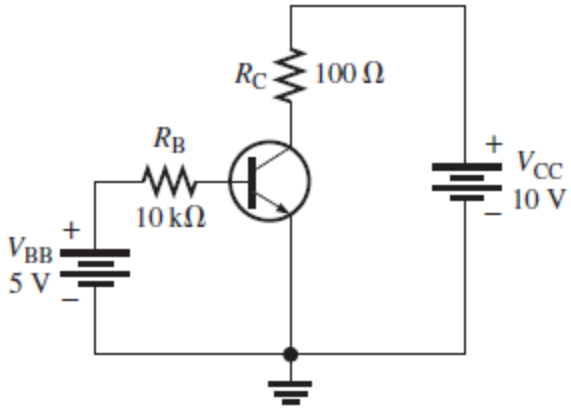
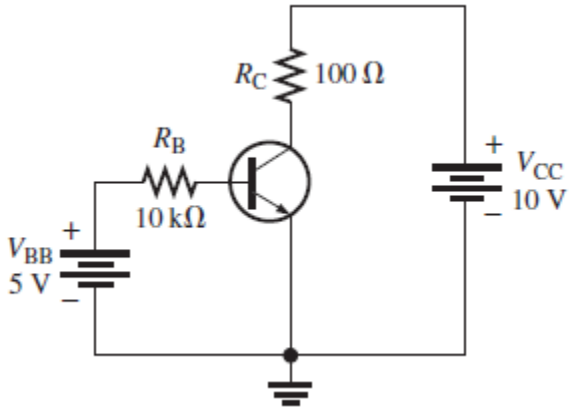
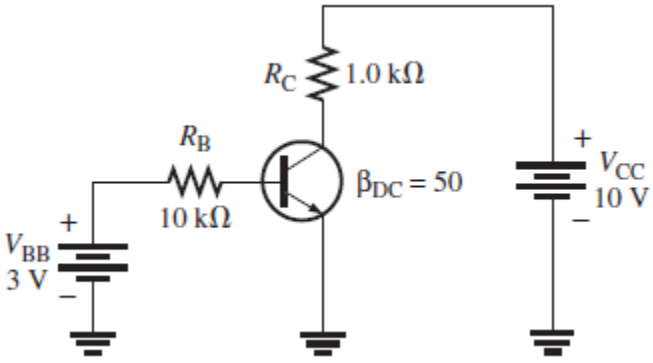
Electronic Circuits - Tutorial 07

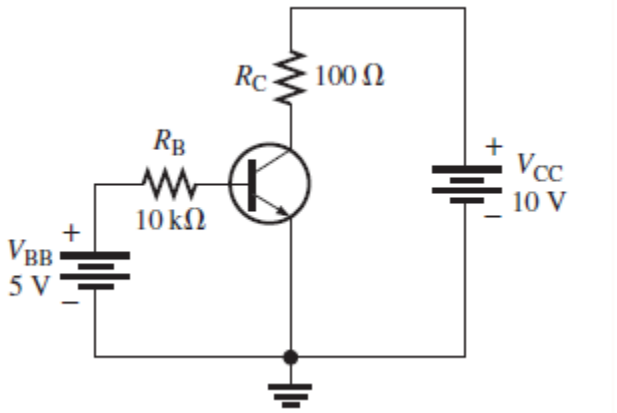
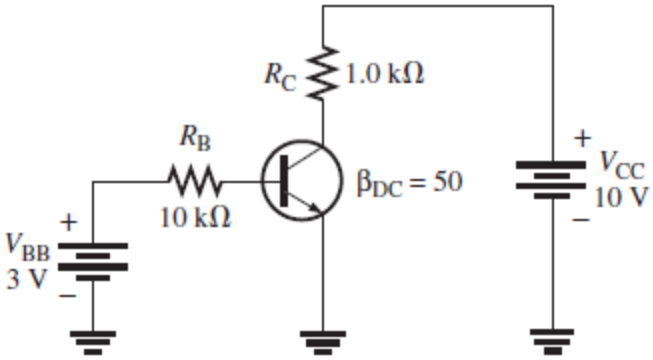
BJT transistor 1

T & F

#	Question	
1	A bipolar junction transistor has three terminals.	T
2	For operation in the linear or active region, the base-emitter junction of a transistor is forward biased.	T
3	The base current and collector current are approximately equal.	F
4	DC and hFE are two different transistor parameters.	F
5	Amplification is the output voltage divided by the input current.	F
6	The three regions of a BJT are base, emitter, and cathode.	F
7	Two types of BJT are npn and pnp.	T
8	The dc voltage gain of a transistor is designated bDC.	F

