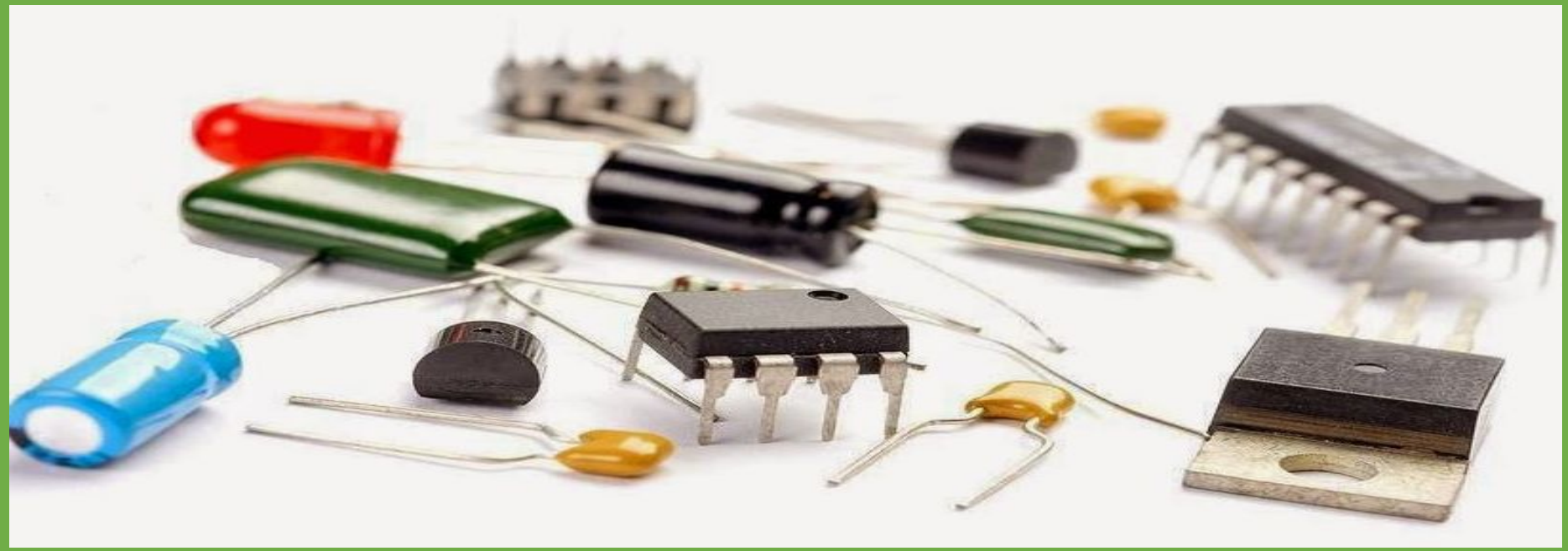


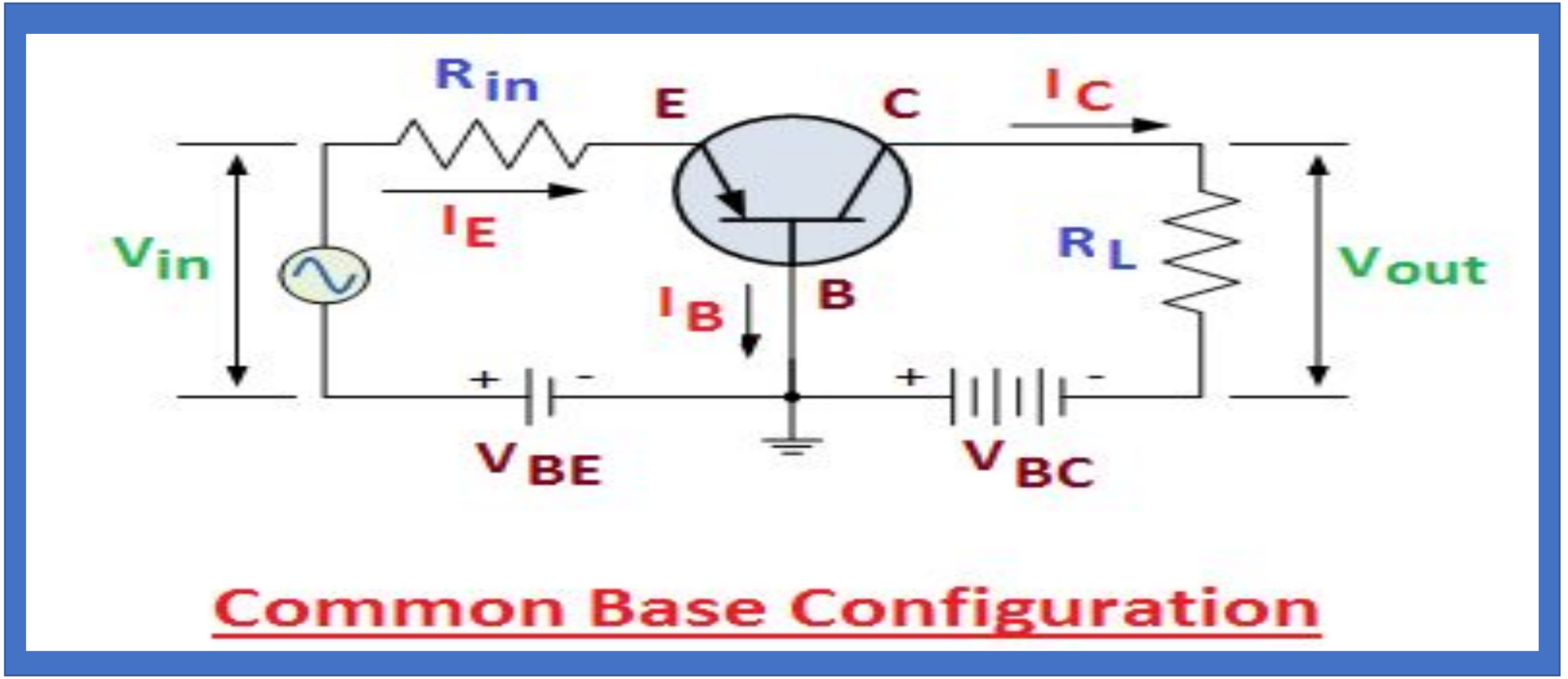
CHAPTER 1- INTRODUCTION OF ELECTRONIC DEVICES

-MRS RASIKA B. NAIK

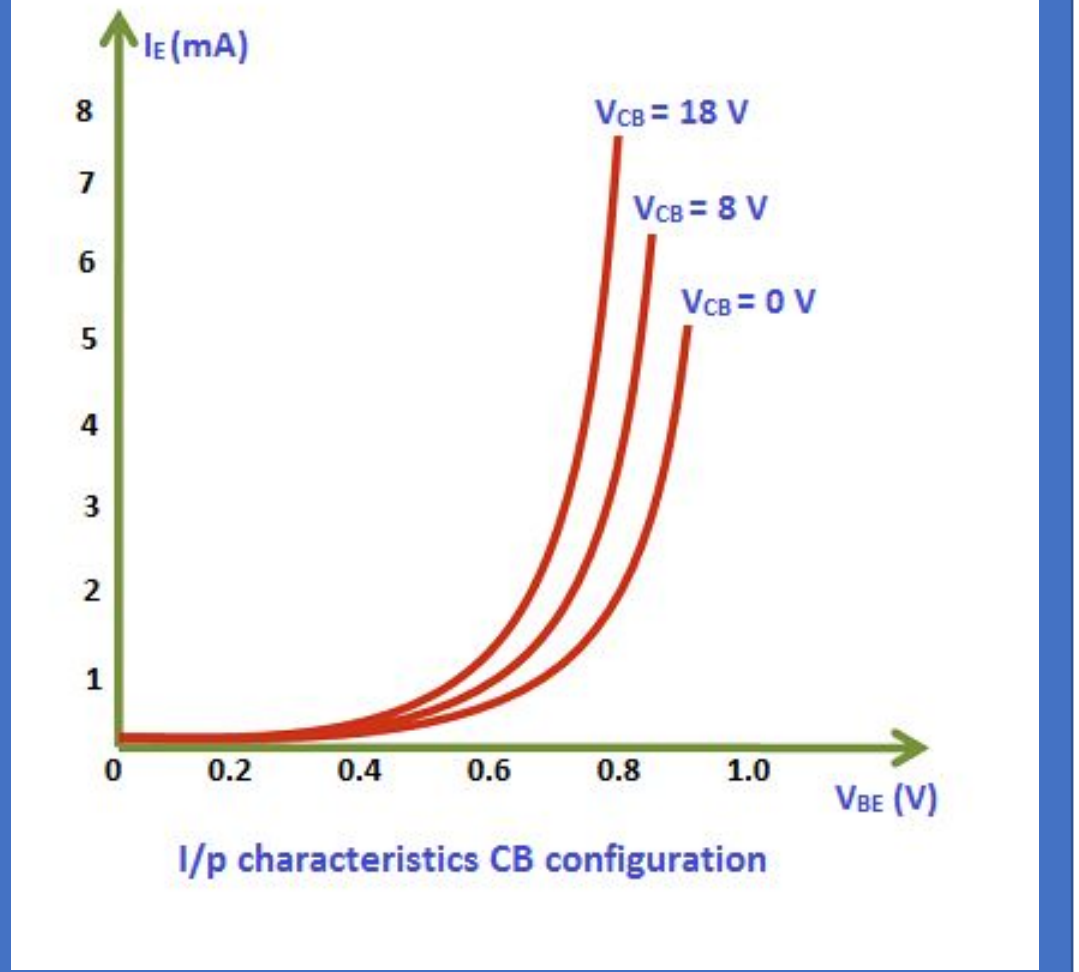
POINTS TO BE COVERED IN TODAYS CLASS

- DC Load Line analysis
- Common Base Configuration
- Input Output Characteristics of CB configuration
- Common Collector Configuration
- Input Output Characteristics of CC configuration
- Comparison of CE, CB and CC

