DATA ANALYSIS (Questions) Total Marks 27

The Decay of Thorium-234

A sample of thorium-234 was placed in storage for nearly 1 year. While it was in storage its activity was monitored regularly by an automatic sensor that was placed 10 cm from the sample.

Let N_o = the original number of atoms of radioactive material.

Let N = the number of atoms of radioactive material present after *n* half-lives have passed.

Therefore, $N = \frac{N_0}{2^n} = N_0\left(\frac{1}{2}\right)^n$

Questions

1 Use the above relationship to complete the data table below. (3)

Time, *t* (days)	No. of half-lives, *n*	No. of atoms of radioactive isotope, *N*	Activity (Bq) 10 cm from sample
0	0	8.0×10^{10}	1900
24	1	4.0×10^{10}	
48	2		
72	3		
96	4		
120	5		
144			
168			
192			
216			
240			
264			
288			
312			
336			
360			

2 Produce a fully labelled graph of *N* versus *t*. (4)

3 What is the name for a curve of the shape shown in your graph of *N* versus *t*? (1)

4 Produce a fully labelled graph of activity versus time. (3)

5 What is the half-life of thorium-234? (1)