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

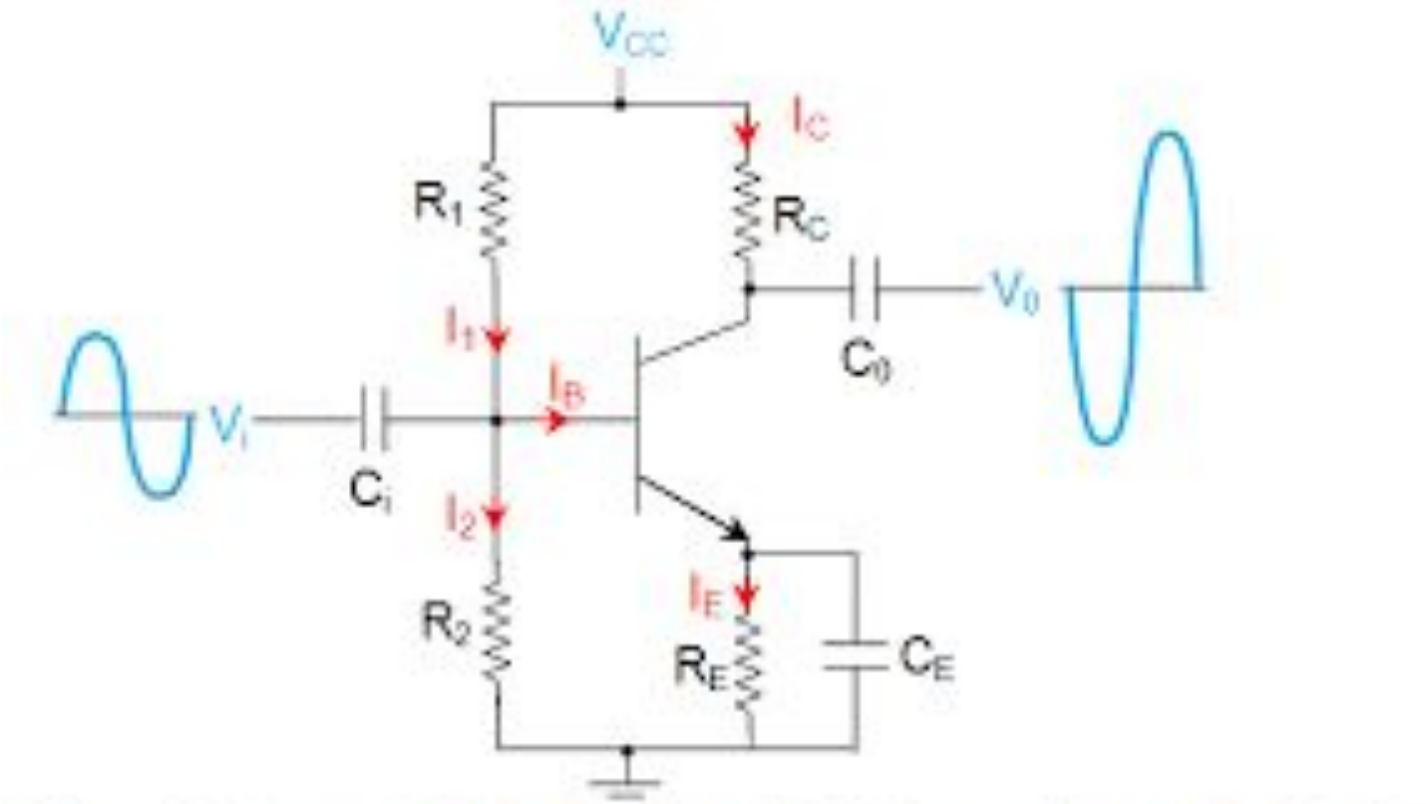
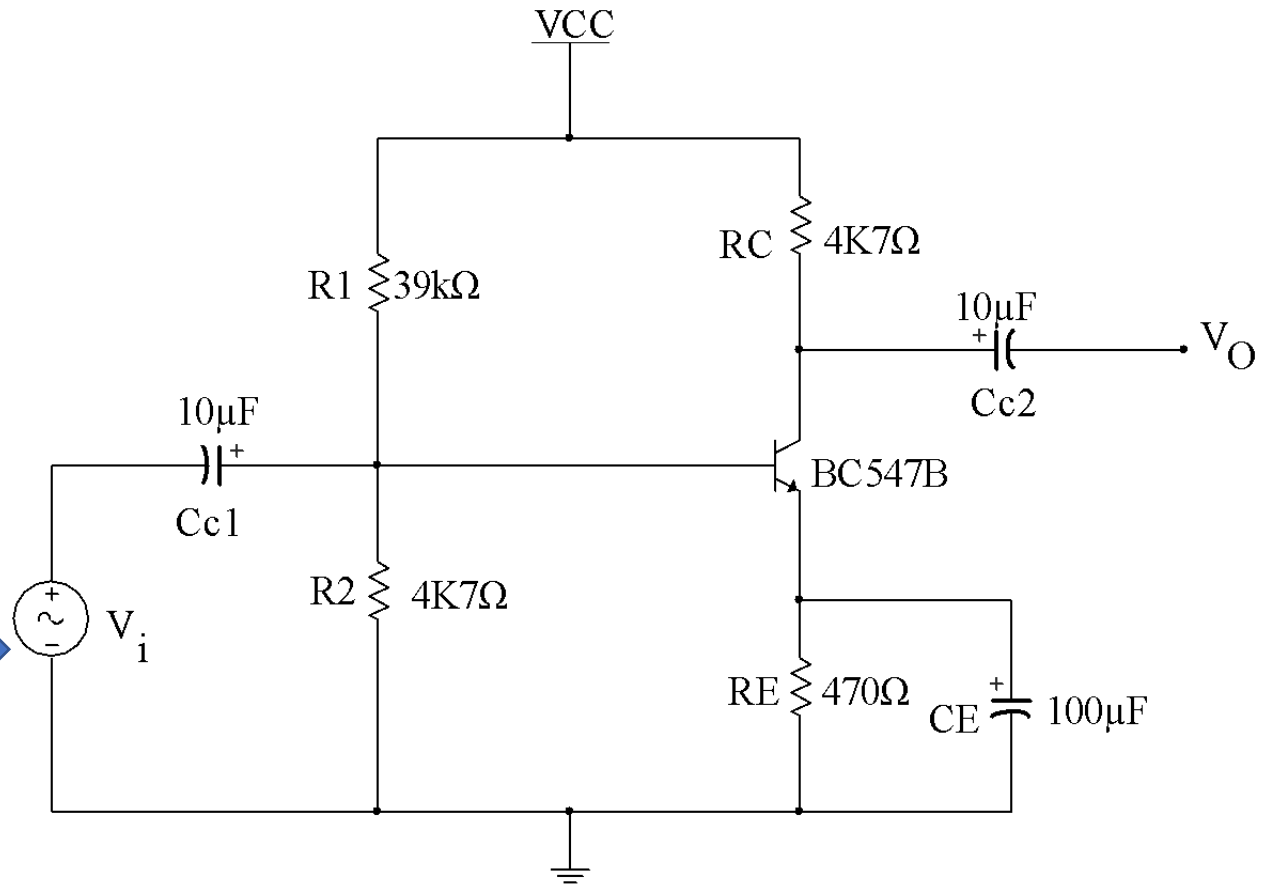


Figure 2 Common Emitter Amplifier with Biasing and Decoupling Details

CE amplifier circuit diagram in the Lab Manual



Input signal to be amplified

Output signal to be observed on oscilloscope

Transistor used as an amplifier

- Gain is the amplification factor
- Av= Voltage Gain= Av=Vout/Vin
- Use a Power supply in Tinkercad as a DC biasing source for Vcc
- Apply a **sine wave** with amplitude **Vin=100 mV and freq=100 Hz** as a input using the function generator, observe it on an oscilloscope
- Observe the output on an oscilloscope. Measure Vout from the waveform
- Calculate the gain, Av

Steps in the labwork-

1. **Understanding the Circuit Diagram with components and**

✔ Transistor, Voltage divider-R1&R2,

✔ Coupling capacitors Cc1 & Cc2,

✔ Rc, R_E, Bypass capacitor C_E

✔ Voltages- Vcc (DC biasing voltage), Vin and Vout

✔ Load resistance, RL

2. Selection of components
3. Connections in simulation software
4. Applying input AC signal and observing the output signal
5. Measuring Vin and Vout to find gain

Component values to be used in Tinkercad

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

- Vcc=10 Volts (Power Supply/ Battery)
- R1=10 Kohms, R2= 1 Kohms
- Rc= 10 Kohms, R_E= 1 Kohms, R_L=10 Kohms
- NPN transistor
- C_{in}=1microF
- Cout=1micro F
- C_E=10microF
- Function Generator for input sinewave
- Oscilloscopes for input and output waveform observations

Simulation Procedure

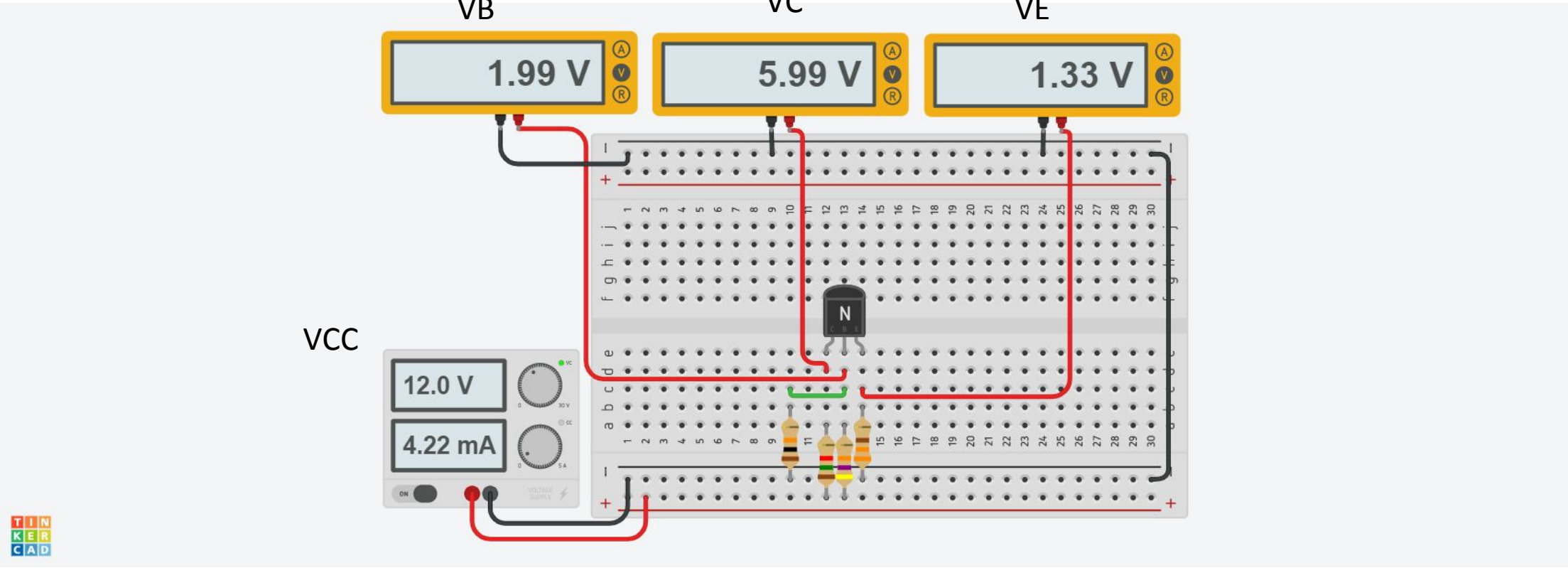
- Build the circuit as per the circuit diagram shown
- Apply the supply voltage, V_{CC} = 10 V.
- Apply ac input signal of 100 mV, 100Hz frequency at the input of the amplifier from function generator.
- Observe the output signal on the CRO and measure V_{out}.
- Calculate the gain of the amplifier using the relation 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

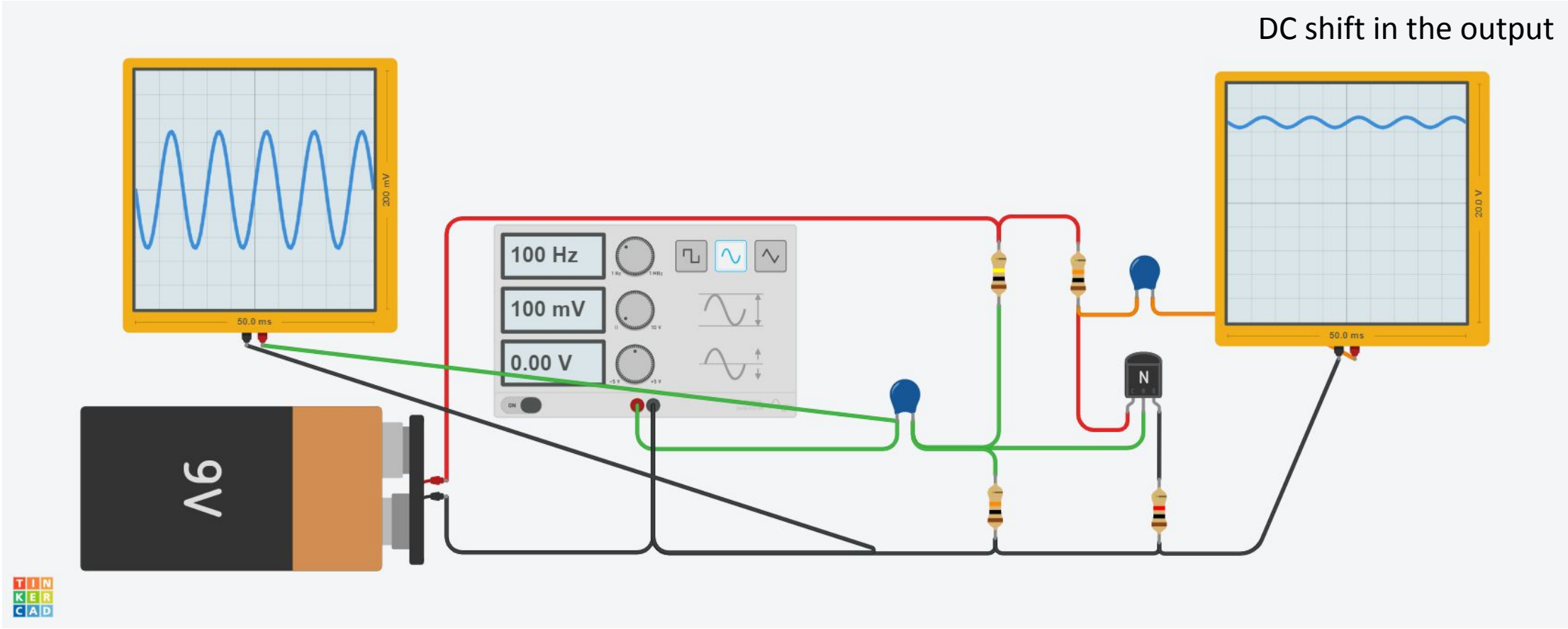
Observation Table: **Input Signal frequency=**

