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

Mark Schemes

Q1.

Question number	Acceptable answers	Additional guidance	Mark
	An explanation that makes reference to: • Electrons/charge transferred from negatively charged plate to positively charge plate through the resistor **(1)** • Hence the charge on capacitor decreases (exponentially) **(1)** • Until the charge on the capacitor equals 0/negligible **(1)**		**3**

Q2.

Question number	Acceptable answers	Additional guidance	Mark
(b)	• Equate the electric force and the gravitational force **(1)** • Use of E=V/d to obtain $q = mgd/V$ **(1)**	$qE = mg$ $q(V/d) = mg$ $q = mgd/V$	**2**
(c)	An explanation that makes reference to: • Electrostatic/upward force (on drop) would be greater than the weight/downward force **(1)** • So drop would accelerate upwards **(1)**	Indication of which force is greater, unbalanced is insufficient.	**2**

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Q3.

<table>
<tr><th>Question number</th><th>Acceptable answers</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>*</td><td>This question assesses a student's ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning.

Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning.

The following table shows how the marks should be awarded for indicative content.

<table>
<tr><th>Number of indicative marking points seen in answer</th><th>Number of marks awarded for indicative marking points</th></tr>
<tr><td>6</td><td>4</td></tr>
<tr><td>5–4</td><td>3</td></tr>
<tr><td>3–2</td><td>2</td></tr>
<tr><td>1</td><td>1</td></tr>
<tr><td>0</td><td>0</td></tr>
</table>
</td><td>Guidance on how the mark scheme should be applied:
The mark for indicative content should be added to the mark for lines of reasoning. For example, an answer with five indicative marking points which is partially structured with some linkages and lines of reasoning scores 4 marks (3 marks for indicative content and 1 mark for partial structure and some linkages and lines of reasoning).
If there are no linkages between points, the same five indicative marking points would yield an overall score of 3 marks (3 marks for indicative content and no marks for linkages).</td><td></td></tr>
</table>

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<table>
<tr><th>Question number</th><th>Acceptable answers</th><th>Additional guidance</th><th>Mark</th></tr>
<tr><td>* (continued)</td><td>The following table shows how the marks should be awarded for structure and lines of reasoning.
<table>
<tr><td></td><td>Number of marks awarded for structure of answer and sustained line of reasoning</td></tr>
<tr><td>Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout</td><td>2</td></tr>
<tr><td>Answer is partially structured with some linkages and lines of reasoning</td><td>1</td></tr>
<tr><td>Answer has no linkages between points and is unstructured</td><td>0</td></tr>
</table></td><td></td><td></td></tr>
</table>

Question number	Acceptable answers	Additional guidance	Mark
* (continued)	**Indicative content** • At terminal velocity the forces on the drop are balanced **OR** weight = drag • The p.d. creates an electrostatic force acting upwards on the drop • The electrostatic force increases as p.d. increases • The net upward force causes the drop to have a negative acceleration • As speed decreases the drag decreases • The drop remains stationary when the forces are balanced **OR** until the drop remains stationary when weight = electrostatic force		**6**

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Q4.

Question Number	Acceptable answers	Additional guidance	Mark
i	• Use of $\ln V = \ln V_o - \frac{t}{RC}$ (1) • Substitution $V = 2.0$ V and $V_o = 8.0$ V (1) • $t = 5.6(1)$ ms (1)	Alternative use of $V = V_o e^{-\frac{t}{RC}}$ Rearrange to $\ln 4 = t / 2700\ \Omega \times 1.5 \times 10^{-6} F$ Example of calculation $t = 2700\ \Omega \times 1.5 \times 10^{-6}$ F $(\ln 8 - \ln 2)$ $t = 5.61$ ms	3
ii	• Use of $W = ½\ CV^2$ (1) • $W = 3.0 \times 10^{-6}$ J (1)	Example of calculation $W = \frac{1}{2} 1.5 \times 10^{-6}$F $\times 2^2$ V$^2 = 3.0 \times 10^{-6}$ J	2

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