TERMS

Be able to define or discuss the following terms with their SI units, if any.

1. (electric) charge
2. (electric) current
3. electron
4. proton
5. neutron
6. conservation of charge
7. quantization of charge
8. conductor
9. insulator
10. semiconductor
11. Coulomb's law Eq. (21.2)
12. electric constant ε_0
13. electric field $\vec{E}$
14. electric field line
15. electric dipole
16. electric dipole moment $\vec{p}$

EQUATIONS

Understand the meaning and know the SI units of all the symbols in these equations—and be able to use the equations to solve problems. (The metric prefixes are on appendix page A-8 and an end paper in your textbook.)

1. Eq. (21.2)
2. Eqs. (21.3) and (21.4)
3. Eq. (21.6)
4. $p = |q|r$ [our version of Eq. (21.14)]
5. Eq. (21.16) [Eq. (21.15) gives the mathematical evaluation of the torque's magnitude]
6. Eq. (21.18) [Eq. (21.17) gives the mathematical evaluation of Eq. (21.18)]

SKILLS

Use the material in these sections to be able to:

1. describe how objects are charged.
2. distinguish between conductors, semiconductors, and insulators in terms of their free charge carriers.
3. explain how charged objects and neutral objects attract one another.
4. determine the directions of electric forces and electric fields from the signs of the charges.
5. for point charges, perform the vector addition of forces and fields to obtain the resultant forces and fields.
6. explain how one charge exerts an electric force on another charge by means of an electric field.
7. explain that, for a continuous charge distribution, its electric field $\vec{E}$ can be determined by first finding $d\vec{E}$ for a general dQ, then performing a vector integral of that expression for $d\vec{E}$.
8. find the direction of the electric dipole moment $\vec{p}$ (it's from the minus charge to the plus charge) .
9. find the direction of the electric torque $\vec{\tau}$ on an electric dipole (see the vector product direction in the next skill).
10. find the *magnitude* of $\vec{C} = \vec{A} \times \vec{B}$, $C = AB \sin \phi$ (where ϕ is the angle that is $\leq 180^\circ$ between $\vec{A}$ and $\vec{B}$ **;** and the *direction* of $\vec{C} = \vec{A} \times \vec{B}$. (Point the fingers of your *right* hand in the direction of the *first* vector, $\vec{A}$. Then, as in starting to make a fist, curl those fingers through ϕ in the direction of the *second* vector, $\vec{B}$. The vector product $\vec{C}$ is a *third* vector, *perpendicular to both* $\vec{A}$ and $\vec{B}$ in the direction of your extended right thumb.)

(Please check your ability to use this right-hand rule with the videos at phys242.ncat.edu.)

Considering this course's prerequisites, you must be able to use algebra, trigonometry, and calculus correctly. Algebraic examples: Using Coulomb's law, you should be able to say what happens to the magnitude of the force if q_1 or q_2 or r is changed by a certain amount. Also, you should be able to solve the Coulomb's law equation for q_1 or q_2, or r.

The harder I worked, the luckier I got. Attributed to various successful persons