Electricity – Lesson 1
Electrostatics
Summer 2004 Cal Poly Pomona

Objective:
To investigate the electrostatic force

Method to be used for all Lessons
We will take the "Scientific Method" approach, which will consist of two parts:
1. Each two-student group will perform experiments and draw conclusions and ideas about the results of the experiments.
2. Each group will discuss their conclusions with the whole class to learn from each other and refine our ideas.

Experiment 1
a. Find a PVC pipe. Slide a string through the center (a paper clip at the end of the string might help). Tie the ends of the string together and hang the pipe from the lab stand on your bench. Use enough string to that the PVC pipe can rotate easily about its center.

b. Take a paper towel, about one square foot, and bring it near one end of the PVC pipe, while the pipe is freely hanging. Write what you observe in your journal.

c. Rub the paper towel vigorously back and forth on one end of the PVC pipe. Let the pipe hang without moving. Now bring the same paper towel near the end of the pipe that was rubbed. Write what you observe in your journal.

d. Rub both the hanging PVC pipe and a PVC pipe from your partner with the paper towel. Let one pipe hang without swinging. Now bring the other PVC pipe near the hanging pipe. Write what you observe in your journal.

When everyone has finished parts a-d, we will discuss our results. Write in your journal the "science" that was learned from the experiments.

Experiment 2
The instructors will tell the class what type of charge is acquired by a PVC pipe when rubbed by a paper towel. You can use the PVC pipe as a reference to find the charge on different objects.

a. PVC pipe _____ and paper towel _____

Below are pairs of materials. Rub the two materials together and determine which one is positively charged and which one is negatively charged. You can use the PVC pipe (hanging) as a reference to find the type of charge obtained by the rubbing the materials below: Write down your results in your journal.

Pick some of the combinations below, or try your own:

b. Balloon _____ and hair _____

c. Comb _____ and hair _____

d. Comb _____ and paper towel _____

e. Comb _____ and cotton _____

f. Balloon_____ and cotton _____

g. Wooden rod_____ and paper towel _____

h. Wooden rod _____ and cotton _____

When everyone has finished, we will compare our results with each other.

Experiment 3

a. Take a piece of paper and cut it up into small pieces. Charge one end of a PVC pipe and bring it near the small pieces of paper. Write in your journal what you observe.

b. Place an empty soda can on the table top. If it is not empty, drink the soda. Charge one end of a PVC pipe and bring it near the soda can. Write in your journal what you observe.

When everyone is finished, we will discuss our observations.

Experiment 4

Design and carry out experiments that will enable you to answer the following questions:

a) How does the strength of the electrostatic force depend on the distance between the two charged objects?

b) How does the strength of the electrostatic force depend on the amount of charge that the two objects have?

When everyone is finished, we will discuss our ideas.

Summary:

The instructors will perform some experiments in from of the class. Your task is to determine what principles of physics are being demonstrated by the experiments. We will do as many as time permits. In each case, write in your journal the demonstration and the appropriate physics:

a) Wimshurst Machine:
b) Van DeGraaf Generator:
c) electroscope:
d) magic tape
e) popcorn popper: