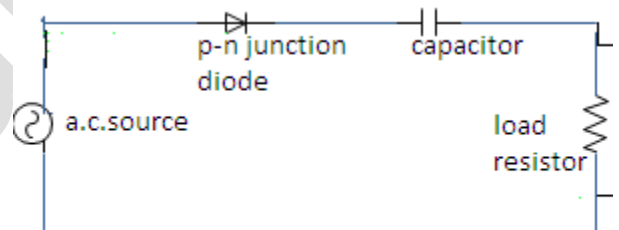


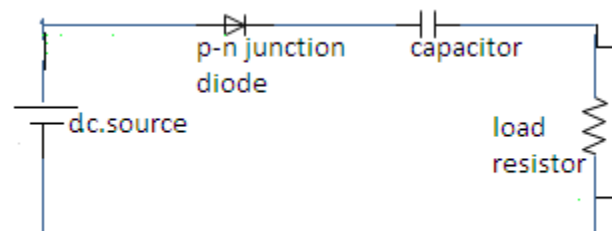
1. Does the material used for making a diode, just a pure semi-conductor? Explain.
2. About how much impurity is added to make a semiconductor change their conductive properties?
3. Why a pure Si or Ge is not good conductors of electricity?
4. C, Si and Ge have same lattice structure. Why is C insulator while Si and Ge intrinsic semiconductors?
5. Why is n-type or a p-type semiconductor in overall electrically neutral?
6. Why does the charge of a hole is taken positive?
7. How n-type material is formed and provides conduction?
8. How a p-type material is formed and provides conduction?
9. Suppose a pure Si crystal has  $5 \times 10^{28}$  atoms  $\text{m}^{-3}$ . It is doped by 1ppm concentration of pentavalent As. Calculate the number of electrons and holes. Given that  $n_i = 1.5 \times 10^{16} \text{ m}^{-3}$ .
10. How does an intrinsic semiconductor behave at 0K
11. Explain the process of diffusion when p-type and n-type materials are fused together.
12. Explain the process of formation of potential barrier and depletion layer.
13. Why the charge diffusion does quickly stops soon after the formation of a pn-junction?
14. When a diode is forward-biased, the negative terminal of the battery repels the mobile electrons in the n-type material, and they move towards the junction. Likewise, the positive terminal repels the holes to move towards the junction. At the junction electrons fills the holes, then how a continual flow of charge is maintained?
15. The current-verses-voltage characteristics of a p-n junction diode show the dependence of the current on the magnitude and polarity of the voltage applied across the diode. Name the *other two factors* upon which the *exact values* of current in forward bias of a semiconductor depend?
16. What does the direction of arrowhead in the symbol of a diode represent?
17. How can you increase or decrease the effective resistance of the junction?
18. What sort of physical changes can be produced in a diode by changing electrical properties?

19. There are two operating regions and three possible "biasing" conditions for the standard **Junction Diode**. List the three biasing conditions.
20. What happens when no external polarity is applied but the diode terminals are shorted together?
21. Explain the process of attaining a state of "Dynamic Equilibrium" of a p-n junction.
22. Draw an experimental circuit arrangement for studying V-I characteristics for both the cases of forward and reverse bias of a p-n junction diode and sketch a typical V-I characteristic curve for the same.
23. Explain under what conditions can a diode act like a  
 a) short circuit  
 b) open circuit
24. Draw a sketch graph to show the output voltage across the load resistor in the following circuit.



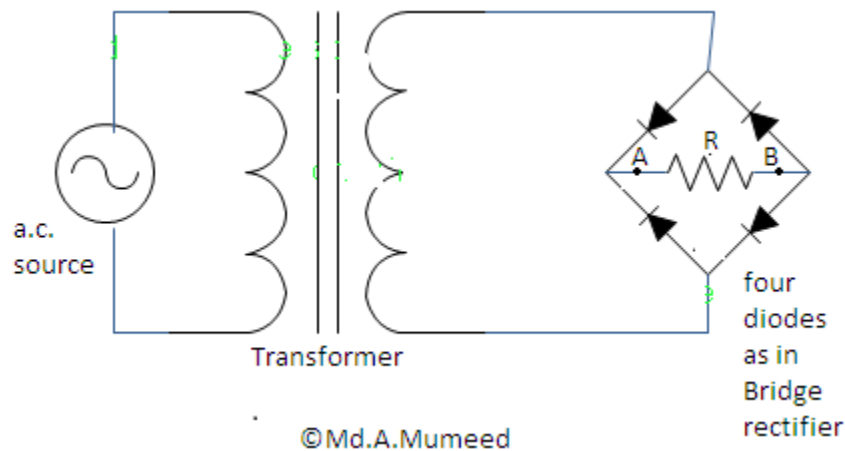
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25. Draw a sketch graph to show the output voltage across the load resistor in the following circuit.



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26. What is the direction of current through the load resistor R given in the circuit below for  
 a) positive half of the generator's voltage cycle  
 b) negative half of the generator's voltage cycle

