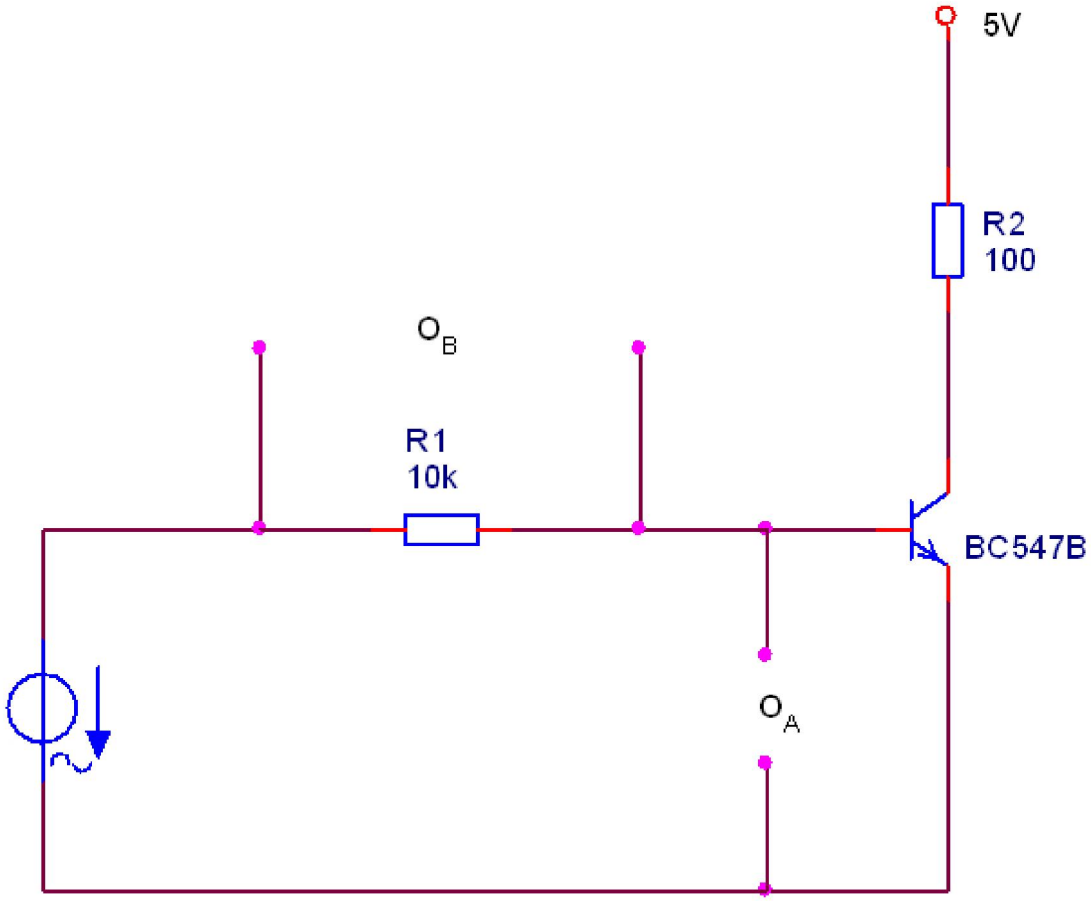
EXP (1) **Input characteristic**

Circuit diagram

The following circuit diagram is used for this experiment:



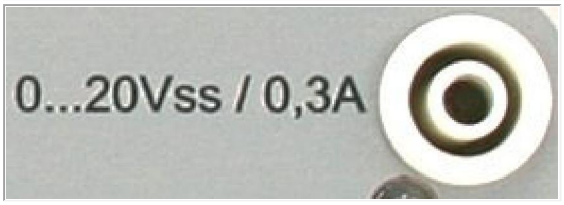
Components

The following components are needed for this experiment:

Parts	Id no.	Designation
3	SO5126-5M	Cables
13	SO5124-6F	Bridges, small
1	PS4121-2N	R 100
1	PS4121-3Q	R 10k
1	PS4123-1C	NPN BC 547

