**Physics summary chapter 2 electricity**

**Section 2. Power and energy.**

Every electrical appliance state shows much electrical energy it consumes per second. This is called the ***power*** of the appliance. The unit of power is the Watt (W). The power of a device depends on 2 factors:

1. The ***voltage*** (across the device) in volts (V).
2. The ***current*** (across the device) in amps (A).

You can calculate the electrical power using the following formula:

Power = voltage x current

P = U x I

A device may require a lot of power, but if you do not use it much, its energy consumption will not be high. Conversely, a device that uses very little power may have an unexpectedly high energy consumption if its left on night and day. The energy consumption of an appliance is therefore determined not only by its power but also by the period of time for which it is consuming energy. You can calculate the energy consumption using the following formula:

Joules = power x time

E = P x T

The amount of electrical energy consumed by electrical appliances are high. These amounts are there often measured in kilojoules and megajoules. Joules are also used for expressing the energy value of foodstuffs. Although the joule is the official unit. 1 kWh is the same as 3.6 MJ.

**Section 3. Electricity in the home.**

A network of electricity wiring runs through the walls and ceilings of a home: the ***domestic supply***. This lets you use the electrical energy anywhere in the house. A circuit consists of various branches in parallel, each leading to one socket or one light fitting. This means that every single light fitting, and socket has a voltage of 230 V. Each circuit has its own circuit switch that you can use to disconnect all its sockets and light fixtures from the power supply. This makes it safe for you to perform repairs or connect an additional socket. If a device is on, current will run through the branch that is connected to. The greater the power consumption of the appliance, the higher the current.

Itot =I1 + I2 + I3

The appliances that are connected to a circuit are almost never all on at the same time. You can calculate the total power using the following formula:

Ptot = P1 + P2 + P3

Ptot = U x Itot

* The brown wire is the ***live wire***, the live wire has a voltage of 230 V.
* The blue wire is the ***neutral wire***, the neutral wire has no voltage. It’s used to complete the circuit.
* The black wire is the ***switch wire***, it runs from switch to bulb. After the switch there could be 230 V on it but normally there isn’t any volts on it.

The total current in any one circuit must not exceed 16 A. If the current goes above 16 A. The copper wire in the wiring will get hot, which creates a fire hazard. One reason why the current may become too high is because too many appliances are switched on at the same time in a circuit. This is called ***overloading***.

Electrical wires are made of thick, highly conductive copper wire. These wires only have very low ***resistance***. This means that the current can pass through them easily. This may change if the current is able to take another path, with less resistance. This will then cause a ***short circuit***.

**Physics summary chapter 2 electricity**

**Section 4. Electricity and safety.**

Using electrical energy is associated with 2 hazards:

1. If wires have to carry too much current, they can become so hot that they cause fires. This hazard can occur as a result of overloading or a short circuit.
2. If you touch a live conducting object, you will get an electric shock. A short electric shock runs through your body.

If the current passing through your body is not too high or only for a moment, you will manage to control your muscles and let go of the live object immediately. But if the current is higher and does not stop immediately, your muscles cannot relax. The size of the current depends on the voltage and the resistance of your body. Your body conducts currents quite well; the ***electrical resistance of your body*** is therefore not very high. The highest resistance to the current is at the locations where it enters and leaves the body. This is called the ***contact resistance***. If your skin gets wet, this will greatly reduce the contact resistance.

Some electrical appliances are ***double-insulated***. The parts that the current runs through are insulated as normal. Additionally, there is a second insulating layer. The outside is usually made of plastic.

Each meter cabinet has its own ***circuit breaker***. If the current exceeds 16 A, the circuit breaker will turn of the power. This prevents the wires from becoming so hot that they become a fire hazard. The meter cabinets also has 1 or more ***earth leakage circuit breakers*** (ELCB). An earth leakage circuit breaker compares the current in the live wire with the current in the neutral wire. If the difference in current exceeds 30 mA, the earth leakage breaker will turn off the power. This means that the current cannot leak through your body.

Appliances are often earthed. A yellow green ***earth wire*** runs from the outer casing of the appliance via the flex to be earth pin. The earth wire then goes from the socket to the ***earth rail*** in the meter cabinet. From there, it is in turn connected to a metal pin that is hammered deep into the ground.