

# PHYSICS 1B – Fall 2009



## Electricity & Magnetism



Friday September 25, 2009  
Course Week 0

Professor Brian Keating  
SERF Building. Room 333

# Physics 1B

## *Electricity & Magnetism!*

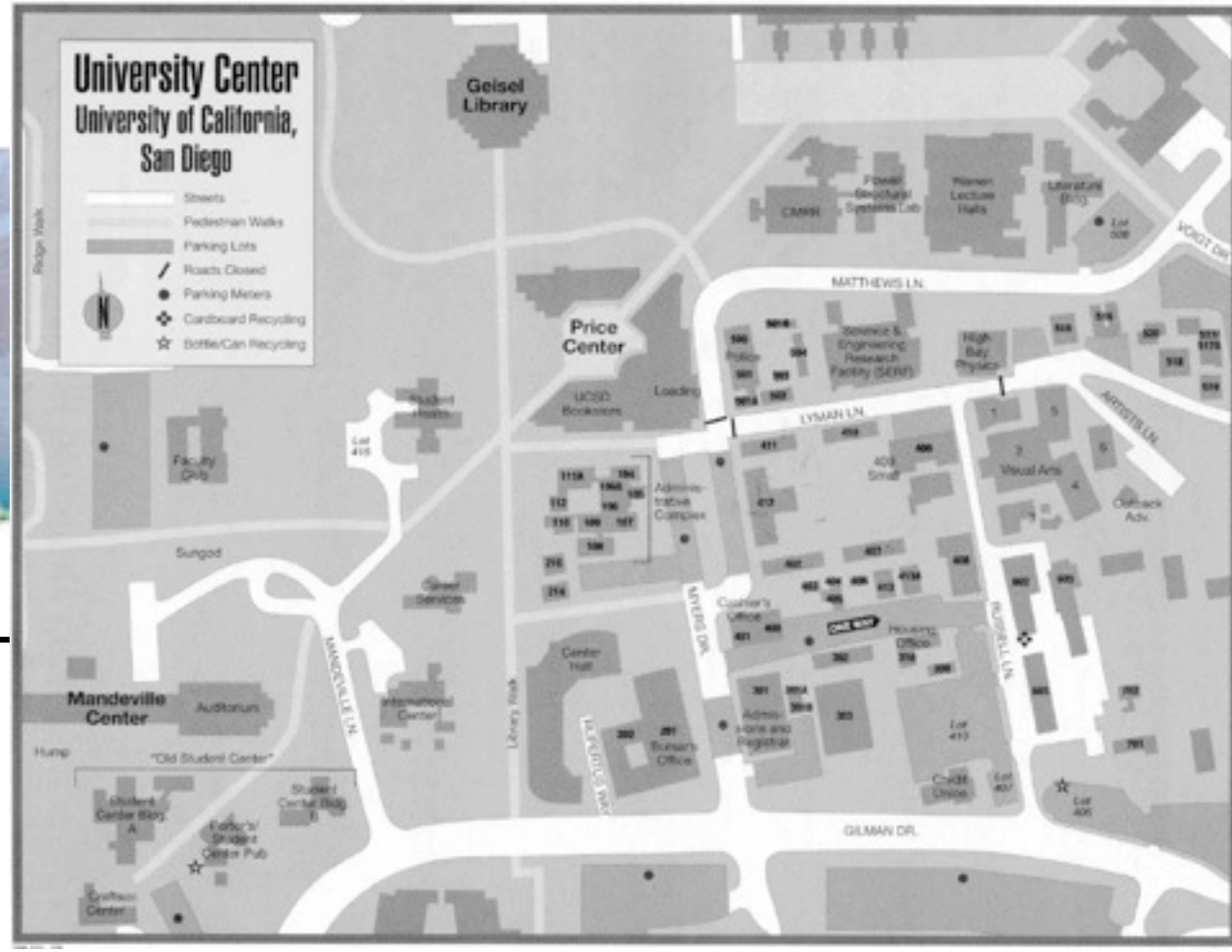
- Professor – Brian Keating  
[bkeating@ucsd.edu](mailto:bkeating@ucsd.edu)
  - Office hours: Mondays 2-3p,
  - **Office Location: SERF Building, Room 333**
  - Lectures: MWF York 2622 1p-1:50p
  - **Quizzes: One every other week starting on Friday 10/9, in lecture.**
  - 4 total quizzes – you are allowed to drop 1 quiz, so no makeup quizzes ☹
  - **Grade**
    - Quizzes 60% (best 3 out of 4)
    - Final exam 40%
    - Extra Credit 5%
    - Final exam **Week of December 7th WLH 2005**
- That's it! What about homework????

