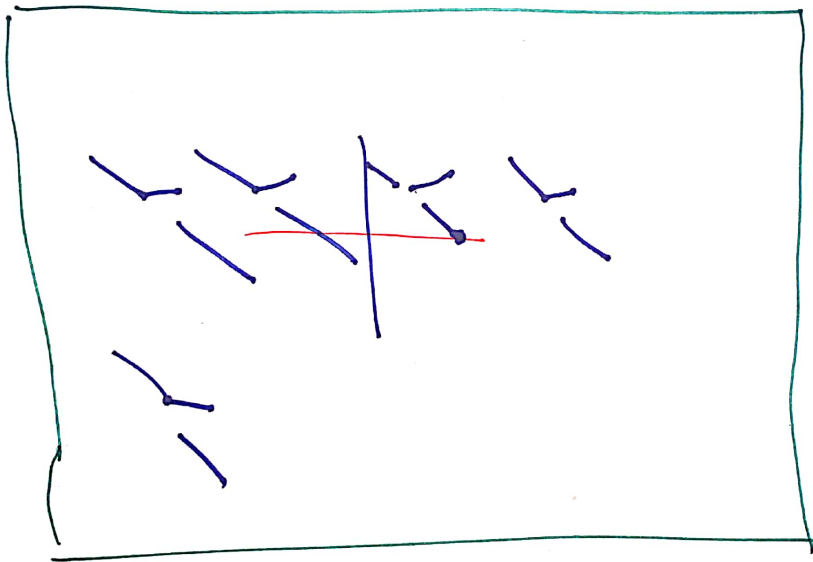
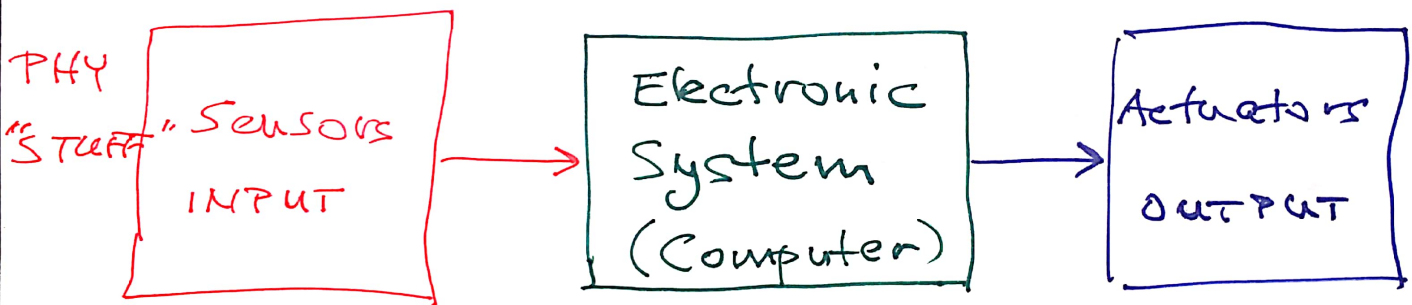


# Introduction to Circuits





## Electricity

• electrons

Voltage  $V$  [V] Volts

Pressure

Current  $I$  [A] Ampère

Water

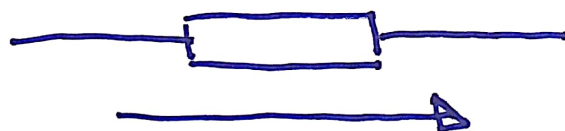
## Circuit Elements

- Resistor
- Switch
- Batteries

Generic C.E. :

