Assume thermal voltage: $V_T = 25 \text{ mV}$

Note for Fig. 4.8: $I_B$ should flow out of transistor.

1. Fill in the blanks in the circuit below. You may neglect the base bias current ($I_B$).

   a) $V_{CC} =$ ________
      $I_C =$ ________
      $V_B =$ ________
      $V_C =$ ________
      $V_{CE} =$ ________
      $V_E =$ ________
      $R_E =$ ________

   b) $V_{CC} =$ ________
      $I_C =$ ________
      $V_B =$ ________
      $I_{R2} =$ ________
      $V_{CE} =$ ________
      $V_E =$ ________
      $R_E =$ ________

   c) $V_{CC} =$ ________
      $I_C =$ ________
      $I_{R2} =$ ________
      $V_{CE} =$ ________
      $V_E =$ ________
      $R_E =$ ________
2. a) Fill in the blanks in the circuit. Neglect $I_B$.

Note: You'll probably want to add a sheet of paper in order to work out the rest of this problem.

b) Is the transistor operating in the active region? Show your evidence. Yes  No

c) If $\beta = 150$, how big is that $I_B$ that we neglected?

d) Compare this value to $I_{R2}$. Was it reasonable to neglect $I_B$? (is $I_B < 10\%$ of $I_{R2}$)

e) If we actually built this circuit, what effect would the actual $I_B$ have on $I_C$? That is would $I_C$ be lower, higher or the same as you found earlier? Hint: would $V_B$ be higher or lower? Would $V_E$ be higher or lower? Would $I_E$ be higher or lower?

IC would be: lower higher same (circle one)

f) Considering only $I_C$ and $V_{CE}$, how much power does this transistor dissipate or contribute?

g) Does it dissipate or contribute power? dissipate contribute (circle one)

h) If the $v_s$ signal were applied at the base, an AC signal would also appear at the collector. How much larger would it be. (Voltage gain).

**Answers**

1. a) $V_E = 2.4 \text{ V}$, $V_{CE} = 5 \text{ V}$, $I_C = 1.2 \text{ mA}$, and $V_{CC} = 11 \text{ V}$  
b) $V_B = 2.4 \text{ V}$, $V_{CC} = 18 \text{ V}$, $V_E = 1.7 \text{ V}$, $R_E = 425$,  
$c) V_E = 2.0 \text{ V}$, $V_{CE} = 7 \text{ V}$, $R_C = 600$, and $V_B = 2.7 \text{ V}$, $I_{R2} = 1.5 \text{ mA}$, $R_1 = 6.2 \text{ k}\Omega$

2. a) $I_E := 11.57 \cdot \text{mA}$  
$b) V_C := 8.51 \cdot \text{V}$  
c) $I_B := 0.077 \cdot \text{mA}$  
d) OK to neglect  
e) lower  
f) $69 \cdot \text{mW}$  
g) dissipate  
h) $3.73$