# Office Hours: My office is in the Science & Eng. Research Facility =

You want this "side" of SERF



SERF from WLH

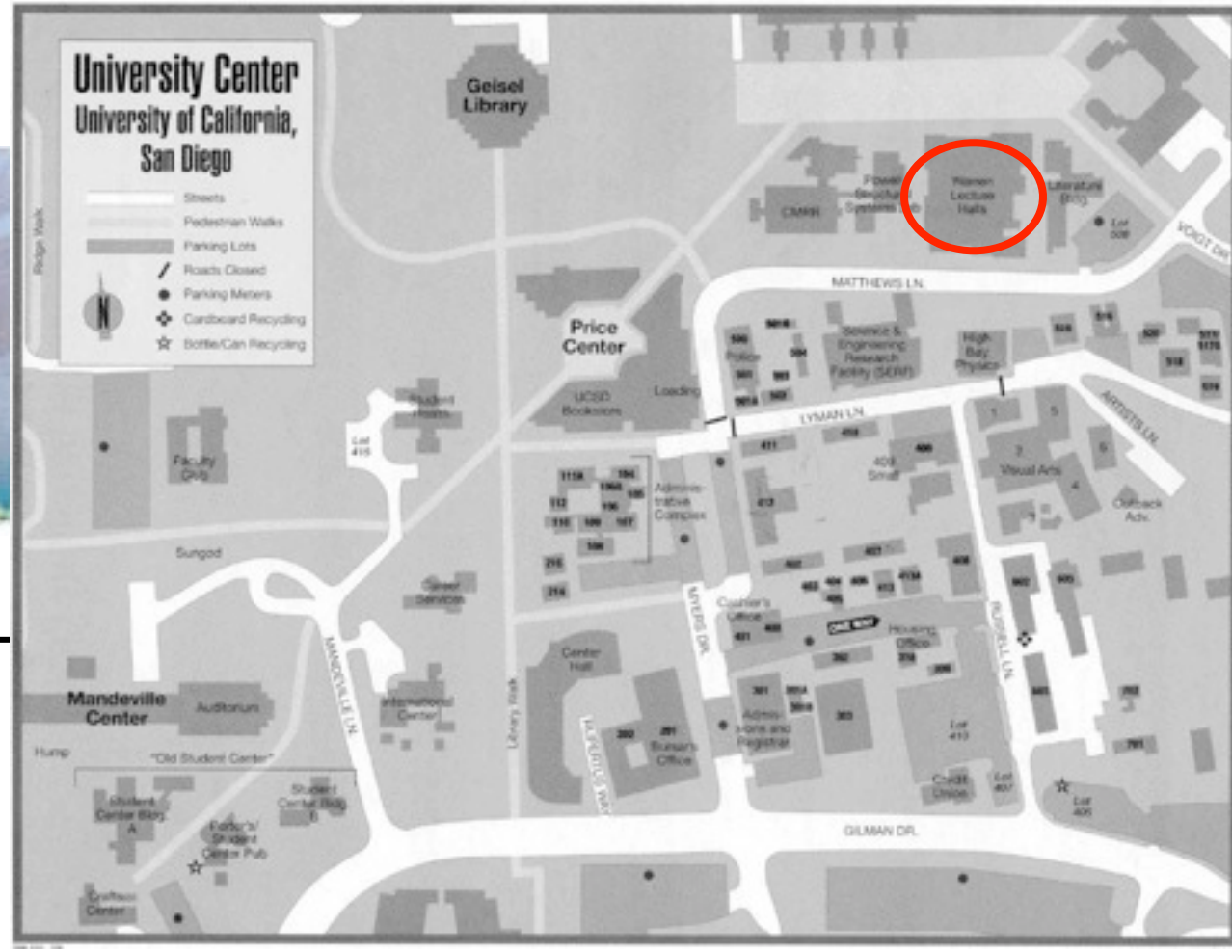


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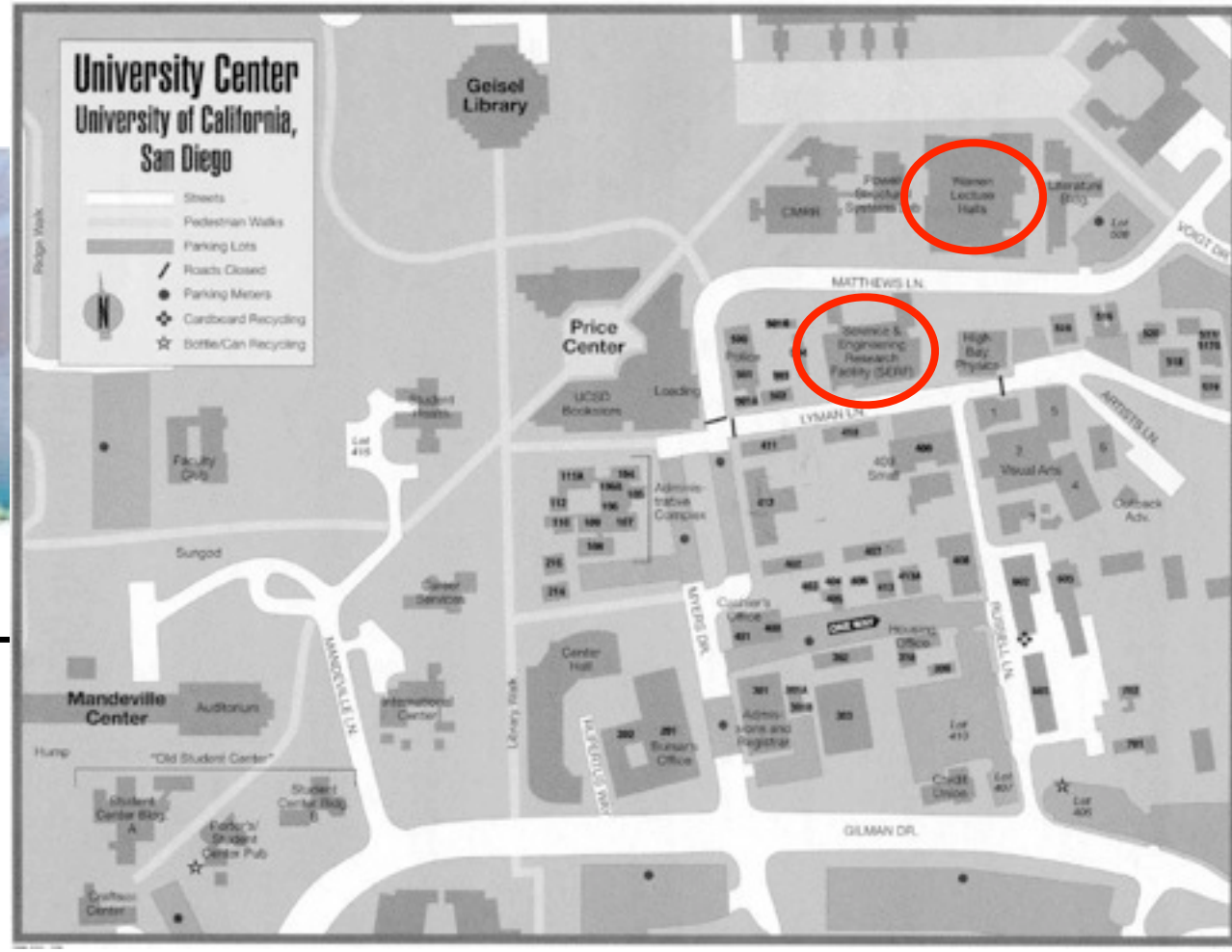


