PHYSICS

1 Mark Questions

CLASS 12

NEET | JEE | CA

CHANAKYA ACADEMY OF PROFESSIONAL STUDIES

Contents

ELECTRIC CHARGES AND FIELDS

Electric Charges

1*. What are point charges?

Ans: Charges whose sizes are very small compared to the distance between them are called point charges

2*. How can a body be positively charged?

Ans: A body can be positively charged by removing electrons from it.

3*. What type of charge acquired by each, when a glass rod is rubbed against silk?

Ans: Glass rod acquires positive charge and the silk acquires negative charge.

4*. What type of charge acquired by each, when a ebonite rod is rubbed against fur?

Ans: Ebonite rod acquires negative charge and the fur acquires positive charge.

5. What is meant by conservation of charge?**

Ans: The total charge of an isolated system remains always constant

6*. The net charge of a system of point charges -4, +3, -1 & +4 (S.I. units)

Ans: +2

7. What is quantization of charge?**

Ans: The electric charge is always an integral multiple of 'e' (charge on an electron).

8*. What is an elementary charge?

Ans: It is the smallest charge that can be added to or removed from a body. It is the charge on the electron. It is denoted by e.

9. What is the value of elementary charge?**

Ans: Its value is $1.602 \text{ X}10^{-19}\ C$

10*. On a macroscopic scale is charge discrete or continuous?

Ans: Continuous.

11. Define one coulomb of charge.**

Ans: 1C is the charge that when placed at a distance of 1m from another charge of the same magnitude, in vacuum, experiences an electrical force of repulsion of magnitude $9\text{x}10^{9}\text{N}$

12.Mention the S.I. unit of charge.**

Ans: Coulomb (C)

13*.How many electrons make 1 C charge?**

Ans: $6.25\text{X}10^{18}$ electrons

14*. What is electrification?

Ans: The process of charging of a body is called electrification.

15*. Mention the sure test of electrification.

Ans: Electric repulsion.

16*. What are the methods of charging of a body?

Ans: Friction, Conduction and Induction.

17*. What is charging by conduction?

Ans: It is a process of charging a neutral conductor by bringing it into contact with a charged body.

18*. What is charging by induction?

Ans: It is a process of charging a neutral conductor by bringing it very close to a charged body but not in contact with it.

19*. An isolated metal sphere is electrically charged. Is there a change in its mass?

Ans: Yes. When it is negatively charged, its mass increases and when its positively charged, its mass decreases.

20*. A body is said to be electrically neutral. What does it mean?

Ans: It means that the net charge on it is zero.

21*. Name the device used to detect the charge on the body.

Ans: Electroscope.

22*. Can a body have fraction amount of charge?

Ans: No. A body can have a charge $Q = n\,e$, where n is an integer and $e = 1.602\ X10^{-19}\ C$ is the elementary charge.

<u>Coulomb's Law</u>

23*.Two point charges q_1 and q_2 are such that $q_1, q_2 > 0$. What is the nature of force between the charges?**

Ans: Repulsive Force. Because they both are in positive charge.

24. For what order of distance is Coulomb's law true?**

Ans: It holds good for all the distances greater than or equal to a *fermi* $f = 10^{-15}\ m$.

25*.What is the effect on the force between two charged bodies when a dielectric slab is introduced between them?**

Ans: The force between them decreases. $F_m = 1/4\pi\varepsilon \times q_1q_2/r^2$

26*. What is the effect on the force between two charged bodies when a metallic slab is introduced between them?

Ans: The force between them becomes zero.

27. If two charges kept in 'air' at a certain separation, are now kept at the same separation in 'water' of dielectric constant 80, then what happens to the force between them?**

Ans: Decreases by 80 times.

28. What happens to the force between two point charges if the distance between them is doubled?**

Ans: Decreases 4 times.

29. What is the force between two point charges which are one coulomb each separated by 1 m in air?**

30. What is the value of absolute permittivity of free space?**

Ans: $\varepsilon o = 8.854 \text{ X} 10^{-12}\ C^2 / Nm^2$

31*. Which principle is employed in finding the force between multiple charges?

Ans: Principle of superposition

Electric Field

32*.Define electric field or electric field intensity**

Ans: Electric field due to a charge at a point in space is defined as the force experienced by a unit positive charge placed at that point.

33*. Is electric field a scalar/vector?

Ans: Vector

34*. Mention the S.I. unit of electric field.

Ans: Newton per coulomb (NC^{-1})

35*. What is the direction of electric field due to a point positive charge?

Ans: Radially outward

36*. What is the direction of electric field due to a point negative charge?

Ans: Radially inward

37*. What is a source charge?

Ans: The charge which produces the electric field

38*. What is a test charge?

Ans: The charge which detects the effect of the source charge

39. When is an electric field said to be uniform?**

Ans: If the force on a test charge is the same at all points in a field in magnitude and direction, then the field is said to be uniform.

40. When is an electric field said to be non-uniform?**

Ans: If the force on a test charge varies from point to point in a field, then the field is said to be non- uniform.

41*.Does a charge experience a force due to its own field?**

Ans: No.

42. What is the acceleration of a charged particle of mass m and charge q in a uniform electric field E?**

Ans: If F be the force acting on the charged particle then $F = q\,E = m\,a$; $\Rightarrow \boldsymbol{a} = \frac{\boldsymbol{qE}}{\boldsymbol{m}}$

43*. What is neutral point in a combined electric field?

Ans: A neutral point in a combined electric field is that point at which the resultant electric field is zero.

Electric Lines of Force

44*.What is an electric field line?**

Ans: An electric field line is a curve drawn in such a way that the tangent to it at each point represents the direction of the net field at that point

45*. How do you pictorially map the electric field around a configuration of charges?

Ans: Using electric field lines

Electric Flux

46*.What is electric flux?**

Ans: Electric flux over a given surface is the total number of electric field lines passing through that surface.

47. Mention the S.I. unit of electric flux.**

Ans: $NC^{-1}m^2$

Electric Dipole

48*.What is an electric dipole?**

Ans: An electric dipole is a set of two equal and opposite point charges separated by a small distance

49*.What is the net charge of an electric dipole?**

Ans: zero

50*.Define dipole moment.**

Ans: Dipole moment of an electric dipole is defined as the product of one of the charges and the distance between the two charges.

51. Is dipole moment a vector / scalar?**

Ans: Vector

52. What is the direction of dipole moment?**

Ans: The dipole moment vector is directed from negative to positive charge along the dipole axis.

53. If E_A and E_B be the electric intensities at a point in the end-on position and an equidistant point in the broad-side-on position respectively of a dipole, what is the ratio E_A to E_B ?**

Ans: E_A is twice E_B or $E_A : E_B = 2:1$

54. What is the net force on an electric dipole placed in a uniform electric field?**

Ans: Zero

55. What happens to an electric dipole when it is placed in a uniform electric field?**

Ans: An electric dipole placed in a uniform electric field is acted upon by a torque. If free to move, the dipole aligns with its dipole moment vector along the direction of the field.

56*.When is the torque acting on an electric dipole placed in a uniform electric field maximum?**

Ans: When the dipole is placed perpendicular to the direction of the field

57*.When is the torque acting on an electric dipole placed in a uniform electric field minimum?**

Ans: When the dipole is placed parallel to the direction of the field

Continuous charge distribution

58*. How the surface density of charge varies with curvature and radius of curvature?

Ans: Surface density of charge is directly proportional to curvature of the surface. Surface density of charge is inversely proportional to radius of curvature of the surface.

Gauss's Law

59*.State Gauss's law.**

Ans: Gauss's law states that 'the electric flux through a closed surface is equal to $\frac{1}{\varepsilon^0}$ times the net charge enclosed by that surface.

60. What is a Gaussian surface?**

Ans: The closed surface we choose to calculate the electric flux and hence to apply Gauss's law

61*.A plane surface is rotated in a uniform electric field. When is the flux of electric field through the surface (i) maximum (ii) minimum?**

Ans: Flux through the surface is

i) maximum when the surface is perpendicular to the field

ii) minimum when the surface is parallel to the field.

62. What is the electric intensity at a point on the surface of a charged spherical conductor?**

Ans: Electric intensity at a point lying just on the surface of a conductor □ □/□□, where □ is the surface density of charge on the conductor.

63*.What is the electric intensity at a point inside a charged spherical conductor?**

Ans: Zero.

ELECTRO STATIC POTENTIAL AND CAPACITANCE

Electric potential

1*. What do you mean by the conservative nature of electric field?

Ans: The work done to move a charge from one point to another point in electric field is independent of path, but it depends only on the initial and final positions of the charge.

2. Define electrostatic potential at a point in an electric field?**

Ans: It is defined as the work done to move a unit positive charge, without any acceleration rom infinity to that point at consideration.

3. What is the SI unit of electric potential?**

Ans: S.I. Unit of electric potential is J C^{-1} = volt (V)

4*. Is electric potential scalar or vector?

Ans: Scalar

5. Define Volt?**

Ans: The electric potential at a point is said to be one volt if one joule of work is done in moving one coulomb of charge from infinity to that point against the electric field.

6. Define potential difference between two points in an electric field?**

Ans: Electric potential difference between two points is defined as the amount of work done in moving a unit positive charge from one point to another point against the electric field.

7. What is the potential of the Earth?**

Ans: Zero

8*. Show that volt and J/C are the units of same physical quantity?

Ans: Electric potential V=Work done/Charge.

Unit of electric potential is Volt

9*. Define electrostatic potential energy of a system of charges.

Ans: Electrostatic potential energy of a system of charges is defined as the work done to move the charges from infinity to their present configuration.

Equipotential surface

10. What is an equipotential surface?**

Ans: A surface whose every point has the same value of electric potential.

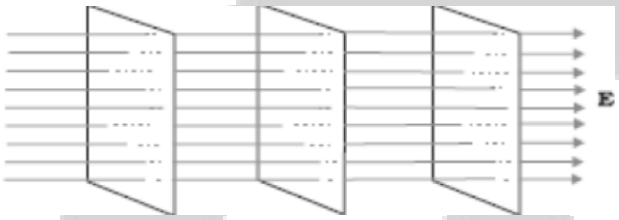
11. What is the nature of the equipotential surface around a point charge?** Ans: Concentric spheres with point charge as a centre.

12*.Sketch equipotential surfaces for a point charge?

Ans:

13*.Draw an equipotential surface in uniform electric field?

Ans:



14*.Explain why the work done in moving a charge on an equipotential surface is Zero?

Ans: Work done to move a charge along an equipotential surface is zero because potential difference between any two points is zero.

15. Examples for equipotential surface?**

Ans: 1. Surface of a charged spherical conductor.

2.Surface of a charged conductor of any shape.

16*. No two equipotential surfaces intersect each other why?**

Ans: If two equipotential surfaces intersect, then there will be two different values of electric potential at the point of intersection which is not possible.

17*. Is electric filed parallel or perpendicular to the equipotential surface?

Ans: The electric field E is always perpendicular to the equipotential surface.