Cable connections

The following cable connections are used in this experiment:

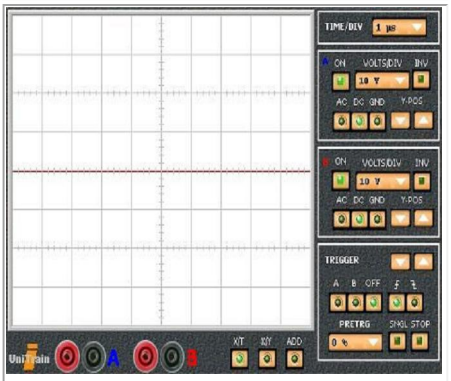
Designation	Symbol	Equipment	Sockets
FG		FUNCTION GENERATOR	
DC 5V		MULTI POWER SUPPLY 60VA / 500KHz	
GND		MULTI POWER SUPPLY 60VA / 500KHz	

Connect the specified sockets to the plug connections designated in the layout diagram.

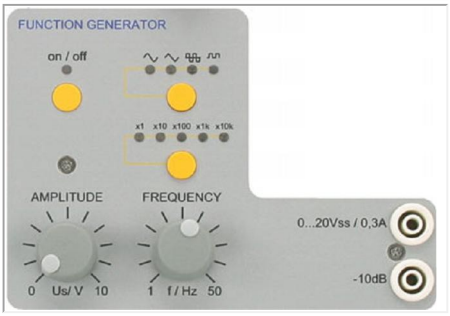
Equipment

The following equipment is needed for the experiment including the corresponding settings:

Equipment	Settings



	Channel A	Channel B
Sensitivity	200 mV/DIV	2 V/DIV
Coupling	DC	DC
Polarity	norm	norm
y-pos	0	0
Time base	2 msec/DIV	
Mode	X/Y	
Trigger channel	-	
Trigger edge	-	