MCQ

#	Question	
1	 If a transistor with a higher b_{DC} is used in Figure, the collector current will **(a)** increase **(b)** decrease **(c)** not change	a
2	 If a transistor with a higher b_{DC} is used in Figure, the base current will **(a)** increase **(b)** decrease **(c)** not change	c
3	 If V_{CC} in Figure is increased, the base current will **(a)** increase **(b)** decrease **(c)** not change	c
4	The three terminals of a bipolar junction transistor are called **(a)** *p*, *n*, *p* **(b)** *n*, *p*, *n* **(c)** input, output, ground **(d)** base, emitter, collector	d
5	For operation as an amplifier, the base of an *npn* transistor must be	a

	(a) positive with respect to the emitter **(b)** negative with respect to the emitter **(c)** positive with respect to the collector **(d)** 0 V	
6	The β_{DC} of a transistor is its **(a)** current gain **(b)** voltage gain **(c)** power gain **(d)** internal resistance	a
7	The approximate voltage across the forward-biased base-emitter junction of a silicon BJT is **(a)** 0 V **(b)** 0.7 V **(c)** 0.3 V **(d)** V_{BB}	b
8	If the output of a transistor amplifier is 5 V rms and the input is 100 mV rms, the voltage gain is **(a)** 5 **(b)** 500 **(c)** 50 **(d)** 100	c
9	 If a transistor with a higher b_{DC} is used in Figure, the emitter current will **(a)** increase **(b)** decrease **(c)** not change	a
10	 If V_{BB} is reduced in Figure, the collector current will **(a)** increase **(b)** decrease **(c)** not change	b
11	In a *pnp* transistor, the *p* regions are **(a)** base and emitter **(b)** base and collector **(c)** emitter and collector	c
12	The emitter current is always **(a)** greater than the base current **(b)** less than the collector current **(c)** greater than the collector current **(d)** answers (a) and (c)	d
13	If I_C is 50 times larger than I_B, then is βdc **(a)** 0.02 **(b)** 100 **(c)** 50 **(d)** 500	c
14	The bias condition for a transistor to be used as a linear amplifier is called **(a)** forward-reverse **(b)** forward-forward **(c)** reverse-reverse **(d)** collector bias	a
15	When a lowercase is used in relation to a transistor, it refers to **(a)** a low resistance **(b)** a wire resistance **(c)** an internal ac resistance **(d)** a source resistance	c

Problems:

Q1	What are the majority carriers in the base region of an *npn* transistor called?
Sol 1	..... Holes .....

Q2	Explain the purpose of a thin, lightly doped base region.
Sol 2	.....

Q3	Why is the base current in a transistor so much less than the collector current?
Sol 3	The base is narrow and lightly doped so that a small recombination (base) current is generated compared to the collector current.

Q4	In a certain transistor circuit, the base current is 2 percent of the 30 mA emitter current. Determine the collector current
Sol 4	.....

Q5	For normal operation of a *pnp* transistor, the base must be (+ or −) with respect to the emitter, and (+ or −) with respect to the collector.
Sol 5	..... Negative, positive .....

Q6	What is the value of I_C for $I_E = 5.34$ mA and $I_B = 475\ \mu$A?
Sol 6	.....

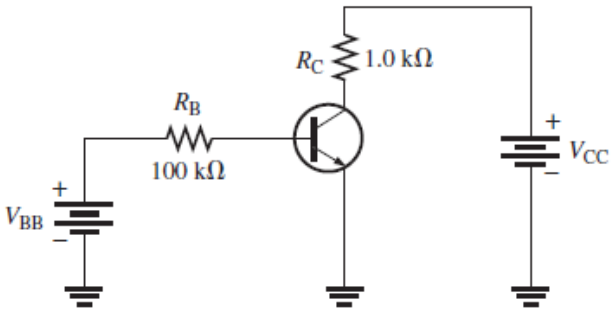
Q7	What is the α_{DC} when $I_C = 8.23$ mA and $I_E = 8.69$ mA?
Sol 7	..... 0.947 .....

