

FY B.Tech 2020-21

BEEE Lab

Expt No. 7

Gain Measurement of CE amplifier

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Application of BJT: Common Emitter Amplifier

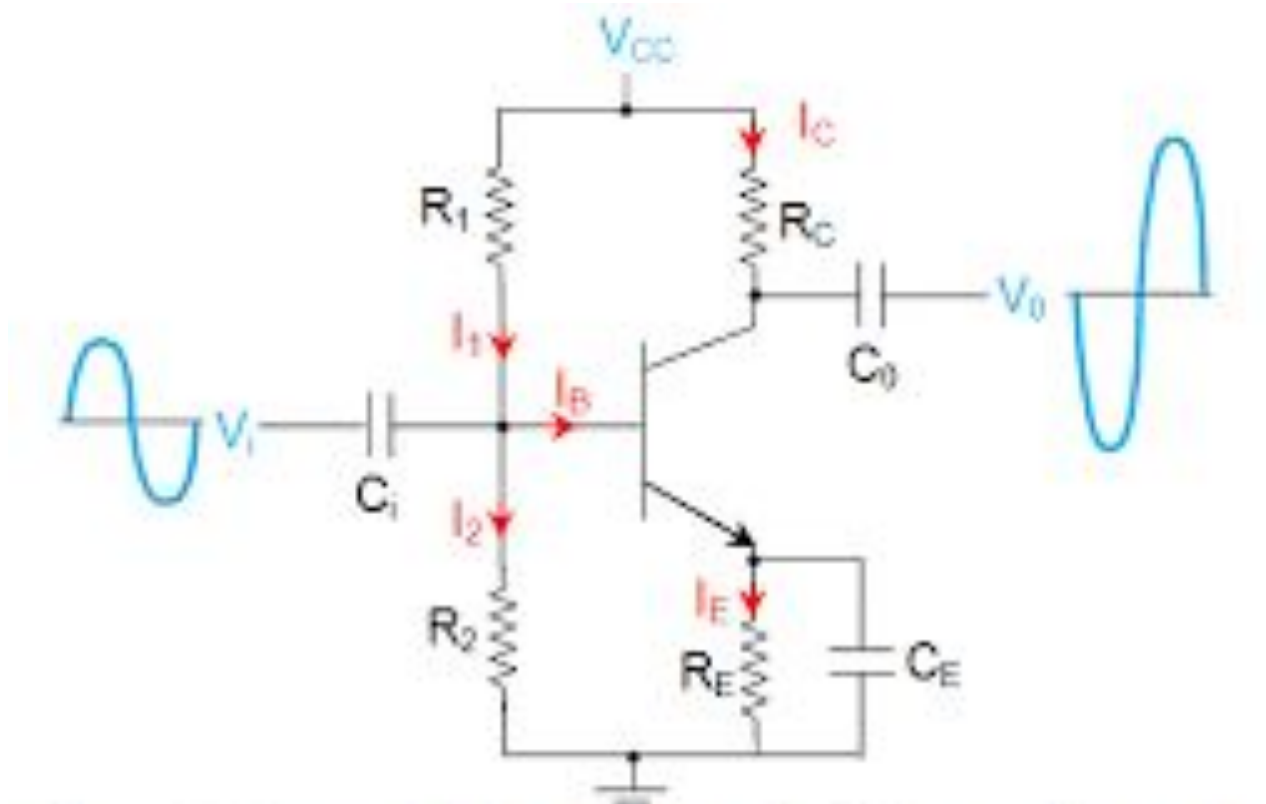
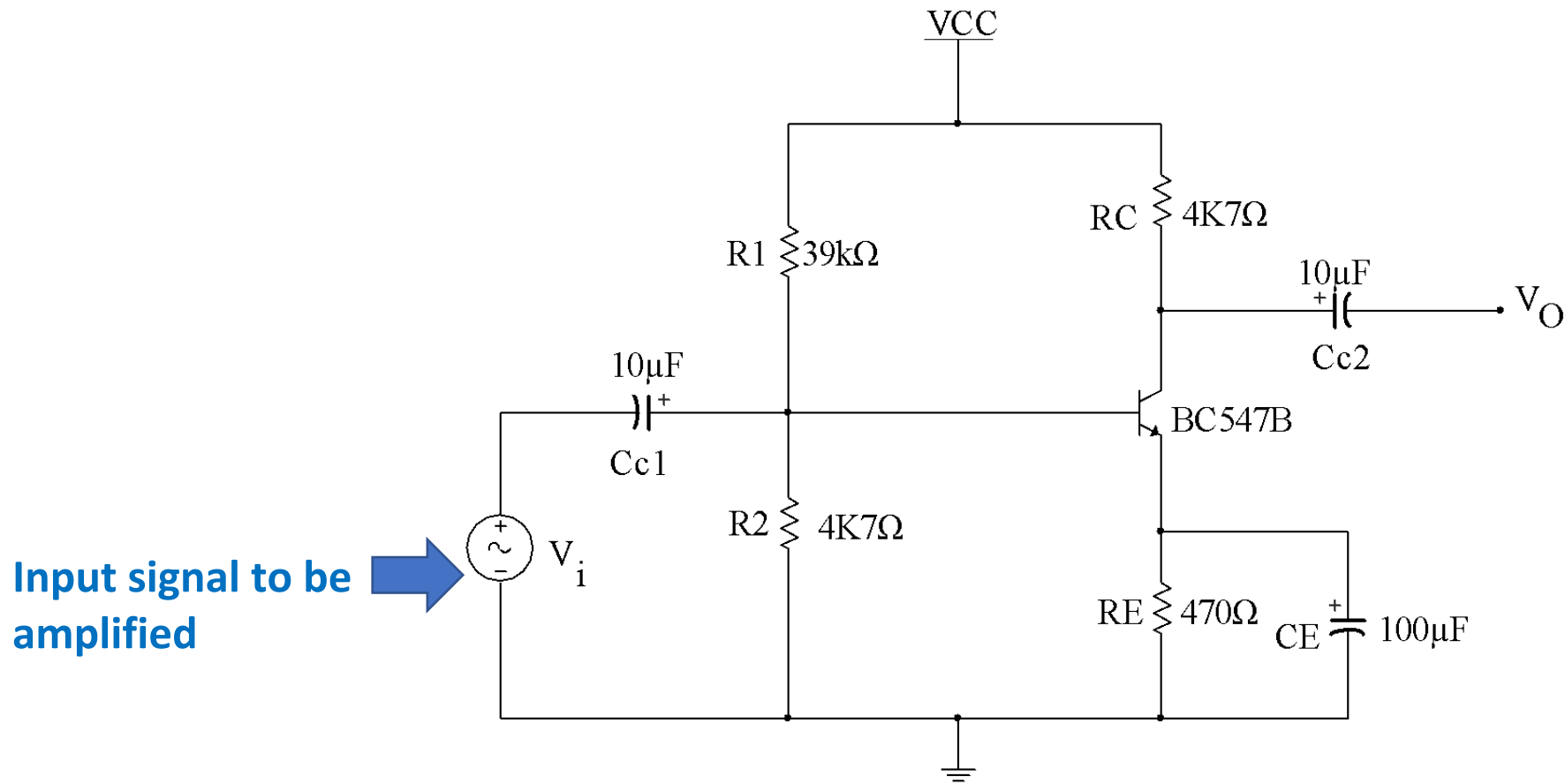


Figure 2 Common Emitter Amplifier with Biasing and Decoupling Details

CE amplifier circuit diagram in the Lab Manual



Output signal
to be observed
on oscilloscope

Transistor used as an amplifier

- Gain is the amplification factor
- $A_v = \text{Voltage Gain} = V_{out}/V_{in}$
- Use a Power supply in Tinkercad as a DC biasing source for V_{cc}
- Apply a **sine wave** with amplitude **$V_{in}=100 \text{ mV}$ and $\text{freq}=100 \text{ Hz}$** as a input using the function generator, observe it on an oscilloscope
- Observe the output on an oscilloscope. Measure V_{out} from the waveform
- Calculate the gain, A_v

Steps in the labwork-

1. Understanding the Circuit Diagram with components and

- ✓ Transistor, Voltage divider- R_1 & R_2 ,
- ✓ Coupling capacitors C_{c1} & C_{c2} ,
- ✓ R_c , R_E , Bypass capacitor C_E
- ✓ Voltages- V_{cc} (DC biasing voltage), V_{in} and V_{out}
- ✓ Load resistance, R_L

2. Selection of components

3. Connections in simulation software

4. Applying input AC signal and observing the output signal

5. Measuring V_{in} and V_{out} to find gain

Component values to be used in Tinkercad

Build and simulate the circuit of CE amplifier with the following components and instruments:

- $V_{cc}=10$ Volts (Power Supply/ Battery)
- $R_1=10$ Kohms, $R_2= 1$ Kohms
- $R_c= 10$ Kohms, $R_E= 1$ Kohms, $R_L=10$ Kohms
- NPN transistor
- $C_{in}=1\text{microF}$
- $C_{out}=1\text{micro F}$
- $C_E=10\text{microF}$
- Function Generator for input sinewave
- Oscilloscopes for input and output waveform observations

Simulation Procedure

- Build the circuit as per the circuit diagram shown
- Apply the supply voltage, $V_{CC} = 10\text{ V}$.
- Apply ac input signal of 100 mV, 100Hz frequency at the input of the amplifier from function generator.
- Observe the output signal on the CRO and measure V_{out} .
- Calculate the gain of the amplifier using the relation $\text{Gain} = \frac{V_{out}}{V_{in}}$.
- Record five readings in the observation table by varying V_{in} from 50 mV to 1V.
- Draw the input and output voltage waveforms