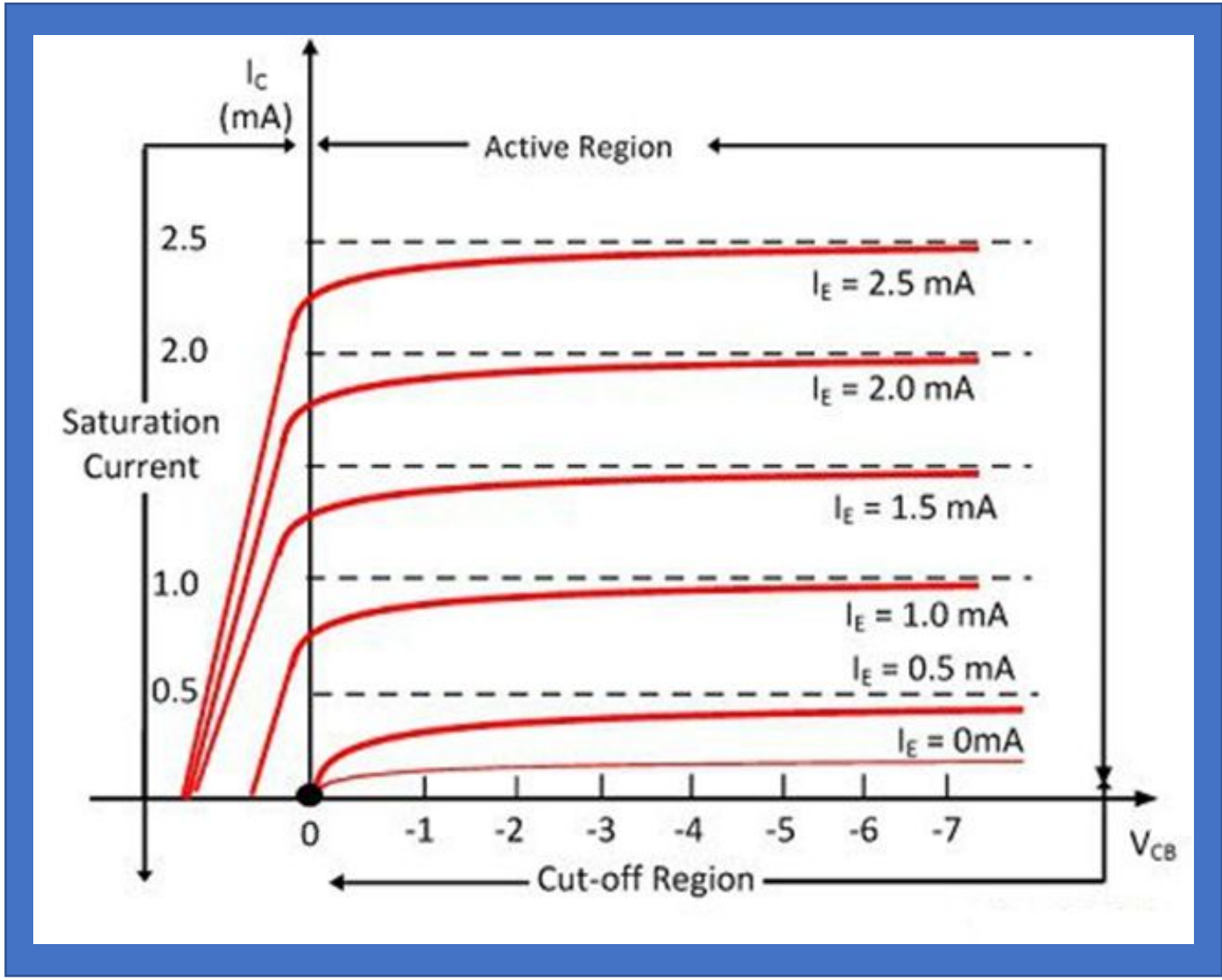
COMMON BASE CONFIGURATION



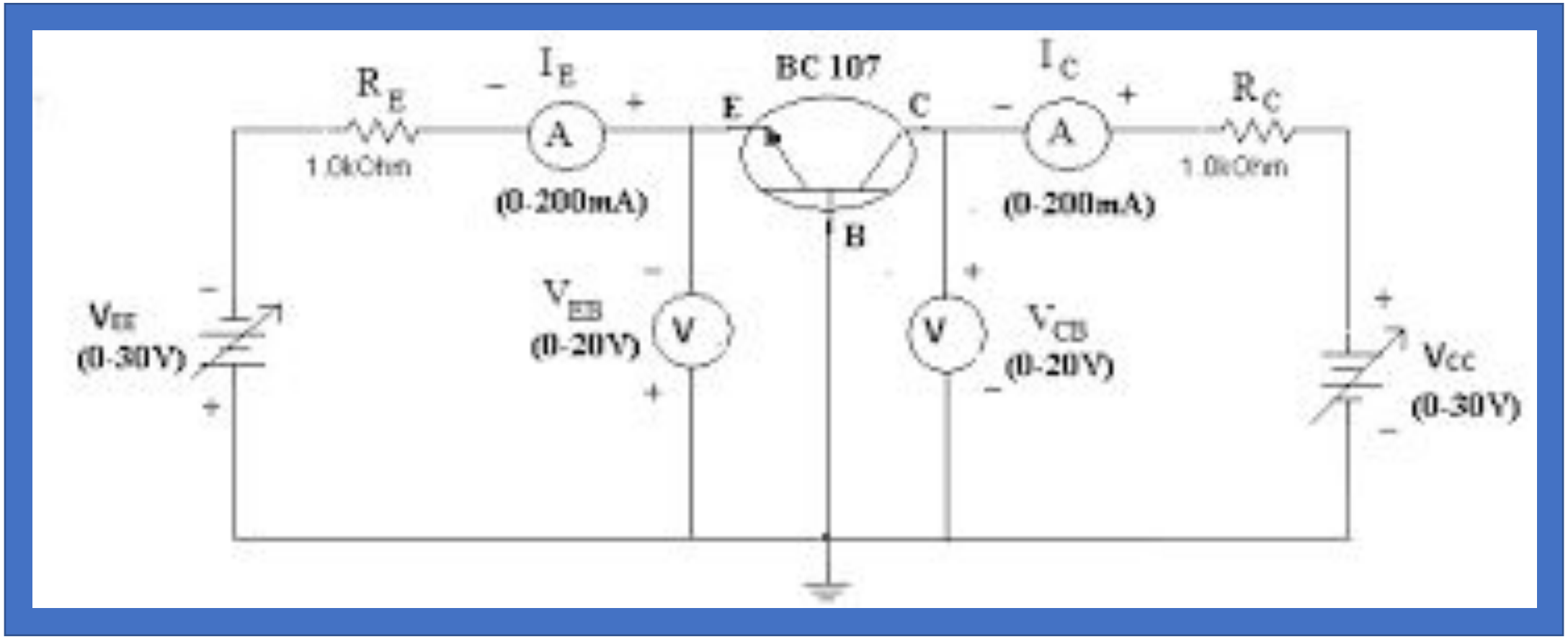
INPUT OUTPUT CHARACTERISTICS OF CB AMPLIFIER



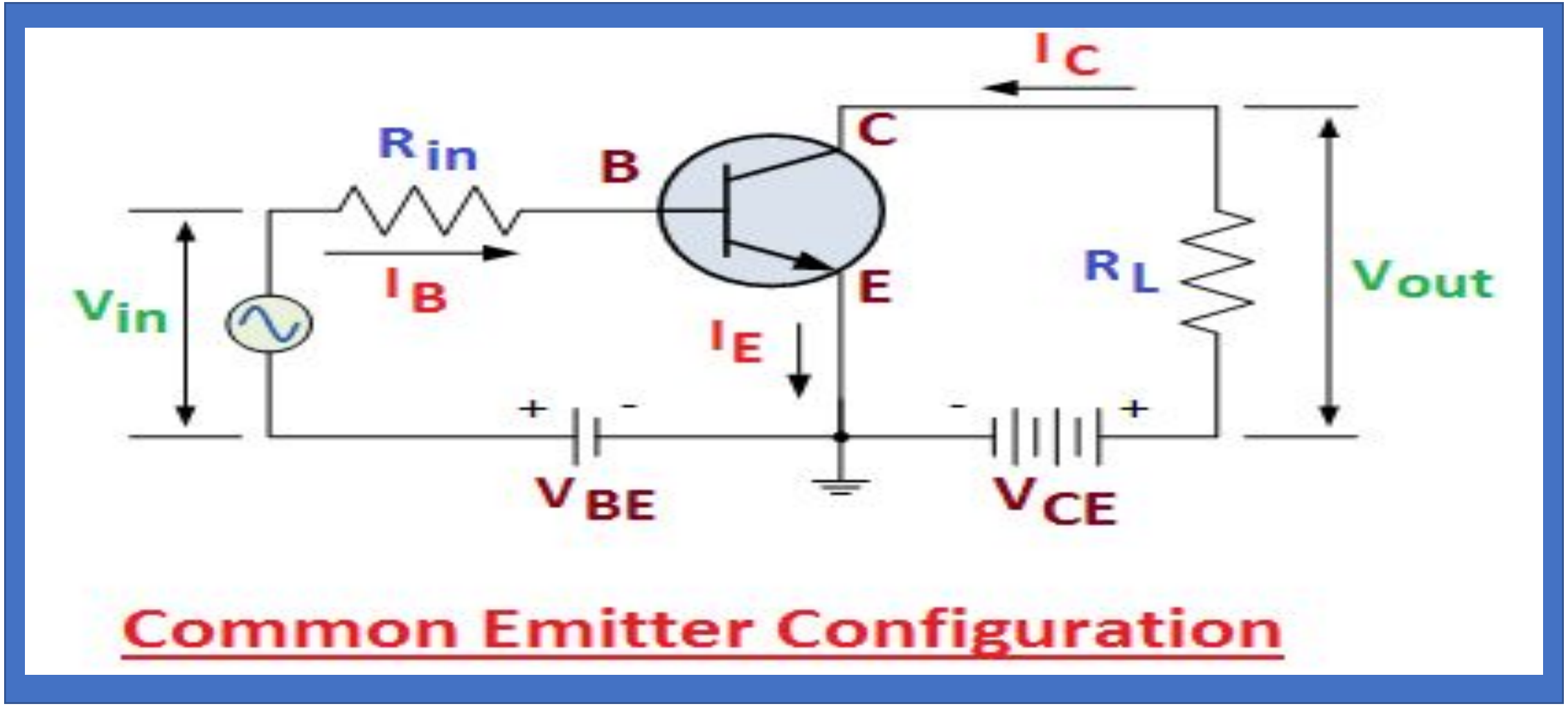
