I. ELECTROSTATICS

One Mark Questions :

Book Back Questions:

1. A glass rod rubbed with silk acquires a charge of 8×10^{-12}C. The number of electrons it has gained or lost

   a) 5×10^{-7} (gained) **b) 5×10^{7} (lost)** c) 2×10^{-8} (lost) d) -8×10^{-12} (lost)

2. The electrostatic force between two point charges kept at a distance d apart, in a medium $\varepsilon_r = 6$, is 0.3 N. The force between them at the same separation in vacuum is

   a) 20 N b) 0.5 N **c) 1.8 N** d) 2 N

3. Electric field intensity is 400 Vm^{-1} at a distance of 2 m from a point charge. It will be 100 V m^{-1} at a distance? **(P Y)**

   a) 50 cm b) 4 cm **c) 4 m** d) 1.5 m

4. Two point charges +4q and +q are placed 30 cm apart. At what point on the line joining them the electric field is zero?

   a) 15 cm from the charge q b) 7.5 cm from the charge q

   c) 20 cm from the charge 4q d) 5 cm from the charge q

5. A dipole is placed in a uniform electric field with its axis parallel to the field. It experiences **(P Y)**

   a) only a net force b) only a torque

   c) both a net force and torque **d) neither a net force nor a torque**

6. If a point lies at a distance x from the midpoint of the dipole, the electric potential at this point is proportional to **(P Y)**

   a) $1/x^2$ b) $1/x^3$ c) $1/x^4$ d) $1/x^{3/2}$

7. Four charges +q, +q,-q and –q respectively are placed at the corners A, B, C and D of a square of side a. The electric potential at the centre O of the square is **(P Y)**

   a) $\frac{1}{4\pi\varepsilon_o}\frac{q}{a}$ b) $\frac{1}{4\pi\varepsilon_o}\frac{2q}{a}$ c) $\frac{1}{4\pi\varepsilon_o}\frac{4q}{a}$ **d) zero**

8. Electric potential energy (U) of two point charges is **(P Y)**

   a) $\frac{q_1 q_2}{4\pi\varepsilon_o r^2}$ **b) $\frac{q_1 q_2}{4\pi\varepsilon_o r}$** c) pE cos θ d) pE sin θ

9. The work done in moving 500 μ C charge between two points on equi potential surface is **(P Y)**

a) zero b) finite positive

c) finite negative d) infinite

10. Which of the following quantities is scalar? **(P Y)**

a) Dipole moment b) electric force

c) electric field **d) electric potential**

11. The unit of permittivity is **(P Y)**

a) $C^2N^{-1}m^{-2}$ b) $Nm^2 C^{-2}$ c) Hm^{-1} d) $N C^{-2}m^{-2}$

12. The number of electric lines of force originating from a charge of 1 C is **(PY)**

a) 1.129×10^{11} b) 1.6×10^{-19}

c) 6.25×10^{18} d) 8.85×10^{12}

13. The electric field outside the plates of two oppositely charged plane sheets of charge density σ is **(P Y)**

a) $\frac{+\sigma}{2\varepsilon_o}$ b) $\frac{-\sigma}{2\varepsilon_o}$ c) $\frac{\sigma}{\varepsilon_o}$ **d) zero**

14. The capacitance of a parallel plate capacitor increases from 5 μF to 60 μF when dielectric is filled between the plates. The dielectric constant of the dielectric is **(P Y)**

a) 65 b) 5 **c) 12** d) 10

15. A hallow metal ball carrying an electric charge produces no electric field at a point **(P Y)**

a) outside the sphere b) on its surface

c) inside the sphere d) at a distance more than twice

Previous Year Questions :

16. Which one of the following is not a dielectric?

a) Ebonite b) Mica c) oil **d) Gold**

17. An example of conductor is **(P Y)**

a) glass **b) human body** c) dry wood d) ebonite

18. Quantization of electric charges is given by

a) q = ne b) q = cV c) $q = \frac{e}{n}$ d) $q = \frac{c}{V}$

19. The law that governs the force between electric charges is

a) Ampere's law b) Faraday's law

c) Coulomb's law d) Ohm's law

20. The value of permittivity of free space is

a) $8.854 \times 10^{12}\ C^2N^{-1}m^{-2}$ b) $9 \times 10^{9}\ C^2N^{-1}m^{-2}$

c) $\frac{1}{9\times10^{9}}\ C^2N^{-1}m^{-2}$ **d)** $\mathbf{\frac{1}{4\pi \times 9 \times 10^{9}}\ C^2N^{-1}m^{-2}}$

21. The Repulsive force between two like charges of 1 coulumb was separated by distance of 1m in vacuum is equal to

a) $\mathbf{9\times10^{9}\ N}$ b) $10^{9}\ N$ c) $9\times10^{-9}\ N$ d) 9 N

22. What must be the distance two equal and opposite point charges (say +q and –q) for the electrostatic force between them to have a magnitude of 16N?

a) $4\sqrt{kq}\ metre$ **b)** $\mathbf{\frac{q}{4}\sqrt{k}\ metre}$ c) 4kq metre d) $\frac{4k}{q}\ metre$

23. The unit of relative permittivity is _____

a) $c^2N^{-1}m^{-2}$ b) Nm^2C^{-2} **c) No unit** d) $NC^{-2}m^{-2}$

24. The value of relative permittivity of air is _____

a) $8.854 \times 10^{-12}\ C^2N^{-1}m^2$ b) $9 \times 10^{9}\ N^{-1}m^{-2}$ **c) 1** d) 8.854×10^{12}

25. The unit of electric field intensity is

a) Vm b) CN^{-1} c) VC^{-1} **d) NC^{-1}**

26. The magnitude of the force acting on a charge of $2x10^{-10}$ C placed in a uniform electric field 10 Vm^{-1} is

a) 2×10^{-9} N b) 4×10^{-9} N c) 2×10^{-10} N d) 4×10^{-10} N

27. The intensity of electric field at a point is equal to

a) the force experienced by a charge q

b) the work done in bringing unit positive charge form infinity to that point

c) the positive gradient of the potential

d) the negative gradient of the potential

28. The intensity of the electric field that produces a force of 10^{-5} N on a charge of 5 μC is

a) $5 \times 10^{-11}\ NC^{-1}$ b) $50\ NC^{-1}$ **c) $2\ NC^{-1}$** d) $0.5\ NC^{-1}$

29. Two point charges +q and –q are placed at points A and B respectively separated by a small distance. The electric field intensity at the midpoint

a) is zero **b) acts along AB**

c) acts along BA d) acts perpendicular to AB

30. The number of electric lines of force originating from a charge of micro coulomb is

a) 1.129×10^{5} b) 1.6×10^{-19} c) 6.25×10^{18} d) 8.85×10^{-12}

31. The unit of electric dipole moment is **(PY)**

a) volt / metre $\left[\frac{V}{m}\right]$ b) coulomb / metre $\left[\frac{C}{m}\right]$

c) volt metre (Vm) **d) coulomb metre (Cm)**

32. The direction of electric field at a point on the equatorial line due to an electric dipole is

a) alone the equatorial line towards the dipole

b) alone the equatorial line away from the dipole

c) parallel to the axis of the dipole and opposite to the direction of the dipole moment

d) parallel to the axis of the dipole and in the direction of the dipole moment

33. Torque on a dipole in a uniform electric field is maximum when angle between $\vec{P}$ and $\vec{E}$ is

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

34. An electric dipole is placed in a non-uniform electric field with its experiences _____

a) only a net force b) only torque

c) both a net force and torque d) Neither a net force and a torque

35. The torque (τ) experienced by an electric dipole placed in a uniform electric Field (E) at an angle θ with the field is

a) PE cos θ b) -PE cos θ **c) PE sin θ** d) 2PE sin θ

36. An electric dipole of moment is placed in a uniform electric field of intensity at an angle with respect to the field. The direction of the torque is

a) along the direction of b) opposite to the direction of

c) along the direction of

d) perpendicular to the plane containing $\vec{P}$ and $\vec{E}$

37. Electric potential energy of an electric dipole in an electric field is given as

a) pE sin θ b) -pE sin θ **c) -pE cos θ** d) pE cos θ

38. When an electric dipole of dipole moment P is aligned parallel to the electric field E then the potential energy of the dipole is given as _____

a) PE b) zero **c) – PE** d) PE /2

39. An electric dipole of dipole moment ' P ' is kept parallel to an electric field of intensity " E ". The work done in rotating the dipole through an angle of 90° is

a) zero b) –pE **c) pE** d) 2pE

40. The work done in moving 4 μC charge from one point to another in an electric field is 0.012 J. The potential difference between them is

a) 3000 V b) 6000 V c) 30 V d) 48 x 10^3 V

41. When a point charge of a 6 μC is moved between two points in an electric Field the work done is 1.8 x 10^{-5}J. The potential difference between the two points is

a) 1.08 V b) 1.08V **c) 3 V** d) 30 V

42. The negative gradient of potential is

a) electric force b) torque

c) electric current **d) electric field intensity**

43. On moving a charge of 20 C by 2 cm, 2 J of work is done, then the potential difference between the points is _____

a) 0.5 V **b) 0.1 V** c) 8 V d) 2 V

44. The ratio of electric potential at point 10 cm and 20 cm from the centre of an electric dipole along its axial line is

a) 1 : 2 b) 2 : 1 c) 1 : 4 **d) 4 : 1**

45. The potential energy of two equal point charges of magnitude 2 μC placed 1 m apart in air is _____

a) 2 J b) 0.36 J c) 4 J **d) 0.036 J**

46. The unit of electric flux is

a) Nm^2C^{-1} b) $Nm^{-2}C^{-1}$ c) Nm^2C d) $Nm^{-2}C$

47. The unit of the number of electric lines of force passing through a given area is

a) no unit b) NC^{-1} **c) $Nm^2 C^{-1}$** d) Nm

48. The electric field intensity at a distance r due to infinitely long straight charged wire is directly proportional to

a) r **b) $\frac{1}{r}$** c) r^2 d) $\frac{1}{r^2}$

49. The electric field intensity at a short distance r from a uniformly charged infinite plane sheet of charge is

a) proportional to r b) proportional to 1/r

c) proportional to $1/r^2$ **d) independent of r**

50. The electric field inside the plates of two oppositely charged plane sheels of charge density is

a) $+\frac{\sigma}{2\varepsilon_0}$ b) $\frac{\sigma}{2\varepsilon_0}$ **c) $\frac{\sigma}{\varepsilon_0}$** d) zero

51. The total flux over a closed surface enclosing a charge q (in)

a) $8\pi q$ b) $9 \times 10^9 q$ **c) $36\pi \times 10^9$ q** d) 8.854×10^{12} q

52. The capacitance of a capacitor is

a) directly proportional to the charge q given to it

b) inversely proportional to its potential V

c) directly proportional to the charge q and inversely proportional to the potential V

d) independent of both the charge q and potential V

53. When the charge given to the capacitor is doubled, its capacitance _____

a) increases twice b) decreases twice

c) increases four times **d) does not change**

54. The capacitance of a parallel plate capacitor increases from 5μF to 50μF when a dielectric is filled between the plates. The dielectric constant of dielectric is _____

a) $8.854 \times 10^{-12}\ C^2N^{-1}m^{-2}$ b) $8.854 \times 10^{-11}\ C^2N^{-1}m^{-2}$

c) 12 **d) 10**

55. The capacitance of a parallel plate capacitor increases from 5μF to 50μF when a dielectric is filled between the plates. The permitivity of dielectric is _____

a) $8.854 \times 10^{-12}\ C^2N^{-1}m^{-2}$ **b) $8.854 \times 10^{-11}\ C^2N^{-1}m^{-2}$**

c) 12 d) 10

56. The equivalent capacitance of two capacitors in series is 1.5 μF. The capacitance of one of them is 4 μF. The value of capacitance of the other is

a) 2.4 μF b) 0.24 μF c) 0.417 μF d) 4.17 μF

57. Three capacitors of capacitances 1 F, 2 F and 3 F are connected in series. The effective capacitance of the capacitors is

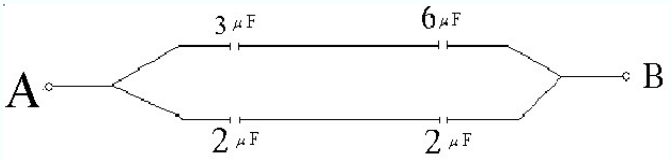
a) 6 F b) 11/6 F **c) 6/11 F** d) 1/6 F

58. n capacitors of capacitance C connected in series. The effective capacitance is

a) n/C **b) C/n** c) nC d) C

59. In the given circuit, the effective capacitance between A and B will be

a) 3 μF b) 36/13 μF c) 13 μF d) 7 μF



60. A capacitor of capacitance 6 μF is connected to a 100 V battery. The energy stored in the capacitor is

a) 30J b) 3J **c) 0.03J** d) 0.06J

61. A dielectric medium is placed in an electric field E0. The field induced inside the medium is _____

a) acts in the direction of electric field E_0

b) acts opposite to E_0

c) acts perpendicular to E_0

d) is zero

62. A non-polar dielectric is placed in an electric field (E). Its induced dipole moment

a) zero

b) acts in the direction of E

c) acts opposite to the direction of E

d) acts perpendicular to E

63. The principle used in lighting conductor is **(PY)**

a) corona discharge

b) mutual induction

c) self-induction

d) electromagnetic induction

64. Van de Graaff generator works on the principle of

a) electromagnetic induction and action of points

b) electrostatic induction and action of points

c) electrostatic induction only

d) action of points only

65. Point charges + q , + q , - q and - q are placed at the corners A, B, C and D respectively of a square. O is the point of intersection of the diagonals AC and BD. The resultant electric field intensity at the point O :

a) acts in a direction parallel to AB **b) acts in a direction parallel to BC**

c) acts in a direction parallel to CD d) is zero

66. Two point charges + q_1 and + q_2 are placed in air at a distance of 2 m apart. One of thecharges is moved towards the other through a distance of 1 m. The work done is :

a) $\frac{q_1 q_2}{4\pi\varepsilon_o}$ b) $\frac{2q_1 q_2}{4\pi\varepsilon_o}$ **c)** $\mathbf{\frac{q_1 q_2}{8\pi\varepsilon_0}}$ d) $\frac{q_1 q_2}{16\pi\varepsilon_o}$

67. The unit of molecular polarisability is :
a) $\mathbf{C^2 N^{-1} m}$ b) Nm^2C^{-1} c) $N^{-1}m^{-2}C^2$ d) $C^{-1}m^2V$

68. The capacitance 0.5 μF and 0.75 μF are connected in parallel. The effective capacitance of the capacitors are
a) 0.80 μF b) 0.70 μF c) 0.25 μF **d) 1.25 μF**

69. The equipotential surface of an electric dipole is
a) Sphere whose centre coincides with the centre of the electric dipole
b) A plane surface inclined at an angle 45° with the axis of the electric dipole
c) A plane surface passing through the centre of the electric dipole and perpendicular to the axis of the electric dipole
d) any plane surface parallel to the axis of the electric dipole

70. A and B are two hollow metal spheres of radii 50 cm and 1m respectively. They are connected externally by a connecting wire. Now the charge flows from
a) A to B till the charges become equal
b) A to B till the potentials become equal
c) B to A till the changes become equal
d) B to A till the potentials become equal

71. When a dielectric slab is introduced between the plates of a charged parallel plate capacitor, its
a) potential increases **b) electricfield decreases**
c) charge increases d) capacitance decreases

72. The force between two charges situated in a medium of permitivity ε is
a) $\frac{\varepsilon}{4\pi}\frac{q_1 q_2}{r^2}$ b) $9\times10^9\,\varepsilon_r\frac{q_1 q_2}{r^2}$ c) $9\times10^9\frac{q_1 q_2}{r^2}$ **d)** $\mathbf{\frac{9\times10^9}{\varepsilon_r}\frac{q_1 q_2}{r^2}}$

73. The work done in moving 6 μC charge between two points is 1.2×10^{-5} J. Find the potential difference between two points
a) 6 V **b) 2 V** c) 12 V d) 72 V

PTA Objective Questions :

1. If two charged bodies of charges +2q and -5q are brought in contact, the total charge of the system is
a) +3q **b) -3q** c) zero d) either +2q or -3q

2. The unit of electric field intensity is
a) NC^{-1} b) $N^{-1}C^2m^{-2}$ c) Cm d) Volt

3. SI unit of electric charge is
a) coulomb b) ampere second c) $\frac{\text{voltsecond}}{\text{ohm}}$ **d) all the above**

4. Which one of the following is an insulator?
a) human body b) earth c) copper **d) ebonite**

5. Electric dipole moment always acts in the direction from
a) +q to -q **b) - q to + q** c) ∞ to +q d) ∞ to -q

6. A device to store charges is
a) resistor **b) capacitor** c) inductor d) conductor

7. An electric dipole in a uniform electric field experiences a
a) force **b) torque**
c) momentum d) neither force nor torque

8. When a dipole is aligned with field, then potential energy is given as
a) PE sin θ b) O **c) -PE** d) -PE cos θ

9. Work done in moving an electric charge on an equipotential surface is
a) 0 b) minimum
c) maximum d) infinity

10. Which one of the follwoing is a non - polar molecule?
a) H_2O b) CO_2 c) HCl **d) O_2**

11. Relative permitivity of vacuum is
a) 3 **b) 1** c) 2 d) 0

12. Van de Graff generator produces potential difference of the order of
a) 10^9 V b) 10^8 V **c) 10^7 V** d) 10^6 V

13. Potential at a point due to point charge is given by
a) $\frac{\mathbf{q}}{\mathbf{4\pi\pi_0 r}}$ b) $\frac{q^2}{4\pi\varepsilon_0 r}$ c) $\frac{q}{4\pi\varepsilon_0 r^2}$ d) $\frac{q^2}{4\pi\varepsilon_0 r^2}$

14. Dielectric is also called as
a) conductor b) inductor c) resistor **d) insulator**

15. The permittivity of vacuum ε_0 is equal to
a) $\frac{1}{4\pi x 9 x 10^9} C^{-2} N^{+1} m^{+2}$ **b)** $\frac{\mathbf{1}}{\mathbf{4\pi \times 9 \times 10^9}} \mathbf{C^{-2}\, N^{-1}\, m^{-2}}$
c) $9x10^9 C^2 N^{-1} m^{-2}$ d) $9x10^9 C^{-2} N^1 m^{+2}$

16. The permittivity of any medium is given by $\varepsilon =$
a) $\varepsilon_0 / \varepsilon_r$ b) $\varepsilon_0 + \varepsilon_r$ **c) $\varepsilon_0\, \varepsilon_r$** d) $\varepsilon_0 - \varepsilon_r$

17. Electric field intensity at any point is given by
a) E = Fq **b) $\mathbf{E = F/q}$** c) $E = q/F$ d) $E = F - q$

18. SI unit of electric flux is
a) Nm^2C^{-1} b) $Nm^{-2}C^{-2}$ c) $Nm\,C^2$ d) Nm^2C^2

19. According to Gauss law

a) $\varphi = \frac{q}{\varepsilon_0}$ b) $\phi = \varepsilon_0 + q$ c) $q = \frac{\phi}{\varepsilon_0}$ d) $q = \frac{\varepsilon_0}{\phi}$

20. A lighting conductor works on the principle of

a) corona discharge b) action of sharp points

c) (a) or (b) d) none

21. A device not working with the principle of electrostactic induction is

a) Vande Graff generator **b) microwave oven**

c) lightning arrestor d) a (or) b

22. When two capacitors are connected in series to a source of emf, then each one of them will have same

a) voltage b) electric field

c) both (a) & (b) **d) charge**

23. A dipole is placed in a uniform electric field with its axis parallel to the field it experiences

a) net force only b) torque only

c) both net force and torque **d) neither a net force nor a torque**

24. If a point lies at a distance x from the mid point of the dipole, the electric potential at this point is proportional to

a) $\frac{1}{x^2}$ b) $\frac{1}{x^3}$ c) $\frac{1}{x^4}$ d) $\frac{1}{x^{3/2}}$

25. Four charges +q, +q, -q and -q, respectively are placed at the corners A, B, C and D of a square of side 'a'. The electric potential at the centre 'O' of the square is

a) $\frac{q}{4\pi\varepsilon_0 a}$ b) $\frac{2q}{4\pi\varepsilon_0 a}$ c) $\frac{4q}{4\pi\varepsilon_0 a}$ **d) zero**

26. Workdone in moving 500 μC charge between two points on equipotential surface is

a) zero b) finite positive c) finite negative d) infinite

27. Which of the following quantity is scalar?

a) dipole moment b) electric force

c) electric field **d) electric potential**

28. SI unit of permittivity is

a) $C^2 N^{-1} m^{-2}$ b) $N\, m^2 C^{-2}$ c) $H\, m^{-1}$ d) $N\, C^{-2}\, m^{-2}$

29. Electric field outside the plates of two oppositely charged plane sheets of charge density σ is

a) $\frac{\sigma}{2\varepsilon_0}$ b) $\frac{-\sigma}{2\varepsilon_0}$ c) $\frac{\sigma}{\varepsilon_0}$ **d) zero**

30. A hollow metal ball carrying an electric charge produces no electric field at points
a) outside the sphere b) on its surface
c) inside the sphere d) at a distance more than twice

31. If the medium between two charges is replaced by air, then the force between them
a) increase b) decreases c) becomes zero d)remains constent

32. The electric potential energy of a system of two charges is given by
a) $\frac{q_1 q_2}{9x10^9 r}$ **b)** $\frac{\mathbf{q_1 q_2}}{\mathbf{4\pi\varepsilon_0 r}}$ c) $\frac{q_1 q_2}{9x10^9 r^2}$ d) $\frac{q_1 q_2}{4\pi\varepsilon_0 r_2}$

33. An electric dipole consists of two
a) like and equal charges b) like and unequal charges
c) Unlike and equal charges d) Unlike and unequal charges

34. If a Gaussian surface encloses a dipole of moment 2qd, then the total flux through the surface is
a) $\frac{q}{\varepsilon_0}$ b) $\frac{2q}{\varepsilon_0}$ c) $\frac{q}{2\varepsilon_0}$ **d) 0**

35. 'Action of points' is used in
a) dynamo b) lightning conductor
c) vande graff generator **d) both (b) & (c)**

36. When air medium in capacitor is replaced by a meduim of dielectric constant ε_r, the capaciance
a) decreases ε_r times b) remains the smae
c) increases ε_r times d) increased ε_r^2 times

37. An example for polar molecule
a) N_2 b) H_2 **c) H_2O** d) O_2

38. A glass rod rubbed with silk acquires a charge of +8 x 10^{-12}C. The number of electrons it has gained or lost
a) 5 x 10^{-7} (gained) **b) 5 x 10^7 (lost)** c) 2 x 10^{-8} (lost) d) -8 x 10^{-12} (lost)

39. Electrostatic force between two point charges kept at a distance d apart, in a medium of ε_r = 6 is 0.3 N. The force between them at the same separation in vacuum is
a) 20N b) 0.5 N **c) 1.8 N** d) 2N

40. Electric field intensity is 400 Vm^{-1} at a distance of 2 m from a point charge. It will be 100 Vm^{-1} at a distance
a) 50 cm b) 4cm **c) 4 m** d) 1.5 m

41. Two point charges +4q and +q are placed 30 cm apart. At what point on the line joining them, the electric field is zero?
a) 15 cm from the charge q b) 7.5 cm from the charge q
c) 20 cm from the charge 4 q d) 5 cm from the charge q

42. The number of electric lines of force originating from a charge of 1C is
a) 1.129×10^{11} b) 1.6×10^{-19} c) 6.25×10^{18} d) 8.85×10^{12}

43. The capacitance of a parallel plate capacitor increases from 5 μF to 60 μF when a dielectric is filled between the plates. The value of electric constant is
a) 65 b) 55 **c) 12** d) 10

44. Two charges 10^{-6} and 10^{-7} C repel each other with a force of 400 N. The distance between the charges is
a) 0.15 mm **b) 1.5 mm** c) 15 mm d) 1.5 m

45. The potential difference between two parallel plates is 100 V and the electric field between them is 10^4 V/m. Then the distance between the plates.
a) 1 mm b) 1 m c) 10 cm **d) 1 cm**

46. The plates of a parallel plate capacitor are separated by a distance of 1 mm. If the capacitance is 8.854 μF , then the area of the plates is
a) 10^{-3} m^2 b) 10 m^2 **c) 10^3 m^2** d) 10^2 m^2

47. If a capacitor of capacitance 55 PF is charged to 1.6 V, then the number of electrons on its negative plate is
a) 55×10^7 b) 5.5×10^7 c) 550×10^7 d) 0.55×10^7

48. The workdone in moving a charge of 2 μC between two points having different potential of 110 V and 220 V is
a) 22×10^{-4} J b) 2.2×10^4 J c) $22 \times 10^{+4}$ J **d) 2.2×10^{-4} J**

49. Two charges + 4 C and +1C are separated by a distance of 3 m. To keep these charges in equilibrium, a third charge is to be placed at
a) 2m from the charge 4 C b) 2 m from the charge 1 C
c) 1.5 cm from the charge 4 C d) 2.5 m from the charge 1 C

50. Equivalent capacitance of two capacitors when connected in parallel is 8 μF and when connected in series is 15/8 μF . Then values of the two capacitors are
a) 7 μF and 1 μF b) 6 μF and 2 μF c) 4 μF and 4 μF **d) 5 μF and 3 μF**

51. Two capacitors of capacitance 200 PF and 600 PF are connected in parallel and then charged to a potential of 120 V. Then the value of the total charge on the capacitors is
a) 24×10^{-9} C **b) 96×10^{-9} C** c) 48×10^{-9} C d) 72×10^{-9} C

52. The intensity of the electric field that produces a force of 10N on a charge of 5 C is
a) 2 NC^{-1} b) 50 NC^{-1} c) 5 NC^{-1} d) 0.5 NC^{-1}

53. If two identical point charges separated by 3 m experience a force of 10 N, then the value of each charge is
a) 10^{-1} C b) 10 C c) 1 C **d) 10^{-4}C**

54. Two identical metal spheres have charges + 15 μC and +25 μC and are separated by a distance. If the spheres are first brought into contact and then separated to the original distance, then the ratio of the new force between them to the previous force is
a) 15 : 16 b) 3 : 5 **c) 16 : 15** d) 5 : 3

55. If the moment of an electric dipole is 1.2 x 10^{-9} Cm and the distance between the charges is 3 mm then the charge of the dipole is
a) 3.6 μC b) 40 μC c) 3.6 x 10^{-12} C **d) 0.4 µC**

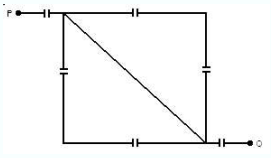
56. A parallel plate capacitor consists of two circular plates of radius 3 cm separated by a dielectric material of thickness 0.5 mm and dielectric constant $\varepsilon_r = 4$. Then the capacitance of the capacitor is
a) 50 PF **b) 200 PF** c) 2 PF d) 0.5 PF

57. A parallel plate capacitor connected to a 12 V source is charged to 21 μC If the capacitor is filled with an oil of dielectric constant 3, then the charge stored is
a) 7 μC **b) 63 µC** c) 14 μC d) 57 μC

58. The equivalent capacitance of two capacitors in series is 1.5 μF. The capacitance of one of them is 4 μF. The value of capacitance of other is
a) 2.4 μF B) 0.24 μF C) 0.417 μF D) 4.17 μF

59. Three capacitors 2 μF, 5 μF and 3 μF are in parallel across 5V supply. The charges on each of them respectively are
a) 12 μC, 30 μC, 18 μC **b) 10 µC, 25 µC, 15 µC**
c) 8 μC, 20 μC, 12 μC d) 6 μC, 15 μC, 9 μC

60. In the electric circuit given below, capacitance of each capacitor is 1 μF. The effective capacitance between the points P and Q is (in μF)



a) $\frac{2}{5}$ b) $\frac{6}{5}$ c) $\frac{5}{6}$ d) $\frac{5}{2}$

61. If the distance between two protons in uranium atom is 9 x 10^{-15} m, then the mutual electric potential energy between them is

a) 9×10^{-14} J b) 1.44×10^{-15}J **c) 2.56×10^{-14} J** d) 1.6×10^{-5} J

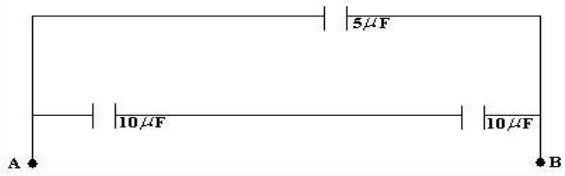
Three Mark Questions:

Book Back Questions :

1. State Coulomb's law in electrostatics and represent it in vector form. **(P Y)**
2. What is permittivity and relative permittivity? How are they related?
3. What is electric dipole? Define electric dipole moment. **(P Y)**
4. What does an electric dipole experience when kept in a uniform electric field and non – uniform electric field.
5. Distinguish between electric potential and potential difference.
6. What is an equipotential surface? Give the examples.
7. Define electric flux. Give its unit. **(P Y)**
8. State and principle of superposition of charges.
9. Define electric field at a point. Give its unit.
10. State Gauss's law. **(P Y)**
11. What is a capacitor? Define its capacitance. **(P Y)**
12. What is meant by dielectric polarization? **(P Y)**
13. Why is it safer to be inside a car than standing under a tree during lightning? **(P Y)**
14. What is polar molecule? Give any two example. **(P Y)**

Previous Year Questions :

15. What you meant by "Additive nature of charge"? Give an example.
16. Define one 'Coulomb' on the basis of Coulomb's law.
17. Mention any three properties of electric lines of force.
18. Define electric potential at a point.
19. Explain the working of a microwave oven.
20. What is electrostatic shielding?
21. Write the application of capacitor.
22. What is non-polar molecule? Give example.
23. What is carona discharge? What are its advantages?
24. Three capacitors each of capacitance 9 pF are connected in series. What is the total capacitance of the combination? **(Eg)**
25. Calculate the potential at a point due to a charge of 4×10^{-7}C located at 0.09 m away from it.
26. Calculate the effective capacitance of the combination as shown in the figure:



27. A sample of HCl gas is placed in an electric field of 2.5×10^4 NC^{-1}. The dipole moment of each HCl molecule is 3.4×10^{-30} Cm. Find the maximum torque that can act on a molecule.
28. An infinite line charge produces a field of 9×10^4 NC^{-1} at a distance of 2 cm. Calculate the linear charge density.

Five Mark Questions:

Book Back Questions :

1. Explain the principle of superposition.
2. Write the properties of electric lines of forces. **(P Y)**
3. Define electric field at a point. Give its unit and obtain an expression for the electric field at a point due to a point charge .
4. Derive an expression for torque acting on the electric dipole when placed in a uniform field**. (P Y)**
5. Define electric potential at a point. Is it a Scalar or Vector? Obtain an expression for electric potential due to a point charge. **(P Y)**
6. What is electrostatic potential energy of a system of two point charges? Deduce an expression for it. **(P Y)**
7. What is capacitor? Explain the principle of capacitor.
8. A parallel plate capacitor is connected to a battery. If the dielectric slab of thickness equal to half the plate separation is inserted between the plates what happens to (i) capacitance of the capacitor (ii) electric field between the plates (iii) potential difference between the plates.
9. Prove that the energy stored in a parallel plate capacitor is $q^2/2C$. **(P Y)**

Previous Year Questions :

10. What is a capacitor? Explain the principle of a capacitor.
11. Deduce an expression for the capacitance of a parallel plate capacitor.
12. Two positive charges of 12 μC and 8 C respectively are 10 cm apart. Find the work done in bringing them 4 cm closer, so that are 6 cm apart. **(Ex)**
13. A square of side 1.3m has charges +12 nC, -24 nC, +31 nC and +17 nC at its corners. Calculate the electric potential at the centre of the square. **(Eg)**
14. A parallel plate capacitor has plates of area 200 cm^2 and separation between the plates is 1mm. Calculate i) the potential difference between the plates is 1 nC charge is given to the capacitor. ii) With the same charge (1 nC) if the plate separation is increased to 2mm, what is the new potential difference and iii) the electric field between the plates? **(Eg)**

15. Three capacitors each of capacitance 9 pF are connected in series. i) What is the total capacitance of the combination? ii) What is the potential difference across each capacitor if the combination is connected to 120 V supply? **(Ex)**
16. Two capacitors of capacitances capacitors 0.5 F and 0.75 F are connected in parallel and the combination to a 110 V battery. Calculate the charge from the source and charge on each capacitor. **(Ex)**
17. Two capacitors of unknown capacitances are connected in series, and parallel. If the net capacitances in the two combinations are 6 F and 25 F respectively, find their capacitances. **(Ex)**
18. A plates of a parallel capacitor have an area of 90 cm^2 and each separated by 2.5 mm. The capacitor is charged by connecting it to a 400 V supply. How much electrostatic energy is stored by the capacitor? **(Eg)**
19. Three charges -2 x 10^{-9} C, +3 x 10^{-9} C and -4 x 10^{-9} C are placed at the vertices of an of an equilateral triangle ABC of side 20 cm. calculate the work done in shifting the charges from A, B and C to A_1, B_1 and C_1 respectively. Which are the mid-points of the sides of triangles?

