TABLE 5.1

Unloaded BJT Transistor Amplifiers

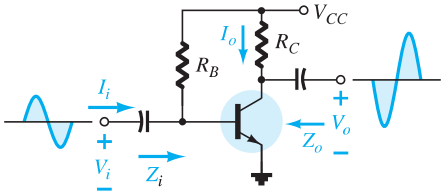
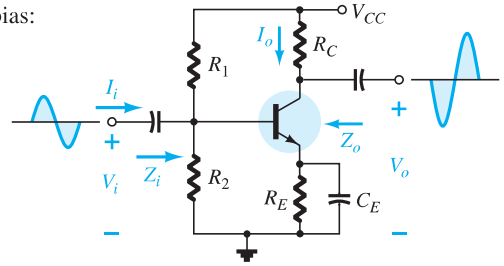
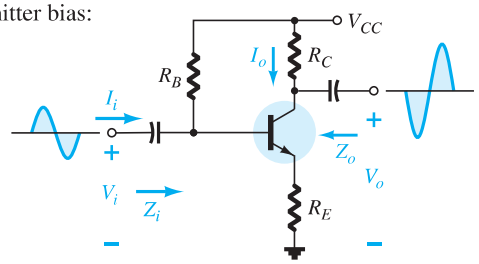
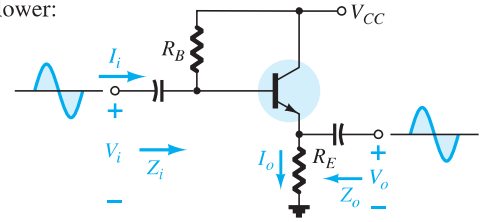
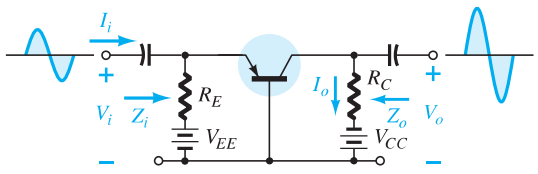
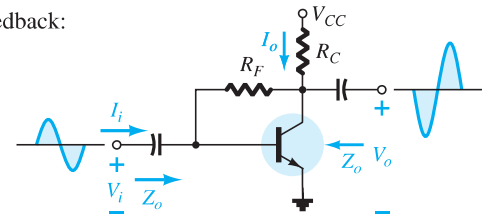
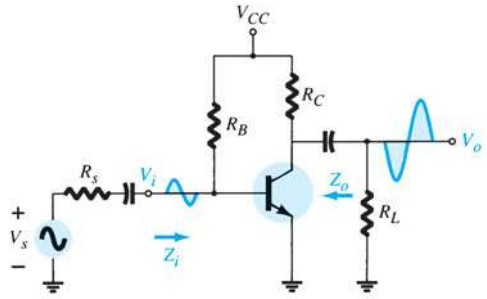
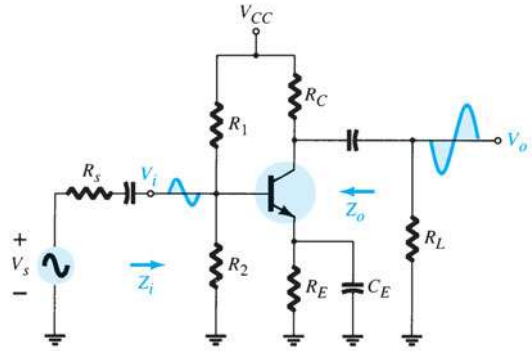
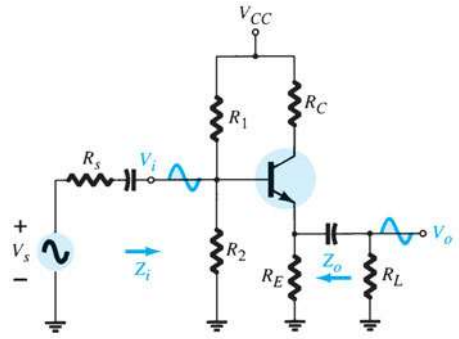
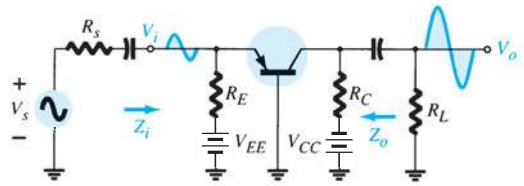
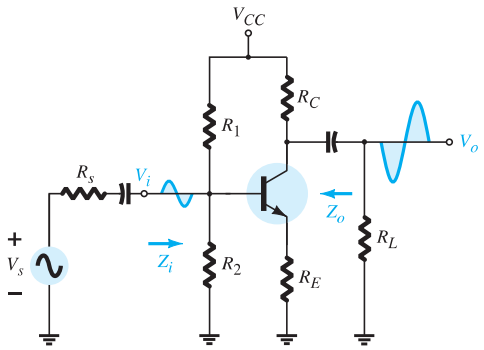
Configuration	Z_i	Z_o	A_v	A_i
Fixed-bias: 	Medium (1 kΩ) $= R_B \| \beta r_e$ $\cong \beta r_e$ $(R_B \geq 10\beta r_e)$	Medium (2 kΩ) $= R_C \| r_o$ $\cong R_C$ $(r_o \geq 10R_C)$	High (−200) $= \frac{-(R_C \| r_o)}{r_e}$ $\cong \frac{-R_C}{r_e}$ $(r_o \geq 10R_C)$	High (100) $= \frac{\beta R_B r_o}{(r_o + R_C)(R_B + \beta r_e)}$ $\cong \beta$ $(r_o \geq 10R_C,$ $R_B \geq 10\beta r_e)$
Voltage-divider bias: 	Medium (1 kΩ) $= R_1 \| R_2 \| \beta r_e$	Medium (2 kΩ) $= R_C \| r_o$ $\cong R_C$ $(r_o \geq 10R_C)$	High (−200) $= \frac{-R_C \| r_o}{r_e}$ $\cong \frac{-R_C}{r_e}$ $(r_o \geq 10R_C)$	High (50) $= \frac{\beta(R_1 \| R_2) r_o}{(r_o + R_C)(R_1 \| R_2 + \beta r_e)}$ $\cong \frac{\beta(R_1 \| R_2)}{R_1 \| R_2 + \beta r_e}$ $(r_o \geq 10R_C)$
Unbypassed emitter bias: 	High (100 kΩ) $= R_B \| Z_b$ $Z_b \cong \beta(r_e + R_E)$ $\cong R_B \| \beta R_E$ $(R_E \gg r_e)$	Medium (2 kΩ) $= R_C$ (any level of r_o)	Low (−5) $= \frac{-R_C}{r_e + R_E}$ $\cong \frac{-R_C}{R_E}$ $(R_E \gg r_e)$	High (50) $\cong \frac{-\beta R_B}{R_B + Z_b}$
Emitter-follower: 	High (100 kΩ) $= R_B \| Z_b$ $Z_b \cong \beta(r_e + R_E)$ $\cong R_B \| \beta R_E$ $(R_E \gg r_e)$	Low (20 Ω) $= R_E \| r_e$ $\cong r_e$ $(R_E \gg r_e)$	Low ($\cong 1$) $= \frac{R_E}{R_E + r_e}$ $\cong 1$	High (−50) $\cong \frac{-\beta R_B}{R_B + Z_b}$
Common-base: 	Low (20 Ω) $= R_E \| r_e$ $\cong r_e$ $(R_E \gg r_e)$	Medium (2 kΩ) $= R_C$	High (200) $\cong \frac{R_C}{r_e}$	Low (−1) $\cong -1$
Collector feedback: 	Medium (1 kΩ) $= \frac{r_e}{\frac{1}{\beta} + \frac{R_C}{R_F}}$ $(r_o \geq 10R_C)$	Medium (2 kΩ) $\cong R_C \| R_F$ $(r_o \geq 10R_C)$	High (−200) $\cong \frac{-R_C}{r_e}$ $(r_o \geq 10R_C)$ $(R_F \gg R_C)$	High (50) $= \frac{\beta R_F}{R_F + \beta R_C}$ $\cong \frac{R_F}{R_C}$

