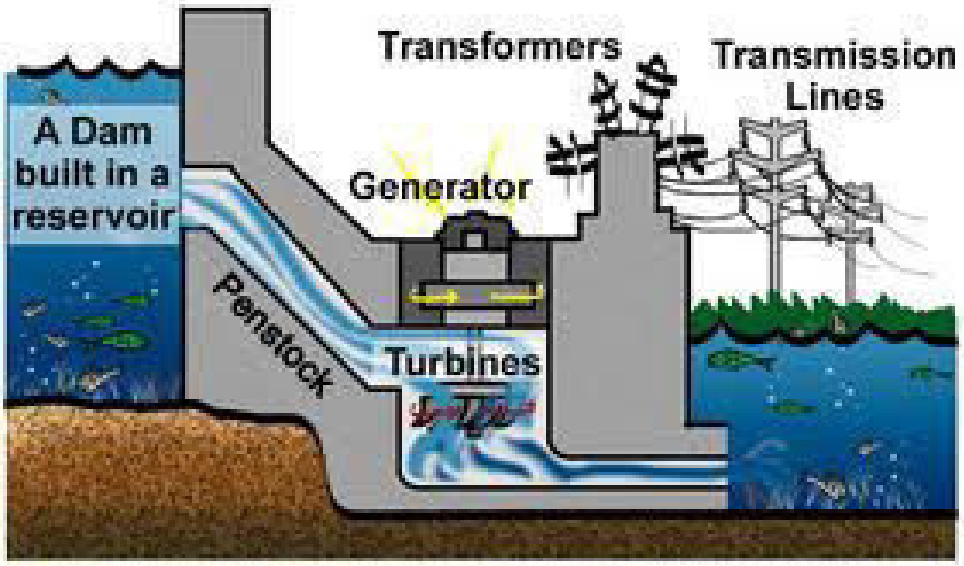
ELECTRICITY UNIT

SCIENCE AND TECHNOLGY- CYCLE 3

NAME_____

GROUP _____



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CLASS NOTES---

Atom

An atom is the smallest particle characterizing an element. All matter in the universe is made up of a combination of different atoms. Atoms are made up of protons, neutrons and electrons.

Electrical charge

An electrical charge is produced when an atom loses or gains an electron. When there are more electrons than protons, the charge is negative. When there are fewer electrons than protons, the charge is positive. The unit of electrical charge is the coulomb (symbol: C).

Electrical current

An electrical current is the movement of negative electrical charges (electrons) through a conductor (electrical wire, metal foil, etc.). In an electrical circuit, the current flows from the point where the electrical potential is highest to the point where it is lowest.

Electrical circuit

An electrical circuit is the complete loop through which an electrical current flows. It is made up of a series of electrical components and conductors (e.g., batteries, electrical wires, light bulbs, etc.). The current only flows in an electrical circuit when the path is completely closed, forming a loop.

Types of electrical circuit

There are two types of electrical circuit, parallel circuits and series circuits. Parallel circuits provide several different paths for the electrical current. Series circuits force the current through a single path; in other words, the electricity flows through all the electrical components of a series circuit one after the other.

Conductors of electricity

Conductors are bodies or materials that allow an electrical current to pass through them. Copper, aluminum, brass, zinc, iron and pewter are examples of metal that conduct electricity well. Salt water is also a good conductor.

Resistance

Resistance is the part of an electrical circuit that resists the flow of electricity (for example, by transforming it into heat or light, as in a light bulb or a buzzer). In an electrical circuit, the presence of a resistor limits the current and prevents damage related to short circuits. The unit used to measure resistance is the ohm (symbol: Ω).

Ampere

The ampere (symbol: A) is the unit used to measure current intensity.

Voltage
Voltage (symbol: V) is the unit used to measure electrical tension, also called “difference of electrical potential.”

Short circuit
A short circuit occurs when two live (i.e., carrying current) conductors accidentally come into contact, either directly or through a conducting object (e.g., when the blade of an electric lawn mower cuts the electrical wire). When this happens, the current can flow with very little restriction because the resistance of the loop formed by the two conductors is very weak. The high amount of current heats up the wires and can cause a fire. Fuses and circuit breakers detect unusually high currents and break the circuit, which helps to prevent fires.

Battery
Batteries are reserves of chemical energy that can be transformed into electrical energy. Small electric cells (commonly called batteries, as in AA batteries) are examples of simple batteries for everyday use.

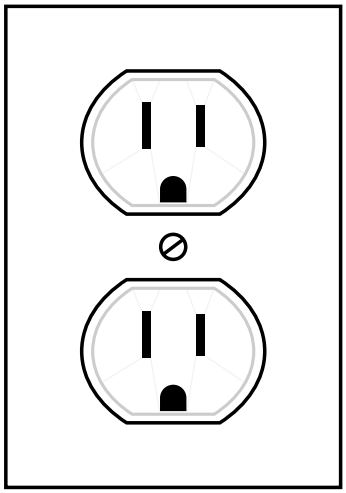
Insulator
Insulators, such as wood and plastic, are materials that do not easily transmit heat, cold or electricity. Electrical wires are covered with an insulator to prevent electrical shocks and short circuits that could cause fires.

People

Thomas Alva Edison (1847-1931), a U.S. inventor who designed the first electric light bulb. He also invented many other devices, including the phonograph, ancestor of the gramophone.

Alessandro Volta (1745-1827), an Italian physicist, invented the first electric battery.

CURRENT ELECTRICITY



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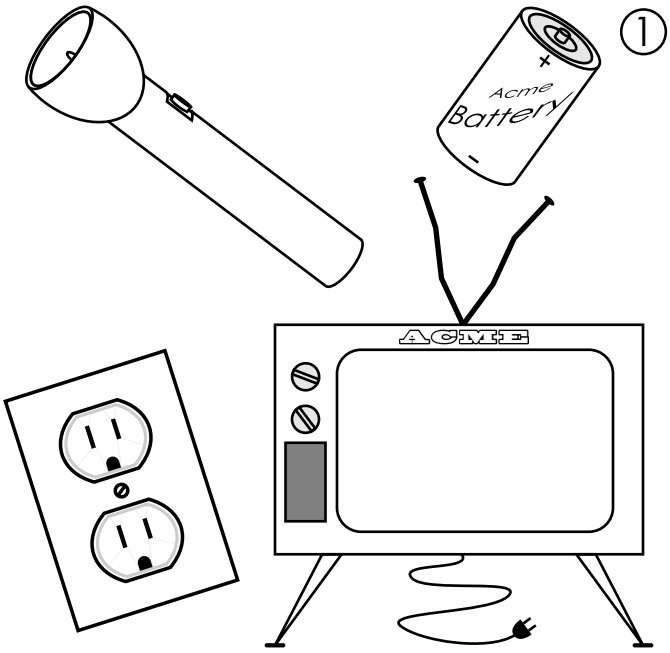
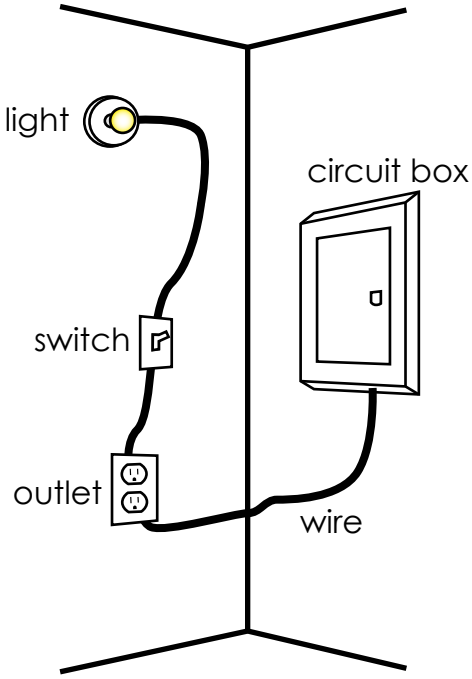


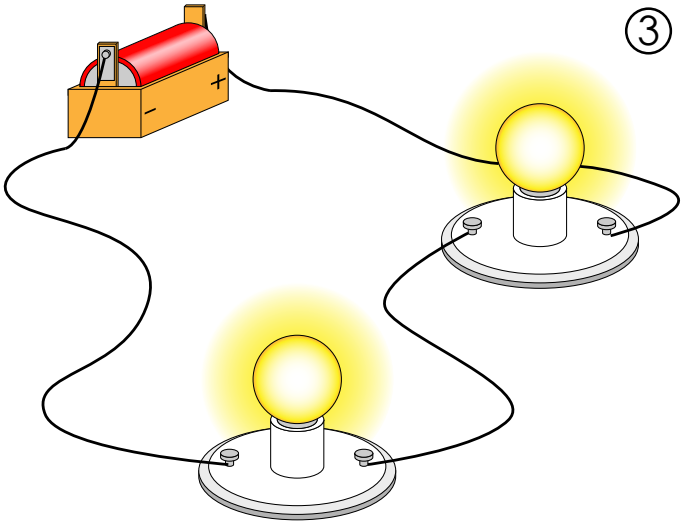
Electricity from the wall outlets in your house powers your television, computer, lights, and microwave. Cell phones, flashlights, and even a car's headlights are powered by the electricity in batteries.

