



Al-MUSTAQBAL UNIVERSITY

*Department of Medical Physics
College of science*

Analog electronics laboratory

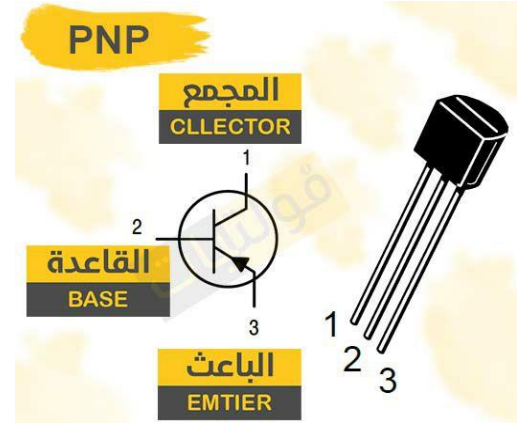
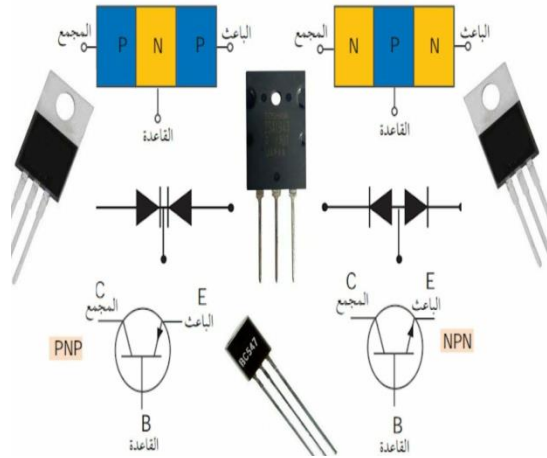
The third stage, morning and evening

Four experience

Transistor bias

BY

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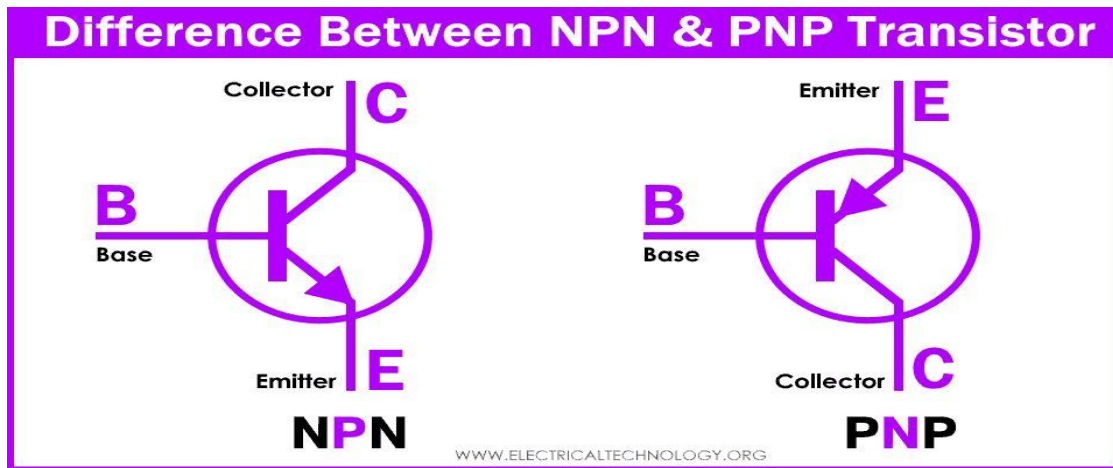
The theoretical Part:-

Transistor:- It is a crystal of a semiconductor material inlaid with germanium or silicon. It contains a very thin crystal such that the middle region of it is a positive or negative semiconductor, and the two outer regions between them are called the base. It has a great ability to amplify electronic signals.

Transistor installation

The transistor consists of three poles, where the emitter and collector are connected to an external circuit, while the third terminal connects the base to an internal circuit. However, raising the voltage applied to the base slightly leads to the entry of a large number of electrons into the base through the forward-biased junction, and this number varies according to the strength of the voltage and because the base area is very thin, the voltage source in the external circuit can attract electrons across the reverse biased junction, and as a result, a strong current flows through the transistor and through the external circuit. In this way, the

flow of a strong current through the external circuit can be controlled by providing the base with a small signal.



