

**A level Physics B**

**H557/01** Fundamentals of physics

**Question Set 13**

1.

A class observes the absorption of  $\alpha$ ,  $\beta$  and  $\gamma$  radiation. A Geiger tube is placed 1.0cm from radioactive sources **X**, **Y** and **Z** as shown in Fig.1.

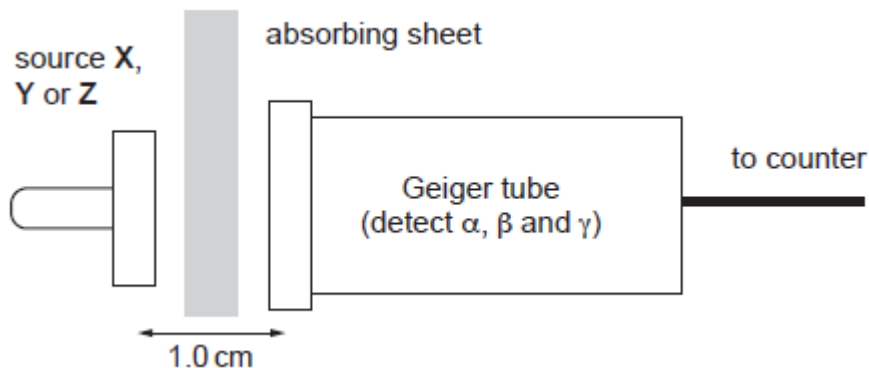


Fig. 1

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

Absorbing material	count rate $C/s^{-1}$			
	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  $\alpha$ ,  $\beta$  and  $\gamma$  radiation, one source emits  $\beta$  and  $\gamma$  and one source emits pure  $\beta$ .

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 .....

.....

- (b) i A source emits  $\alpha$ ,  $\beta$  and  $\gamma$  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.

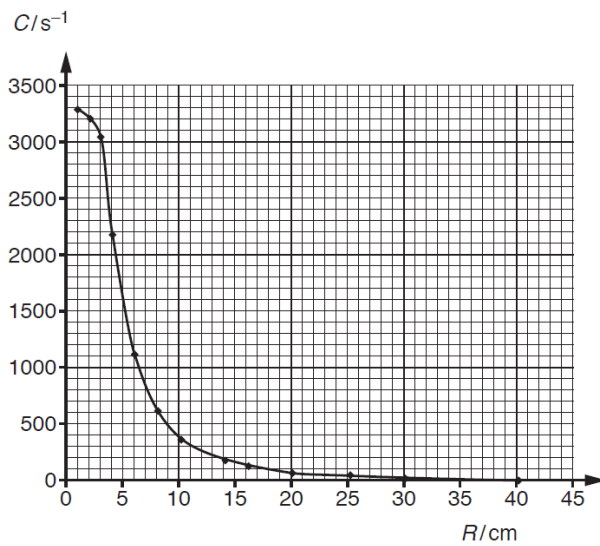


Fig. 2

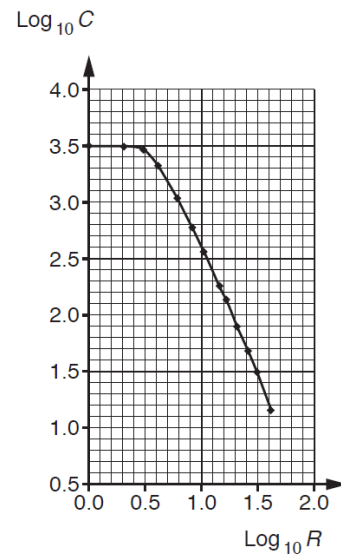


Fig. 3

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)  $\alpha$ ,  $\beta$  or  $\gamma$  might be responsible for such a variation.

[4]

**Total Marks for Question Set: 9**

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