

Basic Electricity - How it Works

To understand the principle of electrical stimulation a review of basic electricity terms can be helpful.

Basic Electrical Terms - A Review

Subtraction or addition of electrons to an atom creates an electrical imbalance, which in turn results in the atom becoming electrically charged. This electrically charged atom is then known as an ion. Ions with fewer electrons than protons are called cations and are positively charged. Ions with more electrons than protons are called anions and are negatively charged. Ions of similar charge repel one another while ions of dissimilar charge attract each other.

The actual movement of the ions is known as an electrical current and is measured in amperes (1 amp = 1 coulomb of electrons moving past a defined point in 1 second). As current flows through electrical devices the energy can be converted to useful forms such as into heat from an electrical range or light from a light bulb. The force that causes ions to move is known as voltage.

Current and voltage are proportional. Ohm's Law is Voltage = Current x Resistance. For example, high voltage (with other factors being equal) produces a movement of many ions, thus a high level of current flow. In the body, current flow is accomplished by the movement of ions in the same manner as outside of the body.

Media that facilitate movement is known as a conductor. Some examples of conductors in the body are water, blood or electrolyte solutions (eg perspiration). Muscle is also a good conductor, but muscle conducts much better in the longitudinal direction of its fibers than in the transverse direction. Media that inhibits movement is known as a resistor. Resistors in the body are skin, fat cells and bone.

Positive and Negative Charges and the Movement of Electricity

The positive and negative charges must remain separated for the current to continue to flow. This separation can be achieved by a chemical action, motion, sunlight or heat.

For example, a battery has two electrodes that are made of different chemically active materials. Between these electrodes is a liquid or paste called an electrolyte, which conducts the electrical current but also keeps the positive charge at one end and the negative charge at the other end. In a flashlight battery, the flat end is the negative electrode and the end with the bump is the positive electrode. When a wire links the electrodes a current flows and this current is converted into light if it passes through the light bulb.

The electrolyte in the battery keeps the positive and negative charges separated.

Here are some links that describe electricity in terms of water:

- [Hydraulic analogy](#)
- [DC Circuit Water Analogy](#)