General Instructions / Routine

- **Class Problems**
  - When you see "**Class Problem ___**", add the problem to a (continuous) sheet of paper(s).
  - **Number the problem**
  - **Show work (including Schematic Diagrams)**
  - **Include units in your answer(s) (V, mA, Ω, W…)**

"Neat and Complete."

- **Graphic Organizers**
- When you see terms in **BOLD RED**, look for the definition/term and fill in the information on the **Unit Graphic Organizer**.
- All of the information provided is potential test material.

Class Problem 1b

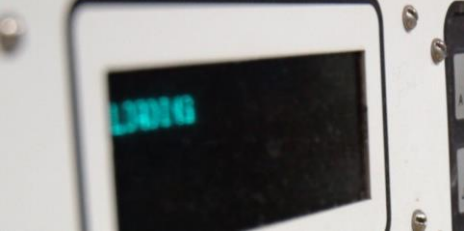
Title a clean sheet of paper: **Class Problems**

Convert 88 feet per second, to miles per hour.

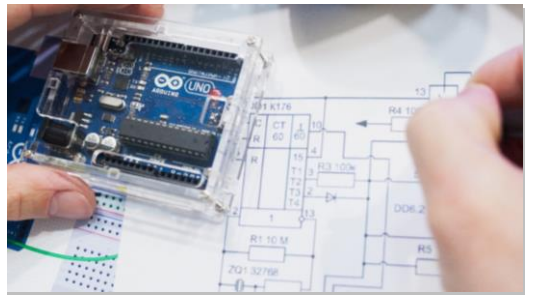
$$\frac{88\ ft}{1\ s} \times \frac{1\ mile}{5280\ ft} \times \frac{3600 s}{1\ hr} = 60\ mph$$

Note: There are 5280 feet in a mile.

01 A day in the life of an instrumentation electrical technician: https://www.youtube.com/watch?v=X13Tiq3CjGo







COMPLETE

pathways to engineering technology employment

Introduction to Electricity

LOUISIANA DELTA COMMUNITY COLLEGE

NSF

Introduction to Electricity

- Use unit conversions to solve problems.
- Define electricity in terms of flow of electric charge (electrons).
- Identify the three types of materials used in the conduction of electric charge: conductors, insulators and semiconductors.
- Recognize the atomic structures that make materials conductive.
- Define electric current, resistance, and voltage.

https://www.khanacademy.org/science/electrical-engineering/introduction-to-ee

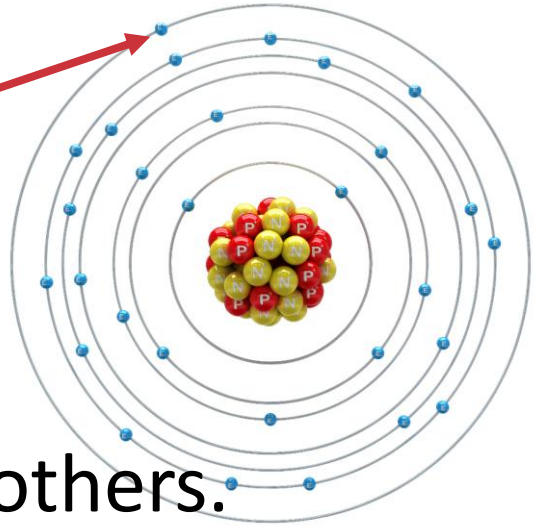
What is electricity?

Flow of electric charge*

Electrons:

e^-

Negatively charged particles

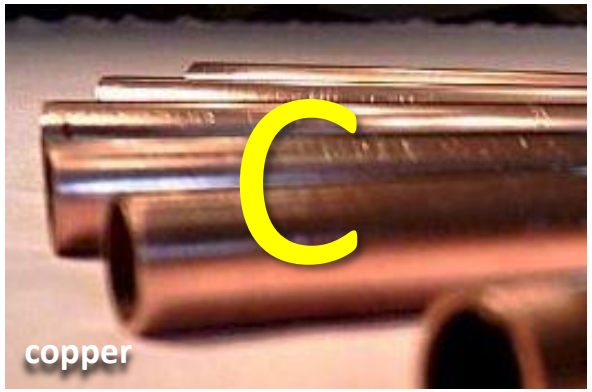


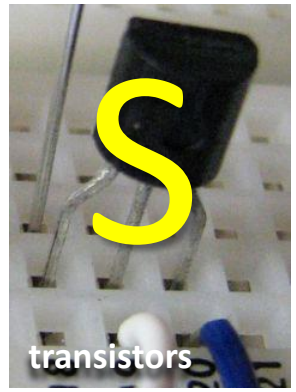
- Electricity moves through some materials better than others.
- Three types of materials used in conducting electricity:
  - **Conductors** – electricity can flow (or conduct) easily
    - **NEC**: Copper, Aluminum, Copper-Clad Aluminum
  - **Insulators** – electricity is prohibited from flowing easily
  - **Semiconductors** – modern materials designed to conduct only under certain conditions

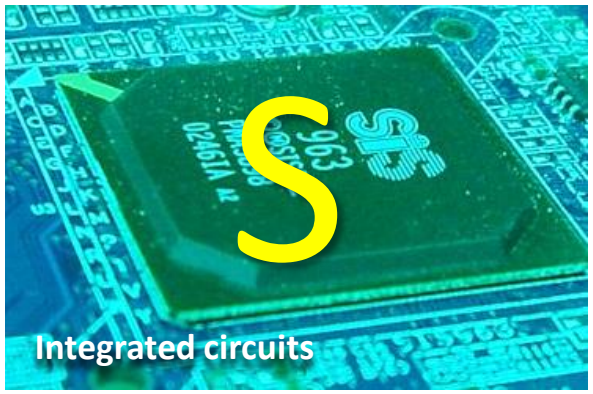
* Record on organizer

What is electricity? (2:11): https://www.youtube.com/watch?v=ZAFW4zdXpbY

Identify the type of material:
Insulator (I), Conductor (C), or Semiconductor (S)





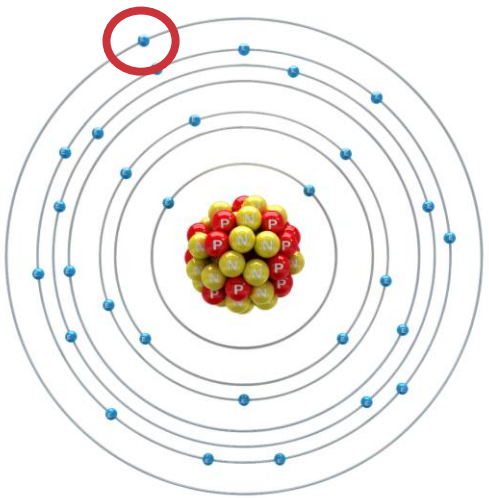


Why do some materials conduct better than others?

- **Bohr Model** - Electrons configure themselves into shells around the nucleus of an atom (center of the atom).
- The ability of a material to conduct electricity depends on the arrangement of electrons around the nucleus; specifically the electrons in the outer shell (**valence electrons**).
- 8 electrons make up a complete outer shell.
- The fewer **valence electrons** (electrons in the outer shell), the more conductive the material.

How many valence electrons does copper have? 1

Because Copper only has one valence electrons, it will more freely give up that electron allowing for it to be a good conductor.

