

7. For normal operation of the transistor, the collector diode has to be
- Forward biased
 - Reverse biased
 - Nonconducting
 - Operating in the breakdown region
8. The base of an *npn* transistor is thin and
- Heavily doped
 - Lightly doped
 - Metallic
 - Doped by a pentavalent material
9. Most of the electrons in the base of an *npn* transistor flow
- Out of the base lead
 - Into the collector
 - Into the emitter
 - Into the base supply
10. Most of the electrons in the base of an *npn* transistor do not recombine because they
- Have a long lifetime
 - Have a negative charge
 - Must flow through the base
 - Flow out of the base
11. Most of the electrons that flow through the base will
- Flow into the collector
 - Flow out of the base lead
 - Recombine with base holes
 - Recombine with collector holes
12. The beta of a transistor is the ratio of the
- Collector current to emitter current
 - Collector current to base current
 - Base current to collector current
 - Emitter current to collector current
13. Increasing the collector supply voltage will increase
- Base current
 - Collector current
 - Emitter current
 - None of the above
14. The fact that there are many free electrons in a transistor emitter region means the emitter is
- Lightly doped
 - Heavily doped
 - Undoped
 - None of the above
15. In a normally biased *npn* transistor, the electrons in the emitter have enough energy to overcome the barrier potential of the
- Base-emitter junction
 - Base-collector junction
 - Collector-base junction
 - Recombination path
16. In a *pnp* transistor, the major carriers in the emitter are
- Free electrons
 - Holes
 - Neither
 - Both
17. What is the most important fact about the collector current?
- It is measured in milliamperes.
 - It equals the base current divided by the current gain.
 - It is small.
 - It approximately equals the emitter current.
18. If the current gain is 100 and the collector current is 10 mA, the base current is
- 10 μA
 - 100 μA
 - 1 A
 - 10 A
19. The base-emitter voltage is usually
- Less than the base supply voltage
 - Equal to the base supply voltage
 - More than the base supply voltage
 - Cannot answer
20. The collector-emitter voltage is usually
- Less than the collector supply voltage
 - Equal to the collector supply voltage
 - More than the collector supply voltage
 - Cannot answer
21. The power dissipated by a transistor approximately equals the collector current times
- Base-emitter voltage
 - Collector-emitter voltage
 - Base supply voltage
 - 0.7 V
22. A small collector current with zero base current is caused by the leakage current of the
- Emitter diode
 - Collector diode
 - Base diode
 - Transistor
23. A transistor acts like a diode and a
- Voltage source
 - Current source
 - Resistance
 - Power supply
24. If the base current is 100 mA and the current gain is 30, the emitter current is
- 3.33 mA
 - 3 A
 - 3.1 A
 - 10 A
25. The base-emitter voltage of an ideal transistor is
- 0
 - 0.3 V
 - 0.7 V
 - 1 V
26. If you recalculate the collector-emitter voltage with the second approximation, the answer will usually be
- Smaller than the ideal value
 - The same as the ideal value
 - Larger than the ideal value
 - Inaccurate
27. In the active region, the collector current is not changed significantly by
- Base supply voltage
 - Base current
 - Current gain
 - Collector resistance
28. The base-emitter voltage of the second approximation is
- 0
 - 0.3 V
 - 0.7 V
 - 1 V
29. If the base resistor is open, what is the collector current?
- 0
 - 1 mA
 - 2 mA
 - 10 mA
30. When comparing the power dissipation of a 2N3904 transistor to the PZT3904 surface-mount version, the 2N3904
- Can handle less power
 - Can handle more power
 - Can handle the same power
 - Is not rated

Problems

SEC. 6-3 TRANSISTOR CURRENTS

- 6-1 A transistor has an emitter current of 10 mA and a collector current of 9.95 mA. What is the base current?
- 6-2 The collector current is 10 mA, and the base current is 0.1 mA. What is the current gain?
- 6-3 A transistor has a current gain of 150 and a base current of 30 μA . What is the collector current?
- 6-4 If the collector current is 100 mA and the current gain is 65, what is the emitter current?

