CHAPTER-1
ELECTRIC CHARGES AND FIELDS

1) An isolated solid metallic sphere is given $+Q$ charge. The charge will be distributed on the sphere

(A) Uniformly but only on surface

(B) Only on surface but non-uniformly

(C) Uniformly inside the volume

(D) Non-uniformly inside the volume

2) There are two metallic spheres of same radii but one is solid and the other is hollow, then

(A) Solid sphere can be given more charge

(B) Hollow sphere can be given more charge

(C) They can be charged equally

(D) None of the above

3) The value of electric permittivity of free space is

(A) $9 \times 10^9 NC^2/m^2$ (B) $8.85 \times 10^{-12} Nm^2/C^2 sec$

(C) $8.85 \times 10^{-12} C^2/Nm^2$ (D) $9 \times 10^9 C^2/Nm^2$

4) Number of electrons in one coulomb of charge will be

(A) 5.46×10^{29} (B) 6.25×10^{18}

(C) $1.6 \times 10^{+19}$ (D) 9×10^{11}

5) One metallic sphere A is given positive charge whereas another identical metallic sphere B of exactly same mass as of $A$is given equal amount of negative charge. Then

(A) Mass of A and mass of B still remain equal (B) Mass of A increases

(C) Mass of B decreases (D) Mass of B increases

6) Two charged spheres separated at a distance d exert a force Fon each other. If they are immersed in a liquid of dielectric constant 2, then what is the force (if all conditions are same)

(A) $\frac{F}{2}$ (B) F

(C) $2F$ (D) $4F$

7) When 10^{19} electrons are removed from a neutral metal plate, the electric charge on it is

(A) $-1.6\ C$ (B) $+1.6\ C$

(C) $10^{+19} C$ (D) $10^{-19} C$

8) The dielectric constant of metal is

(A) 1 B) ∞

(C) 0 (D) $none\ of\ these$

9) When a glass rod is rubbed with silk then, glass rod

(A) Gains electrons from silk (B) Gives electrons to silk

(C) Gains protons from silk (D) Gives protons to silk

10) If E is the electric field intensity of an electrostatic field, then the electrostatic energy density is proportional to

(A) E (B) E^2

(C) $1/E^2$ (D) E^3

11) Conduction electrons are almost uniformly distributed within a conducting plate. When placed in an electrostatic field $\vec{E}$, the electric field within the plate

(A) is zero (B) Depends upon E

(C) Depends upon $\vec{E}$ (D) Depends upon the atomic number of the conducting element

12) The electric field near a sheet having a uniform surface charge density σ is given by

(A) $\frac{\sigma}{\varepsilon_0}$ and is parallel to the surface

(B) $\frac{2\sigma}{\varepsilon_0}$ and is parallel to the surface

(C) $\frac{\sigma}{\varepsilon_0}$ and is normal to the surface

(D) $\frac{\sigma}{2\varepsilon_0}$ and is normal to the surface

13) The unit of intensity of electric field is

(A) $Newton/Coulomb$ (B) $Joule/Coulomb$

(C) $Volt - metre$ (D) $Newton/metre$

14) Which of the following is deflected by electric field

(A) X-rays (B) γ -rays

(C) Neutrons (D) α -particles

15) An electron is moving towards x-axis. An electric field is along y-direction then path of electron is

(A) Circular (B) Elliptical

(C) Parabola (D) None of these

16) A proton enters in an electric field with its velocity in the direction of the electric lines of force. Then

(A) The path of the proton will be a circle

(B) The path of the protonwill be a parabola

(C) The path of the proton will be a straight line

(D) The path of the proton will be helix

17) An electric dipole when placed in a uniform electric field E will have minimum potential energy, if the direction of dipole moment makes the following angle with E

(A) π (B) $\pi/2$

(C) Zero (D) $3\pi/2$

18) An electric dipole is kept in uniform electric fiel(D) It experiences

(A) A force and a torque (B) A force but not a torque

(C) A torque but not a force (D) Neither a force nor a torque

19) An electric dipole is kept in non-uniform electric fiel(D) It experiences

(A) A force and a torque (B) A force but not a torque

(C) A torque but not a force (D) Neither a force nor a torque

20) The electric field due to a dipole at a distance r on its axis is

(A) Directly proportional to r^3

(B) Inversely proportional to r^3

(C) Directly proportional to r^2

(D) Inversely proportional to r^2

21) The torque acting on a dipole of moment $\vec{P}$ in an electric field $\vec{E}$ is

(A) $\vec{P} \cdot \vec{E}$ (B) $\vec{P} \times \vec{E}$

(C) Zero (D) $\vec{E} \times \vec{P}$

22) The electric field at a point on axial line of a dipole and direction of the dipole moment

(A) Will be parallel (B) Will be in opposite direction

(C) Will be perpendicular (D) Are not related

23) The electric field at a point on equatorial line of a dipole and direction of the dipole moment

(A) Will be parallel

(B) Will be in opposite direction

(C) Will be perpendicular

(D) Are not related

24) If E_a be the electric field strength of a short dipole at a point on its axial line and E_e that on the equatorial line at the same distance, then

(A) $E_e = 2E_a$ (B) $E_a = 2E_e$

(C) $E_a = E_e$ (D) None of the above

25) A region surrounding a stationary electric dipoles has

(A) Magnetic field only

(B) Electric field only

(C) Both electric and magnetic fields

(D) No electric and magnetic fields

26) Electric field at a point varies as r^0 for

(A) An electric dipole

(B) A point charge

(C) A plane infinite sheet of charge

(D) A line charge of infinite length

27) For a given surface the Gauss' law is stated as $\oint E \cdot ds = 0$. From this we can conclude that

(A) E is necessarily zero on the surface

(B) E is perpendicular to the surface at every point

(C) The total flux through the surface is zero

(D) The flux is only going out of the surface

28) According to Gauss' Theorem, electric field of an infinitely long straight wire is proportional to

(A) r (B) $\frac{1}{r^2}$

(C) $\frac{1}{r^3}$ (D) $\frac{1}{r}$

29) The S.I. unit of electric flux is

(A) *Weber*

(B) *Newton per coulomb*

(C) *Volt×metre*

(D) *Joule* per *coulomb*

30) Gauss's law in electrostatics should be invalid if

(A) There were magnetic monopoles

(B) The inverse square law were not exactly true

(C) The velocity of light were not a universal constant

(D) None of these

31) A spherical conductor has the charge on it. Then total flux emitted through the gaussian surface drawn around conductor will be

(A) $\frac{1}{\varepsilon_0} \times$ (the charge enclosed by surface)

(B) $\varepsilon_0 \times$ (charge enclosed by surface)

(C) $\frac{1}{4\pi\varepsilon_0} \times$ (charge enclosed by surface)

(D) 0

32) Gauss's law is true only if force due to a charge varies as

(A) r^{-1} (B) r^{-2}

(C) r^{-3} (D) r^{-4}

33) A metallic sphere of radius R has a uniform distribution of electric charge on its surface. At a distance x from its centre, for $x > R$, the electric field is directly proportional to

(A) $\frac{1}{x^2}$ (B) $\frac{1}{x}$

(C) x (D) x^2

KEY ANSWERS;

Question	Option	Question	Option	Question	Option	Question	Option
1	**A**	11	**A**	21	**B**	31	**A**
2	**C**	12	**D**	22	**A**	32	**B**
3	**C**	13	**A**	23	**B**	33	**A**
4	**B**	14	**D**	24	**B**		
5	**D**	15	**C**	25	**B**		
6	**A**	16	**C**	26	**C**		
7	**B**	17	**C**	27	**C**		
8	**B**	18	**C**	28	**D**		
9	**B**	19	**A**	29	**C**		
10	**B**	20	**B**	30	**B**		

FILL IN THE BLANKS

1) A body can be charged by the method of _____.
   Ans: Induction
2) _____ is the simple apparatus with which the presence of electric charge on a body is detected
   Ans: Electroscope
3) SI unit of linear charge density is _____.
   Ans: coulomb per metre
4) The direction of electric field is _____ from the positive charge.
   Ans: away
5) The direction of electric field is _____ the negative charge.
   Ans: towards
6) Electric Field lines do not exist inside a _____.
   Ans: conductor
7) If ($q_1q_2<0$) then nature of force between charges is _____.
   Ans: attractive
8) SI unit of dipole moment is _____.
   Ans: coulomb-metre

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CHAPTER-2
ELECTROSTATIC POTENTIAL AND CAPACITANCE

1. Electric potential at a point due to a point charge q depends on distance as:
   A) Distance B) Distance^2
   C) 1/distance D) 1/distance^2
2. SI unit of electric potential is:
   A) volt B) watt
   C) farad D) coulomb
3. Work done in moving a unit positive charge from infinity to a point against the electric field is said to be the electricat that point.
   A) Field B) Flux
   C) Potential D) Dipole
4. The correct formula for electric potential is:
   A) Potential = work done/ charge B) Potential = work done X charge
   C) Potential = charge/ work done D) Potential = work done – charge
5. Work done in moving a unit positive charge against the electric field from one point to another is called _____
   A) Potential B) Potential energy
   C) Potential difference D) Potential energy difference
6. The ratio of 1joule to 1coulomb is:
   A) 1volt B) 1ampere
   C) 1farad D) 1ohm
7. Identify the vector quantity among the following:
   A) Electric dipole moment B) Electric potential
   C) Electric potential difference D) Electric potential energy
8. Electric potential at a point due to a short dipole varies with distance as:
   A) Distance B) Distance^2
   C) 1/distance D) 1/distance^2
9. Electric potential at a point due to a short dipole varies with orientation as:
   A) Cos Θ B) Sin Θ
   C) Tan Θ D) Cos^{2}Θ
10. For a point on the axis of a short dipole, electric potential due to it is:
   A) $2\frac{1}{4\pi\varepsilon_0}\frac{p}{r}$ B) 0
   C) $\pm\frac{1}{4\pi\varepsilon_0}\frac{p}{r}$ D) $\pm\frac{1}{4\pi\varepsilon_0}\frac{p}{r^2}$
11. For a point on the equatorial line of a short dipole, electric potential due to it is:
   A) $2\frac{1}{4\pi\varepsilon_0}\frac{p}{r}$ B) 0
   C) $\pm\frac{1}{4\pi\varepsilon_0}\frac{p}{r}$ D) $\pm\frac{1}{4\pi\varepsilon_0}\frac{p}{r^2}$
12. Electric potential due to a uniformly charged (with total charge q) spherical shell of radius R at a point on the surface is:
   A) $\frac{1}{4\pi\varepsilon_0}\frac{q}{R}$ B) $\frac{1}{4\pi\varepsilon_0}\frac{q}{R^2}$
   C) $\frac{1}{4\pi\varepsilon_0}\frac{q^2}{R}$ D) 0
13. Electric potential due to a uniformly charged (with total charge q) spherical conducting shell of radius R at any point inside the surface is:
   A) $\frac{1}{4\pi\varepsilon_0}\frac{q}{R}$ B) $\frac{1}{4\pi\varepsilon_0}\frac{q}{R^2}$
   C) Changes at every point D) 0
14. Electric potential due to a uniformly charged (with total charge q) spherical shell of radius R at a distance r (r > R) is:

A) $\frac{1}{4\pi\varepsilon_0}\frac{q}{R}$ B) $\frac{1}{4\pi\varepsilon_0}\frac{q}{r}$

C) $\frac{1}{4\pi\varepsilon_0}\frac{q}{R^2}$ D) $\frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}$

15. The angle between electric field and equipotential surface is:
    A) 90^0 B) 0^0
    C) 180^0 D) 45^0
16. If we carry a charge once around an equipotential surface, then work done by it is:
    A) Positive B) Negative
    C) zero D) Infinite
17. Equipotential surface is a surface
    A) On which each and every point has positive potential
    B) On which each and every point has negative potential
    C) On which each and every point has zero potential
    D) On which each and every point has the same potential
18. Which of the following sentences is WRONG for an equipotential surface?
    A) Work done to move a charge between two points on the surface is 0.
    B) Electric field at any point on the surface is perpendicular to the surface.
    C) Equipotential surfaces are close together in regions of strong electric field
    D) Equipotential surfaces can intersect with each other.
19. Electric field due to a point charge is in the direction in which
    A) Potential increases the steepest B) Flux increases the steepest
    C) Potential decreases the steepest D) Flux decreases the steepest
20. The correct formula connecting electric field and electric potential:
    A) $\vec{E} = \frac{\delta V}{\delta l}$ B) $V = -\frac{\delta \vec{E}}{\delta l}$
    C) $\vec{E} = -\frac{\delta V}{\delta l}$ D) $V = \frac{\delta \vec{E}}{\delta l}$
21. Potential energy due to a system of two charges is negative when:
    A) Both charges are negative
    B) Both charges have unequal magnitude
    C) One charge is positive and the other is negative
    D) Both charges are positive
22. In the relation A=BC where A is Electric Potential energy, B is Electric charge, which physical quantity does C represent?
    A) Capacitance B) Electric potential
    C) Electric force D) Electric flux
23. SI units of potential and potential energy:
    A) Volt and joule B) Joule and volt
    C) Volt and volt D) Joule and joule
24. Potential energy of a system of 2 charges varies with distance as:
    A) Distance B) 1/distance
    C) Distance^2 D) 1/distance^2
25. When dipole moment is aligned in the direction of the uniform electric field:
    A) The dipole is in stable equilibrium
    B) The dipole is in unstable equilibrium
    C) Potential energy stored by the dipole is 0
    D) The dipole stores maximum potential energy
26. When dipole moment is aligned 180^0 with respect to the uniform electric field:
    A) The dipole is in stable equilibrium
    B) The dipole is in unstable equilibrium
    C) Potential energy stored by the dipole is 0

D) The dipole stores minimum potential energy

27. At the surface of a charged conductor, electric field must be always:
    A) Parallel to the surface
    B) Perpendicular to the surface
    C) Aligned at 45^0 from the surface
    D) Zero

28. Electric potential at any point inside a conductor is:
    A) Constant and is equal to the potential on the surface
    B) Constant and is independent of the potential on the surface
    C) Constant and is less than the potential at a point outside the surface
    D) zero

29. The electric field inside a cavity present in a conductor is always:
    A) Positive
    B) Negative
    C) Zero
    D) Greater than the electric field outside the conductor

30. The electric field inside the cavity of a charged conductor is zero. This is known as:
    A) Discharging
    B) Grounding
    C) Electrostatic shielding
    D) Electrification

31. Effect of introducing a dielectric in a region of electric field is:
    A) Electric field decreases but doesn't become zero
    B) Electric field increases
    C) Electric field remains constant
    D) Electric field decreases and becomes zero

32. The maximum electric field that a dielectric medium can withstand without breakdown is called its:
    A) Permittivity
    B) Dielectric constant
    C) Electric susceptibility
    D) Dielectric strength

33. 'A' represents a molecule in which centers of positive and negative charges coincide. 'B' represents a molecule in which centers of positive and negative charges are separate. Then, which of the following is TRUE for A and B?
    A) A and B are both polar molecules
    B) A and B are both non-polar molecules
    C) A is a polar molecule, B is a non-polar molecule
    D) A is a non-polar molecule, B is a polar molecule

34. An example for polar molecule is:
    A) Oxygen (O_2) molecule
    B) Nitrogen (N_2) molecule
    C) Hydrogen (H_2) molecule
    D) Water (H_2O) molecule

35. In case of dielectric, which of the following options is true with regard to the induced dipole moment (p) and the applied external electric field (E_{ext})?
    A) E_{ext} and p can be in any direction
    B) E_{ext} and p are in the same direction but not proportional to each other
    C) E_{ext} and p are in the same direction and proportional to each other
    D) E_{ext} and p are in opposite direction and not proportional to each other.

36. Capacitors are used to
    A) Destroy electric charges
    B) Store electric charges
    C) Produce electric charges
    D) Produce high potential differences

37. Capacitance of a capacitor is defined as:
    A) Ratio of charge on the capacitor to its potential difference
    B) Ratio of potential difference of the capacitor to its charge
    C) Product of charge on the capacitor and its potential difference
    D) Ratio of electric field across the capacitor to the charge on it

38. Capacitance of a parallel plate capacitor does not depend on:
    A) Shape of the plates
    B) Size of the plates
    C) Dielectric constant between the plates
    D) Charge on the plates

39. Capacitance of a parallel plate capacitor with dielectric material of dielectric constant K is given by:
    A) $C = \varepsilon_0 K/d$
    B) $C = \varepsilon_0 KA/d$
    C) $C = \varepsilon_0 A/d$
    D) $C = \varepsilon_0 KA/d^2$
40. In a parallel plate capacitor, the capacitance increases if:
    A) Charge on the plates decreases
    B) Distance between the plates increases
    C) Area of plates increases
    D) Dielectric constant of the material between the plates decreases
41. In a parallel plate capacitor, if the area of the plates is decreased by n times, then the capacitance
    A) Increases by n times
    B) Decreases by n times
    C) Remains same
    D) Increases by n^2 times
42. Ratio of capacitance of a capacitor with a dielectric substance to the capacitance of the same capacitor without the dielectric substance is called:
    A) Permittivity of vacuum
    B) Susceptibility of the dielectric substance
    C) Permittivity of the dielectric substance
    D) Permeability of the dielectric substance
43. When a number of capacitances are connected in parallel, which quantity remains same every time for all the capacitors?
    A) Capacitances
    B) Potential differences
    C) Charges
    D) Dielectric constants
44. For three capacitors connected in series, which of the following formulae is INCORRECT?
    A) $V_s = V_1 + V_2 + V_3$
    B) $Qs = Q_1 = Q_2 = Q_3$
    C) $C_s = (C_1C_2C_3)/(C_1+C_2+C_3)$
    D) $C_s = C_1C_2C_3 /(C_1C_2+C_2C_3+C_3C_1)$
45. Electrical energy stored in a capacitor per unit volume of the space is called as:
    A) Average electrical energy
    B) Total electrical energy
    C) Energy density
    D) Energy coefficient

KEY ANSWERS;

Question	Option	Question	Option	Question	Option	Question	Option	Question	Option
1	**C**	11	**B**	21	**C**	31	**A**	41	**B**
2	**A**	12	**A**	22	**B**	32	**D**	42	**C**
3	**C**	13	**A**	23	**A**	33	**D**	43	**B**
4	**A**	14	**B**	24	**B**	34	**D**	44	**C**
5	**C**	15	**A**	25	**A**	35	**C**	45	**C**
6	**A**	16	**C**	26	**B**	36	**B**		
7	**A**	17	**D**	27	**B**	37	**A**		
8	**D**	18	**D**	28	**A**	38	**D**		
9	**A**	19	**C**	29	**C**	39	**B**		
10	**D**	20	**C**	30	**C**	40	**C**		

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CHAPTER-3
CURRENT ELECTRICITY

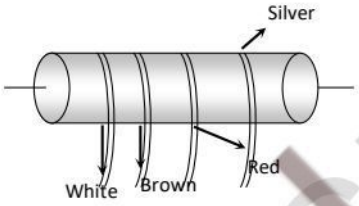
1. The resistance of a carbon resistor is $2.5M\Omega \pm 10\%$. The colour of the third band of the resistor is
   A) Red B) Yellow
   C) Green D) Brown
2. The resistance of a carbon resistor is $(500 \pm 50)\ \Omega$. The colour of the fourth band of the resistor is
   A) Gold B) Yellow
   C) Red D) Silver
3. Kirchoff's junction rule signifies the law of conservation of
   A) Energy B) Momentum
   C) Charge D) Mass
4. Kirchoff's loop rule is a consequence of the law of conservation of
   A) Charge B) Energy
   C) Mass D) Momentum
5. Drift velocity per unit electric field is called
   A) Relaxation time B) Conductivity
   C) Current density D) Mobility
6. Current per unit area is called
   A) Relaxation time B) Conductivity
   C) Current density D) Mobility
7. The resistance offered by a 1m long conductor having a cross sectional area 1sqm is called
   A) Electrical resistance of the conductor
   B) Electrical resistivity of the conductor
   C) Electrical conductance of the conductor
   D) Electrical conductivity of the conductor
8. Average time between two successive collisions is called
   A) Relaxation time B) Conductivity C) Current density D) Mobility
9. The average velocity with which free electrons move in a conductor opposite to the applied electric field is called
   A) Mobility B) Conductivity
   C) Current density D) Drift velocity
10. Constantin and Manganin wires are used in making standard resistance boxes because they have
    A) Low temperature coefficient of resistance and high resistivity
    B) High temperature coefficient of resistance and low resistivity
    C) Low temperature coefficient of resistance and low resistivity
    D) High temperature coefficient of resistance and high resistivity
11. SI unit of current density is
    A)A B)Am^2
    C)Am^{-2} D)Am^{-1}
12. SI unit of Resistivity is
    A)Ω B)Ωm
    C)Ωm^{-1} D)Ωm^{-2}
13. SI unit of Conductance
    A)$mhom$ B)mho
    C)$mhom^{-1}$ D)$mhom^{-2}$
14. SI unit of Conductivity is
    A)$mhom$ B)$mhom^2$
    C)$mhom^{-1}$ D)$mhom^{-2}$
15. SI unit of mobility is
    A)$m^2V^{-1}s^{-1}$ B)$m^{-2}Vs$
    C)$mV^{-1}s^{-2}$ D)$m^{-1}Vs^2$

16. If the third band in a colour coded resistor is silver, the value of the multiplier is
A) 10^{-1} B) 10^{-2}
C) 10^{-3} D) 10^{-4}
17. Principle of working of a meter bridge is
A) Electromagnetic Induction
B) Mechanical effect of Electric current
C) Balanced Wheatstone Bridge
D) Magnetic effect of electric current
18. Resistance of a conducting wire depends on
A) Length B) area of cross section
C) Temperature D) All of these
19. Resistivity of a conducting wire depends on
A) Length B) area of cross section
C) Temperature D) None of these
20. Resistance of a conducting wire increases when
A) Area increases
B) Temperature decreases
C) Length increases
D) None of these
21. Resistors in the higher range are mostly made from
A) Silicon B) Copper
C) Aluminium D) Carbon
22. Drift velocity v_d varies with the intensity of electric field as per the relation
A) $v_d \propto E$ C) $v_d \propto \frac{1}{E}$
C) $v_d = \text{constant}$ D) $v_d \propto E^2$
23. When the length and area of cross-section of a wire both are doubled, then its resistance
A)will become half B) will be doubled
C)will remain the same D) will become four times
24. The resistivity of a wire
A) increases with the length of the wire
B) decreases with the area of cross-section
C) decreases with the length and increases with the cross-section of wire
D) none of the above statement is correct
25. *Ohm*'s law is true
A) For metallic conductors at low temperature
B) For metallic conductors at high temperature
C) For electrolytes when current passes through them
D) For diode when current flows
26. The example for non-*ohm*ic resistance is
A) Copper wire B) Carbon resistance
C) Diode D) Tungsten wire
27. All of the following statements are true except
A) Conductance is the reciprocal of resistance and is measured in *Siemen*
B) *Ohm*'s law is not applicable at very low and very high temperatures
C)*Ohm*'s law is applicable to semiconductors
D) *Ohm*'s law is not applicable to electron tubes, discharge tubes and electrolytes
28. The reciprocal of resistance is
A)Conductance B) Resistivity
C)Voltage D) None of the above
29. The reciprocal of Resistivity is

A) Conductance
B) Conductivity
C) Current density
D) Mobility

30. Which of the following is vector quantity
A) Current density
B) Current
C) Wattless current
D) Power

31. In the figure a carbon resistor has bands of different colours on its body as mentioned in the figure. The value of the resistance is
A) 2.2 $k\,\Omega$
B) 3.3 $k\,\Omega$
C) 5.6 $k\,\Omega$
D) 9.1 $k\,\Omega$



32. The resistance of a conductor increases with
A) Increase in length
B) Increase in temperature
C) Decrease in cross–sectional area
D) All of the above

33. When a current flows through a conductor its temperature
A) May increase or decrease
B) Remains same
C) Decreases
D) Increases

34. The alloys constantan and manganin are used to make standard resistance because they have
A) Low resistivity
B) High resistivity
C) Low temperature coefficient of resistance
D) Both B) and C)

35. The equivalent resistance of resistors connected in series is always
A)Equal to the mean of component resistors
B)Less than the lowest of component resistors
C)In between the lowest and the highest of component resistors
D)Equal to sum of component resistors

36. The correct expression for drift velocity of electrons in a conductor is
A)$v_d = -\frac{mE\tau}{e}$ B)$v_d = -\frac{eEm}{\tau}$
C)$v_d = -\frac{em\tau}{E}$ D)$v_d = -\frac{eE\tau}{m}$

37. The correct expression for conductivity of a conductor is
A)$\sigma = \frac{n^2e\tau}{m}$ B)$\sigma = \frac{ne\tau}{m^2}$
C)$\sigma = \frac{ne^2\tau}{m}$ D)$\sigma = \frac{ne\tau^2}{m}$

38. The correct expression for current density is
A) $J = nev_d$ B)$J = nAev_d$
C)$J = nAv_d$ D)$J = eAv_d$

39. The electron drift speed is small and the charge of the electron is also small but still, we obtain large current in a conductor. This is due to
A) The conducting property of the conductor
B) The resistance of the conductor is small
C) The electron number density of the conductor is small
D) The electron number density of the conductor is enormous

40. The colour code for a resistor of resistance $3.5k\Omega$ with 5% tolerance is

A) Orange, green, red and gold B) Red, yellow, black and gold

C) Orange, green, orange and silver D) Orange, green, red and silver

41. Current in a circuit containing a cell and a resistor (simple circuit) is given by

A) $I = \frac{E}{R}$ B) $I = \frac{E}{r}$

C) $I = \frac{E}{R+r}$ D) $I = \frac{E}{R+2r}$

42. On increasing the temperature of a conductor, its resistance increases because

A)Relaxation time decreases

B)Mass of the electrons increases

C)Electron density decreases

D) None of the above

43. The electric field E, current density J and conductivity σ of a conductor are related as

A) $\sigma = E/j$ B) $\sigma = j/E$

C) $\sigma = jE$ D) $\sigma = 1/jE$

44. The accurate measurement of emf can be obtained using

A) Voltmeter B) Voltameter

C) Potentiometer D) Ammeter

45. Which among the following devices is used to measure unknown resistance?

A) Potentiometer B) Meter Bridge

C) Ammeter D) Voltameter

ANSWER KEY

Question	Option	Question	Option	Question	Option	Question	Option	Question	Option
1	**C**	11	**C**	21	**D**	31	**D**	41	**C**
2	**D**	12	**B**	22	**A**	32	**D**	42	**A**
3	**C**	13	**B**	23	**C**	33	**D**	43	**B**
4	**B**	14	**C**	24	**D**	34	**D**	44	**C**
5	**D**	15	**A**	25	**A**	35	**D**	45	**B**
6	**C**	16	**B**	26	**C**	36	**D**		
7	**B**	17	**C**	27	**C**	37	**C**		
8	**A**	18	**D**	28	**A**	38	**A**		
9	**D**	19	**C**	29	**B**	39	**D**		
10	**A**	20	**C**	30	**A**	40	**A**		

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CHAPTER-4
MOVING CHARGES AND MAGNETISM

1. A charge q is moving in a magnetic field then the magnetic force does not depend upon
(A)Charge (B)Mass
(C)Velocity (D)Magnetic field

2. If a charge q is going in the direction of magnetic field $\vec{B}$ with the velocity of $\vec{v}$ then the force on electron is
(A)Zero (B)$q(\vec{v}.\vec{B})$
(C)$q(\vec{v}\times\vec{B})$ (D)None of these

3. When a charged particle enters perpendicular to the external uniform magnetic field, it follows
(A)Linear path (B) helical path
(C) circular path (D) elliptical path

4. The magnetic force on neutral particle moving in external uniform magnetic field is
(A)Zero (B)qvB
(C)$qvB\ sin\theta$(D)qE

5. The correct expression for Lorentz force is
(A)$q[\vec{E}+(\vec{B}\times\vec{V})](B)q[\vec{E}+(\vec{V}\times\vec{B})]$
(C)$q(\vec{V}\times\vec{B})$(D) $q\vec{E}$

6. When the charged particle move in combined electric and magnetic field, the force acting on it is
(A)centripetal force (B) centrifugal force
(C)Lorentz force (D) magnetic force

7. A charged particle enters a uniform magnetic field perpendicular to it.T he magnetic field
(A)Increases the speed of the particle
(B)Decreases the kinetic energy of the particle
(C)Changes the direction of motion of the particle
(D)Both(A)&(C)

8. If the direction of the initial velocity of the charged particle is neither along nor perpendicular to that of the magnetic field, then the orbit will be
(A)a straight line (B)an ellipse
(C) a circle (D) a helix

9. A magnetic field can be produced by
(A) a moving charge (B) a static charge
(C) neutral particle (D) All of these

10. A charged particle moving in a magnetic field increases its velocity, then its radius of the circle
(A)Decreases (B)Increases
(C)Remains the same(D)Becomes half

11. A proton (or charged particle) moving with velocity v is acted upon by electric field E and magnetic field (B) The proton will move undeflected if
(A)E is perpendicular to B
(B)E is parallel to v and perpendicular to B
(C) E and B both are parallel to v
(D)E, B and v are mutually perpendicular and $v=\frac{E}{B}$

12. Magnetic field at the center of circular current loop is
(A)$\frac{\mu_0 I}{2R}$ (B)$\frac{\mu_0 \pi I}{2R}$

(C)$\frac{I}{2R}$ (D)$\frac{\mu_0 I}{2\pi R}$

13. SI unit of magnetic field is
(A)dyne (B)ohm
(C)tesla (D)volt

14. Cyclotron is a device used to
(A)slow down charged particles
(B)accelerate positively charged particle
(C) accelerate negatively charged particle
(D) accelerate neutral particle

15. In a cyclotron, the angular frequency of a charged particle is independent of
(A)Mass (B)Speed
(C)Charge (D)Magnetic field

16. An electron having mass m, charge q and kinetic energy E enters a uniform magnetic field B perpendicularly. Then its frequency of rotation will be
(A)$\frac{qB}{\pi m}$ (B)$\frac{qB}{2\pi m}$
(C)$\frac{qBE}{2\pi m}$ (D)$\frac{qB}{\pi mE}$

17. Unit of magnetic permeability is
(A)*A/metre* (B)*A*/metre^2
(C) h*enry* (D) h*enry/metre*

18. The magnetic force on a current carrying conductor of length l in an external magnetic field $\vec{B}$ is given by
(A)$\frac{\vec{l}\times\vec{B}}{I}$ (B) $\frac{I\times\vec{B}}{\vec{l}}$
(C)$I(\vec{l}\times\vec{B})$ (D)$I^2\vec{l}\times\vec{B}$

19. Vector form of Biot-Savart's law is
(A)$\overrightarrow{dB}=\frac{\mu_0}{4\pi}i\left(\frac{\overrightarrow{dl}\times\vec{r}}{r}\right)$ (B)$\overrightarrow{dB}=\frac{\mu_0}{4\pi}i^2\left(\frac{\overrightarrow{dl}\times\vec{r}}{r}\right)$
(C)$\overrightarrow{dB}=\frac{\mu_0}{4\pi}i^2\left(\frac{\overrightarrow{dl}\times\vec{r}}{r^2}\right)$ (D)$\overrightarrow{dB}=\frac{\mu_0}{4\pi}i\left(\frac{\overrightarrow{dl}\times\vec{r}}{r^3}\right)$

20. The magnetic induction at the centre of a current carrying circular of coil radius *r*, is
(A)Directly proportional to *r* (B)Inversely proportional *r*
(C)Directly proportional to r^2 (D)Inversely proportional to r^2

21. Ampere's circuital law is given by
(A)$\oint\vec{H}\cdot\overrightarrow{dl}=\mu_0 I_{net}(B)\oint\vec{B}\cdot\overrightarrow{dl}=\mu_0 I_{net}$
(C)$\oint\vec{B}\cdot\overrightarrow{dl}=\mu_0 J$ (D) $\oint\vec{H}\cdot\overrightarrow{dl}=\mu_0 J$

22. The magnetic induction at any point due to a long straight wire carrying a current is
(A)Proportional to the distance from the wire
(B)Inversely proportional to the distance from wire
(C)Inversely proportional to the square of the distance from the wire
(D)Does not depend on distance

23. The magnetic field *B* with in the solenoid having *n* turns per metre length and carrying a current of *I ampere* is given by
(A)$\mu_0 nI$ (B)$\mu_0 I$

(C)$\mu_0 RI$(D)μ_0/nI

24. A toroid has number of turns per unit length *n*, current *I*, then the magnetic field is

(A)$\mu_0 nI$ (B)$\mu_0 I$

(C)$\mu_0 RI$ (D)μ_0/nI

25. Which of the following statement is correct?

A) The magnetic field in the open space inside the toroid is constant

B) The magnetic field in the open space exterior to the toroid is constant

C) The magnetic field inside the core of a toroid is constant

D) The magnetic field inside the core of a toroid is zero

26. Two long parallel wires carrying currents in opposite direction

(A)Attract each other (B)Repel each other

(C)Neither attract nor repel (D)Get rotated to be perpendicular to each other

27. If *m* is magnetic moment and *B* is the magnetic field, then the torque is given by

(A)$\vec{m} \cdot \vec{B}$ (B)$\frac{\vec{m}}{\vec{B}}$

(C)$\vec{m} \times \vec{B}$ (D)$|\vec{m}| \cdot |\vec{B}|$

28. A current carrying loop is placed in a uniform magnetic fiel(D) The torque acting on it does not depend upon

(A)Shape of the loop (B)Area of the loop

(C)Value of the current (D)Magnetic field

29. An electron moves with a constant speed *v* along a circle of radius *r*. Its magnetic moment will be (*e* is the electron's charge)

(A)evr (B)$\frac{1}{2}evr$

(C)$\pi r^2 ev$ (D)πevr

30. In a moving coil galvanometer, the deflection of the coil θ is related to the electrical current *i* by the relation

(A)$i \propto tan\theta$ (B)$i \propto \theta$

(C)$i \propto \theta^2$ (D) $i \propto \sqrt{\theta}$

31. The sensitiveness of a moving coil galvanometer can be increased by decreasing

(A) The number of turns in the coil

(B)The area of the coil

(C) The magnetic field

(D)The couple per unit twist of the suspension

32. To convert a galvanometer into a voltmeter one should connect a

(A) High resistance in series with galvanometer

(B) Low resistance in series with galvanometer

(C) High resistance in parallel with galvanometer

(D) Low resistance in parallel with galvanometer

33. To convert a galvanometer into an ammeter one should connect a

(A) High resistance in series with galvanometer

(B)Low resistance in series with galvanometer

(C)High resistance in parallel with galvanometer

(D)Low resistance in parallel with galvanometer

ANSWER KEYS:

Question	Option	Question	Option	Question	Option	Question	Option
1	**B**	11	**D**	21	**B**	31	**D**
2	**A**	12	**A**	22	**B**	32	**A**
3	**C**	13	**C**	23	**A**	33	**D**
4	**A**	14	**B**	24	**A**		
5	**B**	15	**B**	25	**C**		
6	**C**	16	**B**	26	**B**		
7	**C**	17	**D**	27	**C**		
8	**D**	18	**C**	28	**A**		
9	**A**	19	**D**	29	**B**		
10	**B**	20	**B**	30	**B**		

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CHAPTER-5
MAGNETISM AND MATTER

1. The S.I unit of magnetic pole strength is
   A) ampere metre^{-1} B) ampere metre
   C) ampere metre^{2} D) ampere metre^{-2}
2. Torque acting on a magnetic dipole of magnetic moment ($\vec{M}$)placed in uniform magnetic field $(\overrightarrow{B})$ is
   (A)$\vec{\tau} = \overrightarrow{B} \times \vec{M}$ (B) $.\vec{\tau} = \vec{M} \times \overrightarrow{B}$
   (C)$\vec{\tau} = \overrightarrow{B} \cdot \vec{M}$ (D)$\vec{\tau} = \vec{M} \cdot \overrightarrow{B}$
3. Torque acting on a magnet held at angle Θ with magnet field is maximum when Θ=
   (A) 90° (B)180° (C) 360° (D)0°
4. Potential energy of a magnetic dipole is zero when Θ=
   (A) 0° (B) 90° (C) 180° (D) 360°
5. The small angle between magnetic axis and geographic axis at a place is called
   (A) Magnetic inclination (B) Magnetic declination
   (C) Magnetic dip (D) None of these.
6. Potential energy ofa magnetic dipole of magnetic moment ($\vec{M}$)placed in uniform magnetic field $(\overrightarrow{B})$ is
   (A) $U = \vec{M} \cdot \overrightarrow{B}$(B) $U = -\overrightarrow{B} \times \vec{M}$
   (C)$\vec{\tau} = \overrightarrow{B} \times \vec{M}(D)\vec{U} = -\vec{M} \times \overrightarrow{B}$
7. The angle between magnetic axis and geographic axis is
   (A) 9° $B)\ 10°$ $C)11°$ $D)11.3°$
8. Angle of dip is 90° at
   (A) poles (B) equator
   (C) both (A) and (B) (D) none of these.
9. At magnetic poles the angle of dip is
   (A) 45° $B)30°$ C)90° $D)0°$
10. Angle of dip at magnetic equator is
    (A) 0°(B)45° C)90° $(D)\ 30°$
11. S.I. unit of magnetic susceptibility is
    (A) Am (B) Am^{-1} (C) Hm^{-1} (D) No units.
12. The S.I. unit of magnetic permeability is
    (A) Wb A^{-1} m (B) Wb A $^{-1}$ m^{-1}
    (C) Hm (D) Tm^{-1}(A)
13. For paramagnetic substances.
    (A) $\mu_r = 1$ (B)$\mu_r=0$
    (C) $\mu_r > 1$ (D) $\mu_r = \infty$
14. The magnetic susceptibility of a super conductor is
    (A)$\chi_m = 1$ (B)$\chi_m=-1$
    (C)$\chi_m=0$ (D) $\chi_m=\infty$
15. For a paramagnetic substance
    (A) $\chi_m=T^2$(B) $\chi_m=T^0$
    (C) $\chi_m \alpha\ T$ (D) $\chi_m \alpha\ T^{-1}$
16. 1Curie temperature is the temperature at which
    (a) a ferromagnetic material becomes paramagnetic
    (B) a paramagnetic material becomes diamagnetic

(C) a ferromagnetic material becomes diamagnetic
(b) a paramagnetic material becomes ferromagneti(C)

17. Nickel is a
(A) diamagnetic (B) paramagnetic
(C) ferromagnetic (D) None of these

18. The weber m^{-2} equal to
(A) tesla (B) henry
(C) Watt (D) dyne.

19. Magnetic susceptibility of platinum is 0.0001 relative permeability is
(A) 1. 0000 (B) 0.9999
(C) 1.0001 (D) 0.

20. The magnetic susceptibility oI a paramagnetic material is .
(A) small and positive (B) small and negative
(C) large and positive (D) None of these.

21. For diamagnetic substances X_m is
(A) small and negative (B) small and positive
(C)large and positive (D) none of these.

22. If the magnetic moment of substance is zero, the substance is zero, the substance is
(A) diamagnetic (B) paramagnetic
(C) ferromagnetic (D) anti ferromagneti(C)

23. Earth's magnetic field always has a horizontal components except at
(A) equator (B) geographical poles
(C) magnetic poles (D) None of the above.

