

2017

S1 Topic of Electricity Homework



Homework 1- The Atom

Task (use the information in the written passages below)

1. *Read the information contained in this document*
2. *Draw a labelled diagram of the atom, clearly labelling the following parts*

nucleus, proton, neutron, electron,
negative charge, neutral charge,

3. *Make sure your atom is neutral*
4. *Copy and complete the passage below or write out your own notes on atoms and electricity. If you want to download this passage and complete it you may do so but you MUST stick it in your jotter before handing it in.*

_____ make up all materials. There are _____ parts to atoms. They are called _____, _____, and _____. The _____ are positively charged. The _____ are negatively charged and the _____ have no charge. The centre of the atom is called the _____. This contains the _____ and _____. The _____ move round the centre of the atom. It is the _____ that can be removed from the atom and make _____. Atoms usually have _____ charge and are called _____ because the number of _____ in the nucleus is equal to the number of electrons in the orbits. However, _____ one object on a different object can remove _____ from atoms. When the electrons are "stolen" and made to move we have an _____ or

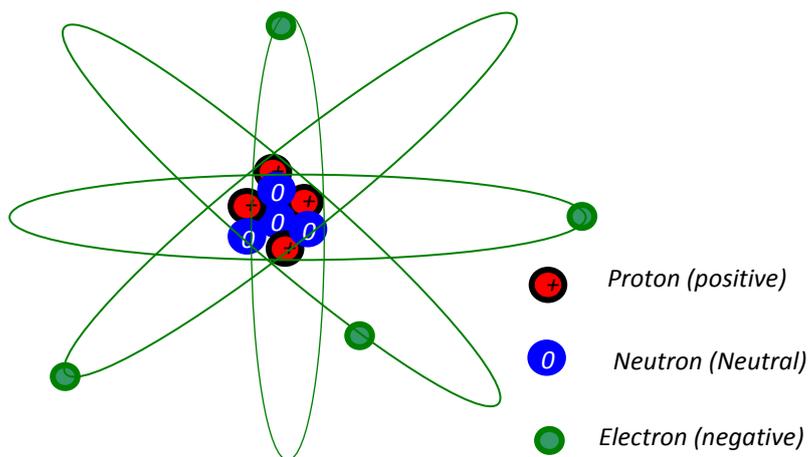
..... We sometimes call these electrons charges because they have a negative charge

You should know that :

All objects are made up of small particles called atoms. Inside each atom there are three even smaller particles called neutrons, protons, and electrons.

.....and you need to know this too.

Diagram of a Neutral Atom



1. The neutrons and the protons are in the centre or nucleus of the atom.

2. *The electrons are moving in orbits around the nucleus. (This is like the planets moving around the Sun).*
 3. A proton has a positive charge. An electron has a negative charge. A neutron is uncharged.
 4. *Normally the atom has no overall charge. It is said to be neutral because the number of protons in the nucleus is equal to the number of electrons in the orbits. However, sometimes an object can 'steal' electrons from other atoms by being rubbed against another object. When the electrons are "stolen" and made to move you have an electric current or electricity. We sometimes call these electrons charges because they have a negative charge, so watch out for this term.*
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EXTENSION

Scientists also know that :

- It is the electrons of atoms that make up electric charge.
- When these small charges move around a circuit we call this a *current*.
- Materials that charges flow through easily are called *conductors*. Conductors do not hold on to the charge but allow it to escape.
- Materials that charges cannot flow through are called *insulators*. Insulators hold on to the charge.
- The difficulty that charges have passing through an object is measured by *resistance*.
- The electrical push that allows current to flow is called *voltage*. It is also a measure of the *energy given to each of the charges* as it passes through the power supply.
- Scientists have found out that a magnetic field exists when electricity passes through a wire.