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

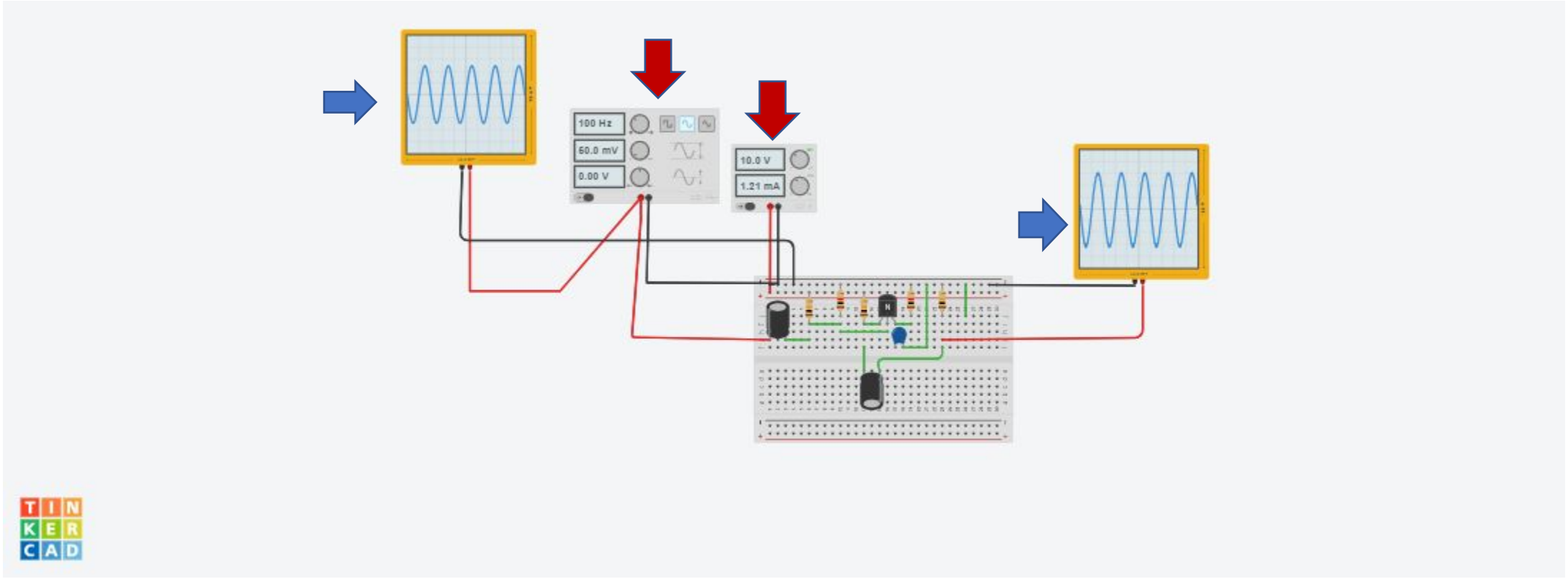