②



The type of electricity that is used to power things we use is called *current electricity*. Current electricity is electricity that flows through wires. The path that electricity follows is called a *circuit*.

③



The picture above shows a circuit. Electricity flows from the negative side of a battery, through the wires, and lights the bulb. The electricity continues to travel around to the positive side of the battery.

Draw arrows on the picture to show the path of the electricity.

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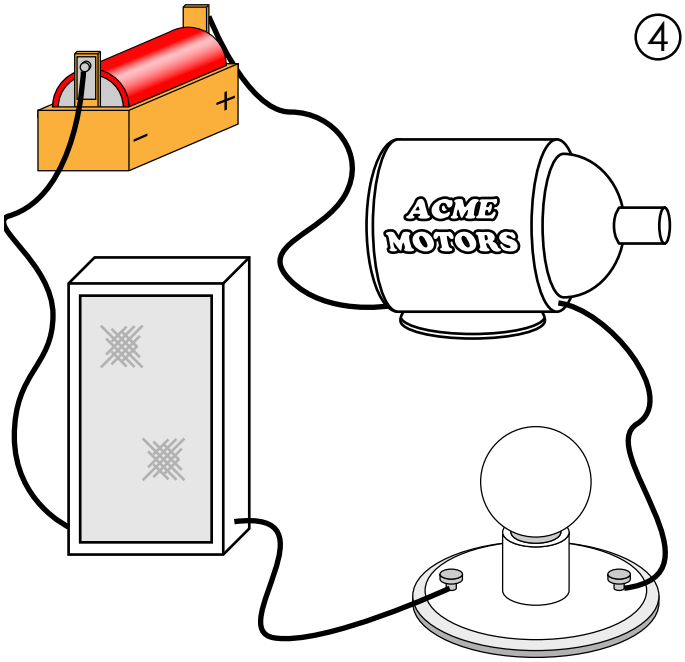
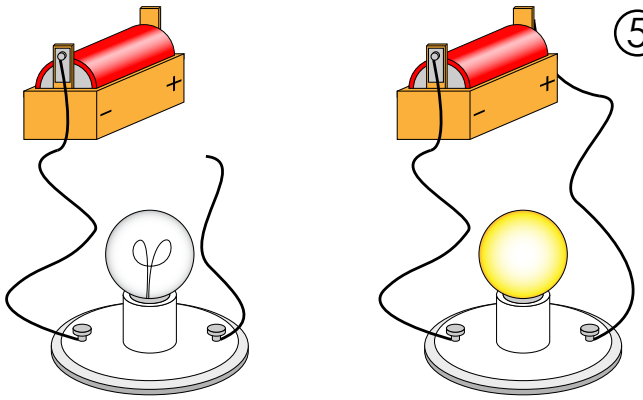


Something that uses some of the electricity in a circuit is called a *resistor*. Resistors could also be things like light bulbs, motors or speakers.

Color the resistors in the circuit above.

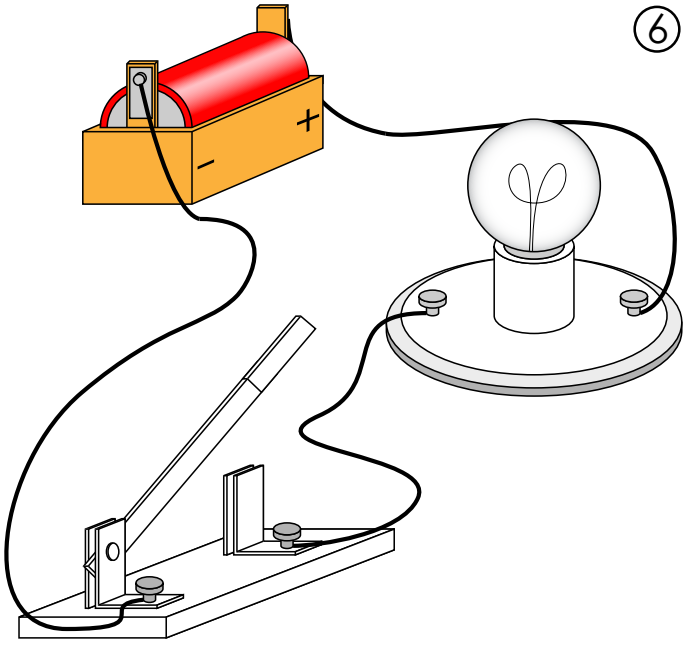
⑤



A circuit can be *open* or *closed*. When a circuit is closed, it is complete and there is no break in the path that the charges must follow. When a circuit is open, it is incomplete and charges can't flow through.

Label the two circuits above with the words "open circuit" and "closed circuit."

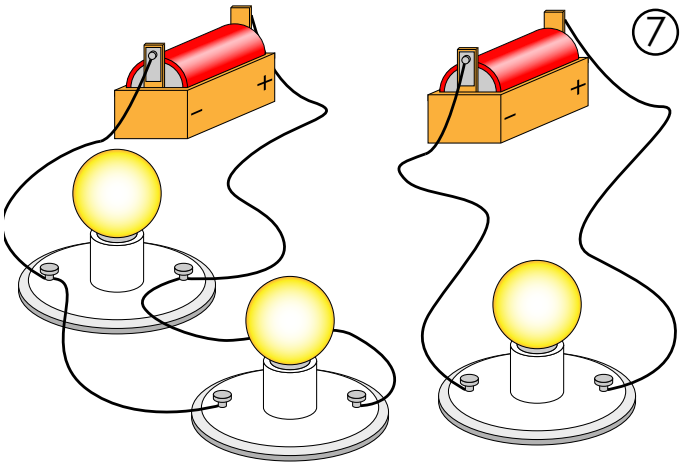
⑥



A *switch* is sometimes added to a circuit. The switch opens and closes a circuit to turn resistors on and off.

Color the switch in the circuit above.

⑦



In a *series circuit*, electricity can follow only one path. In a *parallel circuit*, electricity has more than one path to follow.

Label the two circuits above with the words "series circuit" or "parallel circuit."

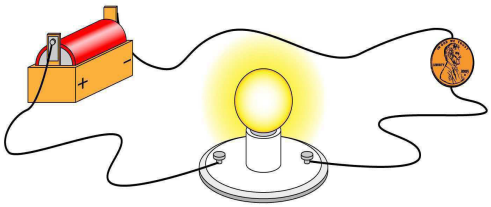
Name: _____

Electricity

Choose the best answer for each question. Write the letter on the line.

_____ **1.** What supplies energy in an electric circuit?

a. a conductor **b.** light bulb
c. a wire **d.** a battery



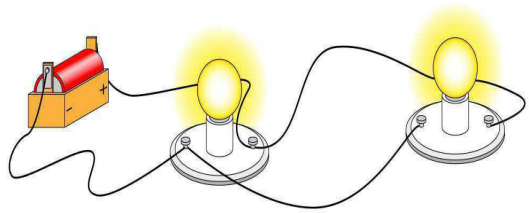
Circuit A

_____ **2.** Which material is a conductor?

a. plastic **b.** silver
c. glass **d.** wood

_____ **3.** Which type of circuit is Circuit A?

a. series **b.** parallel
c. perpendicular **d.** current



Circuit B

_____ **4.** Which item is a resistor in Circuit B?

a. light bulb **b.** wire
c. battery **d.** screws

_____ **5.** Why did the person who made Circuit A probably connect the wires to a penny?

a. They needed to use a penny to make the bulb light.
b. They were testing to see if the penny conducts electricity.
c. They used the penny to supply extra power.
d. The penny will prevent sparks.

