



# Batteries: Stored Energy

## Discussion Questions:

- 1) How is energy stored in a battery?
- 2) How many different types of batteries are there?
- 3) What kinds of tools and machinery can run on batteries?
- 4) Can batteries be re-used?
- 5) Can batteries be recycled?

Can you think of some devices that use batteries?



# Battery or Cell?



A single stored power source is called a cell.



More than one cell grouped together is called a battery.



A car battery is made up of a number of individual cells inside its casing, therefore it is referred to as a battery.

# How Do Batteries Work?

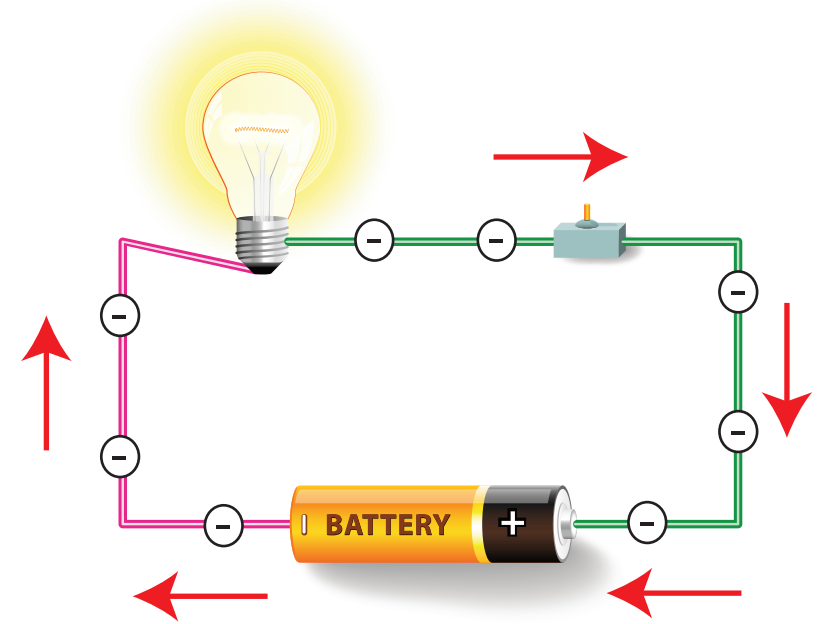
Batteries store energy in the form of chemical energy which is then converted into electrical energy.

Batteries have three parts:

A negative electrode (anode)

A positive electrode (cathode)

An electrolytic substance



The anode and cathode are the connection points (terminals) that are used to complete an electric circuit. The two are made of different materials (one material easily gives up electrons and the other easily receives them). These terminals are separated from each other by an electrolytic substance that doesn't easily allow electrons to flow through it.

When the battery is hooked up into a circuit, chemical reactions begin in the battery. These reactions cause ions (positive charges) to develop in the cathode and electrons (negative charges) to build up in the anode. The electrons are attracted to the positive charges in the cathode, so they travel through the connection wires in order to get there. They can't travel through the electrolyte directly.

Metal cap cathode (+)

Carbon rod (C)

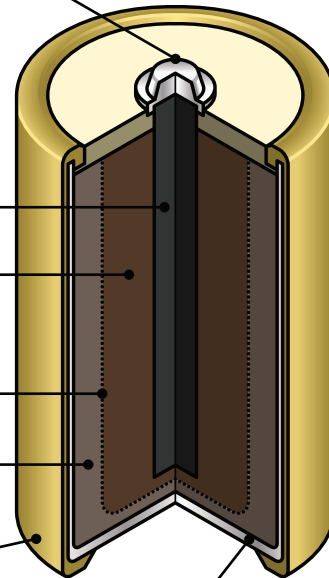
Mixture of powdered carbon (C) and manganese dioxide (MnO<sub>2</sub>)

Fabric separators

Electrolytic paste of ammonium chloride (NH<sub>4</sub>Cl)

Outer plastic coating

Zinc casing anode (-)



NB Different types of batteries are composed of different chemical combinations. This diagram shows an alkaline battery,

Rechargeable batteries are used for many different devices.



# How Do Rechargeable Batteries Work?

A rechargeable battery has the same components as a disposable battery and works in the same way when it is connected in an electrical circuit.

Rechargeable batteries can contain nickel cadmium (NiCd), nickel metal hydride (NiMH) or Lithium (Li). The large battery in a car contains lead acid.

Rechargeable batteries can be plugged into a re-charging device that is connected to a power outlet. The electric current flows through the battery in the reverse direction causing energy to be stored instead of expended. This charges the battery so it is ready to be used all over again.

It is important to remember that rechargeable batteries can only be recharged using a recharger that is made for the particular type of battery. For example, lithium ion batteries cannot be recharged on a NiMH battery type charger. The recharger also needs to be the correct size and voltage for the device it is recharging.



# Recycling Batteries

Single use batteries cannot be recharged. Once the chemicals inside them have been depleted they will no longer work. Many people throw them in the bin and they end up in landfill.

Rechargeable batteries are better for the environment because they can be used over and over. But even these batteries eventually become depleted and need to be disposed of.

Some batteries contain metals that are toxic, such as cadmium, mercury and lead. If these elements make their way into the soil and our waterways they can be hazardous to our health. So how can batteries be disposed of safely?

Many communities have collection points for people to drop off used batteries. These batteries can then be processed to retrieve valuable metals and plastics that can be used in the manufacture of new batteries.



Batteries can leach dangerous chemicals and metals which are bad for the environment. Recycling them at collection points is the most environmentally friendly thing to do.