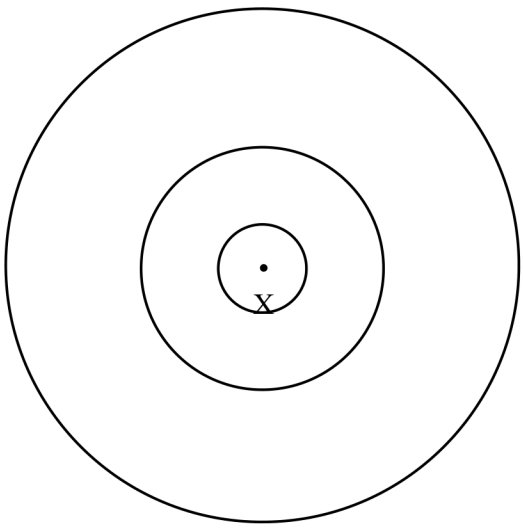
Question Number	Answer	Mark
12(a)	Circles with point X at centre (at least 2) **(1)** Increasing spacing with increasing distance from centre (at least 3) **(1)**  	**2**
12(b)	Use of $F = \frac{Q_1 Q_2}{4\pi\varepsilon_0 r^2}$ (accept use of $F = \frac{k\,Q_1 Q_2}{r^2}$) **(1)** F = 1.8×10^{-4} N **(1)** Example of calculation $F = \frac{-4.5 \times 10^{-9}\ \text{C} \times 7.0 \times 10^{-9}\ \text{C}}{4\pi \times 8.85 \times 10^{-12}\ \text{F m}^{-1} \times (0.040\ \text{m})^2}$ F = (−) 1.77×10^{-4} N	**2**
12(c)	Use of $V = \frac{Q}{4\pi\varepsilon_0 r}$ (accept use of $V = \frac{kQ}{r}$) and $V = \frac{W}{Q}$ **(1)** Subtract *W* at 9.0 cm from *W* at 4.0 cm **Or** Subtract *V* at 9.0 cm from *V* at 4.0 cm **(1)** Work done = 3.9×10^{-6} J **(1)** Example of calculation $W = \frac{-4.5 \times 10^{-9}\ \text{C} \times 7.0 \times 10^{-9}\ \text{C}}{4\pi \times 8.85 \times 10^{-12}\ \text{F m}^{-1} \times 0.040\ \text{m}}$ $\frac{-4.5\ \text{nC} \times 7.0\ \text{nC}}{4\pi \times 8.85 \times 10^{-12}\ \text{F m}^{-1} \times 0.09\ \text{m}}$ = -3.15×10^{-6} J − − 7.08×10^{-6} J Work done = 3.93×10^{-6} J	**3**
	Total for question 12	**7**