# Circuits

## Voltage, Current, Resistance, Capacitance, Power

$V = IR$

$P = IV$

$P = I^2R$

$Q = CV$

$P = \frac{V^2}{R}$

$kWh = (kW)(hr)$

***V*** *- Voltage;* ***I*** *- Current, C;* ***R*** *- Resistance, Ω;* ***C*** *- Capacitance, F;* ***P*** *- Power, W;* ***E*** *- Energy, J;* ***kWh*** *- Kilowatt-Hours*

## Energy and Work

$E = Pt$

$E = IVt$

$W = Vq$

***E*** *- Energy, J;* ***P*** *- Power, W;* ***t*** *- time, s;* ***I*** *- Current, A;*
***V*** *- Voltage;* ***P*** *- Power, W;* ***W*** *- Work, J;* ***q*** *- Charge, C;*

## Quantity of Charge

$n = It$

***n*** *- Number of charges;* ***I*** *- Current, A;* ***t*** *- time, s*

**Amps, Coulombs, Electrons**

1 Ampere = 1 Coulomb / second

1 Coulomb = $6.242 \times 10^{18}$ electrons

## Series and Parallel Circuits

### Series Circuits

$R_{eq} = R_1 + R_2 + R_3 + \ldots$

- Current is the same through all resistors
- Voltage may be different across each resistor
- Individual voltages add up to the total voltage at the source

### Parallel Circuits

$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots$

- Voltage is the same across all resistors
- Current may be different through each resistor
- Individual currents add up to the total current at the source



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