I/p characteristics CB configuration



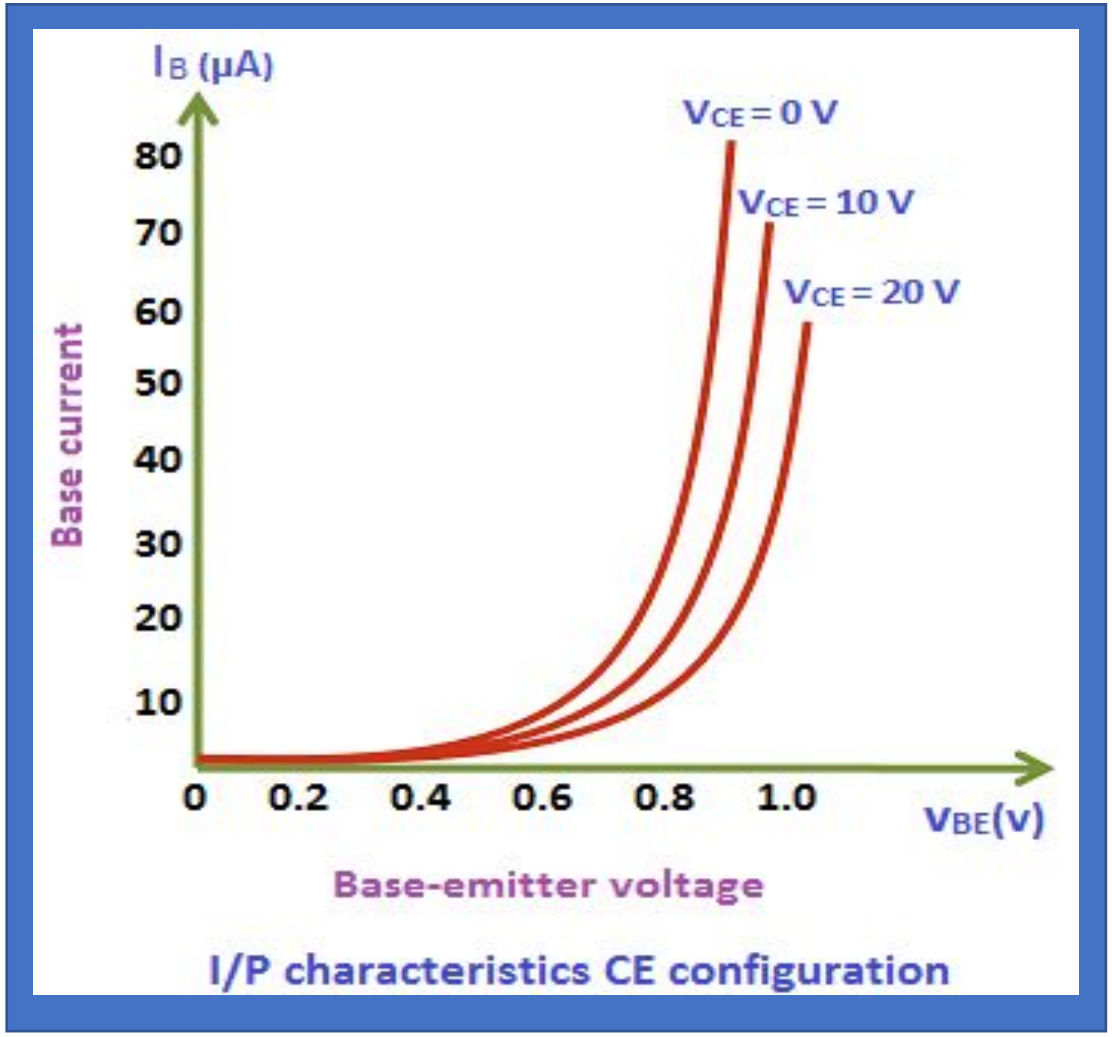
CIRCUIT ARRANGEMENT TO FIND INPUT AND OUTPUT CHARACTERISTICS

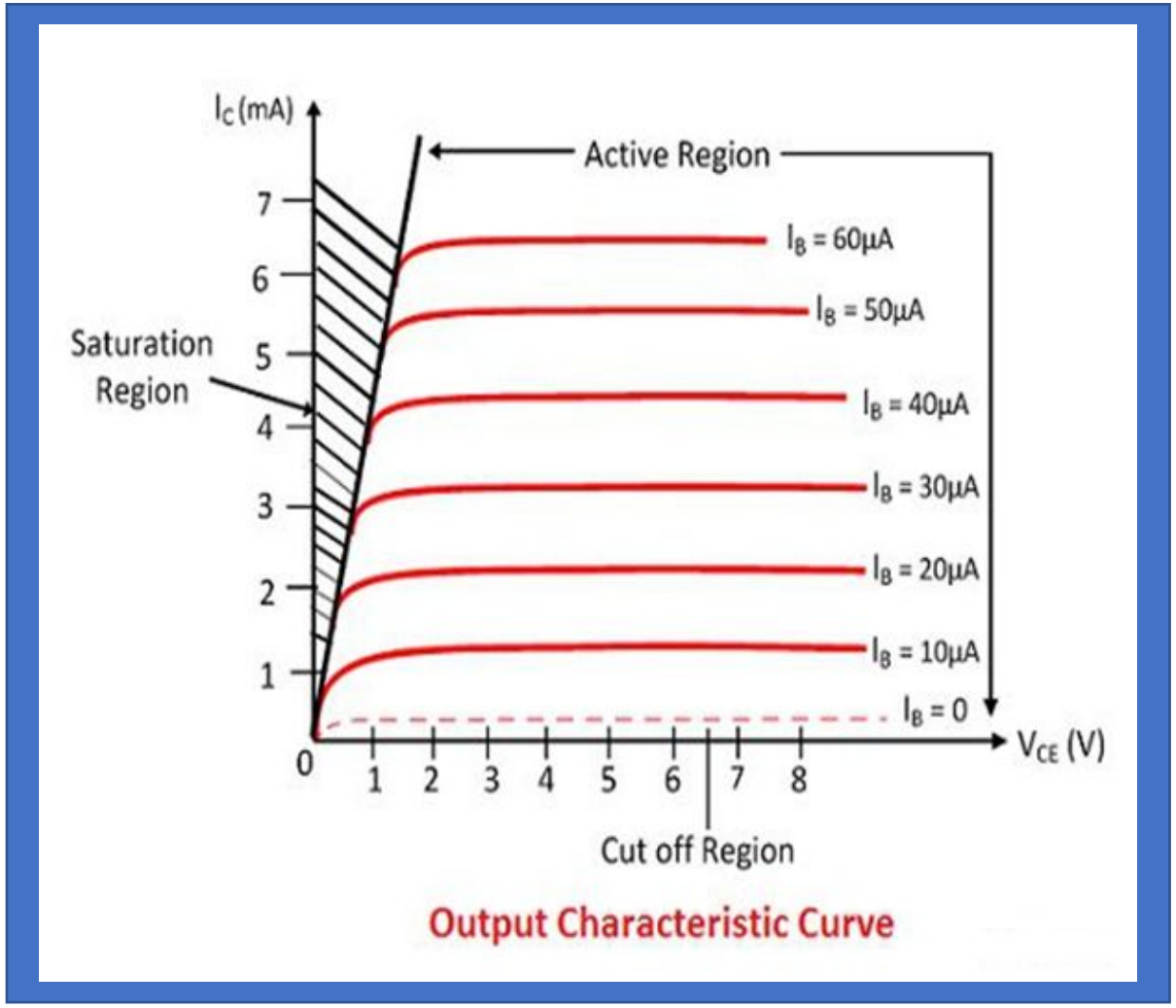


