MARK SCHEME
RADIO ACTIVITY

10	(a)		8 (mins) for value, no working shown	B1	
			8 (mins) for value with suitable working or indication on graph	B1	2
	(b)	(i)	source, aluminium and detector, recognisable shapes	B1	
			quality and all labels correct	B1	2
		(ii)	count background	B1	
			source and detector, no absorber, count taken	B1	
			source, absorber and detector, count taken	B1	3
					[7]

11	(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]

11 (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]

TOTAL 80

10	**(a)**		Analogue, continuously increasing / decreasing readings	**B1**	
			Digital, readings increase / decrease by one unit	**B1**	**2**
	(b)	**(i)**	Transistors + other components such as resistors	**B1**	
		(ii)	Standard symbol, must have labeled inputs and output	**B1**	
		(iii)	Both inputs 0 (off), or either one input 0 (off), output 0 (off)	**B1**	
			Both inputs 1 (on), output 1 (on)	**B1**	**4**
			OR correct truth table drawn (**C1**)		
			Some explanation of what truth table shows (**A1**)		
					[6]
					(6)
11	**(a)**		correct equation i.e. Ra gives Rn + alpha particle or He	**1**	
			all numbers correct on Rn and He	**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)

10	**a**	half-life 4 days*	1	A1	1
	b	at least two points worked out		M1*	
		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	1	A2	2
				QT	6

or ${}^{0}_{-1}\beta$ (not e or β alone)

PAPER TOTAL **80**

${}^{A}_{Z}X \rightarrow e/\beta + {}^{A}_{Z+1}Y$ (C1)