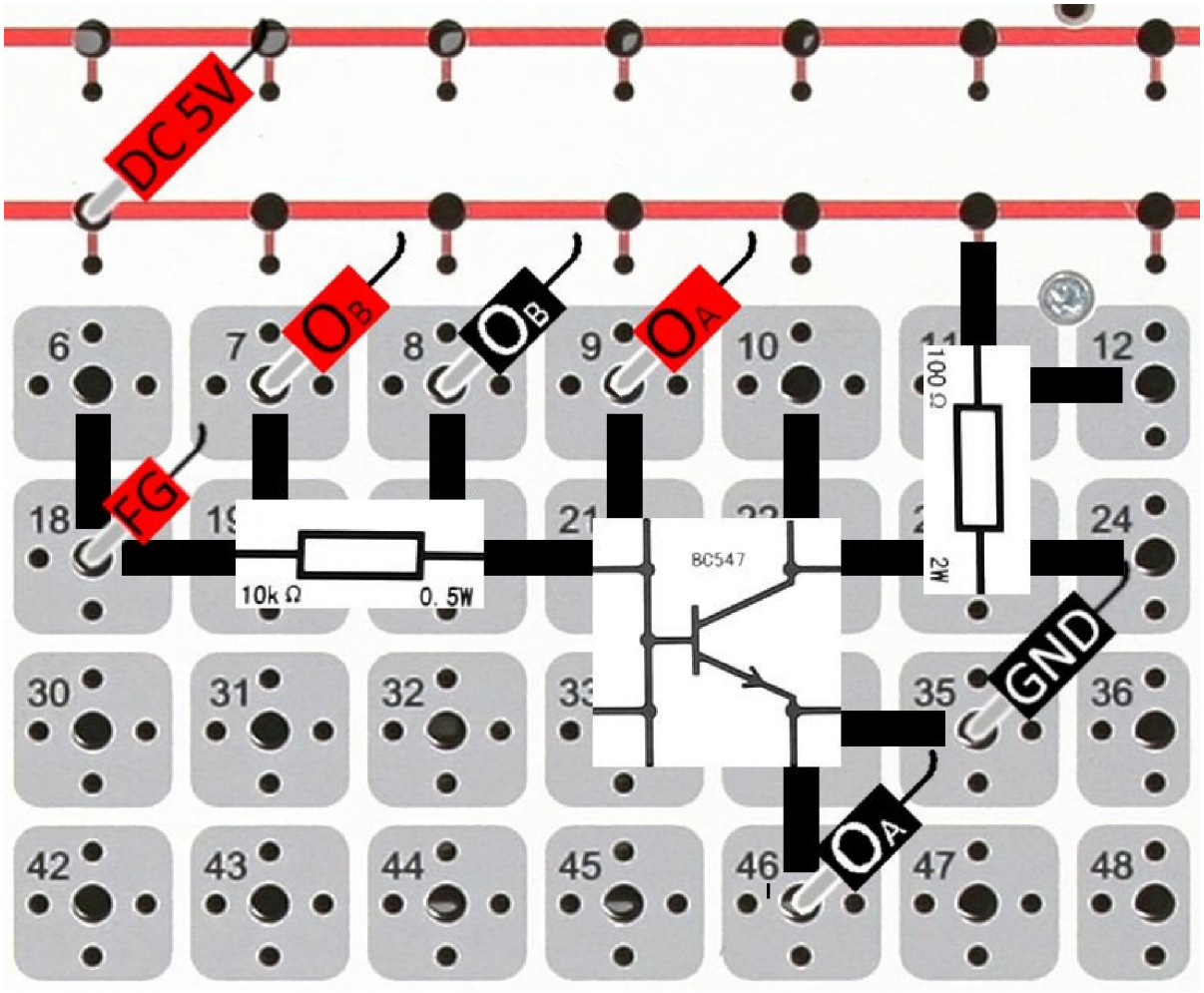


Curve shape	sinusoidal
Amplitude	7 V
Frequency Factor	x1
Frequency	50 Hz

Experiment set-up

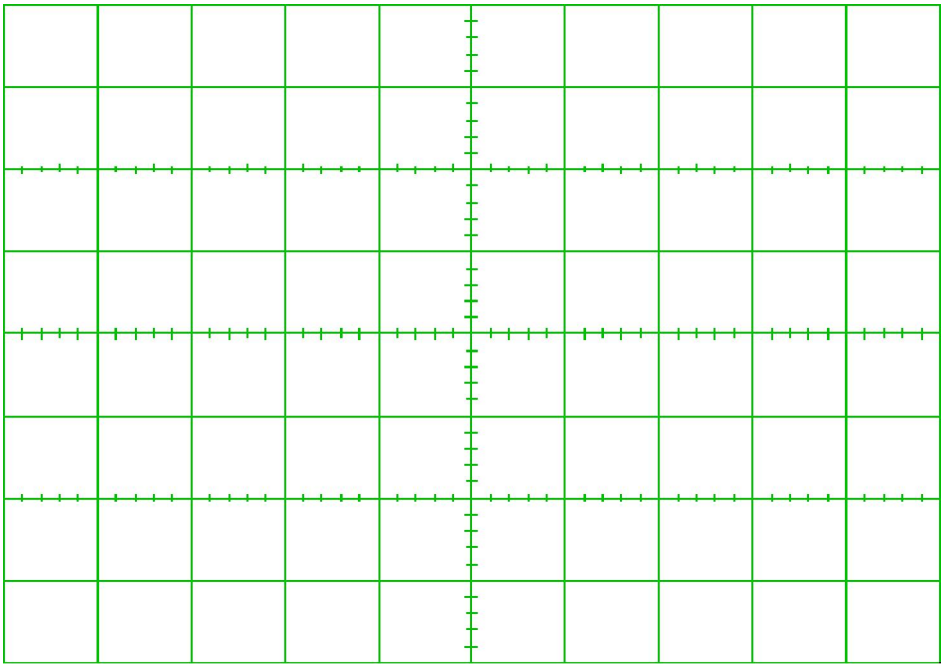
Now set up the experiment as a testing station in the top right corner of the patch panel. Begin with the following components:

- Bridging plugs
- Electronic components
- Measuring instruments and cables



Experiment procedure and exercises

Display the input characteristic of the transistor on the oscilloscope.