SEC. 6-5 THE BASE CURVE

- 6-5 **MultiSim** What is the base current in Fig. 6-20?

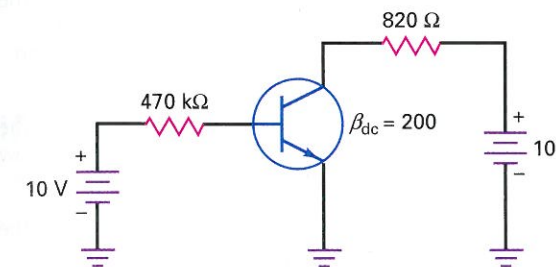


Figure 6-20

- 6-6 **MultiSim** If the current gain decreases from 200 to 100 in Fig. 6-20, what is the base current?
- 6-7 If the 470 k Ω of Fig. 6-20 has a tolerance of ± 5 percent, what is the maximum base current?

SEC. 6-6 COLLECTOR CURVES

- 6-8 **MultiSim** A transistor circuit similar to Fig. 6-20 has a collector supply voltage of 20 V, a collector resistance of 1.5 k Ω , and a collector current of 6 mA. What is the collector-emitter voltage?
- 6-9 If a transistor has a collector current of 100 mA and a collector-emitter voltage of 3.5 V, what is its power dissipation?

SEC. 6-7 TRANSISTOR APPROXIMATIONS

- 6-10 What are the collector-emitter voltage and the transistor power dissipation in Fig. 6-20? (Give answers for the ideal and the second approximation.)
- 6-11 Figure 6-21a shows a simpler way to draw a transistor circuit. It works the same as the circuits already discussed. What is collector-emitter voltage? The transistor power dissipation? (Give answers for the ideal and the second approximation.)
- 6-12 When the base and collector supplies are equal, the transistor can be drawn as shown in Fig. 6-21 b. What is the collector-emitter voltage in this circuit? The transistor power? (Give answers for the ideal and the second approximation.)

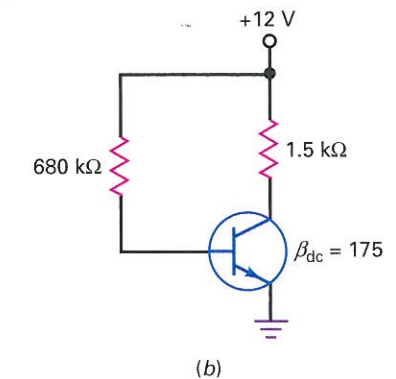
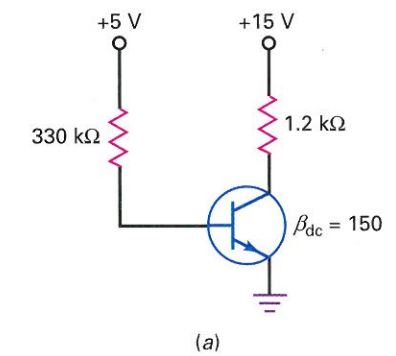


Figure 6-21

SEC. 6-8 READING DATA SHEETS

- 6-13 What is the storage temperature range of a 2N3904?
- 6-14 What is the minimum h_{FE} for a 2N3904 for a collector current of 1 mA and a collector-emitter voltage of 1 V?
- 6-15 A transistor has a power rating of 1 W. If the collector-emitter voltage is 10 V and the collector current is 120 mA, what happens to the transistor?
- 6-16 A 2N3904 has a power dissipation of 625 mW without a heat sink. If the ambient temperature is 65°C, what happens to the power rating?

SEC. 6-10 TROUBLESHOOTING

- 6-17 **MultiSim** In Fig. 6-20, does the collector-emitter voltage increase, decrease, or remain the same for each of these troubles?
- 470 k Ω is shorted
 - 470 k Ω is open
 - 820 Ω is shorted
 - 820 Ω is open
 - No base supply voltage
 - No collector supply