Unit 8 Lesson 1-5 Study Guide

Unit 8 Vocabulary

Lessons	Term	Definition
1	Electric current	The flow of electrons through a wire
1	Electric Field	the influence throughout a space due to one or more electrically charged particles or surfaces
1	Electroscope	an instrument for detecting static electricity
1, 2, 3, 9	Generator	a machine that converts mechanical energy into electrical energy
1, 2, 3, 9	Motor	a machine that converts electrical energy into mechanical energy
2, 3	Resistance	the quality of a substance that hinders the flow of electrons through it
2	Conductor	Any material through which electricity can flow. A copper wire is a good conductor of electric charge as it flows through the circuit
2	Insulator	A substance that cannot conduct electricity very well. The rubber casing around the speaker wire serves as an insulator for the electrical current.
3	Electric Circuit	a continuous looped conducting pathway around which electricity flows
6	Dipole	an object with two sides that have opposite characteristics
6, 7	Domain	a small region in which adjacent atoms that have magnetic fields line up with their magnetic fields oriented in the same direction
6	Magnetic Field	The space around every magnet where the magnetic force can be felt
6	Magnetic Pole	The two ends of a magnet, where the magnetic force is especially strong. Bar magnets have two magnetic poles.
7	Electromagnet	A temporary magnet made using electric current, usually running around a metal core.

Lesson 1: Electric Charge

How Do Electric Charges Interact?

- Electric charges come from specific parts of an atom
  - Every atoms has a nucleus
  - It contains positively charged _____

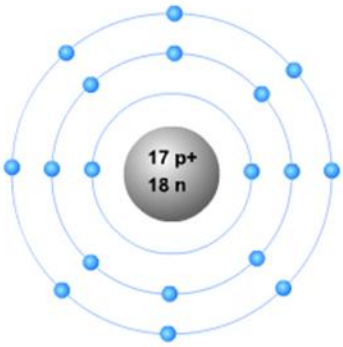
- The nucleus is surrounded by negatively charged _____

What happens when charges "meet"?

- Opposite charges _____ each other
- Like charges _____ each other
- Force of Attraction: is the same one that keeps negatively charged electrons attracted to and orbiting the nucleus of an atom

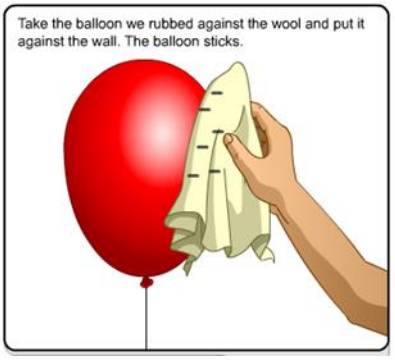
Atomic Particles Have Electric Charges

- Atoms consist of _____ particles
  - Each electron has a charge of: -1 (negative)
  - Each proton has a charge of: +1 (positive)
  - You can ADD these together to determine the charge of any atom
- Atoms are NEUTRAL (no charge) when protons _____ electrons
- Ions: atoms with _____ numbers of protons and electrons
  - Ions are positive when there are more protons than electrons
  - Ions are negative when there are more electrons than protons



Large Objects Have Electric Charges

- Everyday objects can have electric charges.
  - This occurs when the atoms of the object gains or loses _____
- Example: Balloon rubbed with wool.
  - Electrons _____ from atoms in the wool to atoms in the balloon
  - The balloon takes a negative charge
  - When close to a wall, the electrons in the balloon _____ the electrons in the wall, leaving the protons (in the wall) on the wall's surface
  - Because they are oppositely charged, the balloon is _____ to the wall.



Electric Fields

- Electric Field: the influence throughout a _____ due to one or more electrically charged particles or surfaces
  - The _____ of a particles' electric force on other objects depends on the objects' _____ from the charge

- The field is _____ at a point _____ to the charge than it is at a point farther away.
- The effect of two charges on one another _____ as the charges move _____ apart

Electric Force

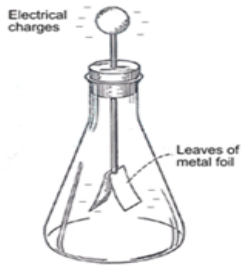
- The electric force between two charges (or charged objects) depends on TWO things:
  - #1. The amount of _____ on each object
    - As the charge increases, electric force increase
  - #2. The _____ between the objects/charges
    - As distance increases, electric force decreases

Where Do the Electrons Go?

