



PHYSICS

BOOKS - JEEVITH PUBLICATIONS

PHYSICS (KANNADA ENGLISH)

SEMICONDUCTOR ELECTRONICS

One Mark Questions With Answer

1. Give an example for a basic block of an electronic circuit.



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2. What is meant by basic building block of an electronic circuit?



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3. What are vacuum tube devices?



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4. What is meant by an cathode used in a vacuum tube?



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5. What is meant by an anode used in vacuum tube?



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6. Why are vacuum tubes obsolete today?



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7. What is meant by a semiconductor device?



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8. Name any one method of increasing the number of charge carriers in a semiconductor.



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9. Give an one advantage of semiconductors over vacuum tubes?



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10. Name the principle on which a Cathode Ray Tube (CRT) works.



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11. Where are CRT's used?



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12. Expand the term 'LCD'.



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13. How are solids classified based on their electrical conductivity?



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14. What is the range of resistivity of metallic conductors?



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15. What is the range of resistivity of semiconductors?



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16. What is the range of resistivity of insulators?



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17. Name any one elemental semiconductor.



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18. Name any one compound semiconductor.



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19. Name any one organic semiconductor.



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20. Name any one organic semiconductor.



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21. What is polymer electronics?



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22. What is a valence band?



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23. What is a conduction band?



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24. What is a forbidden gap?



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25. What is the value of forbidden gap energy of a silicon semiconductor?



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26. What is the value of forbidden gap energy of a germanium semiconductor?



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27. What is the forbidden gap energy of metals?



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28. What are holes in a semiconductor?



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29. What are intrinsic semiconductor?



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30. How does an extrinsic semiconductor crystal maintain charge neutrality?



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31. Relate number densities of holes and electrons with the number density of ionised atoms.



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32. Mention the forbidden gap energy corresponding to diamond.



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33. Mention the forbidden gap energy of insulators.



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34. Name the majority charge carriers in N-type semiconductors.



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35. Name the majority charge carriers in P-type semiconductors.



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36. What is the net current in a p-n junction under equilibrium?



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37. Mention the thickness of depletion region in a p-n junction.



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38. What type of charges are left near and on either sides of the junction diode?



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39. When is a diode side to be forward biased?



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40. What is the reverse bias resistance of an ideal junction diode?



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41. What is the forward bias resistance of an ideal junction diode?



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42. Name a device which converts ac into dc.



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43. What is the value of cut-in or threshold voltage for a germanium diode?



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44. What is half-wave rectifier?



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45. What is meant by a Full Wave Rectifier?



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46. Compare the V_{peak} due to HWR and FWR.



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47. Why is a filter circuit used in rectifier circuits?



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48. Mention any one type of filter circuit that can be used to eliminate ac ripples in the output voltage.



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49. Draw a neat labelled diagram of the output of a HWR.



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50. Draw a neat labelled diagram of the output of A FWR.



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51. What is a Zener diode?



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52. Name any two devices which can be used as voltage regulators.



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53. Mention the order of electric field in the depletion region in an unbiased junction diode.



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54. Name any one optoelectronic junction device.



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55. What are photodiodes?



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56. What are photodiodes used for ?



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57. What are LEDs?



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58. What is a transistor ?



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59. What is the type of bias b/w CB and EB for normal operation?



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60. Which one of the three regions of a transistor is heavily doped?



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61. Why is the collector region doped at intermediate level compared to the emitter and the base?



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62. Expand the term transistor.



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63. Draw input characteristic curve for a CE transistor circuit.



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64. What does the slope in the linear region of input characteristic curve determine?



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65. What does the ratio $\left(\frac{\Delta V_{CE}}{\Delta I_C} \right)$ for a constant I_B determine?



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66. Define ac signal current amplification factor (β).



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67. Define β_{dc} of a transistor.



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68. What will be the value of β_{dc} for most of the transistors?



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69. What is a switch?



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70. In which regions of transfer characteristic does a transistor work as a switch?

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71. What will be the voltage between the collector and the emitter (V_{CE}) of a transistor, used as a switch, during the cut off state?

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72. What will be the voltage V_{CE} during the saturation region?



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73. What is an amplifier?



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74. What is amplification?



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75. What does the negative voltage gain of a CE amplifier indicate?



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76. Give the expression for power gain of a CE amplifier.



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77. What type of feedback is found in the amplifier circuit?



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78. What do you call an amplifier with a positive feedback?



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79. What is meant by a positive feedback?



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80. Write the expression for the frequency of an LC oscillator?



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81. What is a binary signal?



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82. What is logic gates?



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83. What is a logic OR gate?



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84. Write the truth table for logic OR gate.



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85. What is a logic AND gate?



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86. Give the logic symbol, Boolean expression and truth table of an AND gate.



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87. What is an INVERT or NOT gate?



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88. What is a NAND gate?



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89. Write the truth table of NAND gate.



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90. What is a NOR gate?



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91. Give the logic symbol, Boolean expression and truth table of a NOR gate.



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92. Mention any one type of integrated circuit.



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93. Give an example for a linear IC.



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94. What is an integrated circuit?



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95. Mention any one application of LEDs.



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96. What is a solar cell?



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97. Mention two necessary conditions for doping.



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Two Marks Questions With Answers

1. Represent a NOT gate using a NAND gate or a NOR gate.



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2. Mention any two ways of increasing the conductivity of an intrinsic semiconductor.



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3. What are p-type and n-type semiconductors?



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4. Mention the two methods of biasing a diode.



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5. Distinguish between p type and n type semiconductors



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6. Distinguish between n-p-n and p-n-p transistors.