DC biasing of CE amplifier



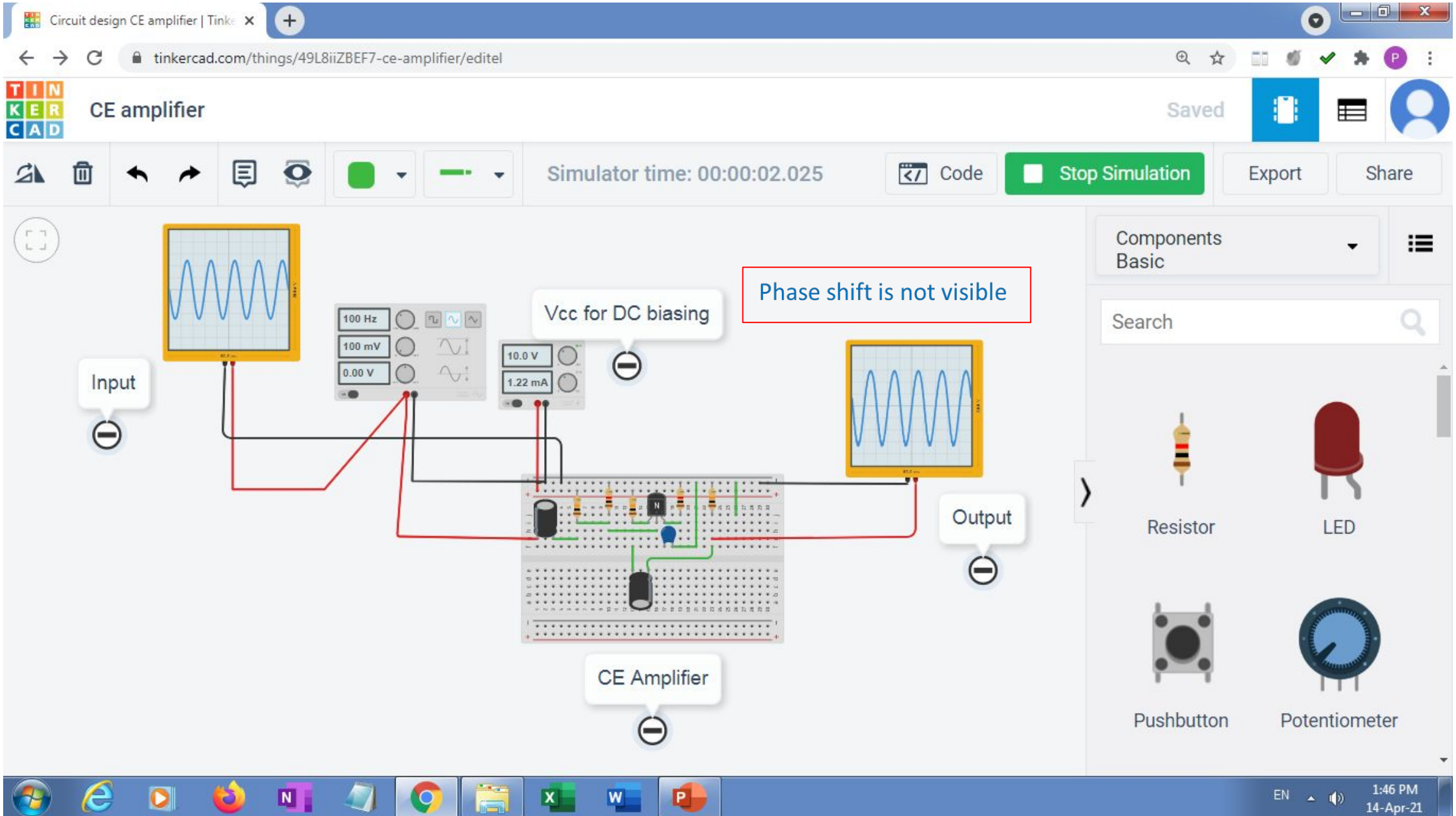
Battery for DC biasing and no breadboard



