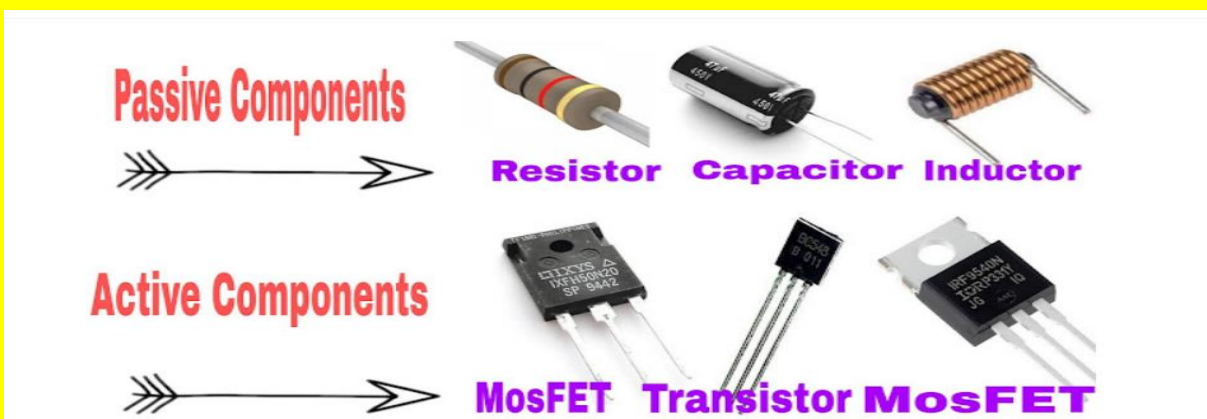
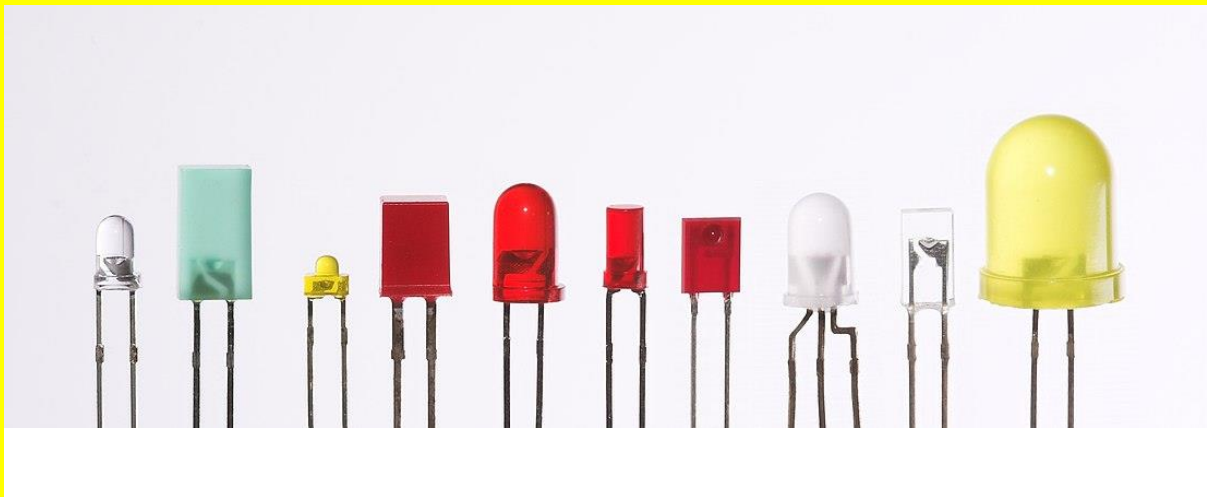
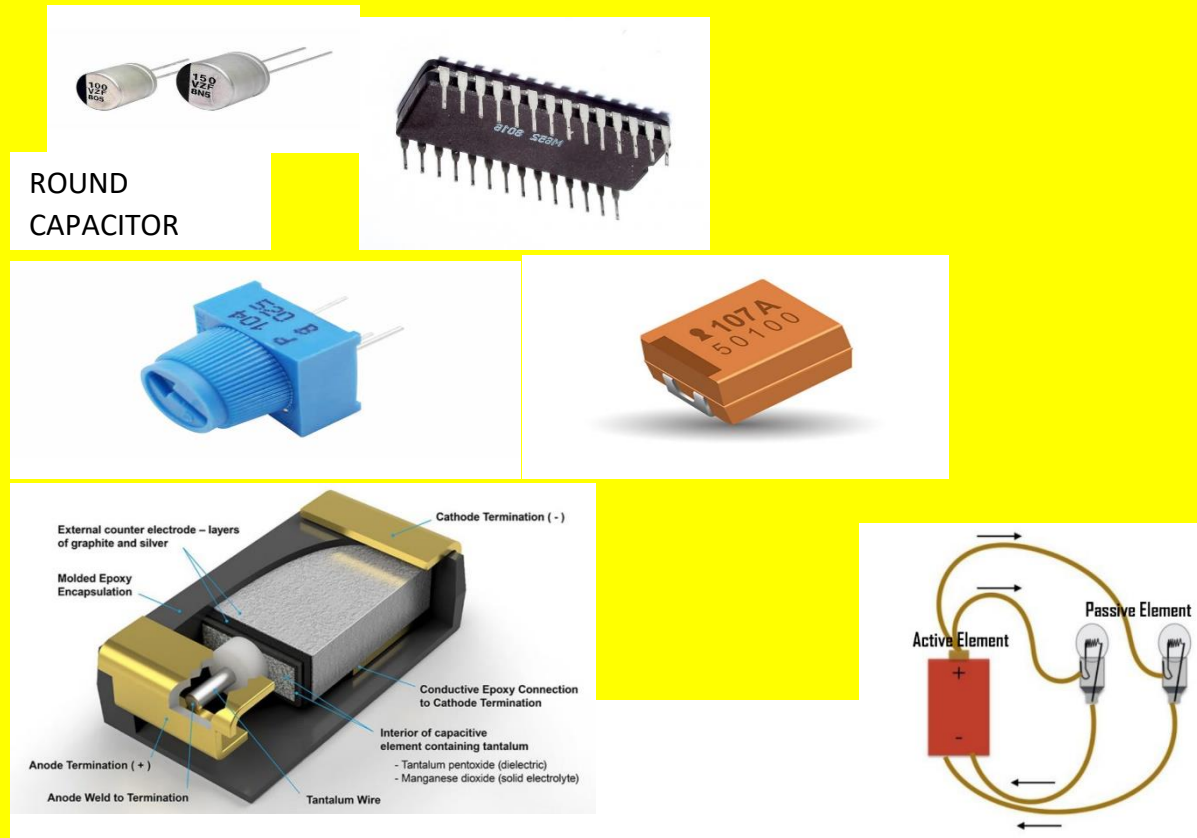


