4 A teacher investigates the count rate detected from a radioactive source.

(a) (i) State one source of background radiation.

(1)

(ii) Describe how the teacher could measure the count rate from a radioactive source and correct the count rate for background radiation.

(4)

(b) The teacher places a piece of lead sheet between the radioactive source and a radiation detector.

The teacher determines the corrected count rate from the radioactive source three times and calculates the mean.

They repeat this process using different thicknesses of lead sheet.

The table shows their results.

Thickness of lead in mm	Count rate in Bq			
	trial 1	trial 2	trial 3	mean
0.0	480	504	469	484
2.0	374	337	357	356
4.0	247	239	229	238
6.0	141	154	148	
8.0	110	104	131	115
10.0	88	91	85	88

(i) Calculate the mean count rate when the thickness of lead is 6.0 mm.

(2)

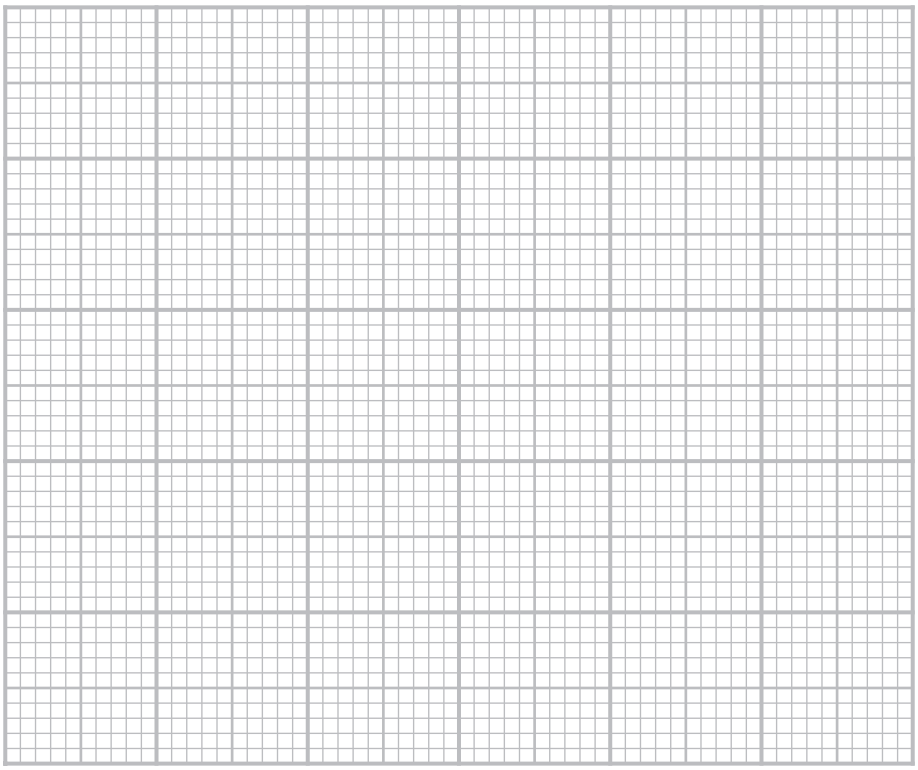
mean count rate = ... Bq

(ii) Plot a graph of mean count rate against thickness of lead.

(3)

(iii) Draw the curve of best fit.

(1)



(iv) When there is not a sheet of lead between the radioactive source and the radiation detector, the mean count rate is 484 Bq.

Use the graph to determine the thickness of lead needed to reduce the mean count rate by 25%.

(2)

thickness = ... mm

(c) The radioactive source emits only one type of radiation.

Explain which type of radiation this radioactive source emits.

(2)

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(Total for Question 4 = 15 marks)