

(5.12) A radioactive sample was measured at different time intervals. Determine the half-lives of the two nuclides (not genetically related) in the sample and their activities (in Bq) at time $t=0$. The background of the detection device was 100376 counts per 1000 min; its counting efficiency was 17%.

Calculations and graphing below gives: half-lives 4.4 and 107 hours. Corresponding zero time activities are: 1030 and 98 Bq. This shows an alternative trial and error method instead of the normal graphical solution.

$$i := 1..9$$

$$t_i := A_i :=$$

$$R_i := \frac{A_i - \frac{100376}{1000}}{60 \cdot 0.17}$$

$$a1 := 98 \quad th1 := 107 \quad a2 := 1030 \quad th2 := 4.43$$

$$fx_i := \frac{R_i - a1 \cdot \exp\left(\frac{-\ln(2)}{th1} \cdot t_i\right) - a2 \cdot \exp\left(\frac{-\ln(2)}{th2} \cdot t_i\right)}{R_i} \cdot 100$$

0.3	11100	R_i
5	5870	
10	3240	$1.078 \cdot 10^3$
15	2005	565.649
20	1440	307.806
30	1015	186.728
40	888	131.336
50	826	89.669
100	625	77.218
		71.14
		51.434

fx_i is remaining difference in %

