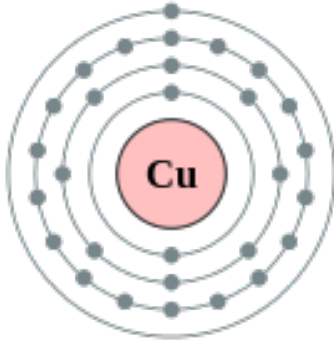




### ***What is Electricity – Matter & Atoms***



Electricity flows or happens based on the atomic structure of atoms. Atoms are what make up matter or elements that make up all the materials we find in our world. We know from science that an atom has a nucleus of protons (positive charge) and neutrons (no charge) and levels of shell electrons (negative charge) orbiting the nucleus. The number of electrons will match the number of protons. The key to electricity flow is if outside shell also known as the valance shell has few electrons (1 to 3) then it can be considered a conductor. A conductor is a material that allows electricity to travel easily through it. Insulators are the opposite and have several electrons of 4 or more on valance shell, not allowing flow of electricity.

### ***Electron Flow***

Using electron flow to explain electricity is the best theory to aid in explanation of its characteristics. In Figure 2, a copper wire is used because it is a good conductor and it only has one free electron in its valence shell or ring. In order for electricity to flow we need to have a positive charge at one end and negative charge at the other (a battery serves this purpose).

What actually happens is electrons are forced into one end (pressure or voltage) which continues to push

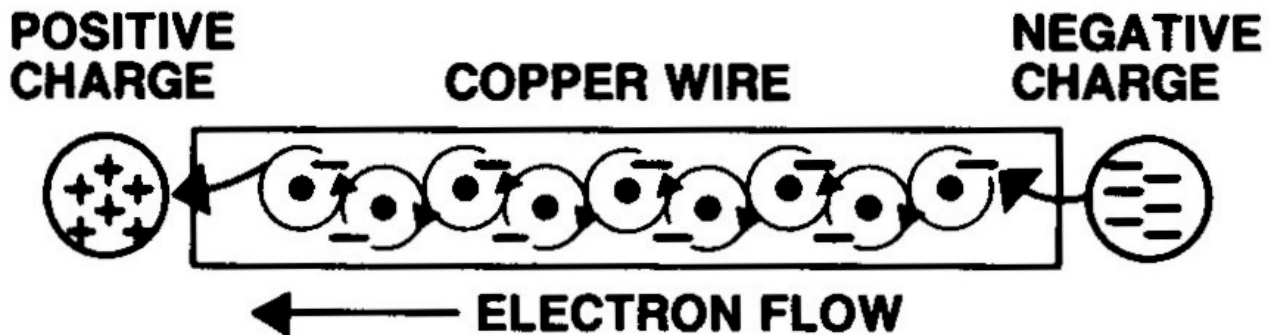


Figure 1: Electron Flow Illustration

adjacent free electrons from one atom to the next and so on. This continues all the way through the conductor until it reaches the positive source. The amount of electrons going through this conductor is known as the current. The larger the conductor the more electrons can flow through (less resistance) which is known as the resistance. The net result is a controlled flow of free electrons from the negative end of the wire to the positive end. This flow would continue as long as the positive and negative charges are at the opposite ends of the wire and no break/opening (switch) in the conductor has been introduced.

Understanding this theory sums up *electricity as:*

**Electricity is the controlled and directed flow of free electrons from atom to atom in a conductor.**



## Introduction to Circuit Theory

There are two theories that are used to explain the flow of electricity. The ELECTRON THEORY, which is used to better understand the operation of electronic components such as diodes and transistors, and the CONVENTIONAL THEORY, which was adequate for most electrical needs, and is used in most automotive applications.

Conventional Theory states: Electrons or electricity flows from positive to negative. See Figure 1. Scientists originally used this theory, when they first began to make discoveries of electricity. It is used in the automotive electrical industry, such that, current leaves the battery's positive terminal and then enters the circuit returning back to the battery's negative terminal, though the grounding of the car.