Ten Mark Questions:

Book Back Questions :

1. Derive an expression for electric field due to an electric dipole at a point on its axial line **(P Y)**
2. Derive an expression for electric field due to an electric dipole at a point along the equatorial line. **(P Y)**
3. Derive an expression for electric potential due to an electric dipole. Discuss the special cases. **(P Y)**
4. State Gauss's law. Applying this, calculate electric field due to an infinitely long straight charged wire with uniform charge density. **(P Y)**
   (ii) an infinite plane sheet of charge of q.
5. Explain the principle of capacitor. Deduce an expression for the capacitance of the parallel plate capacitor. **(P Y)**
6. What is dielectric? Explain the effect of introducing a dielectric slab between the plates of parallel plate capacitor.
7. Deduce an expression for the equivalent capacitance of capacitors connected in series and parallel. **(P Y)**
8. State the principle and explain the construction and working of Vande Graaff generator. **(P Y)**

II. CURRENT ELECTRICITY

One Mark Questions

Book Back Questions :

1. A charge of 60 C passes through an electric lamp in 2 minutes. Then the current in the lamp is
   a) 30A b) 1A **c) 0.5A** d) 5A
2. The material through which electric charge can flow easily is **(P Y)**
   a) quartz b) mica c) germanium **d) copper**
3. The current flowing in a conductor is proportional to
   a) drift velocity b) 1/ area of cross section
   c) 1/ no of electrons d) square of area of cross section
4. A toaster operating at 240 V has a resistance of 120 Ω. The power is **(P Y)**
   a) 400 W b) 2W **c) 480W** d) 240 W
5. If the length of a copper wire has a certain resistance R, then on doubling the length its specific resistance **(P Y)**
   a) will be doubled b) will become $1/4^{th}$
   c) will become 4 times **d)will remain the same**
6. When two 2 Ω resistance are in parallel, the effective resistance is **(P Y)**
   a) 2 Ω b) 4 Ω **c) 1 Ω** d) 0.5 Ω
7. In the case of insulators, as the temperature decreases, resistivity **(P Y)**
   a) decreases **b) increases**
   c) remain constant d) becomes zero
8. If the resistance of the coil is 2 Ω at 0°C and α = 0.004/°C, then its resistance at 100°C is
   a) 1.4 Ω b) 0 Ω c) 4 Ω **d) 2.8 Ω**
9. According to Faraday's law of electrolysis, when a current is passed, the mass of ion deposited at the cathode is independent of
   a) Current b) charge c) time **d) resistance**
10. When n resistors of equal resistances (R) are connected in series, the effective resistance is **(P Y)**
    a) n/R b) R/n c) 1/nR **d) nR**

Previous Year Questions :

11. The relation between current and drift velocity is
    a) $I = \frac{nAV_d}{e}$ **b) $I = nAV_d e$** c) $I = \frac{neV_d}{A}$ d) $I = nAV_d E$

12. When the diameter of a conductor is doubled, its resistance
a) decreases twice **b) decreases four times**
c) decreases sixteen times d) increases four times

13. The electrical resistivity of a thin copper wire and a thick copper rod are respectively . ρ_1 Ωm and ρ_2 Ωm Then
a) $\rho_1 > \rho_2$ b) $\rho_2 > \rho_1$ **c) $\rho_1 = \rho_2$** d) $\frac{\rho_1}{\rho_2} = \alpha$

14. The unit of conductivity is
a) mho b) ohm c) ohm-m **d) mho-m^{-1}**

15. In the case of insulators, as the temperature increase, resistivity
a) decrease b) increases c) remains constant d) becomes zero

16. The transition temperature of mercury is
a) 4.2°C **b) 4.2 K** c) 2.4°C d) 2.4K

17. The colour code on a carbon resistor is red-red-black. The resistance of the resistor is
a) 2.2 Ω **b) 22** Ω c) 220 Ω d) 2.2 K Ω

18. The brown ring at one end of a carbon resistor indicates a tolerance of
a) 1% b) 2% c) 5% d) 10%

19. Resistance of a metal wire of length 10 cm is 2 Ω. If the wire is stretched uniformly to 50 cm, then the resistance is
a) 25 Ω b) 10 Ω c) 5 Ω **d) 50** Ω

20. When 'n' resistors of equal resistance (R) are connected in series and in parallel respectively, then the ratio of their effective resistance is
a) 1 : n^2 **b) n^2 : 1** c) n : 1 d) 1 : 1

21. The resistance of a nichrome wire at 0° C is 10 Ω . If its temperature co-efficient of resistance is 0.004/°C, find its resistance at boiling point of water.
a) 14 Ω b) 13 Ω c) 10 Ω d) 15 Ω

22. A cell of emf 2.2 V sends a current of 0.2 A through a resistance of 10 Ω . The internal resistance of the cell is
a) 0.1 Ω **b) 1** Ω c) 2 Ω d) 1.33 Ω

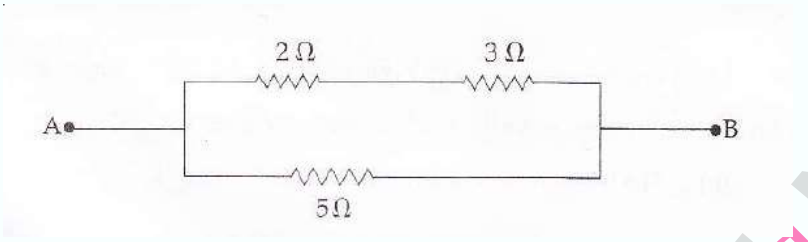
23. The resistance of the filament of a 110 W, 220 V electric blub is
a) 440 Ω b) 220 Ω c) 484 Ω d) 848 Ω

24. The unit of electrochemical equivalent is
a) kg. coulomb b) $\frac{\text{kg}}{\text{ampere}}$ **c) $\frac{\text{kg}}{\text{amperesec}}$** d) $\frac{\text{coulomb}}{\text{kg}}$

25. A graph is drawn taking potential difference across the ends of a conductor along X-axis and current through the conductor along the Y-axis. The slope of the straight line given :
a) resistance **b) conductance** c) resistivity d) conductivity

26. 1 Wh (Watt hour) is equal to
a) 36×10^5 J b) 36×10^4 J **c) 3600 J** d) 3600 Js^{-1}

27. The effective resistance between points A and B in the given network is:



a) 2.5 Ω b) 10 Ω c) 0.4 Ω d) 11 Ω

PTA Objective Questions :

1. Free electrons are very loosely attached to the
a) nuclei b) protons c) atoms d) neutrons

2. The thermodynamic internal energy of the materials is sufficient to liberate
a) inner electrons **b) outer electrons**
c) protons d) neutrons

3. The external energy necessary to drive the free electrons in a definite direction is called
a) current b) resistance **c) emf** d) power

4. If a charge q coulomb passes through any cross section of a conductor in time 't' second, then the current is given by
a) I = qt b) I = t/q **c) I = q / t** d) I = 1 / qt

5. Force experienced by a free electron in an electric field 'E' is
a) Ee b) E / e c) e / E d) Ee^2

6. Acceleration experienced by an electron of mass 'm' and charge 'E' in an electricfield 'E' is a =
a) $\frac{e\tau}{m}$ **b) $\frac{\mathbf{eE}}{\mathbf{m}}$** c) $\frac{\mu E}{m}$ d) $\frac{Em}{e}$

7. Expression for mobiltiy is, μ =
a) $\frac{Ee}{m}$ b) $\frac{E\tau}{m}$ **c) $\frac{\mathbf{e\tau}}{\mathbf{m}}$** d) $\frac{me}{\tau}$

8. The unit of mobility is
a) $m^2 V^1 s^{-1}$ b) $m^2 V^{-1} s^1$ c) $m^{-2} V^{-1} S^{-1}$ **d) $m^2 V^{-1} s^{-1}$**

9. Drift velocity of electrons is proportional to
a) electric field intensity b) charge of protons
c) area of the conductor d) none of these

10. Drift velocity of electrons is of the order of
a) 0.2 cm s^{-1} **b) 0.1 cm s^{-1}** c) 0.1 m s^{-1} d) 1 cm s^{-1}

11. The unit of current density is
a) A m^{-1} b) A m^2 **c) A m^{-2}** d) A m

12. The relation between current and drift velocity is
a) $I = nJeV_d$ b) $nI = AeV_d$ **c) $I = nAeV_d$** d) $I = neV_d$

13. Relation between current density and drift velocity is ,
a) $I = JneV_d$ b) $V_d = Jne$ c) $V_d = neJA$ **d) $J = neV_d$**

14. Expression for electric resistance (R) is ,
a) $R = \frac{mL}{nAe^2\tau}$ b) $R = \frac{nL}{mAe^2\tau}$ c) $R = \frac{nAe^2\tau}{mL}$ d) $R = \frac{mLV}{nAe^2\tau}$

15. Reciprocal of resistance is
a) resistivity b) conductivity c) inductance **d) conductance**

16. The unit of conductance is
a) ohm **b) mho** c) mho $^{-1}$ d) mho m^{-1}

17. The resistance of a conductor of unit length having unit area of cross section is
a) resistivity b) conductivity c) conductance d) capacitance

18. The unit of resistivity is
a) ohm m^{-1} b) mho m **c) ohm m** d) mho m^{-1}

19. The reciprocal of resistivity is
a) conductance b) inductance c) resistance **d) conductivity**

20. The unit of conductivity is
a) ohm m^{-1} **b) mho m^{-1}** c) mho m d) ohm m

21. The conductivity of a material is obtained by the formula
a) $\sigma = RA/l$ b) $\sigma = lA/R$ **c) $\sigma = l/RA$** d) $\sigma = \rho A/R$

22. Materials having resistivity of the order of 10^{-6} - 10^{-8} Ω m are classified as
a) insulators **b) conductors** c) semiconductors d) none of these

23. If the resistivity of materials ranges from 10^8 - 10^{14} Ω m, then they are called as
a) insulators b) conductors c) semiconductors d) none of these

24. Semiconductors have resistivity of the order of
a) 10^{-6} - 10^{-8} Ω m b) 10^{8} - 10^{14} Ω m c) 10^{-2} - 10^{4} Ω m^{-1} **d) 10^{-2} - 10^{4} Ω m**

25. Discontinuous change in specific heat of a material occurs at
a) transition temperature b) high temperature
c) 0 K d) room temperature

26. Resisitivity of mercury is zero at
a) 2.4 K b) 4.2^0 C **c) 4.2 K** d) 2.4^0C

27. At the transition temperature the elctrical resistivity drops to
a) zero b) maximum c) zero d) none of these

28. At the transition temperature the conductivity becomes
a) zero **b) infinity** c) minimum d) none of these

29. The core of a carbon resistor is made of
a) carbon b) silver **c) ceramic** d) iron

30. The tolerance of silver, gold, red and brown rings in carbon resistors are respectively.
a) 1%, 2%, 5% and 10% b) 10%, 2%, 5% and 1%
c) 10%, 5%, 1% and 2% **d) 10%, 5%, 2% and 1%**

31. The tolerance of carbon resistors without a colour ring is
a) 20% b) 10% c) 2% d) 25%

32. The colour code for 1 in carbon resistors is
a) Black **b) Brown** c) Silver d) Red

33. In a carbon resistor the third coloured ring indicates
a) first significant figure b) tolerance
c) powers of 10 to be multiplied d) second significant figure

34. The formula for equivalent resistance of a number resistors connecteed in series is
a) $R_s = \frac{1}{R_1} + \frac{1}{R_2}$ b) $\frac{1}{R_s} = R_1 + R_2 + ...$
c) $\frac{1}{R_s} = \frac{1}{R_1} + \frac{1}{R_2} .....$ **d) $R_s = R_1 + R_2 .....$**

35. The reciprocal of the effective resistance of a number of resistors connected in parallel is
a) $R_p = R_1 + R_2 + ...$ **b) $\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} .....$**
c) $\frac{1}{R_p} = R_1 + R_2 + ...$ d) $\frac{1}{R_P} + \frac{R_1}{R_2}$

36. The effective resistance of two resistances (R_1, R_2) connected in parallel is

a) $\mathbf{R_P = \frac{R_1 R_2}{R_1 + R_2}}$ b) $R_P = \frac{R_1 + R_2}{R_1 R_2}$ c) $R_P = \frac{1}{R_1} + \frac{1}{R_2}$ d) $R_P = R_1 + R_2$

37. If R_0 and R_t are the resistance of a conductor at 0^0C and t^0C respectively, then the temperature coefficient of resistance is

a) $\alpha = \frac{R_0 t}{R_t - R_0}$ b) $\alpha = \frac{R_0 - R_t}{R_0 t}$ **c)** $\mathbf{\alpha = \frac{R_t - R_0}{R_0 t}}$ d) $\alpha = \frac{Rt - R0}{R_t t}$

38. If the resistance of a material increases with increase in temperature then its temperature co efficient of resistance is

a) zero b) negative **c) positive** d) none of these

39. The temperature coefficient of resistane of insulaors and semiconductors is

a) positive **b) negative** c) low d) zero

40. A material with negative temperature coefficient of resistance is called

a) metal b) alloy **c) thermistor** d) thermometer

41. Due to ageing, the internal resistance of a cell

a) increases b) decreases c) does not change d) becomes zero

42. The temperature coefficient of manganin is

a) infinity b) high c) zero **d) low**

43. The internal resistance of a cell can be calculated using the formula

a) $r = \left(\frac{E - V}{I}\right) R$ b) $r = \left(\frac{V - E}{V}\right) R$ c) $r = \left(\frac{E - V}{E}\right) R$ **d)** $\mathbf{r = \left(\frac{E - V}{V}\right) R}$

44. The condition for bridge balance in wheatstone's bridge is

a) $\frac{P}{S} = \frac{R}{Q}$ b) PR = QS **c) PS = QR** d) PQ = RS

45. The equation for electric power (P) is

a) P = VIt **b) P = VI** c) $P = V^2R$ d) $P = I^2Rt$

46. Equation for electrical energy is equal to

a) $\mathbf{I^2Rt}$ b) I^2R c) V^2Rt d) V^2 / Rt

47. One kilo watt hour is equal to

a) 3.6×10^5 J b) 0.36×10^5 J **c)** $\mathbf{36 \times 10^5}$ **J** d) 36×10^3 J

48. The positive ions which are mostly formed from metals or hydrogen are called

a) anions **b) cations** c) positive particles d) atoms

49. When one coulomb of charge is passed through the electroyte, the mass of substance liberated is called

a) electrochemical equivalent b) weight

c) current d) electrical resistance

50. Unit of electrochemical equivalent is
a) C Kg^{-1} b) kg C c) kg C^{-2} **d) kg C^{-1}**

51. The electrodes used in voltaic cell are
a) Cu, Zn b) Cu, Fe c) Cu, C d) Fe, Zn

52. The potential difference between the two electrodes of voltaic cell is
a) 1.5 V b) 1.8 V **c) 1.08 V** d) 1.58 V

53. The emf of Leclanche cell is about
a) 1.08 V **b) 1.5 V** c) 1.05 V d) 1.1 V

54. Leclanche cell can supply a current of
a) 0.25 A b) 0.5 A c) 2.5 A d) 5.2 A

55. Lechlanche cell is used to supply
a) Current of the order 2.5 A b) high current
c) very high current **d) intermittent current**

56. Daniel cell produces an emf of
a) 1.5 V **b) 1.08 V** c) 1.8 V d) 2.0 V

57. In secondary cells the process of reproducing active materials is called
a) charging b) discharging
c) specific gravity d) internal resistance

58. Electroylte used in lead - acid accumulator is
a) lead acid b) HCl **c) dil. H_2SO_4** d) HNO_3

59. The emf of the Lead - acid accmulator under freshly charged and discharged conditions are
a) 2.2V, 2V b) 2V, 2.2V c) 2.2V, 1.35V d) 2V, 1.35V

60. The values of emf developed and specific gravity of a freshly charged Lead- Acid accumulator respectively are
a) 1.9V and 1.35 b) 2.2V and 1.35
c) 2.2 V and 1.28 d) 2.2V and 1.9

61. While on charging and discharging the value of specific gravity of the electrolyte of secondary cells should be
a) 1.12 and 1.28 b) 1.9 and 1.28 **c) 1.28 and 1.12** d) 2 and 2.2

62. A charge of 60 C passes through an electric lamp in 2 minutes. Then the current in the lamp is
a) 30 A b) 1 A **c) 0.5 A** d) 5 A

63. The material through which electric charge can flow is
a) quartz b) mica c) germanium **d) copper**

64. The current flowing in a conductor is proportional to
a) drift velocity b) 1 / area of cross section
c) 1 / no. of electrons d) square of area of cross

65. A toaster operating at 240 V has a resistance of 120 Ω. The power is
a) 400 W b) 2 W **c) 480 W** d) 240 W

66. If the length of a copper wire has a certain resistance R, then on doubling the length its specific resistance
a) will be doubled b) will become $1/4^{th}$
c) will become 4 times **d) will remains the same**

67. When two 2Ω resistors are in parallel, the effective resistance is
a) 2Ω b) 4Ω **c) 1Ω** d) 0.5 Ω

68. In the case of insulators, as the temperature decreases, resistivity
a) decreases **b) increases**
c) remains constant d) becomes zero

69. If the resistance of a coil is 2Ω at 0^0c and α = 0.004 / ^{0}C, then the resistance at 100^0 C is
a) 1.4 Ω b) 0 Ω c) 4 Ω **d) 2.8** Ω

70. According to Faraday's law of electrolysis, when a current is passes, the mass of ions deposited at the cathode is independent of
a) current b) charge c) time **d) resistance**

71. The effective resistance of 'n' resistors of equal resistance (R) connected in series is
a) R b) R / n c) n / R **d) nR**

72. If a charge of 1 C passes through an electric equipment in 10 s, then the current flowing through it is
a) 0.5 A b) 1 A **c) 0.1 A** d) 10 A

73. The markings at the bottom of a tape recorder are as follows. 9V, 450mA. The net resistance of the tape recorder is
a) 20 Ω b) 200 Ω c) 1/20 Ω d) 2 Ω

74. An electrical instrument of resistacne 30 Ω is operated at 240 V. The power is
a) 240 W b) 1290 W c) 920 W **d) 1920 W**

75. If two resistors of resistances 200 Ω and 0.1 KΩ are connected in series then the effective resistance of the system is
a) 200 . 1 Ω **b) 300 Ω** c) 201kΩ d) 2.1 kΩ

76. The resistance of a wire of 1 m length and 0.034 mm^2 area cross section having a specific resistance of $1.7 \times 10^{-8}\ \Omega$ m is
a) 0.5 Ω b) 5.0 Ω c) 2 Ω d) 0.05 Ω

77. A wire of resistance 0.1 Ω having a length of 30 m has a specific resistance of $2.7 \times 10^{-8}\ \Omega$ m. The area of cross section of the wire is
a) $0.81 \times 10^{-6} m^2$ b) $8.1 \times 10^{-5} m^2$ c) $8.1 \times 10^{-4} m^2$ **d) $8.1 \times 10^{-6} m^2$**

78. The resistance of a conductor of 10 m long and 0.1 mm^2 area is 1.7 Ω. The specific resistance of the material of the conductor is
a) $2.7 \times 10^{-8}\ \Omega$ m **b) $1.7 \times 10^{-8}\ \Omega$ m** c) $17 \times 10^{-8}\ \Omega$ m d) $1.7 \times 10^{-6}\ \Omega$ m

79. The number of electrons flowing per second through a conductor, when a current of 3.2 A flows through it is
a) 2×10^{19} b) 3×10^{18} c) 6.25×10^{18} d) 6.25×10^{19}

80. A 1.15 kW, 230 V water heater can draw a current of
a) 0.2 A b) 2 A **c) 5 A** d) 0.5 A

81. The ratio of the diameters of two copper wires of lengths 2m and 8m having equal resistance is
a) 2 : 1 b) 2 : 8 c) 1 : 4 **d) 1 : 2**

82. A current of 0.3 A from a cell of emf 1.5 V is passed through a resistance of 4 Ω. The internal resistance of the cell is
a) 0.1 Ω **b) 1 Ω** c) 10 Ω d) 0.01 Ω

83. If charge per unit volume of a conductor is 600C and the current density is $1.2 Am^{-2}$, then the drift velocity of the electron is
a) 0.2×10^{-2} m/s b) 7.2×10^{-3} m/s c) 200 m/s d) 5×10^{-3} m/s

84. Three resistance of values 10 Ω, 2 Ω and 3 Ω are connected to form the sides of a triangle AB, BC and CA respectively. The effective resistance between A and B is
a) 3.33 Ω b) 2.33 Ω c) 3.5 Ω d) 3.9 Ω

85. A cell of emf 9 V and internal resistance 1 Ω is connected to an external resistance of 8 Ω, the potential difference across the cell is
a) 9 V b) 1 V c) 6 V **d) 8 V**

86. In wheatstone's bridge, under bridge balance condition, the four resistances of the four arms in cyclic order are
a) 5, 10, 4, 8 **b) 5, 10, 8, 4** c) 5, 8, 10, 4 d) 5, 4, 8, 10

87. Two resistances 6 Ω and 4 Ω are connected in parallel and the combination is connected in series with a resistance of 2.6 Ω and an accumulator of emf 2 V, Then the current in the circuit is
a) 5 / 2 A b) 5 / 4 A **c) 2 / 5 A** d) 5 A

88. In a metre bridge, with a standard resistance of 5 ohm in the right gap, the ratio of balancing length is 3 : 2. The value of the other resistance is
a) 10 / 3 Ω b) 10 / 9 Ω **c) 15 / 2 Ω** d) 3 / 5 Ω

89. The balancing lengths of two cells are 250 cm and 750 cm respectively, in a potentiometer experiment. If the emf of the first cell is 2 V, the emf of the second cell is
a) 6 V b) 4 V c) 2 /3 V d) 3 /2 V

90. A copper wire of 10^{-6} m^2 area of cross section carries a current of 1 A. The current density is
a) 2×10^6 A/m^2 b) 0.1×10^6 A/m^2 c) 1×10^{-6} A / m^2 **d) 1×10^6 A/m^2**

91. A 750 W power iron box is used for 4 hours. If the cost per unit is 75 paise, the total expense is
a) Rs. 22.50 b) Rs. 5.25 **c) Rs. 2.25** d) Rs. 3.00

92. The value of a carbon resistor with the colour code of yellow, violet and organge is
a) 37 kΩ b) 4.7 kΩ **c) 47 k Ω** d) 3.7 k Ω

93. The value of a carbon resistor is 33 kΩ. Then the colour code is
a) Yellow , Orange, Red b) Brown, Yellow , Orange
c) Red, Blue , Orange **d) Orange, Orange, Orange**

94. If 6.25×10^{18} electrons flow through a given cross section in unit time, then the current is
a) 1 A b) 2 A c) 0.1 A d) 0.2 A

95. An incandescent lamp is operated at 240 V and the current is 0.5 A, then the resistance of the lamp is
a) 840Ω **b) 480Ω** c) 240Ω d) 380Ω

96. The resistance of nichrome wire at 0^0C is 10Ω. If its temperature coeffeicient of resistance is 0.004 / ^{0}C, then its resistance at 100^0C is
a) 4Ω b) 12Ω **c) 14Ω** d) 18Ω

97. A cell has a potential difference of 6 V in an open circuit, but it falls to 4V when a current of 2 A is drawn from it. Then the internal resistance of the cell is
a) 1Ω b) 10Ω c) 0.1Ω d) 2Ω

98. In a Wheatston's bridge, P = 1000Ω, Q = 10,000Ω and R = 20Ω. If the galvano meter shows zero deflection , the value of S is
a) 20Ω **b) 200Ω** c) 2Ω d) 2000Ω

99. An electric iron of resistance 80Ω isoperated at 200 V for two hours. The electric energy consumed is
a) 1 W h b) 10 kWh **c) 1 kWh** d) 0.1 kWh

Three Mark Questions:

Book Back Questions :

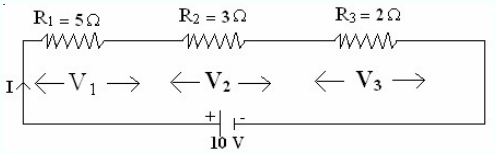
1. State ohms law. **(P Y)**
2. The colour of a carbon resistor is orange, orange, orange. What is the value of resistor?
3. Why is copper wire not suitable for a potentiometer?
4. Distinguish between electric power and electric energy. **(P Y)**
5. Why automobile batteries have low internal resistance?

Previous Year Questions :

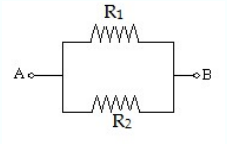
6. Define drift velocity.
7. Define mobility of electrons. Give its unit.
8. Distinguish between drift velocity and mobility.
9. Define the term specific resistance. Give its unit.
10. What is meant by super conductor and super conductivity?
11. Define transition temperature.
12. What are the changes observed at transition temperature when the conductor becomes a superconductor?
13. Mention any three applications of super-conductors.
14. Define temperature coefficient of resistance.
15. Define internal resistance of a cell.
16. State Kirchoff's first law. Mention the sign convention.
17. State Kirchoff's second law. Mention the sign convention.
18. State Kirchoff's (i) current law and (ii) voltage law.
19. State Faraday's law of electrolysis.
20. What is the principle of a potentiometer?
21. Distinguish between electromotive force and potential difference.
22. Give the applications of secondary cells.
23. If 6.25×10^{18} electrons flow through a given cross-section of a conductor in unit time, find the current. [Given : Charge of an electron is 1.6×10^{-19} C] **(Eg)**
24. An incandescent lamp is operated at 240 V and the current is 0.5 A. What is the resistance of the lamp?
25. Two wires of same material and length have resistance 5Ω and 10 Ω respectively. Find the ratio of radii of the wires. **(Eg)**

26. A manganin wire of length 2m has a diameter of 0.4 mm with a resistance of 70 Ω. Find the resistivity of the material. **(Ex)**

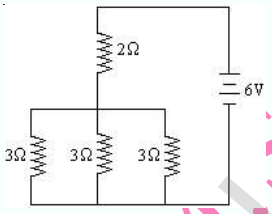
27. Three resistors are connected in series with 10V supply as shown in the figure. Find the voltage drop across each resistor. **(Eg)**



28. From the following network find the effective resistance between A and B. $R_1 = R_2 = 15\ \Omega$.



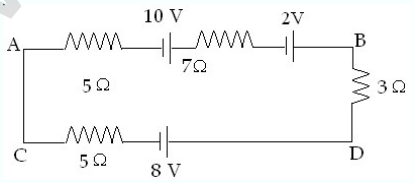
29. In the given circuit, what is the total resistance and current supplied by the battery. **(Ex)**



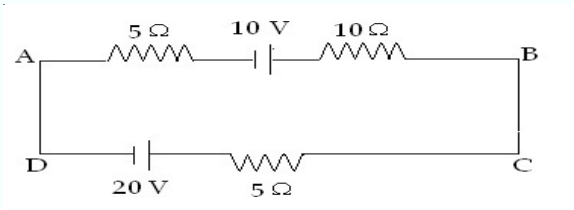
30. The resistance of a platinum wire at 0°C is 4. If its temperature coefficient of resistance of platinum is 0.0038/°C. Find its resistance at boiling point of water.

31. The resistance of a nichrome wire at 0°C is 10 . If its temperature co-efficient of resistance is 0.004/°C, find its resistance at boiling point of water. Comment of the result. **(Eg)**

32. In the following circuit, calculate the current through the circuit. Mention its direction?



33. Find the magnitude and direction of the current in the following circuit.



34. An iron box of 400W power is used daily for 30 minutes. If the cost per unit is 75 paise, find the weekly expense on using the iron box. **(Eg)**
35. A 1.5 V carbon – zinc dry cell is connected across a load of 1000 Ω. Calculate the current and power supplied to it.
36. Define current density? Give its unit.
37. Distinguish between primary cell and secondary cell.

Five Mark Questions:

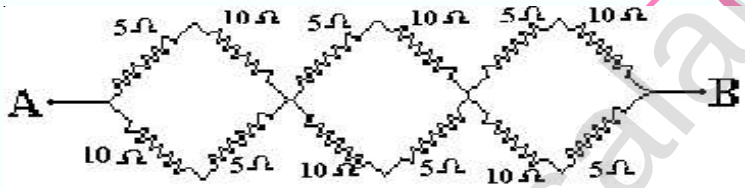
Book Back Questions :

1. Explain the flow of charges in a metallic conductor.
2. Distinguish between drift velocity and mobility. Establish a relation between drift velocity and current. **(P Y)**
3. Define resistivity of a material. How are materials classified based on resistivity?
4. Write a short note on superconductivity. List some applications of superconductors. **(P Y)**
5. Explain the effective resistance of series network and parallel network. **(PY)**
6. Discuss the variation of resistance with temperature with an expression and a graph. **(P Y)**
7. Explain the determination of the internal resistance of a cell by using voltmeter. **(P Y)**
8. State and explain Kirchoff's second law for electrical networks. **(P Y)**
9. Describe an experiment to find unknown resistance and temperature coefficient of resistance using metre bridge?
10. Define the term specific resistance. How will you find this using a metre bridge.
11. Explain the principle of a potentiometer with a neat diagram. **(P Y)**
12. How can emf of two cells be compared using potentiometer? **(P Y)**
13. State and Explain Faraday's first laws of electrolysis. How is the law verified experimentally? **(P Y)**
14. State and Explain Faraday's second laws of electrolysis. How is the law verified experimentally? **(P Y)**
15. Explain the action of the lead acid accumulator. **(P Y)**

Previous Year Questions :

16. Define mobility. Establish a relation between drift velocity and current.
17. Obtain the condition for bridge balance in Wheatstone bridge.

18. Explain the reactions at the electrodes of Daniel cell
19. Explain the reactions at the electrodes of Lechlanche cell.
20. A copper wire of 10^{-6} m^2 area of cross section carriers a current of 2A. If the number of electrons per cubic metre is $8x10^{28}$, Calculate the current density and average drift velocity. (Given e = $1.6x10^{-19}$ C) **(Eg)**
21. What is the drift velocity of an electron in a copper conductor having area 10×10^{-6} m^2, carrying a current of 2 A. Assume that there are 10×10^{28} electrons/m^3. **(Ex)**
22. The effective resistance are 10 Ω , 2.4 Ω when they are connected in series and parallel respectively. What are the resistances of individual resistors?
23. In the given network, calculate the effective resistance between points A & B.Fig. **(Eg)**



24. Find the current flowing across three resistors 3Ω, 5Ω and 2Ω connected in parallel to a 15V supply. Also find the effective resistance and total current drawn from the supply. **(Eg)**
25. The resistance of a field coil measure 50 Ω at 20^0C and 65 Ω at 70^0 C. Find the temperature coefficeint of resistance.
26. In a metre bridge, the balancing length for a 10 Ω resistance in left gap is 51.8 cm. Find the unknown resistance and specific resistance of a wire of length 108 cm and radius 0.2 mm **(Ex).**

III. EFFECTS OF ELECTRIC CURRENT

One Mark Questions

Book Back Questions :

1. Joules law of heating is **(P Y)**

a) $H = \frac{I^2}{R}t$ b) $H = V^2Rt$ **c) H = VIt** d) $H = IR^2t$

2. Nichrome wire is used as the heating element because it has **(P Y)**

a) low specific resistance b) low melting point

c) high specific resistance d) high conductivity

3. Peltier coefficient at a junction of a thermocouple depends on **(P Y)**

a) The current in the thermocouple

b) The time for which current flow

c) the temperature of the junction

d) the charge that passes through the thermocouple

4. In a thermocouple, the temperature of the cold junction is 20^0C, the neutral temperature is 270^0C.The temperature of inversion is **(P Y)**

a) 520^0C b) 540^0C c) 500^0C d) 510^0C

5. Which of the following equation represent Biot – savart law ? **(P Y)**

a) $dB = \frac{\mu_0}{4\pi}\frac{Idl}{r^2}$ b) $d\vec{B} = \frac{\mu_0}{4\pi}\frac{Idl\sin\theta}{r^2}$

c) $d\vec{B} = \frac{\mu_0}{4\pi}\frac{\vec{Idl}\times\vec{r}}{r^2}$ **d) $\mathbf{d\vec{B} = \frac{\mu_0}{4\pi}\frac{\vec{Idl}\times\vec{r}}{r^3}}$**

6. Magnetic induction due to an infinitely long straight conductor placed in medium of permeability μ is **(P Y)**

a) $\frac{\mu_0 I}{4\pi a}$ b) $\frac{\mu_0 I}{2\pi a}$ c) $\frac{\mu I}{4\pi a}$ **d) $\frac{\mu I}{2\pi a}$**

7. In a Tangent galvanometer, for a constant current, the deflection is 30^0. The plane of the coil is rotated through 90^0. Now, for the same current, deflection will be **(P Y)**

a) 30^0 b) 60^0 c) 90^0 **d) 0^0**

8. The period of revolution of a charged particle inside a cyclotron does not depend on **(P Y)**

a) the magnetic induction b) the charge of the particle

c) the velocity of the particle d) the mass of the particle

9. The torque on a rectangular coil placed in a uniform magnetic field is large, when
a) the number of turns is large
b) the number of turns is less
c) the plane of the coil is perpendicular to the field
d) the area of the coil is small

10. Phosphor – bronze wire is used for suspension in a moving coil galvanometer, because it has **(P Y)**
a) high conductivity b) high resistivity
c) large couple per unit twist **d) small couple per unit twist**

11. Of the following devices, which has small resistance? **(P Y)**
a) moving coil galvanometer b) ammeter of range 0 – 1 A
c) ammeter of range 0 – 10 A d) voltmeter

12. A galvanometer of resistance G Ω is shunted with SΩ. The effective resistance of the combination is R_a, then which of the following statement is true?
a) G is less than S b) S is less than R_a but greater than G
c) R_a is less than both G and S d) S is less than both G and R_a

13. An ideal voltmeter has **(P Y)**
a) Zero resistance
b) infinite resistance less than G but greater than zero
c) resistance greater than G but less than infinity
d) infinite resistance

Previous Year Questions :

14. In the experiment to verify Joule's law when the current passed through the circuit is doubled keeping resistance (R) constant and time of passage of current (t) constant, the temperature of the liquid is____
a) increases twice **b) increases four times**
c) increases sixteen times d) decreases four times

15. Which of the following produces large joule heating effects
a) 1 A current through 2Ω resistor for 3 second
b) 1 A current through 3Ω resistor for 2 second
c) 2 A current through 1Ω resistor for 2 second
d) 3 A current through 1Ω resistor for 1 second

16. Fuse wire is an alloy of
a) Lead and Tin b) Tin and Copper c) Lead and Copper d) Lead and Iron

17. Fuse wire
a) is an alloy of lead and copper b) has low resistance
c) has high resistance d) has high melting point

18. In which one of the following pairs of metal of a thermocouple the e.m.f. is maximum?
a) Fe-Cu b) Cu-Zn c) Pt-Ag **d) Sb-Bi**

19. For a given thermocouple the neutral temperature
a) depends upon the temperature of cold junction
b) depends upon the temperature of hot junction
c) the temperature of junction
d) the charge that passes through the thermocouple

20. In a thermocouple, the temperature of the cold junction is 20°C, the inversion temperature is 600°C, and then the neutral temperature is
a) 310°C b) 320°C c) 300°C d) 315°C

21. In a thermocouple, the temperature of the cold junction is 20°C, the temperature of inversion is 520°C.The neutral temperature is
a) 500°C b) 540°C **c) 270°C** d) 260° C

22. In a thermocouple, the temperature of the cold junction is -30°C, and the neutral temperature is 270°C. then the temperature inversion is
a) 520°C b) 540°C c) 500°C **d) 570 °C**

23. Peltier effects is the converse of
a) Joule's effect b) Raman's effect
c) Thomson's effect **d) Seebeck's effect**

24. Unit of Peltier co-efficient is
a) ohm b) mho **c) volt** d) ampere

25. AB is a rod of lead. Ther end A is heated. A current I is allowed to flow along AB. Now, due to Thomson effect, in rod AB.
a) heat is absorbed
b) heat is liberated
c) heat is neither absorbed nor liberated
d) heat is first absorbed and then liberated

26. Thermopile is used to
a) measure temperature b) measure current
c) detect thermal radiation d) measure pressure

27. Which one of the following principles is used in a thermopile?
a) Thomson effect b) Peltier effect
c) Seebeck effect d) Joule's effect

28. Consider a circular coil of radius 10 cm in an air medium. If 5A current passes through it, what would be the magnetic induction at its centre ?
a) $\pi \times 10^{-5}$ T b) $\pi \times 10^{5}$ T c) $\pi \times 10^{-15}$ T d) $\pi \times 10^{15}$ T

29. The unit of reduction factor of tangent galvanometer is
a) no unit b) tesla **c) ampere** d) ampere / degree

30. In a tangent galvanometer a current 1A, produces a deflection of 30°. The current required to produce a deflection of 60° is
a) 3A b) 2A c) $\sqrt{3}$ A d) $\frac{1}{\sqrt{3}}$ A

31. The magnitude and direction of the magnetic Lorentz force is given by
a) $\vec{F} = \vec{V} \times \vec{B}$ b) q / $\vec{V} \times \vec{B}$ **c) $\vec{F} = q(\vec{V} \times \vec{B})$** d) $\vec{F} = V(\vec{q} \times \vec{B})$

32. An electron is moving with a velocity of 3×10^6 ms^{-1} perpendicular to a uniform magnetic field of induction 0.5 T. The force experienced by the electron is
a) 2.4×10^{-13} N b) 13.6×10^{-27} N c) 13.6×10^{-11} N d) zero

33. The current carrying rectangular coil is perpendicular to uniform magnetic field of the induction the torque is
a) maximum **b) zero** c) minimum d) infinite

34. A galvanometer is converted into a voltmeter by connecting a
a) low resistance in series b) high resistance in parallel
c) high resistance in series d) low resistance in parallel

35. When the number of turns (n) in a galvanometer is doubled, current sensitivity
a) remains constant b) decreases twice
c) increases twice d) increases fourth

