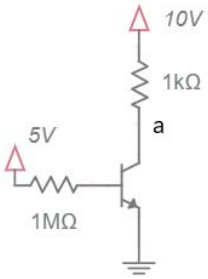
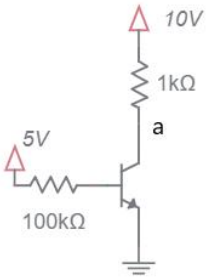
DC circuits with NPN BJTs and resistors

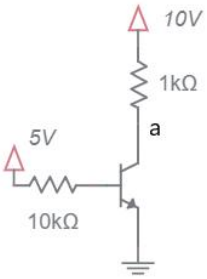
Determine the voltage at labeled nodes and determine ic, ib and ie in the following circuit. If the BJT is in the active region, assume ß = 100 and ic=ie. If the BJT is in saturation, assume that Vce = 0.2V. Only compute ß when the BJT is in saturation. Round you answer to 2-significant figures and include units. If the circuit does not have the variable asked for in the table, leave that entry blank



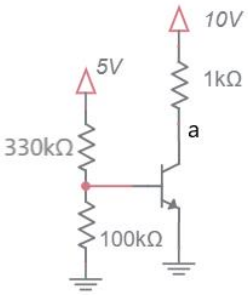
001



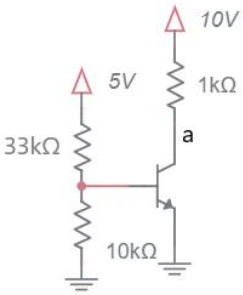
002



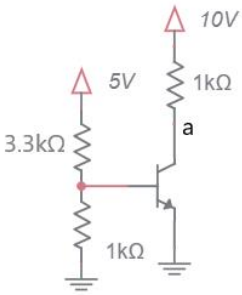
003



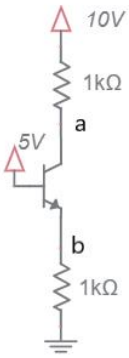
004



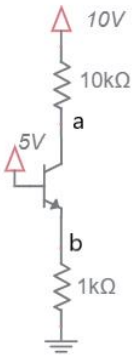
005



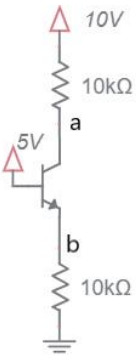
006



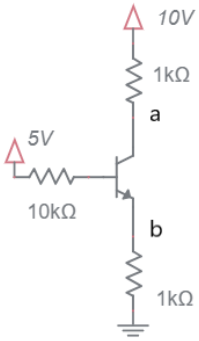
007



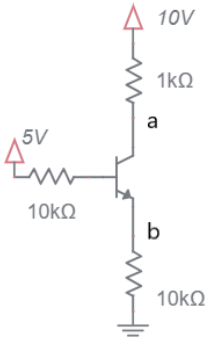
008



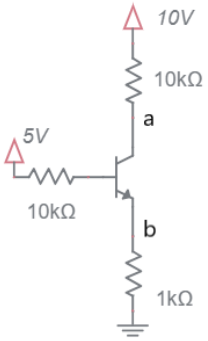
009



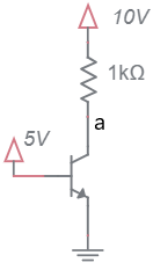
010



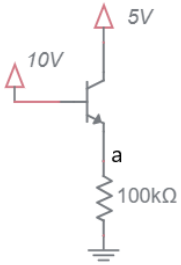
011



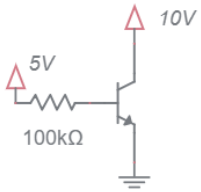
012



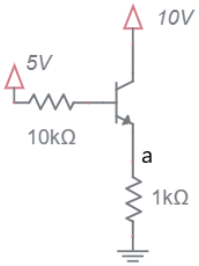
013



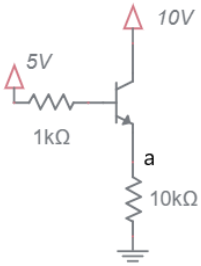
014



015



016

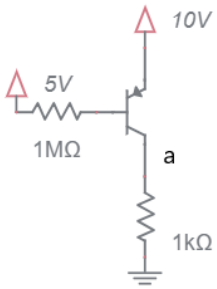


017

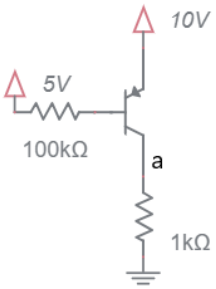
Problem	a	b	ic	ib	ie	ß
001						
002						
003						
004						
005						
006						
007						
008						
009						
010						
011						
012						
013						
014						
015						
016						
017						

DC circuits with PNP BJTs and resistors

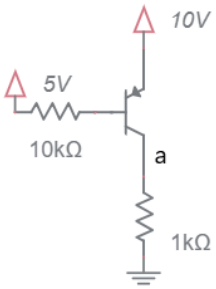
Determine the voltage at labeled nodes and determine ic, ib and ie in the following circuit. If the BJT is in the active region, assume ß = 100 and ic=ie. If the BJT is in saturation, assume that Vce = 0.2V. Only compute ß when the BJT is in saturation. Round you answer to 2-significant figures and include units. If the circuit does not have the variable asked for in the table, leave that entry blank