## EXPERIMENT NO:1

### ACTIVE COMPONENTS



## PASSIVE COMPONENTS



## ACTIVE AND PASSIVE COMPONENTS

OBJECTIVE/Aim: Study of Active and Passive components.

APPARATUS REQUIRED: 1.Multimeter

2.Breadboard

3.Active components

4.Passive components

THEORY:

---

ACTIVE COMPONENT	PASSIVE COMPONENT
<p>*Active component <b>delivers power and energy to the circuit.</b></p> <p>Example: Voltage source, current source (Battery, Diode, transistor).</p> <p>*Device which produces energy in the form of voltage or current.</p> <p>*Active component can control flow of current.</p> <p>*It is energy donor.</p>	<p>*Passive component <b>utilizes energy.</b></p> <p>Example: Resistors, capacitors, Inductors etc.</p> <p>*Device which stores energy in the form of voltage and current.</p> <p>*Passive component cannot control the flow of current.</p> <p>*It is energy Acceptor.</p>

## **PASSIVE COMPONENTS**

### **1. RESISTORS**

Resistors are passive components which oppose the current in a circuit. There are two types of resistors : (a) Fixed Resistors – Resistor value remains fixed. (b) Variable Resistors – Resistor value can be changed.

#### HOW TO MEASURE VALUE OF FIXED RESISTOR

STEP1: If resistor has 4 color bands, turn the resistor like that the gold and silver band is on the right side and other color band is in the lefthand side.

Step2: Then the first band is on the lefthand side. This represents the first digit. Based on color make a note of the digit.

Step3: The second band color represents the second digit.

Step4: Third band denotes the power of tolerance.

Step5: The Forth band denotes the tolerance.

Example:



$$10 \times 10^4 \text{ ohm} = 100 \text{ kohm} @ 5\%$$

5-Band-Resistor

234\*100kΩ = 23.4MΩ @ 0.25%

Color	Band 1	Band 2	Band 3	Multiplic.	Tolerance
Black	0	0	0	$10^0$ (1Ω)	
Brown	1	1	1	$10^1$ (10Ω)	± 1%
Red	2	2	2	$10^2$ (100Ω)	± 2%
Orange	3	3	3	$10^3$ (1kΩ)	
Yellow	4	4	4	$10^4$ (10kΩ)	
Green	5	5	5	$10^5$ (100kΩ)	± 0.5%
Blue	6	6	6	$10^6$ (1MΩ)	± 0.25%
Purple	7	7	7	$10^7$ (10MΩ)	± 0.1%
Gray	8	8	8	$10^8$ (100MΩ)	± 0.05%
White	9	9	9	$10^9$ (1GΩ)	
Gold				$10^{-1}$ (100mΩ)	± 5%
Silver				$10^{-2}$ (10mΩ)	± 10%

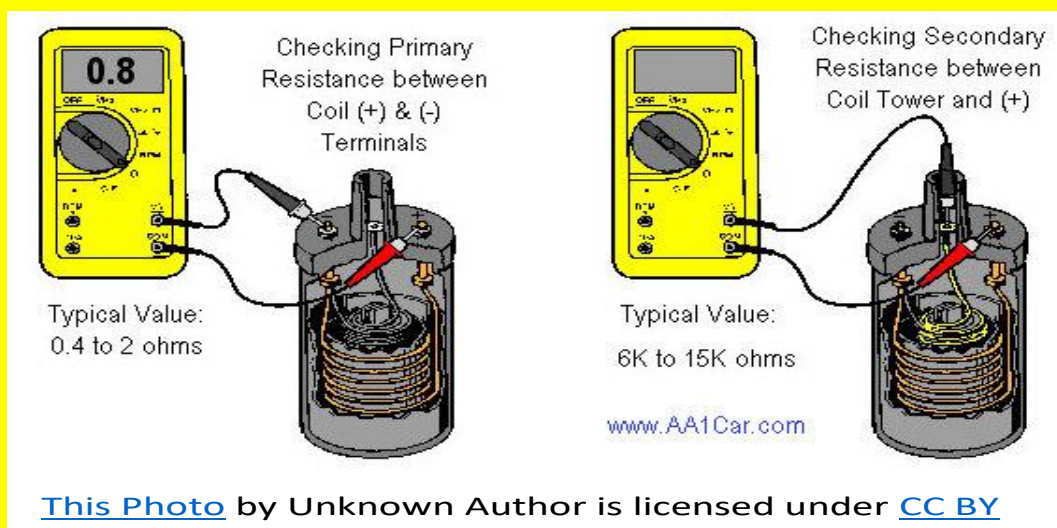
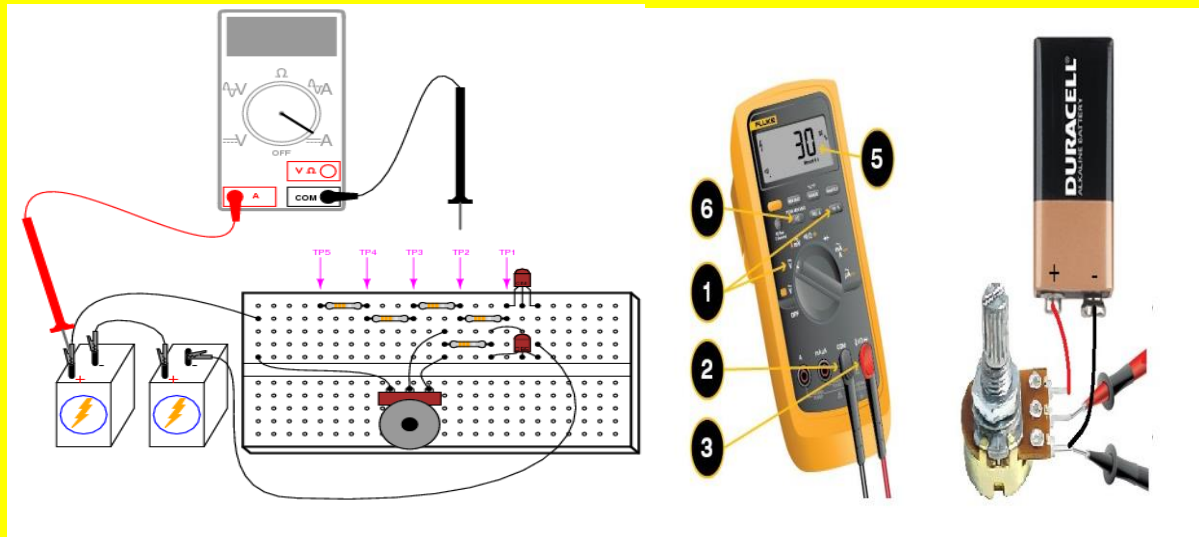
4-Band-Resistor