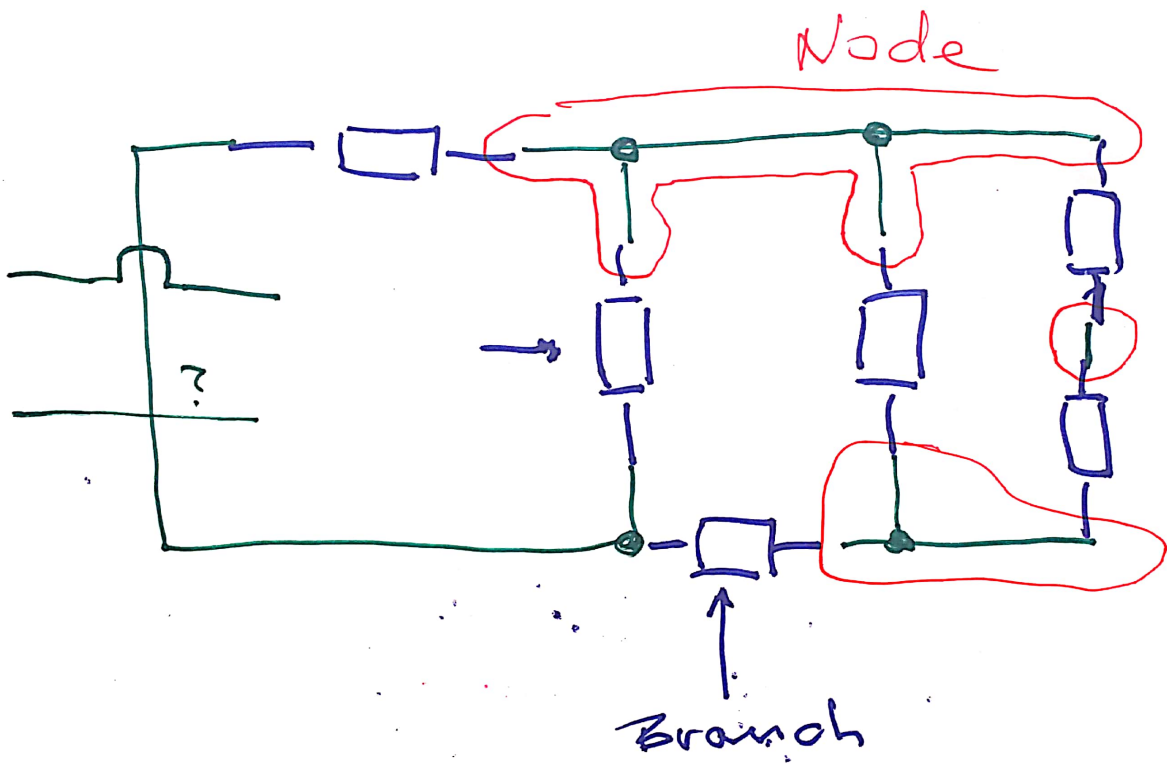
Symbol

+  $V_e$  -



$I_e$

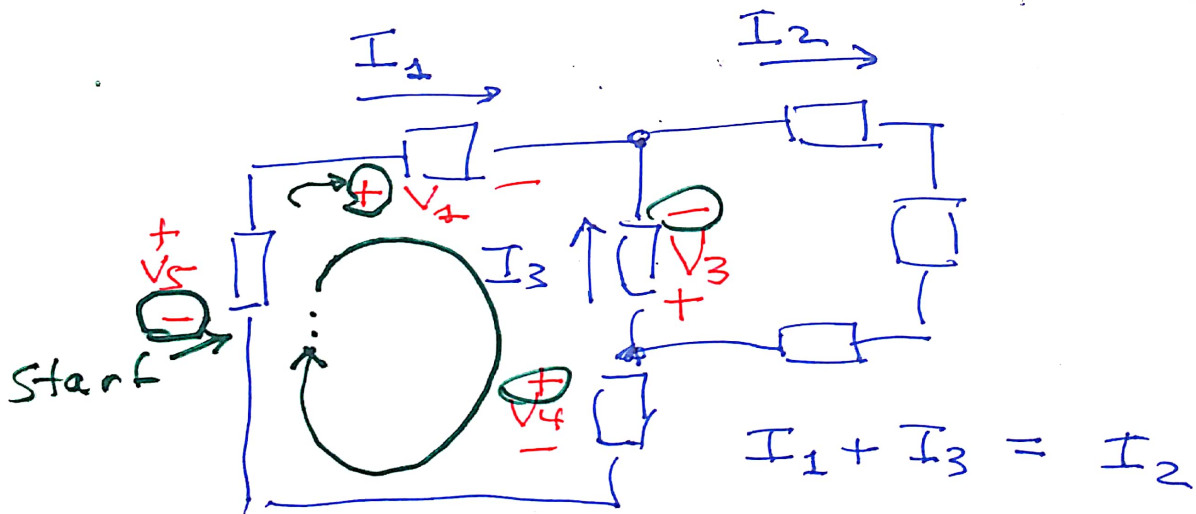
passive  
sign. convention



# Kirchhoff

## KCL

All currents entering