

Radioactivity

Mark Scheme 5

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Atomic Physics
Sub-Topic	Radioactivity
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 5

Time Allowed: 44 minutes

Score: /36

Percentage: /100

1	(a)	β -source and detector suitably arranged deflecting plates suitably arranged additional detail e.g. slit or collimator, vacuum chamber, circuit connected to deflecting plates	B1 B1 B1	[3]
	(b)	at least 3 readings at right angles beyond & perp. to the plates one near +ve, one near -ve and one in centre	M1 A1	[2]
	(c)	highest reading near +ve plate	B1	[1]
	(d)	electrons negatively charged, attracted to +ve	B1	[1]
				Total [7]

2	(a)	correct equation i.e. Ra gives Rn + alpha particle or He all numbers correct on Rn and He	1 1	2
	(b)	(i) radiation from surroundings/background radiation	1	
		(ii) 532 to 552 counts/min	1	
		(iii) 5/6 cm	1	
		(iv) beyond 5/6 cm no alpha, only background radiation	1	4
				(6)

3	(a)	(i)	source, detector	B1	
			named absorber/air and labels	B1	
		(ii)	take detector reading with no source (background)	B1	
			detector reading with source, detector and air only	B1	
	detector reading with appropriate named absorber (including distance in air)	B1			
	(iii)	same reading with absorber(including air) as background	B1		
		so all alpha absorbed by cardboard/paper/air, others would get through	B1	max 6	
	(b)	curved path stated or drawn	B1		
		path at right angles to magnetic field	B1		
		into paper	B1	3	
				[9]	
4	(a)	top line correct, need 24 and 0	B1		
		bottom line correct, need 12 and -1 (accept β or e for electron)	B1	2	
	(b)	particles take curved path (accept from diagram)	B1		
		move between the poles at right angles to lines of force	B1		
		move out of paper	B1	3	
	(c) (i)	use detector to pick up <u>radiation</u> (from isotope at points on/in body etc.)	B1		
		high count where circulation good or v.v. explained	B1		
	(ii)	alpha particles all absorbed, none detected			
		beta particles may be largely absorbed, not penetrative enough			
		gamma rays reach detector/leave body	any two	B2 4	
			[9]		

5	a	half-life 4 days*	1	A1	1
	b	at least two points worked out suitable curve completed	2	A1	2
	c	by 20 days little radioactivity left, after 1 day about 85% left	1	B1	1
	d	${}^A_Z X \rightarrow {}^0_{-1} e + {}^A_{Z+1} Y$ top line, A1/ bottom line A1	2	A2	2
				QT	6