Work sheet no.1

KEY TERMS:

Voltage, current, electricity, electric circuit, electrical charge, Ohm Law, resistance, AC/DC

Ohm's Law

The relationship between voltage, current, and resistance is described by **Ohm's law**. This equation, $I = V/R$, tells us that the current, I, flowing through a circuit is directly proportional to the voltage, V, and inversely proportional to the resistance, R. In other words, if we increase the voltage, then the current will increase. But if we increase the resistance, then the current will decrease.

TASK: COMPLETE THE SENTENCE IN A CORRECT WAY

Ohm's Law

$$I = \frac{V}{R}$$

Electric current = Voltage / Resistance

1.If the voltage is increased:

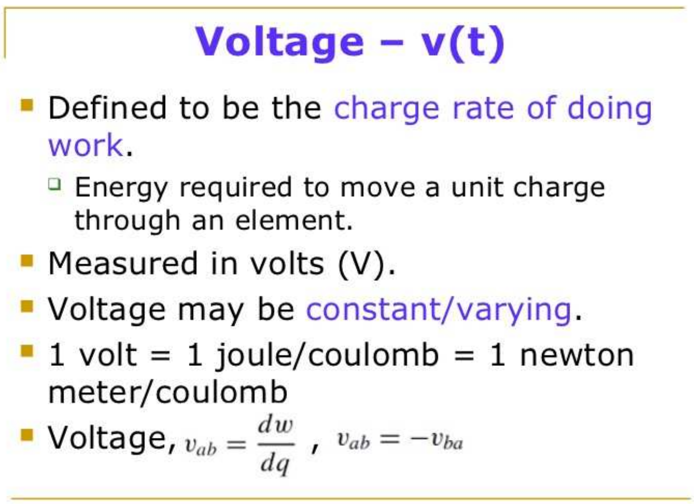
- [x] the current and resistance will increase
- [ ] the resistance will increase
- [ ] the current will increase
- [ ] the resistance will decrease
- [ ] the current will decrease

2.If the resistance is increased:

- [ ] the current will decrease
- [ ] the current will increase
- [ ] the voltage will decrease
- [ ] the voltage will increase
- [ ] the current will not change

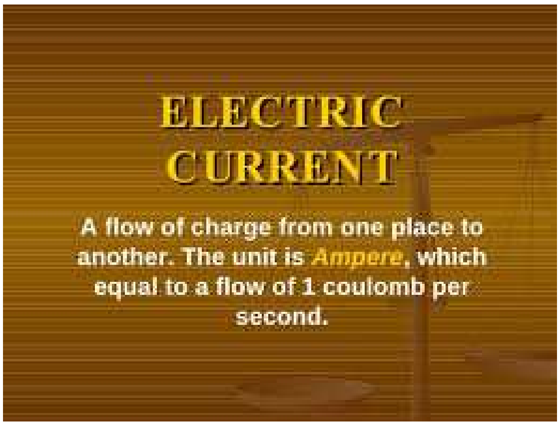
3. Current is equal to:

- [ ] current divided by voltage
- [ ] voltage multiplied by resistance
- [ ] resistance multiplied by voltage
- [ ] voltage divided by resistance
- [ ] resistance divided by voltage



Voltage

We define voltage as the amount of potential energy between two points on a circuit. One point has more charge than another. This difference in charge between the two points is called voltage. It is measured in volts, which, technically, is the potential energy difference between two points that will impart one joule of energy per coulomb of charge that passes through it (don't panic if this makes no sense, all will be explained). The unit "volt" is named after the Italian physicist Alessandro Volta who invented what is considered the first chemical battery. Voltage is represented in equations and schematics by the letter "V".



Current

We can think of the amount of water flowing through the hose from the tank as current. The higher the pressure, the higher the flow, and vice-versa. With water, we would measure the volume of the water flowing through the hose over a certain period of time. With electricity, we measure the amount of charge flowing through the circuit over a period of time. Current is measured in Amperes (usually just referred to as "Amps"). An ampere is defined as $6.241*10^{18}$ electrons (1 Coulomb) per second passing through a point in a circuit. Amps are represented in equations by the letter "I".

AC/DC

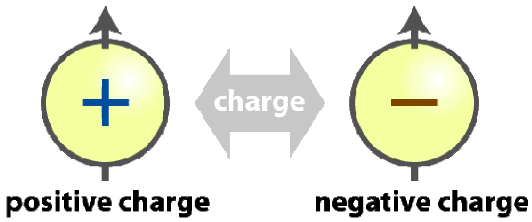
Direct current is, much like the name suggests, the flow of electrons towards a single direction. It is very simple to visualize direct current using the "water circuit" model; simply think of water flowing towards one direction inside a pipe. Common devices producing direct current are solar cells, batteries and dynamo generators.

AC is short for **alternating current**. This means that the direction of current flowing in a circuit is constantly being reversed back and forth. This is done with any type of AC current/voltage source.

The electrical current in your house is alternating current. This comes from power plants that are operated by the electric company. Those big wires you see stretching across the countryside are carrying AC current from the power plants to the loads, which are in our homes and businesses. The direction of current is switching back and forth 60 times each second.

