ELECTROMAGNETIC WAVES

In a coil, a changing magnetic field produces a voltage. A voltage produces an electric field.

\[ \Delta V = -\frac{\Delta B}{\Delta t} A \quad E = -\frac{\Delta V}{\Delta x} \quad E = \frac{\Delta B}{\Delta t} \frac{A}{\Delta x} \]

In a capacitor, a changing charge produces a current. A changing charge produces a changing electric field.

\[ Q = C\Delta V = \frac{A}{4\pi kd} \Delta V = \frac{A}{4\pi k} \frac{\Delta V}{d} = \frac{A}{4\pi k} E \quad i = \frac{A}{4\pi k} \frac{\Delta E}{\Delta t} \]

A current produces a magnetic field.

\[ B = \frac{k' 2I}{r} \]

\[ B = \frac{k' 2}{r} \frac{A}{4\pi k} \frac{\Delta E}{\Delta t} \quad E = \frac{\Delta B}{\Delta t} \frac{A}{\Delta x} \]

\[ qv(t) > i(t) > B(t) > E'(t) > B'(t) > E'(t) > B'(t) \ldots \text{ at } c = \sqrt{\frac{k}{\varepsilon}} \]

\[ c = 3 \times 10^8 \text{ m/s} \]