- Electrons are free to _____:
  - Some objects take on electrons easily
  - Some objects give up electrons easily
- Example: What do clothes stick together in the dryer?
  - The socks become oppositely charged and so are attracted to each other

Electroscope

- Electroscope: an instrument for detecting _____ electricity
- How does an electroscope work?
  - When you touch a charged object to the electroscope, the electrons will move into (or out of) the scope and give the "leaves" of the electroscope the same charge
  - Since the leaves have _____ charges, they will _____



What Happens to Electric Charges?

- Electric charges can either build up on the surface of an object, or they can move
  - When charges build up, we call this _____ electricity
  - When charges move, we call this electric _____
- Electric current: the _____ of electrons through a wire (or other material)

Lesson 2: Electric Currents

Conductors Carry Currents

- Conductor: any material through which electricity can flow
    - Metals are good conductors because they freely allow electrons to move inside of them
    - Ex. Copper, aluminum, gold, silver

Insulators Stop Currents

- Insulator: a substance that _____ conduct electricity very well.
    - Think of an insulator stopping the flow of electricity as a dam stops the flow of water
    - Good Insulators: glass, porcelain, rubber, plastics
    - NOT Good Insulators: water, wax

Resistance and Electrical Currents

- There is NO such thing as a "_____" insulator
    - Even excellent conductors will slow down current
    - Even excellent insulators will allow electrons to flow id they become "overwhelmed"
- Resistance: the quality of a substance that _____ the flow of electrons through it
    - ALL materials hinder the flow of electrons to some degree (conductors less than insulators)
    - As electrons encounters resistance, they _____ down
- When electrons encounter resistances and slow down, WHERE does their energy go?
    - The energy is converted to _____
    - Examples of household devices that use resistance: light bulbs, electric oven, toaster, space heater

What Makes Electricity Flow?

- Because electrons repel one another and are attracted to objects with a positive charge, they will flow from _____ to _____.
- In order to create current, you must first find a way to create this _____ in charge
- This is called an electrical "potential" or _____
- We can make electricity flow by using: batteries, generators, solar panels

Can Electrons Be Used Up?

- It is possible for the flow of electric current to lead to a dead end.
- Building and releasing static charges or charging/discharging a battery can lead to filled capacity or use up "free" electrons.

Keeping Electrons on Track

- Electricity flows in a _____ and can be used to do work such as lighting a light bulb
- Electric currents that provide a continues _____ to keep the electrons flowing allow household appliances to work
- Examples: TV, Lights, Computer, Xbox, Electric Ovens

Lesson 3: Electric Circuits

Circuits: Keeping the Flow

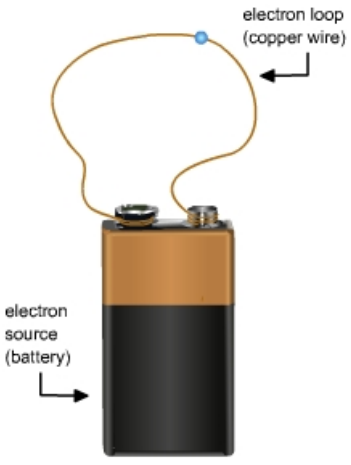
- Electric Circuit: a continuous, looped conducting pathway around which electricity flows

Circuits:

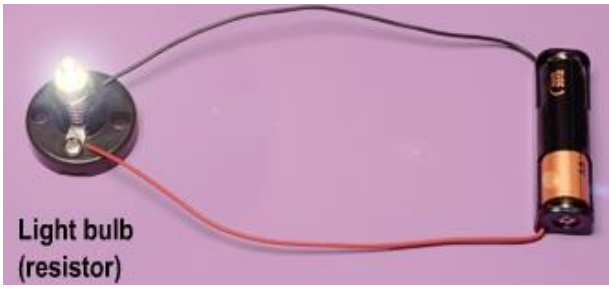
- An electric currents can only exist if electrons are _____
- The current needs a _____ through which to flow
- Because the conductor always has some resistance, electrons continue to flow only if a constant _____ is pushing on them
- If the conductor ends at the same place it begins, the force of repulsion will continue to keep the electrons moving

Circuits: Not Just a Bunch of Wires

- To get electrons flowing, you need a _____ of electrons that will push into the loop and cause the current to flow
- _____ – a common sources of electrons
    - They store TWO difference chemicals:
        - One tends to lose electrons
        - One tends to gain electrons
    - This creates an electric _____, with one pole being more negative and the other being more positive
    - When a conductor (ex. Copper wire) is connected to the two poles, the electrons naturally begin to flow
- Electrons ALWAYS flow from _____ to _____