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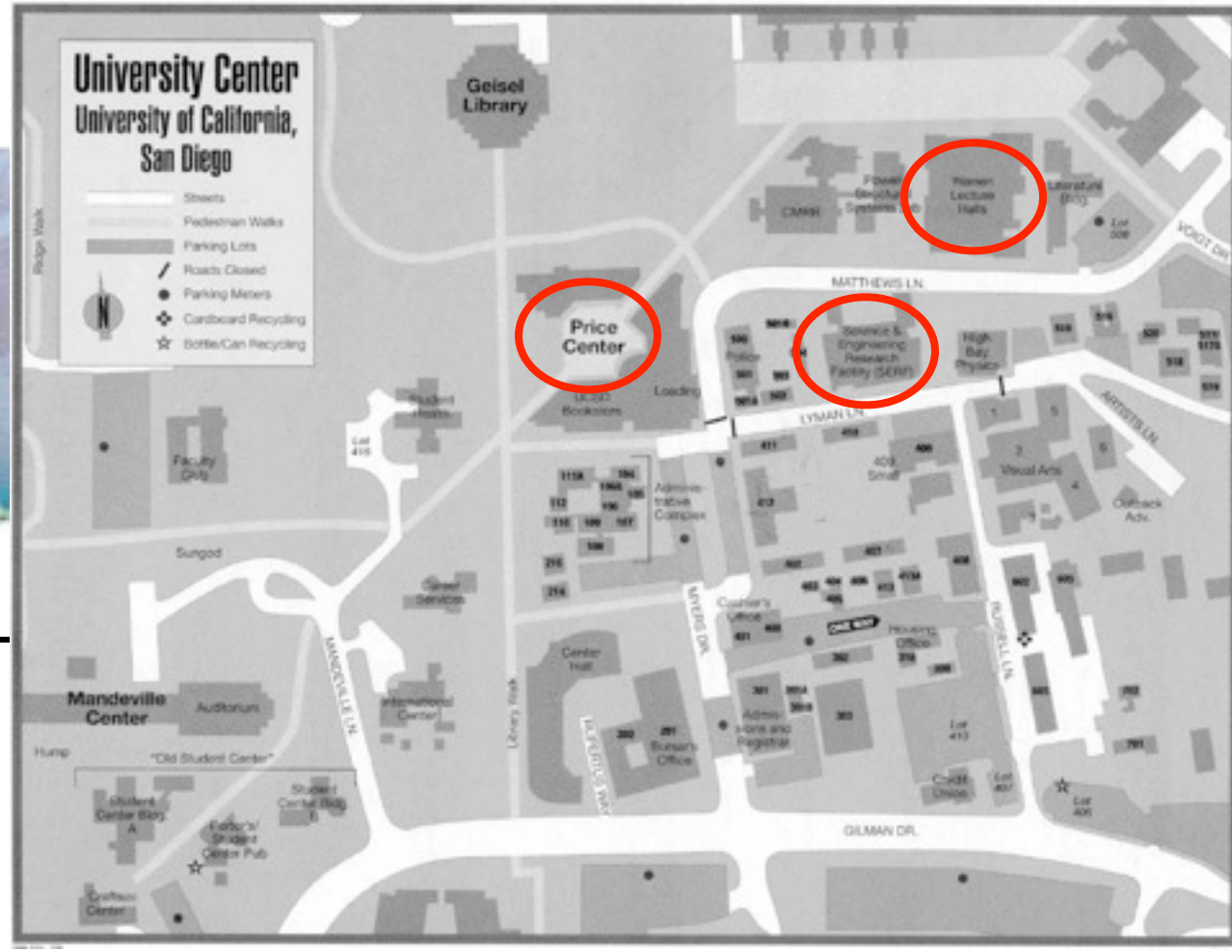


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SERF from WLH



# Today's Plan

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- Review Course



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- Review Course
- Review Policies
- Get started!

# Logistical Stuff

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- Final Exam: in class

# Other Stuff....

- I don't know about extra spots in this lecture/course – check [Studentlink/Blink](#)
- I know *even less* about 1BL
- = lab
- = totally different course/professor – Prof. Anderson. Prof. Anderson has taught 1B before so knows a lot about 1B and 1BL.

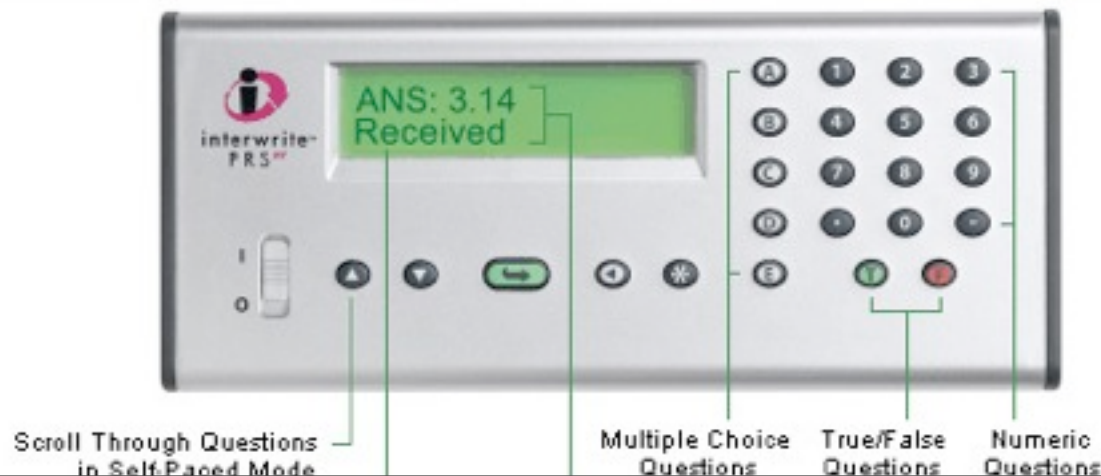


# Text Book

- Serway & Faughn, Title: **College Physics**, 7<sup>th</sup> Edition, Publisher: Thomson/Brooks/Cole.
- Some stuff on web (interactive quizzes for each chapter):
- <http://info.brookscole.com/serway/>

# Clickers a.k.a. “Student Response System”

- Buy at Price Center Bookstore. You need to get the [PRS RF System](#)
- Register using your PID Number. Use the FULL PID A1234567890
- See instructions in Clicker box or on web
- Use to stay involved in lectures
- Use to obtain up to 5% extra credit





Scroll Through Questions in Self-Paced Mode

Receive Visual Notification that Answer was Received or Student has Successfully Joined Class