18. What is the relation between electric field intensity and potential gradient?**

Ans: $E = -\frac{dV}{dx}$

19. Illustrate the condition in which electric field is zero but potential is not zero?**

Ans: Electric field inside a hollow charged sphere is zero but potential is not zero.

20. Illustrate the condition in which electric field is not zero but potential is zero?**

Ans: Electric filed on the equatorial line of a dipole is not zero but potential is zero.

21. Write the expression for potential energy of two point charges in the absence of external electric field.**

Ans: Electrostatic potential energy is $U = 1/(4\pi\varepsilon o) \times [q1q2/r_{12}]$

Where q_1, q_2 are the point charges and r_{12} is the distance between them.

Electric field

22. Explain why Electric field inside a conductor is always zero.**

Ans: Otherwise free electrons would experience force and drift causing electric current.

23. Explain why Electrostatic field is always normal to the surface of charged conductor.**

Ans: If is not normal, it will have component parallel to the surface causing surface currents.

24. Explain why Electric charges always reside on the surface of a charge conductor.**

Ans: Because, if there are static charges inside the conductor, Electric field can be present inside it which is not true.

25*. Write the expression for Electric field near the surface of a charge conductor.

Ans: Electric field at the surface of a charged conductor is $E = \frac{\sigma}{\varepsilon o}\, n\hat{}$

Dielectrics

26. What is dielectric?**

Ans: A non conducting material is called a dielectric.

27. What are the examples of dielectrics?**

Ans: Mica, Transformer oil

28. Define Dielectric constant of a substance.**

Ans: Dielectric constant of a substance is defined as the ratio of the permittivity of the medium to the permittivity of free space.

29. Define Dielectric strength**

Ans: It is minimum electric field applied above which dielectric breakdown just occur.

Capacitors and Capacitance

30*.What is a capacitor?

Ans: Capacitor is a device used to store electric charges or electrical energy

31*.Name S.I. Unit of capacitance?

Ans: Farad(f)

32. Define Farad?**

Ans: Capacitance of a conductor is said to be one farad if one coulomb of charge added the conductor raise its potential by one volt.

33*.Define capacitance of a conductor?

Ans: It is defined as the charge required to raise the potential of a capacitor through one unit. (Or) Capacitance of a capacitor is defined ate ratio of the charge Q on it to the potential difference V across its plates.

34*. Is capacitance is scalar or vector?

Ans: Scalar

35*. What is 1 Coulomb/Volt?

Ans: 1 farad

36. What is parallel plate capacitor?**

Ans: Parallel plate capacitor is a capacitor with two identical plane parallel plates separated by a small distance and the space between is filled with dielectric medium.

37*. What is meant by equivalent capacitor?

Ans: Equivalent capacitor is a single capacitor that has the same capacitance as the actual combination of the capacitors.

38*. What is the effect on the capacitance of a capacitor if the space between the plates filled with a dielectric medium of dielectric constant K.

Ans: Capacitance of a capacitor is increased by a factor K.

39. Mention the expression for capacitance of a Parallel plate capacitor without any dielectric medium between the plates.**

Ans: $C_o = \frac{Qo}{V} = \frac{\varepsilon oA}{d}$ Unit is Farad Where ε_0 = Permittivity of free space. *A* = Area of the plates. d = Plate separation.

40. Mention the expression for capacitance of a Parallel plate capacitor with a dielectric medium between the plates.**

Ans: $C_o = \frac{Qo}{V} = \frac{K\varepsilon oA}{d}$ Where ε_0 = Permittivity of free space. *A* = Area of the plates. d = Plate separation. K = dielectric constant of the medium between the plates.

41*. Write the dimensional formula for capacitance?

Ans: $M^{-1}L^{-2}T^{4}A^{2}$

42*. Write the formula for the effective capacitance of a number of capacitors in series?

Ans: $\frac{1}{C_S} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots + \frac{1}{C_{n-1}} + \frac{1}{C_n}$

43*. Write the formula for the effective capacitance of a number of capacitors in parallel?

Ans: $C_p = C_1 + C_2 + C_3 + \ldots.. + C_n$

44. Formula for energy stored in a capacitor?**

Ans: $U = \frac{1}{2} CV^2$

45. What is the ratio of equivalent capacitance of n similar capacitors first connected in parallel and in series?**

Ans: Cs = $\frac{C}{n}$ & Cp = nC $\Rightarrow$ Cp/ Cs = n^2

CURRENT ELECTRICITY

Electric Current

***1. Name the current carriers in metals (solid conductors), / electrolytic solutions (liquid conductors) and /discharge tubes (gaseous conductors).**

Ans: Free electrons in solid conductors ,/ positively and negatively charged ions in liquid conductors and / positive ions and electrons in gaseous conductors.

Ohm's law

*****2. Define resistivity of a conductor.**

Ans: The resistivity of material of a conductor at a given temperature is equal to resistance of unit length of the conductor having unit area of cross section.

*****3. How does the resistance of a conductor depend on its length and area of cross section of a conductor?**

Ans: The resistance of a conductor is given by $R = \frac{\rho L}{A}$

Where ρ is resistivity, L – length & A is area of cross section

****4.Define electrical conductance.**

Ans: The reciprocal of resistance is called electrical conductance. $G = \frac{1}{R}$

****5.Mention the SI unit of conductance.**

Ans : Its SI unit is Siemen (s) or ohm $^{-1}$ (mho)

*****6. A wire of resistivity ρ is stretched to three times its length .What will be its new resistivity?**

Ans: There will be no change in its resistivity, because resistivity does not depend on length (dimension) of wire.

****7.Define the term current density (j).**

Ans: It is defined as the electric current (I) per unit area (A) taken normal to the direction of current. $j = \frac{I}{A}$

***8. What is the SI unit of current density?**

Ans : Ampere / metre^2(A/m^2). It is a vector quantity.

Drift of electrons

*****9. Define drift velocity.**

Ans: It is defined as the average velocity gained by the free electrons of a conductor in the opposite of the externally applied electric field.

$$v_d = \frac{I}{neA} = \frac{eE\tau}{m}$$ where τ is relaxation time.

Mobility

*****10. Define electron mobility.**

Ans : Mobility (μ) is defined as the magnitude of drift velocity (V_d) per unit electric field (E).

$$\mu = \frac{v_d}{E}$$

****11. Mention the SI unit of mobility.**

Ans : The SI unit is $m^2V^{-1}s^{-1}$ and dimensionless value is $M^{-1}L^0T^2I^1$

Colour code of Resistors

****12. The colour code of a carbon resistor is Brown - Red - Brown - Gold. What is its resistance?**

Ans : R = 12 X 10^1 - 5% i.e. R = 120 Ω - 5%

*****13. The value of resistance of a resistor is 0.1 Ω - 10%. Write the colour sequence of the resistor.**

Ans : Resistance= 0.1 Ω - 10% = 01 X 10^{-1} - 10%.Thus, the colour sequence is Black, brown – gold and silver. Tolerance of 10% is indicated by silver ring.

Cells E.M.F

****14. What is a mesh or loop in an electric network?**

Ans : A mesh or loop is a closed path with in the network for the flow of electric current.

*****15. What is emf of a cell?**

Ans : Emf e is the potential difference between the positive and negative electrodes in an open circuit. i.e. when no current flowing through the cell.

Potentiometer

***16. What is the advantage of potentiometer?**

Ans : The potentiometer has the advantage that it draws no current from the voltage source being measured.

MOVING CHARGES AND MAGNETISM

Magnetic field

1. ***Mention the expressions for force experienced by moving charge in a uniform magnetic field. $F = q(V \times B)$

Ans: $F = BqV \sin\theta$

2. *What is the force acting on a charged particle moving parallel to a uniform magnetic field?

Ans: Zero

Motion of combined electric and magnetic field

3. *What is the significance of velocity selector?

Ans: Velocity selector is used in accelerator to select a charged particle of particular velocity out of a beam containing charges moving with different speeds.

4. **What is a cyclotron?

Ans: It is a device used to accelerate charged particles or ions.

Force between two parallel currents

5. *What is the nature of force between two parallel wires carrying currents in the same directions?

Ans: Attractive.

6. *What is the nature of force between two parallel wires carrying currents in the opposite directions?

Ans: Repulsive.

MAGNETISM AND MATTER

Bar Magnet

*****1. Write the Properties of a magnet.**

Ans: Magnet exhibits mainly attractive property and directive property.

****2. What are the properties of Magnetic poles?**

Ans: Like poles repel each other and unlike poles attract each other.

****3. Define North Pole and South Pole.**

Ans: When a bar magnet or a magnetic needle is suspended freely the pole which points towards the geographic north is called north pole and the pole which points towards geographic south is called South Pole.

****4. Define Magnetic length and write its units.**

Ans: The distance between two poles in a bar magnet is called magnetic length($2l$).

Units: Metre.

*****5. Is monopole exist in a bar magnet?**

Ans: No, if a magnet is cut into two pieces each piece is a magnet with two poles.

****6. Repulsion is sure test of a magnet, why?**

Ans: Repulsion is a sure test because a magnet will attract an iron piece as well as an unlike pole of another magnet. But it always repels like pole of another magnet.

*****7. Define the magnetic lines of force.**

Ans: The path followed by a unit north pole in a magnetic field is called magnetic lines of force.

*****8. Write the properties of lines of force.**

Ans: i) Magnetic lines of force never intersect.

ii)Magnetic lines of force are closed loops.

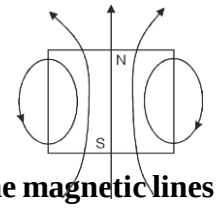
iii)The tangent drawn at any point on a line of force gives the direction of magnetic field at that point.

*****9. The Magnetic lines do not intersect. Why?**

Ans: If magnetic lines intersect ,the magnetic field would have two directions at the point of intersection. But there is only unique direction for the magnetic field. Hence the magnetic lines do not intersect.

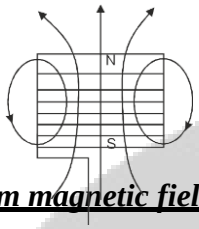
*****10. Draw the magnetic lines of a bar magnet.**

Ans:



***11. Draw the magnetic lines of a Solenoid of ferrite length carrying current.**

Ans:



Dipole in a uniform magnetic field

***12. Define magnetic dipole.**

Ans: Two unlike poles of equal strength and separated by a small distance is called a magnetic dipole.

****13. Define magnetic dipole moment of a bar magnet.**

Ans: It is the product of either of the pole strength and distance between the poles. M = m (2l)

*****14.Write the expression for the magnetic field at a distance from a magnetic dipole on axial Line.**

Ans: $B = \frac{\mu_0 \ 2\ M}{4\pi d^3}$

*****15. Write the expression for the magnetic field at a point on the equatorial line .**

Ans: $B_{equitorial} = \frac{\mu_0 M}{4\pi d^3}$

*****16. Write the expression for a magnetic field at a distance from a magnetic dipole.**

Ans: $B = \frac{\mu_0 M}{4\pi d^3}\sqrt{3\cos^2\theta + 1}$

*****17. Is a bar magnet an equivalent current carrying Solenoid?**

Ans: Yes. Each turn of Solenoid behaves as a small dipole.