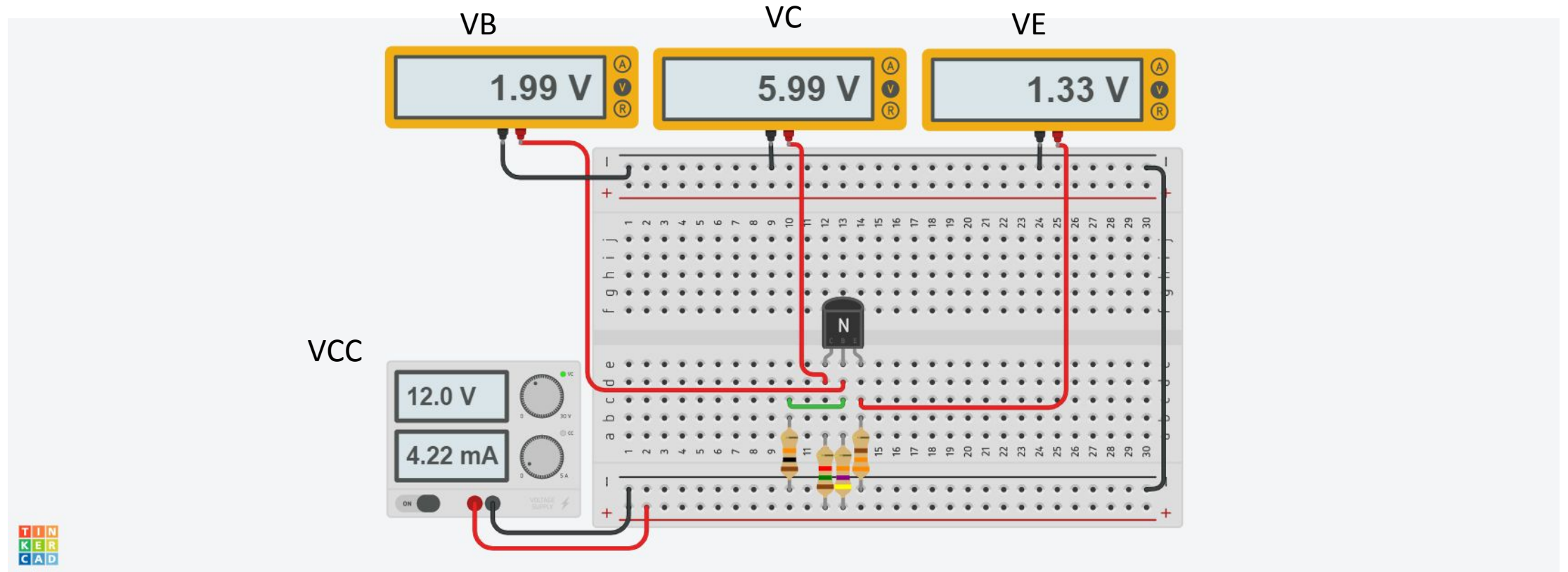
Observations/Readings

Observation Table:

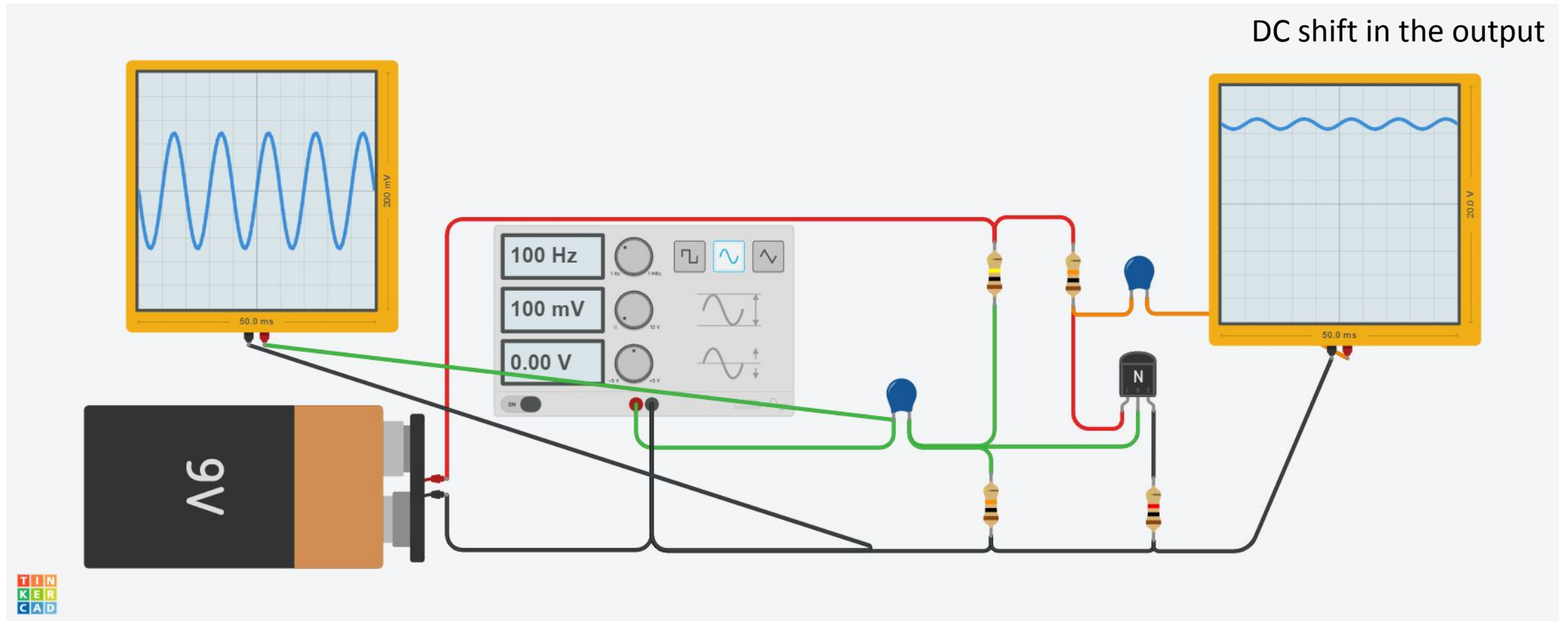
Input Signal frequency=

Input (V_{in})		Output (V_{out})	Gain (V_{out}/V_{in})

