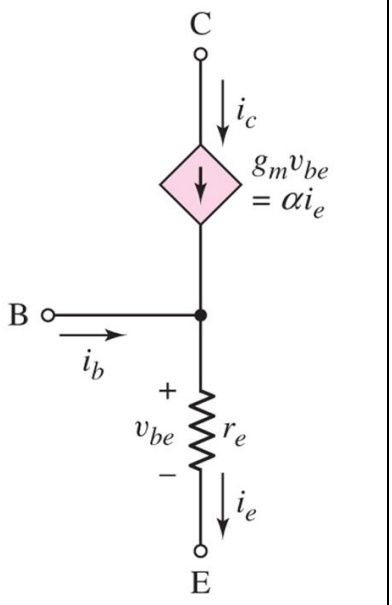
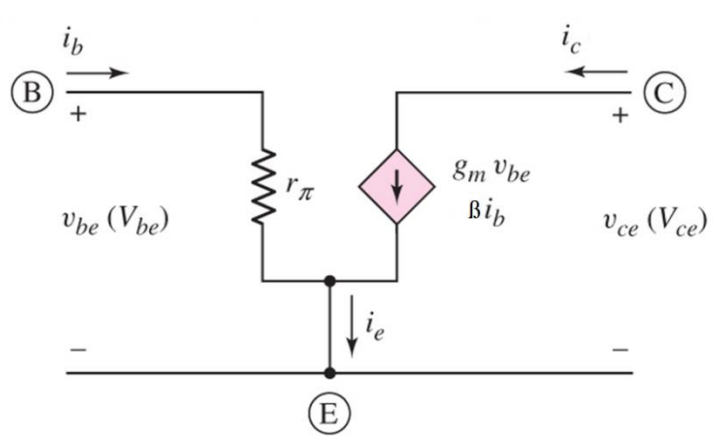
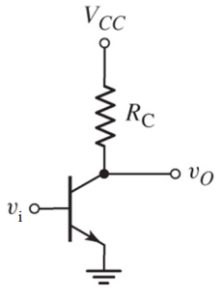
BJT Cheat Sheet Solved

Variable	g_m	r_π	r_e	r_o
Equation				
Typical value				

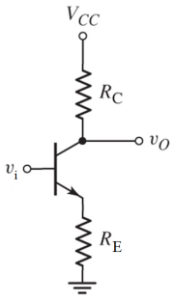
T model	Hybrid Pi model
	

Element	DC Model	AC Model
Resistor	R	R
Capacitor	Open	C
Inductor	L	Short
Diode	0.7V drop	$R_d = V_t/I_D$
Indep. Voltage Source	V	Short
Indep. Current Source	I	Open
BJT	Diode/Current Src	Pi or T model

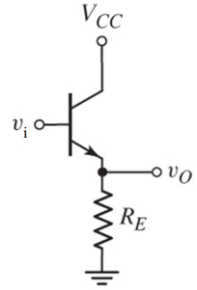
Common Emitter

	Input resistance	
	Output resistance	
	Gain	

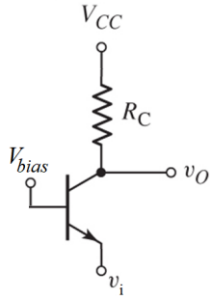
Common Emitter with degeneration resistor

	Input resistance	
	Output resistance	
	Gain	

Common Collector

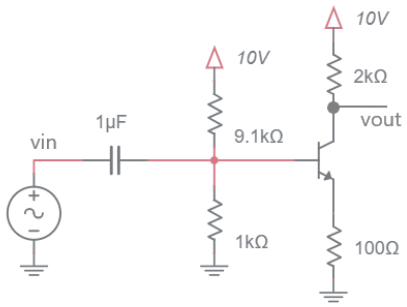
	Input resistance	
	Output resistance	
	Gain	

Common Base

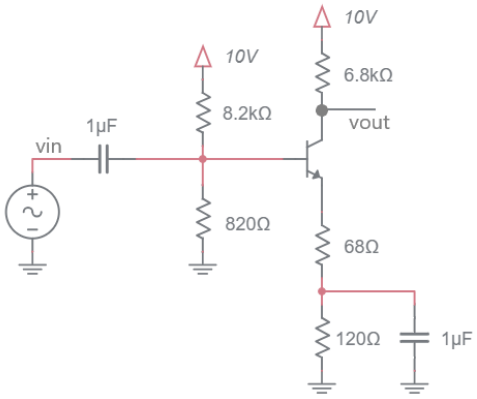
	Input resistance	
	Output resistance	
	Gain	

Small signal analysis of BJT circuits

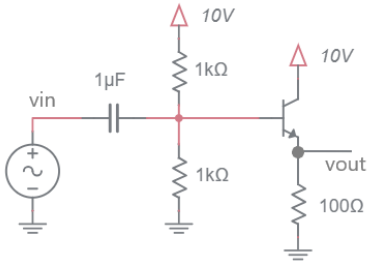
Complete the following table for these circuits. Assume infinite Early voltage.



