Electrical systems

Electric current

The flow of electrical charge through a conductive medium such as a wire.
Unit of current is measured in Amps
Ohm's law is used to state the current flowing through a resistor is directly proportionate to the voltage across the resistor.
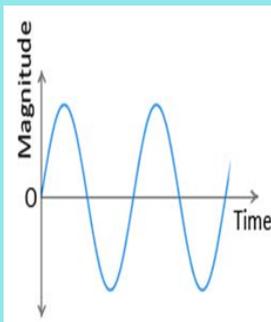
Formula: Current = Voltage / Resistance

Two types of electrical current are used:
* Alternating current
* Direct

Alternating current

This type of current changes direction periodically:
50times a second in the case of mains electricity. The voltage reverses along the current. AC usually has an oscillating voltage that appears graphically as a sine wave.

Mains electricity is an AC supply in the UK as it is straight forward to transport across long distances.

Direct current

This type of current flows in one direction only.
Many digital electronic devices run using DC which can be provides by batteries or cells. These include mobile phones, tablets, computers, e-readers as the main advantage is the DC electricity is reliable and efficient.
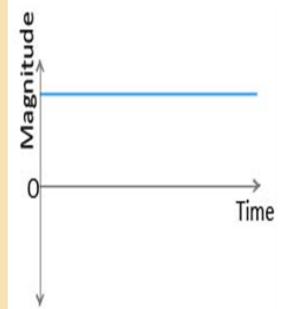
Some digital devices turn AC into DC, this is called rectification and allows the device to be plugged into the mains sockets – e.g. Flat screen TV.

Power Supplies

Electrical devices need power to make them work, two sources in the UK:
* Mains electricity
* Batteries

Mains electricity is supplied at 230V AC using plug sockets for devices to be plugged into to make them work. The plug is connected to a flexible cable and then connected to the device and can be connected to a step down transformer to reduce the voltage to the device.

The advantage of Mains electricity is that it is relatively cheap and widely available.
Limitations are is the device is portable and needs to e used outdoors or if there aren't enough plug sockets.
Mains electricity can be dangerous due to the high voltage which can lead to electric shocks if a wire is not insulated or can lead to fires if not set up correctly.

Batteries are another way of supplying power using two terminals (Anode and Cathode) and an electrolyte. These convert chemical energy into electrical energy. When connected to a device a chemical reaction occurs resulting in the flow of electrical energy.
Batteries come in a range of sizes and shapes (AAA, AA, C, D and PP3).
Examples of different batteries include: Alkaline, Zinc carbon and rechargeable. Single use batteries are thrown away after use but rechargeable batteries can be recharged and reused however these are more expensive in the short term but last longer reducing battery waste.
Batteries are good for portable items and can be combined to make a combined voltage.

What does the term AC and DC stand for?

_____
_____

_____
_____

Write down the equation to calculate Ohm's law

Why is AC used in Mains electricity?

_____
_____

_____
_____

Why is DC better than AC and what is done with digital devices to allow them to use AC when they would work better with DC?

_____
_____

_____
_____

What are the two main sources of power supplied?

.

.

Explain each type

_____
_____

_____
_____

_____
_____

_____
_____

_____
_____

_____
_____

What is a clear advantage of using Main power electricity?

_____
_____

_____
_____

Name an advantage of using Batteries as a power source

Electrical systems

Input control devices

Switches
These are used to make or break a circuit, common uses include turning the power supply on or off.

Relays
These are electronically activated switches, when a current flows through the internal coil a magnetic field is created. This attracts a lever which changes the switch contacts by pushing them together. This then completes the circuit and when the switch is turned off the relay returns to its original position.

These are also used to switch a large load current from a much smaller control current. They allow one circuit to switch to a second., completing a separate circuit.
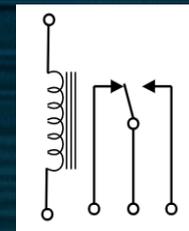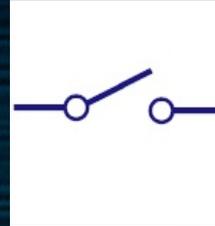
Output devices
These devices can be used to provide light, sound or movement.

Motors and Solenoids
These are two ways to provide movement within a circuit they convert electrical energy into rotary motion.

Solenoids convert electrical energy into mechanical movement through the use of electromagnetism. This is usually in the form of linear motion but can be rotary. They are often used in locking and clamping systems.

Buzzers and bells
These are used to create sound, a buzzer uses an internal oscillator to produce sounds at different frequencies when current flows through them. The frequency depends on the design and voltage rating of the buzzer, which typically is 6V or 12V and can be used in door bells, quiz buzzers and alarm systems.

Bells can also be used to create sound but it does this through the use of an electromagnet, when current flows through a bell it produces a continuous clanging sound.

Lamps
These are output devices used to create a light.

Filament Lamps involve a coil of wires which current passes through which heats it up and produces light as a result.

Lamps are used in a number of products including torches, mood lights and indicator lights. However, Lamps are being replaced with energy efficient lights such as LED's.
When selecting a lamp you need to pay attention to the voltage rating, current rating and fitting type. If too much voltage is applied to a lamp it will be damaged or destroyed.

The fitting type also needs to be known as there are many types including:
Screw, centre contact and Bayonet.

Bulb fittings

Bayonet		Screw		Other	
B22	B15	E14	E27	GU10	MR16

Which
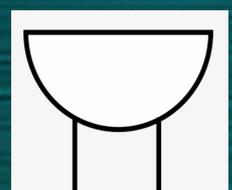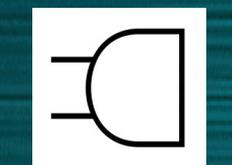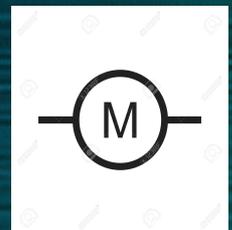
Describe what an input devise is

_____
____

_____
____

Draw down the symbol for a switch and state wat the purpose of the switch is

_____
____

_____
____

Name three special types of switches that you can use

.

.

.

Describe the purpose of a Relay and what it does

_____
____

_____
____

_____
____

Draw down the symbol

Describe what an Output devise is

_____
____

_____
____

Draw down three symbols of different output components

Explain what each one does

_____
____

_____
____

_____
____