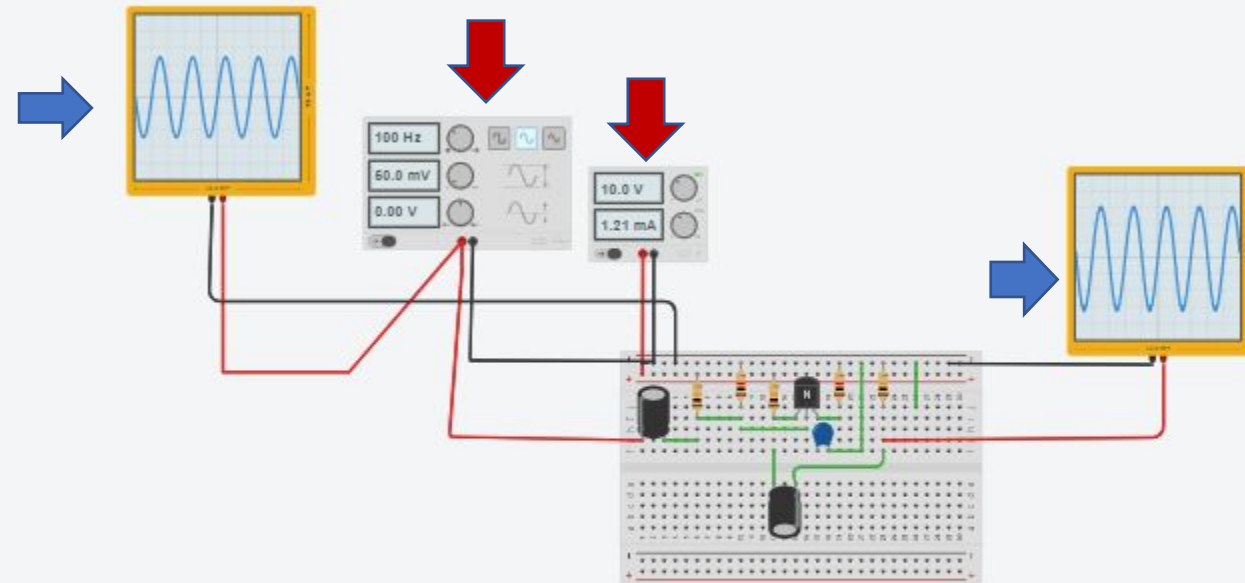
DC biasing of CE amplifier



Battery for DC biasing and no breadboard



CE amplifier in Tinkercad



Circuit simulation in Tinkercad

Circuit design CE amplifier | Tinkercad

tinkercad.com/things/49L8iiZBEF7-ce-amplifier/editel

CE amplifier

Simulator time: 00:00:02.025

Code Stop Simulation Export Share

Components Basic

Search

Resistor LED Pushbutton Potentiometer

Input

Vcc for DC biasing

Phase shift is not visible

Output

CE Amplifier

The image shows a Tinkercad workspace for a Common Emitter (CE) amplifier circuit. The circuit is constructed on a breadboard using a 2N2222 NPN transistor. The input signal, represented by a sine wave, is connected to the base of the transistor through a 10k resistor. The output of the amplifier is taken from the collector, also through a 10k resistor. The emitter of the transistor is connected to ground. A 10V DC voltage source is connected to the collector to provide the necessary DC biasing. Two oscilloscopes are connected to the circuit: one at the input and one at the output, both displaying a sine wave. A red box highlights the output waveform with the text "Phase shift is not visible". The Tinkercad interface includes a top toolbar with simulation controls, a right sidebar with component libraries, and a bottom Windows taskbar.

