

# Previous Lecture

- $RC$  circuits, time constants
- Energy conservation in circuits

# Today

- Announcements about exam
- Start magnetism

September 26, 2011

# First Hour Exam

Exam Wed., Oct. 5 at 4:10 pm covers:

- Reading assignments through chapter 27
- Lectures through L-10 or L-11; HW through HW-10
- Room assignments: class website; next slide

A study guide, a practice exam, and its solution will be posted on the class web site.

Scheduling changes:

- Morning lecture Tues., Oct. 4 ????????
- Review session Tues., Oct. 4 at 7:00 pm in LL270
- No homework assignment due Wed., Oct. 5

# Exam Locations

## Chandler-Ullman 248

- Glueckstein (all)
- Beels (9 am)

## Packard 466

- Malenda (all)
- Faust (all)

## Packard 416

- Tupa (all)
- Beels (10 am)

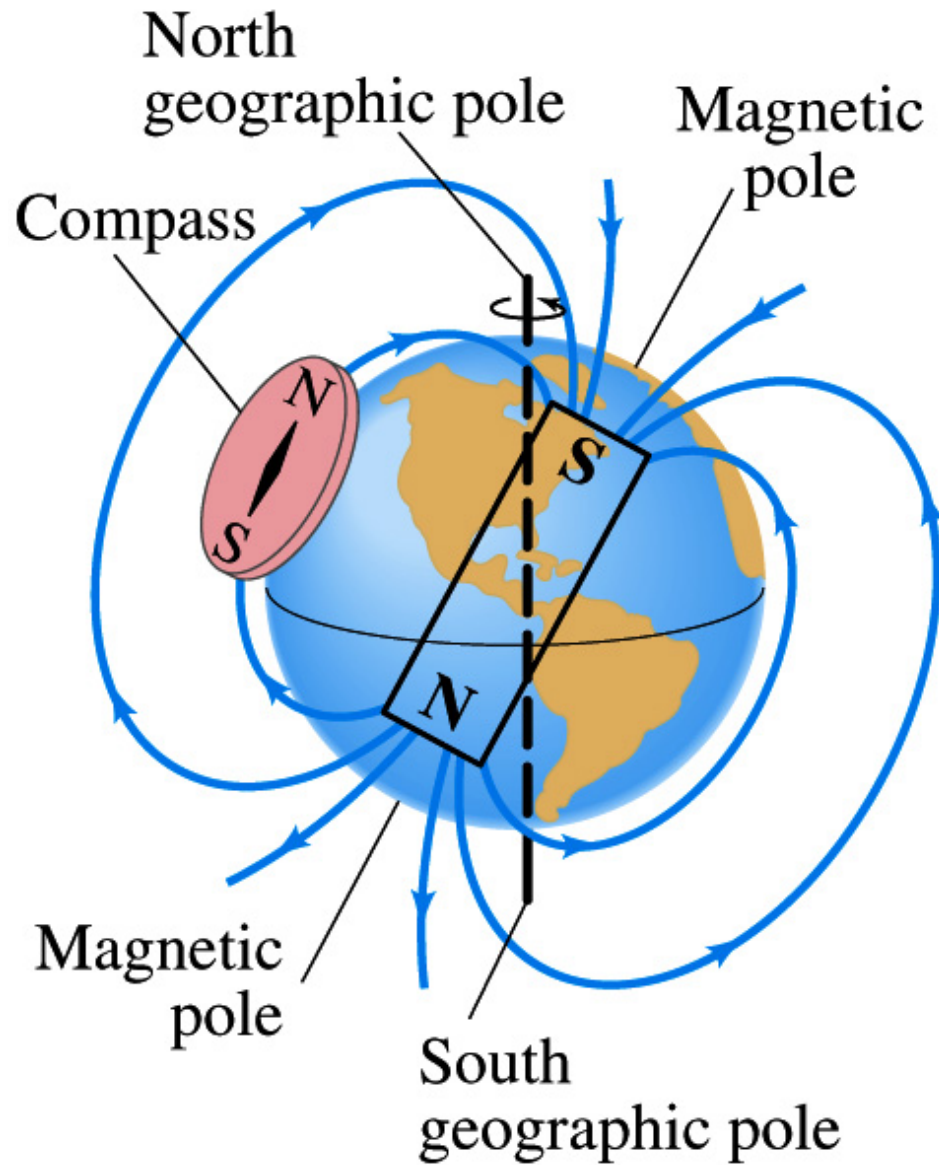
# Electricity

# Electricity & Magnetism

# Electricity & Magnetism

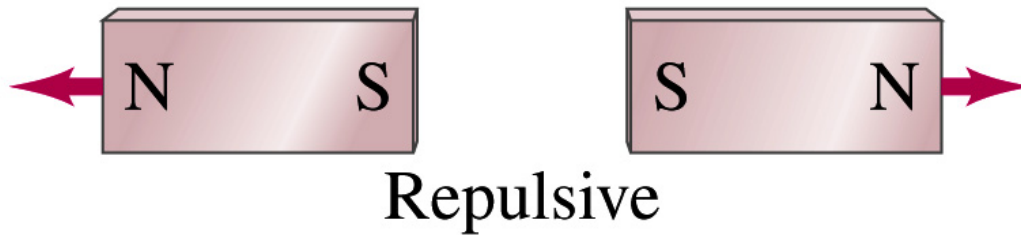
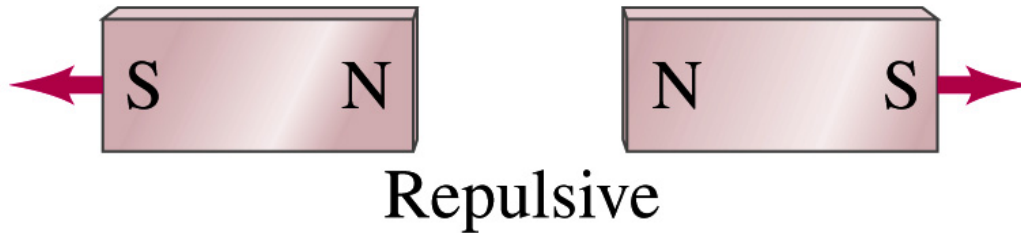
- The magnetic force and magnetic field  $\mathbf{B}$
- $\mathbf{B}$  acts only on moving charges
- Moving charges create  $\mathbf{B}$
- Right hand rule, cross products
- Magnetic and electric dipoles

# The Earth is a Magnet



# Magnetic Forces

Like poles repel, unlike attract:



# Magnetic Charges?



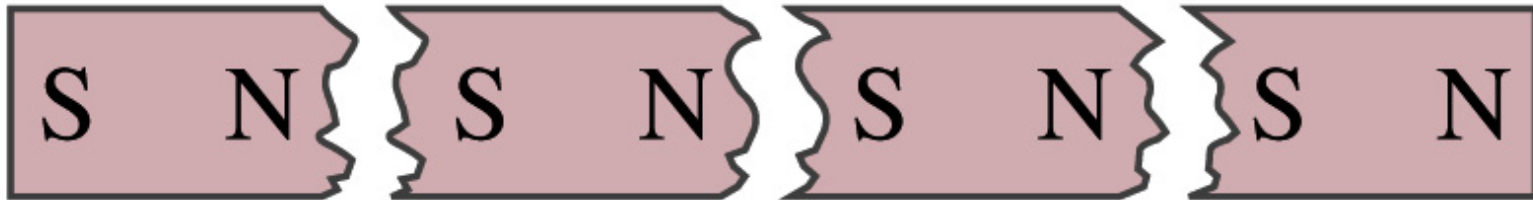
# Magnetic Charges?



# Magnetic Charges?



# Magnetic Charges?



# The Magnetic Force

Just as the magnetic poles  $N$  and  $S$  do not quite correspond to electrical  $+$  and  $-$  charges, the magnetic force doesn't act quite like the electrical force.

