OCR
Oxford Cambridge and RSA

A level Physics B

H557/01 Fundamentals of physics

Question Set 13

1. A class observes the absorption of α, β and γ radiation.
A Geiger tube is placed 1.0 cm from radioactive sources **X**, **Y** and **Z** as shown in **Fig.1**.

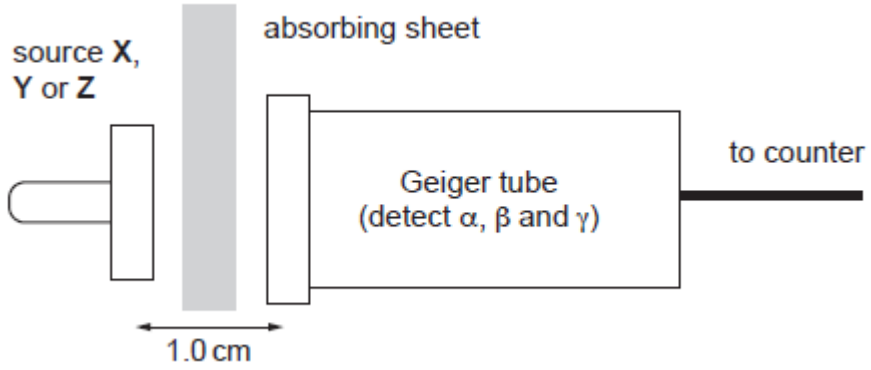

Fig. 1

The time to reach 10^4 counts is recorded and the count rate *C* per second is calculated with an uncertainty of ± 1%. The data has been corrected for background radiation.

	count rate C / s^{-1}			
Absorbing material	**1.0 cm air**	**0.1 mm paper**	**2 mm aluminium**	**5 mm lead**
Source X	395	397	22	background
Source Y	950	420	138	35
Source Z	550	547	238	27

(a) One of the sources emits α, β and γ radiation,
one source emits β and γ
and one source emits pure β.

For each source below state which radiations are emitted. Justify your choices using data from the table.

X emits ..... justification .....

.....

Y emits ..... justification .....

.....

Z emits ..... justification .....

.....

[3]

(b) i A source emits α, β and γ radiation. The corrected count rate *C* from the source is plotted against distance *R* from a thin window Geiger tube as shown in **Fig.2**.

Fig.3 shows the same data in log / log graph form.

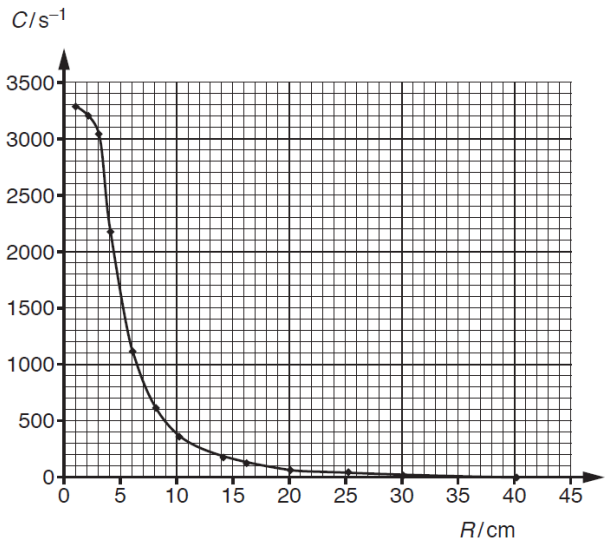

Fig. 2

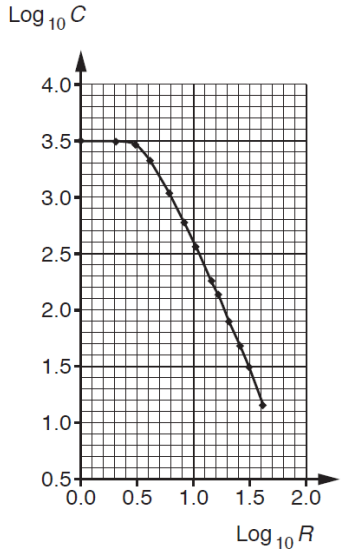

Fig. 3

Calculate the gradient of the sloping part of the log / log graph in **Fig.3**.

gradient =.....

[2]

ii State whether the graph shows that the count rate *C* varies as

$$C \propto \frac{1}{R^2}$$

and explain which radiation(s) α, β or γ might be responsible for such a variation.

[4]

Total Marks for Question Set: 9