Electrical Energy

Bellringer:

1. Greg read the following facts about pillbugs (roly polies).

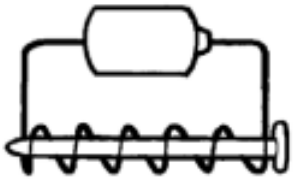
A. Pillbugs are invertebrates with an exoskeleton.
B. Pillbugs thorax has 7 segments.
C. Pillbugs have 14 legs.
D. Pillbugs are nocturnal and avoid light.

Greg can investigate all of these statements. He can do an experiment to test the accuracy of one of these statements. Which statement can be used to design an experiment?

a. Statement A
b. Statement B
c. Statement C
d. Statement D

2. When Katie reported to the class on her experiment, this was her final conclusion statement:

"My experiment shows that the more times a wire is wrapped around the nail, the stronger the electromagnet becomes."



What was the one variable that Katie changed in her experiment?

A. The type of battery she used for her electromagnet.
B. The type of nail she used for her electromagnet.
C. The number of paper clips her electromagnet picked up.
D. The number of times the wire wrapped around the nail.

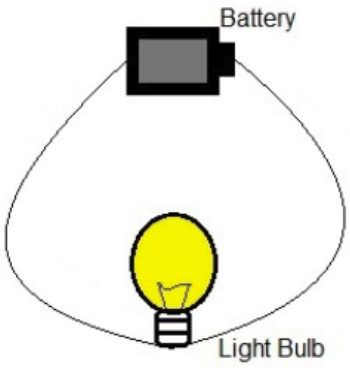
Electrical Energy - Open and Closed Circuits

Words to Know:

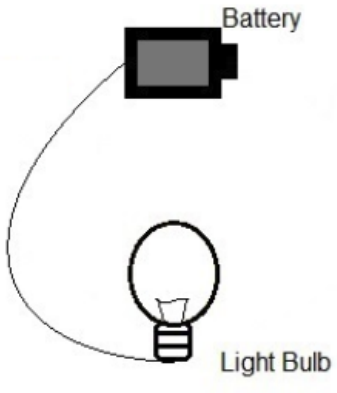
Word	meaning	sketch
Closed circuit		
Open circuit		
Electricity		

Think About This!! - Electrical Energy

Picture 1



Picture 2



Why does the lightbulb in Picture 1 light up but the one in picture 2 does not?

_____

_____

Reading Passage: Electrical Energy is…

Electrical energy is the energy caused by the movement of electric charges. Electric charges flow through materials that are good conductors. Materials that are good conductors are often made of metals.

When you use electricity, you are using electrical energy. The flow of electric charges along a path is called an electric current. You can use electric energy to make electrical

devices work. When they are plugged into a wall outlet, electrical current flows through the wires and into the device to make it work.
An electric circuit is formed when an electric current passes through a complete path of conductors. Switches on electrical devices allow for the path of electric energy to be turned on and off. Open circuits break the path and turn the device off. Closed circuits complete the path and turn the device on.

According to the text, what type of circuit will turn an electric device on and why? _____
_____
_____
_____

Video: Explaining an Electrical Circuit

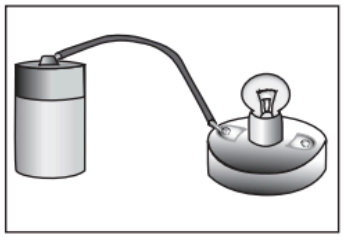
According to the video, how do electrons travel through a closed circuit? _____
_____
_____
_____

Check What You Know:

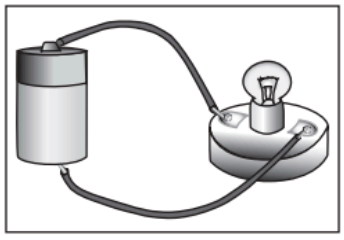
1. Teisha switched the classroom light switch to the "ON" position. What does turning the switch "ON" do?

    a. Opens a circuit, allowing electricity to flow
    b. Closes a circuit, allowing electricity to flow
    c. Opens a circuit, stopping electricity from flowing
    d. Closes a circuit, stopping electricity from flowing

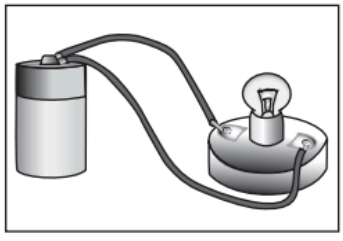
2. Electric circuits must be properly connected or electricity will not flow. Which of the following shows a properly connected circuit that would allow electricity to flow and light the bulb?