_____ **6.** Which of these could be used as a resistor in a circuit?

a. a pencil
b. a gas engine
c. a rubber eraser
d. an electric motor

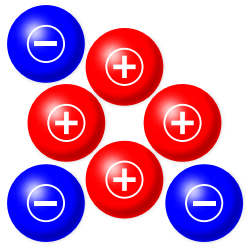
Electrical Charges

If an object has more positive charges (⊕) than negative charges (⊖), its electrical charge is positive (⊕).

If an object has more negative charges (⊖) than positive charges (⊕), its electrical charge is negative (⊖).

If an object has the same number of positive (⊕) and negative (⊖) charges, it has no electrical charge or is neutral.

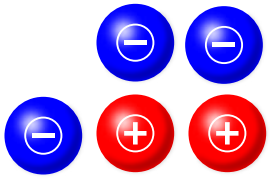
Example:



Electrical charge: positive charge

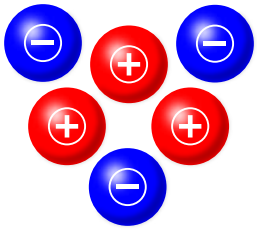
Count the positive and negative charges in each picture. Write *positive charge*, *negative charge*, or *no charge* on each line.

1.



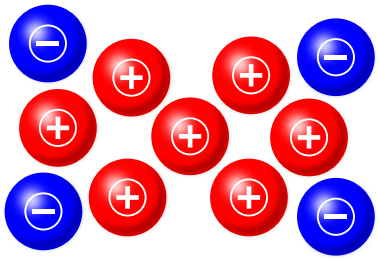
electrical charge: _____

2.



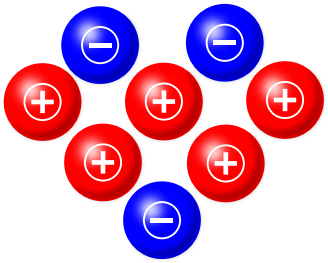
electrical charge: _____

3.



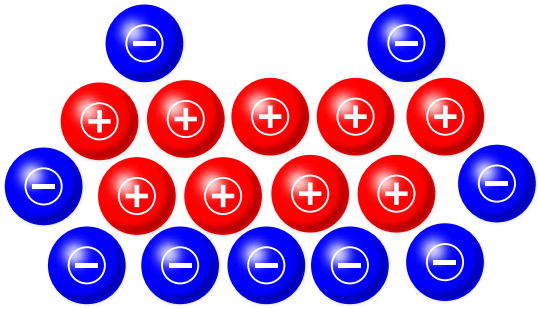
electrical charge: _____

4.



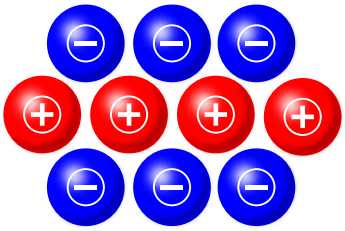
electrical charge: _____

5.



electrical charge: _____

6.

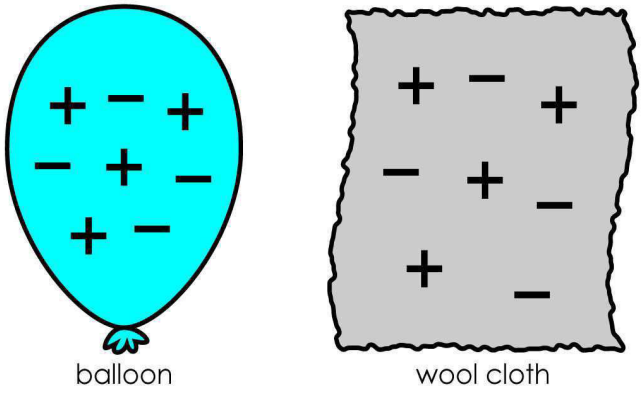


electrical charge: _____

Static Electricity

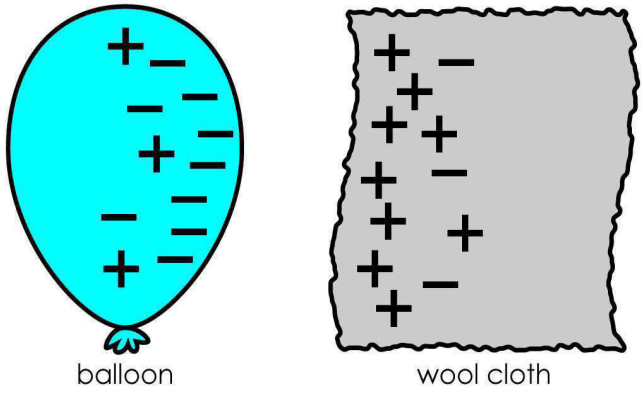
Rubbing a balloon with wool cloth will create static electricity charges.

This balloon has **not** been rubbed with the wool cloth.



Picture 1

This balloon **has** been rubbed with the wool cloth.



Picture 2

In Picture 1, does the balloon have a positive charge, negative charge, or no charge? _____

In Picture 1, does the cloth have a positive charge, negative charge, or no charge? _____

In Picture 2, does the balloon have a positive charge, negative charge, or no charge? _____

In Picture 2, does the cloth have a positive charge, negative charge, or no charge? _____

If you place small pieces of tissue paper near the balloon in Picture 2, they would probably stick to the balloon. Explain why.

_____

_____

_____

_____

Circuits

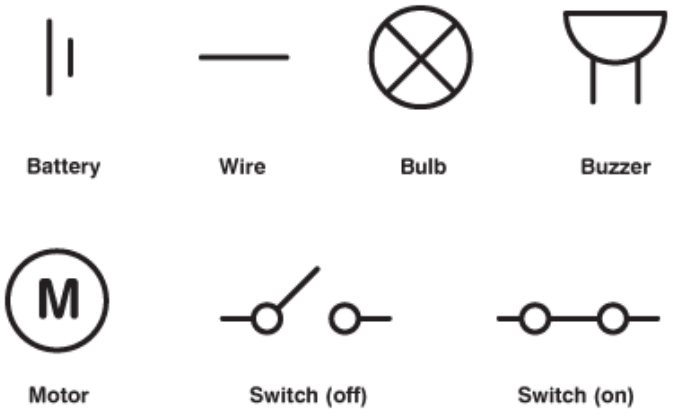
A circuit always needs a power source, such as a **battery**, with wires connected to both the **positive** (**+**) and **negative** (**-**) ends. A battery is also known as a cell.
A circuit can also contain other electrical **components**, such as bulbs, buzzers or motors, which allow electricity to pass through.
Electricity will only travel around a circuit that is **complete**. That means it has no gaps.

Incomplete circuit

Complete circuit

Symbols

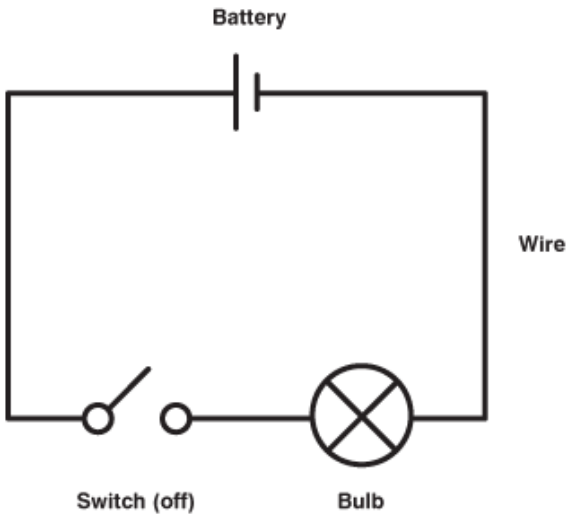
We use these symbols to draw diagrams of circuits:



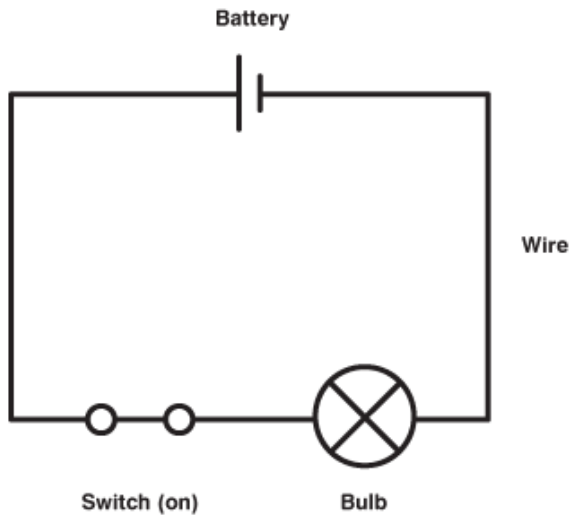
Switches

When a switch is open (off), there is a gap in the circuit.
Electricity **can not** travel around the circuit.
When a switch is closed (on), it makes the circuit complete. Electricity **can** travel around the circuit.