Multiple Choice Questions

Students Can See Their Answers with the 2-line display

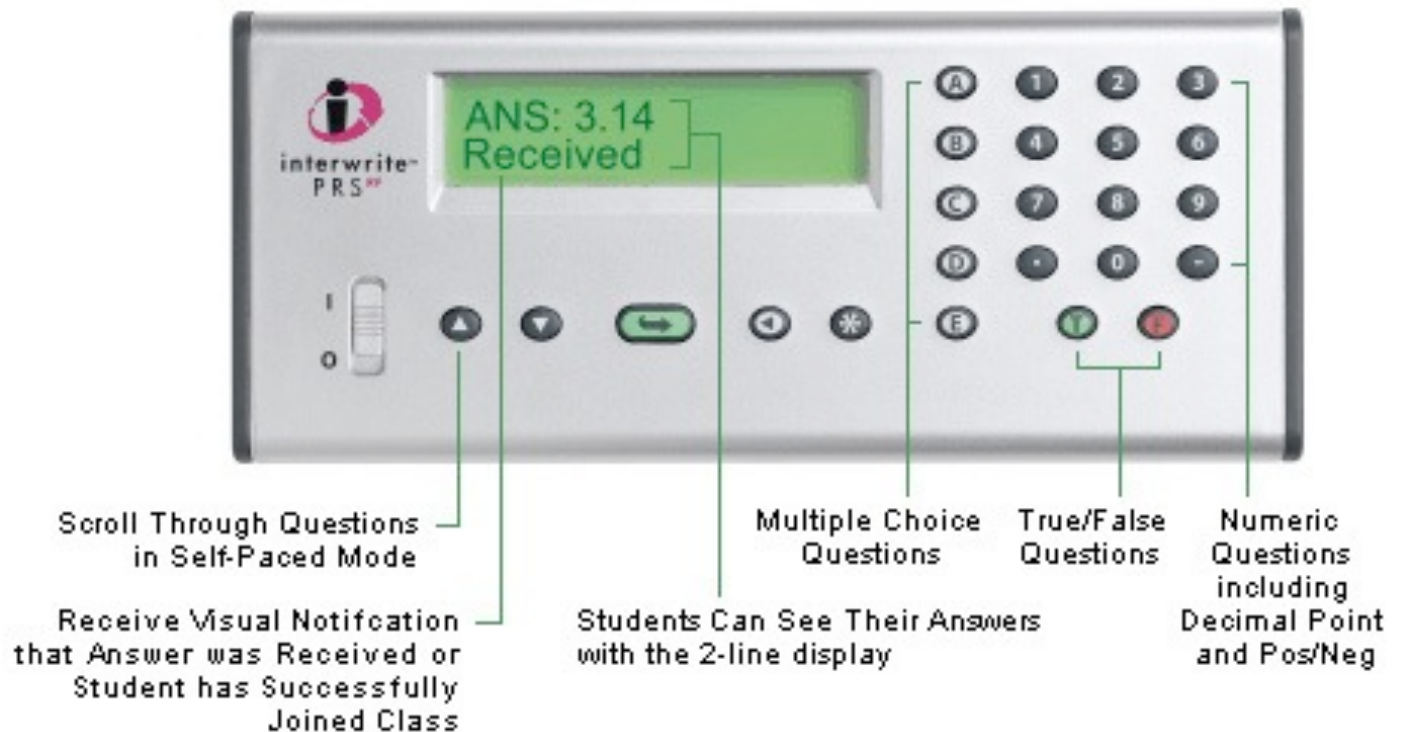
True/False Questions

Numeric Questions including Decimal Point and Pos/Neg



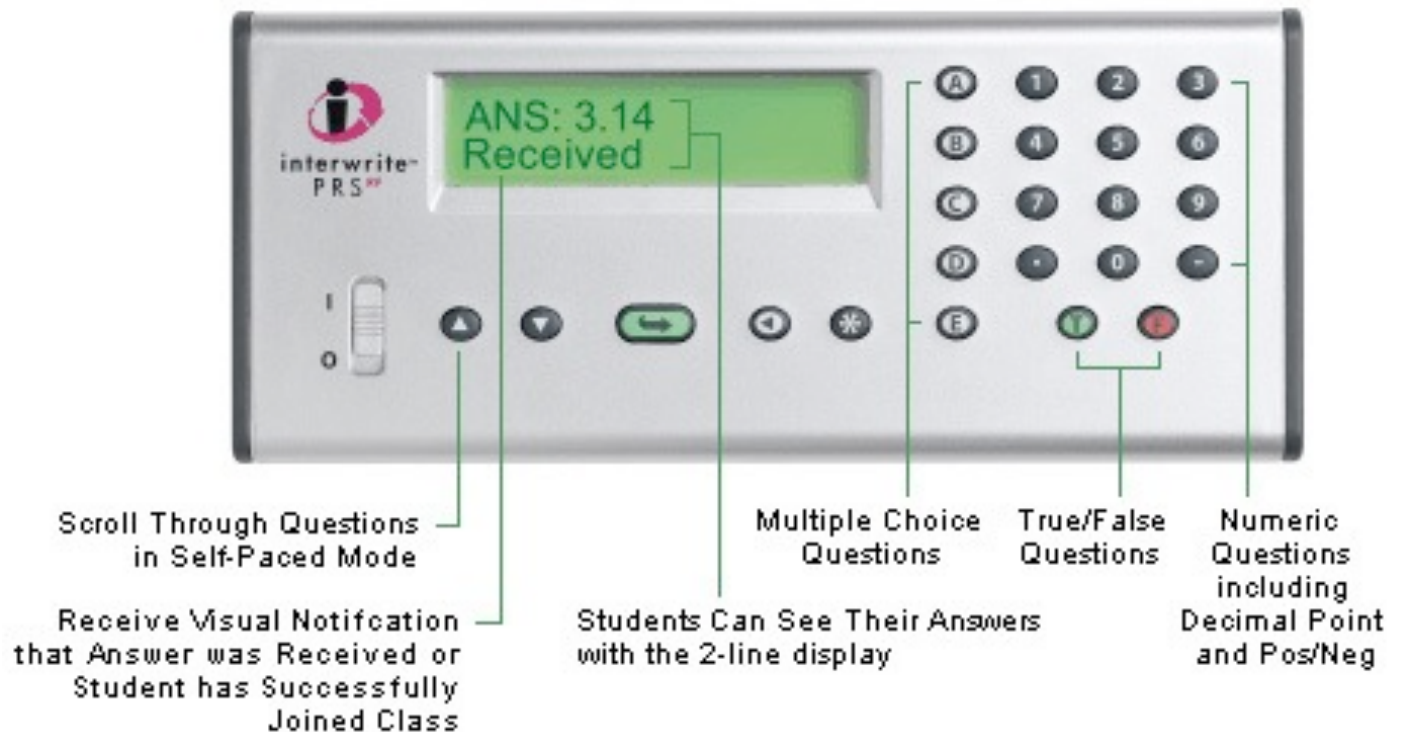
# Pi in the sky: what is the first digit in Pi?

- A. 1



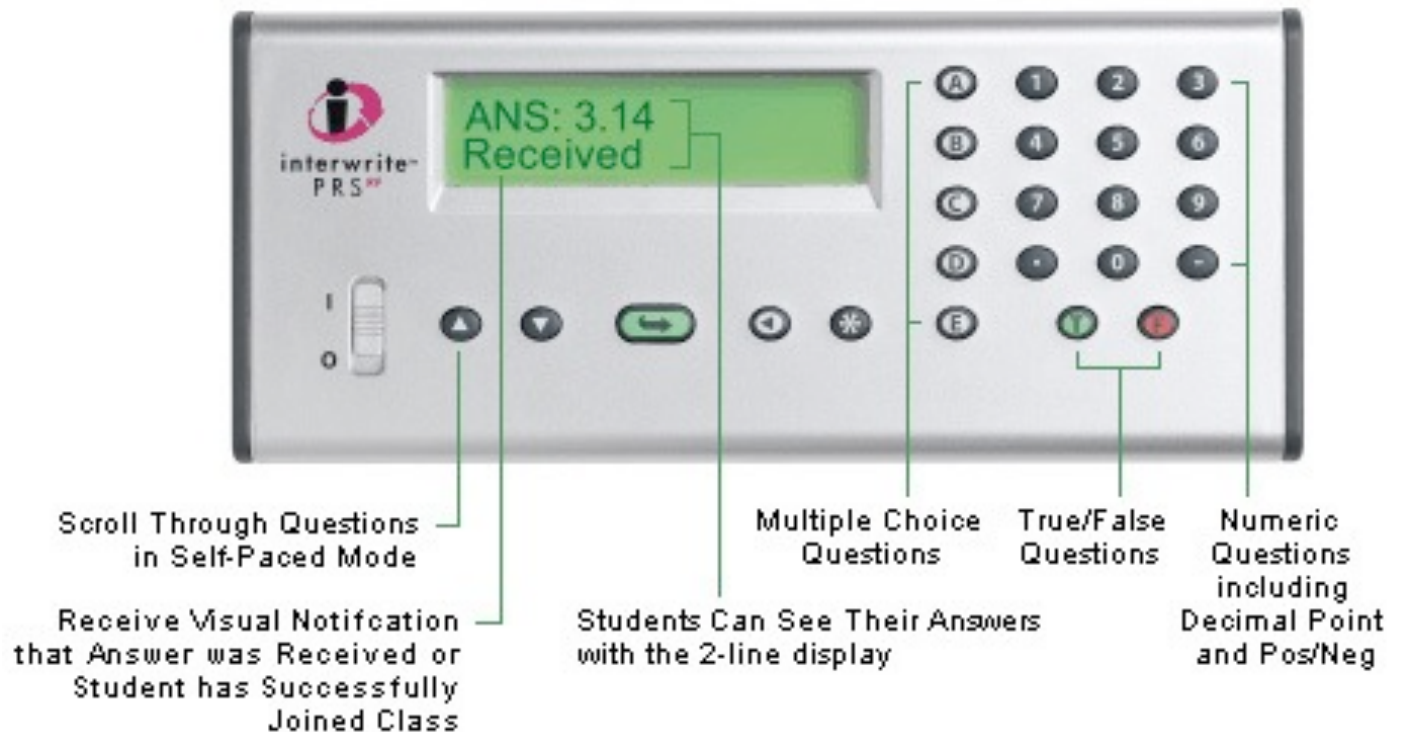
# Pi in the sky: what is the first digit in Pi?

