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

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**Name of the Student**:_____
**Max. Marks : 19 Marks** **Time : 19 Minutes**

Mark Schemes

**Q1.**

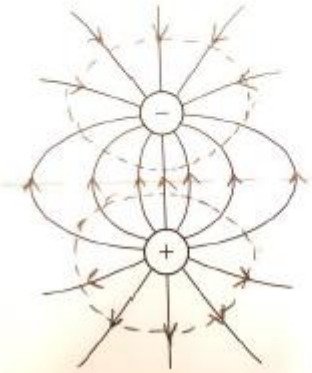
| Question number | Acceptable answers | Additional guidance | Mark |
|---|---|---|---|
| (i) | • Recognise that for passenger to remain in their seat normal reaction $R \geq 0$ **(1)**<br>**or** centripetal force >= weight **(1)**<br>• Equate centripetal force and weight (for $R$=0) **(1)**<br>• $v = 9.1$ m s$^{-1}$ **(1)** | Example of calculation:<br>$\frac{mv^2}{r} = mg$<br>$v = \sqrt{rg} = \sqrt{8.5\,\text{m} \times 9.81\,\text{m s}^{-2}} = 9.13\,\text{m s}^{-1}$ | **3** |
| (ii) | • Equate decrease in gravitational potential energy to increase in kinetic energy at top of loop **(1)**<br>• Adds this to 17.0 **(1)**<br>• $\Delta h = 21.3$ m **(1)** | Example of calculation:<br>$mgh = \frac{1}{2}mv^2$<br>$h = \frac{v^2}{2g} = \frac{(9.13\,\text{m s}^{-1})^2}{2 \times 9.81\,\text{m s}^{-2}} = 4.25\,\text{m}$<br>$\Delta h = 17 + 4.3 = 21.3$ m | **3** |

**Q2.**

| Question Number | Acceptable answers | Additional guidance | Mark |
|---|---|---|---|
| | • convert to radians **(1)**<br>• $\omega = 52$ rad s$^{-1}$ **(1)** | Example of calculation<br>$\omega = \frac{500 \times 2\pi}{60}$<br>$\omega = 52.4$ radians s$^{-1}$ | **2** |

**Q3.**

| Question Number | Acceptable answers | | Additional guidance | Mark |
|---|---|---|---|---|
| (a) | • Replace Work $W$ by force × distance<br>• Replace distance ÷ time by velocity $v$<br>• Use $v = r \times$ Angular velocity<br>• Recognise $F \times r$ is the moment of $F$ | (1)<br>(1)<br>(1)<br>(1) | Alternative method:<br>Consider one revolution of axle , Load rises $2\pi r$<br>Work done = $2\pi rF$<br>Time taken = $2\pi \div \omega$<br>Power = Work ÷ time= $2\pi rF \div 2\pi/\omega$ to give reqd eq | 4 |

| Question Number | Acceptable answers | | Additional guidance | Mark |
|---|---|---|---|---|
| (b)(i) | • Arrow away from + charge **Or** arrow towards − charge<br>• At least 3 Equipotential lines, perpendicular to field lines<br>• Symmetrical about vertical/horizontal axis **and** not touching/crossing | (1)<br>(1)<br>(1) | MP3 dependent on lines being perpendicular in MP2<br>  | 3 |

| Question Number | Acceptable answers | | Additional guidance | Mark |
|---|---|---|---|---|
| (b)(ii) | • Use of $F = \dfrac{Q_1 Q_2}{4\pi\varepsilon_o r^2}$<br>• $F = 0.036$ (N) | (1)<br>(1) | Example of calculation:<br>$F = 8.99\times10^{9}\,\text{Nm}^2\text{C}^{-2}\,\dfrac{(0.1\times10^{-6}\,\text{C})^2}{(0.05\text{m})^2}$<br>$F = 0.036\text{N}$ | 2 |

| Question Number | Acceptable answers | | Additional guidance | Mark |
|---|---|---|---|---|
| (c) | • Use of moment = $F x$ | (1) | Show that value gives $3.2 \times 10^{-3}$ Nm and 0.64 W | 4 |
| | • Expression for correct moment | (1) | Example of calculation:<br>Moment<br>$= 0.036\text{N} \times 0.04\text{m} \times 2 = 2.89 \times 10^{-3}\text{Nm}$ | |
| | • Use of power = moment of force x angular velocity | (1) | | |
| | • Only realistic possibility is pond pump and $P = 0.6$W (calculated answer could also be force and then comparison with b(i)) | (1) | $\text{Power} = 2.89 \times 10^{-3}\text{N m} \times 200\text{s}^{-1} = 0.58\text{W}$ | |