ECEN 204
Lab Report 4
The Bipolar Junction Transistor

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1.

	Resistances
base-collector	483K4
base-emitter	489K9
collector-emitter	undefined

The base-[collector/emitter] were measured across the junction such that it is in forward bias direction, though the junction is **not biased**. There is a path for the test current to flow so a measurement could be read.

From collector to emitter the path is through two opposing junctions, so the path of the test current does not make it between the probes.

2.

Current through the transistor is dependant the current into the base, the resistor controls this by limiting current and the voltage at the base.

The maximum current that can flow through from emitter to collector mandated by the base current. Seen below:

R (K)	Ic (mA)	DVM (V)	Ib (mA)	β = Ic/Ib
1000	1.73	0.02	0.004255319149	406.55
900	1.83	0.022	0.004680851064	390.9545455

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10	10.1	1.354	0.2880851064	35.05908419
0	10.12	4.25	0.9042553191	11.19152941

3.

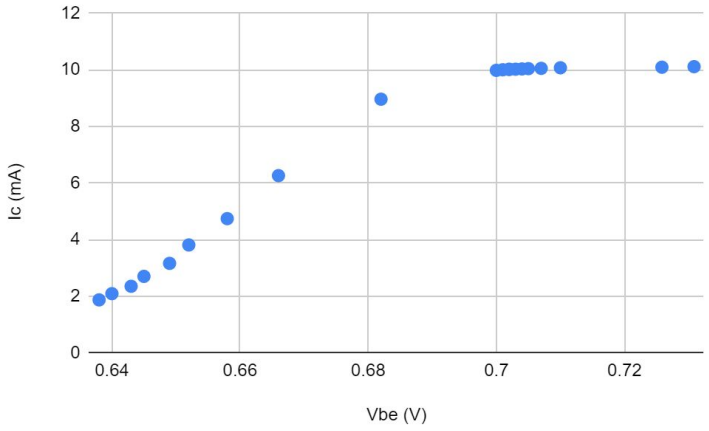
2	Tester
LMR	
CBE	
Hef	422
Ic	2.5mA
V-BE	0.77V
Ib	4.52mA
Ic (leakage)	0

The Tester show a beta value of 422, but this is in the linear (active) region of the transistor characteristic curves.

In the measurements taken, as R is decreased, The better value decreases as Ib increases faster than Ic.

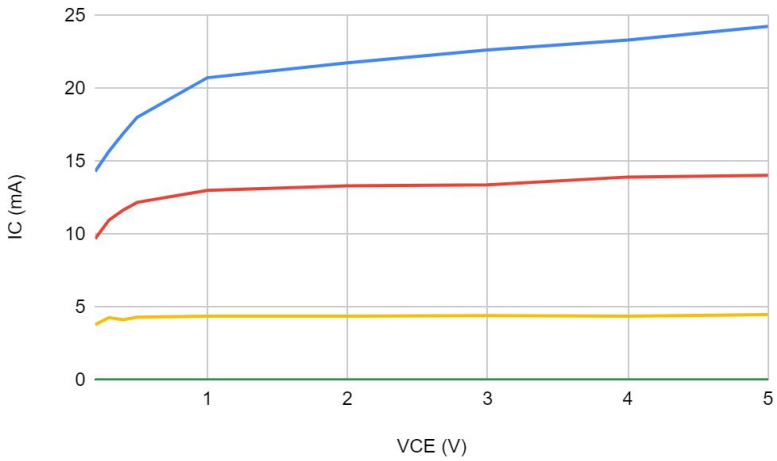
R (K)	Ic (mA)	DVM (V)	Ib (mA)	β = Ic/Ib
1000	1.73	0.02	0.004255319149	406.55
900	1.83	0.022	0.004680851064	390.9545455
800	2	0.025	0.005319148936	376
700	2.23	0.029	0.006170212766	361.4137931
600	2.48	0.034	0.007234042553	342.8235294
500	2.87	0.04	0.008510638298	337.225
400	3.42	0.051	0.01085106383	315.1764706
300	4.3	0.067	0.01425531915	301.641791
200	8.9	0.097	0.02063829787	431.2371134
100	10	0.19	0.04042553191	247.3684211
90	10.01	0.211	0.04489361702	222.971564
80	10.02	0.236	0.05021276596	199.5508475
70	10.03	0.267	0.05680851064	176.5580524
60	10.04	0.308	0.06553191489	153.2077922
50	10.05	0.364	0.07744680851	129.7664835
40	10.06	0.446	0.09489361702	106.0134529
30	10.07	0.574	0.1221276596	82.45470383
20	10.08	0.806	0.1714893617	58.77915633
10	10.1	1.354	0.2880851064	35.05908419
0	10.12	4.25	0.9042553191	11.19152941

4.



This chart shows the transistor zone from the saturation region to the linear region as the Voltage across the base-emitter junction breaches 0.7V. Ie going into forward bias.

5.



blue: Ib = 50 red: Ib = 30 yellow: Ib = 10 green: Ib = 0

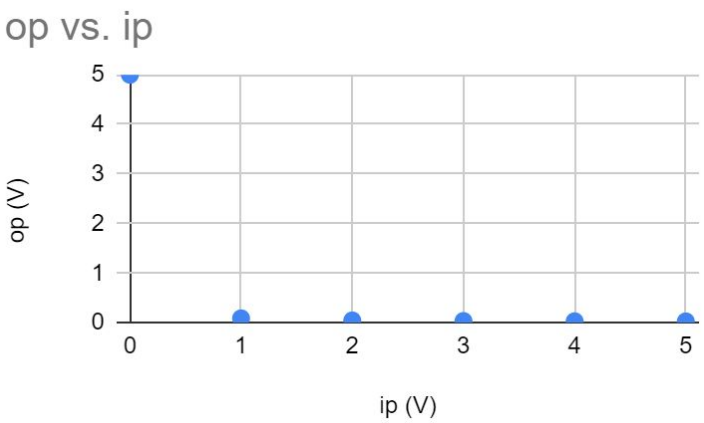
Regions:

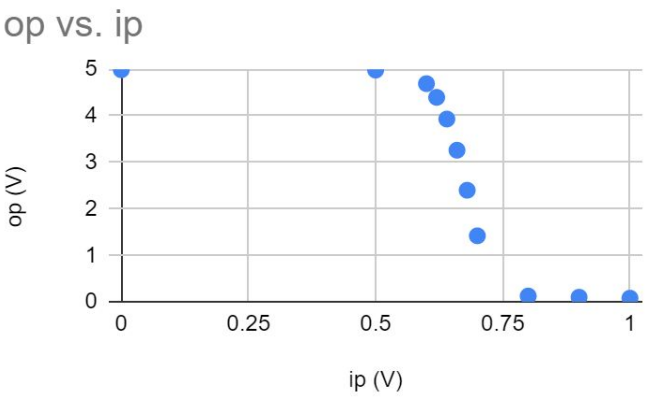
Between VCE = 0.5 → 1V onwards the transistor transitions into the active/linear region and before that is in saturation.

50	485 (upper) : 414.6 (lower)
30	468 (upper) : 433 (lower)
10	448 (upper) : 437 (lower)
0	Undefined

These values are reasonable close considering the resolution of the measurements. They also so the characteristic divergence as VCE increases.

6.





These curves show the rapid voltage transition when the input voltage reaches 0.7 volts in. This shows a very clean level if voltage detection, ie useful for a switch/sensor (with voltage scaling).