Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 6_ Further Mechanics

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Name of the Student:______________________________________

Max. Marks : 16 Marks **Time : 16 Minutes**

Mark Schemes

Q1.

Question Number	Answer		Mark
(i)	Outward spiral from centre in either direction, minimum of two complete loops	(1)	1
(ii)	Direction consistent with diagram: Clockwise path, field out of page Anticlockwise path, field into page	(1)	1
(iii)	Electric field/p.d. between dees causes (resultant) force/acceleration Proton makes half a revolution in half a cycle of the a.c. **Or** facing dee (always) negative when proton reaches gap. **Or** whenever the proton gets to a gap, the p.d. has reversed k.e./speed (only)increases each time the proton crosses the gap **Or** work done by the field in the gap increases the k.e.	(1) (1) (1)	3
(iv)	$Bev=mv^2/r$ **Or** $r=p/Be$ $v=2\pi r/T$ $T=1/f$ (seeing $f=v/(2\pi r)$ scores MP2 & 3) **Or** $Bev=mr\omega^2$ $v=r\omega$ $\omega=2\pi f$ (seeing $v/r=2\pi f$ scores MP2 & 3)	(1) (1) (1) (1) (1) (1)	3
(v)	Use of $B=2\pi fm/e$ with mass of proton $f=1.8\times10^4$ Hz <u>Example of calculation</u> $f=eB/2\pi m$ $f=(1.6\times10^{-19}\text{ C}\times1.2\times10^{-3}\text{ T})/(2\pi\times1.67\times10^{-27}\text{kg})$ $f=1.8\times10^4$ Hz	(1) (1)	2

Q2.

Question Number	Acceptable Answer	Additional Guidance	Mark
(i)	• Satellite would always be above the same point on the Earth's surface **(1)** • So that contact/communication with the space station would be maintained at all times **(1)**		**2**
(ii)	Use of $F = \frac{GMm}{r^2}$ with $F = m\omega^2 r$ **(1)** Use of $\omega = 2\pi/T$ **(1)** $r = 4.23 \times 10^7$ m **(1)** $h = 3.6 \times 10^7$ m **(1)** **OR** Use of $F = \frac{GMm}{r^2}$ with $F = \frac{mv^2}{r}$ **(1)** Use of $v = 2\pi r/T$ **(1)** $r = 4.23 \times 10^7$ m **(1)** $h = 3.6 \times 10^7$ m **(1)**	<u>Example of calculation:</u> $m\omega^2 r = \frac{GMm}{r^2}$ $\therefore \left(\frac{2\pi}{T}\right)^2 = \frac{GM}{r^3}$ $\therefore r = \sqrt[3]{\frac{GMT^2}{4\pi^2}}$ $r = \sqrt[3]{\frac{6.67\times10^{11}\,\text{N m}^2\,\text{kg}^2 \times 6.00\times10^{24}\,\text{kg} \times (8.64\times10^4\,\text{s})^2}{4\pi^2}}$ $r = 4.23 \times 10^7$ m $h = r - R_E = 4.23 \times 10^7 - 6.4 \times 10^6$ m $= 3.59 \times 10^7$ m	**4**