Electric Fields

Equipment

- Computer with Electric Field Hockey program (PhET simulation)
- Various conductors to create different electric field configurations – spheres (hollow), parallel plates etc.
- Electroscope and pith balls for electric field detection
- Van de Graaff generator

Objective

Physics Concepts

- Electric field
- Static charges
- Charge induction

Experimental analysis

- Recognize methods to check concepts
- Recognize the uncertainty in measurements and experimental setups

Conceptual (C-Level)

Two charges are located near each other in space. Assume there are no other charges around.

- Draw the electric field lines for the case where both charges are the same.
- Draw the electric field lines for the case where the charges are equal in magnitude but opposite in sign.

A spherical conducting shell is located in empty space. A charge is placed on the shell.

- Draw the resulting electric field lines.
- Experimentally show that this is true.

EXPLORATIONS:

- Charge a shell and prove that the electric field is zero on the inside.
- Charge other conductor configurations and explore the resulting electric field.

Basic Lab (B-Level)

You will be playing the Electric Field Hockey game today. You need to show solutions for level 1 and 2 as well as for a 3 and 4 charge trap.

- Indicate charges magnitude and signs
- Indicate maximum velocity and force on puck
- Determine a method to calculate the size of the charge on the puck.

Advanced/Extended Lab Ideas (A-Level)

- Charge two parallel plates or other conductor configuration and determine the resulting electric field lines both theoretically and experimentally.
- Determine the charge on a rod by balancing a conductor on an inclined plane.
- Show a mathematical derivation of the dipole pattern.
- Describe in words and pictures the two dimensional topographic charge traps.