Switch open (off). Bulb doesn't light.

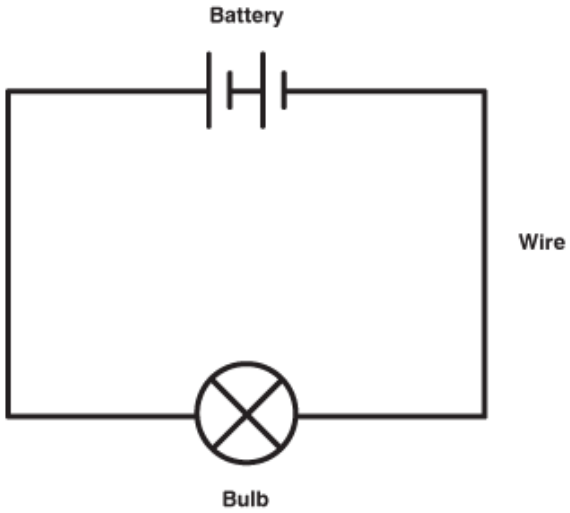


Switch closed (on). Bulb lights.



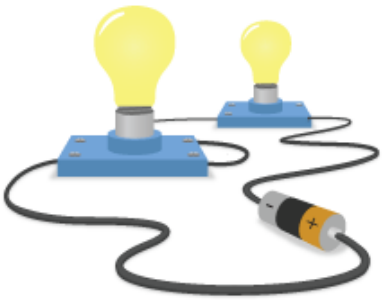
Changing circuits

Adding **more batteries** to a simple circuit will increase the electrical energy, which will make a bulb **brighter**.



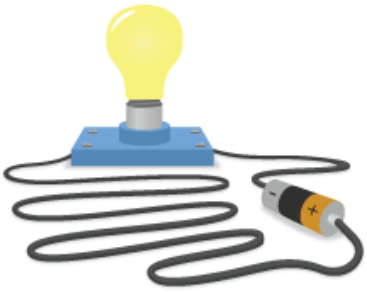
More bulbs

Adding **more bulbs** to a simple circuit will make the bulbs **dimmer**.



Longer wires

Lengthening the wires in a simple circuit will make the bulb **dimmer**.



Electrical circuits - Quiz

1. In a simple series circuit, why does the bulb light when you close the switch?
a-Because the switch produces electricity
b-Because closing the switch completes the circuit
c-Because closing the switch breaks the circuit

2. In a simple series circuit, why does the bulb go out when you open the switch?
a-Because the battery goes flat b-Because opening the switch breaks the circuit
c-Because too much electricity flows through the bulb

3. Imagine a simple series circuit with one 1.5V battery and one bulb. When the 1.5V battery is replaced with a 3V battery ...
A- the bulb gets brighter b- the bulb gets dimmer
c-the bulb stays at the same level of brightness

4. Imagine a circuit with a 1.5V battery and one bulb. Imagine a similar circuit with a 3V battery and two bulbs. Which has the brightest bulbs?
a-The circuit with a 1.5V battery and one bulb
b-The circuit with a 3V battery and two bulbs
c-The bulbs in both circuits are of similar brightness levels

5. Why might a bulb flash and go out when a 1.5V battery and a 3V battery are both connected across it in a simple series circuit?
a-There is not enough electricity flowing around the circuit
b-Too much electricity flows through the bulb's filament and the bulb blows
c-The batteries are flat

6. What is the effect of changing the wire in a circuit from a straight thick wire to a straight thin wire?
a-The bulbs become dimmer b-The bulbs become brighter
c-The bulbs stay at the same level of brightness

7. What is the effect of changing the wire in a circuit from a straight thick wire to a longer (coiled) thick wire?
a-The bulbs become dimmer b-The bulbs become brighter
c-The bulbs stay at the same level of brightness

8. In a circuit diagram, what does a circle with a cross inside it represent?
a-A light bulb b- A motor c- A battery

9. What do the long straight lines represent in a circuit diagram?
a-Motors b-Light bulbs c- Wires

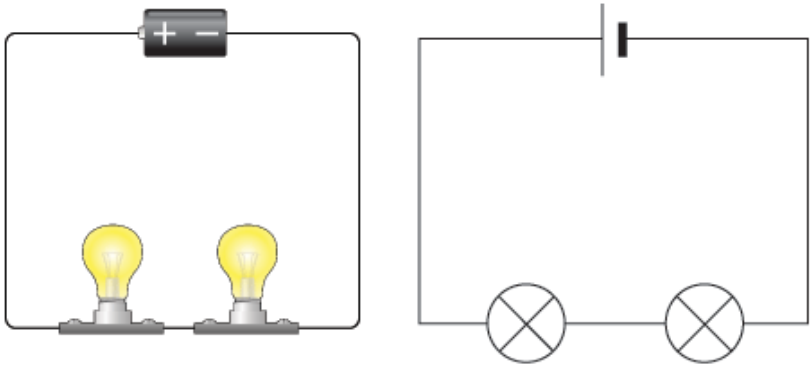
10. How is a battery represented in a circuit diagram?
a-A circle with a cross inside it b- A circle with an M inside it
c-A long line and a short line

Series & parallel circuits

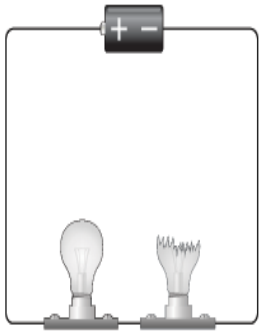
There are two types of circuit we can make,
called **series** and **parallel**.
The components in a circuit are joined by wires.
if there are no branches then it's a series circuit
if there are branches it's a parallel circuit

Series circuits

In a television series, you get several episodes, one after the other. A series circuit is similar. You get several components one after the other. If you follow the circuit diagram from one side of the cell to the other, you should pass through all the different components, one after the other, without any branches.



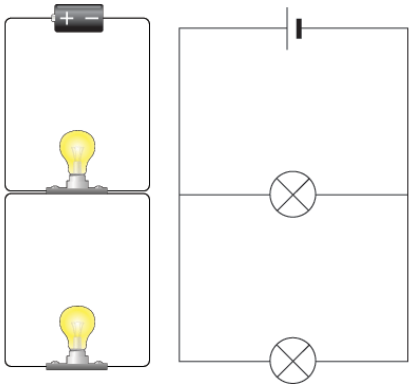
If you put more lamps into a series circuit, the lamps will be dimmer than before.
In a series circuit, if a lamp breaks or a component is disconnected, the circuit is broken and all the components stop working.



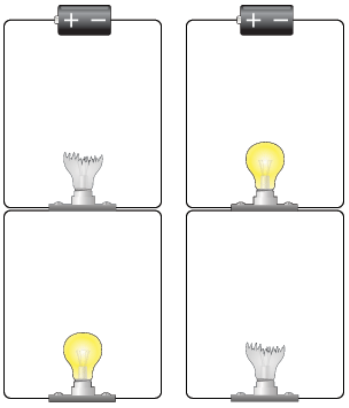
Series circuits are useful if you want a warning that one of the components in the circuit has failed. They also use less wiring than parallel circuits.

Parallel circuits

In parallel circuits different components are connected on different branches of the wire. If you follow the circuit diagram from one side of the cell to the other, you can only pass through all the different components if you follow all the **branches**.



In a parallel circuit, if a lamp breaks or a component is disconnected from one parallel wire, the components on different branches **keep working**. And, unlike a series circuit, the lamps stay bright if you add more lamps in parallel.

