**Work and force in the electric field**

If a charge Q in the electric field E is shifted by the distance s, the force F is needed.

This can be seen from this formula:

From this the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can be received. This describes the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

The potential difference between two points is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

This can be seen from this formula:

**Capacitor (Kondensator)**

**Theory:** Capacitors are used to store \_\_\_\_\_\_\_\_\_\_\_\_\_ energy. They are also a central component of every cell phone. They can be charged when connected to a ­­­\_\_\_\_\_\_\_\_\_\_\_\_\_ current source. The charging process continues until the potential between the plates is \_\_\_\_\_\_\_\_\_\_ to the potential of the power supply.

The capacity C indicates how much \_\_\_\_\_\_\_\_\_\_\_ can be stored in a capacitor at a certain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Mathematics:** This can be seen from this formulas:

Maximum energy that a capacitor can absorb is defined as:

Time for an example. Calculate capacitor capacity if a charge quantity Q of 100000 As can be stored at a voltage U of 10 V. How much energy can be gained from this?

**Moving charges (electric current) (elektrischer Strom)**

**Theory:** What is electric current? The electric current, often just electricity, is a physical phenomenon of electricity theory. In the everyday meaning of the term it means the transport of electrical charge carriers, for example of electrons in conductors or semiconductors or of ions in electrolytes.

**Mathematics:** This can be seen from this formula:

**Direct current DC**

Positive and negative pole \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ position.

**Alternating current AC**

Positive and negative pole \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ position \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Circuits**

Now that we know what electric current is it is time to talk about circuits. First of all, energy is NOT consumed, it‘s only \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (e.g.: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_). A typical circuit looks like this:

For circuits we have two very essential laws:

**Series connection (Serien-, Reihenschaltung)**

**Theory:** The components are installed \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the circuit. For example a classical series connection looks like this:

The current I is identical for all N components of the series connection. The voltage is distributed to the individual components. The sum of the partial voltages is equal to the total voltage (reference to mathematics). But how do you measure current and voltage in a series connection?

Application: Light chain, coils, transistor, diodes, gas discharge lamps,

**Mathematics:**

There is a series connection with the following dimensions:

U=10 V

R1= 100 Ω

R2= 200 Ω

Calculate voltage drop after each resistor, current flow after each resistor, and system power.

**Parallel connection (Parallelschaltung)**

**Theory:** The components are installed \_\_\_\_\_\_\_\_\_\_\_\_\_ in the circuit. For example a classical parallel connection looks like this:

The electrical voltage U is identical for all branches. The current I is distributed to the single branches. The sum of the partial currents is equal to the total current. (reference to mathematics). But how do you measure current and voltage in a parallel connection?

Application: fuse box, circuits with batteries

**Mathematics:**

There is a parallel connection with the following dimensions:

U=10 V

R1= 100 Ω

R2= 200 Ω

Calculate voltage drop after each resistor, current flow after each resistor, and system power.

**Power of Circuits**

Approximately 418.7 kJ/kg are required to heat water from 0 to 100 °C. Calculate which current intensity a kettle must have to heat a mass of water of 5 kg from 0 to 100°C in 2 minutes with a voltage of 220 V. Also calculate the resistance of the heating coil.

**Joule's heat**

Why do electrical devices heat up when they are switched on? Each metal contains an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. In this electron gas each electron has a certain energy which is transferred to the metal atoms by ,,collisions‘‘. This causes the electrons to lose energy, which leads to a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, in the resistor or component. So the electrical energy dissipates in the form of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Therefore the component heats up. This happens to every electronical devise.