Circuits

def: Electrons flowing in a continual closed loop.

Parts of a circuit

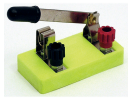
1- Power supply: gives the ***push*** the electrons need to travel in the circuit.

Types: 1- photovoltaic cell: generates current when exposed to light. ex: solar calculator or watch.

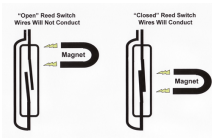
2- Batteries and generators.

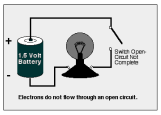
2- Wires: Allows the ***conduction*** of electrons and connects all the parts of the circuit.

3- Control or switch: ***controls*** the ability for electrons to travel in a circuit.



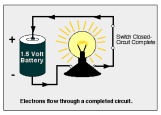
A magnetic switch is often used.



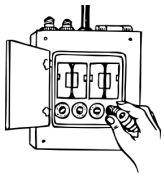


open switch = no current

closed switch = current

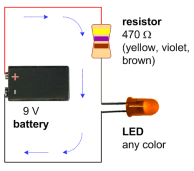


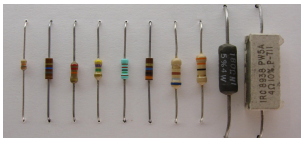
4- Fuses or breakers: ***Protection.*** Completely stops electron flow when too much is asked for.



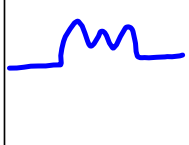
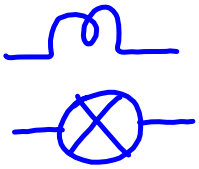
5- Transformers: Device used to transfer electrical energy from one circuit to another or to transfer to another form of energy. Ex: light, sound or motor

6- Resistors: Stop or slow down the flow of electrons in a circuit.





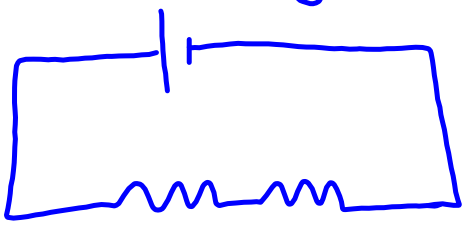
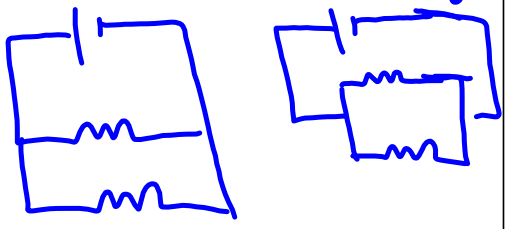
Symbols

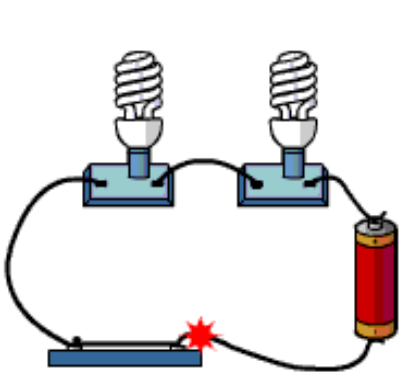
Resistor	Light bulb	Wire	Open switch	Closed switch
				
Power supply	Fuse	Voltmeter	Ammeter	Motor
				

voltmeter: measures the voltage of the circuit.

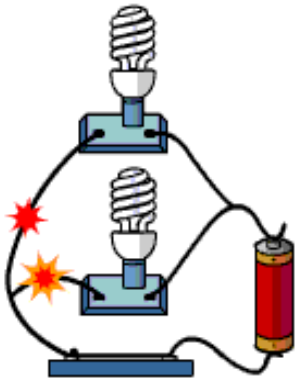
ammeter: measures the current intensity of the circuit.