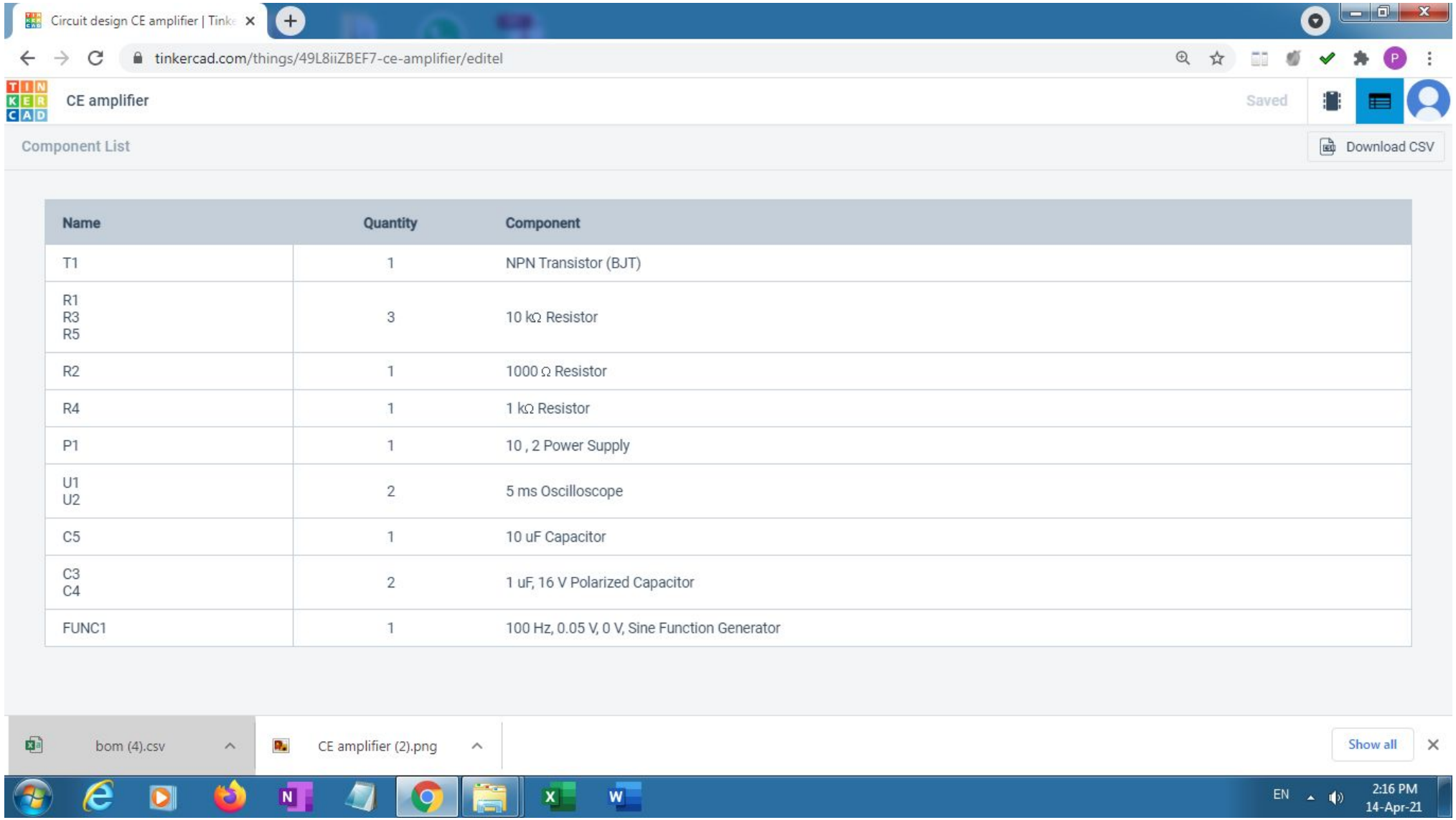
CE amplifier in Tinkercad



Circuit simulation in Tinkercad



List of Components



Name	Quantity	Component
T1	1	NPN Transistor (BJT)
R1 R3 R5	3	10 kΩ Resistor
R2	1	1000 Ω Resistor
R4	1	1 kΩ 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