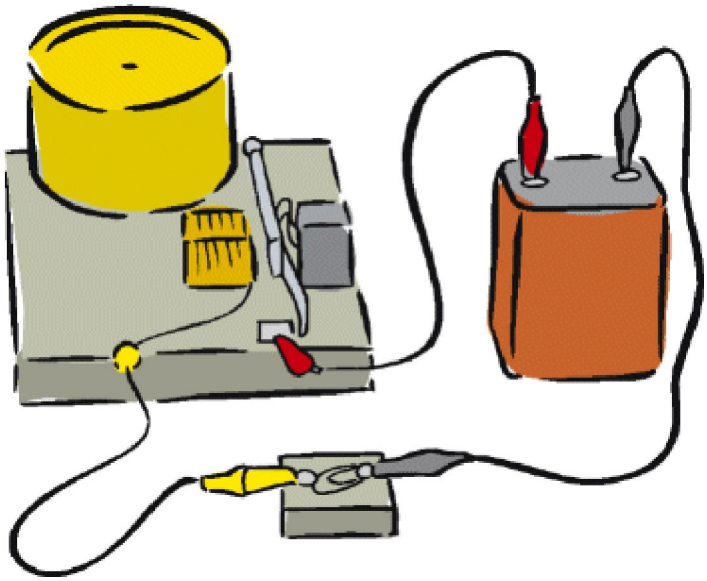


Which of the following statements about the transistor's input characteristic is correct?

- ☐ The characteristic corresponds to that of a resistor.
- ☐ The characteristic corresponds to that of a diode.
- ☐ The current through the base of the transistor initially increases very weakly and then abruptly.
- ☐ The voltage at the base is proportional to the current flowing through the resistor.
- ☐ The current flowing through the resistor is proportional to the voltage across the resistor.

Measure VBE by avometer and record its value

Transistor operating as a switch



Training objectives and introduction

This experiment demonstrates how the common emitter configuraiton can be used as a switch

Training content

- Transistor operating as a switch

Introduction

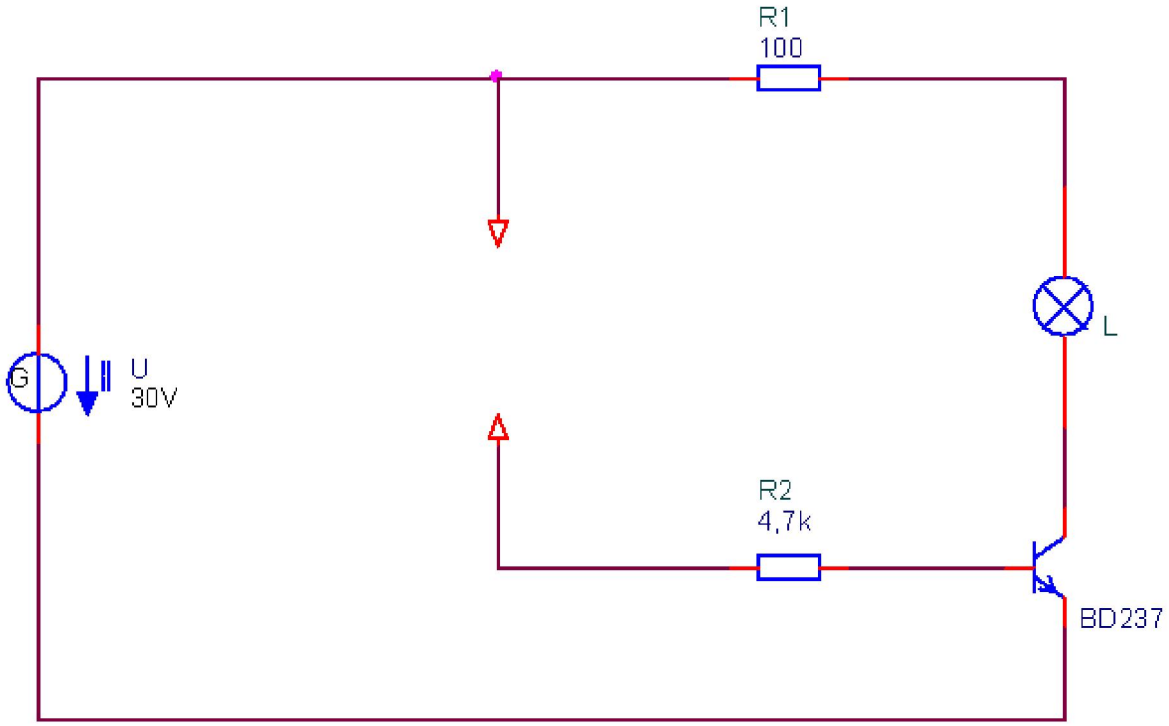
Here the DC behaviour of the transistor is demonstrated. If the transistor is not conducting then the voltage at the connection terminal should be the same as the supply voltage since thanks to resistor R2 it is connected to the positive rail. However, if the transistor is fully conductive, the terminal is connected by the transistor to the zero-volt rail. Provided that the internal resistance of the transistor is considerably less than the level of R2, the voltage at the output should drop to almost zero. However, this is only true if sufficient voltage is applied to the common base thereby injecting enough charge carriers to permit a current to flow between the emitter and the base.

