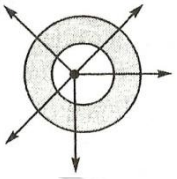
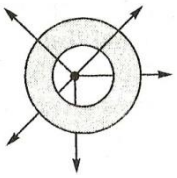
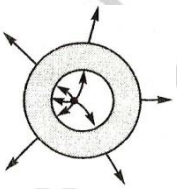
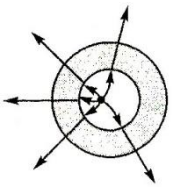
MCQ's

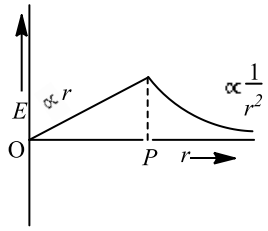
ELECTRIC CHARGES AND FIELDS

1. A comb run through one's dry hair attracts small bits of paper. This is due to
   a) Comb is good conductor
   b) Paper is good conductor
   c) The atoms in the paper get polarised by the charged comb
   d) The comb possesses magnetic properties
2. Two charges +q and $-q$ are kept apart. Then at any point on the right bisector of line joining the two charges
   a) The electric field strength is zero
   b) The electric potential is zero
   c) Both electric potential and electric field strength are zero
   d) Both electric potential and electric field strength are non- zero
3. Identify the wrong statement in the following. Coulomb's law correctly described the electric force that
   a) binds the electrons of an atom to its nucleus
   b) binds the protons and neutrons in the nucleus of an atom
   c) binds atoms together to form molecules
   d) Binds atoms and molecules to from solids
4. In nature, the electric charge of any system is always equal to
   a) Half integral multiple of the least amount of charge
   b) Zero
   c) Square of the least amount of charge
   d) Integral multiple of the least amount charge
5. If a conducting medium is placed between two charges, then the electric force between them will become.
   a) Zero b) Infinity
   c) 1 N d) 1 dyne
6. Which of the following statement is correct?
   a) Electric field is zero on the surface of current carrying wire.
   b) Electric field is non-zero on the axis of hollow current carrying wire
   c) Surface integral of magnetic field for any closed surface is equal to μ_0 times of total algebraic sum of current which are crossing through the closed surface
   d) None of the above
7. Electric field of an isolated metallic sphere at any interior point is
   a) Zero
   b) One
   c) Proportional to field
   d) None of these
8. A metallic shell has a point charge q kept inside its cavity. Which one of the following diagrams correctly represents the electric lines or forces?

   a)  b) 

   c)  d) 

9. Consider a thin spherical shell of radius R consisting of uniform surface charge density σ. The electric field at a point of distance x from its centre and outside the shell is
   a) inversely proportional to σ
   b) directly proportional to x^2
   c) directly proportional to σ
   d) inversely proportional to x^2
10. The figure shows electric field E at a distance r in any direction from the origin O. The electric field E is due to



   a) A charged hollow metallic sphere of radius OP with centre at O
   b) A charged solid metallic sphere of radius OP with centre at O
   c) A uniformly charged non-conducting sphere of radius OP with centre at O
   d) A uniformly charged non-conducting hollow sphere of radius OP with centre at O

11. What is angle between electric field and equipotential surface?
    a) 90°always b) 0° always
    c) 0° to 90° d) 0° to 180°

12. A spherical shell of radius R has a charge$+q$ units. The electric field due to the shell at a point
    a) Inside is zero and varies as r^{-1} outside it
    b) Inside the constant and varies as r^{-2} outside it
    c) Inside is zero and varies as r^{-2} outside it
    d) Inside is constant and varies as r^{-1} outside it

13. A hollow sphere of charge does not produce an electric field at any
    a) Interior point b) Outer point
    c) Beyond 2m d) Beyond 10m

14. Electric field strength due to a dipole at a point on the axial line of dipole is
    a) From positive charge to negative charge
    b) From negative charge to positive charge
    c) Along the equatorial line
    d) At an angle to axial line

15. An electric dipole of the dipole moment **p** is placed in a uniform electric field **E**. The maximum torque experienced by the dipole is
    a) pE b) $\frac{P}{E}$ c) $\frac{E}{P}$ d) **p.E**

16. The relation between the intensity of the electric field of an electric dipole at a distance r from its centre on its axis and the distance r is where ($r \gg 2l$)
    a) $E \propto \frac{1}{r}$ b) $E \propto \frac{1}{r^2}$
    c) $E \propto \frac{1}{r^4}$ d) $E \propto \frac{1}{r^3}$

17. Torque acting on an electric dipole in a uniform electric field is maximum if the angle between **p** and **E** is
    a) 180° b) 0° c) 90° d) 45°

18. The electric field intensity **E**, due to an electric dipole of moment **p**, at a point on the equatorial line is
    a) Parallel to the axis of the dipole and opposite to the direction of the dipole moment **p**
    b) Perpendicular to the axis of the dipole and is directed away from it
    c) Parallel to the dipole moment
    d) Perpendicular to the axis of the dipole and is directed towards it

19. An electric dipole has a pair of equal and opposite point charges q and $-q$ separated by a distance$2x$. The axis of the dipole is defined as
    a) Direction from positive to negative charge
    b) Direction from negative to positive charge
    c) Perpendicular to the line joining the two charges drawn at the centre and pointing upward direction
    d) Perpendicular to the line joining the two charges drawn at the centre and pointing downward direction

20. The electric field due to an extremely short dipole at distance r from it is proportional to
    a) $\frac{1}{r}$ b) $\frac{1}{r^2}$ c) $\frac{1}{r^3}$ d) $\frac{1}{r^4}$

21. The ratio of electric fields on the axis and at equator of an electric dipole will be
    a) 1:1 b) 2:1 c) 4:1 d) 1:4

22. What about Gauss theorem is not incorrect?
    a) It can be derived by using Coulomb's law
    b) It is valid for conservative field, obeys inverse square root law
    c) Gauss theorem is not applicable in gravitation
    d) Both (a) and (b)

23. A Gaussian sphere encloses 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) Dependent on the position of the dipole

24. The Gaussian surface for calculating the electric field due to a charge distribution is
    a) Any surface near the charge distribution
    b) Always a spherical surface
    c) A symmetrical closed surface containing the charge distribution, at every point of which electric field has a single fixed value
    d) None of the given options

25. Flux coming out from a unit positive charge enclosed in air is
    a) ε_0 b) $(\varepsilon_0)^{-1}$ c) $(4\pi\varepsilon_0)^{-1}$d) $4\pi\varepsilon_0$
26. An electric dipole of moment **p** placed in a uniform electric field **E** has minimum potential energy when the angle between **p** and **E** is
    a) Zero b) $\frac{\pi}{2}$ c) π d) $\frac{3\pi}{2}$
27. The magnitude of electric field at distance r from an infinitely thin rod having a linear charge density λ is(use Gauss's law)
    a) $E = \frac{\lambda}{2\pi\varepsilon_0 r}$ b) $E = \frac{2\lambda}{\pi\varepsilon_0 r}$
    c) $E = \frac{\lambda}{4\pi\varepsilon_0 r}$ d) $E = \frac{4\lambda}{\pi\varepsilon_0 r}$
28. When a glass rod is rubbed with silk, it
    a) Gains electrons from silk
    b) Gives electrons to silk
    c) Gains protons from silk
    d) Gives protons to silk
29. A body can be negatively charged by
    a) Giving excess of electrons to it
    b) Removing some electrons from it
    c) Giving some protons to it
    d) Removing some neutrons from it
30. Electric lines of force about negative point charge are
    a) Circular, anticlockwise
    b) Circular, clockwise
    c) Radial, inward
    d) Radial, outward
31. The unit of intensity of electric field is
    a) $Newton/Coulomb$ b) $Joule/Coulomb$
    c) $Volt - metre$ d) $Newton/metre$
32. The wrong statement about electric lines of force is
    a) These originate from positive charge and end on negative charge
    b) They do not intersect each other at a point
    c) They have the same form for a point charge and a sphere
    d) They have physical existence
33. Identify the false statement
    a) Inside a charged or neutral conductor electrostatic field is zero
    b) The electrostatic field at the surface of the charged conductor must be tangential to the surface at any point
    c) There is no net charge at any point inside the conductor
    d) Electric field at the surface of a charged conductor is proportional to the surface charge density
34. Gauss's law 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

ANSWER KEYS(Electric charges and fields)

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

ELECTRIC POTENTIAL AND CAPACITANCE

1. The ratio of electric field and potential (E/V) at mid-point of electric dipole, for which separation l is
   a) $1/l$ b) l
   c) $2/l$ d) None of these
2. The electric potential at centre of metallic conducting sphere is
   a) Zero
   b) Half from potential at surface of sphere
   c) Equal from potential at surface of sphere
   d) Twice from potential at surface of sphere
3. The electric potential inside a conducting sphere
   a) Increases from centre to surface
   b) Decreases from centre to surface
   c) Remains constant from centre to surface
   d) Is zero at every point inside
4. In bringing an electron towards another electron, the electrostatic potential energy of the system
   a) Decreases b) Increases
   c) Remains same d) Becomes zero
5. If a unit positive charge is taken from one point to another over an equipotential surface, then
   a) Work is done on the charge
   b) Work is done by the charge
   c) Work done is constant
   d) No work is done
6. Two charges $+q$ and $-q$ are kept apart. Then at any point on the right bisector of line joining the two charges
   a) The electric field strength is zero
   b) The electric potential is zero
   c) Both electric potential and electric field strength are zero.
   d) Both electric potential and electric field strength are non-zero.
7. Value of potential at a point due to a point charge is
   a) Inversely proportional to square of the distance
   b) Directly proportional to square of the distance
   c) Inversely proportional to the distance
   d) Directly proportional to the distance
8. Work done in carrying a charge Q' once round the circle of radius r with a charge Q at the centre is
   a) $\frac{1}{4\pi\epsilon_0}\frac{Q}{r}$ b) $\frac{1}{4\pi\varepsilon_0}\frac{QQ'}{r}$
   c) Zero d) $\frac{QQ'}{2r}$
9. The work done in bringing a unit positive charge from infinity distance to a point at distance X from a positive charge Q is W. Then, the potential ϕat the point is
   a) $\frac{WQ}{X}$ b) W c) $\frac{W}{Q}$ d) WQ
10. A hollow metallic sphere of radius R is given a charge Q. Then, the potential at the centre is
    a) Zero b) $\frac{1}{4\pi\varepsilon_0}.\frac{Q}{R}$
    c) $\frac{1}{4\pi\varepsilon_0}.\frac{2Q}{R}$ d) $\frac{1}{4\pi\varepsilon_0}.\frac{Q}{2R}$
11. Identify the wrong statement.
    a) In an electric field two equipotential surfaces can never intersect.
    b) A charged particle free to move in an electric field shall always move in the direction of **E.**
    c) Electric field at the surface of a charged conductor is always normal to the surface.
    d) The electric potential decrease along a line of force in an electric field.
12. Electric potential at the centre of a charged hollow metal sphere is
    a) Zero
    b) Twice as that on the surface
    c) Half of that on the surface
    d) Same as that on the surface
13. Identify the wrong statement.
    a) The electrical potential energy of a system of two protons shall increase if the separation between the two is decreased.
    b) The electrical potential energy of a proton-electron system will increase if the separation between the two is decreased.
    c) The electrical potential energy of a proton-electron system will increase if the separation between the two is increased.
    d) The electrical potential energy of system of

two electrons shall increase if the separation between the two is decreased.