****18. What is the net force acting on a bar magnet placed in a Uniform Magnetic Field?**

Ans: Net force becomes zero.

*****19. Give an expression for time period of oscillation when a magnetic needle is placed in a Uniform magnetic field.**

Ans: Time period $= T = 2\ \pi \sqrt{\frac{I}{MB}}$

Where I is moment of Inertia M is magnetic moment B is Magnetic field.

*****20. State and explain Gauss Law in magnetism.**

Ans: Gauss law: The net magnetic flux through any closed surface is always zero.

Consider a small vector area element $\underset{s}{\rightarrow}$ of closed surface S. According to Gauss law in magnetism

$\Phi_B = \oint B.dA = 0$

Earth's magnetism

*****21. What is the cause of Earth's magnetism ? (or) What is Dynamo effect?**

Ans: Earth's magnetism is due to electrical current produced by the convective motion of mainly molten iron and nickel in the outer core of the earth. This is called dynamo effect.

*****22. Define geomagnetism.**

Ans: The branch of physics which deals with the study of magnetism of earth is called geomagnetism.

*****23. What is geographic meridian?**

Ans: The geographic meridian at a place is the Vertical plane containing longitude circle and axis of rotation of earth.

*****24. What is magnetic meridian?**

Ans: The magnetic meridian at a place is the vertical plane which passes through the imaginary line joining the magnetic north and south poles.

*****25. Define magnetic declination at a place.**

Ans: The angle between true geographic north direction and the north shown by the magnetic compass needle is called magnetic declination.

*****26. Define magnetic inclination or dip at a place ?**

Ans: The angle between the earth's total magnetic field at a place and horizontal drawn in magnetic meridian is called magnetic inclination or dip.

***27. Define isogonic lines and agonic lines.**

Ans: **Isogonic Line:** On the world map, line drawn joining places have same value of declination is called isogonic line.

Agonic line: The line through places having zero declination is known as agonic line.

*****28. What are the values of magnetic dip at equator and poles?**

Ans: At equator dip is 0^o and at poles dip is 90^o

****29. What is the value of the magnetic dip at a place where horizontal component of earth's field H_E is zero?**

Ans: Magnetic dip is 90^O

*****30. Define horizontal component of earth's magnetic field at a place.**

Ans: The component of earth's magnetic field at a place along the horizontal is known as horizontal component of earth's magnetic field

*****31. Write the relation between total magnetic field of earth (B_E), horizontal component of earth's field (H_E) and vertical component of earth's field (Z_E) at a place.**

Ans: $\mathbf{B_E = \sqrt{H_E^2 + Z_E^2}}$

*****32. What is the relation between horizontal component of earth's field (H_E), Vertical component of (Z_E) and inclination (I).**

Ans: $x = \tan^{-1}\frac{B_v}{B_H}$ or $\tan^{-1}\frac{Z_E}{B_E}$

Magnetisation and magnetic intensity

*****33. Define magnetisation of a sample and write its units.**

Ans: Net magnetic dipole moment per unit volume is called Magnetisation of a sample.

Unit of magnetisation is A/m Dimensional formula = $L^{-1}A$

***34. Define magnetic permeability.**

Ans: The ability of the material to allow the passage of magnetic field lines through it is called magnetic permeability of that material.

***35. Define relative permeability.**

Ans: Relative permeability is the ratio of magnetic permeability of the material medium to the magnetic permeability of Vacuum. $\mu_r = \frac{\mu}{\mu_0}$

***36. What is magnetic intensity (H) or magnetising force.**

Ans: The degree to which a magnetic field can magnetise a material is represented in terms of magnetic intensity.

*****37. Define magnetic susceptibility. Write its units**

Ans: The ratio of magnetisation M of a substance to the magnetic intensity H of the magnetizing field in which it is placed is called magnetic susceptibility. It has no units

Magnetic properties of materials

*****38. Which magnetic material susceptibility is low and positive?**

Ans: Paramagnetic material susceptibility is low and positive.

*****39. Which magnetic material susceptibility is low and negative?**

Ans: Dia magnetic materials susceptibility is low and negative

****40. Which magnetic material susceptibility is high and positive?**

Ans: Ferro magnetic materials.

*****41. Write the relation between magnetic intensity and magnetic field and susceptibility.**

Ans: $B = \chi H$ where, χ is susceptibility, B is magnetic field & H is magnetic intensity

****42. What is the relation between magnetic relative permeability μ_r and susceptibility χ?**

Ans: $\mu_r = 1 + \chi$

****43. What is the relation between magnetic relative permeability μ_r and permeability μ_0 of the medium?**

Ans: $\mu = \mu_0\mu_r$

***44. What are the types of magnetic materials?**

Ans: Dia, para, Ferro magnetic materials.

***45. State and explain Curie's law for paramagnetism.**

Ans: The magnetisation of a paramagnetic material inversely proportional to the absolute temperature. If T is the absolute temperature of a paramagnet then magnetisation

$M = C\frac{B_0}{T}$ where C is Curie's constant

***46. Distinguish between hard and soft ferromagnetic materials with examples.**

Ans: After removal of external magnetic field if magnetisation remains, they are called hard ferromagnetic materials. Ex: Alnico.

After removal of external magnetic field if magnetisation disappears, they are called soft Ferromagnetic materials. Ex: Iron.

*****47. Define Curie temperature.**

Ans: Curie temperature is the temperature above which a ferromagnetic substance becomes a paramagnetic substance.

****48. What is magnetic hysteresis loop?**

Ans: The magnetic hysteresis loop is the closed B-H curve for cycle of magnetisation of Ferromagnetic material.

*****49. What is retentivity or remanence of ferromagnetic material?**

Ans: The value of B at H=0 in a B-H loop is called retentivity or remanence.

***50. What is coercivity?**

Ans: The value of H at B=0 in a B-H loop is called coercivity.

Permanent magnets and electromagnets

****51. What are permanent magnets?**

Ans: Substances which retain their ferromagnetic property for a long period of time at room temperature are called permanentmagnets.

****52. Which type of materials are required for permanent magnets? Give examples.**

Ans: Materials having high retentivity and low coercivity are required for permanent magnets.

Ex: Iron, steel.

*****53. What does area of hysteresis loop represent?**

Ans: Area of hysteresis loop represents energy dissipated or heat produced

*****54. What are the uses of electromagnets?**

Ans: Electromagnets are used in loud speakers and telephone diaphragms.

*****55. What are the uses of permanent magnets?**

Ans: Permanent magnets are used in measuring instruments.

ELECTROMAGNETIC INDUCTION

The experiments of faraday and henry

1*. Name the phenomenon in which a current induced in coil due to change in magnetic flux inked with it.

Ans: Electromagnetic Induction

2. Define electromagnetic induction.**

Ans: The phenomena of induction of an emf in a circuit due to change in magnetic flux linked with it is called electromagnetic induction.

3. What did the experiments of Faraday and Henry show?**

Ans: Faraday and Henry experiments shows that it is the relative motion between the magnet and the coil that is responsible for generation of electric current in the coil.

4*. Does a magnet kept near a coil induce current in it?

Ans: No. EMF is induced in the coil only when the magnet is moving relative to the coil.

5*. Why does a galvanometer connected to a coil show deflection when a magnet is moved near it?

Ans: Moving a magnet near the coil changes the magnetic field at the coil which in turn changes the magnetic flux linked with the coil. Therefore, an emf is induced in the circuit hence a current.

6*. What happens to the induced emf if an iron bar is introduced into the coils in Faraday' experiment ?

Ans: The emf increases

Magnetic flux

7*. What does magnetic flux measure?

Ans: Magnetic flux through a surface is a measure of the number of lines of magnetic field lines passing through the surface.

8*. What is the value of the magnetic flux through a closed surface:

Ans: Zero

Faraday's law of induction

9*. Magnetic flux linked with a closed loop at a certain instant of time is zero. Does it imply that induced emf at that instant is also zero?

Ans: No. The emf does not depend on the magnetic flux but on the change of magnetic flux.

10*. Can you induce an emf in an open circuit by electromagnetic induction?

Ans: Yes.

11*. Does the electromagnetically induced emf in a coil depend on the resistance of the coil?

Ans: No. But the current does.

12*. If the number of turns in a coil subjected to a varying magnetic flux is increased, what happens to the induced emf?

Ans: EMF also increases (directly proportional to the number of turns)

Lenz's law and conservation of energy

13. Name the law which gives the polarity of Induced emf**

Ans: Lenz's law

14**. **North pole of a bar magnet is moved towards a metal ring. What is the direction of induced current in the ring when viewed from magnet side?**

Ans: Anti clock wise direction

15*. Why Faraday's law need acorrection by Lenz?

Ans: Because Faraday's law was in incompatible with the law of conservation of energy.

16. Write Faraday's law with Lenz's correction**

Ans: Induced emf, $e = -d\Phi/dt$

17*. What does the negative sign in the expression $e = -d\Phi/dt$ imply?

Ans: The negative sign implies that the direction of induced emf opposes its cause, the change in magnetic flux.

18. If you bring the North Pole of a magnet near a face of a coil, what is the direction of the current induced in that side?**

Ans: Anticlockwise. This makes that side of the coil magnetically North which repels the magnet coming towards it.

19*. If the area of a coil kept in a magnetic field is changed, is there any induced current in it?

Ans: Yes. By changing the area, we change the magnetic flux linked with the coil. The current induced is in a direction to counteract this change in magnetic flux.

20. What is the significance of lenz's law?**

Ans: This law is an illustration of the " Law of conservation of energy"

21*. Is lenz's law consistent with the law of conservation of energy?

Ans: Yes

Motional electromotive force

22*. What is motional emf?

Ans: The emf induced in a conductor moving in a plane perpendicular to a magnetic field is called motional emf.

23*. What happens to the magnitude of the motional emf if the a) velocity of the rod b) length of the rod c) the applied magnetic field are increased?

Ans: Increases (in all of the three cases)

24*. Is there an induced emf (motional emf) in a conductor if it moves in a plane parallel to a magnetic field?

Ans: No

25*. A wire pointing north-south is dropped freely towards earth. Will any potential difference be induced across its ends?

Ans: No. (If it is made to fall in E –W direction, there is an emf across its ends)

26*. When a glass rod moves perpendicular to a magnetic field, is there any emf induced in it?

Ans: No. Because glass is an insulator.

27*. State Fleming's right hand rule (generator rule)**

Ans: When a conductor is moved at right angles to a magnetic field, current is induced in it. The direction of generated current is given by Fleming right hand rule

Statement:- "If the first three fingers of the right hand are stretched mutually perpendicular to each other with the fore-finger pointing the direction of the field and thumb representing the direction of motion of the conductor, then the middle finger represents direction of generated current"

Eddy currents

28*. What are eddy currents (Foucault current)?**

Ans: When a bulk conductor is placed in a varying magnetic field, circulating currents are induced in it. These currents are called eddy currents.

