Name: _____

Read this, and KEEP THIS

Electric Circuits

An electric circuit is a pathway of conductive material in which electrons can flow and transfer their energy to perform work.

An electric circuit is made up of components that allow electrons to flow in a path.

Power Sources

A power source gives the circuit the ability to do work. It supplies energy to the electrons within the circuit by a force called the electromotive force.

The change in energy per unit charge is called the potential difference. When there is an increase in potential difference it is called a potential rise and is expressed numerically in Volts.

The Power Source produces a potential rise with varying voltages. When energy is transferred from the electrons to another form of energy like heat and light, this difference in energy per unit charge is called a potential drop.

The potential rise required to light the light bulb adequately depends on the potential drop of the light bulb.

Most electrical outlets produce a potential rise of 120 Volts. The Power Source will have to be plugged into one of these outlets but the voltages can be adjusted to a level more suitable.

Another example of a power source is a battery. A wet-cell battery like those found in cars produces a potential rise of 12 Volts. A dry-cell battery like an alkaline battery (AA or C, etc) produces a potential rise of 1.5 - 6 Volts.

Switches and Wires

An electric circuit is a pathway of conductive material where electrons can flow.

Remember that the flow of electrons per unit time is called and electric current.

Wires are made up of conductive material such as metal, usually copper, and protected by plastic covering.

Electrons are able to travel through the conductive material from one terminal of the power source to the other. If the wires do not complete the circuit then the current will not flow through the system and no work can be done.

The function of the wires is to connect the components of the circuit.

It is often inconvenient to turn off the power source if you want the light bulb off. Switches are used to open the circuit such that the flow of electrons is disrupted. Thus switches are often called circuit breakers.

When used in homes, switches are placed in convenient places for us to control what we want on or off.

Light Bulb Experts

The electric current must pass through the light bulb to return to the power source.

The wire in the light bulb is very thin and resists the flow of electrons through it or the thin wire is said to have a high resistance. This thin wire gains energy from the electrons, heats up, and emits light.

The light bulb is a type of resistor.

We use many types of resistors in our homes to do work, for example all sorts of heating elements, toasters, kettles, baseboard heaters, and blow dryers etc. are resistors.

The energy required to sufficiently light up the bulb per unit charge is called the potential drop. The potential drop is expressed in Volts and should coincide with the potential rise produced by the power source

KEEP THIS

Name: _____ Period: _____

Active Physical Science

Unit 12: Electricity & Magnetism

Vocabulary:

Alternating Current= Current of electron flow that reverses direction alternately

Direct Current = Current in only one direction, as in batteries

Circuit = Pathway for electrons to flow

Circuit Breaker = A resettable device that protects circuits from being overloaded

Closed Circuit = Connected circuit in which electrons flow uninterupted

Open Circuit = Disconnected circuit in which electron flow is interrupted

Current = The measure of the flow of electrons, measured in Amps

Electromagnet = An electric current around an iron rod that acts like a magnet

Electrons = Negative particles that create electric current

Generator = Moving magnets around a wire that make electricity

Parallel Circuit = Circuit with multiple, independent pathways

Series Circuit = Circuit in a single pathway

Power = The rate at which energy is used or generated, measured in Watts

Resistance = The property of slowing the flow of electrons

Switch = A device that can control the flow of electrons in a cirucit

Voltage = Electrical potential, measured in Volts

Basic Understanding

Light bulbs operate because they complete the circuit. They are also an example of a resistor. They produce light by heating a tungsten filament. The friction that causes the glow comes from the flow of electrons in the metal. Electrons flow like water in a hose, each particle moves along as the one before precedes it.

If a circuit is open, any lights in the circuit will not come on because the pathway for the electrons is interrupted. A complete and closed pathway for the electrons to flow is the only way to get electricity to work. This is why series circuits are limited. Outlets in a house are usually connected as parallel circuits. This way not every electrical appliance has to be on at once. 1 light can still light up in a parallel circuit when others have been disconnected because each light has its own closed pathway to the energy source.

Items that operate from battery power are DC, direct current. House power is AC, alternating current since the flow of the electrons changes directions back and forth. Electrons flow from the negative terminal of a battery to the positive terminal.

Fuses and circuit breakers are designed to keep a house or appliance from becoming overloaded with electric current which could become a fire hazard. A circuit is a special kind of switch. It can interrupt the flow of electrons when it is tripped. A fuse must be replaced once it has burned out. However, a circuit breaker can be reset.

A wet cell battery has lead plates and liquid sulfuric acid inside and is the type used in cars. A dry cell alkaline battery (like C & AA) have a paste inside that is a base, not an acid.

Insulators block or slow the flow of electrons. Wood and glass make good insulators. Resistors in a circuit slow the flow of electrons to keep circuits from overloading. Resistance in measured in Ohms (Ω). Increasing resistance decreases current. Conductors are materials that allow electrons to flow. Metals and water are good conductors.

Formulas:

OHM's LAW **I = E/R** **I (current)** **E(voltage)** **R(resistance)**

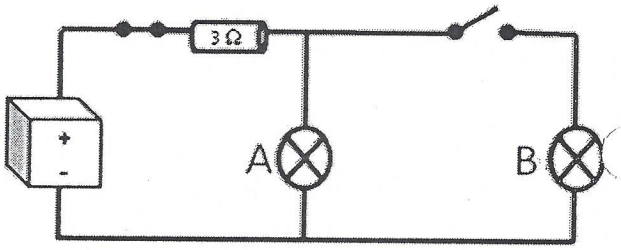
Ohm's Law calculates the flow of electric current (flow of electrons)
The unit for current is Amps (A); for voltage is Volts (V); for resistance is Ohms (Ω)
To calculate current, divide voltage by resistance.

JOULE's LAW **P = IE** **P (power)**

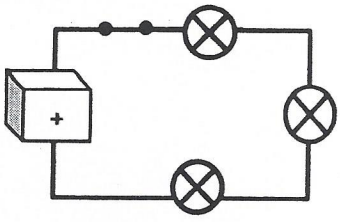
Joule's Law calculates power, the rate at which energy is used. Power is measured in Watts (W).
To calculate Power, multiply current times voltage.
A "typical" household circuit has 120 V and 15A or 20A circuits.
Load limit is the amount of power for a household circuit. Once the load limit is calculated, you can figure which appliances can run on that circuit without tripping the circuit breaker.

Diagrams:

Parallel circuit
A will be on since it has its own closed pathway.
B will be off since the switch is open.
The 3 Ω fuse is serving as a resistor to slow the flow of electrons. The electrons flow from the negative terminal to the positive terminal.



Series curcuit
Since all the bulbs are on the same circuit, if one goes off, they all go off.



Magnetic field