14. The potential to which a conductor is raised, depends on
    a) The amount of charge
    b) Geometry and size of the conductor
    c) Both (a) and (b)
    d) Only on (a)
15. In a parallel plate capacitor , the capacity increases if
    a) Area of the plate is decreased
    b) Distance between the plates increases
    c) Area of the plate is increased
    d) Dielectric constant decrease
16. A dielectric slab is inserted between the plates of an isolated charged capacitor. Which of the following quantities remain unchanged?
    a) The charge on the capacitor
    b) The stored energy in the capacitor
    c) The potential difference between the plates
    d) The electric field in the capacitor
17. If dielectric is inserted in charged capacitor (battery removed), then quantity that remains constant is
    a) Capacitance b) Potential
    c) Intensity d) Charge
18. If the plates of a parallel plate capacitor are not equal in area, then quantity of charge
    a) On the plates will be same but nature of charge will differ
    b) On the plates as well as nature of charge will be different
    c) On the plates will be different but nature of charge will be same
    d) As well as nature of charge will be same
19. The capacitance C of a capacitor is
    a) Independent of the charge and potential of the capacitor
    b) Dependent on the charge and independent of potential
    c) Independent of the geometrical configuration of the capacitor
    d) Independent of the dielectric medium between the two conducting surface of the capacitor
20. A parallel plate capacitor is charged. If the plates are pulled apart
    a) The capacitance increases
    b) The potential difference increases
    c) The total charge increases
    d) The charge and potential difference remain the same
21. In a charged capacitor the energy stored in
    a) The positive charges
    b) The negative charges
    c) The field between the plates
    d) None of the above
22. A sheet of aluminium foil of negligible thickness is introduced between the plates of a capacitor. The capacitance of the capacitor
    a) Decreases b) Remain unchanged
    c) Becomes infinite d) Increases
23. On increasing the plate separation of a charged capacitor, the energy
    a) Increases b) Decreases
    c) Remains unchanged d) Becomes zero
24. The capacitance of an isolated conducting sphere of radius $R$is proportional to
    a) R^{-1} b) R^2 c) R^{-2} d) R
25. The energy stored in a capacitor is in the form of
    a) Kinetic energy b) Potential energy
    c) Elastic energy d) Magnetic energy
26. When two conductors of charges and potentials C_1, V_1 and C_2, V_2 respectively are joined, the common potential will be
    a) $\frac{C_1V_1 + C_2V_2}{V_1 + V_2}$ b) $\frac{C_1V_1^2 + C_2V_2^2}{V_1^2 + V_2^2}$
    c) $C_1 + C_2$ d) $\frac{C_1V_1 + C_2V_2}{C_1 + C_2}$
27. The SI unit of the line integral of electrical field I s
    a) NC^{-1} b) Nm^2C^1 c) JC^{-1} d) Vm^{-1}

ANSWER KEYS (Electric potential and capacitors)

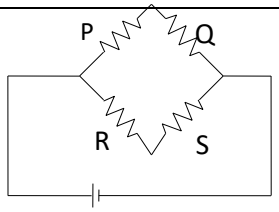
1)	**d**	**2)**	**c**	**3)**	**c**
4)	**b**	**5)**	**d**	**6)**	**b**
7)	**c**	**8)**	**c**	**9)**	**c**
10)	**b**	**11)**	**c**	**12)**	**d**
13)	**c**	**14)**	**c**	**15)**	**c**
16)	**a**	**17)**	**d**	**18)**	**a**
19)	**c**	**20)**	**b**	**21)**	**c**
22)	**b**	**23)**	**a**	**24)**	**d**
25)	**b**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

CURRENT ELECTRICITY

1. As the temperature rises the resistance offered by metal
   a) Increase b) Decrease
   c) Remains same d) None of these
2. Current provided by a battery is maximum when
   a) Internal resistance equal to external resistance
   b) Internal resistance is greater than external resistance
   c) Internal resistance is less than external resistance
   d) None of these
3. The resistance of a metal increases with increasing temperature because
   a) The collisions of the conducting electrons with the electrons increase
   b) The collisions of the conducting electrons with the lattice consisting of the ions of the metal increases
   c) The number of conduction electrons decrease
   d) The number of conduction electrons increase
4. Metals have
   a) Zero resistivity b) High resistivity
   c) Low resistivity d) Infinite resistivity
5. In the absence of applied potential, the electric current flowing through a metallic wire is zero because
   a) The electrons remain stationary
   The electrons are drifted in random
   b) direction with a speed of the order of 10^{-2} cms^{-1}
   c) The electrons move in random direction with a speed of the order close to that of velocity of light
   d) Electrons and ions move in opposite direction
6. Find the true statements
   a) Ohm's law is applicable to all conductors of electricity
   b) In an electrolyte solution, the electric current is mainly due to the movement of electrons
   c) The resistance of an incandescent lamp is lesser when the lamp is switched on
   d) Specific resistance of a wire depends upon its dimension
7. In which of the following substances does resistance decrease with increase in temperature?
   a) Copper b) Carbon
   c) Constantan d) Silver
8. For a metallic wire, the ratio $\frac{V}{i}$ (V =applied potential difference and i=current flowing) is
   a) Independent of temperature
   b) Increases as the temperature rises
   c) Decreases as the temperature rises
   d) Increases or decreases as temperature rises depending upon the metal
9. A metal wire is subjected to a constant potential difference. When the temperature of the metal wire increases, the drift velocity of the electron in it
   a) increases, thermal velocity of the electron decreases
   b) Decreases, thermal velocity of the electron decreases
   c) increases, thermal velocity of the electron increases
   d) Decreases, thermal velocity of the electron increases
10. With the rise of temperature the resistivity of a semiconductor
    a) Remains unchanged
    b) Increases
    c) Decreases
    d) First increases and then decreases
11. The resistance of a straight conductor does not depend on its
    a) Length
    b) Temperature
    c) Material
    d) Shape of cross-section
12. The maximum power dissipated in an external resistance R, when connected to a cell of emf E and internal resistance r, will be
    a) $\frac{E^2}{r}$ b) $\frac{E^2}{2r}$ c) $\frac{E^2}{3r}$ d) $\frac{E^2}{4r}$

13. Kirchoff's second law for the analysis of circuit is based on
    a) Conversion of charge
    b) Conversion of energy
    c) Conversion of both charge and energy
    d) Conversion of momentum of electron
14. The kirchoff;s forst law ($\sum i = 0$)and second law ($\sum iR = \sum E$)where the symbols have their usual meanings, are respectively based on
    a) Conservation of charge, conversion of momentum
    b) Conservation of energy, conservation of charge
    c) Conservation of momentum, conservation of charge
    d) Conservation of charge, conservation of energy
15. It is possible that any some constant value of emf, but the potential difference between the plates is zero?
    a) Not, possible
    b) Yes, if another identical battery is joined in series
    c) Yes, if another identical battery is joined in opposition
    d) Yes, possible, if another similar battery is joined in parallel
16. Which of the following is vector quantity
    a) Current density b) Current
    c) Wattless current d) Power

17. For measurement of potential difference, potentiometer is preferred in comparison to voltmeter because
    a) Potentiometer is more sensitive than voltmeter
    b) The resistance of potentiometer is less than voltmeter
    c) Potentiometer is cheaper than voltmeter
    d) Potentiometer does not take current from the circuit
18. In the circuit given, the current relation to a balanced Wheatstone's bridge is



    a) $\frac{P}{Q} = \frac{R}{S}$ b) $\frac{P}{Q} = \frac{S}{R}$
    c) $\frac{P}{S} = \frac{Q}{R}$ d) $\frac{P}{R} = \frac{S}{Q}$
19. The drift velocity does not depend upon
    a) Cross-section of the wire
    b) Length of the wire
    c) Number of free electrons
    d) Magnitude of the current

20. Which statement is true?
    (i) Kirchoff's law is equally applicable to both AC and DC.
    (ii) Semiconductors have a positive temperature coefficient of resistance.
    (iii) Meter bridge is greater sensitive when the resistance of all four arms of the bridge is of the same order.
    (iv) The emf of a cell depends upon the size and area of electrodes.
    a) (i) and (iv) b) (ii) and (iv)
    c) (iii) and (iv) d) None of these

21. Which factor is immaterial for the wire used in electric fuse?
    a) Length b) Radius
    c) Material d) Current
22. What determines the emf between the two metals placed in an electrolyte?
    a) Relative position of metals in the electro chemical series
    b) Distance between them
    c) Strength of electrolyte
    d) Nature of electrolyte
23. Electric field (E) and current density (J) have relation
    a) $E \propto J^{-1}$ b) $E \propto J$ c) $E \propto \frac{1}{J^2}$ d) $E^2 \propto \frac{1}{J}$
24. By increasing the temperature, the specific resistance of a conductor and a semiconductor

a) Increases for both b) Decreases for both
c) Increases, decreases d) Decreases,increases

25. The reciprocal of resistance is
a) Conductance b) Resistivity
c) Voltage d) None of the above

26. When the length and area of cross-section both are doubled, then its resistance
a) Will become half
b) Will be doubled
c) Will remain the same
d) Will become four times

ANSWER KEYS (Current electricty)

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

MOVING CHARGES AND MAGNETISM

1. A voltmeter essentially consists of
a) A high resistance, in series with a galvanometer
b) A low resistance, in series with a galvanometer
c) A high resistance in parallel with a galvanometer
d) A low resistance in parallel with a galvanometer

2. A current i A flows along an infinitely long straight thin walled tube, then the magnetic induction at any point inside the tube is
a) Infinite b) Zero
c) $\frac{\mu_0}{4\pi} . \frac{2i}{r}$ T d) $\frac{2i}{r}$ T