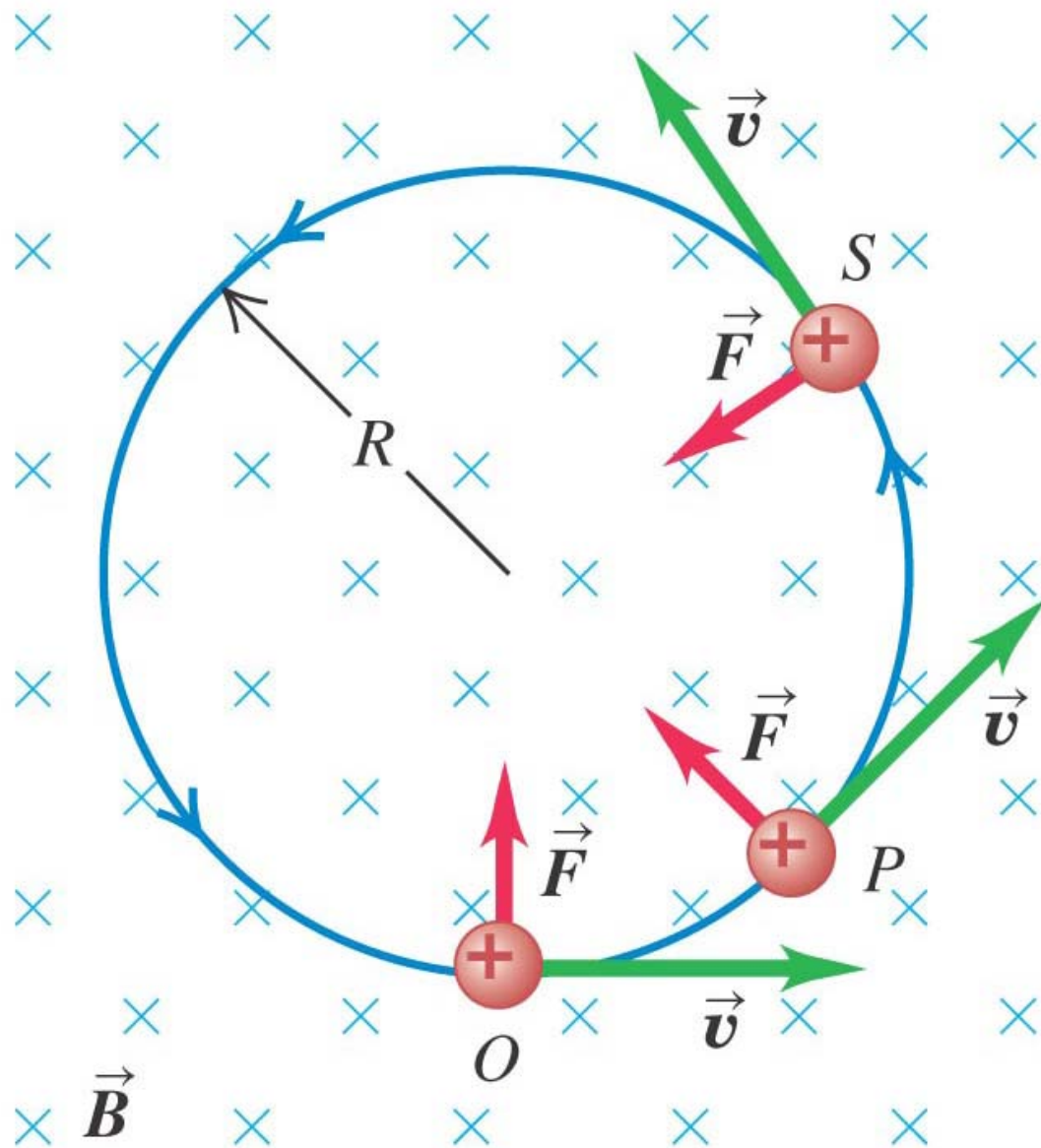
The magnetic force acts only on moving charges.

# The Cross Product

$$\begin{aligned}\mathbf{A} \times \mathbf{B} &= \begin{vmatrix} \hat{\mathbf{x}} & \hat{\mathbf{y}} & \hat{\mathbf{z}} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix} \\ &= \hat{\mathbf{x}}(A_y B_z - A_z B_y) \\ &\quad + \hat{\mathbf{y}}(A_z B_x - A_x B_z) \\ &\quad + \hat{\mathbf{z}}(A_x B_y - A_y B_x)\end{aligned}$$



# Circular motion of $q$ in $\mathbf{B}$



# Spiral motion of $q$ in $\mathbf{B}$

