

PHYSICS 1B – Fall 2007



Electricity & Magnetism



Friday September 28, 2007
Course Week 0

Professor Brian Keating
SERF Building. Room 333

Physics 1B

Electricity & Magnetism!

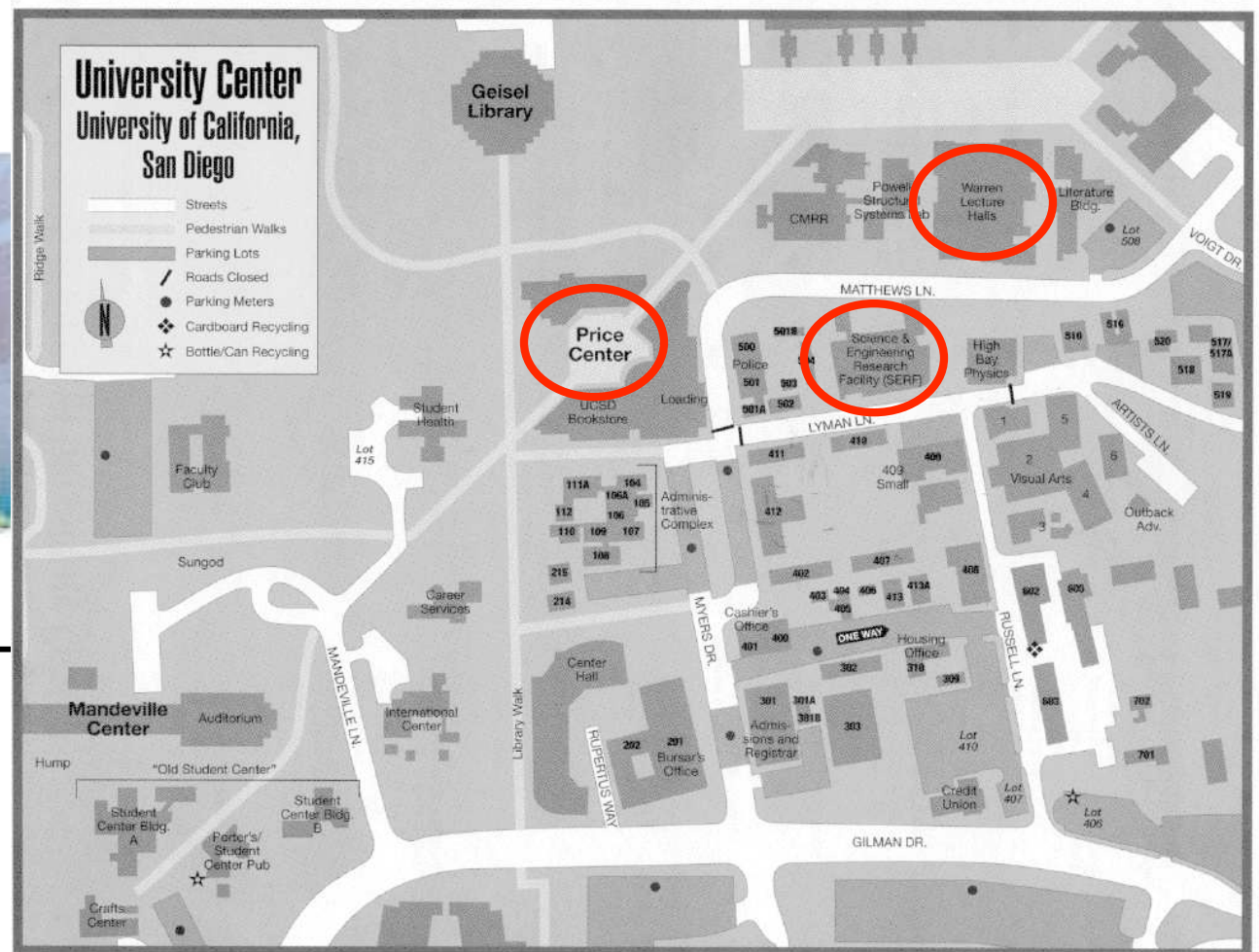
- Professor – Brian Keating
bkeating@ucsd.edu
 - Office hours: Mondays 2-3p,
 - **Office Location: SERF Building, Room 333**
 - Lectures: MWF WLH 2005 10a-10:50a
 - **Quizzes: One every other week starting on Friday 10/12, in lecture.**
 - 4 total quizzes – you are allowed to drop 1 quiz, so no makeup quizzes ☹
 - **Grade**
 - Quizzes 60% (best 3 out of 4)
 - Final exam 40%
 - Extra Credit 5%
 - Final exam **Week of December 10th WLH 2005**
- That's it! What about homework????

