Physical Science  
Study Guide

Chapter 13: Electrostatics

1. Introduction to Electrostatics
   1. Definition: the study of the nature, behavior, and uses of static electricity
   2. Static electricity is the simplest form of electricity and was one of the first forms of electricity that humans noticed and studied
   3. The word *electron* comes from the Greek word for amber because amber was used to produce static electricity
   4. Terms
      1. Electricity is the interactions between electrons and other charged particles
      2. Electric field: the region around a charged object in which other objects are attracted or repelled
      3. Coulomb: the SI unit of electric charge
   5. Electrostatic laws
      1. Law of electric charges: opposite charges attract; like charges repel
      2. Coulomb’s law of electric force: the strength of two charges is inversely related to the square of the distance between them (dividing the distance between charges by 4 results in a force 16x stronger)
   6. Electroscope—device used to detect electric charges
2. Transferring charges
   1. Conduction is a permanent sharing of charges through direct contact
   2. Induction is a generally a temporary charge produced by the presence of an electric field
   3. The flow of charges from one place to another is current
      1. Current in gases: can occur as a spark or “leak” slowly into the air
      2. Current in liquids: solutions containing ions can transport electrons between two charged objects
      3. Current in solids: electrons can be transferred from one atom to the next
3. Applications
   1. Electrostatic generators—devices used to produce static electricity
      1. Van de Graaff generator
      2. Lightning storms
         1. Franklin and the kite experiment
         2. The lightning rod
      3. St. Elmo’s Fire
   2. Storing charges
      1. Leyden jar—an early device used to store an electric charge
      2. Capacitor—modern device used to store electric charge
   3. Other applications
      1. Xerography—photocopiers and laser printers
      2. Electrostatic air filters
      3. Car paint