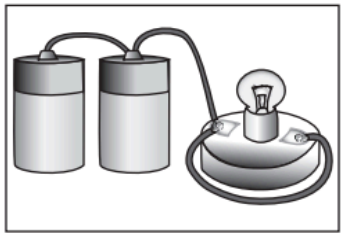
A.



★ C.



B.



D.

Conductor or Insulator?

Eraser □ Conductor □ Insulator	**Metal Pen** □ Conductor □ Insulator	**Paper Envelope** □ Conductor □ Insulator
Pencil □ Conductor □ Insulator	**Paper Clip** □ Conductor □ Insulator	**Chalk** □ Conductor □ Insulator
Coin □ Conductor □ Insulator	**Spoon** □ Conductor □ Insulator	**Nail** □ Conductor □ Insulator

Video: Conductors and Insulators

_____ Conductors
Any type of matter that allows electrical energy to flow through
Examples: _____

_____ Insulators
Any matter that blocks the electrical energy from flowing through

Examples: _____

Reading Passage: Insulators vs Conductors

Insulators

Insulators are materials through which the electricity flow is stopped. If an insulator is put into a circuit, the circuit will stop working because the electricity is blocked from moving throughout the circuit.

As stated before, electrical energy can be transformed into thermal energy. If you do not want to transfer thermal energy, insulators would be used so the flow of heat is stopped. Examples of insulators would be glass, rubber, plastic, or dry cotton. Electrical wires, which are conductors, are then coated with rubber, an insulator, to keep the electrons from “jumping off” the wire. The rubber also keeps you from getting shocked by the electrical charge and protects you from the thermal energy being transformed by the electrical energy. When you are cooking, you often use insulators to keep the thermal energy from touching your skin. Think of the spoons, handles, and hot mitts that you use. They are either made of wood, plastic, or cotton.

Conductors

Conductors are materials through which an electric charge can move easily. Conductors allow the electricity to continue through a circuit without stopping the electric flow. Some materials are better conductors than others. Many types of metals are great conductors; copper, gold, silver, and aluminum. Electric wires are, in fact, usually made out of copper or aluminum.

We know that electricity can transform into other forms of energy like thermal energy. Many items that are good conductors of electricity are often good conductors of thermal energy. Metal pots and pans are good conductors of electricity and are also good conductors of thermal energy. They conduct, or transfer, the thermal energy from the stove top to the pan and then to the food.

Examples of Conductors




_____ _____ _____ _____

Why are people, animals, and living plants good conductors of electricity? _____

_____

_____

Examples of Insulators




_____ _____ _____ _____

Why do people not feel an electric shock when they plug in an electric device into an outlet? _____

_____

_____

Review:

A _____ is a material that allows electricity to flow through it.

An _____ is a material that does not allow electricity to pass through it.

Check What You Know:

1. Antonio is identifying objects that are good conductors of electricity. Which object is a good conductor of both heat and electricity?

A. Rubber tires

B. Oven mitt

C. metal fence

D. wooden spoon

Static Electricity

Words to Know

Word	Meaning	Sketch
Static electricity		
charge		
repel		
attract		

Teacher Demonstration: Balloon and paper

Round 1 (Pre-rubbing): What do you think will happen when the balloon is close to the pieces of paper? _____

_____

_____

Round 2 (Post-rubbing): What do you think will happen when the balloon is close to the pieces of paper? _____

_____

_____

Teacher Demonstration: Comb and water

Round 1 (Pre-rubbing): What do you think will happen when the comb is placed close to the stream of water? _____

_____

_____

Round 2 (Post-rubbing): What do you think will happen when the comb is placed close to the stream of water? _____