36. In Joule's Calorimeter experiment, when a current of 1 ampere is passed through a coil for a known interval of time 't', the temperature of water increases from 30°C to 33° C. When a current of 2 A is passed through the same coil placed in the same quantity of water and for the same time, the temperature of water increases from 30° C to :
a) 33°C b) 36°C c) 39°C **d) 42°C**

37. A proton and an α particle are projected with the same velocity normal to a uniform magnetic field. The ratio of the magnetic Lorentz force experienced by the proton and the α particle is :
a) 1 : 1 **b) 1 : 2** c) 2 : 1 d) 1 : 0

38. A wire of length 1m is made into a circular loop and it carries a current of 3.14A. The magnetic dipole moment of the current loop (in AM^2) is
a) 1 b) 0.5 **c) 0.25** d) 0.314

39. In a thermocouple, when the temperature of cold junction is increased (but less than neutral temperature) the temperature of inversion
a) increases **b) decreases**
c) does not change d) first increases and then decreases

PTA Objective Questions :

1. For a steady current I, the amount of heat produced in time t is _____
a) VIt b) V^2It c) I / Vt d) VI^2t

2. According to Joule's law, for a given R, heat produced is _____
a) directly proportional to the square of current
b) directly proportional to the current
c) inversely proportional to the square of current
d) inversely proportional to the current

3. Which of the following is wrong, according to Joules law of heating effect
a) $H \alpha I^2$, for a given R b) $H \alpha R$ for given I
c) $H \alpha V$ for a given R d) $H \alpha 1/R$ for a given V

4. Nichrome is an alloy of _____
a) nickel and manganese b) nickel, carbon and iron
c) nickel and iron **d) nickel and chromium**

5. Nichrome is used as the heating element, because _____
a) it has high specific resistance b) it has high melting point
c) it is not easily oxidized **d) all the above**

6. Fuse wire is an alloy of _____
a) 37 % Pb & 63 % Sn b) 63 % Pb & 36 % Sn
c) 73 % Pb & 27 % Sn d) 37 % Sb & 63 % Sn

7. Melting point of tungsten is _____
a) 3380^0 C b) 3380 K c) 380^0 C d) 380 K

8. Filament of an electric bulb is usually enclosed in a glass bulb containing
a) inert gas at high pressure **b) inert gas at low pressure**
c) ideal gas at high pressure d) ideal gas at low pressure

9. In which of the following, Joule heating effect undesirable?
a) electric iron b) electric toaster
c) transformer and dynamos d) fuse wire

10. Which of the following is not a thermo emf effect?
a) Peltier effect b) Thomson effect
c) Joule effect d) Seeback effect

11. Complementary effect of seeback effect is _____
a) Peltier effect b) Thomson effect
c) Joule effect d) Negative Thomson effect

12. In a circuit consisting of two dissimilar metals, an emf is developed, when the junctions are maintained _____
a) very high temperature b) very low temperature
c) same temperatures **d) different temperatures**

13. In a Cu - Fe thermocouple, the direction of the current at the hot junction is
a) from Cu to Fe b) from Fe to Cu
c) either (a) or (b) depending on temperature of hot junction
d) random direction

14. Position of the metal in the thermoelectric series depends on _____
a) temperature b) nature of th metal
c) magnitude of thermo emf d) atomic number of metal

15. The temperature dependence of thermo emf of a thermocouple is given by
a) $\mathbf{V = \alpha\theta + \frac{1}{2}\beta\theta^2}$ b) $V = \alpha(\theta + \beta\theta)$ c) $V = \alpha\theta + \frac{1}{2}\beta\theta^3$ d) $V = \alpha\theta^2 + \beta\theta^4$

16. For small temperature difference, the graph showing the variation of thermo emf with temperature of the hot junction is _____
a) Parabola b) circle **c) straight line** d) hyperbola

17. For a given thermocouple, the netural temperature is _____
a) maximum b) minimum c) zero **d) a constant**

18. For a given thermocouple, the temperature of inversion _____
a) is constant
b) depends upon the temperature of the cold junction
c) is independent of temperature of cold junction
d) depends on the neutral temperature

19. Inversion temperature, neutral temperature and the temperature of cold junction of a thermocoulpe is related by _____
a) $\theta_c = 2\theta_n + \theta_i$ b) $\theta_n = (\theta_c - \theta_i)/2$ **c)** $\mathbf{\theta_n = \frac{1}{2}(\theta_c + \theta_i)}$ d) $\theta_i = 2\theta_n + \theta_c$

20. Nichrome is used as the heating element because, it has _____
a) low specific resistance b) low melting point
c) high specific resistance d) high conductivity

21. Electric filament lamp is working on the basis of
a) Joule's heating effect b) Peltier effect
c) Thomson effect d) Seeback effect

22. Peltier co - efficient of a junction of a thermocouple depends on _____
a) the current in the thermocouple
b) time for which the current flows
c) temperature of the junction
d) charge that passes through the junction

23. Heating element of an electric heater should be made with a material which should have _____
a) high specific resistance and high melting point
b) high specific resistance and low melting point
c) low specific resistance and low melting point
d) low specific resistance and high melting point

24. An example for a conductor with negative Thomson effect is _____
a) silver b) Zinc c) cadmium **d) mercury**

25. An example for positive Thomson metal is
a) iron b) cobalt **c) copper** d) nickel

26. In a thermocouple, Peltier co - efficient is _____
a) more at the hot junction b) more at the cold junction
c) same at hot and cold junction d) none of the above

27. _____ is used as one of the metal to form a thermocouple with another metal for the purpose of drawing thermoelectric diagrams.
a) Pt b) Ag **c) Pb** d) Cu

28. The device thermopile is based on
a) Joule's effect b) Peltier effect **c) Seeback effect** d) Thomson effect

29. In a thermocouple, the temperature of the cold junction is 20^0 C, the temperature of inversion is 520^0 C, the netural temperature is _____
a) 250^0 C **b) 270^0 C** c) 500^0 C d) 510^0 C

30. In a thermocouple, the temperature of cold junction is 20^0 C, while the neutral temperature is 300^0C. Its temparature of inversion is _____
a) 580^0 C b) 850^0 C c) 508^0 C d) 805^0 C

31. In a thermocouple, the temperature of the cold junction is 20^0 C, the neutral temperature is 270^0 C, then the temperature of inversion is _____
a) 520^0 C b) 540^0 C c) 500^0 C d) 510^0 C

32. Two wires of equal length are first connected in series and then in parallel with a voltage source. The ratio of heat developed in two cases is _____
a) 2 : 1 b) 1 : 2 c) 4 : 1 **d) 1 : 4**

33. Amount of heat dissipated per second in a wire of resistance 5 ohm through which a current of 5 A flows is _____
a) 125 J / s b) 250 J / s c) 50 J /s d) 75 J / s

34. Current is flowing through a conductor of resistance 10 ohm. Indicate in which of the following cases, maximum heat will be generated
a) 5A passing for 2 minutes b) 4A passing for 3 minutes
c) 3A passing for 6 minutes d) 2A passing for 5 minutes

35. If the heating element of an electric toaster has resistance of 22 ohm and is connected to an voltage source of 110V, the amount of heat generated in 1 minute is _____
a) 33 KJ b) 22 KJ c) 66 KJ d) 3.3 KJ

36. _____ is a device used to detect thermal radiation
a) thermocouple **b) thermopile** c) thermometer d) thermoscope

37. In a thermopile, the deflection in the galvanometer is proportional to _____ of the radiation
a) intensity b) frequency c) velocity d) energy

38. Lead is used as one of the metal to form a thermocouple to _____
a) get large thermo emf b) get large thermo current
c) draw thermoelectric diagrams d) get large heat

39. Which of the following expression represents Biot - Savart law?
a) $dB = \frac{\mu_o}{4\pi}\frac{Idl}{r^2}$ b) $\overrightarrow{dB} = \frac{\mu_o}{4\pi}\frac{Idl\sin\theta}{r^2}$ c) $\overrightarrow{dB} = \frac{\mu_o}{4\pi}\frac{\overrightarrow{Idl}\ x\ \overrightarrow{r}}{r^2}$ **d)** $\mathbf{\overrightarrow{dB} = \frac{\mu_o}{4\pi}\frac{\overrightarrow{Idl}\ x\ \overrightarrow{r}}{r^3}}$

40. Magnetic induction at a point due to infinitely long straight conductor carrying current at a distance of 'a' from the axis is
a) directly proportional to a b) directly proportional to a^2
c) inversely proportional to a d) inversely proportional to a^2

41. Tangent galvanometer works on the principle of
a) Biot -Savart law b) Ampere circuital law
c) Tangent law d) Ampere rule

42. Magnetic needle of a tangent galvanometer is kept small because, the magnetic field is
a) very large at the centre
b) considered to be small and uniform at the centre
c) such that it is convenient to handle small needle
d) radial at the centre

43. If a current of $\sqrt{3}$ A produces a deflection of 45^0 in a tangent galvanometer, then the current required to produce a deflection of 60^0 is
a) 1.732A b) $\frac{1}{\sqrt{3}}A$ **c) 3 A** d) 5 A

44. In a tangent galvanometer, for a constant current, the deflection is 30^0. The plane of the coil is rotated through 90^0. Now for the same current, the deflection will be

a) 30^0 b) 60^0 c) 90^0 **d) 0^0**

45. A current of $\sqrt{3}$ A produces a deflection of 45^0 in a tangent galvanometer having 50 turns and radius 10 cm. The reduction factor of the tangent galvanometer is

a) 1. 732 A b) $\frac{1}{\sqrt{3}} A$ c) $50\sqrt{3}$ d) $5\sqrt{3}\ A$

46. Reduction factor of the tangent galvanometer is

a) $\frac{2a\mu_0 B_H}{n}$ b) $\frac{2an}{\mu_0 B_H}$ **c) $\frac{2aB_H}{\mu_0 n}$** d) $\frac{2nB_H}{a\mu_0}$

47. A current of 2 A flows through 5 turn coil of a tangent galvanometer having a radius of 12.5 cm. If the deflection of the needle at the centre is 45^0, the horizontal component of the earth field at that point is

a) 16π x 10^{-5} T **b) 16π x 10^{-6}T** c) 16π x 10^{-7} T d) 16π x 10^{-8} T

48. In a tangent galvanometer, the plane of the coil should be adjusted to be in

a) geographic meridian **b) magnetic meridian**

c) any direction d) parallel to east - west direction

49. Each section of the coil of wire of a tangent galvanometer has ..... number of turns

a) 1, 2 & 5 **b) 2, 5 & 50** c) 2, 5 & 10 d) 1, 5 & 500

50. If the reduction factor of a tangent galvanometer is 0.9 A ,then the current that produces a deflection of 30^0 is

a) 450 mA **b) 520 mA** c) 780 mA d) 520 A

51. When a current of 1.5 A flows through a tangent galvanometer, a deflection of 60^0 is produced in it. The current required to produce a deflection of 30^0 is

a) 500 mA b) 250 mA c) 250A d) 50A

52. In a tangent galvanometer experiment, the deflecion has to be adjusted between 30^0 and 60^0, since the galvanometer is most sensitive at a deflection of

a) 30^0 **b) 45^0** c) 60^0 d) 90^0

53. Biot - Savart law expressed in an alternative way is called

a) end rule b) Gauss law

c) Ampere circuital law d) Fleming left hand rule

54. In a more generalised way, Ampere circuital law is written as

a) $\oint \vec{B}.\frac{dI}{\mu_0} = dl$ b) $\oint I.dl = \frac{dB}{\mu_0}$ **c)** $\oint \vec{B}.\vec{dl} = \mu_0 I$ d) $\oint \vec{B}.\vec{dl} = I$

55. A long closely wound helical coil is called

a) toroid **b) solenoid** c) inductor d) resistor

56. Direction of magnetic field due to a circular closed loop is given by

a) Ampere - circuital law b) right hand rule

c) right hand screw rule **d) right hand palm rule**

57. For a solenoid, whose length is very large compared to its radius, the magnetic field at points outside the solenoid is

a) maximum b) minimum **c) zero** d) I/μ_0

58. The magnetic polarity of a current carrying solenoid is given by

a) Ampere - circuital law b) right hand palm rule

c) end rule d) Biot - Savart rule

59. The force on a charged particle moving inside a magnetic field is known as

a) Lorentz force b) Coloumb force

c) mechanical force d) electromagnetic force

60. Magnitude and direction of Lorentz force is given by the expression

a) $\vec{F} = v(\vec{q}\,x\,\vec{B})$ **b)** $\vec{F} = q(\vec{V} \times \vec{B})$ c) $\vec{F} = \vec{B}(\vec{V}\,x\,\vec{B})$ d) $\vec{F} = v^2(\vec{q}\,x\,\vec{B})$

61. An electron is moving with a velocity of 3 x 10^6 m/s perpendicular to a magnetic field of 0.5 T, then the force experienced by the electron is

a) 24 x 10^{-11} N **b) 2.4 x 10^{-13} N** c) 13.6 x 10^{-27} N d) 13.6 x 10^{-11} N

62. In the presence of electric field and magnetic field, the total force on moving charged particle is

a) $\vec{F} = q\left[\vec{v}\,x\,\vec{B}\,x\,\vec{E}\right]$ b) $\vec{F} = q\left[(\vec{v}\,x\,\vec{B})\right] + \vec{E}$

c) $\vec{F} = q\left[(\vec{v} \times \vec{B}) + \vec{E}\right]$ d) $\vec{F} = q\left[(\vec{B}x\vec{v}) + \vec{E}\right]$

63. Period of circular motion of the charged particle in a uniform magnetic field is

a) $\frac{2\pi m}{Bq}$ b) $\frac{Bq}{2\pi m}$ c) $\frac{Bq}{m}$ d) $\frac{m}{Bq}$

64. Angular frequency and period of rotation of the charged particle in a magnetic field is independent of _____ of the particle

a) mass and radius **b) velocity and radius**

c) charge and velocity d) mass and charge

65. A charged particle of mass 3.2×10^{-27} kg and charge 1.6×10^{-19}C moves in a circular orbit under the influence of perpendicular magnetic field of strength 3.14T, then the period of revolution of the particle is
a) 10^{-8} s b) 2×10^{-8} s c) 3×10^{-8} s **d) 4×10^{-8} s**

66. An α - particle with (e / m) ratio 4.8×10^{-11} CKg^{-1} travels in a circular path of radius 0.45 m in a magnetic field of 1.2 T, then the speed of the α - particle is
a) 2.6×10^{4} m/s **b) 2.6×10^{5} m/s** c) 2.6×10^{6} m/s d) 1.3×10^{7} m/s

67. Cyclotron cannot accelerate
a) an electron b) a proton c) a deutron d) an α - particle

68. In cyclotron, the dee's are connected to
a) high frequency RF oscillator b) high frequency AF oscillator
c) high voltage DC source d) high voltage AC source

69. Period of revolution of a charged particle inside a cyclotron does not depend on
a) the magnetic induction b) the charge of the particle
c) the velocity of the particle d) the mass of the particle

70. Mechanical force acting on a current carrying conductor placed in a magnetic field is given by
a) F = BIl sin θ b) F = Ilx B c) BIl cos θ **d) both (a) and (b)**

71. Workdone by a Lorentz force is
a) zero when $\theta = 90^0$ b) zero when $\theta = 45^0$
c) always zero d) maximum $\theta = 90^0$

72. Two parallel straight conductors carrying currents in the same direction
a) repel each other **b) attract each other**
c) do not experience any force d) experience a maximum force

73. Direction of a force acting on a current carrying conductor placed in a magnetic field is given by
a) Fleming left hand rule b) Fleming right hand rule
c) end rule d) Ampere - circuital law

74. A current of 2 A flows through two long straight parallel conductors separated by a distance of 10 cm. The force per unit length on each conductor is
a) 0.0458 N b) 8×10^{-4} N c) 8×10^{-5} N **d) 8×10^{-6} N**

75. Two straight parallel current carrying conductors separated by certain distance carrying equal current, experience a force of 16 N. If the distance between them is doubled and the current in each conductor is halved ,then the force between them will be
a) 64 N b) 16 N c) 4 N **d) 2 N**

76. If a current carrying loop is placed in a magnetic field by its plane
a) perpendicular to the field; it will rotate
b) Perpendicular to the field; it will not rotate
c) parallel to the field; it will not rotate
d) perpendicular or parallel; it will not rotate

77. The coil in moving coil galvanometer is suspended by a
a) aluminium wire b) copper wire c) iron wire **d) phosphor - bronze wire**

78. In case of a moving coil galvanometer, the deflection is
a) non - linearly proportional to the current
b) directly proportional to the current
c) directly proportional to the square of current
d) inversely proportional to the current

79. Suspended coil galvanometers can measure current of the order of
a) 10^{-6}A **b) 10^{-8}A** c) 10^{6}A d) 10^{8}A

80. Current sensitivity of a galvanometer is defined as
a) unit deflection produced for given current
b) deflection produced for unit current
c) large deflection produced for small current
d) large deflection produced for large current

81. When the number of turns in a galvanometer is doubled, then
a) current sensitivity and voltage sensitivity doubled
b) current sensititvity is doubled and voltage sensitivity remains un changed
c) current sensitivity remains unchanged
d) voltage sensitivity is doubled

82. A galvanometer can be converted into voltmeter by connecting a .....
a) low resistance in series b) low resistance in parallel
c) high resistance in parallel **d) high resistance in series**

83. Resistance to be connected in series with the galvanometer to convert it as a voltmeter of range 'V' is given by
a) R = V / G - Ig **b) $R = \frac{V}{Ig} - G$** c) R = IgG - V d) IgR = $\frac{V}{G}$

84. An ideal voltmeter is one which has
a) zero resistance b) high resistance c) low resistance **d) infinite resistance**

85. A galvanometer can be converted into an ammeter by connecting a
a) low resistance in series **b) low resistance in parallel**
c) high resistance in parallel d) high resistance in series

86. The torque on a rectangular coil placed in a uniform magnetic field is large when
a) the number of turns is large b) the number of turns is less
c) the plane of the coil is perpendicular to the field
d) the area of the coil is small

87. Phosphour - bronze wire is used for suspension in a moving coil galvanometer, because it has
a) high conductivity b) high resistivity
c) large couple per unit twist **d) small couple per unit twist**

88. Of the following, which has small resistance?
a) moving coil galvanometer b) ammeter of range 0 - 1A
c) ammeter of range 0 - 10 A d) voltmeter

89. A galvanometer of resistance G ohm is shunted with S ohm. The effective resistance of combination is R_a then, which of the following statement is true?
a) G is less than S b) S is less than R_a but greater than G
c) R_a is less than both G and S d) S is less than both G and R_a

90. An ideal voltmeter has
a) zero resistance b) finite resistance less than infinity
c) resistance greater than G but less than infinity **d) infinite resistance**

91. The deflection in moving coil galvanometer is reduced to half, when it is shunted with a resistance of 40 ohm, then the resistance of the galvanometer will be
a) 80 ohm **b) 40 ohm** c) 20 ohm d) 10 ohm

92. A galvanometer of resistance 50 ohm is shunted with a wire of 10 ohm. The current through the galvanometer when the current in the circuit is 12 A is
a) 3 A **b) 2A** c) 5A d) 6A

93. If the resistance of a moving coil galvanometer is 100 ohm and if it shows a full scale deflection for 1 mA, then by connecting 900 ohm in series, the range of the voltmeter is
a) 1 V b) 10 V c) 100 V d) 100 mV

94. The value of gyromagnetic ratio is
a) 8.8×10^{9} Ckg^{-1} **b) 8.8×10^{10} CKg^{-1}** c) 8.8×10^{-10} CKg^{-1} d) 8.8×10^{-9} CKg^{-1}

95. Experessions for the orbital magnetic moment of an electron are
a) $\frac{e}{2m}L$ b) $\frac{neh}{4\pi m}$ c) $\frac{nel}{4\pi m}$ **d) both (a) & (b)**

Three Mark Questions:

Book Back Questions :

1 State Joule's law of heating.

2. Define Peltier coefficient and write its unit.**(PY)**

3. Define Thomson coefficient**. (PY)**

4. State Biot-Savart law.

5. What is Ampere's circuital law ? **(PY)**

6. Define Ampere. **(PY)**

Previous Year Questions :

7. Why nichrome used as a heating element?

8. What are the characteristics of heating element used in electric heating device?

9. What is neutral temperature of a thermocouple?

10. Mention any two differences between Peltier effect and Joule's heating effect.

11. State tangent law.

12. Mention the limitations of cyclotron.

13. State Fleming's left hand rule.

14. How is a galvanometer converted into (i) an ammeter (ii) a voltmeter?

15. In a Galvanometer, increasing the current sensitivity does not necessarily increase the voltage sensitivity.

16. How can we increase the current sensitivity of a galvanometer?

17. Calculate the resistance of the filament of a 100 W, 220 Volt electric bulbs.

18. A conductor or length 50 cm carrying of 5A is placed perpendicular to a magnetic field of induction 2×10^{-3} T. Find the force on the conductor.

Five Mark Questions:

Book Back Questions :

1. Explain how you will convert a galvanometer into an ammeter**. (PY)**

2. Explain how you will convert a galvanometer into an voltmeter**.(PY)**

Previous Year Questions :

3. State and explain Biot-Savart law**.**

4. What are the special features of magnetic Lorentz force?

5. Explain in detail the principle, construction of a tangent galvanometer (diagram, theory not necessary)

6. A long straight wire carrying current produces a magnetic induction of 4×10^{-6} T at a point 15 cm from the wire. Calculate the current through the wire. **(Eg)**

7. A circular coil of radius 20 cm has 100 turns of wire and it carries a current of 5 A. Find the magnetic induction at a point along its axis at a distance of 20 cm from the centre of the coil. **(Ex)**
8. A current of 4A flows through 5 turn coil of a tangent galvanometer having a diameter of 30 cm. If the horizontal component of Earth's magnetic induction is 4×10^{-5} T, find the deflection produced in the coil. (Given $\mu_0 = 4\pi \times 10^{-7}$ Hm^{-1})
9. Two parallel wires each of length 5m are placed at a distance of 10 cm apart in air. They carry equal currents along the same direction and experience a mutually attractive force of 3.6×10^{-4}N. Find the current through the conductors**. (Eg)**
10. Two straight infinitely long parallel wires carrying equal current placed at a distances of 20 cm apart experience a mutually attractive force of 4.9×10^{-5} N per unit length of the wire. Calculate the current.
11. A circular coil of 50 turns and radius 25 cm carries a current of 6A. It is suspended in a uniform magnetic field of induction 10^{-3} T. The normal to the plane of the coil makes an angle of 60° with the field. Calculate the torque of the coil.
12. A rectangular coil of 500 turns and of area 6×10^{-4} m^2 is suspended inside a radial magnetic field of induction 10^{-4} T by a suspension wire of torsional constant 5×10^{-10} Nm per degree. Calculate the current required to produce deflection of 10°. **(Ex)**
13. The rectangular coil of area 20 cm x 10 cm with 100 turns of wire is suspended in a radial magnetic field of induction 5×10^{-3} T. If the galvanometer shows an angular deflection of 15^0 for a current of 1 mA, find the torsional constant of the suspension wire.
14. A moving coil galvanometer of resistance 20 Ω produces full scale deflection for a current of 50 mA. How will you convert the galvanometer into i) an ammeter of range 20 A and ii)a voltmeter of range 120 Volt? **(Eg)**
15. A galvanometer has a resistance of 40 Ω. It shows full scale deflection for a current of 2 mA. How will you convert the galvanometer into a voltmeter of range 0 to 20 V? [0 - 20 V] **(Ex)**
16. The deflection galvanometer falls from 50 divisions when 12 ohm resistance is connected across the galvanometer .calculate the galvanometer resistance.
17. In a hydrogen atom electron moves in an orbit of radius 0.5 Å making 10^{16} evolutions per second. Determine the magnetic moment associated with orbital motion of the electron. (Given: $e = 1.6 \times 10^{-19}$ C) **(Eg)**

Ten Mark Questions:

Book Back Questions :

1. State Joule's law. Explain Joule's calorimeter experiment to verify Joule's laws of heating. **(P Y)**
2. Obtain an expression for the magnetic induction at a point due to an infinitely long straight conductor carrying current. **(P Y)**
3. Deduce the relation for the magnetic induction at a point along the axis of a circular coil carrying current. **(P Y)**
4. Explain in detail the principle, construction and theory of a tangent galvanometer. **(P Y)**
5. Define Ampere's circuital law. Applying it, find the magnetic induction due to along solenoid carrying current. **(P Y)**
6. Deduce an expression for the force on a current carrying conductor placed in a magnetic field. **(P Y)**
7. Explain in detail the principle, construction and the theory of moving coil galvanometer.

Previous Year Questions :

8. Discuss the motion of charged particles in a uniform magnetic field.
9. Explain in detail the principle, construction, working and limitations of a cyclotron with a diagram.
10. Obtain an expression for the force between two long parallel current carrying conductors. Hence define 'ampere'.

IV. ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENT

One Mark Questions

Book Back Questions :

1. Electromagnetic induction is not used in **(P Y)**
   a) transformer **b) room heater** c) AC generator d) choke coil
2. A coil of area of cross section 0.5 m^2 with 10 turns in a plane which is perpendicular to an uniform magnetic field of 0.2 Wb/m^2. The flux through the coil is **(P Y)**
   a) 100 Wb b) 10 Wb **c) 1 Wb** d) zero
3. Lenz's law is in accordance with the law of **(P Y)**
   a) conservation of charges b) conservation of flux
   c) conservation of momentum **d) conservation of energy**
4. The self – inductance of a straight conductor is **(P Y)**
   a) zero b) infinity c) very large d) very small
5. The unit Henry also be written as **(P Y)**
   a) Vs A^{-1} b) Wb A^{-1} c) Ω s **d) all**
6. An emf of 12 V is induced when the current in the coil changes at the rate of 40 A S^{-1}. The coefficient of self induction of coil is **(P Y)**
   a) 0.3 H b) 0.003 H c) 30 H d) 4.8 H
7. A DC of 5 A produces the same heating effect as an AC of **(P Y)**
   a) 50 A rms current b) 5 A peak current
   c) 5 A rms current d) none of these
8. Transformer works on **(P Y)**
   a) AC only b) DC only c) both AC and DC d) AC more effectively than DC
9. The part of the AC generator that passes the current from the coil to the external circuit is **(P Y)**
   a) field magnet b) split rings c) slip rings **d) brushes**
10. In an AC circuit the applied emf e = $E_0 \sin(\omega t + \pi/2)$ leads the current $I = I_0 \sin(\omega t - \pi/2)$ by **(PY)**
    a) $\pi/2$ b) $\pi/4$ **c) π** d) 0
11. Which of the following cannot be stepped up in a transformer? **(P Y)**
    a) input current b) input voltage **c) input power** d) all
12. The power loss is less in transmission lines when **(P Y)**
    a) voltage is less but current is more b) both voltage and current are more
    c) voltage is more but current is less d) both voltage and current are less

13. Which of the following devices does not allow d.c to pass through **(P Y)**
a) resistor **b) capacitor** c) inductor d) all the above

14. In an ac circuit **(P Y)**
a)the average value of current is zero
b) the average value of square of current is zero
c) the average power dissipation is zero
d) the rms current is $\sqrt{2}$ times of peak current.

Previous Year Questions :

15. The angle between the area vector $\vec{A}$ and the plane of the area A is _____
(a) π (b) 2 π **(c) π/2** (d) zero

16. If the flux associated with a coil varies at the rate of 1 Wb/minute then the induced e.m.f. is a) 1V **b) 1/60 V** c) 60V d) 0.60V

17. A coil of area of cross-section 0.5 m^2 with 10 turns is in a plane which is parallel to a uniform magnetic field of 0.2 Wb / m^2. The flux through the coil is
a) 100 Wb b) 10 Wb c) 1 Wb **d) zero**

18. An emf 25V is induced when the current in the coil changes at the of100As^{-1}. The co –efficient of self Induction of coil is
a) 0.3 H **b) 0.25 H** c) 2.5 H d) 0.25 mH

19. An emf of 12 V is induced when the current in the coil changes from 2 A to 6 A in 0.5 s. The coefficient of self-induction of the coil is
a) 1.5 H b) 6 H c) 0.3 H d) 30 H

20. The generator rule is
a) Fleming's left hand rule **b) Fleming's right hand rule**
c) Maxwell's right hand corkscrew rule d) Right hand palm rule

21. The co-efficient of self induction of a solenoid is independent of _____
a) the number of turns of solenoid
b) area of the cross section of the solenoid
c) the length of solenoid
d) the current passing through the coil

22. A rectangular coil is uniformly rotated in a uniform magnetic field such that the axis of rotation is perpendicular to the direction of the magnetic field. When the plane of the coil is perpendicular to the magnetic field.
a) (i) magnetic flux is zero, (ii) induced e.m.f. is zero
b) (i) magnetic flux is maximum, (ii) induced e.m.f. is maximum
c) (i) magnetic flux is maximum, (ii) induced e.m.f. is zero
d) (i) magnetic flux is zero, (ii) induced e.m.f. is maximum

23. In a three phase AC generator the three coil are fastened rigidly together and are displaced from each other by an angle
a) 90° b) 180° **c) 120°** d) 360°

24. In steps-up transformer the output voltage is 11KV and the input voltage is 220V. The ratio of number of turns of secondary to primary is
a) 20 : 1 b) 22 : 1 **c) 50 : 1** d) 1 : 50

25. In a transformer, eddy current loss is minimized by using
a) laminated core made of mumetal **b) laminated core made of stelloy**
c) shell type core d) thick copper wires

26. A power of 11,000 W is transmitted at 220 V. The current through line wires is
a) 50 A b) 5 A c) 500 A d) 0.5A

27. The r.m.s. value of an a.c. voltage with a peak value of 311V is
a) 110V **b) 220V** c) 50V d) 70.7V

28. The r.m.s. value of the alternating current (AC) flowing throughout a resistor is 5A . Its peak value is
a) 3.536 A b) 70.7 A **c) 7.07 A** d) 7 A

29. The effective value of alternating current is
a) $\frac{I_0}{2}$ **b)** $\frac{\mathbf{I_0}}{\sqrt{\mathbf{2}}}$ c) $I_0\sqrt{2}$ d) $2I_0$

30. In an a.c. circuit with an inductor
a) voltage lags current by $\frac{\pi}{2}$ b) voltage and current are in phase
c) voltage leads current by π **d) current lags voltage by** $\frac{\pi}{2}$

31. In an A.C. circuit, the current $I = I_o \sin(\omega t + \frac{\pi}{2})$ lags behind the e.m.f. $e = E_o \sin(\omega t + \frac{\pi}{2})$ by
a) 0 b) $\frac{\pi}{4}$ c) $\frac{\pi}{2}$ d) π

32. The reactance offered by 300 mH inductor to an AC supply of frequency 50 Hz is
a) 1046 Ω **b) 94.2 Ω** c) 9420 Ω d) 104.6 Ω

33. In a AC circuit with capacitor only, if the frequency of the signal is zero, then the capacitive reactance is
a) infinity b) zero c) finite maximum d) finite minimum

34. For a d.c circuit, the value of capacitive reactance (Xc) is
a) Zero **b) infinity** c) $\frac{\pi}{2}$ d) π

35. In an a.c. circuit, the voltage leads the current by a phase of , then the circuit has

a) only an inductor (L) b) only a capacitor (C)
c) only a resistor (R) d) L,C and R is series

36. When the frequency of AC increases , the capacitive reactance offered by capacitor connected in the circuit _____

a) increases **b) decreases** c) remains the same d) becomes zero

37. The instaneous emf and current equations of an a.c circuit are respectively $e = 200\sin(\omega t + \frac{\pi}{3})$ and $i = 10\sin\omega t$ The average power consumed over one complete cycle is

a) 2000 W b) 1000 W **c) 500 W** d) 707 W

38. In RLC series circuit, at resonance

a) current is minimum b) impedance is maximum
c) circuit is purely inductive **d) current is in phase with the voltage**

39. In LCR circuit when $X_L = X_C$ the current

a) is zero **b) is in phase with the voltage**
c) leads the voltage d) lags behind the voltage

40. In LCR series a.c. circuit, the phase difference between current and voltage is 30°. The reactance of the circuit is 17.32. The value of resistance is

a) 30 Ω b) 10 Ω c) 17.32 Ω d) 1.732 Ω

41. In a series LCR circuit, at resonance

a) impedance (Z) maximum b) current minimum
c) equal to impedance (Z) **d) current maximum**

42. In a series LCR circuit, at resonance

a) $X_L = X_C$ b) $X_L > X_C$ c) $X_L < X_C$ d) $\omega = \frac{I}{LC}$

43. The resonant frequency of RLC circuit is υ_0 The inductance is doubled. The capacitance also doubled. Now the resonant frequency of the circuit is _____

a) $2\upsilon_0$ b) $\frac{\upsilon_0}{2}$ c) $\frac{\upsilon_0}{4}$ d) $\frac{\upsilon_0}{\sqrt{2}}$

44. The Q-factor(quality factor) of an a.c. circuit containing a resistance R, inductance L and capacitance C is

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

45. In RLC ac circuit, instaneous emf and current are $I = I_0 \sin(\omega t - \frac{\pi}{3})$ and $e = E_0 \sin \omega t$, phase difference between current and voltage.
a) zero b) 180^0 **c) 60^0** d) 4

46. The average power consumed over one cycle in an a.c. circuit is
a) $E_{rms} I_{rms}$ **b) $E_{rms} I_{rms} \cos\phi$** c) $E_{rms} I_{rms} \sin\phi$ d) $E_o I_o \cos\phi$

47. In an A.C. circuit average power consumed is 200 W and the apparent power is 300 W. The power factor is
a) 1.5 **b) 0.66** c) 0.33 d) 1

48. The core used in audio frequency chokes is
a) iron b) carbon c) lead d) steel

49. In an A.C. circuit, the instantaneous values of emf and current are respectively $e = 200 \sin\left(\omega t - \frac{\pi}{3}\right); i = 10 \sin\left(\omega t + \frac{\pi}{6}\right)$ The phase relation between current and volt age is :
a) voltage lags behind current by a phase angle of $\frac{\pi}{3}$
b) current leads voltage by a phase angle of $\frac{\pi}{6}$
c) current leads voltage by a phase angle of $\frac{\pi}{2}$
d) voltage leads current by a phase angle of $\frac{\pi}{2}$

50. In step-up transformer the output voltage is 11 KV and the input voltage is 220V. The ratio of number of turns of primary to secondary is
a) 50 : 1 **b) 1 : 50** c) 25 : 1 d) 1 : 25

51. If the frequency of AC circuit connected with an inductor of inductance 0.03 H only is 50 Hz, then inductive reactance is
a) 3.14 Ω **b) 9.42 Ω** c) 3 Ω d) 6.28 Ω

52. In a series LCR circuit,at resonance
a) impedance (z) maximum b) current minimum
c) impedance (z) is equal to R d) $\gamma_0 = \frac{1}{\sqrt{LC}}$

53. Q - factor of series resonant circuit is
a) $Q = \frac{1}{\sqrt{LC}}$ b) $Q = \frac{1}{R}\sqrt{\frac{C}{L}}$ **c) $Q = \frac{1}{R}\sqrt{\frac{L}{C}}$** d) $Q = \frac{1}{\sqrt{LR}}$

54. The instantaneous emf and current equation of an RLC series circuit are $e = 200 \sin\left(\omega t - \frac{\pi}{6}\right)$. $i = 20 \sin\left(\omega t - \frac{\pi}{6}\right)$ The average power consumed per cycle is
a) zero b) 2000 W **c) 1000 W** d) 500 W

