Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 7_ Electric Field 2

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Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Mark Schemes

Q1.

Question Number	Answer		Mark
(a)	(Electric field strength (at a point in a field) is) the force per unit charge	(1)	
	(accept force per coulomb of charge)	(1)	2
	Acting on a (small) positive charge.		
(b)(i)	Use of $E = kQ/r^2$	(1)	
	Electric field due to $Q_1 = 4.1(1) \times 10^6$ (N C^{-1})	(1)	
	Use of 11.9 cm to find field due to Q_2	(1)	
	Or		
	Use of $E = kQ/r^2$	(1)	
	Use of $E1 / E2 = Q1\ r22 / Q2\ r12$	(1)	
	$E_1 / E_2 = 1$	(1)	3
	Example of calculation Electric field due to Q_1 $= (8.99 \times 10^9$ N m^2 $C^{-2}) \times (3 \times 10^{-6}$ C) / $(8.1 \times 10^{-2})^2$ $= 4.11 \times 10^6$ N C^{-1} Electric field due to Q_2 $= (8.99 \times 10^9$ N m^2 $C^{-2}) \times (6.5 \times 10^{-6}$ C) / $(11.9 \times 10^{-2})^2$ $= 4.13 \times 10^6$ N C^{-1}		
(b)(ii)	(Force on charge is) zero/negligible/approx zero (Allow values less than 0.1 N)	(1)	1
(b)(iii)	At midpoint repulsive force due to Q_2 > repulsive force due to Q_1 **Or** the resultant field/force is repulsive	(1)	
	Work must be done against the repulsive force/field to move the charge to this position.	(1)	2
	Total for question		**8**

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Q2.

Question number	Acceptable answers	Additional guidance	Mark
(i)	• use of $F = Q_1Q_2/4\pi\varepsilon_0 r^2$ **(1)** • use of $F = Gm_1m_2/r^2$ **(1)** • Expresses forces as a ratio **(1)** **OR** calculates the individual forces $F_e = 8.1 \times 10^{-8}$ N $F_g =$ • 3.6×10^{-47} N **(1)** • Ratio = 2×10^{39} or 5×10^{-40} and identifies gravitational force as insignificant **(1)**		**4**
(ii)	• use of $F = mv^2/r$ and $F = Q_1Q_2/4\pi\varepsilon_0 r^2$ **(1)** • to derive $v = \sqrt{\frac{Q_1Q_2}{4\pi\epsilon_0 rm}}$ **(1)** • velocity = 2.2×10^6 m s^{-1} **(1)**	Example of calculation: $v = \sqrt{\frac{Q_1Q_2}{4\pi\epsilon_0 rm}}$ $v = \sqrt{\frac{1.6\times10^{-19}\,\text{C}\times1.6\times10^{-19}\,\text{C}}{4\pi\times8.85^{-12}\,\text{Fm}^{-1}\times5.3\times10^{-11}\text{m}\times9.1\times10^{-31}\,\text{kg}}}$ $v = 2.185 \times 10^6$ m s^{-1}	**3**

Q3.

Question Number	Acceptable answers	Additional guidance	Mark
(i)	• $Q = CV$ **Or** E10 = C10 * C **(1)** • where $C = 0.001$ (F) **(1)** MP2 dependent on MP1		**2**
(ii)	• $I = \Delta Q / \Delta t$ **Or** G11 = F11 / B11 **(1)**		**1**
(iii)	• Use of $W = \frac{1}{2}CV^2$ **Or** $W = ½\,QV$ **Or** $W = \frac{1}{2}\frac{Q^2}{C}$ **(1)** • $W = 0.0125$ J **(1)**	Example of calculation $W = \frac{1}{2}0.001\,\text{F} \times 5^2\,\text{V}^2 = 0.0125$ J $W = \frac{1}{2}0.005\text{C}\times5\text{V} = 0.0125$ J	**2**

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