9 Science (10FI)

Learning Opportunities

April 27 – May 1

Electricity Use in Homes

Many things we use in our homes use electricity. Choose 3 different rooms in your home and answer the following questions:

How many light sources are in the room? (they may be light fixtures, clock on a microwave, light to indicate the stove burner is on, etc.)

How many things run on batteries? (TV remote, flashlight, etc.)

How many appliances in the room require electricity from an outlet? (TV, stove, etc.)

It does not matter whether items are in use at the time you are counting – still count them.

Electric Circuits

The movement or flow of electric charges from one place to another is called electric current. When the path the electrons take is controlled, we call it an electric circuit. All the items you counted in the activity above work as part of an electrical circuit. Circuits are used to convert electrical energy into the other forms of energy that we need such as light, heat or motion.

The parts of an electric circuit

There are several different parts that make up an electric circuit:

1. The source of electricity - This is what provides energy to the circuit. An example is a battery.
2. Electrical Load - This is what converts the energy into something useful, like light or heat (like the items you counted in the activity above). The load is the reason that we need the circuit.
3. Electric Circuit Control Device - Another word for this is a switch, it controls when the circuit is turned on or off.
4. Connectors - This is the wire that connects all the pieces of the circuit together. They provide a path for the electrons to flow.

Symbols are used to simplify the drawing of electric circuits. Drawings of circuits using these symbols are called schematic circuit diagrams.

We will be using these symbols:

Battery:

Switch:

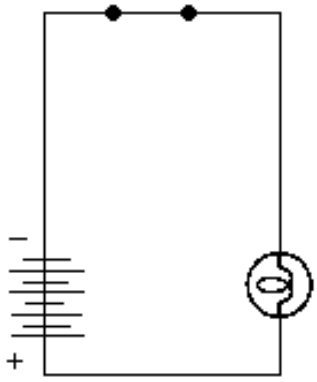
Lightbulb:

Wire:

Open and Closed Circuits

- When a circuit is operating (when it is “on”), it needs a continuous path for the electrons to follow for the current to flow. This is called a closed circuit. This means the switch must be closed.

- When the switch is open, the path is broken and the electrons can no longer flow, so the device (ex. Light bulb) does not get any electricity, and it is “off”.



This is an example of a circuit diagram. This circuit has a battery, a lightbulb, and a switch. The switch is closed. This will allow the electrons to flow and the lightbulb will be on.

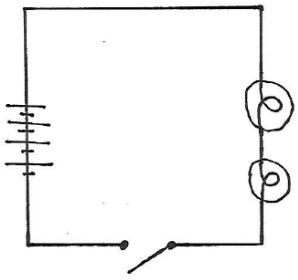
When you can trace a complete path (no breaks) on the circuit diagram, the electrons will flow.

Series and Parallel Circuits

In a circuit, the electrical loads (such as lightbulbs) may be connected in series or parallel.

For a series circuit all the current that leaves the battery must pass through each of the loads. There is only one path the electrons can follow.

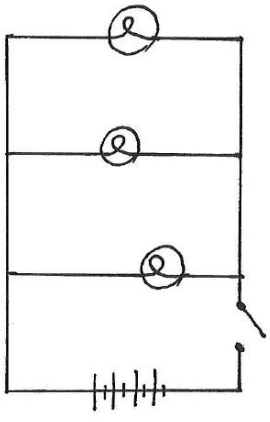
In a parallel circuit, when the current leaving the battery comes to a point in the circuit where the path splits, there is more than one path the electrons can follow.



This is a series circuit.

There is only one path for the electricity to follow.

When the switched is closed both lights will be turned on.



This is a parallel circuit.

There is more than one path for the electricity to follow.

The switch must be closed for the electricity to flow and the lights be turned on.

Practice questions:

1. Draw a **parallel** circuit containing:

1 battery

1 switches

4 light bulbs

All the wire you need

2. Draw a **series** circuit containing:

1 battery

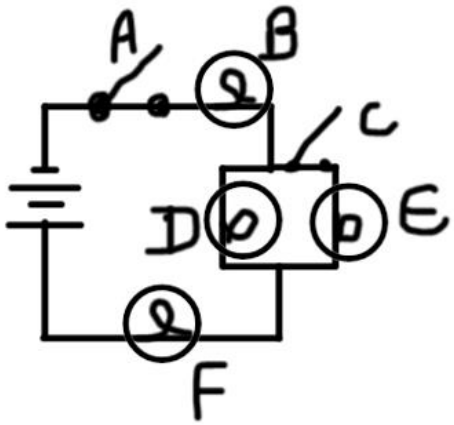
1 switch

4 light bulbs

All the wire you need

To virtually build and test the circuits you designed in questions 1 & 2, go to
https://phet.colorado.edu/sims/html/circuit-construction-kit-dc/latest/circuit-construction-kit-dc_en.html

3.



Which lights will be on if switch A is open and switch C is closed?

Which lights will be on if switch C is open and switch A is closed?

4. Look at the circuit in the document called “Question 4” and answer the following questions.

Which lights will be on if the following switches are closed (all other switches are open)

Remember you are looking for electrons to have a complete circuit to follow:

7, 6 –

1, 4, 5, 7 –

1, 2, 5, 7 –

1, 2, 3, 5, 7 –

1, 4, 5, 6, 7 –

1, 2, 4, 5, 6, 7 –

1, 2, 4, 5, 7 –

Which switch must always be closed for any of the light to work?