3. The ratio of voltage sensitivity (V_S) and current sensitivity (I_s) of a moving coil galvanometer is
a) $\frac{1}{G}$ b) $\frac{1}{G^2}$ c) G d) G^2

4. A current flows in a conductor from east to west. The direction of the magnetic field at a point above the conductor is
a) Towards east b) Towards west
c) Towards north d) Towards south

5. To convert a moving a coil galvanometer (MCG) into a voltmeter
a) A high resistance R is connected in parallel with MCG
b) A low resistance r is connected in parallel with MCG
c) A low resistance r is connected in series with MCG
d) A high resistance R is connected in series with MCG

6. The magnetic field near a current carrying conductor is given by
a) Coulomb's law b) Lenz's law
c) Biot-Savart's law d) Kirchhoff's law

7. If an ammeter is joined in parallel through a circuit, it can be damaged due to excess
a) Resistance b) Current
c) Voltage d) None of these

8. A current carrying conductor produces
a) Only electric field
b) Only magnetic field
c) Both electric and magnetic fields

d) Neither electric nor magnetic field

9. If an ammeter is to be used in place of a voltmeter, then we must connect with the ammeter a
   a) Low resistance in parallel
   b) High resistance in parallel
   c) High resistance in series
   d) Low resistance in series
10. The magnetic induction at the centre of a current carrying circular of radius r, is
   a) Directly proportional to r
   b) Inversely proportional to r
   c) Directly proportional to r^2
   d) Inversely proportional to r^2
11. A voltmeter has a resistance of G ohm and range V volt. The value of resistance used in series to convert it into a voltmeter of range nV volt is
   a) nG b) $\frac{G}{n}$
   c) $(n-1)G$ d) $\frac{G}{n-1}$
12. If two parallel wires carry current in opposite directions
   a) The wires attract each other
   b) The wires repel each other
   c) The wires experience neither attraction nor repulsion
   d) The forces of attraction or repulsion do not depend on current direction
13. A galvanometer can be converted into a voltmeter by connecting
   a) Low residence in parallel
   b) Low residence in series
   c) High residence in parallel
   d) High residence in series
14. A wire oriented in the east-west direction carries a current eastward. Direction of the magnetic field at a point to the south of the wire is
   a) Vertically down b) Vertically up
   c) North-east d) South-east
15. By mistake a voltmeter is connected in series and an ammeter is connected in parallel with a resistance in an electrical circuit. What will happen to the instrument?
   a) Voltmeter is damaged
   b) Ammeter is damaged
   c) Both are damaged
   d) None is damaged
16. The strength of the magnetic field around a long straight wire, carrying current, is
   a) Same everywhere around the wire at any distance
   b) Inversely proportional to the distance from the wire
   c) Inversely proportional to the square of the distance from the wire
   d) Directly proportional to the square of the distance from the wire
17. The magnetic field on the axis of a long solenoid having n turns per unit length and carrying a current i is
   a) $\mu_0 ni$ b) $\mu_0 n^2 i$
   c) $\mu_0 ni^2$ d) None of these
18. The magnetic induction at a distance r from the axis of an infinitely straight conductor which carries current $i$is
   a) $\frac{\mu_0 i}{2\pi r}$ b) $\frac{\mu_0 i}{2r}$ c) ∞ d) Zero
19. Which of the following while in motion cannot be deflected by magnetic field?
   a) Protons b) Cathode rays
   c) Alpha particles d) Neutrons
20. Which of the following particles will describe the smallest circle when projected with the same velocity perpendicular to the magnetic field?
   a) Electron b) Proton
   c) $\alpha-$ particle d) Deuteron
21. An electron moves in a circular orbit with a uniform speed v. It produces a magnetic field B at the centre of the circle. The radius of the circle is proportional to
   a) $\frac{B}{v}$ b) $\frac{v}{B}$ c) $\sqrt{\frac{v}{B}}$ d) $\sqrt{\frac{B}{v}}$
22. A charged particle enters a magnetic field H with its initial velocity making an angle of 45° with H. The path of the particle will be
   a) A straight line b) A circle
   c) An ellipse d) A helix
23. A charged particle enters in a magnetic field whose direction is parallel to velocity of the particle, then the speed of this particle
   a) In straight line b) In coiled path
   c) In circular path d) In ellipse path
24. Under the influence of a uniform magnetic field a charged particle is moving in a circle of

radius R with constant speed v. The time period of the motion
a) Depends on v and not on R
b) Depends on both $R$and v
c) Is independent of both $R$and v
d) Depends on R and not on v

25. The magnetic force on a charged particle moving in the field does not work, because
a) Kinetic energy of the charged particle does not change
b) The charge of the particle remains same
c) The magnetic force is parallel to velocity of the particle
d) The magnetic force is parallel to magnetic field

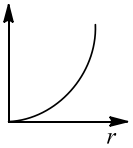
26. The force between two parallel current carrying wires is independent of
a) Their distance of separation
b) The length of the wires
c) The magnitude of currents
d) The radii of the wires

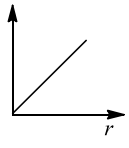
27. The magnetic moment of a circular coil carrying current is
a) Directly proportional to the length of the wire in the coil
b) Inversely proportional to the length of the wire in the coil
c) Directly proportional to the square of the length of the wire in the coil
d) Inversely proportional to the square of the length f the wire in the coil

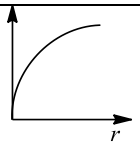
28. The magnetic dipole moment of a current loop is independent of
a) Magnetic field in which it is lying
b) Number of turns
c) Area of the loop
d) Current in the loop

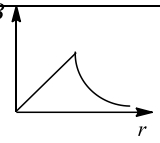
29. If a current is passed in a spring, it
a) Gets compressed
b) Get expanded
c) Oscillates
d) Remains unchanged

30. The magnetic flux density Bat a distance$r$from a long straight rod carrying a steady current varies with $r$as shown in figure.

a) 

b) 

c) 

d) 

31. An electron and a proton enter a magnetic field perpendicularly. Both have same kinetic energy. Which of the following is true?
a) Trajectory of electron is less curved
b) Trajectory of proton is less curved
c) Both trajectories are equally curved
d) Both move on straight line path

32. A current carrying circular loop is freely suspended by a long thread. The plane of the loop will point in the direction
a) Wherever left free
b) North-south
c) East-west
d) At 45° with the east-west direction

33. The coil of a moving coil galvanometer is wound over a metal frame in order to
a) Reduce hysteresis
b) Provide electromagnetic damping
c) Increase the moment of inertia
d) Increase the sensitivity

34. The deflection in a moving coil galvanometer is
a) Directly proportional to the torsional constant
b) Directly proportional to the number of turns in the coil
c) Inversely proportional to the area of the coil
d) Inversely proportional to the current flowing

35. If a copper rod carries a direct current, the magnetic field associated with the current will be
a) Only inside the rod
b) Only outside the rod
c) Both inside and outside the rod
d) Neither inside nor outside the rod

36. A magnetic field can be produced by
a) A moving charge
b) A changing electric field
c) None of these

d) Both of these

37. The direction of magnetic lines of force produced by passing a direct current in a conductor is given by
    a) Lenz's law
    b) Fleming' left hand rule
    c) Right hand palm rule
    d) Maxwell's law
38. Field inside a solenoid is
    a) Directly proportional to its length
    b) Directly proportional to current
    c) Inversely proportional to total number of turns
    d) Inversely proportional to current
39. The magnetic field at the centre of current carrying coil is
    a) $\frac{\mu_0 ni}{2r}$ b) $\frac{\mu_0}{2\pi}\frac{ni}{r}$ c) $\frac{\mu_0 ni}{4r}$ d) $\mu_0 ni$
40. Ampere's circuital law is equivalent to
    a) Biot-Savart law b) Coulomb's law
    c) Faraday's law d) Kirchhoff's law
41. A current carrying wire in the neighborhood produces
    a) No field
    b) Electric field only
    c) Magnetic field only
    d) Electric and magnetic field
42. The dimension of the magnetic field intensity B is
    a) $MLT^{-2}A^{-1}$ b) $MT^{-2}A^{-1}$
    c) ML^2TA^{-2} d) $M^2LT^{-2}A^{-1}$
43. Magnetic effect of current was discovered by
    a) Faraday b) Oersted c) Ampere d) Bohr
44. 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
45. A positive charge is moving towards an observer. The direction of magnetic induction is
    a) Clockwise b) Anticlockwise
    c) Right d) Left
46. A very high magnetic field is applied to a stationary charge. Then the charge experiences
    a) A force in the direction of magnetic field
    b) A force perpendicular to the magnetic field
    c) A force in an arbitrary direction
    d) No force
47. Lorentz force can be calculated by using the formula
    a) $\vec{F} = q(\vec{E} + \vec{v} \times \vec{B})$ b) $\vec{F} = q(\vec{E} - \vec{v} \times \vec{B})$
    c) $\vec{F} = q(\vec{E} + \vec{v} \cdot \vec{B})$ d) $\vec{F} = q(\vec{E} \times \vec{B} + \vec{v})$
49. The magnetic moment of a circular coil carrying current is
    a) Directly proportional to the length of the wire in the coil
    b) Inversely proportional to the length of the wire in the coil
    c) Directly proportional to the square of the length of the wire in the coil
    d) Inversely proportional to the square of the length f the wire in the coil

ANSWER KEYS (Moving charges)