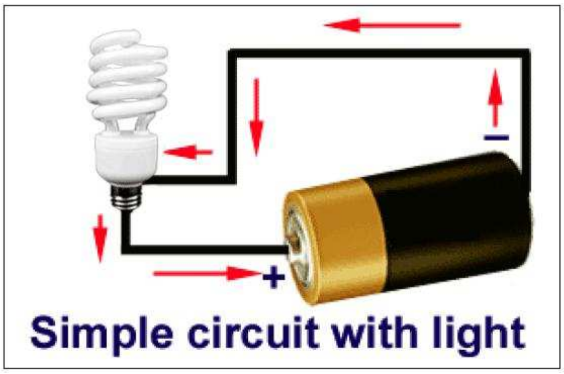
Electric Charge

Electricity is the movement of electrons. Electrons create charge, which we can harness to do work. Your lightbulb, your stereo, your phone, etc., are all harnessing the movement of the electrons in order to do work. They all operate using the same basic power source: the movement of electrons. There are two types of **electric charges**: positive and negative.



Electric circuit

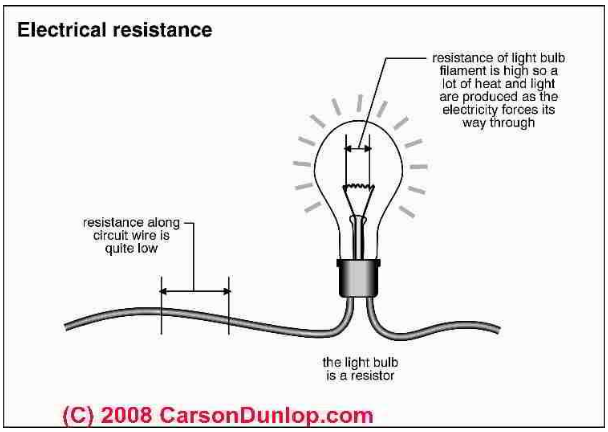
A circular path, which is always required to get electricity to flow and do something useful, is called a circuit.



An **electric circuit** is a path in which electrons from a voltage or current source flow. **Electric** current flows in a closed path called an **electric circuit**. The point where those electrons enter an **electrical circuit** is called the "source" of electrons.

RESISTANCE

Resistance is the opposition that a substance offers to the flow of electric current. It is represented by the uppercase letter R. The standard unit of resistance is the ohm, sometimes written out as a word, and sometimes symbolized by the uppercase Greek letter omega: Ω



TASK A: READING COMPREHENSION - Fill the gaps in the text with the right words below

In electricity, alternating current (AC) occurs when charge carriers in a conductor or semiconductor periodically /1/……………. their direction of movement. Household utility current in most countries is AC with a /2/…………. of 60 hertz (60 complete cycles per second), although in some countries it is 50 Hz. The radio-frequency (RF) current in antennas and transmission lines is another example of AC.

An AC waveform can be sinusoidal, square, or sawtooth-shaped. Some AC waveforms are irregular or complicated. An example of sine-wave AC is common household utility current (in the ideal case). Square or sawtooth waves are produced by certain types of/3/………………………, and by a low-end uninterruptible power supply (UPS) when it is operating from its battery. Irregular AC waves are produced by audio /4/……………… that deal with analog voice signals and/or music.

The voltage of an AC power source can be easily changed by means of a power/5/………….. This allows the voltage to be stepped up (increased) for transmission and distribution. High-voltage transmission is more efficient than low-voltage transmission over long distances, because the loss caused by/6/……………………. decreases as the voltage increases.

The voltage of an AC power source changes from instant to instant in time. The *effective voltage* of an AC utility power source is usually considered to be the DC voltage that would produce the same power dissipation as heat assuming a pure resistance. The effective voltage for a sine wave is not the same as the *peak voltage* . To obtain effective voltage from peak voltage, multiply by 0.707. To obtain peak voltage from effective voltage, multiply by 1.414. For example, if an AC………………. has an effective voltage of 117 V, typical of a household in the United States, the peak voltage is 165 V.

Nikola Tesla, a Serbian-American scientist, electrical engineer, and inventor, developed the alternating-current (AC) electrical system, as well as radio, the Tesla coil transformer,………………….. , and fluorescent lighting.

electronic oscillators,reverse,frequency,transformer, amplifiers, power source, wireless transmission, conductor resistance

TASK : Listening comprehension

Watch the video and complete the sentences with the right expressions from the recording.

1. In the late 19th century, Edison had become a household name. His inventions were for example ....camera, ... , ... / 3 - 4 words /
2. Edison´s system used a steam engine to drive a generator creating ....electricity. /2 words /
3. In a generator,coils of wire rotate in a magnetic field,..................................... / 3 words/of electricity.
4. Edison realized there was a huge .... / 4 words /
5. Edison had no obvious solution for .... problem. / 2 words /
6. Tesla understood that according to Joule´s Law, power lost when current flows in a wire is equal to the...........................of the wire times the ....squared.
7. Tesla combined Ohm ´Law and Joule´s Law and revealed that low voltaga and high current can produce exactly the same power as ....and .... current.
8. The solution that Tesla proposed, was to abandone DC and to develop an .... using AC.
9. AC has some very interesting properties. The surging back and forth motion of the current produces .... that can induce current flow in adjecent but unconnected conductors.
10. Thanks to a device called   ....   it was possible to ....electricity hundreds of kilometres using high voltage low current transmission.