

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

Resistors

Series

$$\frac{1}{C_{\text{equiv}}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \dots$$

$$R_{\text{equiv}} = R_1 + R_2 + R_3 + \dots$$

Parallel

$$C_{\text{equiv}} = C_1 + C_2 + C_3 + \dots$$

$$\frac{1}{R_{\text{equiv}}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$

Kirchhoff's rules

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.