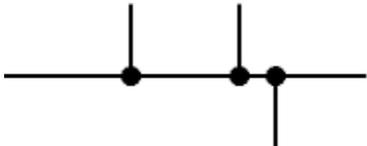
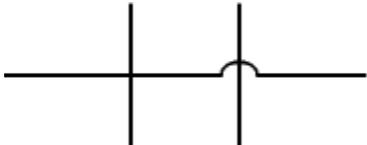
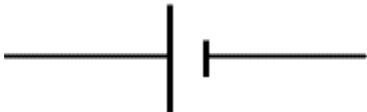
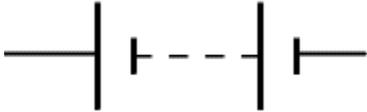
EXTENSION

5. *For more information on atoms and charge read the information below or visit the school library and the internet.*
6. *Everything around us consists of atoms. Atoms, in turn, are made up of three types of tiny particles: electrons, protons and neutrons. Both electrons and protons have an electric charge. An electron has one unit of negative charge, and a proton has one unit of positive charge. A neutron has no charge. Protons and neutrons are heavier than electrons and are crowded into the nucleus, the central core of an atom. Electrons whirl around the nucleus.*

7. *Usually an atom has an equal number of protons and electrons, and so it is electrically neutral. If an atom gains some electrons it becomes negatively charged. If an atom loses some electrons it becomes positively charged. If the electrons are a long way from the nucleus, it may be easy to remove one of them from the atom. Atoms that have an electric charge - either negative or positive - are called ions.*
8. *Every charged particle is surrounded by an electric field, the space around the particle in which the charge has an effect. Charged particles exert a force on one another, even when not touching, because of their electric fields. For example, ions with unlike charges attract one another, and those with like charges repel each other.*
9. *Electricity is sometimes classified as static electricity or current electricity. But both are actually made up of the same kinds of particles. Static electricity consists of electrons or ions that do not move. Current electricity is made up of moving electrons or ions. Almost all the electricity we use is current electricity.*
10. **Static Electricity.** *You can generate static electricity by combing your hair briskly on a dry day. Your hair loses electrons and becomes positively charged. The comb gains electrons and becomes negatively charged. The static electricity makes your hair crackle as you comb it. You can place a charge on yourself by walking across a carpet. This charge will give you a mild shock if you then touch a metal object such as a doorknob. You can also produce static electricity by rubbing a glass rod with a silk cloth. The rod becomes positively charged and the cloth becomes negatively charged. The positive and negative charges remain where they have been placed by the rubbing action. When you rubbed the rod against a cloth or your jumper some of the outer electrons from the material were 'stolen' by the rod. This means that the rod has extra electrons and so is negatively charged. The material has lost some electrons and so is positively charged.*
11. *The material and rod are likely to remain like this for some time. This is because the materials from which they are made do not allow the charges to move or escape. The materials are insulators.*

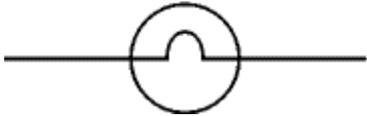
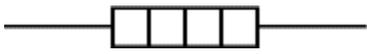
Homework 2- Circuit Symbols

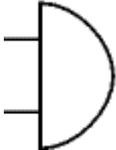
1. Copy the circuit symbols and COMPONENT names for those with a * by them.

<i>Wires and connections</i>		
Component	Circuit Symbol	Function of Component
<i>*Wire</i>		<i>To pass current very easily from one part of a circuit to another.</i>
<i>*Wires joined</i>		<i>A 'blob' should be drawn where wires are connected (joined), but it is sometimes omitted. Wires connected at 'crossroads' should be staggered slightly to form two T-junctions, as shown on the right.</i>
<i>*Wires not joined</i>		<i>In complex diagrams it is often necessary to draw wires crossing even though they are not connected. I prefer the 'bridge' symbol shown on the right because the simple crossing on the left may be misread as a join where you have forgotten to add a 'blob'!</i>
<i>Power Supplies</i>		
Component	Circuit Symbol	Function of Component
<i>*Cell</i>		<i>Supplies electrical energy. The larger terminal (on the left) is positive (+). A single cell is often called a battery, but strictly a battery is two or more cells joined together.</i>
<i>*Battery</i>		<i>Supplies electrical energy. A battery is more than one cell. The larger terminal (on the left) is positive (+).</i>
<i>*DC supply</i>		<i>Supplies electrical energy. DC = Direct Current, always flowing in one direction.</i>

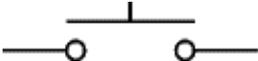
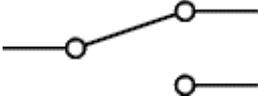
*AC supply		Supplies electrical energy. AC = Alternating Current, continually changing direction.
*Fuse		A safety device which will 'blow' (melt) if the current flowing through it exceeds a specified value.
<u>Transformer</u>		Two coils of wire linked by an iron core. Transformers are used to step up (increase) and step down (decrease) AC voltages. Energy is transferred between the coils by the magnetic field in the core. There is no electrical connection between the coils.
Component	Circuit Symbol	Function of Component
*Earth (Ground)		A connection to earth. For many electronic circuits this is the 0V (zero volts) of the power supply, but for mains electricity and some radio circuits it really means the earth. It is also known as ground.