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

MAGNETISM AND MATTER

1. In which direction, the magnetic field on the axis at a distance z from the centre of the bar magnet would be?
   a) In the perpendicular direction of the magnetic moment (**M**) of the magnet
   b) In the direction of the magnetic dipole moment (**M**) of the magnet
   c) Its direction depends on the magnitude of the magnetic moment (**M**) of the magnet
   d) In the opposite direction of the magnetic dipole moment(**M**) of the magnet
2. The magnetic lines of force inside a bar magnet
   a) Are from north-pole to south-pole of the magnet
   b) Do not exist
   c) Depend upon the area of cross-section of the bar magnet
   d) Are from south-pole to north-pole of the magnet
3. At a point on the right bisector of a magnetic dipole magnetic
   a) Potential varies as $\frac{1}{r^2}$
   b) Potential is zero at all points on the right bisector
   c) Field varies as r^2
   d) Field is perpendicular to the axis of dipole
4. A bar magnet is equivalent to
   a) Torroid carrying current
   b) Straight conductor carrying current
   c) Solenoid carrying current
   d) Circular coil carrying current
5. A current carrying small loop behaves like a small magnet. If A be its area and M its magnetic moment, the current in the loop will be
   a) M/A b) A/M c) MA d) AM^2
6. The magnetic field of a small bar magnet varies in the following manner by the influence of a magnet placed at a large distance d.
   a) $\frac{1}{d}$ b) $\frac{1}{d^2}$ c) $\frac{1}{d^3}$ d) $\frac{1}{d^4}$
7. The effect due to uniform magnetic field on a freely suspended magnetic needle is as follows
   a) Both torque and net force are present
   b) Torque is present but no net force
   c) Both torque and net force are absent
   d) Net force is present but not torque
8. A magnetic dipole is placed in a uniform magnetic field. The net magnetic force on the dipole
   a) Is always zero
   b) Depends on the orientation of the dipole
   c) Can never be zero
   d) Depends on the strength of the dipole
09. Magnetic moment of bar magnet is M. The work done to turn the magnet by 90° of magnet in direction of magnetic field B will be
   a) Zero b) $\frac{1}{2}MB$ c) $2\,MB$ d) MB
10. The ultimate individual unit of magnetism is any magnet is called
   a) North pole b) South pole
   c) Dipole d) Quadrupole
11. The magnetic susceptibility of paramagnetic materials is
   a) Positive, but very high
   b) Negative, but very small
   c) Negative, but very high
   d) Positive, but small
12. If a ferromagnetic material is inserted in a current carrying solenoid, the magnetic field of solenoid
   a) Large increases b) Slightly increases
   c) Largely decreases d) Slightly decreases
13. On applying an external magnetic field, to a ferromagnetic substance domains
   a) Align in the direction of magnetic field
   b) Align in the direction opposite to magnetic field
   c) Remain unaffected
   d) None of the above
14. Magnetic susceptibility of a diamagnetic substance
   a) Decreases with temperature
   b) Is not affected by temperature
   c) Increases with temperature
   d) First increase then decrease with temperature
15. Which one of the following characteristics is not associated with a ferromagnetic material?
   a) It is strongly attracted by a magnet
   b) It tends to move from a region of strong magnetic field to a region of low magnetic

field
c) Its origin is the spin of electrons
d) Above the Curie temperature, it exhibits paramagnetic properties

16. If a magnetic substance is kept in a magnetic field then which of the following substance is thrown out?
a) Paramagnetic b) Ferromagnetic
c) Diamagnetic d) Antiferromagnetic

17. Water is
a) Diamagnetic b) Paramagnetic
c) Ferromagnetic d) None of these

18. To shield an instrument from external magnetic field, it is placed inside a cabin made of
a) Wood
b) Ebonite
c) Iron
d) Diamagnetic substance

19. The relation between B, H and I in SI unit is
a) $B = \mu_0(H + I)$ b) $B = H + 4\mu I$
c) $H = \mu_0(B + I)$ d) None of these

20. $Weber/m^2$ is equal to
a) $Volt$ b) $Henry$
c) $Tesla$ d) All of these

21. The magnet can be completely demagnetized by
a) Breaking the magnet into small pieces
b) Heating it slightly
c) Droping it into ice cold water
d) A reverse field of appropriate strength

22. Magnetic dipole moment is a
a) Scalar quantity b) Vector quantity
c) Constant quantity d) None of these

23. Magnetic lines of force due to a bar magnet do not intersect because
a) A point always has a single net magnetic field
b) The lines have similar charges and so repel each other
c) The lines always diverge from a single point
d) The lines need magnetic lenses to be made to intersect

24. A bar magnet of magnetic moment $\vec{M}$ is placed in a magnetic field of induction $\vec{B}$. The torque exerted on it is
a) $\vec{M}.\vec{B}$ b) $-\vec{M}.\vec{B}$ c) $\vec{M} \times \vec{B}$ d) $\vec{B} \times \vec{M}$

25. If the magnetic flux is expressed in $weber$, then magnetic induction can be expressed in
a) $Weber/m^2$ b) $Weber/m$
c) $Weber\text{-}m$ d) $Weber\text{-}m^2$

26. Domain formation is the necessary feature of
a) Ferromagnetism b) Paramagnetism
c) Diamagnetism d) All of these

ANSWER KEYS (Magnetism and matter)

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

ELECTRO MAGNETIC INDUCTION

1. Two coils are placed close to each other. The mutual inductance of the pair of coils depends upon
   a) The rates at which currents are changing in the two coils
   b) Relative position and orientation of the two coils
   c) The materials of the wires of the coils
   d) The currents in the two coils
2. Whenever a magnet is moved either towards or away from a conducting coil, an emf is induced, the magnitude of which is independent of
   a) The strength of the magnetic field
   b) The speed with which the magnet is moved
   c) The number of turns is the coil
   d) The resistance of the coil
3. Energy associated with a moving charge is due to
   a) Electric field b) Magnetic field
   c) Both (a) and (b) d) None of these
4. If coil is open then L and R become
   a) $\infty, 0$ b) $0, \infty$ c) ∞, ∞ d) $0, 0$
5. Two similar circular loops carry equal currents in the same direction. On moving coils further apart, the electric current will
   a) Increase in both
   b) Decrease in both
   c) Remain unaltered
   d) Increases in one and decreases in the second
6. Voltage in the secondary coil of a transformer does not depend upon
   a) Voltage in the primary coil
   b) Ratio of number of turns in the two coils
   c) Frequency of the source
   d) Both (a) and (b)
7. The net magnetic flux through any closed surface, kept in a magnetic field is
   a) Zero b) $\frac{\mu_0}{4\pi}$ c) $4\pi\mu_0$ d) $\frac{4\mu_0}{\pi}$
8. Lenz's law of electromagnetic induction corresponds to the
   a) Law of conservation of charge
   b) Law of conservation of energy
   c) Law of conservation of momentum
   d) Law of conservation of angular momentum
9. According to Lenz's law of electromagnetic induction
   a) The induced emf is not in the direction opposing the change in magnetic flux.
   b) The relative motion between the coil and magnet produces change in magnetic flux
   c) Only the magnet should be moved towards coil
   d) Only the coil should be moved towards magnet
10. Induced emf in the coil depends upon
    a) Conductivity of coil
    b) Amount of flux
    c) Rate of change of linked flux
    d) Resistance of coil
11. The induction coil works on the principle of
    a) Self-induction
    b) Mutual induction
    c) Ampere's rule
    d) Fleming's right hand rule
12. Electric fields induced by changing magnetic fields are
    a) Conservative
    b) Non-conservative
    c) May be conservative or non-conservative depending on the condition
    d) Nothing can be said
13. Quantity that remains unchanged in a transformer is
    a) Voltage b) Current
    c) Frequency d) None of these
14. 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 factors
15. The efficiency of transformer is very high because
    a) There is no moving part in a transformer
    b) It produces very high voltage
    c) It produces very low voltage
    d) None of the above

16. Fleming's left and right hand rule are used in
    a) DC motor and AC generator
    b) DC generator and AC motor
    c) DC motor and DC generator
    d) Both rules are same, any one can be used

17. Which type of losses donot occur in the transformer?
    a) Iron losses b) Copper losses
    c) Mechanical losses d) Flux leakage

18. A transformer works on the principle of
    a) Magnetic effect of the electrical current
    b) Mutual induction
    c) Electrical inertia
    d) Self induction

19. The particle accelerator that uses the phenomenon of electromagnetic induction is the
    a) Cyclotron
    b) Betatron
    c) Van de Graff generator
    d) Cockroft- Walton generator

20. Lenz's law is statement of
    a) Law of conservation of charge
    b) Law of conservation of current
    c) Law of conservation of energy
    d) None of the above

21. The total charge, induced in a conducting loop, when it is moved in a magnetic field depends on
    a) Rate of change of magnetic on
    b) Initial magnetic flux only
    c) Total change in magnetic flux and resistance
    d) Final magnetic flux only

22. A moving conductor coil in a magnetic field produces an induced e.m.f. This is in accordance with
    a) Ampere's law b) Coulomb's law
    c) Lenz's law d) Faraday's law

23. Lenz's law gives
    a) The magnitude of the induced e.m.f.
    b) The direction of the induced current
    c) Both the magnitude and direction of the induced current
    d) The magnitude of the induced current

24. According to Faraday's law of electromagnetic induction
    a) The direction of induced current is such that it opposes the cause producing it
    b) The magnitude of induced e.m.f. produced in a coil is directly proportional to the rate of change of magnate flux
    c) The direction of induced e.m.f. is such that it opposes the cause producing it
    d) None of the above

25. Lenz's law is expressed by the following formula (here e =induced e.m.f., ϕ =magnetic flux in one turn and N = number of turns)
    a) $e = -\phi\frac{dN}{dt}$ b) $e = -N\frac{d\phi}{dt}$
    c) $e = -\frac{d}{dt}\left(\frac{\phi}{N}\right)$ d) $e = N\frac{d\phi}{dt}$

26. The formula for induced e.m.f. in a coil due to change in magnetic flux through the coil is (here A=area of the coil, B = magnetic field)
    a) $e = -A.\frac{dB}{dt}$ b) $e = -B.\frac{dA}{dt}$
    c) $e = -\frac{d}{dt}(A.B)$ d) $e = -\frac{d}{dt}(A \times B)$

27. Faraday's laws are consequence of conservation of
    a) Energy
    b) Energy and magnetic field
    c) Charge
    d) Magnetic field

28. 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

29. The magnetic flux linked with a vector area $\vec{A}$ in a uniform magnetic field $\vec{B}$ is
    a) $\vec{B} \times \vec{A}$ b) AB c) $\vec{B} \cdot \vec{A}$ d) $\frac{B}{A}$

30. The self inductance of a straight conductor is
    a) Zero b) Very large
    c) Infinity d) Very small

31. In what form is the energy stored in an inductor **or**
    A coil of inductance L is carrying a steady current i. What is the nature of its stored energy
    a) Magnetic
    b) Electrical
    c) Both magnetic and electrical
    d) Heat

32. Why the current does not rise immediately in a circuit containing inductance
    a) Because of induced emf
    b) Because of high voltage drop
    c) Because of low power consumption
    d) Because of Joule heating

33. Self induction of a solenoid is
    a) Directly proportional to current flowing through the coil
    b) Directly proportional to its length
    c) Directly proportional to area of cross-section
    d) Inversely proportional to area of cross-section

34. The average power dissipation in pure inductance is
    a) $\frac{1}{2}LI^2$ b) $2LI^2$ c) $\frac{1}{4}LI^2$ d) Zero

35. The square root of the product of inductance and capacitance has the dimension of
    a) Length b) Mass
    c) Time d) No dimension

36. 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

37. When the speed of a dc motor increases the armature current
    a) Increases
    b) Decreases
    c) Does not change
    d) Increases and decreases continuously

