

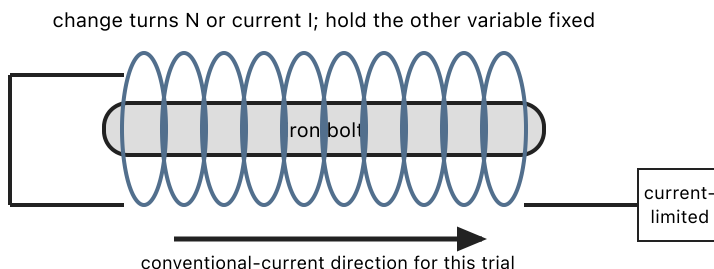
MAGNETISM DAY 12: LAB: ELECTROMAGNET STRENGTH

CED 12.1/12.4 · Skills 3.A/2.D · FRQ: ED

QUICK PREDICTION

In an ideal low-field model, doubling the number of turns while current and geometry stay fixed makes the field **A smaller** / **B about twice as large** / **C unchanged**. Choose; then name the variable that must be held fixed.

ELECTROMAGNET INVESTIGATION SETUP



QUESTION AND MEASURES

How does electromagnet strength depend on turns N and current I ?

Preferred quantitative measure: field-probe reading at a fixed location. **Alternate measure:** paperclip count or lifted mass using the same contact procedure.

Safety: current-limited supply, switch off between readings, short bursts only, and stop if the coil or core warms.

NOTES / REASONING

TEST A: VARY TURNS, HOLD CURRENT FIXED

Use $I = 1.20\text{ A}$ and the same core, winding region, probe position, and on-time.

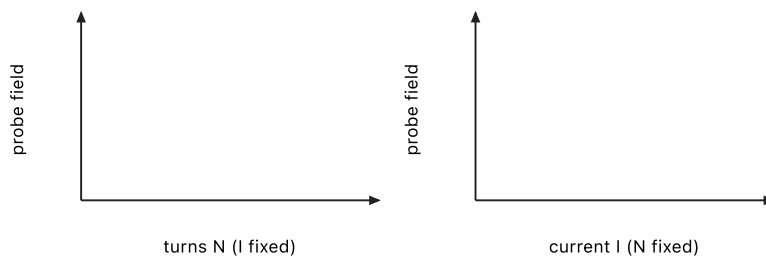
N	I (A)	probe field (mT)	paperclips or mass	notes
24	1.20			
48	1.20			
72	1.20			

TEST B: VARY CURRENT, HOLD TURNS FIXED

Use $N = 48$ and keep every geometry and measurement condition unchanged.

N	I (A)	probe field (mT)	paperclips or mass	notes
48	0.80			
48	1.20			
48	1.60			

NOTES / REASONING

GRAPH AND CLAIM**GRAPH EACH CONTROLLED RELATIONSHIP SEPARATELY**

1. Plot probe field versus N using Test A. State the fixed current in the graph title.

2. Plot probe field versus I using Test B. State the fixed turns in the graph title.

3. For each graph, state a claim, cite data, and describe whether an approximately linear low-field model is supported.

EVALUATE THE EVIDENCE

4. Why should probe position remain fixed?

5. Paperclip count rises from 3 to 6 to 8 as N rises from 24 to 48 to 72. What claim is supported? What stronger claim is not justified?

6. Identify one mechanism that could bend a strength-versus- N or strength-versus- l trend away from a straight line.

7. Explain why changing both N and l between two trials prevents a single-variable causal claim.

Required record: two controlled tables, two labeled graphs, claims with evidence, safety compliance, and measurement limitations.