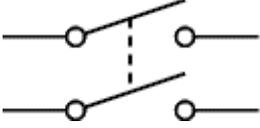
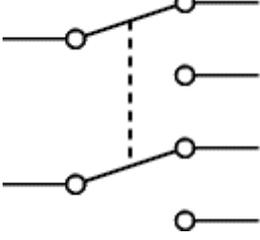
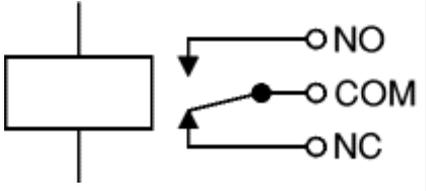
Output Devices: Lamps, Heater, Motor, etc.

Component	Circuit Symbol	Function of Component
<u>Lamp (lighting)</u>		A transducer which converts electrical energy to light. This symbol is used for a lamp providing illumination, for example a car headlamp or torch bulb.
* <u>Lamp (indicator)</u>		A transducer which converts electrical energy to light. This symbol is used for a lamp which is an indicator, for example a warning light on a car dashboard.
*Heater		A transducer which converts electrical energy to heat.
*Motor		A transducer which converts electrical energy to kinetic energy (motion).

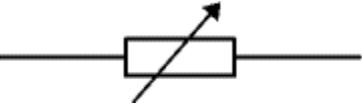
*Bell		A transducer which converts electrical energy to sound.
*Buzzer		A transducer which converts electrical energy to sound.
<u>Inductor</u> (Coil, Solenoid)		A coil of wire which creates a magnetic field when current passes through it. It may have an iron core inside the coil. It can be used as a transducer converting electrical energy to mechanical energy by pulling on something.

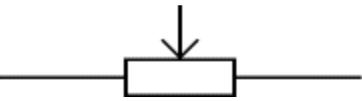
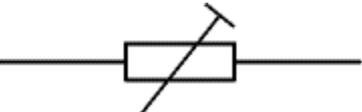
Switches

Component	Circuit Symbol	Function of Component
<u>Push Switch</u> (push-to-make)		A push switch allows current to flow only when the button is pressed. This is the switch used to operate a doorbell.
<u>Push-to-Break Switch</u>		This type of push switch is normally closed (on), it is open (off) only when the button is pressed.
*On-Off Switch (SPST)		SPST = Single Pole, Single Throw. An on-off switch allows current to flow only when it is in the closed (on) position.
*2-way Switch (SPDT)		SPDT = Single Pole, Double Throw. A 2-way changeover switch directs the flow of current to one of two routes according to its position. Some SPDT switches have a central off position and are described as 'on-off-on'.

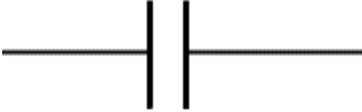
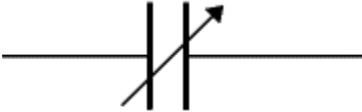
<p><u>Dual On-Off Switch</u> (DPST)</p>		<p>DPST = Double Pole, Single Throw. A dual on-off switch which is often used to switch mains electricity because it can isolate both the live and neutral connections.</p>
<p><u>Reversing Switch</u> (DPDT)</p>		<p>DPDT = Double Pole, Double Throw. This switch can be wired up as a reversing switch for a motor. Some DPDT switches have a central off position.</p>
<p><u>Relay</u></p>		<p>An electrically operated switch, for example a 9V battery circuit connected to the coil can switch a 230V AC mains circuit. NO = Normally Open, COM = Common, NC = Normally Closed.</p>

Resistors

Component	Circuit Symbol	Function of Component
<p><u>*Resistor</u></p>		<p>A resistor restricts the flow of current, for example to limit the current passing through an LED. A resistor is used with a capacitor in a timing circuit. Some publications still use the old resistor symbol: </p>
<p><u>Variable Resistor</u> (Rheostat)</p>		<p>This type of variable resistor with 2 contacts (a rheostat) is usually used to control current. Examples include: adjusting lamp brightness, adjusting motor speed, and adjusting the rate of flow of charge into a capacitor in a timing circuit.</p>