23\*10kΩ = 230kΩ @ 0.5%

## HOW TO MEASURE VALUE OF VARIABLE RESISTOR

For measuring the value of fixed resistor we use multimeter





Step1: Arrange the multimeter.

Step2: Put the positive hand of multimeter into positive terminal of knob and negative hand of multimeter into negative terminal of knob. Then we observe multimeter show a value.

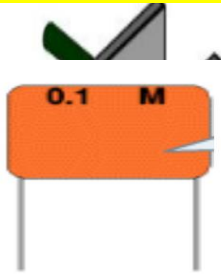
Step3: As we rotate the knob, we get different values of resistor in multimeter.

## 2. CAPACITORS

Capacitors are used to store charge, for voltage pulsation, power conditioning, as a sensor, in tuning circuit and filter circuit. Unit of capacitance is Farad ( microfarad, nanofarad, picofarad ).

## CONSTRUCTION OF CAPACITOR

- \* Capacitor is made up of two metallic plates separated by an insulator like mica, bekalite, rubber etc.



### How to find capacitance value



This type of capacitor is called ceramic capacitor. It is a type of fixed capacitor. The capacity of this capacitor is in the picofarad to a few micro farad. They are used for both AC and DC. Numbers are used to denote value of capacitance. 1<sup>st</sup> digit and 2<sup>nd</sup> digit are the numbers. 3<sup>rd</sup> digit is the numbers of zeros to be put. Value is measured in picofarad. 104 means  $100000\text{pF} = 100\text{ nF} = 0.1\text{ microfarad}$ . J is 5% tolerance. 33KV is maximum operating voltage value.

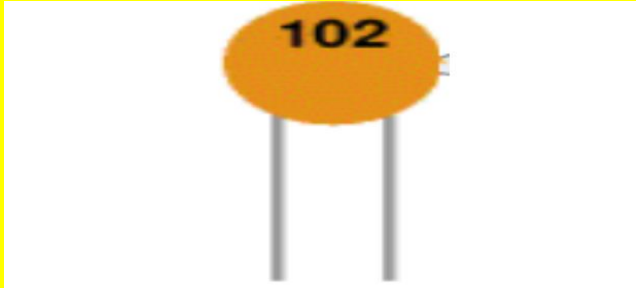


This capacitor is tantalum bead capacitor. It is polarized and it has two voltage rating. The positive sign is used to show positive component lead. Its capacitance range is 1 micro farad to 100 micro farad.

