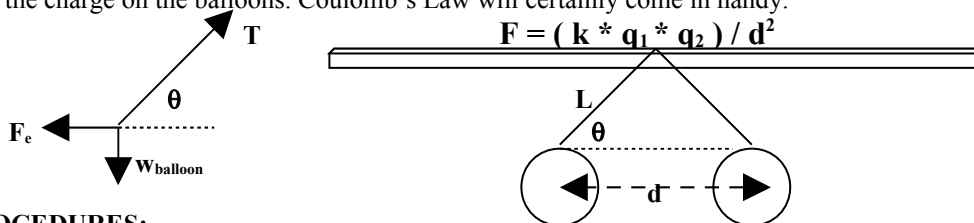


# Coulomb's Balloons

NAME \_\_\_\_\_

In this lab you will investigate the charge on two balloons. When balloons are rubbed with hair, fur, etc., electrons are dislodged and a net charge is acquired. This property of rubber balloons is used at many birthday parties, but how much charge is on the balloon? (I know, you don't care, but you're going to find out anyway!) By using two different balloons and making some simple measurements, it is possible to find the charge on the balloons. Coulomb's Law will certainly come in handy:



## PROCEDURES:

1. Find the mass of an empty balloon using the triple beam balance. The small amount of air soon to be placed in it can be disregarded.
2. Blow up two balloons, tie their ends, and tie each balloon to the ends of a piece of thread approximately 1 meter in length.
3. Hang the balloons from a thumbtack placed on a meter stick so the balloons are free to hang in the space between adjacent lab benches.
4. Measure the distance from the support to the centers of each balloon (should be the same distance). Record this as distance **L**.
5. Now rub each balloon with animal fur or wool so that the balloons acquire a net negative charge due to the addition of electrons. Rub the balloons again to try to get the largest separation possible.
6. With a protractor, measure the angle ( $\theta$ ) made by each balloon string with the horizontal and measure the distance between the centers of each balloon. Record this distance as **d**. You may find it difficult to measure these angles and distances because the balloons will move toward like charged or neutral objects. You might want to rub the plastic ruler or protractor with the fur or wool to give them negative charge.

## DATA:

Mass of balloon = \_\_\_\_\_ grams = \_\_\_\_\_ kg      Weight of balloon = \_\_\_\_\_ N  
**L** = \_\_\_\_\_ cm = \_\_\_\_\_ m       $\theta$  = \_\_\_\_\_      **d** = \_\_\_\_\_ cm = \_\_\_\_\_ m

## ANALYSIS:

1. The figure above and the fact that the balloons are in equilibrium (forces balanced!) can be used to find the electric force of repulsion ( $F_e$ ) between the balloons. Remember: The two y-forces must be equal to one another and the two x-forces must be equal. *Show your work for solution of the electric force.*

$F_e$  = \_\_\_\_\_ Newtons

2. Use Coulomb's Law to solve for the charge on each balloon (assume each balloon has the same charge). *Show your work for solution of the charge on each balloon.*

Charge = \_\_\_\_\_ Coulombs

3. Given that there are  $6.25 \times 10^{18}$  electrons per coulomb of charge, find the number of electrons on each balloon. *Show your work for solution of the number of electrons on each balloon.*

# of electrons = \_\_\_\_\_

## CONCLUSION:

Write a conclusion addressing the objective of the lab, your results, and any possible systematic errors. Does the number of excess electrons on each balloon surprise you?