a node equal sum of all currents exiting node.



KVL :

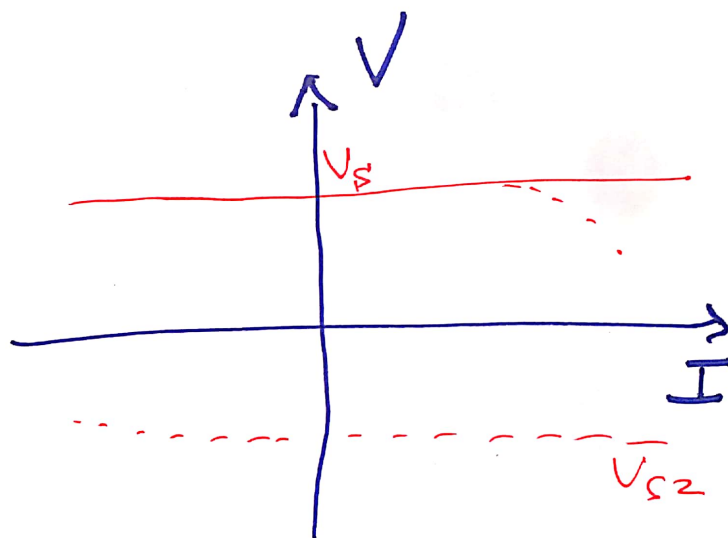
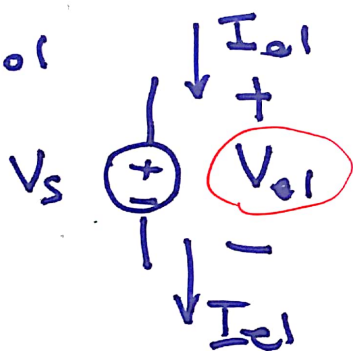
Voltages around all loops  
sum to ZERO.

