Basic components and Electric Circuits (chapter 2)

Current: charges in motion denoted by I

And is determined by value and direction →
Measured in Amper (A)

If these is no motion then there is not current I=0 , Current needs a closed circuit
And transmission medium (wire)

Voltage : is a voltage difference between two points and is determined by value and polarity (+,-)

Measured in Volt (v) , no need for a closed circuit (it needs only different energy levels)

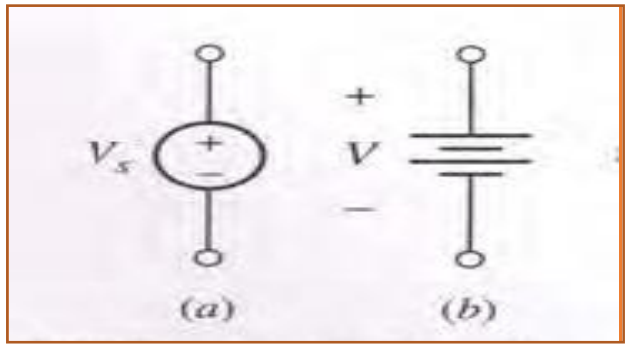
Electrical circuit consists of

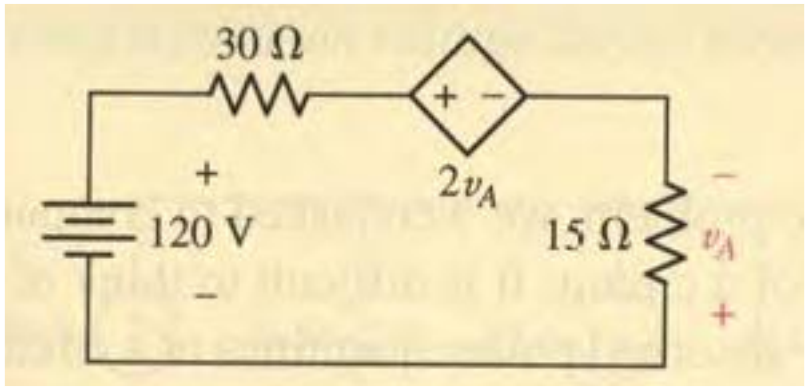
1. Voltage and / or current sources
2. Wires
3. Resistors
4. Capacitors
5. Inductors

Voltage source : we have two types of voltage sources

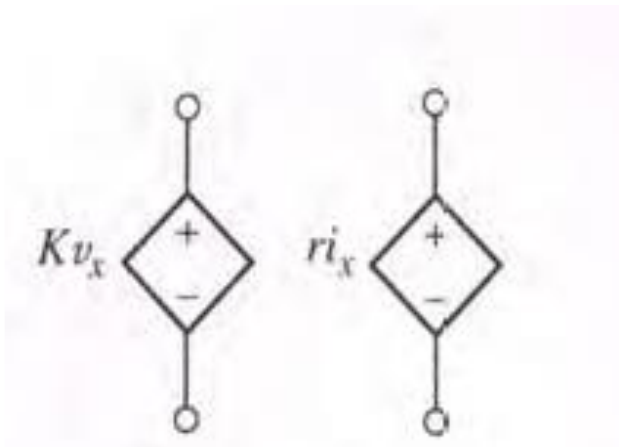
1. Independent voltage source : it’s value does not depend on any thing in the circuit
2. Dependent voltage source : it’s value depends on voltage or current that exist in the circuit

