

Question Number	Answer	Mark
18(a)(i)	X is a neutron (1)	1
18(a)(ii)	Decrease in mass calculated (1) Energy in (G)eV calculated from mass difference (1) Conversion of energy in eV to J (1) Energy released = 8.0×10^{-14} (J) (1) <u>Example of calculation</u> $\Delta m = (25.1333 + 3.7274) \text{ GeV}/c^2 - (27.9206 + 0.9396) \text{ GeV}/c^2$ $= 5.00 \times 10^{-4} \text{ GeV}/c^2$ $\Delta E = 5.00 \times 10^{-4} \text{ GeV}$ $\Delta E = 5.00 \times 10^{-4} \times 10^9 \text{ eV} \times 1.6 \times 10^{-19} \text{ J eV}^{-1} = 8.0 \times 10^{-14} \text{ J}$	4
18(b)	Positrons annihilate with electrons to produce gamma radiation (1) Gamma radiation can penetrate the body (1) Half life is long enough to allow the procedure to be performed (1) Half life is short enough to avoid unnecessarily large radiation dose (1)	4
	Total for question 18	9