$$V_5 \overset{-}{\times} V_1 + V_3 - V_4 = 0$$

## Basic Ckt Et.

• Voltage source

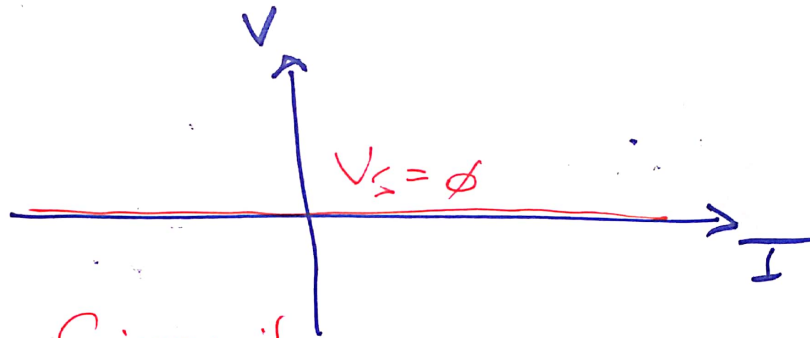
• Symbol



MODEL

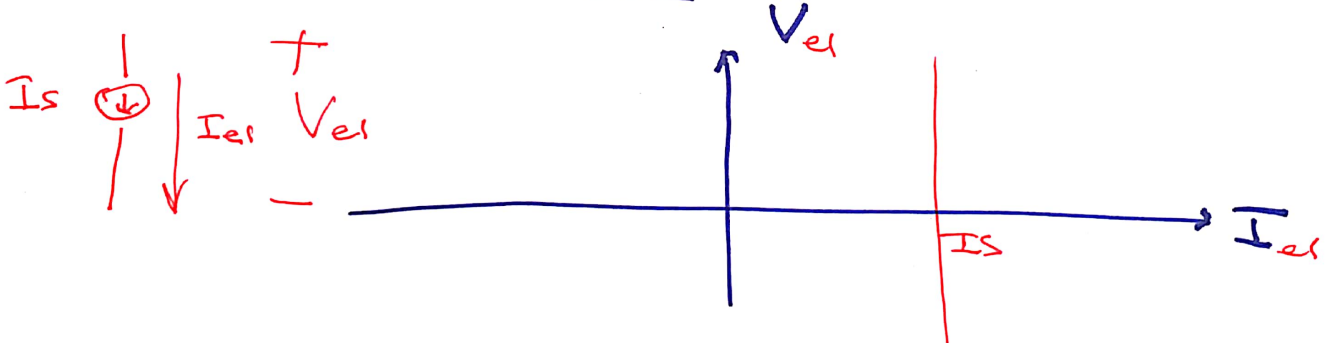


• Wire

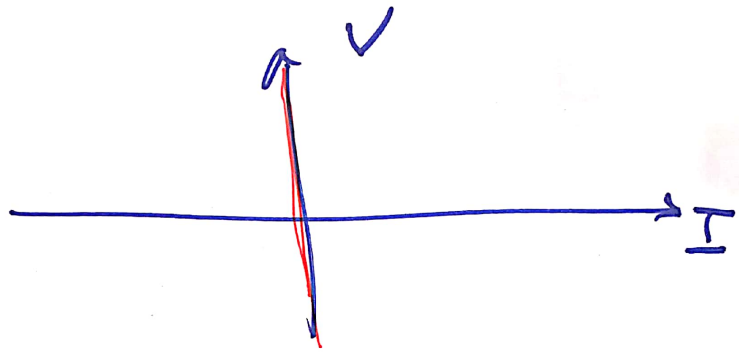


Short Circuit

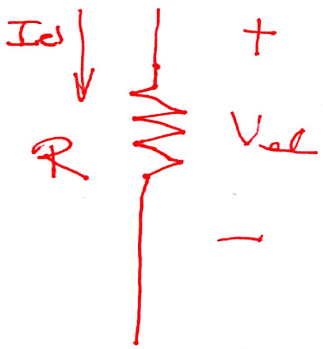
• Current Source



