

Question Number	Answer	Mark
17(a)	<p>At least 4 radial straight lines, from surface of sphere (1)</p> <p>Equal spacing (1)</p> <p>Arrows outward (1)</p>	3
17(b)(i)	<p>Use of $V = \frac{Q}{4\pi\epsilon_0 r}$ (1)</p> <p>$Q = 1.1 \times 10^{-8} \text{ (C)}$ (1)</p> <p><u>Example of calculation</u> $5000 \text{ V} = 8.99 \times 10^9 \text{ Nm}^2\text{C}^{-2} \times \frac{Q}{0.02 \text{ m}}$ $Q = 1.1 \times 10^{-8} \text{ C}$</p>	2
17(b)(ii)	<p>Use of $E = V/d$ (1)</p> <p>Use of $F = EQ$ (1)</p> <p>$F = 5.2 \times 10^{-4} \text{ N}$ (e.c.f from (b)(i)) (1)</p> <p><u>Example of calculation</u> $E = 5000 \text{ V} \div 0.105 \text{ m} = 47\,600 \text{ V m}^{-1}$ $F = 47\,600 \text{ V m}^{-1} \times 1.1 \times 10^{-8} \text{ C}$ $F = 5.24 \times 10^{-4} \text{ N}$</p>	3
17(b)(iii)	<p>Use of $W = mg$ (1)</p> <p>Use of suitable trigonometry, such as $\tan \theta = F/W$ (1)</p> <p>$\theta = 1.1(^{\circ})$ (e.c.f from (b)(i) and (b)(ii)) (1)</p> <p><u>Example of calculation</u> $W = 0.0027 \text{ kg} \times 9.81 \text{ N kg}^{-1} = 0.0265 \text{ N}$ $\tan \theta = 5.24 \times 10^{-4} \text{ N} / 0.0265 \text{ N} = 0.0198$ $\theta = 1.13^{\circ}$</p>	3
17(c)	<p>Use of $F = \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2}$ (1)</p> <p>with $Q_1 = Q_2 = 1.2 \times 10^{-8} \text{ C}$ (1)</p> <p>$r = 0.051 \text{ m}$ (1)</p> <p><u>Example of calculation</u> $5.0 \times 10^{-4} \text{ N}$ $= \frac{8.99 \times 10^9 \text{ Nm}^2\text{C}^{-2} \times 1.2 \times 10^{-8} \text{ C} \times 1.2 \times 10^{-8} \text{ C}}{r^2}$ $r = 0.051 \text{ m}$</p>	3
Total for question 17		14