Cabrillo College
Physics 10L

Full Name _____

LAB 6
Electricity

Read Hewitt Chapters 22 and 23

What to learn and explore

Electricity is a powerful servant, which surrounds us and affects every aspect of our lives. We cannot see, hear, move, think, or do anything (except fall down) without its help. The real purpose of today's lab is to leave you with "more respect, less fear" of this very wonderful natural phenomenon.

Understanding electricity is a challenge because the basic electrical property, charge, is invisible and we have no direct sense of it. It is therefore especially important that you visualize the + and − charges in your mind and make careful sketches that show what you might see if they were visible. Keep in mind that the + charges (the protons) are locked deep in the nuclei of the atoms, while the − charges (the electrons) are relatively mobile.

What to use

PVC and acrylic rods, paper towel, wool, balloons, Van de Graaff generator, electric pom poms, power supplies, conductors, insulators, lamps and bases, leads

What to do

In any order, do the following experiments to help answer the questions I have posed and other questions of your own. As usual, (a) make predictions in writing before making observations and (b) discuss your predictions and observations with your lab partners.

Comments and evaluation: *When you finish the lab,* please write any thoughts and comments you have on today's experiment here. Thank you.

1) Separating Charges.

a) Use the wool or paper towel to charge the gray plastic rod. Bring the charged rod close to the pith ball, without touching it. What happens to the pith ball before it touches the rod?

b) What happens to the pith ball after it touches the rod?

c) Charge the pith ball again by touching it with the charged gray rod. Now charge up the clear plastic rod. Bring this rod near the previously charged pith ball. Does the clear rod have the same charge or a different charge than the grey rod? How can you tell?

d) Charge the gray plastic rod and drag it across the top of the electric pom pom. Explain what you observe.

e) Touch the top of the electric pom pom with your finger. What happens and why?

2) Charging a Balloon.

a) Rub a balloon on your hair and put it against a neutral wall. What do you observe?

b) Explain your observation.

c) If the balloon has excess negative charge, it will repel negative charges in the wall and attract positive charges. Recalling that electrical forces are stronger when charges are close together, consider the following question: will the attractive force be stronger than the repulsive force or vice-versa?

d) Draw a sketch showing the charges in the balloon and the wall when the balloon is against the wall.

3) Charged Rod and Stream of Water.

a) Make a prediction: what will happen to a small neutral stream of water when a charged rod is brought near? Why?

b) Rub the gray rod to charge it and observe its effect on a water stream. What happens and why?

c) Predict what will happen if you do the same thing with the clear plastic rod.

d) Now try it with the clear plastic rod . Were you right?

c) How is this similar to the balloon and the wall? Explain.

4) Van de Graaff Generator

The generator uses a belt to carry excess charge to the metal sphere at the top. Operate the generator while holding a second metal sphere connected to the bottom of it. The smaller metal sphere on the rod is connected to ground, that is, it is always electrically neutral.

a) What do you observe when the two spheres are brought close together?

b) Draw a sketch of the charges on two spheres before the spark jumps. The sphere on the Van de Graff generator is charged; what about the sphere in your hand?

c) Do the two spheres exert an electrical force on each other? Can you feel the force?

d) Does the force change after a spark jumps? Why or why not?

e) Place the aluminum pie plates stacked together on top of the Van de Graaff generator and turn it on. Why do the plates fly off one at a time?

f) Bring an electric pom pom near the charged Van de Graaff generator. Explain what you observe.

g) Tape the electric pom pom to the top of the Van de Graaff generator. Turn on the generator and explain what you observe.

h) Turn off the generator and observe the strings of the electric pom pom for a few minutes. Eventually, the pom pom will completely discharge. How? (see **(i)** below)

i) Hold a tiny piece of fur near the charged Van de Graaff ball. What does it do? Can you get it to boing back and forth between the charged ball and your hand? What is it doing? Hint: this question is related to **(h)** above….

j) Does the ball at the top of the Van de Graaff generator get charged positively or negatively? How could you find out???

5) Conductors and Insulators

Use a small power supply, a small light bulb and some wires to build a basic circuit to light the bulb. Study the bulb carefully, and be sure you see exactly how the current is able to flow completely around the circuit. (The word *circuit* comes from *circle.*)

a) If you open the circuit **at any point**, what happens?

b) Draw your circuit below.

c) Use your simple circuit to test the following items, and others you may wonder about, to see if they can conduct electric current so the power supply can light the bulb. If so, then we call them *conductors.* If not, they are *insulators.* Make a prediction before you try each one.

	Prediction	Observation
Plastic spoon	_____	_____
Metal fork	_____	_____
Fresh water	_____	_____
Salt water	_____	_____
Eraser	_____	_____
Pencil 'lead'	_____	_____
Aluminum foil	_____	_____
Your finger	_____	_____
Try some other things too:		
_____	_____	_____
_____	_____	_____

d) What do you think determines whether something is a conductor or an insulator?

e) Is your body a conductor or an insulator? Why is this an important question?

f) We did this experiment using a 6 volt energy source. If we used 100,000 Volts instead, closer to what's created by the Van De Graaff, or lightning, do you think some of these would change from being insulators to being conductors? Which ones?