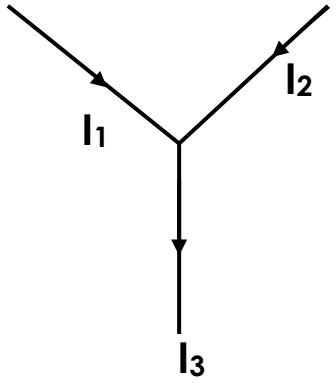
Kirchhoff's law

1. **Junction law (KCL):** Algebraic sum of currents at a junction in a circuit is zero.



$$I_1 + I_2 = I_3$$

$$I_1\, t + I_2\, t = I_3\, t$$

$$Q_1 + Q_2 = Q_3$$

So, the first law describes the charge conservation. (No loss in charge)

2. **Voltage law (KVL):** In a closed loop, sum of all voltages are equal to zero.

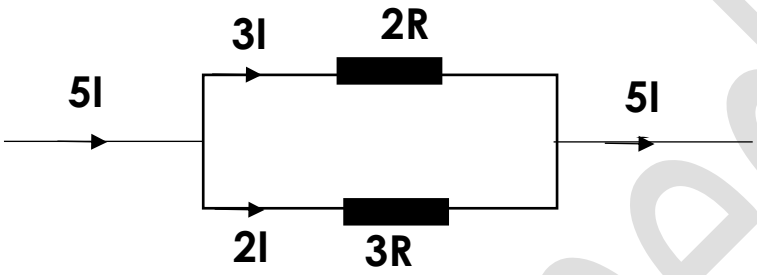
$$\Sigma E = \Sigma IR$$

$$\Sigma E \times I = \Sigma I$$

$$\Sigma EI = \Sigma I^2R$$

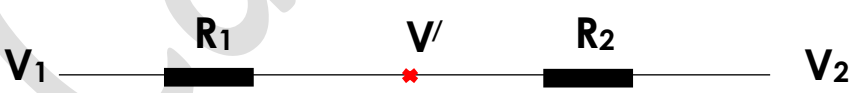
So, the second law demonstrates the constitution of energy conservation.

- **Current division**



- Current in parallel resistors is inversely proportional to resistance
- Current divides by the inverse of the resistance ratio

- **Potential division**



$V_1 > V_2$

$$V' = \frac{R_2}{R_1+R_2} \times (V_1-V_2)$$