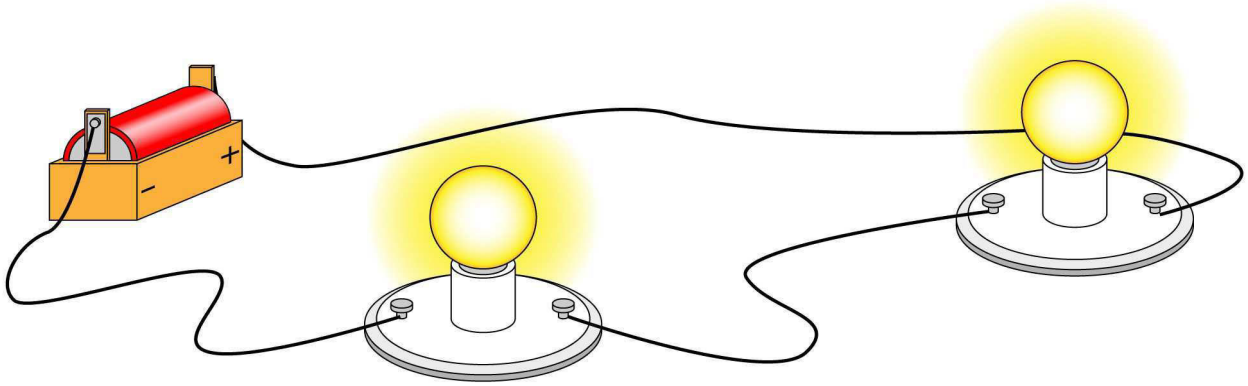


Parallel circuits are useful if you want everything to work, even if one component has failed. This is why our homes are wired up with parallel circuits.

Series and Parallel Circuits

In a **series circuit** electric current has only one path to follow. All parts are connected one after another. Electric current flows from the negative side of the battery around in a loop to the positive side.

Draw arrows to show the path of electric current in this series circuit.



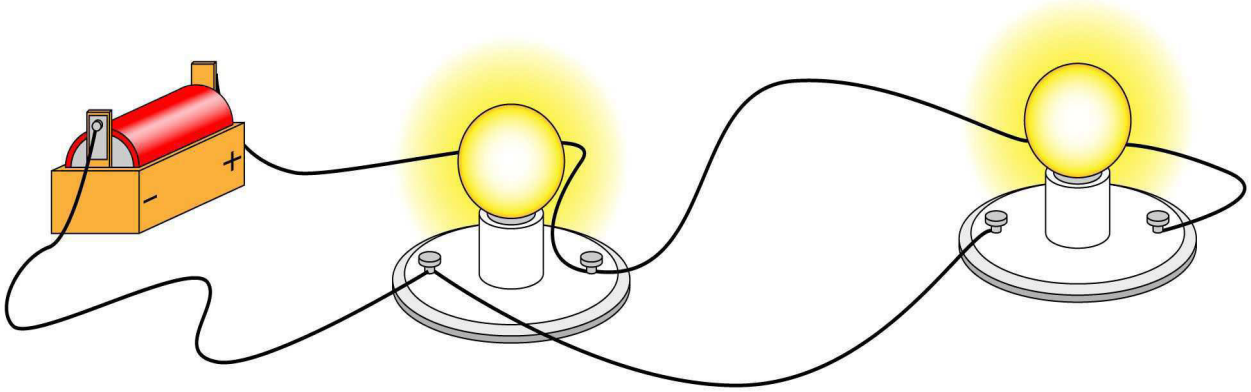
If a light bulb is missing or broken in a series circuit, will the other bulb light? Explain.

_____

_____

In a **parallel circuit**, electric current has more than one path to follow. The electric current can follow different paths as it flows from the negative side of the battery to the positive side.

Draw arrows to show the different paths electric current can travel in this parallel circuit.



If a light bulb is missing or broken in a parallel circuit, will the other bulb light? Explain.

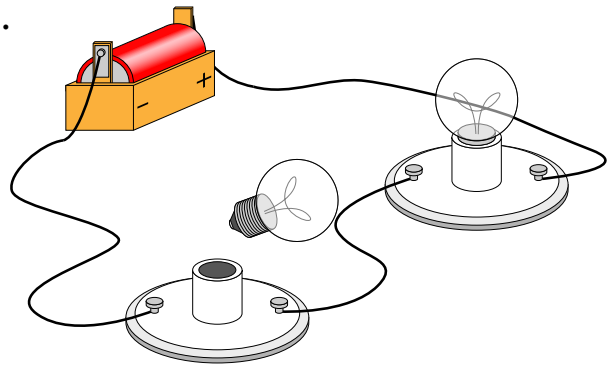
_____

_____

Electrical Circuits

Tell whether the light bulb or bulbs **will light** or **will not light** based on the circuit.

1.



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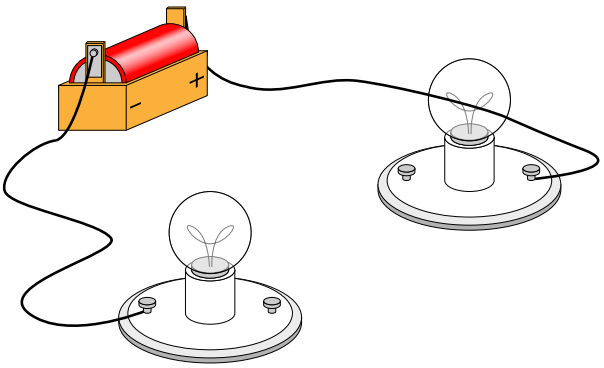

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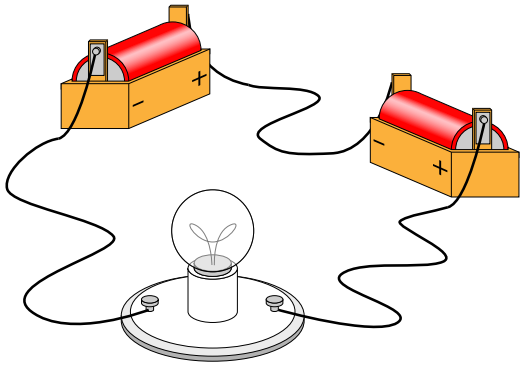
3.



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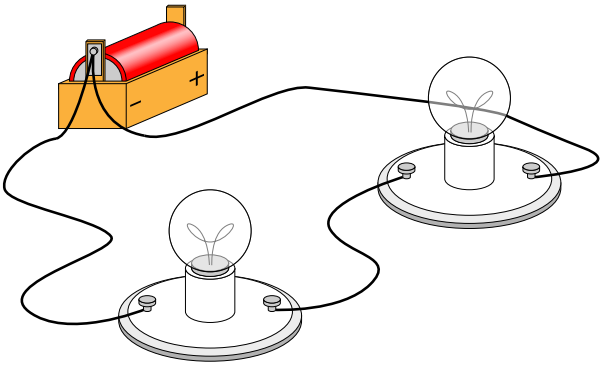

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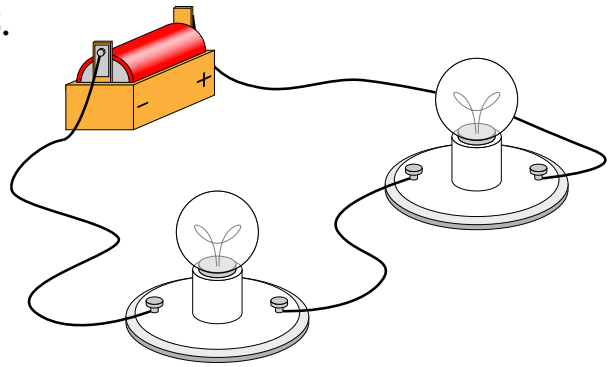
5.



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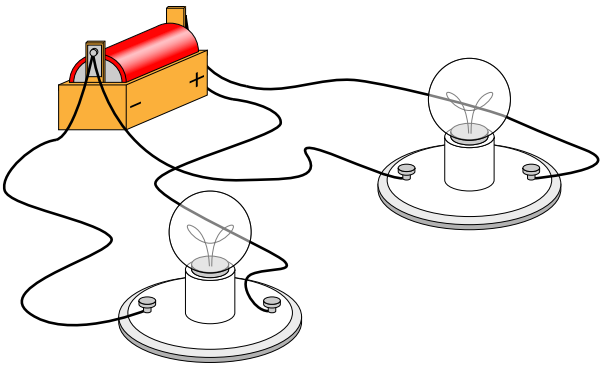
6.