Office Hours: My office is in the Science & Eng. Research Facility = “SERF Building”

You want this “side” of SERF



SERF from W/LH



Today's Plan

- Review Course
- Review Policies
- Get started!

Logistical Stuff

- Last day to add a class: Friday, October 12
- Last day to drop a class w/o a W and change grade option: October 26
- Last day to drop a class ***with*** a W (but without an F!): Monday, November 30
- Final Exam: in class

Help!

- Tutoring- Physics Tutoring Center
Sunday-Thursday Mayer Hall 2101 from 3-8 pm
- TA: Mr. Jonathan Kaufman jkaufman@physics.ucsd.edu
His office hours are Wednesdays from 1p – 3p in Mayer Hall 2101
- If you need help with any of the problems, or are still unsure of the conceptual questions, feel free to send Jon an e-mail.
- Jon will hold problem sessions on Thursday nights. They will be before the quizzes so you can use them to review materials on the quizzes and HW and provide solutions to both. Time, day and location are listed in Syllabus.

Other Stuff....

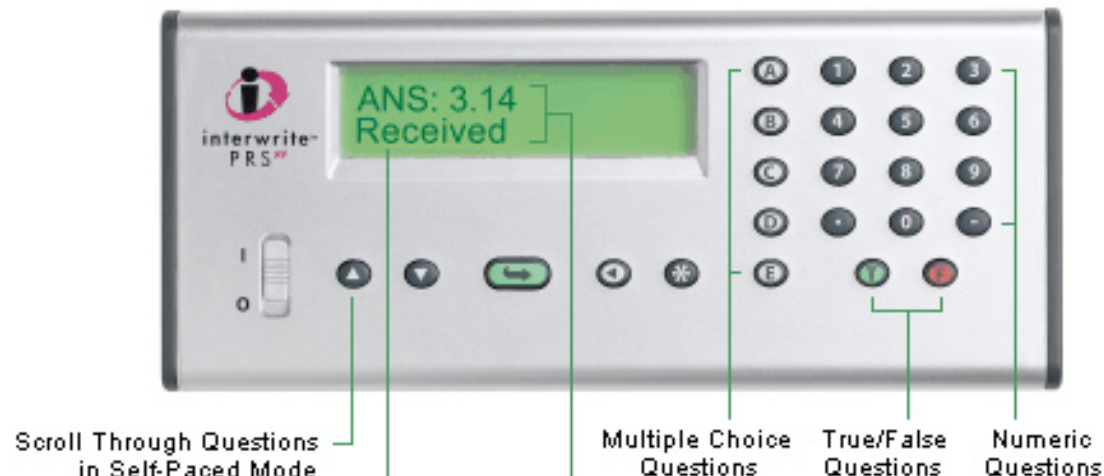
- I don't know about extra spots in this lecture/course – check [Studentlink/Blink](#)
- I know *even less* about 1BL
- = lab
- = totally different course/professor – Prof. Anderson. Prof. Anderson has taught 1B before so knows a lot about 1B and 1BL.