\*This capacitor is unpolarized capacitor. The value printed but without a multiplier, so you need to use experience to work out what the multiplier

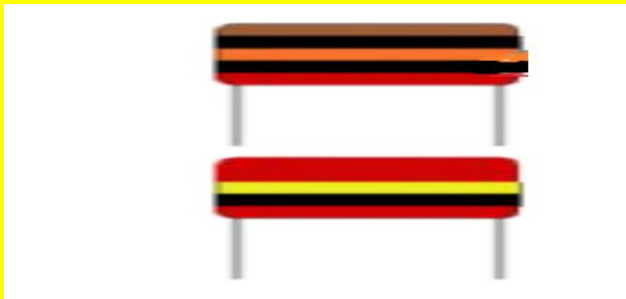
should be! For Example 0.1 means 0.1 pF. Sometimes the multiplier is used in place of the decimal point.

### UNPOLORISED CAPACITOR (capacitor number code)



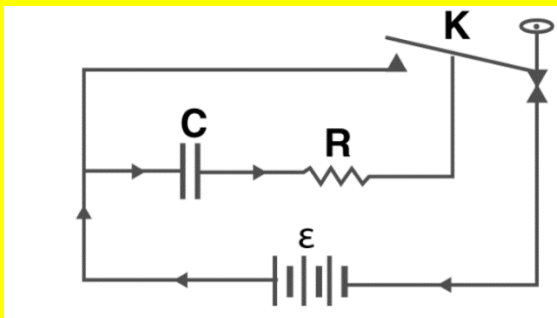
A number code is often used on small capacitors where printing is difficult: The 1st number is the 1st digit, the 2nd number is the 2nd digit, the 3rd number is the number of zeros to give the capacitance in pF. Ignore any letters - they just indicate tolerance and voltage rating. 102 means  $1000\text{pF} = 1\text{nF}$

### UNPOLORISED CAPACITOR (capacitor color code)



In this type of capacitor we measure the value by color from up to down. Here, 1<sup>st</sup> band denote 1<sup>st</sup> digit, 2<sup>nd</sup> band denote 2<sup>nd</sup> digit, 3<sup>rd</sup> band denote multiplier, 4<sup>th</sup> band denote tolerance and 5<sup>th</sup> band denote voltage.

### Charging And Discharging Of A Capacitor Through A Resistor





### 3. INDUCTORS

Inductor is used to store energy in magnetic field, for tuning circuits, as a filter, used in a relay, as ferrite beads.

