



HVAC

Flexible Instruction Day

Assignment #1

Learning Standard	Standard CC.3.5.11-12. B Determine the central ideas or conclusions of a text; etc.
Task # 601	Compare and analyze methods of producing electricity using appropriate terms

CONTACT INFORMATION/ASSISTANCE

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We will be available by email from 7:40-12, and 12:30-3:10 to answer your questions. Please reach out if you are having difficulty completing your assignments.

INSTRUCTIONS

✓ All work is due on the day we return to school. This is counted towards your attendance **and** as a classroom assignment.

Please use Unit 12 Basic Electricity and Magnetism Part 1 Notes to complete the form. Each section of the packet has a section in the notes. For example, Atomic Theory would go along with Atomic Theory in the notes. You will have a hard copy of this and there is a copy on canvas.

Name: _____

Session: _____

____/____ points

Unit 12 Basic Electricity and Magnetism

Part 1

Atomic Theory

-Matter: Anything that occupies space.

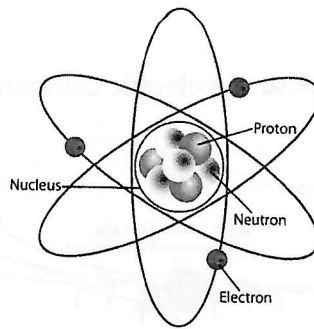
-Atom: A basic unit of matter.

* All matter is made up of atoms.

-Parts of the atom:

* Nucleus- Contains positively charged protons and neutral charged neutrons.

* Electrons- Negative charge, and they orbit the nucleus.

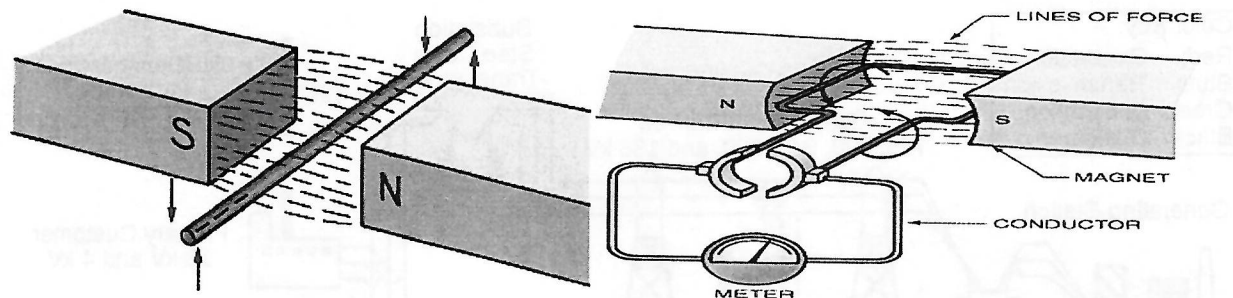


How to Produce Electricity

-Break the invisible lines of magnetic flux caused by permanent magnets with a conductor.