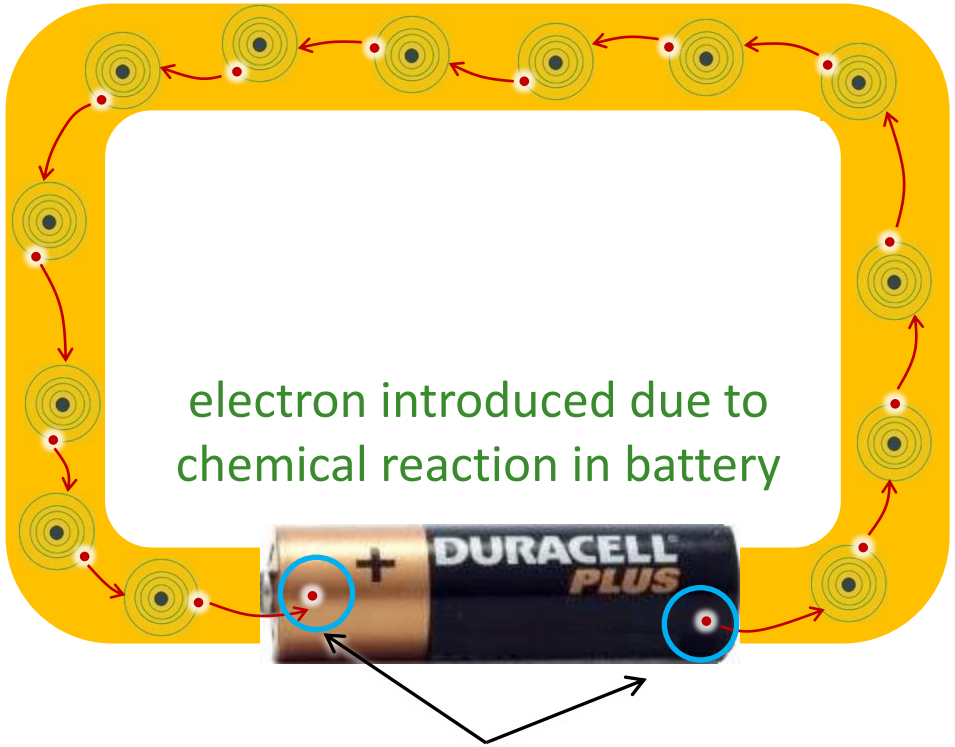


Copper Atom

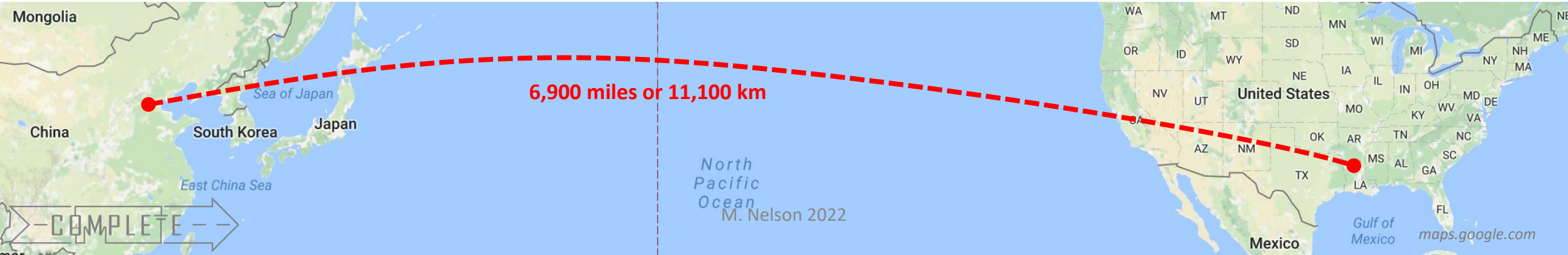
How do electrons move?

Scenario: You are talking on the phone with a friend in Beijing, China.

- Your voice causes the diaphragm in the microphone to move which would induce electron motion.
- Would an electron that you just caused to move in the microphone somehow get to China in a fraction of a second?
  - Assume that your phone is directly wired to your friend's phone in China.