- A. 1
- B. 2



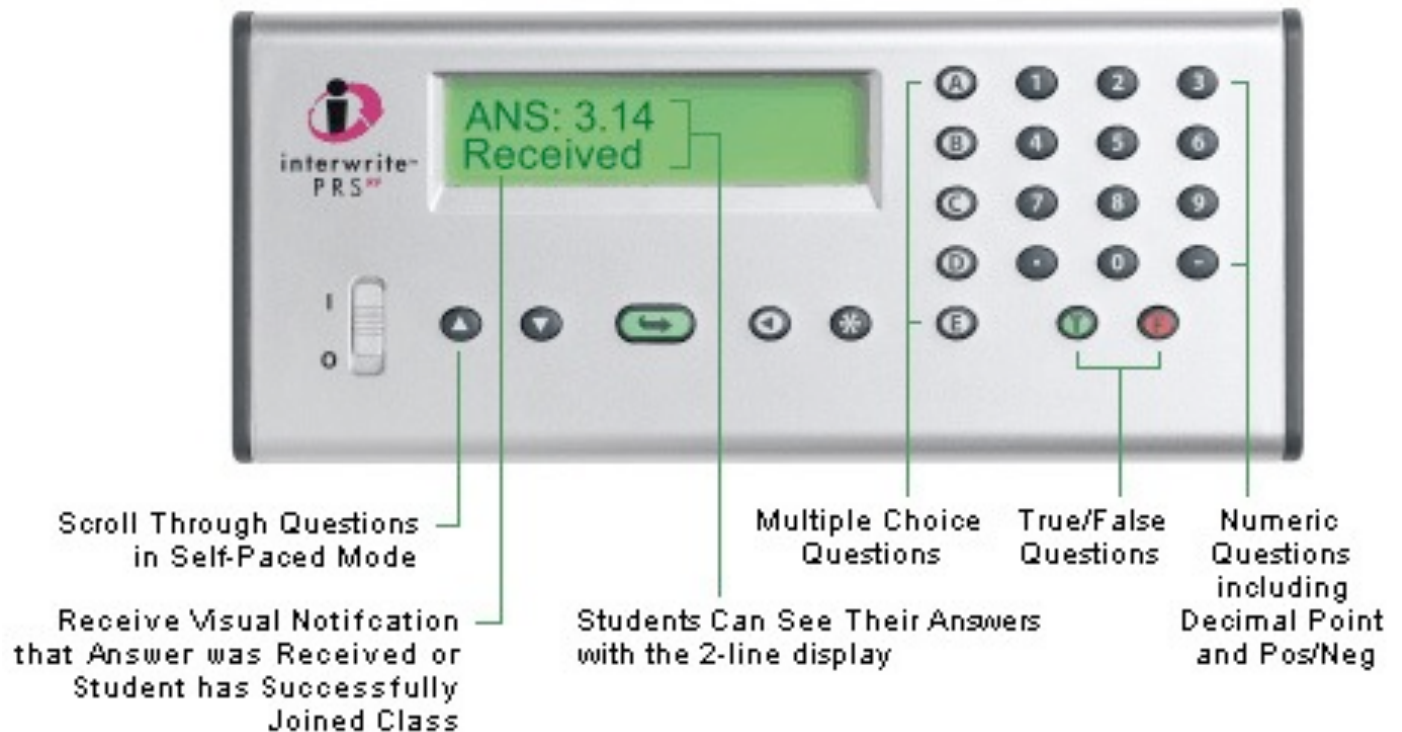
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- A. 1
- B. 2
- C. 3



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- A. 1
- B. 2
- C. 3
- D. 4







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- Encourages attendance (but will not be used to monitor attendance...)

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- Makes learning less one-way (from my notes to your notes, bypassing the brain.)
- Can help me isolate if you have challenges with concepts or problem solving.

# Clickers: Registration

- Read instructions that come with Clicker.
- Use your PID to register.
- Visit: [http://mediacenter.ucsd.edu/crs\\_info2.cfm](http://mediacenter.ucsd.edu/crs_info2.cfm)
- Go under “Students” and learn how to set up.
- We’ll start using it in Class next week.

So what is 1B all about  
anyway?

**NOT MCAT  
preparation**

(though E&M is ~30% of

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Coulomb's Law
Electric Field/ Field Lines
Electrostatic Equilibrium/Millikan
Gauss' Law
Electric Potential
Equipotential Surfaces
Capacitance
Capacitor Combinations
Energy, Dielectrics
Electric Current
Resistance, Ohms' Law
Resistivity, Electric Power
Sources /Resistors - Series and Parallel
Kirchoff's Rules
RC circuits
Magnets, Force on a charge
Force on a current, Torque on current loop
Motion of charge, Ampere's Law
Current loop, solenoid, permanent magnet
Induced EMF, Faraday's Law
Motional EMF, Lenz's Law
Generators, Inductance
RLC Circuits
Electromagnetic Waves

# Chapter 15

## Electric Forces and Electric Fields



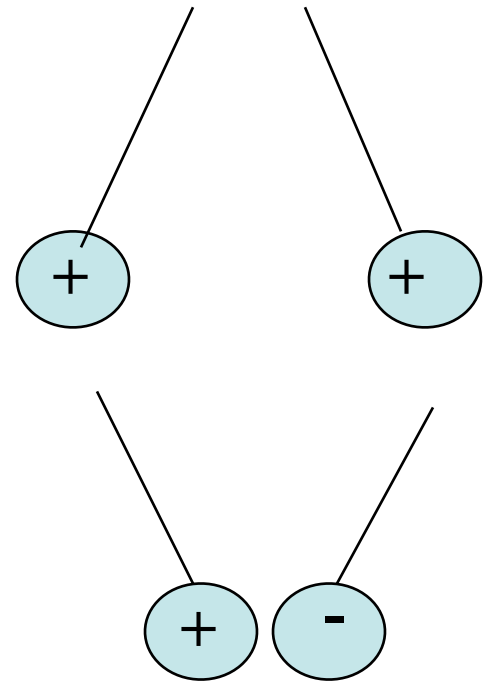
## Electricity and Magnetism- Applications