24. Most suitable material for making transformer Cores is
(A) Steel (B) Nickel
(C) Copper (D) Soft iron.

25. Susceptibility is positive and large for
(A) Paramagnetic (B) Ferromagnetic
(C) Diamagnetic (D)Non of these

26. Susceptibility is positive and small for
(A) Paramagnetic (B) Ferromagnetic
(C) Diamagnetic (D) Non magnetic

27. The area of B-H curve is an indication of
(A) susceptibility of substance (B) Retentivity of substance
(C)the energy dissipated per cycle (D) The permeability of medium

28. A bar magnet is kept in a uniform magnetic field It experiences.
A) A torque but not a force
B) A force but not a torque
C) Both a force and a torque
D) Neither a force nor a torque

29. The unit of magnetic dipole moment is
A) ampere metreB) ampere $metre^{-1}$
C) ampere $metre^{-2}$ D) ampere $metre^{2}$

30. In the hysteresis cycle, the of value of H needed to make the intensity of magnetization zero is called
(A) retentivity (B) coercive force

(C) Lorentz force (D) none of the above

31. The hysteresis cycle for the material of permanent magnet is
    (A) short and wide (B) tall and narrow
    (C) tall and wide (D) none of the above
32. The materials suitable for making electromagnets should have
    A) high retentivity and high coercivity
    B) low retentivity and low coercivity
    C) high retentivity and low coercivity
    D) low retentivity and high coercivity
33. Choose the diamagnetic material out of the following
    (A) gold (B)aluminium
    (C) iron (D) cobalt

FILL IN THE BLANKS

1. The direction of magnetic dipole moment ($\vec{M}$) of a magnet is from …….. inside the magnet.
2. In the northern hemisphere, magnetic lines of force due to earth's field points…….
3. The net magnetic flux through a closed surface is……..
4. The vertical component of earth's magnetic field exists everywhere except at……
5. The materials which develop feeble magnetization in the direction of the magnetizing field are called……. Surface
6. The susceptibility of a …….substance is independent of magnetizing field and temperature.
7. The phenomenon of exhibiting diamagnetic property by the superconductors is called……

KEY ANSWERs :

Question	Option	Question	Option	Question	Option	Question	Option
1	**B**	11	**D**	21	**A**	31	**C**
2	**B**	12	**D**	22	**C**	32	**C**
3	**D**	13	**C**	23	**D**	33	**A**
4	**B**	14	**D**	24	**B**		
5	**B**	15	**D**	25	**A**		
6	**D**	16	**A**	26	**C**		
7	**D**	17	**C**	27	**A**		
8	**A**	18	**A**	28	**A**		
9	**C**	19	**C**	29	**D**		
10	**A**	20	**A**	30	**D**		

FILL IN THE BLANKS ANSWER

1. South and North 2. Towards earth 3. zero 4 . Magnetic equator
5. Paramagnetic 6. Diamagnetic 7. Meisner effect

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CHAPTER-6
ELECTROMAGNETIC INDUCTION

1) The correct statement of EMI is.
   A) Electric current is generated by varying electric field.
   B) Electric current is generated by varying magnetic field.
   C) Electric current is generated by varying charge.
   D) None of the above.

2) In the coil magnet experiment, the deflection in the galvanometer is larger when,
   a. A Coil moves faster towards or away from the magnet.
   b. Magnet moves faster towards or away from the coil.
      A) a only.
      B) b only.
      C) Both a and b .
      D) None of the above.

3) Identify the correct statement among the following option an experiment current induced by change in current.
   A) Galvanometer shows a momentary deflection when the taping key is pressed
   B) The key is pressed continuously, there is no deflection in the galvanometer.
   C) When the key is released, a momentary deflection is observed again in the galvanometer.
   D) All the above.

4) The S.I unit of magnetic flux is,
   A) coulomb meter
   B) tesla meter squared
   C) newton/coulomb meter squared
   D) becquerel.

5) The law which gives the polarity of induced emf in electromagnetic induction is.
   A) Gauss' law in magnetism.
   B) ampere's circuital law
   C) faraday law
   D) Lenz'slaw

6) The significance of Lenz's law is,
   A) Law of conservation of energy.
   B) Law of conservation mass
   C) Law of conservation charge.
   D) none of the above.

7) Induction furnace is the application of.
   A) Electric current
   B) Displacement current
   C) Eddy current.
   D) Photoelectric current.

8) Self-inductance plays the role of.
   A) Inertia.
   B) Impedance.
   C) Mutual inductance.
   D) None of the above.

9) The principle of AC generator is.
   A) Electromagnetic induction.
   B) Ampere's circuital law.

C) Photoelectric effect.
D) None of the above.

10) The possible maximum instantaneous value of the emf is.
A) ε=NBAω.
B) ε=NB(A)
C) E=NBAωsinωt.
D) None of the above.

11) The magnetic flux through a circuit of resistance R changes by an amount $\Delta\phi$ in time Δt, Then the total quantity of electric charge Q, which passing during this time through any point of the circuit is given by

(A) $Q = \frac{\Delta\phi}{\Delta t}$ (B) $Q = \frac{\Delta\phi}{\Delta t} \times R$

(C) $Q = -\frac{\Delta\phi}{\Delta t} + R$ (D) $Q = \frac{\Delta\phi}{R}$

12) The direction of induced e.m.f. during electromagnetic induction is given by
(A)Faraday's law (B)Lenz's law
(C)Maxwell's law (D)Ampere's law

13) To induce an e.m.f. in a coil, the linking magnetic flux
(A)Must decrease (B)Can either increase or decrease
(C)Must remain constant (D)Must increase

14) The north pole of a magnet is brought near a metallic ring. The direction of the induced current in the ring will be
(A)Clockwise (B) Anticlockwise
(C)Towards north (D)Towards south

15) Self-induction of a solenoid is
(A)Directly proportional to current flowing through the coil
(B)Directly proportional to its length
(C)Inversely proportional to area of cross-section
(D)Inversely proportional to area of cross-section

16) Mutual inductance of two coils can be increased by
(A)Decreasing the number of turns in the coils
(B)Increasing the number of turns in the coils
(C)Winding the coils on wooden core
(D)None of the above

17) Which of the following is wrong statement
(A)An emf can be induced between the ends of a straight conductor by moving it through a uniform magnetic field
(B)The self induced emf produced by changing current in a coil always tends to decrease the current
(C Inserting an iron core in a coil increases its coefficient of self induction
(D)According to Lenz's law, the direction of the induced current is such that it opposes the flux change that causes it

18) Eddy currents are produced when
(A)A metal is kept in varying magnetic field
(B)A metal is kept in the steady magnetic field
(C)A circular coil is placed in a magnetic field

(D)Through a circular coil, current is passed

19) Dynamo is a device for converting

(A)Electrical energy into mechanical energy

(B)Mechanical energy into electrical energy

(C)Chemical energy into mechanical energy

(D)Mechanical energy into chemical energy

20) Choke coil works on the principle of

(A)Transient current (B) Self induction

(C)Mutual induction (D) Wattless current

KEY ANSWERS

Question	Option	Question	Option
1	**B**	11	**D**
2	**C**	12	**B**
3	**D**	13	**B**
4	**B**	14	**B**
5	**D**	15	**B**
6	**A**	16	**B**
7	**C**	17	**C**
8	**A**	18	**A**
9	**A**	19	**B**
10	**A**	20	**B**

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CHAPTER-7
ALTERNATING CURRENT

1) When the frequency of AC is doubled, the impedance of an LCR circuited
   A) Is doubled B) increase
   C) Decreases C) is halved
2) A metal ring is held horizontally and bar magnet is dropped through the ring with its length along the axis of the ring .the acceleration of the falling magnet is.
   A) more than g B)equal to g
   C) less than g D) depends on the diameter of the ring and length of the magnet
3.) An alternating current of frequency f is flowing through a resistance R and inductance L connected in series. The impedance of the circuit is.
   A) R +2πfLB) R+L
   C)$\sqrt{R^2 + 4\pi^2 v^2 L^2}$D)$\sqrt{R^2 + L^2}$
4) An electric lamp is connected to 220 V, 50 Hz supply. Then the peak voltage is
   A) 211V B)320 V
   C)311 V D) 210 V
5) An AC voltage source of variable angular frequency w and fixed amplitude A is connected in series with capacitance c and an electric bulb of resistance R .When w is increased
   A) The bulb glows dimmer
   B) the bulb glows brighter
   C) total impedance of the circuit increases
   D) total impedance of the circuit is unchanged
6) What is average value of (A)c over a complete cycle?
   A) 1 B) zero
   C) 180 D)90
7) Write the relation between inductive reactance and frequency
   A) $X_L = 2\pi fL$ B)$w=2\pi f$
   C) t= 1/f D) f=1/t
8) Write the unit of inductive reactance
   A) Ohm B) mho
   C) force D) joule
9) The frequency of AC source is double. What will be the new reactance of the inductor?
   A) reactance is also doubled B) zero
   C) decreases D) increases
10) Amount of opposition offered by LCR Circuit is known as
   A) impedance B) resistor
   C) capacitor D) inductor
11) The phase difference between current and voltage in resistor
   A) 90^0 B) 0^0
   C)180^0 D) 60^0
12) The efficiency of an ideal transformer
   A) 100% B) 50%
   C) 40% D)30%
13) Frequency of DC source is
   A) infinity B) zero

C) 1 D) ½

14) The power dissipation in a pure capacitive circuit is
A) Zero B) 180^0
C)6^0 D) 90^0

15) What is the frequency of the AC mains in India?
A)60 Hz B)50hz
C) 40hz D)30hz

16) An alternating current can be produced by a
A) choke coil B) dynamo
C) electric motor D) transformer

17) Which of the following can measure an alternating current?
A) voltmeter B) ammeter
C) suspended coil galvanometer D) moving coil galvanometer

18) Which of the following circuits exhibits maximum power dissipation?
A) pure inductive circuit B) pure capacitive circuit
C) pure resistive circuit D)none of the above

19) What happens to the inductive reactance when the frequency of the AC supply is increased ?
A) increases B) decreases
C) remains the same D) decreases inversely

20)What happens to the quality factor of an LCR circuit if the resistance is increased ?
A) increases B) decreases
C) remains same D) none of the above

21)Which of the following statements is true about the LCR circuit connected to an AC source at resonance?
A)R equals the applied voltage B)R is zero
C)C is zero D)L equals the applied voltage

22) The impedance in the series LCR circuit is minimum at the resonance frequency.
A) true B) false
C) may be D) no

23) When is the current in a circuit wattless?
A) when the inductance of the circuit is zero
B) when the resistance of the circuit is zero
C)when the current is alternating
D)When both resistance and inductance is zero

24) The power factor is one for which of the following?
A) pure capacitor B) pure inductor
C)pure resistor D) all of the above

25) A device which is used to transformer alternating voltage from greater to smaller or smaller to greater value is known as
A) generator B) transformer
C) transistor D) transducer

26) Transformer works in the principle of
A) power factor B) resonance
C)self-induction D) mutual induction

27) Among the following which is not a source of energy loss in transformer
A) flux leakage B) resistance of the windings
C) Eddy current D) insulation of coil

KEY ANSWERS

Question	Option	Question	Option	Question	Option
1	**B**	11	**B**	21	**A**
2	**C**	12	**A**	22	**A**
3	**C**	13	**B**	23	**B**
4	**C**	14	**A**	24	**C**
5	**B**	15	**B**	25	**B**
6	**B**	16	**B**	26	**D**
7	**A**	17	**B**	27	**D**
8	**A**	18	**C**		
9	**A**	19	**A**		
10	**A**	20	**B**		

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CHAPTER-8
ELECTRO MAGNETIC WAVES

1. A velocity of electromagnetic waves in free space is
   A) $3x10^{-8}$ ms^{-1} B) $3x10^{8}$ ms^{-1}
   C) $3x10^{8}$ kms^{-1} D) $3x10^{-8}$ kms^{-1}
2. Maxwell in his famous equation of electromagnetism introduced the concept of
   A) AC current B) displacement current
   C) DC current D) impedance
3. One of the inconsistencies of ampere's circuital law
   A) Fails to determine magnetic field to conduction current
   B) Fails to determine magnetic field due to displacement current
   C) Fails to explain both (A) and (B)
   D) None of these
4. Which of the following rays is not an electromagnetic wave
   A) X-rays B) $\gamma - rays$
   C) β- rays D) heat rays
5. The part of the spectrum of the electromagnetic radiation used to cook food is
   A) UV- rays B) cosmic rays
   C) γ-rays D) microwaves
6. The wave used by artificial satellites for communication is
   A) Microwaves B) infrared waves
   C) radio waves D) x-rays
7. Which of the electromagnetic waves has smallest wavelength
   A) X-rays B) microwave
   C) radio waves D) γ-rays
8. The decreasing order in wavelength in this electromagnetic wave is ,
   Infrared, microwave, UV rays and gamma rays is
   A) Microwave, Infrared, Ultraviolet, Gamma rays
   B) Infrared, Microwave, Ultraviolet, Gamma rays
   C) Gamma, Infrared, Microwave, Ultraviolet rays
   D) Infrared, Gamma, Microwave, Ultraviolet rays
9. The ultra-high frequency band of radio waves in electromagnetic wave is used as in
   A) television waves B) cellular phone communication
   C) commercial FM radio D) both (A) and (C)
10. The quantity $\sqrt{\mu_0 \epsilon_0}$ represents
    A) Inverse of speed of light in vacuum B) speed of light
    C) speed of sound D) Speed of electromagnetic wave
11. Which radiation is used in the treatment of muscle pains
    A) Infrared rays B) Ultraviolet rays
    C) microwave D) X-rays
12. Which of the following electromagnetic wave used in the treatment of cancer
    A) IR –rays B) visible rays
    C) Gamma rays D) Ultraviolet rays
13. Which of the following has the maximum energy?

A) Micro waves B) IR-rays
C) Ultraviolet rays D) Gamma rays

14. Which of the following has the minimum energy?
A) Micro waves B) IR-rays
C) Ultraviolet rays D) radio waves
15. Which of the following laws was modified by Maxwell by introducing the displacement current?
A) Gauss's law B) Ampere's law
C)Biot-Savart's law D) none of these
16. What is the nature of electromagnetic waves
A) Transverse wave B) longitude wave
C) mechanical wave D) sound wave
17. What is the angle between electric field vector and magnetic field of electromagnetic waves?
A)90^o B)30^o
C)45^o D)15^o
18. Displacement current is a
A) it is the current due to time varying magnetic field
B) it is the current due to time varying electric field
C) it is the current due to time varying both magnetic field and electric field
D) it is the current due to constant magnetic field
19. Correct expression for displacement current is
A) $I_d = \epsilon_o \frac{d\varphi}{dt}$ B)$I_d = \frac{d\varphi}{dt}$
C)$I_d = \mu_o \frac{d\varphi}{dt}$ D)$I_d = \mu_o \epsilon_o \frac{d\varphi}{dt}$
20. Expression for speed of light in terms of permittivity and permeability in free space
A) $\frac{1}{\sqrt{\mu_o \epsilon_o}}$ B)$\frac{1}{\mu_o \epsilon_o}$
C)$\frac{1}{\sqrt{\mu_o + \epsilon_o}}$ D)$\mu_o \epsilon_o$
21. What is the wave length range of electromagnetic spectrum
A) 10 Hz to 10^{10}Hz B) 8Hz to 6 Hz
C) 10 Hz to 10^{22}Hz D) 10 Hz to 10^{24}Hz
22. The maximum frequency wave in the spectrum is
A) Gamma ray B) X-ray
C) UV- rays D) IR-rays
23. The minimum frequency wave in the electromagnetic spectrum is
A) Gamma ray B) Radio wave
C) UV- rays D) IR-rays
24. Which ray is used in photosynthesis
A) X-rays B) UV –rays
C) IR –rays D) visible ray
25. For dehydrated fruits the ray used
A) X-rays B) UV –rays
C) IR –rays D) visible ray
26. Fundamental source of electromagnetic wave is
A) Alternating current B) oscillating charged particles

C) changing magnetic field D) none of these

27. Among the following, which of the ray is used in photocells
    A) UV-rays B) visible rays
    C) X-rays D) micro waves

28. RADAR system use
    A) Radio wave B) micro waves
    C) IR-rays D) UV-rays

KEY ANSWER

Question	Option	Question	Option	Question	Option
1	**B**	11	**A**	21	**C**
2	**B**	12	**C**	22	**A**
3	**B**	13	**D**	23	**B**
4	**D**	14	**D**	24	**B**
5	**D**	15	**B**	25	**C**
6	**A**	16	**A**	26	**B**
7	**D**	17	**A**	27	**A**
8	**A**	18	**B**	28	**B**
9	**B**	19	**A**		
10	**A**	20	**A**		

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CHAPTER-9
RAY OPTICS AND OPTICAL INSTRUMENTS

1. The speed of light in vacuum is
   (A) 3 X 10^5 m/s (B) 3 X 10^5 km/s (C) 3 X 10^8 km/s (D) 3 X 10^6 m/s
2. The relation between focal length (f) and radius of curvature (R) of a mirror
   (A) f = R/2 (B) R = f/2 (C) R = f (D) R = f/3
3. Mirror equation is given by
   (A) f = v + u (B) f = $\frac{uv}{u+v}$ (C) $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ (D) Both B and C
4. The position of the object to get virtual image in the case of concave mirror is
   (A) Between F and P (B) Beyond C (C) At C (D) Between F and C
5. At which position of the object a concave mirror produces a magnification equal to -1
   (A) Between F and P (B) Beyond C (C) At C (D) Between F and C
6. The mirror which produces only a virtual and diminished image is
   (A) Plane mirror (B) Concave mirror (C) Convex mirror (D) None
7. The bouncing back of light after hitting any surface is called
   (A) Interference (B) Refraction (C) Diffraction (D) Reflection
8. For what angle of incidence Snell's law is not valid
   (A) 45^0 (B) 0^0 (C) 90^0 (D) 50^0
9. The colour of the light which has highest refractive index is
   (A) Violet (B) Red (C) Yellow (D) Green
10. The colour of the light which has least refractive index is
    (A) Violet (B) Red (C) Yellow (D) Green
11. Due to atmospheric refraction of sunlight, the length of the day increases by about
    (A) 2 minute (B) 1 minute (C) 4 minute (D) 3 minute
12. The colour which has least critical angle of incidence is
    (A) Violet (B) Red (C) Yellow (D) Green
13. The colour which has highest critical angle of incidence is
    (A) Violet (B) Red (C) Yellow (D) Green
14. The critical angle for diamond – water interface is nearly
    (A) 54^0 (B) 42^0 (C) 30^0 (D) 24^0
15. Convex mirrors are used as side view mirrors in cars because
    (A) they form diminished, virtual images (B) they form enlarged, virtual images
    (C) they form diminished, real images (D) they form enlarged, real images
16. Virtual images are formed
    (A) In front of the mirrors (B) Behind the mirrors
    (C) Both in front and behind the mirrors (D) Neither in front nor behind the mirrors
17. Refractive index is the
    (A) Ratio of speeds of light (B) Ratio of wavelengths of light
    (C) Ratio of frequencies of light (D) Both A and B
18. The one which has lowest refractive index is
    (A) Vacuum (B) Air (C) Water (D) Glass
19. When light travel from air to glass, frequency
    (A) increases (B) decreases (C) remains same (D) may increase or decrease
20. Twinkling effect of stars is due to
    (A) Refraction (B) Scattering (C) Diffraction (D) Reflection

21. For critical angle of incidence, Angle of refraction is
(A) 0^0 (B) 30^0 (C) 60^0 (D) 90^0

22. Principle of optical fibre is
(A) Total internal reflection (B) Reflection (C) Refraction (D) Diffraction

23. Pick the odd one out
(A) Polaroid (B) Mirage (C) Sparkling of diamond (D) Optical fiber

24. dioptre is equivalent to
(A) meter (B) $meter^2$ (C) $meter^{-1}$ (D) $meter^{-2}$

25. Deviation produced by a thin prism is
(A) (2n-1)A (B) (n-1) A (C) (n-1)A/2 (D) (2n-1) A/2

26. The nature of the image produced by concave lens is
(A) Virtual and diminished (B) Real and diminished
(C) Virtual and enlarged (D) Real and enlarged

27. At which position of the object, a convex lens produces a magnification of – 1?
(A) At F (B) At 2F (C) Beyond 2F (D) Between F and 2F

28. At which position of the object, a convex lens produces an enlarged real image?
(A) At F (B) At 2F (C) Beyond 2F (D) Between F and 2F

29. The SI unit of power of a lens is
(A) joule (B) farad (C) dioptre (D) coulomb

30. According to Rayleigh scattering law, intensity of scattering is proportional to
(A) $\frac{1}{\lambda^4}$ (B) $\frac{1}{\lambda^3}$ (C) $\frac{1}{\lambda^2}$ (D) $\frac{1}{\lambda}$

31. Blue colour of the sky is due to
(A) Reflection of light (B) Refraction of light (C) Diffraction of light (D) Scattering of light

32. In primary rainbow there are _____ total internal reflections
(A) 1 (B) 2 (C) 3 (D) 4

33. In secondary rainbow there are _____ total internal reflections
(A) 1 (B) 2 (C) 3 (D) 4

34. Magnification produced by simple microscope is given by
(A) $1 + \frac{2D}{f}$ (B) $1 + \frac{D}{2f}$ (C) $1 + \frac{D}{f}$ (D) $\frac{D}{f}$

35. Magnification produced by a compound microscope is
(A) $\left(\frac{L}{f_0}\right)\left(\frac{D}{f_e}\right)$ (B) $\left(\frac{L}{f_0}\right)$ (C) $\left(\frac{D}{f_e}\right)$ (D) $1 + \frac{D}{f_e}$

36. Magnification produced by a telescope is
(A) $\frac{f_o}{f_e}$ (B) $\frac{f_e}{f_o}$ (C) $\frac{2f_o}{f_e}$ (D) $\frac{f_o}{2f_e}$

37. The length of a telescope in normal adjustment is
(A) $f_o - f_e$ (B) $f_o + f_e$ (C) f_o/f_e (D) $f_o f_e$

38. The final image formed by compound microscope is
(A) Inverted and Diminished (B) Erect and Diminished
(C) Inverted and Enlarged (D) Erect and Enlarged

39. Deviation produced by a prism is
(A) i + e –A (B) i – e –A (C) i + e + A (D) i – e +A

40. Angle of a prism is
(A) $r_1 - r_2$ (B) $(r_1-r_2)/2$ (C) $(r_1+r_2)/2$ (D) $r_1 + r_2$

KEY ANSWERS

Question	**Option**	Question	**Option**	Question	**Option**	Question	**Option**
1	**B**	11	**C**	21	**D**	31	**D**
2	**A**	12	**A**	22	**A**	32	**A**
3	**D**	13	**B**	23	**A**	33	**B**
4	**A**	14	**D**	24	**C**	34	**C**
5	**C**	15	**A**	25	**B**	35	**A**
6	**C**	16	**B**	26	**A**	36	**A**
7	**D**	17	**D**	27	**B**	37	**B**
8	**B**	18	**A**	28	**D**	38	**C**
9	**A**	19	**C**	29	**C**	39	**A**
10	**B**	20	**A**	30	**A**	40	**D**

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CHAPTER - 10
WAVE OPTICS

1. Corpuscualr model of light was first given by

A) Newton B) Huygen C) Descartes D) Maxwell

2. According to Huygens constructions, the speed of the secondary wavelets is

A) Twice that of the wave B) Same as the wave C) Zero D) infinite

3. The source of the plane wave is

A) Point source B) Extended source C) Source at large distance D) Do not exist

4. The nature of the refracted wavefront from a prism when the incident wavefront is plane is

A) Plane wave B) Spherical wave C) Cylindrical wave D) Plane wave making angle with the incident wave

5. Coherent waves refers to wave of

A) Constant phase difference B) Constant amplitude C) Constant wavelength D) different frequency

6. Two coherent sources of light can be obtained by

A) Two different lamps B) Two different lamps of same power C) Two different lamps of same power and colour D) Two slits illuminated by a same source

7. Path difference b/w coherent waves for constructive interference must be

A) nλ B) $(2n+1)\frac{\lambda}{2}$ C) $n\frac{\lambda}{2}$ D) $(2n+2)\frac{\lambda}{2}$

8. The expression for the fringe width,(where the symbols have their usual meaning)

A) $\frac{1}{\beta}=\frac{\lambda D}{d}$ B) $\beta=\frac{\lambda D}{2d}$ C) $\beta=\frac{\lambda D}{d}$ D) $\frac{1}{\beta}=2n\frac{\lambda}{2}$

9. The distance at which an n^{th} bright fringe formed is (where the symbols have their usual meaning)

A) $X_n=\frac{n\lambda D}{d}$ B) $X_n=\frac{n\lambda D}{2d}$ C) $X_n=\frac{2\lambda D}{nd}$ D) $X_n=\frac{n\lambda d}{D}$

10. The distance at which an n^{th} dark fringe formed is (where the symbols have their usual meaning)

A) $X_n=\frac{n\lambda D}{d}$ B) $X_n=\frac{(2n+1)\lambda D}{2d}$ C) $X_n=\frac{2\lambda D}{nd}$ D) $X_n=\frac{(2n+1)\lambda d}{D}$

11. If the distance between the slit and the screen is increased, what happens to fringewidth

A) Doubles B) Remains same C) Decreases D) Increases in proportion to the distance

12. If the monochromatic source is replaced by another source of shorter wave length, the fringe width

A) Decreases B) Remains same C) Increases D) zero

13. If the monochromatic source is replaced by white light the central fringe will be

A) White B) Blue C) Red D) Yellow

14. The colours seen when CD is viewed is due to

A) Reflection B) Refraction C) Interference D) Diffraction

15. If D is the distance between slit and screen, 'a' width of the slit illuminated by a monochromatic source, the width of the central diffraction maxima is given by

A) $\frac{a}{D\lambda}$ B) $\frac{a\lambda}{D}$ C) $\frac{2D\lambda}{a}$ D) $\frac{\lambda}{a}$

16. Interference and diffraction fringes are consistent with

A) Conservation of charge B) Conservation of energy C) Conservation of momentum D) Conservation of mass

17. If the monochromatic source is replaced by white light the central fringe in diffraction will be

A) White B) Blue C) Red D) Yellow

18. Polarization is the phenomenon of light based on

A) Particle nature B) Wave nature C) Quantum phenomenon D) Transverse electromagnetic nature

19. Polaroids are used to produce

A) Monochromatic light B) Unpolarised light C) polarised light D) White light

20. The relation $I = I_o cos^2\theta$ (Where the symbols have their usual meaning) is

A) Newton's law B) Snell's law C) Malus' law D) Brewster's law

21. The intensity of the emergent beam will be zero if the pass axis of two polaroids are

A) Only when perpendicular to each other B) Parallel to each other C) At an angle of 45^0 D) At angles greater than 0 and 90

22. The angle of incidence at which the reflected wave is totally polarized and reflected and refracted rays are perpendicular to each other is called

A) Critical angle B) Snell's angle C) Fresnel angle D) Brewster angle.

23. If the intensity varies b/w maximum and minimum but not completely dark when viewed through analyser Polaroid is called

A) Completely polarized light B) Partially chromatic light C) Monochromatic light D) Partially polarized light

24. A point source of light produce

A) A. spherical wavefront B) cylindrical wavefront C) plane wavefront D) both A and C

25. Path difference for second minima in diffraction pattern a single slit

A) 0 B) λ/2 C) λ D) 2λ

ANSWERS;

QN	ANS	QN	ANS	QN	ANS	QN	ANS	QN	ANS
1	C	6	D	11	D	16	B	21	A
2	B	7	A	12	A	17	A	22	D
3	C	8	C	13	A	18	D	23	D
4	D	9	A	14	D	19	C	24	D
5	A	10	B	15	C	20	C	25	D

FILL IN THE BLANKS

1. A wavefront is the locus of all points vibrating in same phase
2. A point source at finite distance is the source of Spherical waves
3. According to Huygens construction the amplitude of the secondary wavelet is zero in backward direction
4. The physical quantity which remains same when a wave gets refracted from one medium to another of different optical density is frequency
5. The nature of the reflected plane wavefront from a concave mirror is a spherical wavefront.
6. Doppler effect produced when the light source move away from the observer is called red shift
7. Doppler effect produced when the light source move towards the observer is called blue shift.
8. The superposition of two coherent wave resulting in zero intensity is called destructive interference.
9. The path difference between two coherent waves resulting in destructive interference is odd multiple of $\frac{\lambda}{2}$
10. The alternate dark and bright bands of equal width and intensities resulting due to superposition are called interference fringes.
11. The distance between two consecutive bright or dark fringe is called fringe width.
12. Central fringe in the interference pattern is a bright fringe.
13. Fringes of unequal intensities and width are referred as diffraction pattern
14. The resolution of the telescope can be increased by increasing the diameter of the objective.
15. A telescope produces resolved image of the object.
16. A microscope produces magnified image of the object.

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CHAPTER - 11
DUAL NATURE OF RADIATION AND MATTER

1) Work function is the energyrequired __
   A) to produce x-rays
   B) to exhibit an atom
   C) to eject an electron just out of thesurface
   D) explore an atom

2) Photoelectric effect is basedupon
   A) energy
   B) momentum
   C) charge
   D) mass

3) The photoelectric effect occurs only when the incident light has more than certain minimum
   A) wavelength
   B) speed
   C) charge
   D) frequency

4) The maximum number of photo electrons released in a photocell is independent
   A) nature of the cathode surface
   B) frequency of the incident ray
   C) intensity of radiation incident oncathode surface
   D) none of the above

5) Intensity of light incident on photo sensitive surface is doubled then
   A) the number of emitted electrons tripled
   B) the number of emitted electronsis doubled
   C) kinetic energy is doubled
   D) momentum is doubled

6) If the frequency of light in photoelectric experiment is doubled, the stopping potential will
   A) be doubled
   B) be halved
   C) become more than doubled
   D) become less than doubled

7) The best metal to be used for photo emission is
   A) potassium
   B) sodium
   C) caesium
   D) lithium

8) de Brogile wavelength depends on the mass and energy accordingto the relation
   A) $(\text{mass} \times \text{energy})^{-1/2}$
   B) $(\text{mass} \times \text{energy})^{1/2}$
   C) $(\text{mass}/\text{energy})^{1/2}$
   D) mass x energy

9) The incident photon involved in the photoelectric effect experiment
   A) completely disappears
   B) comes out with increasedfrequency
   C) comes out with decreasedfrequency
   D) comes out without change in frequency

10) The kinetic energy of Photoelectron is directly proportional to
   A) intensity of incident light
   B) the difference between the frequency of the incident light and the threshold frequency
   C) the sum of frequency of incidentlight and threshold frequency
   D) the ratio of frequency of lightused and threshold frequency

11) If wavelength of an electron and a photon is same then they will have___same
   A) velocity
   B) momentum
   C) energy
   D) all of these

12) A proton and an electron move with a same velocity. The associatedwavelength for proton is
   A) shorter than that of the electron
   B) longer than that of the electron
   C) the same of as that of theelectron
   D) zero

13) Which of the following has thelargest de Brogile wavelength if they are moving with the same velocity?
   A) neutron
   B) proton
   C) alpha particle
   D) beta particle

14) For a given metal, the maximum kinetic energy of emitted electrons in a photoelectric effect does not depend upon
   A) intensity
   B) stopping potential

C) wavelength D) frequency

15) If an electron and a proton have the same de Broglie wavelength, then the kinetic energy of the electron is

A) more than that of the proton B) equal to that of the proton

C) zero D) less than that of the proton

16) In photoelectric effect, the number electrons ejected per second is directly

A) proportional to the wavelengthof the light

B) proportional to the intensity ofthe light

C) proportional to the workfunction of the light

D) proportional to the frequencyof the light

17) Light of certain frequency and intensity incident on photosensitive material causes photoelectric effect.If both the frequency and intensity are doubled the photoelectric current becomes

A) unchanged B) halved

C) doubled C) quadrupled

18) When green light is made incident on a metal, Photo electrons are emitted by it but no photo electrons are obtained by yellow light. If red light is made to incidenton that metal then

A) no electron will be emitted B) less electron will be emitted

C) more electron will be emitted D) none of the above

19) The value of e/m was found to be independent of

A) nature of the metal used as the cathode

B) gas introduced in the discharge tube

C) both (a) and (b)

D) none of these

20) The electromagnetic theory of light failed to explain

A) photoelectric effect B) polarisation

C) diffraction D) interference

21) G. P Thomson experimentally confirmed that existence of matterwaves by the phenomena

A) diffraction B) refraction

C) polarisation D) scattering

22) The waves associated with material particles in motion are called

A) matter waves B)light waves

C) motional waves D) particle waves

23) Photons are electrically

A) positive B) negative

C) neutral D) all of these

24) R. A Millikan performed the pioneering oil -drop experiment for the precise measurement of

A) mass of the electron B) charge of the electron

C) position of the electron D) charge of the proton

25) The minimum negative potential applied to the anode to just stop the photo emission fromcathode is called

A) stopping potential B) threshold frequency

C) work function D) threshold wavelength

26) The maximum wavelength of the incident radiation above which there is no photo emission is called as

A) threshold frequency B) work function

C) threshold wavelength D) de Brogile wavelength.

27) The wavelength of matterwaves is known as

A) threshold frequency B) threshold wavelength

C) de Brogile wavelength D) matter waves

28) The photoelectric effect is based on the law of conservation of

A) energy B) momentum

C) mass D) angular momentum

29) The phenomenon of photoelectric emission was discovered by
A) R. A Millikan B) Albert Einstein
C) Roentgen D) Heinrich hertz

30) Which of the followings is the type of electron emission?
A) Thermionic emission B) field emission
C) Photoelectric emission D) all of the above

31) The work function depends on the
A) properties of the metal B) the nature of metal surface
C) both (a) and (b) D) none of the above

32) _____metal has highest workfunction of 5.65eV
A) platinum B) caesium
C) iron D) cobalt

33) Dual nature of matter is proposed by
A) louis de Brogile B) Albert Einstein
C) Heinrich Hertz D) R. A Millikan

34) Photoelectric current is directly proportional to
A) time B) velocity
C) intensity of incident radiation D) distance

35) Photoelectric current depends on
A) Intensity B) Frequency
C) Potential of the emitter plate D) Both A and C

:Answers:

Q	AN	Q	AN	Q	AN	Q	AN	Q	AN	Q	AN	Q	AN
1	C	6	C	11	B	16	B	21	A	26	C	31	C
2	A	7	C	12	A	17	C	22	A	27	C	32	A
3	D	8	A	13	D	18	A	23	C	28	A	33	A
4	B	9	A	14	A	19	C	24	B	29	D	34	C
5	B	10	B	15	A	20	A	25	A	30	D	35	D

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CHAPTER - 13
NUCLEI

1. Nucleons are
   A) Protons and neutrons B) Neutrons and electrons
   C) Protons and electrons D) All of these
2. What is the approximate ratio of volume of a nucleus to the volume of an atom ?
   A) 10^{-34} B) 10^{-20}
   C) 10^{-12} D) 10^{-10}
3. The set which represents the isotope, isobar and isotones respectively is
   A) $({}_1^2H,\ {}_1^3H)$, $({}_{79}^{197}Au, {}_{80}^{198}Hg)$ and $({}_2^3He, {}_1^2H)$
   B) $({}_2^3He, {}_1^1H)$, $({}_{79}^{197}Au, {}_{80}^{198}Hg)$ and $({}_1^1H,\ {}_1^3H)$
   C) $({}_2^3He, {}_1^3H)$,$({}_1^2H,\ {}_1^3H)$ and $({}_{79}^{197}Au, {}_{80}^{198}Hg)$
   D) $({}_1^2H,\ {}_1^3H)$, $({}_2^3He, {}_1^3H)$ and $({}_{79}^{197}Au, {}_{80}^{198}Hg)$
4. ${}_1^3H\ and\ {}_2^3He$ atoms are example for
   A) Isobars B) Isotones
   C) Isotopes D) Isomers.
5. ${}_{17}^{37}Cl\ and\ {}_{19}^{39}K$ atoms are example for
   A) Isobars B) Isotones
   C) Isotopes D) Isomers.
6. ${}_1^1H, {}_1^2H\ and\ {}_1^3H$ atoms are example for
   A) Isobars B) Isotones
   C) Isotopes D) Isomers
7. Order of magnitude of density of uranium nucleus is
   A) 10^{20}kgm^{-3} B) 10^{17}kgm^{-3}
   C) 10^{14}kgm^{-3} D) 10^{11}kgm^{-3}
8. The force between two protons is same as the force between proton and neutron. The nature of the force is
   A) Electrical force B) Weak Nuclear force
   C) Gravitational force D) Strong nuclear force
9. The nuclear force
   A) Is purely an electrostatic force B) Obeys inverse square law of distance
   C) Is equal in strength to gravitational field D) Is a short range force.
10. All the nucleons in an atom are held by
    A) Nuclear forces B) Vander Waal's force
    C) Tensor forces D) Coulomb forces
11. Carbon dating is best suited for determining the age of fossils ., if their age in years is of the order of
    A) 10^3 B) 10^4
    C) 10^5 D) 10^6
12. Which of the following can be emitted by radioactive substances during their decay?
    A) Neutrinos B) Helium nuclei
    C) Electrons D) All of these.
13. Pick out the incorrect statement from the following:
    A) β^-emission from the nucleus is always accompanied with a neutrino.
    B) The energy of the α-particle emitted from a given nucleus is always constant.

C) ϒ- ray emission makes the nucleus more stable.
D) Nuclear force is charge independent.

14. Consider α and β particles and ϒ- rays each having an energy of 0.5MeV. In the increasing order of penetrating power, the radiation are respectively:
A) α, β, ϒ B) α, ϒ, β
C) β, ϒ, α D) ϒ, β, α

15. An electron emitted in beta radiation originates from
A) Inner orbits of atom
B) free electrons existing in the nucleus.
C) decay of neutrons in a nuclei.
D) photon escaping from the nucleus.

16. Complete the series; $_2He^6 \rightarrow {}_3Li^6 + {}_{-1}e^0 +$ _____
A) Neutrino B) Antineutrino
C) Proton D) Neutron

17. The equation $4\ {}_1^1H^+ \rightarrow {}_2^4He^{2+} + 2e^- +$ 26 MeV represents
A) β–decay B) ϒ-decay
C) fusion D) fission

18. Light energy emitted by star is due to
A) Breaking of nuclei. B) Joining of nuclei
C) Burning of nuclei. D) Reflection of solar light.

19. In nuclear reactors, the control rods are made of
A) Cadmium B) graphite
C) Krypton D) Plutonium.

20. Fast neutrons can easily be slowed down by
A) The use of lead shielding.
B) Passing them through water.
C) Elastic collision with heavy nuclei.
D) Applying a strong electric field.

21. Fission of nuclei is possible because the binding energy per nucleon in them
A) Increases with mass number at low mass numbers.
B) Decreases with mass number at low mass numbers.
C) Increases with mass number at high mass number.
D) Decreases with mass number at high mass number.

22. The graph of $\log\left[\frac{R}{R_o}\right]$ versus log A where R= radius of a nucleus and A = its mass number is
A) A straight line B) a parabola
C) an ellipse D) none of the above.

23. Which particle is emitted beta decay?
A) Protons B) Neutron
C) nuclei D) A high energy electron.

24. Which is not a characteristics of gamma radiation ?
A) Stopped by several feet of concrete or several inches of lead.
B) High energy, high penetration.
C) Stopped by thin metal.
D) Most dangerous type of radiation.

25. What is radioactive decay ?

A) The spontaneous breakdown of an atomic nucleus resulting in a release of energy and matter.
B) The spontaneous breakdown of an atomic nucleus resulting in only matter release.
C) The spontaneous breakdown of an atomic nucleus resulting in only energy release.
D) The decay of the use of radios and the increased use of televisions.

26. Which is not true of radioactive decay?
A) Radioactivity can be useful.
B) It happens only in nuclear power plants
C) It is hazardous to human health
D) It is a result of instability in atoms.

27. Isotopes of the same element have different _____
A) Number of electrons B) Number of neutrons
C) Number of protons D) Symbols

28. When does radioactive decay occur?
A) When the electrons of an isotope are shared with another isotope.
B) When the electrons of an isotope are spinning.
C) When the nucleus of an isotope is unstable.
D) When the nucleus of an isotope is stable.