The importance of the transistor:-

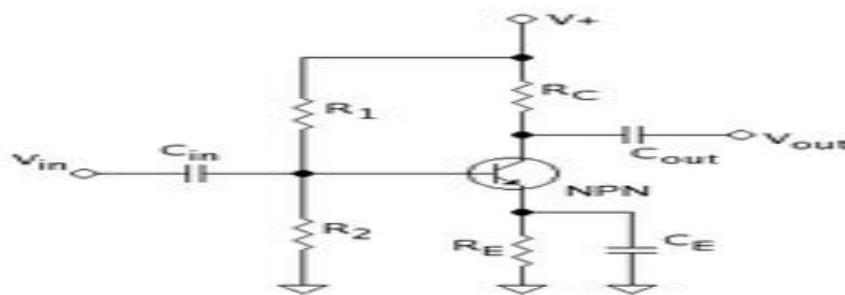
The transistor is the most important modern electronic component and is considered one of the greatest inventions of the twentieth century. Its importance in the life of society derives from the superior ability to produce it using automated processes (semiconductor manufacturing processes, which makes its production low-cost). Although many companies annually produce more than a billion separate transistors, the vast majority of the transistors produced are in integrated circuits, which are abbreviated to IC. These integrated circuits contain many switches, diode connections, resistors, capacitors, and other electronic components, which represent a circuit. It is fully electronic and performs a specific function. There are also logic gates that consist of a number of switches, which may reach twenty to make one logic gate. One of the most important features of the switch is its low cost, flexibility in use and stability, which made it widely used and widespread. Switches have entered into mechanical control circuits and replaced The mechanical tools that were used in this, and a microcontroller can also be used to

write a small program to perform the required control function that is equivalent to the task carried out by the mechanical design.

“Uses of transistor”

Using a transistor as an amplifier:- The transformer with the emitter connected to the ground is designed to respond to small signals entering the base and amplify these signals on the output at the collector. There are many configurations of amplification circuits, which have different features, whether for current, voltage, or both, depending on what is required. In some mobile phones and televisions, there are many Products in which the transformer is used as an amplifier, such as loudspeakers, radio transmission, or signal processing.

Transistor as a switch:- The switch is the most electronic switch, whether in low-power circuits, such as logic gates, or high-power circuits, such as power supply switches. Examples of light switches include emitter circuits connected to the ground.



استخدام الترانزستور كمكبر إشارة

Transistor features:-

1- Small size and weight, which leads to the development of electronic circuits to be very small.

2-Automated manufacturing processes that reduce the cost per unit.

3-The small voltages that it can operate on make it suitable

4-There is no need for a warm-up cycle for cathode heaters after power is applied.

5-Low power consumption and high energy efficiency.

6-High reliability and physical endurance.

7-Long lifespan, as some of them work for more than fifty years.

8-The presence of complementary devices and the ease of building identical integrated circuits, which is impossible in the case of valves.

9-Insensitivity to mechanical shock and vibration, which facilitates the solution of this problem, for example in the case of microphones.

Reasons for replacing diodes with transistors:-

1-There is no electrical energy consumption to heat the cathode.

2-The small size and light weight of the transistor allows the creation and manufacture of electrical circuits in a small size.

3- The transistor operates at a voltage much lower than the voltage needed to operate the LED (the anode voltage of the triode is about 200 volts, while the downstream voltage of the transistor is 12-30 volts).

4-The transistor does not require primary heating.

5-It emits less dissipated heat energy and has higher efficiency.

6-Continuity of work and ability to withstand shocks.

7-Longer lifespan: Some electronic devices are still working for about 50 years.

8-The transistor allows the operation of complex compact regulations, something that did not exist with electronic valves.

9-The sensitivity of some transistors to light makes them used in photography

Practical part:-

the purpose of the experiment:-

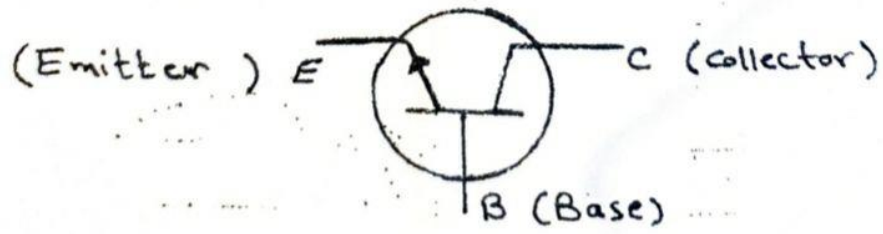
Identify the transistor and ways to connect it, study the characteristics of the transistor, and calculate the hybrid coefficients.