- Electricity - lighting, refrigerators, tv, radio, computers, medical diagnostic equipment, Clickers
- Magnetism - electromagnets, electric motors, electric generators, MRI.
- Electromagnetic radiation – light, radio, tv, cell phones, medical imaging (Xrays, CT Scans)



# Getting Started - Electric Charges

- Two kinds
  - Positive +
  - Negative -
- Like charges repel
  
- Unlike charges attract



# Electric Charges

- Charge is Conserved
- Charge is Quantized – electron charge ( $e$ )
- Unit of Charge - Coulomb (C)  
 $e = 1.60 \times 10^{-19} \text{ C}$

⊕ proton charge  $e = 1.602 \times 10^{-19} \text{ coulombs}$

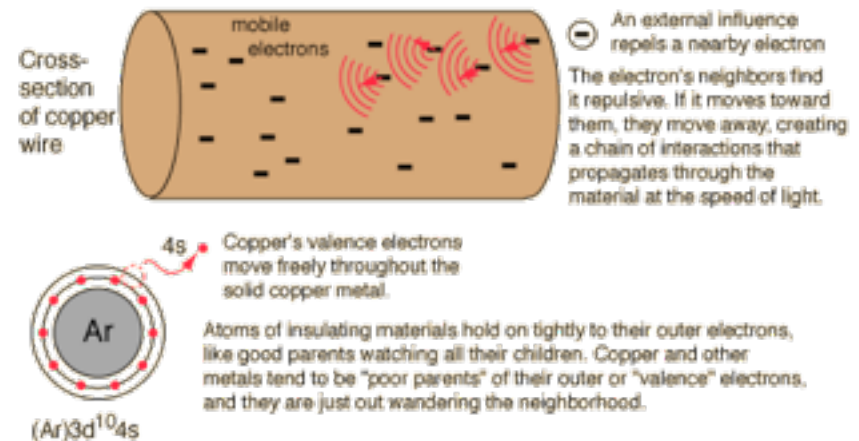
⊖ electron charge  $-e = -1.602 \times 10^{-19} \text{ coulombs}$

# Nature of Matter

- Matter made up of charged particles, positive nuclei and negative electrons
- Most matter is neutral, sum of charges = zero
- Most often charge transfer is due to movement of electrons

# Insulators and Conductors

- Insulators-do not conduct charge. Examples: glass, rubber, paper, plastic
- Conductors- conduct charge –metals
- Semiconductors- intermediate conduction properties, important for electronic devices that control charge flow- Silicon, germanium.



