emf and Internal Resistance

- A real battery has some internal resistance
- Therefore, the terminal voltage is not equal to the emf



More About Internal Resistance

- The schematic shows the internal resistance, r
- The terminal voltage is $\Delta V = V_{b}-V_{a}$
- $\Delta V = \epsilon Ir$
- For the entire circuit,
 ε = IR + Ir



Internal Resistance and emf, cont

- ε is equal to the terminal voltage when the current is zero
 - Also called the open-circuit voltage
- R is called the *load resistance*
- The current depends on both the resistance external to the battery and the internal resistance

Internal Resistance and emf, final

- When R >> r, r can be ignored Generally assumed in problems Power relationship $I \varepsilon = I^2 R + I^2 r$ When R >> r, most of the power delivered by the battery is transferred to the load
 - resistor