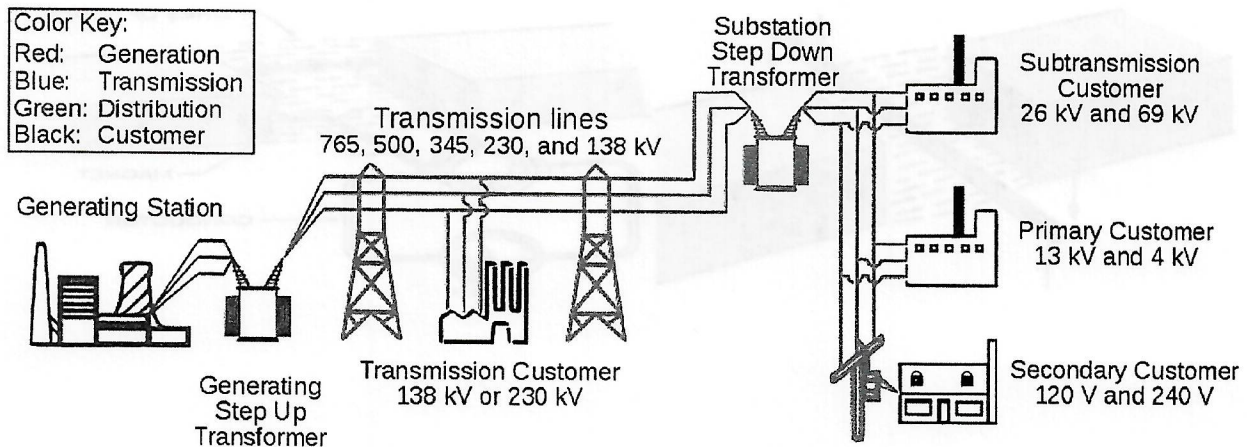
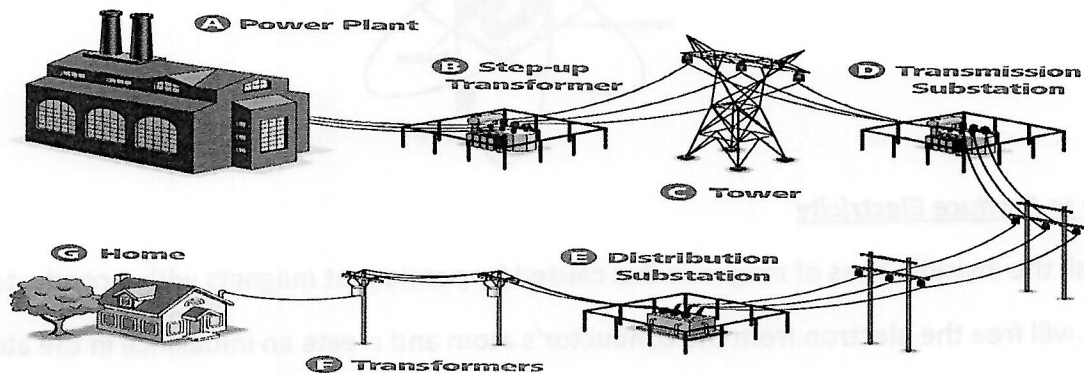
-This will free the electron from the conductor's atom and create an imbalance in the atom.

-These free electrons create the electron flow which is what gives us power.



Electron Flow

- The electron flow will travel from the power plant first to the step up transformer
- The step up transformer will increase the voltage to carry it over long distances.
- The transmission lines are tall and well protected to keep people safe from the high voltage.
- The transmission substation uses a step down transformer to drop the voltage from over 100,000 volts to about 35,000 volts.
- Distribution substation drops the voltage down again in the range of 13,000 to 4,000 volts.
- It is then delivered to your pole transformer, dropping the voltage for the last time to 120/240v.
- The power is metered at your electric meter socket before it enters the houses breaker or fuse panel.
- The electrons flow is now sent back to the electric company to complete the circuit.



Conductors VS Insulators

-Conductors allow the electrons to flow easily

*Example: Copper, Gold, and Silver

-Insulators do not let the electrons to flow very easily from one atom to another.

*Example: Rubber, porcelain, Glass

-All metals are insulators.



How Do We Measure Electricity

-Amperage: The measurement of current in a circuit.

*Flow of electrons (How Much)

*Intensity

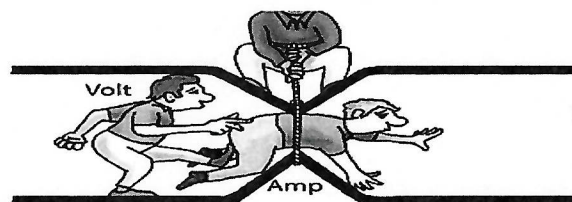
-Voltage: The measurement of pressure (Potential)

*How fast the electron flow is.

* Electromotive force

-Ohms: The forces that oppose the flow of electron current in a conductor.