29*. What happens to a velocity of a conductor when it moves in a varying magnetic field?

Ans: Decreases. The eddy currents induced in the conductor damp the motion of the conductor.

30*. Why are the oscillations of a copper disc in a magnetic field damped?

Ans: Because of the eddy currents produced in the disc.

31*. Why are eddy currents undesirable?

Ans: Because they produce heating effect and damping effect.

32*. How does the magnetic braking in train work?

Ans: Strong electromagnets placed over the rails are activated. This produces eddy current in the rails which produce braking effect.

33*. What is principle behind induction furnaces?

Ans: Eddy currents. In an induction furnace, a high frequency AC is passed through a coil which surrounds the metal to be melted. The eddy currents produced in the metal heats it to high temperatures and melts it.

34. How can eddy currents be minimized?**

Ans: Eddy currents can be minimized by slicing the conductor into pieces and laminating them so that the area for circulating currents decreases.

Inductance

35. What is Inductance?**

Ans: Inductance of a coil is the magnetic flux linked with the coil per unit current producing it.

$L = \Phi_B / I$

36*. On what factors does the inductance of a coil depend?

Ans: The inductance of coil depends on the geometry of the coil and intrinsic material properties.

37. What is mutual induction?**

Ans: Mutual induction is the phenomenon of production of emf induced in a coil due to a change in current in a nearby coil.

38*. Give the expression for mutual inductance between two coils which are wound one over another.

Ans: $M_{12} = \mu_0 n_1 n_2 \pi r_1^2 L$

where μ_r is the relative permeability of the medium inside the coils, μ_0 is the permeability of free space, n_1 and n_2 are the number turns per unit length of each coils, r_1 is the radius of the inner coil and L is the length of the coil.

39. Mention one device which works on the principle of mutual induction.**

Ans: Transformer

40*. How can mutual inductance be increased without changing the geometry of the coils?

Ans: By inserting a ferromagnetic material inside the coils

41. Mention the expression for the emf induced in a coil of a mutual inductance due to the change in current through another.**

Ans: $\varepsilon_1 = - M \frac{dI_2}{dt}$

42*. Define mutual inductance between pair of coils as one henry

Ans: Mutual inductance between a pair of coils is said to be one henry if one volt of emf is induced in one coil when the current in the other coil changes at one ampere per second

43*. What is self-induction?

Ans: Self – induction is the phenomena of induction of an emf in a coil due to a change in the current through it.

44*. Mention the expression for the emf induced in a solenoid in terms of change in current through it.

Ans: $\varepsilon = - L \frac{dI}{dt}$

45*. What is electrical analogue of mass in mechanics? OR Which electrical device plays the role of electrical inertia?

Ans: Self –inductance.

46. What is back emf?**

Ans: The emf induced in a coil which opposes the rise of current through a coil is called back emf.

47*. Why does a bulb connected in series with a self – inductance glows brilliantly for a moment when the current in the circuit is switched off?

Ans: Because of the forward emf produced.

48*. Mention the expression for the self – inductance in terms of geometry of the coil

Ans: $L = \mu r \mu_0 n^2 Al$

where μ_r is the relative permeability of the medium inside the coil, n is the number of turns per unit length of the coil, A is the area of the coil
and l is the length of the coil.

49*. Does emf rise instantaneously after the battery connected to it is switched on?

Ans: No. Because the back emf produced opposes the growth of current through the coil

50*. Can a thin wire act as an inductor?

Ans: No. Because a thin wire does not enclose a significant magnetic flux.

51*. What happens to the self – induction of a coil if a soft iron rod is inserted into it?

Ans: Increases. Since iron has large permeability, the inductance increases.

52. Mention the expression for the magnetic potential energy stored in an inductor.**

Ans: $Energy, U = 1/2\, LI^2$, Where L is the inductance of coil, I is the current in coil.

53*. What is the S.I. Unit of self -inductance?

Ans: Henry (H)

54*. Define self-inductance of a coil as one henry

Ans: Self-inductance of a coil is said to be one henry if one volt of emf is induced in it when the current in it changes at one ampere per second

55. The inductance coils are made of copper why?**

Ans: The inductance coils are made of copper because the resistivity of copper is very small and thus induced current will be large

56*. Name the devices working on the principle of self-Induction

Ans: Choke and electric generator.

57*. What is the frequency of AC in India?

Ans: 50 HZ

ALTERNATING CURRENT

1*. Define alternating voltage and current.

Ans: The voltage which varies periodically with time both in magnitude and direction is called alternating voltage and the current driven by it in the circuit is called alternating current.

2*. Give the mathematical expression for alternating voltage and currents.

Ans: Alternating voltage $V = V_m \sin \omega t$ Alternating current $i = i_m \sin \omega t$

V_m , i_m are peak value of voltage and current. ωt is phase ω is angular frequency.

3*. Define rms current.

Ans: rms current is the equivalent dc current that would produce the same average power loss as the alternating current.

4*. Give the relation between rms value and peak value for current and voltage**

Ans:

$$i_{rms} = \frac{i_m}{\sqrt{2}} = 0.707\, i_m \qquad V_{rms} = \frac{V_m}{\sqrt{2}} = 0.707\, V_m$$

AC Voltage applied to an Inductor

5*. Define inductive reactance. Give the mathematical form with units.

Ans: Opposition offered by inductor for flow of AC is called inductive reactance

$X_L = \omega L = 2\pi\, \nu L$ unit: ohm

AC Voltage applied to a Capacitor

6*. Define capacitive reactance. Give the mathematical form with units.

Ans: Opposition offered by capacitor for flow of AC is called capacitive reactance

$X_C = \frac{1}{\omega C}$ unit: ohm

AC Voltage applied to a series LCR circuit

7. Define impedance. Give the mathematical form with units.**

Ans: Effective opposition offered by L, C and R for the flow of AC is called impedance.

$z = \sqrt{R^2 + (X_C - X_L)^2}$ unit: ohm

AC Voltage applied to a resistor

8*. What is the phase difference between current and voltage in a AC circuit containing pure resistor?

Ans: Current and voltage are in same phase i.e. phase difference is zero.

9*. What is the phase difference between current and voltage in a AC circuit containing pure inductor?

Ans: Voltage leads current by 90^0

10*. What is the phase difference between current and voltage in a AC circuit containing pure capacitor?

Ans: Current leads voltage by 90^0

Representation of AC Current and Voltage by rotating Vectors - Phasors

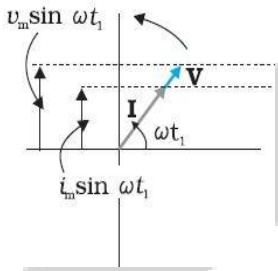
11*. What is phasor? What does the magnitude of phasor represent?

Ans: . Representation of voltage or current by a vector rotating about origin is called phasor. The magnitude of phasor represents the peak value of the quantity.

AC Voltage applied to a Resistor

12*. Draw the phasor diagram for pure resistive circuit.

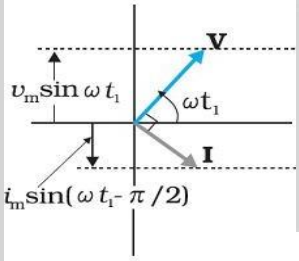
Ans:



AC Voltage applied to an Inductor

13*. Draw the phasor diagram for pure inductive circuit.

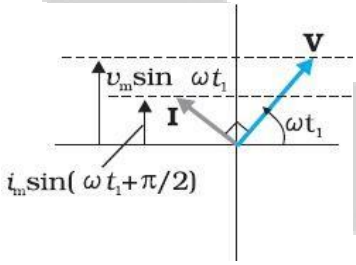
Ans:



AC Voltage applied to a Capacitor

14*. Draw the phasor diagram for pure capacitive circuit.

Ans:



Power in AC Circuit the Power factor

15. What is meant by wattless current.**

Ans: The AC current through pure inductive(L) and capacitive (C) circuit is called wattless current.

ELECTROMAGNETIC WAVES

ONE MARK QUESTIONS WITH ANSWERS

1*. Who first predicted the existence of Electromagnetic waves?

Ans: Maxwell

2*. Who first confirmed the existence of Electromagnetic waves?

Ans: Hertz

3*. What is the source of Electromagnetic waves?**

Ans: Accelerated charges are the source of Electromagnetic waves

4. Mention any two uses of Micro waves?**

Ans: Microwaves are used in aircraft navigation. Microwaves are also used in microwave ovens.

5. Mention any two uses of IR waves?**

Ans: IR-waves from the sun keep the earth warm and hence help to sustain life on the earth IR-rays photographs are used for weather forecasting.

6. Mention any two uses of U V Waves?**

Ans: Highly focused UV-rays are used in eye surgery. UV-lamps are used to kill germs in water purifiers.

7*. Do Electromagnetic waves carry Energy and momentum?

Ans: Yes

8*. What is the angle between electric field vector and magnetic field vector? Yes

Ans: 90^0

***** What are Electromagnetic waves?**

Ans: Waves radiated by accelerated charges and consist of time varying, transverse electric and magnetic fields are called electromagnetic waves

10*. Why do welder's wear special glass goggles or face masks?

Ans: To protect their eyes from large amount of ultraviolet rays produced by welding arcs.

RAY OPTICS AND OPTICAL INSTRUMENTS

Reflection

***1. Define focal length of a mirror.**

Ans: The distance between the principal focus and the pole of the mirror is called as focal length of mirror

****2. Write the expression for the magnification in terms of object and image distance.**

Ans: Magnification , $m = \frac{v}{u}$ where v=image distance , u=object distance.

*****3. Define linear magnification.**

Ans: Linear magnification is the ratio of height of the image to the height of the object.

Refraction

*****4. Write the formula for refractive index for normal refraction.**

Ans: Refractive index $n_m = \frac{Speed\ of\ light\ in\ air}{Speed\ of\ light\ in\ the\ medium} = \frac{c}{v}$

Total Internal Reflection

*****5. Define critical angle.**

Ans: The angle of incidence corresponding to angle of refraction 90^o is called critical angle.

*****6. Write the relation between refractive index and critical angle of a material.**

Ans: $n = \frac{1}{sinC}$ where n is refractive index and C is the critical angle.

*****7. What is total internal reflection?**

Ans: When a ray of light travels from denser medium to rarer medium and if the angle of incidence is greater than the critical angle, then the incident ray is totally reflected to the same medium. This phenomenon is called total internal reflection.

*****8. On what principle optical fibre does work?**

Ans: Optical fibre works on the principle of total internal reflection.

Refraction By Lens

*****9 Which type of lens is used to correct the myopia?**

Ans: Concave lens is used to correct myopia.

*****10. Write the expression for optical power of a lens. Write its units.**

Ans: Optical Power of lens $= \frac{1}{f}$ Here f = focal length of lens Unit for focal power is dioptre.

