Question Number	Answer	Mark
14a	Determines correct radius from measurements from the paper (accept measurement of line between ends of arc as diameter) (1) Applies scale to measured distance - (1) Use of $r = p/BQ$ (1) $p = 1.9 \times 10^{-19}$ N s (range 1.6×10^{-19} N s to 1.9×10^{-19} N s) (1) Example of calculation radius 17 mm so actually 170 mm (range 14 mm to 17 mm) $p = 0.17\ \text{m} \times 7.0\ \text{T} \times 1.6 \times 10^{-19}\text{C}$ $p = 1.90 \times 10^{-19}$ N s (140 mm → $p = 1.57 \times 10^{-19}$ N s)	**4**
14b	Kaon does not leave a track (1) pions have opposite charge and charge is conserved (1)	**2**
14c	Antiproton: $\bar{u}\,\bar{u}\,\bar{d}$ **Or** antiup antiup antidown (1) negative pion: $\bar{u}\,d$ **Or** antiup down (1) (Quarks can be listed in any order for each particle)	**2**
14d	Use of $\Delta E = c^2 \Delta m$ (1) Conversion from J to eV (1) mass = 0.94 (GeV/c^2) (1) Example of calculation $\Delta E = (3 \times 10^8\ \text{m s}^{-1})^2 \times 1.67 \times 10^{-27}\ \text{kg} = 1.503 \times 10^{-10}$ J $\Delta E = 1.503 \times 10^{-10}$ J / 1.60×10^{-19} J/eV = 9.39×10^8 eV mass = 0.94 GeV/c^2	**3**
	Total for question 14	**11**