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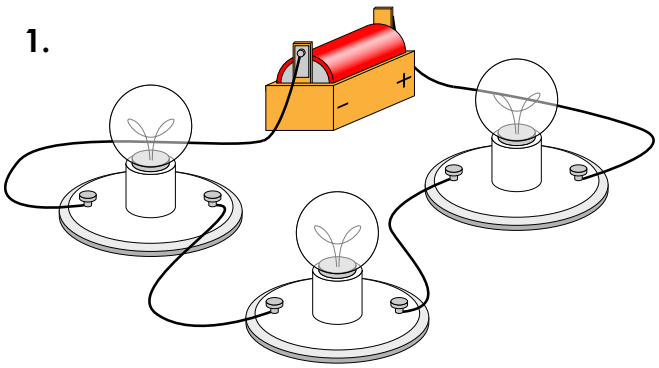
Series & Parallel Circuits

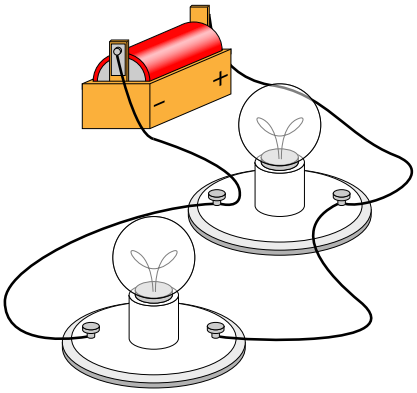
Tell whether each picture shows a **series circuit** or **parallel circuit**.

1.



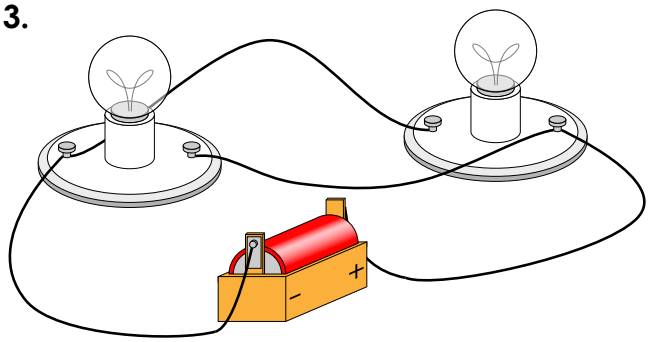
type: _____

2.



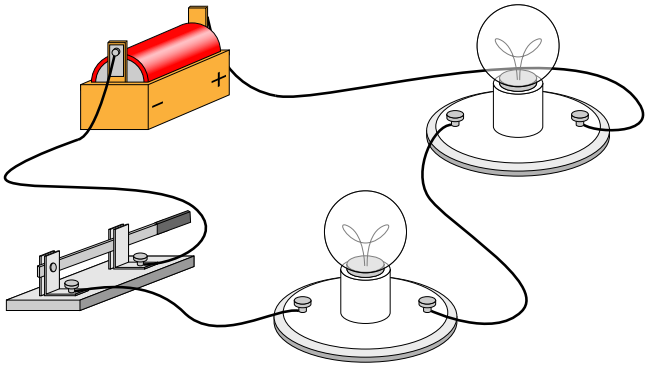
type: _____

3.



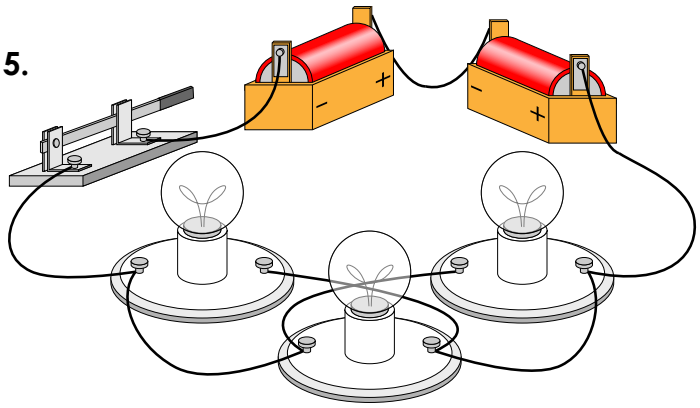
type: _____

4.



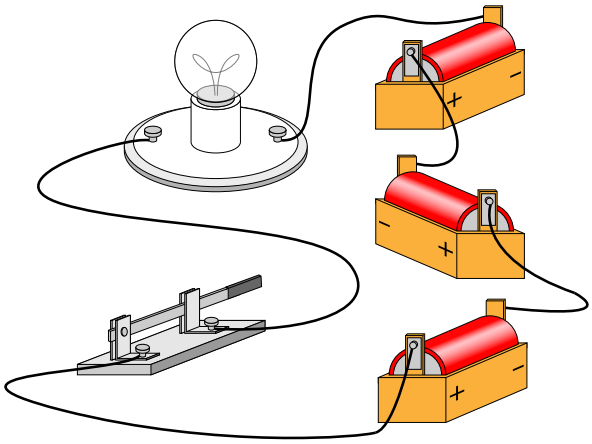
type: _____

5.



type: _____

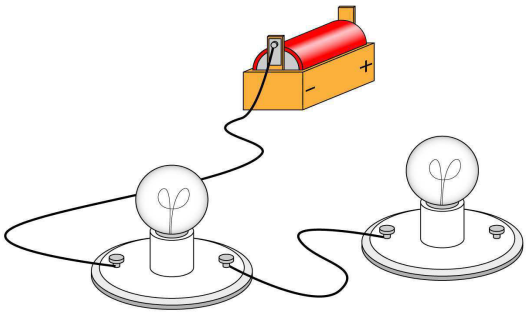
6.



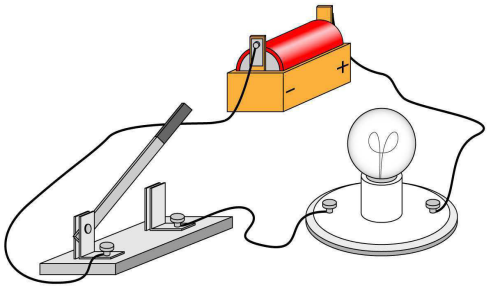
type: _____

What's Wrong With These Circuits?

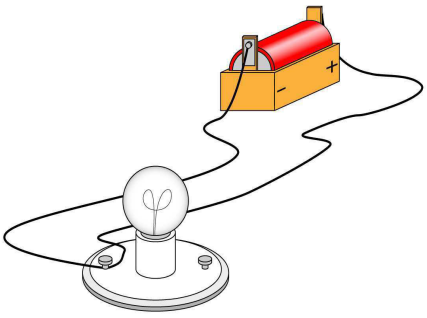
1. Explain why the light bulbs won't light in the circuit pictured on the right.



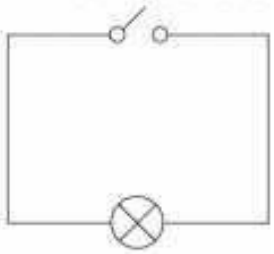
2. Explain why the light bulb isn't lighting up in the circuit pictured on the right.



3. Explain why the light bulb isn't lighting up in the circuit pictured on the right.



1. What needs to be done to this circuit so that the lamp lights up?

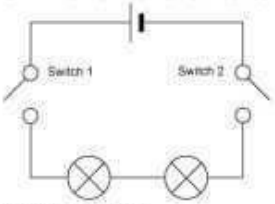


- close the switch
- add another lamp
- add a cell and close the switch

2. What component does this circuit symbol represent?

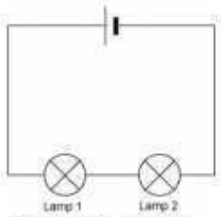
- cell
- buzzer
- capacitor

3. Which switch or switches must be closed to make the lamps light?



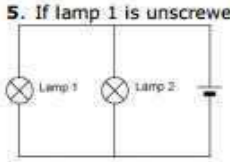
- only switch 1
- only switch 2
- switches 1 and 2

4. If lamp 1 is unscrewed from its holder, what will happen to lamp 2?



- it will get brighter
- it will go out
- it will stay the same brightness

5. If lamp 1 is unscrewed from its holder, what will happen to lamp 2?



- it will stay lit
- it will go out
- it will get dimmer

8. Which statement about electric current is correct?

- it always flows clockwise
- it gets used up as it goes around the circuit
- it does not get used up as it goes around the circuit

