Tuesday Reading Assessment: Unit 1, Ohm's Law and Batteries, DC Circuits and Power

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1 Memory Bank

- $V = IR$ ... Ohm's Law
- $P = IV$ ... Relationship between power, voltage, and current
- $V_{\text{terminal}} = \epsilon - Ir$ ... For a battery, the terminal voltage is the emf or ideal voltage, minus the current times the internal resistance.

2 Batteries and Power

1. (a) What is the power consumption of a 24 V system that draws 0.5 A of current? (b) If a different system operates at 12 V, and has a total resistance of 50Ω, what is the power consumption?

2. Suppose a a battery is connceted in series with a resistor (Fig. 1). The ϵ, or emf of the battery is 1.5 V. The resistor R is 50Ω. The current measured to be 0.0285 A. (b) What is r, the internal resistance? (c) If another 50Ω resistor was added *in parallel*, what would be the new current?

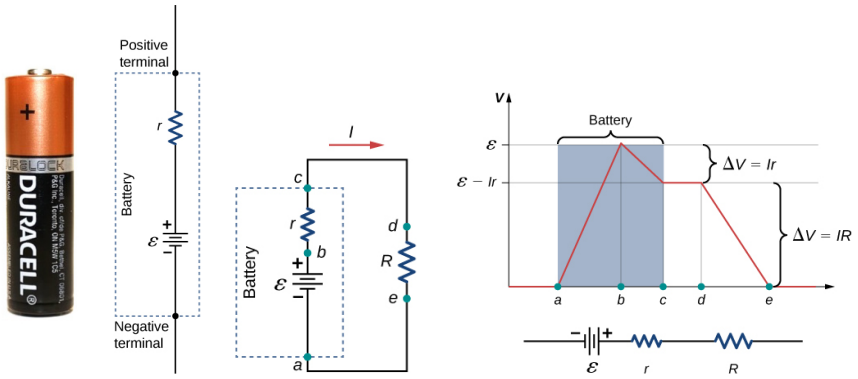

Figure 1: (Left) A battery is similar to a chemical capacitor, but keeps constant a constant voltage ϵ called the emf. (Middle) However, a more accurate model is that the battery has some intrinsic or internal resistance r. (Right) Thus, the measured voltage V_{terminal} does not reach the idea emf for a given current I.