

Criteria A - Half life of radioisotope

Learning goals : Students should be able to calculate the half life of a radioactive substance based on the data given.

Key terms

Half life : The time taken for a radioactive isotope to reduce by half its numbers.

Activity : The number for radiations / particles emitted from a radioactive substance in one second. It is represented by A. Its unit is Becquerel.

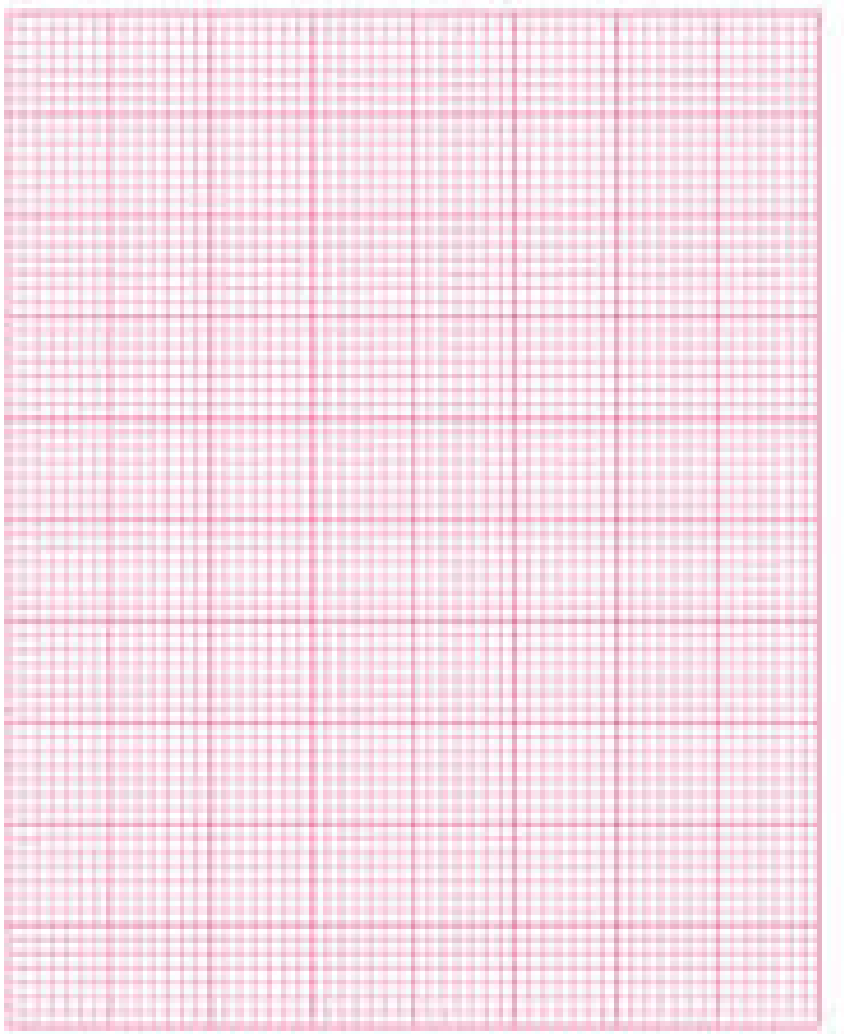
Or

The number of counts detected by the counter placed near a radioisotope in one second

1. A sample of a radioactive substance contains 1000 undecayed atoms. Its half life is 5 years. Calculate the number that will remain undecayed after 15 years.
2. A radioactive substance has a half life of 13 years. Calculate the time it will take for the number of undecayed atoms in a sample to fall to one - eighth of their original number.
3. Table shows how the activity of a radioactive sample changed as it decayed. On the graph below, draw the graph of activity against time and use it to deduce the half life of the substance.

