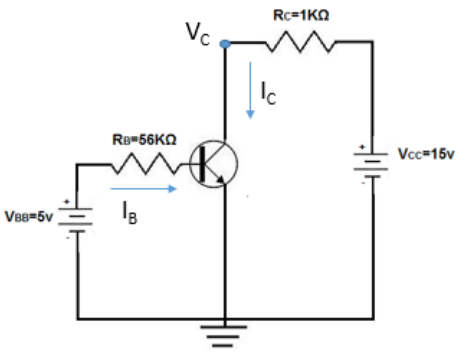
Lecture 4 Quiz Solution

April 2020

Q:	1. I_C, I_B and I_E which one is the largest? which one is the smallest 2. Why silicon type transistors are more often used than germanium type: (select the only one answer) a. Because the price of silicon material is cheaper than the price of germanium. b. Because the isolation of silicon is higher than germanium. c. Because silicon transistor has smaller current I_{CBO} which depends on temperature. 3. Why emitter and base are made smaller than collector? (select the only one answer) a. Because collector is to dissipate much power. b. Because the collector is the largest current. c. Because collector has positive voltage. 4. Why the width of the base of a transistor is smallest region compared to emitter and collector? (select the only one answer) a. Because the base current is smallest. b. Because the base needs to pass most of the injected charge carriers to the collector. c. Because the base is negative voltage. 5. Which transistor modes is used for amplification? 6. Which transistor mode is used for switching?
Ans	1. I_E *is largest*; I_B *is smallest* 2. C 3. A 4. B 5. Active mode 6. Cut-off and Saturation mode
Q7	7. Given a npn transistor with $I_s = 10^{-14}$ A, $V_{BE} = 0.7$V. Calculate I_B and I_E if $\alpha = 0.99$.
ans.	$I_c = I_s e^{\frac{V_{BE}}{V_T}} = 14.4\ mA; \beta = \frac{\alpha}{1-\alpha} = 99$ $I_B = \frac{I_c}{\beta} = 0.145\ mA; \quad I_E = \frac{I_c}{\alpha} = 14.54\ mA$

Q8	8. A transistor circuit is given in the Figure with V_{BB} = 5V, V_{CC} = 15V, R_B = 56kΩ, R_C = 1kΩ, V_{BE} = 0.7V and β = 100. a. Compute I_B and I_C. b. Compute voltage V_C. (Use KVL) 
ans	**a)** $I_B = \frac{5-0.7}{56*10^3} = 0.077\ mA$ $I_B = \frac{I_C}{\beta}$ ⇨ $I_C = \beta * I_B = 100 * 0.077 = 7.7\ mA$ **b)** $V_C = V_{CC} - I_C R_C = 15 - 7.7 * 10^{-3} * 1 * 10^3$ $= 7.3\ V$