

CIRCUITS DAY 6: LAB — CIRCUIT CONSTRUCTION KIT

LAB: CIRCUIT CONSTRUCTION KIT (PHET)

Sim: PhET "Circuit Construction Kit: DC" (search: phet circuit construction kit dc). Use the ammeter and voltmeter tools throughout — the ammeter goes **IN** the line; the voltmeter goes **ACROSS** elements.

Goal: verify Ohm's law from data, test the series/parallel rules against measurement, and catch a real battery sagging.

PART 1 Ohm's Law From Data

Build: one battery, one $10\ \Omega$ resistor, an ammeter in line. Vary the battery voltage and record five (V, I) pairs. Plot V (vertical) against I (horizontal) below and draw the best-fit line.

V (V)					
I (A)					

Slope of your line = _____ (units!). It should reproduce the resistor you built.

PART 2 Series & Parallel Verification

(a) Wire $10\ \Omega$ and $20\ \Omega$ in SERIES across 12 V. Predict I, then measure: predicted _____, measured _____.

(b) Rewire them in PARALLEL across 12 V. Predict the battery current ($R_{eq} = 20/3\ \Omega$), then measure: predicted _____, measured _____.

(c) Measure the current in EACH parallel branch and verify the junction rule numerically.

PART 3 Catch the Sag

In the battery menu, give the battery internal resistance $r = 0.5\ \Omega$. Put the voltmeter across its terminals. **(a)** Open circuit reading: _____. **(b)** Reading while driving a $2.0\ \Omega$ load: _____. **(c)** Use the sag to compute r from your own data and compare to $0.5\ \Omega$.

ANALYSIS

A Percent Error

For each prediction in Part 2, compute the percent difference from measurement. Which rule tested cleaner — series or parallel — and what limits the agreement?

B The Brightness Puzzle

Two identical bulbs: wired in series they glow dimly; in parallel they glow at full brightness. Explain BOTH observations with $P = V^2/R$, tracking the voltage each bulb actually receives.

C Reflection

One measurement that surprised you, and the physics that un-surprised it:

Before you leave: your V-I slope, both network verifications, and the computed r from Part 3 should all be on this sheet.