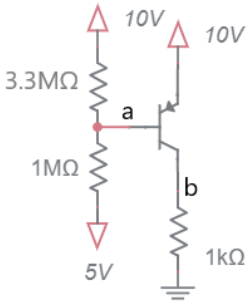
001



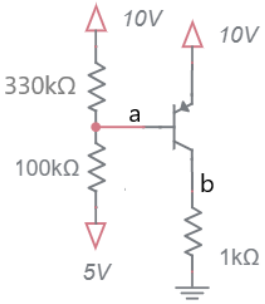
002



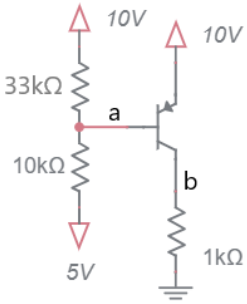
003



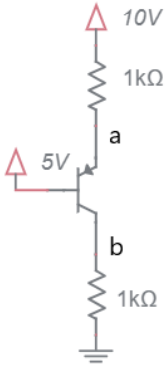
004



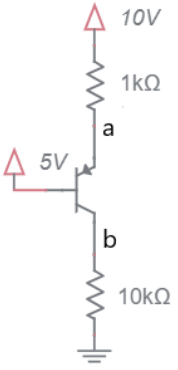
005



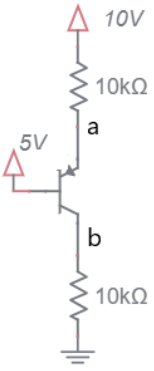
006



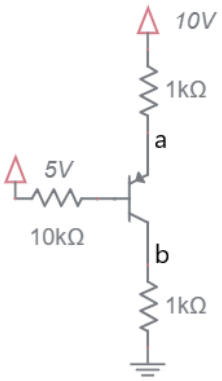
007



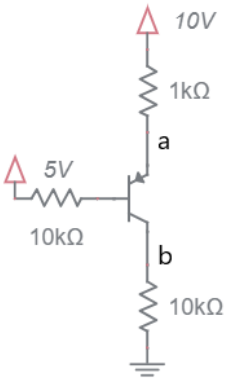
008



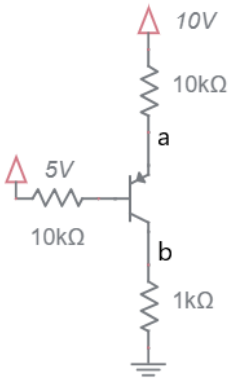
009



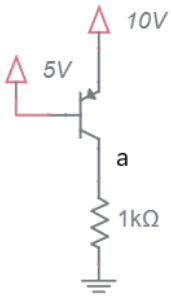
010



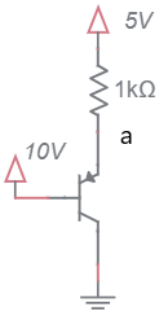
011



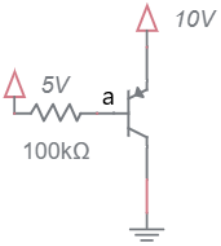
012



013



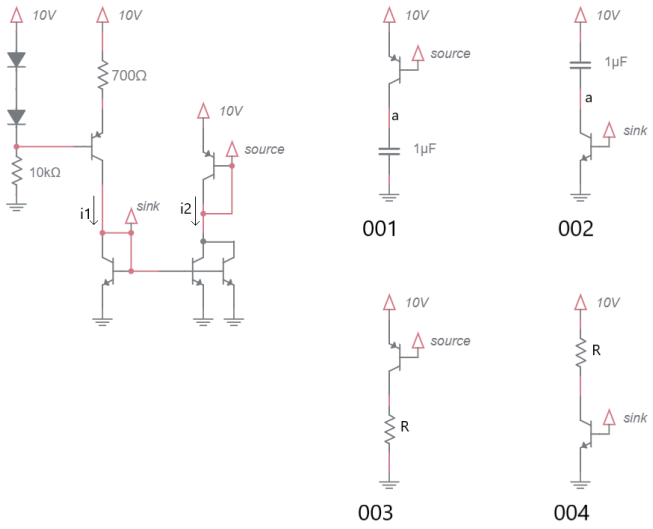
014



015

Problem	a	b	ic	ib	ie	ß
001						
002						
003						
004						
005						
006						
007						
008						
009						
010						
011						
012						
013						
014						
015						

BJT Current Sources and mirrors



1. Determine the currents i1 and i2.
2. What is the range of resistance in the circuits 003 and 004 to keep their BJTs in the active region?
3. Plot the volage at point a in circuits 001 and 002 assuming the capacitor is discharge at time 0. You can use the following questions to help.
    a. Use the voltage/current equation for a capacitor to determine dv/dt for the capacitor.
    b. The initial voltage drop across the capacitors is 0V. What is the voltage at point a?
    c. The final voltage drop across the capacitors is 10V. What is the voltage at point a?

