Question Number	Answer		Mark
3 (a)	Any **TWO** from Handle the source using long tongs (1) Keep the source in a lead-lined box when not in use (1) Maintain a distance from the source when in use (1) Use the source for as short a time as possible (1) Do not accept answers relating to PPE		**2**
3 (b)	Background count rate should be subtracted from measured count rate (1) Background radiation adds a constant amount to the overall count rate **Or** It is a systematic error (1)		**2**
3 (c)	The gradient of the graph is $-\lambda$ (1) As $\ln C = \ln C_0 - \lambda t$ is in the form $y = c + mx$ **Or** As $\ln C = -\lambda t + \ln C_0$ is in the form $y = mx + c$ (1) [Accept alternative letters for m and c]		**2**
3 (d)(i)	$\ln C$ values correct to 2 d.p. Accept 3 d.p. (1) Axes labelled: y as $\ln(C / s^{-1})$ and x as t / hours (1) Most appropriate scales for both axes (1) Plots accurate to ± 1mm (1) Straight best fit line with even spread of plots in region $t \geq 4$ hours (1)		**5**
3 (d)(ii)	Correct calculation of gradient using large triangle shown (1) Value of λ in range 0.064 to 0.072 (h^{-1}) (1) Value of λ given as positive, to 2 or 3 s.f. (1) <u>Example of calculation</u> *gradient* = ((5.38 – 4.54) / (0 – 12.4) = – 0.84 / 12.4 = – 0.068 $\lambda = 0.068\ hr^{-1}$		**3**
3 (d)(iii)	Use of $t_{½} = \ln 2 / \lambda$ (1) Value of $t_{½}$ given 2 or 3 s.f., with correct unit ecf from (d)(ii) (1) <u>Example of calculation</u> $t_{½} = \ln 2 / \lambda = \ln 2 / 0.068 = 10.2$ hours		**2**
	Total for question		**16**