

Year 10

Physics booklet

Topic 2 – Electricity

Name: \_\_\_\_\_

# Electricity

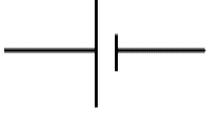
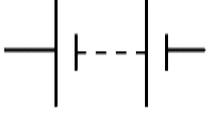
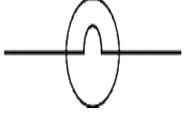
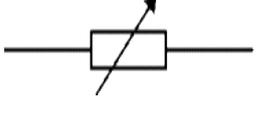
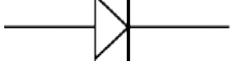
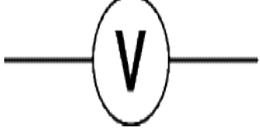
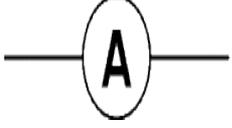
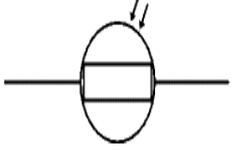
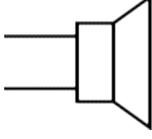
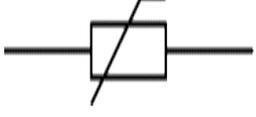
Give a definition for each of these key words:

Circuit	
Electrons	
Charge	
Current	
Potential difference	
Resistance	
Series circuit	
Parallel circuit	
Resistor	
Alternating current	
Direct current	
Power	
National grid	
Electric field pattern	

## **Electricity equations:**

(write down equations that you find about electricity)

## Circuit symbols

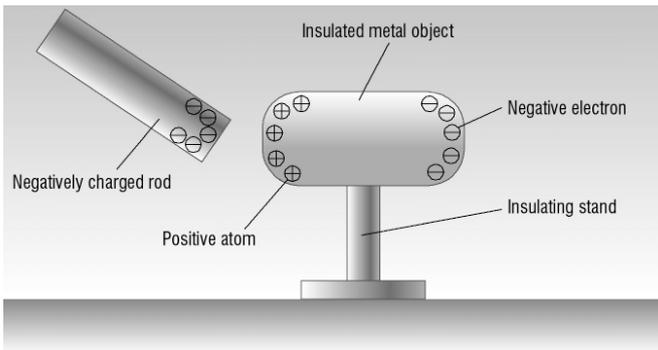
Circuit Symbol	Name	Description – what does the device do?
		
		
		
		
		
		
		
		
		
		
		
		
		

**An electric current** is a flow of ..... carried by ..... which move round the circuit from the ..... terminal of the battery to the ..... terminal.

A metal contains ..... that can move about freely inside the metal. A metal object can only hold ..... if it is insulated from the ground.

When two oppositely charged metal objects are brought into contact, electrons transfer from the ..... object to the ..... object.

The diagram shows the location of the charged atoms in an insulated metal object when a negatively charged rod is brought near to it.



The conduction electrons in the object moved from the left-hand side of the object to the right-hand side when the negatively charged rod was brought near the object.

i) Why did the charged rod cause the conduction electrons to move to the other end?

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ii) Why did the transfer of the conduction electrons in the object make the one end positive and the other end negative?

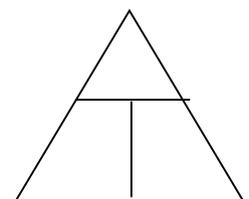
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In terms of electron transfer, explain why the insulated object would become charged negative overall if the rod touched the object?

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The amount of charge that has flowed in a circuit can be calculated using the equation

**Charge = Current x time**  
**(in coulombs, C) (in amps, A) (in seconds)**



1. What is an electric current? Use key words in your answer.

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2. A current of 1.5A flows through an electric toothbrush for 90 seconds. How much charge has flowed through the toothbrush?

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3. 350 coulombs of charge flows through an iron in 70 seconds. What is the current flowing through the iron?

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4. If a current of 2A flows through a bulb for 5 minutes, how much charge has passed through the bulb?

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5. Roberta and Eugene were trying to work out how much charge there was stored in different electric toothbrush batteries. They measured the current flowing into toothbrush when it was switched on and timed how long it took to run the batteries down. The toothbrush required two batteries. They repeated their experiment twice. Here are their results.

