure 10.

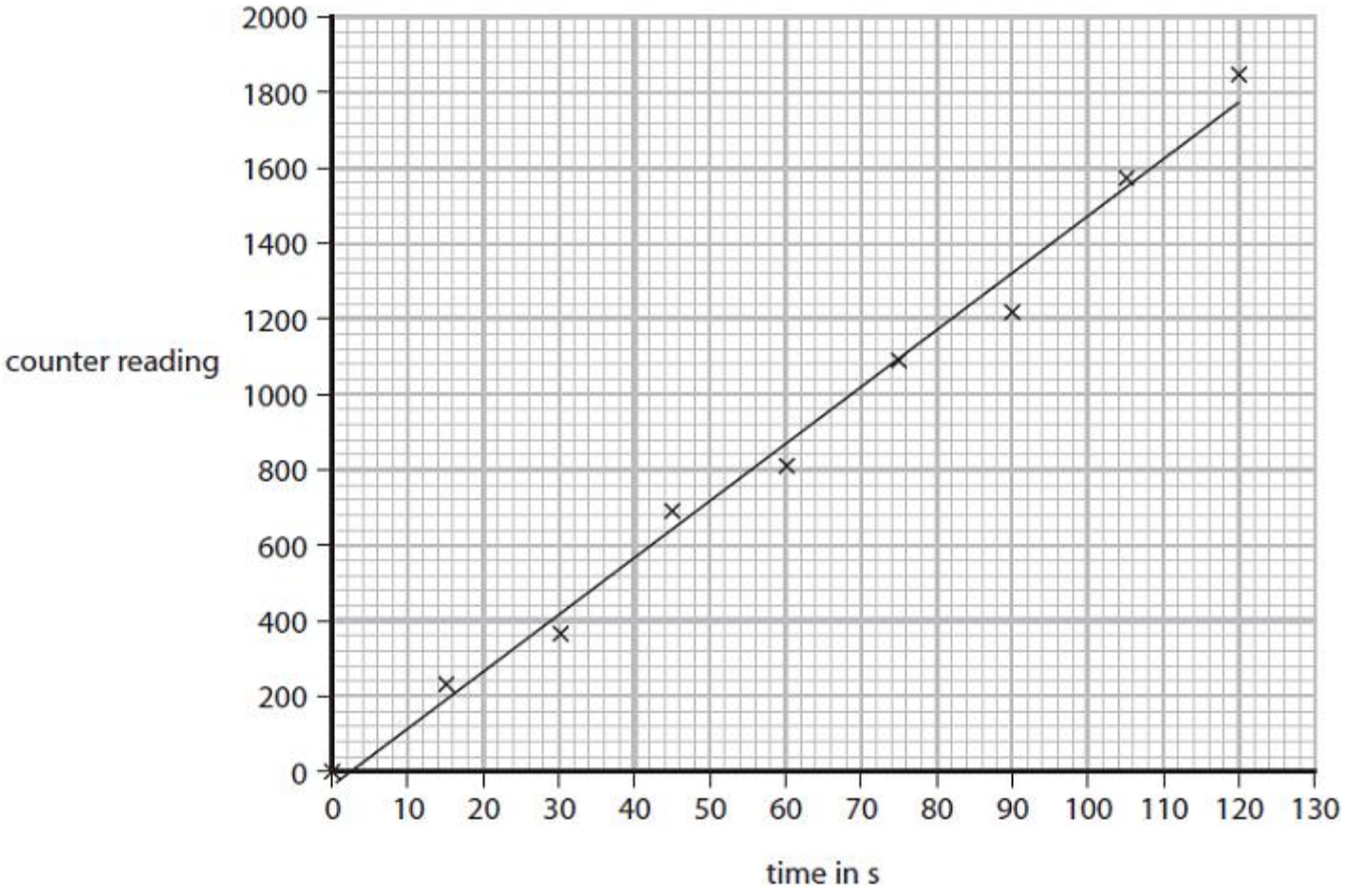

Figure 10

(i) Calculate the average count rate, in counts / s, from the graph.
Show your working on the graph.

(2)

average count rate = ... counts / s

(ii) The student says that the experiment must have been done carelessly because the data seemed quite

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scattered

away from the best fit line.

The teacher claims such results should be expected in radioactivity experiments.
Justify the teacher's claim.

(2)

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(Total for question = 4 marks)

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Q2.

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)

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Q3.

In the Sun, four protons start the process of nuclear fusion.
These protons combine and finally produce a helium nucleus.
The helium nucleus has a smaller mass than the four protons.
This difference in mass is converted to energy.
Four protons have a total mass of 6.69×10^{-27} kg.
A helium nucleus has a mass of 6.64×10^{-27} kg.
Calculate the percentage of the original mass that has been converted to energy.

(3)

percentage of mass converted to energy ..... %

(Total for question = 3 marks)

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Q4.

The intensity of gamma radiation can be measured using a Geiger-Müller tube and counter.

The count rate recorded by the counter tube depends on how far away the Geiger-Müller tube is from the gamma radiation source.

The equation relating count rate to distance from the source is

$$\text{count rate} = \frac{k}{d^2}$$

where d is the distance from the source and k is a constant.

A Geiger-Müller tube is placed 0.70 m from a source of gamma radiation.
The counter displays a count rate of 85 000 count per minute.

Calculate the count rate recorded when the Geiger-Müller tube is placed 1.3 m away from the same gamma radiation source.

(3)

count rate = ... counts per minute

(Total for question = 3 marks)

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Q5.

Some questions must be answered with a cross in a box (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

Radioactive tracers can be used when scanning a person's kidneys.

A radioactive isotope is injected into a person's blood stream.

The isotope emits radiation.

As the blood flows through the kidneys, this radiation is detected outside the body by a scanner.

(i) What type of radiation travels from the kidney to the scanner?

(1)

- ☐ **A** alpha
- ☐ **B** beta plus
- ☐ **C** beta minus
- ☐ **D** gamma

(ii) During the scan, a technician needs to take readings for about 30 minutes.

The half-life of the isotope used is about 6 hours.

1. State why an isotope with a half-life of about 6 minutes is **not** suitable.

(1)

.....

.....

2. State why an isotope with a half-life of about 6 days is **not** suitable.

(1)

.....

.....

(iii) State **two** ways of reducing the radiation risks to the technician.

(2)

1 .....

.....

2 .....

.....

(Total for question = 5 marks)

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