

Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 7_ Electric Field

Name of the Student: _____

Max. Marks : 21 Marks

Time : 21 Minutes

Mark Schemes

Q1.

Question Number	Acceptable answers	Additional guidance	Mark
(i)	<ul style="list-style-type: none"> $Q = CV$ Or $E10 = C10 * C$ (1) where $C = 0.001$ (F) (1) MP2 dependent on MP1		2
(ii)	<ul style="list-style-type: none"> $I = \Delta Q / \Delta t$ Or $G11 = F11 / B11$ (1) 		1
(iii)	<ul style="list-style-type: none"> Use of $W = \frac{1}{2} CV^2$ Or (1) $W = \frac{1}{2} QV$ Or $W = \frac{1}{2} \frac{Q^2}{C}$ (1) $W = 0.0125$ J 	<u>Example of calculation</u> $W = \frac{1}{2} 0.001 \text{ F} \times 5^2 \text{ V}^2 = 0.0125 \text{ J}$ $W = \frac{1}{2} 0.005 \text{ C} \times 5 \text{ V} = 0.0125 \text{ J}$	2

Question Number	Acceptable Answers	Additional Guidance	Mark												
*	<p>This question assesses a student's ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning.</p> <p>Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning.</p> <p>The following table shows how the marks should be awarded for indicative content.</p> <table border="1" data-bbox="368 770 790 1323"> <thead> <tr> <th data-bbox="368 770 571 994">Number of indicative marking points seen in answer</th> <th data-bbox="571 770 790 994">Number of marks awarded for indicative marking points</th> </tr> </thead> <tbody> <tr> <td data-bbox="368 994 571 1055">6</td> <td data-bbox="571 994 790 1055">4</td> </tr> <tr> <td data-bbox="368 1055 571 1122">5 - 4</td> <td data-bbox="571 1055 790 1122">3</td> </tr> <tr> <td data-bbox="368 1122 571 1189">3 - 2</td> <td data-bbox="571 1122 790 1189">2</td> </tr> <tr> <td data-bbox="368 1189 571 1256">1</td> <td data-bbox="571 1189 790 1256">1</td> </tr> <tr> <td data-bbox="368 1256 571 1323">0</td> <td data-bbox="571 1256 790 1323">0</td> </tr> </tbody> </table>	Number of indicative marking points seen in answer	Number of marks awarded for indicative marking points	6	4	5 - 4	3	3 - 2	2	1	1	0	0	<p>Guidance on how the mark scheme should be applied:</p> <p>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).</p>	
Number of indicative marking points seen in answer	Number of marks awarded for indicative marking points														
6	4														
5 - 4	3														
3 - 2	2														
1	1														
0	0														

The following table shows how the marks should be awarded for structure and lines of reasoning.

	Number of marks awarded for structure of answer and sustained line of reasoning
Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout	2
Answer is partially structured with some linkages and lines of reasoning	1
Answer has no linkages between points and is unstructured	0

(6)

Indicative content

- the capacitor can be charged to a higher p.d. than that of the battery
- storing larger amount of energy on capacitor as predicted by $E = \frac{1}{2} CV^2$
- with a low resistance in the bulb the capacitor discharges rapidly
- this produces enough power, $P = W/t$ to produce the flash
- use of $T = RC$ to estimate a value for T (1 ms)
- comparison of time constant with 4 ms

Example of calculation:

$$T = 6 \Omega \times 185 \mu\text{F} = 1.1 \text{ ms}$$

Accept $5T > 4 \text{ ms}$

Q3.

Question Number	Acceptable Answers	Additional guidance	Mark
	<ul style="list-style-type: none"> tangent at correct point (1) triangle with base at least 0.4 m (1) $5.3 \times 10^6 \text{ (Vm}^{-1}\text{)}$ (range 4.9×10^6 to 6.1×10^6) (1) So would ionise as value greater than 3×10^6 (1) <p>Alternative:</p> <ul style="list-style-type: none"> Correct value of V at 30 cm (1) Use of $E = k \frac{Q}{r^2}$ and $V = k \frac{Q}{r}$ (1) $5.3 \times 10^6 \text{ (Vm}^{-1}\text{)}$ (1) So would ionise as value greater than 3×10^6 (1) 	<p>Example of calculation:</p> <p>Gradient = $3200000 / 0.6$</p> <p>$E = 5.3 \times 10^6 \text{ V m}^{-1}$</p> <p>MP4 to be consistent with calculated value</p> <p>$V = 1.6 \times 10^6 \text{ V m}^{-1}$</p>	4

Q4.

Question Number	Acceptable Answer	Additional Guidance	Mark
	<ul style="list-style-type: none"> So that the lightning makes contact with the conductor rather than the statue (1) 		1

Q5.

Question Number	Acceptable Answer	Additional Guidance	Mark
(i)	<ul style="list-style-type: none"> Use of $F = BQv$ and $F = EQ$ (1) Algebra to show $v = \frac{E}{B}$ (1) 		2
(ii)	<ul style="list-style-type: none"> Use of $W = QV$ and $E_k = \frac{1}{2}mv^2$ (1) Use of $v = \frac{E}{B}$ (1) $\frac{e}{m} = 1.7 \times 10^{11} \text{ C kg}^{-1}$ (1) 	<p>Example of calculation:</p> $v = \frac{E}{B} = \frac{1.4 \times 10^4 \text{ V m}^{-1}}{1.5 \times 10^{-3} \text{ T}} \quad \frac{e}{m} = \frac{v^2}{2V}$ $\frac{e}{m} = \frac{(9.33 \times 10^6 \text{ m s}^{-1})^2}{2 \times 250 \text{ V}} = 1.74 \times 10^{11} \text{ C kg}^{-1}$	3