# Detecting charge - Electroscope

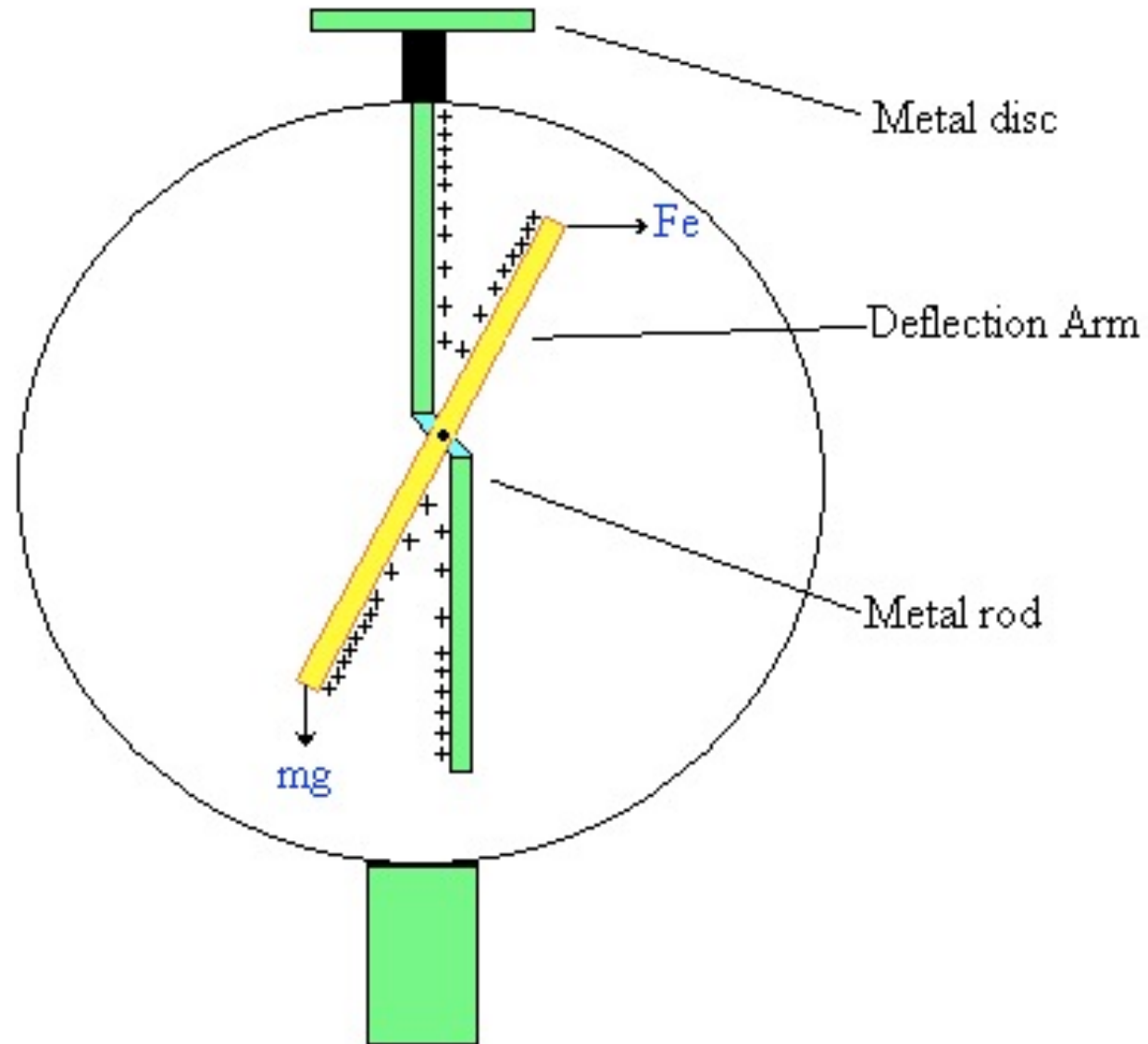


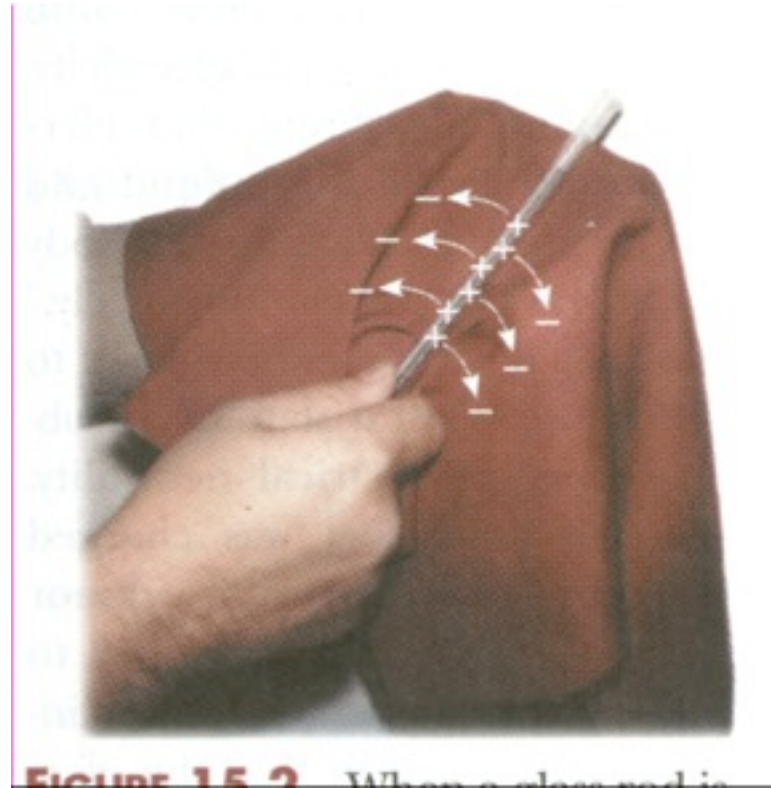
Figure 1: Electroscope

# Charging by Rubbing

Triboelectric sequence

Fur	Positive
Glass	
Silk	
Cotton	
Wood	
Rubber	negative

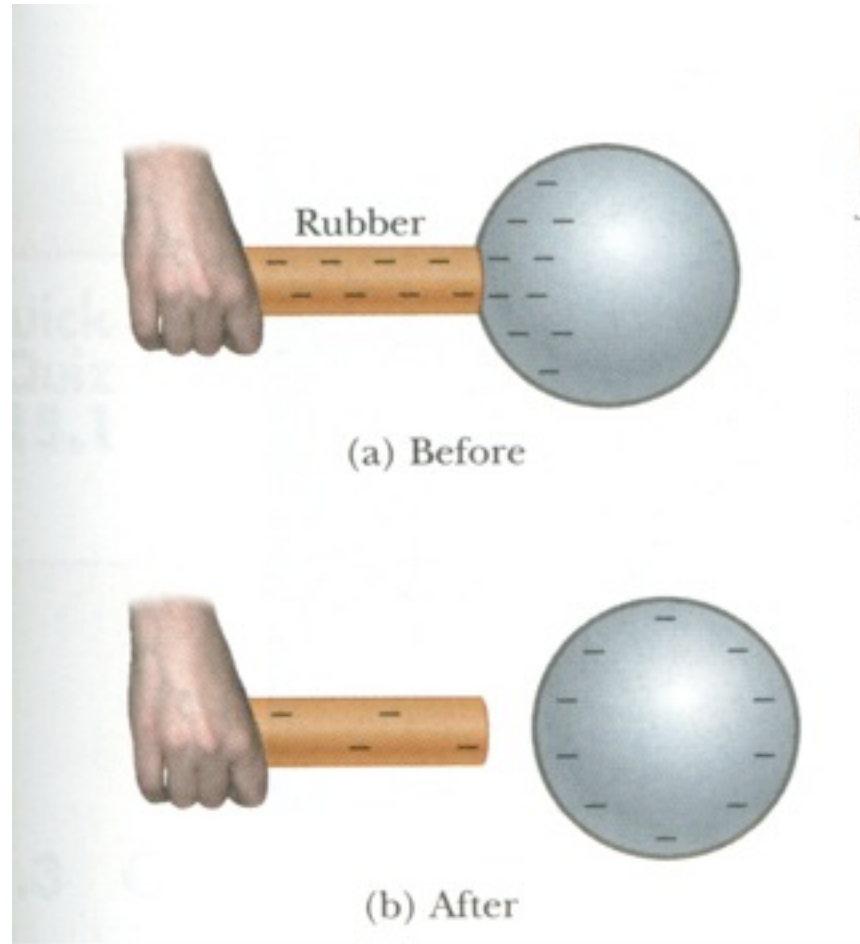
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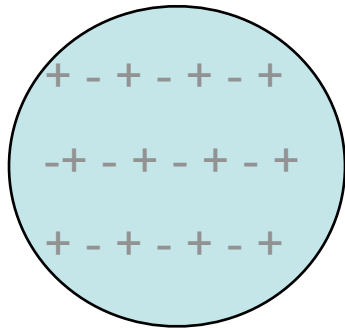
Negative charges transferred from glass to silk

# Charging by conduction

Charged rubber rod transfers electrons to metal sphere



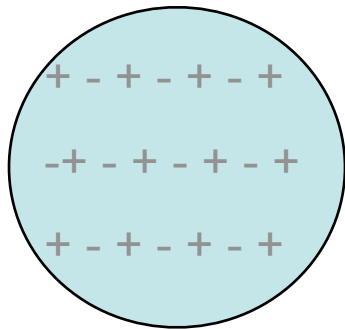
# Induced charge (Polarization)