COMMON EMITTER CONFIGURATION

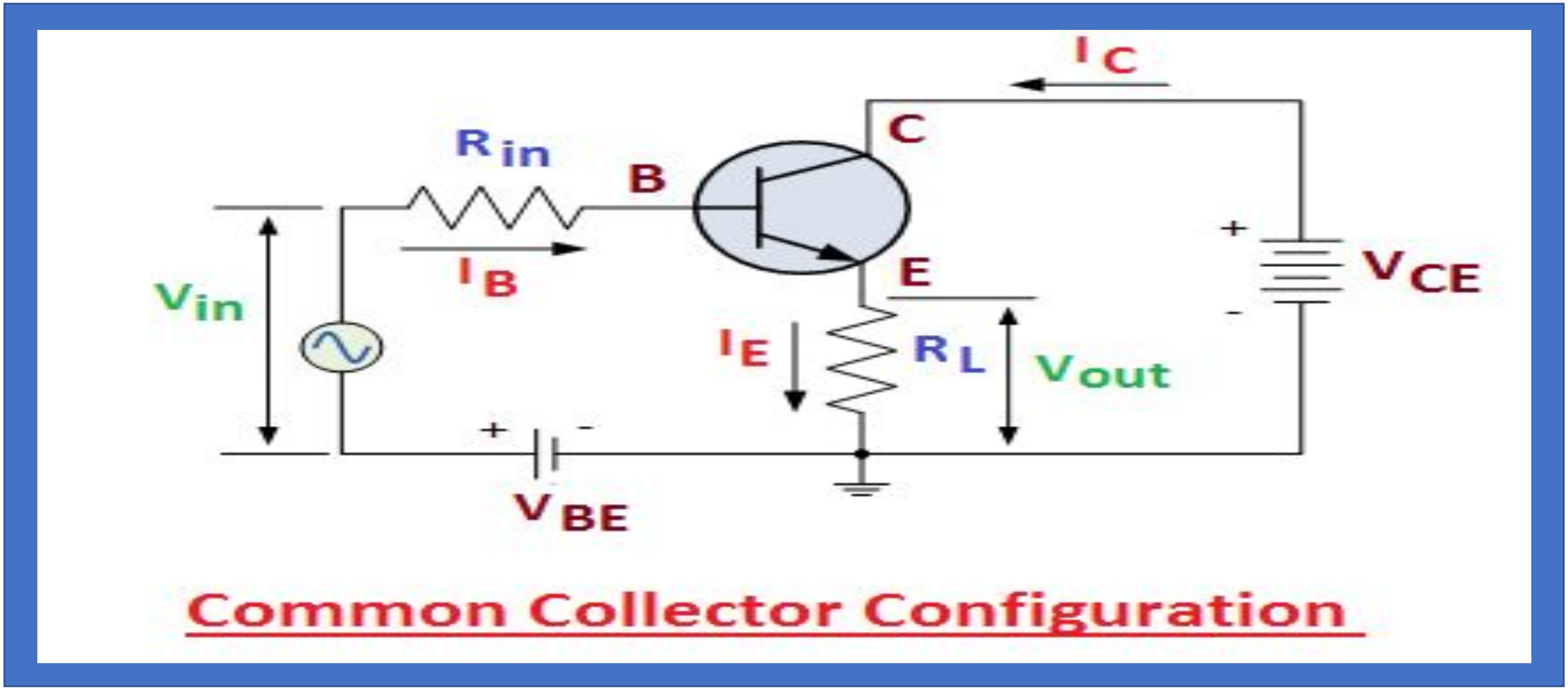


INPUT OUTPUT CHARACTERISTICS OF CE AMPLIFIER

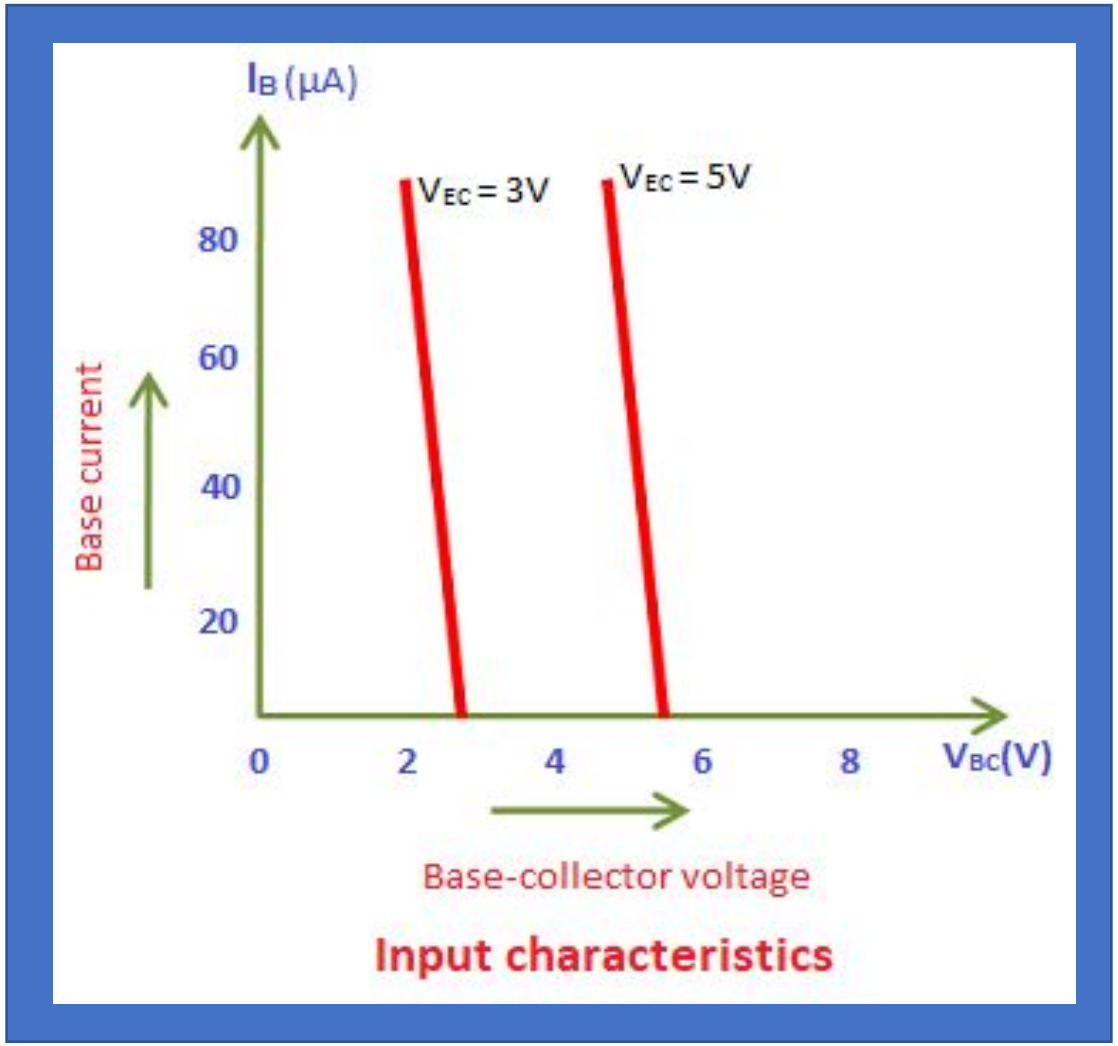


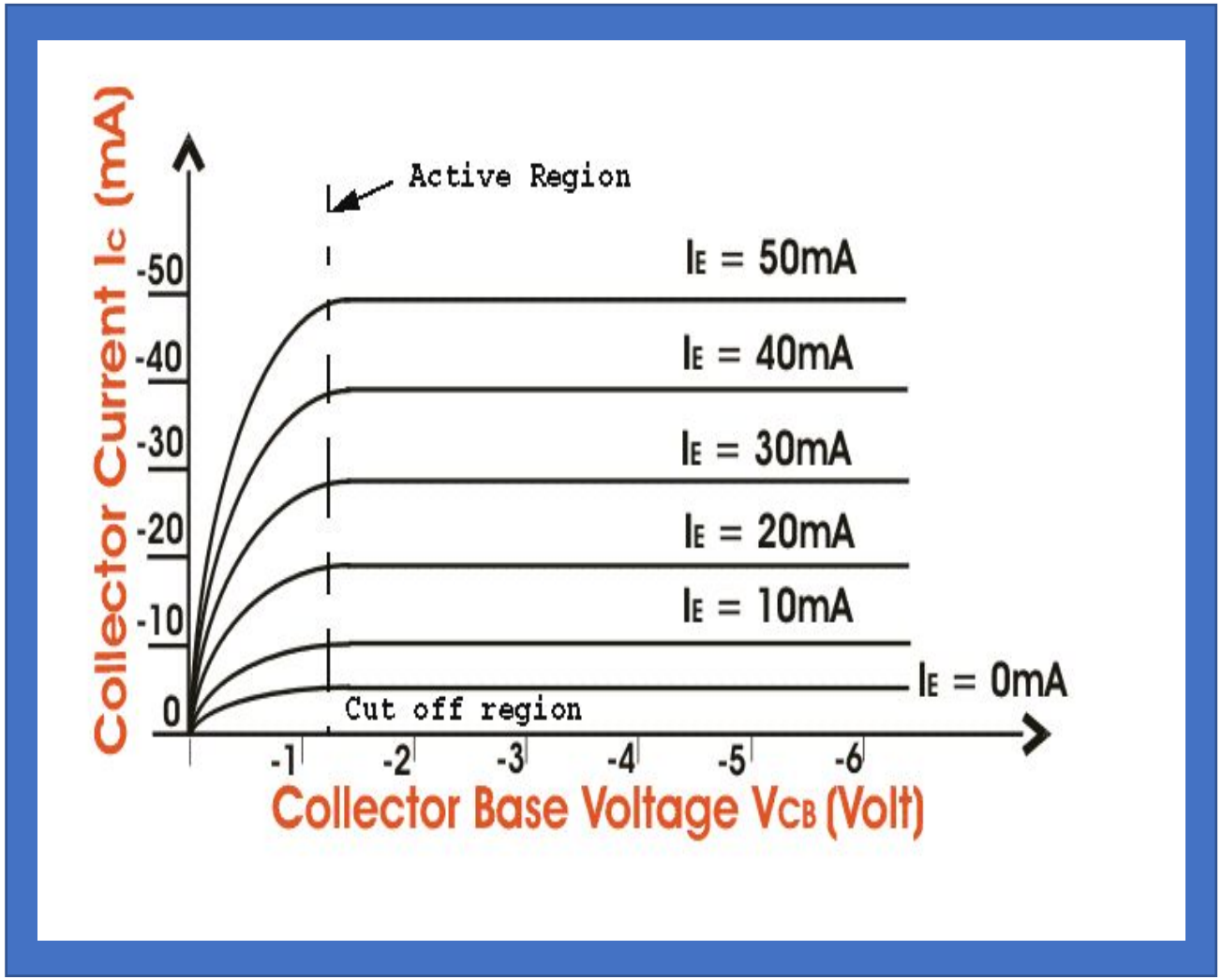


COMMON COLLECTOR CONFIGURATION



INPUT OUTPUT CHARACTERISTICS OF CC AMPLIFIER





CURRENT AMPLIFICATION FACTOR

In CC- Current Amplification Factor (γ_{dc}) $\gamma = \frac{\Delta I_E}{\Delta I_B}$