Types of circuits

Series	Parallel
one pathway 	multiple pathways 



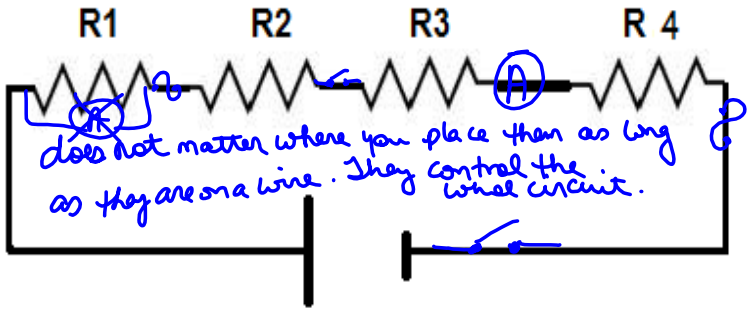
Series Circuit

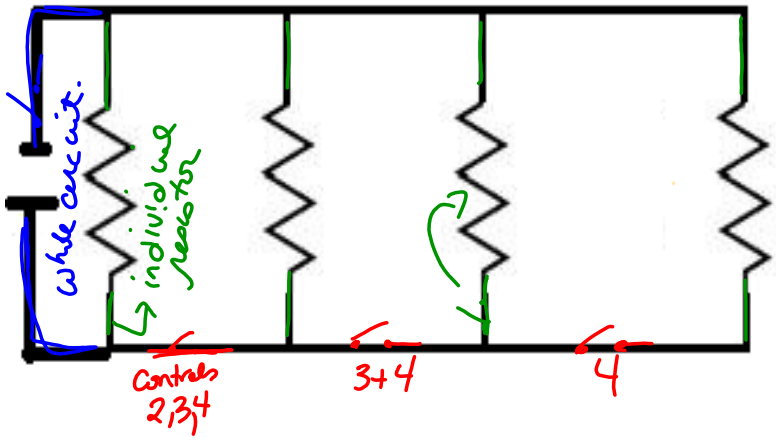


Parallel Circuit

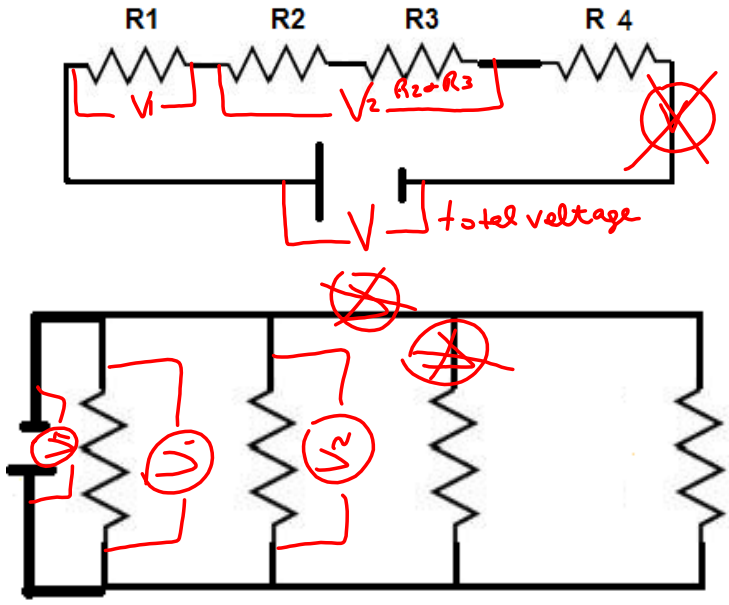
Symbols on a circuit

Ammeter, switches and fuses: All are placed the same way on a circuit, directly on a wire. Depending where they are placed they can control a part, parts or the whole circuit. The way they are placed is called in 'series'.