****11. Write the expression for the focal power of combination of number of thin lenses.**

Ans: $P = P_1 + P_2 + P_3 + ...$

Prism

12. What is dispersion of light?

Ans: The phenomenon of splitting of light into its component colors is known as dispersion.

Some Natural Phenomena Due To Sunlight

****13. Give the reason for red color of the sun during sunset.***

Ans: During sunset, sun is at horizon. Sun rays have to pass through larger distance in the atmosphere. Most of the blue and other shorter wavelengths are removed by scattering. The least scattered red light reaches our eyes. Hence sun is red at sunset.

Optical Instruments

****14. Define angular magnification of a telescope.***

Ans: The angular magnification of a telescope is the ratio of the angle subtended at the eye by the final image to the angle for which the object subtends at the lens.

15. Write the expression for linear magnification of a simple microscope.

Ans: Linear magnification $m = \left(\frac{L}{f}\right)$

16. Mention the expression for angular magnification of a simple microscope.

Ans: Angular magnification $m = \left(1 + \frac{D}{f}\right)$

17. Mention the expression for magnification of a compound microscope.

Ans: Magnification $M = \frac{v_0}{u_0}\left(1 + \frac{D}{f_e}\right)$ *for final image at near point* $\frac{v_0}{u_0} \times \frac{D}{f_e}$ *for image at infinity*

****18. Write the expression for magnifying power of a telescope in terms of focal length***

Ans: Magnifying Power of telescope $M = -\frac{f_0}{f_e}\left(1 + \frac{f_e}{D}\right)$

WAVE OPTICS

ONE MARK QUESTIONS WITH ANSWERS

1. What is light?

Ans: Light is a form of energy which produces sensation of sight.

2. Name the theories of light.

Ans: Newton's corpuscular theory, Huygens's wave theory, Maxwell's electromagnetic theory Planck's quantum theory of radiation

Huygens's principle

****3. Define wavefront.***

Ans: A locus of points, which oscillate in phase is called a wavefront.

4. What is the nature of light according to Huygens' theory?

Ans: According to this theory, light is emitted by the luminous body propagated in the form of waves.

****5. What is the shape of wavefront obtained from a point source at a (i) small distance (ii) large distance?***

Ans: (i) Spherical wavefront (ii) Plane wavefront.

*****6. Under what conditions a cylindrical wave front is obtained?***

Ans: A cylindrical wave front is obtained at a small distance from a linear source of light.

7. What type of wavefront is obtained when a plane wave is reflected by a concave mirror?

Ans: Spherical wavefront (converging).

8. Who proposed the wave theory of light?

Ans: Christian Huygens.

Refraction and reflection of plane waves using Huygen's principle

*****9. What is Doppler effect?***

Ans: Apparent change in the frequency of light wave due to the relative motion between the source and the observer is called Doppler effect of light.

10. What is Redshift?

Ans: When waves are received from a source of light moving away from the observer, there is an apparent increase in wavelength (apparent decrease in frequency) due to Doppler effect which is called Redshift.

11. What is Blueshift?

Ans: When waves are received from a source of light moving towards the observer, there is an apparent decrease in wavelength (apparent increase in frequency) due to Doppler effect which is called Blueshift.

Interference of light waves and Young's experiment

12. What is interference of light?

Ans: The modification in the distribution of light energy due to the superposition of two or more waves of light is called interference of light.

13. Name the physicist who experimentally studied the interference of light for the first time.

Ans: Thomas Young.

***14. What is the maximum intensity of light in Young's double slit experiment if the intensity of light** emerging from each slit is I_O?*

Ans: Maximum intensity of light in Young's double slit experiment is $4I_O$

15. Define fringe width.

Ans: The distance between two consecutive bright (or two consecutive dark) fringes is called fringe width.

16. What is the relation between phase difference and path difference?

Ans: A phase difference of δ corresponds to a path difference of x.

Path difference x between the two waves corresponding to a phase difference δ is given by,

$$\boxed{x = \frac{\lambda}{2\pi} \times \delta}$$

17. How does the fringe width in interference pattern vary with the wavelength of incident light?

Ans: The fringe width is directly proportional to the wavelength of incident light.

18. How does the fringe width in interference vary with the intensity of incident light?

Ans: The fringe width is not affected by the intensity of incident light.

Diffraction

19. Which colour of light undergoes diffraction to maximum extent?

Ans: Red.

20. Name a factor which affects the resolving power of a microscope.

Ans: The wave length of light or refractive index of medium between objective lens and the object.

21. How will the diffraction pattern due single slit change when violet light replaces green light?

Ans: The diffraction bands become narrower.

22. Do all waves exhibit diffraction or only light?

Ans: All the waves exhibit the phenomenon of diffraction.

23. What is the condition for minima in diffraction at a single slit?

Ans: $\boxed{Path\ difference = d \sin\theta = n\lambda}$,where $n = 1, 2, 3...$ for 1^{st} , 2^{nd} , 3^{rd} , … minima.

Where, λ = Wavelength of light, d = Width of the slit and θ = Angular position of the minima.

24. What is resolving power of microscope?

Ans: The resolving power of the microscope is defined as the reciprocal of the minimum separation of two points which are seen as distinct.

25. Mention the expression for limit of resolution of microscope.

Ans: Minimum separation or limit of resolution: $\boxed{d_{\min} = \frac{1.22\lambda}{2n\sin\theta}}$

Where λ = wavelength of light, n-refractive index of the medium between the object and the objective lens and 2θ-angle subtended by the object at the diameter of the objective lens at the focus of the microscope.

26. Write the expression for limit of resolution of telescope.*

Ans: Expression for limit of resolution of telescope: Limit of resolution: $\boxed{\Delta\theta = \frac{0.61\lambda}{a} = \frac{1.22\lambda}{2a}}$

Where λ= wavelength of light and 2a-diameter of aperture of the objective.

27. How can the resolving power of a telescope be increased?*

Ans: Using objective of larger diameter.

Polarisation

28. Which phenomenon confirms the transverse nature of light?*

Ans: Polarisation.

29. What is meant by plane polarised light?*

Ans: Plane polarised light is one which contains transverse linear vibrations in only one direction perpendicular to the direction of propagation.

30. Define plane of vibration.

Ans: Plane of vibration is the plane in which vibrations occur with maximum amplitude.

31. Define plane of polarization.

Ans: Plane of polarization is the plane in which no vibrations occur

32.What is pass axis?

Ans: When an unpolarised light wave is incident on a polaroid, the light wave will get linearly polarised with the electric vector oscillating along a direction perpendicular to the aligned molecules. This direction is known as the pass-axis of the polaroid.

33.What should be the angle between the pass axes of two polaroids so that the intensity of transmitted light from the second polaroid will be maximum?

Ans: 0^o .

34. State Brewster's Law.

Ans: Brewster's Law: The refractive index of a reflector is equal to tangent of the polarising

angle.

35. Write the relation between refractive index of a reflector and polarising angle.

Ans: $\boxed{n = \tan i_B}$ *where n - refractive index of the reflector and* i_B *- polarising angle.*

36. Define Brewster's angle (OR Polarising angle).

Ans: Brewster's angle/Polarising angle(i_B): The angle of incidence for which the reflected light is completely plane polarised is called Brewster's angle.

37. What are Polaroids?

Ans: Polaroids are the devices used to produce plane polarized light and analyze light

DUAL NATURE OF RADIATION AND MATTER

ONE MARK QUESTIONS WITH ANSWERS

Electron emission

***1. Define specific charge of an electron. what is the value of specific charge of electron?**

Ans: The charge to mass ratio (e/m) of electron is called specific charge of electron.
Value of e/m = 1.76×10^{11} C/Kg.

***2. Who discovered electron?**

Ans: J .J. Thomson

***3. Who discovered charge of electron?**

Ans: R.A. Millikan.

****4. What is the outcome of Millikan's experiment?**

Ans: Electric charge is quantised.

Photoelectric effect

****5. Define work function of a metal?**

Ans: The minimum energy required for an electron to escape from the metal surface is called the work function of the metal .

****6. Define electron volt (ev)?**

Ans: 1eV is the energy gained by an electron when it is accelerated through a potential difference of one volt.

*7. On what factors does the work function of a metal depend?

Ans: 1.The properties of the metal
2. Nature of the surface

*8. For which metal the work function is highest and lowest?

Ans: Highest- platinum Lowest- caesium

****9. Who discovered photoelectric effect?**

Ans: Henrich Hertz discovered photoelectric effect.

****10. Define photoelectric emission or photoelectric effect?**

Ans: Emission of electrons from metal surface, when it is illuminated with light of suitable frequency is called photoelectric effect.

****11. Define threshold frequency of a metal? How it is related to work function?**

Ans: The minimum cut-off frequency of incident light below which no photoelectric emission takes place irrespective of intensity of incident light is called threshold frequency of a metal.

$W_0 = hf_0$

**12. How photo electric current depends on intensity of incident light?

Ans: Above threshold frequency, photoelectric current is directly proportional to intensity of incident light.

13. What do you mean by saturation current?

Ans: As the potential of collector is increased for a radiation of certain high frequency and

intensity, photoelectric current increases and reaches to a maximum constant value. This constant current is called saturation current.

***14. Define stopping potential of a given photosensitive metal?**

Ans: The minimum negative potential applied to the collector at which the photoelectric current becomes zero is called stopping potential of a given photosensitive metal .

***15. Give the mathematical relation between stopping potential and maximum kinetic energy of photoelectron.**

Ans: $K_{max} = eV_0$ Here, K_{max} = max*imum kinetic energy of photo electron*

*e = ch*arg*e of electron*, V_0 = *Magnitude of stopping potential* .

***16. Define threshold wavelength. How it is related to work function W_0 ?**

Ans: The maximum wavelength of incident radiation above which no photoelectric emission takes place is called threshold wavelength (λ_0)

$W_0 = \frac{hC}{\lambda_0}$

***17. A photo emissive surface just emits photo electrons when blue light is incident on it. Will there be photo emission if yellow or red light is used?**

Ans: No ($\therefore$ wave length of yellow and red light is greater than that of blue light which is the threshold wavelength)

***18. How does stopping potential depend on the frequency of incident radiation?**

Ans: Stopping potential increases with increase in frequency of incident radiation.

***19. How does maximum kinetic energy (or stopping potential) of photo electrons vary with intensity of the incident radiation?**

Ans: Maximum kinetic energy (or stopping potential) is independent of intensity of the incident radiation.

***20. How does work function of a photo sensitive surface vary with intensity or frequency of the incident radiation?**

Ans: Work function of a photo sensitive surface is independent of intensity or frequency of the incident radiation.

***21. Why sufficiently powerful AM radio signal cannot produce photoelectric effect?**

Ans: The energy of radio photon is less than the work function of any metal. So even sufficiently powerful AM radio signal cannot produce photoelectric effect.

