

1. Electrochemical Cells
2. Voltage, Current, Resistance
3. Circuits
4. Insulator vs Conductor

## Electrochemical Cell

Electrochemical cell:

- Transforms \_\_\_\_\_ energy into \_\_\_\_\_ energy
- The common name for an electrochemical cell is a \_\_\_\_\_

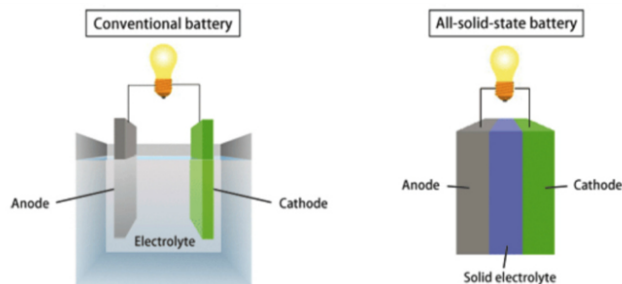
Battery:

- A \_\_\_\_\_ of two or more cells

We can consider electrochemical cells and batteries as \_\_\_\_\_. A source is anything that \_\_\_\_\_ electrical energy. An \_\_\_\_\_ would also be considered a source.

An electrochemical cell is made up of three major parts:

- \_\_\_\_\_: negative side of the cell
- \_\_\_\_\_: positive side of the cell
- \_\_\_\_\_: a catalyst (helps to speed up chemical reactions) that works by promoting the movement of \_\_\_\_\_ from the cathode to the anode when the cell is being charged

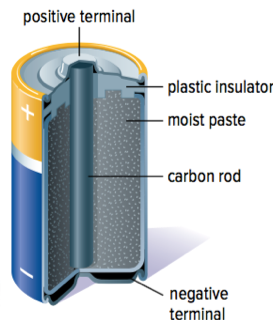
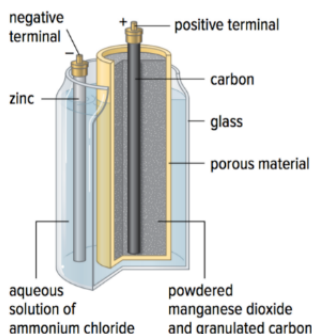


How does an electrochemical cell work?

- \_\_\_\_\_ occur on the surface of \_\_\_\_\_ (a metal conductor which allows electricity to enter and leave)
- The electrodes are placed in a solution called \_\_\_\_\_
- The chemical reactions that occur causes one electrode to be \_\_\_\_\_ (cathode) and one electrode to be \_\_\_\_\_ (anode)
- The electrodes are then placed in contact with the \_\_\_\_\_ of the cell
- When we connect the terminals to an electrical \_\_\_\_\_, charges flow through it

There are two main types of cells: a \_\_\_\_\_, and a \_\_\_\_\_

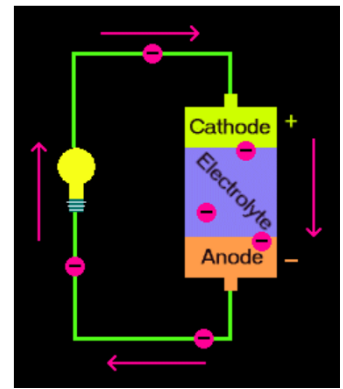
- Wet cell: the electrolyte is a \_\_\_\_\_ solution
- Dry cell: the electrolyte is a \_\_\_\_\_ paste



The chemical reactions that occur within the electrochemical cell causes a buildup of \_\_\_\_\_ on the \_\_\_\_\_. As negative charges want to repel each other, the electrons want to move around so that there is no difference between the anode and the cathode.

- The \_\_\_\_\_ prevents the electrons from moving within the electrochemical cell

When we connect the cell into a circuit, the electrons will be able to leave the anode and travel through the circuit before returning to the cathode.



### Practice Questions

1. What are the similarities and differences between an electrochemical cell and a battery?
2. Describe the functions of the electrolyte in an electrochemical cell

## Voltage, Current, Resistance

An electrical circuit is a \_\_\_\_\_ that allows electrons to flow. Within a circuit, we are able to describe quantities such as \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_

### What is voltage?

Voltage (also known as an electrical potential difference) is the amount of \_\_\_\_\_ between two points of a cell. It is the difference in charge between two points.

- A unit of charge (called a coulomb) is able to gain voltage when it passes through a source.