The value at which this happens is determined in the experiment. It can also be observed that the voltage drops rapidly as soon as the threshold voltage has been reached. In both extreme cases the output is decribed as saturated. In both of these conditions the transistor can be seen as fully conductive or fully blocking.

Experiment procedure

Circuit diagram

The following circuit diagram is used for this experiment:



Components

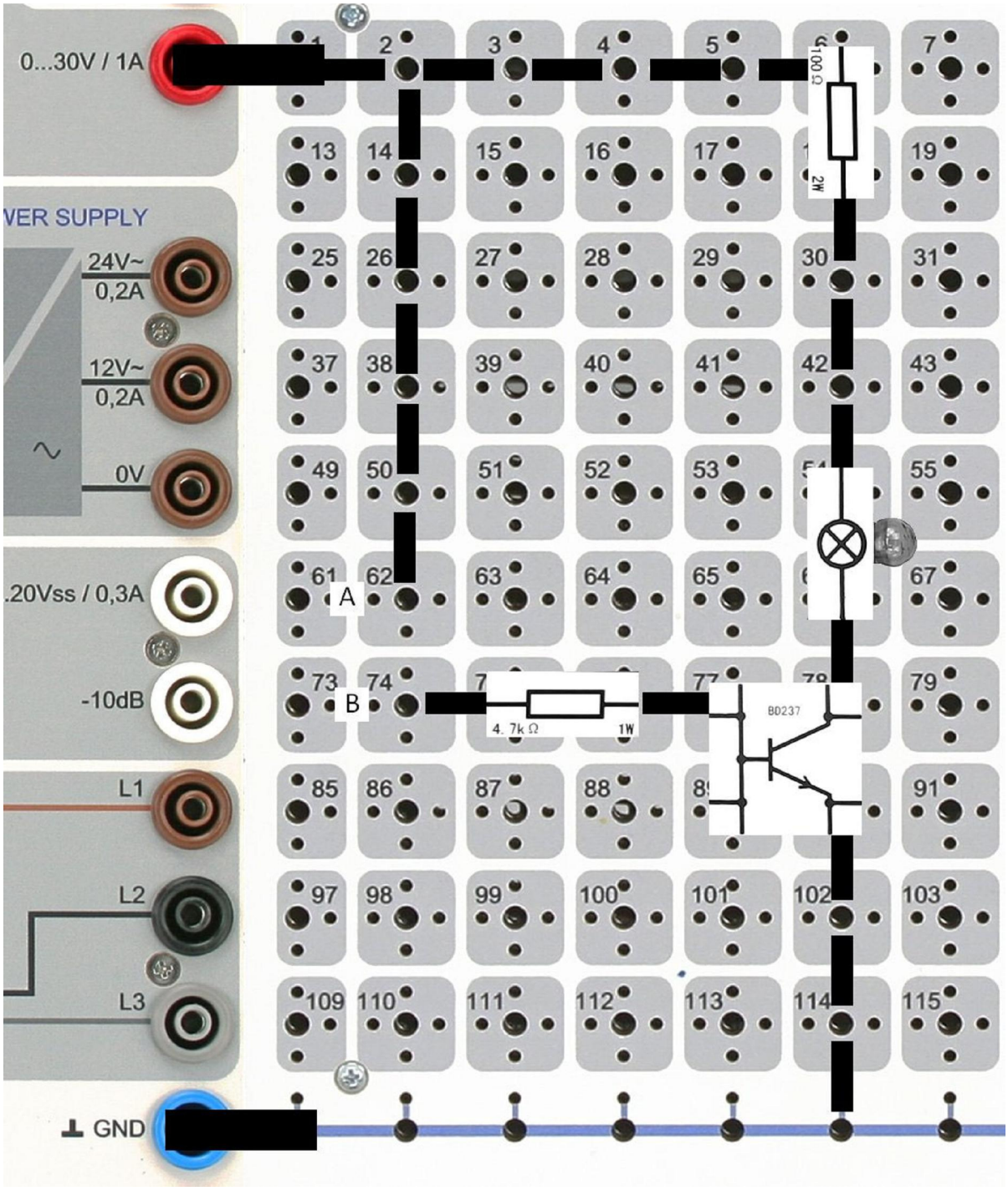
The following components are used for this experiment:

Parts	Id no.	Designation
0	SO5126-5M	Cables
2	SO5126-5E	Bridge, large
2	SO5124-6F	Bridge, small
1	PS4123-8P	Lamps, 15V E10
1	PS4121-2N	R 100
1	PS4121-3L	R 4.7k
1	PS4123-1G	NPN BD 237

Experiment set-up

Now please set up the experiment on the plug-in patch panel in the following sequence.

- Bridging plugs, starting at pad 110
- Electronic components
- Measuring instruments and cables



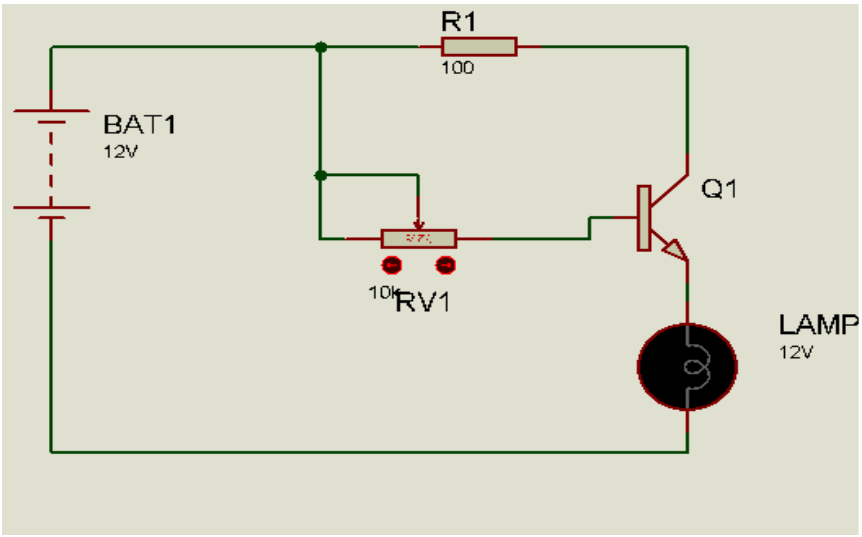
Experiment procedure and exercises

Connect one cable each to position A and one cable to position B. Set the power supply to 30 V. Touch both ends of the cable. What can you observe?