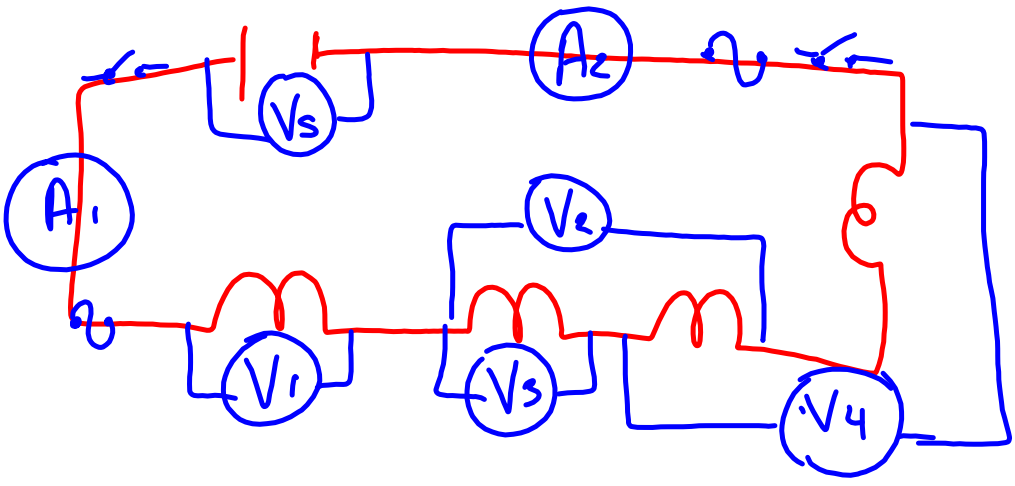
Voltmeters: Are placed in 'parallel' which means above or below the resistor or power supply.



Putting it all together

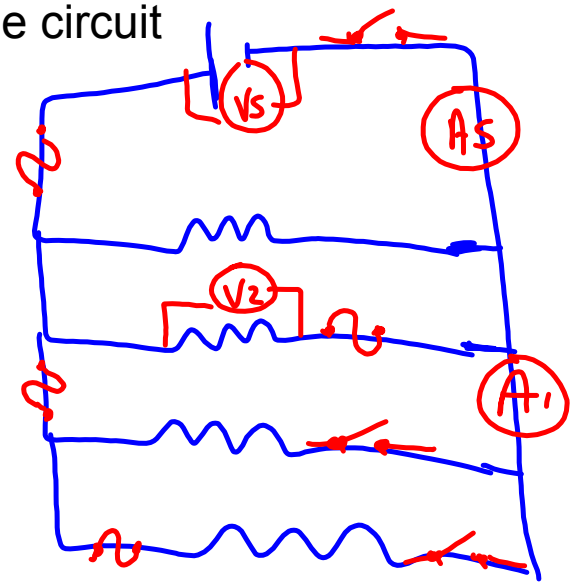
Example 1:

- Circuit with one pathway
- 4 light bulbs
- Voltmeter for total voltage, (Vs)
- Voltmeter for L_1, (V_1)
- Voltmeter for L_2 and L_3 together, (V_2)
- Voltmeter for L_2, (V_3)
- Voltmeter for L_3 and L_4 together, (V_4)
- Ammeter for total current, (A_1)
- Ammeter for current of L_1, (A_2)
- Fuse for the whole circuit.
- Fuse for L_3
- Switch for L_1
- Switch for all lights



Example 2:

- Circuit with 4 pathways with resistors
- Voltmeter for total voltage, (Vs)
- Voltmeter for R_2, (V_2)
- Ammeter for total current, (As)
- Ammeter for R_3 and R_4 together, (A_1)
- Fuse for the whole circuit
- Fuse for R_2
- Fuse for R_3 and R_4 together
- Fuse for R_4
- Switch for R_3
- Switch for R_4
- Switch for whole circuit

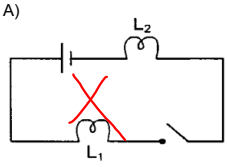


1. A mystery circuit consists of two light bulbs (L_1 and L_2), a switch, and a power supply. The following table shows what happens to both light bulbs when the switch is opened or closed.