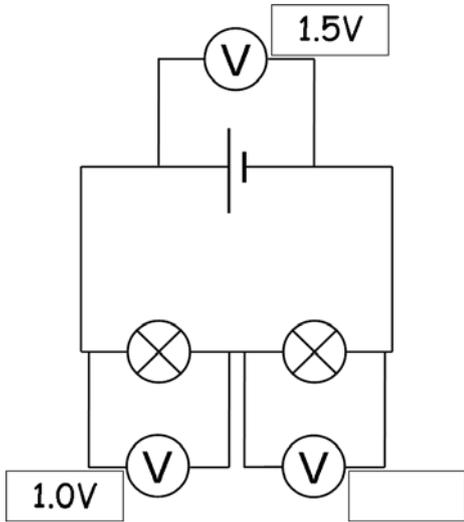
Battery	Current flowing (Amps)	Time taken (seconds)				Charge flowed (Coulombs)
		1	2	3	Mean	
Longalast	1.15	965	944	957		
Durablast	1.25	888	900	768		
Morelife	1.20	915	900	909		

- a) Circle the anomalous result in the table.
- b) Calculate the mean average for each brand of battery.
- c) Calculate the amount of charge stored by each brand of battery.
- d) How would you present the results of this experiment? Justify your answer.

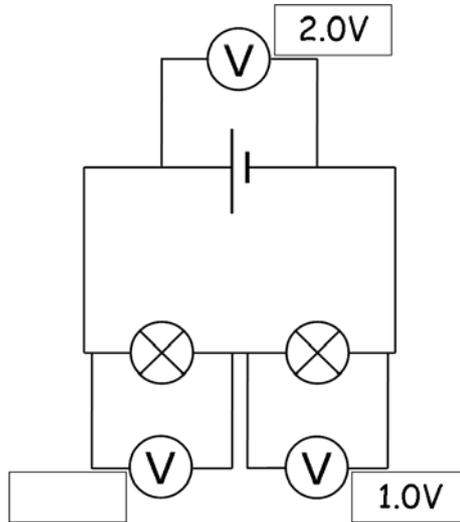
## Series circuits – currents and voltages

Fill in the boxes. Some diagrams have more than one box to fill in.

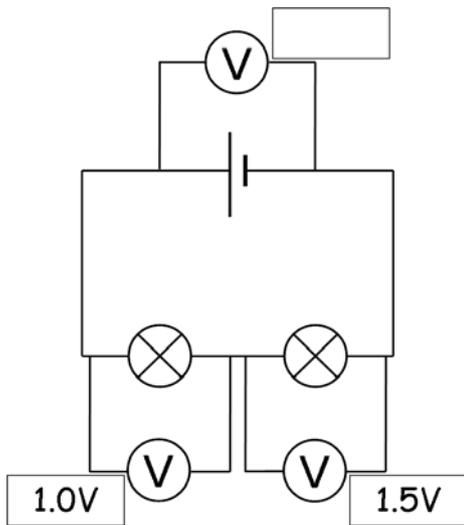
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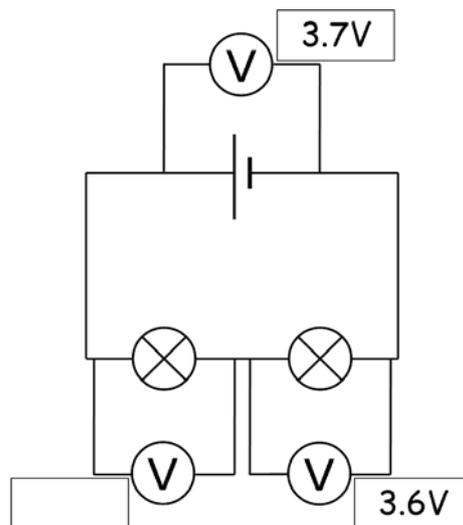
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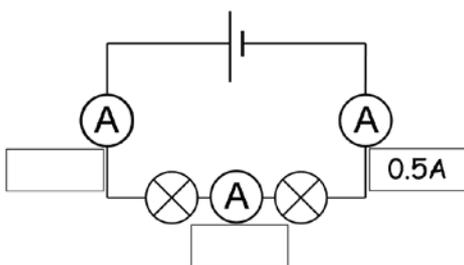
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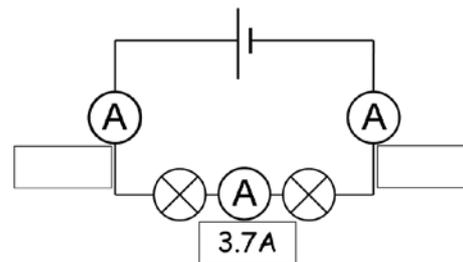
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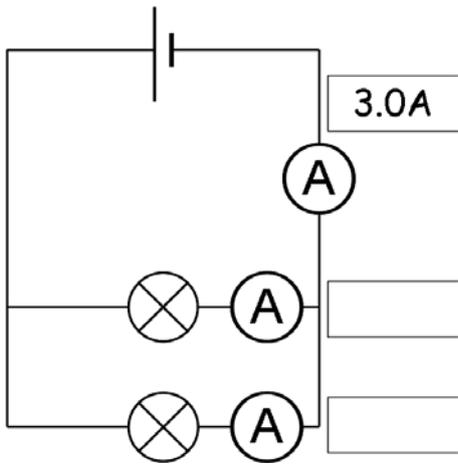