***22. Name the factors on which maximum kinetic energy of photoelectrons depends.**

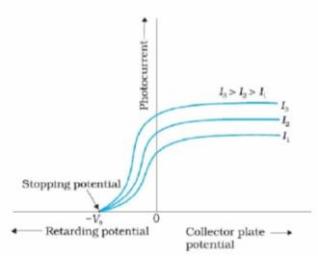
Ans: Maximum kinetic energy of photoelectrons depends on the nature of the emitter and the frequency of incident radiation

***23. What determines the strength of photoelectric current?**

Ans: Intensity of the incident radiation.

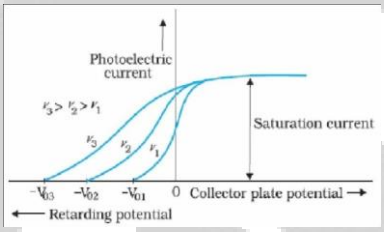
****24. Give the graphical representation of the variation of photoelectric current with collector plate potential**

Ans:



****25. Represent the variation of stopping potential with frequency of incident light graphically.**

Ans:



Particle nature of light: The photon

*26. **Define quanta?**

Ans: Radiation energy is built up of discrete units of energy called quanta.

27. Who verified Einstein's photoelectric equation?

Ans: R.A. Millikan

28. What is the value of slope of the graph drawn between stopping potential (V_0) and frequency (λ)?

Ans: h/ e Here h=Planck's constant, e=charge of electron

*****29. Who proposed quantum theory of radiation?***

Ans: Max Planck

******30. What is a photon?***

Ans: Quantum of light energy is called photon.

******31. What is the charge and rest mass of a photon?***

Ans: Charge of a photon=0 Rest mass=0

******32. Write the expressions for energy and momentum of a photon?***

Ans: Energy of a photon, $E = hf$ Momentum of a photon, $P = h/\lambda$

***33. In a photon-particle collision which are conserved?**

Ans: Total energy and total momentum

34. In interaction of radiation with matter, how the radiation behave?

Ans: The radiation behave as it is made up of particles called photons.

Wave nature of matter

******35. What are matter waves or de-Broglie waves?***

Ans: Waves associated with moving particles are called matter waves.

36. Who introduced the concept of matter waves?

Ans: Louis de-Broglie

****37. Write the expression for de-Broglie wave length in terms of linear momentum of the particle?***

Ans: $\lambda = h/p$ Here h= Planck's constant ; P = Linear momentum of the particle

38. How does the de-Broglie wave length of an electron change if its velocity increases?

Ans: De-Broglie wave length decreases when velocity increases. $\lambda \alpha 1/c$

39. Write the expression for debroglie wavelength of electron in terms of accelerating potential?

Ans: $\lambda = 1.227 / \sqrt{V}$ nm

****40. An electron and proton have same speed (Kinetic energy). Which of them has smaller de-Broglie wavelength.***

Ans: Proton

[$\lambda = h / m\nu$, i.e. for same speed , $\lambda = 1 / m$]

41. An electron and a proton have same de-Broglie wavelength. Which of them has greater speed.*

Ans: Electron

[$\lambda = h / m\nu$, i.e. for same wavelength , $\nu = 1 / m$]

42. An electron and proton have same speed(Kinetic energy). Which of them has greater de-Broglie wavelength.

Ans: Electron

[$\lambda = h / m\nu$, i.e. for same speed , $\lambda = 1 / m$]

****43.Write the expression for debroglie wavelength in terms of kinetic energy?***

Ans: $\frac{h}{\sqrt{2mK}}$ K =kinetic energy

****44. Write the expression for debroglie wavelength in terms of accelerating potential?***

Ans: $\lambda = h/\sqrt{2mqV}$; V= accelerating potential.

Photocell

45. What is a photoelectric cell or photocell?

Ans: It is a device which converts radiant energy into electric energy.

Davission and Germer' s experiment

46. Name the scientist who proved the wave nature of electron?

Ans: Davisson and Germer(for slow electrons), G.P. Thomson (for fast electrons)

47. What is the outcome of Davisson and Germer experiment?

Ans: It confirms the wave nature of electrons.

ATOMS

Alpha Particle Scattering and RutherFord's Nuclear Model

*****1. How is impact parameter related to angle of scattering?**

Ans: Impact parameter $b = \frac{Z_1 Z_2 e^2}{8\pi\varepsilon_0 K} \cot\frac{\theta}{2}$

θ = angle of scattering , K = $\frac{m v_0^2}{2}$

*****2. What are stationary orbits?**

Ans These are permitted non-radiating orbits.

Electron Orbits

*****3. What does the negative sign indicate in the expression for total energy of electron?**

Ans**:** The electron is bound to the atom and energy must be given to the electron to remove it from the atom.

Atomic spectra

***4. Which part of the electro-magnetic spectrum does the Lyman series belong?**

Ans: Ultra Violet range.

***5. Which part of the electro-magnetic spectrum does the Balmer series belong?**

Ans: Visible range.

***6. Which part of the electro-magnetic spectrum does the Paschen series belong?**

Ans**:** Infra-red range.

Bohr's Model of Atom

*****7. How does the velocity of electron depends on the principal quantum number?**

Ans: It is inversely proportional to the principal quantum number.

****8. How does the energy of electron change with the atomic number?**

Ans: Energy increases with increase in atomic number (Z)

*****9. How is the energy of electron depends on the principal quantum number?**

Ans: $E_n = -R_H\left(\frac{1}{n^2}\right)$

****10. How does the radius of electron depends on the principal quantum number?**

Ans: $R \alpha n^2$

*****11. Give the value of Rydberg's constant.**

Ans: 1.097 X10^7 m^{-1}.

***12. Give the expression for energy of hydrogen atom.**

Ans: E = (-13.6/n2) electron volt (eV).

*****13. What is wave number?**

Ans: It is the number of waves per unit length.

*****14. What is ionization energy?**

Ans: It is the minimum energy required to remove electron completely from the atom.

****15. What is ionization potential?**

Ans**:** It is the minimum potential required to accelerate the electron so that it acquires kinetic energy to ionize the atom.

*****16. What is excitation energy?**

Ans It is the energy required to shift the electron to its higher orbit.

****17. What is excitation potential?**

Ans**:** It is the minimum potential difference applied to an external electron must be accelerated so that it acquires kinetic energy to excite the atom.

*****18. Give the expression for angular momentum of electron.**

Ans: Angular momentum= $mvr = kh / 2\pi$

NUCLEI

Atomic masses and Composition of Nucleus

***1. Mention the mass of C^{12} *atom*.**

Ans: The mass of C^{12} *atom* is 1.992647 X10^{-26} *Kg*.

***2. Mention the commonly used unit to measure the nuclear mass.**

Ans: Atomic mass unit. It is denoted by amu or u.

****3. Mention the mass of proton.***

Ans: $m = 1.00727u = 1.67262 \times 10^{-27}\ Kg$

****4. Mention the mass of neutron.***

Ans: $m = 1.00866u = 1.6749 \times 10^{-27}\ Kg$

****5. What are nucleons?***

Ans: Protons and neutrons in nucleus are collectively called as nucleons.

***6. What is atomic number?**

Ans: Number of protons in a nucleus is called atomic number (Z).

****7. What is mass number?***

Ans: Total number of protons and neutrons in a nucleus is called mass number (A).

$\therefore A = Z = N$

****8. How many neutrons are present in U_{92}^{235} ?**

Ans: Z=92. A=235 Number of neutrons = A-Z=235-92=143.

***9. Which nucleus does not contain neutrons?**

Ans: H_1^1 (*Hydrogen*)

****10. What are Isotopes? Give example.**

Ans: Nuclei with same atomic number but different mass numbers are called isotopes.

e.g. C_6^{11}, C_6^{12}, C_6^{13} *and* C_6^{14} are the isotopes of carbon atom.

*****11. What are isobars? Give example.***

Ans: Nuclei having same mass number, but different atomic numbers are called isobars.

e.g. 1) O_8^{16} *and* N_7^{16} 2) H_1^3 *and* He_2^3

*****12. What are Isotones? Give example.***

Ans: Nuclei with different atomic number and different mass number with same number of neutrons are called isotones.

e.g. 1) N_7^{14} *and* C_6^{13} 2) C_6^{14} and O_8^{16}

*****13. What are Isomers? Give example.***

Ans: Nuclei with same atomic number and same mass numbers but with different nuclear energy are called Isomers.

e.g. $Br_{35}^{80}(m)$ $Br_{35}^{80}(g)$ (Where m=meta stable, g=ground state).

***14. Define electron - volt (eV).**

Ans: One electron - volt is the energy gained by an electron when it is accelerated through a potential difference of one volt.

***15. Define atomic mass unit (u) or amu.**

Ans: The atomic mass unit (amu) is defined as 1 /12th of the mass of the carbon atom C^{12} in its lowest energy state.

16. What is the relation between Kg and amu?

Ans: $1amu = 1.661X10^{-27}\ Kg$

***17. Give the relation between amu and MeV.**

Ans: 1amu = 931 MeV

Size of the Nucleus

***18. How does nuclear radius of an atom depend on its mass number?**

Ans: Nuclear radius (or diameter) is directly proportional to cube root of its mass number.

$R \alpha A^{1\ 3}$ *or* $R = R_0 A^{1/3}$

***19. What is the order of magnitude of the radius of a nucleus?**

Ans: The radius of a nucleus is about $1\,fm = 10^{-15}\,m$

**20. The mass number of a nucleus is 125. What is its approximate radius?*

Ans: $A=125 \Rightarrow R = R_0 A^{1/3} = 1.2 \times 10^{-15} * 125^{(1/3)} = 6\ fermi = 6 X 10^{-15} m$

***21. What is the ratio of the nuclear radii of elements with mass numbers 216 and 125?**

$A = 216 \Rightarrow R = R_0 A^{1/3} = 1.2 \times 10^{-15} * 216^{(1/3)} = 7.2\ fermi = 7.2 X 10^{-15} m$

$A = 125 \Rightarrow R = R_0 A^{1/3} = 1.2 \times 10^{-15} * 125^{(1/3)} = 6\ fermi = 6.0 X 10^{-15} m$

Ratio of radius = 1.2

**22. What is the order of nuclear density?*

Ans: $10^{17}\ kgm^{-3}$

23. How does nuclear density vary with mass number?

Ans: Nuclear density is independent of its mass number.

24. Why is the density of the nucleus more than that of the atom?

Ans: In any atom, total mass is concentrated at the center of the atom called nucleus. Also, most of the atom is empty. Hence density of the nucleus is more than that of atom.

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

Ans: The ratio of nuclear densities is 1:1($\Rightarrow$ Nuclear density do not depend upon mass no)

Mass - Energy and Nuclear Binding Energy

***26. Mention Einstein's mass - energy relation.**

Ans: According to Einstein, mass and energy can be changed from one form to another. The energy equivalent of mass 'm' is given by $E = mc^2$. Where c is the speed of light in vacuum.

