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CAPSULE 30 SUBJECT-PHYSICS

1. (i) Define an equipotential surface ?
   (ii) Write any two properties of an equipotential surface.
   [Ans. (i) Equipotential surface : A surface drawn in an electric field at which every point has the same potential, is known as equipotential surface (ii) Properties : (a) No work is done in moving a test charge from one point to another over an equipotential surface (b) Electric field is always normal to the equipotential surface at every point

2. State the conditions for the phenomenon of total internal reflection to occur.
   Ans.(i) Light ray must travel from a denser to a rarer medium.
   (ii) Angle of incidence must be greater than the critical angle.

3. Why do the electric field lines never cross each other ?

Ans. Because ,if they do so, at the point of intersection two tangents can be drawn, which would represent two directions of electric field at that point, which is not possible.

4. Why are the electrostatic field lines always normal to the surface of a conductor ?

Ans. If the electrostatic field lines are not normal, then electric field would have a tangential component which will make electrons move along the surface creating surface currents and the conductor will not be in equilibrium.

5. Give two uses of eddy currents.

Ans. Magnetic breaking in electric trains.

To produce heat in induction furnaces

6. What is meant by mutual induction?

Ans. When a changing current is passed through a coil an emf is induced in the neighbouring coil due to change in magnetic flux passing through it.This phenomenon is called mutual induction.

7. Define the term wattless current.

Ans. The current which flows in a circuit without consuming any electrical power is called wattless current.

8. Can the voltage drop across the inductor or the capacitor in series LCR circuit be greater than the applied voltage of the a.c. source ?

Ans. Yes,because in series LCR circuit, V_L or V_C are not in same phase, hence cannot be added like ordinary numbers.

9. Describe briefly any two energy losses, giving the reason of their occurrence in actual transformer. How are these reduced ?

Ans. a) copper loss- Energy loss due to resistance of primary coil and secondary coil is called copper loss and can be minimised by using thin copper wires.

b) Iron loss - Energy loss as heat due to eddy current in the iron core is called iron loss and can be reduced by using a laminated iron core.

c) Hysteresis loss- Magnetisation of iron core is repeatedly reversed by the alternating magnetic field and energy is lost in the form of heat in the core. This is called hysteresis loss and can be minimized by using a core of a material having low hysteresis loop.

d) Flux leakage- There is always some flux leakage that is all of the flux due to primary does not pass through the secondary. It can be minimized by winding primary and secondary coils one over the other.

10. How is the transformer used in large scale transmission and distribution of electrical energy over long distances ?

Ans. a) Output voltage of power generator is stepped- up so that current is reduced and as a result line loss I^2R is also reduced.

b) It is then transmitted over long distances to an area sub-station, where voltage is stepped down.

c) It is further stepped down at local sub-stations and poles before a power supply of 220 V reaches our homes.

11. What are electromagnetic waves ? Are these waves transverse or longitudinal ?

Ans. The waves produced by accelerated charged particles, in which there are sinusoidal variations of electric and magnetic field vectors at right angles to the direction of propagation of wave, are called electromagnetic waves, electromagnetic waves are transverse in nature.

12. i) How are electromagnetic waves produced ? Expain.

ii) What is the source of energy of these waves ?

Ans. i) Electromagnetic waves are produced by accelerated/oscillating charges.A charge oscillating with some frequency, produces an oscillating electric field in space, which produces an oscillating magnetic field perpendicular to the electric field ,which in turn is a source of electric field,this process goes on repeating, producing em waves in space perpendicular to both fields.

ii) Source of energy of electromagnetic waves is the energy of accelerated/oscillating charge.

13. When can a charge act as a source of em wave ?

Ans. When the charge is either oscillating or accelerated.

14. What is meant by the transverse nature of electromagnetic waves ?

Ans. Transverse nature means , $\vec{E}$ and $\vec{B}$ are perpendicular to each as well as perpendicular to the direction of propagation of the wave.