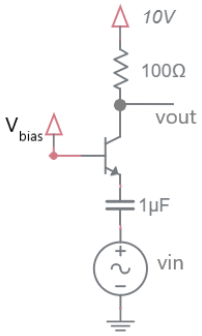
001



002



003

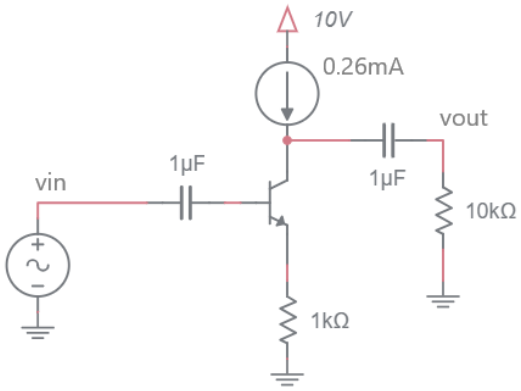


004

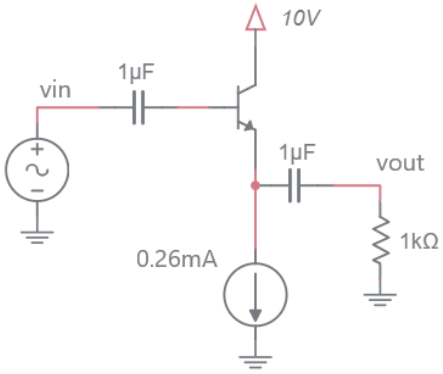
Circuit	I_C	V_{OUT}	g_m	r_e	A_V
001					
002					
003					
004					

Small signal analysis of BJT circuits

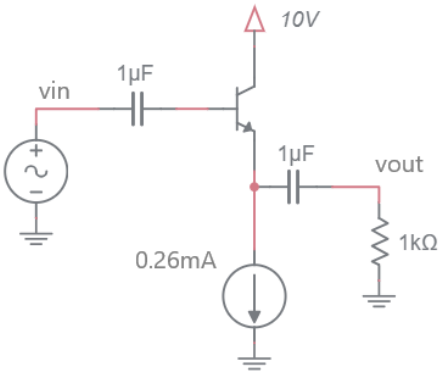
Complete the following table for these circuits. Assume infinite Early voltage.



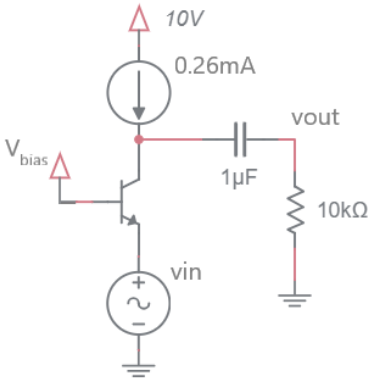
001



002



003

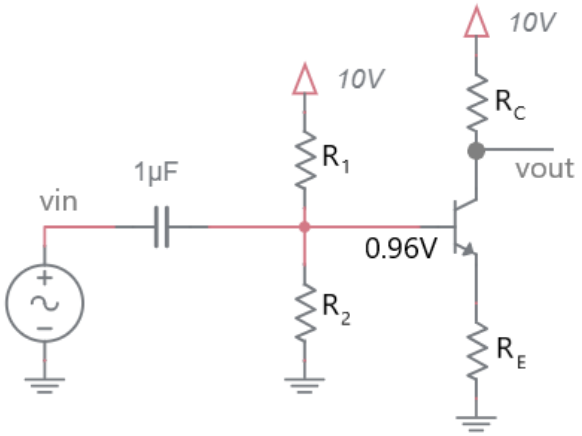


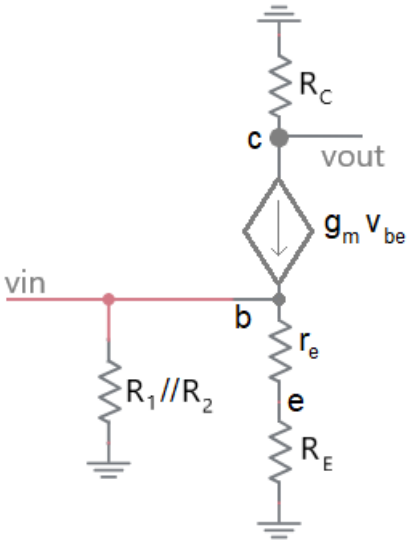
004

Circuit	I_C	V_{OUT}	g_m	r_e	A_V
001					
002					
003					
004					

Small signal analysis of BJT circuits

Let's explore the range of AC gain that you can achieve with the following circuit. The values of R1 and R2 have been selected so that the base of the BJT is DC biased to 0.96V – you do not need to compute the resistors values needed to make this happen.





Step 1: Describe I_C in terms of R_E

Step 2: Describe V_{OUT} in terms of R_E and R_C

Step 3: Describe g_m and r_e in terms of R_E

Step 4: Build a small signal model for the circuit

Step 5: Describe the small signal gain in terms of R_E and R_C

Step 6: Describe V_{OUT} in terms of A_v

Step 7: Find the maximum gain before the BJT saturates