38. What is increased in step-down transformer
    a) Voltage b) Current
    c) Power d) Current density

ANSWER KEYS(EMI)

1)	**b**	**2)**	**d**	**3)**	**c**
4)	**b**	**5)**	**a**	**6)**	**c**
7)	**a**	**8)**	**b**	**9)**	**b**
10)	**c**	**11)**	**b**	**12)**	**b**
13)	**c**	**14)**	**b**	**15)**	**a**
16)	**c**	**17)**	**c**	**18)**	**b**
19)	**b**	**20)**	**c**	**21)**	**c**
22)	**d**	**23)**	**b**	**24)**	**b**
25)	**b**	**26)**	**c**	**27)**	**a**
28)	**b**	**29)**	**c**	**30)**	**a**
31)	**a**	**32)**	**a**	**33)**	**c**
34)	**d**	**35)**	**c**	**36)**	**b**
37)	**b**	**38)**	**b**		

ALTERNATING CURRENT

1. At high frequency, the capacitor offer
   a) More reactance b) Less reactance
   c) Zero reactance d) Infinite reactance
2. Average power in the *L-C-R*circuit depends upon
   a) Current
   b) phase difference only
   c) Emf
   d) Current, emf and phase difference
3. What is the average value of the AC voltage over one complete cycle?
   a) Zero b) $V_{\max}$ c) $\frac{2V_{\max}}{\pi}$ d) $\frac{V_{\max}}{2}$
4. In a circuit, the current lags behind the voltage by a phase difference of $\pi/2$, the circuit will contain which of the following?
   a) Only R b) Only C c) R and C d) Only L
5. The power loss in AC circuit will be minimum when
   a) Resistance is high, inductance is high
   b) Resistance is high, inductance is low
   c) Resistance is low, inductance is low
   d) None of the above
6. An inductor is connected to an AC source. When compared to voltage , the current in the lead wires
   a) Is ahead in phase by π
   b) Lags in phase by π
   c) Is ahead in phase by $\frac{\pi}{2}$
   d) Lags in phase by $\frac{\pi}{2}$
7. SI unit of magnetic flux is
   a) Tesla
   b) Oersted
   c) Gauss
   d) Weber
8. The current which does not contribute to the power consumed in an AC circuit is called
   a) non-ideal current
   b) wattles current
   c) convectional current
   d) inductance current
9. Magnetic flux is
   a) Scalar
   b) Vector
   c) Zero
   d) None of these
10. In an ac circuit with voltage V and current I, the power dissipated is
    a) VI
    b) $\frac{1}{2}VI$
    c) $\frac{1}{\sqrt{2}}VI$
    d) Depends on the phases between V and I
11. The ratio of peak value and $r.m.s.$ value of an alternating current is
    a) 1 b) $\frac{1}{2}$ c) $\sqrt{2}$ d) $1/\sqrt{2}$
12. The resistance of a coil for dc is in ohms. In ac, the resistance
    a) Will remain same b) Will increase
    c) Will decrease d) Will be zero
13. In an ac circuit, the $r.m.s.$ value of current, I_{rms} is related to the peak current, I_0 by the relation
    a) $I_{rms} = \frac{1}{\pi}I_0$ b) $I_{rms} = \frac{1}{\sqrt{2}}I_0$
    c) $I_{rms} = \sqrt{2}I_0$ d) $I_{rms} = \pi I_0$
14. The root mean square value of the alternating current is equal to
    a) Twice the peak value
    b) Half the peak value
    c) $\frac{1}{\sqrt{2}}$ times the peak value
    d) Equal to the peak value
15. The voltage of domestic ac is 220 $volt$. What does the represent
    a) Mean voltage
    b) Peak voltage
    c) Root mean voltage
    d) Root mean square voltage
16. In general in an alternating current circuit
    a) The average value of current is zero
    b) The average value of square of the current is zero
    c) Average power dissipation is zero
    d) The phase difference between voltage and current is zero
17. For series LCR circuit, wrong statement is
    a) Applied e.m.f. and potential difference across resistance are in same phase
    b) Applied e.m.f. and potential difference at inductor coil have phase difference of $\pi/2$

c) Potential difference at capacitor and inductor have phase difference of $\pi/2$
d) Potential difference across resistance and capacitor have phase difference of $\pi/2$

18. In an ac circuit, the power factor
a) Is zero when the circuit contains an ideal resistance only
b) Is unity when the circuit contains an ideal resistance only
c) Is unity when the circuit contains an ideal inductance only
d) Is unity when the circuit contains an ideal capacitor only

19. The power factor of good choke coil is
a) Nearly zero b) Exactly zero
c) Nearly one d) Exactly one

20. An LCR series circuit is at resonance. Then
a) The phase difference between current and voltage is 90°
b) The phase difference between current and voltage is 45°
c) Its impedance is purely resistive
d) Its impedance is zero

21. Power factor is maximum in an LCR circuit when
a) $X_L = X_C$ b) $R = 0$ c) $X_L = 0$ d) $X_C = 0$

22. The average power dissipated in a pure inductor of inductance L when an ac current is passing through it, is
(Inductance of the coil L and current I)
a) $\frac{1}{2}LI^2$ b) $\frac{1}{4}LI^2$ c) $2\,Li^2$ d) Zero

23. A choke coil has
a) High inductance and low resistance
b) Low inductance and high resistance
c) High inductance and high resistance
d) Low inductance and low resistance

24. In a purely resistive ac circuit, the current
a) Lags behind the e.m.f. in phase
b) Is in phase with the e.m.f.
c) Leads the e.m.f. in phase
d) Leads the e.m.f. in half the cycle and lags behind it in the other half

25. In an $A.C.$ circuit the current
a) Always leads the voltage
b) Always lags behind the voltage
c) Is always in phase with the voltage
d) May lead or lag behind or be in phase with the voltage

ANSWER KEYS(AC)

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

ELECTROMAGNETIC WAVES

1. If μ_0 is permeability of free space and ε_0 is permittivity of free space, the speed of light in vacuum is given by
   a) $\sqrt{\mu_0\varepsilon_0}$ b) $\sqrt{\frac{\mu_0}{\varepsilon_0}}$ c) $\sqrt{\frac{1}{\mu_0\varepsilon_0}}$ d) $\sqrt{\frac{\varepsilon_0}{\mu_0}}$
2. According to Maxwell's hypothesis, changing electric field gives rise to
   a) Magnetic field b) Pressure gradient
   c) Charge d) Voltage
3. An Electromagnetic Wave has
   a) Electric vector only
   b) Magnetic vector only
   c) Electric and Magnetic vector Perpendicular to each other
   d) Neither the Electric vector nor the Magnetic vector
4. In a medium of dielectric constant K, the electric field is $\mathbf{E}$. If ε_0 is permittivity of the free space, the electric displacement vector is
   a) $\frac{K\mathbf{E}}{\varepsilon_0}$ b) $\frac{\mathbf{E}}{K\varepsilon_0}$ c) $\frac{\varepsilon_0\mathbf{E}}{K}$ d) $K\varepsilon_0\mathbf{E}$
5. Electromagnetic Waves can be deflected by
   a) Electric field only
   b) Magnetic field only
   c) Both (a) and (b)
   d) None of these
6. The average value of electric energy density in an Electromagnetic Waves is (E_0 is peak value)
   a) $\frac{1}{2}\varepsilon_0 E_0^2$ b) $\frac{E_0^2}{2\varepsilon_0}$ c) $\varepsilon_0 E_0^2$ d) $\frac{1}{4}\varepsilon_0 E_0^2$
7. The frequency 1057 MHz of radiation arising from two close energy levels in hydrogen belongs to
   a) Radio waves b) Infrared waves
   c) Micro waves d) $\gamma-$ rays
8. In an Electromagnetic Wave, direction of propagation is in the direction of
   a) $\mathbf{E}$ b) $\mathbf{B}$
   c) $\mathbf{E}\times\mathbf{B}$ d) None of these
9. Maxwell in his famous equation of electromagnetism introduced the concept
   a) AC current b) DC current
   c) Displacement current d) Impedance
10. The speed of electromagnetic Wave in vacuum depends upon the source radiation. It
    a) Increases as we move from $\gamma-rays$ to radio waves
    b) Decreases as we move from $\gamma-rays$ to radio waves
    c) Is same for all of them
    d) None of the above
11. What is order of energy of X-rays (E_X), radio waves (E_R) and microwave (E_M)?
    a) $E_X < E_R < E_M$ b) $E_X < E_M > E_R$
    c) $E_M > E_X > E_R$ d) $E_M < E_R < E_X$
12. All components of the Electromagnetic Spectrum in vacuum have the same
    a) Energy b) Velocity
    c) Wavelength d) Frequency
13. An electromagnetic radiation has an energy of 13.2 keV. Then the radiation belongs to the region of
    a) Visible light b) Ultraviolet
    c) Infrared d) X-ray
14. The Maxwell's four equations are written as
    (i) $\oint \vec{\mathbf{E}} \cdot \overrightarrow{\mathbf{ds}} = q/\varepsilon_0$
    (ii) $\oint \vec{\mathbf{B}} \cdot \overrightarrow{\mathbf{ds}} = 0$
    (iii) $\oint \mathbf{E} \cdot \overrightarrow{\mathbf{dl}} = -\frac{d}{dt}\oint_s \vec{\mathbf{B}} \cdot \overrightarrow{\mathbf{ds}}$
    (iv) $\oint \vec{\mathbf{B}} \cdot \overrightarrow{\mathbf{dl}} = \mu_0 I + \mu_0\varepsilon_0 \frac{d}{dt}\oint_s \vec{\mathbf{E}}.\overrightarrow{\mathbf{ds}}$
    The equation which have sources of $\vec{\mathbf{E}}$ and $\vec{\mathbf{B}}$ are
    a) (i), (ii), (iii) b) (i), (ii)
    c) (i)and (iii) only d) (i)and (iv) only
15. The oscillating electric and magnetic field vectors of electromagnetic wave are oriented along
    a) The same direction and in phase
    b) The same direction but have a phase difference of 90°
    c) Mutually perpendicular directions and are in phase
    d) Mutually perpendicular directions but has a phase difference of 90°
16. Which of the following has zero average value in a plane electromagnetic wave?
    a) Kinetic energy b) Magnetic field

c) Electric field d) Both (b) and (c)