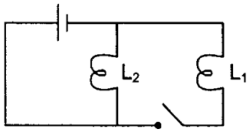
Test	Observations
Open the switch	L1 stays onL2 goes out
Close the switch	L1 stays onL2 comes on

Which diagram correctly represents this mystery circuit?

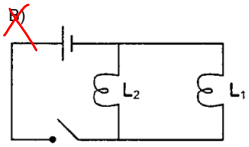
A)



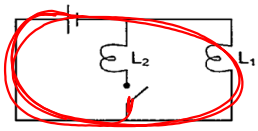
C)



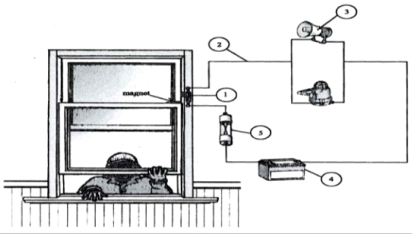
B)



D)



2. The electrical circuit of a magnetic alarm system is illustrated in the diagram below



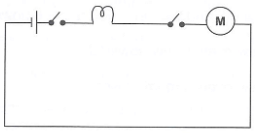
Which of the following shows the correct match between the five numbered components in this circuit diagram and their corresponding electrical functions?

	1	2	3	4	5
A	control	conduction	transformation	Power supply	protection
B	control	conduction	Power supply	transformation	protection
C	power supply	protection	transformation	control	conduction
D	power supply	conduction	protection	transformation	control

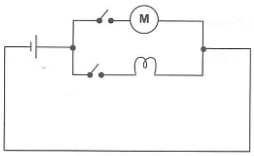
3 When a grocery store check-out clerk is ready to serve customers:
- he must press a switch to turn on a light indicating that the cash is open
- he can start the conveyer belt motor, if necessary, by using another switch
- he can start the conveyer belt motor only if the light is on to indicate that his cash is open

Which electrical circuit represents the situation described above?

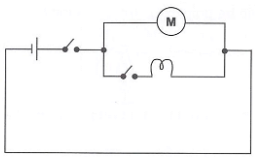
A)



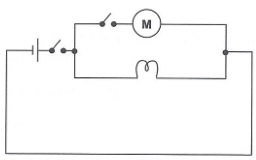
B)



C)

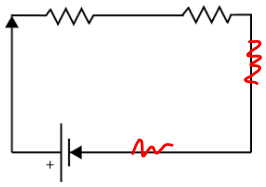


D)

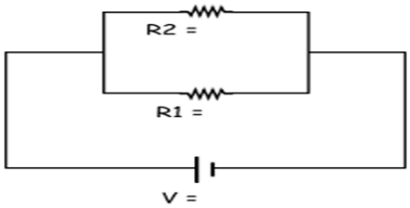


Comparing series and parallel circuits and their relationship with current intensity and resistance

A series circuit has _one_ pathway(s). This means current must go through _all_ resistors. Since they are going through all resistors there is a _high_ resistance. Since there is a high resistance there will be _lower_ current intensity. If you add another resistor to the circuit the resistance of the circuit _increases_ which will cause the current intensity to _decrease_. If the current intensity is low, power (P=IV) and energy (E=IVt) will also be _low_.



A parallel circuit has _many_ pathway(s). This means current will be _shared_ amongst the resistors. Since current is not going through each resistor, the resistance of the circuit is _low_. Since the resistance is low, the current intensity of the circuit will be _high_. If the current intensity is high, power (P=IV) and energy (E=IVt) will also be _high_.



To summarize:
Series circuit = 1 pathway = high resistance = low current intensity = low power and energy

Parallel circuit = 2 pathways = low resistance = high current intensity = high power and energy