SECTION 2

Capacitance

SECTION OBJECTIVES

- **Relate capacitance to the storage of electrical potential energy in the form of separated charges.**
- **Calculate the capacitance of various devices.**
- **Calculate the energy stored in a capacitor.**

CAPACITORS AND CHARGE STORAGE

A *capacitor* is a device that is used to store electrical potential energy. It has many uses, including tuning the frequency of radio receivers, eliminating sparking in automobile ignition systems, and storing energy in electronic flash units.

An *energized* (or charged) capacitor is useful because energy can be reclaimed from the capacitor when needed for a specific application. A typical design for a capacitor consists of two parallel metal plates separated by a small distance. This type of capacitor is called a *parallel-plate capacitor.* When we speak of *the charge on a capacitor,* we mean the magnitude of the charge on either plate.

The capacitor is energized by connecting the plates to the two terminals of a battery or other sources of potential difference, as **Figure 5** shows. When this connection is made, charges are removed from one of the plates, leaving the plate with a net charge. An equal and opposite amount of charge accumulates on the other plate. Charge transfer between the plates stops when the potential difference between the plates is equal to the potential difference between the terminals of the battery. This charging process is shown in **Figure 5(b).**

Capacitance is the ratio of charge to potential difference

capacitance

the ability of a conductor to store energy in the form of electrically separated charges

The ability of a conductor to store energy in the form of electrically separated charges is measured by the **capacitance** of the conductor. Capacitance is defined as the ratio of the net charge on each plate to the potential difference created by the separated charges.

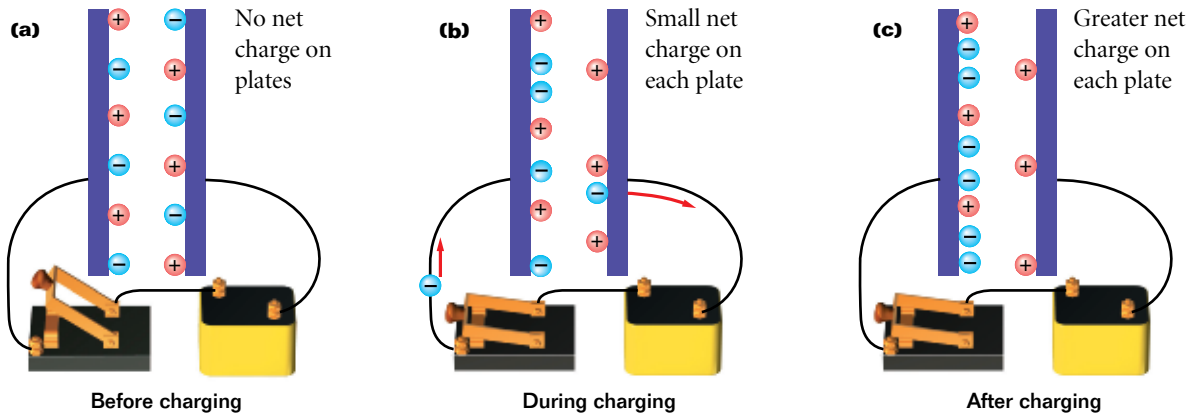

Figure 5
When connected to a battery, the plates of a parallel-plate capacitor become oppositely charged.