CHAPTER 16 Highlights

KEY TERMS

electrical conductor (p. 561)

electrical insulator (p. 561)

induction (p. 562)

electric field (p. 572)

PROBLEM SOLVING

See **Appendix D: Equations** for a summary of the equations introduced in this chapter. If you need more problem-solving practice, see **Appendix I: Additional Problems.**

Diagram Symbols

Positive charge	$+q$
Negative charge	$-q$
Electric field vector	**E**
Electric field lines	

KEY IDEAS

Section 1 Electric Charge

- There are two kinds of electric charge: positive and negative. Like charges repel, and unlike charges attract.
- Electric charge is conserved.
- The fundamental unit of charge, *e*, is the magnitude of the charge of a single electron or proton.
- Conductors and insulators can be charged by contact. Conductors can also be charged by induction. A surface charge can be induced on an insulator by polarization.

Section 2 Electric Force

- According to Coulomb's law, the electric force between two charges is proportional to the magnitude of each of the charges and inversely proportional to the square of the distance between them.
- The electric force is a field force.
- The resultant electric force on any charge is the vector sum of the individual electric forces on that charge.

Section 3 The Electric Field

- An electric field exists in the region around a charged object.
- Electric field strength depends on the magnitude of the charge producing the field and the distance between that charge and a point in the field.
- The direction of the electric field vector, **E,** is the direction in which an electric force would act on a positive test charge.
- Field lines are tangent to the electric field vector at any point, and the number of lines is proportional to the magnitude of the field strength.

Variable Symbols

Quantities		Units		Conversions
$F_{electric}$	electric force	N	newtons	$= \text{kg} \bullet \text{m/s}^2$
q	charge	C	coulomb (SI unit of charge)	$= 6.3 \times 10^{18}\ e$
		e	fundamental unit of charge	$= 1.60 \times 10^{-19}$ C
k_C	Coulomb constant	$\text{N} \bullet \frac{\text{m}^2}{\text{C}^2}$	newtons $\times \frac{\text{meters}^2}{\text{coulombs}^2}$	$= 8.99 \times 10^9\ \text{N} \bullet \text{m}^2$
E	electric field strength	N/C	newtons/coulomb	