55. A rectangular coil of wire palced in a uniform magnetic field such that the plane of the coil is parallel to the magnetic field. The magnetic flux linked with the coil and the emf induced are respectively

a) zero and zero b) zero and maximum

c) maximum and zero d) maximum and maximum

56. In an AC circuit containing only a capacitor the instantaneous current is given by the equation $I = I_0 \sin\left(\omega t + \frac{\pi}{3}\right)$. The instantaneous emf is given by the equation

a) $e = E_0 \sin \omega t$ b) $e = E_0 \sin\left(\omega t - \frac{\pi}{6}\right)$ c) $e = E_0 \sin\left(\omega t + \frac{\sqrt{\pi}}{6}\right)$ **d)** $\mathbf{e = E_0 \sin\left(\omega t + \frac{\pi}{6}\right)}$

57. The instantaneous curreent in an AC circuit containing a pure inductor is $i = I_0 \sin \omega t$ .The instantaneous emf is

a) $\mathbf{e = E_0 \sin\left(\omega t + \frac{\pi}{2}\right)}$ b) $e = E_0 \sin\left(\omega t - \frac{\pi}{2}\right)$

c) $e = E_0 \sin(\omega t - \pi)$ d) $e = E_0 \sin(\omega t + \pi)$

58. In RLC series AC circuit at resonance

a) Resistance is zero **b) Net reactance is zero**

c) impedance is maximum

d) voltage leads the current by phase a angle $\frac{\pi}{2}$

PTA Objective Questions :

1. The reverse effect of Oersted experiment was demonstrated by _____

a) Faraday b) Ohm c) Henry d) Lenz

2. An emf of 12 volt is induced when the current in the coil changes at the rate of $40 As^{-1}$. The co-efficient of self induction of the coil is _____

a) 0.3 H b) 0.003 H c) 30 H d) 4.8 H

3. Transformer works on _____

a) AC only b) DC only

c) both AC and DC d) AC more effectively than DC

4. A fuse wire has a current rating of 5 A. Then the peak value of the current in the fuse wire is _____

a) 0.7 A b) 1 A **c) 7.07 A** d) 70.7 A

5. The power loss is less in transmission lines when _____

a) voltage is less but current is more b) both voltage and current are more

c) voltage is more but current is less d) both voltage and current are less

6. A generator produces an emf given by e = 141 sin 88 t. The frequency and rms value of voltage are _____

a) 50 Hz and 99.7 V b) 7 Hz and 49.5 V

c) 14 Hz and 99.7 V d) 50 Hz and 49.5 V

7. The emf in an AC containing only inductance will _____
a) lag behind the current by $\pi/2$ **b) leads behind of current by** $\pi/2$
c) have current in phase with the applied voltage
d) always be out of phase

8. An ideal transformer has a power input of 10 kW. The secondary current is 25 A. If the ratio of number of turns in the primary and the secondary coils is 5 : 1, then the potential difference applied to the primary is _____
a) 100 V b) 200 V **c) 2000 V** d) 1500 V

9. Which of the following devices does not allow d.c. to pass through?
a) resistor **b) capacitor** c) inductor d) all the above

10. In a LCR circuit, when $X_L = X_C$ _____
a) current is minimum, impedance is maximum
b) current is maximum, impedance is maximum
c) current is maximum, impedance is minimum
d) current is minimum, impedance is minimum

11. The unit henry can also be written as _____
a) VsA^{-1} b) WbA^{-1} c) Ωs **d) all**

12. An aeroplane having a wingspan of 35 m flies at a speed of 100 m/s. If the vertical component of earth's magnetic field is $4\times10^{-4}T$, then the induced emf across the wingspan is
a) 28 V b) 2.8 V c) 14 V **d) 1.4 V**

13. The co - efficient of mutual induction between a pair of coils depends upon _____
a) size and shape of the coil b) number of turns of the coil
c) proximity of the coil **d) all the above**

14. The generator rule is _____
a) Fleming's left hand rule **b) Fleming's right hand rule**
c) Maxwell's right hand cork screw rule d) Ampere's swimming rule

15. A field of induction 20 T acts at right angles to a coil of area $20m^2$ with 50 turns. The flux linked with the coil is
a) 2000 Wb **b) 20000 Wb** c) 0 Wb d) 200 Wb

16. The number of lines of force crossing unit area normally is _____
a) magnetic flux **b) magnetic induction**
c) induced emf d) total flux

17. If in an LCR circuit, $X_L = 500\Omega$, $X_C = 326.8\Omega$, $R = 100\Omega$, then φ = _____
a) 60° b) 30 ° c) 45 ° d) 90°

18. Lenz's law is in accordance with law of conservation of _____
a) charges b) momentum c) mass **d) energy**

19. Q factor has values lying between _____ for normal frequencies
a) 0 to 10 b) 10 to 50 c) 50 to 100 **d) 10 to 100**

20. Cores of chokes used in low frequency AC circuits are made of
a) stelloy b) mumetal **c) iron** d) aluminium

21. In an A.C. circuit the applied emf $e = E_0 Sin\left(\omega t + \pi/2\right)$ leads the current $I = I_0 Sin\left(\omega t - \pi/2\right)$ by _____
a) $\pi/2$ b) $\pi/4$ **c) π** d) 0

22. At what rate must the current change in a 65 mH coil to have a 1 volt self induced emf?
a) $25\,As^{-1}$ b) $17\,As^{-1}$ c) $25.4\,As^{-1}$ **d) $15.4As^{-1}$**

23. Power loss due to Joule - heating is also called as _____
a) copper loss b) Eddy current loss c) flux leakage d) Hysteresis loss

24. The equation of a 25 cycle current sine wave having rms value of 30 Å is
a) 30 sin 157 t b) 30 sin 150 t **c) $30\sqrt{2}\sin 157t$** d) $30\sin 160t$

25. The power factor of a choke coil having inductance "L" and resistance "r" is given by
a) $\sqrt{r^2+\omega^2L^2}$ b) $\frac{\sqrt{r^2+\omega^2L^2}}{r}$ **c) $\frac{r}{\sqrt{r^2+\omega^2L^2}}$** d) $r^2+\omega^2L^2$

26. The Q factor of an a.c. circuit containing a resistance R, inductance L and a capacitor C is
a) $Q=\frac{1}{\sqrt{LC}}$ b) $Q=\frac{1}{R}\sqrt{\frac{C}{L}}$ **c) $Q=\frac{1}{R}\sqrt{\frac{L}{C}}$** d) $Q=\frac{1}{\sqrt{LR}}$

27. The part of the AC generator that passes the current from the coil to the external circuit is _____
a) field magnet b) slip rings c) split rings **d) brushes**

28. The peak voltage and peak current in a circuit containing resistor alone are 220V and 1A respectively then the power in the circuit is
a) 110 W b) 11 W c) 110 kW d) 0

29. The energy stored in a coil of inductance 5H and resistance 20Ω. When the emf applied to the coil is 100 volt is
a) 62.5 J b) 125 J c) 12.5 J d) 15.6 J

30. _____ transmits large amount of power with low cost and high efficiency
a) two phase alternator **b) three phase alternator**
c) single phase alternator d) none of the above

31. AC frequency of 100 kHz to 100 MHz is required for _____
a) satellite purpose b) domestic purpose
c) transmission of audio and video signals d) high transmission

32. Power dissipation in an AC circuit in which voltage and current are given by $E = 300\sin(wt + \frac{\pi}{2})$ and $I = 6\sin\omega t$ is _____
a) 0 watt b) 750 watt c) 375 watt d) 1500 watt

33. How much current is drawn by the primary of a transformer connected to a 220 V supply, when it delivers power to a 110 V and 550 W refrigerator.
a) 55 A **b) 2.5 A** c) 0.4 A d) 44A

34. In low power AC dynamoes magnetic field is provided by _____
a) Permanent magnets b) electromagnets
c) horse-shoe magnets d) cylinder magnets

35. The average power of an ac is also called _____ of the circuit
a) true power b) instantaneous power
c) reasonant power d) RMS power

36. As the coil rotates with an angular velocity (ω) in an uniform magnetic field, the emf induced is maximum when ____
a) $\omega t = 0$ **b) $\omega t = \frac{\pi}{2}$** c) $\omega t = \frac{\pi}{4}$ d) $\omega t = \frac{3\pi}{2}$

37. In a three phase AC generator, the three coils are inclined at an angle of _____
a) 45° b) 90° **c) 120°** d) 180°

38. For an ideal transformer, efficiency η is _____
a) greater than one b) less than one **c) equal to one** d) infinity

39. Induction motors are used in _____
a) Grinders b) Generator c) Refrigirators **d) Fans**

40. The co - efficient of mutual inductance of a pair of coils is 4 mH. If the current in one of the coils changes from 0.6 A to 0.61 A in 0.02 seconds, then induced emf is ____
a) $20\mu V$ in the same coil **b) 2 mV in the other coil**
c) $20\mu V$ in the other coil d) $20mV$ in the same coil

41. In a step-down transformer, the following condition satisfied
a) $E_s > E_p$ **b) $K < 1$** c) $I_P > I_S$ d) $N_P > N_S$

42. A wire cuts across a flux of 0.2×10^{-2} weber in 0.12 second. What is the emf induced in the wire?
a) 0.06 V b) 0.02 V **c) 0.0167 V** d) 0.24 V

43. Choke coils are commonly seen in _____ __

a) incandescent bulbs **b) fluorescent tubes**

c) stabiliser circuits d) radio

44. The unit of self inductance is

a) $\frac{Weber - ampere}{turns}$ **b)** $\frac{\textbf{Weber - turns}}{\textbf{ampere}}$

c) $\frac{Weber - turns}{ampere^2}$ d) $\frac{Weber - turns}{volt}$

45. A circuit will have flat resonance, if the Q value is _____

a) high b) infinits **c) low** d) zero

46. 400 MW power produced at 15,000 V at Neyveli power station is stepped upto _____ before transmission

a) 22, 000 V **b) 230, 000 V** c) 110, 000 V d) 20, 000 V

47. In a step down transformer, the input voltage is 22 KV and the output volt age is 550 V. The ratio of number of turns in the primary to that in the secondary is

a) 1 : 40 **b) 40 : 1** c) 1 : 20 d) 20 : 1

48. Flux loss can be minimised by _____

a) using wires of low resistance

b) using laminated core made of mumetal

c) using shell type of core

d) using laminated core made of stelloy

49. The co - efficient of mutual induction between two long solenoids S_1 and S_2, whose core is filled with a magnetic material of perimeability μ is _____

a) $M = \frac{\mu_0 N_2 N_1 A}{l}$ b) $M = \frac{\mu_0 N_2 N_1}{l}$

c) $\mathbf{M = \frac{\mu N_1 N_2 A}{l}}$ d) $M = \frac{\mu N_1 N_2 A I}{l}$

Three Mark Questions:

Book Back Questions :

1. What is electromagnetic induction? **(P Y)**
2. State Faraday's laws of electromagnetic induction. **(P Y)**
3. State lenz's law in electromagnetic induction. **(P Y)**
4. Define self –inductance. Give its unit. **(P Y)**
5. Define the unit of self – inductance. **(P Y)**
6. Define coefficient of mutual induction.
7. Give the practical application of self – induction.
8. State Fleming's right hand rule. **(P Y)**
9. Define rms value of a.c. **(P Y)**
10. State the methods of producing induced emf. **(P Y)**
11. What is poly phase AC generator?
12. What is inductive reactance?
13. Define alternating current and give its expression.
14. What is resonant frequency in LCR circuit?
15. Mention the difference between the step up and step down transformer.
16. What is capacitive reactance?
17. Define power factor.
18. Why a d.c. ammeter cannot read a.c.? **(P Y)**
19. Define quality factor. What does it refer? **(P Y)**
20. A capacitor blocks d.c but allows a.c Explain.
21. What happens to the value of current in RLC series circuit, if frequency of the source is increased?
22. Differentiate between self- inductance and mutual inductance.
23. Discuss the advantages and disadvantages of a.c over d.c.
24. Define efficiency of a transformer. **(P Y)**

Previous Year Questions :

25. A coil of area of cross-section 0.5 m^2 with 10 turns is in a plane perpendicular to a uniform magnetic field of 0.2 Wb/m^2. Calculate the flux through the coil.
26. An e.m.f. of 5 V is induced when the current in the coil changes at the rate of 100 As^{-1}. Find the coefficient of self-induction of the coil.
27. If the rate change of current of 2 As^{-1} induces an emf of 10 mV in a solenoid, what is self-inductance of the solenoid?
28. A solenoid of length 1m and 0.05m diameter has 500 turns. If a current of 2A passes through the coil, calculate the co-efficient of self induction of the coil.

29. Calculate the mutual inductance between two coils when a current of 4 A changing to 8 A in 0.5 s in one coil, induces an e.m.f. of 50 mV in the other coil. **(Eg)**
30. The wings of an aero plane are 10 m apart. The plane is moving horizontally towards the north at a place where the vertical component of earth's magnetic field is 3×10^{-5}T. Calculate the induced e.m.f set up between the tips of the wings if the velocity of the aero plane is 720 km/hr.
31. An aircraft having a wing span of 20.48 m flies due north at a speed of 40 ms^{-1}. If the vertical component of earth's magnetic field at the place is 2×10^{-5} T, calculate the e.m.f. induced between the ends of the wings. **(Eg)**
32. What is eddy current (Foucault's current)?
33. Mention the applications of eddy current?
34. State the principle of transformer.
35. 11 kW power is transmitted at 22,000 V through a wire of resistance 2 Ω. Calculate the power loss.
36. An ideal transformer has transformation ratio 1: 20. If the input power and primary voltage are 600 W and 6 V respectively, find the primary and secondary currents.
37. A capacitor of capacitance 2 μF is in a.c circuit of frequency 1000 Hz. If the r.m.s value of the applied e.m.f is 10 V, find the effective current flowing in the circuit. **(Eg)**
38. Write the equation of a 25 cycle current sine wave having rms value of 30 A.
39. Calculate the capacitive reactance of a capacitor of capacitance 2F in an A.C. circuit of frequency 1000 Hz.
40. Give the difference between AF choke and RF choke.
41. Magnetic field through a coil having 200 turns and cross sectional 0.04 m^2 changes 0.1 wbm^{-2} to 0.04 wbm^{-2}. Find the induced emf.
42. Calculate the power loss in the form of heat when a power of 11,000 W is transmitted at 220 V.

Five Mark Questions:

Book Back Questions :

1. State Lenz's law and illustrate through an experiment. Explain how it is in accordance with the law of conservation of energy.
2. Obtain an expression for the self-inductance of a long solenoid.
3. Explain the mutual induction between the long solenoids. Obtain an expression for the mutual inductance. **(P Y)**
4. Explain how emf can be induced by changing the area enclosed by the coil. **(P Y)**
5. Describe the principle, construction and working of three-phase a.c generator.

6. Explain how power can be transmitted efficiently to long distance.
7. Obtain an expression for the rms value of an a.c.
8. Obtain an expression for the current flowing in a circuit containing resistance only to which alternating emf is applied. Find the phase relationship between voltage and current.
9. Derive an expression for the average power in an ac circuit.
10. Describe the principle, construction and working of a choke coil.

Previous Year Questions :

11. Explain the Energy stored in a Inductor.
12. An a.c. generator consists of a coil of 10,000 turns and of area 100 cm^2. The coil rotates at an angular speed of 140 rpm in a uniform magnetic field of 3.6×10^{-2} T. Find the maximum value of the emf induced. **(Eg)**
13. What is eddy current? Give its applications. How they are minimized.
14. What is efficiency of a transformer? Explain the different energy losses in a transformer? How can they be minimized?
15. What are the different energy losses in a transformer? How can they be minimized?
16. Obtain an expression for the current flowing in a circuit containing inductance only to which alternating emf is applied. Find the phase relationship between voltage and current.

Ten Mark Questions:

Book Back Questions :

1. Discuss with theory the method of changing emf in a coil by changing its orientation with respect to the direction of the magnetic field. **(P Y)**
2. Describe the principle, construction and working of a single-phase a.c generator. **(P Y)**
3. Explain the principle of transformer. Discuss its construction and working. **(P Y)**
4. What are eddy currents? Give their applications. How are they minimized? **(P Y)**
5. Obtain an expression for the current flowing in a circuit containing a pure inductance. Find the phase relationship between voltage and current. **(P Y)**
6. Obtain an expression for the current flowing in a circuit containing capacitance only to which alternating emf is applied. Find the phase relationship between voltage and current. **(P Y)**
7. A source of alternating emf is connected to a series combination of a resistor R, an inductor L and a capacitor C. Obtain with the help of a vector diagram and impedance diagram, an expression for the (i) effective voltage (ii) impedance (iii) phase relationship between current and voltage. **(PY)**

V. ELECTROMAGNETIC WAVES AND WAVE OPTICS

One Mark Questions

Book Back Questions :

1. In an electromagnetic wave **(P Y)**
   a) power is equally transferred along the electric and magnetic fields
   b) power is transmitted in a direction perpendicular to both the fields
   c) power is transmitted along electric field
   d) power is transmitted along magnetic field
2. Electromagnetic waves are **(P Y)**
   a) transverse
   b) longitudinal
   c) may be longitudinal or transverse
   d) neither longitudinal nor transverse
3. Refractive index of glass is 1.5. Time taken for light to pass through a glass plate of thickness 10 cm is
   a) 2×10^{-8} s b) 2×10^{-10} s c) 5×10^{-8} s **d) 5×10^{-10} s**
4. In an electromagnetic wave the phase difference between electric field $\vec{E}$ and magnetic field $\vec{B}$ is **(P Y)**
   a) $\pi/4$ b) $\pi/2$ c) π **d) zero**
5. Atomic spectrum should be **(P Y)**
   a) pure line spectrum b) emission band spectrum
   c) absorption line spectrum d) absorption band spectrum
6. When a drop of water is introduced between the glass plate and Plano convex lens in Newton's rings system, the ring system **(P Y)**
   a) contracts b) expands
   c) remains same d) first expands, then contracts
7. A beam of monochromatic light enters from vacuum into a medium of refractive index μ. The ratio of the wavelengths of the incident and refracted waves is
   a) μ : 1 b) 1 : μ c) $\mu^2 : 1$ d) $1 : \mu^2$
8. If the wavelength of the light is reduced to one fourth, then the amount of scattering is **(P Y)**
   a) increased by 16 times b) decreased by 16 times
   c) increased by 256 times d) decreased by 256 times
9. In Newton's ring experiment the radii of the m^{th} and $(m+4)^{th}$ dark rings are respectively $\sqrt{5}$ mm and $\sqrt{7}$ mm. What is the value of m? **(P Y)**
   a) 2 b) 4 c) 8 **d) 10**

10. The path difference between two monochromatic light waves of wavelength 4000Å is 2×10^{-7} m. The phase difference between them is

a) π b) 2π c) $3\frac{\pi}{2}$ d) $\frac{\pi}{2}$

11. In Young's experiment, the third bright band for wavelength of light 6000 Å coincides with the fourth bright band for another source in the same arrangement. The wavelength of the another source is

a) 4500 Å b) 6000 Å c) 5000 Å d) 4000 Å

12. A light of wavelength 6000 Å is incident normally on a grating 0.005 m wide with 2500 lines. Then the maximum order is **(P Y)**

a) 3 b) 2 c) 1 d) 4

13. A diffraction pattern is obtained using a beam of red light. What happens if the red light is replaced by the blue light? **(P Y)**

a) bands disappear b) no change

c) diffraction pattern becomes narrower and crowded together

d) diffraction pattern becomes broader and farther apart

14. The refractive index of the medium, for the polarising angle 60^0 is **(P Y)**

a) 1.732 b)1.414 c) 1.5 d) 1.468

Previous Year Questions :

15. Velocity of the electromagnetic waves through vacuum is

a) $\sqrt{\mu_o \varepsilon_o}$ **b)** $\frac{1}{\sqrt{\mu_o \varepsilon_o}}$ c) $\sqrt{\frac{\mu_o}{\varepsilon_o}}$ d) $\sqrt{\frac{\varepsilon_o}{\mu_o}}$

16. The existence of electromagnetic waves was confirmed experimentally by

a) Hertz b) Maxwell c) Huygens d) Planck

17. Which one of the following is not an electromagnetic wave?

a) x-rays b) γ - rays c) U-V rays **d) β - rays**

18. The radiations used in physiotherapy are

a) ultraviolet **b) infrared** c) radio waves d) microwaves

19. Which of the following is used to study crystal structure?

a) micro wave b) Infra red rays c) UV rays **d) X- ray**

20. Which of the following gives rise to continuous emission spectrum?

a) Electric filament lamp b) Sodium vapour lamp

c) Gases in the discharge tube d) Calcium salt in Bunsen flame

21. Electric filament gives rise to

a) Line spectrum **b) Continuous spectrum**

c) Band spectrum d) Line absorption spectrum

22. The wavelength of D1 and D2 lines emitted by sodium vapour lamp is
a) 589.96nm, 589nm b) 589nm, 589.6nm
c) 589.6nm, 589nm d) 589nm, 589.3 nm

23. The photoelectric effect can be explained on the basis of
a) corpuscular theory of light b) wave theory of light
c) electromagnetic theory of light **d) quantum theory of light**

24. The dark lines found in the solar spectrum are called
a) Raman lines **b) Fraunhofer lines**
c) Stoke's lines d) Anti-Stoke's lines

25. According to Focault and Michelson experiment the velocity of light in a rarer medium is :
a) greater than in a denser medium
b) lesser than in a denser medium
c) equal to that in a denser medium
d) either greater or lesser than in a denser medium

26. In Raman effect, the incident photon makes collision with an excited molecule of the substance. The scattered photon gives rise to
a) Stoke's line **b) anti-Stoke's line**
c) Rayleigh line d) Zeeman line

27. In Raman effect, if the scattered photon gains energy, it gives rise to
a) stoke's line **b) anti - stoke's line**
c) stoke's and anti- stoke's lines d) Rayleigh line

28. In Raman effect, the spectral line with lower frequency than the incident frequency is
a) Fraunhofer line b) Rayleigh line **c) stoke's line** d) anti - stoke's line

29. A ray of light passes from a denser medium into a rarer medium. For an angle of incidence of 45°, the refracted ray grazes the surface of separation of the two media. The refractive index of the denser medium is
a) $\frac{3}{2}$ b) $\frac{1}{\sqrt{2}}$ **c) $\sqrt{2}$** d) 2

30. If 'i' is the angle of incidence, the angle between the incident wave front and normal to the reflecting surface is
a) i **b) 90° - i** c) $3\pi/2$ d) $\pi/2$

31. If C is the velocity of light in vacuum, the velocity of light in a medium with refractive index μ is
a) μC **b) $\frac{C}{\mu}$** c) $\frac{\mu}{C}$ d) $\frac{1}{\mu C}$

32. If the velocity of light in a medium is 2.25×10^8 ms^{-1}, then the refractive index of the medium will be
a) 1.5 b) 0.5 **c) 1.33** d) 1.738

33. The refractive index of glass is 1.5. The velocity of light in glass is
a) 2×10^8 ms^{-1} b) 4.5×10^8 ms^{-1} c) 3×10^8 ms^{-1} d) 1.33×10^8 ms^{-1}

34. In young's double slit experiment, band width â contains
a) a bright band only b) a dark band only
c) either a bright band or a dark band **d) both a bright band and a dark band**

35. In Young's double slit experiment, the separation between the slits is halved, and the distance between the slits and the screen is doubled. Then the fringe width is
a) unchanged b) halved c) doubled d) **quadrupled**

36. Waves from two coherent sources interfere with each other. At a point where the trough of one wave superposes with the trough of the other wave, the intensity of light is
a) maximum b) minimum c) zero d) no change

37. Soap bubbles exhibit brilliant colours in sun light is due to
a) scattering of light b) diffraction of light
c) polarisation of light **d) interference of light**

38. The phenomenon of light used in the formation of Newton's ring is
a) diffraction **b) interference**
c) refraction d) polarisation

39. In Newton's ring experiment, light of wavelength 5890Å is used. The order of the dark ring produced where the thickness of the air film is 0.589 μm is
a) 2 b) 3 c) 4 d) 5

40. The radii of Newton's dark rings are in the ratio
a) 1:2:3.... **b) $\sqrt{1} : \sqrt{2} : \sqrt{3}$ .....**
c) $\sqrt{1} : \sqrt{3} : \sqrt{5}$ ... d) 1:4:9.....

41. The ratio of the radii of the 4^{th} and 9^{th} dark rings in Newton's rings experiment is
a) 4 : 9 **b) 2 : 3** c) 16 : 81 d) 3 : 2

42. In case of Fraunhofer diffraction, the wavefront undergoing diffraction is
a) spherical wavefront b) cylindrical wavefront
c) elliptical wavefront **d) plane wavefront**

43. In a plane diffraction grating, the unit of grating element is
a) no unit **b) metre** c) metre^{-1} d) degree

44. A ray of light travelling in a rarer medium and reflected at the surface of a denser medium automatically undergoes a
a) phase change of $\pi/2$ b) phase change of 2π
c) path difference of λ **d) path difference of $\lambda/2$**

45. In the grating formula the unit of N is
a) metre **b) metre^{-1}** c) no unit d) (metre)^2

46. In a plane transmission grating the width of a ruling is 12000 Å and the width of the slit is 8000 Å the grating element is
a) 20 μm **b) 2 μm** c) 1 μm d) 10 μm

47. The transverse nature of light waves is demonstrated only by the phenomenon of
a) interference b) diffraction **c) polarisation** d) reflection

48. Unpoliarised light passes through a tourmaline crystal. The emergent light is analysed by an analyser. When the analyser is rotated through 90°, the intensity of light
a) remains uniformly bright
c) varies between maximum and minimum
b) remains uniformly dark
d) varies between maximum and zero

49. A ray of light is incident on a glass plate at its polarising angle. The angle between the incident ray and the reflected ray is
a) 57.5° b) 32.5° c) 90° **d) 115°**

50. The polarising angle for water is 53° 4′. If the light is incident at this angle on the surface of water, the angle of refraction in water is
a) 53° b) 26°3 c) 30° **d) 36° 56′**

51. When a ray of light is incident on a glass surface at polarising angle of 57.5°, the angle between the incident ray and the reflected ray is
a) 57.5° b) 32.5° **c) 115°** d) 90°

52. A ray of light is incident on a glass surface such that the reflected ray is completely plane polarised. The angle between the reflected ray and the refracted ray is
a) 57.5° b) 32.5° **c) 90°** d) 115°

53. In nicol prism the ordinary ray is prevented from coming out of Canada balsam by the phenomenon of
a) reflection b) polarization
c) diffraction **d) total internal reflection**

54. The nature of wave front corresponding to extra ordinary ray inside a calcite crystal is
a) plane b) spherical **c) elliptical** d) cylindrical

55. Of the following, which one is biaxial
a) Tourmaline b) ice c) calcite **d) mica**

56. An example of uniaxial crystal is
a) Tourmaline b) mica c) topaz d) selenite

57. Which of the following is a biaxial crystal ?
a) calcite b) quartz c) tourmaline **d) topaz**

58. Of the following, which one is a uniaxial crystal?
a) Mica b) Aragonite c) Topaz **d) Quartz**

59. One of the following, optically active material is
a) sodium chloride b) calcium chloride c) sodium d) chlorine

60. The optical rotation does not depend on
a) concentration of the solution b) frequency of the light used
c) the temperature of the solution **d) intensity of the light used**

61. Which of the following is not an optically active material?
a) Quartz b) Sugar crystals
c) Turpentine oil **d) Calcium chloride**

62. A light of wavelength 4000 Å after travelling a distance of 2 μm produces a phase change of :
a) zero b) 3π c) $\frac{\pi}{2}$ d) $\frac{\pi}{3}$

63. According to Foucault and Michelson experiment the velocity of light in a rarer medium is :
a) greater than in a denser medium
b) lesser than in a denser medium
c) equal to that in a denser medium
d) either greater or lessor than in a denser medium

64. In Snell's law of refraction $\mu = \frac{\sin i}{\sin r}$, μ is :
a) directly proportional to sin i b) inversely proportional to sin r
c) both (a) and (b) **d) independent of (a) and (b)**

65. Which of the following is not an electromagnetic waves?
a) x - rays b) γ – rays c) u - v rays **d) β– rays**

66. The scattering of sunlight by gas molecules in the earth's atmosphere is
a) Raman's effect b) α - scattering
c) Tyndall scattering **d) Rayleigh scattering**

67. A wave of 'λ' correspond to a phase of 2π. Calculate the phase when a distance of 'δ' correspond to a phase of ϕ

a) $\phi = \frac{2\pi}{\lambda} \times \delta$ b) $\phi = \frac{\lambda}{2\pi} \times \delta$ c) $\phi = \frac{2\pi}{\delta} \times \lambda$ d) $\phi = \frac{\pi}{2\lambda} \times \delta$

68. The refractive index of a material for a polarising angle of 55° is

a) 1.4281 b) 1.7321 c) 1.4141 d)1.5051

69. A ray of light travelling in air is incident on a denser surface at an angle of 60°. If the velocity of light in the denser of refraction inside the denser medium is

a) 30° b) $\sin^{-1}(0.75)$ **c)** $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$ d) $\sin^{-1}(0.6666)$

70. A ray of light incident normally on a glass surface of refractive index 1.5. The angle of refraction is

a) 30° b) $\sin^{-1}(0.6666)$ **c) zero** d)$\sin^{-1}(0.75)$

71. In Newton's experiment, when a wavelength of light λ and plano convex lens of radius of curvature 50 cm is used, the radius of 10^{th} dark ring $\sqrt{3}$ mm. Then with the same wave length, a plano convex lens of radius of curvature 2 m is used , the radius of the 10^{th} dark ring is

a) 3mm b) **$2\sqrt{3}$ mm** c) $3\sqrt{3}$ mm d) $4\sqrt{3}$ mm

72. In Raman effect,wavelength of incident light is 5890 Å. THe wavelength of stokes and antistokes lines are respectively

a) 5885 Å and 5880 Å b) 5895 Å and 5900 Å

c) 5885 Å and 5895 Å **d) 5895 Å and 5885 Å**

PTA Objective Questions :

1. Angle between the electric component and magnetic component of an electro magnetic wave is

a) 0 b) $\pi/4$ **c) π/2** d) π

2. Phase difference between the electric field and magnetic field of an electromagnetic wave is

a) 0 b) $\pi/4$ c) $\pi/2$ d) π

3. Electromagnetic waves are

a) mechanical waves b) similar to sound waves

c) transverse in nature d) longitudinal in nature

4. If an electromagnetic wave is propagating along x - direction and electric field variation is along y - direction then the magnetic field variation will be

a) along x - direction b) inclined at an angle of 45° with x - direction

c) along y direction **d) along z - direction**

5. In an electromagnetic wave
a) power is equallly transmitted along electric and magnetic fields
b) power is transmitted in a direction perpendicular to the field
c) power is transmitted along electric field
d) power is transmitted along magnetic field

6. Electromagnetic waves are
a) transverse b) longitudinal
c) may be longitudinal or transverse d) neither longitudinal nor transverse

7. If the energy of the electromagnetic wave is 'E' then the energy assiciated with electric field vector
a) E b) 2E c) $E/4$ **d) E/2**

8. The velocity of electromagnetic waves in vacuum or free space is
a) $\frac{1}{\mu_0\varepsilon_0}$ b) $\mu_0\varepsilon_0$ **c)** $\frac{1}{\sqrt{\mu_0\varepsilon_0}}$ d) $\sqrt{\mu_0\varepsilon_0}$

9. Electromagnetic waves are not defleceted in electric and magnetic fields, be cause
a) they travel with very high velocity **b) they are chargeless waves**
c) they travel even in vacuam d) they are transverse in nature

10. Existence of electromagnetic waves was confirmed experimentally by
a) Maxwell b) Henry **c) Hertz** d) Huygen

11. In Hertz experimental arrangement, the two metal plates A and B are placed with a separation of
a) 6 m b) 60 mm c) 6 cm **d) 60 cm**

12. Frequency of electromagnetic waves produced by Hertz arrangement was about
a) $\mathbf{5\times10^7\ Hz}$ b) $50\times10^7\ Hz$ c) $8\times10^{14}\ Hz$ d) $4\times10^{14}\ Hz$

13. The frequency of oscillation of charges between the plates A and B in Hertz experimental setup is given by
a) $2\pi\sqrt{LC}$ b) $\frac{1}{2\pi}\sqrt{\frac{L}{C}}$ **c)** $\frac{1}{\mathbf{2\pi\sqrt{LC}}}$ d) $\frac{1}{2\pi}\sqrt{\frac{C}{L}}$

14. Frequency range of electromagnetic spectrum is
a) $10^{-3}\ Hz - 10^{22}\ Hz$ **b)** $\mathbf{10^3\ Hz - 10^{22}\ Hz}$
c) $10\ Hz - 10^{22}\ Hz$ d) $10\ Hz - 10^{-5}\ Hz$

15. Physical properties of electromagnetic wavs are determined by their
a) wavelength b) sources c) method of excitation d) all these

16. The overlapping in certain parts of the electromagnetic spectrum reveals that the particular wave
a) can be produced by only one method b) has very high energy values
c) can be produced by different method d) has very low energy values

17. Frequency band of radio waves used in cellular phones is
a) high frequency b) low frequency
c) ultra high frequency d) very low frequency

18. Frequency range if AM band of radio waves is from
a) 54 MHz to 890 MHz b) 530 KHz to 108 MHz
c) 530 KHz to 1710 KHz d) 88 MHz to 108 MHz

19. Radio waves used in television communication is ranging from
a) 54 MHz to 890 MHz b) 530 MHz to 108 MHz
c) 530 KHz to 1710 KHz d) 88 MHz to 108 MHz

20. Radiation used to destroy bacteria and for sterilizing surgial instruments are
a) radio waves b) X - ray
c) ultra violet radiation d) gamma rays

21. Microwaves are used in
a) radio communication systems b) television communication systems
c) Radar communication systems d) radio & TV communications

22. Infrared absorption spectrum is used to study
a) crystal structure **b) molecular structure**
c) atomic structure d) electronic configuration

23. Wavelength range of visible portion of electromagnetic spectrum is from
a) $6\times10^{-10}m$ *to* $4\times10^{-7}m$ **b) 4×10^{-7} m to 8×10^{-7} m**
c) $8\times10^{14}m$ *to* $4\times10^{14}m$ d) $10^{-3}m$ *to* $0.3m$

24. Atoms and molecules in an electrical discharge produce
a) X - rays b) visible light c) IR rays **d) UV rays**

25. Infrared lamps are used in
a) weather forecasting b) Infra red photography
c) Physiotherapy d) sterlizing surgical instrument

26. Radiation used in the detection of forged documents and finger prints in forensic laboratories is
a) IR rays **b) UV rays** c) gamma rays d) X - rays

27. UV rays are used to find
a) crystal structure b) nuclear structure
c) structure of atoms d) molecular structure

28. Match the radiations with their applications

A) IR rays	-	a) molecular structure
B) UV rays	-	b) crystal structure
C) X - rays	-	c) nuclear structure
D) γ - rays	-	d) structure of atoms

a) A(a) B(b) C(c) D(d) **b) A(a) B(d) C(b) D(c)**
c) A(c) B(b) C(d) D(a) d) A(a) B(c) C(d) D(b)

29. When the light emitted by the source is directly examined by a spectrometer, the spectrum obtained is
a) continuous spectrum **b) emission spectrum**
c) band spectrum d) absorption spectrum

30. Wavelength of two sodium lines(D_1 and D_2) are
a) 8590Å and 8596Å b) 5893Å and 5890Å
c) 5896Å and 5890Å d) 6958Å and 6950Å

31. Spectrum produced by incandescent solid at high temperature is
a) continuous emission spectrum b) line emission spectrum
c) continuous absorbtion spectrum d) line absorption spectrum

32. Spectrum produced by electric filament lamp
a) depends on temperature of the source only
b) is independent of temperature of the source
c) depends on characteristic of the source
d) depends on method of excitation

