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Course web site available through COD and Toolkit  
or at http://people.virginia.edu/~gdc4k/phys106/spring08

February 8, 2008
Announcements

• THE FIRST QUIZ will be:
  • be Monday, February 18th,
  • given in-class, and roughly 20 minutes in length,
  • multiple choice,
  • cover everything up to and including whatever we get to next week,
  • and will potentially include topics from the book that we have not explicitly covered in class but that are closely related, i.e., I will assume that you have actually read the book.

• Late submittal for Problem Set #1 ends Sunday Night
• Problem Set #2 will be posted early next week.
Conductors and Insulators

- Charge flows relatively freely on conductors.
- Charge flows only against great resistance on insulators.
- Semi-conductors have conductance that can be affected by a number of factors.
Corona Discharge

- Charge tends to accumulate on sharp points.
- Once you get enough charge onto a point, it will start jumping off into the air.
- This is called “corona discharge”.
Charges always distribute themselves so as to maximize the distances between themselves (or more accurately, to achieve the lowest potential energy)

- Charges flow onto conductors and spread themselves out.
- On hollow conductors, charges flow onto the outside surfaces.
van de Graaff generator

- Charge is sprayed onto the belt (using corona discharge).
- Charge is transported into the sphere.
- A conducting “brush” touches the belt and allows the charge to jump off of the belt and flow onto the sphere.
- The voltage builds and builds.
Electrostatic Air Cleaners
Observations about air cleaners

• Dust doesn’t settle quickly on its own.
• Mechanical filters gradually plug up.
• Dust clings to things with static electricity.
• Air cleaners can be based on static electricity.
Here is an example of a simple but very effective electrostatic air cleaner.

- The wire is charged negatively, the inside of the can is charged positively.
Question:

When we pass smoke through a can that is positively charged with a negatively charged wire running down the middle, the smoke disappears. Where did it go?

A. It is deposited on the wire in the middle.
B. It is deposited on the can on the outside.
C. Some is deposited on the wire, and some is deposited on the can.
D. It is dissipated by the high voltage.
Polarizing Objects

- Nearby charges can shift an object’s charges, thereby causing it to be “polarized”.
- Once an object is polarized, it experiences an attraction to the charged object.
An electrostatic air cleaner uses the following phenomena:

- electrostatic polarization,
- corona discharge,
- and coulombic attraction.
Question:

When we pass smoke through a can that is positively charged with a negatively charged wire running down the middle, the smoke disappears. Where did it go?

A. It is deposited on the wire in the middle.
B. It is deposited on the can on the outside.
C. Some is deposited on the wire, and some is deposited on the can.
D. It is dissipated by the high voltage.
Electrostatic precipitator, or air cleaner

Uses the phenomena of electrostatic polarization, corona discharge, and coulombic attraction.