**Physics summary chapter 6 circuits**

**Section 1. Charge and voltage.**

If you rub a PVC pipe with a woollen cloth, the pipe will then attract paper shreds. A fine stream of water is also attracted by the tube. We say that the PVC tube is ***electrically charged*** or ***static*** as a result of being rubbed.

There are various ways that you may notice that an object is charged:

* The object attracts other objects.
* Sparks may jump across to other objects.

A charged object mostly loses its charge quickly. The ideal conditions are if the air is very dry.

There are 2 kinds of ***charge***:

1. Objects that have the same charge **repel** each other.
2. Objects that have the same charge **attract** each other.

One type of charge is called ***positive*** (plus) and the other is called ***negative*** (minus).

2 positives repel each other, as do 2 negatives. But a positive and negative attract each other. An uncharged object contains exactly the same amount of positive charge and negative charge. You therefore do not notice that such an object contains any charges. We say that the object is ***neutral***. Negative particles which can jump across when an object is charged are called ***electrons***. There are also positively charged particles, but they cannot move from one object to the other. There can be a ***voltage*** between a positive and a negative charge.

**Section 2. Resistance.**

The ***resistance*** of a device will hold back the current to a certain amount. The resistance is given in ***ohms***. You can calculate the resistance using the following formula:

Resistance = voltage : current

R = U : I

Voltage = current x resistance

U = I x R

Current = voltage : resistance

I = U x R

The voltage ( across the wire) and the current (through the wire) are directly proportional. This is called Ohm’s law. Circuits sometimes use components with variable resistors. 2 examples are:

* NTC thermistor, an NTC thermistor is sensitive to changes in temperature. As the temperature of an NTC thermistor increases, its resistance becomes lower. The NTC thermistor will conduct much better then and pass more current.
* AN LDR is sensitive to changes in the amount of light. If more light falls on an LDR, its resistance will be lower. The LDR will conduct much better then and pass more current.

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**Section 3. Working with resistors.**

When you want to connect a battery to a device you sometimes need to increase the resistance first. You then need a circuit component with the right resistance for the purpose. Such a component is called a ***resistor***. Once you have found the right resistor, you have to connect it in series with the bulb. The current is equally high everywhere in a series circuit. Because there are not branches where the current has to split. If you connect more and more resistors in series, the resistance of the whole circuit will get higher and higher. You can calculate the total resistance in ***series*** by adding all the resistances:

Rtot = R1 + R2 + R3

Utot = U1 + U2 + U3

If you connect more and more resistors in parallel, the total resistance will be lower. The voltage is the same everywhere in a parallel circuit. You can calculate the total resistance in ***parallel*** using the following formula:

1:Rtot = 1:R1 + 1:R2 + 1:R3

Itot = I1 + I2 + I3