

PRACTICE A

Coulomb's Law

1. A balloon rubbed against denim gains a charge of $-8.0\ \mu\text{C}$. What is the electric force between the balloon and the denim when the two are separated by a distance of 5.0 cm? (Assume that the charges are located at a point.)
2. Two identical conducting spheres are placed with their centers 0.30 m apart. One is given a charge of $+12 \times 10^{-9}\ \text{C}$ and the other is given a charge of $-18 \times 10^{-9}\ \text{C}$.
 - a. Find the electric force exerted on one sphere by the other.
 - b. The spheres are connected by a conducting wire. After equilibrium has occurred, find the electric force between the two spheres.
3. Two electrostatic point charges of $+60.0\ \mu\text{C}$ and $+50.0\ \mu\text{C}$ exert a repulsive force on each other of 175 N. What is the distance between the two charges?

Resultant force on a charge is the vector sum of the individual forces on that charge

Frequently, more than two charges are present, and it is necessary to find the net electric force on one of them. As demonstrated in Sample Problem A, Coulomb's law gives the electric force between any pair of charges. Coulomb's law also applies when more than two charges are present. Thus, the resultant force on any single charge equals the vector sum of the individual forces exerted on that charge by all of the other individual charges that are present. This is an example of the *principle of superposition*. Once the magnitudes of the individual electric forces are found, the vectors are added together exactly as you learned earlier. This process is demonstrated in Sample Problem B.

Why it Matters

Conceptual Challenge

1. Electric Force

The electric force is significantly stronger than the gravitational force. However, although we feel our attraction to Earth by gravity, we do not usually feel the effects of the electric force. Explain why.

2. Electrons in a Coin

An ordinary nickel contains about 10^{24} electrons, all repelling one another. Why don't these electrons fly off the nickel?

3. Charged Balloons

When the distance between two negatively charged balloons is doubled, by what factor does the repulsive force between them change?