uncharged  
conductor



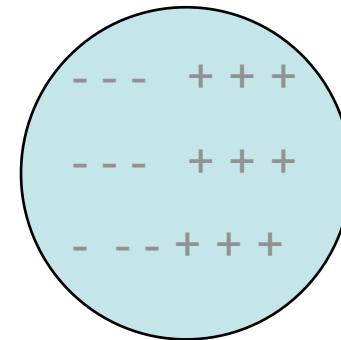
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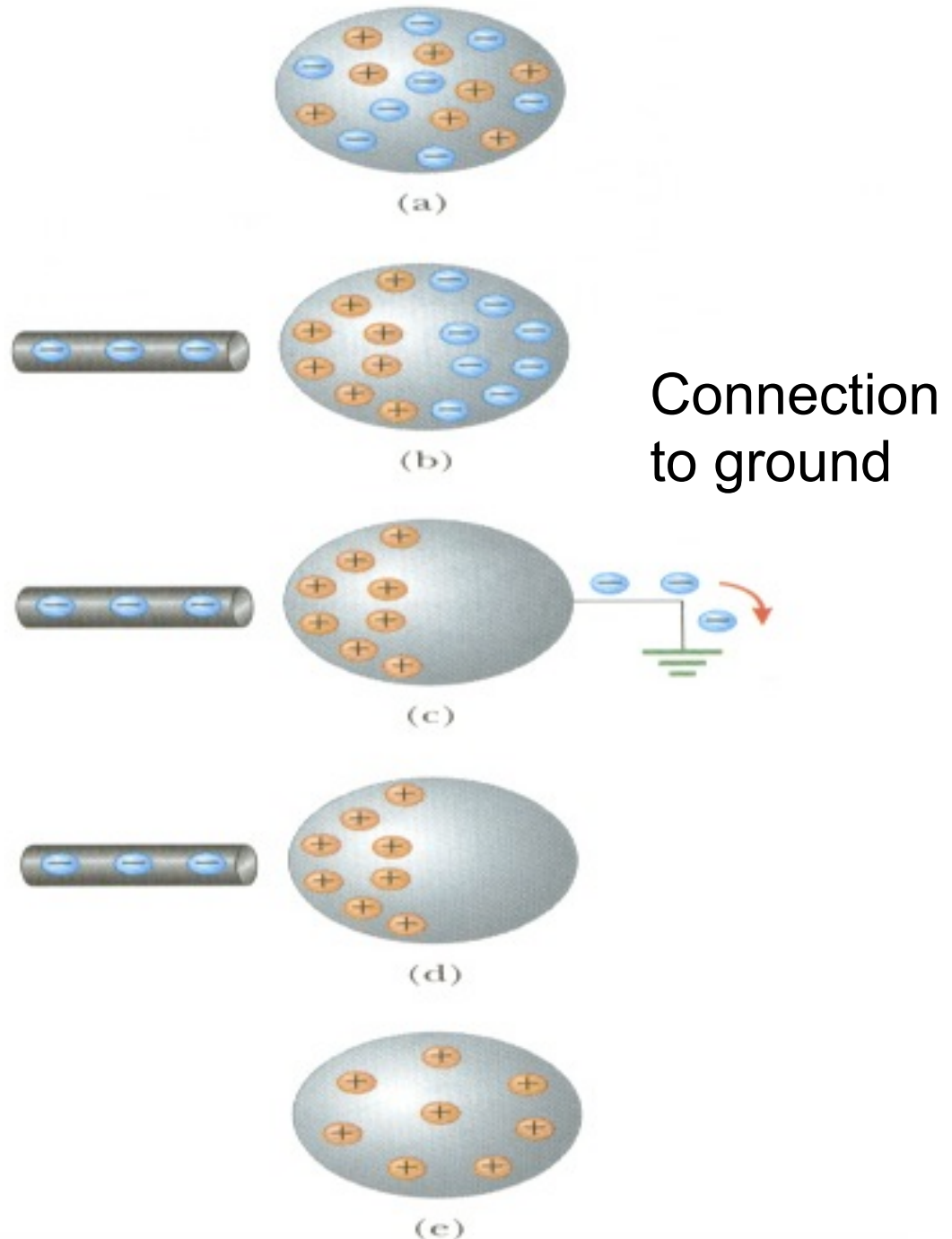
Attractive Force



induced charge

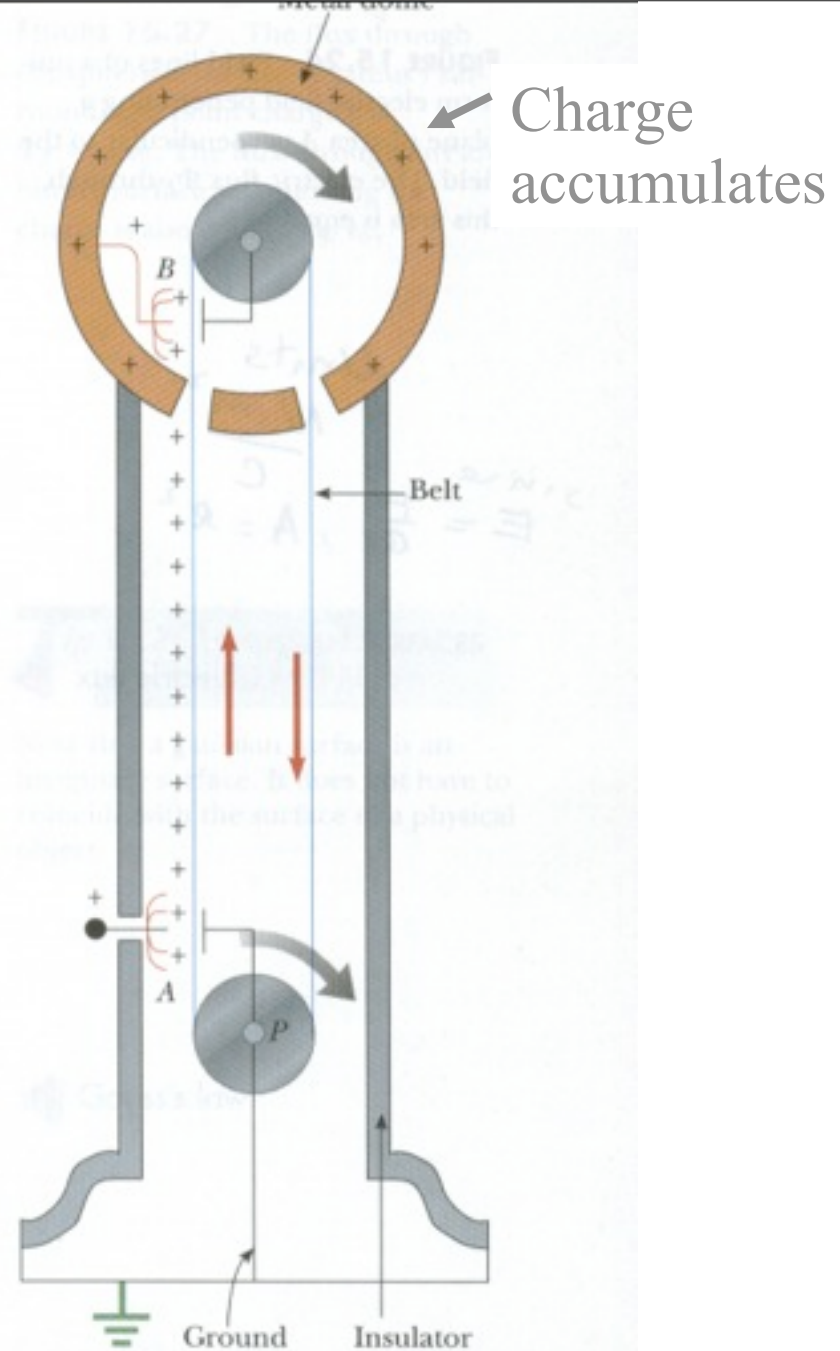
# Charging by induction

Ground - sink for electric charge



# Charging – Van de Graaf

Spark- charge  
conduction due to  
ionization of atoms.



**FIGURE 15.23** A diagram of a Van de Graaff generator. Charge is transported by the belt to the metal dome, where it accumulates.