**SEMICONDUCTOR DEVICES–CLASS 12 PHYSICS QUESTION BANK**

1. Draw a circuit diagram of OR gate.

2. What is a logic gate?

3. What types of charge-carriers are there in a n-type semi conductor?

4. Give the logical symbol of an AND gate. Mark the inputs and outputs.

5. Draw the logic symbol for a NAND gate.

6. Which biasing will make the resistance of p-n junction high?

7. Write the truth table for OR gate.

8. What is the change in the collector current, in a transistor of a.c. current gain 150, for a 100µA change in its base current?

9. When the voltage drop across a p-n junction diode is increased from 0.65V to 0.70V, the change in the diode current is 5mA. What is the dynamic resistance of the diode?

10. How does conductivity of a semiconductor change with rise in its temperature?

11. Draw a p-n junction with reverse bias.

12. What is the order of energy gap in a semiconductor?

13. Give the ratio of the number of holes and the number of conduction electrons in an intrinsic semiconductor.

14. In the given diagram, is the diode D forward or reversed biased?

15. Convert the number 39 into binary system.

16. Write the truth table for the combination of gates shown here.

17. How does the conductance of a semi conducting material change with rise in temperature?

18. Draw energy band diagram for a (i) p- type extrinsic semiconductor (ii) n-type extrinsic semiconductor (iii) intrinsic semiconductors

19. Write the truth table for the following combination of gates: (i)

(ii)

20. How does the collector current change in a junction transistor, if the base region has larger width?

21. How does the thickness of the depletion layer in a p-n junction vary with increase in reverse bias?

22. How does the energy gap in an intrinsic semiconductor vary, when doped with a pentavalent impurity?

23. Name the logic gate realized using p-n junction diodes in the given diagram. Give its logic symbol.

24. How does the energy gap in an intrinsic semiconductor vary, when doped with a trivalent impurity?

25. How does the width of the depletion region of a p-n junction vary, if the reverse bias applied to it increases?

26. What is a solar cell? How does it work? Give its one use.

27. Frequency of input voltage to a half –wave rectifier is 50 Hz. What will be the frequency of the output voltage?

28. Draw the graph showing the variation of current with voltage for a p-n junction diode.

29. The output of an AND gate is connected to both the inputs of NAND gate. Draw the logic circuit of this combination of gates and write its truth table.

30. Derive a relationship between current gain of common base amplifier and current emitter amplifier.

31. Draw a circuit for p-n junction diode in forward bias. Sketch the voltage versus current graph for the same.

32. In the following diagrams, indicate which of the diodes are forward biased and which are reversed biased. (i) (ii) (iii) (iv)

33. If the emitter and base of n-p-n transistor have same doping concentration, explain how will the collector and base-currents be affected?

34. What is an intrinsic semiconductor? How can you convert an intrinsic semiconductor into N-type extrinsic semiconductor?

35. Distinguish between n-type and p-type semiconductors on the basis of energy band diagram.

36. What is an ideal diode? Draw the output waveform across the load resistor R, if the input waveform is as shown in the figure.



37. Write the function of base region of a transistor. Why is this region made thin and slightly doped?

38. The output of a two input NAND gate is fed to a NOT gate. Write down the truth table for the final output of the combination.

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| --- | --- | --- |
| A | B | Output |
| 0011 | 0101 | 1110 |

39. The input resistance of a CE amplifier is 2KΩ and a current gain is 20. If the load resistance is 5 kΩ, Calculate: (i) the voltage gain of the amplifier and (ii) the trans-conductance of transistor used.

40. Draw the logic symbol of a 2-input NAND gate. Write down its truth table.

41. Draw the logic symbol of a 2-input NOR gate. Write down its truth table.

42. The following truth table gives the output of a 2-input logic gate.

(i) Identify the logic gate used and draw its logic

symbol.

(ii) If the output of this gate is fed as input to a

NOT gate, name the new logic gate so formed.

43. Give the logic symbol of AND gate. Explain with the help of circuit diagram, how this gate is realized in practice.

44. Give the logic symbol of OR gate. Explain with the help of circuit diagram, how this gate is realized in practice.

45. What is meant by the term, doping of an intrinsic semiconductor? How does it affect the conductivity of a semiconductor?

46. If the output of a 2-input NAND gate is fed a the input to a NOT gate (i) name the new logic gate obtained and (ii) write down its truth table.

47. Explain briefly why the output and input signals of a common-emitter amplifier differ in phase by 1800.

48. In only one of the circuits given below the lamp L lights. Which circuit is it? Give reason for your answer.

 (a) (b)

49. In the circuit diagram given, a voltmeter V is connected across a lamp L. What changes would occur at lamp L and voltmeter V, if the resistor R is reduced in value? Give reason for your answer.

50. Draw the energy band diagram of an N-type semiconductor. How does the forbidden energy gap of an intrinsic semiconductor vary with increase in temperature?

51. If the emitter and base region of a transistor have same doping concentration, state how (i) collector current and (ii) d.c. current gain of the transistor will change.

52. Determine the currents through the resistance ‘R’ of the circuits (i) and (ii), when similar diodes D1 and D2 are connected as shown below.

53. Pure silicon at 300 K has equal electron and hole concentrations of 1.5 x 1016/m3. Doping by Indium increases the hole concentration to 4.5 x 1022/m3. Calculate the new electron concentration in the doped silicon.