Independent voltage source





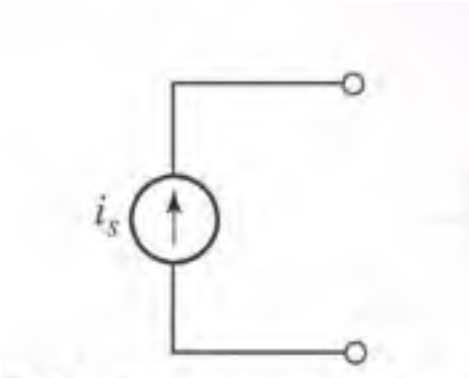
Dependent voltage source

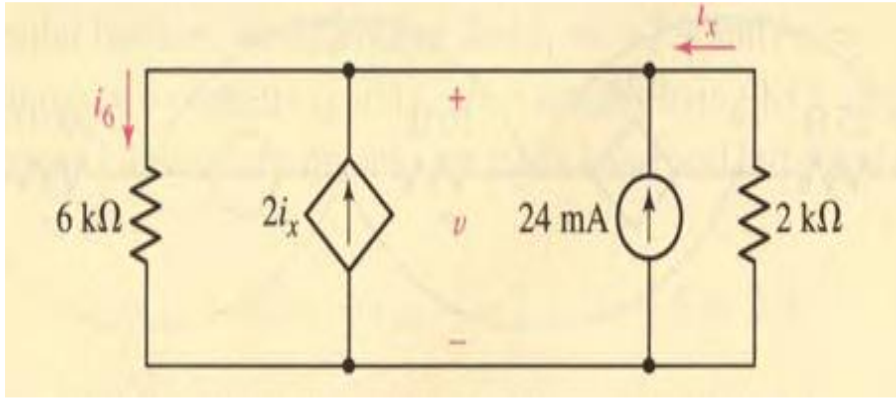


Current source : we have two types of Current sources

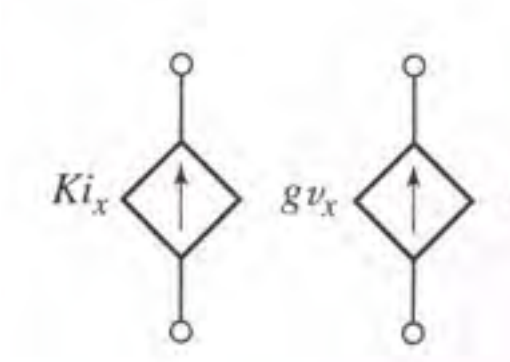
1. Independent current source : it's value does not depend on any thing in the circuit
2. Dependent Current source : it's value depends on voltage or current that exist in the circuit

Independent current source





dependent current source

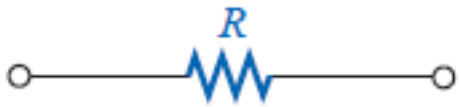


Wires: are conductors

conductors ***are those materials that permit a generous flow of electrons with very little external force (voltage) applied.***
No voltage difference between any two points on the wire (conductor)

Resistance

The flow of charge through any material encounters an opposing force similar in many respects to mechanical friction. This opposition, due to the collisions between electrons and between electrons and other atoms in the material, *which converts electrical energy into another form of energy such as heat,* is called the **resistance** of the material. The unit of measurement of resistance is the **ohm,** for which the symbol is **Ω**.

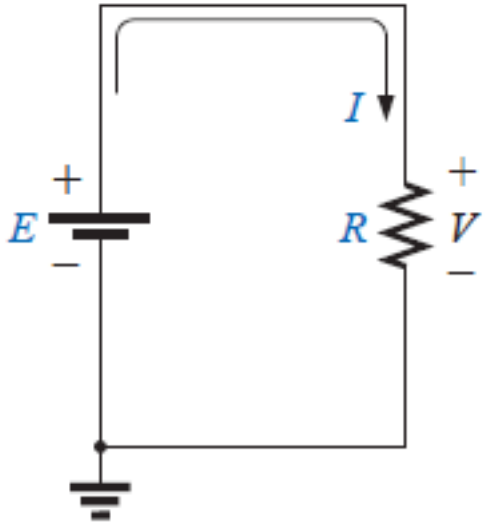


Ohm's Law, Power, and Energy

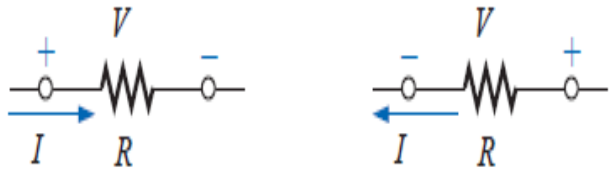
$$I = \frac{E}{R} \quad \text{(amperes, A)}$$

$$E = IR \quad \text{(volts, V)}$$

$$R = \frac{E}{I} \quad \text{(ohms, } \Omega\text{)}$$



Passive sign convention : Current flows from + signed voltage to – signed voltage



EXAMPLE Determine the current resulting from the application of a 9-V battery across a network with a resistance of 2.2 Ω.

$$I = \frac{E}{R} = \frac{9\ \text{V}}{2.2\ \Omega} = \mathbf{4.09\ A}$$

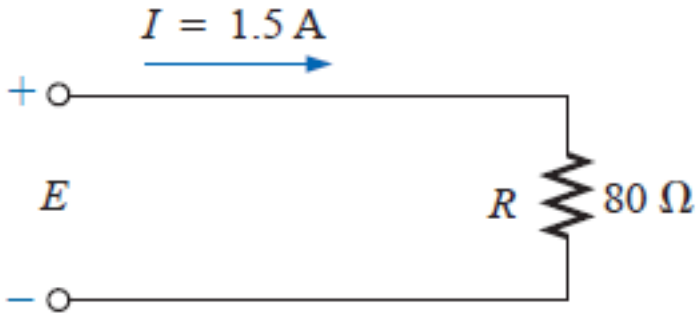
EXAMPLE

Calculate the resistance of a 60-W bulb if a current of 500 mA results from an applied voltage of 120 V.

$$R = \frac{E}{I} = \frac{120\ \text{V}}{500 \times 10^{-3}\ \text{A}} = \mathbf{240\ \Omega}$$

EXAMPLE

In the following circuit . Find value of E



$$E = IR = (1.5\ \text{A})(80\ \Omega) = \mathbf{120\ V}$$