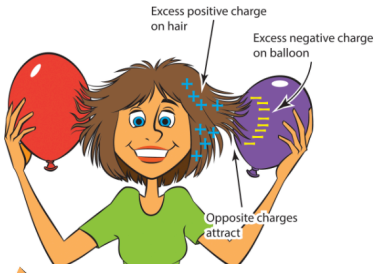
_____

_____

Student Activity: 2 balloons, 2 pieces of string, 1 hanger

Draw: Before rubbing the balloons	Draw: After rubbing the balloons

** Touching the balloons to each other should even the charges and return them to a neutral charge.

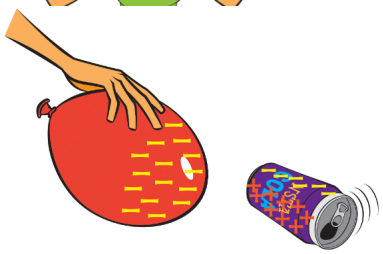


Why does your hair (or your classmates' hair) stand on end after rubbing the balloon on your head?

_____

_____

_____



How does the charged balloon affect the aluminum can?

_____

_____

_____

Reading Passage: What is Static Electricity?

Static electricity is a type of electricity that occurs when electric charges transfer to different materials through contact. The same charged particles that move through wire in electrical circuits can move to other objects when objects are rubbed together. These charged particles are known as electrons.Static electricity is what makes your hair stand on end when you remove a wool hat from your head. It is also what makes clothes in the dryer stick together. The electric charges transfer to other objects through contact and cause the overall charge of the objects to change.Materials that gain a negatively charged particle become negatively charged. Materials that lose a negatively charged particle become positively charged. Materials with opposite charges become attracted to each other and stick together.

What is static electricity? _____

_____

_____

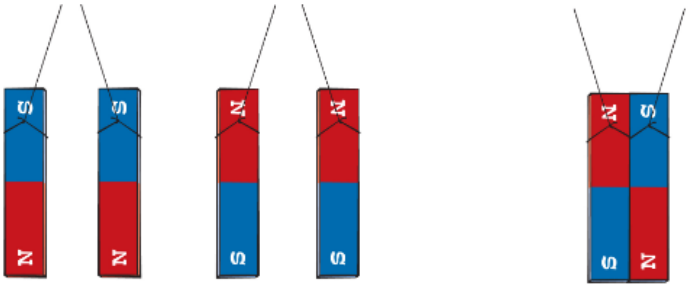
Why do some objects have charges and some objects do not? _____

_____

_____

Reading Passage: How is Static Electricity like Magnets?

Static electricity behaves much like magnets. While magnets don't have an electrical charge, they do attract and/or repel each other. A magnet has two poles, a north and a south. A north-to-north pole or south-to-south pole will repel or push away from each other. With static electricity, like magnets, opposite charges (positive to negative) will attract each other, or pull each other together. And like magnets, similar charges (positive to positive, or negative to negative) will repel each other, or push each other away.



How do two objects with the same overall charge behave? _____

_____

_____

How do two objects with the opposite overall charge behave? _____

_____

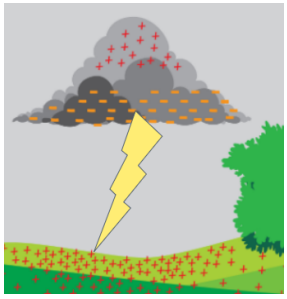
_____

How is this similar to magnets? _____

_____

_____

Reading Passage: Lightning - Static Electricity



Lightning is a form of static electricity. The charges build up inside of clouds as water molecules bump into each other and transfer electrons. Negatively charged particles build up at the base of clouds and positively charged particles build up at the tops of clouds. The ground will build up positively charged particles. When the electrical field between the ground and the cloud builds up enough, then lightning will strike.

Video: Study Jams: Electricity

Electricity is energy produced by the movement of _____.

Explain why socks in a dryer stick together sometimes. _____

_____

_____.

_____ or _____ objects together can make electrons move.

When electrons jump between atoms, _____ or _____ charges build up on objects.