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Welcome!

Physics 194 - Lecture 16

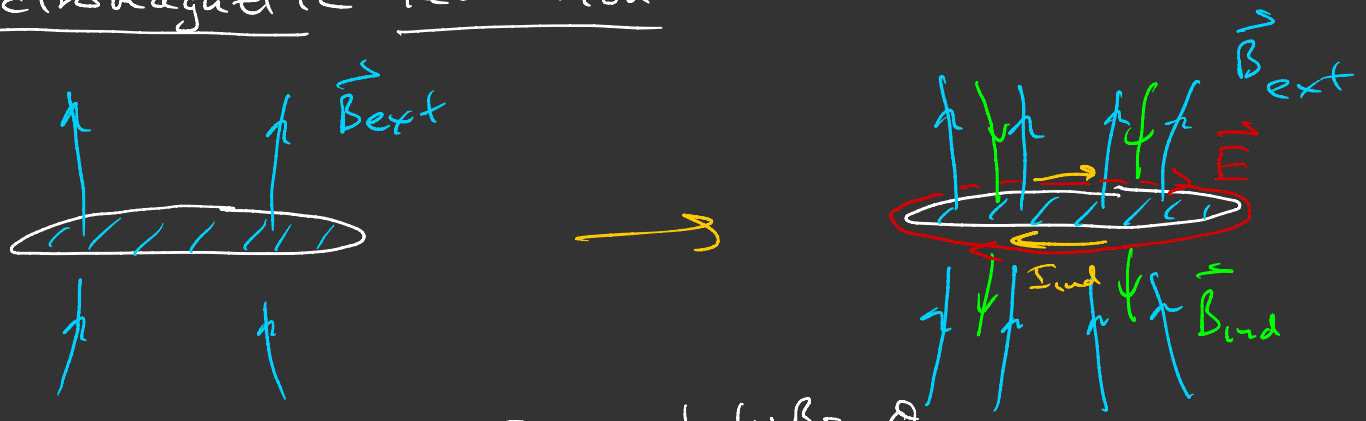
Have a question during class? Please ask it right away, even if it means interrupting in the middle of a thought. I want you to!

Agenda

- Electromagnetism and a surprising prediction
- In order for you to see something...
- Light reflection

Class starts @ 2:15 pm

Electromagnetic induction



$$F_{\vec{B}on\,q} = |q| v B \sin\theta$$

The $\vec{B}$-field can't exert a force on a charged object at rest, so $\vec{B}$ can't start that current.

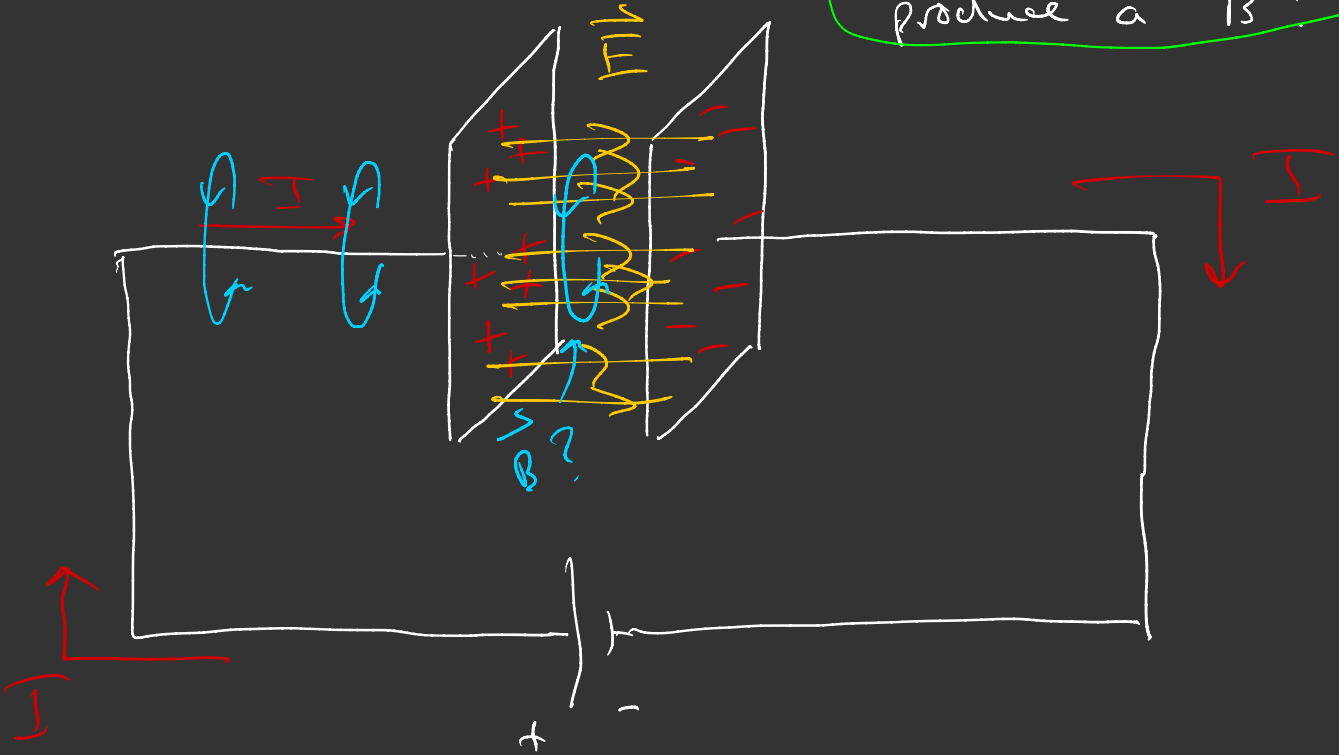
The $\vec{E}$-field can!

