Rasic Floatricity	
Basic Electricity	
EAS 199A Lecture Notes	
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Lagurina Obigativa	
Learning Objectives	
Successful completion of this module will enable	
students to	
Link the basic model of an atom to the flow of	
electricity	
 Apply the definitions of Amp, Volt, Coulomb, 	
Joule, Watt to unit conversions and basic	
problems involving current and voltage	
Apply Ohm's Law to simple DC circuits	
Definition	
Floatricity is a form of an army reculting	
Electricity is a form of energy resulting from the existence of charged particles	
(such as electrons or protons), either	
statically as an accumulation of	
charge or dynamically as a current.	
charge or dynamically us a carrent.	
Concise Oxford English Dictionary, revised 10 th edition	

Electricity is a form of energy resulting from the existence of charged particles (such as electrons or protons), either statically as an accumulation of charge or dynamically as a current.

Concise Oxford English Dictionary, revised 10^{th} edition

Definition

Conductor:

A conductor is a material that readily allows the flow of electricity. A good conductor has a high numerical value of a *conductivity*, and a low numerical value of *resistance*.

Definition

Conductivity:

All materials have a measurable property called electrical conductivity that indicates the ability of the material to either allow or impede the flow of electrons. Materials that easily conduct electricity have a high conductivity.

Definition

Insulator:

An insulator is a material that tends to impede the flow of electricity. A resistor has a low numerical value of conductivity and high numerical value of resistance.

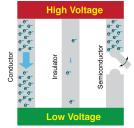
Definition

Semiconductor:

A semiconductor is a material with conductivity between that of a conductor and insulator.

The conductivity of a semiconductor can be changed by exposing it to an electrical field, light, mechanical pressure, or heat.

Simplified Functional Differences



Semiconductors can be used in devices that act like a switch.

Elements

- Pure substances are made of elements.
- An element consists of atoms
- Atoms have a nucleus consisting of protons and neutrons
- Electrons move in shells around the nucleus



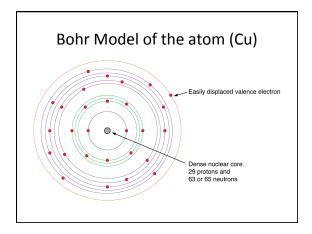
Elements

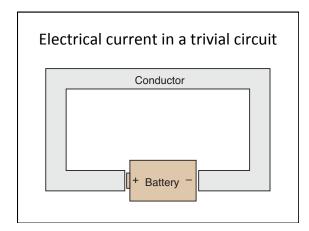
- Number of protons determines the element
- Number of electrons varies
 - State of electrical charge
 - Is the element in a chemical bond?
- Number of neutrons varies with isotope

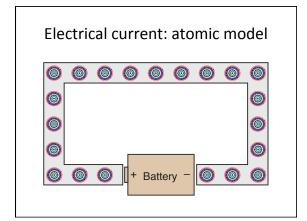


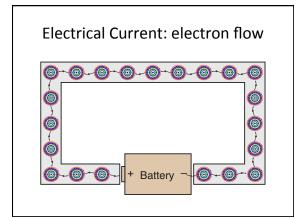
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				ACTIVAN	200000			MPTAKA	NUTOWAN	MERCUN	CURSON	BETWEEN	CALPONNA	ENITENA	remove	MDGGDAN	NOREUM	ANTENCS.

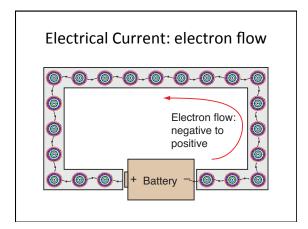
Atomic number = number of protons in the nucleus | Cu | Symbol | Element name









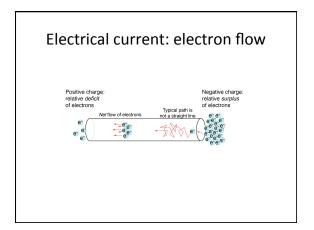


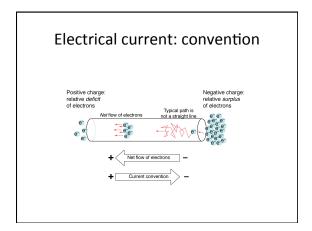
Electrical Current: current convention Current flow: Electron flow: positive to negative to positive Battery Battery