33. The spectrum, consisting of unbroken luminuous bands of all wavelengths containing all colours from red to violet is given by
a) mercury in mercury vapour lamp
b) Calcium and barium salts in Bunsen flame
c) carbon arc lamp
d) CO_2 gas in molecular state in discharge tube

34. Free excited atoms emit _____ spectrum
a) continuous emission **b) line emission**
c) band emission d) line absorption

35. _____ spectrum is characteristic of the emitting substance and is used to identify the gas
a) Continuous emission **b) Line emission**
c) Continuous absorption d) Line absorption

36. Ammonia and nitrogen in molecular state in the discharge tube gives _____ spectrum
a) continuous emission b) line emission
c) band emission d) line absorption

37. Spectrum which is the characteristic of the absorbing substance is
a) line emission spectrum b) band emission spectrum
c) absorption spectrum d) emission spectrum

38. When the temperature of the solid is increased, the spectrum spread from
a) red to green b) blue to green **c) red to blue** d) violet to red

39. If a white light is allowed to pass through the solution of blood or chlorophyll the resulting spectrum is
a) line absorbtion **b) band absorption**
c) continuous absorption d) line emission

40. The spectrum used for making dye is
a) line absorption **b) band absorption**
c) continuous absorption d) line emission

41. Dark lines appearing in the solar spectrum are called
a) Raman lines b) Tyndall lines **c) Fraunhofer lines** d) Rayleigh lines

42. Temperature of sun's outer layer is about
a) $14 \times 10^6\ K$ b) $14 \times 10^7\ K$ c) 6000^0 C **d) 6000 K**

43. Lifetime of atoms of the substance exhibiting the phenomenon of fluorescence is
a) more than $10^{-5}\ s$ b) equal to $10^{-5}\ s$ **c) less than 10^{-5} s** d) equal to $10^3\ s$

44. Delayed fluorescence is known as
a) luminescence b) bio - luminescence
c) phosphorescence d) reflection

45. According to corpuscular theory, the difference in colours is due to different _____ of the corpuscles
a) shapes **b) sizes** c) velocities d) energies

46. According to corpuscular theory, when the corpuscules approach a surface between a two media, if they are attracted it gives to the phenomenon of
a) reflection b) scattering **c) refraction** d) inteference

47. "Velocity of light in denser medium is greater than the velocity of light in rarer medium" - this statement is TRUE in
a) corpuscular theory b) wave theory
c) electromagnetic theory d) quantum theory

48. Experimental results of Focault on velocity of light do not support
a) corpuscular theory b) wave theory
c) electromagnetic theory d) quantum theory

49. "No material medium is necessary for the propagation of light waves" this statement is 'TRUE' according to
a) corpuscular theory b) wave theory
c) electromagnetic theory d) quantum theory

50. Energy associated with each photon is given by
a) $\mathbf{E = hv}$ b) $E = \frac{h}{v}$ c) $E = \frac{h}{v^2}$ d) $E = hv^2$

51. The value of Planck's constant is
a) $6.625 \times 10^{34}\ Js$ **b)** $\mathbf{6.625 \times 10^{-34}\ Js}$ c) $66.25 \times 10^{34}\ Js$ d) $6.025 \times 10^{23}\ Js$

52. Light wave behaves as
a) particle in both high and low energy ranges
b) particle in low energy range, but as wave in high energy range
c) wave in both high and low energy ranges
d) wave in low energy range, but as particle in high energy range

53. Strength of scattering depends on
a) wavelngth of the light b) size of the particle
c) both (a) and (b) d) velocity of light

54. Absorption of light by the molecules, followed by its reradiation in different directions is called
a) reflection b) multiple reflection
c) scattering d) dispersion

55. According to Rayleigh scattering law, the amount of scattering is _____
a) directly proportional to λ^4 **b) inversely proportional to** λ^4
c) directly proportional to λ^2 d) inversely proportional to λ^2

56. Blue colour of the sky is due to scattering of light by
a) colloidal particles **b) atmosphere**
c) molecules of liquid d) Raman effect

57. When light passes through a colloidal solution, its path is visible inside the solution. This is due to
a) Rayleigh scattering b) Raman effect
c) Tyndall scattering d) Scattering of light by atmosphere

58. In Raman effect, lines of shorter wavelengths are called
a) Stokes lines **b) antistokes lines**
c) Raman lines d) Rayleigh lines

59. In Stokes lines, energy of scattered photon is
a) equal to energy of incident photon
b) lesser than the energy of incident photon
c) greater than the energy of incident photon
d) zero

60. Raman shift is
a) independent of the frequency of incident light
b) characteristic of the substance
c) independent of characteristic of the substance
d) both (a) and (b)

61. Which of the following is true?
a) Intensity of Stokes lines is always greater than that of antistokes line
b) Intensity of Stokes lines is always lesser than that of antistokes lines
c) Antistokes lines are of lower frequency than Stokes lines
d) Stokes lines are of higher frequency than the antistokes lines

62. A linear source of light at a finite distance in an isotropic medium emits a _____ wavefront
a) spherical **b) cylindrical** c) circular d) plane

63. If the refractive index of second medium with respect to the first medium is greater than one, then it implies that
a) first medium is rarer and the second medium is denser
b) first medium is denser and the second medium is rarer
c) velocity of light in first medium is less than that in the second medium
d) velocity of light is same in both media

64. If v_0 is the frequency of incident radiation and v_s is thefrequency of scattered radiation of given molecular sample, then Raman shift of Raman frequency (Δv) is given by
a) $\mathbf{\Delta v = v_0 - v_s}$ b) $\Delta v = v_s - v_0$ c) $\Delta v = v_s + v_0$ d) $\Delta v = (v_0 + v_s)$

65. If the path difference between two monochromatic waves is δ, the phase difference must be
a) $2\pi\lambda\delta$ b) $\frac{\lambda}{2\pi}\delta$ **c)** $\mathbf{\frac{2\pi}{\lambda}\delta}$ d) $\frac{2\pi\lambda}{\delta}$

66. In the interference pattern, the energy is
a) created at position of maximum
b) destroyed at the position of medium
c) conserved but it is redistributed d) none of the above

67. Colours in thin films is due to
a) dispersion of light b) scattering of light
c) interference of light d) reflection of light

68. A ray of light travelling in a rarer medium, gets reflected at the surface of a denser medium. the automatic path change produced is

a) λ b) $\frac{3\lambda}{4}$ **c)** $\frac{\lambda}{2}$ d) $\frac{\lambda}{4}$

69. In thin films, the condition for getting bright fringe due to inteference of the reflected light is

a) $2\mu t \cos r = (2n-1)\lambda/2$ b) $2\mu t = n\lambda$

c) $2t = n\lambda$ d) $2\mu t = (2n+1)\lambda/2$

70. In Newton's ring experiment, the radius of the n^{th} dark ring is proportional to

a) n b) n^2 **c)** $\sqrt{n}$ d) $\frac{1}{\sqrt{n}}$

71. Bending of light waves around the edges of an obstacle is known as

a) reflection **b) diffraction** c) refraction d) polarisation

72. In case of Fraunhofer diffraction, the incident wavefront is

a) spherical b) cylindrical c) elliptical **d) plane**

73. In Fresnel's diffraction, the shape of the incident wavefront is

a) spherical b) cylindrical c) plane **d) (a) or (b)**

74. The points on the successive slits separated by a distance equal to grating element are called as

a) identical points b) grating points

c) corresponding points d) equal points

75. Transverse nature of electromagnetic waves was confirmed by the phenomenon of

a) interference b) diffraction **c) polarisation** d) reflection

76. In the propagation of light waves, the angle between the plane of vibration and plane of polarisation is

a) 0 **b) 90°** c) 45° d) 180°

77. In the propagation of light waves, the angle between the direction of propagation and plane of polarisation is

a) 0 **b) 90°** c) 45° d) 180°

78. In case of partially polarised light, when the analyser is rotated through 90°, the intensity of light beam varies from

a) maximum to zero b) zero to maximum

c) maximum to minimum d) remains same

79. The polarising angle for glass is

a) 57.5° b) 52.5° c) 32.5° d) 37.5°

80. According to Brewster's law

a) $\mu = \tan i_p$ b) $i_p = \tan\mu$ c) $\mu = \cot i_p$ d) $i_p = 1/\tan\mu$

81. In the arrangement of pile of plates, the glass plates are inclined at an angle of _____ with the axis of the tube
a) 57.5° b) 52.5° **c) 32.5°** d) 37.5°

82. _____ is an example for uniaxial crystal
a) Mica b) Topaz c) Selenite **d) Quartz**

83. Of the following optically active material is
a) sodium chloride b) Calcium chloride
c) sodium d) chlorine

84. Instrument used to determine the optical rotation produced by the substance is _____
a) interfero meter b) Jamin's photometer
c) polariscope **d) polarimeter**

85. Atomic spectrum should be a
a) pure line spectrum b) emission band spectrum
c) line absorption spectrum d) band absorption spectrum

86. In Raman effect, Raman shift in frequency is always
a) positive b) negative
c) negative for stoke's line and positive for Antistoke's lines
d) positive for stoke's line and negative for Anti-stoke's lines

87. In Raman effect, if frequencies of incident radiation and stoke's lines are respectively $6.198\times10^{15}\ Hz$ and $6.1602\times10^{15}\ Hz$ then the value of Raman shift is
a) $-0.038\times10^{15}\ Hz$ **b) 0.038×10^{15} Hz** c) $3.8\times10^{15}\ Hz$ d) $-3.8\times10^{15}\ Hz$

88. If the wavelength of light is reduced to one-fourth of its initial value then the amount of scattering is
a) increased by 16 times b) decreased by 16 times
c) increased by 256 times d) decreased by 256 times

89. The ratio of scattering powers of two wavelengths 400 nm and 6000Å is
a) 81 : 16 b) 16 : 81 c) 81 : 64 d) 64 : 81

90. If A denotes the amount of scattering, the wavelength of light is proportional
a) inversely to A^4 b) directly to A^4 **c) inversely to $A^{1/4}$** d) directly to $A^{1/4}$

91. A beam of monochromatic light enters from vacuum into a medium of refractive index μ. The ratio of the wavelengths of the incident and refracted waves is
a) $\mu:1$ b) $1:\mu$ c) $\mu^2:1$ d) $1:\mu^2$

92. If the velocity of light in a medium is $2.25\times10^8\ m/s$ then the refractive index of the medium will be
a) 1.5 b) 0.5 **c) 1.33** d) 1.73

93. If the wavelength of light wave in vacuum is $6.4\times10^{-7}\,m$. Then wavelength of light wave in water of refractive index of the medium will be
a) $4\times10^{-7}\,m$ b) $4.8\times10^{-7}\,m$ **c) 2.64×10^{-7} m** d) $5\times10^{-7}\,m$

94. The refractive indices for glass and water respectively is 1.5 and 1.33, then the ratio of velocity of light in glass and water is
a) 4 : 3 b) 3 : 4 **c) 8 : 9** d) 9 : 8

95. The time taken by the light to travel a distance of 200 m in a medium of refractive index 1.5 is
a) $2\times10^{-8}\,s$ **b) 10^{-6}s** c) $10^{-8}\,s$ d) $3\times10^{8}\,s$

96. If the path difference between two monochromatic light waves of wavelength 4000Å is $2\times10^{-7}\,m$ the phase difference b/w them will be
a) π b) 2π c) $\frac{3\pi}{2}$ d) $\frac{\pi}{2}$

97. In Young's double slit experiment, the third order bright band for wave length of light 6000Å coincides with fourth order bright fringe for another source in the same arrangement. The wavelength of the another source will be
a) 4500Å b) 6000Å c) 5000Å d) 4000Å

98. In Young's double slit experiment, lights of wavelength $5.48\times10^{-7}\,m$ and $6.85\times10^{-8}\,m$ are used, in turn keeping D and d constant. The ratio of respective bandwidths in the two cases will be
a) 1 : 4 b) 1 : 8 **c) 8 : 1** d) 4 : 1

99. In Youngs double slit experiment, if the distance between the coherent sources is increased twice that of initial value then the new bandwidth will be
a) increased 4 times b) increased 2 times
c) decreased 4 times **d) decreased 2 times**

100. In Youngs double slit experiment, if the distance between the slits is halved and the distance between the slits and the screen is doubled, the new fringe width will be
a) remains same b) halved c) doubled **d) quadrupled**

101. In Youngs double slit experiment, sodium light is employed and inter ference fringes are obtained in which the bandwidth of 3^{rd} bright fringe is 2.2 mm. What will be the bandwidth of 2^{nd} dark fringe?
a) 2.2 mm b) 1.1 mm c) 4.4 mm d) 3.3 mm

102. Newton's rings were obtained with a light of wavelength 5460Å. The thickness of the air film where 2^{nd} dark ring formed is
a) 5.46×10^{-7}m b) $3.276\times10^{-6}\,m$ c) $32.76\times10^{-6}\,m$ d) $54.6\times10^{-7}\,m$

103. In Newton's ring experiment, the ratio of the radii of 4^{th} ring and 9^{th} ring is
a) 4 : 9 **b) 2 : 3** c) 16 : 81 d) $\sqrt{2}:\sqrt{3}$

104. In Newton's ring experiment, if the radii of m^{th} and $(m+4)^{th}$ dark rings are $\sqrt{5}\,mm$ and $\sqrt{7}\,mm$ respectively, then the value of 'm' is
a) 2 b) 4 c) 8 **d) 10**

105. If a light of wavelength 6000Å is incident normally on a grating 0.005 m wide with 2500 lines then the maximum order of diffraction must be
a) 3 b) 2 c) 1 d) 4

106. A diffraction pattern is obtained using a beam of red light, what happens if the red light is replaced by blue light?
a) bands disappear
b) no change is noticed
c) diffraction pattern becomes narrower and crowded together
d) diffraction pattern becomes broader and farther apart

107. Refractive index of glass is 1.5. The time taken by the light to travel a distance 10 cm in a glass is
a) 5×10^{-8} s **b) 5×10^{-10} s** c) 2×10^{-8} s d) 2×10^{-10} s

108. In a plane transmission grating experiment, the wavelength of light is $1/\sqrt{2}$ times of grating element used. The angle of diffraction for the first order maximum will be
a) 30° **b) 45°** c) 60° d) 90°

109. The distance between the two corresponding points in a grating is $2\times10^{-4}\,cm$. The number of lines per meter width of the grating will be
a) 20000 b) 2000 **c) 500000** d) 50000

110. The refractive index of the medium for the polarizing angle 60° is
a) 1.732 b) 1.414 c) 1.5 d) 1.468

Three Mark Questions:

Book Back Questions :

1. What are electromagnetic waves?
2. What is fluorescence and phosphorescence?
3. Distinguish between corpuscle and photon.
4. What is Tyndal scattering? **(P Y)**
5. How are Stoke's and Anti-stoke's line formed?
6. Why the sky appears blue in colour? **(P Y)**
7. State Huygen's principle. **(P Y)**
8. What is principle of superposition of waves?
9. Give the conditions for sustained interference.
10. What are Newton's ring?
11. Why the centre of the Newton's rings is dark? **(P Y)**
12. Distinguish between Fresnel and Fraunhofer diffraction. **(P Y)**
13. Distinguish between polarised and unpolarised light.
14. State Brewster's law
15. Bring out the differences between ordinary and extra ordinary light.
16. What is meant by optical rotation? On what factors does it depend? **(P Y)**

Pervious Year Questions :

17. Write any three uses of infrared radiations.
18. What is band emission spectrum? Give an example.
19. What are emission and absorption spectra?
20. Write the conditions for total internal reflection to take place.
21. Define optic axis of a crystal.
22. Define specific rotation.
23. An LC resonant circuit contains a capacitor 400 pF and an inductor 100 μH. It is sent into oscillations coupled to an antenna. Calculate the wavelength of the radiated electromagnetic wave. **(Ex)**
24. In Young's experiment, the width of the fringe obtained with light of wavelength 6000 Å is 2mm. Calculate the fringe width if the entire apparatus is immersed in a liquid of refractive index 1.33. **(Eg)**
25. Two slits 0.3 mm apart are illuminated by light of wavelength 4500 Å. The screen is placed at 1 m distance from the slits. Find the separation between the second bright fringe on both sides of the central maximum.
26. In Newton's rings experiment the diameter of certain order of dark ring is measured to be double that of second ring. What is the order of the ring? **(Eg)**

27. A 300 mm long tube containing 60 cc of sugar solution produces a rotation of 9° when placed in a polarimeter. If the specific rotation is 60°, Calculate the quantity of sugar contained in the solution. **(Eg)**
28. A light of wavelength 6000Å falls normally on a thin air film, 6 dark fringes are seen between two points. Calculate the thickness of the air film. **(Ex)**
29. A plano-convex lens of radius 3 m is placed on an optically flat glass plate and is illuminated by monochromatic light. The radius of the 8^{th} dark ring 3.6 mm. Calculate the wavelength of light used. **(Eg)**
30. The refractive index of a medium is $\sqrt{3}$. Calculate the angle of refraction if the unploarised light is incident on it at the polarising angle of the medium. **(Ex)**
31. List out the uses of U-V radiation.
32. What are Fraunhofer lines?
33. What are uniaxial and biaxial crystals? Give an example

Five Mark Questions:

Book Back Questions :

1. Mention the characteristics of electromagnetic waves.
2. Give the source and uses of electromagnetic waves**.**
3. Describe an experiment to demonstrate transverse nature of light.
4. State and explain Brewster's law **(P Y)**
5. Write a notes on: (i) Nicol prism (ii) Polaroid **(P Y)**

Previous Year Questions :

6. In Newton's Ring experiment the diameter of certain order of dark ring is measured to be double that of second ring. What is the order of the ring?
7. Distinguish between interference and Diffraction.
8. Write a note on pile of plates.
9. A monochromatic light of wavelength 589 nm is incident on a water surface having refractive index 1.33. Find the velocity, frequency and wavelength of light in water.
10. In Young's experiment a light of frequency 6×10^{14} Hz is used. Distance between the centres of adjacent fringes is 0.75 mm. Calculate the distance between the slits, if the screen is 1.5 m away. **(Ex)**
11. In a Newton's rings experiment the diameter of the 20^{th} dark ring was found to be 5.82 mm and that of the 10^{th} ring 3.36 mm. If the radius of the Plano-convex lens is 1 m, calculate the wavelength of light used. **(Ex)**

12. A soap film of refractive index 1.34, is illuminated by white light incident at an angle 30°. The reflected light is examined by a spectroscope in which dark band corresponding to the wavelength 5893 Å is found. Calculate the smallest thickness of the film. **(Eg)**
13. A soap film of refractive index 1.33 is illuminated by white light incident at an angle 30°. The reflected light is examined by spectroscope in which dark band corresponding to the wavelength 6000 Å is found. Calculate the smallest thickness of the film.
14. A parallel beam of monochromatic light is allowed to incident normally on a plane transmission grating having 5000 lines per centimeter. A second order spectral line is found to be diffracted at an angle 30°. Find the wavelength of the light. **(Eg)**
15. A plane transmission grating has 5000 lines / cm. Calculate the angular separation in second order speectrum of red line 7070Å and blue line 5000Å **(ex)** .
16. A 300 mm long tube containing 60 cc of sugar solution produces a rotation of 9^0 when placed in a polarimeter. If the specific rotation is 60^0, Calculate the quanity of sugar contained in the solution.
17. In young's double slit experiment, the intensity ratio of two coherent sources is 81 : 1. Calculate the ratio between maximum and minimum intensites.
18. Write a notes on Polaroid and uses.

Ten Mark Questions:

Book Back Questions :

1. Explain emission and absorption spectra. **(P Y)**
2. Explain the Raman scattering of light with the help of energy level diagram.**(P Y)**
3. What is Raman effect? Explain Raman spectrum with diagram. **(P Y)**
4. On the basis of wave theory, explain total internal reflection. Write the conditions for the total internal reflection to takes place.**(P Y)**
5. Derive an expression for bandwidth of interference fringes in Young's double slit experiment. **(P Y)**
6. Discuss the theory of interference in thin transparent film due to reflected light and obtain condition for the intensity to be maximum and minimum. **(P Y)**
7. Discuss the theory of plane transmission grating.

Previous Year Questions :

8. State Huygens's principle. On the basis of wave theory, prove the laws of reflection.

VI. ATOMIC PHYSICS

One Mark Questions

Book Back Questions :

1. The cathode rays are **(P Y)**

   a) a stream of electrons b) a stream of positive ions

   c) a stream of uncharged particles d) the same as canal rays

2. A narrow electron beam passes undeviated through an electric field E = 3 x 10^4 V/m and an overlapping magnetic field B = 2 x 10^{-3} Wb/m^2. The electron motion, the electric field and magnetic field are mutually perpendicular. The speed of the electron is **(P Y)**

   a) 60 ms^{-1} b) 10.3 x 10^7 ms^{-1} **c) 1.5 x 10^7 ms^{-1}** d) 0.67 x 10^{-7} ms^{-1}

3. According to Bohr's postulates, which of the following quantities take discrete values? **(P Y)**

   a) kinetic energy b) potential energy **c) angular momentum** d) momentum

4. The ratio of the radii of the first three Bohr orbit is **(P Y)**

   a) 1 : 1/2 : 1/3 b) 1 : 2 : 3 **c) 1 : 4 :9** d) 1 : 8 : 27

5. The first excitation potential energy or the minimum energy required to excite the atom from ground state of hydrogen atom is **(P Y)**

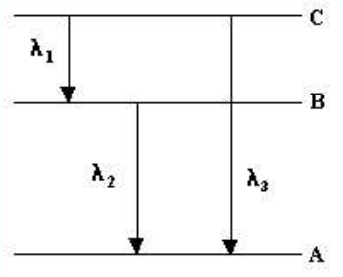
   a) 13.6 eV **b) 10.2 eV** c) 3.4 eV d) 1.89 eV

6. According to Rutherford atom model, the spectral lines emitted by an atom is **(PY)**

   a) line spectrum **b) continuous spectrum**

   c) continuous absorption spectrum d) band spectrum

7. Energy levels A,B,C of a certain atom correspond to increasing values of energy (i.e.,) $E_A < E_B < E_C$. If $\lambda_1, \lambda_2, \lambda_3$ are the wavelengths of radiations corresponding to the transitions C to B, B to A, and C to A respectively, which of the following statements are correct.



a) $\lambda_3 = \lambda_1 + \lambda_2$ **b)** $\lambda_3 = \frac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$ c) $\lambda_1 = \lambda_2 + \lambda_3 = 0$ d) $\lambda_3^2 = \lambda_1^2 + \lambda_2^2$

8. The elliptical orbits of electron in the atom were proposed by **(P Y)**
a) J.J. Thomson b) Bohr **c) Sommerfeld** d) De Broglie

9. X- rays is **(P Y)**
a) phenomenon of conversion of kinetic energy into radiation
b) conversion of momentum
c) conversion of energy into mass
d) principle of conservation of charge

10. In an X–ray tube, the intensity of the emitted X–ray beam is increased by **(P Y)**
a) increasing the filament current b) decreasing the filament current
c) increasing the target potential d) an atomic transition in the target

11. The energy of a photon of characteristic X –ray from a Coolidge tube comes from **(P Y)**
a) the kinetic energy of a free electrons of the target
b) the kinetic energy of ions of the target
c) the kinetic energy of the striking electron
d) an atomic transition in the target

12. A Coolidge tube operates at 24800 V. The maximum frequency of X – radiation emitted from Coolidge tube is **(P Y)**
a) 6×10^{18} Hz b) 3×10^{18}Hz c) 6×10^{8}Hz d) 3×10^{8}Hz

13. In hydrogen atom, which of the following transitions produce a spectral line of maximum wavelength **(P Y)**
a) $2 \rightarrow 1$ b) $4 \rightarrow 1$ **c) $6 \rightarrow 5$** d) $5 \rightarrow 2$

14. In hydrogen atom , which of the following transition produce a spectral line of maximum frequency **(P Y)**
a) $2 \rightarrow 1$ b) $6 \rightarrow 2$ c) $4 \rightarrow 3$ d) $5 \rightarrow 2$

15. After pumping process in laser,
a) the number of atoms in the ground state is greater than the number of atoms in the excited state
b) the number of atoms in the excited state is greater than the number of atoms in the ground state
c) the number of atoms in the ground state is equal to the number of atoms in the excited state
d) no atoms are available in the excited state

16. The chromium ions doped in the ruby rod **(P Y)**
a) absorbs red light **b) absorbs green light**
c) absorbs blue light d) emits green light

Previous Year Questions :

17. In a discharge tube, the source of positive rays (canal rays) is
a) cathode b) anode
c) gas present in the discharge tube d) fluorescent screen

18. $\frac{e}{m}$ of cathode ray particle
a) depends upon the nature of the cathode
b) depends upon the nature of the anode
c) depends upon the nature of the gas atoms present inside the discharge tube
d) is independent of all these

19. In Thomson's experiment, cathode rays moving with a velocity 'v' enter perpendicular to an electric field of intensity 'E'. The deflection produced by the cathode rays is directly proportional to
a) v b) v^{-1} c) v^{2} **d) v^{-2}**

20. The direction of viscous force in Millikan's oil drop experiment is
a) always downwards b) always upwards
c) opposite to the direction of motion of the oil drop
d) either upwards or downwards.

21. In Millikan's oil drop experiment, charged oil drop is balanced between the two plates. Now the viscous force _____
a) acts downwards b) acts upwards
c) **is Zero** d) acts either upwards or downwards

22. In Millikan's experiment, the plates are kept at a distance of 16 mm and are maintained at a potential difference of 10000V. The electric intensity is
a) 62.5 V/m **b) 6.25×10^{5} V/m** c) 6.25×10^{3} V/m d) 1.6×10^{5} V/m

23. In Millikan's experiment , an oil drop of mass 4.9×10^{-14} Kg is balanced by applying a potential difference of 2kV between two plates which are 2mm apart. The charge of the drop is equal to ____
a) 1.96×10^{-18} C b) 1.602×10^{-19} C c) 12 C **d) 4.9×10^{-19} C**

24. The ratio of areas enclosed by first three Bohr orbits of hydrogen atom is
a) 1 : 2 : 3 b) 1 : 8 : 27 c) 1 : 4 : 9 **d) 1 : 16 : 81**

25. Wave number is defined as the number of waves
a) Produced in one second **b) in a distance of 1 metre**
c) in a distance of 3×10^{8} metre d) in a distance of λ metre

26. Number of waves per unit length is known as
a) wavelength **b) wave number** c) bandwidth d) frequency

27. If R is Rydberg's constant, the minimum wavelength of hydrogen spectrum is

a) $\frac{1}{R}$ b) $\frac{R}{4}$ c) $\frac{4}{R}$ d) R

28. The unit of Rydberg's constant is

a) m b) no unit c) m^{-2} **d) m^{-1}**

29. The value of Rydberg's constant is

a) $1.097 \times 10^{-7}\ m^{1}$ b) $1.097 \times 10^{-7}\ m^{-1}$ **c) $1.097 \times 10^{7}\ m^{-1}$** d) $1.097 \times 10^{-6}\ m^{-1}$

30. The spectral series of hydrogen in UV region are called

a) Balmer series **b) Lyman series** c) Paschen series d) Pfund series

31. If R is Rydberg constant, the shortest wavelength of Paschen series is

a) $\frac{R}{9}$ **b) $\frac{9}{R}$** c) $\frac{16}{R}$ d) $\frac{25}{R}$

32. The wave number of a spectral line of hydrogen atom is equal to Rydberg's constant. The line is

a) first line of Lyman series **b) series limit of Lyman series**

c) first line of Pfund series d) series limit of Pfund series

33. Arrange the spectral lines $H_\alpha, H_\beta, H_\gamma, H_\delta$ in the increasing order of their wavelength : – – –

a) $H_\alpha, H_\beta, H_\gamma H_\delta$ **b) $H_\delta, H_\gamma, H_\beta H_\alpha$** c) $H_\beta, H_\alpha, H_\delta H_\gamma$ d) $H_\alpha, H_\beta, H_\delta H_\gamma$

34. In hydrogen atom , which of the following transition produce a spectral line of minimum wavelength

a) $2 \rightarrow 1$ b) $6 \rightarrow 2$ c) $4 \rightarrow 3$ d) $5 \rightarrow 2$

35. In hydrogen atom, which of the following transitions produces a spectral line of minimum wavelength

a) $2 \rightarrow 1$ **b) $4 \rightarrow 1$** c) $6 \rightarrow 5$ d) $5 \rightarrow 2$

36. The wavelength of D_1 and D_2 lines emitted by sodium vapour lamp is

a) 589.6 nm, 589 nm b) 589 nm, 589.6 nm

c) 589.3 nm, 589 nm d) 589 nm, 589.3 nm

37. The energy of the electron in the first orbit of hydrogen atom is -13.6 eV. Its potential energy is

a) -13.6 eV b) 13.6 eV **c) -27.2 eV** d) 27.2 eV

38. The ionization potential of hydrogen atom is

a) 13.6 eV b) -13.6 eV **c) 13.6 V** d) -13.6 V

39. When an electric field is applied to an atom each of the spectral lines split into several lines. This effect is known as

a) Zeeman effect **b) Stark effect** b) Raman effect d) Seebeck effect

40. If 'a' and 'b' are semi-major and semi-minor axes of the ellipse respectively and '*l*' is the orbital quantum number, then the expression to find the possible elliptical orbits is

a) $\frac{b}{a} = \frac{l+1}{n}$ b) $\frac{b}{a} = \frac{l-1}{n}$ c) $\frac{a}{b} = \frac{l+1}{n}$ d) $\frac{a}{b} = \frac{l-1}{n}$

41. In Sommerfeld atom model, for a given value of n, the number of values can taken as

a) n b) n + 1 c) n – 1 d) 2n + 1

42. In Sommerfeld atom model, for principal quantum number n = 3 which of the following sub shells represents circular orbit?

a) 3 s b) 3 p **c) 3 d** d) None of these

43. For the first order X-ray diffraction, the wavelength of the X-ray is equal to the lattice spacing at a glancing angle of

a) 15° b) 60° c) 45° **d) 30°**

44. A crystal diffracts monochromatic X-rays. If the angle of diffraction for the second order is 90°, then that for the first order will be

a) 60° b) 45° **c) 30°** d) 15°

45. If the minimum wavelength of X-rays produced from a Coolidge tube is 0.062 nm, then the potential difference between the cathode and target material is

a) 2000 V **b) 20,000 V** c) 2×10^5 V d) 6.2×10^3 V

46. A Coolidge tube operates at 18600V. The maximum frequency of X - ray radiation emitted from it is

a) 4.5×10^{18} Hz b) 45×10^{18} Hz c) 4.05×10^{18} Hz d) 45.5×10^{18} Hz

47. The minimum wavelength of X-rays produced is an X-ray tube at 1000 kV is

a) 0.0124 Å b) 0.124 Å c) 1.24 Å d) 0.00124 Å

48. A coolidge tube operates at 24800V. The minimum Wavelength of X – ray radiation emitted from coolidge tube is

a) 6×10^{18}m b) 3×10^{18} m c) 0.6×10^{-10} m **d) 0.5×10^{-10} m**

49. If the potential difference between cathode and the target of Coolidge tube is 1.24×10^5 V, then the minimum wavelength of continuous X-rays is _____

a) 10 Å b) 1 Å **c) 0.1 Å** d) 0.01 Å

50. When an electron jumps from M shell to K shell it gives _____

a) K_α **b) K_β** c) L_α d) L_β

51. If ν is frequency of characteristic X – ray line emited by a target element of atomic number Z, then Mosley's law is _____

a) $\nu \alpha Z$ **b) $\nu \alpha Z^2$** c) $\nu \alpha \sqrt{Z}$ d) $\nu \alpha Z^3$

52. A three dimensional image of an object can be formed by
a) atomic spectroscopy **b) holography**
c) molecular spectroscopy d) MASER

53. In holography, which of the following are recorded on a photographic film?
a) Amplitude and frequency b) Phase and frequency
c) phase and amplitude d) Amplitude, phase and frequency

54. Maser material are
a) diamagnetic ions **b) paramagnetic ions**
c) ferromagnetic ions d) non-magnetic ions

55. The direction of the electric field in Millikan's oil drop experiment acts :
a) downwards b) upwards
c) first upwards then downwards d) first downwards, then upwards

56. The longest wavelength that can be analysed by a rock salt crystal of spacing d = 2.82 Å in the first order is :
a) 2.82 Å **b) 5.64 Å** c) 11.28 Å d) 21.76 Å

57. A beam of cathode rays moves from left to right in a plane of the paper and it enters into a uniform magnetic field acting perpendicular to the plane of the paper and inwards. Now the cathode rays are deflected.
a) downwards **b) upwards**
c) in a direction perpendicular to the plane of the paper and inwards
d) in a direction perpendicular to the plane of the paper and outwards

58. The colour of light emitted by ruby laser
a) green light **b) red light** c) yellow light d) white light

59. What is the value of Bohr's radius?
a) 5.3 Å **b) 0.53 Å** c) 53 Å d) 5.03 Å

PTA Objective Questions :

1. In hydrogen atom, which of the following transition produce spectral line of maximum wavelength _____
a) $2 \rightarrow 1$ b) $4 \rightarrow 1$ **c) $6 \rightarrow 5$** d) $5 \rightarrow 2$

2. The chromium ions doped in ruby rod _____
a) absorbs red light **b) absorbs green light**
c) absorbs blue light c) emits green light

3. The value of Rydberg's constant is _____
a) $1.094 \times 10^{7} \text{m}^{1}$ b) $1.094 \times 10^{-7} m$ **c) $1.094 \times 10^{7} \text{m}^{-1}$** d) $1.094 \times 10^{-7} m^{-1}$

4. The quantity which takes discrete values, according to Bohr's postulates is _____
a) kinetic energy b) potential energy **c) angular momentum** d) momentum

5. The first excitation potential energy or the minimum energy required to excite the atom from ground state of hydrogen atom is
a) 13.6 eV **b) 10.2 eV** c) 3.4 eV d) 1.89 eV

6. The life time of atoms for laser in excited state is _____
a) $10^{-8}s$ **b) 10^{-3}s** c) $10^{-5}s$ d) $10^{3}s$

7. When an electron jumps from M shell to the vacant K shell, it contributes _____
a) K_β b) K_α c) L_α d) L_β

8. Positive column in a discharge tube is produced at a pressure of
a) 110 mm of Hg b) 100 mm of Hg **c) 10 mm Hg** d) 0.1 mm of Hg

9. The wavelength of radiations absorbed by chromium ions in Ruby laser is _____
a) 5800Å b) 5400Å c) 5400Å **d) 5500Å**

10. Sommerfeld model explains the _____
a) Zeeman effect
b) distribution and arrangement of electrons in atom
c) intensities of spectral lines
d) back ground of fine structure of spectral wavelength

11. For a given operating voltage the minimum wavelength of X - rays is _____
a) the same for all metals b) not same for all metals
c) zero for some metals d) high for certain metals

12. The elliptical orbits of electron was explained by _____
a) J.J. Thomson **b) Sommerfeld** c) de Broglie d) Bohr

13. The ratio of radii of the first three Bohr orbit is _____
a) 1 : 2 : 3 b) 1 : 1/2 : 1/3 c) 1 : 8 : 27 **d) 1 : 4 : 9**

14. In hydrogen atom, which of the following transition produce spectral line of maximum frequency?
a) $2 \rightarrow 1$ b) $6 \rightarrow 2$ c) $4 \rightarrow 3$ d) $5 \rightarrow 2$

15. The cathode rays are _____
a) a stream of electrons b) a stream of positive ions
c) a stream of uncharged particles d) the same as canal rays

16. Based on Thomson atom model, the wavelength of spectral line obtained from Hydrogen atom is
a) 1300Å b) 4861Å c) 6363Å d) 1500Å

17. Laue used _____ crystals to demonstrate the diffraction of X - rays.
a) rock salt **b) ZnS** c) quartz d) $Caco_3$

18. Bohr's quantisation condition is
a) $mvr = h/4\pi$ b) $mv = h/2\pi$ c) $mvr = nh/\pi$ **d) mvr = nh/2π**

19. Moseley's law led to the discovery of chemical element _____
a) Helium b) Iodine **c) Rhenium** d) Radon

20. The life time of metastable state is _____
a) $10^{-5}s$ **b) 10^{-3}s** c) $10^{-4}s$ d) $10^{-8}s$

21. When X - rays fall on certain metals, they liberate _____
a) positrons b) electrons c) photons **d) photoelectrons**

22. In an X - ray tube, the intensity of emitted X - ray beam is increased by _____
a) increasing the filament current b) decreasing the filament current
c) increasing the target potential d) decreasing the target potential

23. In He-Ne laser, the ratio of helium and neon is _____
a) 4 : 1 **b) 1 : 4** c) 1 : 2 d) 2 : 1

24. When an electron jumps from any outer orbits to the first orbit, then the emitted spectral line is _____
a) Lyman series b) Balmer series c) Paschen series d) Pfund series

25. X - rays is _____
a) phenomenon of conversion of kinetic energy into radiation
b) conversion of momentum
c) conversion of energy into mass d) principle of conservation of charge

26. After pumping process in laser, _____
a) the number of atoms in the ground state is greater than the number of atoms in the excited state
b) the number of atoms in the excited state is greater than the number of atoms in the ground state
c) the number of atoms in the ground state is equal
d) no atoms are available in excited state.