*Resistance



Quantity	Symbol	Unit of Measurement	Unit Abbreviation
Current	I	Ampere (Amp)	A
Voltage	V or E	Volt	V

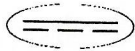
Types of Currents

-DC Direct Current

- * Travels in one direction, negative to positive.

- * Batteries

- * Symbol

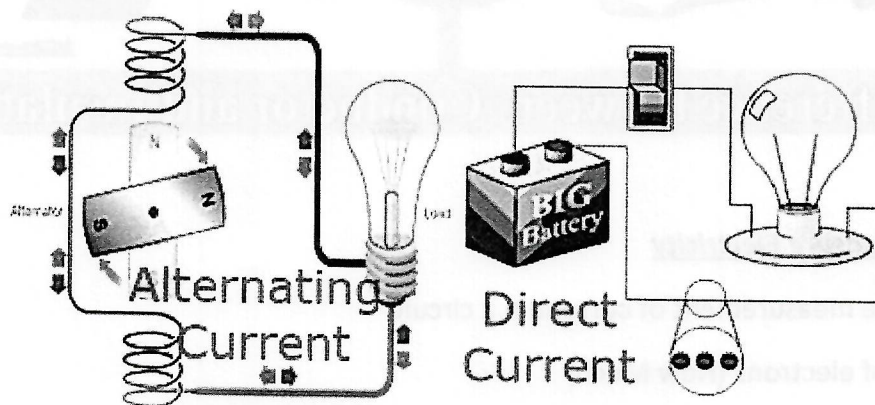


-AC Alternating Current

- * Most common power source (Power Company)

- * Electron flow changes direction

- * Symbol



The Electrical Circuit

-The Power Source

- * AC or DC

-The Load

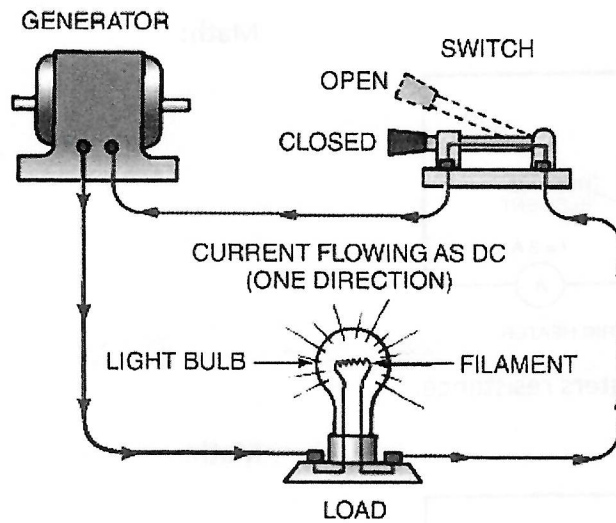
- * Device that uses electrical power
- * Can be resistive or inductive

-The Switch

- * Controls the load

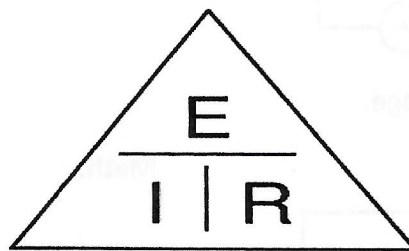
-The Conductors

- * Provide the path for the current



Ohms Law

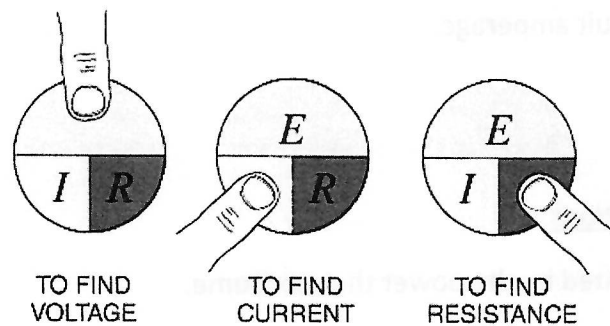
-Relationship between voltage, current, and resistance.



