P1320L, Electric Field Mapping
Lab 5, Work Sheet

Submitted by: ____________________ Experiment's date: ____________________

Team members:

1.- ______________________________ 2.- ______________________________

3.- ______________________________ 4.- ______________________________

Instructor must initial:________________

Introduction

Write a short paragraph about the purpose of this lab.

Data

Instructions: Collect your data using your lab manual as a guide, unless directed to do otherwise by your lab instructor. Each measurement must have units. If a table is used, then it must have headers (for rows or columns) that include units

Parallel Plate Capacitor

1. Trace the equipotential curves for voltages between 1 V to 10 V. Include a picture of your trace in the space below. Be sure that the values of the equipotentials can be easily distinguished. Verify with your instructor that you have enough data. They will be looking for adequate coverage between the plates outside the plates, and about the regions where edge-effects occur.

Cylindrical Capacitor (Coaxial Cable)

2. Trace the equipotential curves for voltages between 0.5 V to 4.5 V. Include a picture of your trace in the space below. Be sure that the values of the equipotentials can be easily distinguished. It may be difficult or impossible to get to 4.5 V, but do the best you can. Verify with your instructor that you have enough data. They will be looking for adequate coverage inside the cylinder and outside the cylinder.

Analysis

Parallel Plate Capacitor

1. On your data plot, locate and mark the most direct electric field line. You will use this as a sample of your data for the remainder of this section.

2. Use the next table to record ΔV_g (potential difference relative to ground), x (distance relative to the positive electrode), ΔV_r (potential difference relative to the next more negative equipotential), Δx (change in distance between the current equipotential and the next more negative one), and E_{avg} (the average electric field calculated using Equation 3). Consult your lab manual and ask your instructor if this is unclear.

ΔV_g (V)	x (mm)	ΔV_r (V)	Δx (mm)	E_{avg} $\mathrm{V\,m^{-1}}$

3. Plot ΔV_g versus x.

4. Find the equation for the best-fit line. Note that the slope is the magnitude of the electric field, E.

5. Compare the theoretical field to the electric field given by the slope of the best-fit line.

6. Plot the electric field versus distance.

Cylindrical Capacitor (Coaxial Cable)

7. On your data plot, locate and mark the most direct electric field line. You will use this as a sample of your data for the remainder of this section.

8. Make a table that records ΔV_g (potential difference relative to ground), x (distance relative to the positive electrode), ΔV_r (potential difference relative to the next more negative equipotential), Δx (change in distance between the current equipotential and the next more negative one), and E_{avg} (the average electric field calculated using Equation 3). Consult your lab manual and ask your instructor if this is unclear.

ΔV_g (V)	x (mm)	ΔV_r (V)	Δx (mm)	E_{avg} $\mathrm{V\,m^{-1}}$

9. Use the next grid to plot ΔV_g versus x.

10. Estimate the slope of the tangent line at each point graphically. The slope values correspond to the average electric field, E_{avg}.

11. Compare these to the E_{avg} values you tabulated earlier.

12. Plot the electric field versus distance.

Questions

1. Describe what you found about the potential difference values outside of the coaxial cable setup. Explain this using Gauss' Law.