12 A scientist placed a radioactive source in front of a Geiger-Muller detector and measured the count rate every 20 minutes.

The table shows her data.

Time in minutes	Count rate in counts per minute	Corrected count rate in counts per minute
0	660	630
20	462	432
40	330	300
60	240	210
80	180	150
100	142	112

(a) The scientist corrects the count rate readings to allow for background radiation.

   (i) State two sources of background radiation.

   (2)

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   (ii) Describe how the scientist should measure the background radiation and correct the count rate readings.

   (3)

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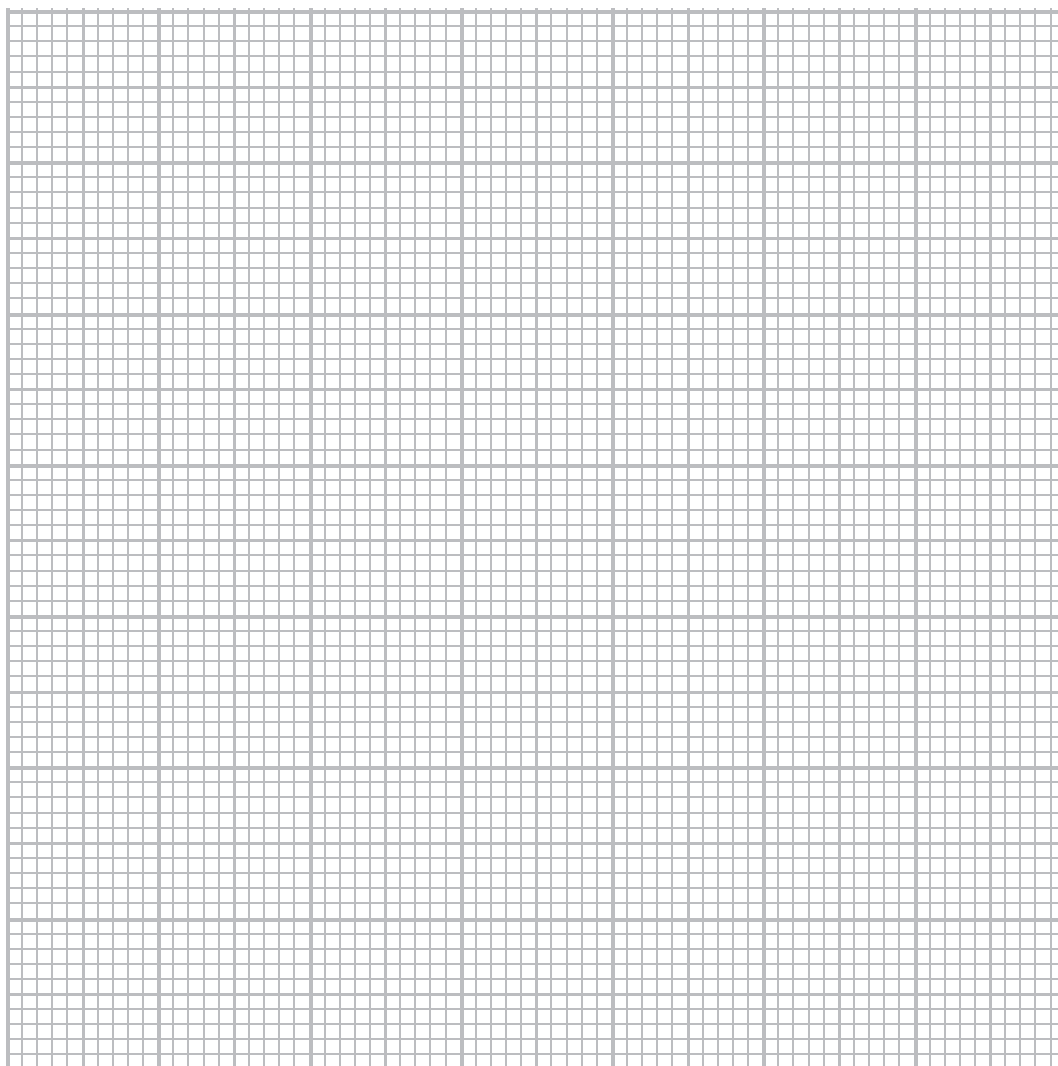
(iii) Plot a graph of corrected count rate against time and draw the curve of best fit.

(5)

(iv) Use your graph to find the half-life of the radioactive source.

(2)

half-life = ... minutes

(b) The radioactive nuclei in the source emit beta radiation.

What effect does the emission of a beta particle have on a nucleus?

(2)

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(c) The scientist needs to reduce the risks when working with radioactive sources.

(i) Explain why radioactive sources can be dangerous.

(2)

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(ii) Describe how the risks of working with radioactive sources can be reduced.

(3)

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(Total for Question 12 = 19 marks)