Used equipments:-

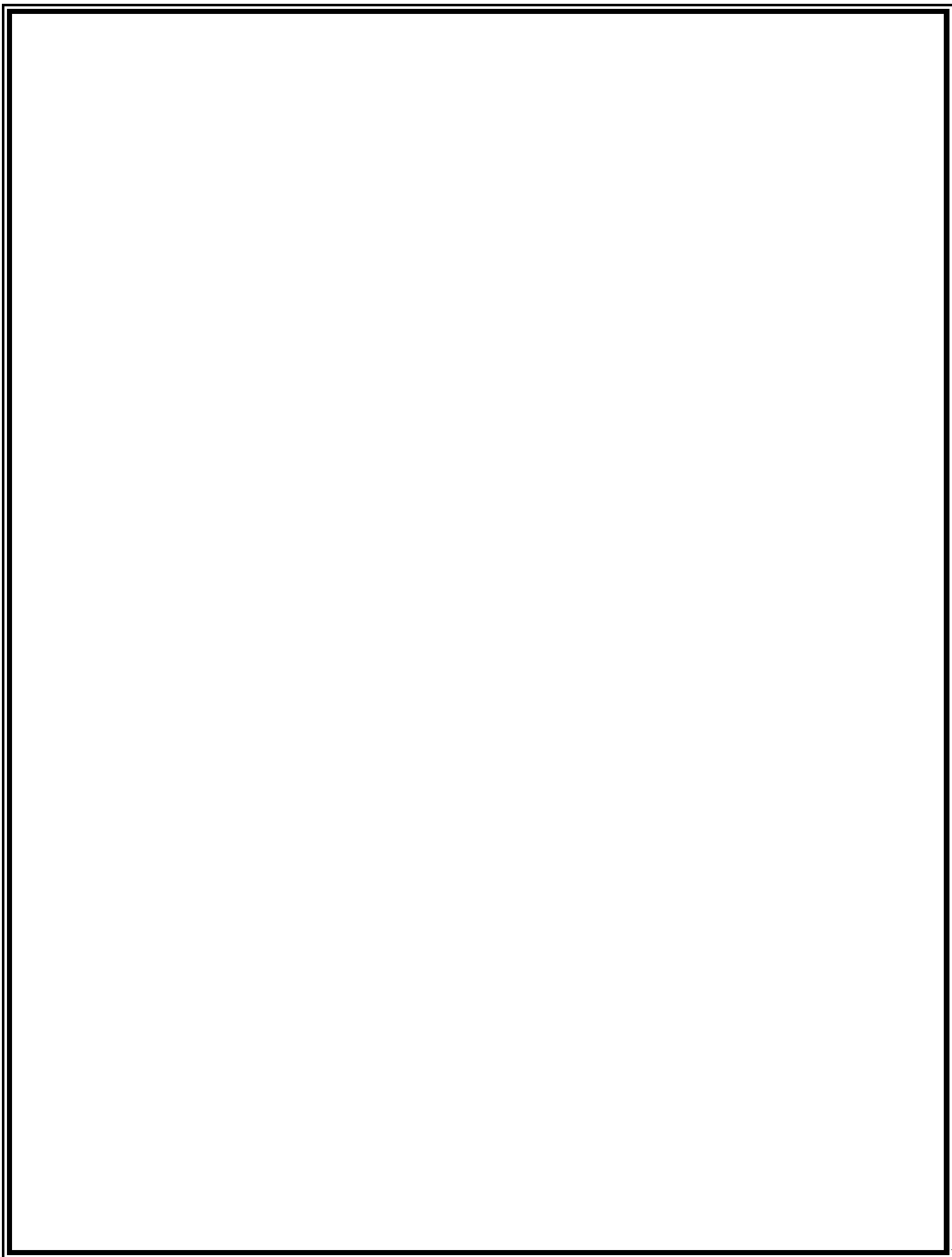
- 1- Transistor
- 2- Resistors
- 3- Continuous power supply.
- 4- Multi-gradation current and voltage measuring devices

Action Steps:(دراسة خصائص الترانزستور PNP)

We connect the drawn circuit one at a time, then change the DC source to several voltages and note the current reading for each voltage.