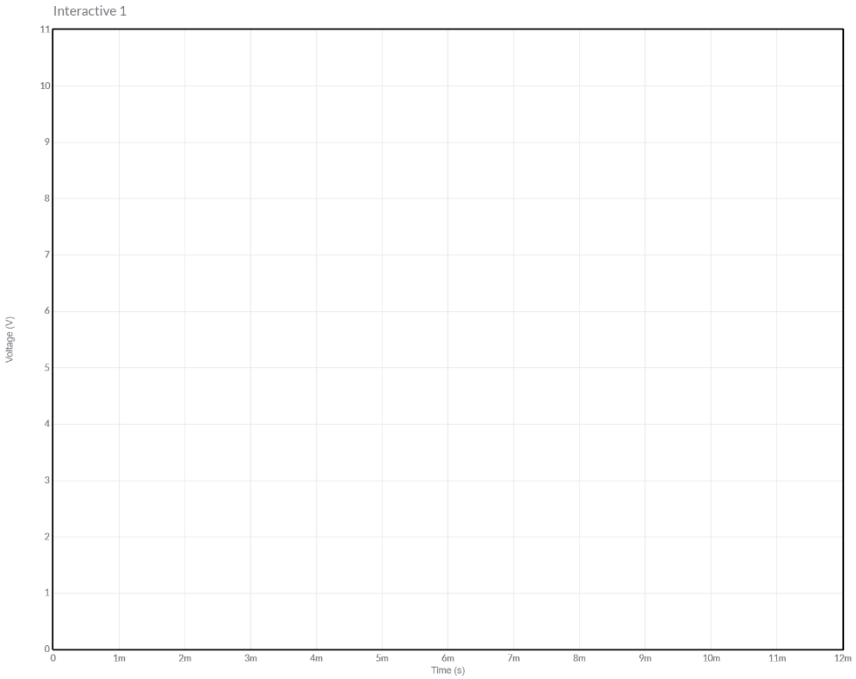


*Figure 1: Plot the voltage at node **a** for the circuits shown in 001 and 002*

You are required to illuminate a Cree Xlamp XM-L2 High Power LED using a current source. The LED has a I vs. V curve is shown at left in Figure 2. Your current source, shown at right in Figure 2, uses a TIP31 (a high powered NPN transistor) and a 2.7V Zener diode. You need to run the LED at 2 amps.

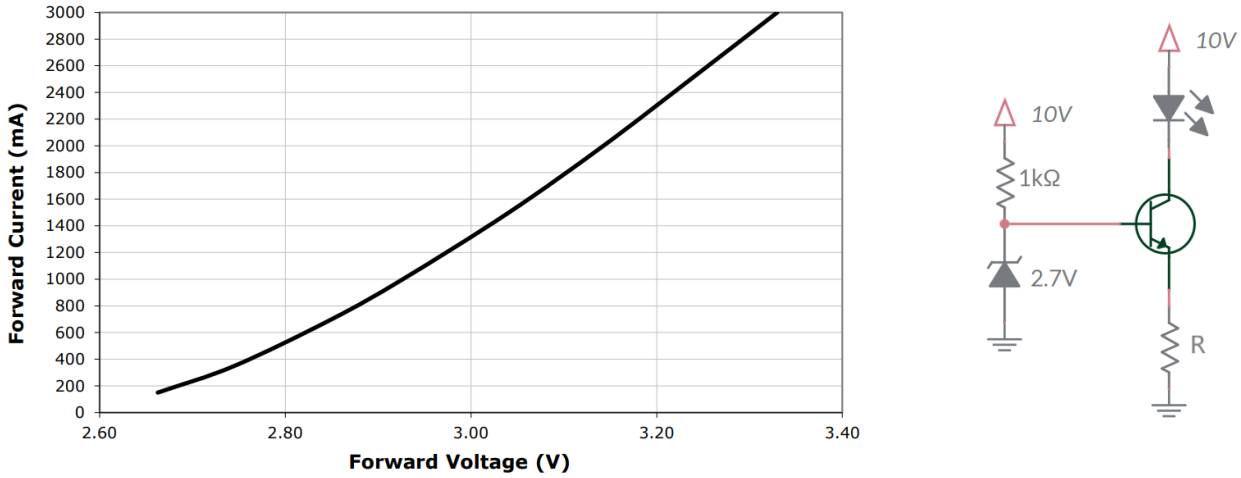


Figure 2: (Left) I/V curve for a Cree Xlamp XM-L2 High Power LED. (Right) The constant current source used to drive the LED.

a. What is the emitter voltage?
b. What value of emitter resistor, R, will produce the needed 2A through the LED?
c. What is the voltage drop across the LED at 2A?
d. What is the power dissipated by the LED at 2A?
e. What is the power dissipated by the resistor R at 2A?
f. What is the voltage across the BJT at 2A?
g. What is the power dissipated by the BJT at 2A?
h. How can you reduce the power dissipation of the BJT while keeping 2A running through the LED? Do not change the circuit topology.