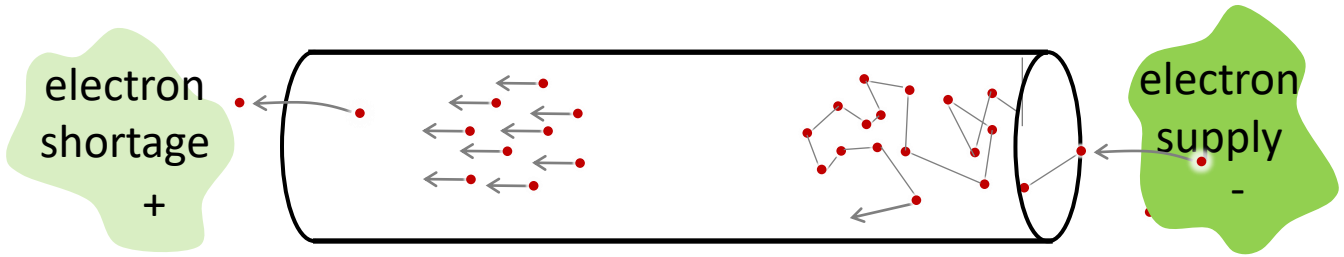


When one electron leaves the negative terminal of the battery, another one enters the positive terminal, so that the battery remains electrically neutral overall.



Electric Current

- Electrons migrate from the supply to the shortage.



The actual path that electrons take is scattered mostly due to atom oscillations.

+ **net flow of electrons** -

the net flow of electrons through a material is called electron current

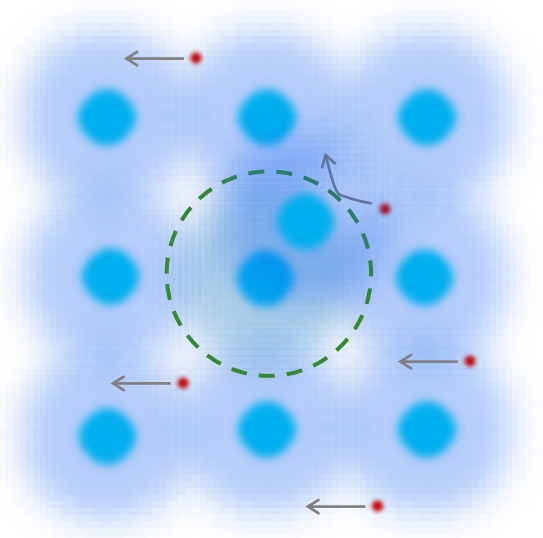
+ **conventional current** -

$conventional\ current\ (I)$

- ***Conventional current*** is opposite of the actual flow of electrons and goes from + to – .
- We determine the conventional current when we measure or compute currents in a circuit.

Electrical Resistance

- Consider the interaction of electrons with ions as they pass through a material.



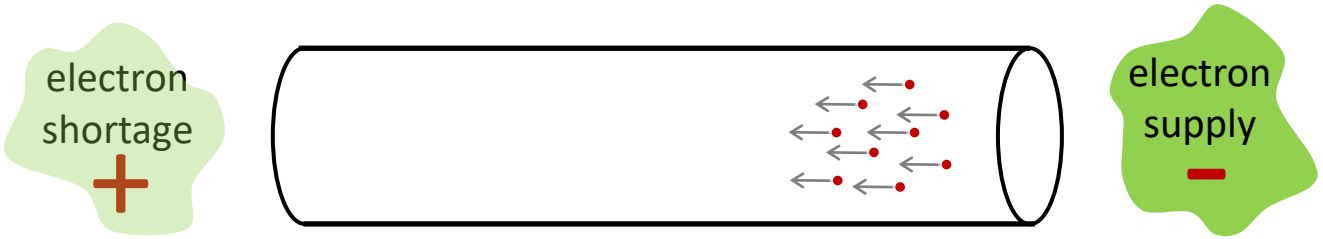
- Atoms oscillate about their equilibrium positions due to thermal energy
- The amplitude of oscillation increases with temperature
- The conduction of electrons through a material is interrupted due to destructive interactions with oscillating atoms
- This scattering and destructive interaction cause electrical resistance as well as heat generation

Electrical resistance is a measure of a material's opposition to the passage of electric current.

$$resistance = \boldsymbol{R}$$

Voltage

Electrons migrate from the supply to the shortage.



The **potential difference** between the strength of the electron supply and the electron shortage defines the **voltage**.

$$voltage = V$$

Voltage is a measure of how badly electrons want to cover a distance. "Cloud to ground lightening begins within the cloud when the localized electrical potential gradient exceeds 3 million volts per meter along a path perhaps 50m long."

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