

Current, Voltage, Resistance, Temp

Module 5

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1 Voltage

- Driver of current (Joules per Coulomb)

$$1V = \frac{W}{Q}$$

- Higher voltage is associated with a higher current (pressure differential in)

2 Current

- Current is the rate of flow of charge past a fixed point(1 Ampere)

$$I = \frac{Q}{t}$$

3 Resistance

Resistance is the opposition of the flow of electrical charge (current) in a material

- Cause by collision of charges moving through the material (similar to friction). Resistance converts electrical energy to heat.
- insulators are Material that strongly resist the flow of current. Electrons are bounded tightly to atoms

resistivity also depends n temperature, resistivity usually increases with increasing temperature.

$$\rho(T) = \rho_A[1 + \alpha(T - T_A)]$$

- ρ_A reference resistivity at the referenec temperature T_A

$$R = \frac{\rho l}{A} = \frac{l}{\sigma A}$$

Conductivity

$$\sigma = \frac{1}{\rho}$$

Series

Series resistors are connected end to end with nothing else connected in between

Parallel

Parallel resistors are connected together at each end. *Branched path

Resistivity

Current density

$$J = \frac{1}{\rho} E = \sigma E$$

where ρ is the resistivity with units of $\omega \cdot m$.

Ohm's law

$$V = IR$$

$$V_{term} = \epsilon - I_r$$

- Voltage from the terminal, electric motive force, and internal resistance