$$I_E = I_C + I_B$$

$$\Delta I_E = \Delta I_C + \Delta I_B$$

$$\Delta I_B = \Delta I_E - \Delta I_C$$

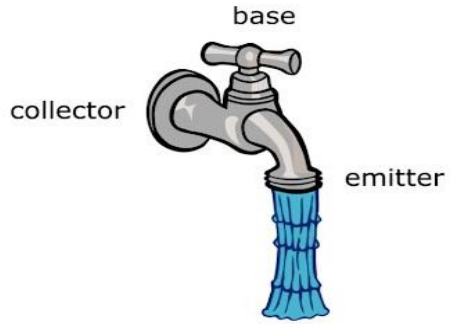
$$\gamma = \frac{\Delta I_E}{\Delta I_E - \Delta I_C}$$

$$\gamma = \frac{\Delta I_E/\Delta I_E}{\Delta I_E/\Delta I_E - \Delta I_C/\Delta I_E}$$

$$\gamma = \frac{1}{1 - \Delta I_C/\Delta I_E}$$

$$\gamma = \frac{1}{1 - \alpha}$$

CURRENT AMPLIFICATION FACTOR



In CB- Current Amplification Factor (α_{dc}):

For a transistor with common base configuration it is defined as the ratio of static (d.c.) collector current I_C to the static emitter current I_E at a constant collector voltage with respect to base.

$$\alpha_{dc} = \left(\frac{I_C}{I_E}\right)_{[V_{CB}=\text{constant}]} \qquad \beta_{dc} = \left(\frac{I_C}{I_E}\right)_{[V_{CE}=\text{constant}]}$$

In CE- For a transistor with common emitter configuration it is defined as the ratio of static collector current I_C to the static base current I_B at a constant collector voltage with respect to emitter.

RELATION BETWEEN α_{DC} AND β_{DC}:

We know that

$$I_E = I_B + I_C$$

Dividing both sides by I_C, we get

$$\frac{I_E}{I_C} = \frac{I_B}{I_C} + 1$$

or, $$\frac{1}{\alpha_{dc}} = \frac{1}{\beta_{dc}} + 1$$

$$\alpha_{dc} = \frac{\beta_{dc}}{1+\beta_{dc}}$$

or, $$\beta_{dc} = \frac{\alpha_{dc}}{1-\alpha_{dc}}$$

COLLECTOR CURRENT IN TERMS OF LEAKAGE CURRENT

$$I_C = \alpha I_\beta + I_{CBO}$$

$$I_E = I_C + I_B = (\alpha I_\beta + I_{CBO}) + I_B$$

$$I_E(1-\alpha) = I_\beta + I_{CBO}$$

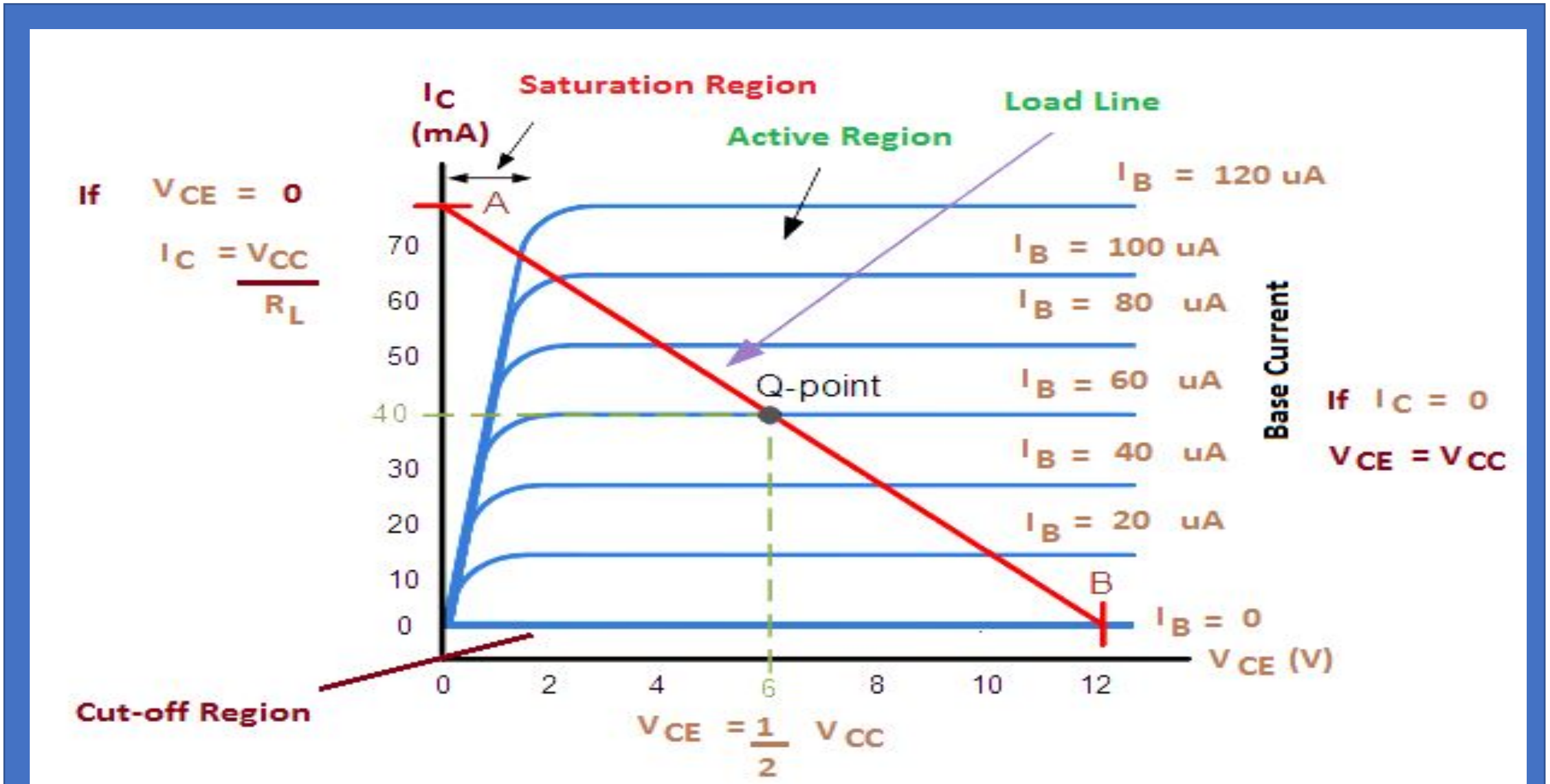
$$I_E = I_B\left(\frac{1}{1-\alpha}\right) + I_{CBO}\left(\frac{1}{1-\alpha}\right)$$