27. According to Rutherford atom model, the spectral line emitted by an atom is _____ spectrum
a) line **b) continuous spectrum** c) continuous absorption d) band

28. The energy of photon of characteristic X - rays from a Coolidge tube come from _____
a) the kinetic energy of the free electrons of the target
b) the kinetic energy of the ions of the target
c) the kinetic energy of the striking electrons
d) an atomic transition in the target

29. The spacing between the atoms arranged in three dimensional space in crystal is of the order _____
a) 10^{-10} m b) 10^{-10} cm c) 10^{-8} m d) 10^{-8} mm

30. The continuous X - rays spectra consists of radiations of _____
a) well defined wavelengths b) very low wavelengths
c) very high wavelengths **d) all possible wavelengths**

31. The size of an atom from Rutherford experiment is _____
a) 10^{-10} m b) 10^{-16} m c) 10^{-14} m d) 10^{-12} m

32. The energy of meta stable state of Ne in He - Ne laser is _____
a) 20.66 eV b) 1.89 eV c) 10.2 eV d) 3.4 eV

33. Achieving more atoms in the excited state than in the ground state is _____
a) population inversion b) normal population
c) stimulated emission d) spontaneous emission

34. Bohr's model fails because it explain _____
a) only the continuous spectrum b) only the line spectrum
c) spectral lines of hydrogen atom and hydrogen like atom
d) the spectral lines of all atoms.

35. The light from a LASER source is monochromatic because all the photons ____
a) are in phase b) have same energy
c) have same amplitude d) are in the same direction

36. Einstein's photoelectric effect and Bohr's theory of hydrogen spectral lines confirmed _____
a) energy of matter **b) dual nature of radiant energy**
c) radiant energy d) matter waves

37. In Bohr atom model the energy of electron in the n^{th} orbit is _____
a) $\frac{13.6}{n^2} eV$ **b) $\frac{-13.6}{n^2}$ eV** c) $-13.6eV$ d) $-1.36eV$

38. In an hydrogen atom, value of Bohr radius is
a) 0.53×10^{-8} m b) 53Å **c) 0.53Å** d) 530 nm

39. The spectral lines of hydrogen in UV region are called _____
a) Balmer series **b) Lyman series** c) Paschen series d) Pfund series

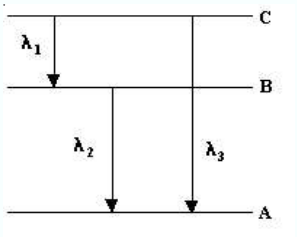
40. A Coolidge tube operates at 24800V. The maximum frequency of X - ray radiation emitted from Coolidge tube is _____
a) 16×10^{18} Hz **b) 6×10^{18}Hz** c) 3×10^{18} Hz d) 16×10^{8} Hz

41. A crystal diffracts monochromatic X-rays. If the angle of diffraction for first order is 30°, then that for second order will be _____
a) 90° b) 15° c) 60° d) 45°

42. For the principal quantum number 3, the possible l values are _____

a) 3, 2, 1 **b) 2, 1, 0** c) 1, 0, -1 d) 0, -1, -2

43. The energy levels of A, B, C of a certain atom correspond to increasing values of energy i.e., $E_A < E_B < E_C$. If $\lambda_1, \lambda_2, \lambda_3$ are the wavelength of radiations corresponding to the transitions C to B, B to A and C to A respectively, which of the following statement is correct?



a) $\lambda_3 = \lambda_1 + \lambda_2$ **b)** $\lambda_3 = \frac{\lambda_1\lambda_2}{\lambda_1 + \lambda_2}$ c) $\lambda_1 = \lambda_2 + \lambda_3 = 0$ d) $\lambda^2_3 = \lambda^2_1 + \lambda^2_2$

44. The glancing angle of monochromatic X - ray of wavelength 1Å is 30°. The lattice space between the second order reflection is _____

a) $\mathbf{2\times10^{-10}m}$ b) $2\times10^{-9}m$ c) $2\times10^{-10}cm$ d) $2\times10^{-9}cm$

45. In a Bragg's spectrometer the glancing angle for the fourth order spectrum of X - ray is found to be 30°. What will be the glancing angle for the occurrence of first order spectrum?

a) $\sin^{-1}0.25$ b) $\sin^{-1}0.217$ c) $\sin^{-1}0.5$ **d) $\sin^{-1}$ 0.125**

46. The radius of second orbit of hydrogen atom is _____

a) 0.53 Å **b) 2.12 Å** c) 1.06 Å d) 4.24Å

47. The ionization potential of the hydrogen atom is 13.6eV. The energy of the atom in n = 2 state is _____

a) -13 .6 eV **b) -3.4 eV** c) 3.4 eV d) 13.6 eV

48. The ratio of the specific charge of an electron to that of a positron is _____

a) 1 : 2 **b) 1 : 1** c) 2 : 1 d) 1 : 4

49. An electron moves through an electric field of intensity $9\times10^3\ v/m$. If the mass of the electron is $9.1\times10^{-31}\ kg$, then the acceleration of electron is _____

a) $1.71\times10^{-15}\ ms^{-2}$ b) $1.6\times10^{-15}\ ms^{-2}$

c) $\mathbf{1.6\times10^{15}\ ms^{-2}}$ d) $1.58\times10^{-14}\ ms^{-2}$

50. An electron with speed of $2.5\times10^7\ m/s$ suffers a deflection in a magnetic field of induction $2\times10^{-3}T$ then the electric field that would give the same deflection is

a) $5\times10^{-3}v/m$ b) $1.25\times10^3 v/m$

c) $12.5\times10^2 v/m$ **d)** $\mathbf{5\times10^4}$ **v/m**

51. The potential difference between the cathode and the target of Coolidge tube is $1.24\times10^{5}V$, then the minimum wavelength of continuous X - ray is _____
a) 10 Å b) 1Å **c) 0.1Å** d) 0.01Å

52. A narrow beam of electrons passes undeviated through an electric field $E=3\times10^{4}V$ and an overlapping magnetic field $B=2\times10^{-3}\,Wb/m^{2}$. The electron motion electric field and magnetic field are mutually perpendicular. The speed of electron is
a) 60 m/s b) 10.3 m/s **c) 1.5×10^{7} m/s** d) $0.67\times10^{-7}\,m$

53. For a first order X - ray diffraction, the wavelength of X - ray equal to the interplanar distance at a glancing angle of _____
a) 45° **b) 30°** c) 60° d) 15°

54. Radius of first orbit of hydrogen atom is 0.53Å then the radius of third orbit is
a) 59Å **b) 4.774Å** c) 1.06Å d) 2.12Å

55. The minimum wavelength an X - ray coming out of X - ray tube under a potential difference of 1000 volt is _____
a) 12.4 Å b) 12400 Å c) 1240 Å d) 0.0124 Å

56. Given that the charge on an electron is $1.6\times10^{-19}C$, What is the energy gained by the cathode ray particles when a voltage of 800 volts is applied between the electrodes of a cathode ray tube _____
a) $2\times10^{-21}J$ b) $8\times10^{-17}J$ c) $1.28\times10^{-18}J$ **d) 1.28×10^{-16} J**

57. The charge on an oil drop is $12.82\times10^{-19}C$, then the number of elementary charges are _____
a) 6 b) 2 c) 7 **d) 8**

58. In Millikan's oil drop experiment, two plates separated by 5 cm in air are at a potential of 5 V, then the electric field is _____
a) 1 V/m b) 10 V/m **c) 100 V/m** d) 2 V/m

59. 1 MeV = _____
a) $1.602\times10^{-19}J$ b) $1.602\times10^{-16}J$ **c) 1.602×10^{-13} J** d) $1.602\times10^{-31}J$

Three Mark Questions:

Book Back Questions :

1. What are cathode rays?
2. What is the principle of Millikan's method for determining the charge of an electron? **(P Y)**
3. What are the draw backs of the Rutherford atom model. **(P Y)**
4. What is meant by energy level diagram?
5. What are the draw backs of Sommerfeld atom model? **(P Y)**
6. Define excitation potential and ionization potential energy. **(P Y)**
7. What are X-rays?
8. What are hard X-rays and soft X-rays?
9. State Moseley's law. **(P Y)**
10. Write the differences between spontaneous emission and stimulated emission.
11. What is meant normal population?
12. What are important characteristics of laser? **(P Y)**
13. How does the laser light differ from ordinary light?
14. What are the various applications of laser in medical field? **(P Y)**

Previous Year Questions :

15. Explain any one of the drawbacks of the Rutherford atom model.
16. Define ionization potential.
17. What are the two important facts established by Laue experiment?
18. Write the applications of Mosley's law.
19. What are the conditions to achieve laser action?
20. Write any three applications of laser in industry.
21. What is hologram?
22. A beam of electrons moving with a speed of 4×10^7 ms^{-1} is projected normal to the uniform magnetic field where B = 10^{-3} Wb/m^2. What is the path of the beam in magnetic field?
23. Rydberg constant for hydrogen atom is 1.097×10^7 m^{-1}. Calculate the shortest wavelength of the spectral line of its Lyman series. **(Eg)**
24. Calculate the short wavelength of limit of Lyman series. ($R=1.097 \times 10^7$ m^{-1}) **(Eg)**
25. Calculate the longest wavelength that can be analysed by a rock salt crystal of spacing d=2.82 Å in the first order. **(Eg)**

26. An X-ray diffraction of a crystal gave the first line at a glancing angle of $6°27'$. If the wavelength of X-ray is 0.58Å, find the distance between the two cleavage planes. **(Ex)**
27. In Bragg's spectrometer, the glancing angle for first order spectrum was observed to be 8°. Calculate the crystal lattice spacing, if the wavelength of the X – ray is 0.7849 Å.
28. How much should be the voltage of an X-ray tube so that the electrons emitted from the cathode may give an X-ray of wavelength 1Å after striking the target? **(Ex)**
29. Find the minimum wavelength of X-rays produced by an X-ray tube operating 1000 kV. **(Ex)**
30. The minimum wavelength of X – rays produced by Coolidge tube is 0.05nm. Find operating voltage of Coolidge tube.
31. In millikan's experiment an oildrop of mass 4.9×10^{-14} kg is balanced by applying a potential difference of 9.8 kV between the two plates which are 12.8 mm apart calculate the number of elementary charges on the drop (Take g = 10 ms $^{-2}$)
32. A coolidge tube operates at 24,800 V. What is the maximum frequency of X - radiation emitted from coolidge tube?

Five Mark Questions:

Book Back Questions :

1. Write the properties of cathode rays. **(P Y)**
2. Explain the results of Rutherford α-particle scattering experiment.
3. State the postulates of Bohr atom model. **(P Y)**
4. Prove that the energy of an electron for hydrogen atom in n^{th} orbit is, $E_n = \frac{-me^4}{8\varepsilon_0^2 n^2 h^2}$. **(P Y)**
5. Explain the spectral series of hydrogen atom. **(P Y)**
6. Write the properties of X-rays? **(P Y)**
7. State and obtain Bragg's law. **(P Y)**
8. Explain the origin of characteristic X-rays. **(P Y)**

Previous Year Questions :

9. Write the properties of canal rays.
10. Describe Laue experiment. What are the facts established by it?

11. An electron beam passes through a transverse magnetic field of 2×10^{-3} tesla and an electric field E of 3.4×10^{4} V/m acting simultaneously. If the path of the electrons remains undeviated, what will be the radius of the electron path?
12. An α-particle is projected with an energy of 4 MeV directly towards a gold nucleus. Calculate the distance of its closest approach. Given atomic number of gold = 79, Atomic number of α -particle = 2. **(Eg)**
13. Wavelength of Balmer Second line is 4861 Å. Calculate the wavelength of the first line. **(Eg)**
14. In Bragg's spectrometer the glancing angle for first order spectrum was observed to be 8°. Calculate the wavelength of X-rays, if $d=2.82 \times 10^{-10}$ m. At what angle will the second maximum occur? **(Eg)**

Ten Mark Questions:

Book Back Questions :

1. Describe J.J.Thomson method for determining the specific charge of electron. **(P Y)**
2. Describe Millikan's oil drop experiment to determine the charge of an electron. **(P Y)**
3. State the postulates of Bohr atom model. Obtain the expression for the radius of the n^{th} orbit of an electron based on Bohr's theory. **(P Y)**
4. State and obtain Bragg's law. Explain how a Bragg's spectrometer can be used to determine the wavelength of X-rays. **(P Y)**
5. Explain the working of Ruby laser with neat sketch. **(P Y)**
6. With the help of energy level diagram, explain the working of He-Ne laser. **(P Y)**

Previous Year Questions :

7. Explain how Bragg's spectrometer can be used to determine the wavelength of X – rays? Write any five properties of X – rays.

VII. DUAL NATURE OF RADIATION AND MATTER AND RELATIVITY

One Mark Questions

Book Back Questions :

1. A photon of frequency ν is incident on a metal surface of threshold frequency ν_0, The kinetic energy of the emitted photoelectron is **(P Y)**
   a) $h(\nu - \nu_0)$ b) $h\nu$ c) $h\nu_0$ d) $h(\nu + \nu_0)$
2. The work function of a photoelectric material is 3.3 eV. The threshold frequency will be equal to **(P Y)**
   a) 8×10^{14} Hz b) 8×10^{10} Hz c) 5×10^{20} Hz d) 4×10^{14} Hz
3. The stopping potential of a metal surface is independent of **(P Y)**
   a) frequency of incident radiation
   b) intensity of incident radiation
   c) the nature of the metal surface
   d) velocity of the electrons emitted
4. At the threshold frequency, the velocity of the electron is **(P Y)**
   a) zero b) maximum c) minimum d) infinite
5. The photoelectric effect can be explained on the basis of **(P Y)**
   a) corpuscular theory of light b) wave theory of light
   c) electromagnetic theory of light **d) quantum theory of light**
6. The wavelength of the matter wave is independent of **(P Y)**
   a) mass b) velocity c) momentum **d) charge**
7. If the kinetic energy of the moving particle is E, then the de Broglie wavelength is **(P Y)**
   a) $\lambda = \frac{h}{\sqrt{2mE}}$ b) $\lambda = \frac{\sqrt{2mE}}{h}$ c) $\lambda = h\sqrt{2mE}$ d) $\lambda = \frac{h}{E\sqrt{2m}}$
8. The momentum of the electron having wavelength 2Å is **(P Y)**
   a) 3.3×10^{24} kg m s^{-1} b) 6.6×10^{24} kg m s^{-1}
   c) 3.3×10^{-24} kg m s^{-1} d) 6.6×10^{-24} kg m s^{-1}
9. According to relativity, the length of a rod in motion **(P Y)**
   a) is same as its rest length
   b) is more than its rest length
   c) is less than its rest length
   d) may be more or less than or equal to rest length depending on the speed of the rod

10. If 1 kg of a substance is fully converted in to energy, then the energy produced is **(P Y)**

a) 9×10^{16} J b) 9×10^{24} J c) 1 J d) 3×10^{8}J

Previous Year Questions :

11. The value of stopping potential when the frequency of light is equal to the threshold frequency is

a) maximum **b) zero** c) minimum d) infinity

12. In photoelectric effect, a graph is drawn taking the frequency of incident radiation along X- axis and the corresponding stopping potential along the Y – axis. The nature of the graph is

a) a straight line passing through origin

b) a straight line having positive Y – intercept

c) a straight line having negative Y – intercept

d) a parabola

13. A graph is drawn taking frequency of incident radiation (ν) along the X-axis and its stopping potential (V_0) along the y-axis. The nature of the graph is

a) a straight line b) a parabola c) an ellipse d) a circle

14. In the photoelectric phenomenon if the ratio of the frequency of incident radiation incident on a photosensitive surface is 1 : 2 : 3, the ratio of the photoelectric current is _____

a) 1 : 2 : 3 b) $\sqrt{1} : \sqrt{2} : \sqrt{3}$ c) 1 : 4 : 9 **d) 1 : 1 : 1**

15. Two photons, each of energy 2.5 eV are simultaneously incident on the metal surface. If the work function of the metal is 4.5 eV, then from the surface of the metal

a) one electron will be emitted

b) two electrons will be emitted

c) more than two electrons will be emitted

d) not a single electron will be emitted

16. Einsten's photoelectric equation is

a) $w + h\nu = \frac{1}{2} m v^2_{max}$ b) $\frac{1}{2} m v^2_{max} = w$ c) $h\nu = \frac{1}{2} m v^2_{max} - w$ **d)** $\mathbf{W + \frac{1}{2} m v^2_{max} = h\nu}$

17. A photon of energy 2E is incident on a photosensitive surface of photoelectric work function E. The maximum KE of photoelectron emitted is _____

a) E b) 2E c) 3E d) 4E

18. The work function of a metal is 6.626×10^{-19} J. The threshold frequency is

a) 1×10^{15} Hz b) 10×10^{-19} Hz c) 1×10^{-15} Hz d) 10×10^{19} Hz

19. If c is the velocity, γ the frequency and λ the wavelength of a radiation, then its frequency is defined as — — — —
a) the number of waves in a distance of one metre
b) the number of waves in a distance of λ
c) the number of waves in a distance of c
d) the number of waves produced in a period of T second

20. When the momentum of a particle increases, its de – Broglie wavelength — —
a) increases **b) decreases** c) does not change d) infinity

21. An electron of a mass m and charge e accelerated from rest through a potential of V volt, then its final velocity is

a) $\sqrt{\frac{Ve}{m}}$ b) $\sqrt{\frac{Ve}{2m}}$ **c)** $\sqrt{\frac{\mathbf{2Ve}}{\mathbf{m}}}$ d) $\frac{2Ve}{m}$

22. The de Broglie wavelength of electron accelerated with a potential V is

a) $\lambda = \frac{h}{\sqrt{Vem}}$ **b)** $\boldsymbol{\lambda = \frac{h}{\sqrt{2Vem}}}$ c) $\lambda = \frac{h}{m\sqrt{2Vem}}$ d) $\lambda = \frac{h}{m\sqrt{Ve/m}}$

23. When an electron is accelerated with potential difference V, its de – Broglie wavelength is directly proportional to _____
a) V b) V^{-1} c) $V^{1/2}$ **d)** $\mathbf{V^{-1/2}}$

24. If the radius of third orbit of hydrogen atom is r, then the de Broglie wave length of electron in this orbit is
a) $\frac{r}{3}$ b) 3 r **c)** $\frac{\mathbf{2\pi r}}{\mathbf{3}}$ d) $3(2\pi r)$

25. Electron microscope works on the principle of
a) photoelectric effect b) particle nature of electron
c) wave nature of moving electron d) dual nature of matter.

26. According to special theory of relativity the only constant in all frames of reference is
a) mass b) length c) time **d) velocity of light**

27. When a material particle of rest mass 'm_0' attains the velocity of light, its mass becomes
a) 0 b) $2 m_0$ c) $4 m_0$ **d)** ∞

28. Which one of the particle having zero mass and energy
a) electron **b) photon** c) proton d) neutron

29. Photons has
a) energy but zero mass b) mass but zero energy
c) zero mass and zero energy d) infinite mass and energy

30. The length of the rod placed inside a rocket is measured as 1m by an observer inside the rocket which is at rest. When the rocket moves with a speed of 36 x 10^6 km / hr. The length of the rod as measured by the same observer is

a) 0.997 m b) 1.003 m **c) 1 m** d) 1.006 m

31. The number of de - broglie waves of an electron in the n th orbit of an atom is

a) n b) n - 1 c) n + 1 d) 2n

PTA Objective Questions :

1. Photoelectric effect can be explained on the basis of _____

a) corpuscular theory b) wave theory

c) Electromagnetic theory **d) quantum theory**

2. At threshold frequency, the velocity of electrons is _____

a) zero b) maximum c) minimum d) infinity

3. The wavelength of matter waves is independent of _____

a) mass b) velocity c) momentum **d) charge**

4. A photon of frequency ν is incident on a metal surface of threshold frequency ν_0. The kinetic energy of emitted photo electron is _____

a) $\mathbf{h(\nu - \nu_0)}$ b) $h\nu$ c) $h\nu_0$ d) $h(\nu + \nu_0)$

5. According to relativity the length of rod in motion _____

a) is same as its rest length

b) is more than its rest length

c) is less than its rest length

d) may be more or less than or equal to rest length depends on the speed of the rod

6. Focal length of the electromagnetic lens used in an electron microscope depends on _____

a) the velocity of electrons

b) the magnitude of the current passing through energizing coils

c) the medium between the energizing coils

d) all the above

7. photoelectric current depends upon _____

a) intensity of incident light b) frequency of incident light

c) the potential difference between two plates **d) all the above**

8. Electron microscope is operated in _____

a) high pressure **b) high vacuum**

c) normal pressure d) none of the above

9. Stopping potential of a metal surface is independent of _____
   a) frequency of incident radiation **b) intensity of incident radiation**
   c) the nature of metal surface d) velocity of electron emitted

10. If the KE of a moving particle is E, then the deBroglie wavelength is _____
   a) $\lambda = h/\sqrt{2mE}$ b) $\lambda = \sqrt{2mE}/h$ c) $\lambda = h\sqrt{2mE}$ d) $\lambda = E\sqrt{2mh}$

11. In Photo cell the light energy is converted into _____
   a) sound energy b) magnetic energy **c) electric energy** d) heat energy

12. The mathematical form of Einstein's photoelectric equation is
   a) $h\nu = \frac{1}{2} mv^2_{max}$ **b)** $h\nu - h\nu_0 = \frac{1}{2} mv^2_{max}$
   c) $h\nu = W - \frac{1}{2} mv^2_{max}$ d) $h\nu = W + h\nu_0$

13. The maximum KE of the photoelectrons _____
   a) increases with intensity of incident light
   b) decreases with intensity of incident light
   c) varies linearly with the frequency of incident light
   d) varies exponentially with the frequency of the incident light

14. Current produced by a photoelectric cell is _____ of the incident light.
   a) proportional to the intensity b) inversely proportional to the intensity
   c) independent of intensity d) proportional to the frequency

15. The linear momentum of de Broglie wave is _____
   a) h/p b) λ/P **c)** h/λ d) λ/h^2

16. The resolving power of an electron microscope will be _____ than that of an optical microscope
   a) 10, 000 times greater **b) 1,00,000 times greater**
   c) 1,00,000 times lesser d) 10,000 times lesser

17. The relation between the mass of a body at rest (m_0) and the mass of the same body moving with a velocity v is _____
   a) $m = m_0$ b) $m = \frac{m_o}{\sqrt{1 - \frac{C^2}{V^2}}}$ **c)** $m = \frac{m_o}{\sqrt{1 - \frac{V^2}{C^2}}}$ d) $m = \frac{m_o}{\sqrt{\frac{V^2}{C^2} - 1}}$

18. When the frequency of incident radiation increases the value of stopping potential _____
   a) will decrease **b) will increase**
   c) remains the same d) will not increase

19. When the intensity of light incident on a photoelectric surface is doubled,
a) the frequency of emitted photons will be doubled
b) the number of photoelectrons will be doubled
c) the number photoelectrons will become 4 times
d) there is no effect at all

20. The potential which is just sufficient to bring the photoelectric current to zero is called _____ potential
a) photoelectric b) threshold **c) stopping** d) minimum

21. The electron microscope is based on the principle of _____
a) photoelectric effect b) dual nature of electron
c) particle nature of electron **d) wave nature of moving electrons**

22. The rest mass of photon is
a) $h\nu$ b) $h\nu/C$ c) $C/h\nu$ **d) zero**

23. de Broglie wavelength λ of a particle is related to its kinetic energy E by the relation
a) $\lambda \alpha E$ b) $\lambda \alpha 1/E$ c) $\lambda \alpha \sqrt{E}$ **d) $\lambda \alpha 1/\sqrt{E}$**

24. The energy required to bring the electrons of maximum velocity to rest is _____
a) eV **b) eV_0** c) $\frac{1}{2}mv^2$ d) mv^2

25. The Phenomenon of photoelectric effect is
a) spontaneous process **b) instantaneous process**
c) continuous process d) stimulated process

26. The cathode of a photo emissive cell is coated with
a) low work function material b) high work function material
c) light sensitive material d) reflecting material

27. Newton's laws are not valid in
a) inertial frames **b) non-inertial frames**
c) all frames d) reference frames

28. In the photo emissive cell, the anode is made up of
a) copper b) gold **c) platinum** d) zinc

29. Photoelectric cells are used in
a) reproducing sound in cinematography
b) controlling the temperature of the furnace
c) automatic switching on & off of street lights **d) all the above**

30. In Newton's mechanics which of the following is treated as absolute ?
a) mass b) time c) length & space **d) all the above**

31. According to the special theory of relativity, the velocity of light in free space is
a) dependent on the motion of the source
b) dependent on the motion of the observer
c) independent of the motion of the observer
d) a constant in all frames of reference

32. The clock in moving space will appear to
a) go slower than the clock on the earth
b) go faster than the clock on the earth c) be the same as on the earth
d) come to rest compared to the clock on the earth

33. _____ demonstrated photoelectric effect experimentally first
a) J.J. Thomson **b) Hallwachs** c) Richardson d) de Broglie

34. The relationship between stopping potential V_0 & KE of electrons is given as
a) $eV_o = mv^2_{max}$ b) $eV_0 = \frac{1}{2} mv_{max}$ **c) $eV_0 = \frac{1}{2} mv^2_{max}$** d) $V_0 = \frac{1}{2} mv^2_{max}$

35. The momentum of electron having wavelength 2Å
a) 3.3×10^{24} kgms^{-1} b) 6.6×10^{24} kgms^{-1}
c) 3.3×10^{-24} kgms^{-1} d) 6.6×10^{-24} kgms^{-1}

36. If 1 kg of a substance is fully converted into energy, then the energy produced is
a) 9×10^{16} J b) 9×10^{24} J c) 1 J d) 3×10^{24} J

37. When a material particle of rest mass m_0 attains a speed C, its mass becomes
a) 0 b) $2 m_0$ c) $4 m_0$ **d) ∞**

38. Light of frequency 1.5 times the threshold frequency is incident on a photo sensitive material. If the frequency is halved and intensity is doubled, the photoelectric current becomes
a) quadrupled b) doubled c) halved **d) zero**

39. The work function of a photoelectric material is 3.3 eV. The threshold frequency will be equal to
a) 8×10^{14} Hz b) 8×10^{10} Hz c) 5×10^{20} Hz d) 4×10^{14} Hz

40. If the electron is moving with a velocity of 500 km/s then the de Broglie wave length is
a) 500 m b) 9.11 Å **c) 14.5 Å** d) 66.2 Å

41. An electron of mass 'm' and charge 'e' accelerated from rest through a potential of V volt. then its final velocity
a) $\sqrt{Ve/m}$ b) $\sqrt{Ve/2m}$ **c) $\sqrt{2Ve/m}$** d) 2Ve/m

42. The de Broglie wavelength of an object of mass 0.03 kg moving with a velocity 20 m/s
a) 2.1×10^{-34} m **b) 1.1×10^{-33} m** c) 6.6×10^{-34} m d) 3.3×10^{-33} m

43. The frequency of photon having an energy of 413 eV is
a) 10^{18} Hz **b) 10^{17} Hz** c) 10^{16} Hz d) 10^{15} Hz

44. The wave number of light of radiation of wavelength 5000 Å is
a) 2×10^{-7} m^{-1} b) 2×10^{-6} m^{-1} c) 5×10^{-7} m^{-1} **d) 2×10^{6} m^{-1}**

45. Threshold frequency of a metal is 3×10^{13} Hz, then its work function
a) 4×10^{-19} J b) 3×10^{-19} J **c) 2×10^{-20} J** d) 5×10^{-19} J

46. If the momentum of a radiating photon is 3.3×10^{-29} kg ms^{-1} then its wavelength is
a) 6×10^{-3} m b) 3×10^{-3} m c) 2×10^{-3} m **d) 2×10^{-5} m**

47. de Broglie wavelength of a proton moving with $1/15^{th}$ of velocity of light is
a) 3×10^{-14} m b) 2×10^{-15} m **c) 2×10^{-14} m** d) 3×10^{-16} m

48. The de Brolie wavelength of an electron having KE of 20 eV is
a) 0.275 nm b) 2.75 Å c) 27.5 nm d) 0.275 Å

49. A particle of mass 10^{-34} kg is moving with a speed of 1.8×10^{8} m/s. The mass of the particle when it is in motion is
a) 12.5×10^{-24} kg **b) 1.25×10^{-24} kg** c) 0.125×10^{-24}kg d) 12.5×10^{-22} kg

50. On a metal surface two photons of energy 1eV and 2.5eV falls consecutively. The work function of the metal is 0.5 eV. What is the ratio of maximum velocity of two photons ?
a) 1 : 4 b) 1 : 1 c) 2 : 1 **d) 1 : 2**

51. The wavelength of X-rays is about than that of visible light
a) 2000 to 3000 times greater b) 3000 to 4000 times lesser
c) 2000 to 3000 times lesser d) 3000 to 4000 times greater

52. The wavelength of electrons accelerated by a potential difference of 60,000 V is about
a) 3×10^{-12} m **b) 5×10^{-12} m** c) 5×10^{-10} m d) 4×10^{-10} m

53. Proton when accelerated through a potential difference of V volt has a wavelength λ associated with it. An alpha particle in order to have the same wave length must be accelerated through the voltage
a) V b) V **c) V/8** d) 2V

54. If an electron is accelerated by a potential of 54 kV, then its de Broglie wave length is
a) 3.34 Å **b) 1.67 Å** c) 16.7 Å d) 0.84 Å

55. If the wavelength of an electron is 7.218 Å then its velocity is
a) 10^3 m/s **b) 10^6 m/s** c) 10^{12} m/s d) 10^9 m/s

56. If the wavelength of electron is 50 x 10^{-13} m, then the potential difference applied is
a) 12,000 V **b) 60,000 V** c) 6,000 V d) 120,000 V

57. The momentum of photon of wavelength 6600 Å
a) 10^{27} kgms^{-1} **b) 10^{-27} kgms^{-1}** c) 10^{19} kgms^{-1} d) 10^{-19} kgms^{-1}

58. The wavelength of electron having momentum 3.3 x 10^{-24} m/s is
a) 10Å **b) 2Å** c) 20Å d) 1Å

59. The wavelength of proton having frequency 1.5 x 10^{13} Hz is
a) 2 x 10^{-10} m **b) 2 x 10^{-5} m** c) 0.2Å d) 20Å

60. The de Broglie wavelength of proton accelerated through a p.d. of 823 V is
a) 10^{-12} m b) 10^{-10} m c) 10^{-8} m d) 2.417 Å

61. The momentum of a proton and an alpha particle are equal. The mass of alpha particle is four times the mass of proton. The ratio of wavelength associated with them
a) 1 : 4 b) 4 : 1 **c) 1 : 1** d) 1 : 2

62. An alpha particle and a proton are accelerated through the same potential. The ratio of their de Broglie wavelength is
a) 1 : 1 b) 1 : 2 c) 1 : 3 **d) $1:2\sqrt{2}$**

63. The frequency of photon of energy 65 eV is
a) 1.57 x 10^{16} Hz b) 1.57 x 10^{15} Hz
c) 1.04 x 10^{15} Hz d) 1.04 x 10^{16} Hz

64. The energy required for the transition n = 2 to n = ∞
a) 3.4 eV b) 1.7 eV c) 6.8 eV d) -13.6 eV

65. Threshold frequency of metal is 10^{15} Hz, the frequency of incident light is 2 x 10^{15} Hz then the energy of photo electron emitted is
a) 6.6 J **b) 6.625 x 10^{-19} J** c) 12.25 x 10^{19}J d) 2.25 x 10^{-19} J

66. If threshold wavelength of sodium is 6800 Å, what is its work function ?
a) 0.91 eV b) 13.6 eV **c) 1.82 eV** d) 1.72 eV

67. The energy of incident UV rays on aluminium metal of work function 4.2 eV is 6.2 eV. Then the kinetic energy of emitted photoelectron is
a) 3 x 10^{-17} J **b) 3 x 10^{-19} J** c) 3 x 10^{29} J d) 6 x 10^{-19} J

68. A light of wavelength 4000Å falls on metal surface of work function 2eV. Then the maximum kinetic energy of emitted photon is
a) 2 eV **b) 1.1 eV** c) 1.5 eV d) 0.5 eV

Three Mark Questions:

Book Back Questions :

1. What is photo electric effect?
2. Define stopping potential. **(P Y)**
3. Define threshold frequency.
4. Define work function.
5. What are photo cells and give their types.
6. Write any three applications of photo-cells? **(P Y)**
7. What are matter waves?
8. Mention the applications of electron microscope. **(P Y)**
9. Define frame of reference and what are their types?
10. State the postulates of special theory of relativity. **(P Y)**
11. If a body moves with the velocity of light, what will be its mass? Comment on your result.

Previous Year Questions :

12. Write any three applications of Photoelectric cell.
13. What are the limitations of electron microscope?
14. According to classical mechanics, what is the concept of time?
15. What are inertial and non inertial frames?
16. Difference between inertial and non – intertial frames of reference.
17. Calculate the threshold wavelength of certain metal of work function 1.8 eV
18. What is the de Broglie wavelength of electron of kinetic energy 120 eV? ($h = 6.626 \times 10^{-34}$ Js; $m = 9.1 \times 10^{-31}$ kg) **(Eg)**
19. Find de Broglie wavelength of electron in the fourth orbit of hydrogen atom.