15. How are the directions of the electric and magnetic field vectors in an em wave are related to each other and to the direction of propagation of the em waves ?

Ans. $\vec{E}$ and $\vec{B}$ are perpendicular to each as well as perpendicular to the direction of propagation of the wave.

16. What is the frequency of electromagnetic waves produced by oscillating charge of frequency ?

Ans. Frequency of electromagnetic wave = frequency of oscillating charge

17. When monochromatic light is incident on a surface separating two media , the reflected and refracted light both have the same frequency as the incident frequency. Why ?

Ans. Reflection and refraction arise through interaction of of incident light with atomic constituents of matter which vibrate with the same frequency as that of incident light. Hence frequency remains unchanged.

18. Define refractive index of a transparent medium. What is minimum and maximum value of refractive index ?

Ans. Refractive index of a medium is defined as the ratio of velocity of light in vacuum to the velocity of light in that medium.

Minimum value of refractive index is 1 for air and maximum is 2.42 for diamond.

19.A comb run through one's dry hair attracts small bits of paper. Why ? What happens if the hair is wet or if it is a rainy day ?

Ans. When a comb is run through dry hair, it gets charged due to friction. Molecules in the paper gets polarized by the charged comb resulting in a net force of attraction. If the hair is wet or it is a rainy day, friction reduces, comb does not get charged and thus it will not attract small bits of paper .

20. Define electric line of force/electric field line.

Ans. An electric field line may be defined as the imaginary straight or curved path, along which a unit positive, isolated charge would tend to move if free to do so.

21. Define current density. Write its S.I. unit. Is it a scalar or vector quantity ?

Ans. Current density : – Electric current flowing normally per unit area of cross section is called current density **.**It is a vector quantity . Its S.I. unit is A/ .

22.(a) Define resistance of a conductor. Write its S.I. unit.

(b) What are the factors on which the resistance of a conductor depends ?

Ans. (a) Resistance : It is the ratio of potential difference applied across the ends of a conductor to the current flowing through it .

Its S.I. unit is ohm .

(b)Factors : (i) Length of the conductor

(ii) Area of cross section of the conductor (iii) nature of material & temperature.

23. (a) Define resistivity of a conductor. Write its S.I. unit.

Ans. (a) Resistivity : Resistivity of the material of a conductor is defined as the resistance of conductor of that material of unit length and unit area of cross section . Its S.I. unit is ohm metre .

24. Nichrome and copper wires of same length and same radius are connected in series. Current I is passed through them. Which wire gets heated up more ? Justify your answer.

Ans. Nichrome

Reason : (Resistivity of Ni > Resistivity of Cu)

25.Define the term conductivity of a conductor. On what factors does it depend ?

Ans. Conductivity : It is defined as the current flowing per unit area per unit electric field .

It is also defined as the reciprocal of resistivity .

Factors : (i) nature of material and (ii) temperature (relaxation time)

26.Resistance of a conductor increases with the rise in temperature. Why ?

Ans. Due to increase in frequency of collision of electrons with ions/atoms in the conductor.

27 . If a wire is stretched to double its original length without loss of mass, what will be its new-

(a) Resistivity (b) resistance ?

Ans. (a) Resistivity will remain same

(b) Resistance will be 4 times the original resistance .

28. Explain, why alloys like constantan and manganin are used for making standard resistors ?

Ans. Because they have

1. High resistivity 2. Very small temperature coefficient of resistivity

29. Define internal resistance of a cell. Write any two factors on which it depends.

Ans. Internal resistance : It is the resistance offered by the electrolyte of a cell to the flow of current between its electrodes

Factors :(i) nature of electrolyte

(ii) concentration of electrolyte

30.The emf of a cell is always greater than its terminal voltage. Give reason.

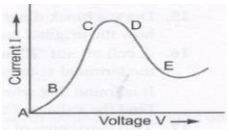
Ans. Because there is a potential drop across the internal resistance of the cell, when cell is in a closed circuit .

