Electric Fields and Force

Equipment

- Computer with access to 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

Experimental analysis

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

Conceptual (C-Level)

- Draw the electric field lines for a single positive charge located in empty space (far from any other charges).
- Draw the electric field lines for a single negative charge located in empty space (far from any other charges).

Two charges are located near each other in empty space (far from any other charges).

- 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.

EXPLORATIONS:

- Charge a spherical shell and prove that the electric field is zero on the inside.

Basic Lab (B-Level)

You will be playing the Electric Field Hockey game today. You need to show solutions for both level 1 and level 2. Note: Use a screen capture to store a successful configuration.

- Indicate the number of charges, their magnitudes and signs
- Indicate with an appropriate vector the maximum force on the puck.
- Indicate with an appropriate vector the maximum velocity 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 a two dimensional topographic charge traps.