

Physics 202, Lecture 12

Today's Topics

- Magnetic Field (Ch 29, part II)
 - Force on Current Carrying Wires
 - Force and Torque on a Current Loop In Uniform \mathbf{B} Field
 - Magnetic dipoles
 - Motion of a Charged Particle In a Uniform \mathbf{B} Field
 - Applications:
 - Magnetic Confinement
 - First Modern Particle Accelerator: Cyclotron
 - Mass Selector (q/m)
 - Hall Effect.

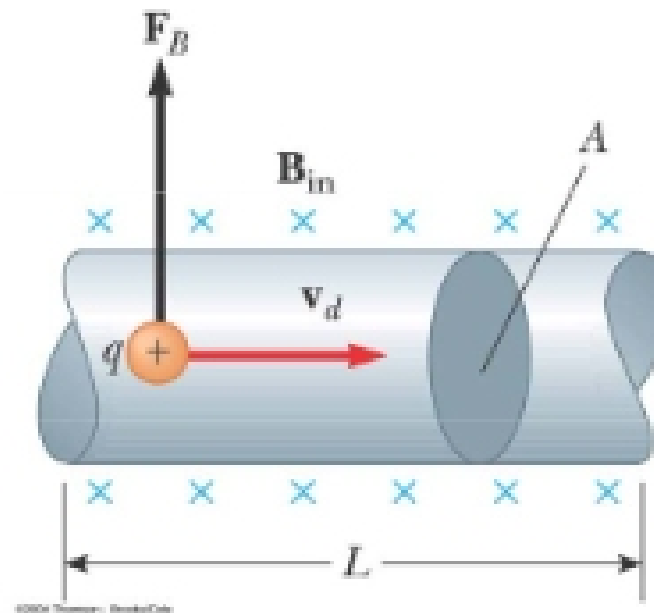
Magnetic Force On Current Carrying Wire Segment (Review of Last Lecture)

□ Magnetic force on a current segment of length L in uniform field \mathbf{B} :

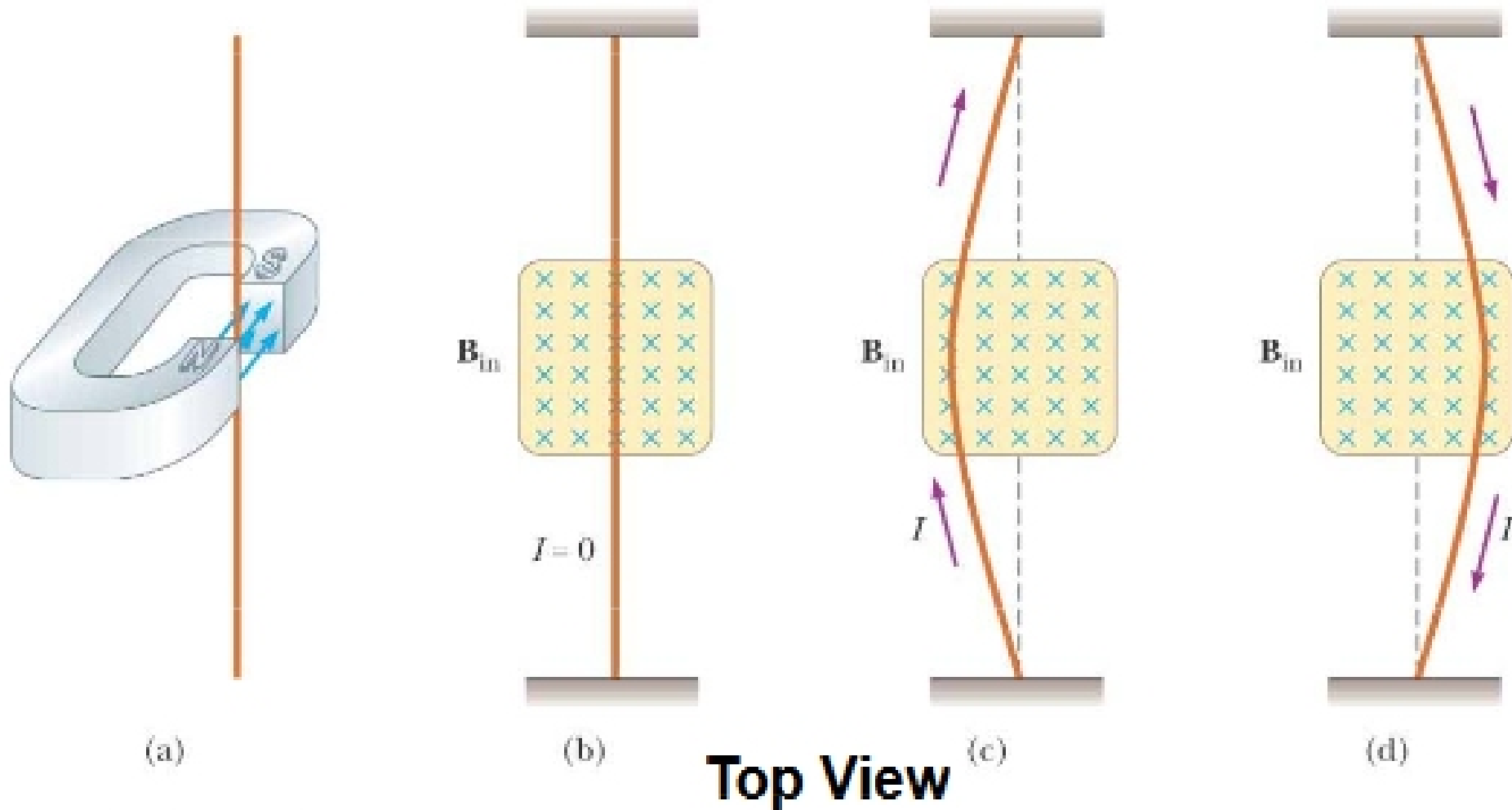
$$\mathbf{F}_B = \sum q \mathbf{v} \times \mathbf{B} = I \mathbf{L} \times \mathbf{B}$$

▪ Key steps to derive:

- Current: moving charges. $I = qn v_d A$
- Magnetic force on charge q : $q \mathbf{v}_d \times \mathbf{B}$
- $\mathbf{F}_B = q \mathbf{v}_d \times \mathbf{B} (ALn) = I \mathbf{L} \times \mathbf{B}$



Demo: Magnetic Force On A Current Carrying Wire



©2004 Thomson - Brooks/Cole

Also demo: Bending electron beam