31. Can the value of terminal potential difference be greater than the emf of a cell ?

Ans. yes During the charging of the cell

32. Graph showing the variation of current versus voltage for a material GaAs as shown in figure. Identify the region of

(i) negative resistance (ii) where Ohm's law is obeyed.



Ans. (i) Region DE because current decreases on increasing voltage

Region AB because current increases linearly on increasing voltage

33. Define the term drift velocity of charge carriers in a conductor and write its relation with the current flowing through it.

Ans. Drift velocity : The average velocity acquired by free electrons of a conductor in a direction opposite to the applied electric field is called drift velocity.

34.How does the random motion of free electrons in a conductor gets affected when a potential difference is applied across its end.

Ans. Random motion is partially directed towards positive end of conductor .

35.When electrons drift in a metal from lower to higher potential, does it mean that all the 'free' electrons of the metal are moving in the same direction?

Ans. By no means, the drift velocity is superposed over the large random velocities of electrons.

36.The electron drift speed is estimated to be only a few for currents in the range of a few amperes ? How then is current established almost the instant a circuit is closed ?

Ans. When the circuit is closed, electric field is setup in the entire circuit instantly with the speed of em waves which causes electron drift at every portion of the circuit. A current starts flowing in the circuit almost instantly.

37. If the electron drift speed is so small, and the electron's charge is small, how can we still obtain large amounts of current in a conductor ?

Ans. because the electron number density is very large

38.The electron drift arises due to the force experienced by electrons in the electric field inside the conductor. But force should cause acceleration. Why then do the electrons acquire a steady average drift speed ?

Ans. Each 'free' electron does accelerate, but due to frequent collisions with ions they acquire only an average speed known as drift speed.

39. What happens if the galvanometer and cell are interchanged at the balanced point of the Wheatstone bridge? Would the galvanometer show any current ?

Ans. Balanced condition still remains satisfied, hence galvanometer does not show any current.

40. Explain giving reasons, how the internal resistance of a cell changes in the following cases :

(i) When concentration of the electrolyte is increased

(ii) When area of the anode is decreased

(iii) When temperature of the electrolyte is increased

Ans. (i) Internal resistance increases

Reason : inter ionic attractions increase and the movement of the ions become difficult **(ii)** Internal resistance increases

Reason : lesser area of the anode decreases its tendency to attract its oppositely charged ions **(iii)** Internal resistance decreases

Reason : Both inter ionic attractions and viscous forces decrease at higher temperature

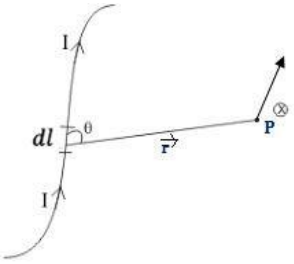
41. A potential difference is applied across a conductor of length and diameter . How is the drift velocity , of charge carriers in the conductor is affected when (i) is halved (ii) is doubled and (iii) is halved ? Justify your answer in each case.

Ans (i) will become half as **(ii)** will become half as (iii) will remain same as it does not depend on diameter

42. State Biot – Savart law .

Ans. Biot-Savart's law : It states that magnetic field due to a current element, at a point, having a position vector relative to the current element, is found to depend

(i) directly on the length of current element,
(ii) inversely on the square of the distance,
(iii) directly on the sine of angle between the current element and the position vector
(iv) directly proportional to the current



43. What is the source of magnetic field (or magnetism) ?

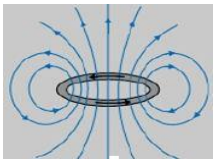
Ans. The electrons revolving in atoms behave as current loops. These current loops give rise to magnetism.

44. Does a magnetic monopole exists ? Justify your answer.

Ans. No, a magnetic monopole does not exist. The reason is that magnetic field is produced by a current loop and not by monopole of a magnet .

45.Draw the magnetic field lines due to a circular wire carrying current **.**

Ans.



