

# Half Life

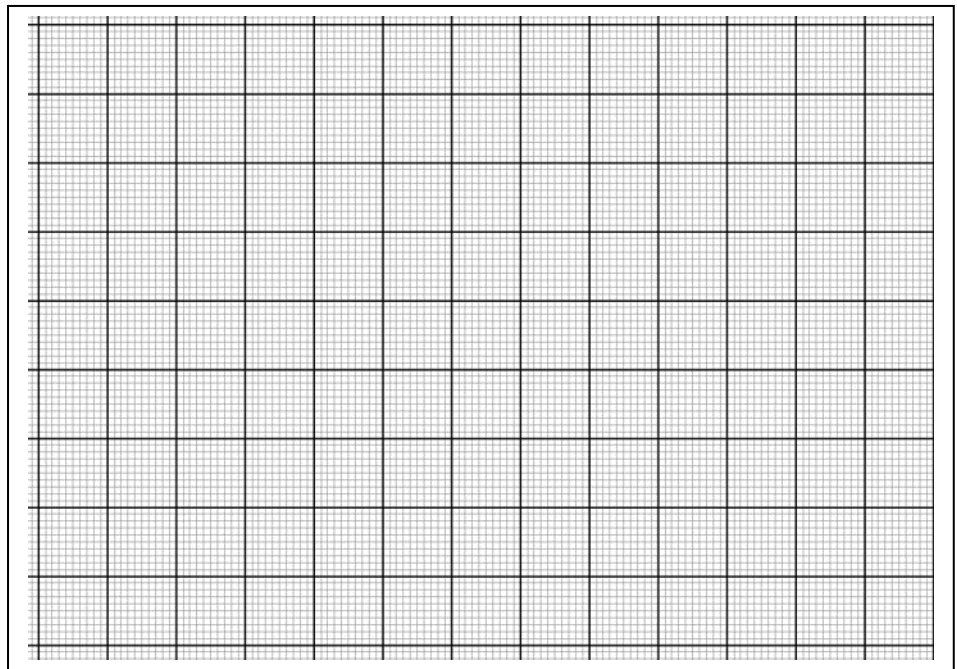
All answers to calculations should be to 2 significant figures.

1. Define the term half life

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2a. Using the data below, plot a graph of activity in counts per second against time in seconds.

Time (seconds)	Activity (counts per second)
0	241
30	212
60	188
90	165
120	145
150	127
180	112
210	99
240	87
270	76
300	67
330	59



2b. Using the graph above draw on two half lives and work out the half life of the isotope.

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3. Polonium-210 has a half life of 140 days. If an original sample of Polonium-210 has an activity of 500Bq what will its activity be after 420 days.

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4. Polonium-218 has a half life of 5 minutes. A teacher took a sample of Polonium-218 out of a box. 15 minutes later the teacher measured the count rate in Becquerels and was found to be 800. What would the count rate had been when the sample was being removed from the box?

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5. A scientist discovered a new radioactive isotope which he called Alphium. The count rate was 600Bq and decreased to 75 Bq over a period of 9 hours. What is the half life of Alphium?

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6. Technetium-99m has a half life of 6 hours. After 87.5% of the original isotope had undergone radioactive decay the count rate was 30 counts per second. How long did it take for 87.5% of the sample to decay?

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7. Carbon-14 is used for radioactive dating to find the age of an object that contains carbon. Carbon-14 has a half life of 5730 years. In the year 2000 a piece of wood was extracted from a bog which was found to contain 0.125g of carbon-14. When the wood was originally formed it contained 1g of carbon-14. Calculate the year that the wood was formed.

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8. A radioactive isotope undergoes 5 half lives.

8a. Express as a fraction the amount of the isotope the amount left after 5 half lives

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8b. Express as a percentage the amount of the isotope that has decayed

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9. Uranium-235 is used in nuclear fuel rods and it has a half life of 700 million years. Due to the long half life it will take a significant amount of time for the count rate to decrease. However, over a time span of 50 to 100 years the activity or count rate of Uranium-235 actually seems to increase slightly.

9a. Suggest a reason for the increase in count rate over the 50-100 year time period.

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Q10. A sample decays to  $1/256^{\text{th}}$  of its original count rate over a period of 5 minutes. Calculate the half life in seconds.

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Q11. Explain why temperature will not affect half life

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