



Digital version

ENGS152 Circuits Lab Section B

Battery charge indicator with a voltage divider and a LED

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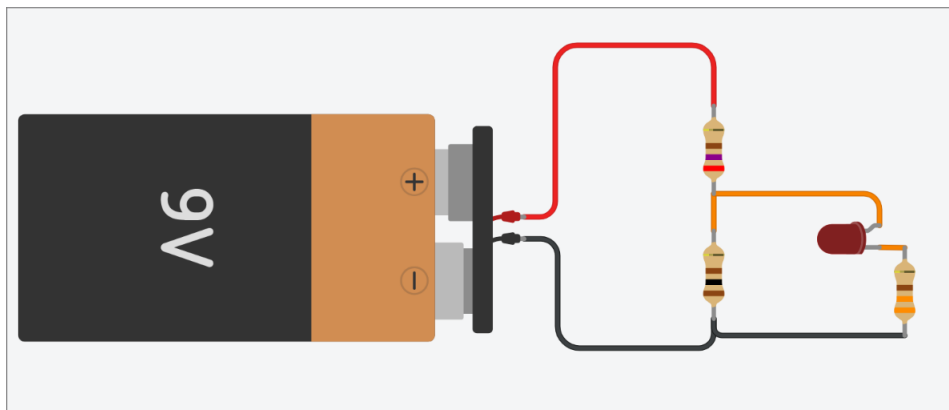
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1 Introduction

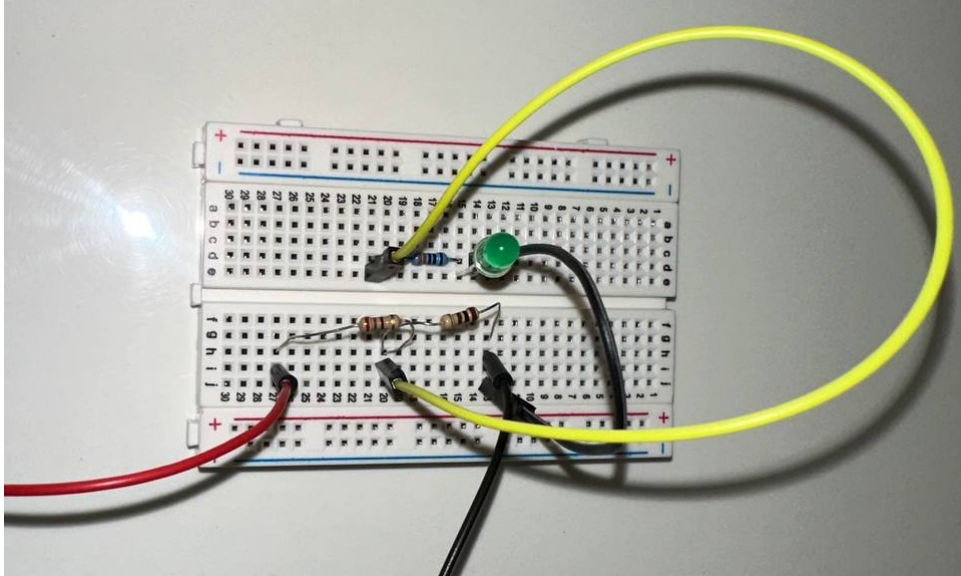
A voltage divider is a simple linear circuit that reduces larger voltages into smaller voltages. The voltage output (V_{out}) is determined by the formula:

$$V_{out} = V_{in} \frac{R_2}{R_1 + R_2}$$

Using a voltage divider circuit, battery testers measure a battery's voltage under different conditions to assess its charge level and performance.



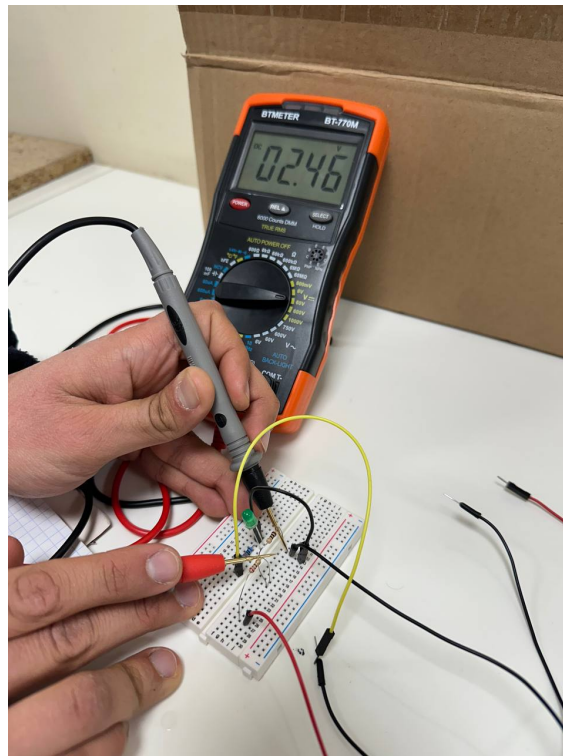
$$R_1 = 270\Omega, R_2 = 100\Omega, R_{LED} = 330\Omega.$$