Text Book

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

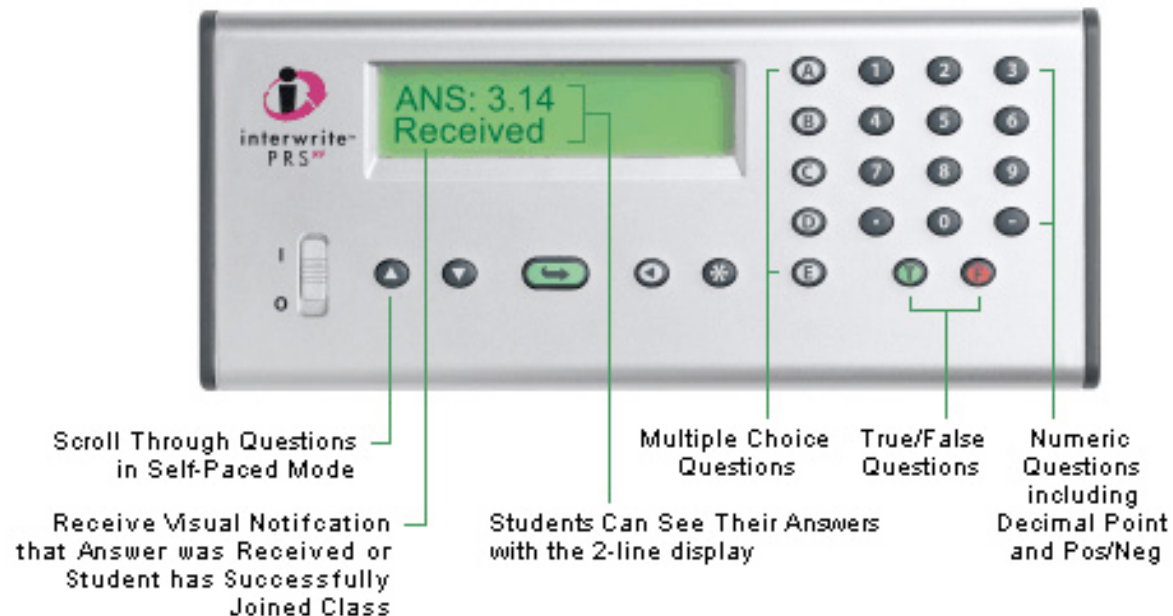
Clickers a.k.a. “Student Response System”

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



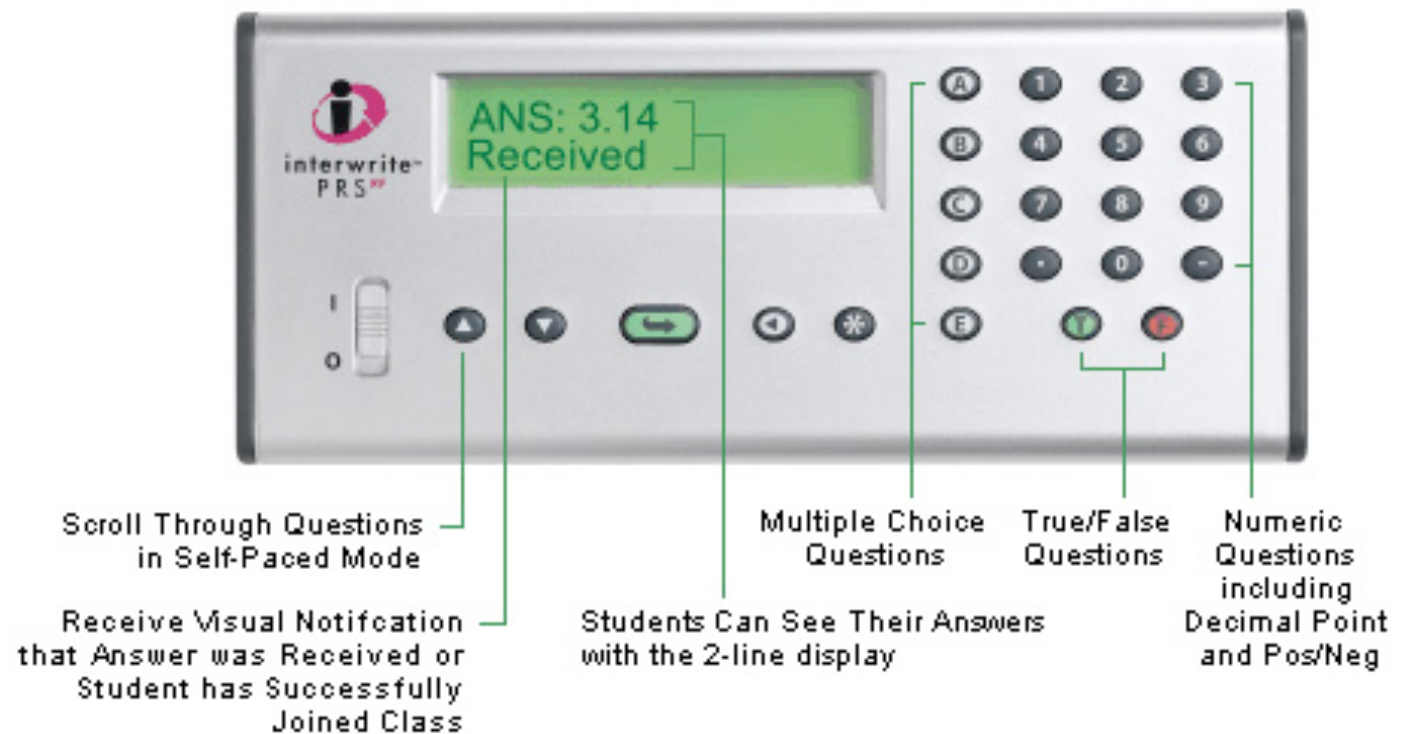
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Pi in the sky: what is the first digit in Pi?