Phase Reversal in CE amplifier

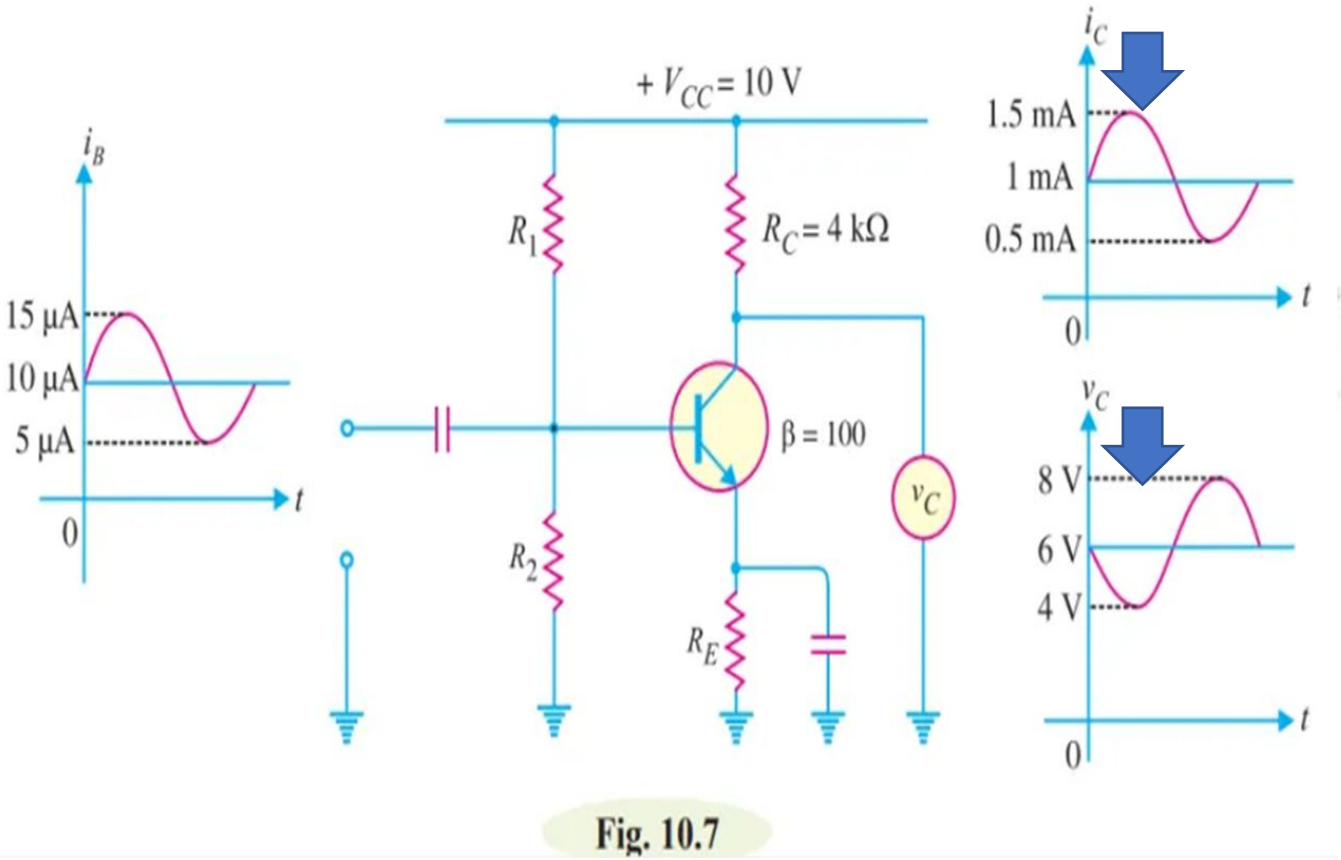
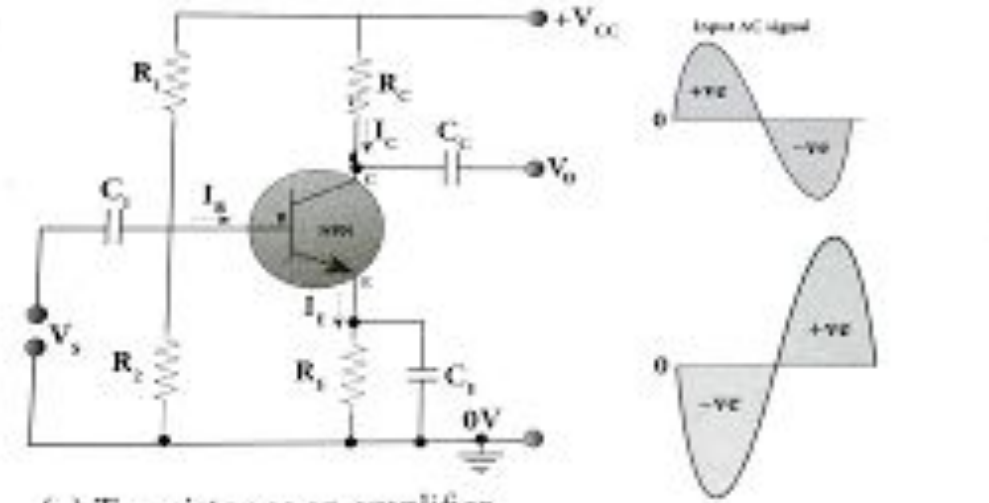


Fig. 10.7



(a) Transistor as an amplifier
(b) Input and output waveform showing 180° phase reversal.