Physics 161
Lecture 23 Summary
DC Currents

November 21, 2017
Lecture 23: learning objectives

You will be able to describe in qualitative terms the concept of EMF.

You will be able to state the equivalent resistance of resistors in series and parallel.

You will be able to state Kirchhoff’s rules and apply them to DC circuits.
EMF, capacitors and resistors

EMF is given by

\[ \mathcal{E} = \Delta V + Ir \]

**Capacitors**

Series

\[ \frac{1}{C_{\text{equiv}}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \cdots \]

Parallel

\[ C_{\text{equiv}} = C_1 + C_2 + C_3 + \cdots \]

**Resistors**

Series

\[ R_{\text{equiv}} = R_1 + R_2 + R_3 + \cdots \]

Parallel

\[ \frac{1}{R_{\text{equiv}}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots \]
Kirchhoff’s rules:
1) Sum of currents coming to any "junction" is zero.
2) Sum of potential differences of all elements around a loop is zero.

In practice:
1. Assign a current in all elements.
2. Apply (1) to junctions.
3. Apply (2) to complete loops.
4. Need as many equations as the number of unknown currents.