Electrical conductors –

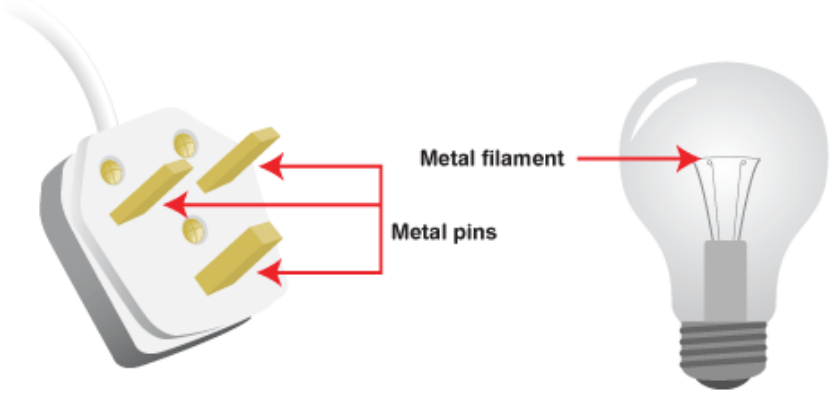
Introduction

Electricity travels easily through electrical conductors, like metals.

Materials that do not let electricity pass through them easily are called electrical insulators. Plastic, wood, glass and rubber are good electrical insulators.

Electrical conductors

Some materials let electricity pass through them easily. These materials are known as electrical **conductors**.
Many **metals**, such as copper, iron and steel, are good electrical conductors. That is why the parts of electrical objects that need to let electricity pass through are always made of metal.



Metal is used in plugs to allow electricity to transfer from the wall socket, through the plug, and into a device such as a radio or TV.
In a light bulb, the metal filament conducts electricity and causes the light bulb to light up.

Electrical insulators

Some materials do **not** allow electricity to pass through them. These materials are known as electrical **insulators**. Plastic, wood, glass and rubber are good electrical insulators. That is why they are used to cover materials that carry electricity.

The plastic covering that surrounds wires is an electrical insulator. It stops you from getting an electrical shock.

Electrical conductors – Quiz– Circle the best answer

1. A material that lets electricity pass through it is called ...
a-an electrical conductor b-an electrical insulator c- an electrical appliance

2. A material that does NOT let electricity pass through it is called ...
a-an electrical conductor b- an electrical insulator d-an electrical appliance

3 .Which of the following materials is an electrical conductor?
a-Silver b- Silver-coloured plastic c-Cork

4. Which of the following materials is an electrical insulator?
a-Aluminum b-Gold c- Rubber

5. In which circuit will the bulb or bulbs glow brightest?
a-A simple circuit with one bulb and one battery
b-A simple circuit with one bulb and two batteries
c-A simple circuit with two bulbs and one battery

6. Why is a bulb brighter when it is powered by two batteries rather than one?
a-Because the flow of electricity in the circuit is less
b-Because the flow of electricity in the circuit is the same
c-Because the flow of electricity in the circuit is greater

7. Ruby has connected two bulbs across two batteries in a simple circuit. How can she make the bulbs dimmer?
a-Replace one of the batteries with a section of wire
b-Replace one of the batteries with a cork
c-Replace one of the bulbs with a section of wire

8. Ruby makes a complete simple circuit with one bulb and three batteries. The bulb lights for an instant and then goes out. Why?
a-Not enough electricity flows around the circuit
b-Too much electricity flows through the bulb's filament
c-The batteries are flat

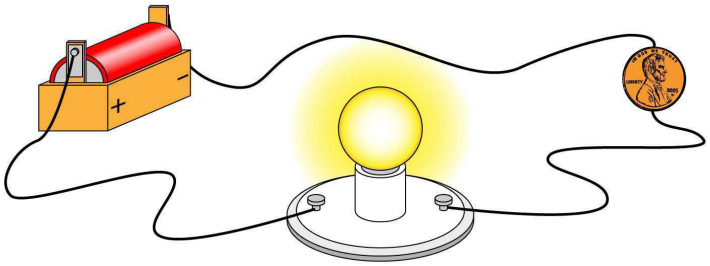
9. Why is electrical wiring usually made from copper?
a-Because copper is shiny b- Because copper conducts electricity
c-Because copper is not magnetic

10. Why is electrical wiring usually covered with a layer of plastic?
a-To make it look pretty
b-To help electricity flow along the wire
c-To make it safe

Conductors and Insulators

A **conductor** is a material that allows electricity to flow through it.
An **insulator** is a material that electricity cannot flow through.

To determine whether an object is a conductor or insulator, you can build a simple circuit with a battery, light bulb, and three pieces of wire.



Touch the free ends of the wire to the object you are testing. If the light bulb lights up, the object is made from a conductor. if it does not, the object is made from an insulator.

Complete the table. Predict whether each item is made from a material that is a conductor or insulator. Then test each item to determine if it is made from a conductor or insulator.

Object	Prediction: Conductor or Insulator?	Result: Conductor or Insulator?
rubber band		
penny		
nickel		
toothpick		
key		
paper clip		
brass paper fastener		
glass microscope slide		
(your choice)		
(your choice)		

Name: _____

Electricity

circuit	**glass**	**insulators**	**conductors**
electric current	**rubber**	**series**	**parallel**
resistor	**copper**	**battery**	**silver**

Chose the best word(s) from the word box to complete each sentence.

1. The flow of electricity is an _____.

2. A path that an electric current follows is a _____.

3. A _____ supplies energy to move electricity through a circuit.

4. _____ are materials that electrical current cannot pass through.

5. _____ are materials that electrical current can easily pass through.

6. _____ and _____ are examples of materials that are conductors.

7. _____ and _____ are examples of materials that are insulators.

8. A _____ is a material that cuts down the flow of current, but does not stop it.

9. A _____ circuit is a circuit in which electrical current can follow only one path.

10. A _____ circuit is a circuit in which electrical current has more than one path to follow.

Non Renewable Resources

We get energy from many different types of energy resources, including fuels, food and stores of energy such as batteries or the wind. We can divide energy resources into two categories: **non-renewable** and **renewable**.

Non-renewable energy resources cannot be replaced once they are all used up.

Renewable energy resources can be replaced, and will not run out.

On the this page we'll look at non-renewable resources.

Coal, **oil** and **natural gas** are called fossil fuels. They formed millions of years ago from the remains of living things. Coal was formed from plants. Oil and natural gas were formed from sea creatures

.

The energy stored in the fossil fuels originally came from **sunlight**. Plants used light energy from the Sun for **photosynthesis** to make their chemicals. This stored chemical energy was transferred to stored chemical energy in animals that ate the plants. When the living things died, they were gradually buried by layers of rock. The buried remains were put under pressure and chemical reactions heated them up. They gradually changed into the fossil fuels.

When the remains of the plants and animals became fossil fuels, their chemical energy was stored in the fuels. The energy is transferred to the surroundings as **thermal** energy and **light** energy when the fuels burn.

Once we have used them all up, they will take millions of years to replace, if they can be replaced at all. For this reason we call fossil fuels **non-renewable** energy resources.

Renewable resources

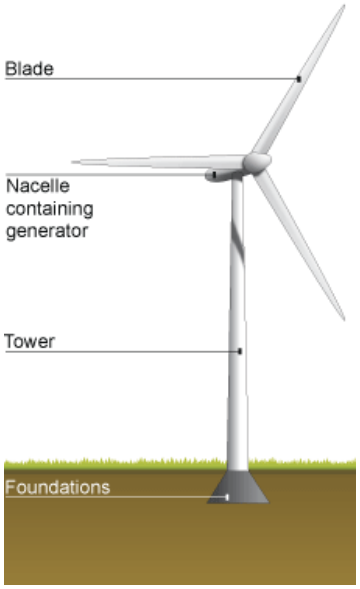
Renewable energy resources can be replaced, and will not run out. Be careful - it is not true to say that they can be re-used.

Biomass

Biomass fuels come from **living things**. Wood is a biomass fuel. As long as we continue to plant new trees to replace those cut down, we will always have wood to burn. Just as with the fossil fuels, the energy stored in biomass fuels came originally from the Sun.

