

P1320L, Magnetic Forces II

Lab 10, Work Sheet

Submitted by: _____ Experiment's date: _____

Team members:

1.- _____ 2.- _____

3.- _____ 4.- _____

Instructor must initial: _____

Instructions: Follow the steps on this worksheet, using your lab manual as a guide, unless directed to do otherwise by your lab instructor. Show at least one sample calculation for each result requested. The results must include appropriate SI units. If a table is used, then it must have headers (for rows or columns) that include units.

Introduction

Write a short paragraph about the purpose of this lab¹.

Data

For this lab, take $q_e/m_e = 1.7588 \times 10^{11} \text{ (C kg}^{-1}\text{)}$ as the accepted value for the electron's charge-to-mass ratio. Follow the procedure in the manual to set up the apparatus and check with your TA before you start your measurements. In particular, what current values should be used. Collect the Coils' parameters in Table ???. Arrange your observations of Current, Voltage and corresponding diameter of the electron's track in a table with headers and units. The first column must used to index the number of observations. The table should have one column for the diameter per team member. For each row, the last column must

have the average of the observed diameters. Tabulate your data inside the box titled Table ??, below.

Table 1: Coils parameters

Coils' Diameter (cm)	Number of loops per coil

Table 2: Tabulated Data

Analysis

Arrange your results for the magnetic field, charge-to-mass in a table. The first row must be the index used in the data table that you built, Table ??. Use the box labeled Table ??, below, to tabulate your results.

1. For each current used, calculate the magnetic field and added to Table ??. Show a sample calculation here.

2. Using your observations, determine q_e/m_e for each voltage and add your results to your results table. Show a sample calculation here.

3. Determine the average value for q_e/m_e .

4. Make a scatter plot of your results for q_e/m_e . Use the index as the horizontal axis. Include a horizontal line to represent the average value. Your plot should have a title and labeled axis with appropriate units. Use the box labeled Figure ??, below, for your plot.

5. Look at the values that you have plotted and assess if their average is an acceptable representation for all of them. Write a short explanation to support your assessment.

6. Calculate the percentage difference between the average of q_e/m_e and the accepted value given above.

7. For the largest voltage used, estimate the electron's velocity, v_e .

8. For the largest voltage used, the fraction of the speed of light at which the electrons are moving, v_e/c .

9. Based on your previous estimates, is it reasonable to use Newtonian mechanics to analyze the motion of electrons in this experiment? Explain.

Table 3: Results

2025-2026	
Year	Month
2025	Jan
2025	Feb
2025	Mar
2025	Apr
2025	May
2025	Jun
2025	Jul
2025	Aug
2025	Sep
2025	Oct
2025	Nov
2025	Dec
2026	Jan
2026	Feb
2026	Mar
2026	Apr
2026	May
2026	Jun
2026	Jul
2026	Aug
2026	Sep
2026	Oct
2026	Nov
2026	Dec

Figure 1: Electron's Charge-to-Mass variability

