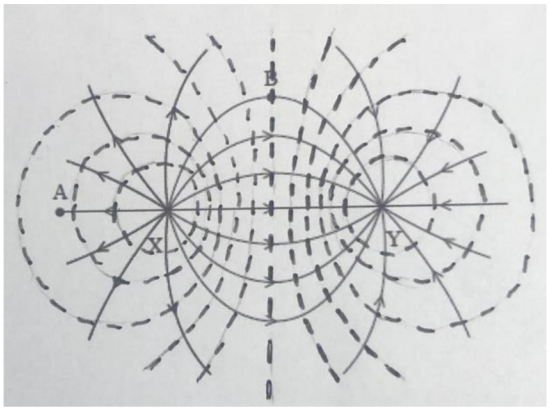
Question Number	Answer	Mark
16 (a)	• Use of $E = Q / 4\pi\varepsilon_0 r^2$ **Or** Use of $E = kQ / r^2$ (1) • Adds E due to X to E due to Y (1) • $E = 2.8 \times 10^6$ V m^{-1} (1) Example of calculation E due to X = 2.5×10^{-7} C / $4 \times \pi \times 8.85 \times 10^{-12}$ F m $^{-1}$ $\times$ $(4.0 \times 10^{-2}$ m$)^2$ = 1.4×10^6 V m^{-1} (towards Y) E due to Y = 2.5×10^{-7} C / $4 \times \pi \times 8.85 \times 10^{-12}$ F m $^{-1}$ $\times$ $(4.0 \times 10^{-2}$ m$)^2$ = 1.4×10^6 V m^{-1} (towards Y) $E = 1.4 \times 10^6$ V m^{-1} + 1.4×10^6 V m^{-1} = 2.8×10^6 V m^{-1}	**3**
16 (b) (i)	• Central straight line equidistant from X and Y **and** at least one of the diverging lines between X and the central line **and** at least one of the diverging lines between the central line and Y (1) • At least one line looping X **and** one line looping Y (1) • Line spacing between X and Y smaller than line spacing to the left of X **and** to the right of Y (1) Example of diagram 	**3**

16 (b) (ii)	• Field lines show direction of force on a (positive) charge (1) • (So) field line shows the direction of acceleration (1) • Point A - Where the line is straight, a charge (initially at rest) will follow the line, so true in this case (1) • Point B - Curved line means acceleration always changing direction but velocity is not in the direction of acceleration so statement not true (1)	**4**
16 (c)	• Use of $V = Q / 4\pi\varepsilon_0 r$ **Or** Use of $V = kQ / r$ (1) • Applies potential at each point is sum of potential due to charge at X and potential due to charge at Y (1) • Applies p.d. = sum of potentials at D – sum of potentials at C (1) • $V = (-)\ 2.0 \times 10^5$ V (1) <u>Example of calculation</u> V_C due to X= 5.0×10^{-7} C / $4 \times \pi \times 8.85 \times 10^{-12}$ F m $^{-1}$ × 2.5×10^{-2} m = 1.8×10^5 V V_D due to X= 5.0×10^{-7} C / $4 \times \pi \times 8.85 \times 10^{-12}$ F m $^{-1}$ × 5.5×10^{-2} m = 0.8×10^5 V V_D due to Y= -5.0×10^{-7} C / $4 \times \pi \times 8.85 \times 10^{-12}$ F m $^{-1}$ × 2.5×10^{-2} m = -1.8×10^5 V V_C due to Y = -5.0×10^{-7} C / $4 \times \pi \times 8.85 \times 10^{-12}$ F m $^{-1}$ × 5.5×10^{-2} m = -0.8×10^5 V $V_C = 1.8 \times 10^5$ V $- 0.8 \times 10^5$ V $= 1.0 \times 10^5$ V $V_D = -1.8 \times 10^5$ V $+ 0.8 \times 10^5$ V $= -1.0 \times 10^5$ V $V_{CD} = V_D - V_C$ $= -1.0 \times 10^5$ V $- 1.0 \times 10^5$ V $= -2.0 \times 10^5$ V	**4**
	Total for Question 16	**14**