Problems

18.1 Electrical Charges, Conservation of Charge, and Transfer of Charge   25.

A dust particle acquires a charge of -13 nC. How many excess electrons does it carry?

    a. 20.8×10^{-28} electrons
    b. $20.8 \times ^{-19}$ electrons
    c. 8.1×10^{10} electrons
    d. 8.1×10^{19} electrons

26.

Two identical conducting spheres are charged with a net charge of $+5.0$ q on the first sphere and a net charge of -8.0 q on the second sphere. The spheres are brought together, allowed to touch, and then separated. What is the net charge on each sphere now?

    a. $-3.0q$
    b. $-1.5q$
    c. $+1.5q$
    d. $+3.0q$

18.2 Coulomb's law   27.

Two particles with equal charge experience a force of 10 nN when they are 30 cm apart. What is the magnitude of the charge on each particle?

    a. -5.8 $\times$ 10^{-10} C
    b. -3.2 $\times$ 10^{-10} C
    c. +3.2 $\times$ 10^{-10} C
    d. +1.4 $\times$ 10^{-5} C

28.

Three charges are on a line. The left charge is $q_1 = 2.0$ nC . The middle charge is $q_2 = 5.0$ nC . The right charge is $q_3 = -3.0$ nC . The left and right charges are 2.0 cm from the middle charge. What is the force on the middle charge?

    a. -5.6×10^{-4} N to the left
    b. -1.12×10^{-4} N to the left
    c. $+1.12 \times 10^{-4}$ N to the right
    d. 5.6×10^{-4} N to the right

18.3 Electric Field   29.

An electric field $(15 \text{ N/C})\hat{z}$ applies a force $(-3 \times 10^{-6} \text{ N})\hat{z}$ on a particle. What is the charge on the particle?

    a. -2.0×10^{-7} C

b. 2.0×10^{-7} C
c. 2.0×10^{-8} C
d. 2.0×10^{-9} C

30.

Two uniform electric fields are superimposed. The first electric field is $\vec{E}_1 = (14 \text{ N/C})\hat{x}$. The second electric field is $\vec{E}_2 = (7.0 \text{ N/C})$. With respect to the positive x axis, at which angle will a positive test charge accelerate in this combined field?

a. 27°
b. 54°
c. 90°
d. 108°

18.4 Electric Potential 31.

You move a charge q from $r_\text{i} = 20$ cm to $r_\text{f} = 40$ cm from a fixed charge $Q = 10$ nC. What is the difference in potential for these two positions?

a. -2.2×10^2 V
b. -1.7×10^3 V
c. -2.2×10^4 V
d. -1.7×10^2 V

32.

How much work is required from an outside agent to move an electron from $x_\text{i} = 0$ to $x_\text{f} = 20$ cm in an electric field $(50\text{N/C})\hat{x}$?

a. 1.6×10^{-15} J
b. 1.6×10^{-16} J
c. 1.6×10^{-20} J
d. 1.6×10^{-18} J

18.5 Capacitors and Dielectrics 33.

A 4.12 μF parallel-plate capacitor has a plate area of 2,000 cm^2 and a plate separation of 10 μm . What dielectric is between the plates?

a. 1, the dielectric is strontium titanate
b. 466, the dielectric is strontium
c. 699, the dielectric is strontium nitrate
d. 1,000, the dielectric is strontium chloride

34.

What is the capacitance of a metal sphere of radius R?

a. C = \frac{R}{k}

b. $C = \frac{k}{R}$
c. $C = \frac{V}{Q}$
d. $C = QV$