Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Mark Schemes

Q1.

Question Number	Answer		Mark
(a)	$\overline{u}$d (allow $\overline{c}$d $\overline{c}$s $\overline{u}$s)	(1)	1
(b)	π^0	(1)	1
(c)	Use of $v = s/t$ $t = 2.6 \times 10^{-8}$ s Example of answer $t = 5.9\text{ m} / 2.3 \times 10^{8}\text{ m s}^{-1}$ $t = 2.57 \times 10^{-8}$ s	(1) (1)	2
*(d)	(QWC – Work must be clear and organised in a logical manner using technical wording where appropriate) **Max 6** Pions are charged so leave a track Pion interacts with a stationary charged particle 2 neutral particles produced Because there are gaps in the trail **Or** no tracks produced Tracks are in different directions so that momentum is conserved Both particles decay into two charged particles At each decay particles have opposite charges Because charge is conserved **Or** particles move in opposite curvature. At each decay momentum is conserved	 (1) (1) (1) (1) (1) (1) (1) (1) (1)	6
(e)(i)	Antiproton Same mass as proton **and** opposite charge	(1) (1)	2
(e)(ii)	It will annihilate with a proton/particle	(1)	1
	Total for question		13

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Q2.

Question Number	Answer	Mark
(a)	<table><tr><th>Meson</th><th>Charge/*e*</th><th>Strangeness</th></tr><tr><td>$\bar{u}s$</td><td>+1</td><td>+1</td></tr><tr><td>$\bar{d}s$</td><td>0</td><td>+1</td></tr><tr><td>$\bar{s}u$</td><td>-1</td><td>-1</td></tr><tr><td>$\bar{s}d$</td><td>0</td><td>-1</td></tr></table> **(1)** **(1)** **(1)** **(1)** 1 mark for each correct row. Antiquark can be before quark. (If the + are missing. e or 1.6×10^{-19} appears in charge column apply a 1 mark total penalty.)	**4**
(b)	(Different) masses/lifetimes/stabilities/decay products **(1)** (accept mass-energy but not energy or weight)	**1**
	Total for question	**5**

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