Question Number	Answer	Mark
13(a)	Top line correct (1) Bottom line correct (1) <u>Example of calculation</u> $^{40}_{19}K \rightarrow {}^{40}_{20}Ca + {}^{0}_{-1}\beta^- + {}^{0}_{0}\overline{\nu}$	**2**
13(b)	**Any TWO from:** Both have the same mass (1) Both are leptons (1) Both are fundamental particles (1) Both have the same magnitude charge (1) Both are deflected in electric/magnetic fields (1) Both are (weakly) ionising (1)	**2**

13(c)	Use of $\lambda = \frac{\ln 2}{t_{1/2}}$ Use of $A = A_0 e^{-\lambda t}$ to find time for activity to fall to background level $t = 8.6 \times 10^9$ years, so claim is incorrect **OR** Use of $\lambda = \frac{\ln 2}{t_{1/2}}$ Use of $A = A_0 e^{-\lambda t}$ to find activity after 9×10^9 years $A = 0.33$ Bq so claim is incorrect <u>Example of calculation</u> $\lambda = \frac{\ln 2}{1.25 \times 10^9 \text{ years}} = 5.55 \times 10^{-10} \text{ year}^{-1}$ $\ln\left(\frac{0.42 \text{ Bq}}{48.6 \text{ Bq}}\right) = -5.55 \times 10^{-10} \text{ years}^{-1} \times t$ $\therefore t = \frac{-4.75}{5.55 \times 10^{-10} \text{ years}^{-1}} = 8.56 \times 10^9 \text{ years}$	(1) (1) (1) (1) (1) (1)	3
	Total for question 13		**7**