Wind power

Wind is caused by huge convection currents in the Earth's atmosphere, driven by heat energy from the Sun. The moving air has huge amounts of **kinetic** energy, and this can be transferred into electrical energy using **wind turbines**. Wind turbines cannot work if there is no wind, or if the wind speed is so high it would damage them.



Solar cells

Solar cells are devices that convert **light** energy directly into electrical energy. You may have seen small solar cells on calculators. Larger arrays of solar cells are used to power road signs, and even larger arrays are used to power satellites in orbit around Earth.

Solar panels

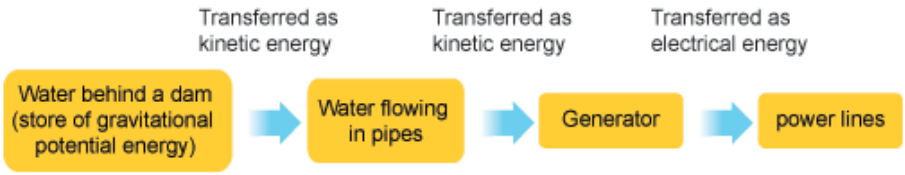
Solar panels are different to solar cells. Solar panels **do not** generate electricity. Instead they heat up water directly. A pump pushes cold water from a storage tank through pipes in the solar panel. The water is heated by heat energy from the Sun and returns to the tank. They are often located on the roofs of buildings where they can receive the most sunlight.

Water power

Moving water has **kinetic** energy. This can be transferred into useful energy in different ways. For example:
wave machines use the up and down movement of waves to turn electricity generators
dams are built across the mouths of rivers. As water moves in or out of the river mouth when the tide turns, the kinetic energy in the water is used to turn electricity generators.

Hydroelectric power (HEP) schemes store water high up in dams. The water has **gravitational potential energy** which is released when it falls. As the water rushes down through pipes, this stored energy is transferred to kinetic energy, which turns electricity generators.

An energy transfer diagram for an HEP scheme:



Geothermal

In some places the rocks underground are hot. Deep wells can be drilled and cold water pumped down. The water runs through fractures in the rocks and is heated up. It returns to the surface as hot water and steam, where its energy can be used to drive turbines and electricity generators

REVIEW-- ELECTRICITY

Part 1 Choose the best word.

atom	**battery**	**current**	**dam**	**Thomas Edison**	~~**Michael Faraday**~~
Benjamin Franklin	**magnet**	**negative**	**neutron**	**shock**	**static**
switch	**volt**	**wire**	**Albert Einstein**	~~**Alessandro Volta**~~	

1-Motors work because electricity in a coil makes one of these. _____

2-All matter is made up of one of these. _____

3-A "metal" string that brings electricity to your house. _____

4-The charge an electron has spinning around a nucleus. _____

5-The part of a nucleus with neither a positive nor a negative charge. _____

6-Being careless with electricity can cause this! _____

7-What turns electricity "on" and "off". _____

8- The kind of electrical energy that stays in one place. _____

9- A measure of the electric force that "pushes" electrons. _____

10- Electrical energy can be stored in a _____. (also known as DC current)

11- A big structure that holds back water._____

12- Scientist responsible for the invention and a new way of producing light._____

13- American scientist that used a kite to demonstrate static electricity. _____

14- Italian Physicist who invented the first battery. **Alessandro Volta**

15- British Scientist who discovered that if an electric conductor, like a copper wire, is moved through a magnetic field, electric current will flow (or "be induced") in the conductor. So the mechanical energy of the moving wire is converted into the electric energy of the current that flows in the wire. **Michael Faraday**

/13

Part 2- Questions

1-What is electricity?

_____

_____

_____

/2

Part 3- Chose the best form of energy. Then circle if the energy is Renewable or Non-Renewable

Solar Energy	**~~Geothermal Energy~~**	**Hydro-Electrical Energy**	**Nuclear Energy**
	Wind Energy	**Fossil Fuels Energy**	

1-Energy from the heat deep in the earth

is called: Geothermal Energy Renewable/Non-Renewable

2- Spinning windmill blades turn a turbine to

create electricity:_____ Renewable/Non-Renewable

3-Power comes from the energy of

falling water. _____ Renewable/Non-Renewable

4- Tiny atomic particles of uranium fuel this

type of power._____ Renewable/Non-Renewable

5- Source of energy that uses the sun. _____ Renewable/Non-Renewable

6- Source of energy that uses coal, oil,

and natural gaz. _____ Renewable/Non-Renewable **/9**

Part 4- ATOMS--Describe the type of charge they have.

Type of Charge (-,+, Neutral)

Electron- _____

Neutron- _____

Proton - _____

/3

Use the words on the side to **draw and label** the structure of the Atom. /3

/6

Part 5- Decide which material is a conductor and which is an insulator.

Iron _____ rubber_____

wood _____ copper _____

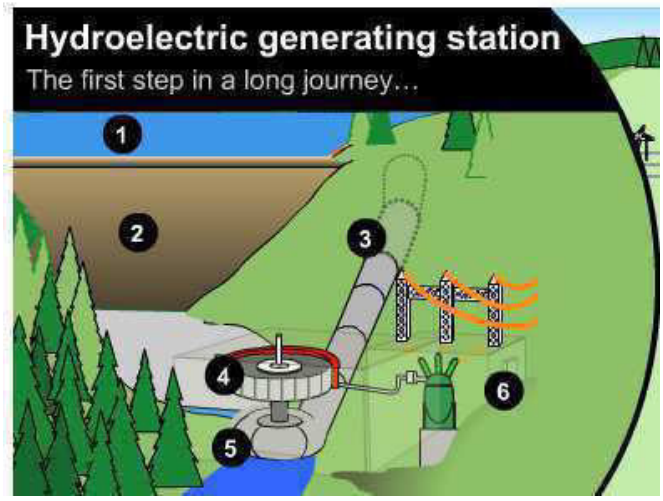
aluminum ____ _____ glass _____

salt water _____ gold_____

leather _____ plastic _____

/5

Part 6- Look at the picture below and match the parts of the hydroelectric generating station with their definitions. /6



Penstock
When the reservoir gates open, the outgoing water falls downward and flows through the penstock.
#____

Generator
A magnet rotates around a winding of electric wires and produces electrical power.
#_____

Reservoir
The water retained by the dam forms the electrical generating station's reserve.
_____

Dam
Very thick walls which hold the water inside the reservoir.
#_____

Transforming station
It increases the voltage of the electricity to make it easier to carry over high-voltage lines.
#____

Turbine
It turns when its blades come in contact with rushing water.
#_____

Part 7- What did Thomas Edison have to do to make the light bulb work? Explain. /1

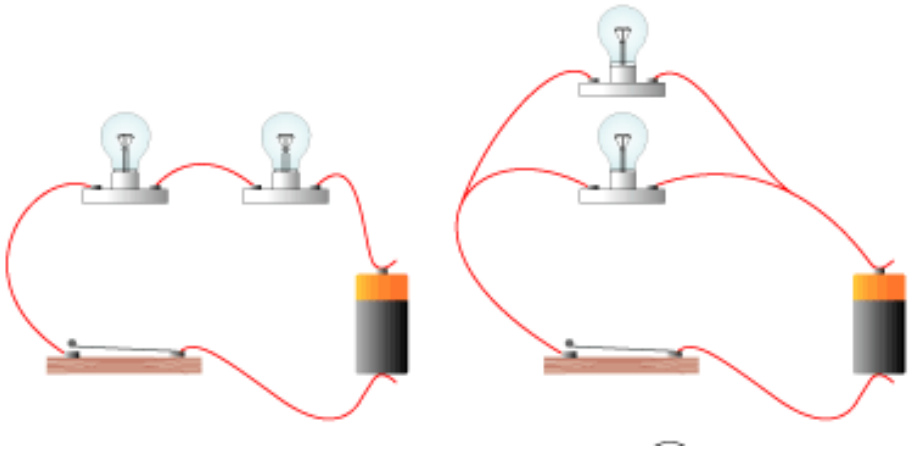
_____

_____

_____

Part7- Use the following words to match the pictures: **parallel circuit, series circuit**

/2



a-_____ b-_____

Part 8- Which circuit is better? Explain. /1

_____

_____

_____

_____

Part 9- What are the three main parts of a circuit? /3

1-_____ 2-_____ 3-_____

Part 10- What are **<u>fuses</u>** and **<u>breakers</u>**? Why are they important? /2

_____

_____

_____

_____