

Capacitor

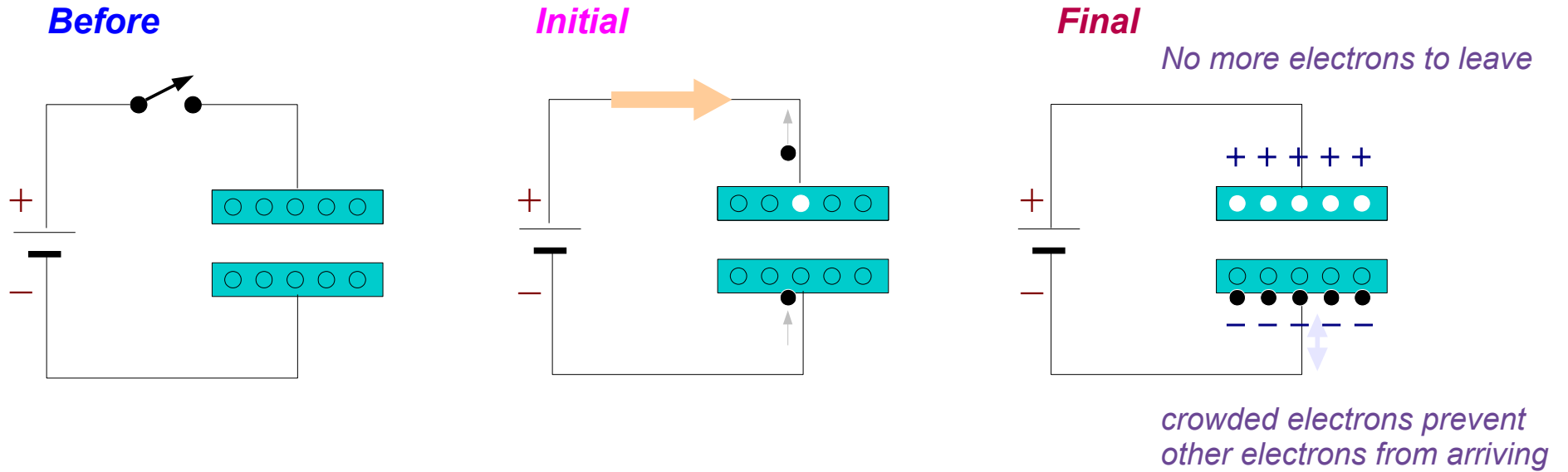
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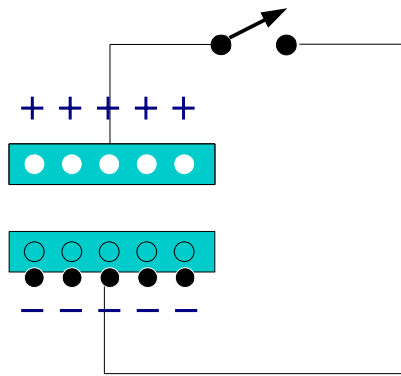
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Charge

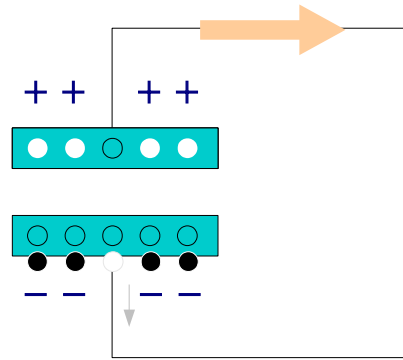


Discharge

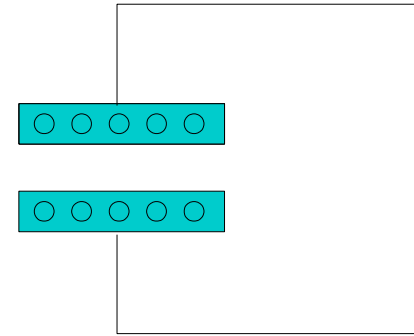
Before



Initial



Final



No more electrons moving

Sinusoid (Sine Waves)

$$A \cos(\omega t + \theta)$$

$$\left\{ \begin{array}{ll} \text{Amplitude} & A \\ \text{Angular Frequency} & \omega \\ \text{Angular Frequency} & \theta \end{array} \right.$$

1. Representation using Euler's Formula

$$A \cos(\omega t + \theta) = \frac{A}{2} \cdot e^{+i(\omega t + \theta)} + \frac{A}{2} \cdot e^{-i(\omega t + \theta)}$$

2. Representation using Real Part

$$A \cos(\omega t + \theta) = \operatorname{Re}\{A e^{i(\omega t + \theta)}\} = \operatorname{Re}\{A e^{i\theta} \cdot e^{i\omega t}\}$$

$$\rightarrow A e^{i\theta} \cdot e^{i\omega t}$$

$$\rightarrow A e^{i\theta}$$

$$\rightarrow A \angle \theta$$

Phase Lags and Leads

$$\frac{d}{dx} f(x) = \cos(x) \quad \text{leads} \quad f(x) = \sin(x)$$

$$\frac{d}{dx} f(x) = -\sin(x) \quad \text{leads} \quad f(x) = \cos(x)$$

$$\int f(x) dx = -\cos(x) + C \quad \text{lags} \quad f(x) = \sin(x)$$

$$\int f(x) dx = \sin(x) + C \quad \text{lags} \quad f(x) = \cos(x)$$

$$\frac{d}{dx} f(x) \quad \text{leads} \quad f(x) \quad \text{by} \quad \frac{\pi}{2}$$

$$\int f(x) dx \quad \text{lags} \quad f(x) \quad \text{by} \quad \frac{\pi}{2}$$

References

- [1] <http://en.wikipedia.org/>
- [2] J.H. McClellan, et al., Signal Processing First, Pearson Prentice Hall, 2003