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



So why use Clickers???

- Encourages attendance (but will not be used to monitor attendance...)
- 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 the numeric part of your PID only to register.
- Visit:
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 the Physics portion of the MCATs...)

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



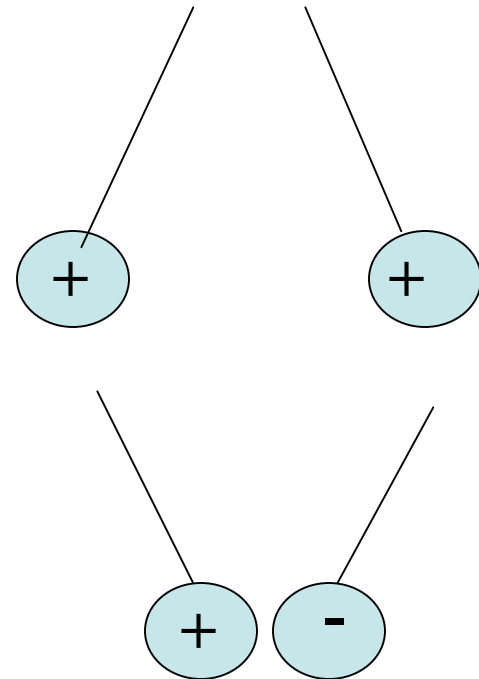
Electricity and Magnetism- Applications

- 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 $e = 1.602 \times 10^{-19}$ coulombs

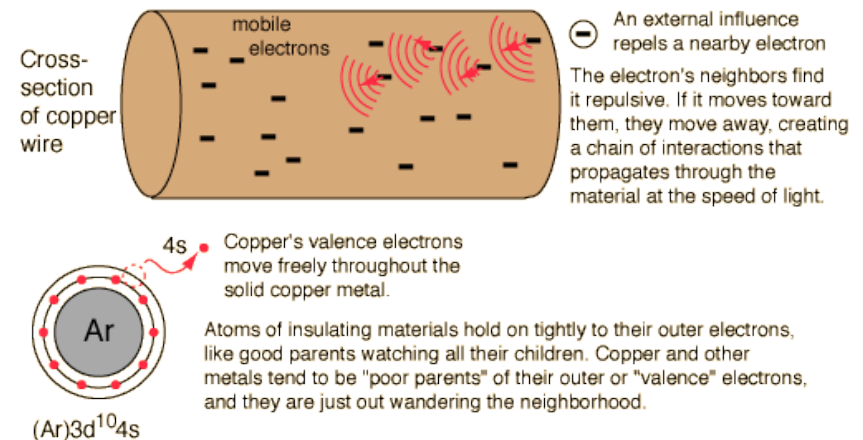
⊖ electron charge $-e = -1.602 \times 10^{-19}$ coulombs