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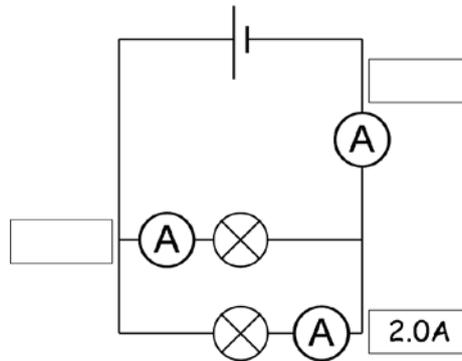


## Parallel circuits – currents and voltages

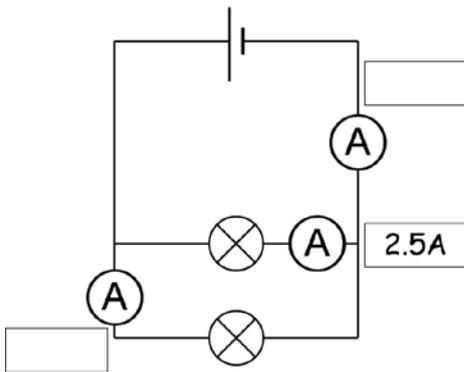
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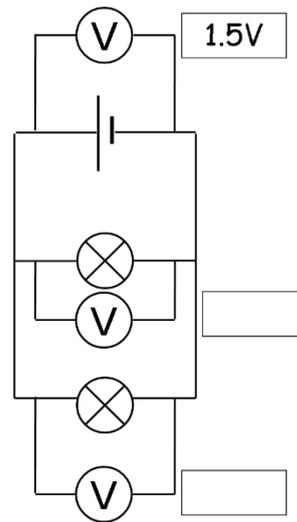
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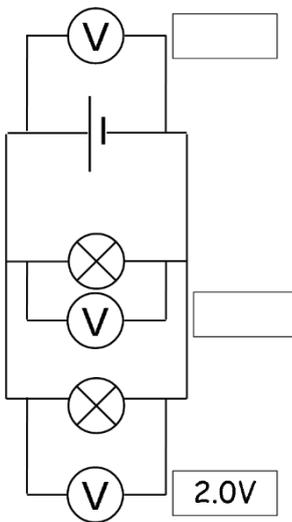
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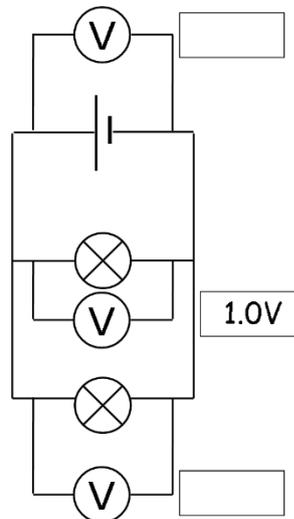
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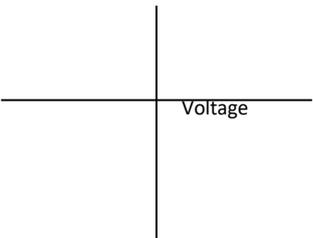
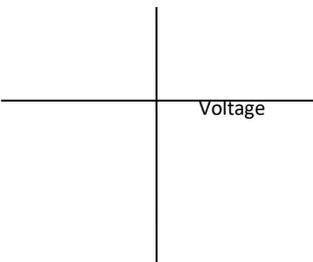
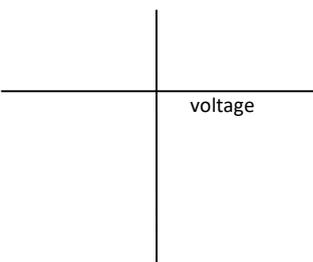
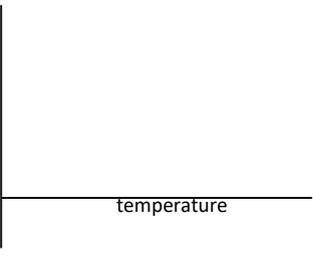
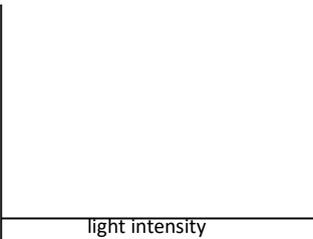
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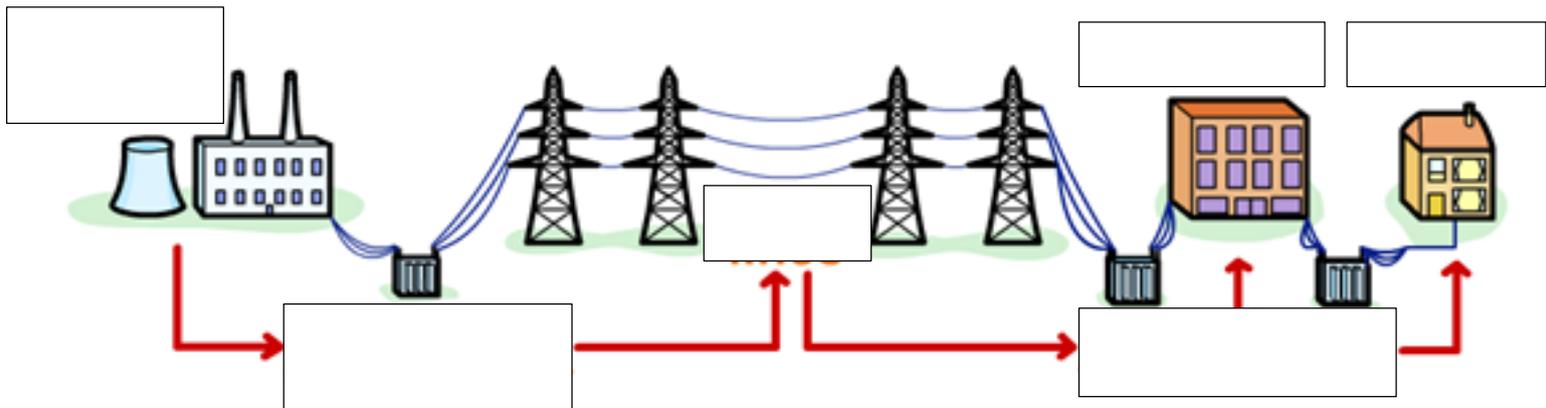
12.



