# Chapter 18 Summary

Essential Concepts and Formulas

# Charged Objects and Electric Force

- Charge, like mass, is conserved in isolated system
- Like charges repel, opposites attract
- Unit of charge is the coulomb (C)
- e is the charge on a single proton or electron

$$e = 1.60 \times 10^{-19} C$$

# Conductors and Insulators

◆ Conductors are substances that allow electric charges to move relatively easily (like silver)

◆ Insulators are substances that don't allow charges to move easily (like wood)

# Charging by Contact and Induction

◆ Charging by contact is when charged object directly gives another object some charge.

◆ Charging by induction is process by which object can be "induced" to have electric charges, but without touching the charged object

# Coulomb's Law

- Analogous to law of gravitation
- Relates force to the magnitudes of the charges and inversely proportional to square of distance between them
- If more than two charges, net force is vector sum of individual forces

$$F = k \frac{|q_1||q_2|}{r^2}$$

# Electric Field

- Imagine we have a small, positive test charge, $q_o$
- Put this charge in a field created by other charges
- Remember, test charge does NOT affect field or force itself.
- Unit: Newton per Coulomb (N/C)

$$E = \frac{F}{q_0}$$

$$E = k \frac{|q|}{r^2}$$

$$E = \frac{q}{\varepsilon_0 A}$$

For parallel plate capacitor

# Electric Field Lines

- Field, like force, is a vector.
- Always directed away from positive charges and towards negative charges
- Number of lines is proportional to strength of field



field lines

The electric field from an isolated positive charge

The electric field from an isolated negative charge
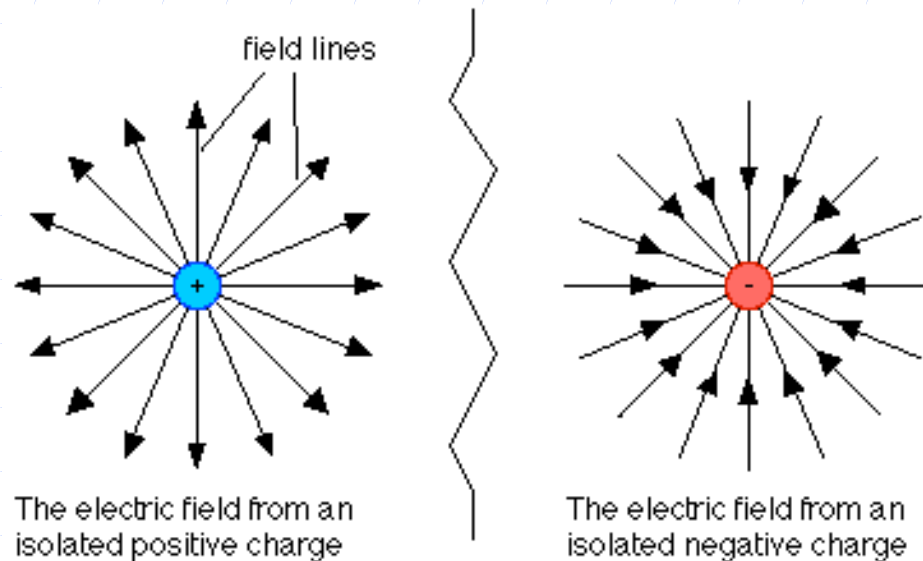
# Summary of Important Equations

$$e = 1.60 \times 10^{-19} C$$

$$F = k \frac{|q_1||q_2|}{r^2}$$

$$k = \frac{1}{4\pi\varepsilon_0}$$

$$E = \frac{F}{q_0}$$

$$E = k \frac{|q|}{r^2}$$