We can measure the amount of voltage in \_\_\_\_\_ ( )

The symbol to represent voltage is  $V$ .

### What is current?

Electric current is the \_\_\_\_\_ where \_\_\_\_\_ flows past a certain point in an electric circuit. It can be described as the movement of electrons through a wire.

We can measure the amount of current in \_\_\_\_\_ ( )

The symbol to represent current is  $I$ .

### What is resistance?

Resistance is described as the degree to which the flow of current is \_\_\_\_\_ by a load. A load is an object that is able to \_\_\_\_\_ the flow of current. Loads are able to \_\_\_\_\_ electrical energy into another form of energy.

- Example: a lightbulb is a load that converts electrical energy into light and thermal energy
- Example: a radio is a load that converts electrical energy into sound energy

We can measure the amount of resistance in \_\_\_\_\_ ( )

The symbol to represent resistance is  $R$ .

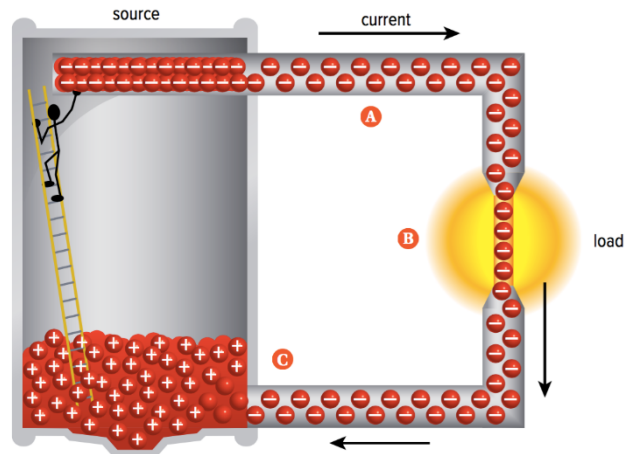
Variable	Symbol	Unit
Voltage	V	Volts (V)
Current	I	Amperes (A)
Resistance	R	Ohms ( $\Omega$ )

## Circuits

An electrical circuit always contains a \_\_\_\_\_, a \_\_\_\_\_, and \_\_\_\_\_ that are connected in a closed \_\_\_\_\_. Electrical circuits allow current to flow through each component.

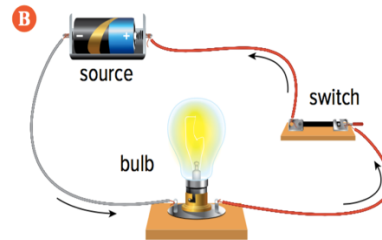
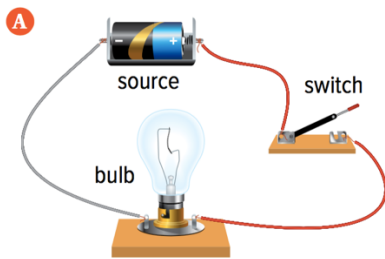
How does current flow through a circuit?

- Electrons will leave the \_\_\_\_\_ of the electrochemical cell due to the repulsion between the charges and the attraction to the positive charges in the positive terminal
- The electrons leaving the electrochemical cell will carry \_\_\_\_\_ provided by the cell
- The electrons will pass through the \_\_\_\_\_ and transfer some of its energy to the load
- The electrons will leave the load and return to the cell



We can control the flow of current with a \_\_\_\_\_.

- If the switch is \_\_\_\_\_, the circuit is open and current \_\_\_\_\_ flow
- If the switch is \_\_\_\_\_, the circuit is closed and current \_\_\_\_\_ flow



It is also possible to create a short circuit. A short circuit results when the resistance within the circuit is too low, making the \_\_\_\_\_ that it becomes dangerous.

- Example: If there wasn't a load (light bulb) to resist the flow of current, the current would be so large that the conductor would get very hot and start a fire

## Conductor vs. Insulator

When creating a circuit, it is important to understand what materials are insulators and what materials are conductors. Electrons are able to either stay on the surface of an object or travel through it.

- \_\_\_\_\_: A material charges cannot travel through
- \_\_\_\_\_: A material charges can travel through

We can describe how easily charges are able to travel through a material as \_\_\_\_\_.

- The higher the conductivity of a material, the easier electrons are able to travel through it
- Example: metals tend to be good conductors whereas plastics are insulators