46.How are the magnetic field lines different from the electrostatic field lines ?

Ans. The magnetic field lines form closed loops while the electrostatic field lines originate from positive charges and end at negative charges .

47.Why do magnetic field lines for continuous closed loops ?

Ans. because a magnet is always a dipole and as a result, net magnetic flux is always zero

48.Can two magnetic lines of force intersect each other. Justify your answer.

Ans. No, because if they do so then at the point of intersection two tangents can be drawn which would represent two directions of magnetic field, which is not possible.

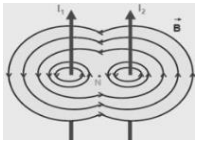
49.Magnetic field lines can be entirely confined within the core of a toroid, but not within a straight solenoid. Why ?

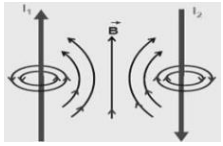
Ans. Magnetic field lines can be entirely confined within the core of a toroid because toroid has no ends. But a straight solenoid has two ends. If the entire magnetic flux were confined between these ends, the magnetic field lines will no longer be continuous.

50. Depict magnetic field lines due to two straight, long, parallel conductors carrying steady currents and in the

(i) Same direction, (ii) opposite direction.

Ans. **(i)** **(ii)**





51.How is the magnetic field inside a given solenoid made strong ?

Ans. (i) by increasing number of turns in the solenoid

(ii) by increasing current flowing through the solenoid

(iii) by inserting soft iron core inside the solenoid.

52.What is the function of soft iron core, in a moving coil galvanometer ?

Ans. It increases the sensitivity of the galvanometer and make the magnetic field to be more radial

53.What is the importance of radial magnetic field in a moving coil galvanometer ?

Ans. It always keeps the plane of the coil parallel to the magnetic field in every orientation .

54.What is meant by figure of merit of a galvanometer ?

Ans. **<u>Figure of merit</u> :** It is defined as the amount of current which produces one scale deflection in the galvanometer.

55. Explain giving reasons, the basic difference/ underlying principle used, in converting a galvanometer into-

(i) an ammeter, and (ii) a Voltmeter.

Ans. (i) A galvanometer is converted into an ammeter by connecting a shunt in parallel with it, so that when ammeter is connected in series, it does not reduce the current in the circuit .

(ii) A galvanometer is converted into voltmeter by connecting high resistance in series with it, so that when voltmeter is connected in parallel a negligible current flows through it and the potential difference across the given component is not affected .

56.What is shunt ? Write its S.I. unit. Why is it used in a galvanometer ?

Ans. **<u>Shunt</u> :** Shunt is a very small resistance used in parallel with a galvanometer. S.I. unit of shunt is ohm.

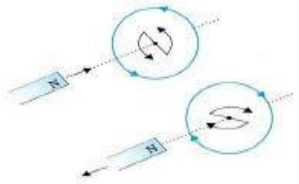
Use : It is used to protect galvanometer from high currents/ to convert galvanometer into ammeter/ to increase range of ammeter .

57. State Lenz's law.

Ans. Lenz's law : The direction of induced current is such that it opposes the change in magnetic flux responsible for its production .

58.Illustrate by giving an example, how Lenz's law helps in predicting the direction of the current in a loop in the presence of a changing magnetic flux ?

Ans. Illustration :



When north pole is moved towards loop, due to Lenz's Law loop will repel it by inducing current in anticlockwise direction. Similarly, when north pole is taken away current will be induced in clockwise direction.

59. Why is the use of a.c. voltage is preferred over d.c. voltage ? Give two reasons.

Ans. 1. A.C. voltage can be stepped up & stepped down by using a transformer, but same is not true for d.c. voltage.

2. A.C. voltage can be converted in to d.c. voltage by using rectifier but d.c. voltage cannot be converted in to a.c. voltage .

60.These days most of the electrical devices we use require a.c. voltage. Why ?