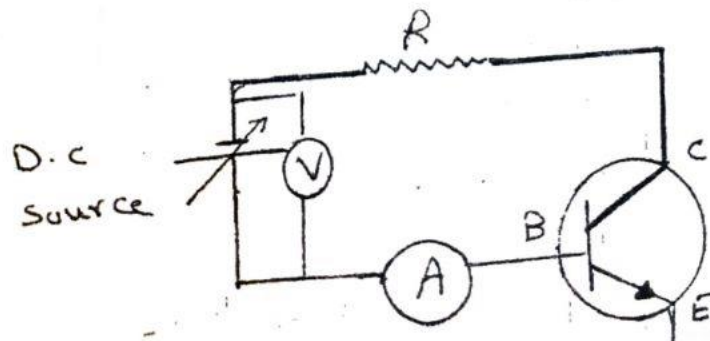
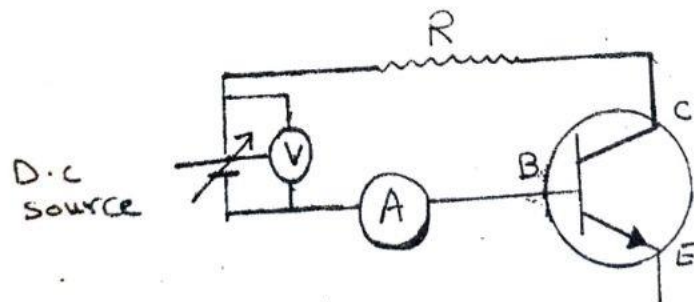
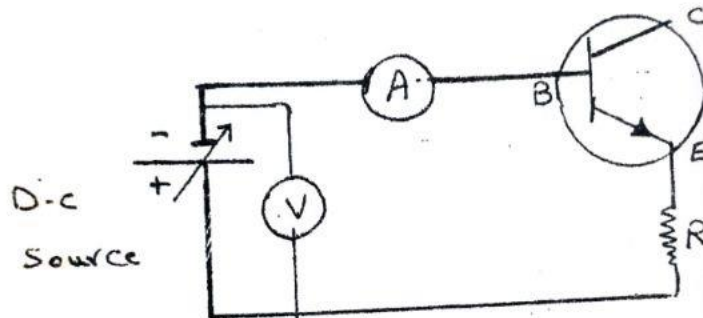
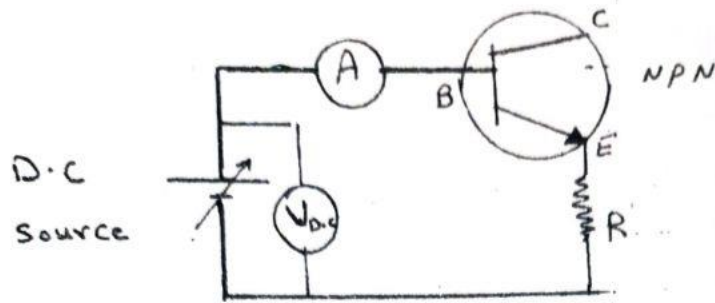


