Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Mark Schemes

Q1.

Question number	Answer	Additional guidance	Mark
(i)	use of gradient on graph (1) = 1480 / 97 evaluation (1) 15.3 (counts /s)	look for a triangle / line going up allow 1480 / 100 accept other data from the graph allow numbers between 12.0 and 16.0 award full marks for answers in the correct range without working	(2)

Question number	Answer	Additional guidance	Mark
(ii)	explanation the process (of radioactive decay) is unpredictable / (occurs) random(ly) (1) so the count rate would not be constant / there will be variations with each reading (1)	 do not allow 'difficult to predict' ignore background results (expected to) scatter	(2)

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Q2.

Question number	Answer	Additional guidance	Mark
CS2	33 days is 3 half-lives (1) $2.1(25) \times 10^{22}$ (1)	$\frac{1.7 \times 10^{23}}{2\ (\times 2 \times 2)}$ 2.1(25) to any other power of ten scores mp1 only award full marks for correct answer without working.	**(2)** **AO2**

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Q3.

Question	Answer	Additional guidance	Mark
	subtraction (1) $6.69 \times 10^{-27} - 6.64 \times 10^{-27}$ OR $0.05 (\times 10^{-27})$ OR $5.0 (\times 10^{-29})$ use of % (1) $\frac{5.0 \times 10^{(-29)} \times 100}{6.69 \times 10^{-27}}$ evaluation (1) 0.75 %	accept negative mass difference throughout accept use of 0.05×10^{-27} 6.64×10^{-27} 0.75/0.747/0.753 to any other power of 10 scores 2 marks $\frac{6.64 \times 10^{-27}}{6.69 \times 10^{-27}} (\times 100\%)$ or 99% or 0.99 scores 1 mark award full marks for the correct answer without working	**3** **AO2.1**

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Q4.

Question number	Answer	Additional guidance	Mark
	Substitution and rearrangement to find k (1) $k = 85000 \times 0.70^2$ Substitution to find new count rate (1) count rate = $\frac{85000 \times 0.70^2}{1.3^2}$ Answer (1) 25000 (counts per minute)	41650 24645 (counts per minute)	**(3)**

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Q5.

Question Number	Answer	Mark
(i)	**D gamma** ***A*** *is not correct because alpha cannot pass through and out of the body* ***B*** *is not correct because beta plus cannot pass through and out of the body* ***C*** *is not correct because beta minus cannot pass through and out of the body*	**(1)** **AO1**

	Answer	Additional guidance	Mark
(ii) **CLIP with** (ii)	decays too quickly to give a reading (1)	accept (half-life) not long enough for reading to be taken ignore disappear after 12 min	**(1)** **AO1**

	Answer	Additional guidance	Mark
(ii) **CLIP with** (ii)	stays in the body too long (1)	accept could harm / damage other organs patients stay radioactive for too long so the patient does not get too high a dose of radiation	**(1)** **AO1**

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	Answer	Additional guidance	Mark
(iii)	**Two** from: shielding (1) time limiting exposure (1) distance limiting exposure (1) wear PPE / protective clothing (1)	 accept stand behind barriers / store (source) in lead box radiation monitoring badges leave the room / go outside / stay away from the patient / use tongs lead aprons / gloves ignore goggles / masks	**(2)** **AO1**

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