$$\vec{F}_{\vec{E}on\,q} = q\vec{E}$$

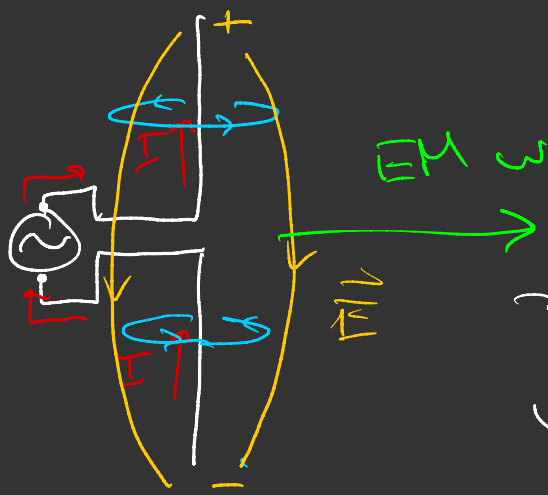
Looks like that a changing $\vec{B}$ produces an $\vec{E}$!

Project 1 (Capacitors)

Can a changing $\vec{E}$ produce a $\vec{B}$?



A changing $\vec{B}$ $\longrightarrow$ $\vec{E}$, if changing $\longrightarrow$ $\vec{B}$, if changing



This feedback loop creates waves in the $\vec{E}$ & $\vec{B}$ fields

$$V = \sqrt{\frac{F_{max}}{\mu}}$$

$$V_{EM\ waves} = \sqrt{\frac{2k}{k_m}}$$

$$E = \boxed{k}\frac{|q|}{r^2}$$

$9 \times 10^9\ N m^2/C^2$

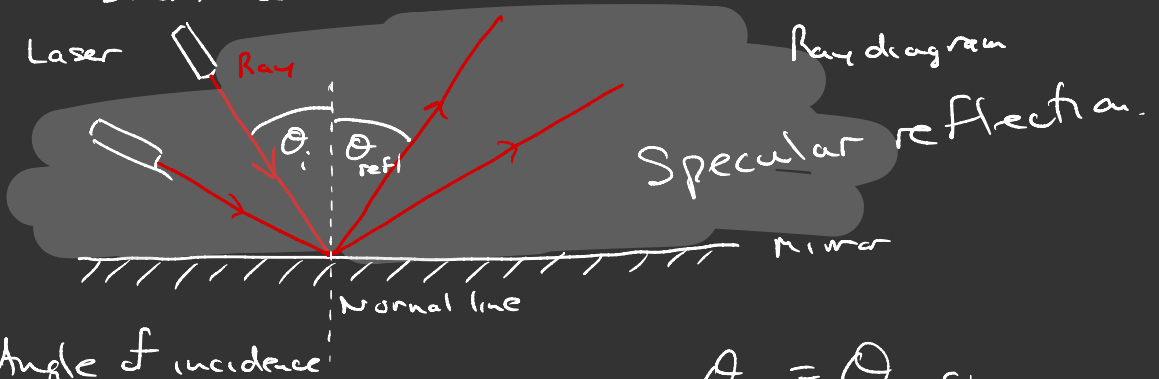
$$B = \boxed{k_m}\frac{I}{r}$$

$= 2 \times 10^{-7}\ T m/A = \frac{\mu_0}{2\pi}$

$$V_{EM\ waves} = \sqrt{\frac{2(9 \times 10^9\ N m^2/C^2)}{2 \times 10^{-7}\ T m/A}} = 3 \times 10^8\ m/s$$

Light

Let's start with reflection...



Ray diagram

Specular reflection.

θ_i: Angle of incidence

θ_{refl}: Angle of reflection.

$\theta_i = \theta_{refl}$

Law of reflection