29. Two smaller nuclei combines to form a larger nucleus is
A) Fission B) Fusion
C) gamma radiation D) half life

30. The splitting of a nucleus into smaller nuclei is
A) Fission B) Fusion
C) gamma radiation D) half life

31. Which atoms combine together during fusion reaction on the Sun ?
A) Helium and Hydrogen atoms B) Hydrogen and Carbon atoms
C) Hydrogen atoms D) Hydrogen and Lithium atoms

32. Very high temperature and pressure is required to:
A) Fission B) Fusion
C) gamma radiation D) half life

33. One disadvantage of nuclear energy is ___
A) It emits large amounts of pollution into the atmosphere.
B) It is a fossil fuel.
C) There are no disadvantages.
D) It leaves behind radioactive waste.

34. One advantage of nuclear energy over coal energy is _____
A) The nuclear plant emits more greenhouse gases.
B) There is very little dangerous waste with nuclear energy.
C) The nuclear plant does not emit as many greenhouse gases.
D) It is very cheap to build and maintain a nuclear power plant.

35. A radioactive nucleus emits a beta particle, then the parent and daughter nuclei are
A) Isotones B) Isotopes
C) Isomers D) Isobars

36. Which of the following are not emitted by radioactive substances?
A) Protons B) Electrons
C) Gamma Rays D) Helium Nuclei

37. A nucleus undergoes gamma decay due to
A) Excess of neutrons B) Excess of protons
C) Its excited state D) Large mass

38. Isotones have the same number of
A) Protons B) Electrons
C) Neutrons D) All of the above

39. If 'K' is a measure of the growth rate of neutrons in a reactor, then the value of 'K' is for the chain reaction gradually dies out is
A) K =1 B) K<1
C) K>1 D) K=0

40. In proton-proton cycle, the approximate amount of energy released is
A) 26.7 MeV B) 20.1 MeV
C) 28.9 MeV D) 22.5 MeV

ANSWERS;

Q N	AN	QN	AN	QN	AN	QN	AN
1	A	11	B	21	D	31	C
2	C	12	D	22	A	32	B
3	D	13	A	23	D	33	D
4	A	14	A	24	C	34	C
5	B	15	C	25	A	35	D
6	C	16	B	26	B	36	A
7	B	17	C	27	B	37	C
8	D	18	B	28	C	38	C
9	D	19	A	29	B	39	B
10	A	20	B	30	A	40	A

FILL IN THE BLANKS:

1. Protons and neutrons present in the nucleus are together called the nucleons.
2. The number of proton present in the nucleus is called the atomic number.
3. The number of nucleons in the nucleus is called the atomic mass number.
4. Nuclei of the same element having same atomic number but different mass number are called isotopes.
5. Nuclei of different elements having same mass number but different atomic number are called isobars.
6. Nuclei of different elements having same number of neutrons are called isotones.
7. Neutrons were discovered by James Chadwick.
8. Mass spectrograph is the instrument use to measure the atomic masses.
9. The order of nuclear density is $10^{17} kgm^{-3}$.
10. Energy equivalent of 1 a m u is 931.5MeV.
11. During the pair annihilation , the energy is released in the form of Υ-rays(Photons).
12. The difference between the sum of the masses of the nucleons forming the nucleus and the rest mass of the nucleus is called mass defect.
13. The minimum amount of energy required to split the nucleus into its constituents is called nuclear binding energy.

14. Binding energy per nucleon is maximum for Fe^{56}.
15. Binding energy per nucleon is minimum for U^{238}.
16. The forces that hold the nucleons together inside the nucleus are called nuclear forces.
17. Nuclear forces are strongest forces in nature.
18. Nuclear forces are short range forces.
19. The amount of energy released in per fission of $_{92}U^{235}$ is about 200MeV.
20. A nuclear reactor is a device which produces nuclear energy at a steady state.
21. The fission chain reaction will be critical and the chain reaction is just sustained when multiplication factor of a fissionable mass ,K=1.
22. The fission chain reaction gradually dies out, when K<1.
23. The fission chain reaction grows exponentially, when K>1.
24. A material used to slowdown the neutrons to thermal energies in a nuclear reactor is called moderator.
25. Control rods are used for absorption of excess neutrons in a nuclear reactor.
26. The phenomenon by which energy is produced in a star is Nuclear Fusion.
27. Nuclear fusion reactions require very high temperature of the order of 10^9K.
28. Nuclear fission is the principle of atom bombs.
29. Nuclear fusion is the principle of hydrogen atoms.
30. The phenomenon of spontaneous disintegration of heavy nuclei with emission of certain radiations is called radioactivity.
31. Henry Becquerel discovered radioactivity.
32. Alpha-particle is a helium nucleus consists of two protons and two neutrons.
33. Gamma rays are the uncharged radiation emitted by radioactive substances.
34. The SI unit of activity is becquerel (Bq).
35. The practical unit of activity is curie (Ci).
36. If mean life of a radioactive element is one year, then its half year is 0.693 year.
37. In α-decay, atomic number decreases by two units.
38. In α-decay, mass number decreases by four units.
39. In negative β-decay , the atomic number increases by one unit.
40. Antineutrino is emitted in negative β-decay.
41. In positive β-decay, the atomic number decreases by one unit.
42. Neutrino is emitted in positive β-decay.
43. In proton-proton cycle, the approximate amount of energy released is 26.7MeV.
44. The principle used in nuclear reactor is controlled fissioin chain reaction.

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CHAPTER-14

SEMICONDUCTOR ELECTRONICS: MATERIALS, DEVICES AND SIMPLE CIRCUITS

1. In semiconductors at room temperature
   (A) The valence band is partially empty and the conduction band is partially filled
   (B) The valence band is completely filled and the conduction band is partially filled
   (C) The valence band is completely filled
   (D) The conduction band is completely empty.
2. In the insulators
   (A) The valence band is partially filled with electrons.
   (B) The conduction band is partially filled with electrons.
   (C) The conduction band is partially filled with electrons and valence band is empty.
   (D) The conduction band is empty and the valence band is filled with electrons.
3. Example for elemental semiconductor is
   (A) silicon (B) gallium arsenic
   (C) anthracene (D)polypyrrole
4. The resistivity range of metals is
   (A) $10^{-2} – 10^{-8}$ Ωm (B) $10^{-5} – 10^{6}$ Ωm
   (C) $10^{11} – 10^{19}$ Ωm (D) 0
5. In n-type semiconductor the electron concentration is equal to
   (A)number of donor atoms (B)number of acceptor atoms
   (C)number of both type of atoms (D) neither number of acceptor atoms nor number of donor atoms
6. Which of the following statement is not true
   (A) the resistance of intrinsic semiconductors decreases with increase of temperature.
   (B) doping pure Si with trivalent impurities give p-type semiconductors.
   (C) the majority charge carriers in n- type semiconductors are holes
   (D) a p-n junction can act as a semiconductor diode.
7. In a n- type semiconductor, the Fermi energy level lies
   (A) In the forbidden energy gap nearer to the conduction band
   (B) In the forbidden energy gap nearer to the valence band
   (C) In the middle of forbidden gap
   (D) Outside the forbidden energy gap.
8. An n- type and p-type silicon can be obtained by doping pure silicon respectively with
   (A) Arsenic and phosphorous (B) indium and aluminium
   (C) Phosphorous and indium (D) aluminium and boron.
9. The element that can be used as acceptor impurity to dope silicon is
   (A) antimony (B) arsenic
   (C) boron (D) phosphorous
10. Among the following, the wrong statement in the case of semiconductor is
    (A) Resistivity is in between that of a conductor and insulator.
    (B) Temperature coefficient of resistance is negative.
    (C) Doping increases conductivity
    (D) At absolute zero temperature it behaves like a conductor.
11. Band gap in insulator is of the order
    (A) 6 eV (B) 0.60 eV
    (C) – 6 eV (D) 0 eV

12. In p- type semiconductor conduction is due to
(A) Greater number of holes and less number of electrons
(B) Only electrons
(C) Only holes
(D) Greater number of electrons and less number holes.

13. In n- type semiconductor conduction is due to
(A) Greater number of holes and less number of electrons
(B) Only electrons
(C) Only holes
(D) Greater number of electrons and less number holes.

14. With increase in temperature in an intrinsic semiconductor the ratio of conduction electrons and holes is
(A)1 : 1 (B) 1 : 2
(C)2 : 1 (D) 1 : 3

15. To obtain n- type extrinsic semiconductor, the impurity element to be added to germanium should be of valence
(A) 2 (B) 5
(C) 4 (D) 3

16. To obtain p- type extrinsic semiconductor, the impurity element to be added to germanium should be of valence
(A) 2 (B) 5
(C) 4 (D) 3

17. The majority carriers in a p-type semiconductor are
(A) electrons (B) holes
(C) both (D)none

18. On increasing reverse voltage in a p-n junction diode the value of reverse current will
(A) gradually increases (B) first remains constant and then suddenly increase.
(C) remains constant (D) gradually decreases

19. P-n junction in forward bias behaves like
(A) an inductor (B) a condenser
(C) amplifier (D) an on switch

20. When p-n junction is forward biased, the current across the junction is mainly due to
(A) diffusion of charges (B) drifting of charges
(C) both diffusion and drifting of charges (D) holes only

21. The thickness of depletion layer is approximately
(A) 1 μm (B) 1 mm
(C) 1 cm (D) 1 m

22. The diffusion current in a p-n junction is greater than the drift current when the junction is
(A) forward biased (B) reverse biased
(C) un biased (D) both forward and reverse biased

23. When a junction diode is reverse biased, the current called drift current is due to
(A) majority charge carriers of both n and p sides
(B) minority charge carriers of both n and p sides
(C) holes of both n and p sides
(D) conduction band electrons of n- side only

24. Among the following one statement is not correct when a junction diode is in forward bias
(A) the width of depletion region decreases

(B) free electron on n-side will move towards the junction
(C) holes on p- side move towards the junction
(D) electron on n-side and holes on p-side will move away from junction.

25. A zener diode when used as a voltage regulator is connected,
(a) in forward bias (b) in reverse bias (c) in parallel to the load (d) in series to the load
(A) (a) and (b) are correct (B) (b) and (c) are correct
(C) (a) only is correct (D) (d) only is correct

26. When p-n junction is reverse biased, as bias voltage increases, the thickness of the depletion layer
(A) increases (B) decreases
(C) becomes zero (D) remains constant

27. Among the following one gives output 1in the AND gate
(A) A= 0 , B = 0 (B) A = 1, B = 1
(C) A= 1 , B = 0 (D) A = 0, B = 1

28. NAND and NOR are called universal gates because they
(A) Are universally available (B) Can be combined to produce OR , AND and NOT gates
(C) Are widely used in the integrated circuits(D) Can be easily manufactured

29. In Boolean algebra A + B = Y implies that
(A) Sum of A and B is Y
(B) Y exist when A exist or B exists or both A and B exist
(C) Y exist only when A and B both exist
(D) Y exist when A or B exist but not when both A and B exist

30. In Boolean algebra A.B = Y implies that
(A) Product of A and B is Y
(B) Y exists when A exist or B exists
(C) Y exists when both A and B exist but not when only A or B exists
(D) Y exists when A or B exists but not both A and B exist

31. The output of a 2- input OR gate is zero only when its
(A) both inputs are 0 (B) either input is 1
(C) both inputs are 1 (D) either input is zero.

32. The main cause of Zener breakdown is
(A) the base semiconductor being germanium
(B) production of electron – hole pairs due to thermal excitation
(C) low doping (D) high doping

33. Example of optoelectronics device is
(A)Capacitor (B)Resistor
(C)Inductor (D)Photodiode

34. In optoelectronic device, the charge carriers are produced by
(A) internal electric field (B) photons
(C) temperature (D) bombarding primary electrons

35. Among the following, is not an optoelectronic device
(A) transformer (B) photodiode
(C) solar cells (D) LED

36. Photo diodes are also called as photo detectors, because
(A) It converts electrical energy into light energy (B) It detects optical signals
(C) It detects DC signals (D) It detects AC signals

37. The main function of LED is

(A) detecting optical signals (B) convert electrical energy into light
(C) convert optical radiation into electricity (D) convert AC into DC

38. The magnitude of photocurrent produced in photodiode is proportional to
(A) the barrier voltage at the junction
(B) intensity of light falling on the cell
(C) the frequency of the light falling on the cell
(D) the voltage applied at the p-n junction.

39. Light emitting diodes are operated under
(A) forward biased (B) reverse biased
(C) un biased (D) none of these

40. Photons emitted in LED's are due to
(A) recombine of excess minority charge carrier with the majority charge carrier near the junction.
(B) majority charge carrier
(C) minority charge carrier
(D) internal electric field

41. Semiconductor used for fabrication of visible LED's must at least have bandgap
(A) 1.8 eV to 3 eV (B) less than 1.8 eV
(C) greater than 3 eV (D) none of these

42. Among the following, the incorrect statement in the case of LED's over lower power incandescent lamp is
(A) low operational voltage and less power
(B) slow action and warm-up time required
(C) long life and ruggedness
(D) fast on-off switching capability

43. Solar cells are operated under
(A) forward biased (B) reverse biased
(C) un biased (D) none of these

44. Band gap of semiconductor material used for solar cell fabrication is
(A) 1.8 eV to 3 eV (B) ~ 0.1 eV to1.8 eV
(C) greater than 3 eV (D) none of these

45. The width of depletion region in Zener diode is
(A)$< 10^{-6}$ m (B)$> 10^{-6}$ m
(C) 10^{-6} m (D) none of these

Answer keys

Quest	Opt	Quest	Opt	Quest	Opt	Quest	Opt	Quest	Opt
1	**A**	11	**A**	21	**A**	31	**A**	41	**A**
2	**D**	12	**A**	22	**A**	32	**D**	42	**B**
3	**A**	13	**D**	23	**B**	33	**D**	43	**C**
4	**A**	14	**A**	24	**D**	34	**B**	44	**B**
5	**A**	15	**B**	25	**B**	35	**A**	45	**A**
6	**C**	16	**D**	26	**A**	36	**B**		
7	**A**	17	**B**	27	**B**	37	**B**		
8	**C**	18	**B**	28	**B**	38	**B**		
9	**C**	19	**D**	29	**B**	39	**A**		
10	**D**	20	**A**	30	**C**	40	**A**		

FILL IN THE BLANKS

1. The level formed due to impurity atom, in the forbidden energy gap, very near to the valence band in a p-type semiconductor is called _____ level. (Acceptor)
2. The atoms in a semiconductor are bonded by _____ bond. (Covalent)
3. Conductivity of a pure semiconductor _____ with the increase of temperature. (Increases)
4. Semiconductors at 0K behave as _____ (insulators)
5. When electric field across a semiconductor is increased, the number of charge carriers will _____ (increase)
6. In intrinsic semiconductor, at room temperature, the number of electrons and holes will be _____ (equal)
7. Majority charge carrier in n-type semiconductors is _____ (electron)
8. Rectification is a process of converting alternating current into _____ current. (Direct)
9. P-n junction under _____ bias acts as an open switch. (Reverse)
10. The region of immobile positive and negative ions in a semiconductor is called _____ region. (depletion)
11. The potential in the depletion region is due to _____ (ions)
12. _____ is used as voltage regulators. (Zener diode)
13. NOR gate is a combination of OR gate and _____ gate. (NOT)
14. Photodiodes are operated under _____ bias (reverse)
15. IV characteristics of _____ is drawn in the fourth quadrant of the coordinate system. (solar cell)

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ELECTRIC CHARGE AND FIELD

MULTIPLE CHOICE QUESTIONS

1. Which of the following statements is true about electric forces?
   a) Electric forces are produced by electric charges
   b) Like charges attract, unlike charges repel
   c) Electric forces are weaker than gravitational force
   d) Positive and negative charges can combine to produce a third type of charge

2. When two bodies are rubbed against each other, then they acquire.
   a) Equal and similar charge
   b) Equal and opposite charges
   c) Unequal and similar charges
   d) Unequal and opposite charges

3. What will happen when we rub glass rod with silk cloth
   a) Some of the electrons from the glass rod are transferred to silk cloth
   b) The glass rod gets positive charge and silk cloth gets negative charge
   c) New charges are created in the process of rubbing
   d) Both a and b are correct

4. Two positive charges
   a) Attract each other
   b) No force between them
   c) Repel each other
   d) Both a and b

5. When a body is given a positive charge of 1 C, then
   a) 6.25×10^{18} electrons are removed from the body
   b) 6.25×10^{18} electrons are added to the body
   c) 6.25×10^{18} protons are added to the body
   d) 1.6×10^{-19} C of positive charge given to the body

6. Electric force between the two point charges varies with distance as
   a) $F \propto 1 / d^3$
   b) $F \propto 1 / d^2$
   c) $F \propto d^2$
   d) $F \propto 1 / d$

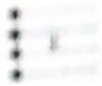
7. S. I. unit of charge is
   a) newton
   b) farad
   c) coulomb
   d) curie

8. One coulomb of the positive charge constitute
   a) 6.25×10^{18} protons
   b) 1.6×10^{14} protons
   c) 1.6×10^{19} electrons
   d) 6.25×10^{18} electrons

9. Electric field lines provide information about
   a) Field strength
   b) Nature of charge
   c) Direction
   d) All of these

10. The tangent drawn to electric lines of force gives
    a) Direction of potential
    b) Direction of electric field
    c) Nature of electric field
    d) Direction of motion of charge

11. Which of the following figure represents electric field lines due to a single positive charge?

a)  b)  c)  d) 

12. Which of the following figure represents electric field lines due to a single negative charge?

a)  b)  c)  d) 

13. Which of the following figure represents the electric field lines due to a charge $q > 0$?

a)  b)  c)  d) 

14. Electric field lines due to $q < 0$ is

a)  b)  c)  d) 

15. The electric field lines of force $q_1 q_2 > 0$ is

a)  b)  c) d) 

16. The electric lines for $q_1 q_2 < 0$ is

a)  b)  c)  d) 

17. Which of the following statements is not true about electric field lines?
a) Electric field lines start from positive charge and end at negative charge
b) Two electric field lines can never cross each other
c) Electric field lines cannot be taken as continuous curve
d) Electrostatic field lines do not form any closed loops

18. The S.I. unit of electric flux is
a) $NC^{-1}m^2$ b) NCm^{-2} c) $NC^{-2}m^2$ d) $NC^{-1}m^{-2}$

19. Electric field inside a spherical conductor is

a) ∞ b) Constant c) Maximum d) Zero

20. The S. I. unit of electric intensity is

a) NC b) NC^{-1} c) $N^{-1}C$ d) Weber

21. A sphere enclosed an electric dipole within it. The total flux across the sphere is

a) Zero
b) Half that due to a single charge
c) Double that due to a single charge
d) Depend on the position of dipole

22. Electric dipole is a

a) A pair of unequal charges separated by a small distance
b) System of two equal and similar charges separated by a small distance
c) System of two equal and opposite charges separated by a small distance
d) Pair of two charges separated by a small distance

23. Dipole moment of a dipole is given by

a) $P = 2aq^2$ b) $P = 2a^2q$ c) $2aq$ d) $2a / q$

24. The direction of electric dipole moment is

a) Perpendicular to dipole axis
b) From positive to negative charge
c) From negative to positive charge
d) Parallel to dipole axis

25. The angle between dipole moment and electric field along the axial line is

a) π b) $\pi / 2$ c) $0°$ d) 2π

26. The angle between dipole moment and electric field along the equatorial line is

a) π b) $\pi / 2$ c) $0°$ d) 2π

27. The relation between the electric field along the axial line E_A and equatorial line E_B are

a) $E_A = E_B$ b) $E_A = E_B / 2$ c) $E_A / E_B = 1 / 1$ d) $E_A = 2E_B$

28. The electric field (E) at a point due to a short dipole varies with distance (r) as

a) $E \propto 1/r^3$ b) $E \propto 1/r^2$ c) $E \propto r$ d) $E \propto r^3$

29. Dipole moment of electric dipole in vector form is given by

a) $\vec{p} = 2aq\hat{p}$ b) $\vec{p} = 2a\hat{p} / q^2$ c) $\vec{p} = 2a^2q\,\hat{p}$ d) $\vec{p} = 2aq^2\hat{p}$

30. Electric charge is

a) Quantized b) Conserved c) Unaltered by its motion d) All of these

31. Equal charges are given to two spheres of different radii, the electric field will

a) Be more on the smaller sphere
b) Be more on the bigger sphere
c) Be equal on both sphere
d) Depend on the nature of the materials of the spheres

32. Two charges +q and –q are situated at certain distance

a) Electric field and potential both are zero
b) Electric field is zero but potential is not zero
c) Electric field is not zero but potential is zero
d) Neither electric field nor potential is zero

33. Gauss's law is valid for

a) Any closed surface
b) Only regular closed surfaces
c) Any open surface
d) Only irregular open surfaces

34. When an electric dipole P is placed in a uniform electric field E then at what angle between P and E the value of torque will be maximum

a) 90^0 b) 0^0 c) 180^0 d) 45^0

35. An electric dipole of moment P is placed in a uniform electric field E, then

a) The torque on the dipole is $P \times E$
b) The potential energy of the system is $P.E$
c) The resultant force on the dipole is 0
d) a and c are correct

36. Electric field at a point due to a point positive charge is

a) $\mathbf{E} = \frac{1}{4\pi\varepsilon_0}\left(\frac{q}{r}\right)$ b) $\mathbf{E} = \frac{1}{4\pi\varepsilon_0}\left(\frac{q}{r^3}\right)$ c) $\mathbf{E} = \frac{1}{4\pi\varepsilon_0}\left(\frac{q}{r^2}\right)$ d) $\mathbf{E} = \frac{1}{4\pi\varepsilon_0}\left(\frac{q}{\sqrt{r}}\right)$

37. q_1 and q_2 are two point charges and the product of two point charges $q_1q_2 > 0$, then the nature of the force between them is

a) attractive b) repulsive c) no force between them d) neither attractive nor repulsive

38. q_1 and q_2 are two point charges and the product of two point charges $q_1q_2 < 0$, then the nature of the force between them is

a) attractive b) repulsive c) no force between them d) neither attractive nor repulsive

39. The net electric flux due to a dipole is

a) ∞ b) 1 c) Maximum d) Zero

40. Electric field at a point on the surface of a spherical conductor of radius R given a charge Q is $K = \frac{1}{4\pi\varepsilon_0}$

a) $E = K Q / R$ b) 0 c) $E = K Q / R^3$ d) $E = K Q / R^2$

41. The electric field at a point due to infinite plane sheet is

a) $E = \sigma / \varepsilon_0$ b) $E = \sigma / 2\varepsilon_0$ c) $E = \sigma / 2\varepsilon_0 r$ d) $E = \sigma^2 / \varepsilon_0$

42. The electric field at a point due to uniformly charged infinitely long wire is

a) $E = \lambda / 2\pi\varepsilon_0 r$ b) $E = \lambda / 2\pi\varepsilon_0 r^3$ c) $E = \lambda / 2\pi\varepsilon_0 r^2$ d) $E = \lambda^2 / 2\pi\varepsilon_0 r$

43. Electric field E at a point just outside a perfect conductor is

a) Parallel to the surface b) Zero

c) Perpendicular to the surface d) Can have any direction

44. Two identical metal spheres A and B. If A is given positive charge and B is given equal amount of negative charge then

a) Mass of A and B remains same b) Mass of A increases

c) Mass of B increases d) Mass of B decreases

45. A dielectric medium is inserted between two similar charges q_1 and q_2 then

a) The electric force between them decreases

b) The electric force between them increases

c) Dielectrics have no effect on the force between the charges

d) Force of repulsion increases

46. Force acting on a charge 'q' placed in an electric field is

a) $F = E / q$ b) $F = q / E$ c) $F = e / q^2$ d) $F = Eq$

47. Direction of electric field around a point positive charge is

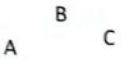
a) Away from the charge b) Towards the charge

c) Parallel to the charge d) Perpendicular to the charge

48. The following figure represents electric field lines for non-uniform electric field

a) $E_A = E_B = E_C$ b) $E_A > E_B = E_C$

c) $E_A < E_B < E_C$ d) $E_A > E_B > E_C$



49. Electric force between two point charges in presence of dielectric medium is

a) $F_m = F_a / \varepsilon_r$ b) $F_m = F_a / \varepsilon_r^2$ c) $F_m = F_a \varepsilon_r$ d) $F_m = \varepsilon_r / F_a$

50. The electric field around a point positive charge are a negative charge is always

a) Uniform b) No uniform c) Either uniform or non uniform d) Always uniform

Solutions:

1	2	3	4	5	6	7	8	9	10
a	b	d	c	a	b	c	a	d	b
11	12	13	14	15	16	17	18	19	20
a	b	a	b	a	b	c	a	d	b
21	22	23	24	25	26	27	28	29	30
a	c	c	c	c	a	d	a	a	d
31	32	33	34	35	36	37	38	39	40
a	c	a	a	d	c	b	b	d	d
41	42	43	44	45	46	47	48	49	50
b	a	c	c	a	d	a	d	a	b

FILL IN THE BLANKS

1. _____is used to find the nature of electric charge on a body.(**Gold leaf electroscope)**

2. When two bodies are rubbed against each other, then they acquire_____. ***(Equal and opposite charges)***

3. What will happen when we rub glass rod with silk cloth _____ ***(Some electrons from the glass rod are transferred to silk cloth)***

4. Two positive charges _____**(Repel each other).**

5. When a body is given a positive charge of 1 C, then _____are removed from the body. (6.25×10^{18} **electrons)**

6. S. I. unit of charge is ____**(Coulomb.)**

7. The tangent drawn to electric lines of force gives _____**(direction of electric field.)**

8. The nature of electric force between two point charges if $q_1 q_2 > 0$ is _____**(repulsive.)**

9. The nature of electric force between two point charges if $q_1 q_2 < 0$ is _____**(attractive.)**

10. Two electric field lines can never _____each other. **(intersect)**

11. Electric field inside a spherical conductor is _____**(Zero.)**

12. The S. I. unit of electric intensity is _____(NC^{-1}.)

13. A sphere enclosed an electric dipole within it. The total flux across the sphere is _____**(Zero.)**

14. Electric dipole is a system of two _____charges separated by a small distance. **(equal and opposite)**

15. Dipole moment of a dipole is given by _____($p = 2aq$)

16. Electric dipole moment is a _____**(Vector quantity.)**

17. The direction of electric dipole moment is _____**(from negative to positive charge)**

18. The angle between dipole moment and electric field along the axial line is _____**(zero degree.)**

19. The angle between dipole moment and electric field along the equatorial line is ____(π or 180^0.)

20. According to Gauss theorem, Total outward electric flux over a closed surface is equal to $\frac{1}{\epsilon_0}$ times the _____ enclosed by it.(**net charge)**

21. Electric charge is _____**(Conserved, quantized.)**

22. When an electric dipole $\vec{P}$ is placed in a uniform electric field $\vec{E}$ then angle between $\vec{P}$ and $\vec{E}$ for maximum value of torque _____(90^0)

23. An electric dipole of moment $\vec{P}$ is placed in a uniform electric field $\vec{E}$, then the torque on the dipole is _____$(\vec{P}\times\vec{E})$

24. The net electric flux due to a dipole is _____**(Zero.)**

25. Two identical metal spheres A and B. If A is given positive charge and B is given equal amount of negative charge then _____**(mass of B increases.)**

26. A dielectric medium is inserted between two similar charges q_1 and q_2 then, electric force between them _____**(decreases.)**

27. Force acting on a charge 'q' placed in an electric field is _____$(F = Eq)$

28. Direction of electric field around a point positive charge is _____from the charge. **(Away)**

29. Electric force between two point charges in presence of dielectric medium is _____. $(F_m = \frac{F_a}{\epsilon_r})$

30. The electric field inside a conductor is _____**(Zero.)**

ELECTROSTATIC POTENTIAL AND CAPACITANCE

MULTIPLE CHOICE QUESTIONS

1. Which of the following statement is not true?
   a) electrostatic force is a conservative force
   b) Potential energy of charge q at a point is the work done per unit charge in bringing a charge from any point to infinity
   c) Spring force and gravitational force are conservative force
   d) Both a and c

2. Work done in bringing a unit positive charge from infinity to a point is:
   a) potential energy b) electrostatic potential c) electric field d) work

3. Which of the following is true for bringing a positive test charge close to a negative charge Q?
   a) $W > 0, V > 0$ b) $W < 0, V > 0$ c) $W < 0, V < 0$ d) None of these

4. Which of the following is not true?
   a) For a point charge, the electrostatic potential varies as 1/r
   b) For a dipole, the potential depends on the position vector and dipole moment vector
   c) The electric dipole potential varies as 1/r at large distance
   d) For a point charge, the electrostatic field varies as $\frac{1}{r^2}$

5. Which of the following is true about electrostatic potential for an electric dipole?
   a) It is inversely proportional to square of distance
   b) It depends upon angle between dipole moment and distance
   c) For distance much greater than dipole length and *l*, potential of a point charge is greater than potential of a dipole
   d) All of the above

6. A dipole is placed in a uniform electric field. Its potential energy will be minimum when the angle between its axis and field is:
   a) 0 b) $\pi/2$ c) π d) 2π

7. For system of charges, the total potential at a point depends upon:
   a) Charges b) position of point with respect to charges c) nature of medium d) All of the above

8. Which of the following is not a equipotential surface?
   a) Sphere with a point charge at its centre b) Infinitely long sheet with charge at the centre
   c) Non-interesting spheres in. case of a dipole d) All of the above

9. Equipotential surfaces:
   a) are closer in regions of large electric fields compared to regions of lower electric fields
   b) will be more crowded near sharp edges of a conductor
   c) will always be equally spaced
   d) Both (a) and (b) are correct

10. What is not true for equipotential surface for uniform electric field?
    a) Equipotential surface is flat
    b) Two equipotential surfaces can cross each other
    c) Electric lines are perpendicular to equipotential surface
    d) Work done is zero

11. A, B and C are three points in a uniform electric field in the direction of electric field respectively. The electric potential is:
    a) maximum at A
    b) maximum at B
    c) maximum at C
    d) same at all the three points A, B and C

12. For constant potential on the surface, the value of electric field is:
    a) Zero
    b) Negative
    c) Positive
    d) Infinity

13. What is the angle between electric field and equipotential surface?
    a) 90^0 always
    b) 0^0 always
    c) 0^0 *to* 90^0
    d) 0^0 *to* 180^0

14. Equipotential at a great distance from a collection of charges whose total sum is not zero are approximately
    a) Spheres
    b) planes
    c) paraboloids
    d) ellipsoids

15. In a certain range, a uniform electric field exists along X-direction. The equipotential surfaces associated with this field will be:
    a) equidistant planes parallel to YZ-plane
    b) equidistant planes parallel to XY-plane
    c) equidistant planes parallel to XZ-plane
    d) Coaxial cylinders of increasing radii around the X-axis.

16. In a region of constant potential:
    a) the electric field is uniform
    b) the electric field is zero
    c) there can be no charge inside the region
    d) Both (b) and (c) are correct

17. work done for bringing a charge q form infinity to a point in space is:
    a) positive
    b) negative
    c) zero
    d) depends on the presence of electric field

18. Which of the following condition leads to negative potential energy between two charges?
    a) One charge is negative and other charge is positive
    b) Repulsive electrostatic force
    c) Both (a) and (b)
    d) None of the above

19. Which of the following angle has minimum potential energy when dipole is placed in uniform potential field?
    a) 0^0
    b) 90^0
    c) 45^0
    d) 180^0

20. Electric field just outside a charged conductor of an arbitrary shape is:
    a) always parallel to the surface of conductor
    b) always perpendicular to the surface of conductor
    c) always zero
    d) directed randomly

21. When a conductor is subjected to electric field, which of the following property it follows?
    a) Electric field is normal to the surface
    b) Electric field is zero in the interior of the conductor
    c) Potential is constant inside the conductor
    d) All the above

22. Which of the following statements is false for a perfect conductor?
   b) The surface of the conductor is an equipotential surface
   c) The electric field just outside the surface of a conductor is perpendicular to the surface
   d) The charge carried by a metallic sphere is always uniformly distributed over its surface
   e) None of the above

22. A charge q is supplied to a metallic conductor. Which is true?
   a) Electric field inside it is same as on the surface
   b) Electric potential inside it is zero
   c) Electric potential on the surface is zero
   d) Electric potential inside it is constant

23. The dipole moment per unit volume is:
   a) polarization b) susceptibility c) surface charge density d) density

24. Which of the following is not a non-polar molecule?
   a) H_2 b) O_2 c) H_2O d) CO_2

25. Which among the following is an example of polar molecule?
   a) H_2 b) O_2 c) N_2 d) HCl

26. Choose the correct statement
   a) Polar molecules have permanent electric dipole moment
   b) CO_2 molecule is a polar molecule
   c) H_2O is a non-polar molecule
   d) The dipole field at large distances falls of as $1/r^2$

27. The SI unit of polarization are:
   a) Cm^2 b) Cm^{-2} c) C^2m d) None of these

28. Due to polarization of an dielectric slab, the value of electric field is:
   a) reduced b) increased c) remains same d) cannot be determined

29. In case of polarization, polarization density is numerically equal to:
   a) electric field b) charge induced per unit area c) dielectric constant d) electrical susceptibility

30. Under what condition, non-polar dielectric behaves as polar dielectric?
   a) In the absence of electric field
   b) In the presence of large external electric field
   c) In the presence of small external electric field
   d) None of the above

31. Capacitance depends upon which of the following factors?
   a) Size and shape of conductor b) Permittivity c) Presence of other conductors nearby d) All the above

32. The ratio of charge to potential of a body is known as:
   a) capacitance b) conductance c) inductance d) resistance

33. If two conducting spheres are separately charged and then brought in contact:
   a) the total energy of the two spheres is conserved
   b) the total charge on the two spheres is conserved
   c) Both the total energy and charge are conserved
   d) the final potential is always the mean of the original potentials of the two spheres

34. The capacity of an isolated conducting sphere of radius R is proportional to:
    a) the potential applied across the plates
    b) radius of the sphere
    c) the thickness of plates
    d) square of radius of the sphere

35. The capacitance of a parallel plate condenser does not depend on:
    a) area of the plates
    b) medium between the plates
    c) distance between the plates
    d) metal of the plates

36. Capacitance of parallel plate capacitor is derived by using:
    a) Gauss's Law
    b) Coulomb's law
    c) Polarization
    d) Electrostatic induction

37. Identify how we can increase the capacitance of a parallel plate capacitor.
    a) Increasing the charge
    b) Decreasing the plate area
    c) Increasing the plate separation
    d) Decreasing the plate separation

38. A parallel plate capacitor is charged. If the plates are pulled apart:
    a) the capacitance increases
    b) the potential difference increases
    c) the total charges increases
    d) the charge and potential difference remain the same

39. The intensity of electric field at a point between the plates of a charged capacitor:
    a) is directly proportional to the distance between the plates
    b) is inversely proportional to the distance between the plate's
    c) is inversely proportional to the square of the distance between the plates
    d) does not depend upon the distance between the plates

40. If dielectric constant and dielectric strength be denoted by K and X respectively, then a material suitable for use as a dielectric in a capacitor must have:
    a) high K and high X
    b) high K and low X
    c) low K and high X
    d) low K and low X

41. When a slab of dielectric material is introduced between the parallel plates of a capacitor which remains connected to a battery, then charge on plates relative to earlier charge:
    a) is same
    b) is more
    c) may be less or more depending on the nature of the material introduced
    d) is less

42. When a dielectric material is introduced between the plates of a charged condenser then electric field between the plates:
    a) Decreases
    b) increases
    c) remain constant
    d) first increases then decreases

43. When number of capacitors are connected in parallel, which quantity remains constant:
    a) common potential difference
    b) charge
    c) capacitance
    d) energy

44. If n number of capacitors are connected in series and then in parallel, then their ratio of capacitance is:
a) 1 : 1 b) $1:n^2$ c) $n^2:1$ d) None of these

45. In a charged capacitor, the energy resides:
a) in the positive charges b) both in the positive and negative charges
c) in the electric field between the plates d) around the edge of the capacitor plates

46. Which form of energy is stored in a capacitor during its charging?
a) Chemical energy b) Heat energy c) Electrical potential energy d) Sound energy

47. Energy density in capacitor depends upon:
a) electric field b) nature of medium c) energy stored in capacitor d) All of the above

48. A battery is used to charge a parallel-plate capacitor, after which it is disconnected. Then the plates are pulled apart to twice their original separation. This process will double the:
a) Capacitance b) surface charge density on each plate
c) stored energy d) electric field between the two plates

49. An air capacitor is connected to a battery. The effect of filling the space between the plates with a dielectric is to increase:
a) the charge and the potential difference b) the potential difference and the electric field
c) the electric field and the capacitance d) the charge and the capacitance

Solutions:

1	2	3	4	5	6	7	8	9	10
b	b	b	c	d	a	c	b	b	b
11	12	13	14	15	16	17	18	19	20
a	a	a	a	a	d	d	a	a	b
21	22	23	24	25	26	27	28	29	30
d	d	d	a	c	d	a	b	a	b
31	32	33	34	35	36	37	38	.39	40
b	d	a	b	d	d	a	d	b	d
41	42	43	44	45	46	47	48	49	50
a	b	a	a	b	c	c	d	c	d

CURRENT ELECTRICITY

Multiple choice questions

1. Unit of electric current is,
   a. ampere b. coulomb. c. volt d. ohm

2. Rate of flow of charges inside the conductor when the potential difference is applied across the conductor is called,
   a. Electric current b. electric flux c. electric charge d. electric field

3. The positive temperature coefficient of resistance is for
   a. carbon b. germanium c. copper d. an electrolyte

4. The reciprocal of resistance is
   a. conductance b. resistivity c. voltage d. None of these

5. Resistance of a conducting wire is directly proportional to
   a. Length b. area of cross section c. thickness d. surface area

6. Resistivity of a wire depends on,
   a. Free electron density
   b. Area of cross section of the wire.
   c. length of the wire.
   d. resistance of the wire.

7. Conductivity is the reciprocal of
   a. Resistivity b. resistance c. conductance d. conductivity.

8. As the temperature increases, resistivity of the material of a conducting wire,
   a. Decreases b. increases c. remains same d. may increase or decrease.

9. Nichrome is generally used for making standard resistors because,
   a. It has high temperature co efficient of resistance. b) It has low temperature co efficient of resistance.
   c) It has high resistivity. d) It has low resistivity.

10. If the temperature is decreased then the relaxation time of the electrons in the metal
    a. Increases b. decreases c. fluctuates d. remains constant.

11. Drift velocity is given by,
    a. $v_d = -\frac{Ee}{m}\tau$ b. $v_d = \frac{Ee}{m}\tau$ c. $v_d = -\frac{Ee}{m\tau}$ d. $v_d = \frac{Ee}{m\tau}$

12. Unit of resistivity is,
    a. Ωm b. Ωm^{-1} c. Ωm^2 d. Ωm^{-2}

13. Mobility of electrons is given by

a. $\frac{Eer}{m}$ b. $\frac{er}{m}$ c. $\frac{mr}{ne^2}$ d. $\frac{m}{er}$

14. Unit of mobility of electron is

a. $\frac{m^2}{Vs}$ b. $\frac{m}{Vs}$ c. $\frac{m^2}{vs^2}$ d. ms^{-1}

15. Unit of resistance is,

a. Ω b. μ c. Ω^{-1} d. VA

16. Colour code of a resistor is Brown-Black-Red-Silver. Then tolerance is

a. 5% b. 10% c. 15% d. 20%

17. Unit of potential difference is,

a. volt b. ampere c. coulomb d. henry.

18. When two unequal resistors are connected in series then equivalent resistance is

a. Less than the maximum value of two resistors
b. More than the maximum value of two resistors
c. Less than the minimum value of two resistors
d. More than the minimum value of two resistors

19. In the series combination of resistance,

a. Current through all the resistor is same
b. Potential difference across all the resistors is same.
c. both current and potential difference remains same.
d. Both current and potential difference is different in all the resistors.

