Half life

➢ Radioactive Decay :

The release of radiation by unstable nuclei is called **radioactive decay.** This process occurs naturally and cannot be influenced by chemical or physical processes.

➢ A Random event:

The release of radiation is also a random event and overtime the activity of the radioactive material decreases.

➢ Predication of decaying material:

It is not possible to predict when an individual nucleus in a radioactive material will decay.

➢ Half life:

It is possible to measure the time taken for half of the nuclei in a radioactive material to decay. This is called the half life of radioactive material. Half life is defined as

" Time taken for the number of nuclei in a radioactive material to halve."

Or

"Time taken for the count rate of a sample of radioactive material to fall to half of its starting level"

➢ Instrument used for measurement of Half life:

This can be measured with a **Geiger-Muller tube and counter**—> that records the number of radiation counts per second **(Count Rate).**

➢ Why half life is used:

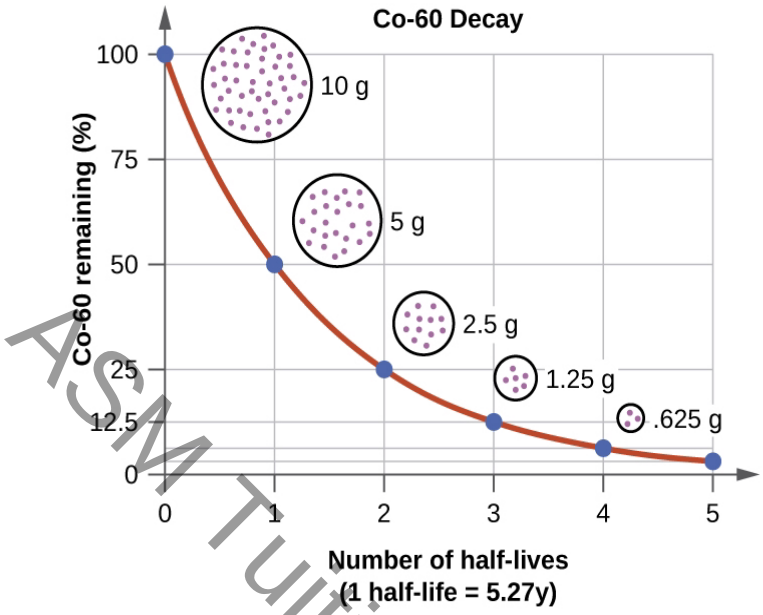
Half life is used to find the rate at which a source decay.

➢ Unit of half life :

Half life activity measured in Becquerels (**1 Bq = 1 decay per sec.)**

➤ Radioactivity of source decrease over time :

① Each time when a radioactive element decay to become stable one it's activity will decreases.



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② For Some isotopes only few hours are required to decay while other take million of years to decay.

Parent	Decays into:	Half life (years)
Carbon-14	Nitrogen-14	5,730
Aluminum-26	Magnesium-26	740,000
Iodine-129	Xenon-129	17 million
Uranium-235	Lead-207	704 million
Potassium-40	Argon-40	1.3 billion
Rubidium-87	Strontium-87	49 billion

Calculation of Half life :

Formula :

1st Half life = initial activity / 2

2nd half life = 1 half life / 2

3rd half life = 2nd half life / 2 and soo on…..

Q. The initial activity of a sample is 640 Bq. Calculate the final activity as a percentage of the initial activity after 2 half lives.

Solution:

1 half life = 640 / 2 = 320

2nd half lives = 320/ 2 = 160

To make them in percentage = 2nd half live * 100/ 640

= **25%**

Graphically half life Representation