

## INFORMATION SHEET 1: The atomic source of electric current.

To fully understand electronics and radio, one should have a basic understanding of the atom. The concept of the Atom has changed greatly since its first discovery. Protons, for example, are composed of even smaller "particles" such as Quarks. Everything we see and touch is made from atoms which contain Protons, Neutrons and Electrons. Fortunately, we only need some general understanding of how Protons and Electrons are used with electronics and radio.

Figure 1 is a simplified view of an atom. It has a nucleus composed of Protons and Neutrons. The number of Protons, Neutrons and Electrons are different for each Element. Electrons orbit around the nucleus. These orbits continual shift forming "cloudy" layers around the nucleus, somewhat like the layers on an onion. Each layer is a discreet distance from other layers and from the nucleus. Each of these layers has a preferred distance, its energy level, from the nucleus.

Figure 2 illustrates the energy levels as rings or shells. Only two shells are shown here but there can be many more depending on the element. The outermost shell is called the "valence" shell. It has the highest energy level. Any outside energy can cause these outer layer electrons to leave their atoms and float around between similar atoms in a material such as a copper wire. These roaming electrons are called "free electrons". That outside energy can be in the form of heat, magnetism, radiation, chemical, friction or an electromotive force (voltage).

The electron has a negative electrical charge, the proton has a positive electrical charge. For our purposes, electrical current is the movement of negative charges (electrons) through a medium such as wire, air, vacuum, water, gases, etc. The medium which carries the negative charges is a conductor.

Materials composed of atoms whose valence electrons are not easily moved are insulators. Materials which have only some movable electrons are semiconductors. Semiconductor materials can be made by combining two elements to provide a surplus of valence electrons. This is called "N" type material. Two different elements can also be combined which result in a shortage of valence electrons. This is called "P" type material. The spaces with a shortage of electrons are called "Holes". More about this when we discuss semiconductors.

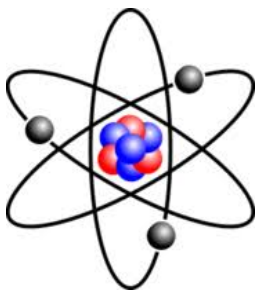


Figure 1

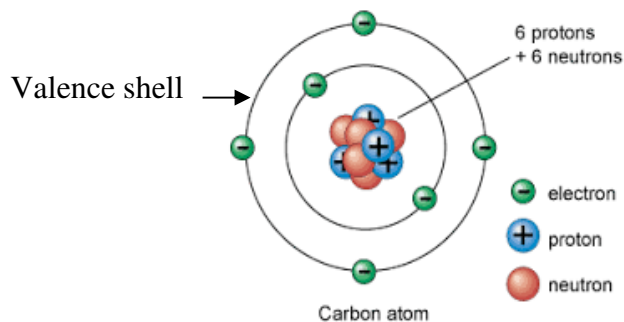


Figure 2