20. If n equal resistors of resistance R are connected in series, then equivalent resistance of combination is,

a. nR b. $\frac{n}{R}$ c. $\frac{R}{n}$ d. n^2R

21. If n equal resistors of resistance R are connected in parallel, then equivalent resistance of combination is,

a. nR b. $\frac{n}{R}$ c. $\frac{R}{n}$ d. n^2R

22. The current inside cell is carried by

a. Positive ions b. negative ions c. both a and d. electrons

23. In the parallel combination of resistance,

a. Current through all the resistor is same
b. Potential difference across all the resistors is same.
c. both current and potential difference remains same.
d. Both current and potential difference is different in all the resistors.

24. When two unequal resistors are connected in parallel then equivalent resistance is
    a. Less than the maximum value of two resistors
    b. More than the maximum value of two resistors
    c. Less than the minimum value of two resistors
    d. More than the minimum value of two resistors

25. Potential difference between two electrodes when no current is flowing through the circuit is called,
    a. EMF b. potential difference c. voltage d. current

26. When two cells are connected in series, then
    a. EMF increases and internal resistance decreases.
    b. EMF decreases and internal resistance increases.
    c. Both EMF and internal resistance increases.
    d. Both EMF and internal resistance decreases.

27. Ohm-meter is the unit of
    a. Resistivity b. resistance c. conductivity d. conductance.

28. Current through the circuit can be measured by
    a. Ammeter b. voltmeter c. ohmmeter d. galvanometer.

29. Potential difference between the ends can be measured by
    a. Ammeter b. voltmeter c. galvanometer d. ohmmeter.

30. Resistance of a conductor can be measured by using
    a. Meter bridge b. potentiometer c. voltmeter d. ammeter

31. Which of the following is vector quantity?
    a. Current density b. Current c. Wattless current d. Power

32. Which material is used for an electric fuse wire?
    a. Its specific resistance b. Its radius c. Its length d. Current flowing through it

33. When two cells are connected in parallel, then
    a. EMF remains same and internal resistance decreases.
    b. EMF decreases and internal resistance increases.
    c. Both EMF and internal resistance increases.
    d. Both EMF and internal resistance decreases.

34. If n cells of equal EMF "E" are connected in series, then, equivalent EMF is
    a. nE b. n^2E c. $\frac{E}{n}$ d. $\frac{E^2}{n}$

35. If n cells of equal EMF "E" and equal internal resistance "r" are connected in parallel then, equivalent EMF is

a. E b. n^2E c. $\frac{E}{n}$ d. $\frac{E^2}{n}$

36. If n cells of equal EMF "E" and equal internal resistance "r" are connected in parallel then, equivalent internal resistance is

a. nr b. n^2r c. $\frac{n}{r}$ d. $\frac{r}{n}$

37. If n cells of equal EMF "E" and equal internal resistance "r" are connected in series then, equivalent internal resistance is

a. nr b. n^2r c. $\frac{n}{r}$ d. $\frac{r}{n}$

38. EMF of a cell is equal to potential difference when,

b. External resistance is zero
c. External resistance is minimum
c. internal resistance is minimum.
d. external resistance is infinity.

39. When galvanometer and battery are interchanged in a balanced wheat stones network, then

a. The bridge is still balanced
b. May or may not be balanced.
c. the bridge is not balanced.
d. no current flows through the circuit.

40. Identify the material commonly used for making coil of a resistance box

a. molybdenum b. manganese d. manganin d. magnesium

41. Unit of electrical power is,

a. watt b. joule c. volt/ampere d. ohm

42. Power dissipated (P_c) in the connecting wires of resistance R is given by

a. $\frac{P^2R}{V^2}$ b. VI c. $\frac{V^2}{R}$ d. I^2R

43. Current density is,

a. Scalar b. vector c. dimension less quantity d. unit less quantity.

44. Current through a wire per unit area is called,

a. Electric charge.
b. surface density of charge.
c. current density.
d. electric current.

45. Which of the following represents ohms law in vector form?

a. $j = \sigma E$ b. $j = \rho E$ c. $V = IR$ d. $E = jR$

46. Materials used for making standard resistors should have

a. High temperature coefficient of resistance
b. High resistivity
c. low temperature coefficient of resistance.
d. low resistivity.

47. The resistance offered by the electrolyte of the cell for the flow of charges is called,

a. Internal resistance
b. external resistance.
b. Conductance
d. EMF

48. Which of the following is non ohmic device?

a. Diode b. lamp filament c. copper wire d. carbon resistor

49. For higher sensitivity which of the following is essential for the potentiometer?

a. Larger length of the potentiometer
c. higher resistivity of the potentiometer
b. Higher emf of the primary battery
d. none of these.

50. Watt hour meter measures

a. Electrical energy b. power c. voltage d. current.

Solutions:

1	2	3	4	5	6	7	8	9	10
a	a	c	a	a	a	a	a	b	A
11	12	13	14	15	16	17	18	19	20
a	a	b	a	a	b	a	b	a	A
21	22	23	24	25	26	27	28	29	30
c	c	b	c	a	c	a	a	b	A
31	32	33	34	35	36	37	38	39	40
a	a	a	a	a	d	a	d	a	c
41	42	43	44	45	46	47	48	49	50
a	a	b	c	a	c	a	a	a	a

MOVING CHARGES AND MAGNETISM

Multiple choice questions

1. A charge q interacts with electric field E. Then the magnitude of force F experienced by it is givenby,
   a) $F = q^2E$ b) $F = qE$ c) $F = \frac{q^2}{E}$ d) $F = \frac{q}{E}$

2. A charge q interacts with electric field E. Then the direction of force F experienced by it is,
   a) Perpendicular to E b)) Parallel to E c) Anti-parallel to E d) At 60^0 to E

3. A charged particle experiences magnetic force in the presence of uniform magnetic field. Identifythe correct statement:
   a) The particle moving parallel to the magnetic field.
   b) The particle moving perpendicular to the magnetic field.
   c) The particle is at rest in the magnetic field.

4. A charge q moving with a velocity v interacts with magnetic field B at an angle θ. Then the magnitude of force F experienced by it is given by,
   a) $F = q^2vB\sin\theta$ b) $F = q^2vB\cos\theta$ c) $F = qvB\sin\theta$ d) $F = qvB\cos\theta$

5. A charge q moving with a velocity v parallel to magnetic field B. Then the magnitude of force F experienced by it is,
   a) Infinite b) Zero c) $F = qvB$ d) $F = qvB^2$

6. A charge q moving with a velocity v perpendicular to magnetic field B. Then the magnitude of force F experienced by it is,
   a) Infinite b) Zero c) $F = qvB$ d) $F = qvB^2$

7. The force on a charged particle moving in a magnetic field is maximum when the angle between the velocity of the charge and the magnetic field is,
   a) 180^0 b) 90^0 c) 45^0 d) 0^0

8. SI unit of magnetic field is,
   a) weber b) farad c) tesla d) newton

9. SI unit of magnetic field is,
   a) $\frac{newton-coulomb}{meter-second}$ b) $\frac{coulomb-meter}{newton-second}$ c) $\frac{meter-second}{coulomb-newton}$ d) $\frac{newton-second}{coulomb-meter}$

10. When the force acting on a unit charge, moving perpendicular to magnetic field B with a speed $1ms^{-1}$, isone newton. Then the magnitude of magnetic field is,
    a) 1 weber b) 1 farad c) 1 tesla d) 1 newton

11. One gauss magnetic field is equal to
a) 10^{-3}tesla b) 10^{-4}tesla c) 10^{-5}tesla d) 10^{-6}tesla

12. The value of earth's magnetic field is about,
a) $3.6\times10^{-3}T$ b) $3.6\times10^{-4}T$ c) $3.6\times10^{-5}T$ d) $3.6\times10^{-6}T$

13. The force on a conductor of length l carrying current I in the presence of external magnetic field B is,
a) $F = I\left(l \times B\right)$ b) $F = I\left(I \times B\right)$ c) $F = B\left(l \times I\right)$ d) $F = I\left(l \cdot B\right)$

14. The path traced by a charged particle moving perpendicular to uniform magnetic field is,
a) Straight line b) Ellipse c) Parabola d) Circle

15. The path traced by a charged particle having velocity component along uniform magnetic field is,
a) Straight line b) Helical c) Parabola d) Circle

16. The radius of the circle described by the charged particle moving perpendicular to uniform magnetic field is directly proportional to,
a) mass of the particle. b) speed of the particle.
c) charge of the particle. d) both mass and speed of the particle.

17. The radius of the circle described by the charged particle moving perpendicular to uniform magnetic field is directly proportional to,
a) charge b) magnetic field c) Centripetal force d) momentum

18. The angular frequency of the charged particle moving perpendicular to uniform magnetic filed in a circular path is independent of
a) velocity b) mass c) charge d) magnetic field

19. In cyclotron, charged particle is always accelerated due to
a) mass b) frequency c) magnetic field d) electric field

20. In cyclotron, the path traced by a charged particle is,
a)) Helical b) Spiral c) Parabola d) Circular

21. In an uniform magnetic field, a charged particle is moving in a circle of radius $\boldsymbol{R}$ with constant speed $\boldsymbol{v}$. The period of the motion
a) depends on $\boldsymbol{v}$ and not on $\boldsymbol{R}$ b) depends on both $\boldsymbol{R}$ and $\boldsymbol{v}$
c) independent of both $\boldsymbol{R}$ and $\boldsymbol{v}$ d) depends on $\boldsymbol{R}$ not on $\boldsymbol{v}$

22. Cyclotron is not used in
a) bombard nuclei with energetic particles b) implant ions into solids
c) velocity selector d) hospitals to produce radioactive substances

23. Field at the centre of a circular coil of radius R, through which a current I flows is,
a) Directly proportional to R b) Inversely proportional to I
c) Directly proportional to I d) Directly proportional to I^2

24. According to Biot-Savart's law, the magnitude of the magnetic field due to current element is inversely proportional to
a) the current I b) the element length dl
c) the square of the distance r d) the angle between dl and r

25. In SI the value of permeability of free space μ_0 is,
a) $4\pi \times 10^{-7} TmA^{-1}$ b) $2\pi \times 10^{-7} TmA^{-1}$ c) $10^{-7} TmA^{-1}$ d) $\pi \times 10^{-7} TmA^{-1}$

26. The speed of light in vacuum in terms of permittivity and permeability of free space is given by,
a) $c = \sqrt{\frac{\varepsilon_0}{\mu_0}}$ b) $c = \frac{1}{\sqrt{\varepsilon_0 \mu_0}}$ c) $c = \sqrt{\varepsilon_0 \mu_0}$ d) $c = \sqrt{\frac{\mu_0}{\varepsilon_0}}$

27. Curl the palm of right hand around the circular wire with the fingers pointing in the direction of the current. Then the direction of the magnetic field due to this current loop is given by
a) left-hand thumb b) right-hand thumb c) left-hand forefinger d) left-hand forefinger

28. The magnitude of magnetic field at a distance r outside the straight infinite current-carrying wire is given by,
a) $B = \frac{2\pi r}{\sqrt{\mu_0 I}}$ b) $B = \frac{2\pi I}{\sqrt{\mu_0 r}}$ c) $B = \frac{\mu_0 I}{2\pi r}$ d) $B = \frac{\mu_0 r}{2\pi r}$

29. The force between two parallel conductors carrying currents in the same direction is,
a) attractive b) repulsive c) zero d)) infinite

30. The magnitude of the force per unit length between two parallel conductors carrying currents I_a and I_b is given by,
a) $f = \frac{\mu_0 I_a I_b}{2\pi d}$ b) $f = \frac{\mu_0}{2\pi d}$ c) f = I (l x B) d) $f = \frac{2\pi d}{\mu_0 I_a I_b}$

31. The force between two very long, straight, parallel conductors carrying 1ampere current and placedone metre apart in vacuum is,
a) $2\pi \times 10^{-7} Nm^{-1}$ b) $2\times 10^{-7} Nm^{-1}$ c) $2\pi \times 10^{-7} Nm$ d) $2\times 10^{-7} Nm$

32. In a solenoid, with n number of turns per unit length and carrying current I, the magnetic field insideit is,
a) $B = \mu_0 nI$ b) $B = 2\pi nI$ c) $B = \varepsilon_0 nI$ d) $B = nI$

33. In an ideal toroid, the magnitude of magnetic field inside the toroid is,
a) Zero b) infinite c) varying d) constant

34. When a steady current of **1A** is set up in a conductor, the quantity of charge that flows through its cross-section in **1s** is,

a) one farad b) one coulomb c) one henry d) one volt

35. Magnetic moment of the current loop is equal to

a) *current × radius of theloop* b) *Current × area of theloop*

c) *Current × length of theloop* d) *Current × diameter of theloop*

36. SI unit of magnetic moment is,

a) Am b) Am^2 c) Am^{-1} d) Am^{-2}

37. Torque experienced by a current loop of magnetic moment m in an uniform magnetic field B is expressed as,

a) $\tau = m + B$ b) $\tau = m - B$ c) $\tau = m \cdot B$ d) $\tau = m \times B$

38. When the magnetic moment m of a current loop is either parallel or antiparallel to the magnetic field B, the value of torque is

a) zero b) infinite c) finite but no zero d) negative

39. Magnetic moment of an electron does not depends on

a) angular momentum b) velocity of electron

c) radius of electron orbit d) permittivity of free space

40. Gyromagnetic ratio of an electron is defined as

a) $\frac{magnetic\ moment}{angular\ momentum}$ b) $\frac{angular\ momentum}{magnetic\ moment}$ c) $\frac{torque}{magnetic\ moment}$ d) $\frac{magnetic\ moment}{torque}$

41. The value of gyromagnetic ratio of an electron is

a) $8.8\times10^{10}\,C\,kg^{-1}$ b) $1.6\times10^{-19}C$ c) $9.1\times10^{-31}kg$ d) $1.76\times10^{11}\,C\,kg^{-1}$

42. The value of Bohr magneton

a) $8.8\times10^{10}\,C\,kg^{-1}$ b) $1.6\times10^{-19}C$ c) $9.1\times10^{-31}kg$ d) $9.27\times10^{-24}\,Am^2$

43. Deflection produced in a given galvanometer varies with

a) current b) area of coil c) magnetic field d) Resistance of coil

44. The resistance of an ideal voltmeter is,

a) zero b) very low c) very high d) infinite

45. The resistance of an ideal ammeter is,

a) zero b) very low c) very high d) infinite

46. To convert a galvanometer into voltmeter, we must connect a,
a) low resistance in series. b) high resistance in parallel.
c) low resistance in parallel. d) high resistance in series.

47. To convert a galvanometer into ammeter, we must connect a,
a) low resistance in series. b) high resistance in parallel.
c) low resistance in parallel. d) high resistance in series.

48. The current sensitivity of the galvanometer is defined as,
a) deflection per unit current b) full scale deflection current
c) current per unit deflection d) deflection for given current

49. If double the number of turns of coil of a galvanometer, then the current sensitivity will
a) remain same b) double c) halved d) triple

50. If double the number of turns of coil of a galvanometer, then the voltage sensitivity will
a) remain same b) double c) halved d) triple

Solutions:

1	2	3	4	5	6	7	8	9	10
b	b	b	c	b	c	b	c	d	c
11	12	13	14	15	16	17	18	19	20
b	c	a	d	b	d	d	a	d	b
21	22	23	24	25	26	27	28	29	30
c	c	c	c	a	b	b	c	a	a
31	32	33	34	35	36	37	38	39	40
b	a	d	b	b	b	d	a	d	a
41	42	43	44	45	46	47	48	49	50
a	d	c	d	a	d	c	a	b	a

MAGNETISM AND MATTER

Multiple choice questions

1. The word leading stone was given to which ore of Iron.
   a) Magnetite b) Hematite c) Limonite d) Siderite

2. The force that exist between a north pole and south pole of two magnets is
   a) Attractive b) Repulsive c) zero d) neutral

3. The magnetic field lines of a bar magnet are
   a) discontinuous loops b) Continuous loops
   c) begins at north pole and ends at south pole d) escapes to infinity

4. A large number of field lines crossing per unit area indicates
   a) Weak magnetic field b) Strong magnetic field
   c) Zero magnetic field d) Infinite magnetic field

5. The expression for magnetic potential energy is
   a) $mB\cos\theta$ b) $mB\sin\theta$ c) $-mB\cos\theta$ d) $-mB\sin\theta$

6. The torque acting on a magnetic dipole placed in an uniform magnetic field is
   a) $mB\sin\theta$ b) $mB\cos\theta$ c) Zero d) $-mB\sin\theta$

7. The expression representing Gauss law of magnetism is
   a) $\oint_s B.ds \neq 0$ b) $\oint_s B.ds = 0$ c) $\oint_s B.ds = \mu_0 q_m$ d) $\oint_s B.ds = \frac{q_m}{\mu_0}$

8. The strength of the earth's magnetic field is of the order of
   a) 10^{-5} T b) 10^{5} T c) 10^{-17} T d) 10^{-9} T

9. The value of declination at Delhi is
   a) 0^0 41'E b) 0^0 58'W c) 0^0 41'W d) 0^0 58'E

10. Relation between magnetic intensity (H) and magnetisation (M) is
    a) $M = \chi H$ b) $H = \chi M$ c) $M = \frac{H}{\chi}$ d) $M = \frac{\chi}{H}$

11. The value of χ for paramagnetic substance is
    a) small and negative b) small and positive c) large and negative d) large and positive

12. Susceptibility (χ) is small and positive for
    a) Diamagnetic substances b) paramagnetic substances c) ferromagnetic substances d) none of these.

13. If a diamagnetic substance is brought near the south or north pole of a bar magnet, it is
    a) repelled by the north pole and attracted by the south pole
    b) repelled by the south pole and attracted by north pole
    c) attracted by both the poles
    d) repelled by both the poles

14. Curie temperature is the temperature above which
    a) Ferromagnetic material becomes diamagnetic material
    b) Ferromagnetic material becomes paramagnetic material
    c) Paramagnetic material becomes diamagnetic material
    d) Paramagnetic material becomes ferromagnetic material

15. If a paramagnetic material is placed in external non uniform magnetic field it moves from
    a) stronger to weaker field
    b) weaker to stronger field
    c) weaker to weaker field
    d) stronger to stronger field

16. Magnetisation of a paramagnetic material is
    a) Inversely proportional to absolute temperature
    b) Directly proportional to absolute temperature
    c) Directly proportional to temperature on Celcius scale
    d) Inversely proportional to temperature on Celcius scale

17. Which of the following expression gives the Curie's law
    a) $X = C\frac{T}{\mu 0}$
    b) $X = C\frac{\mu 0}{T}$
    c) $T = C\frac{X}{\mu 0}$
    d) $C = T\frac{X}{\mu 0}$

18. Ferromagnetic materials are
    a) strongly attracted by the magnets
    b) weakly attracted by the magnets
    c) strongly repelled by the magnets
    d) weakly repelled by the magnets

19. If a Ferromagnetic material is placed in external non uniform magnetic field it moves from
    a) stronger to weaker field
    b) weaker to stronger field
    c) weaker to weaker field
    d) stronger to stronger field

20. Which of the following materials is used to make permanent magnets
    a) Alnico
    b) soft iron
    c) copper
    d) calcium

21. The materials used to make permanent magnet should possess
    a) High retentivity , low coercivity
    b) Low retentivity, high coercivity
    c) High retentivity, highcoercivity
    d) Low retentivity, low coercivity

22. The material used to make electromagnet should have
    a) High permeability and high retentivity
    b) Low retentivity and low permeability
    c) High permeability and low retentivity
    d) Low permeability and high retentivity

23. Name the material which is not used to make permanent magnet

a) steel b) ticonol c) alnico d) soft iron

24. Electromagnets are used in

a)electric bells b) loudspeakers c) telephone diaphragms d) all of these

25. When a bar magnet of dipole moment m is placed in a uniform magnetic field the force on it is

a) zero b) Infinity c) $mB\sin\theta$ d) $mB\cos\theta$

26. For diamagnetic materials

a) $\mu<\mu_0$ b) $\mu>\mu_0$ c) $\mu = \mu_0$ d) $\mu>>\mu_0$

27. For ferromagnetic materials

a) $\mu<\mu_0$ b) $\mu>\mu_0$ c) $\mu = \mu_0$ d) $\mu>>\mu_0$

28. For paramagnetic materials

a) $\mu<\mu_0$ b) $\mu>\mu_0$ c) $\mu = \mu_0$ d) $\mu>>\mu_0$

29. The value of dip at equator is

a) 0^0 b) 90^0 c) 180^0 d) 60^0

30. The value of dip at poles is

b) 0^0 b) 90^0 c) 180^0 d) 60^0

31. When a bar magnet is suspended freely it comes to rest along

a) Geographic north - south direction b) Geographic south - north direction

c) Geographic east- west direction d) Geographic west - east direction

32. The susceptibility is independent of temperature for

a) Ferromagnetic materials b) Paramagnetic materials c) Diamagnetic materials d) None of these

Solutions:

1	2	3	4	5	6	7	8	9	10	11
a	a	b	b	a	a	a	a	b	a	b
12	13	14	15	16	17	18	19	20	21	22
b	d	b	b	a	b	a	b	a	c	c
23	24	25	26	27	28	29	30	31	32	
d	d	a	a	d	b	a	b	a	c	

Fill in the blanks

1. The word magnet is from the Greek word .....(magnesia)
2. Two like magnetic poles .....each other.(repel)
3. A bar magnet is equivalent to .....(solenoid)
4. The magnetic field of earth arise due to .....effect.(dynamo effect)
5. The location of the north magnetic pole is at a latitude of .....(79.74^0N)
6. The pole near the geographic north pole of earth is called .....(north magnetic pole)
7. The angle between the true geographic north and north shown by compass needle is called .....(declination)
8. The angle of dip is also known as .....(Inclination)
9. Declination is minimum at .....(equator)
10. Unit of magnetization is .....(Am^{-1})
11. χ (susceptibility) is large and positive for .....materials. (ferromagnetic materials)
12. Aluminium is an example for .....material.(paramagnetic material)
13. The meaning of the word hysteresis is.....(lagging behind)
14. The magnetic flux is .....quantity.(scalar)
15. Magnetisation is .....quantity.(vector)
16. SI Unit of magnetic moment.....(Am^2)
17. Magnetic susceptibility is .....quantity.(scalar)
18. SI unit of magnetic intensity is .....(Am^{-1})
19. SI unit of magetic flux is .....(weber)
20. The property of the ferromagnetic material to oppose the removal of residual magnetism is called.....(coercivity)
21. The property of ferromagnetic material to retain magnetism even after the removal of magnetising field is called .....(retentivity)
22. Soft ferromagnets have .....hysteresis loop. (narrow)
23. Hard ferromagnetic materials have .....hysteresis loop. (wide)
24. The dimension of magnetisation M is ----------($[L^{-1}A]$
25. A superconductor is .....by a magnet(repelled)
26. Superconductors show perfect .....(diamagnetism)
27. The phenomenon of perfect diamagnetism in superconductors is known as ..... (Meissner effect)
28. The temperature of transition from ferromagnetic to paramagnetism is called .....(curie temperature)
29. The direction to the magnetic field lines at a given point represents.....(Its direction)
30. Magnetric field lines donot .....(intersect)

ELECTROMAGNETIC INDUCTION

Multiple choice questions

1. The magnetic flux through a plane of area A placed in a uniform magnetic field B is given by
   a) $\phi = B.A = BA\cos\theta$ b) $\phi = BxA = BA\sin\theta$ c) $\phi = B.A = BA\tan\theta$ d) $\phi = B.A = BA\cot\theta$

2. The S.I unit of magnetic flux is
   a) Angstrom b) kgm^{-2} c) Tesla – meter d) Tesla per meter

3. Magnetic flux has
   a) Only direction b) only magnitude c) both direction & magnitude d) sometimes direction

4. The magnitude of induced emf in a circuit is equal to _____of magnetic flux through the circuit.
   a) Time rate of change of electric flux b) Time rate of change of voltage
   c) Time rate of change of time d) Time rate of change of magnetic flux

5. The negative in the faraday-Lenz equation of EMI indicates
   a) Both direction of induced Emf & current b) Only direction of current
   c) Magnitude of induced Emf d) Magnitude of current

6. Lenz law of EMI is consistent with
   a) Law of conservation of momentum b) Law of conservation of energy
   c) Law of conservation of mass d) Law of conservation of potential

7. The induced E.M.F produced by moving a conductor in a magnetic field is called
   a) Notional emf b) motional emf c) static emf d) direct emf

8. Force acting on a stationary charged conductor is
   a) $F = qv$ b) $F = q(E + [v \times b])$ c) $F = qe$ d) $F = qEVB$

9. The phenomenon of eddy current was discovered by
   a) Faraday b) Lenz c) Foucault d) Fresnel

10. Eddy currents are induced in bulk conductors due to charging _____ flux
    a) Electric b) magnetic c) both electric & magnetic d) current

11. The phenomenon of eddy currents can be explained on basis of
    a) Interference b) EMI c) Electric induction d) polarization

12. The dimension of inductance is
    a) $[MLT^{-1}A^{-1}]$ b) $[ML^2T^{-2}A^{-2}]$ c) $[M^3LT^2A]$ d) $[ML^2T^2A^2]$

13. The emf in a.c. generator is maximum when armature rotation angle θ is
    a) 0^0 b) 180^0 c) 270^0 d) 360^0

14. The frequency of armature in a.c. generator in USA is
    a) 50 Hz b) 60 Hz c) 40 Hz d) 220 Hz

15. The induced charge in EMI is independent of
    a) Resistance of coil b) change of flux c) time d) none of these

16. The instrument constructed based on EMI is
    a) Galvanometer b) voltmeter c) electric motor d) generator

17. The self inductance of a coil is independent of
    a) Induced voltage b) time c) current d) coil resistance

18. Rule used to identify the direction of current induced in a wire moving in a magnetic field is
    a) Ampere rule b) Fleming left hand rule c) Fleming right hand rule d) Lenz law

19. Two coils are placed closed to each other. The mutual inductance of pair of cots depends on
    a) Rate of changes of currents in coils b) Materials of wires of coils
    c) Relative position & orientation of two coils d) The currents in two coils

20. One henry is
    a) weber/ampere b) weber/volt c) weber-ampere d) volt-ampere

21. The magnate flux ϕ linked with a coil is related to numbers of turns N of coil as
    a) $\phi \propto N$ b) $\phi \propto 1/N$ c) $\phi \propto N^2$ d) $\phi \propto 1/N^2$

22. The coefficient of self inductance of coil is
    a) $L = I/\phi$ b) $L = \phi/I$ c) I d) ϕ

23. The phase difference between the flux linkage and E.m.f in a rotating coil in a uniform magnetic field is
    a) Zero b) $\pi/4$ c) $\pi/2$ d) π

24. The magnetic flux linked with a coil is inversely prepositional to
    a) Magnetic field b) area of cross sector c) number of turns d) diameter of wire

25. The energy stored in a 50 mH inductor carrying 4 amp current is
    a) 0.1 J b) 0.4 J c) 0.04 J d) 0.01 J

26. Two coils 2 mH and 8 mH are close together that effective flux in one coil is completely linked with other. The mutual inductance is
    a) 4mH b) 16 mH c) 10 mH d) 6mH

27. The phase in which eddy currents are produced in a conductor is inclined to the plane of magnetic field at an angle of

a) 45^0 b) 180^0 c) 90^0 d)0^0

28. An inductor may store energy in

a) Its electric field b) its coil c) its magnetic field d) both magnetic & electric fields

29. If in a galvanometer the coil is wound on a bad conductor, the eddy current will be

a) Maximum b) minimum c) 50% d) zero

30. Induction furnace make use of

a) Self induction b) mutual induction c) electric power d) eddy current

31. The instrument used in faraday experiment is

a) Ammeter b) voltmeter c) galvanometer d) meter bridge

32. The coils in resistance box are made from doubled insulated wire to nullify effect of

a) heating b) pressure c) self induced EMF d) magnetism

33. If number of turns in primary and secondary coils is increased to two times each the mutual inductance is

a) 2 times b) half c) 4 times d) remains unchanged

34. A choke is used as resistance in _____ circuits

a) dc b) ac c) both ac & dc d) neither of ac or dc

Solutions:

1	2	3	4	5	6	7	8	9	10	11	12
a	c	b	d	a	b	b	c	c	b	b	A
13	14	15	16	17	18	19	20	21	22	23	24
c	b	c	d	d	c	c	a	a	b	b	a
25	26	27	28	29	30	31	32	33	34		
b	c	c	c	d	d	c	c	c	b		

ALTERNATE CURRENT

Multiple choice questions

1. In an AC circuit
   a) Average value of current is zero
   b) Average value of square of current is zero
   c) Average power is zero
   d) Phase difference between V & I is zero

2. The peak value of a.c current following through a resistor is
   a) $Io = E_o / R$ b) $I = E / R$ c) $I_o = E_o$ d) $I_o = R / E_o$

3. An A.C. source is connected to a resistive circuit. which of following is true:
   a) Current leades voltage in phase
   b) Current lags voltage is phase
   c) Current and voltage are is same phase
   d) No relation between V & I.

4. With the increase in frequency of A.C. supply, inductive reactance
   a) Decreases
   b) Increases directly with frequency
   c) Increases as square of frequency
   d) Decreases inversely with frequency

5. If the A.C. frequency is made 4 times of the initial value ,the inductive reactance will be
   a) 4 times b) 2 times c) half d) remain same

6. A capacitor blocks
   a) Only DC b) only AC c) DC & AC d) cannot block AC & DC

7. The capacitive reactance in a A.C circuit is
   a) Effective wattage b) effective voltage c) effective resistance due to capacitor d) none of these

8. Which statement is correct about capacitive reactance
   a) Reactance of capacitor is directly proportional to ability to store charge
   b) It is inversely proportional to frequency of a.c
   c) It is measured in farad
   d) It is similar to resistance of a capacitor in D.C circuit.

9. Phase difference between voltage & current in a capacitor in a.c circuit
   a) π b) 0 c) $\pi / 3$ d) $\pi / 2$

10. In LCR Circuit if resistance increases quality factor
    a) Increases finitely b) remain constant c) decreases finitely d) zero

11. With increases in frequency of a.c the impedance of an LCR series circuit
    a) Remains constant
    b) increases
    c) Decreases first become minimum and then increases
    d) decreases

12. If a LCR series circuit is connected to a a.c source, then at resonance the voltage across
    a) R is zero b) R equals the applied voltage c) C is zero d) L equals the applied voltage

13. In a LCR series a.c circuit the circuit
    a) Is always in phase with voltage b) Always lags with voltage
    c) Always leads the voltage d) none of these

14. At resonance frequency, the impedance in series LCR around is
    a) Maximum b) minimum c) zero d) Infinity

15. At resonance frequency the current amplitude in since LCR circuit is
    a) Maximum b) zero c) minimum d) infinity

16. The power factor in a.c circuit is
    a) Unity when circuit contains ideal inductance only
    b) Unity when circuit contains ideal resistance only
    c) Zero when circuit contains ideal resistance only
    d) Unity when circuit contains ideal capacitance only

17. Current in a.c. circuit is wattless if
    a) Inductances is zero b) resistance is zero
    c) current is alternating d) resistance & Inductance both or zero

18. Power factor of a a.c. circuit varies between
    a) 0 & 0.5 b) 0.5 & 1 c) 0 to 1 d) 1 to 2

19. The graph between inductive reactance and frequency is
    a) Parabola b) straight line c) hyperbola d) arc of a circle

20. The transformer voltage induced in the secondary coil of a transformer is due to
    a) Varying electric field b) varying magnetic field
    c) vibration of primary coil d) iron core of transformer

21. A transformer is used to
    a) Convert ac to dc b) convert dc to ac
    c) to produce suitable ac voltage d) obtains suitable dc voltage

22. Transformer are used in
    a) DC circuit only b) AC circuit only c) both AC & DC circuit d) cannot be used in any circuit

23. A transformer is based on the principle of
    a) Self induction b) ampere law c) mutual induction d) coulomb law

24. Quantity that remains unchanged in a transformer is
    a) Voltage b) current c) phase d) frequency

25. The transformer ratio is step up transformer is _____

a) One b) less than one c) grater then one d) variable and not decided

26. The core of transformer is laminated to reduce

a) Flux leakage b) copper less c) hysteresis d) eddy current

27. The formula to find Q – factor of series LCR circuit is

a) $Q = \frac{1}{R}\sqrt{\frac{C}{L}}$ b) $Q = \frac{1}{2}\sqrt{\frac{C}{L}}$ c) $Q = \frac{1}{C}\sqrt{\frac{R}{L}}$ d) $Q = \frac{1}{R}\sqrt{\frac{L}{C}}$

28. The peak value of a,c voltage an a 220 V mains is _____ volts

a) $200\sqrt{2}$ b) $230\sqrt{2}$ c) $220\sqrt{2}$ d) $240\sqrt{2}$

Solutions:

1	2	3	4	5	6	7	8	9	10
a	a	c	b	a	a	c	b	d	c
11	12	13	14	15	16	17	18	19	20
a	b	d	b	a	b	b	c	b	b
21	22	23	24	25	26	27	28		
c	b	c	d	c	d	d	c		

ELECTROMAGNETIC WAVES

Multiple choice questions

1. Maxwell in his famous equations of electromagnetism introduced the concept of:
   a) Ac current b) Displacement current c) Impedance d) Reactance

2. A plane electromagnetic wave travels in free space along X-direction. If the value of B (in tesla) at a particular point in space and time is 1.2×10^{-8} k, the value of E (inVm^{-1}) at that point is
   a) 1.2 j b) 3.6 k c) 1.2 k d) 3.6 j

3. If a variable frequency ac source is connected to a capacitor, then with decreased in frequency the displacementcurrent will:
   a) Increase b) Decrease c) Remains constant d) First decrease then increase

4. Displacement current goes through the gap between the plates of a capacitor when the charge on the capacitor
   a) is changing with time b) is decreases c) does not change d) decreases to zero

5. The conduction current is same as displacement current when source is
   a) Ac only b) Dc only c)Either ac or dc d) Neither dc nor ac

6. IF μ_0 be the permeability and ε_0 be the permittivity of a medium, then its refractive index is given by
   a) $1/\sqrt{\mu_0\varepsilon_0}$ b) $1/\mu_0\varepsilon_0$ c) $\sqrt{\mu_0\varepsilon_0}$ d) $\mu_0\varepsilon_0$

7. A plane electromagnetic wave travels in vacuum along z- direction. If the frequency of the wave is 40MHz thenits wavelength is
   a) 5 m b) 7.5 m c)8.5m d) 10 m

8. The source of electromagnetic waves can be charge, when:
   a) Moving with a constant velocity b) Moving in a circular orbit
   c) Falling in an electric field d) Both (b) and (c)

9. A radio can tune to any station in 7.5 MHz to 12 MHz band. The corresponding wavelength band is:
   a) 40 m to 25 m b) 30 m to 25 m c) 25 m to 10 m d)10 m to 5 m

10. Which of the following is not true for electromagnetic waves?
    a) They transport energy. c) They travel at different speeds in air depending on their frequency.
    b) They have momentum. d) They travel at different speeds in medium depending on their frequency

11. The amplitude on an electromagnetic wave in vacuum is doubled with not other changes made to the wave. As aresult of this doubling of the amplitude, which of the following statement is correct?
    a) The speed of wave propagation changes only b) The frequency of the wave changes only
    c) The wavelength of the wave changes only d) None of these.

12. The ratio of amplitude of magnetic fields to the amplitude of electric fields for an electromagnetic wave propagating in vacuum is equal to
    a) The speed of light in vacuum
    b) Reciprocal of speed of light in vacuum
    c) The ratio of magnetic permeability to the electric susceptibility of vacuum
    d) Unity

13. Which of the following rays is not an electromagnetic wave?
    a) X-rays
    b) γ-rays
    c) β-rays
    d) Heat rays

14. We consider the radiation emitted by the human body. Which one of the following statements is true?
    a) The radiation emitted is in the infrared region.
    b) The radiation is emitted only during the day
    c) The radiation is emitted during the summers and absorbed during winter.
    d) The radiation emitted lies in the ultraviolet region a hence is not visible.

15. The part of the spectrum of the electromagnetic radiation used to cook food is
    a) Ultraviolet rays
    b) Cosmic rays
    c) X rays
    d) Microwaves

16. The decreasing order of wavelength of infrared, microwave, ultraviolet and gamma rays is
    a) Microwave, infrared, ultraviolet, gamma rays
    b) Infrared, microwave, ultraviolet, gamma rays
    c) gamma rays, ultraviolet, infrared, microwave
    d) Microwave, gamma rays, infrared, ultraviolet

17. Which waves are used in sonography?
    a) Microwaves
    b) Infrared rays
    c) Radio waves
    d) Ultrasonic

18. Which of the following electromagnetic wave is used in high precision application like LASIK eye surgery?
    a) Microwave
    b) Ultraviolet rays
    c) Gamma rays
    d) X-rays

19. The ultra-high frequency band of radio waves in electromagnetic wave is used as in
    a) Television waves
    b) Cellular phone communication
    c) Commercial FM radio
    d) Both (a) and (c)

20. Which of the following electromagnetic waves has smallest wavelength?
    a) X-rays
    b) Microwaves
    c) γ-rays
    d) Radio waves

21. A. Wavelength of microwaves is greater than that of ultraviolet rays.
    B. The wavelength of infrared rays is lesser than the ultraviolet rays.
    C. The wavelength of microwaves is lesser than the that of infrared rays
    D. Gamma ray has shortest wavelength in the electromagnetic spectrum
    (a) A and B are true
    b) B and C are true
    c) C and D are true
    d) A and D are true

22. Which of the following electromagnetic waves is used in medicine to destroy cancer cells?
    a) IR-rays
    b) Visible rays
    c) Gamma rays
    d) Ultraviolet rays

23. X-rays and γ -rays of same energies are distinguished by their
a) Frequency b) Charges c) Ionizing power d) Method of production

24. The crystal structure can be studies by using
a) UV rays b) X-rays c) IR radiation d) Microwaves

25. The waves used by artificial satellites for Communication is
a) Microwaves b) Infrared waves c) Radio waves d) X-rays

26. Which of the following electromagnetic wave play an important role in maintaining the earth's warmth or averagetemperature through the greenhouse effect
a) Visible rays b) Infrared waves c) Gamma rays d) Ultraviolet rays

27. If v_g v_x and v_m are the speed of gamma rays, X- rays and microwaves respectively in vacuum, then
a) $v_g < v_x < v_m$ b) $v_g > v > v_m$ c) $v_g > v_x < v_m$ d) $v_g = v_x = v_m$

28. Frequency of radiations arising from two close energy levels in hydrogen. Known as lamb shift is 1057 MHzThis frequency falls in which range of electromagnetic
a) Infrared rays b) X-rays c) γ -rays d) Radio waves

29. X-rays, gamma rays and microwaves travelling in vacuum have
a) Same wavelength but different velocities b) Same frequency but different velocities
c) Same velocities but different wavelengths d) Same velocities and same frequency

30. Radio waves diffract around buildings, although light waves do not. The reason is that radio wave
a) Travel with speed larger than c b) Have much larger wavelength than light
c) Are not electromagnetic waves d) None of these

Solutions:

1	2	3	4	5	6	7	8	9	10
b	d	b	a	c	c	b	d	a	c
11	12	13	14	15	16	17	18	19	20
d	b	c	a	d	a	d	b	b	c
21	22	23	24	25	26	27	28	29	30
d	c	d	b	a	b	d	d	c	b

RAY OPTICS AND OPTICAL INSTRUMENTS

Multiple choice questions

1. A monochromatic beam of light passes from a denser medium to a rarer medium. As a result
   a) Its velocity increases b) Its velocity decreases
   c) Its frequency decreases d) Its frequency increases

2. Critical angle of light passing from glass to air is minimum for
   a) Red b) Green c) Yellow d) Violet

3. Sin I / Sin r = constant. The value of this constant depends on
   (A) Pair of medium (B) Colour of incident light (C) Wavelength (D) Refracting nature of material
   a) only on A b) only on B c) only on A & D d) A, B, C & D

4. Which of the following is not the case with image formed by a plane mirror
   a) It is erect b) it is virtual c) it is diminished d) it is at the same distance.