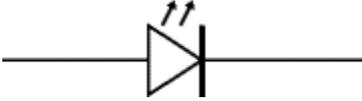
<p><u>Variable Resistor (Potentiometer)</u></p>		<p>This type of variable resistor with 3 contacts (a potentiometer) is usually used to control voltage. It can be used like this as a transducer converting position (angle of the control spindle) to an electrical signal.</p>
<p><u>Variable Resistor (Preset)</u></p>		<p>This type of variable resistor (a preset) is operated with a small screwdriver or similar tool. It is designed to be set when the circuit is made and then left without further adjustment. Presets are cheaper than normal variable resistors so they are often used in projects to reduce the cost.</p>

Capacitors

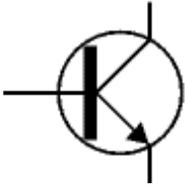
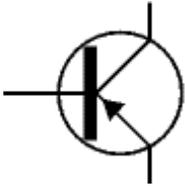
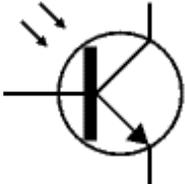
Component	Circuit Symbol	Function of Component
<p><u>Capacitor</u></p>		<p>A capacitor stores electric charge. A capacitor is used with a resistor in a timing circuit. It can also be used as a filter, to block DC signals but pass AC signals.</p>
<p><u>Capacitor, polarised</u></p>		<p>A capacitor stores electric charge. This type must be connected the correct way round. A capacitor is used with a resistor in a timing circuit. It can also be used as a filter, to block DC signals but pass AC signals.</p>
<p><u>Variable Capacitor</u></p>		<p>A variable capacitor is used in a radio tuner.</p>
<p><u>Trimmer Capacitor</u></p>		<p>This type of variable capacitor (a trimmer) is operated with a small screwdriver or similar tool. It is designed to be set when the circuit is made and then left without further adjustment.</p>

Diodes

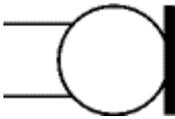
Component	Circuit Symbol	Function of Component
<p><u>Diode</u></p>		<p>A device which only allows current to flow in one direction.</p>

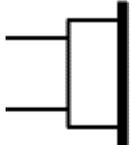
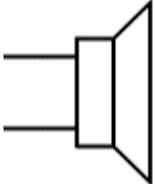
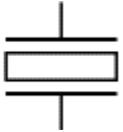
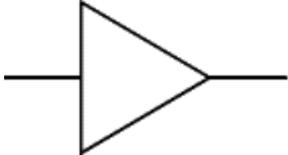
LED <i>Light Emitting Diode</i>		<i>A transducer which converts electrical energy to light.</i>
Zener Diode		<i>A special diode which is used to maintain a fixed voltage across its terminals.</i>
<i>Photodiode</i>		<i>A light-sensitive diode.</i>

Transistors

Component	Circuit Symbol	Function of Component
Transistor NPN		<i>A transistor amplifies current. It can be used with other components to make an amplifier or switching circuit.</i>
Transistor PNP		<i>A transistor amplifies current. It can be used with other components to make an amplifier or switching circuit.</i>
<i>Phototransistor</i>		<i>A light-sensitive transistor.</i>

Audio and Radio Devices

Component	Circuit Symbol	Function of Component
<i>Microphone</i>		<i>A transducer which converts sound to electrical energy.</i>

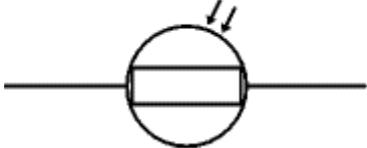
Earphone		A transducer which converts electrical energy to sound.
<u>Loudspeaker</u>		A transducer which converts electrical energy to sound.
<u>Piezo Transducer</u>		A transducer which converts electrical energy to sound.
Amplifier (general symbol)		An amplifier circuit with one input. Really it is a block diagram symbol because it represents a circuit rather than just one component.
Aerial (Antenna)		A device which is designed to receive or transmit radio signals. It is also known as an antenna.

Meters and Oscilloscope

Component	Circuit Symbol	Function of Component
<u>*Voltmeter</u>		A voltmeter is used to measure voltage. The proper name for voltage is 'potential difference', but most people prefer to say voltage!