Electron Theory states: Electrons or electricity flows from negative to positive. This is the current theory used in electronic communications, computers and other parts of the electrical industry. Although this theory is probably the most accurate in terms of explanation of this theory, it is more convenient to use

Conventional theory in automotive. See Figures 1 and 2.

If we were to use a train, as an analogy to help explain the two theories, it would be explained like this: As

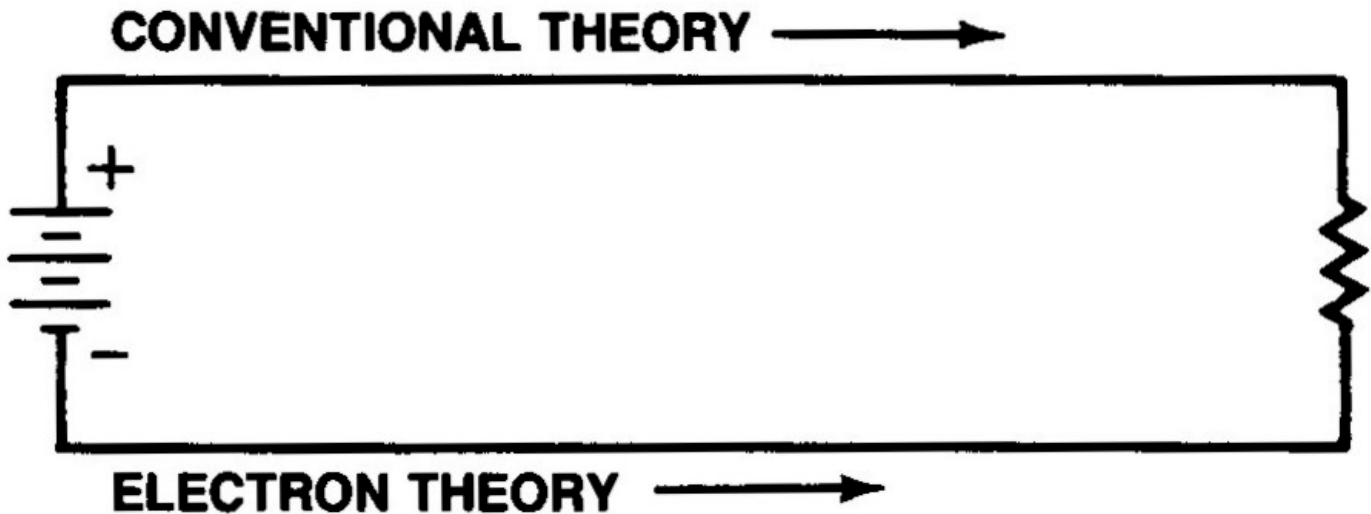


Figure 2: Circuit Theory Illustration

the train starts to move to the right, the couplers that connect the cars together would make a “clunk” noise as the slack was taken up. The noise of the couplers would move to the left. If you could see, but not hear, you would follow the train to the right, but if you could hear and not see, you would follow the “clunk” noise to the left.

Be aware that regardless of whether electron current flow or conventional current flow is used in circuit analysis, **THE ANSWERS COME OUT THE SAME!**





**Circuit Theory**



***Instructions:***

*Answer all of the following questions below, on the blank lines provided. Neatly write your answer(s) in sentence form. Any questions left blank will receive a zero. Make sure you write your last initial, first name, date and course section above. Staple any extra sheets together to the back of this page once finished, and then hand in.*

**Questions:**

1) What direction is the current flow for both electron flow and conventional flow?

\_\_\_\_\_  
\_\_\_\_\_

2) Explain why electron theory and conventional theory are still used today?

\_\_\_\_\_  
\_\_\_\_\_

3) What result would happen in the same circuit if you were to use different circuit theory standards and why?

\_\_\_\_\_  
\_\_\_\_\_

4) Explain what the voltage, current and resistance of the circuit flow is?

\_\_\_\_\_  
\_\_\_\_\_

5) What is the definition of electricity?

\_\_\_\_\_  
\_\_\_\_\_

6) Explain in words and with the aid of a neat diagram what electricity is (on the back).

Mark  
Breakdown  
Column

Q#	A
1	2
2	2
3	2
4	3
5	2
6	4
T=	15