### Mathematical notation of inductance

$$L = V \, dt/di \text{ ( unit is Henry )}$$



### NOTE:

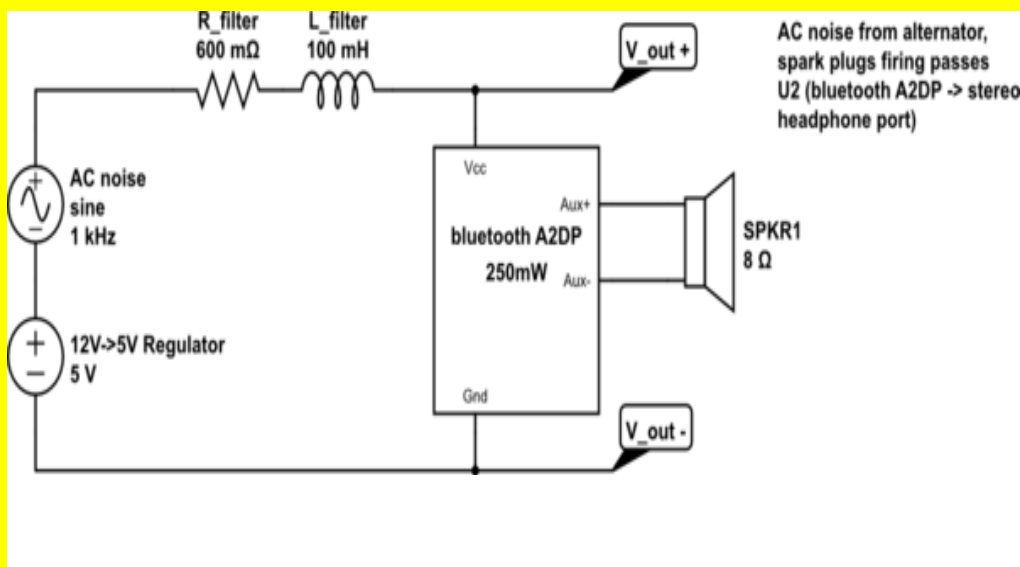
$$*L \propto N^2.$$

$$*L \propto A$$

$$*L \propto 1/\text{length}$$

### WORKING OF SPARK PLUG

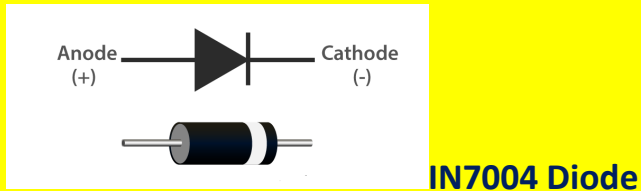
When switch is opened, the inductor opposes change in flux by inducing a current in it. A large potential difference develops across the inductor for change to jump the spark plug gap.