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

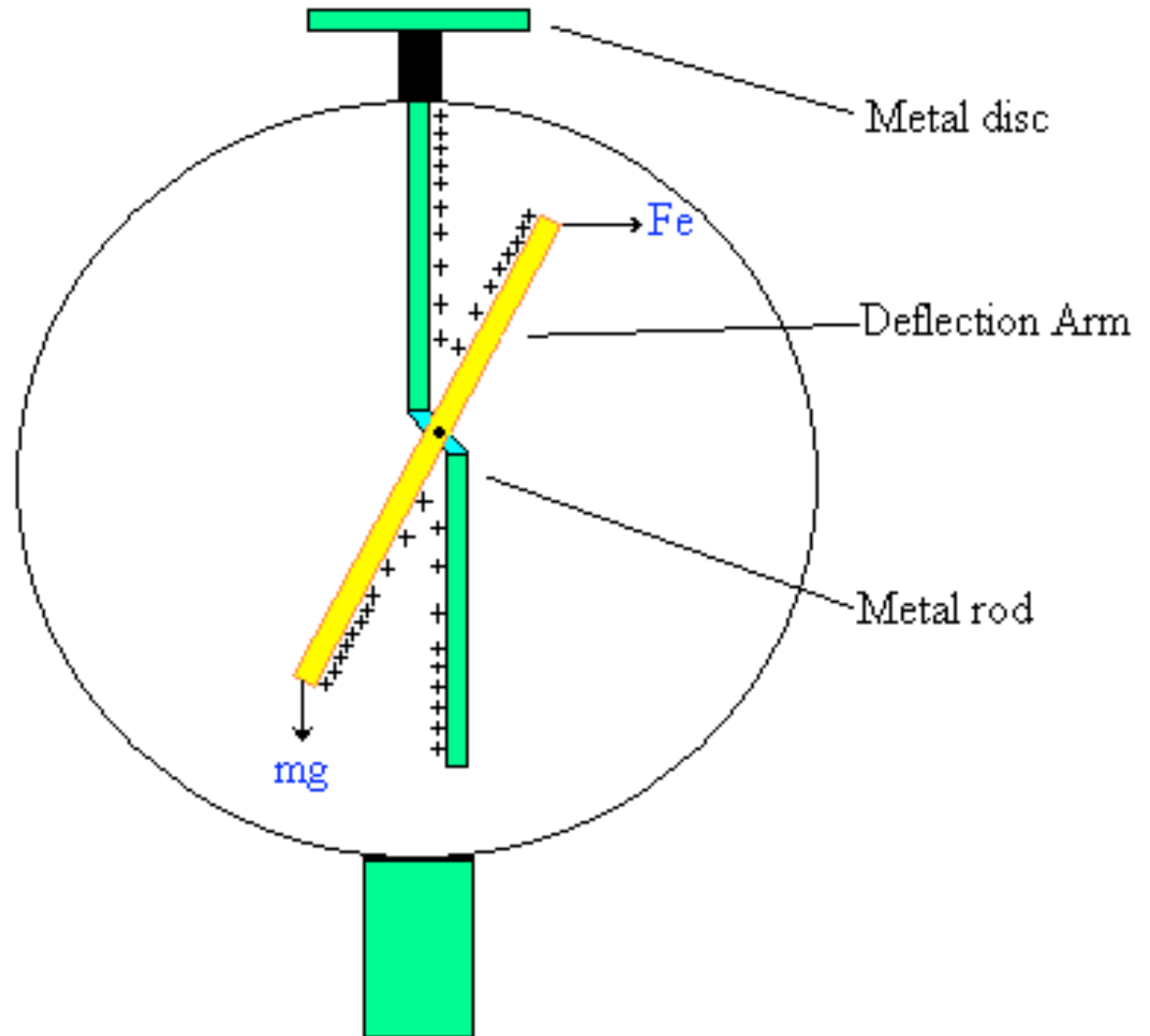


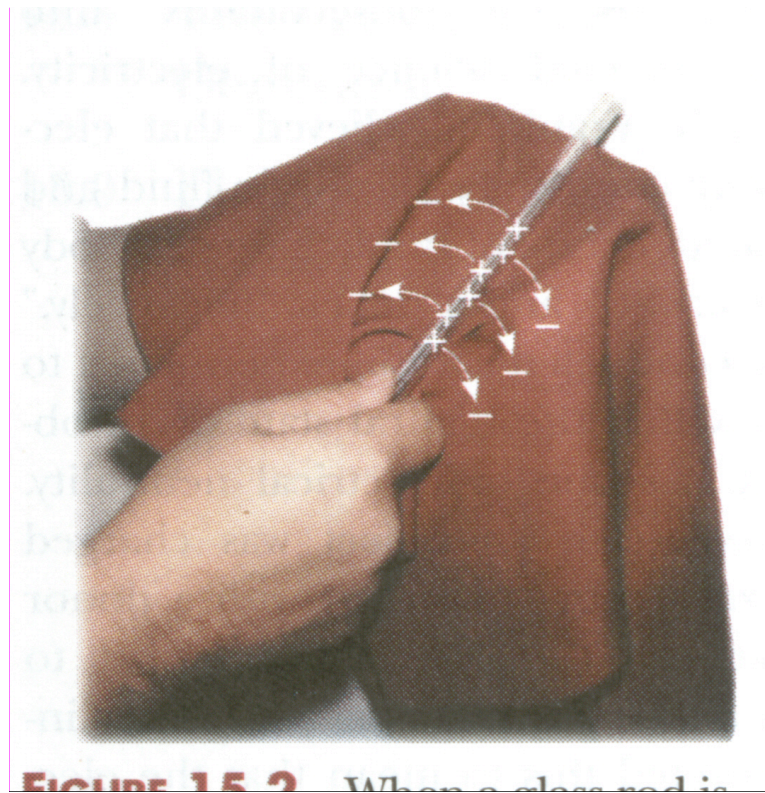
Figure 1: Electroscope

Charging by Rubbing

Triboelectric sequence

Fur	Positive