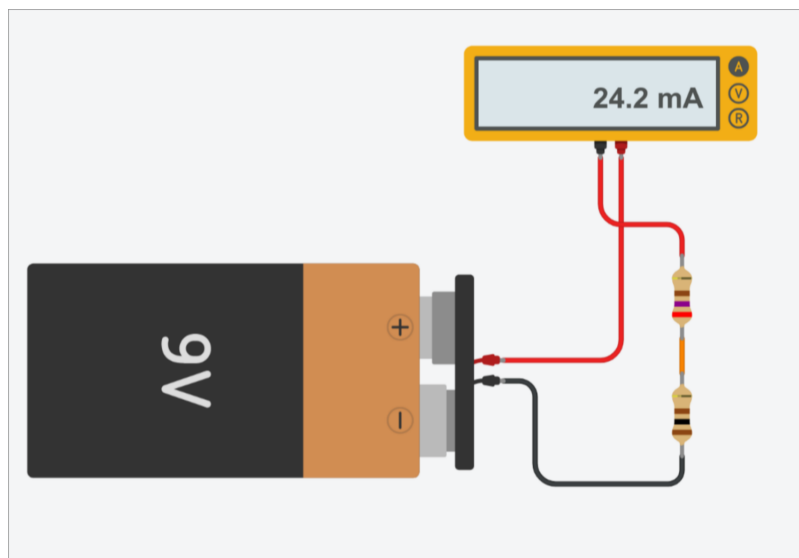
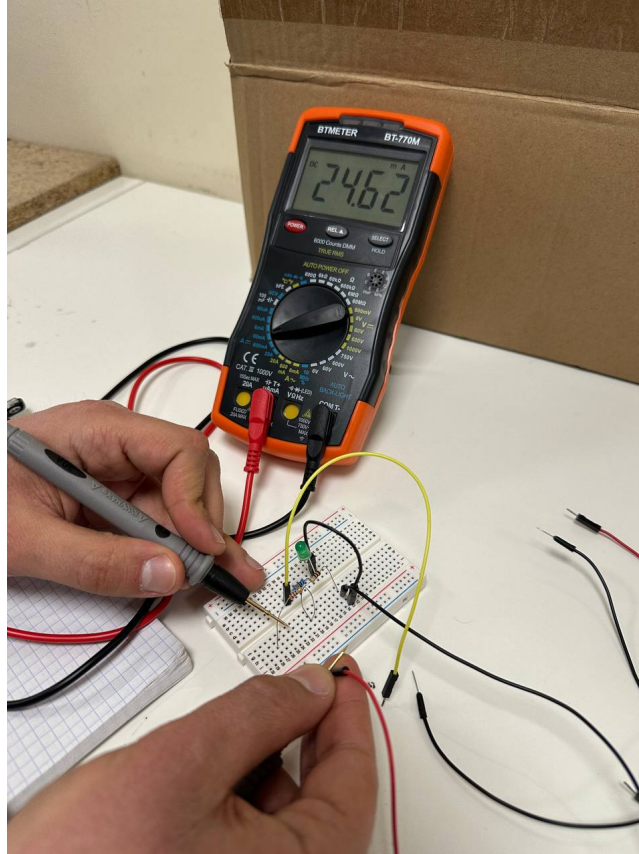


2 Voltage Divider

At first $2k\Omega$ and $4.7k\Omega$ resistors were used, however when the LED was connected, the voltage dropped and the LED didn't light up.

For the divider, 100Ω and 270Ω resistors were used. For 9V, the output voltage is 2.4V, and for 6V it's 1.6V. The current flowing through the circuit without the LED is $\frac{9V}{370\Omega} \approx 24.3mA$.





Measured current is $24.6mA$, the calculate current is $24.2mA$.

3 Led Indicator

The current limiting resistor value is calculated $R_{LED} = \frac{9V - 2V}{20mA} = 350\Omega$, hence a 330Ω resistor was used.

The brightness decreases as the voltage decreases, and turns off at around $6V$.

