

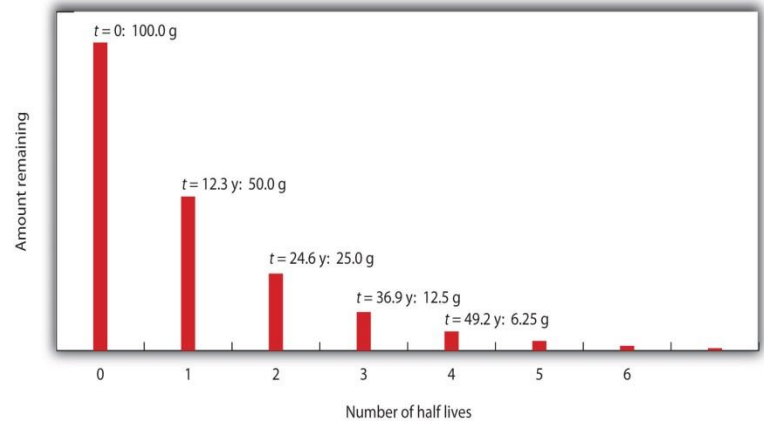
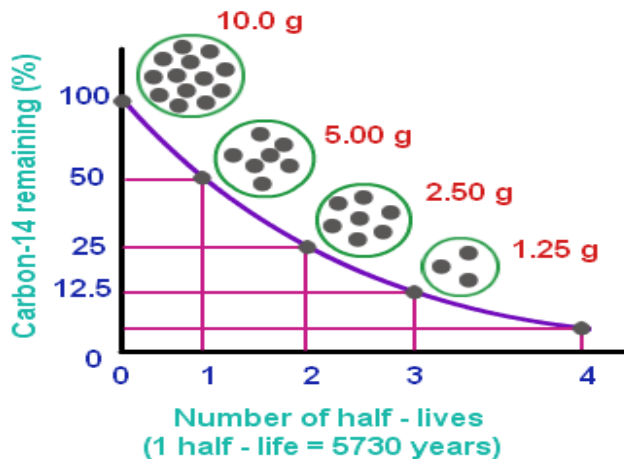
Half-Life - Enriched

Def : _____

Info:

- Could be short, as little as 0.16 seconds to decay or long, 1 300 000 years.
- Each radioactive element has its own half-life, it is characteristic.

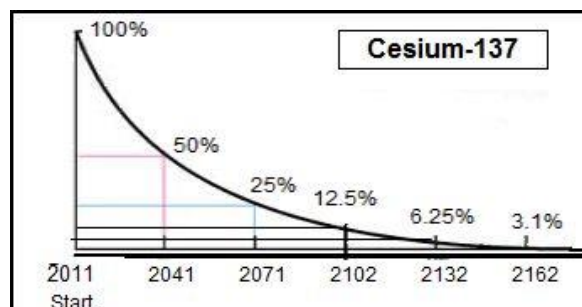
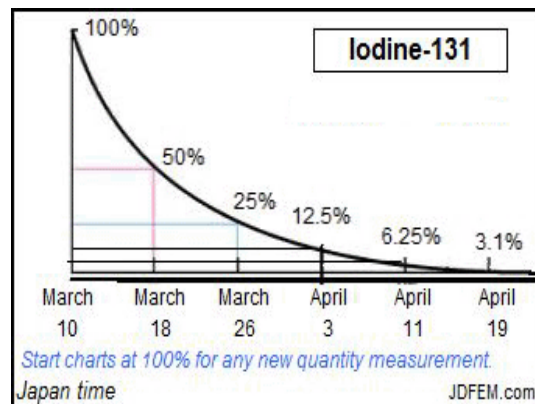
Decay of Carbon - 14



Example 1- Determining length of the half life

Using the charts below, determine the half-life of each substance.

Day	Time	% In system
Friday	2pm	100
Sat	8pm	50
Monday	2am	25
Tuesday	8am	12.5
Wednesday	2pm	6.25
Thursday	8pm	3.125
Saturday	2am	1.5625
Sunday	8am	0.78125



Example 2- Te 130's half-life is 7 days. How long would it take to have less than 1 g of Te left if you start with 35.0 g? What percentage of Te would be left? How many half-lives have passed?

$\frac{1}{2}$ life (days)	Number of half lives	Mass (g)	Percent (%)

Example 3- Polonium's half-life is 0.16 s. You have 10.0 g, how long would it take you to have less than 2 g? What % will be left?

$\frac{1}{2}$ life (seconds)	Number of half lives	Mass (g)	Percent (%)

Example 4- You found 7.0 g of a radioactive substance you think is 70 000 years old. Would it be better to use carbon-14 which has a half-life of 5 770 years or plutonium with a half-life of 24 000 years to date the object?

Carbon 14			Plutonium	
$\frac{1}{2}$ life (y)	Mass (g)	# of $\frac{1}{2}$ lives	Percent (%)	$\frac{1}{2}$ life (y)
0	7	0	100	0
5770	3.5	1	50	24 000
11 540	1.8	2	25	48 000
17 310	.9	3	12.5	72 000
23 080	.45	4	6.3	
28 850	2.3	5	3.1	
34 620	.12	6	1.6	
40 390	.060	7	.78	
46 160	.030	8	.39	
51 930	.0015	9	.20	

Example 5- After 200 years, 1.25 g of a 20.0 g sample remains of a radioactive isotope. What is its half-life?

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Example 6- Radium 226 has a half-life of 1 600 years. You want to use radium to date a substance that only has 12.5% left. How old is the substance?

When is it best to use something with a short half-life?

Past exam Question:

1. Radioactive isotopes can be used to date archaeological artefacts. Carbon 14, ^{14}C , is often used for this purpose. It was used to establish the date of the Viking artefacts found in Newfoundland. Which of the following statements best describes why ^{14}C is useful in dating historical artefacts?
 - A) ^{14}C is a radioactive isotope and accumulates over time with a predictable half-life.
 - B) ^{14}C is a radioactive isotope and decays over time with a predictable half-life.
 - C) ^{14}C is a radioactive isotope which is produced in artefacts as they decay.
 - D) ^{14}C is chemically unreactive and remains unchanged over time.
2. A radioactive substance has a half-life of 30 minutes. What fraction of the atoms will **not** have decayed after 2 hours?