Glass	
Silk	
Cotton	
Wood	
Rubber	negative

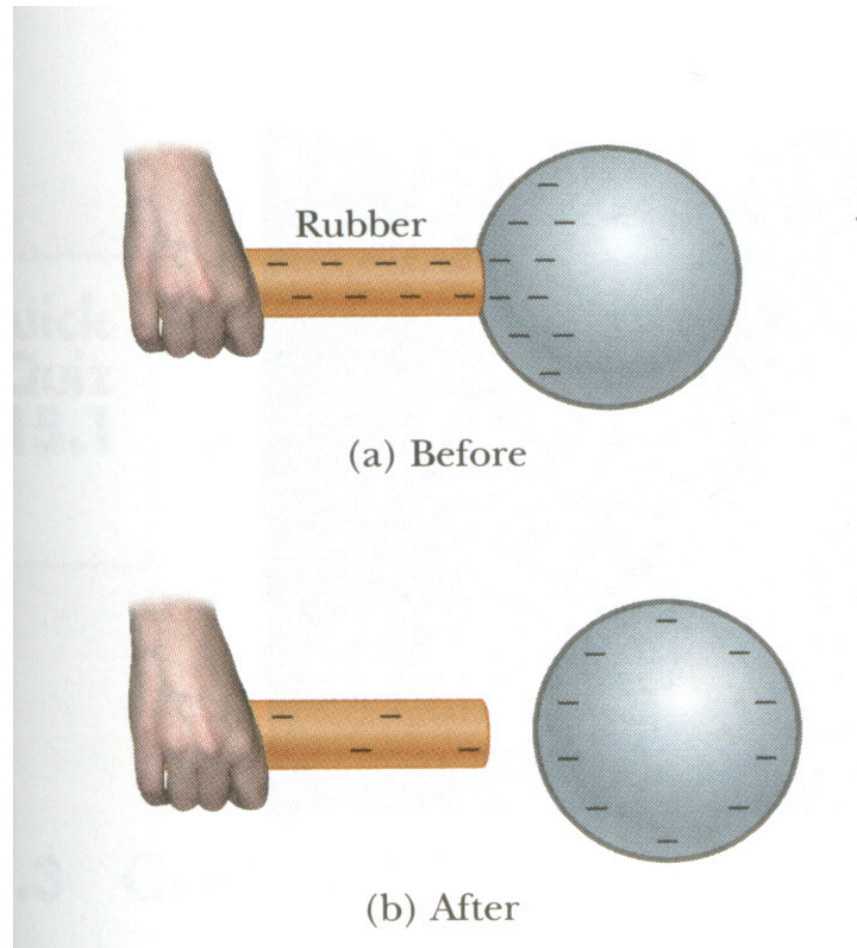
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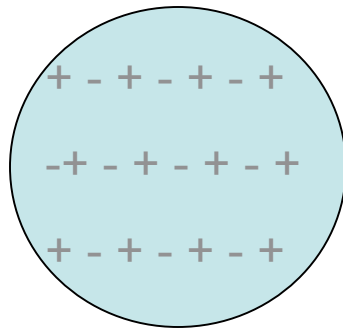
Negative charges transferred from glass to silk

