

# A Home School Introduction to Micro-Electronics for Students with Hyperlexia and Kids of All Ages

## Introduction

I hate boring books. So, I am going to try to entertain you as well as help you learn the basics.

To make sure that this book isn't boring, I'm going to make a lot of little jokes. To make sure that my jokes are not confusing, when I am making a joke you will see a little smiley face ---> :)

I have a pretty weird sense of humor, so you might not think my jokes are funny. My jokes might contain a real fact BUT they might not contain any facts at all. Don't believe anything with a ---> :) unless you check out the facts by yourself. How do you do this? You go to the internet on your computer and then you go to Answers.com and ask a question.

There are some facts that are very important, because you will be using that fact very often. This is the sort of fact that you will want in your memory. These facts will be followed by four exclamation marks and four stars --> !!!!\*\*\*\* Important facts get used all of the time. They are the easiest facts to remember, because you will use them so often. But the first time you run into a fact, you can't know that you will be running into that fact every five minutes. Some facts are important but you only use them occasionally these facts are indicated by ---->!!!! four exclamation marks. An important fact that you might not use very often is a fact that you might need to try to remember. Birthdays are--->!!!! Someone's birthday only happens once a year, but if someone doesn't remember someone's birthday, someone is going to be disappointed--->:)

Let's practice this a little.

Electronics is the study and practical use of electricity!!!!

Now, go to Answers.com and enter the following question in the big empty box at the top of the page:

Computer-->Internet browser-->Answers.com --> "what is electronics?"

After you type the question, press your enter or return key, and the answer will magically appear.

What you should see is more about the definition of electronics than you really want to know. Read until you are convinced that I'm not joking about

the definition of electronics.

In the way that we are studying, electricity results from the flow of electrons. Electricity can also result from the flow of other things, but for the most part, when you flip a light on or hook up a battery, electricity is being caused by the flow of electrons.

In science, nothing is considered to be completely true--->!!!!\*\*\*\* This is an important fact, but you will read it frequently in this book, so you don't have to memorize it.

In science, things are always considered to be true in some ways and false in other ways. So, in electronics when we say that something is true, what we mean is that it is true in the way that we are discussing and for the purposes that we are trying to achieve. We are going to concentrate on "facts" that are true in the way that we are talking about them but may also be false in some way that is important to someone else, who is doing something slightly different. So, nothing that I say is a lie... but it is mostly true in the way that I am talking about it. If that is confusing, don't worry about it.

### **Question:**

What is electricity?

### **Answer:**

In the way that we are studying, when we are talking about electricity, we are actually talking about certain kinds of physical effects that result from the massive flow of electrons, which can be described as an electron current. We will be turning massive flows of electrons into the power to do something useful by constructing an electronic circuit.

This answer is only partially true.

We know that an electron is a "**sub-atomic particle**," meaning that the electron is smaller than an atom. An electron has a peculiar nature. The electron is said to possess a "charge." Everyone talks about charge, but no-one knows exactly what a charge is. Each electron is considered to carry one unit of charge.

What we do know for sure is that there are other kinds of small and large particles, which can contain a different kind of charge that can also flow and can also produce electricity. AND we know that electrons, which all share the same kind and amount of charge, tend to push other electrons away. What attracts electrons are "other things" with the opposite charge.

These are very important facts in many important ways. But these facts are not very helpful right now. Don't worry about it.

**Question:**

What **don't** we know about electrons?

**Answer:**

**A lot.** We don't know if the single unit of charge that we see for each electron is the **net charge** or is the only charge. For example, inside of the electron, there could be an equal number of oppositely charged particles, so tightly stuck together that they never come apart. And on the surface there could be one additional charge, which is the one that we can actually measure.

So, when we speak of electricity as being the flow of electrons, we are talking about a particular kind of electricity. When we speak of currents, we are speaking of electron currents. But there are other particles and other kinds of currents that are very important to other people, doing something slightly different.

**Question:**

Who invented electricity?

**Answer:**

No one!!!!

As far as we know, electricity has always existed.

