CIRCUITS DAY 10: LAB: EMF & INTERNAL RESISTANCE

CED 11.5 · Skills 3.A/2.D · FRQ: ED · bounded investigation

RETRIEVAL — NO DEMO

As a safe load draws more current from a real battery, predict terminal voltage: **rises / falls / remains constant**.

QUESTION AND MODEL

Question: What are the battery's emf and internal resistance?

$$V_t = \varepsilon - Ir$$

Graph V_t vertically and measured I horizontally.

Prediction: sketch the expected graph and label the intercept and slope sign.

DESIGN AND SAFETY

Supplies: battery, current-limited variable load or resistor set, switch, leads, and two DMMs. A tired battery is useful for comparison.

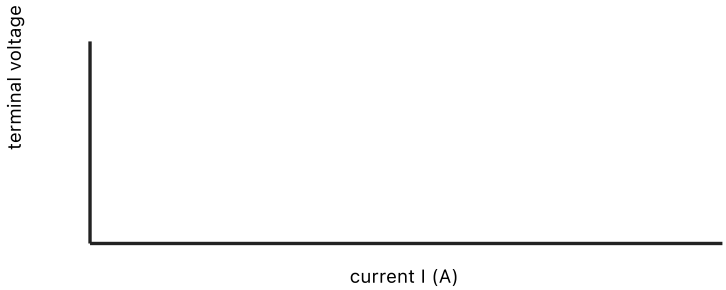
- Ammeter in series; voltmeter across the battery terminals.
- Choose at least five safe load settings; never measure short-circuit current.
- Open the switch between settings and monitor heating.

Procedure: choose load order, settling rule, repeated trials, and a safe stopping condition.

RAW DATA AND GRAPH

Trial	load setting	I (A)	V_terminal (V)
1			
2			
3			
4			
5			
6			

V TERMINAL VERSUS MEASURED CURRENT



Best fit: mark the y-intercept and use two well-separated points to calculate the signed slope.

ANALYSIS AND CLAIM

1. Report ε from the intercept with units.

2. Calculate $r = -\text{slope}$, carrying V/A = Ω.

3. Predict terminal V at a new safe current.

4. Explain one source of scatter or curvature.

Required record: prediction, checked circuit, raw table, graph, fit, ε/r extraction, and claim.