E=Electromotive force (volts)

I=Intensity (amps)

R=Resistance



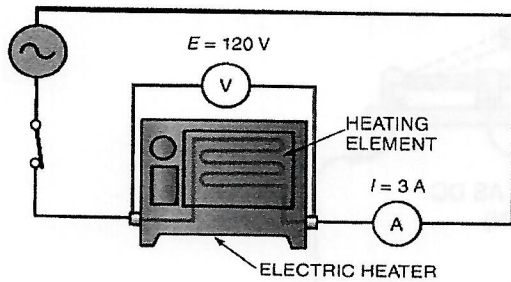
$E = I \times R$ to calculate voltage

$I = E/R$ to calculate Amperage

$R = E/I$ to calculate resistance

Problem 1

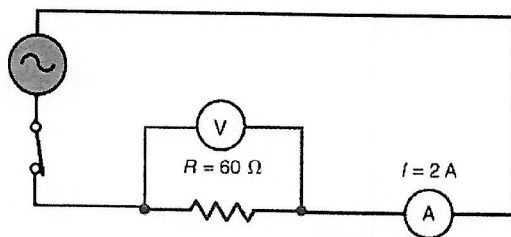
Math:



Calculate the heaters resistance.

Problem 2

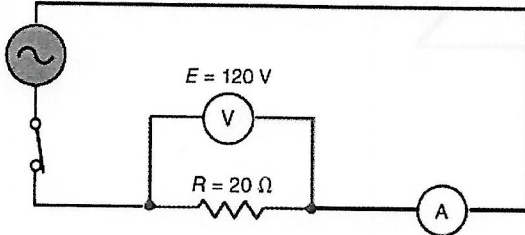
Math:



Calculate the circuit voltage.

Problem 3

Math:



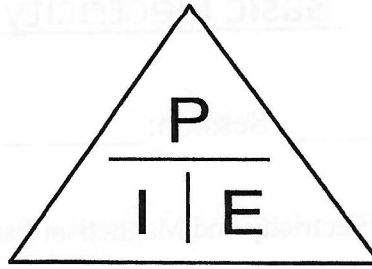
Calculate the circuit amperage.

Electrical Power Calculations

-Most load devices are rated by the power they consume.

Watts= Power consumed

Watts= Volts x Amps



P=Watts (Power)

I=Amps (Current, Intensity)

E=Volts (Potential, Electromotive Force)

Example

$$P = E \times I$$

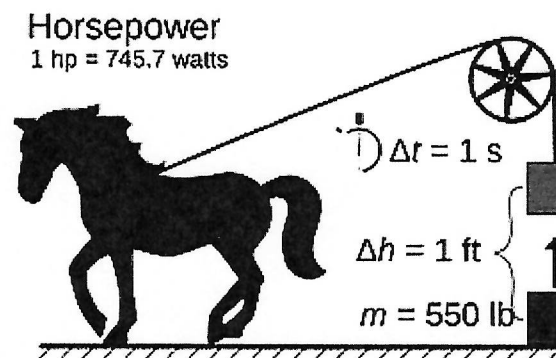
$$P = 120 \text{ V} \times 22 \text{ A} = 2640 \text{ W}$$

$$\text{kW} = P \div 1000$$

$$\text{kW} = 2640 \text{ W} \div 1000 = 2.64 \text{ kW}$$

-Horsepower= 33,000 lbs. to a height of one foot in one minute.

1HP=746 watts



550lbs at a height of 1ft in one second x 60 = 33,000lb for one minute

Inclement Weather: Assignment 1

Basic Electricity

Name: _____ Session: _____ Date: _____

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Please note that this assignment will be part of your participation grade for the day. This needs to be returned completed the day of return. If this is not returned you will NOT receive your participation grade for the day. You will also be marked absent for the day if not completed.