****27. Calculate the energy equivalent of mass 1 kg using Einstein's mass - energy relation.** Ans: According to Einstein's mass - energy relation

$E = mc^2 = 1X(3X10^8)^2 = 9X10^{16} J$

******28. Define the term mass defect.***

Ans: The difference between the sum of the masses of the nucleons forming the nucleus and its rest mass is called mass defect.

Mass defect, $\Delta m = (Z(m_p + m_e) + (A-Z)m_n) - M$

Where Z-atomic number, A-mass number, M-rest mass of the nucleus, m_p, m_e and m_n are the rest masses of proton, electron and neutron respectively.

****29. Define packing fraction.**

Ans: It is mass defect per nucleon. Packing fraction = Δ m/ A

*****30. Define the term binding energy.**

Ans: The energy, which binds the nucleons to form a stable nucleus, is called binding energy or It can also be defined as the energy required to break the nucleus into its constituent particles.

***31. Define the term specific binding energy or Binding fraction or Average binding energy.**

Ans: Binding energy per nucleon (or mass number) is called specific binding energy.

Specific binding energy = Binding energy / Mass number

*****32. Give the relation between mass defect and B.E.**

Ans: If Δm is in Kg then B.E = $\Delta m X C^2$ *Joules*

If Δm is in amu then B.E = Δm X 931.5*MeV*

***33. The mass defect when a nucleus is formed is 0.4 amu. If it contains 50 nucleons, what is the specific binding energy?**

Ans: Specific binding energy = Binding energy / Mass number

Binding energy = Mass defect X 931.5 MeV

Mass Number = no of nucleons = 50

Specific binding energy = 0.4 X 931.5 / 50 MeV = 7.448 MeV

****34. The binding energy of the nucleus of C_6^{12} = 92.17MeV . Find the Specific Binding energy?***

Ans: *Specific B.E = binding energy/Mass Number = 92.17 / 12 = 7.681 MeV*

****35. Give the range of mass number (A), for which the atoms are stable.***

Ans: 30 < A < 170

***36. What is the maximum average binding energy of nuclei.**

Ans: 8.75 MeV

***37. Which element, does it have the maximum average binding energy.**

Ans: Iron

Nuclear force

****38. What is range of nuclear forces?**

Ans: The range of nuclear forces is about $1\,fm = 10^{-15}\,m$

****39. If the distance between nucleons is larger than 0.8fm, which nuclear force will act between them?***

Ans: Attractive force

***40. Which nuclear force will act, if the distance between nucleons is less than 0.8fm?**

Ans: Repulsive force

***41. What about the nuclear force is between, proton - proton, proton - neutron and neutron-neutron?**

Ans: Nuclear force between proton - proton, proton - neutron and neutron - neutron is the same.

Radioactivity

*****42. What is natural radioactivity?***

Ans: The phenomenon of spontaneous disintegration of heavy nuclei with emission of certain radiations is called natural radioactivity.

***43. Who discovered radioactivity?**

Ans: Henry Becquerel

***44. Name the radioactive radiation, which is not deflected by electric or magnetic field.**

Ans: Gamma rays.

***45. Which radioactive radiation is used in the treatment of Cancer?**

Ans: Gamma radiation.

***46. Name the radioactive radiation, which has the greatest ionizing power?**

Ans: *Alpha rays*

****47. Why α and β rays are deflected in electric field and magnetic field?**

Ans: Because they consist of charged particles.

***48. Which type of a radioactive emission produces a daughter nucleus which is an isobar of the parent?**

Ans: Beta decay.

***49. Name the radioactive radiation, which has the greatest penetrating power?**

Ans: Gamma rays

*****50. State the radioactive decay law.**

Ans: The rate of decay of radioactive substance at any instant is directly proportional to the number of parent atoms present in the sample at that instant. $dN/dt = \lambda N$, λ = *decay constant*

*****51. Give the relation between half - life and decay constant.**

Ans: If λ be the decay constant and T the half - life of a radioactive substance then,

$T = \ln 2 / \lambda = 0.693 / \lambda$

****52. Give the relation between mean - life and decay constant.**

Ans: If τ be the mean life and λ be the decay constant of a radioactive substance then, $\tau = 1/\lambda$

****53. Give the relation between half - life and mean - life of a radioactive substance.**

Ans: If T is half - life and τ is the mean - life of radioactive substance then, $T = 0.693\tau$

*****54. Define activity of a radioactive element. What is its SI unit?**

Ans: Activity of a radioactive element at any instant is defined as the rate of decay at that instant.

Its SI units is Becquerel.

***55. Write the terms Curie (Ci) and Rutherford (Rd) in terms of Becquerel (Bq).**

Ans: 1 Becquerel (Bq) = 1 disintegration per second (1 dps)

1 Curie (Ci) = 3.7×10^{10} *dps*

1 Rutherford (Rd) = 10^6 *dps*

****56. The half - life of a radioactive element A is same as mean life of another radioactive element B. Initially, both have same number of atoms. B decays faster than A. Why?***

Ans: $T_A = \tau_B = 1.44T_B$

$\Rightarrow T_A < T_B \quad \therefore \tau_A > \tau_B$. Therefore, B decays faster than A.

****57. The temperature of a radioactive sample is doubled. How does its activity or half - life or mean - life change?***

Ans: Remains same.

***58. What is a radioisotope?**

Ans: Isotope of an element, which is radioactive is called radioactive isotope.

***59. Mention some of the fields in which radioisotopes are extensively used.**

Ans: Radioisotopes are extensively used in medicine, industry, agriculture, biology and geology.

*****60. Does a radioactive nucleus emit α, β and γ rays simultaneously?***

Ans: No

Nuclear Energy

*****61. What is nuclear fission?**

Ans: The process in which a heavy nucleus bombarded by a neutron splits into lighter nuclei of comparable masses releasing two or three neutrons and energy is called nuclear fission.

62*. What is nuclear fusion?**

Ans: The process by which two light nuclei combine to form a heavier nucleus with the liberation of energy is known as nuclear fusion.

*****63. What is a chain reaction?**

Ans: A chain reaction is a self - sustained process in which the number of neurons in fission goes on multiplying rapidly until the entire fissionable (or fissile) material disintegrates.

*****64. What is the principle of Atom bomb?**

Ans: Uncontrolled nuclear chain reaction.

*****65. What is the principle of Hydrogen bomb?**

Ans: Hydrogen bomb works on the principle of fusion reaction.

****66. What is a nuclear reactor?**

Ans: A nuclear reactor is a device in which a self sustained and controlled nuclear chain reaction takes place.

***67. Name the first nuclear reactor in India.**

Ans: Apsara.

*****68. Why neutron is used as bombarding agent in nuclear fission?**

Ans: Neutrons are used in nuclear fission, as they are electrically neutral. Hence they do not experience any coulomb force.

*****69. What is a moderator? Give example.**

Ans: A moderator slows down neutrons to thermal energies. e.g. heavy water and Beryllium.

****70. Which is the moderator in Apsara nuclear reactor?**

Ans: Water

71*. What is the function of control rods in a reactor? Give example.**

Ans: Control rods in a nuclear reactor are used to absorb neutrons and hence control the rate of reaction. e.g. Cadmium and Boron rods.

******72. What are thermal neutrons? What is their importance?***

Ans: Neutrons of energy about 0.04MeV are called thermal neutrons or slow neutrons. Thermal neutrons are needed in the fission of U^{235}, to control the chain reaction in nuclear reactor.

****73. What are fast neutrons?**

Ans: Neutrons whose energies greater than or equal to 1 MeV are called fast neutrons.

****74. What is critical mass?**

Ans: The mass of the fissionable material at the critical size for which chain reaction occurs at a constant rate is called critical mass.

****75. How many protons are involved in proton - proton cycle?**

Ans: Four protons.

***76. What is the energy released in the fusion of four hydrogen atoms to form a helium nucleus?**

Ans: The energy released in the fusion of four hydrogen atoms, to form a helium nucleus is 26.7MeV.

***77. What will be the age of Sun?**

Ans: The age of Sun will be about $5X10^9$ years.

***78. Once the life time of Sun is over, how does it convert into?**

Ans: Red giant.

***79. Why fusion reaction is called thermonuclear reaction?**

Ans: Nuclear fusion reaction takes place at very high temperature nearly 10^7 K . Hence they are called thermonuclear reactions.

80. Name the process responsible for the release of energy in stars?

Ans: Nuclear fusion.

***81. Between fission and fusion, which yields more energy per unit mass?**

Ans: Fusion.

*****82. What is electron capture? Which photon is emitted in an electron capture process?**

Ans: Electron capture is a process in which a nucleus absorbs one of the inner atomic electrons with the result that a nuclear proton becomes a neutron and a neutrino is emitted. An X - ray photon is emitted in electron capture.

****83. What is neutrino? Why is it difficult to detect a neutrino?**

Ans: Neutrino is an elementary particle belonging to the family of leptons. It is difficult to detect a neutrino since it interacts very weakly with matter.

****84. Name the anti particles of a neutrino and an electron.**

Ans: The anti particles of a neutrino is antineutrino and that of electron is positron.

*****85. Give an example of nuclear fusion reaction.**

Ans: $U_{92}^{235} + n_0^1 \rightarrow Ba_{56}^{139} + Kr_{36}^{94} + 3N_0^1$

*****86. Name the anti particle of electron.**

Ans: Positron

SEMICONDUCTOR ELECTRONICS

1. What is an electronic device?

Ans: It is a device in which controlled flow of electrons takes place either in vacuum or in semiconductors.

Classification of Metals, Conductors And Semiconductors

****2. What is an energy band in a solid?***

Ans: Energy band is a group of close by energy levels with continuous energy variation.

*****3. What is a valence band?***

Ans: Valence band is the energy band which includes the energy levels of the valence electrons. It is the range of energies possessed by valence electrons.

****4. What is conduction band?***

Ans: Conduction band is the energy band which includes the energy levels of conduction electrons or free electrons.

*****5. What is energy gap or energy band gap?***

Ans: The gap (spacing) between the top of the valence band (E_V) and the bottom of the conduction band (E_C) is called the energy band gap (E_g) or energy gap.

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

Ans: 1eV

7. In which solids the forbidden gap is least / highest?

Ans: In conductors the forbidden gap is least and insulators it is highest.

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

Ans: The conductivity increases exponentially with temperature.

9. Is the ionisation energy of an isolated free atom different from the ionization energy E_g for the atoms in a crystalline lattice?

Ans: Yes. It is different since in a periodic crystal lattice each bound electron is influenced by many neighbouring atoms.

Intrinsic Semiconductors

****10. At what temperature would an intrinsic semiconductor behave like a perfect insulator?***

Ans: 0 K (absolute zero temperature).

*****11.What is an intrinsic semiconductor?***

Ans: It is a pure semiconductor in which electrical conductivity is solely due to the thermally generated electrons and holes.