Charging by conduction

Charged rubber rod transfers electrons to metal sphere



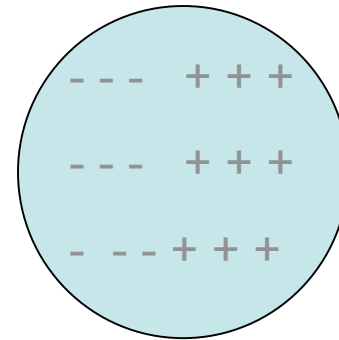
Induced charge (Polarization)



uncharged
conductor



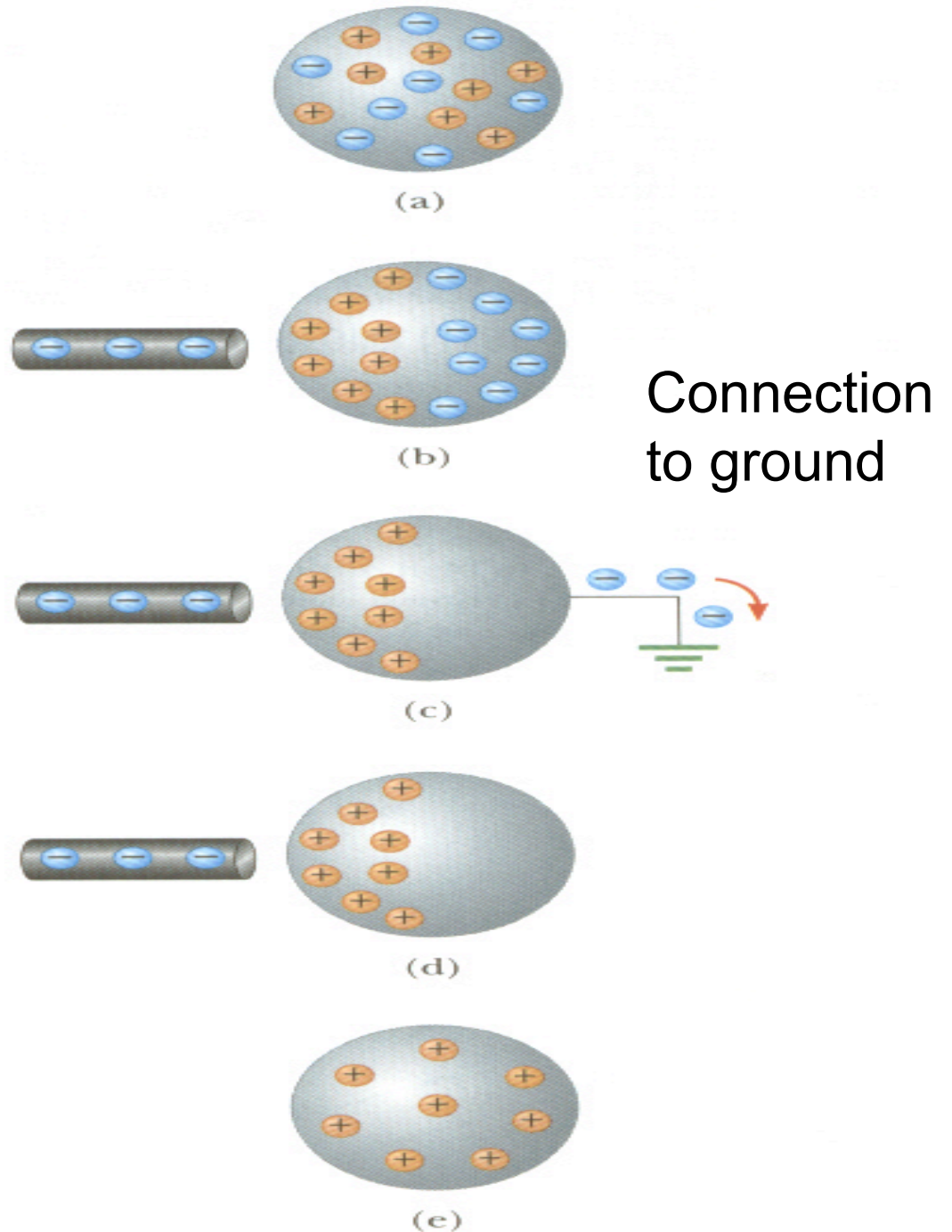
Attractive Force



induced charge

Charging by induction (polarization)

Ground - sink for electric charge



Charging – Van de Graaf Generator

Spark- charge
conduction due to
ionization of atoms.