## Resistors

Name and symbol of type of resistor	Sketch graph	What does the sketch graph show?	What is this type of resistor used for?
<b>Fixed resistor</b>		<p>As the p _____ difference increases the current also i _____</p> <p>Current is d _____ proportional to the voltage.</p>	
<b>Filament lamp</b>		<p>As the potential differences i _ _____ the current starts to increase. Gradually the current increases l ___ and less each time because the filament in the lamp gets h _ _ . This makes the lamp's r _ _ _____ go up.</p>	
<b>Diode</b>		<p>When the diode is connected the right way round then a large C _____ flows as the v _____ increases. If connected the other way round then no current flows as the r _____ is so high</p>	
<b>Thermistor</b>		<p>As the t _____ increases the resistance of a thermistor d _____. At higher temperatures the r _ _ _____ decreases less than at lower t _____</p>	
<b>LDR</b>		<p>As the l _____ intensity increases the resistance starts to d _____. It falls q _ _ _ _ at first, but decreases more slowly for h _ _ _ _ light intensities.</p>	

## The national grid



Power stations generate ..... This is transferred to our homes from power stations through a series of pylons and cables called the ..... To reduce energy losses as it is transported along power lines, a ..... is used to change the ..... If the voltage increases, the ..... decreases. This reduces the loss of energy in the form of ..... Before the electricity reaches our homes the voltage must be decreased using a .....

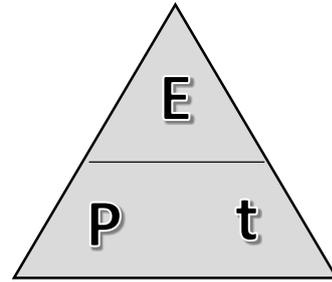
**Why do we need to decrease the voltage of electricity before it is delivered to our factories and homes?**

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## Power

Convert the following units (10)

	Quantity	Convert into....
1	900W	kW
2	1.2kW	W
3	430kJ	J
4	990kJ	MJ
5	9J	kJ
6	0.03kW	W
7	20kJ	MJ
8	12.3Mw	kW
9	300J	MJ
10	0.001MW	kW



***Include the units in ALL of the following answers***

1. How much energy does a pair of 800W hair straighteners transfer every second?

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2. 1.5kJ of energy are used every second by a microwave oven, what is the power rating of the oven?

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3. 0.8MJ of energy are used by a blender in 3 and a half minutes. What is the power rating on the blender?

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4. A 3kW oven supplied with 9kJ of energy. How many seconds can it be run for?

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5. The Tesla Roadster electric car is rated at 16.8kW. How much energy does it use during a one hour drive? Answer in MJ (3)

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