Five Mark Questions:

Book Back Questions :

1. Explain the variation of photoelectric current with applied voltage.
2. State the laws of photoelectric emission. **(P Y)**
3. Explain Einstein's theory of photoelectric effect (or) equation **(P Y)**
4. What are the applications of photo-cells? **(P Y)**
5. Derive an expression for de Broglie wavelength of matter waves. **(P Y)**
6. Draw a neat sketch of an electron microscope. Explain its working. Give its uses and limitations.
7. Discuss the concept of space, time and mass.
8. Explain length contraction. **(P Y)**

9. Explain time dilation. **(P Y)**
10. Derive Einstein's mass energy equivalence. **(P Y)**
11. A proton is moving at a speed of 0.900 time the velocity of light. Find its kinetic energy in joule and MeV. **(Ex) (P Y)**

Previous Year Questions :

12. What is photoelectric effect? State the laws of photo electric emission.
13. Define work function. State the laws of photo – electric emission.
14. Explain the construction and working of a photo emissive cell with diagram.
15. Explain the wave mechanical concept of atom.
16. Explain FitzGerald – Lorentz contraction with an example.
17. The metallic surface when illuminated with light of wavelength 3333Å emits electrons with energies upto 0.6 eV. Calculate the work function of the metal . **(Eg)**
18. The work function of iron is 4.7 eV. calculate the cut off frequency and the corresponding cut off wavelength for this metal. **(Ex)**
19. What is de Broglie wavelength of an electron of kinetic energy 120 eV?
20. How fast would a rocket have to go relative to an observer for its length to be corrected to 99% of its length at rest? **(Eg)**
21. The time interval measured by an observer at rest is 2.5×10^{-8} s. what is the time interval as measured by an observer moving with a velocity v = 0.73c. **(Ex)**
22. At what speed is a particle moving if the mass is equal to three times its rest mass? **(Eg)**

VIII. NUCLEAR PHYSICS

One Mark Questions

Book Back Questions :

1. The nuclear radius of $_4Be^8$ nucleus is **(PY)**
   a) 1.3×10^{-15} m **b) 2.6×10^{-15} m** c) 1.3×10^{-13} m d) 2.6×10^{-13} m
2. The nuclei $_{13}Al^{27}$ and $_{14}Si^{28}$ are example of **(P Y)**
   a) isotopes b) isobars **c) isotones** d) isomers
3. The mass defect of a certain nucleus is found to be 0.03 amu. Its binding energy is **(PY)**
   a) 27.93 eV b) 27.93 KeV **c) 27.93 MeV** d) 27.93 GeV
4. Nuclear fission can be explained by **(PY)**
   a) shell model **b) liquid drop model**
   c) quark model d) Bohr atom model
5. The nucleons in a nucleus are attracted by **(PY)**
   a) gravitational force b) electrostatics force
   c) nuclear force d) magnetic force
6. The ionisation power is maximum for **(P Y)**
   a) neutrons **b) alpha particle** c) gamma rays d) beta particle
7. The half life period of a certain radioactive element with disintegration constant 0.0693 per day is **(P Y)**
   a) 10 days b) 14 days c) 140 days d) 1.4 days
8. The radio isotope used in agriculture is **(P Y)**
   a) $_{15}P^{31}$ **b) $_{15}P^{32}$** c) $_{11}Na^{23}$ d) $_{11}Na^{24}$
9. The average energy released per fission is
   a) 200 eV **b) 200 MeV** c) 200 meV d) 200 GeV
10. The explosion of atom bomb is based on the principle of **(P Y)**
    a) uncontrolled fission reaction b) controlled fission reaction
    c) fusion reaction d) thermonuclear reaction
11. Anaemia can be diagnosied by **(P Y)**
    a) $_{15}P^{31}$ b) $_{15}P^{32}$ **c) $_{26}Fe^{59}$** d) $_{11}Na^{24}$
12. In the nuclear reaction $_{80}Hg^{198} + X \rightarrow {}_{79}Au^{198} + {}_1H^1$, X - stands for **(P Y)**
    a) proton b) electron **c) neutron** d) deutron
13. In β -decay **(P Y)**
    a) atomic number decreases by one b) mass number decreases by one
    c) proton number remains the same **d) neutron number decreases by one**

14. Isotopes have **(P Y)**
a) same mass number but different atomic number
b) same proton number and neutron number
c) same proton number but different neutron number
d) same neutron number but different proton number

15. The time taken by the radioactive element to reduce to 1/e times is **(P Y)**
a) half life **b) mean life** c) half life/2 d) twice the mean life

16. The half life period of N^{13} is 10.1 minute. Its life time is **(P Y)**
a) 5.05 minutes b) 20.2 minutes c) $\frac{10.1}{0.6931}$ minutes **d) infinity**

17. Positive rays of the same element produce two different traces in a Bainbridge mass spectrometer. The positive ions have
a) same mass with different velocity
b) same mass with same velocity
c) different mass with same velocity
d) different mass with different velocity

18. The binding energy of $_{26}Fe^{56}$ nucleus is **(P Y)**
a) 8.8 MeV b) 88 MeV **c) 493 MeV** d) 41.3 MeV

19. The ratio of nuclear density to the density of mercury is about
a) 1.3 x 10^{10} b) 1.3 **c) 1.3 x 10^{13}** d) 1.3 x 10^{4}

Previous Year Questions :

20. Which of the following are isotones?
a) $_{92}U^{235}$ *and* $_{92}U^{238}$ b) $_{8}O^{16}$ *and* $_{7}N^{14}$ c) $_{6}C^{14}$ *and* $_{7}N^{14}$ d) $_{7}N^{14}$ ***and*** $_{6}C^{13}$

21. If the nuclear radius is 2.6 x 10^{-15} m, the mass number will be
a) 2 b) 4 **c) 8** d) 16

22. When mass number increases, nuclear density _____
a) increases b) decreases
c) remains constant d) may increase or decrease

23. One amu is equal to
a) 931 eV b) mass of carbon atom
c) 1.66 x 10^{-27} kg d) mass of electron

24. The energy equivalent of 1 amu is _____
a) 931 MeV b) 931 meV c) 931 eV d) 913 MeV

25. The nuclear force between a proton and another proton inside the nucleus is _____
a) zero **b) short range** c) repulsive d) long range

26. The nuclear force is due to the continuous exchange of particles are called
a) leptons **b) mesons** c) hyperons d) photons

27. Arrange α, β and γ rays in the increasing order of their ionising power
a) $\alpha\,\beta\,\gamma$ b) $\beta\,\alpha\,\gamma$ c) $\gamma\,\beta\,\alpha$ d) $\gamma\,\alpha\,\beta$

28. The penetrating power is maximum for
a) α - particles b) β - particles **c) gamma rays** d) protons

29. An element ${}_{Z}X^{A}$ successively undergoes three α - decays and four β decays and gets converted to an element Y. The mass number and atomic number of the element Y are respectively
a) A-12, Z-2 b) A-12, Z+2 c) A-12, Z+4 d) A-8, Z+2

30. The number of α and β particles emitted when an isotope ${}_{92}U^{238}$ undergoes and decays to form ${}_{82}Pb^{206}$ are respectively.
a) 6, 8 b) 4, 3 **c) 8, 6** d) 3, 2

31. The radioactive element ${}_{z}X^{A}$ after emitting three α-particles and four β-particles is converted into an element Y represented as
a) ${}_{z-6}Y^{A-12}$ b) ${}_{z+2}Y^{A-12}$ **c) ${}_{z-2}Y^{A-12}$** d) ${}_{z-10}Y^{A-12}$

32. According to the law of disintegration, the number of radioactive atoms that have been decayed during a time of t is
a) N_0 b) N **c) $N_0 - N$** d) $\frac{N_0}{2}$

33. The half-life of a radioactivity element is 300 days. The disintegration constant of the radioactive element is
a) 0.00231 day **b) 0.00231/day** c) 0.0231/day d) 0.0231/day

34. The time taken by a radioactive element of reduce to $e^{-1/2}$ times its original amount is its
a) half - life period b) $\frac{\text{half} - \text{life period}}{2}$
c) mean - life period **d)** $\frac{\textbf{mean} - \textbf{life period}}{\textbf{2}}$

35. The mean life (τ) and half-life ($T_{1/2}$) of a radio activity element are related as
a) $\tau = 2\,T_{1/2}$ **b)** $\boldsymbol{\tau = \frac{T_{1/2}}{0.6931}}$ c) $\tau = 0.6931\,T_{1/2}$ d) $\tau = \frac{T_{1/2}}{2}$

36. The mean life of radon is 5.5 days. Its half-life is _____
a) 8 days b) 2.8 days c) 0.38 days **d) 3.8 days**

37. The unit of disintegration constant is _____
a) no unit b) second **c) second $^{-1}$** d) curie

38. One curie is
a) activity of I gm of uranium b) 1 disintegration / second
c) 3.7 x 10^{10} becquerel d) 1.6 x 10^{12} disintegration / second

39. In the nuclear reaction $_4Be^9 + X \rightarrow {}_6C^{12} + {}_0n^1$, X stands for
a) Proton **b) α-particle** c) Electron d) Deutron

40. Slow neutrons are neutrons having energies between
a) 1000 eV to 2000 eV b) 2000 eV to 0.5 MeV
c) 0 eV to 1000 eV d) 0.5 MeV to 10 MeV

41. In the following nuclear reaction, $_{13}Al^{27} + {}_2He^4 \rightarrow X + {}_0n^1$ the element X is
a) $_{15}Si^{30}$ **b) $_{15}P^{30}$** c) $_{15}S^{30}$ d) $_{15}Si^{29}$

42. Which of the following is used to detect the presence of block in blood vessels?
a) $_{15}P^{31}$ b) $_{15}P^{32}$ c) $_{26}Fe^{59}$ **d) $_{11}Na^{24}$**

43. In the following nuclear reaction $_7N^{14} + {}_0n^1 \rightarrow X + {}_1H^1$ the element X is
a) $_6N^{14}$ **b) $_6C^{14}$** c) $_6O^{14}$ d) $_7C^{13}$

44. The fuel used in Kamini (Kalpakkam mini reactor) is
a) mixture of carbides of uranium and plutonium
b) mixture of oxides of plutonium and uranium
c) $_{92}U^{233}$ d) $_{92}U^{235}$

45. The moderator used in nuclear reactor is
a) cadmium b) Boron carbide **c) heavy water** d)Uranium ($-_{92}U^{235}$)

46. Which of the following is not a moderator?
a) Liquid sodium b) Ordinary water c) Graphite d) Heavy water

47. In a nuclear reactor, cadmium rods are used to _____
a) speed up neutrons b) slow down neutrons
c) absorb neutrons d) remove heat

48. The coolant used in fast breeder reactor is
a) ordinary water b) heavy water **c) liquid sodium** d) boron carbide

49. Hydrogen bomb is based on the principle of _____
a) nuclear fission **b) nuclear fusion**
c) nuclear force d) carbon nitrogen cycle

50. In proton – proton cycle four protons fuse together to give _____
a) an α - particle, two neutrinos and energy of 26.7MeV
b) an α - particle, two positrons, two neutrinos and energy of 26.7MeV
c) a helium atom, two positrons, two neutrinos and energy of 26.7 MeV
d) an α - particle, two positrons, two anti – neutrinos and energy of 26.7 MeV

51. The cosmic ray intensity is maximum at a latitude of _____
a) 0° b) 45° **c) 90°** d) 60°

52. Particle that has no charge and no rest mass but travels with velocity of light is
a) baryon b) meson c) lepton **d) photon**

53. The particle which has zero mass but has energy, is
a) electron **b) photon** c) proton d) neutron

54. Which of the following particles is a lepton?
a) Electron b) Proton c) Neutron d) Meson

55. Which of the following is massless and chargeless but carrier of energy and spin? _____
a) neutrino b) muon c) pion d) kaon

56. Which of the following belongs to Baryon group?
a) Photon b) Electron c) Pion **d) Proton**

57. Coolant acts in fast breeder reactor is
a) ordinary water b) heavy water
c) liquid sodium d) liquid helium

58. The radio - isotope used in the treatment of skin diseases is :
a) Co^{60} b) Na^{24} c) Fe^{59} **d) P^{32}**

59. The nature of the electrostatic force and nuclear force between a proton and a neutron inside a nucleus are respectively :
a) repulsive and attractive **b) zero and attractive**
c) repulsive and repulsive d) attractive and attractive

60. The binding energy per nucleon of $_{26}Fe^{56}$ nucleus is
a) 8.8 Mev b) 88 Mev c) 493 Mev d) 41.3 Mev

61. The decay constant of a free neutron is
a) 0.013 minute $^{-1}$ **b) 0.053 minute $^{-1}$** c) 3 minutes d) 0.069 minute $^{-1}$

PTA Objective Questions :

1. Mass of proton is _____ times the mass of electron
a) 2 **b) 1836** c) 1636 d) 1863

2. Number of neutrons in $_{17}Cl^{35}$ is
a) 17 **b) 18** c) 35 d) 19

3. Since the atoms of Isotopes have idential electronic structure, they have
a) equal number of neutrons b) identical physical properties
c) identical chemical properties d) dissimilar chemical properties

4. Isobars are
   a) different nucelei of same element
   b) having similar physical and chemical properties
   c) identical nuclei of different elements
   d) having different physical and chemical properties

5. Emprical relation between radius of nucleus (R) and its mass number (A) is given by
   a) $R=r_0A^4$ b) $R=r_0^3A^4$ c) $R=r_0^3A^{1/3}$ **d) $R=r_0A^{1/3}$**

6. In an emprical relation connecting radius of nucleus (R) and its mass number (A), then value of r_0 is
   a) 1.3×10^{-3} F b) 1.3×10^{-15} F **c) 1.3×10^{-15} m** d) 13 F

7. If the nuclear density of $_1H^2$ nuclei is 1.816×10^{17} kgm^{-3} then the nuclear density of $_2He^4$ nuclei is
   a) $2 \times 1.816 \times 10^{17}$ kg m^{-3} b) $1.816 / 4 \times 10^{17}$ kg m^{-3}
   c) $4 \times 1.816 \times 10^{17}$ kg m^{-3} **d) 1.816×10^{17} kg m^{-3}**

8. The charge of $_8O^{16}$ nuclei is
   a) 1.6×10^{-19} C b) -12.8×10^{-19} C **c) 1.228×10^{-18} C** d) 2.56×10^{-18} C

9. Examples of isobars are
   a) $_1H^1$ and $_2He^4$ b) $_1H^2$ and $_2He^3$ **c) $_1H^3$ and $_2He^3$** d) $_1H^1$ and $_2He^4$

10. The nuclear radius of $_4Be^8$ is
    a) 1.3×10^{-15} m **b) 2.6×10^{-15} m** c) 1.3×10^{-13} m d) 2.6×10^{-13} m

11. The nuclei $_{13}Al^{27}$ and $_{14}Si^{28}$ are examples of _____
    a) isotopes b) isobars **c) isotones** d) isomers

12. Isotopes have _____
    a) same mass number but different atomic number
    b) same proton number and neutron number
    c) same proton number but different neutron number
    d) same neutron number but different proton number

13. The ratio of nuclear density to the density of mercury is about
    a) 1.3×10^{10} b) 1.3 **c) 1.3×10^{13}** d) 1.3×10^4

14. The electrons in the atom of an element which determine its chemical and electrical properties are called _____
    a) active electrons b) revolving electrons
    c) excess electrons **d) valence electrons**

15. The ratio of radii of two nuclei is 1 : 2. The ratio of their mass number is _____
    a) 1 : 4 b) 8 : 1 **c) 1 : 8** d) 1 : 16

16. Energy equivalence of 1 amu is
a) 931 eV b) 913 eV **c) 931 MeV** d) 913 MeV

17. In $\frac{B.E}{A}$ graph, beyond A = 120, the binding energy per nucleon is
a) decreases rapidly b) increases slowly
c) decreases slowly d) a constant

18. The binding energy of $_{26}Fe^{56}$ nucleus is _____
a) 8.8 MeV b) 88 MeV **c) 493 MeV** d) 41.3 MeV

19. The energy equivalent of 1 amu is = _____
a) 981 MeV b) 913 MeV **c) 931 MeV** d) 942 MeV

20. The mass defect of certain nucleus is found to be 0.03 amu. Its binding energy is _____
a) 27.93 eV b) 27.93 KeV **c) 27.93 MeV** d) 27.93 GeV

21. The mass of proton is 1.007277 amu and that of neutron is 1.008665 amu. If the mass of $_1H^2$ = 2.01473 amu. Then the binding energy of $_1H^2$ is _____
a) 1.128 MeV b) 0.164 c) 1.52 MeV d) 2.42 MeV

22. In Bainbridge mass spectrometer, the velocity selector is
a) v = F/q b) v = B/q **c) v = E/B** d) v = Eq/B

23. In Bainbridge mass spectrometer, the mass of an ion is
a) $\frac{BRq}{B'E}$ b) $\frac{B'Rq}{BE}$ **c)** $\frac{\mathbf{BB'Rq}}{\mathbf{E}}$ d) $\frac{}{BB'Rq}$

24. In Bainbridge mass spectrometer, the distance between the opening of the chamber and the position of the dark line gives
a) the radius **b) the diameter** c) half the radius d) twice the diameter

25. Positive rays of the same element produce two different traces in a Bainbridge mass spectrometer. The positive ions have
a) same mass with different velocity b) same mass with same velocity
c) different mass with same velocity
d) different mass with different velocity

26. Ratio of strength of nuclear force to that of gravitational force is
a) 10^{-40} b) 10^{-20} c) 10^{20} **d) 10^{40}**

27. According to present view of the nuclear force, the force that binds the protons and neutrons is a
a) electrostatic force b) magnetic force
c) secondary force d) gravitational force

28. The nucleons in a nucleus are attracted by
a) gravitational force b) electrostatic force
c) nuclear force d) magnetic force

29. Nuclear forces were explained by
a) Chadwick b) Bohr c) Curie **d) Yukawa**

30. Nuclear force is acting between
a) neutron - neutron only b) proton - proton only
c) neutron - proton only **d) all the above**

31. Nuclear force is a
a) long range force **b) short range force**
c) repulsive force d) charge based force

32. During the radioactive disintegration of radium $_{88}Ra^{226}$ into Radon $_{86}Rn^{222}$, the energy of gamma ray emited is about
a) 18.7 MeV **b) 0.187 MeV** c) 1.87 MeV d) 187 MeV

33. According to the concept of Yukawa, the particles which exchange between the nucleon are responsible for the origin of nuclear force are
a) photons b) Leptons **c) mesons** d) baryons

34. Nuclear density
a) depends on atomic number **b) is a constant**
c) depends on neutron number d) depends on mass number

35. 1 amu is equal to
a) 1.494×10^{-10} J b) 14.94×10^{-10} J c) 931 J d) 931 eV

36. Energy released per nuclear fusion
a) 200 MeV b) 26.7 eV c) 2.67 MeV **d) 26.7 MeV**

37. Of the following isotonic nuclei are
a) $_{11}Na^{22}, _{12}Mg^{24}$ **b) $_{11}Na^{24}, _{10}Ne^{23}$** c) $_{12}Mg^{24}, _{11}Na^{24}$ d) $_{10}Ne^{23}, _{11}Na^{22}$

38. Acticity of one gram of radium is
a) 3.7×10^{10} becquerel b) 3.7 curie
c) 3.7×10^{10} curie d) 1 becquerel

39. An equation for a free neutron decay is
a) $_0n^1 \rightarrow {}_1H^1 + {}_{-1}e^0 + \bar{\nu}$ b) $_0n^1 \rightarrow {}_{-1}e^0 + {}_1H^2 + +\nu$
c) $_0n^1 \rightarrow {}_1H^1 + {}_{-1}e^0 + \nu$ d) $_0n^1 \rightarrow {}_1H^1 + {}_1e^0 + \nu$

40. In pressurised heavy water reactors, the fuel used is
a) uranium b) uranium carbide
c) uranium oxide d) Low enriched uranium

41. In the reaction $_{90}Th^{234} \rightarrow {}_{91}Pa^{234} + x$, the particle emitted is
a) α **b) β** c) γ d) photon

42. The ionization power is minimum for
a) alpha particles b) β - particles **c) gamma rays** d) electron

43. Which one travels with velocity of light ?
a) α ray b) β ray **c) γ ray** d) cathode ray

44. When a gamma ray is emitted from a radioactive atom
a) only its mass number changes
b) only its atomic number changes
c) both mass number and atomic number changes
d) neither mass number nor atomic number changes

45. In beta decay,
a) atomic number decreases by one b) mass number decreases by one
c) proton number remains the same **d) neutron number decreases by one**

46. In which of the following decays the element does not change
a) α decay b) β decay **c) γ decay** d) neutron decay

47. An alpha particle has
a) a charge +e b) the mass equal to deutron
c) a charge -2e **d) charge to mass ratio equal to that of a deutron**

48. In beta decay
a) atomic number increases by one b) neutron number increases by one
c) mass number decrease by one d) proton number remains the same

49. The relation connecting half life and mean life of a radioactive sample is
a) $\tau = 0.6931T$ b) $T = \frac{0.6931}{\tau}$ c) $T = \frac{0.6931}{\tau}$ **d) $T = 0.6931\,\tau$**

50. Activity of one gram of radium is equal to
a) 1 roentgen **b) 1 curie** c) 1 henry d) 1 second

51. Isotope used to locate brain tumour is
a) Na^{24} **b) I^{131}** c) Fe^{59} d) P^{32}

52. Isotope used in the treatment of skin disease is
a) Na^{24} b) I^{131} c) Fe^{59} **d) P^{32}**

53. The ratio of C^{14} and C^{12} atoms in atomsphere is
a) $10^6 : 1$ b) $10^4 : 1$ **c) $1 : 10^6$** d) $1 : 10^4$

54. The exposure of radiation dosage which causes diseases like leukemia is
a) 600 R **b) 100 R** c) 250 mR d) 25 mR

55. The half life period of an isolated neutron is about
a) 31 minutes **b) 13 minutes** c) 13 hours d) 13 seconds

56. The natural radioactive gas is
a) radon b) helium c) oxygen d) krypton

57. The radio isotope used in agriculture is
a) $_{15}P^{31}$ **b) $_{15}P^{32}$** c) $_{11}Na^{23}$ d) $_{11}Na^{24}$

58. Cobalt 60 is used for the treatment of
a) cancer b) heart attack
c) thyroid gland d) maintaining blood circulation

59. Anemia can be diagonised by
a) $_{15}P^{31}$ b) $_{15}P^{32}$ **c) $_{26}Fe^{59}$** d) $_{11}Na^{24}$

60. The half life period of radio carbon is
a) 2800 years **b) 5600 years** c) 4200 years d) 5300 years

61. A radioactive substance has a half life period of 30 days. The disintegration constant is
a) 0.023 / day b) 0.231 / day c) 2.31 / day d) 23.1 / day

62. The half life of a certain radioactive element with disintegration constant 0.0693 per day is
a) 10 days b) 14 days c) 140 days d) 1.4 days

63. The half life period of N^{13} is 10.1 minute. Its life time is
a) 5.05 minutes b) 20.2 minutes c) 10.1 / 0.693 minutes **d) infinity**

64. The half life of a radioactive substance is 5 minutes. The amount of substance decayed in 20 minutes will be
a) 93.75 % b) 75 % c) 25% d) 6.25 %

65. In nuclear fission 0.1% mass is converted into energy. The energy released by the fission of 1kg mass will be
a) 9×10^{16} J b) 9×10^{19} J **c) 9×10^{13} J** d) 9×10^{17} J

66. The percentage of initial quantity of a radioactive element remaining undecayed after six half life period is
a) 3% b) 6.25 % c) 1% **d) 1.5 %**

67. Which of the following statement is wrong ? In nuclear reaction
a) the sum of initial atomic numbers is equal to sum of the final atomic numbers
b) law of conservation of charge is satisfied
c) conservation of nucleons is satisfied
d) the initial rest mass is equal to the final rest mass

68. An example for electrostatic accelerator is
a) Cockcraft - Walton accelerator b) linear accelerator
c) cyclotron d) Betatron

69. The class of accelerators which can accelerate articles only upto few million electron volt are
a) Linear accelerators b) cyclotron accelerator
c) spiral type accelerator **d) electrostatic accelerator**

70. With spiral type accelerators, the particles are accelerated to an energy in the order of
a) few million electron volt b) 10^6 eV
c) 10^9 eV d) 10^{-9} eV

71. The first instrument to record the visual observation of the tracks of the charged particles when they pass through matter is
a) geiger - muller counter **b) Wilson's cloud chamber**
c) Vandegraff generator d) Cyclotron

72. Average number of neutrons released per fission of uramium is
a) 2 b) 3 **c) 2.5** d) 3.5

73. The instrument used to measure the intensity of radioactive radiation is
a) cyclotron b) Bainbridge spectrometer
c) electron microscope **d) Geiger - Muller counter**

74. The rest mass of mesons vary between
a) 250 m_e - 1000 m_p b) 250 m_p - 1000 m_p
c) 250 m_e - 1000 m_e d) 250 m_e - 1000 m_e

75. In fast breeder reactors,
a) heavy water used as moderator b) graphite is used as moderator
c) ordinary water is used as moderator **d) no moderator is required**

76. The average energy released per fission is
a) 200 eV **b) 200 MeV** c) 200 meV d) 200 GeV

77. The explosion of atom bomb is based on the principle of
a) uncontrolled fission reaction b) controlled fission reaction
c) fusion reaction d) thermonuclear reaction

78. Which of the following is not a moderator ?
a) heavy water b) paraffin c) graphite **d) Cadmium**

79. The principle of an atom bomb is
a) nuclear fission b) nuclear fusion
c) conservation of momentum d) collision of simple particles

80. The explosion of atom bomb is based on the principle of
a) uncontrolled fission reaction b) controlled fission reaction
c) fusion reaction d) thermo nuclear reaction

81. In the following reaction ${}_4Be^9 + {}_2He^4 \rightarrow {}_bX^a + {}_0n^1$, the value of 'a' is
a) 16 **b) 12** c) 10 d) 14

82. The fusion reaction in hydrogen bomb is
a) ${}_1H^3 + {}_1H^2 \rightarrow {}_2He^4 + {}_0n^1 + Q$ b) ${}_4{}_1H^3 \rightarrow {}_2{}_1He^4 + {}_2{}_1e^0 + Q$
c) ${}_1H^2 + {}_1H^2 \rightarrow {}_2He^3 + Q$ d) ${}_1H^1 + {}_1H^3 \rightarrow {}_2He^4 + Q$

83. Total energy radiated by sun is about
a) 3.8×10^{-26} j/s **b) 3.8×10^{26} j/s** c) 8.3×10^{-26} j/s d) 8.3×10^{-26} j/s

84. In the nuclear reaction ${}_{80}Hg^{198} + X \rightarrow {}_{79}AU^{198} + {}_1H^1$, X stands
a) proton b) electron **c) neutron** d) deutron

85. The neutrons with energy range 0.5 MeV to 10 MeV are called
a) slow neutrons **b) Fast neutrons**
c) thermal neutrons d) none of the above

86. Slow neutrons are neutrons having energies between _____
a) 1000 eV and 2000 eV b) 2000 eV and 0.5 MeV
c) zero to 1000 eV d) 0.5 MeV and 10 MeV

87. Between latitudes of 42° and 90°, the cosmic ray intensity is
a) minimum b) maximum **c) a constant** d) none of the above

88. _____ is the reason for production of carbon
a) X-rays b) UV rays **c) Cosmic rays** d) gamma rays

89. The cosmic ray intensity is maximum at an altitude _____
a) 10 km **b) 20 km** c) 40 km d) 60 km

90. The cosmic ray intensity is maximum at a place of latitude
a) 0 b) 30° c) 40° **d) 90°**

91. Particles having mass equal to or less than about 207 times the mass of an electron are
a) mesons **b) leptons** c) baryons d) Hyperons

92. Particles possessing rest mass intermediate between $250m_e$ to $1000m_e$ are known as
a) mesons b) leptons c) baryons d) Hyperons

93. Mass of hyperons vary from
a) 1000 m_e and 270 m_e b) 207 times of mass of electron to zero
c) 2180 m_e and 3275 m_e d) m_e and m_p

94. Natural uranium consists of
a) 99.28 % of U^{235} and 0.72% of U^{238} b) 99.28 % of U^{235} and 0.72 % of Pu^{239}
c) 99.28 % of U^{238} and 0.72% of U^{235} d) 99.28 % of U^{238} and 0.72 % of Pu^{239}

95. Energy of the primary cosmic rays is in order of
a) 10^8 MeV b) 10^8 eV c) 10^{18} MeV d) 10^{18} eV

96. Intensity of consmic ray is maximum at a height of about
a) 20 m **b) 20 km** c) 200 m d) 45 km

97. In a nuclear reaction, the mass of product nuclei is 0.03 amu less than the mass of reactant nuclei, then the energy released in the nuclear reaction is
a) 2793 eV b) 2.793 MeV **c) 27.93 MeV** d) 0.2793 MeV

98. A radioactive material of mass 40 milligram becomes 5 milligram in 6 hours then the half life period of the element is
a) 1 hour b) 90 min **c) 2 hours** d) 3 hours

99. A radioactive substance is allowed to decay for a time equal to its mean life. Then the fraction of the element that has decayed is
a) $\frac{1}{e}$ **b)** $\frac{e-1}{e}$ c) e d) $e^2 - 1$

100. The time taken by the radioactive element to reduce to 1/e times is
a) half life **b) mean life** c) half life / 2 d) twice the mean life

101. The safe limit of a person to receive radioactive radiation per week is
a) 250 R b) 25 mR **c) 250 mR** d) 250μR

102. Which of the following is the strongest force in nature ?
a) electrostatic force b) gravitational force
c) nuclear force d) magnetic force

103. Muons belong to
a) photons **b) leptons** c) baryons d) Mesons

104. Nuclear fission can be explained by
a) quark model b) Bohr atom model
c) liquid drop model d) Shell model

Three Mark Questions:

Book Back Questions :

1. Define and calculate the energy equivalence of one atomic mass unit.
2. Give any three characteristics of nuclear forces**. (P Y)**
3. Define radioactivity.
4. Define Curie. **(P Y)**
5. What do you meant by artificial radioactivity? **(P Y)**
6. How do you classify the neutrons in terms of its kinetic energy? **(P Y)**
7. What is artificial transmutation?
8. What is meant by breeder reactor? **(P Y)**
9. What are thermo nuclear reactions?
10. What are cosmic rays? **(P Y)**

Previous Year Questions :

11. Select the pairs of isotopes, isobars and isotones from the following nuclei: ${}_{11}Na^{22}, {}_{12}Mg^{24}, {}_{11}Na^{24}, {}_{10}Ne^{23}$.
12. Calculate the number of atoms in one gram of ${}_{3}Li^{6}$ (Avagadro number = 6.023×10^{23})
13. What is binding energy of nucleus? **(Ex)**
14. What is mass defect?
15. Write any three conclusions obtained for BE curve.
16. What is α -decay? Give example.
17. The radioactive isotope ${}_{84}Po^{214}$ undergoes a successive disintegration of two α -decays and two β -decays. Find the atomic number and mass number of the resulting isotope. **(Ex)**
18. The isotope ${}_{92}U^{238}$ successively undergoes three α - decays and two β - decays. What is the resulting isotope?
19. State the radioactive law of disintegration.
20. Write the methods of production of artificial radio – isotopes.
21. The half-life of ${}_{84}Po^{218}$ is 3 minute. What percentage of the sample has decayed in 15 minutes? **(Ex)**
22. Tritium has a half-life of 12.5 years. What fraction of the sample will be left over after 25 years? **(Ex)**
23. What percentage of a given radioactive substance will be left after 5 half – life periods?
24. Tritium has a half-life of 12.5 years. What fraction of the sample will be left over 50 years?

25. The half-life of radon is 3.8 days. Calculate its mean life. **(Ex)**
26. Write any three properties of neutron.
27. Define roentgen.
28. Define critical size and critical mass.
29. What is the use of control rod in the reactor? Mention any two control rods.
30. What are the uses of nuclear reactors?
31. Write the Proton-Proton cycle that takes place in sun and stars.
32. What is meant by pair production and annihilation?
33. Write a note on Leptons.
34. What are the precautions to be taken by the people who are working in radiation laboratories ?
35. Write any three properties of β rays.

Five Mark Questions:

Book Back Questions :

1. With example explain the classification of the nuclei in terms of its proton number and neutron number.
2. Explain mass defect and binding energy.
3. Show that nuclear density is almost a constant for all the nuclei.
4. Explain the variation of binding energy with mass number by a graph and discuss its features.
5. Explain the different characteristics of nuclear forces. **(P Y)**
6. Explain the Soddy-Fajan's radioactive displacement law. **(P Y)**
7. Obtain the relation between half-life period and decay constant. **(P Y)**
8. Explain how carbon-nitrogen cycle can account for the production of stellar energy.
9. Explain the latitude effect of cosmic rays. **(P Y)**
10. Explain how the intensity of the cosmic rays changes with altitude. **(P Y)**
11. Explain how a cosmic ray shower is formed. **(P Y)**
12. How do you classify the elementary particles into four groups?