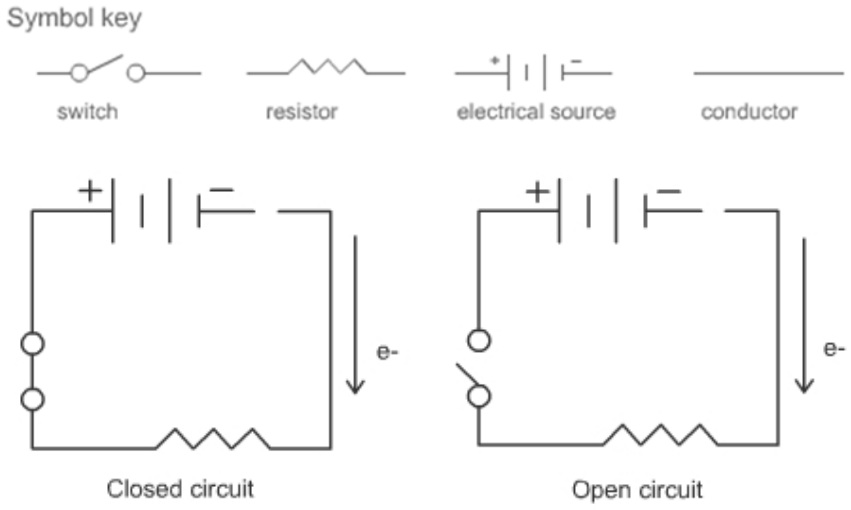
Resistors: Resisting the Flow



- Resistor: a resistor is anything that _____ the flow of electrons
    - As resistance increase, current flow decrease
    - As resistance decrease, current flow increase
- Example: adding a light bulb to the circuit, filament inside the bulb will resist the flow of electrons and convert energy into light and heat
- **How will you know if you have successfully created a circuit with flowing electricity?**
    - If you add a resistor, you will know electricity is flowing because the resistance in the circuit will cause the energy to be converted into _____ or light!

Switches Stop the Flow

- Closed Circuit: electric current will only flow if there are NO _____ in the circuit
- Open Circuit: the flow of electric current stops at the point where the circuit is _____
- Switches can be used to control the flow of electrons by opening and closing the circuit

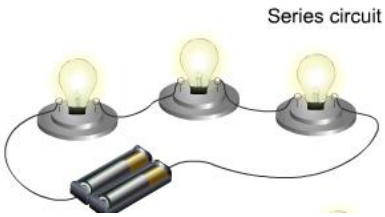


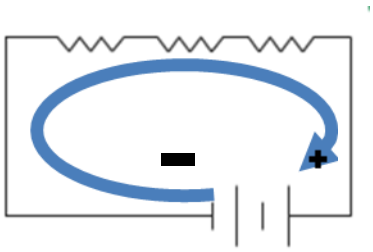
Series vs. Parallel Circuits

Series Circuits:

- Uses ONE continuous wire from the battery through the light bulbs.
- The GOOD: full power is delivered

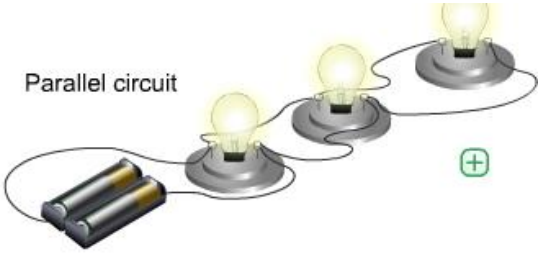
- The BAD: if any ONE bulb burns out, then the circuit is BROKEN (opened) and ALL the bulbs/devices will go out.

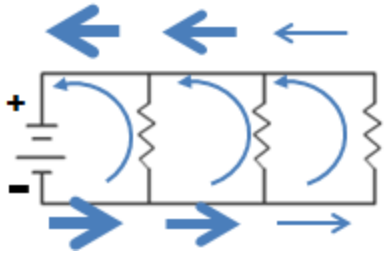




Parallel Circuits:

- Has many sets of wires, creating multiple paths through which current can flow.
- The GOOD: if one bulb burns out, the circuits will NOT be broken and will remain closed, and only one build will go dark.
- The BAD: the electric current _____, so each device has LESS overall power





Lesson 5: Lab: Series vs. Parallel

– see OLS lesson, class connect session, and website