Lab Surface Charge/Electrostatic Potential
Caden Roberts 5N-01 Lab 10/16

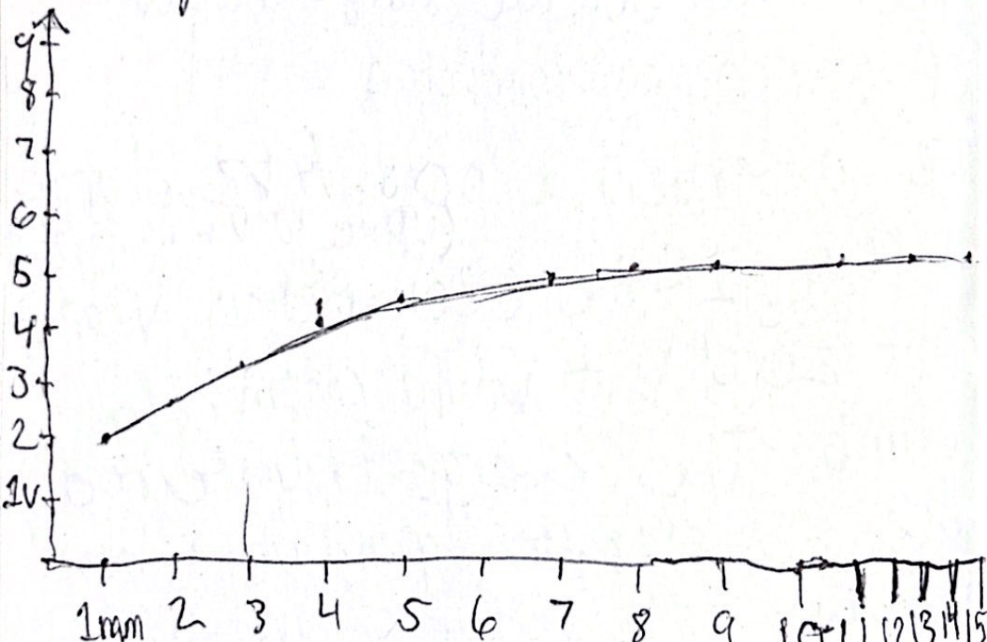
Experiment 1 Partner Wesa

We are doing this experiment to test the surface charge behavior of a spherical conductor.

we observed a positive charge increase (up to 100V with long tracks). If the electrometer was not zero'd, it would continue to climb. The charge transferred does not seem to depend on where on the sphere we touch the proof plane. I would expect different behavior from an irregularly shaped object because there would be a ~~clear~~ ununiform charge distribution. This is evident in theory and after experiment in the back of class.

Experiment 2

We are doing this experiment to see how a parallel plate capacitor behaves. As the distance increases the voltage should increase.



Potential is indeed increasing as distance increases. The change is tapering off because the distance isn't increasing as drastically.

Experiment 4

We are doing ~~this~~ experiment to investigate series capacitance law and parallel capacitance law. The capacitance of the 3 capacitors were 97.8, 32.8, and 48.2 nF.
yellow red green
For a parallel connection of yellow and green, we predict $C_{total} = 97.8 + 48.2 = 146$. We observe 146.1 nF in our experiment. We predict for all 3 in parallel $C_{total} = 146 + 32.8 = 178.8$. We measure 178.5 in our experiment. We predict $\frac{1}{C_{total}} = \frac{1}{97.8} + \frac{1}{48.2} = \frac{1}{32.28}$, $C_{total} = 32.28$, and we measure 32 in practice. We predict for 3 in series $C_{total} = \frac{1}{\frac{1}{97.8} + \frac{1}{48.2} + \frac{1}{32.8}} = 16.27$. In our experiment we measure 16.2 nF.

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1. $\sigma = \frac{\varepsilon_0 V}{R} = 8.854 \cdot 10^{-12} \cdot 1000 \cdot \frac{1}{0.065}$

$= 1.36 \times 10^{-7}\ C/m^2$

2. $Q_{disc} = \pi (0.0127)^2 (1.36 \times 10^{-7})$

$= 6.9\cancel{0} \times 10^{-11}\ C$

3. $C = \frac{\varepsilon_0 A}{d} = \frac{(0.1)^2 \pi}{0.001} \cdot 8.854 \cdot 10^{-12}$

$= 2.78 \times 10^{-10}\ nF$

4. For parallel $C_{total} = C_1 + C_2 = 50 + 100 = 150$

For series $\frac{1}{C_{total}} = \frac{1}{C_1} + \frac{1}{C_2} = \frac{1}{150} + \frac{1}{200} = \frac{7}{600}$

Hence, $\frac{600}{7}$ or 85.71 nF is the capacitance