17. The unit of expression $\mu_0\varepsilon_0$ are
    a) ms^{-1} b) m^2s^{-2} c) s^2m^{-2} d) sm^{-1}
18. An electromagnetic wave, going through vacuum is described by $E = E_0 \sin(kx - \omega t)$ Which of the following is independent of wavelength?
    a) k b) ω c) k/ω d) $k\omega$
19. The wavelength of X-rays lies between
    a) Maximum to finite limits
    b) Minimum to certain limits
    c) Minimum to infinite limits
    d) Infinite to finite limits
20. X-ray are not used for radar purpose, because they are not
    a) Reflected by target
    b) Partly absorbed by target
    c) Electromagnetic waves
    d) Completely absorbed by target
21. Which of the following rays is emitted by a human body?
    a) X-rays b) UV rays
    c) Visible rays d) IR rays
22. Which of the following electromagnetic waves have the longest wavelength?
    a) Heat waves b) Light waves
    c) Radio waves d) Ultraviolet waves
23. X-rays are produced by jumping of
    a) Electrons from lower to higher energy orbit of atom
    b) Electrons from higher to lower energy orbit of atom
    c) Protons from lower to higher energy orbit of nucleus
    d) Proton from higher to lower energy orbit of nucleus
24. If v_s, v_x and v_m are the speeds of gamma rays, X-rays and microwaves respectively in vacuum, then
    a) $v_s > v_x > v_m$ b) $v_s < v_x < v_m$
    c) $v_s < v_x < v_m$ d) $v_s = v_x = v_m$
25. Out of the following electromagnetic radiation, which has the shortest wavelength?
    a) Radiowaves b) Infrared
    c) Ultraviolet d) X-rays

ANSWER KEYS (EMW)

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

RAY OPTICS

1. A plane mirror produces a magnification of
   a) -1 b) +1 c) Zero d) Infinite
2. Which mirror is to be used to obtain a parallel beam of light from a small lamp?
   a) Plane mirror b) Convex mirror
   c) Concave mirror d) Any one of these
3. The focal length (f) of a spherical (concave or convex) mirror of radius of curvature R is
   a) $\frac{R}{2}$ b) R c) $\left(\frac{3}{2}\right)R$ d) $2R$
4. 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 mirror
   c) Concave mirror d) None of these
5. A man having height 6 m, observes image of 2 m height erect, then mirror used is
   a) Concave b) Convex
   c) Plane d) None of the above
6. For a real object, which of the following can produced a real image?
   a) Plane mirror b) Concave lens
   c) Convex mirror d) Concave mirror
7. When light travels from glass to air, the incident angle is θ_1 and the refracted angle is θ_2. The true relation is
   a) $\theta_1 = \theta_2$ b) $\theta_1 < \theta_2$
   c) $\theta_1 > \theta_2$ d) Not predictable
8. A light moves from denser to rarer medium. Which of the following is correct?
   a) Energy increases
   b) Frequency increases
   c) Phase changes by 90°
   d) Velocity increases
9. When a ray of light enters a glass slab from air
   a) Its wavelength decreases
   b) Its wavelength increases
   c) Its frequency increases
   d) Neither its wavelength nor its frequency changes
10. When a ray of light is incident normally on a surface, then
    a) Total internal reflection takes place
    b) It passes undeviated
    c) It undergoes dispersion
    d) It gets absorbed by the surface
11. To a fish under water, viewing obliquely a fisherman standing on the bank of the lake, the man looks
    a) Taller than what he actually is
    b) Shorter that what he actual is
    c) The same height as he actually is
    d) Depends on the obliquity
12. When a plane electromagnetic wave enters a glass slab, then which of the following will not change?
    a) Wavelength b) Frequency
    c) Speed d) Amplitude
13. Why is refractive index in a transparent medium greater than one?
    a) Because the speed of light in vacuum is medium
    b) Because the speed of light in vacuum is always greater than speed in a transparent medium
    c) Frequency of wave changes when it crosses medium
    d) None of the above
14. When light enters water from the vacuum, then the wavelength of light
    a) Decreases b) Increases
    c) Remain constant d) Becomes zero
15. Critical angle of light passing from glass of water is minimum for
    a) Red colour b) Green colour
    c) Yellow colour d) Violet colour
16. The instrument used by doctors for endoscopy works on the principle of
    a) Total internal reflection
    b) Reflection
    c) Refraction
    d) None of the above
17. The communication using optical fibres is based on the principle of
    a) Total internal reflection
    b) Brewster angle
    c) Polarization
    d) Resonance
18. Transmission of light to large distances through optical fibres is based on
    a) Dispersion
    b) Refraction
    c) Total internal reflection
    d) Interference
19. Which of the following is not the case with the

image formed by a concave lens?
a) It may be erect or inverted
b) It may be magnified and diminished
c) It may be real or virtual
d) Real image may be between the pole and focus or beyond focus

20. Image formed by a convex lens is virtual and erect when the object is placed
a) At F
b) Between F and the lens
c) At $2F$
d) Beyond $2F$

21. When sunlight is incident on a prism, it produces a spectrum due to
a) Interference of light
b) Diffraction of light
c) Total internal reflection
d) Variation in speeds of different colours of light in the prism

22. A monochromatic light is passed through a prism…….colours shows minimum deviation
a) Red b) Violet c) Yellow d) Green

23. An achromatic combination of lenses produces
a) Images in black and white
b) Coloured images
c) Images unaffected by variation of refractive index with wavelength
d) Highly enlarged images are formed

24. In order to increase the angular magnification of a simple microscope, one should increase
a) The object size
b) The aperture of the lens
c) The focal length of the lens
d) The power of the lens

25. Spherical aberration in a lens
a) Is minimum when most of the deviation is at the first surface
b) Is minimum when most of the deviation is at the second surface
c) Is minimum when the total deviation is equally distributed over the two surfaces
d) Does not depend on the above considerations

26. For normal vision, what is distance of object from eye?
a) 30 cm b) 25 cm c) Infinite d) 40 cm

27. An electron microscope is superior to an optical microscope in
a) Having better resolving power
b) Being easy to handle
c) Low cost
d) Quickness of observation

28. Near and far points of human eye are
a) 25 cm and infinite b) 50 cm and 100 cm
c) 25 cm and 50 cm d) 0 cm and 25 cm

29. In a compound microscope, the intermediate image is
a) Virtual erect and magnified
b) Real, erect and magnified
c) Real, inverted and magnified
d) Virtual, erect and reduced

30. An astronomical telescope has a large aperture to
a) Reduce spherical aberration
b) Have high resolution
c) Increase span of observation
d) Have low dispersion

31. If the apertaure of a telescope is decreased the resolving power will
a) Increase b) Decrease
c) Remain same d) Zero

32. A plane mirror reflects a pencil of light to form a real image. Then the pencil of light incident on the mirror is
a) parallel
b) convergent
c) divergent
d) Any of these

33. The light reflected by a plane mirror may form a real image
a) If the rays incident on the mirror are diverging
b) If the rays incident on the mirror are converging
c) If the object is placed very close to the mirror
d) Under no circumstances

34. A diminished virtual image can be formed only in
a) Plane mirror
b) A concave mirror
c) A convex mirror

d) Concave-parabolic mirror

35. A virtual image larger than the object can be obtained by
    a) Concave mirror b) Convex mirror
    c) Plane mirror d) Concave lens
36. The field of view is maximum for
    a) Plane mirror b) Concave mirror
    c) Convex mirror d) Cylindrical mirror
37. Image formed by a convex mirror is
    a) Virtual b) Real
    c) Enlarged d) Inverted
38. The bottom of a container filled with liquid appear slightly raised because of
    a) Refraction b) Interference
    c) Diffraction d) Reflection

ANSWER KEYS (RAY OPTICS)

1)	**b**	**2)**	**c**	**3)**	**a**
4)	**b**	**5)**	**b**	**6)**	**d**
7)	**b**	**8)**	**d**	**9)**	**a**
10)	**b**	**11)**	**b**	**12)**	**b**
13)	**b**	**14)**	**a**	**15)**	**d**
16)	**a**	**17)**	**a**	**18)**	**c**
19)	**d**	**20)**	**b**	**21)**	**d**
22)	**a**	**23)**	**c**	**24)**	**d**
25)	**c**	**26)**	**b**	**27)**	**a**
28)	**a**	**29)**	**c**	**30)**	**b**
31)	**a**	**32)**	**b**	**33)**	**b**
34)	**c**	**35)**	**a**	**36)**	**c**
37)	**a**	**38)**	**a**		

WAVE OPTICS

1. Which of the following cannot be explained on the basis of wave nature of light?
   1. Polarization
   2. Optical activity
   3. Photoelectric effect
   4. Compton effect

   a) (iii) and (iv) b) (ii) and (iii)
   c) (i)and (iii) d) (ii) and (iv)
2. The wave theory of light, in its original form, was first postulated by
   a) Issac Newton b) Christian Huygens
   c) Thomas Young d) Augustin Jean Fresnel
3. According to Newton's corpuscular theory, the speed of light is
   a) Same in all the media
   b) Lesser in rarer medium
   c) Lesser in denser medium
   d) Independent of the medium
4. In Huygen's wave theory, the locus of all points in the same state of vibration is called
   a) A half period zone b) Oscillator
   c) A wave front d) A ray
5. The wave theory of light was given by
   a) Maxwell b) Planck c) Huygen d) Young
6. Which one of the following property of light does not support wave theory of light?
   a) Light obeys laws of reflection and refraction
   b) Light waves get polarized
   c) Light shows photoelectric effect
   d) Light shows interference
7. The theory associated with secondary wavelets is
   a) Doppler's effect
   b) Special theory of relativity
   c) Huygen's wave theory
   d) None of the above
8. The wavefront of distant source of unknown shape is approximately
   a) Spherical b) Cylindrical
   c) Elliptical d) Plane
9. In Young's double slit experiment a minima is observed when path difference between the

interfering beam is
a) λ b) 1.5λ
c) 2λ d) 2.25λ

10. In Young's double slit experiment, a minimum is obtained when the phase difference of superimposing waves is
a) Zero b) $(2n-1)\pi$ c) $n\pi$ d) $(n+1)\pi$

11. Colours in thin films are due to
a) Diffraction phenomenon
b) Scattering phenomenon
c) Interference phenomenon
d) Polarization phenomenon

12. In the phenomenon of interference, energy is
a) Destroyed at bright fringes b) Created at dark fringes c) Conserved but it is redistributed d) Same at all points

13. A very thin film that reflects white light appears
a) Coloured
b) White
c) Black
d) Red

14. In the diffraction pattern of a single slit
a) All bands are uniformly bright b) All bands are uniformly wide c) Central band is narrower d) Central band is wider

15. The diffraction effect can be observed in
a) Only sound waves
b) Only light waves
c) Only ultrasonic waves
d) Sound as well as light waves