5. The rear-view mirror of a car is
   a) Plane b)Convex c)Concave d) either convex or concave

6. A convex mirror is used to forms image of a real object. The wrong statement is
   a) The image lies between the pole and focus b) the image is diminished
   c) the image is erect d) the image is real

7. As the angle of incidence on the first face of a prism increases, the angle of deviation of emergent ray
   a) Increases b) Decrease c) First increases then decreases d) First decreases then increases

8. When a ray of light is refracted by a prism such that the angle of deviation is minimum, then
   a) The angle of emergence is equal to the angle of incidence
   b) The angle of emergence is greater than the angle of incidence
   c) The angle of emergence is smaller than the angle of incidence
   d) The sum of the angle of incidence and the angle of emergence is equal to 90°

9. The path of a refracted ray of light in a prism is parallel to the base of the prism only when the
   a) Light is of a particular wavelength b) Ray is incident normally to one face
   c) Ray undergoes minimum deviation d) Prism is made of a particular type of glass

10. To get a real magnified image in a convex lens, the object position is
    a) In between lens and F b) In between F and 2F c) At 2F d) Beyond 2F

11. The focal length of a lens depends on
    a) Colour of light b) Radius of curvature of the lens c) Material of the lens d) All the above

12. A convex lens made of glass is immersed in water, compared to its power in air, its power in water will
    a) Increase b) Decrease c) Not change d) Decrease for red light increase for violet light

13. Lens maker's formula is applicable to
    a) Thin Lenses and paraxial rays which subtend very small angles with the principal axis.
    b) Thick lenses and paraxial rays which subtend very small
    c) Thin lenses and for marginal rays
    d) Thick lenses and for marginal rays

14. A spherical air bubble in water will act as
    a) A convex lens b) A concave lens c) Plane glass plate d) Plano-concave lens

15. Water drop in air acts as a
    a) Concave lens b) Plano concave lens c) Convex lens d) Plano convex lens

16. If a convex lens is dipped in a liquid whose refractive index is equal to their refractive index of the lens, then lens acts like a
    a) Concave lens b) Plane parallel glass plate c) Plano convex lens d) Plano concave lens

17. In a refraction, light waves are bent on passing from one medium to the second medium, because, in the second medium
    a) The speed is different b) the frequency is different
    c) The coefficient of elasticity is different d) the amplitude is smaller

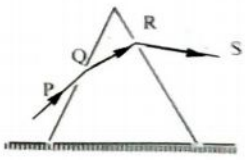
18. Brilliance of diamond is due to
    a) Shape b) Cutting c) Reflection d) Total internal reflection

19. A person sees his virtual image by holding a mirror very close to the face, when he moves the mirror away from his face, the image becomes inverted. What type of mirror he is using?
    a) Plane mirror b) Convex 0mirror c) Concave mirror d) None of these

20. A ray of light is incident normally on a plane mirror. The angle of reflection will be
    a) 0° b) 90° c) will not be reflected d) none of these

21. The image formed by an objective of a compound microscope is
    a) Virtual and enlarged b) Virtual and diminished c) Real and diminished d) Real and enlarged

22. An equilateral prism is placed on a horizontal surface. A ray PQ is incident in to it. For minimum deviation
    a) PQ is horizontal b) QR is horizontal c) RS is horizontal d) Any one will be horizontal



23. A plane mirror produces a magnification of

a) -1 b) +1 c) zero d) between 0 & ∞

24. The minimum distance between the object and its real image of the same size for a concave mirror is

a) f b) 2f c) 4f d) zero

25. Under which of the following conditions will a convex mirror of focal length f produce an image that is erect, diminished and virtual

a) Only when $2f > u > f$ b) only when u = f c) only when $u > f$ d) always

26. The ratio of the refractive index of red light to blue light in air is

a) Less than unity b) equal to unity

c) greater than unity d) less as well as greater than unity depending on the experimental setup

27. Total internal reflection of light is possible when light enters from

a) Air to glass b) Vacuum to air c) Air to water d) Water to air

28. Total internal reflection of a ray of light is possible when (i_c = critical angle, i = angle of incidence)

a) Ray goes from denser medium to rarer medium and $i < i_c$

b) Ray goes from denser medium to rarer medium and $i > i_c$

c) Ray goes from rarer medium to denser medium and $i > i_c$

d) Ray goes from rarer medium to denser medium and $i < i_c$

29. Mirage is a phenomenon due to

a) Reflection of light b) refraction of light c) total internal reflection d) diffraction of light

30. A converging lens is used to form an image on a screen. When upper half of the lens is covered by an opaque screen

a) Half the image will disappear

b) complete image will be formed of same intensity

c) half image will be formed of same intensity

d) complete image will be formed of decreased intensity.

Solutions:

1	2	3	4	5	6	7	8	9	10
a	d	d	c	b	d	d	a	c	b
11	12	13	14	15	16	17	18	19	20
d	b	a	b	c	b	a	d	c	a
21	22	23	24	25	26	27	28	29	30
d	b	b	d	d	a	d	b	c	d

WAVE OPTICS

Multiple choice questions

1. The locus of all the particles in a medium, vibrating in the same phase is called,
   a. Wavelet b. fringe c. wavefront d. fringe width

2. Wavefront is the locus of all points, where the particles of the medium vibrate with the same,
   a. phase b. amplitude c. frequency d. period

3. The phenomena which is not explained by Huygens's construction of wavefront
   a. Reflection b. diffraction c. refraction d. origin of spectra

4. Light waves can be polarized because they,
   a. have high frequencies b. have short wavelength c. are transverse in nature d. can be reflected

5. Transverse nature of light confirmed by the phenomenon of
   a. refraction of light b. diffraction of light c. dispersion of light d. polarization of light

6. Intensity of light depends on
   a. frequency b. wavelength c. amplitude d. velocity

7. The geometrical shape of wavefront that emerges when a plane wave is incident on a thin convex lens is,
   a. converging spherical b. diverging spherical c. spherical wavefront of radius R/2 d. plane

8. In YDSE, the central point on the screen is,
   a. bright b. dark c. first bright and later dark d. first dark and later bright

9. In YDSE, which uses a monochromatic light, the shape of interference fringes, formed on a screen is,
   a. parabola b. straight line c. circle d. hyperbola

10. The geometrical shape of a plane wave, when it emerges out of a thin prism is,
    a. converging spherical b. diverging spherical c. plane d. spherical wavefront of radius R / 2

11. By Huygen wave theory of light, we cannot explain the phenomena of
    a. interference b. diffraction c. polarization d. photoelectric effect

12. Ray diverging from a point source form a wave front that is,
    a. cylindrical b. spherical c. plane d. cubical

13. Astronomical wavelength increase due to doppler's effect known as ,
    a. red shift b. violet shift c. UV shift d. IR shift

14. In interference, we require two sources which emit radiations of,
    a. nearly the same frequency b. the same frequency
    c. different wavelength d. the same frequency and having a definite phase relationship

15. Bending of light at the edges of an obstacle is,
    a. reflection b. refraction c. polarization d. diffraction

16. The limit of resolution of an optical instrument arises on account of,
a. reflection b. diffraction c. polarization d. interference

17. Which of the following phenomena is not common to sound and light waves,
a. interference b. diffraction c. coherence d. polarization

18. Diffracted fringes obtained from the slit aperture are of
a. same width b. different width
c. uniform intensity d. non uniform width and non-uniform intensity

19. R I of material is equal to tangent of polarizing angle it is called,
a. Brewster's law b. Bragg's law c. Malu's law d. Gauss's law

20. Polaroid glass is used in sunglasses because,
a. it is fashionable b. it is cheaper
c. it reduces the light intensity to half on account of polarization d. it has good colour

21. Linearly polarized lights are
a. longitudinal waves b. transverse c. both A and B d. none of these

22. The expression for fringe width of interference pattern in YDSE is,
a. $\beta = \lambda D/d$ b. $\beta = \lambda d/D$ c. $\beta = d/\lambda D$ d. $\beta = D/\lambda d$

23. In the interference pattern energy is
a. created at the position of Maxima b. destroyed at the position of minima c. conserved but is redistributed d. none of the above

24. In YDSE, a minimum is obtained when the phrase difference of superposing wave is,
a. zero b. $(2n - 1)$ c. $n\pi$ d. $(n + 1)\pi$

25. The path difference of destructive interference is,
a. $n\lambda$ b. $n(\lambda + 1)$ c. $(n + 1)\lambda/2$ d. $(2n + 1)\lambda/2$

26. A polaroid produces a strong beam of light which is
a. circularly polarized b. elliptically polarized c. plane polarised d. unpolarised

1	2	3	4	5	6	7	8	9
c	a	d	c	d	c	a	a	b
10	11	12	13	14	15	16	17	18
c	d	b	a	d	d	b	d	d
19	20	21	22	23	24	25	26	
a	c	b	a	c	b	d	c	

Fill in the blanks

1. Surface joining all the particles in same phase is called _____(wavefront)

2. The shape of the wavefront due to a linear source at a finite distance is ___ (spherical)

3. The shape of the wavefront due to a linear source at an infinite distance is____ (plane)

4. Apparent change in the frequency of light wave due to the relative motion between the source and the observer is called____ (Doppler's effect)

5. The distance between two consecutive bright or two consecutive dark fringes in an interference pattern is_____ (fringe width)

6. Modification in the distribution of light energy due to the superposition of two or more wave is __ (interference)

7. Limit of resolution of a telescope is____($d\theta = 1.22\lambda/d$)

8. Limit of resolution of a microscope is_____($dx = 1.22\lambda/2n\sin\beta$)

9. Resolving power of a telescope is_____($d / 1.22\lambda = 1/d\theta$)

10. Resolving power of a microscope is_____($1/dx = 2n\sin\beta /1.22\lambda$)

11. Condition for constructive interference in terms of phase difference is_____($\theta = 2n\pi$)

12. Condition for destructive interference in terms of phase difference is____($\theta = (2n + 1)\pi$

13. Condition for constructive interference in terms of path difference is_____($\delta = n\lambda$)

14. Condition for destructive interference in terms of path difference is_____($\delta = (2n+1)\lambda/2$)

15. One can get total transmission of light through a prism when light is incident on the prism at an angle called __(Brewster's angle)

16. The angle of incidence for which the reflected light is completely plain polarized is called_____ (Brewster's)

17. The relation between RI of a medium and polarizing angle is_____($n = \tan\theta p$)

18. The phenomenon in which the vibrations of light waves are restricted to a particular plane is_____ (polarisation)

19. The expression of Malu's law for the polarisation of light is_____($I = I_0 \cos^2\theta$)

20. The phenomenon which confirms the transverse nature of light_____ (polarisation)

21. ___ Colored light undergoes diffraction to a maximum extent. (red)

22. The angle between the pass axes of two polaroids to get the maximum intensity of transmitted light from the second polaride is_____(0^0)

23. When a Ray of light is incident at polarizing angle on a glass plate, the angle between the reflected ray and refracted ray is_____(90^0)

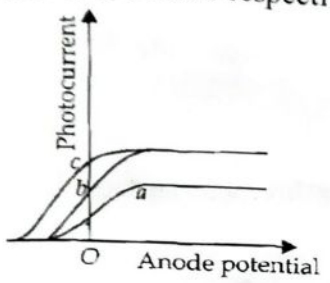
24. The angle of incidence for which the reflected light from a surface is completely plain polarized is called_____(polarising angle)

DUAL NATURE OF RADIATION AND MATTER

Multiple choice questions

1. The minimum energy required for the electron emission form the metal surface can be supplied to the freeelectrons by which of the following physical processes?
   a)Thermionic emission b) Field emission c) Photoelectric emission d) All of these

2. The figure shows the variation of photo current with anode potential for a photo-sensitive surface for three different radiations. Let I_a, I_b and I_c be the intensities and ν_a, ν_b and ν_c be the frequencies of the curves a, b and c respectively.ν



   a) $\nu_a = \nu_b$ and $I_a \neq I_b$ b) $\nu_a = \nu_b$ and $I_a = I_c$ c) $\upsilon_a = \upsilon_c$ and $I_a \neq I_b$ d) $\nu_a = \nu_b$ and $I_a = I_b$

3. A metal surface ejects electrons when hit by green light but none when hit by yellow light. The electrons willbe ejected when the surface is hit by:
   a) Blue light b) Heat rays c) Infrared light d) Red light

4. Which one among the following shows particle nature of light?
   a) Photoelectric effect b) Interference c) Refraction d) Polarization

5. In photoelectric effect, the photocurrent
   a) Depends both on intensity and frequency of the incident light.
   b) Does not depend on frequency of incident light but depends on intensity of the incident light.
   c) Decreases with increase in frequency of incident light.
   d) Increases with increase in frequency of incident light

6. In photoelectric effect, the photoelectric current is independent of
   a) Intensity of incident light b) Potential difference applied between the two electrodes
   c) The nature of emitter material d) Frequency of incident light

7. When the photons of energy hν fall on a photosensitive metallic surface of work function $h\nu_0$, electrons are emitted from the surface. The most energetic electron coming out of the surface have kinetic energy equal to:
   a) hν b) $h\nu_0$ c) $h\nu + h\nu_0$ d) $h\nu - h\nu_0$

8. In photoelectric effect, stopping potential depends on
   a) Frequency of incident light b) Nature of the emitter material
   c) Intensity of incident light d) Both (a) and (b)

9. In a photoelectric experiment, it both the intensity and frequency of the incident light are double, then thesaturation photoelectric current:
   a) Remains constant b) Is halved c) Is doubled d) Becomes four times

10. Which of the following statement is correct regarding the photoelectric experiment?
   a) The photocurrent increases with intensity of light
   b) Stopping potential increases with increase in intensity of incident light.
   c) The Photocurrent increases with increases in frequency.
   d) All of these

11. Photoelectric emission occurs only when the incident light has more than a certain minimum:
   a) Power b) Wavelength c) Intensity d) Frequency

12. The work function for a metal surface is 4.14eV. The threshold wavelength for this metal surface is
   a) 4125Å b) 2062.5Å c) 3000Å d) 6000Å

13. The linear momentum of a 3MeV photon is:
   a) 0.01eV s m^{-1} b) 0.02eV s m^{-1} c) 0.03eV s m^{-1} d) 0.04eV s m^{-1}

14. A proton and an α particle accelerated through the same potential difference. The ratio of de-Broglie wavelength λp to that of $\lambda\alpha$ is
   a) $\sqrt{2} : 1$ b) $\sqrt{4} : 1$ c) $\sqrt{6} : 1$ d) $\sqrt{8} : 1$

15. The de Broglie wavelength of a particle of kinetic energy K is λ. What will be the wavelength of the particle, if its kinetic energy is K / 4
   a) λ b) 2λ c) $\lambda / 2$ d) 4λ

16. The wavelength of matter wave is independent of
   a) Mass b) Velocity c) Momentum d) Charge

17. Which of these particles having the same kinetic energy has the largest de Broglie wavelength?
   a) Electron b) Alpha particle c) Proton d) Neutron

18. In Davisson and Germer experiment, the tungsten filament is coated with.
   a) Aluminum oxide b) Barium chloride c) Titanium oxide d) Barium oxide

19. Wave theory cannot explain the phenomena of
   1. Polarization 2. Diffraction 3. Compton effect 4. Photoelectric effect
   Which of the following is correct?
   a) 1 and 2 b) 2 and 4 c) 3 and 4 d) 4 and 1

20. If h is Planck's constant, the momentum of a photon of wavelength 0.01Å is
a) 10^{-2}h b) h c) 10^{2}h d) 10^{12}h

21. The frequency of incident light falling on a photosensitive plate is doubled, then maximum K.E of the emittedphotoelectrons will become
a) 2 times of the earlier value b) more than 2 times of the earlier value
c) less than 2 times of the earlier value d) Unchanged

22. Graph of maximum K.E of photoelectrons against frequency of radiation incident on metal surface is astraight line of slope given by
a) plank's constant b) work function c) stopping potential d) h / e

23. An electron is placed in a uniform electric field. As the electron moves, its de-Broglie wavelength
a) Increases b) decreases c) remains same d) first increases and then decreases

24. When the light of frequency $2\upsilon_0$ (where υ_0 is threshold frequency) is incident on a metal plate, the maximum velocity of electron emitted is υ_1. When the frequency of the incident radiation is increased to $5\upsilon_0$, the maximum velocity of electrons emitted from the same plate is υ_2. The ratio of υ_1 to υ_2 is
a) 4:1 b) 1:4 c) 1:2 d) 2:1

25. In the Davisson and Germer experiment, the velocity of electrons emitted from the electron gun can beincreased by
a) increasing the potential difference by anode and filament b) increasing the filament current
c) decreasing the filament current d) increasing filament to 2times

26. Which of the following is matched wrongly?
a) Dual nature of matter → de Broglie b) Quantum of charge →Millikan
c) Atomic nucleus → Chadwick d) Uncertainity Principle → Heisenberg

27. Plank's constant has the dimension of
a) Energy b) linear momentum c) Work d) angular momentum

28. The maximum K.E of photoelectrons released when it is stopped by 2V of negative potential is
a) 2J b) 2erg c) 3.2×10^{-19}J d) 3.2×10^{-19}erg

29. The energy equivalent of 0.5g of a substance is
a) 1.5×10^{13} J b) 0.5×10^{13}J c) 4.5×10^{16}J d) 4.5×10^{13}J

30. What is the energy of photon if its wavelength (λ) is 400nm
a) 3.98×10^{-34}J b) 4.98×10^{-34}J c) 4.98×10^{-19}J d) 3.98×10^{-19}J

31. Ratio of energies of two photons whose wavelengths are 600Å and 400Å

a) 2:3 b) 3:2 c) 1:5 d) 5:1

32. What did Einstein prove by the photoelectric effect?

a) $E = h\nu$ b) $KE = \frac{1}{2} mv^2$ c) $E = mc^2$ d) $E = -Rhc^2 / n^2$

33. De-Broglie equation states

a) Dual nature b) particle nature c) wave nature d) none of these

34. If the threshold wavelength for photoelectric effect on sodium metal is 5000Å then find its work function

a) 15J b) 4×10^{-19}J c) 4×10^{-14}J d) 4×10^{-22}J

Solutions:

1	2	3	4	5	6	7
d	a	a	a	b	d	d
8	9	10	11	12	13	14
d	c	a	d	c	a	d
15	16	17	18	19	20	21
b	d	a	d	c	d	A
22	23	24	25	26	27	28
a	b	b	a	c	d	c
29	30	31	32	33	34	
d	c	a	a	c	c	

NUCLEI

Multiple choice questions

1. 1 atomic mass unit(1u) is equal to,
   a. mass of ^{12}C atom
   b. 1/12 th of mass of ^{12}C atom
   c. 12 times mass of ^{12}C atom
   d. mass of electron

2. A nucleus contains
   a. only protons b. only neutrons c. both protons and neutrons d. protons, neutrons and electrons

3. Which of the following statement aboutneutron is false?
   a. free neutron is unstable.
   b. It decays into a proton, an electron and a antineutrino.
   c. inside the nucleus it is stable.
   d. it is lighter than proton.

4. Atomic number of a nucleus is equal to
   a. the number of protons
   b. the number of neutrons
   c. total number of protons andneutrons
   d. its mass number

5. Mass number of a nucleus is equal to
   a. the number of protons
   b. the number of neutrons
   c. total number of protons andneutrons
   d. its mass number

6. If Z is the atomic number and A is the massnumber, then number of neutrons in thenucleus is,
   a. $A + Z$ b. $A - Z$ c. $(A + Z)/2$ d. z

7. Nuclear radius is given by,
   a. $R = R_0 A^{1/3}$ b. $R = R_0 A$ c. $R = R_0 A^2$ d. $R = R_0 A^3$

8. Nuclear density is,
   a. increases with mass number
   b. decreases with mass number
   c. constant and independent ofmass number
   d. different for different isotopes

9. Which of the following about Einstein'sequation $E = mc^2$ is wrong?
   a. mass is another form of energy
   b. mass can be converted to an-other form of energies
   c. mass and energy together areconserved in reactions.
   d. mass and energy are conservedseparately

10. Identify the correct statement
    a. nuclear mass is always less than the total mass of its individual protons and neutrons
    b. nuclear mass is more than the total mass of its individual protons and neutrons
    c. nuclear mass is always equal tothe total mass of its individual protons and neutrons
    d. nuclear mass and atomic masses are same as electrons do not have any mass.

11. Mass defects is,
    a. due to defect in the measuring device
    b. difference between mass of a nucleus and its constituents
    c. defect in measuring the mass of any object
    d. mass that is lost when two particle bombard each other.

12. Identify the wrong statement about binding energy
    a. it is the amount of energy released when protons and neutrons are brought together to form a nucleus.
    b. it is the amount of energy required to separate a nucleus into its nucleons.
    c. binding energy = mass defect $\times c^2$
    d. binding energy is same as rest mass energy of nucleons

13. Binding energy per nucleon
    a. is almost constant and is independent of mass number for $30 < A < 170$
    b. does not depend on mass number A
    c. shows a sharp peak for $A = 238$
    d. decreases with increase in A

14. Maximum value of binding energy per nucleon is,
    a. 13.6eV b. 8.75MeV c. 7.6MeV d. 2eV

15. The value of E_{bn} is lower for both light nuclei ($A < 30$) and heavy nuclei ($A > 170$). This means that,
    a. both light nuclei and heavy nuclei are unstable compared to middle mass number
    b. light nuclei are more stable
    c. heavy nuclei are more stable
    d. all nuclei are stable

16. Nuclear force is short ranged. This means that,
    a. nuclear force acts on small particles only
    b. nuclear force acts for small time only
    c. nuclear force is weaker thanatomic force
    d. Each nucleon inside the nucleus will attract only few of its neighbours

17. Which of the following is not a propertyof nuclear force
    a. It is short range force b. It is saturated
    c. It does not depend on electriccharge d. It act between proton and electron

18. Radioactivity is a nuclear process in which an unstable nucleus decays with the emission of certain radiation. Which of the following is not emitted during radioactivity
    a. alpha particles b. beta particles c. gamma rays d.protons

19. Unit of activity is

a. becquerel b. hertz c. farad d. henry

20. Activity is the

a. number of nuclei disintegratingper unit time b. number of nuclei reacting inunit time

c. number of particles emitted inunit time d. number of energy released perunit time.

21. Half life is

a. half of the total life time of all the nuclei present.

b. time for disintegration of half of the original nuclei present inthe sample.

c. equal to mean life

d. same for all the elements

22. During alpha decay,

a. both atomic number and massnumber decrease by 2

b. atomic number increases by 2 and mass number decreases by4

c. atomic number decreases by 2and mass number decreases by4

d. atomic number decreases by 2and mass number increases by4

23. In β^+ decay,

a. a positron and a neutrino are emitted b. a positron and antineutrino are emitted

c. an electron and a neutrino areemitted d. an electron and a antineutrinoare emitted

24. In β^- decay,

a. a positron and a neutrino are emitted b. a positron and antineutrino are emitted

c. an electron and a neutrino are emitted d. an electron and a antineutrino are emitted

25. Gamma rays are emitted when

a. an atom in an excited state spontaneously decays to itsground state

b. a nucleus in an excited statespontaneously decays to itsground state

c. two nucleus interact with eachother

d. energy is given to a nucleus

26. Nuclear fission is a process in which

a. a small nucleus decays into twoor more large nucleus

b. a light nucleus combines to form a heavy nucleus

c. a heavy nucleus decays into two or more intermediate massfragments

d. a heavy nucleus combines toform even bigger nucleus

27. A nuclear fusion is a process in which

a. light nuclei fuse to form a heavynuclei b. light nuclei splits into two lighter nuclei

c. a heavy nuclei splits into lighter nuclei d. a heavy nuclei fuse to formheavier nuclei

28. The difference between nuclear reactor and nuclear bomb is that,
   a. Reactor works on controlled chain reaction while bomb works on uncontrolled chain reaction
   b. Reactor gives more energy while bomb gives less energy
   c. reactor gives less energy while bomb gives more energy
   d. bomb can be stopped while reactor cannot be stopped

29. The main function of moderator is,
   a. to increase energy of neutrons
   b. to maintain moderate temperature inside the reactor
   c. to accelerate the neutrons
   d. to slow down the neutrons

30. Which of the following is not a moderator?
   a. Water b. heavy water c. graphite d. uranium

31. The operation of a reactor is critical when
   a. multiplication factor $K > 1$
   b. multiplication factor $K < 1$
   c. multiplication factor $K = 1$
   d. multiplication factor $K = 10$

32. A nuclear reactor is surrounded by a reflector to
   a. reduce the leakage of neutrons
   b. increase the temperature ofcore
   c. to reflect light back to the core
   d. slow down the neutrons

33. The source of energy in stars is
   a. nuclear fission b. nuclear fusion c. controlled chain reaction d. uncontrolled chain reaction

34. What is a thermonuclear process?
   a. It is a nuclear fusion achievedby raising the temperature
   b. It is a nuclear fission achievedby raising the temperature
   c. It is a chemical reaction that re-leases high energy
   d. It is a chemical reaction the liberates heat

35. Temperature at the interior of the sun is,
   a. 8000K b. 1.5×10^7 K c. 1.5×10^5 K d. 3×10^9 K

36. Age of the sun is,
   a. 5 million years b. 10 million years c. 2 billion years d. 5 billion years

Solutions:

1	2	3	4	5	6	7	8	9
b	c	d	a	c	b	a	c	D
10	11	12	13	14	15	16	17	18
a	b	d	a	d	a	d	d	D
19	20	21	22	23	24	25	26	27
a	a	b	c	a	d	b	c	A
28	29	30	31	32	33	34	35	36
a	d	d	c	a	b	a	b	d

Fill in the blanks

1. Volume of the nucleus is —— times thevolume of atom(10^{-12})
2. Instrument used to measure atomic massis —— (mass spectrometer)
3. Nuclei having same atomic number butdifferent mass number are called —(isotopes)
4. Nuclei having same numbers of neutronsare called— (isotones)
5. Nuclei having same mass number but different atomic number are called —(isobars)
6. Deuterium and tritium are —(isotopes of Hydrogen)
7. Energy associated with chemical reactions are in terms of few —— (eV)
8. Energy associated with nuclear reactionsare in terms of few —— (MeV)
9. —— discovered neutron. (James Chadwick)
10. — discovered radioactivity. (A H Becquerel)

SEMICONDUCTOR ELECTRONICS

Multiple choice questions

1) An example for elemental Semiconductor
   a) Ge b) Ga c) P d) Al

2) Cathode ray tubes used in television work on the principle of
   a) Vacuum device b) Semiconductor device c) transistor d) voltameter

3) At Ok temperature, the conduction band of Germanium is
   a) Partly filled b) disappeared c) completely empty d) Completely filled

4) The forbidden energy gap in conductors, Semiconductors and insulators are Ec, Es, and Ei, respectively then
   a) $E_c = E_s = E_i$ b) $E_c = E_s > E_i$ c) $E_c < E_s < E_i$ d) $E_c > E_s < E_i$

5) In Semiconductors holes are present in.
   a) Conduction band b) valence band c) forbidden energy gap d) only in depletion region

6) In intrinsic Semiconductors, conductivity is due to
   a) Holes only b) elections only
   c) Both holes and elections d) either holes or electrons depending on temperature of the material.

7) In intrinsic Semiconductors at room temperature the number of elections and holes are
   a) Zero b) Infinite c) Unequal d) equal.

8) An external voltage is applied across the intrinsic Semiconductor Current due to electron and current due to holes are in the
   a) Same direction b) opposite direction
   c) Mutually perpendicular directions d) direction making some angle

9) The pieces of copper and silicon are cooled, the resistances
   a) Both increase b) both decrease
   c) Copper increases and silicon diseases d) Copper decreases and Silicon increases

10) P-type and n-type semiconductor
   a) Electrically neutral b) p-type is the +vely charged and n-type is -vely charged
   c) p-type is the -vely charged and n-type is +vely charged d) both are -vely charged.

11) In n-type Semiconductor, the dopant used.
   a) Trivalent b) monovalent c) tetravalent d) pentavalent

12) In n-type semiconductor, the aditional energy level due to impurity atoms lies
   a) Just below conduction band b) just above valance band
   c) Just below conduction band d) midway between conduction and valance band

13) Barrier potential across the p-n junction
a) opposes the diffusion current
b) supports the diffusion current
c) Opposes the drift current
d) produces no effect on diffusion Current

14) Current is mainly due to holes in the case of
a) p-type semiconductor b) n-type semiconductor c) intrinsic semiconductor d) metals

15) If a small amount of phosphorous is added to Germanium, then it's conductivity
a) becomes zero b) remains unchanged c) decreases d) increases

16) At forward bias 'cut in voltage', the diode offers
a) High resistance b) very low resistance c) infinite resistance d) Zero resistance

17) In reverse bias, the reverse current in the diode is due to
a) Minority carriers
b) majority carriers
c) Both minority and majority carriers.
d) Neither majority nor minority carriers

18) Rectifier circuits convert
a) Unidirectional signal into bidirectional signal
b) bidirectional signal into unidirections Signal
c) Heat into work
d) work into heat

19) Half wave rectifies circuit converts
a) only +ve half cycle of AC indo DC.
b) only -ve half cycle of Ac into DC.
c) Both +ve and -ve half Cycle AC into DC
d) either +ve half cycles or -ve half cycles of AC into DC

20) Output of rectifies circuit is
a) Steady DC b) pulsating DC c) AC d) zero

21) Zener diode is designed to operate under
a) Reverse bias b) forward bias c) any biased condition d) very low voltage

22) Output of filter circuit is
a) Steady DC b) AC c) pulsating DC d) Zero

23) Zener diode is a Semiconductor diode with
a) n-region is doped heavily
b) p-region is doped heavily
c) Both n and p regions are doped lightly
d) both n and p regions are doped heavily

24) Zener diode is a
a) Current regulator b) voltage regulator c) temperature regular d) pressure regulator

25) In photodiode, as intensity of incident radiation increases
a) Forward current increases
b) forward current decreases
c) Reverse current increases
d) reverse current decreases.

26) For detecting intensity of light, we use
a) Photodiode in forward bias
b) LED in forward bias
c) Photodiode in reverse bias
d) LED in reverse bias

27) The frequency of radiation emitted in LED depends on
a) The value of energy gap of the material
b) the value of applied reverse voltage
c) The value of applied forward voltage
d) concentration & minority charge carriers

28) Photovoltaic diodes are used to
a) Generate emf
b) produce radiation
c) generate heat
d) identify colours of light

29) For an OR gate which set of inputs give zero output
a) 0,0
b) 1,0
c) 0,1
d) 1, 1

30) NAND gate is AND gate followed by
a) OR gate
b) NOT gate
c) NOR gate
d) AND gate

31) The circuit Symbol  represents
a) OR gate
b) NAND gate
c) NOR gate
d) NOT gate

32) The basic logic having only one input and one out put is
a) OR gate
b) AND gate
c) NOT gate
d) NAND gate

33) For NOR gate which set of inputs give high output
a) 1,0
b) 1,1
c) 0,1
d) 0,0

34) Reverse bias applied to a diode,
a) Lowers the potential barrier
b) rises the potential barrier
c) increases the diffusion Current
d) decreases the drift Current

1	2	3	4	5	6	7	8	9	10	11	12
a	a	c	c	b	c	d	a	d	a	d	A
13	14	15	16	17	18	19	20	21	22	23	24
a	a	d	b	a	b	d	b	a	a	d	B
25	26	27	28	29	30	31	32	33	34		
c	c	a	a	a	b	d	c	d	b		

Fill in the blank

1) Immobile ions present in n-type semiconductor are_____(Positive)

2) Energy of Conduction band compared to valance band is _____(more)

3) In depletion region number of mobile majority charge carriers_____(zero)

4) At room temperature, conduction band of insulator is _____(empty)

5) In extrinsic Semiconductor, doping decreases _____(resistivity)

6) In extrinsic Semiconductor, conductivity is due to _____(majority carriers)

7) Additional energy level due to impurity atoms lies just above the valence band in_____(P-type)

8) The intrinsic Semiconductor with donor impurity is _____(n-type)

9) Temperature of the Semiconductor increases, it's Conductivity _____(increases)

10) If the forward voltage increases, the barrier potential _____(decreases)

11) Polarity of the potential barrier on the n-side of the diode is_____(positive)

12) Reverse current in diode is due to flow of _____(minority carriers)

13) Reverse current in diode increases sharply at and above____(breakdown voltage)

14) Semiconductor diode has____(unidirectional conducting property)

15) As the width of depletion regions increases, the electric field across the p-n junction_____(increases)

16) Reverse current in the diode is in the order of _____(10^{-6}A)

17) In optoelectronic a semiconductor diodes, charge carriers are generated by_____(photons)

18) LED emits radiations under___(forward bias)

19) In NOR gate, the output is maximum when both inputs are___ (zero)

20) In NOT gate, the output is the compliment of____(input)

CHAPTER-I ELECTRIC CHARGES AND FIELDS

1. The total charge of an isolated system remains constant, means

A. quantization of charge B. conservation of charge

C. additivity of charge D. Coulomb's law

2. The total charge of the system is the algebraic sum of all the charges present on the system is known as,

A. additiviity of charge B. quantisation of charge

C. conservation of charge D. Coulomb's law

3. The electric charge is an integral multiple of electronic charge means

A. Coulomb's law B. quantisation of charge

C. conservation of charge D. additivity of charge

4. The electric charges has,

A. both magnitude and direction B. only magnitude but no direction

C. only direction but not magnitude D. neither magnitude nor direction

5. The electric charge carried by a body is

A. increases by increasing velocity B. decreases by increasing velocity

C. decreases by decreasing velocity D. remains same during motion

6. The electric charges of same kind

A. repel each other B. attract each other

C. cancel each other D. neither attract nor repel each other

7. The electric charges of different kind

A. repel each other B. attract each other

C. neither attract nor repel each other D. donot exert any force on each other

8. Device used to detect the charge on a body

A. cyclotron B. capacitor C. inductor D. Gold-leaf electroscope

9. SI unit of electric charge is,

A. farad B.ohm C. coulomb D. henry

10. In case of conductor, the charges always

A. distributed on the entire surface of the conductor

B. located at centre of the conductor

C. located away from the surface of the conductor

D. distributed over the entire mass of the conductor

11. In case of insulator, the charges always

A. distributed on entire surface of the insulator

B. localised at the centre of the insulator

C. located away from the surface of the insulator

D. stays at the same place on the insulator

12. *Electric conductors can be charged*

A. only by conduction B. only by induction

C. only by friction D. by conduction or induction

13. *Insulators can be charged*

A. only by conduction B. only by induction

C. only by friction D. by conduction or induction

14. *A body can be charged by*

A. conduction process B. induction process

C. friction D. by conduction or induction or friction

15. *Electrostatic force of attraction or repulsion between any two point charges depends on the distance between them as,*

A. $(\text{distance})^2$ B. $\frac{1}{(distance)^2}$ C. $(\text{distance})^3$ D. $\frac{1}{(distance)^3}$

16. *The free space constant in electrostatics is,*

A. $4\pi\varepsilon_0$ B. $4\pi\varepsilon_0\varepsilon_r$ C. $\frac{1}{4\pi\varepsilon_0\varepsilon_r}$ D. $\frac{1}{4\pi\varepsilon_0}$

17. *The force between q_1 and q_2 separated by a distance r in free space is,*

A. $F = \frac{1}{4\pi\varepsilon_0}\frac{q_1q_2}{r^2}$ B. $F = \frac{1}{4\pi\varepsilon_{0\varepsilon_r}}\frac{q_1q_2}{r^2}$ C. $F = \frac{1}{4\pi\varepsilon_0}\frac{q_1q_2}{r}$ D. $F = \frac{1}{4\pi\varepsilon_0\varepsilon_r}\frac{q_1}{r^2}$

18. *Relative permittivity ε_r in terms of force between two point charges in free space (F_o) and force between same charges in medium (F_m) is,*

A. F_oF_m B. $\frac{F_o}{F_m}$ C. $\frac{F_m}{F_o}$ D. $\varepsilon_o\frac{F_o}{F_m}$

19. *The force between multiple charges is calculated by using,*

A. Coulomb's law B. Gauss's law

C. Faraday's law D. both Coulomb's law and principle of Superposition

20. *In case of a point charge, the electric field due to it depends on the distance from it as,*

A. $(\text{distance})^2$ B. $\frac{1}{(distance)^2}$ C. $(\text{distance})^3$ D. $\frac{1}{(\text{distance})^3}$

21. *Electric field of a charge depends on,*

A. test charge B. does not depend on any charge

C. source charge D. depends on both test charge & source charge

22. *Identify the right statement among the following actions about electric field lines,*

A. they can intersect each other B. they form closed loops

C. they start from positive charge & end at negative charge

D. they can pass through conductors

23. *Identify the wrong statement among the following statements about electric field lines,*

A. they do not form closed loops B. they cannot pass through conductor

C. they cannot intersect each other D. they start from negative charge and end at positive charge

24. The direction of dipole moment is,

A. from positive charge to negative charge of the dipole

B. from negative charge to positive charge of the dipole

C. perpendicular to axis of dipole D. there is no direction for dipole moment

25. Electric flux is maximum when the angle between electric field and area vector is,

A. 90^0 B. 0^0 C. 45^0 D. 60^0

26. The total charge of electric dipole is,

A. +2q B. -2q C. zero D. q

27. The net force on electric dipole placed in uniform electric field is,

A. F=0 B. F=+qE C. F=-qE D. +2qE

28. The torque acting on the dipole is maximum when the angle between electric dipolemoment and electric field is,

A. 0^0 B. 180^0 C. 90^0 D. 60^0

29. At a distance from the electric dipole, the electric field due to it depends on the distance from it as,

A. $\frac{1}{(\text{distance})^3}$ B. $(\text{distance})^2$ C. $(\text{distance})^3$ D. $\frac{1}{(\text{distance})^2}$

30. The direction of electric field due to electric dipole at a point on its axis is,

A. perpendicular to direction of dipolemoment

B. opposite to direction of dipolemoment

C. in the direction of dipolemoment D. none of the above

31. The direction of electric field due to dipole at a point on the equatorial plane of the dipole is,

A. in the direction opposite to dipolemoment

B. in the direction of dipolemoment

C. perpendicular to the direction of dipolemoment D. none of the above

32. Electric flux is maximum, when

A. electric field is perpendicular to area of the surface

B. electric field is parallel to area of the surface

C. electric field is 45^0 to area of the surface

D. electric field is 60^0 to area of the surface

33. ***In case of polar molecules, choose wrong statement***

A. they are permanent dipoles

B. centres of positive charge and centres of negative charge do not coincide

C. have zero dipolemoment in the absence of external electric field

D. centre of positive charges and centres of negative charges are separated by a small distance

34. Example for polar molecule is,

A. H_2 B. Co_2 C. NH_4 D. H_2O

35. Identify the wrong statement in case of Non-polar molecules

A. centres of positive charge and centres of negative charge do not coincide

B. centres of positive charge and centres of negative charge coincide

C. not having permanent dipoles

D. having zero dipolemoment in the absence of external electric field

36. Example for Non-polar molecule,

A. H_2O B.N_2 C. CO D. HI

37. The electric flux through any closed surface can be explained by

A. Coulomb's law B. Gauss's law

C. Principle of superposition D. Law of conservation of energy

38. SI unit of linear charge density is,

A. coulomb(C) B. coulomb per metre(Cm^{-1})

C. coulomb per metre square(Cm^{-2}) D. coulomb per metre cube(Cm^{-3})

39. SI unit of surface charge density

A. coulomb (C) B. coulomb per metre(Cm^{-1})

C. coulomb per metre square(Cm^{-2}) D. coulomb per metre cube(Cm^{-3})

40. SI unit of volume charge density

A. coulomb (C) B. coulomb per metre (Cm^{-1})

C. coulomb per metre square(Cm^{-2}) D. coulomb per metre cube(Cm^{-3})

41. In case of uniformly charged thin spherical shell, the electric field due to it depends on the distance from it as,

A. $(\text{distance})^2$ B.$(\text{distance})^3$ C. $\frac{1}{(\text{distance})^2}$ D. $\frac{1}{(\text{distance})^3}$

42. In case of uniformly charged thin infinitely long straight conductor, the electric field due to it depends on distance from it as,

