Name of the Student:_____
Max. Marks : 21 Marks **Time : 21 Minutes**

Mark Schemes

Q1.

Question Number	Acceptable answers	Additional guidance	Mark
	• The atom is mainly empty space (1) • All/most of mass of the atom is in a nucleus/centre which is charged (1) • The nucleus is small compared to the atom (1)	Accept dense and charged	3

Q2.

Question Number	Acceptable answers	Additional guidance	Mark
	• **p** : u u d (1) • **n** : u d d (1) • π : u $\bar{d}$ (1)	Accept labelled $\pi-$: $\bar{u}$ d	3

Q3.

Question Number	Acceptable answers	Additional guidance	Mark
	• Identifies mass of antiproton is the same as proton (1) • Convert kg to J (1) • Convert J to eV (1) • Mass = 940 (MeV/c^2) (1)	MP1: use of 1.67×10^{-27} kg Example of calculation $m = \frac{1.67 \times 10^{-27}\ \text{kg} \times (3.0 \times 10^{8})^2 (\text{m s}^{-1})^2}{1.6 \times 10^{-13}\ \text{J MeV}^{-1}}$ $m = 939\ \text{MeV/c}^2$	4

Q4.

Question Number	Acceptable answers	Additional guidance	Mark
	• Magnetic field is used to curve the track **Or** Magnetic field exerts a centripetal force (1) • The direction of curvature indicates whether the charge is positive or negative (1) • It enables the momentum of particles to be determined (1)		3

Q5.

Question Number	Acceptable Answer	Additional Guidance	Mark
	An explanation that makes reference to the following points: • The potential difference creates an electric field • An (electric) field/force does work on the electrons (increasing their kinetic energy) **Or** an (electric) field/force accelerates the electrons (increasing their velocity) (1) (1)		2

Q6.

Question Number	Acceptable answers	Additional guidance	Mark
	• Use of $\Delta E = m L$ **(1)** • Convert peak voltage and current to r.m.s. values (230 V and 8.77 A) **(1)** **OR** use $P=I_{peak}V_{peak}/2$ **(1)** • Use of $E = VI\,t$ **(1)** • t = 264 s (1)	Example of calculation: $\Delta E = mL = 0.225\text{kg} \times 2.37\times10^{6}\,\text{J kg}^{-1} = 5.33\times10^{5}\,\text{J}$ $V = 325\text{ V}/\sqrt{2} = 230\text{ V}$ and $I = 12.4\text{ A}/\sqrt{2} = 8.77\text{ A}$ $t = \frac{E}{VI} = \frac{5.33\times10^{5}\,\text{J}}{230\,\text{V}\times8.75\,\text{A}} = 264\,\text{s}$	**4**

Q7.

Question number	Acceptable answers	Additional guidance	Mark
	An explanation that makes reference to the following points: • Resistance increases with decreasing intensity **(1)** • As distance increases light intensity decreases so resistance increases **(1)**		**2**