

Question Number	Answer	Mark
16(a)	<p>Calculation of mass difference (1)</p> <p>Use of $1 \text{ u} = 1.66 \times 10^{-27} \text{ kg}$ (1)</p> <p>Use of $\Delta E = c^2 \Delta m$ (1)</p> <p>$\Delta E = 7.6 \times 10^{-13} \text{ (J)}$ (1)</p> <p><u>Example of calculation</u></p> <p>$\Delta m = (230.0331 - 226.0254 - 4.0026) \text{ u} = 5.1 \times 10^{-3} \text{ u}$</p> <p>$\Delta m = 5.1 \times 10^{-3} \times 1.66 \times 10^{-27} \text{ kg} = 8.47 \times 10^{-30} \text{ kg}$</p> <p>$\Delta E = (3.00 \times 10^8 \text{ m s}^{-1})^2 \times 8.47 \times 10^{-30} \text{ kg} = 7.62 \times 10^{-13} \text{ J}$</p>	4
16(b)	<p>Use of $\lambda = \frac{\ln 2}{t_{1/2}}$ (1)</p> <p>Use of $N = N_0 e^{-\lambda t}$ (1)</p> <p>Use of 90% $[\frac{N}{N_0} = 0.1]$ (1)</p> <p>$t = 2.5 \times 10^5 \text{ (years)}$ (1)</p> <p><u>Example of calculation</u></p> <p>$\lambda = \frac{\ln 2}{t_{1/2}} = \frac{0.693}{75400 \text{ years}} = 9.19 \times 10^{-6} \text{ year}^{-1}$</p> <p>$0.1 = e^{-9.19 \times 10^{-6} t}$</p> <p>$t = \frac{\ln 0.1}{-9.19 \times 10^{-6} \text{ year}^{-1}} = 2.51 \times 10^5 \text{ years}$</p>	4
Total for question 16		8