Ans. (a) It can be stepped up or stepped down.

(b) It can be converted in to direct current. (c) line loss can be minimized

61.In India, domestic power supply is at 220V,50Hz, while in U.S.A. it is 110V,50Hz. Give one advantage and one disadvantage of 220V supply over 110V supply.

Ans. Advantage – power loss at 220V supply is less than that at 110V.

Disadvantage- 220V is more dangerous than 110V because its peak value (311V) is more than peak value (155.5V) for 110V supply .

62.Why is the core of a transformer is laminated ?

Ans. to minimize the energy losses due to eddy current

63.Mention the two characteristic properties of a material suitable for making core of a transformer.

Ans. (i) Low coercivity/ Low retentivity (ii) High permeability

64. In which situation there is a displacement current but no conduction current ?

Ans. Between the plates of capacitor during charging/discharging or in the regions of time varying electric field

65.The charging current for a capacitor is 0.25 A. What is the displacement current across its plates ?

Ans. same as the convection current $I_D = 0.25$ A

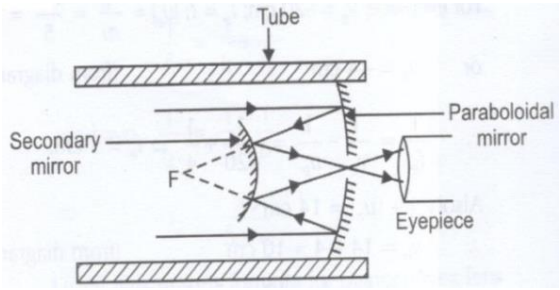
66. Write two main limitations of refracting telescopes. Explain how these can be minimized in a reflecting telescope.

Ans. Limitations of refracting telescope:

(i) Suffers from spherical aberration . It can be corrected by using parabolic mirror objective

(ii) Suffers from chromatic aberration. It can be corrected by using mirror objective instead of spherical lens

67. (i) Draw a schematic diagram of a reflecting telescope. State the advantages of reflecting telescope over refracting telescope. (ii) What is its magnifying power ?



Ans. Advantages of reflecting telescope

(i) No chromatic aberration

(ii) No spherical aberration

(iii) Brighter image

(iv) large magnifying power

(v) High resolving power

68. Explain, why is the objective of a compound microscope be of short aperture ? **Ans.** to minimize spherical aberration and to collect all the reflected light from object to produce brighter image

69.Explain, While viewing through a compound microscope, why should our eyes be positioned not on the eye piece but a short distance away from it for best viewing ?

Ans. To collect complete light refracted by the objective and to increase field of view

70.How is the focal length of a spherical mirror affected, when the wavelength of light used is increased ?

Ans. No change as focal length of a spherical mirror does not depend on wavelength

71.How is the focal length of a spherical mirror affected, when it is immersed in water/Glycerin ?

Ans. No change as focal length of a spherical mirror does not depend on medium

72.Write the main considerations required in selecting the objective and eye piece lenses in order to have large magnifying power and high resolution of the telescope

Ans. (i) to have large magnifying power

Hence, focal length of objective should be large, while focal length of eye piece should be small .

(ii) to have high resolving power D should be large.

Hence aperture of objective should be large

73.What is interference of light ? Give one example of interference in daily life.

Ans. Interference of light : It is the phenomenon of non-uniform distribution of resultant intensity when two light waves from two coherent sources superimpose on each other.

Example in daily life : colours in bubbles of soap solution/ in thin oil films in white light

74. What are coherent sources of light ? Why are coherent sources necessary to produce a sustained interference pattern?

Ans. Coherent sources : Two sources producing light waves of same frequency and zero or constant initial phase difference are called coherent sources of light .

Necessity : Coherent sources produce waves with constant phase difference, due to which positions of maxima and minima does not change with time and a sustained interference pattern is obtained .

75. What are the essential conditions for two light sources to be coherent ?

Ans. (i) Two sources must produce waves of same frequency/ wavelength, and phase difference between the waves must be constant .

