

GCSE Physics A (Gateway)

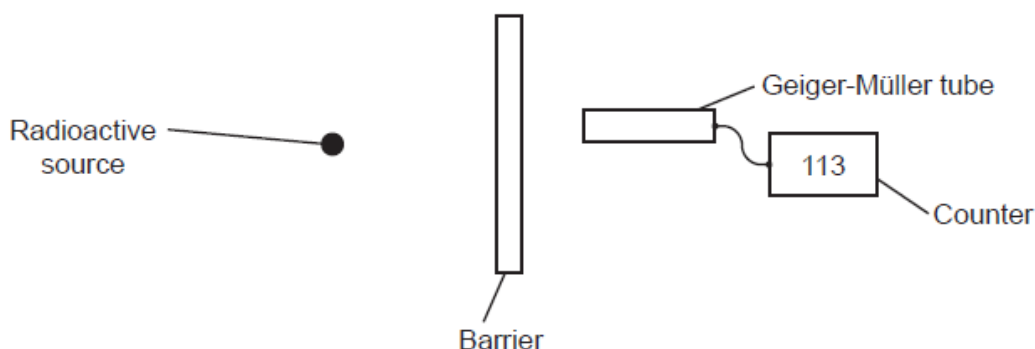
J249/02 Physics A P5-P8 and P9 (Foundation Tier)

Question Set 2

1

A teacher demonstrates an experiment about radioactivity. He demonstrates how different types of radiation can be absorbed.

He puts different barriers between the source and the Geiger-Müller tube. He uses four different radioactive sources **A**, **B**, **C** and **D**.



- (a) Suggest two safety precautions that the teacher should use when demonstrating this experiment.

- When handling the radioactive source, hold it with tongs or gloves
 - The radioactive source should be held away from body

[2]

- (b) The teacher chooses source **A** and uses the Geiger-Müller tube to measure the count rate (counts per minute) for different barriers. He repeats the experiment with source **B**, source **C** and then source **D**.

Look at his results.

Source	Count rate using different barriers			
	Paper	Aluminium	Lead	No barrier
A	113	112	22	112
B	20	21	20	182
C	162	23	21	164
D	282	78	24	280

He also finds that the **average count rate** with **no** sources and **no** barriers is 20.

- (i) Which source **A**, **B**, **C** or **D** emits **gamma** radiation only?

Explain your answer.

A as gamma has the highest penetration ability therefore easily travels through paper and aluminium and is only reduced by lead.

[2]

- (ii) Which source **A**, **B**, **C** or **D** emits **alpha** radiation only?

Explain your answer.

B as alpha radiation is stopped by paper, it has the lowest penetration ability.

[2]

(iii) Which source A, B, C or D emits beta and gamma radiation?

Explain your answer.

D as the count rate significantly decreased by aluminium but did not reach the background count rate until it reached lead barrier.

Beta is stopped by aluminium but gamma passed through.

[2]

(c) The teacher notices that the count rate behind the lead barrier ranges from 20 to 24. Give two reasons why there are a wide range of results around 22 counts per minute.

This is due to Cosmic Microwave Background Radiation which is around 22 counts per minute. There may also be some other slightly radioactive sources nearby, or some gamma radiation getting through the lead. (22 counts is an average)

[2]

(d) The teacher decides to repeat the experiment.

This time he records the number of counts for a much longer time interval for each source.

Explain why this is an improvement to the experiment.

The real average count rate can be determined more accurately by running the experiment for longer.

Repeating increases the reliability of the result.

[2]

Total Marks for Question Set 2: 12

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