16. An unpolarised beam of intensity I_0 falls on a polariod. The intensity of the emergent light is
a) $\frac{I_0}{2}$ b) I_0 c) $\frac{I_0}{4}$ d) Zero

17. The phenomenon of polarization of light indicates that
a) Light is a longitudinal wave b) Light is a transverse wave
c) Light is not a wave d) Light travels with the velocity of 3×10^8 ms^{-1}

18. The wave front due to a source situated at infinity is
a) Spherical
b) Cylindrical
c) Planar
d) None of these

19. A Young's double slit experiment uses a monochromatic source. The shape of the interference fringes formed on a screen is
a) Hyperbola
b) Circle
c) Straight line
d) Parabola

20. Two coherent sources of light can be obtained by
a) Two different lamps
b) Two different lamps but of the same power
c) Two different lamps of same power and having the same colour
d) None of the above

21. Intensity of light depends upon
a) Velocity b) Wavelength
c) Amplitude d) Frequency

22. By corpuscular theory of light, the phenomenon which can be explained is
a) Refraction b) Interference
c) Diffraction d) Polarization

23. Soap bubble appears coloured due to the phenomenon of
a) Interference b) Diffraction
c) Dispersion d) Reflection

24. Huygens wave theory allows us to know
a) The wavelength of the wave
b) The velocity of the wave
c) The amplitude of the wave
d) The propagation of wave fronts

25. Wavefront of a wave has direction with wave motion
a) Parallel b) Perpendicular
c) Opposite d) At an angle of θ

26. Two waves of intensity I undergo Interference. The maximum intensity obtained is
a) $I/2$ b) I c) $2I$ d) $4I$

27. A wave can transmit ……. from one place to another
    a) Energy b) Amplitude
    c) Wavelength d) Matter
28. The principle of superposition is basic to the phenomenon of
    a) Total internal reflection
    b) Interference
    c) Reflection
    d) Refraction
29. Wavefront means
    a) All particles in it have same phase
    b) All particles have opposite phase of vibrations
    c) Few particles are in same phase, rest are in opposite phase
    d) None of these
30. In a Young's double slit experiment, the central point on the screen is
    a) Bright
    b) Dark
    c) First bright and then dark
    d) First dark and then bright
31. 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
32. To observe diffraction the size of an obstacle
    a) Should be of the same order as wavelength
    b) Should be much larger than the wavelength
    c) Have no relation to wavelength
    d) Should be exactly $\lambda/2$
33. Light waves can be polarized as they are
    a) Transverse b) Of high frequency
    c) Longitudinal d) Reflected

ANSWER KEYS (WAVE OPTICS)

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

DUAL NATURE OF RADIATION AND MATTER

1. A particle with rest mass zero is moving speed *c*. The de-Broglie wavelength associated with it
   a) Zero b) Infinity c) $\frac{hv}{c}$ d) $\frac{m_0 c}{h}$
2. Which of the following is not the property of the photons?
   a) Momentum b) Energy
   c) Charge d) Velocity
3. Four particles have same momentum. Which has maximum kinetic energy?
   a) Proton b) Electron
   c) Deuteron d) α- particle
4. In photoelectric effect, the KE of electrons emitted from the metal surface depends upon
   a) Intensity of light
   b) Frequency of incident light
   c) Velocity of incident light
   d) Both intensity and velocity of light
5. Photoelectric effect can be explained by
   a) Corpusular theory of light
   b) Wave nature of light
   c) Bohr's theory
   d) Quantum theory of light
6. The photoelectric effect represents that
   a) Light has a particle nature
   b) Electron has a wave nature
   c) Proton has a wave nature
   d) None of the above
7. The maximum kinetic energy of emitted electrons in a photoelectric effect does not depend upon
   a) Wavelength b) Frequency
   c) Intensity d) Work function
8. Which of the following event, support the quantum nature of light?
   a) Diffraction b) Polarization
   c) Interference d) Photoelectric effect
9. In photoelectric effect, the number of electrons ejected per second is
   a) Proportional to the wavelength of light
   b) Proportional to the intensity of light
   c) Proportional to the work function of the metal
   d) Proportional to the frequency of light
10. In photoelectric effect, the electrons are ejected from metals if the incident light has a certain minimum
    a) Wavelength b) Frequency
    c) Amplitude d) Angle of incidence
11. The photoelectric effect can be understood on the basis of
    a) The principle of superposition
    b) The electromagnetic theory of light
    c) The special theory of relativity
    d) Line spectrum of the atom
12. When intensity of incident light increases
    a) Photo-current increases
    b) Photo-current decreases
    c) Kinetic energy of emitted photoelectrons increases
    d) Kinetic energy of emitted photoelectrons decreases
13. In photoelectric effect if the intensity of light is doubled, then maximum kinetic energy of photoelectrons will become
    a) Double b) Half
    c) Four times d) No change
14. Stopping potential required to reduce the photoelectric current to zero
    a) Is directly proportional to the wavelength of the incident radiation
    b) Increases uniformly with wavelength of the incident radiation
    c) Is directly proportional to the frequency of the incident radiation
    d) Decreases uniformly with the frequency of the incident radiation
15. The wavelength of de-Broglie wave associated with a thermal neutron of mass m at absolute temperature T is given by (Here, k is the Boltzmann constant)
    a) $\frac{h}{\sqrt{2mkT}}$ b) $\frac{h}{\sqrt{mkT}}$ c) $\frac{h}{\sqrt{3kmT}}$ d) $\frac{h}{2\sqrt{mkT}}$
16. An electron and a proton have the same de-Broglie wavelength. Then the kinetic energy of the electron is
    a) Zero
    b) Infinity

c) Equal to kinetic energy of the proton
d) Greater than the kinetic energy of proton

17. Which one of the following statements regarding photo-emission of electrons is correct?
    a) Kinetic energy of electrons increases with the intensity of incident light.
    b) Electrons are emitted when the wavelength of the incident light is above a certain threshold wavelength.
    c) Photoelectric emission is instantaneous with the incidence of light.
    d) Photoelectrons are emitted whenever a gas is irradiated with ultraviolet light.
18. Electron volt is a unit of
    a) Potential b) Charge c) Power d) Energy
19. Dual nature of radiation is shown by
    a) Diffraction and reflection
    b) Refraction and diffraction
    c) Photoelectric effect alone
    d) Photoelectric effect and diffraction
20. The wavelength of the matter wave is independent of
    a) Mass b) Velocity
    c) Momentum d) Charge
21. Which phenomenon best supports the theory that matter has a wave nature
    a) Electron momentum b) Electron diffraction
    c) Photon momentum d) Photon diffraction
22. Which is the incorrect statement of the following
    a) Photon is a particle with zero rest mass
    b) Photon is a particle with zero momentum
    c) Photons travel with velocity of light in vacuum
    d) Photon even feel the pull of gravity
23. If a photon has velocity c and frequency v, then which of following represents its wavelength
    a) $\frac{hc}{E}$ b) $\frac{hv}{c}$ c) $\frac{hv}{c^2}$ d) hv
24. The momentum of a photon of energy hv will be
    a) hv b) hv/c c) hvc d) h/v
25. By photoelectric effect, Einstein, proved
    a) $E = hv$ b) $K.E. = \frac{1}{2}mv^2$
    c) $E = mc^2$ d) $E = \frac{Rhc^2}{n^2}$
26. The magnitude of saturation photoelectric current depends upon
    a) Frequency b) Intensity
    c) Work function d) Stopping potential
27. The mass of a photo electron is
    a) $9.1 \times 10^{-27} kg$ b) $9.1 \times 10^{-29} kg$
    c) $9.1 \times 10^{-31} kg$ d) $9.1 \times 10^{-34} kg$
28. The work function of a metal is
    a) The energy for the electron to enter into the metal
    b) The energy for producing X-ray
    c) The energy is required for an electron to come out from metal surface
    d) None of these

ANSWER KEYS (DUAL NATURE)

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

ATOMS

1. Number of neutrons in C^{12} and C^{14} are
   a) 8 and 6 b) 6 and 8
   c) 6 and 6 d) 8 and 8
2. When a hydrogen atom is raised from the ground state to an excited state
   a) P.E. increases and K.E. decreases
   b) P.E. decreases and K.E. increases
   c) Both kinetic energy and potential energy increase
   d) Both K.E. and P.E. decrease
3. In Rutherford scattering experiment, what will be the correct angle for α scattering for an impact parameter b=0?
   a) 90° b) 270° c) 0° d) 180°
4. The nucleus of an atom consists of
   a) Electrons and protons
   b) Electrons, protons and neutrons
   c) Electrons and Neutrons
   d) Neutrons and protons
5. To explain his theory, Bohr used
   a) Conservation of linear momentum
   b) Conservation of angular momentum
   c) Conservation of quantum frequency
   d) Conservation of energy
6. Rutherford's atomic model could account for
   a) Concept of stationary orbits
   b) The positively charged control core of an atom
   c) Origin of spectra
   d) Stability of atoms
7. The de-Broglie wavelength of an electron in the first Bohr orbit is
   a) Equal to one fourth the circumference of the first orbit
   b) Equal to half the circumference of the first orbit
   c) Equal to twice the circumference of the first orbit
   d) Equal to the circumference of the first orbit
8. In Bohr's model of hydrogen atom, which of the following pairs of quantities are quantized?
   a) Energy and linear momentum
   b) Linear and angular momentum
   c) Energy and angular momentum
   d) None of the above
9. When hydrogen atom is in its first excited level, its radius is …… its ground state radius
   a) Half b) Same
   c) Twice d) Four times
10. In the Bohr's model of the hydrogen atom, the lowest orbit corresponds to
    a) Infinite energy b) Maximum energy
    c) Minimum energy d) Zero energy
11. The kinetic energy of an electron revolving around a nucleus will be
    a) Four times of P.E. b) Double of P.E.
    c) Equal to P.E. d) Half of its P.E.
12. Bohr's atom model assumes
    a) The nucleus is of infinite mass and is at rest
    b) Electrons in a quantized orbit will not radiate energy
    c) Mass of electron remains constant
    d) All the above conditions.
13. In Bohr model of the hydrogen atom, the lowest orbit corresponds to
    a) Infinite energy b) The maximum energy
    c) The minimum energy d) Zero energy
14. For an electron in the second orbit of Bohr's hydrogen atom, the moment of linear momentum is
    a) $n\pi$ b) $2\pi h$ c) $\frac{2h}{\pi}$ d) $\frac{h}{\pi}$
15. Which of these is non-divisible
    a) Nucleus b) Photon c) Proton d) Atom
16. The production of band spectra is caused by
    a) Atomic nuclei b) Hot metals
    c) Molecules d) electrons
17. According to classical theory, the circular path of an electron in Rutherford atom is
    a) Spiral b) Circular
    c) Parabolic d) Straight line
18. Electrons in the atom are held to the nucleus by
    a) Coulomb's forces
    b) Nuclear forces
    c) Van der Waals' forces
    d) Gravitational forces

