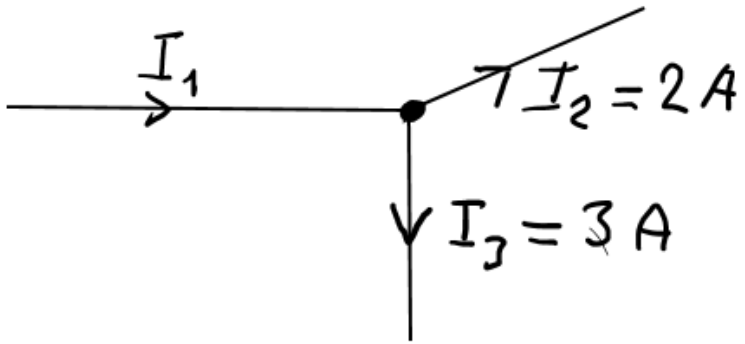
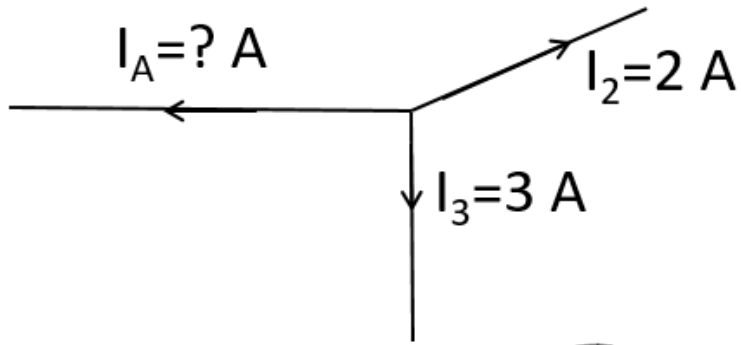
Kirchhoff's Current Law (KCL)

KCL is a consequence of that we require that no net charge build up or depletion occurs inside a circuit element

The sum of all currents into a node = The sum of all currents out of a node



$I_1 = I_2 + I_3 = 2+3 = 5A$



$0 = I_A + I_2 + I_3$

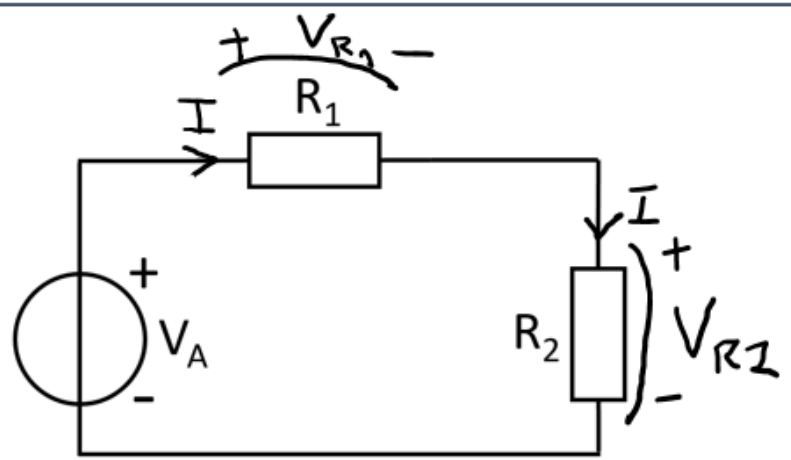
$I_A = -I_2 - I_3 = -2-3 = -5A$

$I_1 = -I_A$

Kirchhoff's Voltage Law (KVL)

KVL is a consequence of that we require that the magnetic flux in a loop outside the circuit element does not change

The sum of all voltages over circuit elements in a loop is equal to zero.



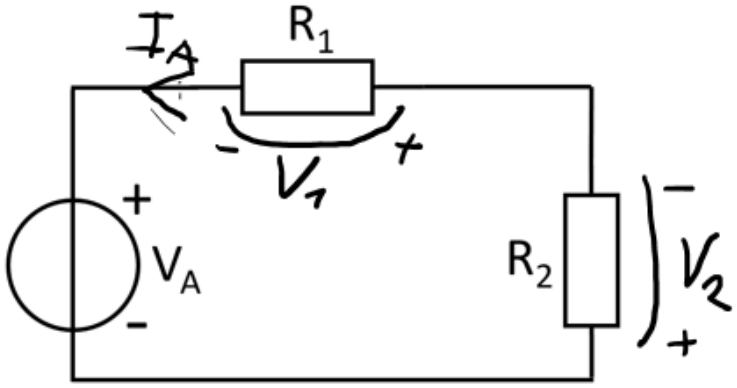
$$V_A - V_{R1} - V_{R2} = 0$$

$V_A = 10\,V \quad R_1 = 1\,k\Omega \quad R_2 = 4\,k\Omega$

$$V_A - IR_1 - IR_2 = 0$$

$$I = \frac{V_A}{R_1 + R_2} = \frac{10}{1+4} = 2\,mA$$

$$V_{R1} = I \cdot R_1 = 2 \cdot 1 = 2V \qquad V_{R2} = IR_2 = 2 \cdot 4 = 8V$$



$$V_A + V_1 + V_2 = 0$$

$$V_A + I_A \cdot R_1 + I_A \cdot R_2 = 0$$

$$I_A = \frac{-V_A}{R_1 + R_2} = -2\,mA$$

$$V_1 = I_A \cdot R_1 = -2 \cdot 1 = -2V$$

$$V_2 = I_A \cdot R_2 = -2 \cdot 4 = -8\,V$$