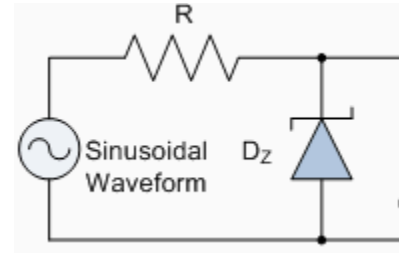


27. What are unidirectional devices?
28. Explain the process of conversion of applied a.c. signal into half wave rectified signal. And also give the reason for the name "Half wave Rectifier".
29. Give the expression for d.c. equivalent output voltage of the half wave rectifier in terms of
  - a) maximum voltage value of the AC supply, and
  - b) the r.m.s. value of the supply
30. Calculate the current, ( $I_{DC}$ ) flowing through a  $100\Omega$  resistor connected to a 240v single phase half-wave rectifier as shown above. Also calculate the power consumed by the load.
31. The capacitor used in a rectifier circuit should be connected in parallel or series with the load resistor? How does it become helpful in that connection? And also sketch a graph to show the variation of output voltage with time.
32. For single phase, half-wave rectifier circuits it is not very practical to try and reduce the ripple voltage by capacitor smoothing alone. Give the reason and suggest any alternate, instead.
33. Full wave rectifiers have two important fundamental advantages over their half wave rectifier counterparts. What are those advantages?
34. Explain "Full Wave Rectification" of applied a.c. signal giving details of circuit connection and showing output wave form.
35. Sketch the output for a Full-wave Rectifier with Smoothing Capacitor.
36. What do you mean by the process of ionization in a solar cell? What is cause of it? Which part of a solar cell produces it?

37. Which type of biasing, if any, is need by a Solar Cell to produce current in external circuit?
38. Explain making of Solar panels or photovoltaic systems (PV systems).
39. Explain the process of conversion of sunlight into electricity.
40. Name a diode in which the energy conversion is just reverse as that of Solar Cell.
41. Why an ordinary diode does warm up but not a LED when electrons and holes combine in the junction?
42. What determines the colour of photons emitted by a LED?
43. What colour of light is emitted by a LED made of gallium aluminium arsenide?
44. What colour of light is emitted by a LED made of aluminium indium gallium phosphate?
45. What material should be used to make a LED to emit green light?
46. What material should be used to make a LED to emit blue light?
47. Why does a small current ( $10^{-8}$  A) arise when a diode is reverse- biased?
48. Why does the reverse-bias current increases with the light intensity?
49. Name the diode which permits current to flow in the forward direction as normal, but will also allow it to flow in the reverse direction when the voltage is above a certain value - the **breakdown voltage**.
50. What is a Zener voltage?
51. What is an avalanche breakdown and how a controlled breakdown can be obtained?
52. How does a reverse current above **Zener voltage** affect
- a normal pn-junction diode
  - a zener-diode
- Give reason for your answer.
53. Draw a sketch graph to show the variation of current with applied voltage for the case of a zener diode in both the forward and reverse biases and also label region of leakage current, avalanche current, zener voltage and operating reverse voltage.
54. Explain the working of a Zener Diode as Voltage Regulator with a neat circuit diagram
55. A 5.0V stabilised power supply is required to be produced from a 12V DC power supply input source. The maximum power rating  $P_z$  of the zener diode is 2W.
- The maximum current flowing through the zener diode.
  - The value of the series resistor,  $R_s$

- c) The load current  $I_L$  if a load resistor of  $1k\Omega$  is connected across the Zener diode.  
 d) The total supply current  $I_S$

56. Generally, a zener diode can be used to regulate a constant DC source but what if the input signal was not steady state DC but an alternating AC waveform how would the zener diode react to a constantly changing signal. Explain and also draw a sketch graph showing the approximate output across the given zener diode for the given sinusoidal waveform.

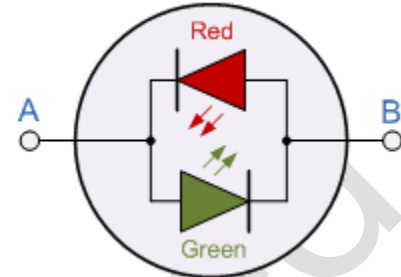


57. Draw circuit symbols for the following
- photo diode
  - LED
  - zener diode
  - junction diode
58. Draw a circuit diagram to illustrate the working of a photodiode and also draw a sketch graph to show the variation of reverse current with light intensity.
59. Draw a circuit diagram to illustrate the working of a LED showing a component used to prevent it from destruction for large currents and also draw a sketch graph showing the dependence of light output power on forward current.
60. There is very little resistance to limit the current in LED. How do to avoid any damage to it?
61. "All junction diodes emit light, when forward biased". Comment on the given statement giving full justification.
62. LED made up of GaAsP has a forbidden energy gap of  $1.9\text{eV}$ . Does it emit a visible or invisible photons when forward biased?. Explain.
63. The main P-type dopant used in the manufacture of **Light Emitting Diodes** is Gallium and N-type dopant used is Arsenic. The semiconductor compound GaAs is used for television remote controls as this LED emits certain radiation. Does the wavelength of the emitted radiation increase or decrease when Phosphorus is added to the GaAs?
64. What process makes an LED to emit light?
65. Give the range of forbidden energy gap,  $E_g$ , of the materials used for making LED's giving light in visible region.
66. An amber coloured LED with a forward volt drop of 2 volts is to be connected to a  $5.0\text{V}$  stabilised DC power supply. Calculate the value of the series resistor required to limit the forward current to less than  $10\text{mA}$ .

67. An amber coloured LED with a forward volt drop of 2 volts is to be connected to a 5.0v stabilised DC power supply. Calculate the current flowing through the diode if a 100Ω series resistor is used.

68. What is the colour of emitter light for the following terminal connections for the given combination of LEDs'?

- Only terminal A made positive
- Only terminal A made negative
- Low voltage and low frequency a.c. supply is connected across terminals A and B.



69. How many individual LEDs (the segments), are there within one single display package used for displaying digital data in the form of numbers?

70. Name a diode designed to be responsive to optical input.

71. What are the possible biases a Photo diode can be given?

72. On what principle does the "Zero biased photodiode " work? What is the direction of current in this condition?

73. Diodes usually have extremely high [resistance](#) when reverse biased. How it is made possible for a Photodiode to work in reverse-biased condition?

74. Receivers for remote controls in [VCRs](#) and [televisions](#) often use which type of diodes?

75. Explain action of a photodiode with circuit diagram.