Solutions

Each answer shows the steps, then the **result**.

2.1

$$E = \frac{F}{q} = \frac{0.10\ \text{N}}{2.0 \times 10^{-6}\ \text{C}}$$

- $E = \mathbf{5.0 \times 10^{4}}\ \text{N C}^{-1}$

2.2

- radially outward, away from the charge

2.3

$$E = k\frac{q}{r^2} = (8.99 \times 10^{9}\ \text{N m}^2\,\text{C}^{-2})\frac{4.0 \times 10^{-6}\ \text{C}}{(0.20\ \text{m})^2}$$

- $E = \mathbf{9.0 \times 10^{5}}\ \text{N C}^{-1}$

3.1 B

- force per unit charge.

3.2 B

- toward it.

3.3

(a)

- field of a point charge, with $q = 6.0 \times 10^{-6}$ C:

$$E = k\frac{q}{r^2} = (8.99 \times 10^{9}\ \text{N m}^2\,\text{C}^{-2})\frac{6.0 \times 10^{-6}\ \text{C}}{(0.30\ \text{m})^2}$$

- $E = \mathbf{6.0 \times 10^{5}}\ \text{N C}^{-1}$

(b)

- away from the charge (radially outward)

3.4

(a)

- $E = \dfrac{kq}{r^2} = \dfrac{(8.99 \times 10^{9})(4.0 \times 10^{-6})}{(0.30)^2} = \mathbf{4.0 \times 10^{5}}\ \text{N C}^{-1}$

(b)

- the fields (right and up) are at right angles: $E = \sqrt{2}\,(4.0 \times 10^{5}) = \mathbf{5.7 \times 10^{5}}\ \text{N C}^{-1}$ at 45° above the right

3.5 A

- charges in a conductor move until the field inside is zero, which leaves the excess charge on the surface; an insulator can hold charge inside

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