• Open Ckt



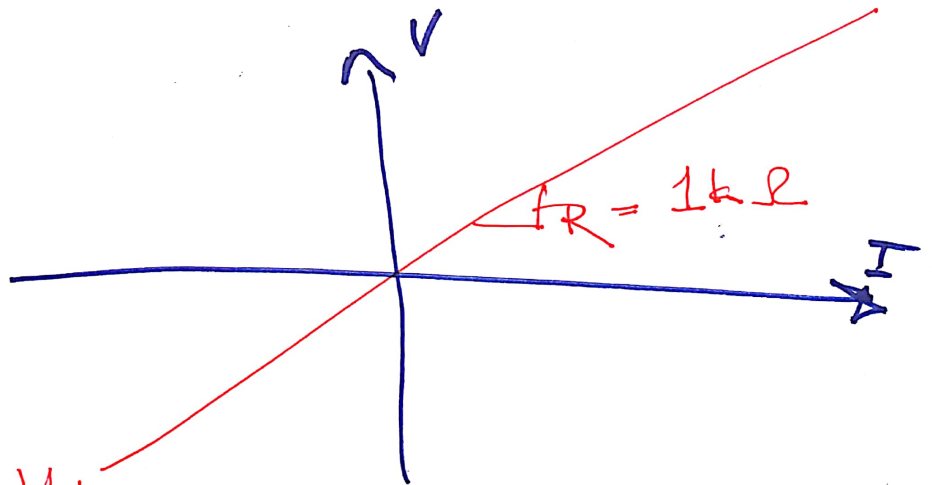
• Resistor



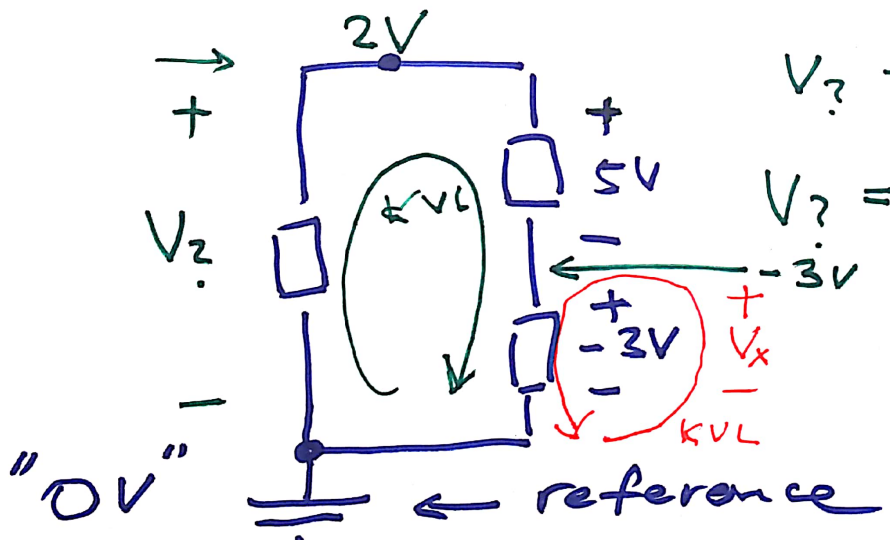
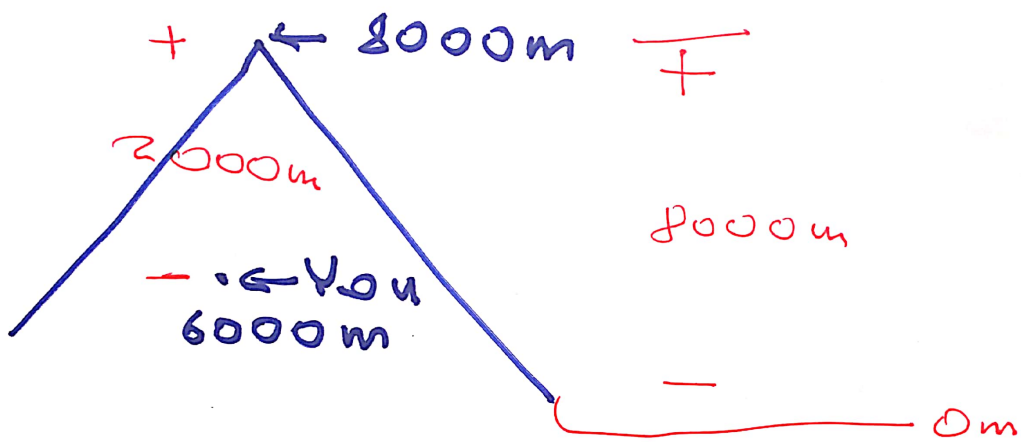
resistance

$$R = \frac{V_{el}}{I_{el}}$$

Ohms [ $\Omega$ ]



# Node Voltage



$$V_2 - 5V + 3V = 0$$

$$V_2 = 2V$$

$$V_x - (-3V) = 0$$

reference