Static Charges

Equipment

- Electrophorus supplies (tape, Styrofoam plate and cup, Al foil and Al pie plate)
- Leyden Jar supplies (Al foil, water, nail and film canister)
- Various rods and scraps of fur and assorted fabrics
- Van de Graaff generator
- Pith balls or other conducting objects

Objective

Physics Concepts

- Electrostatic force
- Static charges and triboelectric series
- Charge induction

Experimental analysis

- Recognize methods to graph quantities
- Recognize the uncertainty in measurements

Conceptual (C-Level)

A charged plate (held vertically) is brought close to a conducting object hanging vertically from a string. The plate touches the object which causes the object to move horizontally away from the plate so it is now hanging at an angle θ.

- Draw force diagrams for the conducting object before and after it is touched by the charged plate. Note: Before the object is charged assume the plate is far away.
- Determine expressions for every force on your deflected object in your diagram above.

A rubber balloon is blown up, rubbed on a small furry animal and stuck to the ceiling.

- Draw a diagram showing the charge distribution.
- Draw a force diagram for the balloon.

EXPLORATIONS:

Build an electrophorus and use it to explore static electricity.

- Charge a Leyden jar – light a neon lamp
- Deflect objects like pith balls (or try a weak stream of water)

Play with the rods and materials to further explore static electricity and the triboelectric series

Basic Lab (B-Level)

- Determine the product of the charge on both the plate and conducting object. Include the derivation of your equation.
- Draw a series of diagrams showing how the electrophorus transfers charge to the Leyden jar. Use both pictures and words to describe this process.

Advanced/Extended Lab Ideas (A-Level)

- Explore the limitations of your assumption that a plate with charge is equivalent to point charge.
- Determine (and prove) where the "charge' is stored in the Leyden jar.
- Quantify the amount and location of charge transferred to insulators.