Extrinsic Semiconductors

12. What is doping?

Ans: The process of adding suitable impurity atoms to the crystal structure of pure semiconductor like Ge or Si to enhance their electrical conductivity is called doping.

*****13. What is a hole?***

Ans: The vacancy of an electron(of charge -e) in the covalent bond with an effective positive charge +e is called a hole.

14. What is an extrinsic semiconductor?

Ans: The semiconductor obtained by doping a pure semiconductor like silicon with impurity atoms to enhance its conductivity is called an extrinsic or doped semiconductor.

15. Name one dopant which can be used with germanium to form an n-type semiconductor.

Ans: Phosphorus.

16. What are dopants?

Ans: The impurity atoms added to pure semiconductors like germanium to increase their electrical conductivity are called dopants.

****17.Name the majority charge carriers in p-type semiconductors.***

Ans: Holes.

P-N Junction diode

****18. What is depletion region in a p-n junction?***

Ans: The space charge region at the p-n junction which consists only of immobile ions and is depleted of mobile charge carriers is called depletion region.

****19. How does the width of the depletion region of a p-n junction change when it is reverse biased?***

Ans: The depletion region width increases.

20. Which process causes depletion region in a p-n junction?*

Ans: The diffusion of majority charge carriers i.e., free electrons and holes across the p–n junction causes the depletion region.

21. What is the order of the thickness of the depletion layer in an unbiased p-n junction?*

Ans: micrometer (10^{-6} m).

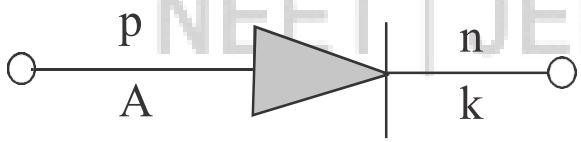
Semiconductor diode

**22. What is the forward resistance of an ideal p-n junction diode?*

Ans: Zero.

****23.Draw the circuit symbol of a semiconductor diode.***

Ans:

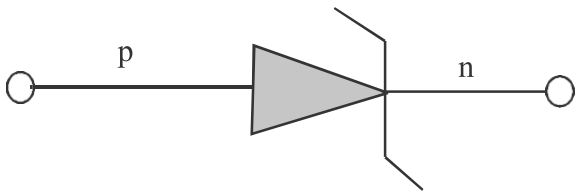


24. Name any one optoelectronic device.

Ans: Photodiode / Light emitting diode / photovoltaic cell or solar cell.

****25. Draw the circuit symbol of a Zener diode.*

Ans:



26. Under what condition does a junction diode work as an open switch.

Ans: A junction diode works as open switch when it is reverse biased.

Applications of Junction Diode as a rectifier

****27.What is rectification?***

Ans: The process of converting AC (alternating current) to pulsating DC is called rectification.

****28. What is the frequency of output in full wave rectifier if input frequency is n Hz?***

Ans: Frequency of output is 2n Hz.

Special purpose P-N Junction Diodes

****29. What is a photodiode?***

Ans: It is a special purpose p-n junction diode whose reverse current strength varies with the intensity of incident light.

****30. Under which bias condition a Zener diode is used as a voltage regulator?***

Ans: Reverse bias.

****31. How is the band gap Eg of a photodiode related to the maximum wavelength λ that can be detected by it?***

Ans: $E_g = hc/\lambda$ h : Planck's constant c : speed of light in vacuum.

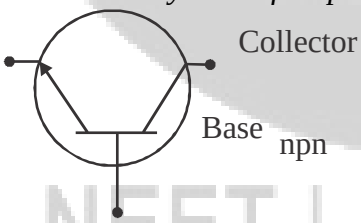
****32. What is a solar cell?**

Ans: It is a photovoltaic cell which is basically a p-n junction which generates emf when solar radiation falls on it.

Junction Transistors

*****33. Draw the circuit symbol of a npn transistor.*

Ans:



****34. Define current gain or current amplification factor of transistor in CE mode.***

Ans: The current gain (α) is defined as the ratio of change in collector current to corresponding change in base current at constant collector–emitter voltage.

****35. What kind of biasing will be required to the emitter and collector junctions when a transistor is used as an amplifier?***

Ans: Emitter-base junction is forward biased while collector-base junction is reverse biased.

****36. Which region of the transistor is made thin and is lightly doped?**

Ans: Base.

****37. Under what condition a transistor works as an open switch?**

Ans: When the transistor is in cut off state it works as an open switch.

*****38.What is an oscillator?**

Ans: It is an electronic device which is used to produce sustained electrical oscillations of constant frequency and amplitude without any external input.

*****39. What type of feedback is used in an oscillator?**

Ans: Positive feedback.

*****40.Write the relation between current gains α and β.**

Ans: $\alpha = (\beta / (\beta+1))$ or $\beta = (\alpha /(\alpha-1))$

Digital Electronics And Logic Gates

****41. What is an analogue signal?**

Ans: An electrical signal (current or voltage) which varies continuously with time is called an analogue signal.

*****42. What is a digital signal?**

Ans: A signal (current or voltage) which takes only discrete values is called digital signal.

*****43. What is a logic gate?**

Ans: A logic gate is a digital circuit that follows certain logical relationship between the input and output signals and works on the principles of Boolean algebra.

******44. Draw the logic symbol of an OR gate.***

Ans:

*****45. Write the truth table for a NOT gate.***

Ans:

A	*y or A'*
0	1
1	0

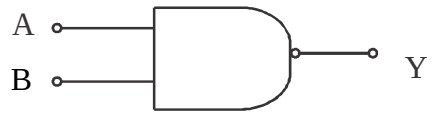
******46.Write the truth table for a OR gate.***

Ans:

INPUT		OUTPUT
A	B	Y=A+B
0	0	0
0	1	0
1	0	0
1	1	1

***47.Draw the logic symbol of NAND gate**

Ans:



***48.The output of OR gate is connected to the input of NOT gate. Name the equivalent logical gate.**

Ans: NOR gate.

*****49.Which gates are called universal gates?**

Ans: NAND and NOR gates are called universal gates.

Integrated Circuits

***50. What is integrated circuit (IC)?**

Ans: An electronic circuit formed on a small piece of semiconductor has revolutionized the electronic technology. Known as integrated circuit.

COMMUNICATION SYSTEM

Basic Terminology Used In Electronic Communication System

*****1. What is communication?**

Ans: Communication is the act of transmission of information.

*****2. What is ``world wide web`` (www) ?**

Ans: It is an encyclopedia of knowledge accessible to everyone round the clock throughout the year

***3. Name the Indian scientist who demonstrated wireless telegraphy?**

Ans: Jagdish Chandra Bose

****4. Mention the elements of a communication system ?**

Ans: Transmitter , channel and receiver

***5. What is transmitter?**

Ans: The system that sends out the information is called as the transmitter

***6. What is channel?**

Ans: The path through which the information travels is called as the channel

***7. What is receiver?**

Ans: The system that receives the information is called the receiver

****8. What are basic modes of communication?**

Ans: There are two basic modes of communication

a) point to point b) broadcast

***9. What is transducer? Give an example?**

Ans: It is a device which converts one form of energy into another ex: microphone , speaker .etc.

*****10. Define modulation.?**

Ans: Modulation is defined as the process of varying the amplitude ,frequency or phase of carrier signal in accordance with the instantaneous voltage of the modulating signal

*****11. What is demodulation?**

Ans: The process of retrieval of information from the carrier wave at the receiver is called demodulation.

***12. What is an digital signal?**

Ans: It is discontinuous and discrete signal having binary variations 1 and 0 with time

***13. What is analog signal?**

Ans: It is an electrical signal which varies continuously with time.

****14. What is a range in a communication system?***

Ans: It is the largest distance between the source and the destination up to which the signal is received with sufficient signal.

***15. What is meant by attenuation?**

Ans: It refers to loss of strength of a signal during propagation of a signal.

****16. What is noise in communication system?**

Ans: The unwanted signal is called a noise in a communication system.

*****17. What is meant by amplification of a signal?**

Ans: It is the process of raising the strength of a signal.

Band Width Of Signals

****18. What is meant by bandwidth transmission?***

Ans: It is the frequency range with in which a transmission is made.

*****19. Mention the frequency range of speech signals?**

Ans: Frequency range 300Hz to 3100Hz.

****20. Mention the band width of transmission medium for Coaxial Cable?**

Ans: Coaxial cable offers a band width of approximately 750 MHz

***21. What is the frequency range for space wave propagation?**

Ans: UHF(>4OMHz)

Propagation of Electromagnetic Waves

*****22. Name the different types of radio wave communication?**

Ans: i)Ground wave(or surface wave) propagation
ii) Sky wave(or Ionospheric) propagation
iii) Space wave (or Tropospheric) propagation

***23. What is ground wave ?**

Ans: The radio waves propagating from one place to another following the earth`s surface are called ground waves.

*****24. Which type of communication is employed in mobile phones?**

Ans: Space wave communication is employed in mobile phones

****25. What is sky wave?**

Ans: It is a mode of communication , which uses ionosphere as a reflector for propagation.

***26. Which type of communication uses discrete and binary coded version of signal?**

Ans: Digital communication

***27. Name the orbit of the satellite that helps in satellite communication?**

Ans: Geostationary orbit.(At a height of 36,000 km above the surface of the earth)

***28. What is space wave?**

Ans: Radio waves having high frequencies are basically called as space waves.

****29. What are microwaves? What is their uses?***

Ans: Microwaves are electromagnetic waves of wave length range 1mm to 3mm.They are used in space communication.

***30. Name the device which generate radio wave of constant amplitude?**

Ans: Oscillator

***31. Which layer of atmosphere reflects radio waves back to earth?**

Ans: Ionosphere.

***32. Define line of sight (LOS) communication ?**

Ans: If the signal travels the distance between the transmitter and reciever antenna in a straight line, then such a type of communication is known as LOS communication.

Modulation and its necessity

*****33. Mention the three types of modulation**

Ans: The three types modulation are
i) Amplitude modulation

ii) Frequency modulation

iii) Phase modulation

*****34. What is amplitude modulation?**

Ans: Amplitude modulation is defined as the process of varying the amplitude of the carrier wave in accordance with the instantaneous voltage of the modulating signal keeping the frequency and phase of the carrier constant.

***35. What is a carrier wave?**

Ans: It is a high frequency wave which carries the information or signal

****36. What type of modulation is required for radio broad cast?**

Ans: Amplitude modulation

****37. What type of modulation is required for television broadcast?**

Ans: Frequency modulation.

***38. Name any one advantage of digital signal over analog signal?**

Ans: They are relatively noise-free and error free

*****39. What is modulation index of an AM wave?**

Ans: $k = A_m/A_c$ where A_m = Amplitude of modulating wave. A_c = Amplitude of carrier wave

***40. What are different modes of line of communication?**

Ans: a) Two wire transmission lines

b) coaxial cables

c) optical cables

****41. What is meant by phase modulation?***

Ans: If the phase carrier wave changes in accordance with the face of the message signal, then the modulation is known as phase modulation