- ☐ The lamps light up and remain lit continuously.
- ☐ The lamps light up as soon as contact is made at both ends. Current flows through the fingers to the lamp.
- ☐ The lamp lights up, the current flowing through the body is amplified by the transistor multiply and is able to light up the lamp.
- ☐ The lamp lights up as soon as contact is made with both ends.
- ☐ The lamp never lights up because the voltage is far too low.

The current flowing through the body at this low voltage is harmless. Several answers are possible.

Now Connect the circuit below , fixed dc supply 12V and a variable resistance 10K connected to the base of the BJT, record when the intensity of lamp increases and decreases



(a) If R2 increases, tha lamp intensity .....

(b) If R2 decreases , the lamp intensity .....

(c) state why ?.....

EXP (3)

Light Dectecting Resistor (LDR)

Objective:

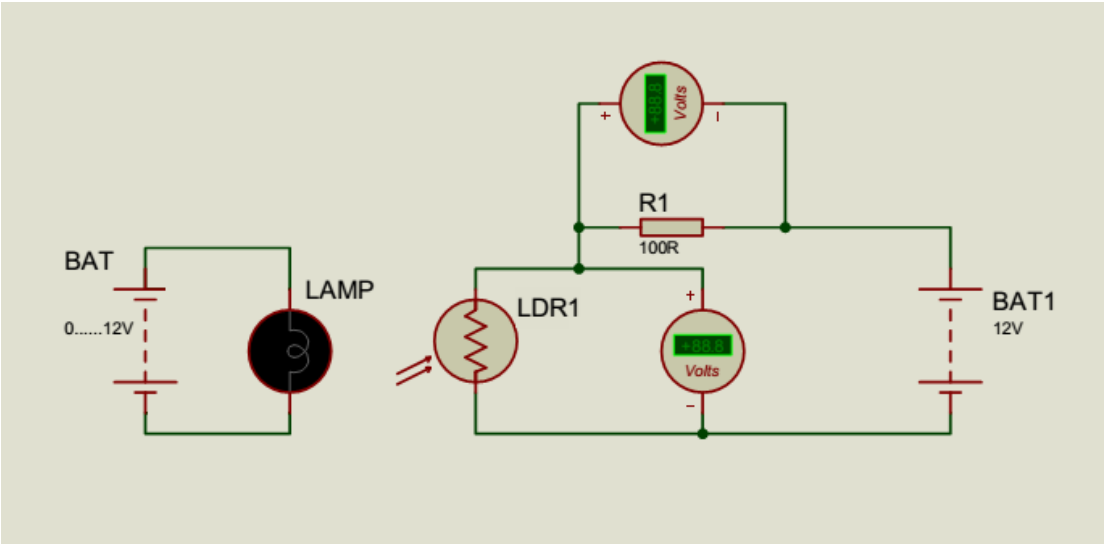
Determine the resistance of an LDR as a Function of the illumination factor of an incandescent lamp

Experiment Equipment:

1. **Power supply unit 12V.**
2. **2 multi-meters.**
3. **Resistor 100Ω or 220 Ω.**
4. **Photo-resistor LDR.**
5. **Lamp socket.**
6. **Trainer board.**

Procedure:

1. **Construct the circuit shown below.**
2. **Cover the LDR completely from the lamp and any external light and measure the voltage across it, and the current through it.**
3. **Now, be sure that LDR is as near as possible from the lamp, then Repeat step 2 by exposure LDR to the lamp only and still opaque from external light.**
4. **Write down the measured and calculated results.**
5. **Plot a graph of the resistance as a function of the illumination factor.**



EXP (3)

Light Dectecting Resistor (LDR)

RESULTS:

1. LDR Covered: V = …….. Volt; I=……mA; R_{LDR}=……..KΩ.

2- LDR resistance as a function of illumination factor

Vin(lamp)	4	5	6	7	8	9	10	11	12
V_{LDR}									
$I_{LDR}=V_{100}/100$ Or $V_{220}/220$									
$R_{LDR}= V_{LDR}/ I_{LDR}$									

3- Plot (R_{LDR} vertical versus V_{IN} (lamp) Horizontal)