A. distance B.$(\text{distance})^2$ C. $\frac{1}{\text{distance}}$ D. $\frac{1}{(\text{distance})^2}$

43. Electric field due to infinite plane sheet is $\frac{1}{2\varepsilon_o}$ times the,

A. charge on the sheet B. surface charge density C. linear charge density D. volume charge density

44. Pick the wrong statement in case of electric field lines,

A. they crowded at stronger region of electric field

B. they spread at weaker region of electric field

C. they parallel to each other in uniform electric field

D. they are not normal to the surface of the conductor

45. The electric flux through closed surface is $\frac{1}{\varepsilon_o}$ times the

A. total electric field through closed surface B. total charge in the surface

C. total force through the closed surface D. total potential through the closed surface

46. Electric charge is a

A. vector B. scalar C. both vector and scalar D. neither vector or scalar

47. A body can be negatively charged

A. by adding excess electrons to it B. by removing electrons from it

C. by adding excess protons to it D. by removing protons from it

48. A glass rod is rubbed against a silk cloth, the silk acquires

A. positive charge B. negative charge

C. neither positive nor negative charge D. both positive and negative charge

49. Choose the correct statements given below. Across the surface of a charged conductor,

(i). field is continuous (ii) potential is continuous

(iii) field is discontinuous (iv) potential is discontinuous

A. (i) and (ii) B. (ii) and (iii) C.(iii) and (iv) D. (i) and (iv)

50. An ebonite / plastic rod is rubbed against a fur, the ebonite / plastic rod acquires

A. positive charge B. negative charge

C. neither positive nor negative charge D. both positive and negative charge

51. When a dipole is placed in a variable electric field, it experiences

A. a net force B. a torque C. both a net force and torque D. neither a net force nor torque

52. The electric field inside a spherical shell of uniform surface charge density is,

A. zero B. constant other than zero+

C. same as that on the surface D. same as that of as outside the surface

53. The electric field (E) due to a point charge (q) at a distance (r) is, given by

A. $E = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}$ B. $E = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^3}$ C. $F = \frac{1}{4\pi\varepsilon_0}\frac{q^2}{r}$ D. $F = \frac{1}{4\pi\varepsilon_0}\frac{q^2}{r^2}$

54. Torque (τ) on electric dipole of dipolemoment(p) in uniform electric field(E) inclined at an angle θ is,

A. $\tau = pE\sin\theta$ B. $\tau = p\cos\theta$ C. $\tau = E\sin\theta$ D. $\tau = pE\cos\theta$

55. Electric flux ($\emptyset$) through a surface of area (A) in uniform electric field (E) inclined at an angle θ is ,

A. $\emptyset = EA\sin\theta$ B. $\emptyset = EA\cos\theta$ C. $\emptyset = E\sin\theta$ D. $\emptyset = A\cos\theta$

56. The total electric flux through a closed surface consisting an electric dipole is,

A. maximum B. minimum C. zero D. varying

57. There is an electric charge outside the closed surface, then the flux through that surface is,

A. maximum B. zero C. minimum D. varying

58.The mutual force of attraction or repulsion between any two point charges is given by,

A.Gauss's law B. Faraday's law C. Coulomb's law D. Lenz's law

Fill in the blanks:

(Gauss's law, radially inward, electric flux, coulomb, gold leaf electroscope,vector, electric field intensity, electric flux, Coulomb's law, scalar, positive charge, superposition principle, electric flux)

1. The direction of electric field due to _____ is radially outward.
2. The direction of electric field due to negative charge is _____

3. The number of electric field lines passing through the surface is called_____
4. SI unit of electric charge is _____
5. Electric flux is a_____ quantity.
6. Dipolemoment is a _____quantity.
7. SI unit of _____is NC^{-1}
8. SI unit of _____is $NC^{-1}m^2$
9. The surface choose to calculate _____ is called Gausian surface.
10. Force between two point charges is given by _____
11. Electric flux through closed surface in vacuum is given by _____
12. The electric force on a charge due to multiple charges is given by _____
13. The device used to detect the charge on a body is_____

KEY ANSWERS CHAPTER-I ELECTRIC CHARGES AND FIELDS

						Fill in the Blanks	
1	B	21	C	41	C		
2	A	22	C	42	C	1	positive charge
3	B	23	D	43	B	2	radially inward
4	B	24	B	44	D	3	electric flux
5	D	25	B	45	B	4	Coulomb
6	A	26	C	46	B	5	Scalar
7	B	27	A	47	A	6	Vector
8	D	28	C	48	B	7	electric field intensity
9	C	29	A	49	B	8	electric flux
10	A	30	C	50	B	9	electric flux
11	D	31	A	51	C	10	Coulomb's law
12	D	32	A	52	A	11	Gauss's law
13	C	33	C	53	A	12	superposition principle
14	D	34	D	54	A	13	gold leaf electroscope
15	B	35	A	55	B		
16	D	36	B	56	C		
17	A	37	B	57	B		
18	B	38	B	58	C		
19	D	39	C				
20	B	40	D				

Chapter 2 – ELECTROSTATIC POTENTIAL & CAPACITANCE

1. ***The S.I unit of electric potential is***

a. volt b. volt / meter

c. Ampere d. Ohm

2. ***Electric potential at a point outside the shell is***

a. $v = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q}{r^2}$ b. $v = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q}{r}$

c. $v = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q^2}{r}$ d. $v = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q^2}{r^2}$

3. ***What is electric potential of a charge at a point at infinity***

a. ∞ b. 0 c. maximum d. minimum

4. ***Electric potential energy due to a dipole placed in a uniform electric field is***

a. $\mu = -P.E\ cos\theta$ b. $\mu = P.E\ .cos\theta$

c. $u = P.E\ sin\theta$ d. $u = -P.E\ sin\theta$

5. ***Electric potential energy due to a dipole placed in a uniform electric field is stable when?***

a. $\theta = 0$ b. $\theta = 90^0$

c. $\theta = 45^0$ d. $\theta = 60^0$

6. ***Dielectric are the materials which ..***

a. insulators which transmit electric charge

b. insulators which donot transmit electric charge

c. Conductors which transmit electric charge

d. Semiconductors which transmit electric charge

7. ***Which of the following is a polar molecule***

a. H_2O b. O_2

c. N_2 d. CO_2

8. ***Which of the following is non polar molecule***

a. O_2 b. H_2o

c. Hcl d. none of the above

9. ***The S.I. unit of dielectric strength is***

a. Vm^{-1} b. Vm c. $v^{-1}m^{-1}$ d. none of the above

10. ***The charge on an electron was calculated by***

a. Faraday b. J.J Thomson's

c. Millikan d. Einstein's

11. ***What is the angle between electric field and equipotential surface***

a. 90^0 always b. 0^0 always

c. 0 *to* 90^0 d. 0 *to* 180^0

12. ***Equipotential Surface***

a. are closer in the region of large electric field compare to region of lower electric field

b. will be more crowded near sharp edges of a conductor

c. will always be equally spaced

d. both (a) and (b) correct

13. ***Dielectric constant for a metal is***

a. Zero b. infinity c. 1 d. 10

14. *Vande-Graff generator is used to*
   a. Store electrical energy
   b. build up high voltages of few million volts
   c. decelerate charged particles like electrons
   d. both (a) and (b) are correct

15. *The S.I. unit of capacitance is*

   a. Joule b. volt c. Farad d. Henry

16. *Capacitance of a conductor doesnot depend upon the*

   a. Size of the conductor b. Shape of the conductor
   c. Near by conductor d. Material of the conductor

17. *1 Farad is same as.*

   a. 1 J/c b. 1 v/c c. 1 c/v d. 1 v/m

18. *Capacity (or) capacitance of a conductor signifies its.*

   a. Size of the conductor b.density of matter
   c. ability to hold the charge d. ability to withstand electric filed

19. *The plates of a charged capacitor*

   a. Have equal magnitude of charge b. are equipotential surfaces
   c. have a potential difference d. all the above are true

20. *The capacity of the parallel plate capacitor increases when*

   a. area of the plate is decreased b. area of the plate is increased
   c. . distance between the plate is increases d. None of the above

Key Answers

1	a	11	a
2	b	12	d
3	b	13	b
4	a	14	b
5	a	15	c
6	a	16	d
7	a	17	c
8	a	18	c
9	a	19	d
10	c	20	c

Fill in the Blanks

1) *The work done in moving a unit positive test charge over a closed path in an electric field is___*

_____(Zero)

2) *A surface that has the same electrostatic potential at every point on it is known as.*

_____(Equipotential Surface)

3) ***The work done against electrostatic force gets stored in which form of energy***

_ _ _ _ _ _ _ _ _ _ _ _ (potential energy)

4) ***The electric potential inside a conducting sphere***_ _ _ _ _ _ _ _ _ _ _ _ (remains constant from centre to the surface)

5) ***The Surface with a constant value of potential at all points on the surface is called***_ _ _ _ _ _ _ _ _ _ _ (Equipotential surface)

6) ***Inside a conductor electrostatic field is*** _ _ _ _ _ _ _ _ _ _ _ _ (0)

7) ***A capacitor is a system of two conductors separated by***_ _ _ _ _ _ _ _ _ _ _ _ (an insulator)

8) ***If a unit +ve charge is moved from one point to another, over an equipotential surface i, work done is*** _ _ _ _ _ _ _ _ _ _ _ _ (0)

9) ***The electrostatics potential due to an electrical point*** _ _ _ _ _ _ _ _ _ _ _ _ (0)

10) ***The amount of work done in moving a point charge around a circular are of radius 'r'*** _ _ _ _ _ _ _ _ _ _ _ _ (0)

CHAPTER 3: CURRENT ELECTRCITY

1. Resistance offered by 1mlength of a conductor having a cross sectional area of 1sq.m is known as

a)conductance ofthe material ofconductor.

b)electrical resistivity of the material ofconductor.

c)resistance of the material ofconductor.

d)electrical conductivity ofthe material of conductor.

2. Resistivity of the material of a conductor does not dependupon

a) temperature b) nature of the material c) size of the conductor d) impurities.

3. The resistance of a conductor

a)does not dependupon its length.

b)inverselyproportional to its length.

c)directly proportional to its length.

d)None of the above.

4.The resistance of a carbon resistor is $15X10^3 \pm$ 10%. The color of the firstband of the resistor is

a) green b) black c)orange d) silver.

5.The law which signifies the principle of conservation of energy is

a)Kirchhoff's loop ruleb) ohm's lawc)coulomb's lawd)Kirchhoff'sjunctionrule.

6. The average velocity with which free electrons drift in a conductor in a direction opposite to the direction of the applied electric field is called

a)Relaxation time b)Resistivity c)Mobility d)Drift velocity.

7. ***"At any junction, the sum of current entering the junction is equal to the sum of current leaving the junction." This is the statement of***

a. Ohm's law b) Kirchhoff'sjunction rule c) Kirchhoff's loop rule d) Ampere's circuital law.

8. ***SI unit of current density.***

a)Ampere b) Am^{-2} c) AN^{-2} d) Am^{2}

9. ***The mobility of electrons in a conductor is defined as***

a)The magnitude of drift velocity per unit resistance.

b)The magnitude of average velocity per unit electric field.

c)The magnitude of drift velocity per unit area.

d)The magnitude of drift velocity per unit electric field.

10. ***Two unequal resistances are connected in parallel across a battery. Then, which of the following statement is correct:***

a) potential across each resistance is same.

b) potential across each resistance is different.

c)currentthrough each resistance is same.

d) current through any resistance depends on emf of the battery.

11. ***Two unequal resistances are connected in series across a battery. Then, which of the following statement is correct***

a) potential across each resistance is same.

b) potential across each resistance is different.

c) current through each resistance is same.

d) bothb and c.

12. ***In the equation XY=Z, X is the current density, Z is electric field, then Y is***

a) resistivity b) conductivity c) potential difference d) resistance.

13. ***Ohms law is valid when the temperature of conductor is***

a) very low. b) very high.c) constant. d) varying.

14. ***When the temperature of a semiconductor increased, its resistance***

a) increases b) decreases c) remains same d) first increases then decreases.

15. ***SI unit of mobility is***

a)$m^2 V s^{-1}$ *b)* $m^2 V^{-1} s$ *c)* $m^2 V^{-2} s^{-1}$ *d)* $m^2 V^{-1} s^{-1}$

16. ***Mathematical form of ohm's law is***

a)$V = I R$ b)$R = V I$ *c)* $V=\frac{I}{R}$ d)$I = V R$

17. ***An example for ohmic device is***

a) Transistors b) Diodes c) Resistors d) vacuum tube

18. ***The devices which do not obey ohm's law are called***

a)Non-Ohmic devices b) Transistors c)Ohmic devices d) Diodes

19. SI unit of Conductivity is

a) Ω mb)Ω^{-1}mc)S d) $\Omega\ m^{-1}$

20. Internal resistance of a cell does not depends on

a) The nature of electrolyte b) Length of Electrodes

c) Temperature of Electrolyte d) Nature of Electrodes

21. An expression for main current in a simple circuit is

a)I= $\frac{e}{V+r}$ b) I=$\frac{e}{R+r}$ c) I=$\frac{e}{R-r}$ d) V=I/R

22. Potentiometer is used to

a) compare the emf of two cells b) both a and d

c) find capacity of cell. d) find internal resistance of a cell.

23) The SI unit for resistance is

a) Ω b) mho c) ohm/m d) m/ohm

24)Expression for drift velocity of free electrons in a conductor.

a) $V_d = \frac{2Ee\tau}{m}$ b) $V_d = \frac{eE\tau}{m}$ c)$V_d = \frac{\tau Ee^2}{m}$ d)M= $\frac{Vd}{Ee\tau}$

25) SI unit for electromotive force of a cell

a) ms^{-1} b) Joule c) Coulomb d) Volt

26)Expression for equivalent internal resistance & equivalent EMF when two cells connected in series is

a) $R_S = r_2+r_1$,$Es=E_2+E_1$ b) $R_S = r_1+r_2$, $E_2=Es-E_1$

c) $R_S = r_s+r_2$,$E_s=E_1-E2$ d) $R_S = R_1-r_2$, $Es=E_1+E_2$

27) The practical form of wheatstone bridge is

a) Meter bridge b) galvanometer c) Ammeter d) Voltmeter

28) The good conductor of electricity is

a) paper b) iron c) glass d) ebonite

29) The three resistors 320Ω, 450Ω & 600 Ω are connected in series.The effective resistance of the combination is

a) 14257 Ω b) 1370 Ωc) 0.007 Ωd) None of these.

30)Expressions for equivalent internal resistance and EMF when two cells are connected in parallel are

a) $r_p = \frac{r1r2}{r1+r2}$ Ep= $\frac{E1r2+E2r1}{r1+r2}$ b) $r_p = \frac{r1+r2}{r1r2}$ Ep=$\frac{E2r2+E1r1}{r1+r2}$

c) $r_p = \frac{r1r2}{r1-r2}$ Ep= $\frac{E1r1+E2r2}{r1+r2}$ d) $r_p = \frac{r1-r2}{r1r2}$Ep= $\frac{E1r2+E2r1}{r1-r2}$

31) The device used to measure emf or potential difference is

a) voltmeter b) potentiometer c) potential meter d) resistance box

32) The balancing condition of wheatstone network is

a) current through galvanometer maximum b) current through galvanometer is zero

c)$I_g \neq 0$ d) $I_g > 0$

33) Current density is

a) Scalar quantity b) vector quantity c) dimensionless quantity d) none of these.

34)) Expression for power loss is

a) $P=I^2R$ b) $P=I^3R$ c) $P^2=I^2R$ d) $P=IR$

35) The paths of electrons between successive collisions in the presence of electric field are

a) straight lines b) circle c) curved d) parabolic.

36) The graph obtained by plotting voltage (V) versus current (I) for metallic conductor is

a) straight lines b) circle c) hyperbola d) parabola

37) Main features of Carbon resistors are

a) compact b) inexpensive c) high range value of resistance d) all these.

38) Manganin and Constantan are widely used in wire bound standard resistors, since their resistivity

a) weakly depend on temperature b) strongly depend on temperature

c) doesn't depend on temperature d) none of these.

39)If 2Ω and 6Ω resistors are connected in series to 2V battery of negligible internal resistance. The current flowing through the circuit is

a) ½ Ab) ¼ Ac) 1/3 A d) 0.7A

40)The relation between V and I for GaAs is

a) nonlinear b) linear c) non unique d) unique .

41) The current Ithrough an area of cross section is given by

a) $\vec{J}.\overrightarrow{\Delta s}$ b) $\vec{J}X\overrightarrow{\Delta s}$ c) $j.\Delta s$ d)jXs

42) The dimensional formula for electrical resistance is

a)$[ML^2T^{-3}A^{-2}]$ b) $[ML^2T^{-2}A^{-2}]$

c) $[ML^3T^{-3}A^{-2}]$ d) $[ML^2T^{-3}A^{-1}]$

Answers

1a	**2c**	**3c**	**4 b**	**5 a**	**6 d**	**7 b**
8b	**9d**	**10a**	**11d**	**12 a**	**13 c**	**14b**
15 d	**16a**	**17c**	**18a**	**19c**	**20b**	**21b**
22 b	**23a**	**24b**	**25a**	**26a**	**27a**	**28 b**
29 b	**30a**	**31b**	**32 b**	**33 b**	**34a**	**35 c**
36 a	**37d**	**38 a**	**39 b**	**40c**	**41a**	**42 a**

Fill in the blanks.

[wire bound resistors, Relaxation time, impurities,Ohmic device, temperature coefficient of resistivity, emf, Carbon resistors, meter bridge]

1.The average time interval between two successive collisions of free electrons inside the conductor is called _____

2. The device which obey ohm's law is called _____

3. _____ are made by winding the wires of an alloys,vizmanganin,constantan or similar ones.

4. _____ are extensively used in electronic circuits.

5. Potential difference across the cell, when no current flowing through it is known as _____

6. The _____ is defined as the fractional increase in resistivity per unit increase in temperature.

7. The resistivity of semiconductor also affected by presence of _____

8. A practical device works on the principle of Wheatstone bridge is ____.

FILL IN THEBLANKS:

1. Relaxation time
2. Ohmic device
3. wire bound resistors
4. Carbon resistors
5. emf
6. temperature coefficient of resistivity
7. impurities
8. meter bridge

CHAPTER 4:MOVING CHARGES AND MAGNETISM

1. ***The path traced by the charged particle when it enters the magnetic field perpendicular to field direction is***

   (a)parabola (b) ellipse (c) circle (d) helix

2. ***Which of the following doesn't experience force in a magnetic field?***

   (a)a bar magnet (b) a current loop

   (c) a charge moving parallel to field direction.

   (d) a charge moving perpendicular to field direction.

3. **A cyclotron cannot be used to accelerate**

   (a) protons (b) α-particle

   (c) electrons (d) positive ions

4. ***Magnetic field at a point due to a current element is given by***

   (a) Ampere's Circuital law (b)Biot-Savart's law (c) Maxwell's law (d)Gauss's law

5. **Force acting on a current carrying conductor in magnetic field is maximum, when it is kept**

   (a) parallel to field direction (b) perpendicular to field direction

   (c) anti - parallel to field direction (d)at 45^0 to the field direction

6. ***When a current loop is kept in a uniform magnetic field, it will experience***

   (a) only torque (b) net force (c)both torque and net force (d) neither torque nor net force

7. ***If two straight parallel wires carrying current along opposite directions, they will***

   (a) attract each other (b) repel each other

   (c) doesn't experience any force (d) none of these

8. ***The current sensitivity of the pointer galvanometer can be increased by ,***

   (a) decreasing number of turns (b)increasing number of turns

   (c) decreasing area of the coil (d) Increasing torsional constant

9. ***A galvanometer is converted in ammeter by connecting,***

   (a) a high resistance in series (b) a low resistance in series

   (c) a high resistance in parallel (d) a low resistance in parallel

10. ***Resistance of an ideal voltmeter is***

    (a) zero (b)infinite (c)moderate (d)none of these

11. ***Magnetic field along the axis of the wire carrying current is,***

    (a) maximum (b) zero (c) minimum (d) None of the above

12. ***S.I. unit of magnetic field is,***

    (a) *gauss* (b) tesla (c)oersted (d)weber

13. **In a cyclotron acceleration of charged particle tohigh energy is possible by use of**

(a) magnetic field alone (b) electric field alone

(c) both electric and magnetic fields along same direction (d) crossed electric and magnetic fields

14. ***For a coil carrying current magnetic field is maximum at***

(a)around the coil (b)at the centre of the coil

(c) along the axis of the coil (d)none of these

15. ***for a solenoid carrying current magnetic field is uniform***

(a) along the axis of the coil

(b) only near the ends of the coil

(c) outside the solenoid

(d) none of these

FILL IN THE BLANKS WITH APPROPRIATE ANSWER GIVEN IN THE BRACKET

(Bohr-magneton, synchrotron, mass spectrometer,strong and radial, magnetic dipole)

1. The principle of velocity selector is employed in _ _ _ _ _ _ _ _

2. _ _ _ _ _ _ _ _ uses both solenoid and toroid to generate high magnetic field.

3.The minimum magnetic field generated due to orbital motion of electrons is called_ _ _ _ _ _

4. The use of cylindrical sof-iron core in the moving coil galvanometer makes the magnetic field_ _ _ _

5. A current carrying loop acts like _ _ _ _ _ _ _ _

MOVING CHARGS AND MAGNETISM - I MAIN KEY ANSWERS									
1	2	3	4	5	6	7	8	9	10
C	C	C	B	B	A	B	B	D	B
11	12	13	14	15					
B	B	D	B	A					
1. MASS SPECTROMETER									
2.SYNCHROTRON									
3.BOHR-MAGNETON									
4.STRONG AND RADIAL									
5.MAGNETIC DIPOLE									

CHAPTER : 5 MAGNETISM AND MATTER

1. In a permanent magnet at room temperature

(a) magnetic moment of each molecule is zero.

(b) the individual molecules have non-zero magnetic moment which are all perfectly aligned.

(c) domains are partially aligned.

(d) domains are all perfectly aligned.

2. A magnet of magnetic moment M and pole strength m is divided in two equal parts, then magnetic moment of each part will be

(a) M (b) $M/2$ (c) $M/4$ (d) $2M$

3. If a magnet is hanged with its magnetic axis then it stops in

(a) Magnetic meridian (b) Geometric meridian (c)Angle of dip (d)None of these

4. A magnetic needle is kept in a non-uniform magnetic field. It experiences

(a) A force and a torque (b) A force but not a torque

(c) A torque but not a force (d) Neither a torque nor a force

5. At the magnetic poles of the earth, a compass needle will be

(a) Vertical (b) Bent slightly (c) Horizontal (d) Inclined at 45° to the horizontal

6. The material of permanent magnet has

(a) High retentivity, low coercivity (b) Low retentivity, high coercivity

(c) Low retentivity, low coercivity (d) High retentivity, high coercivity

7. When a ferromagnetic material is heated to temperature above its Curie temperature, the material

(a) Is permanently magnetized (b) Remains ferromagnetic

(c) Behaves like a diamagnetic material (d) Behaves like a paramagnetic material

8. The magnetic field lines due to a bar magnet are correctly shown in

(a) 

(b) 

(c) 

(d) 

9. The relative permeability is represented by μ_r and the susceptibility is denoted by χ for a magnetic substance. Then for a paramagnetic substance

(a) $\mu_r < 1, \chi < 0$ b) $\mu_r < 1, \chi > 0$ (c) $\mu_r > 1, \chi < 0$ (d) $\mu_r > 1, \chi > 0$

10. Curies law can be written as

(a) $\chi \propto (T - T_c)$ (b) $\chi \propto \frac{1}{T - T_c}$ (c) $\chi \propto \frac{1}{T}$ (d) $\chi \propto T$

11. Let V and H be the vertical and horizontal components of earth's magnetic field at any point on earth. Near the north pole

(a) $V >> H$ (b) $V << H$ (c) $V = H$ (d) $V = H = 0$

12. The magnetism of magnet is due to

(a) The spin motion of electron (b)Earth

(c) Pressure of big magnet inside the earth (d) Cosmic rays

13. Which of the following, the most suitable material for making permanent magnet is

(a) Steel (b) Soft iron (c)Copper (d)Nickel

14. Magnetic induction is a

(a) Scalar quantity (b) Vector quantity (c) Both (a) and (b) (d) None of the above

15. Magnetic lines of force

(a) Always intersect (b)Are always close

(c) Tend to crowd far away from the poles of magnet (d)Do not pass through vacuum

Fill in the blanks by choosing appropriate answer given in the brackets for ALL the following questions:

(Demagnetization , 1 : 2, Declination, Infinity, *Tesla*)

1. Unit of magnetic flux density (or magnetic induction) is .....
2. ..... is the angle between the magnetic meridian and geographical meridian.
3. Ratio between total intensity of magnetic field at equator to poles is.....
4. Keeping dissimilar poles of two magnets of equal pole strength and length same side, their time period will be.....
5. Magnetizing in the opposite direction is known as .....

MAGNETISM AND MATTER - I MAIN KEY ANSWERS									
1	2	3	4	5	6	7	8	9	10
C	B	A	A	B	D	D	D	D	C
11	12	13	14	15					
A	A	A	B	B					

1. TESLA	2. DECLINATION	3. 1:2	4. INFINITY	5.DEMAGNETIZATION

CHAPTER 6:ELECTROMAGNETIC INDUCTION

1. ***The emf induced in the circuit when the magnetic flux associated with an electric circuit changes is known as:***

   A. Hysteresis loss B.Lenz's law C.electromagnetic induction D.Kirchhoff laws

2. ***A battery is connected to a coil of insulated wire. The pointer of the galvanometer is deflected if it is taken to it because***

   A. an induced current is produced B. coil act as magnet

   C.the number of turns in the galvanometer's coil is changed D.none of above

3. ***In Faraday's experiment on electromagnetic induction, more deflection will be shown by galvanometer, when***

   A. Magnet is in uniform motion towards the coil

   B. Magnet is uniform motion away from the coil

   C. Magnet is in accelerated motion towards the coil

   D. Magnet is at rest near the coil

4. ***A coil of metal wire is kept stationary in a non-uniform magnetic field:***

   A. An e.m.f. and current both are induced in the coil

   B. An e.m.f. but not the current is induced in the coil

   C. Current but not the e.m.f is induced in the coil

   D. Neither e.m.f. nor current is induced in the coil

5. ***Barmagnets produce induced e.m.fwhen inserted into coils. The strength of the induced e.m.f. is independent of***

   A. number of turns of coil

B. the resistance of the wire in the coil

C. the strength of the magnet

D. speed with which the magnet is moved

6. *Polarity of the induced emf is determined by*

A. Fleming's right hand rule B. Fleming's left hand rule

C. Ampere's circuital law D.Lenz's law

7. ***The negative sign in the equation*** $e = -\frac{d\phi}{dt}$ ***indicate***

A. emf is negative B. induced emf opposes change in magnetic flux

C. induced emf increase with change in magnetic flux D.none of the above

8. ***lenz's law is a consequence of law of conservation of***

A. charge B. mass C. momentum D.energy

9. ***The self inductance of a coil is mechanical analogue of***

A. Inertia B.Power C. Energy D. Velocity

10. ***When the rate of change of current is unity ,the induced emf is equal to***

A. Total flux linked with coil

B. Number of turns of coil

C. Coefficient of self inductance

D. Thickness of coil

11. ***Two identical coaxial coils P and Q carrying equal amount of current in the same direction are brought nearer. The current in***

A. P increses Q decreses

B. Q increses P decreses

C. Both P and Q increase

D. Both P and Q decreses

12. ***The motional emf depend on***

A. Velocity of conductor

B. Magnetic field

C. Length of conductor

D. All the above

13. ***The motional e.m.f. is the induced e.m.f.***

A. In a circuit due to variation in its own current

B. In a circuit due to variation of current in the neighboring circuit

C. in a coil due to the motion of the magnet near it

D. across the ends of a conductor moving in a magnetic field

14. ***Eddy currents produced in a conductor are responsible for:***

A. Damping B. Loss of energy C. Heating D. All the above

15. ***The SI unit of magnetic flux is***

A. tesla B. tesla meter C. weber D. weber/meter^2 (Wbm^{-2})

16. ***Magnetic flux linked with a coil of N turns of area of cross section A held with is plane parallel to magnetic field(B) is***

A. NAB B.NAB/2 C. NAB/4 D.Zero

17. ***Which of following rule is used to identify the direction of current induced in a wire moving in magnetic field***

A.Fleming's right hand rule B.Fleming's left hand rule

C.Right hand clasp rule D.Ampere's rule

18. ***The laws of electromagnetic induction have been used in construction of***

A. Generator B.Ammeter C. Voltmeter D.Voltameter

19. ***The phenomenon due to which emf induced in a coil due to variation of current in same coil is***

A. Steady current
B. Susceptance
C. Self inductance
D. Mutual inductance

20. ***The self inductance of coil is independent of***

A. Time B.Voltage C.Resistance of coil D.current

21. ***Mutual inductance between two magnetically coupled coils depends on***

A. permeability of core material
B. number of turns of coil
C. the cross sectional area of their common core
D. all the above

22. ***Identify incorrect statement concerned to mutual inductance***

A. Mutual inductance depends on current
B. Mutual inductance is large in transformers
C. Magnetic flux of one coil doesn't link with other coil
D. Current in one coil induces emf in other coil

23. ***Eddy currents can be produced in bulk piece of conductor***

A. By placing conductor in changing electric fileld
B. By placing conductor in changing magneticfileld
C. By placing conductor in uniform electric fileld
D. By placing conductor in uniform magnetic fileld

24. ***The following device doesn't use the application of eddy current***

A. Electric power meter
B. Magnetic braking of train
C. Induction furnace
D. LED light

25. ***Which of the following is/are equal to Henry?***

A. Volt second/ampere

B. Volt(second)^2/coulomb

C. Joule (second)^2/(coulomb)^2

D. All of these

26. ***Which of following circuit elements opposes the change in current in circuit?***

A. Capacitor

B. Resistor

C. Inductor

D. Ammeter

27. ***The energy stored in an inductor is given by***

A. $U = \frac{1}{2}LI^2$

B. $U = \frac{1}{2}IL^2$

C. $U = \frac{1}{2}CV^2$

D. $U = LI$

28. ***When current I is passed through an inductor of coefficient of self-inductance L, energy stored in it is*** $\frac{1}{2}LI^2$***. This energy storedis in the form of***

A. Voltage

B. Current

C. Electric field

D. Magnetic field

29. ***Which of following device works on principle of electromagnetic induction?***

A. Electric kettle

B. Electric lamp

C. Electric bell

D. Electric generator

30. ***The device which converts mechanical energy into electrical energy is***

A. Electric motor

B. Electric generator

C. Wind turbines

D. Galvanometer

31. ***The metal detectors installed at airports and other security purpose are based on principle of***

A. Electromagnetic difference

B. Wheatstone's network

C. Electromagnetic induction

D. Potentiometer

32. ***In an AC generator if the plane of coil placed perpendicular to field lines then the number of lines passing through the coil is***

A. maximum

B. minimum

C. zero

D. may be zero or minimum

33. ***Induced e.m.f. produced in a coil rotating in a magnetic field will be maximum when the angle between the axis of coil and direction of magnetic field is:***

A. 180^0

B. 90^0

C. 45^0

D. 0^0

34. ***A transformer converts,***

A. Low voltage to high voltage

B. High voltage to low voltage

C. Both A and B correct

D. Only A is correct

35. ***In a step up transformer the value of current in secondary coil in comparison to primary coil is***

A. Less B.More C.Equal D.No relation

36. ***In ac generator when the plane of armature is perpendicular to magnetic field then***

A. Flux linked with coil is zero

B. Induced emf in coil is zero

C. Only B is correct

D. Both A and B are correct

Fill in the blanks

(electromagneticinduction,electromagnetic,damping Lenz'slaw,magneticflux,opposes,change in current, flux linkage,backemf ,motional emf, magnetic flux, increasd ,self inductance)

1. Total number of magnetic lines of force crossing a surface normally is called _____
2. The emf induced in conducting rod when it moves in region of magnetic field is called _____
3. Phenomenon of production of induced emf due to change of magnetic flux linked with a closed circuit is known as _____
4. Direction of induced current is such that it _____ the cause which produces it.
5. Polarity of induced emf is given by _____
6. The kind of opposition offered by eddy currents to the motion of system is _____
7. If a core of soft iron is introduced into a coil its coefficient of self induction gets _____
8. When the rate of change of current through a closed circuit is unity, then the induced e.m.f. produced in it is equal to _____

9. The product of number of turns in the coil and magnetic flux linked with the coil is_____

10. A circuit element which opposes _____is called inductor.

Key answers

1	2	3	4	5	6
C	A	C	D	B	D
7	8	9	10	11	12
B	D	A	C	D	D
13	14	15	16	17	18
D	D	C	D	A	A
19	20	21	22	23	24
C	C	D	C	B	D
25	26	27	28	29	30
D	C	A	D	D	B
31	32	33	34	35	36
C	A	B	C	A	D

FIB

1. Magnetic flux
2. Motional emf
3. Electromagnetic induction
4. Opposes
5. Lenz's law
6. Electromagnetic damping
7. Increased
8. Self inductance
9. Flux linkage
10. Change in current.

CHAPTER 7:ALTERNATE CURRENT

1. ***Hot wire ammeters are used for measuring***

A)Both AC and DC. B) Only AC C. Only DC D) Neither AC nor DC

2. ***In alternating current circuits, the a.c. meters measure***

A) r.m.s. value B) Peak value C) Mean value D) Mean square value

3. ***In series LCR circuit, the phase difference between voltage across L and voltage across C is***

A) Zero **B) π** C) $\frac{\pi}{2}$ D) 2π

4. ***With increase in frequency of an a.c. supply, the impedance of an LCR series circuit***

A) Remains constant B) Decreases

C) Increases **D) Decreases at first, becomes minimum and then increase**

5. ***Power factor of an ideal choke coil (i.e, R = 0) is***

A) Near about zero **B) Zero**

C) Near about one D) One

6. *At resonance, the value of the power factor in an LCR series circuit is*

A) Zero **B) 1** C) $\frac{1}{2}$ D) Not defined

7. *In a LCR series circuit, at resonant frequency,*

A) the impedance and the current are maximum.

B) the impedance is maximum.

C) the current and voltage are out of phase.

D) the current is maximum.

8. *A choke is a :*

A) capacitor with a large self inductance

B) resistor with a large self inductance

C) inductor with a large self inductance

D) inductor with a small self inductance

9. ***In an ideal parallel LC circuit, the capacitor is charged by connecting it to a dc source which is then disconnected. The current in the circuit,***

A) becomes zero instantaneously.

B) grows monotonically.

C) decays monotonically.

D) oscillates instantaneously.

10. *The frequency of AC mains in India is*

A) 30 Hz **B) 50 Hz** C) 500 Hz D) 5000 Hz

11. *The average value of alternating current over one complete cycle is,*

A) $\frac{I_{max}}{\sqrt{2}}$ B) $\sqrt{2}\ I_{max}$ C) 0.63 I_{max} **D) Zero**

12. *An AC source is connected to resistive circuit. What of the following is true ?*

A) Current leads ahead of voltage in phase.

B) Current lags behind voltage in phase.

C) Current and voltage are in same phase.

D) Any of the above may be true depending upon the value of resistance.

13. *Current in the LCR circuit becomes extremely large when*

A) frequency of AC supply is increased

B) frequency of AC supply is decreased

C) inductive reactance becomes equal to capacitive reactance

D) Inductance becomes equal to capacitance.

14. *Alternating current cannot be measured by DC ammeter, because*

A) AC is virtual

B) AC change its direction

C) AC cannot pass through DC ammeter

D) Average value of AC for complete cycle is zero.

15. *AC power is transmitted from a power house at a high voltage as,*

A) The rate of transmission is faster at high voltage.

B) It is more economical due to less power loss.

C) Power cannot be transmitted at low voltage.

D) A precaution against theft of transmission lines.

16. *With increases in frequency of an AC supply, the inductive reactance,*

A) decreases

B) Increases directly with frequency

C) Increases as square of frequency

D) Decreases inversely with frequency

17. *In which of the following circuits the maximum power dissipation is observed?*

A) Pure capacitive circuit

B) Pure inductive circuit

C) Pure resistive circuit

D) None of these.

18. *In an LCR series AC circuit, the current,*

A) Is always in phase with the voltage.

B) Always lags the generator voltage.

C) Always leads the generator voltage.

D) None of these.

19. *Alternating current can be produced by,*

A) **Dynamo**

B) Choke coil

C) Transformer

D) Electric motor.

20. *The core of transformer is laminated to reduce,*

A) Flux leakage.

B) Hysteresis.

C) Copper loss.

D) Eddy current.

21. *A transformer is based on the principle of,*

A) Mutual induction.

B) Self induction

C) Ampere's law.

D) X-ray crystallography.

22. *The transformation ratio in the step up transformer is,*

A) One

B)Greater than one

C)Less than one

D)The ratio greater or less than one depends on the other factor.

23. *In the case of inductor,*

A) Voltage lags the current than by $\frac{\pi}{2}$

B) Voltage leads the current than by $\frac{\pi}{2}$

C) Voltage leads the current than by $\frac{\pi}{3}$

D) Voltage leads the current than by $\frac{\pi}{4}$

24. ***Quantity that remains unchanged in a transformer is,***

A) Voltage

B) Current

C) Frequency

D) None of these.

25. ***The loss of energy in the form of heat in the iron core of a transformer is,***

A) Iron loss

B) Copper loss

C) Mechanical loss

D) None of these.

Fill in the blanks:

(Current, $220\sqrt{2}$ V, mutual inductance, zero average current, admittance, minimum, maximum, angle, zero, increases, mechanical energy, 0.63 I_0 , lag behind, increases)

1. The quantity is increased in a step up transformer is ***Current***
2. The Peak value of AC voltage on a 220 V mains is $220\sqrt{2}$ ***V***
3. A transformer works on the principle of ***mutual inductance***
4. The line that draws power supply to your house from street has ***zero average current***
5. Reciprocal of impedance is ***admittance.***
6. At resonance frequency the impedance in series LCR circuit is ***minimum***
7. At resonance frequency the current amplitude in series LCR circuit is ***maximum***
8. Quality factor & power factor both have the dimensions of ***angle***
9. Average value of AC over a complete cycle is ***zero***
10. Inductive reactance increases with ***increases*** in frequency of AC.
11. In AC generator ***mechanical energy*** is converted into electrical energy of alternating form.
12. Average or mean value of AC over a half cycle is $0.63\ I_0$
13. Current in the inductive AC circuit ***lag behind*** the voltage.
14. Capacitive reactance increases with ***increases*** in frequency of AC.