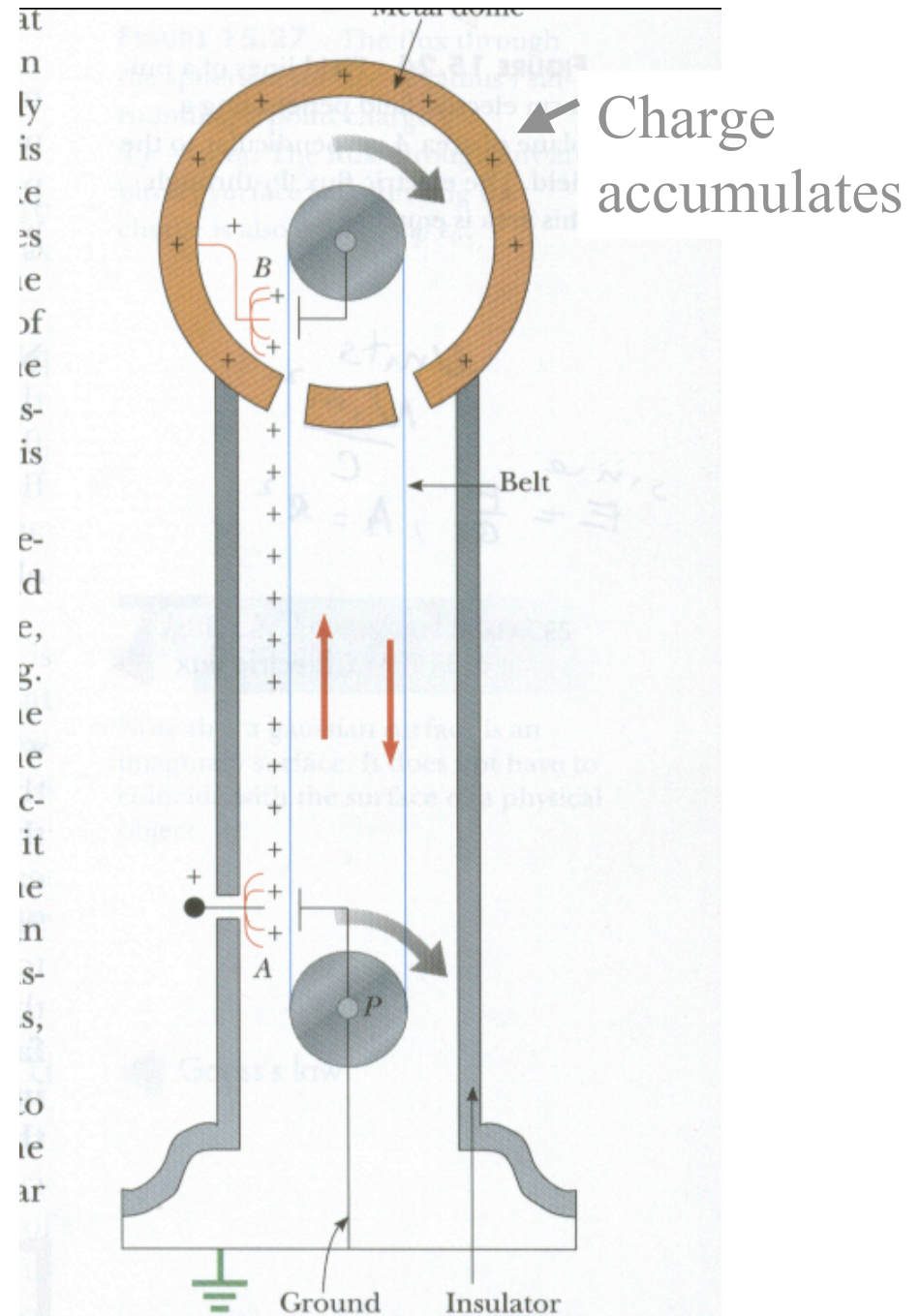


FIGURE 15.23 A diagram of a Van de Graaff generator. Charge is trans