

Magnetic Fields

As you work through the steps in the lab procedure, record your experimental values and the results on this worksheet. Use the exact values you record for your data to make later calculations.

Field Lines Due to a Permanent Magnet

Upload your magnetic field map. (Submit a file with a maximum size of 1 MB. *You will upload this file in the WebAssign question.*)

Using the Hall Probe

Do the voltage readings shift when the probe is turned parallel to the Earth's field?

What happens to the voltage when the probe is turned 180° ?

Record the conversion factor for your probe.

How might you change the apparatus to make the Hall probe more sensitive? Think about the factors that affect the voltage reading in a Hall measurement; would more carriers (larger n) increase the Hall voltage? Larger current? A thicker/thinner Hall bar?

Field of a Circular Coil

Make a rough sketch of the field line distribution on the template. Indicate the direction of circulation of the current and the direction of the magnetic field. (Submit a file with a maximum size of 1 MB. *You will upload this file in the WebAssign question.*)

Record values of field and position in Table 1.

Table 1

Position (cm)	Magnetic Field (T)

Calculate the theoretical magnetic field expected at the center of the coil.

Upload the plot of your data. (Submit a file with a maximum size of 1 MB. *You will upload this file in the WebAssign question.*)

Find the slope and y -intercept for a $\ln(B)$ versus $\ln(z^2 + R^2)$ using your data. (Do not enter units for these answers, but be sure to use magnetic field B in units of T and distances z and R in units of m.)

How does your fit compare to the theoretical curve? Discuss your results.

Magnetic Fields and Materials

Record your magnetic field measurements in Table 2.

Table 2

Material	Magnetic Field (T)
Plastic block	
Aluminum block	
Steel sheet	
Iron keeper	

Write a short explanation of these 4 measurements and what they imply about the magnetic properties of these materials.

Strength of Permanent Magnets

Record the maximum reading (in volts) for the horseshoe and cylindrical magnets.

Record their corresponding magnetic field strengths in T.

Order the following materials from highest to lowest with respect to their field strengths, where 1 represents the highest field strength and 4 represents the lowest.

Table 3

Material	Strength Ranking
Iron	
Aluminum	
Nickel	
Cobalt	