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7. What is a photo diode? In which mode of biasing does it work?



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8. Relate I_E , I_B and I_C for a transistor.



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9. Define current gain at a constant V_{CE} and V_{BE} .



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10. What is meant by input and output resistance of a transistor amplifier in CE mode?



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11. Mention a few semiconductors employed in the fabrication of solar cells.



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12. Explain a typical p-n junction solar cell with a neat labelling



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13. Draw I-V characteristics of a solar cell.



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14. Draw a labelled diagram for a N-P-N transistor showing the necessary DC-bias conditions.



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15. Draw DC bias condition for a PNP transistor.



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16. Show the circuit arrangement for studying the input and output characteristics of a n-p-n transistor in CE configuration.



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17. Draw a neat labelled diagram of a transistor amplifier in a CE mode.



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18. Explain briefly Barkhausen's criteria.



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19. Distinguish between positive feedback and negative feed back.



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20. What is Boolean algebra?



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21. Give the logic symbol, Boolean expression and truth table of an AND gate.



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22. Write the symbol and truth table for a logic NOT gate



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23. Give the logic symbol, Boolean expression and truth table of a NAND gate?



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24. Give the logic symbol, Boolean expression and truth table of a NOR gate.



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25. Write the Boolean equation for a NOR gate and a NAND gate



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26. Name the two types of integrated circuits.



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27. How are electron-hole pairs created in a semiconductor?



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28. When does electron-hole recombination take place?



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29. Give a schematic two-dimensional representation of an intrinsic Si or Ge crystal.



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30. Draw energy band diagram of an intrinsic semiconductor at room temperature.



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31. Draw I-V characteristics of a Zener diode with neat labelling.



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32. Draw a neat labelled diagram of a Zener diode used as a DC voltage regulator.



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33. Write the symbols for a NPN and PNP transistors.



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34. Draw the output characteristic curve for a CE transistor circuit.



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35. Give the expression for voltage gain in a CE amplifier along with the meaning of the symbols used.



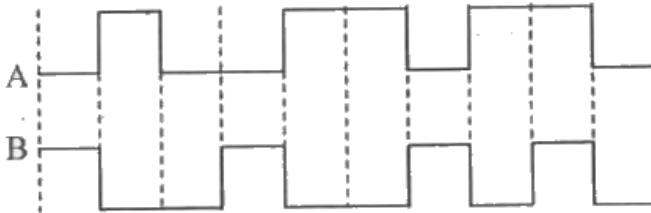
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36. What is a tuned circuit?



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37. If the following waveform is applied to an OR gate, then write the output.



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38. Mention a few important criteria for the selection of a material for the fabrication of solar cells.



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39. Identify the terms SSI, MSI, LSI and VLSI with respect to digital Ics.



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40. Explain the working of a zener diode as a voltage regulator.



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41. Explain the working of a forward biased p-n junction diode.



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42. Explain the working of a reverse biased p-n junction diode.



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Five Marks Questions With Answers

1. What is half wave rectification? Explain the working of a half wave rectifier. Indicate the waveforms of input and output voltage.



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2. What is full wave rectification? Explain the working of a full wave rectifier. Indicate the wave forms of input and output voltage.



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3. With the help of a diagram, describe the action of a CE amplifier.



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4. Classify metals, semiconductors and insulators based on the band theory of solids.



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5. Outline the method of drawing input and output characteristics with a neat labelled diagram of an N-P-N transistor in CE configuration.



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6. Explain briefly, the action of a transistor as a switch.



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7. Show that voltage gain in a transistor amplifier in CE mode is negative and hence obtain the expression for the voltage gain.



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8. Explain briefly the action of a transistor as a tuned collector oscillator.



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9. Write a note on integrated circuits.



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Optional Numericals With Solutions

1. If the peak value voltage in the secondary output ac voltage is 12V, then what will be the average DC in the case of HWR and FWR?



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2. For a CE transistor amplifier, the audio signal across the collector resistance of $2k\Omega$ is 2V. Suppose the current amplification factor of the transistor is 100, find the input signal

voltage and base current, if the base resistance is $1\text{ k}\Omega$.



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3. Two amplifiers are connected one after the other in series. The first amplifier has a voltage gain of 10 and the second has a voltage gain of 20. If the input signal is 0.01V . Calculate the output ac signal.



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4. A p-n photo diode is fabricated from a semiconductor with band gap of 2.8eV. Can it detect a wavelength of 6000nm?



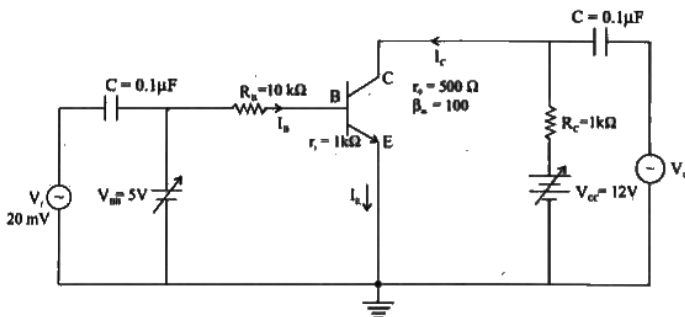
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5. The number of silicon atoms per m^3 is 5×10^{28} . This is doped simultaneously with 5×10^{22} atoms per m^3 of Arsenic and 5×10^{20} per m^3 atoms of Indium. Calculate the number of electrons and holes given that

$n_i = 1.5 \times 10^{16} m^{-3}$. Is the material n-type or p-type?

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6. Calculate the voltage gain of the following common-emitter amplifier. If the input signal voltage is 20 mV then calculate the output voltage.





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