<u>*Ammeter</u>		An ammeter is used to measure current.
<u>Galvanometer</u>		A galvanometer is a very sensitive meter which is used to measure tiny currents, usually 1mA or less.
<u>*Ohmmeter</u>		An ohmmeter is used to measure resistance. Most multimeters have an ohmmeter setting.
<u>*Oscilloscope</u>		An oscilloscope is used to display the shape of electrical signals and it can be used to measure their voltage and time period.

Sensors (input devices)

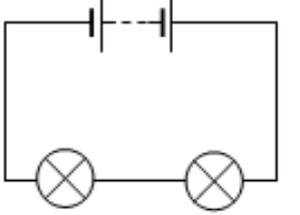
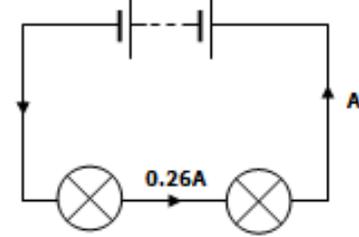
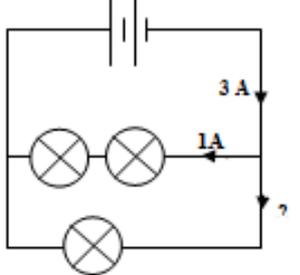
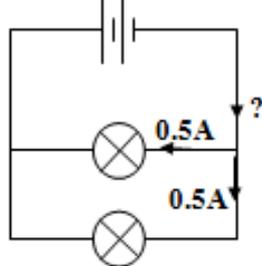
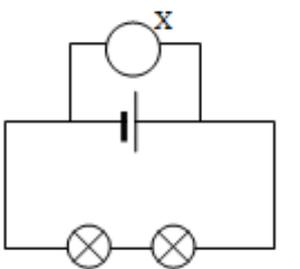
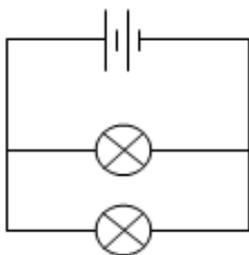
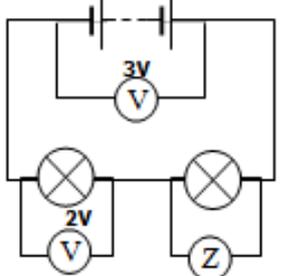
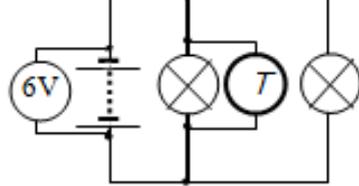
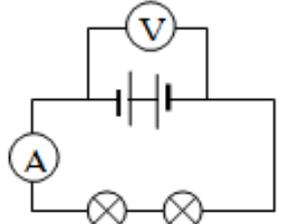
Component	Circuit Symbol	Function of Component
<u>LDR</u>		A transducer which converts brightness (light) to resistance (an electrical property). LDR = Light Dependent Resistor
<u>Thermistor</u>		A transducer which converts temperature (heat) to resistance (an electrical property).

2. Now copy the four rules below.

1. Draw wires as straight lines and not wobbly.
2. Do not cross your wires
3. Do not draw components at the corners.
4. Start by drawing the power supply or battery; it is usual to draw it at the top.

Homework 3- Definitions Dominoes

Cut and stick the dominoes sheet your teacher has given you into your jotter so that the questions and answers match up.

<p>1. Answer = 6V</p> <p>Name the type of circuit?</p>		<p>2. Answer = Ammeter</p> <p>What is the current at position A?</p>	
<p>3. Answer = Voltmeter</p> <p>What is the value of the missing current?</p>		<p>4. Answer = CELLS FACING</p> <p>What is the value of the missing current?</p>	
<p>5. Answer = 1V</p> <p>What type of meter is X?</p>		<p>6. Answer = 0.26A</p> <p>Name the type of circuit?</p>	
<p>7. Answer = PARALLEL</p> <p>What is the reading on meter Z?</p>		<p>8. Answer = 2A</p> <p>What is the reading on meter T?</p>	
<p>9. Answer = SERIES</p> <p>Name the fault</p>		<p>10. Answer = 1.0 A</p> <p>What type of meter is Y?</p>	