Electricity is all around us and inside of us. Each time your heart beats, it produces electricity. When you click your mouse button with your finger, electricity starts in your brain, goes into a big nerve, which branches like a tree into little nerves, and some of that electricity ends up in the muscles that control your mouse finger. When your finger finally gets the message and presses the mouse button, an electronic signal is sent to your computer, which then turns that signal into something that you can see on the screen. When you move your eyes, you are producing electricity. When you see lightning, you are looking at the spectacular result of electricity flowing between a cloud and the Earth. The light from the lightning that enters your eye, excites electrons in the retina in your eye, which produces electricity, which then travels from one cell to another and finally ends up in your brain. When the message finally gets from your eye to your brain, you finally see the lightning. When you play Nintendo, when

you watch television, when you change the temperature in your house, when you ride in your car, when you turn on a light... all of this happens because of electricity,

Without electricity, we would not exist. Bacteria wouldn't exist. The Earth would be a big rock and nothing else. Electricity is a fundamental part of nature. It is everywhere.

But electricity was not discovered until recently, because we can't actually see electricity, we can only see what electricity does. It is hard to believe that electricity is everywhere and takes part in almost everything that happens and nobody noticed it until a couple of hundred years ago. Notice that we cannot actually see the wind either. We know that wind exists, because we can feel the wind blowing our hair and hitting our face, and we can see things flying around in the wind. So, even though we cannot see the wind, we can know that it exists. We cannot see electrons, but we know that they exist.

It was not until someone figured out a way to show us what electricity can do and until someone figured out a way to let people actually feel the effects of electricity that anyone began to believe that electricity existed. But even after people figured out that electricity existed, they didn't know exactly what electricity "was." It turns out that electricity results from the movement of electrons. Wind is the flow of air. Electricity is the flow of electrons (or other charged particles).

Since electricity is everywhere and is part of almost everything, it is not possible to talk about everything that is interesting or important about electronics in one book. In this book we will be studying a small part of electronics that is very useful, but there are vast areas of electronics that we aren't going to discuss.

Imagine going to a party, which only lasts 15 minutes, with 100 people that you have never met. If you try to talk to all of them, you won't have much time to talk to any of them:) But if you talk to just one person, you could learn a lot about that person. Fifteen minutes is a short party, so you would probably pick that one person you think is most interesting.

So, this course is trying to teach you a lot about a relatively small part of electronics in a relatively short period of time. Having fun with electronics is easy. So, this should be a great party (ummm, book:).

We can't see electricity, because we can't see electrons. We can only see what electrons do. Electricity is complicated because it turns out that electrons can do a lot of different things.

**What an electron does depends upon what surrounds it.** If an electron is in a place that is not very complicated, what it does will be easier to understand. If we put an electron in a copper wire, what it does will be fairly easy to understand. Put that same electron in your brain and it might get lost:)

We will be studying electricity in a particular way. So, when we want electrons to do something for us, we will make sure that the conditions are just right and that what we want to happen actually does happen. But electrons can do a lot of other things.

A lot is known about electrons and electronics.

**The smartest person in the world could study electronics every day for his entire life and at the end of his life, there would still be a lot about electrons and electronics that he would not know.**

Electronics is constantly growing. Every time we learn something new that electrons can do, we build a new industry around it. Even if a person managed to know everything about electronics at a particular moment, he couldn't stop studying because more is being learned about electronics all the time.

OK... now you know what electronics is and you know that I am a joker, but **what is micro-electronics?**

Almost everything we do involves some kind of electronics, but the kind of electronics that is most useful for studying basic electronics isn't basic electronics. It is a special branch of electronics called, "micro-electronics." We will be using micro-electronics to understand what happens when we make electrons flow through electron "circuits," which contain very tiny electronic devices.

Our circuits will always have three things: a power source, some electronic devices, and wires to connect the power to the electronic devices.

The type of electronics that engineers use to make computers, radio controlled cars and video games is called "micro-electronics." The electronics that you will use to get your foot in the door of electronics is micro-electronics.

A special device used to control electronic devices is called a "**controller.**"

A really tiny controller is called a **micro-controller** --->!!!!\*\*\*\*.

**The best way to study electronics is by using micro-electronics. The**

**best way to use micro-electronics to study micro-electronics is by using a micro-controller to control the devices in your circuits.**

OK?