

Physics 305 Lab E01

name _____

Basic electrostatics exploration activities

partner _____

_____block _____

1/17/03

materials list/ set-up per station

2 styrofoam cups suspended by thread

1 large piece of rabbit fur

1 balloon

metal rod or pan

2 suspended small aluminum foil balls

small paper bits

thin stream of water

tape

thread

plastic wrap

plexiglass

plastic collar strips

styrofoam bars or other large pieces

Your goal in the following investigations is to draw some basic conclusions about electric charging and electric forces. Do not write any complicated equations which you may know from past experience. All conclusions must be drawn from observations in these activities.

In these investigations you must handle the materials carefully or they will fool you and lead you to incorrect conclusions! All observations must be easily reproducible.

Between steps, be sure to neutralize the objects by touching them all over with your hands (your body acts as sort of a charge reservoir and takes up or gives away electrons to the objects as needed--neat!)

All explorations should be accompanied by pictures and word explanations. Some parts of the lab direct you to use certain materials, other parts leave you to be creative and try various materials--be sure to keep an accurate record of what you did and what you observed. Be prepared to demonstrate and explain any part of this lab for a grade.

Focus I Charging by Rubbing/Friction

- A. *Can an object become charged due to friction from another object?*
Equally rub both of the suspended Styrofoam cups with the fur.
How do the two equally rubbed cups react to one another when they are brought near one another?

B. *Does more rubbing yield more charge?* Explore the interaction of the two cups when they are rubbed a little or a lot. Summarize your findings.

C. *If one object becomes charged due to friction with a second object, does the second object also become charged? How can you tell?* Explore the interaction of the balloon and the fur after rubbing the balloon with the fur. Summarize your investigation and findings.

D. *When an object (insulator) is charged by friction does only the small "rubbed" part gain and hold charge, or is the entire object charged?* Explore this with a balloon rubbed with fur on only one part, a neutral cup, and a cup rubbed all over with fur. Summarize your findings.

E. *Are there some objects (metal--conductors) which do not become charged by friction with other objects?* Try rubbing the metal rod with the fur and then see if the rubbed rod interacts with the hairs on your arm. Summarize.

Focus II Electrostatic Force Characteristics

- A. *Do two charged objects have to be touching to exert a force on one another?* Describe your experimental observations which lead to your conclusion.

B. *How does the interaction between two charged objects change as the distance between them is increased? or decreased? Describe your experimental findings which lead to your conclusion.*

C. *Are electrical forces only attractive? only repulsive?* Describe your experimental findings which lead to your conclusion.

D. *How does the interaction between two charged objects change as the charge on one or both of them is increased? Describe your experimental findings which lead to your conclusion.*

E. *Is electrical force greater than gravitational force?* Describe your experimental findings which lead to your conclusion.

Focus III Charging by Contact

- A. *Can a neutral object become charged by simply touching a charged object?* Rub the balloon with the fur. Touch the charged balloon to a suspended aluminum ball. Observe the interaction of the ball and the balloon after they have touched. You should get an obvious and strong behavior. From your observation, what do you know about the charge of the aluminum at this point?

B. Touch the charged aluminum ball to the other (neutral) aluminum ball. How do the two balls interact after briefly touching? From your observation, what do you know about the charge of the two aluminum balls at this point?

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Focus IV Interaction of Charged and Neutral Objects

- A. *Do two neutral objects exert an electrical force on one another?*
Neutralize both of the suspended aluminum balls. Bring them near to one another and observe their behavior. Describe what you see and draw a conclusion.

B. *Is there an electrical interaction between a neutral object and a charged object? If so, is the force attractive or repulsive?* Charge a balloon by rubbing with the fur. Hold the balloon near some small paper bits on the tabletop. Describe the behavior the paper bits as the balloon is moved closer and closer.

C. Bring the charged balloon near to (but not into!) a thin stream of water. Describe what you see. Explain why you see what you see. Hint: is there something special about water?