

Equations to Know

Chapter 32

MAXWELL'S EQUATIONS

Gauss's Law for Electricity

$$\oint \mathbf{E} \cdot d\mathbf{A} = \frac{Q}{\epsilon_0}$$

Gauss's Law for Magnetism

$$\oint \mathbf{B} \cdot d\mathbf{A} = 0$$

Faraday's Law

$$\mathcal{E} = \oint \mathbf{E} \cdot d\mathbf{l} = -N \frac{d\Phi_B}{dt}$$

Generalized Ampère's Law

$$\oint \mathbf{B} \cdot d\mathbf{l} = \mu_0 I_{encl} + \mu_0 \epsilon_0 \frac{d\Phi_E}{dt}$$

Gauss's Law for Electricity (in a vacuum)

$$\oint \mathbf{E} \cdot d\mathbf{A} = 0$$

Maxwell's Displacement Current

$$I_D = \epsilon_0 \frac{d\Phi_E}{dt}$$

The Rate of Change of  $\mathbf{E}$  Between a Parallel Plate Capacitor

$$\frac{dE}{dt} = \frac{1}{\epsilon_0 A} \frac{dQ}{dt}$$

$\mathbf{B}$  Induced Between a Parallel Plate Capacitor (Inside)

$$B = \frac{\mu_0 \epsilon_0}{2} r \frac{dE}{dt} \quad [r \leq r_0]$$

$\mathbf{B}$  Induced Between a Parallel Plate Capacitor (Outside)

$$B = \frac{\mu_0 \epsilon_0}{2} \frac{r_0^2}{r} \frac{dE}{dt} \quad [r \geq r_0]$$

Relationship between  $\mathbf{E}$  and  $\mathbf{B}$

$$v = \frac{E}{B}$$

Speed of Light

$$v = \sqrt{\frac{1}{\mu_0 \epsilon_0}}$$