16 A point positive charge and a point negative charge are placed 8.0 cm apart at X and Y, as shown.

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X

•
Y

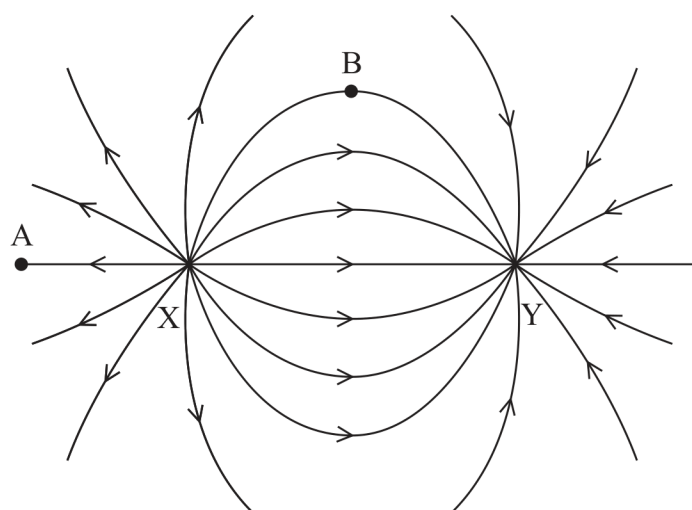(a) Calculate the magnitude of the electric field strength midway between X and Y.

charge at X = + 2.5 × 10^{-7} C
charge at Y = – 2.5 × 10^{-7} C

(3)

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Electric field strength = ...

(b) The diagram below represents the electric field for this combination of charges.

(i) Add dashed lines to the electric field diagram to show equipotentials for this combination of charges.

(3)

(ii) A textbook states, "An electric field line shows the path a free positive test charge follows".

Discuss the accuracy of this statement for free positive test charges placed at point A and at point B.

(4)

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(c) The charges at X and Y are replaced by charges of twice the magnitude.

$$\xleftarrow{\hspace{4cm}} 8.0\,cm \xrightarrow{\hspace{4cm}}$$

$$\xleftarrow{\hspace{1.5cm}} 2.5\,cm \xrightarrow{\hspace{1.5cm}} \qquad\qquad \xleftarrow{\hspace{1.5cm}} 2.5\,cm \xrightarrow{\hspace{1.5cm}}$$

X   C   D   Y
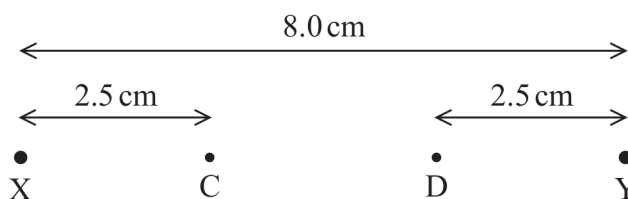
C and D are points between the charges.

Determine the magnitude of the potential difference between points C and D.

charge at X $= +5.0 \times 10^{-7}\,C$
charge at Y $= -5.0 \times 10^{-7}\,C$

(4)

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Magnitude of potential difference = ...

(Total for Question 16 = 14 marks)