76. What happens to the interference pattern if phase difference between two light sources varies continuously ?

Ans. Positions of bright and dark fringes would change rapidly hence the interference pattern shall not be sustained

77. Why cannot two independent monochromatic sources produce sustained interference pattern ?

Ans. Two independent sources do not maintain constant phase difference, therefore the interference pattern will also change with time

78. In Young's double slit experiment, the two slits are illuminated by two different lamps having same wavelength of light. Explain with reason, whether interference pattern will be observed on the screen or not **.**

Ans. Interference pattern will not be observed as two independent lamps are not coherent sources .

79. Does the appearance of bright and dark fringes in the interference pattern violate, in any way, law of conservation of energy ? Explain.

Ans. No , appearance of the bright and dark fringes is simply due to a redistribution of energy .

80. What is diffraction of light ? State the essential condition for diffraction of light.

Ans. Diffraction : The phenomenon of bending of light round the corners of small obstacles or apertures is called diffraction of light.

Essential condition : Size of slit/ aperture must be of the order of wavelength of light

81.How would the width of central maximum in diffraction pattern due to a single slit be affected, If the wavelength of the light used is increased ?

Ans. Width of central maximum will be increased

82. How does the angular separation between fringes in single slit diffraction experiment change when the distance of separation between the slit and screen is doubled ?

Ans. remains unchanged as it does not depend on D

83. What is Photoelectric effect ?

Ans. Photoelectric effect : When an electromagnetic radiation (such as U.V rays, x-rays etc.) of suitable frequency is incident on a metal surface, electrons are emitted from the surface. This phenomenon is called photoelectric effect

84.Define the term Work function of a photoelectric surface.

Ans. (i) Work function (W) : The minimum energy required to by an electron to just eject out from the metallic surface is called work function of that surface

85.Define the term (i) cut off frequency & (ii) Threshold wavelength in photoelectric emission.

Ans. (i) Cut off frequency : The minimum frequency of incident radiation, **below which** photoelectric emission is **not** possible, is called cut off frequency or threshold frequency

(**ii) Threshold Wavelength :** The maximum wavelength of incident radiation, **above which** photoelectric emission is **not** possible, is called threshold wavelength

86.Define the term 'intensity of radiation' in photon picture .

Ans. Intensity of radiation : Number of photons incident per unit area per second normal to the surface, is defined as the intensity of radiation.

87.Define the term "stopping potential" or "Cut-off Potential" in relation to photoelectric effect.

Ans. Stopping potential or Cut-off Potential :

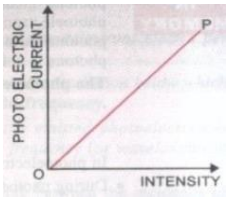
The minimum negative potential of anode at which photoelectric current becomes zero is called stopping potential.

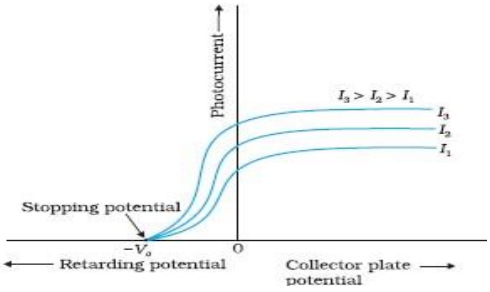
88. Plot a graph showing the variation of photoelectric current with intensity of light.

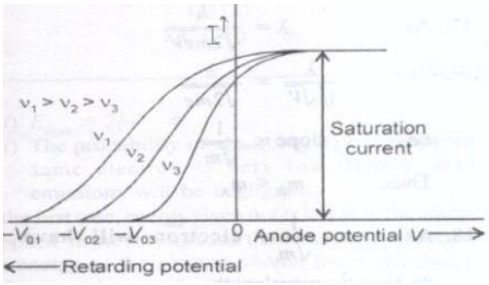
(ii) Show the variation of photocurrent with collector plate potential for different intensity but same frequency of incident radiation

(iii) Show the variation of photocurrent with collector plate potential for different frequency but same intensity of incident radiation

(i) **(ii)** **(iii)**







89. How does the stopping potential in photoelectric emission depends upon-

(i) intensity of the incident radiation

(ii) frequency of incident radiation

(iii) distance between light source and cathode in a photocell ?