$$= (\beta+1)I_B + (\beta+1)I_{CBO}$$

Comparison of configurations

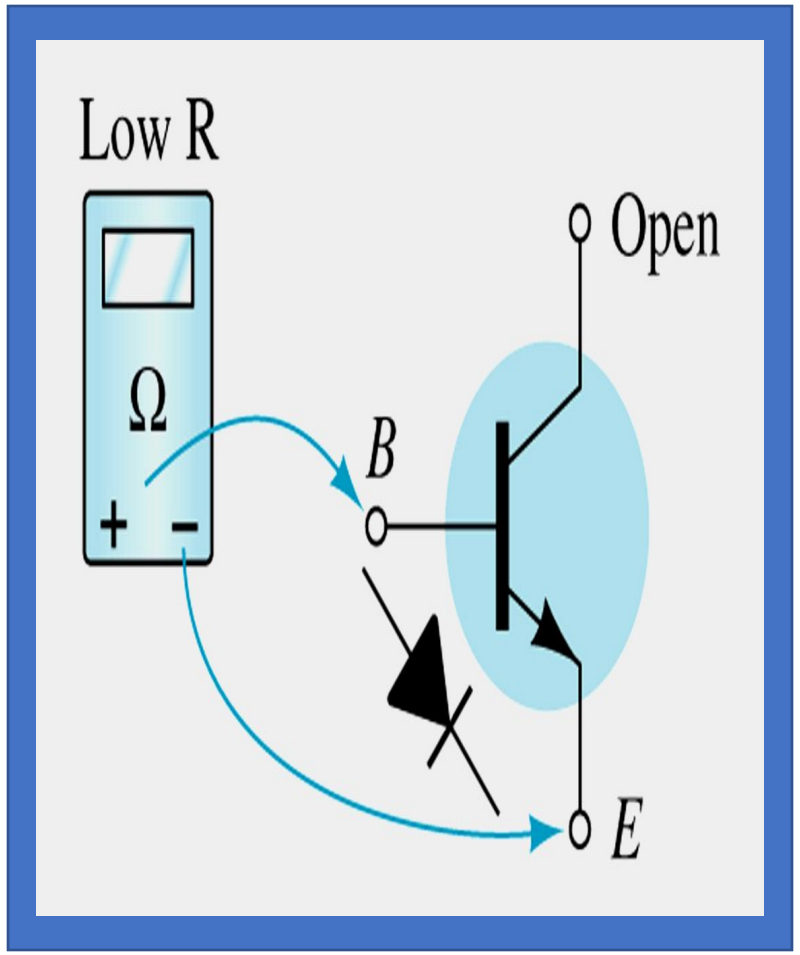
Sr. No.	Parameter	CB	CE	CC
1.	Common terminal between input and output	Base	Emitter	Collector
2.	Input current	I_E	I_B	I_B
3.	Output current	I_C	I_C	I_E
4.	Current gain	$\alpha_{dc} = I_C / I_E$	$\beta_{dc} = I_C / I_B$	$\gamma_{dc} = I_E / I_B$
5.	Input voltage	V_{EB}	V_{BE}	V_{BC}
6.	Output voltage	V_{CB}	V_{CE}	V_{BC}
7.	Voltage gain	Medium	Medium	Less than 1
8.	Input resistance	Very low (20 Ω)	Low (1kΩ)	High (500 kΩ)
9.	Output resistance	Very high (1MΩ)	High (40 KΩ)	Low (50 Ω)
10.	Applications	As preamplifier	Audio amplifier	For impedance matching

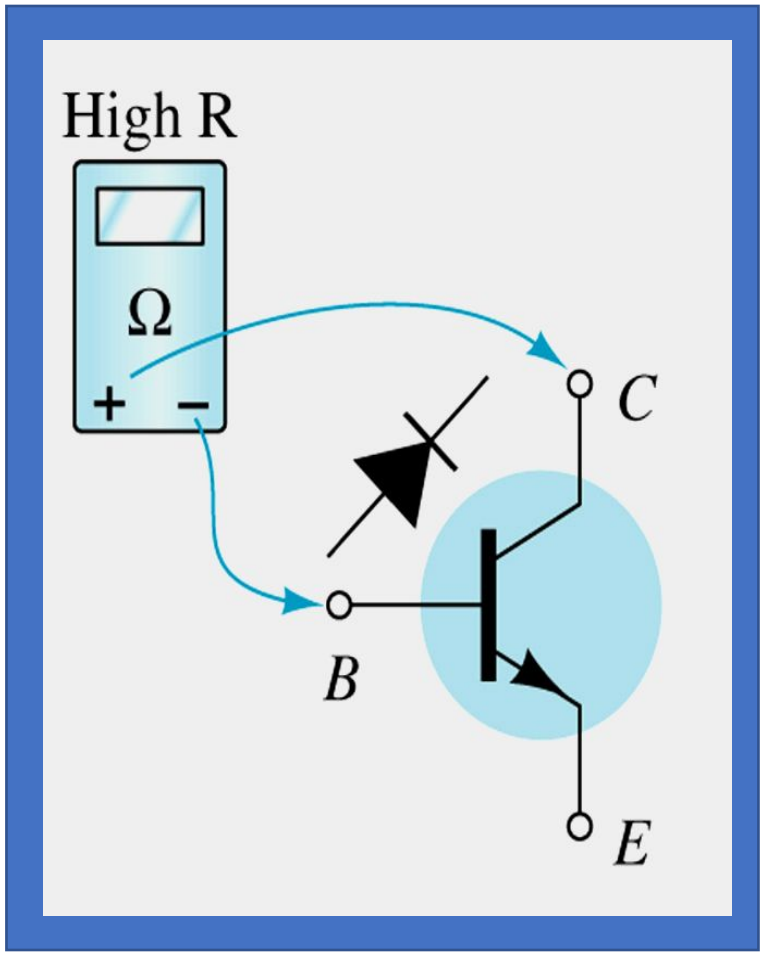
DC LOAD LINE


I_C (mA)
Saturation Region
Load Line
Active Region
If $V_{CE} = 0$
$I_C = \frac{V_{CC}}{R_L}$
A
I_B = 120 uA
I_B = 100 uA
I_B = 80 uA
I_B = 60 uA
I_B = 40 uA
I_B = 20 uA
I_B = 0
Base Current
Q-point
If $I_C = 0$
$V_{CE} = V_{CC}$
B
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
V_{CE} (V)
Cut-off Region
$V_{CE} = \frac{1}{2} V_{CC}$

Transistor Testing

Using DMM: some DMM's will measure β_{DC} or hfe.





REFLECTION SPOT

testmoz.com/4766730

https://www.youtube.com/watch?v=7ukDKVHnac4

SUMMARY

- DC Load Line analysis
- Common Base Configuration
- Input Output Characteristics of CB configuration
- Common Collector Configuration
- Input Output Characteristics of CC configuration
- Comparison of CE, CB and CC