Example: How many valence electrons are in a 1cm cube of copper? Useful data: Atomic mass = 63.55 g/mol Density of pure copper = 8.94 g/cm³ Avogadro's number $N_d = 6.022 \times 10^{23}$ atoms/mol

How many electrons? Example: How many valence electrons are in a 1cm cube of copper?							
Useful data: Atomic mass = 63.55 g/mol Density of pure copper = 8.94 g/cm ³ Avogadro's number $N_A = 6.022 \times 10^{23}$ atoms/mol							
First compute the number of atoms, N							
$N = 1 \text{ cm}^3 \times 8.93 \frac{\text{gm}}{\text{cm}^3} \times \frac{1 \text{ mol}}{63.55 \text{ g}} \times \frac{6.022 \times 10^{23} \text{ atoms}}{\text{mol}} = 8.5 \times 10^{22} \text{ atoms}$							
Since each copper atom has one valence electron, there are 8.5×10^{22} valence							
electrons in a 1 cm cube of copper.							
Note: N is greater than the number of grains of sand on the earth. Compute the number of sand grains by assuming that 10 cm of sand covers all 200 million square							
miles of the earth's surface. Assume that each grain is 1 mm in diameter and are the							
packing efficiency is 68 percent.							

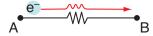
Positive charge: relative deficit of electrons Regative charge: relative surplus of electrons relative surplus of electrons





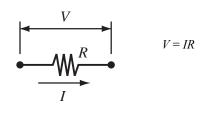
_ 6	
Definition: Charge	
Elementary charge 1 electron = 1.602×10^{-19} coulomb	
Coulomb	
1 coulomb= 6.24×10^{18} electrons	
Definition: Current	
$1A = 1 \frac{C}{}$	
S	
$1 C = 6.24 \times 10^{18} electrons$	
Definition: Voltage	
J. J.	
$1 \text{ V} = 1 \frac{\text{J}}{\text{coulomb}}$	-
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Voltage and electrical work

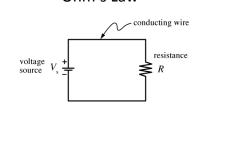


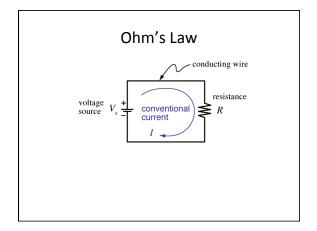
If the voltage between A and B is one volt, then one Joule of work is done when 6.28×10^{18} electrons move from A to B.

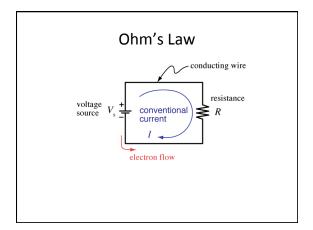
Ohm's Law

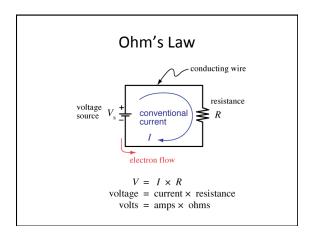


Ohm's Law









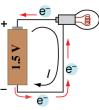
Example: Current through a light bulb

- A 1.5 volt AA battery is wired to a light bulb with a resistance of 30 $\Omega.\,$
- a. Sketch the components.
- b. Draw the circuit.
- c. Find the current flowing through the light bulb.

Example: Current through a light bulb

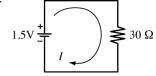
A 1.5 volt AA battery is wired to a light bulb with a resistance of 30 Ω_{\cdot}

a. Sketch the components.



Example: Current through a light bulb

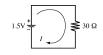
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Example: Current through a light bulb

c. Find the current flowing through the bulb

Apply Ohm's Law to the loop V = IR



V and R and known, so solve for II = V/R

Substitute the known values and compute the value of $\it I$

$$I = \frac{1.5 \, \text{V}}{30 \, \Omega} = 0.05 \, \text{A} = 50 \, \text{mA}$$
 where 1 A = 1000 mA.