

## 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  $N_0$  = 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,  $N = \frac{N_0}{2^n} = N_0 \left(\frac{1}{2}\right)^n$  **No horizontal lines for fractions**

**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	$8.0 \times 10^{10}$	1900
24	1	$4.0 \times 10^{10}$	
48	2		
72	3		
96	4		
120	5		
144			
168			
192			
216			
240			
264			
288			
312			
336			
360			

**No grid lines for the table**

- 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)