

Static Electricity Review Sheet

Basic Principles:

- Charge is quantized, two types, units are Coulombs (~6 billion billion electrons– 6.24×10^{18})
- Rubber wiped with fur gives a negative charge, glass wiped with silk gives a positive charge
- Like charges repel, unlike charges attract
- Force and field decrease as the square of distance
- Materials are conductors, insulators, or semi-conductors depending on how easily they permit charge to flow
- Objects can be charged by conduction and induction, the charge on a conductor is always arranged on the surface of the conductor
- Both neutral insulators and neutral conductors are attracted to charged objects.
- Coulomb's Law determines electric force, $F = kQq/r^2$ ←note the inverse r^2 relationship like gravitational force. Force, as always, is a vector.
- Electric potential for a point charge is $V = kQ/r$. Electric potential is a scalar. Electric potential is zero at infinity.

Electric Field and Potential

- Electric Field is force/unit charge, produced by potential difference; N/C or V/m
- Field is visualized by field lines.
Field lines:
 1. Start at + charges (source), end at – charges (sink)
 2. Show the direction a + charge would move
 3. Never cross
 4. The density of lines shows field strength (more field lines = stronger field)
 5. Are perpendicular to “equipots”
- Voltage or potential is the potential energy per unit charge
- Potential is high near + charges, low near – charges
- To change potential, one must move along a field line, not perpendicular to one
- $\Delta V = Ed$ (for uniform field or $\bar{E}d$ in general); $W = q\Delta V$ (work)
- A parallel plate capacitor provides a constant electric field which can be used to study field, voltage, force, and energy
- The student should be able to identify where the field is zero, where the potential is zero, where the field is large, where the potential is large + or large – in a distribution of charges