Ans. (i) stopping potential does not depend on intensity

(ii) stopping potential frequency

(iii) stopping potential does not depend on the distance between the light source and the cathode in a photocell

90.A beam of monochromatic radiation is incident on a photosensitive surface. Answer the following questions giving reasons :-

(i) Do the emitted photoelectrons have the same kinetic energy ?

(ii) Does the kinetic energy of the emitted electrons depend on the intensity of incident radiation ?

(iii) On what factors does the number of emitted photoelectrons depend ?

Ans. (i) No, all the emitted photoelectrons do not have same K.E. The reason is that different electrons are bound with different forces in different layers of metals. More tightly bound electron will emerge with less K.E.

(ii) No, kinetic energy of the emitted electrons does not depend on the intensity of incident radiation.

(iii) number of emitted photoelectrons depends on intensity of incident radiation provided that energy h

91.Write two characteristic features observed in photoelectric effect which support the photon picture of electromagnetic radiation.

Ans.(i) number of photoelectrons emitted is proportional to the intensity of incident radiation

(ii) maximum kinetic energy of photoelectrons increases with frequency of incident radiation

92.State three important properties of photon which are used to write Einstein's photoelectric equation.

Ans. (i) for a radiation of frequency , the energy of each photon is .

(ii).During the collision of a photon, with an electron, the total energy of photon gets absorbed by the electron

(iii) Intensity of light depends on the number of photons crossing per unit area per unit time

93.Write three characteristic features in photoelectric effect which cannot be explained on the basis of wave theory of light, but can be explained only using Einstein's equation. **Ans.** (i) Instantaneous emission of photoelectrons

(iii) Existence of threshold frequency

(iv) Maximum Kinetic energy of emitted photoelectrons is independent of intensity of incident light

94. Two nuclei have mass numbers in the ratio 1:2. What is the ratio of their nuclear densities ?

Ans. 1:1 as nuclear density does not depend on mass number

95.What are nuclear forces ? State any two characteristic properties of nuclear forces.

Ans. Nuclear Forces ; Very short range strongest attractive forces, which firmly hold the nucleons together inside a nucleus, are called nuclear forces.

Properties: (i) very short range, strongest attractive forces.

(ii) charge independent.

(iii) non-central forces

(iv) do not obey inverse square law

96.Define the term mass defect.

Ans. Mass defect : The difference in mass of a nucleus and its constituents, is called the mass defect.

97.Define binding energy of a nucleus.

Ans. Binding Energy : It is defined as the minimum energy required to separate its nucleons and place them at rest at infinite distance apart

It is the equivalent energy of mass defect.

98.What is meant by the term binding energy per nucleon

Ans. Binding Energy per nucleon : It is the average energy per nucleon needed to separate a nucleus in to its individual nucleons

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

Ans. Doping : Deliberate adding of desired impurity to a semiconductor to increase its conductivity is called doping. Conductivity of a semiconductor increases due to doping

100.How does the energy gap of an intrinsic semiconductor vary, when doped with a trivalent impurity/ pentavalent impurity?

Ans. Decreases

101.How does the forbidden energy gap of an intrinsic semiconductor vary with increase in temperature?

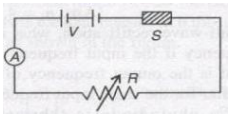
Ans. no effect

102.Name the two factors on which electrical conductivity of a pure semiconductor at a given temperature depends.

