Question Number	Answer	Mark
13(a)	Calculation of mass difference **(1)** Use of $\Delta E = c^2 \Delta m$ **(1)** Conversion of energy from J to eV **(1)** E = 1.2 (MeV) **(1)** [If correct answer has been obtained by using 1 u = 931.5 MeV, then full marks can be awarded. If incorrect answer has been obtained by using 1 u = 931.5 MeV, MP1 can be awarded provided substitutions for mass difference are correct. This is the only mark that can be awarded] <u>Example of calculation</u> $(2.82185 \times 10^{-26} + 1.67299 \times 10^{-27}) - (2.32451 \times 10^{-26} + 6.64432 \times 10^{-27})$ $= (2.98915 - 2.98894) \times 10^{-26} = 2.07 \times 10^{-30}$ kg $\Delta E = (3.0 \times 10^8 \text{ m s}^{-1})^2 \times 2.07 \times 10^{-30} \text{ kg} = 1.863 \times 10^{-1}$ J $\Delta E = \frac{1.89 \times 10^{-13} \text{ J}}{1.6 \times 10^{-19} \text{ J eV}^{-1}} = 1.16 \times 10^6 \text{ eV} = 1.16 \text{ MeV}$	**4**
13(b)	Momentum (and energy) is conserved **(1)** [Accept symbols for momentum i.e. *mv* or *p*] (So) products must have E_k / momentum after the reaction (as the alpha particle has momentum before the reaction) **(1)**	**2**
	Total for question 13	**6**