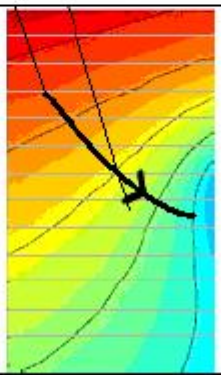
Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

Q1.

Question Number	Answer		Mark
(a)	Arrow(s) downwards	**(1)**	**1**
(b)	Use of $E = V/d$ Use of $F = EQ$ $F = 5.1 \times 10^{-16}$ N Example of calculation $F = (160\ \text{V} \times 1.6 \times 10^{-19}\ \text{C}) / 5.0 \times 10^{-2}\ \text{m}$ $F = 5.12 \times 10^{-16}$ N	**(1)** **(1)** **(1)**	**3**
(c)	Between the plates there is an acceleration/force which is vertical/upwards Constant horizontal velocity Outside the plates no (electric) field /force acts **Or** Outside the plates speed so large that gravitational effect negligible	**(1)** **(1)** **(1)**	**3**
(d)(i)	Release of (surface) electrons due to heating	**(1)**	**1**
(d)(ii)	Use of $E_k = \frac{1}{2}mv^2$ Use of $V = W/Q$ p.d. = 410 V Example of calculation $E_k = 9.11 \times 10^{-31}\ \text{kg} \times (1.2 \times 10^{7}\ \text{m s}^{-1})^2/2$ $E_k = 6.56 \times 10^{-17}$ J p.d. $= (6.56 \times 10^{-17}\ \text{J})/(1.6 \times 10^{-19}\ \text{C})$ p.d. = 410V	**(1)** **(1)** **(1)**	**3**
	Total for question		**11**

Q2.

Question Number	Acceptable answers		Additional guidance	Mark
(i)	• States a value of ΔV	(1)		(3)
	• Uses $\Delta V/\Delta d$ with a difference in distance	(1)		
	• $E = 560$ V m^{-1} allow range 500-560 V m^{-1}	(1)	Example of calculation: $E = \frac{(80-75)V}{0.009m} = 556$ V m^{-1} (Alt: 5.6 V cm^{-1})	
(ii)	• Line perpendicular to a least 2 equipotential lines	(1)		(2)
	• Arrow pointing towards flower	(1)		
(iii)	• States $V \times r$ = constant	(1)	Example of calculation: Using $V = 95$ and $r = 2.0 - 2.2$: $Vr = 190 - 209$ $V = 90$ and $r = 2.1 - 2.5$: $Vr = 189 - 225$ $V = 85$ and $r = 2.5 - 2.8$: $Vr = 212 - 238$ $V = 80$ and $r = 3.5 - 3.8$: $Vr = 280 - 304$ $V = 75$ and $r = 4.3 - 4.7$: $Vr = 323 - 353$ $V = 70$ and $r = 5.8 - 6.2$: $Vr = 406 - 434$ Using $r = 3$ and $V = 82-83$: $Vr = 246-249$ $r = 4$ and $V = 77-78$: $Vr = 308-312$ $r = 5$ and $V = 72-73$: $Vr = 360-365$	(3)
	• One corresponding pair of values of V and r	(1)		
	• At least two pairs of values used to show that the product is not constant therefore not radial (MP3 dependent on MP2)	(1)		