

Electrical power explained

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How does electricity work. In this article we'll be learning the basic concept behind how electricity works according to classical theory. We'll cover Atoms, electrons, protons, neutrons then move onto the difference between conductors and insulators, wires and cables, circuits, volts and voltage, currents and amps, resistors, resistance and ohms, induction and inductors, transformers, capacitors and finally the difference between AC and DC power. These are the basics to grasp in order to understand how electricity works before moving onto more advanced areas of electrical and electronic engineering. Scroll to the bottom to watch the video tutorial on this subject

Everything is made from Atoms, including you! Different materials have different types of atoms. At the centre of an Atom is the Nucleus, this houses two particles known as the Neutron and Proton. The Neutron has no electrical charge but the Proton has a positive electrical charge.

Surrounding the Nucleus are different layers of orbital shells which act like flight paths for another type of particle known as the electron. The electrons travel long these paths much like satellites orbit around our planet, except that the electrons travel at almost the speed of light.

The negative charge of the neutrons is attracted to the positive charge of the Proton which keeps the electrons in orbit. Each orbital shell can hold a set number of electrons. The number of Protons, Neutrons and Electrons an Atom has tells us which material it is and the combination is unique for each material.

Materials which can pass electrons are known as "Conductors" meaning they can conduct electricity. Most Metals are conductors. Atoms which do not have free electrons are known as insulators, materials like glass and rubber are good examples of this.

We can combine Conductors and Insulators together to safely use electricity. This is done by surrounding the conductor with an insulator, this allows electrons to flow but it restricts where they can flow to. This is how a cables and wires work.

If we look inside a slice of Copper cable we would see the free electrons of the atoms move from one atom to another, however this occurs randomly in any direction.

If the slice of cable were then connected in a closed circuit to a source of power such as a battery, then the voltage will force the free electrons to move and this will cause them to all flow in the same direction, to try and get back to the other terminal of the battery.

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The term circuits refers to a route which the electrons can flow along to get between the two terminals of the power source (Positive and Negative).

A Volt is a Joule per Coulomb. A Joule is a measurement of energy or work. A Coulomb is a group of flowing electrons.

To measure the flow of electrons we use the unit of Amperes or Amps for short. 1 Amp means 1 Coulomb per second and one coulomb equals 6,242,000,000,000,000,000 electrons per second. This is an extremely large number which is why they are grouped together and called Amps.

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