54. Distinguish between n-type and p-type semiconductors on the basis of energy band diagram.

55. The output of an OR gate is connected to both the inputs of a NAND gate. Draw the logic circuit of this combination of gates and write its truth table.

56. Draw a circuit diagram to show the biasing of a n-p-n transistor. Explain the transistor action.

57. Define the terms ‘potential barrier’ and ‘depletion region’ for a p-n junction diode. State how the thickness of depletion region will change when the p.n junction diode is (i) forward biased. (ii) reverse biased.

58. With the help of labelled circuit diagram, explain the rectification action of a full wave rectifier.

59. If the base region of a transistor is made large, as compared to a usual transistor, how does it affect (i) the collector current, and (ii)current gain of this transistor? What is the phase difference between the input and output signals of a common emitter amplifier?

60. Explain how the depletion layer and barrier potential are formed in a p-n junction diode.

61. The output of an OR gate is connected to both the inputs of a NAND gate. Draw the logic circuit of this combination of gates and write its truth table.

62. Symbolically represent a pnp transistor. Show the biasing of a pnp transistor and explain the transistor action.

63. Distinguish between conductors, semiconductors and insulators on the basis of band theory of solids.

64. Draw the circuit diagram of a common-emitter amplifier, with appropriate biasing. What is the phase difference between the input and output signals ?State two reasons why a common-emitter-amplifier is preferred to a common base amplifier.,

65. Draw the energy band diagram of a p-type semiconductor. Deduce an expression for the conductivity of a p-type semiconductor.

66. Draw a circuit diagram to obtain the characteristics of a npn transistor in emitter configuration. Describe how you will obtain input and output characteristics. Give shape of the curves.

67. Draw the circuit diagram of a full-wave rectifier and briefly explain its working principle.

68. Identify the logic gates marked X and Y in the figure given. Write the truth-table to find the. output at Z for all values of A and B.

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69. Explain how the depletion region and barrier potential are formed in a p-n junction diode.

70. Identify the logic gates marked X and Y in the figure given. Write the truth-table to find the. output at Z for all values of A and B.

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71. With a circuit diagram, briefly explain how a zener diode can be used as a voltage regulator.

72. In the figure given below is (i) the emitter, and (ii) the collector forward or reverse biased? With the help of a circuit diagram, explain the action of a n-p-n transistor.

73. Explain how an intrinsic semiconductor can be converted into (i)n-type and (ii) p-type semiconductor. Give one example of each and their energy band diagrams.

74. Draw the circuit diagram to show the use of a transistor as an oscillator. State how the positive feedback is provided in the circuit.

75. In the figure below, circuit symbol of a logic gate and two input waveforms ‘A’ and ‘B’ are shown. (i) Name the logic gate. (ii) Write its truth table. (iii) Give the output waveform.

76. A semiconductor has the electron concentration 0.45 x 1012/m3 and hole concentration 5 x 1020m-3. Find its conductivity. Given electron mobility = 0.135m2 V-ls-1 and hole mobility 0.048 m2V-ls-1 .

77. A semiconductor has equal electron and hole concentrations of 2 x 108/m3. On doping with a certain impurity, the hole concentration increases to 4 x 1010/m3. (i) What type of semiconductor is obtained on doping? (ii) Calculate the new electron hole concentration of the semiconductor. (iii) How does the energy gap vary with doping?

78. In a transistor, the base current is changed by 30 μA. This results in a change of 0.03 V in base to emitter voltage and a change of 3 mA in the collector current. (i) Find (a) current gain ‘βac‘ and (b) transconductance ‘gm’, (ii) If this transistor is used as an amplifier with the load resistance 7.5 kΩ, calculate voltage gain of amplifier.

79. The input resistance of a silicon transistor is 665 Ω. Its base current is changed by 15 μA which results in change of collector current by 2 mA. This transistor is used as a common emitter amplifier with a load resistance of 5 k Ω. Calculate(i) current gain ‘βa.c.’, (ii) trans-conductance ‘gm‘, and (iii) voltage gain ‘Av’ of the amplifier.

80. In a transistor a change of base current by 20 μA, results in a change of 0.02V in base emitter voltage and a change of 2mA in the collector current, Find (i) current gain ‘βa.c.’, (ii) trans-conductance ‘gm‘. Also calculate the voltage gain of this transistor when used as a common emitter amplifier with a load resistance of 5 kΩ.

81. How a pn junction can be used as a (a) half wave rectifier (b) full-wave rectifier?

82. What is a pn junction? Explain with the help of a diagram, how depletion layer is formed near the junction. Explain also what happens to this layer when the junction is (i) forward biased and (ii) reverse biased.

83. What do you understand by the term “holes” in a semiconductor. Discuss how they move under the influence of electric field.

84. What is a pn junction? How is a pn junction made? How potential barrier is caused into it?

85. By drawing a labeled circuit diagram, explain how a NPN transistor can be used as an amplifier in common base configuration. Find its current gain, voltage gain and power gain.

86. Define the terms “potential barrier” and ‘depletion region’ for a pn junction. Explain with the help of a circuit diagram, the use of a pn junction as a full wave rectifier. Draw the input and output waveforms.

87. Frequency of input voltage to a half wave rectifier is 50Hz. What will be the frequency of the output voltage?

88. In a n type semiconductor, the number of free electron is greater than the number of holes. Does it have net negative charge? Why?

89. Write short note on LED.