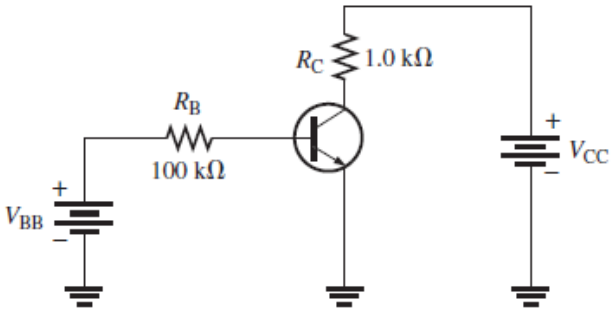
Q8	A certain transistor has an $I_C = 25$ mA and an $I_B = 200$ μA. Determine the β_{DC}.
Sol 8	.....

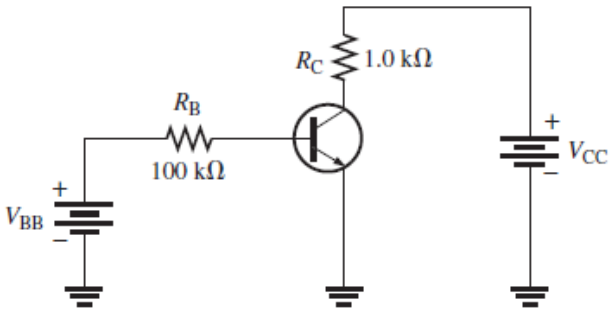
Q9	What is the β_{DC} of a transistor if $I_C = 20.3$ mA and $I_E = 20.5$ mA?
Sol 9	..... 101.5 .....

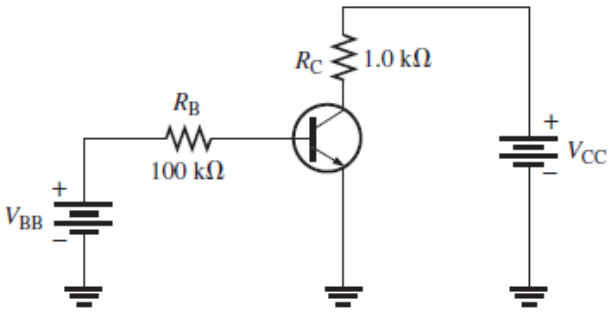
Q10	What is the α_{DC} if $I_C = 5.35$ mA and $I_B = 50\ \mu$A?
Sol 10	.....

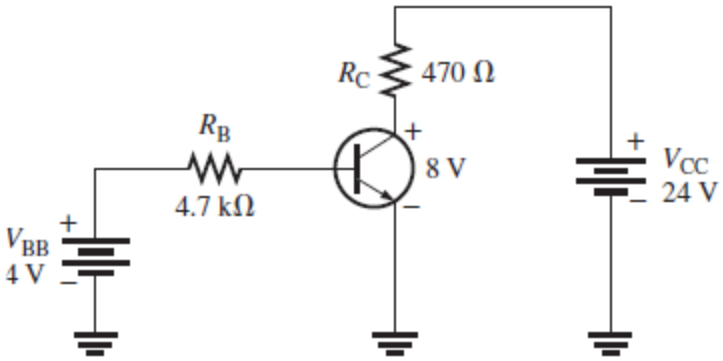
Q11	A certain transistor exhibits an α_{DC} of 0.96. Determine I_C when $I_E = 9.35$ mA.
Sol 11	.... 8.98 mA .....

Q12	A base current of 50 μA is applied to the transistor in Figure 4–53, and a voltage of 5 V is dropped across R_C. Determine the β_{DC} of the transistor. GURE 4–53 
Sol 12	.....

Q13	Calculate α_{DC} for the transistor in A base current of 50 μA is applied to the transistor in Figure 4–53, and a voltage of 5 V is dropped across R_C. Determine the β_{DC} of the transistor. GURE 4–53 
Sol 13	..... 0.99 .....

Q14	Assume that the transistor in the circuit of Figure 4–53 is replaced with one having a β_{dc} of 200. Determine I_B, I_C, I_E, and V_{CE} given that $V_{CC} = 10$ V and $V_{BB} = 3$ V. GURE 4–53 
Sol 14	.....

Q15	If V_{CC} is increased to 15 V in Figure 4–53, how much do the currents and V_{CE} change? GURE 4–53 
Sol 15	5.3 V increase

Q16	Determine each current in Figure 4–54. What is the β_{DC}? 
Sol 16	.....