_____ COMPLETE

_____ INCOMPLETE

Basic Electricity

Guided notes

Name: _____ Session: _____ Date: _____

Atomic theory

Electricity is a form of _____ in which electrons move from one _____ to another _____.

An atom is made up of _____, (negative charge) _____, (positive charge) and _____ (neutral charge).

_____ orbit the atom, while _____ and _____ - make up the nucleus.

Energy cannot be _____ or _____, it can only converted from one form to another.

When the electrical charge (positive vs. negative) between two points is not in balance, the imbalance of electrons is called _____ difference.

Units of electrical measurement

The unit of measurement for electromotive force or (_____ difference) is the _____.

Electromotive force is not electricity; it is the driving force that causes _____ to move from one point to another.

The unit of measurement for intensity, (current flow) or (electron flow) is the _____.

_____ converts electrical energy to another form of energy and its unit of measurement is the _____.

The two types of resistance are resistive and _____.

Resistive remains constant or fixed like an incandescent light bulb, electric heaters, and toaster. Higher voltage will cause a _____ in current flow and lower voltage will cause a _____ in current flow.

Reactive resistance is found on devices that have a magnetic coil. The coil creates counter voltage called _____ which causes an increased resistance that decreases current flow.

The rate at which electric power is harnessed to perform a useful function is _____.

Basic Electricity

Guided notes

_____ are calculated by multiplying Volts x Amps.

Ohms Law

Ohms law is the relationship between _____, _____, and _____.

Ohms law is used to predict and control the activity of _____.

_____ = Intensity x Resistance

_____ = Electromotive force / Resistance

_____ = Electromotive force / Intensity

Conductors and insulators

_____ provide the necessary free electrons and provide the pathway for electrons to flow.

_____ are materials that make it difficult for electrons to set themselves free.

Silver, copper, gold, aluminum, and iron are examples of good _____.

Glass, rubber, paper, and silk are examples of good _____.

All insulators can break down under moisture, heat, excess current flow, or chemical contact.

Large diameter conductors can handle _____ current than smaller conductors.

NEC requires all electrical conductors be properly marked. Markings contain: AWG size, type of insulation, voltage rating, testing agency, and number of conductors.

NEC specifies the neutral wire be colored _____ or natural gray.

NEC specifies the ground wire be colored _____ or bare copper.

NEC specifies current carrying conductors be colored _____ or _____.

Switches and loads

Basic Electricity

Guided notes

A _____ is an energy-conversion device that converts electrical energy to another form of energy.

The amount of current flowing through the _____ is determined by the combination of voltage and resistance.

Electrical _____ offer no resistance to the flow of electrons. Rather, they start and stop the flow of electrons to an energy conversion device.

Light bulbs, hair dryers, and motors are examples of _____.

When a switch is _____, the pathway is broken, and electrons cannot flow to the load.

When a switch is _____, the pathway is open, and electrons can flow to the load.

Devices that are normally wired in series are _____.

Devices that are normally wired in parallel are _____.

AC / DC

_____ flows in only one direction (batteries).

_____ reverses direction many times in one second (Power Company).

To maintain a continuous current flow, a constant voltage difference must exist between the _____ and _____ battery terminals.

A dead battery exists when the chemical reaction stops (no voltage difference).

The frequency of alternating current is measured in _____ there are 60 cycles per second in the United States.

Flow reversal (120 times per second) is so rapid that a light bulb will not flicker.

Electrical Forefathers

1836 Andre Ampere – measured the number of electrons flowing past a given point

1798 Alessandro Volta- discovered the principle of EMF

Beginning of the 19th century George Ohm- relationship between volts, amps, ohms.

1763-1819 James Watt- determined how to measure electrical power.

Heinrich Hertz - Early pioneer of alternating current.

Basic Electricity

Guided notes

Nikola Tesla – Inventor of the induction motor and countless other inventions dealing with alternating current.

Ben Franklin – Was intrigued by electricity and experimented with it.