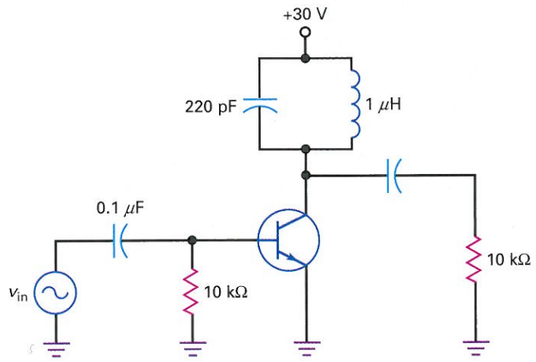
Figure 12-44



Critical Thinking

12-48 The output of an amplifier is a square-wave output even though the input is a sine wave. What is the explanation?

12-49 A power transistor like the one in Fig. 12-36 is used in an amplifier. Somebody tells you that since the case is grounded, you can safely touch the case. What do you think about this?

12-50 You are in a bookstore and you read the following in an electronics book: "Some power amplifiers can have an efficiency of 125 percent." Would you buy the book? Explain your answer.

12-51 Normally, the ac load line is more vertical than the dc load line. A couple of classmates say that they are willing to bet that they can draw a circuit whose ac load line is less vertical than the dc load line. Would you take the bet? Explain.

12-52 Draw the dc and ac load lines for Fig. 12-38.

Up-Down Analysis

In Fig. 12-45, P_L is the output power in the load resistor, and P_S is the dc input power from the supply.

12-53 Predict the response of the dependent variables to a slight increase in V_{CC}. Use the table to check your predictions.

12-54 Repeat Prob. 12-53 for a slight increase in R_1.

12-55 Repeat Prob. 12-53 for a slight increase in R_2.

12-56 Repeat Prob. 12-53 for a slight increase in R_E.

12-57 Repeat Prob. 12-53 for a slight increase in R_C.

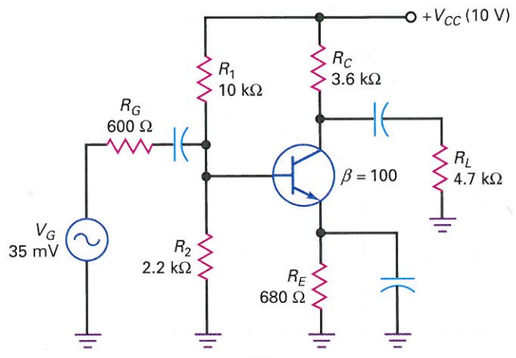
12-58 Repeat Prob. 12-53 for a slight increase in V_G.

12-59 Repeat Prob. 12-53 for a slight increase in R_G.

12-60 Repeat Prob. 12-53 for a slight increase in R_L.

12-61 Repeat Prob. 12-53 for a slight increase in β.

Figure 12-45



(a)

UP-Down Analysis

Slight increase	P_L	P_D	P_S	MPP	η
V_{CC}					
R_1					
R_2					
R_E					
R_C					
V_G					
R_G					
R_L					
β					

(b)

Job Interview Questions

1. Tell me about the three classes of amplifier operation. Illustrate the classes by drawing collector current waveforms.
2. Draw brief schematics showing the three types of coupling used between amplifier stages.
3. Draw a VDB amplifier. Then, draw its dc load line and ac load line. Assuming that the Q point is centered on the ac load lines, what is the ac saturation current? The ac cutoff voltage? The maximum peak-to-peak output?
4. Draw the circuit of a two-stage amplifier and tell me how to calculate the total current drain on the supply.
5. Draw a class C tuned amplifier. Tell me how to calculate the resonant frequency, and tell me what happens to the ac signal at the base. Explain how it is possible that the brief pulses of collector current produce a sine wave of voltage across the resonant tank circuit.
6. What is the most common application of a class C amplifier? Could this type of amplifier be used for an audio application? If not, why not?
7. Explain the purpose of heat sinks. Also, why do we put an insulating washer between the transistor and the heat sink?
8. What is meant by the duty cycle? How is it related to the power supplied by the source?
9. Define Q.
10. Which class of amplifier operation is most efficient? Why?
11. You have ordered a replacement transistor and heat sink. In the box with the heat sink is a package containing a white substance. What is it?
12. Comparing a class A amplifier to a class C amplifier, which has the greater fidelity? Why?
13. What type of amplifier is used when only a small range of frequencies is to be amplified?
14. What other types of amplifiers are you familiar with?

Self-Test Answers

1.	b	13.	b	25.	b
2.	b	14.	b	26.	c
3.	c	15.	b	27.	c
4.	a	16.	b	28.	a
5.	c	17.	c	29.	d
6.	d	18.	a	30.	d
7.	d	19.	a	31.	b
8.	b	20.	c	32.	c
9.	b	21.	b	33.	d
10.	d	22.	d	34.	c
11.	c	23.	a	35.	a
12.	d	24.	a		

Practice Problem Answers

12-1 $I_{CQ} = 100$ mA; $V_{CEQ} = 15$ V

12-2 $i_{c(sat)} = 350$ mA; $V_{CE(cutoff)} = 21$ V; MPP = 12 V

12-3 $Ap = 1122$

12-5 $R = 200\ \Omega$

12-6 $I_{CQ} = 331$ mA; $V_{CEQ} = 6.7$ V; $r_e = 8\ \Omega$

12-7 MPP = 5.3 V

12-8 $P_{D(max)} = 2.8$ W; $P_{out(max)} = 14$ W

12-9 Efficiency = 63%

12-10 Efficiency = 78%

12-11 $f_r = 4.76$ MHz; $V_{out} = 24$ V pp

12-13 $P_D = 16.6$ mW

12-14 $P_{D(max)} = 425$ mW