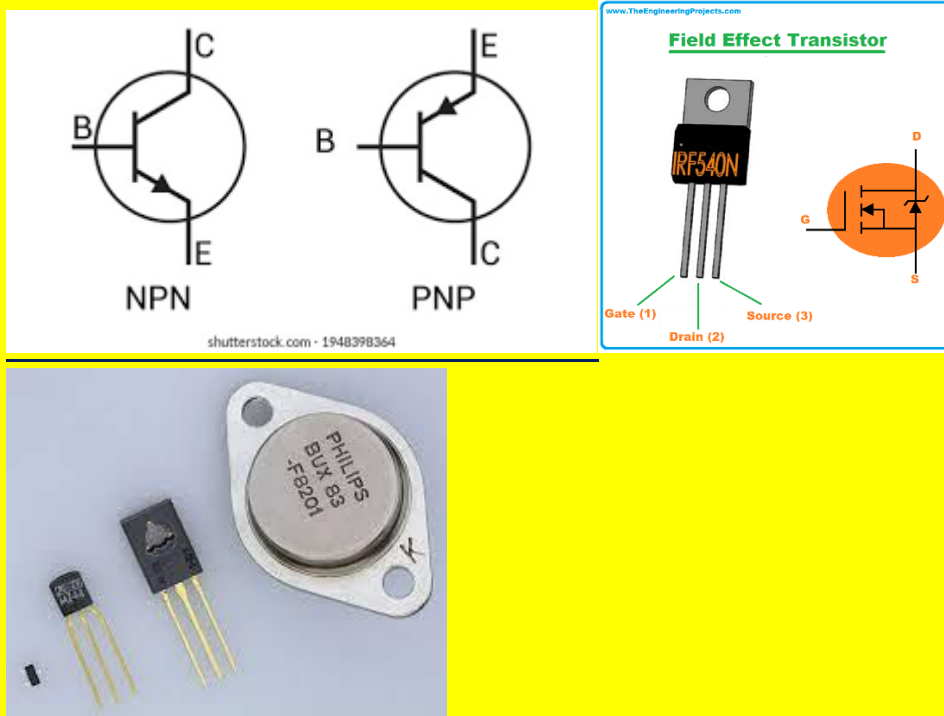


## **ACTIVE COMPONENTS**

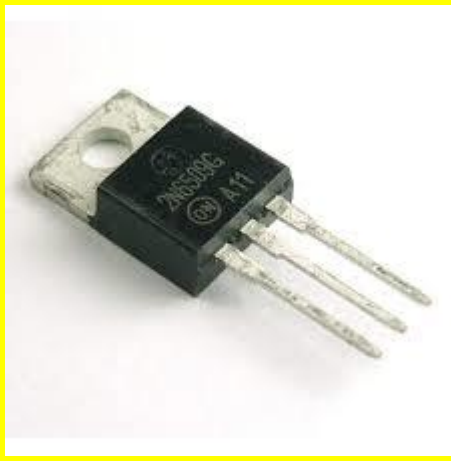
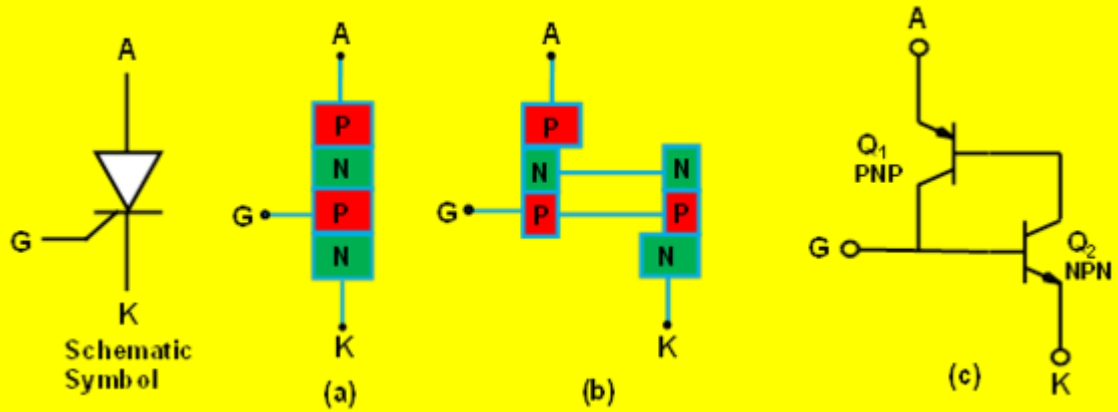
1. **DIODE** : Diode is a semiconductor device (P-N junction device) that allows flow of current in one direction. Different types of diode are Light emitting diode (LED), Laser diode, Zener diode, Photodiode, Avalanche diode, Schottky diode.



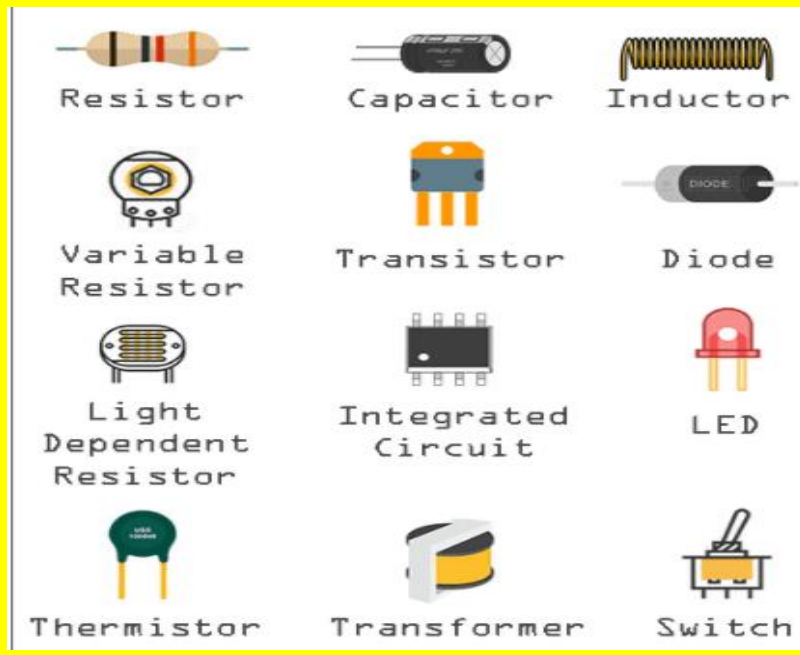
2. **TRANSISTOR** : Transistor is a three terminal semiconductor device (pnp or npn) used to amplify or switch electrical signals and power. It is one of the most basic building blocks of modern electronics. Two types of transistors are 1. Bipolar ( having three terminals: collector, base, emitter) and 2. Field Effect transistor ( having Gate, Drain, Source as terminals).



3. **SILICON CATHODE RECTIFIER ( SCR )** : A silicon controlled rectifier or semiconductor controlled rectifier is a four-layer solid-state current-controlling device. The name "silicon controlled rectifier" is General Electric's trade name for a type of thyristor.



### **SOME IMPORTANT NOTATION OF ACTIVE AND PASSIVE COMPONENTS.**



### OBSERVATIONS:

1. Few active and passive components were studied and measured their values.
2. Few experiments were performed to understand working of capacitor. **videos were recorded.**

### PRECAUTIONS:

1. Handle components carefully.
2. Keep working area dry.
3. Always wear hand gloves.