Ans. (i) The width of the forbidden band
(ii) Intrinsic charge carrier concentration

103.The diagram shows a piece of pure semiconductor 'S' in series with variable resistor R and a source of constant voltage V. Would you increase or decrease the value of R to keep the reading of ammeter (A) constant whe semiconductor 'S' is heated ? Give one reason.

Ans. Increase the value of R



Reason : on heating, conductivity of the semiconductor increases

104. An n-type semiconductor has a large number of electrons but still it is electrically neutral. Explain the reason.

Ans. because impurity atoms added to the semiconductor are electrically neutral

105.Is the ratio of the number of holes and number of electrons in a p-type semiconductor more than, less than or equal to 1 ?

Ans. 1

106.Why is the conductivity of n-type semiconductor greater than that of the p-type semiconductor even when both of these have same level of doping ?

Ans.because mobility of electrons is higher than that of holes

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

Ans. Conductivity of a semiconductor increases exponentially with the temperature

108. What are energy bands ? How are these formed ?

Ans. Energy bands : A group of large number of closely spaced energy levels spread in a very short energy range, is called an energy band

Formation of energy bands :

Due to interaction of electrons in outermost orbits of atoms in a crystal, different energy levels with continuous energy variation splits and energy bands are formed.

109.What is a valance band & conduction band ?

Ans. Valence Band : The highest energy band filled with valence electrons is called the valence band

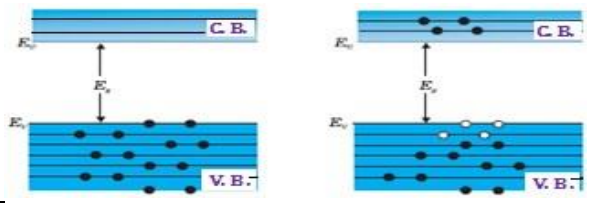
Conduction Band : The lowest unfilled allowed energy band above the valence band is called conduction band

110.Define forbidden energy gap ?

Ans. Forbidden energy gap : The energy gap between the valence band and the conduction band in which no allowed energy levels can exists is called the energy band gap ( )

111.Draw the energy band diagram of an intrinsic semiconductor.

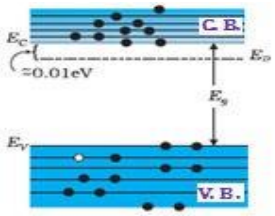
Ans. Energy band diagrams of an intrinsic semiconductor

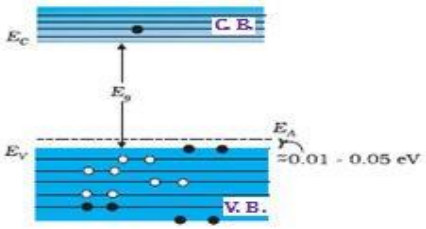


(a) at T = 0 K **(b) at T > 0 K**

112.Draw the energy band diagram of & semiconductor.

Ans. n-type semiconductor **(** - 1) p-type semiconductor **(** - 1)





113.Distinguish between intrinsic and extrinsic semiconductors.

Ans.

Intrinsic Semiconductor	**Extrinsic Semiconductor**
1. It is a pure semiconductor.	1. It is a semiconductor with added impurity.
2. Low conductivity at room	2. High conductivity at room temperature
3. Its electrical conductivity depends on temperature only.	3. Its electrical conductivity depends on temperature and the amount of doping.

114.Distinguish between intrinsic and a p-type semiconductor.

Ans.

n-type semiconductor	**p-type semiconductor**
1. It is obtained by adding controlled amount of pentavalent impurity to a pure semiconductor.	1. It is obtained by adding controlled amount of trivalent impurity to a pure semiconductor.
2. Its electrical conductivity is due to free electrons.	2. Its electrical conductivity is due to holes.

115.Name the two important processes that occur during the formation of a p-n junction.

Ans. (i) Diffusion (ii) drift

116.What happens when a forward bias is applied to a p-n junction ?

Ans. p-n junction conducts current when a forward bias is applied to it