TABLE 5.2

BJT Transistor Amplifiers Including the Effect of R_s and R_L

Configuration	$A_{v_L} = V_o/V_i$	Z_i	Z_o
	$\dfrac{-(R_L \| R_C)}{r_e}$	$R_B \| \beta r_e$	R_C
	Including r_o: $\dfrac{-(R_L \| R_C \| r_o)}{r_e}$	$R_B \| \beta r_e$	$R_C \| r_o$
	$\dfrac{-(R_L \| R_C)}{r_e}$	$R_1 \| R_2 \| \beta r_e$	R_C
	Including r_o: $\dfrac{-(R_L \| R_C \| r_o)}{r_e}$	$R_1 \| R_2 \| \beta r_e$	$R_C \| r_o$
	$\cong 1$	$R'_E = R_L \| R_E$ $R_1 \| R_2 \| \beta(r_e + R'_E)$	$R'_s = R_s \| R_1 \| R_2$ $R_E \| \left(\dfrac{R'_s}{\beta} + r_e\right)$
	Including r_o: $\cong 1$	$R_1 \| R_2 \| \beta(r_e + R'_E)$	$R_E \| \left(\dfrac{R'_s}{\beta} + r_e\right)$
	$\cong \dfrac{-(R_L \| R_C)}{r_e}$	$R_E \| r_e$	R_C
	Including r_o: $\cong \dfrac{-(R_L \| R_C \| r_o)}{r_e}$	$R_E \| r_e$	$R_C \| r_o$
	$\dfrac{-(R_L \| R_C)}{R_E}$	$R_1 \| R_2 \| \beta(r_e + R_E)$	R_C
	Including r_o: $\dfrac{-(R_L \| R_C)}{R_E}$	$R_1 \| R_2 \| \beta(r_e + R_e)$	$\cong R_C$