CHAPTER8: ELECTROMAGNETIC WAVES

1. ***In electromagnetic waves the phase difference between electric and magnetic field vectors are***
   (a) π (b) π/2 (c) π/4 (d) Zero
2. ***Which of the following has minimum wavelength***
   (a) Blue light (b) γ-rays
   (c) infrared rays (d) microwave

3. ***Which of the following are not electromagnetic waves***
   (a) Cosmic rays
   (b) γ-rays
   (c) β-rays
   (d) X-rays
4. ***Which radiations are used in treatment of muscle ache***
   (a) Infrared
   (b) Ultraviolet
   (c) Microwave
   (d) X-rays
5. ***Waves in decreasing order of their wavelength are***
   (a) X-rays, infrared rays, visible rays, radio waves
   (b) radio waves, visible rays, infrared rays, X-rays.
   (c) radio waves, infrared rays, visible rays, X-rays
   (d) radio waves, ultraviolet rays, visible rays, X-rays
6. ***The source of electromagnetic waves can be a charge***
   (a) moving with a constant velocity
   (b) moving in a circular orbit.
   (c) at rest
   (d)falling in a magnetic field
7. ***Which one of the following has the shortest wavelength***
   (a) Infrared rays (b) Ultraviolet rays (c)Microwaves (d) Gamma rays
8. ***Select the wrong statement. EM waves***
   (a) are transverse in nature
   (b) travel in free space at a speed of light
   (c) are produced by accelerating charges
   (d)travel in all media with same speed
9. ***Which characteristic of an electromagnetic wave is affected by the medium through which it travel***
   (a) Time period (b) Velocity
   (c) Wavelength (d) Frequency
10. ***The current induced in conductor kept in varying electric field is called as***
   (a) Alternating current (b)Diffusion current
   (c) Displacement current (d)Eddy current

Fill in the blank

1. The electromagnetic waves used in finding thickness of materials_____
2. The electromagnetic waves used in crystal structure analysis_____
3. The electromagnetic waves used in radar system_____
4. Electromagnetic waves are _____
5. The electromagnetic waves used in long distance photography_____

(Answers: **gamma rays ,X-rays,Microwaves, transverse waves,IR rays)**

Key anwers

1	2	3	4	5
D	B	C	A	C
6	7	8	9	10
B	D	D	B	C

CHPTER 8:RAY OPTICS AND OPTICAL INSTRUMENTS

1. ***The relation between focal length(f) and radius of curvature (R) for a spherical mirror is***

(A) f =R/2 (B) R=f/2

(C) R=f (D) f=R

2. ***In case of convex mirror magnification (m) is***

(A) Negative only (B) Positive only

(C) May be positive or negative (D) Zero

3. ***During refraction of light,***

(A) Velocity of light changes (B) Path of light changes

(C) Wavelength of light changes (D) All the above

4. ***Identify the wrong statement: Refractive index of pair of medium(n)***

(A) Depends on wavelength of light (B) Independent of angle of incidence (i)

(C) Depends on nature of two medium (D) Depends of angle of incidence (i)

5. ***When a ray of light moves from optically rarer to optically denser medium,***

(A) It bends away from the normal (B) It bends towards normal

(C) It moves undeviated if angle of incidence is 0^0 (D) Both (B) and (C) are correct

6. ***If n_{32} is refractive index of medium 3 w.r.t medium 2, then***

(A) $n_{32} = n_{31}/ n_{12}$ (B) $n_{32} = n_{13} x\ n_{32}$

(C) $n_{32} = n_{31} + n_{12}$ (D) $n_{32} = n_{31} x\ n_{12}$

7. ***Lateral shift is,***

(A) Proportional to thickness of glass slab.

(B) Proportional to square of thickness of glass slab.

(C) Inversely Proportional to thickness of glass slab.

(D) Inversely Proportional to square of thickness of glass slab.

8. ***The bottom of the tank filled with water appears to be raised , due to***

(A) Scattering of light (B) Reflection of light

(C)Refraction of light (D)Total internal reflection of light

9. ***The sun appears 2 minutes before actual sunrise because of atmospheric***

(A) Scattering of light (B) Reflection of light

(C)Refraction of light (D)Total internal reflection of light

10. ***Which of the following is/are the condition/s for Total Internal Reflection (TIR) to occur,***

(A) Light ray should travel from rarer to denser medium

(B) Light ray should travel from denser to rarer medium

(C) Angle of incidence in denser medium should be greater than critical angle ($i>c$)

(D) Both (B) and (C)

11. When light ray travels from denser to rarer medium, if angle of incidence(i)= critical angle(c), then Angle of refraction(r) in rarer medium is

(A) 180^0 (B)0^0 (C)270^0 (D)90^0

12. Brilliance of Diamond is due to

(A) Total internal reflection of light (B) Reflection of light

(C)Refraction of light (D) Scattering of light

13. Lens Maker's formula is

(A) True for convex lens only

(B) True for concave lens only

(C) True for both convex and concave lenses

(D) True for both convex and concave mirrors

14. Identify the wrong statement.

(A) For biconvex lens focal length is positive

(B) For biconvex lens focal length is negative

(C) For biconcave lens focal length is negative

(D) SI unit of focal length is meter

15. If (f) is focal length of a lens , (u) is object distance and (v) is image distance then

(A) $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ (B) $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ (C) $\frac{1}{f} = \frac{1}{u} - \frac{1}{v}$ (D) f = u + v

16. SI unit for power of a lens is

(A) meter(m) (B) dioptre (D) (C) joule (J) (D) No unit

17. If (P) is the power of a lens and (f) is the focal length, then identify the correct relation

(A) $\frac{1}{p} = \frac{1}{f}$ (B) $P^2 = f$ (C) $f^2 = P$ (D) $P = \frac{1}{f}$

18. In various optical instruments two or more lenses are combined to (or) need for combination of lenses is to

(A) increase the magnification of image (B) make the final image erect

(C) reduce certain aberrations (D)all of the above

19. If f_1 and f_2 are individual focal lengths of two lenses and F is effective focal length of two lenses in contactthen,

(A) $F = f_1 + f_2$ (B) $F = f_1 - f_2$ (C) $\frac{1}{F} = \frac{1}{f1} - \frac{1}{f2}$ (D) $\frac{1}{F} = \frac{1}{f1} + \frac{1}{f2}$

20. If P_1 and P_2 are individual powers of two lenses and P is effective power of two lenses in contact then,

(A) $P = P_1 + P_2$ (B) $P = P_1 - P_2$ (C) $P = P_1 \times P_2$ (D) $P = P_1 / P_2$

21. If m_1 and m_2 are individual magnifications of two lenses and m is effective magnification of two lenses then,

(A) $m = m_1 + m_2$ (B) $m = m_1 \times m_2$ (C) $m = m_1 - m_2$ (D) $m = m_1 / m_2$

22. ***For a prism, at angle of minimum deviation***

(A) Light ray passes along the base (B) Light ray passes perpendicular to the base

(C) Light ray passes parallel to the base (D) Light ray bisects the base

23. ***Formation of rainbow is the combined effect of***

(A) Dispersion,refraction and total internal reflection

(B) Dispersion and total internal reflection

(C) Dispersion and refraction

(D) Dispersion,refraction, scattering and total internal reflection

24. ***Identify the wrong statement,***

(A) The inner of the two bows is primary rainbow.

(B) Primary rainbow has red colour at the outside and violet colour inside

(C) Secondary rainbow has red colour at the outside and violet colour inside

(D) Secondary rainbow is formed by rays which undergo two refraction and two internal Reflection.

25. ***Blue colour of sky is due to***

(A) dispersion of light (B) scattering of light

(C) Interference of light (D) Refraction of light

26. ***The intensity of scattered light varies inversely as the***

(A) Fourth power of the wavelength of incident light

(B) Fifth power of the wavelength of incident light

(C) Sixth power of the wavelength of incident light

(D) Seventh power of the wavelength of incident light

27. ***For an object kept an infinity infront of concave mirror, the image will be formed***

(A)Beyond C (B) Between C and F

(C) at infinity (D)at Focus

28. ***For simple microscope, object should be held at a distance***

(A) One focal length or less (B) more than one focal length

(C) Exactly at 2F (D) Beyond 2F

29. ***The magnification of a compound microscope is***

(A) Directly proportional to tube length(L)

(B) Inversly proportional to tube length(L)

(C) Directly proportional to focal length of eye piece (f_e)

(D) Directly proportional to focal length of objective(f_o)

30. ***In reflecting telescope objective lens is replaced by***

(A) Concave mirror B) Convex mirror (C) Plane mirror (D) Eyepiece

Fill banks:

1. The geometric centre of spherical mirror is called ----------
2. For a spherical mirror focal length is always half of the ----------
3. The ratio of real depth to apparent depth is called ----------
4. Optical fibers works on the principle of ----------
5. Convex mirror always produces ---------- images.
6. Power of a concave lens is taken ----------
7. Light of ---------- is scattered more.
8. ---------- is defined as ratio of linear size of image to linear size of object.
9. ---------- is used to design lenses of desired focal length.
10. dioptre is the SI unit of ----------

(Answers: **pole, radius of curvature, refractive index, total internal reflection, virtual, negative, shorter Wavelength ,Magnification, Lens maker's formula, power)**

1	2	3	4	5	6	7	8	9	10
A	**B**	**D**	**D**	**D**	**D**	**A**	**C**	**C**	**D**
11	12	13	14	15	16	17	18	19	20
D	**A**	**C**	**B**	**A**	**B**	**D**	**D**	**D**	**A**
21	22	23	24	25	26	27	28	29	30
B	**C**	**A**	**C**	**B**	**A**	**D**	**A**	**A**	**A**

WAVE OPTICS

1. ***What is the nature of the wave front associatd with a parallel beam of light?***

a)Planeb) Spherical c) Elliptical d) None of the above.

2. ***Huygen's principle of secondary waves is used to***

a)Obtian the wave front geometrically b) explain polarization

c)Obtain focal length of thick lenses d) explain dispersion of light

3. ***A wavefront is a surface on which all the point***

a) remain in phasae b) remain out of phase c) have a phase difference of $\pi/2$ with their neighbouring points d) have abruptly varying phase

4. ***A wave front originating from a point source is***

a) cylindrical 2) plane c) spherical d) cubical

5. ***The phenomenon that confirms the transervrse the transverse nature of light is***

a) interference b)polarization c) diffraction d) dispersion

6. ***Sources of light which emit the light waves of the same wavelength and constant phase difference are said to be***

a) Incoherent b) luminous c)non luminous d)coherent

7. ***Which of the following is correct relation between the wavefront and the ray of light? The ray of light***

a) is normal to the wavefront b) is tangent to the wavefront

c) can be inclined at any angle with the wavefront d) does not exist according the Huygen's principle

8. ***In Young's double slit experiment a maximum is obtained when the path difference between the interferneing waves is***

A) nπ b) 2nπ c) (2n+1) π d) (2n+1) π/2

9. ***For a sustained interference interference we need two sources which emit radiation***

a) with same intensity b) with same amplitude c)having constant phase differenced) in a narrow beam

10. ***In Young's double slit experiment a minimum is obtained when the phase difference of superimposing waves is (Given that m = 1,23,4..)***

a) zero b) mπ c) (m+1) π d) (2m+1) π

11. ***For best contrast between maxima and minima in the interference pattern of Young's double slit experiment, the intensity of light emerging out of the two slits should be***

a) equal b) double c) small d) large

12. ***In Young's double slit experiement, the central spot on the screen is always bright because***

a) the path difference between the lght waves meeting at this point is λ/2

b) the phase difference between the eaves meeting at this point is π/2

c) the path difference between the light waves meeting at this point is zero

d) the path difference between the light waves meeting at this point is λ

13. ***The interference differes from diffraction in that***

a) it cannot be observed with white lightb) unlike diffraction the interference fringes are of varying intensity c) interference minima are perfectly dark and that of diffraction may not be darkd) The diffraction fringes are of equal width but the interference fringes are of unequal width.

14. ***The width of the diffraction fringes varies***

a) directly as the distance between the slit and the screen b) inversely as the the wavelength c) directly as the width of the slitd) inversely as the size of the source from which slit is illuminated

15. ***Diffractrion pattern cannot observed with***

a) to narrow slits b) large number of narrow slits c) one narrow slit d) one wide slit

16. ***The width of central diffraction maximum when the width of the aperture increases with***

a) increases b) decrease c) be unchanged d) not be predicted

17. ***The diffraction of light shows that light***

a) Is a transverse wave nature b) is a longitudinal wave c) travels in the form of a waved) is of particle

18. ***Diffraction effects can be observed***

a) Only in light waves supersonic waves b) only in sound waves c) both in light and sound wavesd) only in

19. ***The condition for the formation of diffractrion maxima is that path difference &x should be equal to***

a) nλ b) (2n-1) λ/2 c) (n-1) λ/2 d)(n-1)n λ/2

20. ***The resolving power of a microscope can be increased by***

a)increasing the wavelength of light b) decreasing the wavelength of light

c)increasing the refractive index of the medium the object and the objective d) both (b) and (c)

21. ***When the light is polarized by reflection, what is the angle between the reflected and the refracted rays***

a) 0 b) $\pi/4$ c) $\pi/2$ d) π

22. ***When the light is incident at the polarising angle, which of the following is completely polarized***

a) reflected light b) refracted light c) both reflected as well as refracted lightd) neither reflected nor refracted light

23. ***The transverse nature of light wave is confirmed by***

a) interference b) diffraction c) polarization d) None of the above

24. ***The refractive index is equal to the tangent of the angle of polarization, it is called***

a) Brewster's law b) Malu's law c) Bragg's law d) Grimaldi's law

25. ***$I=I_0\cos^2\theta$ is***

a) Malus law b) Brewster law c) Huygens law d) Newtons law

26. ***From the Brewster's law it follows that angle of polarization depends on***

a) wavelength b) frequency c) plane of polarization d) plane of vibration

27. ***From Brewster's law, it follows that the polarizing angle is independent of***

a) wavlength of light b) nature of the reflecting surface c) both wavelength of light and nature of the reflecteing surface d) orientation of plane of polarization

28. ***Polaroid is an optical device used to***

a) produce plane polarized light b) analyse plane polarized light

c) produce and analyse plane polarized light d) to scatter the light.

Answers:

1.a	2.a	3.a	4.c	5.b	6.d	7.a	8.b	9.c	10.d	11.a	12.b.
13.c	14.a	15.d	16.a	17.c	18.c	19.b	20.d	21.c	22.a	23.c	24.a
25.a	26.a	27.d	28.c								

Fill in the blanks:(polarization, interference, diffraction, limitof resolution of telescope, fringewidth)

1. Redistribution of light energy due to superposition of two or more light waves is called_____
2. _____is bending of light around the corners of an obstacle.
3. The minimum angular seperation between the two point objects so that they are seen just resolved is called_____
4. _____is distance between two bright fringe or dark fringe.
5. _____is the vibrations of light wave are restricted to one plane perpendicular to the direction of propogation.

Answers: **1.Interference** **2.Diffraction** **3.Limit of resolution of telescope**
4. fringewidth **5. polarisation**

CHAPTER 11. DUAL NATURE OF RADIATION AND MATTER

1. ***The phenomenon of emission of electron from a metal surface by heating it is called***
   a. filled emission
   b. thermionic emission
   c. photoelectric emission
   d. secondary emission
   Ans:a.thermionic emission
2. ***The photocurrent in an experiment on photoelectric effect increases if***
   a. the intensity of source is increased
   b. the frequency of light is increased
   c. the intensity of source is decreased
   d. the frequency of light is decreased
   Ans: a.the intensity of source is increased
3. ***Kinetic energy of electron emitted in photoelectric effect depends upon***
   a. frequency of incident light
   b. intensity of incident light
   c. nature of atmosphere surrounding the photosensitive surface
   d. none of the above
   Ans: a. frequency of incident light
4. ***Moving with the same kinetic energy which of the following has longest wavelength of the matter wave***
   a. $\propto$ particle b.β particle
   c. Proton d.Neutron
   Ans: b. β particle
5. ***Davisson - Germer experiment proved***
   a. Wave nature of electrons b.Particle nature of electrons
   c.Wave nature of light d.Particle nature of light
   Ans: a. Wave nature of electrons
6. ***The de-broglie wavelength of electron accelerated from rest through a potential V is proportional to***
   a. $\frac{1}{V}$ b. $\frac{1}{\sqrt{V}}$ c. V d. $\sqrt{V}$
   Ans:b. $\frac{1}{\sqrt{V}}$

7. ***Photoelectric effect is discovered by***

a. Henrich Hertz b. de-broglie c. Max plank d. C.T. Davisson

Ans:a. Henrich Hertz

8. ***The electrons emitted during photoelectric effect***

a. Photo current b. Photo electron c. field emission d. Both a. and b.

Ans:b. Photo electron

9. ***Stopping potential depends on***

a. Frequency of the incident radiation b. Intensity of the incident radiation

c. Both a. and b. d. None of the above

Ans:a. Frequency of the incident radiation

10. ***On what factor the threshold frequency depends***

a. Nature of the metal surface b. Number of electron in the metal surface

c. kinetic energy of the electron d. Both b. and c.

Ans:a. Nature of the metal surface

11. ***The work function of a photosensitive material related to the threshold wavelength***

a. Inversely proportional b. Directly proportional

c. Square of the threshold wavelength d. None of the above

Ans:a. Inversely proportional

12. ***Photoelectric current depends on***

a. Frequency of radiation b. Intensity of radiation

c. Both a. and b. d. Kinetic energy of the photoelectron

Ans:b. Intensity of radiation

13. ***Stopping potential independent on***

a. Frequency of incident radiation b. Intensity of incident radiation

c. Wavelength of incident radiation d. Both a. and b.

Ans: b. Intensity of incident radiation

14. ***The relation between stopping potential and maximum kinetic energy of photoelectron***

a. Kmax = ev_o b. Kmax=$\frac{1}{ev_o}$

c. Kmax= -ev_o d. Kmax= ev_o^2

Ans: a.Kmax = ev_o

15. ***The wave associated with the material particles in motion***

a. Electromagnetic wave b. Matter waves

c. Electric wave d. Magnetic wave

Ans:b. Matter waves

16. ***Dual nature of matter is postulated by***

a. Millikan b. Davission

c. Louis de-broglie d. Einstein

Ans:c. Louis de-broglie

17. ***Theory which explains the phenomenon to photo electric emission***

a. Quantum theory

b. Classical theory

c. Both a. and b.

d. None of the above

Ans: a. Quantum theory

18. ***The velocity of photo electrons emitted vary with frequency of incident light on a photo Cathode***

a. Velocity $\propto \sqrt{frequency}$

b. Velocity $\propto \frac{1}{\sqrt{frequency}}$

c. Velocity $= \sqrt{frequency}$

d. Velocity $\neq \sqrt{frequency}$

Ans: a. Velocity $\propto \sqrt{frequency}$

19. The energy of each photon

a. $E = h\nu^{-1}$

b. $E = h\nu$

c. $E = -h\nu$

d. $E = h\nu^2$

Ans: **b. $E = h\nu$**

20. Energy of photon is directly ***proportional*** to

a. Square of frequency of the photon

b. Frequency of the photon

c. Cube of the frequency of the photon

d. square root of the frequency of the photon

Ans:b. Frequency of the photon

21. Charge of photons are

a. Electrically neutral

b. Electrically positive

c. Electrically negative

d. None of the above

Ans: a. Electrically neutral

22. The photoelectric emission takes place when

a. $\nu > \nu_o$ b. $\nu < \nu_o$

c. $\nu < 1/\nu_o$ d. $\nu = 1/\nu_o$

Ans: **a. $\nu > \nu_o$**

23. For which color in VIBGYOR has stopping potential if maximum

a. Red

b. Blue

c. Violet

d. Green

Ans:c. Violet

24. For which color in VIBGYOR has stopping potential is minimum

a. Blue

b. Yellow

c. Red

d. Velvet

Ans:c. Red

25. Einstein's photoelectric equation is

a. $E = \varphi_o + K_{max}$

b. $E = \varphi_o - K_{max}$

c. $E = \varphi_o + K_{max}^2$

d. $E = \varphi_o - 1/K_{max}$

Ans:a. $E = \varphi_o + K_{max}$

FILL IN THE BLANKS:

1. The minimum energy required for an electron come out from the metal surface is **work function**.
2. Emission of electrons by the application of a strong positive electric field near the surface **field emission**.
3. The liberation of electrons from the surface of a metal is **electron emission**.
4. **Photo electric effect** is the phenomenon which illustrates particle nature light.
5. **Threshold frequency**is the phenomenon minimum frequency of the incident radiate on below which there is no photo emission occur.
6. **Stopping potential** is the minimum negative potential of the anode for which no electron reaches the anode.
7. **Millikan** verified the Einstein's photoelectric effect experimentally.
8. Energy is made up of discreate unit of energy is **quanta**.
9. **Photon** is a packet of light energy.
10. **Alkali metals** are photo sensitive metal even to visible light.
11. Rest mass of photon is **zero**.
12. Kinetic energy of photoelectrons emitted by a metal surface depends on **frequency of incident radiation**.
13. Electrons emitted by the metal surface are **photoelectron**.
14. $\Delta x \Delta p \approx \hbar$ representing Heisenberg's uncertainty principle.
15. Not possible to measure both the position and momentum of an electron at the same time exactly is **Heisenberg's uncertainty principle**.

CHAPTER12:ATOMS

I.Pick the correct option among the four given options for ALL of thefollowing questions:

1) ***Which of the following atom model is also known as planetary model***

A)Thomson's model B)Rutherford's model C)Bohr's model D)Vector atom model

2) ***According to Bohr's quantization condition for angular momentum of an electron is***

A)$nh/2\pi$ B)$n^2h/2\pi$ C)$h/2\pi n$ D)$h/2\pi n^2$

3)***For hydrogen atom Bohr's radius varies as***

A)$r_n \alpha n^2$ B)$r_n \alpha n$ C)$r_n \alpha 1/n$ D)$r_n \alpha 1/n^2$

4)***If KE and PE are the kinetic energy and potential energy of an electron in an atom then***

A) $|PE| = 2|KE|$ B)$|KE| = 2|PE|$ C)$|KE| = |PE|$ D)$|PE| = |\sqrt{KE}|$

5)***According to Rutherford's atomic model the order of radius of the nucleus is***

A) 10^{-10}m B) 10^{-12}m **C) 10^{-15}m** D) 10^{-9}m

6) ***According to Rutherford's atomic model the order of radius of the atom is***

A) 10^{-10}m B) 10^{-12}m C) 10^{-15}m D) 10^{-9}m

7)***Suppose an α-particle incident towards the centre of the nucleus then velocity of the α-particle is***

A)increases B)decreases C)Remains constant **D)decreases and bouns back**

8)***The necessary centripetal force for an electron to revolve around the nucleus is provided by***

A)Electrostatic force B)Magnetic force C)Electromagnetic force D)Lorentz's force

9) ***Which of the following series lies in UV-region of electromagnetic spectrum***

A)Balmer B)Bracket C)Lyman D)Pfund

10)***Which of the following series lies in Visible region of electromagnetic spectrum***

A)Balmer B)Bracket C)Lyman D)Pfund

11)***Bohr's theory of atomic model fail to explain***

A)Stability of an atom B)Origin of spectral lines C)Rydberg constant value **D)Wave nature of electron**

12)***Bohr's atomic model successfully explained***

A)Zeeman effect B)Stark effect C)Fine structure **D)Origin of spectral lines**

13)***According to de-Broglie the electron in it's circular orbit must produce***

A)Progressive wave **B)Stationary waves** C)Electromagnetic waves D)Laser

14)***For an electron in a given atom always***

A) Excitation energy = Ionisation energy B) Excitation energy > Ionisation energy

C) Excitation energy < Ionisation energy D) Excitation energy =√ Ionisation energy

15)***An atom is always electrically***

A)Positive charge B)Negative charge **C)Neutral** D)Varies

16)Plum pudding model for atom was propose by

A)Rutherford **B)J.J.Thomson** C)Bohr D)Schrodinger

17) The wave number of a spectral line related to it's wavelength as

A)$\bar{\upsilon} \alpha 1/\lambda$ B)$\bar{\upsilon} \alpha 1/\lambda^2$ C)$\bar{\upsilon} \alpha 1/\lambda^4$ D)$\bar{\upsilon} \alpha \lambda$

18)An atom radiate energy according to Bohr's theory only when

A)An electron jumps from lower energy orbit to higher energy orbit B)An electron remains in higher energy orbit

C)An electron jumps from higher energy orbit to lower energy orbit D)An electron remains in lower energy orbit

19)If an atom absorb energy according to Bohr's theory , then

A)An electron jumps from lower energy orbit to higher energy orbit

B)An electron remains in higher energy orbit

C)An electron jumps from higher energy orbit to lower energy orbit

D)An electron remains in lower energy orbit

20)For series limit of Paschen series of hydrogen atom, electron transition should be from

A)Infinity to 4^{th} orbit **B)Infinity to 3^{rd} orbit** C)Infinity to 4^{th} orbit D)Infinity to 2^{nd} orbit

21)Fine structure can be observed in the following series of hydrogen spectrum

A)Lyman **B)Balmer** C)Pfund D)Paschen

22)The following order shows the Balmer series members with increase in their intensities

A)H_α H_β H_γ H_δ B) H_δ H_γ H_β H_α C)H_α H_δ H_γ H_β D) H_δ H_β H_α H_γ

23)Excitation potential required to excite the electron from -3.4 eV energy to -13.6 eV energy orbit is

A)-17V B)17V **C)10.2V** D)-10.2V

24)For ground state of hydrogen atom it's electron should be in the following orbit

A)Zero **B)First** C)n^{th} D)Infinity

25)Electron was discovered by

A) J.J.Thomson B)Chadwick C)Newton D)Einstein

II.Fill in the blanks by choosing appropriate answer given in the bracket

(Lyman, Rutherford's alpha scattering experiment, angle of scattering, Paschen, $_{83}Bi^{254}$, J.J.Thomson)

1)The first atom model was proposed by ----------

2) ---------- determines the upper limit to the size of the nucleus.

3)The angle between incident direction of alpha particles and direction of scattered alpha particle is called as-----

4)An electron transists from 5^{th} orbit to 3^{rd} orbit in hydrogen atom. The spectral line belongs to ---------- series.

5)In Geiger-Marsden experiment ---------- element is used as a source of α-particle.

ANSWERS: 1B 2A 3A 4A 5C 6A 7D 8A 9C 10A 11D 12D
13B 14C 15C 16B 17A 18C 19A 20B 21B 22A 23C 24B 25A

CHAPTER 13.NUCLEI

1) SI unit of activity is ----------

a) bequerel b) curie c) ruther d) Bequerel

2)Density of nuclei is independent of

a) atomic number b) mass number c) nuclear mass a) nuclear size.

3)Nuclei having same mass number but different atomic number are called

a) isotopes b) isobars c) isotones d) isomers

4) Nuclei having same atomic number but different mass number are called

a) isotopes b) isobars c) isotones d) isomers.

5) Among the following , which set of nuclei are isotopes ?

a) ${}_6C^{14}$ and ${}_7N^{14}$ b) ${}_2He^3$and ${}_1H^3$ c) ${}_{92}U^{235}$ and ${}_{92}U^{238}$ d) ${}_{14}Si^{28}$ and ${}_{32}Ge^{73}$

6) Density of the nucleus is of the order of

a) 10^{17} kgm^{-3} b)10^{-17} kgm^{-3} c) 10^{12} kgm^{-3}d) 10^{-12} kgm^{-3}

7) The force between nucleons inside the nucleus is due to exchange of

a) fermions b) π mesons c) nuetrons d) protons .

8) If F_{PP} , F_{NN} and F_{PN} denotes the strong nuclear force between proton-proton, neutron-nuetron, and proton- neutron within the nucleus, then

a) $F_{PP} < F_{NN} = F_{PN}$ b) $F_{PP} = F_{NN} = F_{PN}$ c) $F_{PP} > F_{NN} = F_{PN}$ d) $F_{PP} < F_{NN} < F_{PN}$

9) Binding energy of the nucleus is energy equivalent of

a) mass of nucleus b) mass of proton c) mass defect of nucleus d) mass of nuetrons.

10) The specific binding energy is maximum for

a) Fe (iron) b) s (sulphur) c) O (Oxygen) d) U (Uranium)

11) Example for particle- antiparticle is

a)electron- positron b)electron –proton c)electron – antielectron d) electron – neutron

12) The number of nuclei undergoing the decay per unit time depends on

a) total number of nuclei in the sample

b) temperature of nuclei in the sample

c) pressure

d) both a and b

13) Dimensional formula for activity is

a) T b) T^{-1} c) s d) s^{-1}

14) Half life of Radioactive sample depends on

a) pressure b) temperature c) number of nuclei present d) nature of the element.

15) Reciprocal of the decay constant of a radioactive sample is

a) mean life b) half life c) activity d) none of these

16) *Tritium has a half life 12.5 years undergoing beta decay. The fraction of a sample of pure tritium will remain undecayed after 25 years is*

a) $1/8^{th}$ of initial b) $1/4^{th}$ of initial c) $1/16^{th}$ of initial d) 1/2 of the initial

17) *In a radioactive decay, neither the atomic number nor the mass number changes. Following particle is emitted in the decay*

a) proton b) neutron c) photon d) electron

18) *During radioactive decay of a nucleus,the mass number decreases by 4 units and atomic number decreases by 2 units. Then the type of radioactive decay is*

a)gamma decay b) alpha decay c) β^- decay d) β^+ decay

19) *During radioactive decay of a nucleus, the mass number remains same and atomic number increases by one units. Then the type of radioactive decay is*

a) gamma decay b) alpha decay c) β^- decay d) β^+ decay

20) *Alpha particle emitted from radioactive material is*

a) Helium nuclei b) Hydrogen nuclei c) Lithium nuclei d) none of these

21) *The emission electron in β^- decay is accompanied by the emission of an*

a) proton b) neutrino c) antineutron d) electron

22) *which of the following are not emitted by radioactive substance ?*

a) electron b) proton c) Gamma rays d) Helium nuclei.

23) *The gamma rays are of electromagnetic radiation of wavelength*

a) shorter than X- ray
b) longer than X- ray
c) shorter than uv- ray
d) longer thanuv- ray

24) *The control rods used in nuclear reactor can be made up of*

a) Graphite b) uranium c) cadmium d) lead .

25) $_{92}U^{235} + {}_0n^1 \longrightarrow {}_{92}U^{236} \longrightarrow {}_{56}Ba^{141} + {}_{X}Kr^{Y} + 3{}_0n^1 + energy$

The values of X and Y are

a) 36,92 b) 38 ,90 c) 35, 91 d) 37 ,89

26) *The source of stellar energy is*

a) nuclear fusion b) nuclear fission c) radioactivity d) none of these

27) *The principle of hydrogen bomb is*

a) Radioactivity b) nuclear fission c) nuclear fusion d) none of these

28) $_{15}P^{32} \longrightarrow X + {}_{-1}e^0 + \bar{\nu}$, *the X in the reaction is*

a) $_{92}U^{236}$ b) $_{56}Ba^{141}$ c) $_{11}Na^{22}$ d) $_{16}S^{32}$

ANSWERS

1) a 2) b 3) b 4) a 5) c 6) a 7) b 8) b 9) c 10) a 11) a 12) a 13) b 14) c 15) a 16) b 17) c 18) b 19) c20) a 21) c 22) b 23) a 24) c 25) a 26) a 27) c 28) d

FILL IN THE BLANKS:

(nuetronto proton, James Chadwick, few femtometres,Apsara, A.H Becquerel, isotons, isobars,heavy water, mass spectrometer)

1)---------- used measure atomic masses.

2) All nuclides with same mass number A are called ---------.

3) $_{198}Hg^{80}$ and $_{79}Au^{197}$ are called ----------.

4) The nuclear forces between two nucleons falls rapidly to zero as their distance is more than a ----------.

5) ---------- discovered radioactivity in1896 purely by accident.

6) ---------- used as a moderator in nuclear reactor.

7) The first nuclear reactor in India----------

8) Beta negative decay is the conversion of ----------

9) Nuetrons are discovered by ----------

1. **mass spectrometer**
2. **isobars**
3. **isotones**
4. **fewfemtometres**
5. **A.H Becquerel**
6. **heavy water**
7. **Apsara**
8. **nuetron to proton**
9. **James Chadwick**

CHAPTER14: SEMICONDUCTOR DEVICES

1. ***The majority charge carriers in P-type semiconductor are***
   (a)Electrons (b)Protons (c)Holes (d) Neutrons
2. ***A P-type semiconductor can be obtained by adding***
   (a)Arsenic to pure silicon (b) Gallium to pure silicon
   (c)Antimony to pure germanium (d) Phosphorous to pure germanium

3. ***Electrical conductivity of a semiconductor***
   (a) Decreases with the rise in its temperature
   (b) Increases with the rise in its temperature
   (c) Does not change with the rise in its temperature
   (d) First increases and then decreases with the rise in its temperature

4. ***Let n_p and n_e be the number of holes and conduction electrons respectively in a semiconductor. Then***
   (a) $n_p > n_e$ in an intrinsic semiconductor
   (b) $n_p = n_e$ in an extrinsic semiconductor
   (c) $n_p = n_e$ in an intrinsic semiconductor
   (d) $n_e > n_p$ in an intrinsic semiconductor

5. ***The energy band gap is maximum in***
   (a)Metals (b) Superconductors
   (c)Insulators (d) Semiconductors

6. ***At room temperature, a P-type semiconductor has***
   (a) Large number of holes and few electrons
   (b) Large number of free electrons and few holes
   (c) Equal number of free electrons and holes
   (d) No electrons or holes

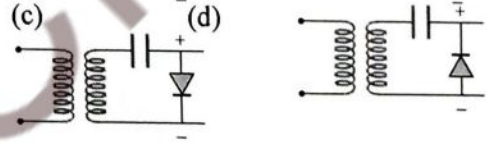
7. ***In the forward bias arrangement of a PN-junction diode***
   (a) The *N*-end is connected to the positive terminal of the battery
   (b) The *P*-end is connected to the positive terminal of the battery
   (c) The direction of current is from *N*-end to *P*-end in the diode
   (d) The *P*-end is connected to the negative terminal of battery

8. ***The reason of current flow in P-N junction in forward bias is***
   (a) Drifting of charge carriers
   (b) Minority charge carriers
   (c) Diffusion of charge carriers
   (d) All of these

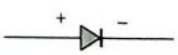
9. ***Which is the correct diagram of a half-wave rectifier***

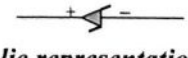
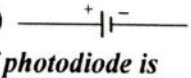
(a) (b)

(c) (d)



10. ***The correct symbol for zener diode is***

(a)  (b) 

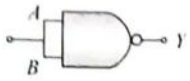
(c)  (d) 

11. ***Symbolic representation of photodiode is***

(a)  (b)  (c)  (d) 

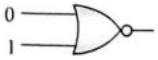
12. *This symbol represents*

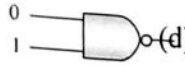
a. NOT gate
b. OR gate
c. AND gate
d. NAND gate



13. *Which of the following gates will have an output of 1*

(a) 

(b) 

(c) 

(d) 

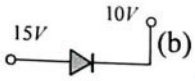
14. *Which of the following logic gate is an universal gate*

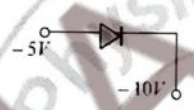
(a)OR (b)NOT (c)AND (d) NOR

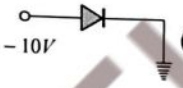
15. *The logic behind 'NOR' gate is that it gives*

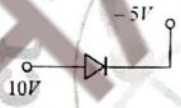
(a) High output when both the inputs are low b) Low output when both the inputs are low
(b)High output when both the inputs are high d)None of these

16. *Which one is reverse-biased*

(a) 

(b) 

(c) 

(d) 

17. *The energy band gap of Si is*

(a) $0.70eV$ (b) 1.1 eV(c) (c)Between $0.70eV$ to $1.1eV$ (d)5 eV

18. *The impurity atoms which are mixed with pure silicon to make a P-type semiconductor are those of*

(a)Phosphorus (b) Boron(c) Antimony (d) Copper

19. *The forbidden gap in the energy bands of germanium at room temperature is about*

(a) $1.1eV$ (b) $0.1eV$
(c) $0.67eV$ (d) $6.7eV$

20. *When phosphorus and antimony are mixed in germaniun, then*

(a) *P*-type semiconductor is formed
(b) *N*-type semiconductor is formed
(c) Both (a) and (b)
(d) None of these

Fill in the blank

1.The optoelectronic device used to detect light signal _____
2.The optoelectronic device used to convert electrical energy into light energy _____
3.The width of depletion region in forward bias of semiconductor diode _____
4.The circuit that convert AC into pulsating DC is _____
5.The conductivity of intrinsic semiconductors after doping will _____
(Anwers: **Photodiode ,LED, decreases, Rectifier, increases)**

Key answers

1	2	3	4	5
C	B	B	C	C
6	7	8	9	10
A	B	C	B	A
11	12	13	14	15
C	A	C	D	B
16	17	18	19	20
C	B	B	C	B

II PUC PHYSICS MCQs

ELECTRIC CHARGE AND FIELD AND ELECTRIC POTENTIAL CAPACITORS

1. Which one of the following is the unit of electric field
   a) Coulomb b) Newton c) Volt **d) N/C**
2. If an electric dipole is kept in a uniform electric field then result electric force on it is
   a) always zero b) never zero
   c) depend upon capacity of dipole d) none
3. The work done in rotating an electric dipole in an electric Field
   a) W = ME (1-cosθ) b) W = ME tanθ
   c) W = ME secθ d) W = 0
4. If sphere of a bad conductor is given charge then it is distributed on
   a) surface b) inside the surface
   c) only inside the surface **d) none**
5. A soap bubble is given a negative charge then its radius
   a) decreases **b) increases** c) remains same d) zero
6. Two charges are placed at a distance apart of a glass slab is placed between them force between them will be
   a) zero b) increases
   c) decreases d) remains same
7. The acceleration of a charged particle in a uniform electric field is
   a) proportional to its charge only
   b) inversely proportional to its mass only
   c) proportional to its specific charge
   d) inversely proportional to specific charge
8. Dimensions of ϵ_0
   a) $[M^{-1} L^3 T^4 A^2]$ b) $[M^0 L^{-3} T^3 A^3]$
   c) $[M^{-1} L^{-3} T^3 A]$ d) $[M^{-1} L^{-3} T A^2]$
9. The dielectric constant of a metal is
   a) 0 b) 1 **c) α** d) 1
10. Column law in vector form can be written as
    a) $\vec{F} = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1 q_2}{r^2}\right)$ 2) $\vec{F} = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1 q_2}{r}\right)\hat{r}$
    c) $\vec{F} = \frac{1}{4\pi\epsilon_0}\left(\frac{q_1 q_2}{r^2}\right)\hat{r}$ d) $\vec{F} = \frac{1}{8\pi\epsilon_0}\left(\frac{q_1 q_2}{r^2}\right)\hat{r}$
11. S.I unit of 'ϵ_0' will be
    1) $N^{-1} m^{-2} c^{-2}$ b) $N m^{-2} c^2$
    c) $N^{-1} m^{-2} c^2$ d) $Nm^{-2} c^2$
12. When a dipole is placed in a uniform electric field it Experiences
    a) a net force **b) a torque**

c) both net force and torque
d) neither a force or torque

13. The S.I unit of electric dipole moment
a) C b) Cm^{-1} **c) Cm** d) Nm^{-1}

14. $E = -\frac{dV}{dr}$, here negative sign sign signified that
a) E is opposite to b) E is negative
c) E increases when V decreases
d) E is directed in the direction of decreasing V

15. When a dipole moment 'P' is placed in uniform electric field E, then torque acting dipole on
a) $\overline{C} = \overline{P}.\overline{E}$ b) $\overline{C} = \overline{P} + \overline{E}$
c) $\overline{\mathbf{C}} = \overline{\mathbf{P}} \mathbf{x} \overline{\mathbf{E}}$ d) $\overline{C} = \overline{P} - \overline{E}$

16. The number of electrons contained in 1C of charge
a) 6.25×10^{18} b) 6.25×10^{17}
c) $\mathbf{6.25 \times 10^{19}}$ d) 1.6×10^{19}

17. 1 Volt is equal to
a) 1N b) 1 Mm^{-1} **c)** $\mathbf{1\ NC^{-1}}$ d) $1J^{-1}$

18. The minimum amount of charge observed so far is
a) 1C b) $4.8 \times 10^{-13}C$
c) $\mathbf{1.6 \times 10^{-19}C}$ d) $1.6 \times 10^{+19}C$

19. For large distances from a short dipole, the electric field due to it depends on the distance form it as
a) $\frac{1}{(\text{distance})^2}$ **b)** $\frac{\mathbf{1}}{\mathbf{(distance)^3}}$
c) $(\text{distance})^3$ d) $(\text{distance})^2$