List of Components

Circuit design CE amplifier | Tinker x

tinkercad.com/things/49L8iiZBEF7-ce-amplifier/editel

TINKERCAD CE amplifier Saved

Component List Download CSV

Name	Quantity	Component
T1	1	NPN Transistor (BJT)
R1 R3 R5	3	10 k Ω Resistor
R2	1	1000 Ω Resistor
R4	1	1 k Ω Resistor
P1	1	10 , 2 Power Supply
U1 U2	2	5 ms Oscilloscope
C5	1	10 uF Capacitor
C3 C4	2	1 uF, 16 V Polarized Capacitor
FUNC1	1	100 Hz, 0.05 V, 0 V, Sine Function Generator

bom (4).csv CE amplifier (2).png Show all

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Phase Reversal in CE amplifier

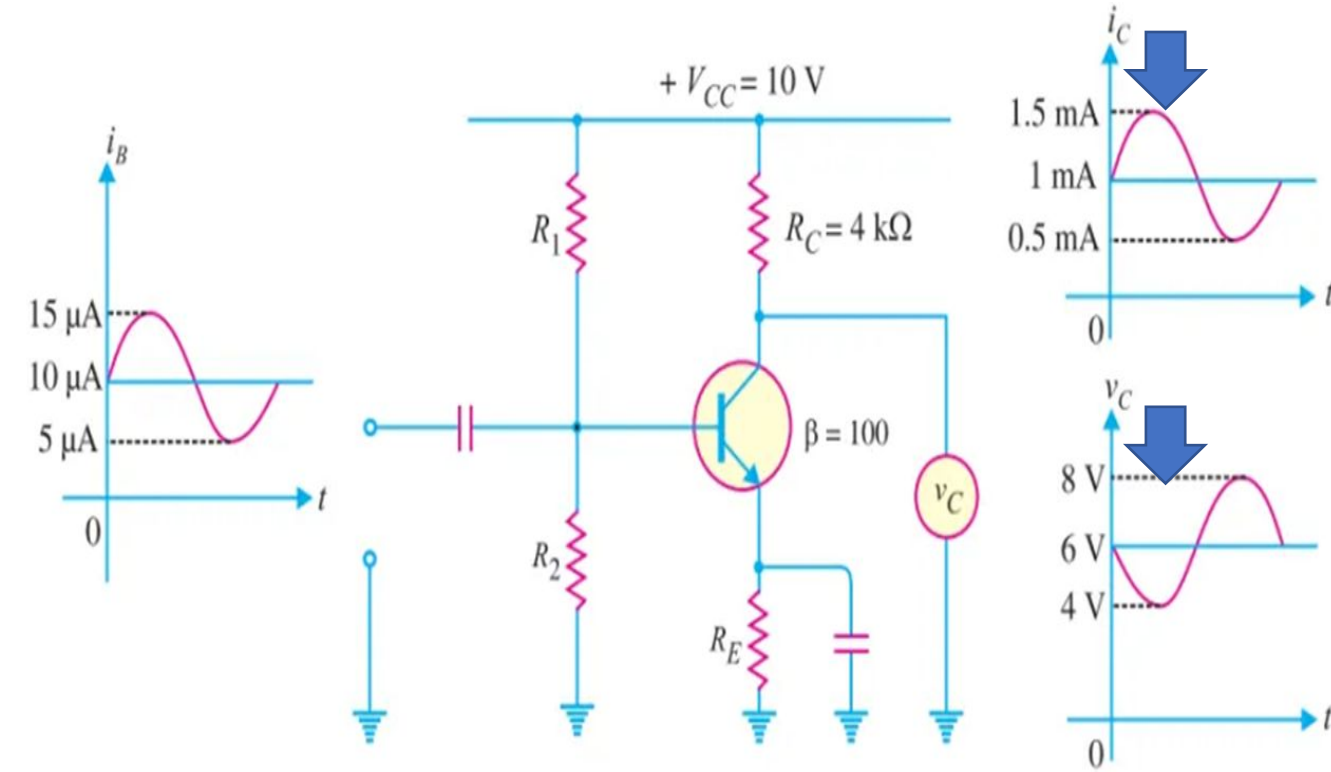


Fig. 10.7