Time (hours)	0	2	4	6	8
Activity (counts per second)	500	250	160	95	55

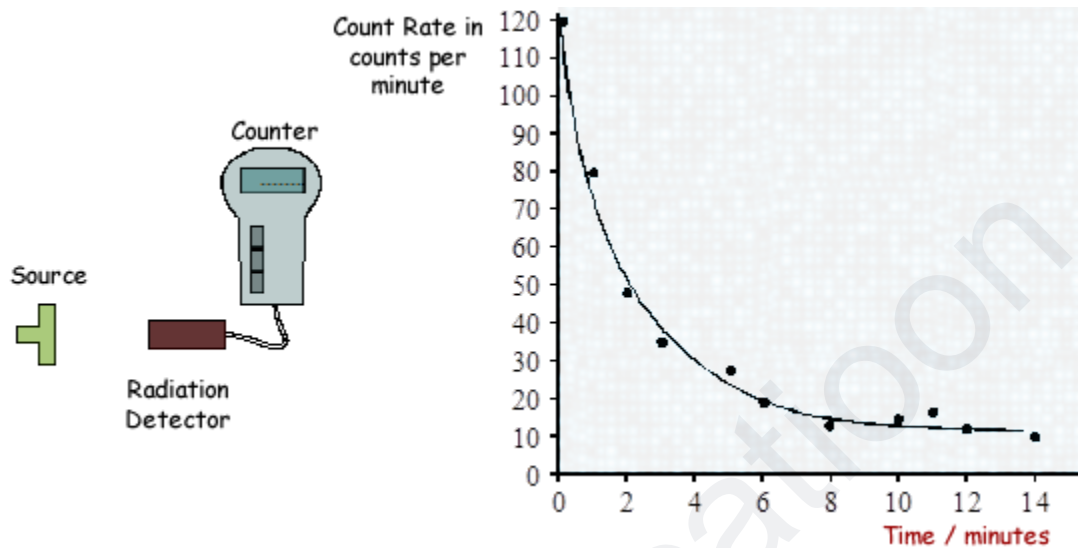
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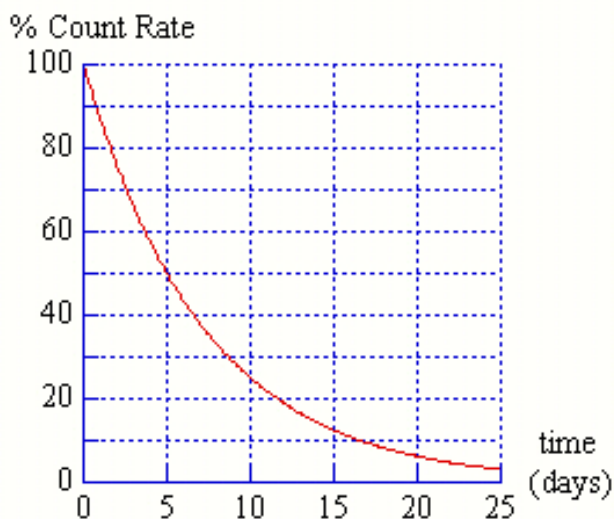
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4. Figure below shows the counts per minute in a sample of a radioactive substance as it decayed.



From the graph, determine

- The background radiation.
 - Initial count rate from a radioactive substance.
 - The half life of a radioactive substance.
5. A source contains two different elements with unstable nuclei. Isotope A has a half life of 16 hours, and isotope B has a half life of 8 hours. The count rate from each is 128 per second to begin with. Calculate the count rate after 32 hours.
6. Graph below shows the percentage of the radioactive isotopes that decayed with time. Use the information from the graph to answer the questions that follow.



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- a. What is the half life of this isotope ?
 - b. How much percentage of particles would be left after two half lives ?
 - c. How much percentage of particles would be left after 15 days ?
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7. Design your question to find the half life of a radioisotope, and solve it.
 8. Design your question to find the amount of the material left after 4 half lives and solve it. Design a question to find half life from the activity of a radioisotope and solve the question.
 9. The isotope Np_{93}^{238} has a half life of 2 days. If 4.0 g of neptunium is produced on Monday, what will be the mass of neptunium remaining on Tuesday of the next week ?
 10. A sample of polonium 210 was purchased for a physics class on September 1st. Its activity is 2×10^6 Bq. The sample was used in an experiment on June 1st. What activity can be expected if the half life of the radioisotope is 138 days ?
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Resources -

- Science Quest 9 - Jacaranda - second edition
- MYP 4 and 5 - Oxford
- MYP 4 and 5 - Hodder
- IGCSE Physics - Duncan
- Physics for cambridge IGCSE - workbook - David Sang and Darrell Hamilton
- physics - principles and problems - Glencoe science.