20. When does the torque acting on electric dipole placed in a uniform electric field is maximum
a) $\mathbf{\theta = 0^0}$ b) $\theta = 180^0$
c) $\theta = 90^0$ d) $\theta = 120^0$

21. When does the torque acting on an electric field placed in a uniform electric field is minimum
a) $\theta = 0^0$ b) $\theta = 180^0$ **c)** $\mathbf{\theta = 90^0}$ d) $\theta = 120^0$

22. S.I unit of electric flux
a) $\mathbf{Nm^2/C}$ b) N^2M^2/C c) $Nm^{-1}C^3$ d) Nm^2C^{-2}

23. Name the apparatus used to detect electric charge on a body
a) gold leaf electroscope b) vande gruff generator
c) metal detector d) electroscope

24. S.I unit of linear charge density
a) c/m^2 **b) c/m** c) c/m^3 d) cm

25. S.I unit of surface charge density
a) c/m **b)** $\mathbf{c/m^2}$ c) c/m^3 d) cm

26. S.I unit of volume charge density
a) c/m b) c/m^2 **d)** $\mathbf{c/m^3}$ d) cm

27. What is the value of electric potential at a point on the equatorial line of an electric dipole

a) zero b) $V = \frac{1}{4\pi\epsilon_0}\frac{q}{r^2}$

c) infinity d) maximum conductor

28. Net electric field in the interior of a charged

a) infinity **b) zero** c) $E = \frac{1}{4n\epsilon_0} \times \frac{q}{r^2}$ d) maximum

29. Why net electric field in the interior of a charged conductor is zero

a) charges always reside on the outer surface of the conductor

b) charges does not reside on the outer surface of the conductor

c) charged reside only inner side of conductor

d) all the above

30. The difference between electric lines of force and magnetic lines of induction is

a) electric lines pass through vacuum and magnetic lines do not

b) Electric lines of force are open and magnetic lines are closed curves

c) magnetic lines exist electric lines do not

d) there is no difference

31. Work required to move a charge from one point to another on the equipotential surface

a) Vq b) Eq **c) zero** d) infinity

32. Direction of dipole moment

a) positive to negative **b) negative to positive**

c) perpendicular to equatorial line

d) parallel to equational line

33. Electric potential at a point on the axial line from the centre of the dipole is (short dipole)

a) directly proportional to (distance)

b) directed proportional to $(distance)^2$

c) inversely proportional to $(distance)^3$

d) inversely proportional to (distance)

34. Expression for electric field due to uniformly charged in infinite plane sheet

a) $\frac{\sigma}{\epsilon_0}$ **b)** $\frac{\sigma}{2\epsilon_0}$ c) $\frac{\sigma}{3\epsilon_0}$ d) $\frac{\sigma}{4\epsilon_0}$

35. Work done in rotating the dipole in the uniform field from position $\theta 1$ to θ_2 is

a) W = PE (cos θ1-cosθ2) b) W = PE (cos θ)

c) W = PE sin θ d) W = PE (cos θ2-cos

36. Work done ion rotating the dipole from its stable equilibrium position through an angle 'θ' is
a) W = PE (1-cos θ) b) W = PE (1-sin θ)
c) W = 0 d) W = PE sin θ

37. Expression for linear charge density (λ)
a) $\frac{q}{r}$ b) $\frac{q}{A}$ c) $\frac{q}{v}$ d) qlAV

38. Expression for surface charge density (σ)
a) $\frac{q}{r}$ **b)** $\frac{q}{A}$ c) $\frac{q}{v}$ d) qlAV

39. Expression for volume charge density (b)
a) $\frac{q}{r}$ b) $\frac{q}{A}$ **c)** $\frac{q}{V}$ d) qrAV

40. An electron is moving along x-axis and electric field is also in same direction
a) circular b) parabola c) elliptical **d) straight line**

41. Potential at the point of pointed conductor is point
a) maximum b) minimum
c) zero **d) same as at any other**

42. An equatorial line and a line of force are
a) perpendicular to each other b) parallel to each other
c) in any direction d) at an angle of 45^0

43. When a positively charged conductor is placed near an earth connected conductor its potential
a) always increases **b) always decreases**
c) may increases or decreases d) remains the same

44. Electric potential at same point in space is zero. Then at that point
a) electric intensity is necessarily zero
b) electric intensity is necessarily non zero
c) electric intensity is may or may not be zero
d) electric intensity is necessary infinity

45. The angle between the electric dipole moment and the electric field strength due to if on the equatorial line
a) 0^0 b) 90^0 **c) 180^0** d) 60^0

46. What will be the value of electric field at the centre of the electric dipole
a) zero
b) equal to the electric field due to one charge at centre
c) twice the electric field due to one charge at centre
d) half the value of electric field due to one charge at centre

47. Write the relation between electric field and electric potential at a point
a) E = - $\frac{dV}{dx}$ b) E = + $\frac{dV}{dx}$ c) = E = - $\frac{dx}{dV}$ d) E = $\frac{dV}{dt}$

48. Example for Non polar molecule _____ O_2, N_2, H_2 etc.

49. Example for poalr molecule HCl, H_2O, etc.

CURRENT ELECTRICITY

1. The slope of V-I graph gives
   a) Resistance b) Impedance
   c) Reactance d) Susceptance
2. The reciprocal of resistance is called
   a) Mobility **b) Conductance**
   c) Admittance d) Conductivity
3. The conductivity is the reciprocal of
   a) Resistivity b) Mobility
   c) Susceptibility d) Permeability
4. A carbon resistance reads red-red-black what is its resistance
   a) 2.2 Ω **b) 22Ω** c) 220 Ω d) 0.22 kΩ
5. ohms law hold good for
   a) All conductors **b) Metallic conductors**
   c) Semiconductors d) Ionic conductors
6. Which of the following is example for non-ohmic device
   a) copper b) iron
   c) semiconductor d) aluminum
7. In series combination which physical quantity remains constant
   a) current b) potential c) difference d) power
8. Ohms law of valid when the temperature of conductor is
   a) very low b) very high c) varying **d) constant**
9. Current per unit area is called
   a) Mobility **b) current density** c) resistance d) resistivity
10. Average velocity with which free electrons moves in the conductor opposite to applied electric field is called
    a) thermal velocity **b) drift velocity**
    c) specific velocity d) Brownian velocity
11. Kirchhoff's loop rule is a consequence of law of conservation of
    a) energy b) charge c) mass d) momentum
12. Kirchhoff's junction rule is a consequence of law of conservation of
    a) energy **b) charge** c) momentum d) mass
13. Principle of working of meter bride is
    a) balanced wheat stone bridge b) unbalanced
    c) electromagnetic induction d) mechanical effect of current
14. Resistance of a wire is directly proportional to
    a) area **b) length**
    c) cube of the length d) square root of the length

15. Which of the following is vector
    a) current **b) current density**
    c) resistance d) power
16. The S.I unit of resistivity is
    a) ohm $-m^2$ **b) ohm – m** c) ohm/m d) ohm
17. The alloys like constantan and manganese are used to make standard resistance because have
    a) low resistivity b) zero resistivity
    c) very low temperature coefficient of resistance
    d) very high temperature coefficient of resistance
18. The internal resistance of a cell is determined by using
    a) voltmeter b) ammeter
    c) potentiometer d) A.C generator
19. Which of the following instrument is used to measure emf of a cell Accurately
    a) voltmeter b) rheostat
    c) potentiometer d) ammeter
20. Which of the following is used to protect circuits from high currents
    a) resistor **b) fuse** c) voltmeter d) capacitor

MOVING CHARGES AND MAGNETISM

1. Toroid is
   a) ring shaped closed solenoid
   b) ring shaped open solenoid
   c) rectangular shaped solenoid
   d) square shaped solenoid
2. A charge 'q' moves with velocity 'v' through electric field (E) as well as magnetic field (B). Then the force acting on it is
   a) q $(\vec{E}\,X\,\vec{V})$ b) q $(\vec{B}\,X\,\vec{V})$ **c) q** $(\vec{E}+\vec{V}X\vec{B})$ d) q $(\vec{V}\,X\,\vec{B})$
3. Which of the following while in motion cannot be deflected by magnetic field
   a) protons b) cathode rays c) alpha particles **d) neutrons**
4. Maximum kinetic energy gained by the charged particle in the cyclotron in independent of
   a) radius of the does b) charge
   c) mass **d) frequency of revolution**
5. A charged particle enters the magnetic field by an angle 90^0 with the magnetic field. Its path is
   a) circular b) helical c) straight line d) ellipse
6. Two parallel conductors carrying currents in same direction
   a) neither attract nor repel each other b) repel each other
   c) attract each other d) will have rotational
7. Two parallel conductor carrying unequal current in the opposite direction
   a) repel each other b) attract each other
   c) neither repel nor attract d) will have rotational motion
8. Torque acting on a rectangular coil carrying current I situated parallel to magnetic field of induction 'B' having number of turns 'n' and area 'A' is
   a) ni $(\vec{A}.\vec{B})$ b) $\frac{nBA}{i}$ **c) ni** $(\vec{A}\,X\,\vec{B})$ d) $\frac{iBA}{n}$
9. Which of the following is exact expression for bohr Magneton
   a) $\frac{eh}{2\pi m}$ **b)** $\frac{\mathbf{eh}}{\mathbf{4\pi m}}$ c) $\frac{h}{e\pi m}$ d) $\frac{e}{2m}$
10. The magnetic field $\overrightarrow{dB}$ due to small current element $\overrightarrow{dl}$ at a distance $\vec{r}$ and element carrying current 'i' is
    a) $\overrightarrow{dB}=\frac{\mu_0}{4\pi}i\left(\frac{\vec{dl}x\vec{r}}{r}\right)$ b) $\overrightarrow{dB}=\frac{\mu_0}{4\pi}i^2\left(\frac{\vec{dl}x\vec{r}}{r}\right)$
    c) $dB=\frac{\mu_0}{4\pi}i^2\left(\frac{\vec{dl}x\vec{r}}{r^2}\right)$ **d)** $\overrightarrow{\mathbf{dB}}=\frac{\mu_0}{4\pi}\mathbf{i}\left(\frac{\vec{dl}x\vec{r}}{r^3}\right)$

11. The magnetic field at a point inside the solenoid is
a) $\frac{\mu_0 ni}{2}$ **b) $\mu_0 ni$** c) zero d) $\mu_0 i$

12. A charged particle in the motion may produce
a) electric field only b) magnitude field only
c) both of them
d) sometimes electric and magnetic field

13. The magnetic dipole moment of a current loop is independent of
a) magnetic field in which it is lying
b) no of turns c) area of the loop
d) maximum at the centre and minimum at the edge

14. A cyclotron is used to accelerate
a) only negatively charged particles
b) neutron
c) both positively and negatively charged particles
d) only positively charged particles

15. A galvanometer can be converted into ammeter by Connecting
a) a small resistance in series with it
b) a small resistance in parallel with it
c) a high resistance in parallel with it
d) a high resistance in series with it

16. The resistance of ideal voltmeter and ideal ammeter Respectively are
a) 0, 0 **b) ∞, 0** c) 0, ∞ d) ∞, ∞

17. The line integral of magnetic field induction enclosed by a loop is equal to
a) $\mu_0 q$ **b) $\mu_0 i$** c) $\frac{q}{\epsilon_0}$ d) zero

18. In moving coil galvanometer, the current flowing through it is proportional to
a) θ b) tan θ c) cot θ d) sin θ

19. A galvanometer can be converted into a voltmeter by Connecting
a) high resistance in parallel with it
b) high resistance in series with it
c) low resistance in series with it
d) low resistance in parallel with it

20. Which of the following is/are the sources of magnetic field.
a) current b) magnet
c) both 1 and 2 d) data inadequate

MAGNETISM AND MATTER

1. Which of the following is/are wrong statements regarding to magnetic lines of force.
   a) Magnetic lines of force are open loops
   b) Inside the magnet they are from south pole to north pole
   c) Magnetic field lines does not pass through superconductors
   d) Magnetic field lines determines strong and weak field regions
2. Which of the following expression represents gauss law in Magnetism.
   a) $\oint \vec{B}.\overrightarrow{ds} = \mu_0 i$ **b)** $\oint \vec{B}.\overrightarrow{ds} = 0$ c) $\oint \vec{B}.\overrightarrow{dl} = \mu_0 i$ d) $\oint \vec{B}.\overrightarrow{ds} = \frac{q}{\epsilon_0}$
3. The magnetic susceptibility is negative for
   a) diamagnetic materials only
   b) ferromagnetic materials
   c) paramagnetic material only
   d) both dia and ferromagnetic materials
4. Curie temperature is the temperature above which
   a) Ferromagnetic materials converts into paramagnetic
   b) Paramagnetic materials converts into ferromagnetic
   c) paramagnetic materials converts into diamagnetic
   d) ferromagnetic materials converts into diamagnetic
5. Which of the following is one use of electromagnets
   a) loud speaker b) electric crane
   c) telephone diaphragm **d) all of the above**
6. A ferromagnetic material in the magnetic field moves
   a) from stronger to the weaker parts of the field
   b) from weaker to the stronger parts of the field
   c) perpendicular to the field
   d) any other direction
7. Electromagnets are made of soft iron because soft iron has
   a) low retentivity and high coersivity
   b) low retentivity and low coersivity
   c) high retentivity and low coersivity
   d) high retentivity and high coersivity
8. The S.I unit of magnetic flux is
   a) ampere b) tesla **c) weber** d) curie
9. A magnetic needle placed in uniform magnetic field experiences
   a) a force and a torque b) a force but not a torque
   c) torque but not a force d) neither a torque nor a force

10. The expression for time period of oscillation of a magnetic needle in the uniform magnetic field is

a) $2\pi\sqrt{\frac{M}{IB}}$ **b) $2\pi\sqrt{\frac{I}{MB}}$** c) $2\pi\sqrt{\frac{IB}{M}}$ d) $2\pi\sqrt{\frac{IMB}{3}}$

11. For a paramagnetic material, the dependence of the magnetic susceptibility 'λ' on the absolute temperature 'T' is given by

a) $\chi\ \alpha\ T$ **b) $\chi\ \alpha\ \frac{1}{T}$** c) $\chi\ \alpha\ T^{-2}$ d) $\chi\ \alpha\ T^{0}$

12. The area enclosed by a hysteresis loop is a measure of

a) retentivity b) coersivity
c) permeability d) energy loss per cycle

13. The relation between relative permeability and susceptibility Is

a) $\mu_r = x - 1$ **b) $\mu_r = x$**
c) $\mu_r = x + 1$ d) $\mu_r = x^{-1}$

14. The angle between geographical meridian and magnetic meridian is called

a) dip **b) delination** c) polarization d) electrification

15. The value of dip at poles

a) zero **b) 90^0** c) 45^0 d) 5^0

16. The value of B_H at poles is

a) zero b) constant and non-zero
c) variable and non-zero d) equal to B

17. The expression for potential energy of bar magnet is

a) –PE cos θ b) PE cos θ
c) PE sin θ d) 1-PE sin θ

18. The magnetic moment per unit volume is numerical equal to

a) magnetic intensity **b) magnetization**
c) susceptibility d) permeability

19. The S.I unit of magnetic field induction is

a) Weber/m^2 b) A/m c) weber d) weber/m^3

20. If the horizontal component of the earth is equal to its vertical component then dip value is

a) 45^0 b) 90^0 c) 0^0 d) 180^0

21. For a material the magnetic susceptibility χ=-1 then the material may be

a) super conductor b) platinum
c) iron d) cobalt

E.M.I

1. Which of the following law gives the direction of induced emf.
   a) ampere circuital law **b) lenz's law**
   c) Flemings right hand rule d) Flemings left hand rule
2. Lenz's law is a consequence of law of conservation of
   a) charge **b) energy** c) mass d) momentum
3. Which of the following is an application of eddy currents
   a) speedometer b) optical fibre c) AC generator
   d) brilliance of diamond
4. The core of the transformer is laminated to minise the loss due to
   a) hysteresis **b) eddy currents**
   c) copper losses d) winding losses
5. The self inductance of a solenoid is directly proportional to
   a) N **b) N^2** c) N^{-1} d) N^0
6. The change in magnetic flux in a coil induces current in the same coil. This phenomena is called
   a) mutual induction b) self induction
   c) Magnetisation d) electrification
7. Which of the following electrical analogne of mass
   a) resistance **b) inductance**
   c) capacitance d) conductance
8. The charge induced in a coil
   a) depends on time into which change in flux occurs
   b) independent of time
   c) depends on the resistance of the coil
   d) both 2 and 3
9. Which of the following expression is equal to energy stored in inductor
   a) $\frac{1}{2}$ Li **b) $\frac{1}{2}$ Li^2** c) Li d) $\frac{1}{3}$ Li^2
10. The energy in the inductor is stored in the form of
    a) electric field **b) magnetic field**
    c) both electric and magnetic field
    d) some times electric and some times magnetic field.

11. Whenever the flux linked with a coil changes then
    a) current is always induced
    b) an emf and a current are always induced.
    c) an emf is always induced and current is induced when the coil is a closed one.
    d) an emf is induced but a current is never induced.
12. The frequency of alternating current in India is
    a) 500 Hz **b) 50 Hz** c) 60 Hz d) 70 Hz
13. Where a rod of length 'l' is moving with a speed 'v' in the magnetic field perpendicular to its length then emf induced across the rod is
    a) B^2l^2u **b) blv** c) B/lv d) l/Bv
14. Name the quantity which is measured in Henry/meter
    a) resistance b) capacitance
    c) inductance d) conductance.
15. Which of the following is the exact expression for mutual inductance of two coaxial solenoids
    a) $\frac{\mu_0 NA}{l}$ b) $\frac{\mu_0 N_1 N_2 A}{l}$ c) $\frac{1}{4\pi\epsilon_0}\frac{N_1 N_2 A}{l}$ d) $\frac{\epsilon_0, N_1, N_2 A}{l}$
16. The basic cause of induced emf
    a) change in current b) variable magnetic field
    c) change in magnetic flux d) all the above
17. A metallic piece becomes very hot when it is surrounded by a coil carrying high frequency alternating currents. What is the principle involved in this.
    a) total internal reflection b) magnetic hysteresis
    c) eddy currents d) joule effect
18. The alternating emf can be expressed as $e = e_0 \sin wt$. in this expression 'e_0' is
    a) $\frac{NB}{Aw}$ b) $\frac{AW}{NB}$ **c) NBAW** d) LW
19. The magnitude of induced emf in a coil is directly proportion to rate of change in
    a) resistance b) current
    c) magnetic flux d) reactance.
20. The magnetic flux is the dot product of area vector and
    a) electric flux **b) magnetic flux**
    c) work done d) velocity

ALTERNATING CURRENT

1. In general in an alternating current circuit
   a) The average value of current in zero
   b) The average value of square of current is zero
   c) average power dissipated zero.
   d) The phase difference between voltage and current is zero
2. In an ac circuit the current
   a) Is in the phase with voltage
   b) leads the voltage
   c) lags the voltage
   d) any of the above depending on the circumstances
3. Alternating current is transmitted to distant place at
   a) high voltage and low current
   b) high voltage and high current
   c) low voltage and low current
   d) low voltage and high current.
4. In an ac circuit containing only capacitance in the circuit
   a) leads voltage by 180^0 b) lags the voltage by 90^0
   c) leads the voltage by 90^0
   d) remains in phase with the voltage
5. An LCR circuit is connected to a source of alternating current at resonance the applied voltage and the current at resonance the applied voltage and the current flowing through the circuit will have phase difference of
   a) $\frac{\pi}{4}$ **b) zero** c) π d) $\frac{\pi}{2}$
6. Transformer works on the principle of
   a) mutual induction b) self induction
   c) induced emf d) current
7. Transformer ratio
   a) $\frac{E_S}{E_P} = \frac{N_S}{N_P}$ b) $E_S\ E_P = N_S N_P$
   c) $E_P\ N_P = E_S N_S$ d) $\frac{E_P}{E_S} = \frac{N_S}{N_P}$
8. Ideal transformer transformation is equal to
   a) one b) two c) three d) four
9. The efficiency of a transformer is the ratio
   a) $\mathbf{n = \frac{output\ power}{input\ power}}$ b) n = output power x input power
   c) $n = \frac{\text{input power}}{\text{output power}}$ d) n = input power – out put power
10. The electric current whose magnitude changes with time and direction reverses periodically is
    a) alternating current b) direct current

c) average current d) instantaneous current

11. RMS value of A.C

a) $\boldsymbol{I_{rms} = \frac{I_0}{\sqrt{2}}}$ b) $I_{rms} = \sqrt{2}\ I_O$

c) $I_{rms} = \frac{\sqrt{2}}{I_0}$ d) $I_{rms} = 2I_0$

12. RMS value of voltage of AC

a) $\boldsymbol{V_{rms} = \frac{V_0}{\sqrt{2}}}$ b) $V_{rms} = \sqrt{2}\ V_0$

c) $V_{rms} = \frac{\sqrt{2}}{V_0}$ d) $V_{rms} = 2V_0$

13. Inductive reactance=

a) Lω b) L-ω c) $\frac{L}{\omega}$ d) ωR

14. Capacitive reactance is=

a) $\frac{1}{\omega c}$ b) ω c c) $\frac{\omega}{c}$ d) $\frac{C}{\omega}$

15. Instaneous value of alternating through an inductor

a) $\boldsymbol{I = I_0 \sin\left(wt - \frac{\pi}{2}\right)}$ b) $I = I_0 \sin\left(wt + \frac{\pi}{2}\right)$

c) $I = \sin\left(wt - \frac{\pi}{2}\right)$ d) $I = \sin\left(wt + \frac{\pi}{2}\right)$

16. The voltage across condenser is lagging behind the current by a phase angle of

a) $\frac{\pi}{2}$ b) π c) $\frac{\pi}{4}$ d) $\frac{\pi}{3}$

17. The current is lagging behind the resultant voltage by a phase angle of

a) $\frac{\pi}{2}$ b) π c) $\frac{\pi}{4}$ d) $\frac{\pi}{3}$

18. Current is in phase with voltage when

a) $\boldsymbol{\omega_L = \frac{1}{\omega_c}}$ b) $\omega_L = \omega_c$ c) $\omega = \frac{1}{c}$ d) $\omega_c = \omega_R$

19. Which of the following material is used as core of a transformer

a) Soft iron b) Copper c) Molybdenum d) Bismuth

20. Frequency of DC source is

a) ∞ **b) 0** c) 340 Hz d 220 Hz

ELECTROMAGNETIC WAVES

1. Identify the wrong statement among the following options about properties of electromagnetic waves
   a) They are produced by accelerated charges.
   b) They are transverse in nature
   c) They can be polarized.
   d) They required material medium for their propagation
2. Displacement current arise due to
   a) constant electric flux b) time varying electric flux
   c) change of magnetic flux d) constant magnetic flux
3. Micro waves are used
   a) in nuclear reactions b) to keep earth warm
   c) to kill germs in water purifiers
   d) to cook food micro ovens
4. Existence of electromagnetic waves experimentally confirmed by the scientist
   a) James clerk maxwell b) Newton
   c) Heinrich hertz d) Einstein
5. The wavelength is maximum for
   a) Radio waves b) gamma rays
   c) UV rays d) micro waves
6. The frequency is maximum for
   a) Radio waves **b) gamma rays**
   c) UV rays d) micro waves
7. The transverse nature of electromagnetic waves is confirmed By
   a) reflection b) interference
   c) polarization d) diffraction
8. The nature of electromagnetic waves is
   a) longitudinal **b) transverse**
   c) mechanical d) stationary
9. The range of wavelength for visible region is
   a) 700nm to1mm **b) 400nm to 700nm**
   c) 1nm to 400nm d) 1nm to 1pm
10. The cause of greenhouse effect is due to
    a) X-rays b) UV-rays c) radio waves **d) infra-red rays**
11. Electromagnetic waves do not transport
    a) energy **b) charge**
    c) momentum d) information
12. Which of the following rays are used in LASIK eye surgery
    a) X-rays **b) UV-rays** c) radio waves d) infra-red rays

Ray optics

1. Air bubble in water behave as
   a) Concave, sometimes convex lens
   b) Concave lens c) Convex lens
   d) Always refracting surface
2. In the formation of a rainbow the light from the sun on water droplets
   Undergoes
   a) dispersion **b) TIR**
   c) Dispersion and TIR d) Scattering
3. When a ray of light enters from one medium to another medium then which of the following does not change?
   a) Frequency b) Wavelength
   c) Speed d) Amplitude
4. Mirage is a phenomenon of
   a) Refraction of light b) Reflection of light
   c) Total internal reflection of light d) Diffraction of light

1. Refractive index = $\frac{\text{velocity of light in vacuum}}{\text{velocity of light in medium}}$
2. The distance between the focus and the pole of the mirror
   a) Focal length b) Radius of curvature
   c) Pole d) Optical centre
3. Relation between real depth and apparent depth
   a) $\mu = \frac{\text{Real depth}}{\text{Apparent depth}}$ b) $\mu = \frac{\text{Apparent depth}}{\text{Real depth}}$
   c) μ = Real depth x apparent depth
   d) μ = real depth + apparent depth
4. Relation between critical angle and retractive index
   a) $\mu = \frac{1}{\sin\theta_c}$ b) $\mu = \sin\theta_c$ c) $\mu = \sin\theta_c$ x sini d) $-\frac{1}{\mu} = \frac{1}{\sin\theta c}$
5. The distance between the principal focus and the optical centre of the lens is
   a) Focal length b) Radius of curvature
   c) Principal axis d) Centre of curvature
6. Linear magnification produced by a lens
   a) Magnification = $\frac{\text{size of image}}{\text{size of object}}$ b) Magnification = $\frac{\text{size of object}}{\text{size of image}}$
   c) Magnification = size of object x size of image
   d) size of image = $\frac{\text{magnification}}{\text{size of object}}$

1. Virtual image formed by convex mirror has magnification negative
2. Optical denseness of a medium is measured in terms of refractive index
3. Minimum angle of incidence in the dense medium for which angle of refraction becomes 90^0 is called critical angle
4. Blue colour of sky is due to phenomenon of scattering of light
5. Optical fibre works on the principle of total internal reflection
6. The splitting of white light into it's constituent colours when it passes through a glass prism is called dispersion
7. Snell's law of refraction of light $N = \frac{\sin i}{\sin r}$
8. SI unit of power of lens dioptre
9. Deviation produced by a prism of small angle $\delta = \mu - 1) A$
10. The near point of a normal eye is at a distance 25cm
11. The reciprocal of focal length expressed in terms $P = \frac{1}{f}m$
12. Relation between critical angle and refractive index $\mu = \frac{1}{\sin c}$
13. Relation between focal length and radius of curvature is focal length $= 1/2 \times$ radius of curvature

1. The direction of light ray and its wave front is
   a) parallel **b) perpendicular** c) opposite d) same direction
2. Which of the following has maximum refractive index
   a) water **b) diamond** c) glass d) air
3. The bottom of a tank appears to be concave due to
   a) reflection **b) refraction** c) diffraction d) scattering
4. Duration of day time is greater than night time due to this property of light
   a) refraction b) reflection c) diffraction d) scattering
5. Mirage and looming are due to
   a) reflection b) refraction c) diffraction d) total internal reflection
6. Glittering of diamond is due to
   a) total internal reflection b) reflection
   c) refraction d) interference
7. The lens maker's formula is applicable to only
   a) marginal rays **b) paraxial rays** c) for all rays d) non paraxial rays
8. The focal length of convex lens is maximum for
   a) blue b) green c) yellow **d) red**
9. A prism is placed in water the angle of minimum deviation
   a) increases **b) decrease**
   c) remains same d) increases and decreases

10. The colour of light is a characteristics of
    a) amplification b) wavelength c) velocity **d) frequency**
11. Why a ray of light enters into air from a glass slab
    a) It's wavelength increases **b) It's wavelength decreases**
    c) It's frequency increases d) It's frequency decreases
12. Wave nature of light was proposed by
    a) Huygen b) young c) Fresnel d) Maxwell

Wave optics

1. Interference of light was first demonstrated by
   a) Thomas young b) Malus
   c) Max planck d) Newton
2. In Huygen's wave theory the locus of all points in the same state of vibration is called
   a) half period zone **b) wave front**
   c) point source d) reflection
3. Young's double slit experiment the band width is maximum for the colour
   a) Red b) Yellow c) Green d) Blue
4. Young's double slit. Experiment the central spot of the fringes is
   a) Bright b) Dark
   c) Partially dark d) Partially bright
5. In plane polarized light plane containing electric vector is called plane of
   a) Circulation **b) vibration**
   c) Polarisation d) Diffraction
6. The substance which can rotate the plane of polarization is Called
   a) Optically active substance b) Inactive substance
   c) Polarizing substance d) analyzing substance
7. Ordinary light is
   a) Plane polarized b) Partially polarized
   c) Circularly polarized **d) Un polarized**
8. Double refraction of light was discovered by
   a) Brewster b) Snell **c) Barthrolinus** d) Stoke
9. Substance from the following which gives double refraction
   a) glass b) water **c) calcite** d) flint
10. The relation between refractive index of the medium and angle of polarization is called
    a) Brewster law b) malus law
    c) stoke's law d) newton law
11. Waves are said to undergo constructive interference if phase difference between them
    a) $\frac{\pi}{4}$ b) π c) $\frac{\pi}{2}$ **d) 0**
12. Waves are said to undergo destructive interface if phase difference between them
    a) π b) $\frac{\pi}{2}$ c) $\frac{\pi}{4}$ d) $\frac{\pi}{6}$

13. Interference proves
a) transverse nature of light b) longitudinal nature of light
c) wave nature of light d) If young's double slit experiment

14. If young's double slit experiment is immersed in water then the fringe width
a) Increase **b) decrease**
c) remains unchanged d) become infinite

15. Light appears to travel in a straight line because
a) It velocity is very large
b) it is not absorbed by the surroundings
c) Its wavelength is very small
d) It is reflected by the surrounding

16. The contrast in the fringe in any inference pattern depends on
a) fringe width b) wavelength
c) intensity ratio of sources d) distance between the sources

17. For constructive interference to take place between two monochromatic light waves of wavelength λ the path difference should be
a) $(2n-1)\frac{\lambda}{4}$ b) $(2n-1)\frac{\lambda}{2}$
3) n λ d) $(2n+1)\frac{\lambda}{2}$

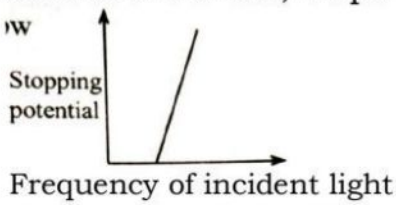
18. Diffraction can be explained by
a) Newton's corpuscular theory **b) Huygen's Fresnel principle**
c) E.M theory d) Plank quantum theory

19. The phenomenon which does not take place sound wave is
a) scattering b) diffraction
c) interference **d) polarization**

20. In propagation of electromagnetic wave the angle between the direction of propagation and plane polarisation is
a) 0^0 b) 45^0 c) 90^0 d) 180^0

DUAL NATURE OF RADIATION & MATTER

1. Radiations of frequency υ are incident on a photo sensitive metal. The maximum K.E of photo electrons is E. when the frequency of the incident radiations is doubled, what is the maximum. K.E of photo electrons?
   a) E + hv b) 4E c) 2E d) E – hv
2. In photoelectric effect, slope of the graph given below gives



   a) Charge on the electron b) Planck's constant
   c) Work function of emitter **d) h/e**
3. The least energy required to eject an electron from an atom is called
   a) K.E b) Electrical energy
   c) Work – function energy d) Chemical energy
4. Work function is the energy required
   a) To produce X-rays b) to excite an atom
   c) To explore an atom
   d) To eject an electron just out of the surface
5. Photo electric effect is based upon
   a) Energy b) Momentum c) Charge d) Mass
6. Photoelectric effect supports
   a) Huygen's wave theory of the light
   b) Maxwell's electromagnetic theory of light
   c) Planck's quantum theory of light
   d) Newton's corpuscular theory of the light
7. The best metal to be used for photoemission is
   a) Potassium b) Sodium
   c) Cesium d) Lithium
8. The photo electric effect occurs only when the incident light has more than a certain minimum
   a) Wavelength b) Speed
   c) Charge **d) Frequency**
9. The photo electric threshold wavelength of certain metal is 3000 Å. If the radiation of 2000 Å is incident on a metal, then
   a) Electrons will be emitted b) Protons will be emitted
   c) Positrons will be emitted d) Electrons will not be emitted

10. The maximum number of photoelectrons released in a photocell is independent of
    a) Nature of the cathode surface
    b) Frequency of incident ray
    c) Intensity of radiations incident on cathode surface
    d) None of the above
11. Intensity of light incident on a photo sensitive surface is doubled. Then
    a) The no of emitted electrons is trebled
    b) The no of emitted electrons is doubled
    c) K.E is doubled
    d) Momentum is doubled
12. If the frequency of light in a photoelectric experiment is doubled, the stopping potential will:
    a) Be doubled b) Be halved
    c) Become more than double d) Become less than double
13. The K.E of photo electrons depends on
    a) Intensity of incident light
    b) The difference between the frequency of the incident light and the threshold frequency
    c) The sum of frequency of incident light and threshold frequency
    d) The ratio of frequency of light used and threshold frequency
14. If the distance of 100 watt lamp is increased from a photo cell, saturation current I. In the photo cell, I varies with distance d as
    a) $I \propto d$ b) $I \propto d^2$ **c) $I \propto \frac{1}{d^2}$** d) $I \propto \frac{1}{d}$
15. The rest mass of photon is
    a) Zero b) 1kg
    c) 1.6×10^{-19}kg d) 3.1×10^{-30}kg
16. A proton and an electron move with the same velocity. The associated wavelength for proton is
    a) Shorter than that of the electron
    b) Longer than that of the electron
    c) The same as that of the electron
    d) Zero
17. The wavelength of De-Broglie wave associated with a thermal neutron of mass 'm' at absolute temperature T is given by
    a) $\frac{h}{\sqrt{mkT}}$ b) $\frac{h}{\sqrt{2mkT}}$ **c) $\frac{h}{\sqrt{3mkT}}$** d) $\frac{h}{\sqrt{4mkT}}$

NUCLEI (13)

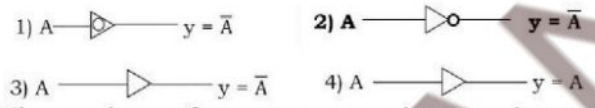
1. The binding energy of an alpha particle
   a) Is released when be particle splits
   b) Must be added to turn the particle
   c) Is released when the particle turns its constituents
   d) Adds to the mass of the alpha particle.
2. In the process of fusion
   a) B.E/ nucleons increases
   b) B.E / nucleons decreases
   c) B.E / nucleons remains constant
   d) Energy is absorbed
3. For stable (neutral) atom
   a) $N < Z$ **b) $N = Z$** c) $N > Z$ d) $N > Z$
4. The value of 1 atomic mass unit – in kilogram
   a) $1u = 1.66 \times 10^{-72}$ kg b) $1\ u = 1.56 \times 10^{-27}$ kg
   c) $1\ u = 1.66 \times 10^{-27}$ kg d) $1\ u = 1.66 \times 10^{27}$ kg
5. How is the radius of the nucleus of an atom related to its mass number.
   a) $R \alpha A^{1/3}$ b) $R \alpha 1/A^{1/3}$
   c) $R \alpha A^{3/1}$ d) $R \alpha A^{2/3}$
6. What is the energy equivalent to 1 amu?
   a) 932.5 Mev **b) 931.5 Mev**
   c) 931.5 eV d) 932.5 eV
7. What happens when an electron and a positron collide?
   a) Photon is produced b) Electron is produced
   c) Positron is produced d) None of the above
8. Which property of nuclear forces is responsible for constancy of binding energy per nucleon.
   a) Long range force b) Medium range force
   c) Short range force d) Long or short range force
9. Who discovered the phenomenon of radio activity?
   a) Mary cuire b) Chadvic
   c) Einstein **d) Becquerel**
10. Which particle emitted along with electron when a neutron is converted into proton in a nucleus.
    a) Anti – proton b) proton – proton
    c) electron – proton **d) anti – neutrino**
11. How does the number of radioactive atoms vary with time?
    a) Decreases b) Increases
    c) Constantly increases d) No change
12. How does the half – life of a radioactive sample depend on its decay constant?

a) $T \alpha \lambda$ b) $T \alpha 2/\lambda$ **c) $T \alpha 1/\lambda$** d) $T \alpha \lambda^{-2}$

13. In which type of B-decay antineutrino is emitted?
    a) positive β-decay **b) negative β-decay**
    c) In both positive – negative β-decay
    d) none of the above
14. Einsteins mass – energy relation is
    a) $E = \upsilon c^2$ b) $E = mc$
    c) $E = mc^2$ d) $E = m^2c$
15. Nuclear forces are
    a) Strongly attractive forces b) Weak attractive forces
    c) Long range – forces d) Central forces.
16. The parameter used to measure the stability of the nucleus is
    a) Average binding energy b) Number of protons
    c) Number of neutrons d) Number of electrons
17. The radius of a nucleus mainly depends on
    a) Proton number b) Electron number
    c) Mass number d) Neutron number
18. The nuclear size is measured in units of
    a) Angstrom **b) Fermi** c) Bar d) light – year
19. Nuclides which have the same mass number are called
    a) Isotopes **b) Isobars** c) Isotones d) Isomers
20. Among the following one is not emitted by a radioactive substance.
    a) Electrons b) β-rays
    c) Positron **d) Protons**

SEMICONDUCTOR DEVICES

1. A semiconductor at OK behaves as
   a) Conductor **b) Insulator**
   c) Super conductor d) Extrinsic semiconductor
2. On increasing temperature the conductivity of pure Semiconductors
   a) Decreases **b) Increases**
   c) Remains unchanged d) Becomes zero.
3. The other name of P-n junction is
   a) Insulator b) Diode resistor
   c) Transistor **d) Semiconductor diode**
4. The circuit symbol of NOT gate is



5. The value of energy gap in semiconductor is
   a) Energy gap < 3 eV b) Energy gap = 3 e V
   c) Energy gap > 3 e V d) Energy gap > 3 e V
6. The width of the depletion region when the diode is forward biased.
   a) Increases **b) Decreases**
   c) Constant d) Increases rapidly
7. The valence of impurity element for making p-type semiconductor is
   a) 5 b) 4 **3) 3** d) 7
8. In intrinsic semiconductor at room temperature the number of electrons and holes are
   a) Equal b) Zero c) Unequal d) Infinite
9. Band gap in insulator is of the order
   a) 6eV b) 0.60eV c) -6eV d) 0 eV
10. The majority carriers in a P-type semiconductor are
    a) Electrons **b) Holes**
    c) Both (1) & (2) d) Impurities
11. In intrinsic semiconductor conductivity is
    a) Low b) Average c) High d) Very low
12. In intrinsic semiconductor conductivity is due to
    a) Doping b) Holes
    c) Breaking of covalent bonds d) Free electrons
13. P-n junction diode acts as
    a) ohmic resistance **b) Non-ohmic resistance**
    c) Both (1) & (2) d) Amplifier

14. In forward bias the depletion layer behaves like
    a) An insulator b) Capacitor
    c) A semiconductor **d) A conductor**
15. P-n junction in reverse bias behaves like
    a) A condenser b) An inductor
    c) Amplifier **d) An off switch**
16. The main cause of avalanche breakdown is
    a) Collision by ionization b) High doping
    c) Recombination of electrons & holes
    d) Low doping
17. The thickness of depletion layer is approximately
    a) 1 μm b) 1 mm c) 1 cm d) 1m
18. The potential in the depletion layer due to
    a) Electrons b) Holes
    c) Ions d) Forbidden band
19. P-n Junction diode can be used as.
    a) Amplifier **b) Detector**
    c) Oscillator d) Capacitor
20. In the boolean algebra, the following one is wrong
    a) 1 + 0 = 1 b) 0 + 1 = 1
    c) 1 + 1 = 1 **d) 0 + 0 = 1**