19. According to Bohr's theory of hydrogen atom, for the electron in the nth allowed orbit the
(i) Linear momentum is proportional to $1/n$
(ii) Radius is proportional to n
(iii) Kinetic energy is proportional to $1/n^2$
(iv) Angular momentum is proportional to n
Choose the correct option from the codes given below.
a) (i),(iii),(iv) are correct
b) (i) is correct
c) (i),(ii) are correct
d) (iii) is correct

20. According to Bohr's atomic model, the relation between principal quantum number(n) and radius of orbit(r) is
a) $r \propto n^2$ b) $r \propto \frac{1}{n^2}$ c) $r \propto \frac{1}{n}$ d) $r \propto n$

21. The angular momentum (L) of an electron moving in a stable orbit around nucleus is
a) Half integral multiple of $\frac{h}{2\pi}$
b) integral multiple of h
c) integral multiple of $\frac{h}{2\pi}$
d) Half integral multiple of h

22. When hydrogen atom is in its first excited level, its radius is how many times its ground state radius?
a) Half b) Same
c) Twice d) Four times

ANSWER KEYS(Atoms)

1)	**b**	**2)**	**a**	**3)**	**d**
4)	**d**	**5)**	**b**	**6)**	**b**
7)	**d**	**8)**	**c**	**9)**	**d**
10)	**c**	**11)**	**d**	**12)**	**d**
13)	**c**	**14)**	**d**	**15)**	**b**
16)	**c**	**17)**	**a**	**18)**	**a**
19)	**a**	**20)**	**a**	**21)**	**c**
22)	**d**				

NUCLEI

1. For uranium nucleus how does its mass vary with volume?
a) $m \propto V$ b) $m \propto 1/V$ c) $m \propto \sqrt{V}$ d) $m \propto V^2$

2. The radius of nucleus is
a) Proportional to its mass number
b) Inversely Proportional to its mass number
c) Proportional to the cube root of its mass number
d) Not related to its mass number

3. The approximate nuclear radius is proportional to (A is the mass number and Z the atomic number)
a) $\sqrt{A}$ b) $A^{1/3}$ c) $\sqrt{Z}$ d) $Z^{1/3}$

4. The mass number of nucleus is
a) Sometimes equal to its atomic number
b) Sometimes less than and sometimes more than its atomic number
c) Always less than its atomic number
d) Always more than its atomic number

5. Which shows radioactivity?
a) Protium b) Deuterium
c) Tritium d) None of these

6. Fusion reaction takes place at high temperature because
a) KE is high enough to overcome repulsion between nuclei
b) nuclei are most stable at this temperature
c) nuclei are unstable at this temperature
d) None of the above

7. Which of the following is not conserved in nuclear reaction?
a) Total energy
b) Mass number
c) Charge Number
d) Number of fundamental particles

8. When ${}_{92}U^{235}$ is bombarded with one neutron, fission occurs and the products are three neutrons, $Ba_{36}Kr^{94}$, and
a) ${}_{56}Ba^{141}$ b) ${}_{54}Xe^{139}$ c) ${}_{56}Ba^{139}$ d) ${}_{58}I^{142}$

9. The energy released in the explosion of an atom bomb is mainly due to
a) nuclear fusion
b) nuclear fission

c) Controlled nuclear chain reaction
d) None of the above

10. For maintaining sustained chain reaction, the following is required
a) Protons b) electrons c) neutrons d) positons
11. The difference between U^{235} and U^{238} atom is that
a) U^{238} contains 3 more protons
b) U^{238} contains 3 protons and 3 more electrons
c) U^{238} contains 3 more neutrons and 3 more electrons
d) U^{238} contains 3 more neutrons
12. When the number of nucleons in nuclei increase, the binding energy per nucleon
a) Increases continuously with mass number
b) Decreases continuously with mass number
c) Remains constant with mass number
d) First increases and then decreases with increases of mass number
13. In helium nucleus, there are
a) 2 protons and 2 electrons
b) 2 neutrons, 2 protons and 2 electrons
c) 2 protons and 2 neutrons
d) 2 positrons and 2 protons
14. The rest energy of an electron is
a) 510 KeV b) 931 KeV c) 510 MeV d) 931 MeV
15. For effective nuclear forces, the distance should be
a) $10^{-10}m$ b) $10^{-13}m$ c) $10^{-15}m$ d) $10^{-20}m$
16. Sun energy is due to
a) Fission of hydrogen
b) Fusion of hydrogen
c) Both fission and fusion
d) Neither fusion nor fission
17. Size of nucleus is of the order of
a) $10^{-10}m$ b) $10^{-15}m$ c) $10^{-12}m$ d) $10^{-19}m$
18. Nuclear binding energy is equivalent to
a) Mass of proton
b) Mass of neutron
c) Mass of nucleus
d) Mass defect of nucleus
19. The binding energy of nucleus is a measure of its
a) Charge b) Mass
c) Momentum d) Stability

ANSWER KEYS(Nuclei)

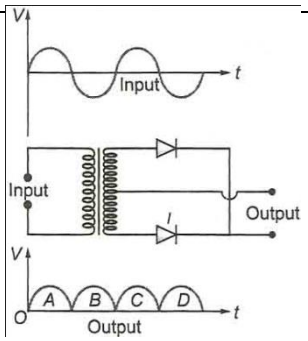
1)	**a**	**2)**	**c**	**3)**	**b**
4)	**a**	**5)**	**c**	**6)**	**a**
7)	**d**	**8)**	**c**	**9)**	**b**
10)	**c**	**11)**	**d**	**12)**	**d**
13)	**c**	**14)**	**a**	**15)**	**c**
16)	**b**	**17)**	**b**	**18)**	**d**
19)	**d**				

SEMICONDUCTORS

1. For an insulator the forbidden energy gap is
   a) Zero b) 1 eV c) 5 eV d) 2 eV
2. The energy band gap (distance between the conduction band and valence band) in conductor is
   a) Zero b) 4 Å c) 10 Å d) 100 Å
3. When a solid with a band gap has a donor level just below its empty energy band, the solid is
   a) An insulator
   b) A conductor
   c) p-type semiconductor
   d) n-type semiconductor
4. The reverse saturation of p-n diode
   a) Depends on doping concentrations
   b) Depends on diffusion lengths of carriers
   c) Depends on the doping concentrations and diffusion lengths
   d) Depends on the doping concentrations, diffusion length and device temperature
5. Barrier potential of a p-n junction diode does not depend on
   a) Forward bias b) Doping density
   c) Diode design d) Temperature
6. Within depletion region of p-$n$junction diode
   a) p-side is positive and n-side is negative
   b) p-side is negative and n-side is positive
   c) Both sides are positive or both negative
   d) Both side are neutral
7. An intrinsic semiconductor at 0 K temperature behaves like
   a) Conductor
   b) p-type semiconductor
   c) n-type semiconductor
   d) Insulator
8. Identify the property which is not characteristic for a semiconductor?
   a) At a very low temperature, it behaves like an insulator
   b) At high temperature two types of charge carriers will cause conductivity
   c) The charge carriers are electrons and holes in the valence band at higher temperatures
   d) The semiconductor is electrically neutral
9. Application of a forward bias to a p-n junction
   a) Increase the number of donors on the n-side
   b) Increase the electric field in the depletion zone
   c) Increase the potential difference across (the depletion zone)
   d) Widens the depletion zone
10. In silicon when phosphorus is doped ……. is formed
    a) p-type semiconductor
    b) n-type semiconductor
    c) p-n junction
    d) None of these
11. The charge carries in a p-type semiconductor are
    a) Electrons only
    b) Holes only
    c) Holes in larger numbers and electrons in smaller numbers
    d) Holes and electrons in equal numbers
12. The n-type semiconductors are obtained, when germanium is doped with
    a) Arsenic b) Phosphorus
    c) Antimony d) Any one of these
13. n-type semiconductor is
    a) Positively charged
    b) Negatively charged
    c) Neutral
    d) Positive or negative depending upon doping material
14. Doping of intrinsic semiconductor is done
    a) To neutralize charge carriers
    b) To increase the concentration of majority charge carriers
    c) To make it neutral before disposal
    d) To carry out further purification
15. What is the name of the level formed due to impurity atom in p-type in the forbidden gap?
    a) Donor level b) Acceptor level
    c) Conduction level d) Forbidden level
16. A p-type material is electrically …….
    a) Positive
    b) Negative
    c) Neutral
    d) Depends on the concentration of p

impurities

17. If the forward voltage in a diode is increased, the width of the depletion region
    a) Increases b) Decreases
    c) Fluctuates d) No change
18. When p-n junction diode is forward biased then
    a) The depletion region is reduced and barrier height is increased
    b) The depletion region is widened and barrier height is reduced
    c) Both the depletion region and barrier height are reduced
    d) Both the depletion region and barrier height are increased
19. Electric conduction in semi-conductor takes place due to
    a) Electrons only
    b) Holes only
    c) Both electrons and holes
    d) None of the above
20. The electrical circuit used to get smooth DC output from a rectifier circuit is called
    a) Filter b) Oscillator
    c) Logic gates d) Amplifier
21. By increasing the temperature, the specific resistance of a conductor and a semiconductor
    a) Increases for both
    b) Decreases for both
    c) Increases, decreases respectively
    d) Decreases, increases respectively
22. Minority carriers in a p-type semiconductor are
    a) Free electrons
    b) Holes
    c) Neither holes nor free electrons
    d) Both holes and free electrons
23. In depletion layer of unbiased p-n junction
    a) Holes are present
    b) Electrons are present
    c) Only fixed ions are present
    d) None of the above
24. A full wave rectifier circuit along with the input and output are shown in the figure, the contribution from the diode I is (are)



    a) C b) A, C
    c) B, D d) A, B, C, D
25. 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
26. Function of rectifier is
    a) To convert ac into dc b) To convert dc into ac
    c) Both (a) and (b) d) None of these
27. Select the correct statement
    a) In a full wave rectifier, two diodes work alternately
    b) In a full wave rectifier, two diodes work simultaneously
    c) The efficiency of full wave and half wave rectifiers is same
    d) The full wave rectifier is bi-directional

ANSWER KEYS (Semiconductors)

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