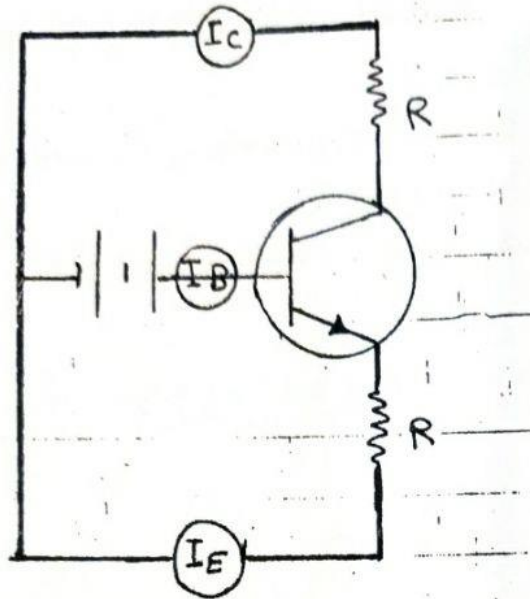
NPN ترانزیستور



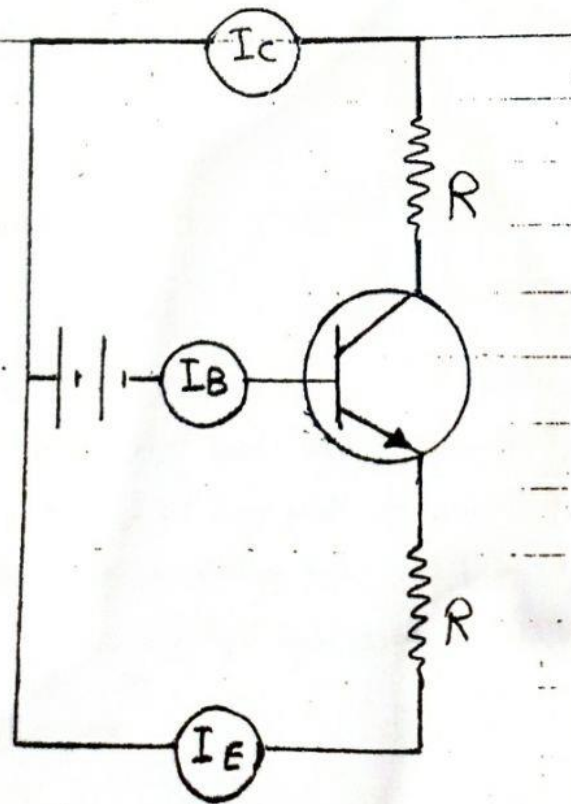
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دائرة :-



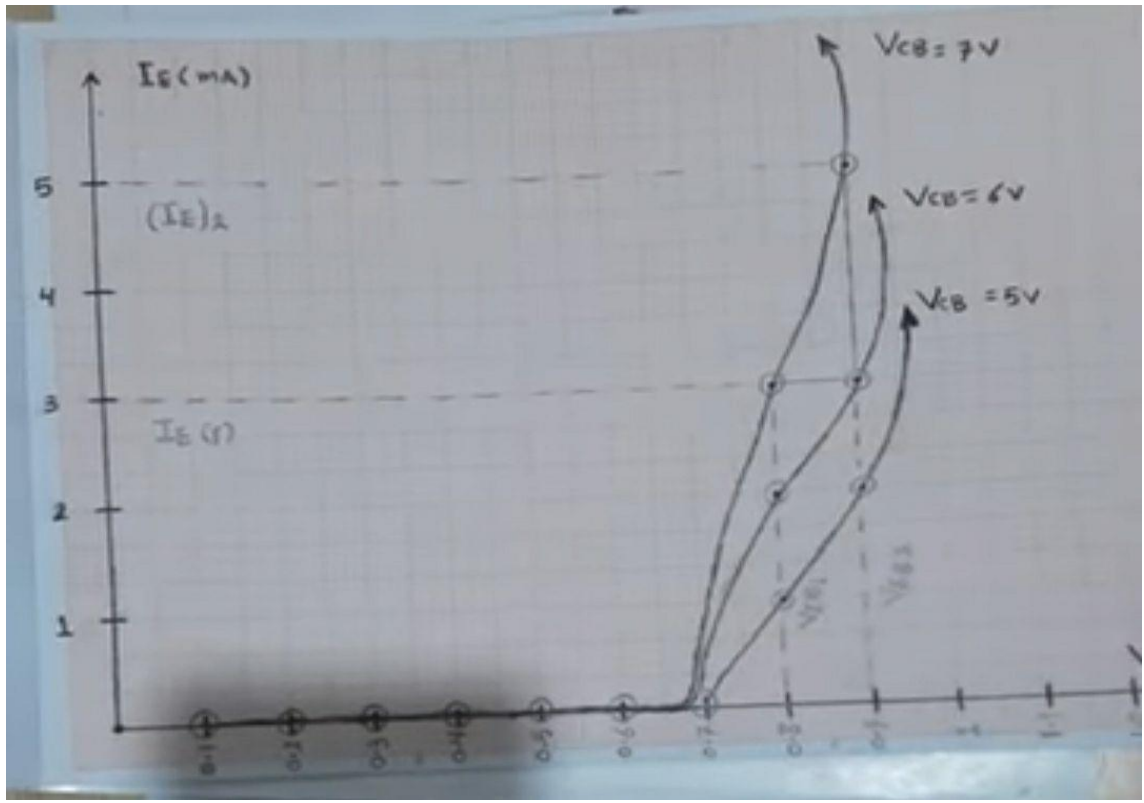


(5)



(6)

EB(Volt)	VCB=5V	VCB=6V	VCB=7V
0	0	0	0
0.1	0	0	0
0.2	0	0	0
0.3	0	0	0
0.4	0	0	0
0.5	0	0	0
0.6	0	0	0
0.7	0	0	0
0.8	1	2	3
0.9	2	3	5



Discussion and questions:-

Through the circuits you connected, explain the relationship between the transistor and the diode. Does our statement that the transistor is a diode agree with your results? How would these circuits work if the transistor were PNP, and why?