Previous Year Questions :

13. Explain the variation of binding energy with mass number and discuss its features. (graph is not necessary)
14. Write the properties of alpha rays.
15. Write a note on the biological hazards of nuclear radiations.
16. Explain the principle and working of an atom bomb.
17. Write the properties of γ - rays

18. Calculate the binding energy and binding energy per nucleon of $_{20}Ca^{40}$ nucleus. Given : mass of 1 proton = 1.007825 amu; mass of 1 neutron = 1.008665 amu; mass of $_{20}Ca^{40}$ = 39.96259 amu. **(Ex)**

19. Calculate the energy released in the following equation : $_{13}Al^{27} + _1H^2 \rightarrow _{12}Mg^{25} + _2He^4$. Given the mass of $_{13}Al^{27}$ nucleus = 26.981535 amu. Mass of $_1H^2$ = 2.014102 amu. Mass of $_{12}Mg^{25}$ = 24.98584 amu. Mass of $_2He^4$ nucleus = 4.002604 amu. **(Eg)**

20. Calculate the energy released in the following equation : $_3Li^6 + _0n^1 \rightarrow _2He^4 + _1H^3$. Given the mass of $_3Li^6$ nucleus = 6.015126 amu. Mass of $_0n^1$ = 1.008665 amu. Mass of $_2He^4$ = 4.002604 amu. Mass of $_1He^3$ nucleus = 3.016349 amu. **(Ex)**

21. Find the energy released when two $_1H^2$ nuclei fuse together to form a single $_2He^4$ nucleus. Give the binding energy per nucleon of $_1H^2$ and $_2He^4$ are 1.1 MeV and 7.0 MeV respectively. **(Ex)**

22. If the mass defect of the nucleus $_6C^{12}$ is 0.098 amu, then calculate the binding energy per nucleon.

23. The binding energy per nucleon for $_6C^{12}$ nucleus is 7.68 MeV and that for $_6C^{13}$ is 7.47 MeV. Calculate the energy required to remove a neutron from $_6C^{13}$ nucleus. **(Eg)**

24. A piece of bone from an archaeological site is found to give a count rate of 15 counts per minute. A similar sample of fresh bone gives a count rate of 19 counts per minute. Calculate the age of the specimen. (Given $T_{½}$ = 5570 years) **(Eg)**

25. Show that the mass of radium ($_{88}Ra^{226}$) with an activity of 1 curie is almost a gram. (Given : $T_{½}$ = 1600 yrs. Curie = 3.7 x 10^{10} disintegrations per second) **(Ex)**

26. The disintegration constant λ of a radioactive element is 0.00231 per day. Calculate its half-life and mean life. **(Ex)**

27. Calculate the time required for 60% of a sample of radon to undergo decay. (Given $T_{½}$ of radon = 3.8 days) **(Eg)**

28. A reactor is developing energy at the rate of 32 MW. Calculate the required number of fissions per second of $_{92}U^{235}$. Assume that energy per fission is 200 MeV. **(Ex)**

29. Calculate the energy released when 1 kg of $_{92}U^{235}$ undergoes nuclear fission. Assume, energy per fission is 200 MeV. Avogadro Number is 6.023×10^{23}. Express your answer in Kilowatt hour also. **(Eg)**

30. Calculate the mass of coal required to produce the same energy as that produced by the fission of 1 kg of U^{235}(Heat of combustion of coal = 33.6×10^{6} Jkg^{-1}. 1 ton = 1000 kg. Energy per fission of U^{235} = 200 MeV. 1eV = 1.6×10^{-19} J, Avogadro number N = 6.023×10^{23}) **(Eg)**

Ten Mark Questions:

Book Back Questions :

1. Discuss the principle and action of a Bainbridge mass spectrometer to determine the isotopic masses. **(P Y)**
2. Obtain an expression to deduce the amount of the radioactive substance present at any moment. Obtain the relation between half life period and decay constant. **(P Y)**
3. Explain the construction and working of a Geiger-Muller counter. **(P Y)**
4. With a neat sketch, explain the working of a nuclear reactor.
5. What are cosmic rays? Explain the latitude and altitude effect. How a cosmic ray shower is formed **(P Y)**

Previous Year Questions :

6. What is a nuclear reactor ? Explain the functions of i) moderator ii) control rods and iii) neutron reflector. Mention the uses of nuclear reactor. (Diagram is not necessary)

IX. SEMICONDUCTOR DEVICES AND THEIR APPLICATIONS

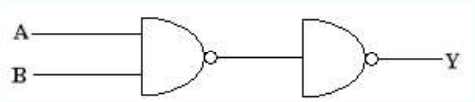
One Mark Questions

Book Back Questions :

1. The electron in the atom of an element which determine its chemical and electrical properties are called
   a)valence electrons b) revolving electrons
   c) excess electrons d) active electrons
2. In an N – type semiconductor, there are
   a) immobile negative ions b) no minority carriers
   c) immobile positive ions d) holes as majority carriers
3. The reverse saturation current in a PN junction diode is only due to **(P Y)**
   a) majority carriers **b) minority carriers**
   c) acceptor ions d) donor ions
4. In the forward bias characteristic curve, a diode appears as **(P Y)**
   a) a high resistance b) a capacitor
   c) an OFF switch **d) an ON switch**
5. Avalanche breakdown is primarily dependent on the phenomenon of **(P Y)**
   a) collision b) ionisation
   c) doping d) recombination
6. The colour of light emitted by a LED depends on **(P Y)**
   a) its reverse bias b) the amount of forward current
   c) its forward bias **d) type of semiconductor material**
7. The emitter bias junction of a given transistor is forward biased and its collector base junction is reverse biased. If the base current is increased, then its
   a) V_{CE} will increase b) I_C will decrease
   c) I_C will increase d) V_{CC} will increase
8. Improper biasing of a transistor circuit produces
   a) heavy loading of emitter current **b) distortion in the output signal**
   c) excessive heat at collector terminal d) faulty location of load line
9. An oscillator is **(P Y)**
   a) an amplifier with feedback b) a convertor of ac to energy
   c) nothing but an amplifier d) an amplifier without feedback
10. In a Colpitt's oscillator circuit **(P Y)**
    a) capacitive feedback is used b) tapped coil is used
    c) no tuned LC circuit is used d) no capacitor is used

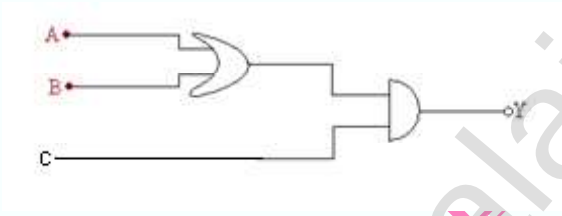
11. Since the input impedance of an ideal operational amplifier is infinite **(P Y)**
a) its input current is zero
b) its output resistance is high
c) its output voltage becomes independent of load resistance
d) it becomes a current controlled device

12. The following arrangements performs the logic function of ____ gate **(P Y)**



a) AND b) OR c) NAND d) EXOR

13. If the output (Y) of the following circuit is 1, the input ABC must be **(P Y)**



a) 0 1 0 b) 1 0 0 **c) 1 0 1** d) 1 1 0

14. According to the laws of Boolean algebra, the expression (A + AB) is equal to **(P Y)**
a) A b) AB c) B d) $\overline{A}$

15. The Boolean expression $\overline{ABC}$ can simplified as **(P Y)**
a) $AB + \overline{C}$ b) $\overline{A}.\overline{B}.\overline{C}$ c) AB + BC + CA **d) $\overline{A} + \overline{B} + \overline{C}$**

Previous Year Questions :

16. The forbidden energy gap for germanium is of the order of
a) 1.1 eV **b) 0.7 eV** c) 0.3 eV d) 10 eV

17. Forbidden energy gap for the semiconductors Ge and Si are respectively
a) 1.1 eV and 0.7 eV **b) 0.7 eV and 1.1 eV**
c) 4 eV and 0.7 eV d) 1.1 eV and 7 eV

18. The forbidden energy of silicon is of the order of
a) 0.1 eV b) 0.3 eV c) 0.7 eV **d) 1.1 eV**

19. The forbidden energy gap for conductors is
a) 0.7 eV b) 1.1eV **c) zero** d) 3 eV

20. One of the following , the donor atoms are
a) silicon and germanium b) aluminum and gallium
c) bismuth and arsenic d) boron and indium

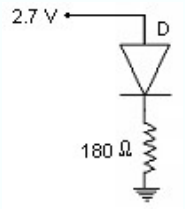
21. An example of n-type semiconductor is _____
a) pure Ge b) pure si
c) Si doped with P d) Ge doped with B

22. In an N-type semiconductor donor level lies _____
a) just below the conduction band b) just above the conduction band
c) just below the valence band d) just above the valence band

23. In a PN junction diode on the side of N but very close to the junction there are
a) donor atoms b) acceptor atoms
c) immovable positive ions d) immovable negative ions

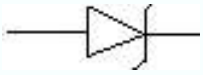
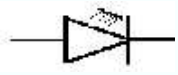
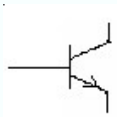
24. The potential barrier of silicon PN junction diode is approximately
a) 0.3 V **b) 0.7 V** c) 1.1 V d) 10 V

25. Find the voltage across the resistor as shown in the figure (silicon diode is used)



a) 2.4 V **b) 2.0 V** c) 1.8 V d) 0.7 V

26. The symbol to represent LED is

a)  b)  **c)**  d) 

27. In a junction transistor the emitter region is heavily doped since emitter has to supply to the base
a) minority carriers **b) majority carriers**
c) acceptor ions d) donor ions

28. In a transistor, the value of $\left(\frac{1}{\alpha}-\frac{1}{\beta}\right)$ is equal to
a) α b) β c) $\frac{\beta}{\alpha}$ **d) 1**

29. In common emitter transistor circuit, the base current(I_B) of the transistor is 50 μA and the collector current (I_c) is 25 mA. Then the current gain is
a) 50 **b) 500** c) 20 d) 200

30. In common emitter (CE) amplifiers, the phase reversal between input and output voltage is
a) 0° b) 90° c) 270° **d) 180°**

31. The phase reversal between the input and the output voltages in single phase CE amplifier is

a) $\frac{\pi}{2}$ b) 2π **c) π** d) $\frac{3\pi}{2}$

32. In CE single amplifier, the voltage gain at mid-frequency is 10. The voltage gain at upper cut-off frequency is

a) 10 b) 14.14 **c) 7.07** d) 20

33. In CE single amplifier if the voltage gain at mid – frequency is A_M, then voltage gain at lower cut off frequency is :

a) $\frac{A_M}{2}$ b) $\sqrt{2}\ A_M$ c) $\frac{\sqrt{2}}{A_M}$ **d)** $\frac{A_M}{\sqrt{2}}$

34. An example of non-sinusoidal oscillator is

a) multivibrator b) RC oscillator

c) colpitts oscillator d) crystal oscillator

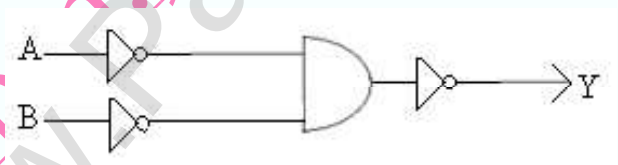
35. Conditions for oscillator is

a) $A\beta=0$ **b) $A=\frac{1}{\beta}$** c) $A\beta=\infty$ d) $A+\beta=0$

36. Barkhausen condition for maintenance of oscillation is

a) $\beta=\frac{1}{A}$ b) $A\beta=\infty$ c) $A=\beta$ d) $A\beta=\frac{1}{\sqrt{2}}$

37. The output (Y) of the logic circuit given below is



a) A + B b) Y = A.B c) $\overline{A+B}$ d) $\overline{A}$ + $\overline{B}$

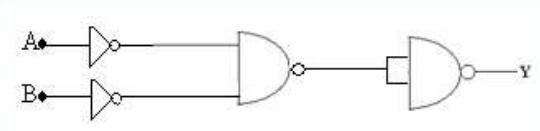
38. The Boolean expression to represent NAND operation is

a) Y = A + B b) Y= A.B c) Y = $\overline{A}$ **d) Y = $\overline{AB}$**

39. A logic gate which has an output '1' when the inputs are complement to each other is

a) AND b) NAND c) NOR **d) EXOR**

40. The following arrangement performs the logic function of

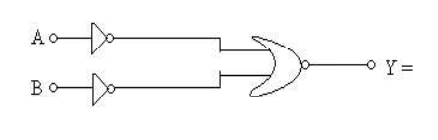


a) AND gate b) NAND gate c) OR gate **d) NOR gate**

41. A logic gate for which there is 'LOW' output only when both the inputs are 'High' is

a) AND **b) NAND** c) NOR d) EXOR

42. The following arrangement performs the logic function of



a) AND b) NAND c) OR d) EXOR

43. A logic gate for which there is an output only when both the inputs are zero is

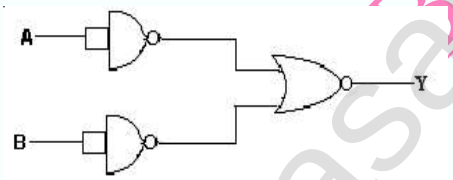
a) NAND **b) NOR** c) EXOR d) AND

44. What will be the input for the Boolean expressions $\overline{(A+B)}\overline{(A.B)}=1$

a) 0.1 b) 1.0 **c) 0.0** d) 1.1

45. The following arrangement performs the logic function of :

a) NOT b) EX-OR c) OR **d) AND**

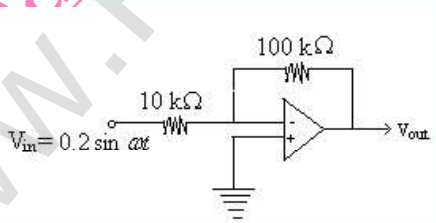


46. In the pin configuration of IC 741, pin 3 represents

a) inverting input **b) non-inverting input**

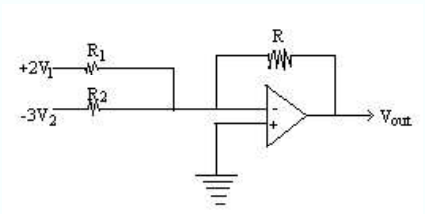
c) $-V_{cc}$ d) output

47. The output of the given operational amplifier is



a) $-2\sin\omega t$ b) $2\sin\omega t$ c) $-2\sin(\omega t+10°)$ d) $2\sin(\omega t+10°)$

48. The output voltage of the operational amplifier given below is



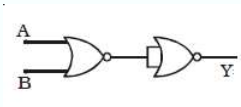
a) -1V **b) +1V** c) +5V d) -5V

49. Which of the following devices has a source of emf inside it?
a) voltmeter b) Ammeter
c) ohm meter d) Rectifier

50. The potential barrier of germanium PN junction diode is approximately
a) 0.7 V b) 0.5 V **c) 0.3 V** d) 0.2 V

51. For a transistor connected in common emitter mode CE the slope of the input characteristic curve gives
a) input impedance b) current gain
c) reciprocal of input impedance d) current gain

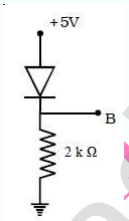
52. The following arrangement performs the logic function of



a) NOT b) EX - OR **c) OR** d) AND

53. $A(\overline{A} + B) = ?$
a) A b) B **c) AB** d) A + B

54. The voltage at B in the figure is (Germanium diode is used)



a) 5.3 V **b) 5.7 V** c) 6.3 V d) 6 V

55. In a multimeter , when the current scale shows full scale deflection, the ohmmeter scale reads:
a) maximum but not infinity b) infinity
c) zero d) minimum but not zero

PTA Objective Questions :

1. A solid state electronic device mainly consists of a
a) conducting b) insulating
c) super conducting **d) semiconducting**

2. Resistivity of a semiconductor is
a) greater than that of conducting material
b) smaller than that of insulator
c) greater than that of insulator but lesser than conductors
d) equal to that of conductors

3. Of the following choose the wrong statement
   a) Resistivity of semiconductor is approximately 10^{-2} - 10^{4} ohm m
   b) Resistance of semiconductor decreases with increase of temperature
   c) Resistance of a conductor increases of temperature
   d) Resistivity of a conductor is 10^{-2} - 10^{4} ohm-m
4. _____ is an example for semiconductor
   a) Fe b) C c) Ag **d) Ge**
5. Electrons in the atom of an element which determine its chemical and electrical properties are called
   a) valence electrons b) revolving electrons
   c) excess electrons d) active electrons
6. For an insulator the forbidden energy gap is
   a) less than 3 eV b) less than 0.7 eV
   c) greater than 3 eV d) equal to 3 eV
7. In glass, the energy gap between valence band and conduction band is of the order of
   a) 3 eV b) 6 eV **c) 10 eV** d) 0.7 eV
8. Forbidden energy gap for the semiconductors like Ge and Si are respectively
   a) 1.1 eV & 0.7 eV **b) 0.7 eV & 1.1 eV** c) 11 eV & 0.7 eV d) 1.1 eV & 7 eV
9. In case of good conductors, forbidden energy gap is
   a) more than 3eV b) equal to 3eV **c) zero** d) 0.7 eV
10. Electrons in an intrinsic semiconductor, which move into the conduction band at high temperature are called
    a) valence electrons b) hole **c) intrinsic carrier** d) donor
11. In intrinsic semiconductors,
    a) number of free electrons is equal to number of holes
    b) number of free electrons is greater than number of holes
    c) number of free electrons is lesser than number of holes
    d) number of free electrons is zero
12. Amount of impurity to be added to a intrinsic semiconductor is of the order of
    a) 50 ppm **b) 100 ppm** c) 500 ppm d) 1000 ppm
13. Donar atom is a
    a) tetravalent b) trivalent **c) pentavalent** d) divalent
14. Of the following , the donor atoms are
    a) Si and Ge b) aluminium and gallium
    c) bismuth and arsenic d) boron and indium

15. Acceptor atom is a
a) tetravalent **b) trivalent** c) pentavalent d) divalent

16. _____ is an example for acceptor atom
a) Al b) Bi c) P d) As

17. In an N type semi conductor, there are
a) immobile negative ions b) no minority carriers
c) immobile positive ions d) holes as majority carriers

18. In an N-type semiconductors,
a) holes are the majority carriers
b) both holes and electrons are the majority carriers
c) electrons are the majority carriers
d) electrons are the minority carriers

19. The difference of potential from one side of the barrier to the other side of a PN junction is known as
a) depletion region b) potential gradient
c) potential barrier d) contact potential

20. Width of the potential barrier in a PN junction diode depend on
a) number of electrons b) potential difference
c) number of holes **d) nature of the material**

21. In forward biased PN junction diode
a) potential barrier is reduced
b) potential barrier is increased
c) width of the potential barrier increases
d) potential barrier remains same

22. In a Forward biased junction diode, the voltage at which current starts to increase rapidly is known as
a) leakage voltage b) reverse saturation voltage
c) knee-voltage d) cutoff voltage

23. Rectifier efficiency of half wave rectifier is approximately
a) 60.4 % b) 81.2 % **c) 40.6** % d) 30.2 %

24. The output of an half-wave rectifier is
a) unidirectional and constant b) alternating and pulsating
c) alternating and constant **d) unidirectional and pulsating**

25. Variations of d.c. output voltage as a function of d.c load current is called
a) rectification b) filter
c) regulation d) full wave rectification

26. Percentage of regulation is given by

a) $\frac{V_{noload} - V_{load}}{V_{noload}} \times 100$ b) $\frac{V_{noload} - V_{load}}{100}$

c) $\frac{\mathbf{V_{noload} - V_{load}}}{\mathbf{V_{load}}} \times \mathbf{100}$ d) $\frac{V_{load} - V_{noload}}{V_{load}} \times 100$

27. Zener diodes are used as

a) rectifiers b) filters **c) regulators** d) amplifier

28. Zener current is

a) dependent of applied voltage **b) independent of applied voltage**

c) dependent on material of the diode d) dependent on knee voltage

29. _____ is a reverse biased, heavily doped semiconductor PN junction diode

a) LED b) LCD **c) Zener diode** d) transistor

30. A Zener diode working in the _____ region can act as voltage regulators

a) normal b) saturated **c) breakdown** d) constant voltage

31. The reverse saturation current in a PN Junction diode is only due to

a) majority carriers **b) minority carriers** c) acceptor ions d) donor ions

32. A forward biased diode will act as

a) a high resistance device b) a capacitor

c) an OFF switch **d) an ON switch**

33. Avalanche breakdown primarily depends on

a) collision b) ionisation c) doping d) recombination

34. Colour of light emitted by a LED depends on

a) its reverse bias voltage b) the amount of forward current

c)its forward bias voltage **d) type of semiconducting materials**

35. When an electron in the conduction band recombines with a hole in the valence band then energy is

a) stopped b) absorbed **c) released** d) needed

36. During the normal operation of a transistor, if its base current is increased then its,

a) V_{CE} will increase b) I_C will decrease

c) Ic will increase d) V_{CC} will increase

37. Emitter's main function is to supply

a) electrons **b) majority charge carriers**

c) minority charge carriers d) holes

38. The thickness of the base of a transistor is of the order of

a) 100 μm b) 50 μm **c) 25μm** d) 200 μm

39. In all transistors region is made physically larger than any other _____ region because it has to dissipate more power

a) base **b) collector** c) emitter d) either (b) or (c)

40. In any transistor, which of the following is true ?

a) $I_B = I_E / I_C$ b) $I_C = I_E + I_B$ **c) $I_E = I_B + I_C$** d) $I_C = I_E / I_B$

41. Ratio of the collector current to the emitter current is denoted by

a) α b) β c) A d) β A

42. Value of β interms of α is given by

a) $\beta = \frac{\alpha}{1+\alpha}$ **b) $\beta = \frac{\alpha}{1-\alpha}$** c) $\beta = \frac{1+\alpha}{\alpha}$ d) $\beta = \frac{1-\alpha}{\alpha}$

43. The value of α in any transistor lies between

a) 50 - 300 b) upto 1000 c) 0 - 9 **d) 0.95 - 0.99**

44. The value of $\frac{\Delta V_{BE}}{\Delta I_B}$ is called

a) input impedance b) output admittance

c) input admittance d) output impedance

45. Common emitter configuration has

a) high input impedance b) low output impedance

c) higher current gain **d) all the above**

46. In CE amplifiers, the phase reversal between input and output voltages is

a) 0° b) 90° **c) 180°** d) 270°

47. _____ is the most widely used method of providing bias and stabilization to a transistoer

a) base bias b) base bias with emitter feedback

c) base bias with collector feed back **d) voltage divider bias**

48. Voltage gain of a RC amplifier depends on the _____ over which the amplifier operates

a) current b) Voltage **c) frequency** d) phase

49. The gain of the amplifier is constant at range _____

a) low frequency **b) mid frequency**

c) high frequency d) both low and high frequency

50. At lower and upper cut-off frequencies, the gain of the amplifier is _____ times of mid frequency gain

a) 2 b) $\frac{1}{2}$ c) $\sqrt{2}$ **d) $\frac{1}{\sqrt{2}}$**

51. Improper biasing of a transistor circuit produces
a) heavy loading of emitter current **b) distortion in output signal**
c) excessive heat at collector terminal d) faulty location of load line

52. When number of amplifiers are connected in cascade, the overall voltage gain is equal _____ to individual states
a) sum of voltage gain b) difference of voltage gain
c) product of voltage gain d) mean voltage gain

53. When a fraction β of output voltage V_0 is fed into input voltage Vi, the new input voltage will be
a) $V_i' \equiv V_i + \beta V_0$ b) $V_i' = V_i - \beta V_0$ **c)** $\mathbf{V_i' = V_i \pm \beta V_0}$ d) $V_i' = V_i . \beta \sqrt{V_0}$

54. Voltage gain of the amplifier with positive feedback is
a) $\frac{A}{1+\beta A}$ **b)** $\frac{\mathbf{A}}{\mathbf{1-\beta A}}$ c) $\frac{1-\beta A}{A}$ d) $\frac{1+\beta A}{A}$

55. Essential conditions for the maintenance of oscillation is
a) β = 1/A with positive feedback b) β =1/ A with negative feedback
c) β = 1 with positive feedback d) β = A with negative feedback

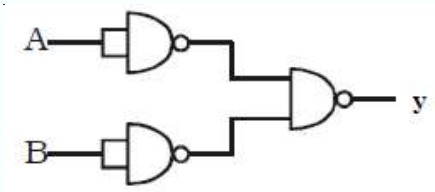
56. An oscillator is
a) an amplifier with positive feedback
b) a converter of ac to dc voltage
c) an amplifier with negative feedback
d) an amplifier without feedback

57. In a Colpitt's oscillator circuit
a) capacitative feedback is used b) tapped coil is used
c) tuned LC tank circuit is used d) RC tank circuit is used

58. Frequency of oscillations in Colpitts oscillators is
a) $f = \frac{1}{2\pi(L_1 + L_2 + 2M)C}$ b) $f = \frac{1}{2\pi\sqrt{(C_1 C_2)}}$ c) $f = \frac{1}{2\pi}\sqrt{\frac{C_1 C_2}{C_1 + C_2}}$ **d)** $\mathbf{f = \frac{1}{2\pi}\sqrt{\frac{C_1 + C_2}{L(C_1 C_2)}}}$

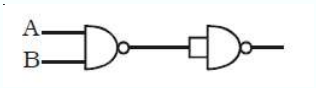
59. The Boolean expression to represent EXOR operation is
a) Y = A + B b) $Y = \overline{AB + \overline{AB}}$ **c)** $\mathbf{Y = A\bar{B} + \bar{A}B}$ d) Y=A.B

60. The circuit equivalent to



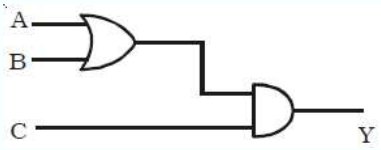
a) AND gate **b) OR gate** c) NOR d) EXOR

61. The following arrangement performs the logic functions of _____ gate



a) AND b) OR c) NAND d) EXOR

62. If the output of the following circuit is 1, then the input A, B, C must be



a) 0, 1, 0 b) 1, 0, 0 **c) 1, 0, 1** d) 1, 1, 0

63. According to law of Boolean algebra, the expression (A+AB) is equal to

a) A b) AB c) B d) $\overline{A}$

64. The Boolean expression $\overline{ABC}$ can be simplified as

a) $AB+\overline{C}$ b) $\overline{A}.\overline{B}.\overline{C}$ c) AB + BC+CA **d)** $\overline{\mathbf{A}}+\overline{\mathbf{B}}+\overline{\mathbf{C}}$

65. OP-AMP consists of

a) 20 transistors, 11 resistors, 1 capacitor

b) 1 transistor, 11 resistors, 20 capacitors

c) 20 transistors, 1 resistor, 11 capacitors

d) 11 transistors, 20 resistors, 1 capacitor

66. Since the input impedance of an ideal operational amplifier is infinite,

a) its input current is zero b) its output resistance is high

c) its output voltage become independent of load

d) it become a current controlled device

67. In a common base connection $\alpha = 0.95$, $I_E = 1$ mA then the value of collector current is

a) 0.05 mA **b) 0.95 mA** c) 1.05 mA d) 1 mA

68. In a transistor, the value of α is 0.99, then the value of β is

a) 49 b) 90 **c) 99** d) 9.9

69. In a transistor with $\beta = 40$, the base current is 25 μA. Then the collector current I_C is

a) 100 μA b) 1000 mA **c) 1 mA** d) 0.1 mA

70. In a common base configuration of a transistor, I_C = 12.5 mA and I_E = 13 mA, then the base current of the transistor is

a) 25.5 mA **b) 0.5 mA** c) 50 mA d) 50 μA

71. The input impedance of a transistor is 1000 ohm and β = 100 then, the base to emitter voltage required for collector current of 1 mA is

a) 1 V b) 100 mV **c) 10 mV** d) 1 mV

72. In CE configuration , the IC changes from 2 mA to 4 mA. If V_{CE} is increased from 5 V to 10 V, output admittance must be

a) 8×10^{-4} mho **b) 0.4×10^{-3} mho**

c) 2.5×10^{3} mho d) 1.25×10^{3} mho

73. Three amplifier have gains 10, 50 and 80 respectively, when they are connected in cascade the overall gain is

a) 4000 b) 400 **c) 40000** d) 140

74. If an inductor of Inductance $\frac{1}{4\pi^2}$ H and a capacitance 4pF are connected in parallel to form LC tank circuit, then the frequency of oscillations is

a) 5 MHz **b) 0.5 MHz** c) 50 MHz d) 500 MHz

Three Mark Questions:

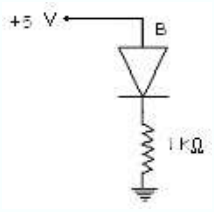
Book Back Questions :

1. Define forbidden energy gap.
2. What do you understand by intrinsic and extrinsic semi conductor ? **(P Y)**
3. What is rectification? **(P Y)**
4. What is zener breakdown ? **(P Y)**
5. Why is a transistor called as current amplification device?
6. Why CE configuration is preferred over CB configuration for operating transistor as an amplifier?
7. Define band width of an amplifier? **(P Y)**
8. What is meant by feedback? Name the two types of feedback?
9. What are the advantages of negative feed back? **(P Y)**
10. Give the Barkhausen criteria for oscillations. **(P Y)**
11. What are universal gates? Why are they called so? **(P Y)**
12. What is an EXOR gate? Give the Boolean expression for the EXOR operation.
13. State DeMorgan's theorems. **(P Y)**
14. What is integrated circuit? **(P Y)**
15. Identify the analog and digital signals from the following. (i) square wave (ii) sine wave.
16. Differentiate between linear IC's and digital IC's.
17. Give the important parameters of an operational amplifier. **(P Y)**
18. Explain the term virtual ground of an operational amplifier. **(P Y)**
19. Draw the circuit diagram for OR gate using diodes. **(P Y)**
20. What is a light emitting diode? Give any one of its uses. **(P Y)**
21. Mention any three uses of cathode ray oscilloscope **(P Y)**

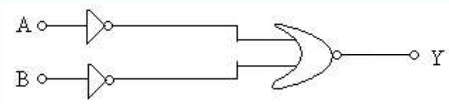
Previous Year Questions :

22. What is meant by doping?
23. Write the different methods of doping a semiconductor.
24. What are extrinsic semiconductors?
25. Draw energy band diagrams of N-type semiconductor and P-type semiconductor.
26. What is a Zener diode? Draw its symbol?
27. Draw the circuit diagram for NPN transistor at Common Emitter (CE) mode.

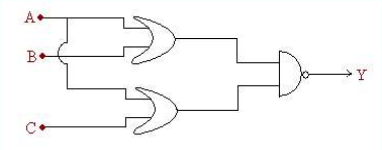
28. Draw the circuit configuration of NPN transistor in common collector (CC) mode.
29. Define input impedance of a transistor connected in common emitter mode.
30. Define output impedance of a transistor.
31. Draw the block diagram of an oscillator and mention the components
32. Mention any three advantages of integrated Circuit(IC).
33. Distinguish between analog signal and digital signal.
34. Draw the circuit diagram of AND gate using diodes and resistor
35. Draw NOT gate using transistor.
36. Draw the circuit diagram for inverting amplifier using Op-Amp.
37. Draw the circuit diagram for summing amplifier.
38. Find the voltage at the point B in the figure (Silicon diode is used).



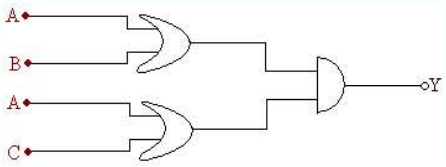
39. The base current of a transistor is $50\mu A$ and collector current is $25\,mA$. Find the value of current gain β. **(Ex)**
40. In a common base transistor circuit $I_C = 0.97$ mA and $I_B = 30\ \mu$A. Calculate the value of (α) the current gain. **(Ex)**
41. When there is no feedback the gain of the amplifier is 100. if 5% of the output voltage is feedback into the input through a negative feedback network, find out the voltage gain after feedback. **(Ex)**
42. When the negative feedback is applied to an amplifier of gain 50, the gain falls to 25. Calculate the feedback ratio. **(Eg)**
43. The voltage gain of an amplifier without feedback is 100. If negative feedback is applied with a feedback fraction β=0.1, Calculate the voltage gain after feedback.
44. The gain of a amplifier without feedback is 100 and gain with positive feedback is 200. Calculate the feedback fraction.
45. The output of two NOT gates are NOR gate, as shown in the figure, what is the logic operation performed? **(Eg)**



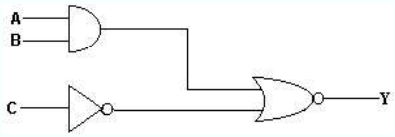
46. Find out the output Y of the logic circuit given below.



47. Give the Boolean equation for the given logic diagram **(Ex)**



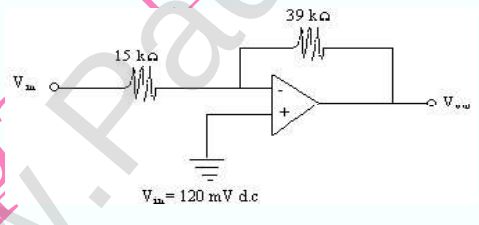
48. What is the Boolean expression for the logic diagram shown in figure. Evaluate its input if A = 1, B = 1 and C = 1. **(Ex)**



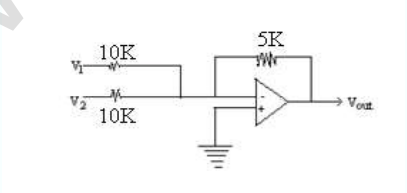
49. Prove the Boolean identity:
(A + B) (A + C) = A + BC. **(Eg)**

50. Prove the following logic expression $\left(\overline{A} + \overline{B}\right)(A + B) = B$.

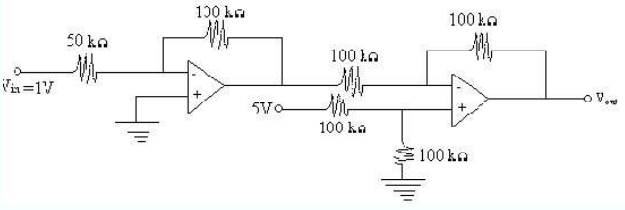
51. Find the output of the ideal operational amplifier shown in the figure for the input of the V_{in} = 120 mV direct current **(Eg)**



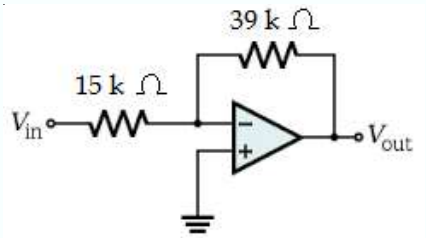
52. Find the output of the given circuit: **(Ex)**



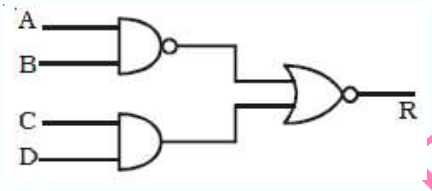
53. Find the output of the amplifier circuit given below:



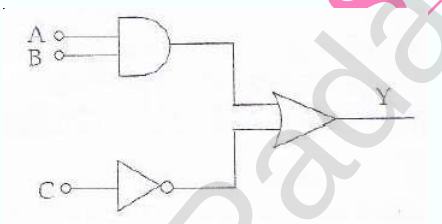
54. Find the output of the ideal operational amplifier shown in the figure for input of V_{in} = - 2.5 V d.c.(Eg)



55. What do you understand by intrinsic semi conductor ?
56. What is a light emitting diode? Give any one of its uses. Draw its symbol
57. For a transistor to work, how is the biasing?
58. Give the boolean equation for the given logic diagram



59. What is the boolean expression for the logic diagram shown in figure. Evaluate its output if A = 1 , B = 1 , C = 1



Five Mark Questions:

Book Back Questions :

1. Describe the valence band, conduction and forbidden energy gap with the help of energy level diagram.
2. Describe the energy band structure of insulator, semiconductor and conductor.
3. What do you understand by intrinsic and extrinsic semiconductor?
4. Explain the working of a half wave diode rectifier. **(P Y)**
5. Explain the working of a bridge rectifier with a neat circuit diagram. **(P Y)**
6. Describe the construction of Zener diode.
7. Explain with necessary circuit how the zener diode can be used as a voltage regulator. **(P Y)**
8. Deduce the relation between α and β of a transistor. **(P Y)**
9. Derive an expression for voltage gain of an amplifier with negative feed back.
10. Give the function of 'OR' and 'NAND' gates.

11. State and prove DeMorgan's theorems. **(P Y)**
12. Describe the action of an operational amplifier as difference amplifier.
13. Explain how multimeter is used as ohm meter. **(P Y)**

Previous Year Questions :

14. Explain the function of a transistor as a switch.
15. With the circuit diagram, explain voltage divider biasing of a transistor.
16. Draw the frequency response curve of single stage CE amplifier and discuss the results.
17. What is an AND gate? Explain the function of AND gate using electrical circuit using diodes.
18. Explain the circuit symbol and Pin-out configuration of an operational amplifier.
19. A transistor is connected in CE configuration. The voltage drop across the load resistance (R_c) $3 k\Omega$ is 6V. Find the base current. The current gain α of the transistor is 0.97. **(Eg)**
20. What is an OR gate? Explain the function of OR gate using electrical circuit using diodes.
21. What is an NOT gate? Explain the function of NOT gate using electrical circuit using transistor.

Ten Mark Questions:

Book Back Questions :

1. Explain an experiment to determine the characteristics of a transistor in CE configuration. Explain how the transistor parameters can be evaluated.
2. Describe the working of transistor amplifier. **(P Y)**
3. Sketch the circuit of Colpitt's oscillator. Explain its working. **(P Y)**
4. Describe an operational amplifier. Explain its action as (i) inverting amplifier and (ii) non inverting amplifier. **(P Y)**
5. Explain how operational amplifier is used as a summer and difference amplifier. **(P Y)**
6. What is meant by feed back? Derive an expression for voltage gain of an amplifier with negative feedback. **(P Y)**
7. Describe the working of PNP and NPN transistors.

Previous Year Questions :

8. What is rectification ? Explain the working of a bridge rectifier with necessary waveforms.
9. Explain the output characteristics of an N-P-N transistor connected in common emitter configuration with the help of a neat circuit diagram.
10. Explain with neat circuit diagram, the working of single stage CE amplifier.

X. COMMUNICATION SYSTEMS

One Mark Questions

Book Back Questions :

1. High frequency waves follow **(P Y)**
   a) the ground wave propagation b) the line of sight direction
   c) ionospheric propagation d) the curvature of the earth
2. The main purpose of modulation is to
   a) combine two waves of different frequencies
   b) acquire wave shaping of carrier wave
   c) transmit low frequency information over long distances efficiently
   d) produce side bands
3. In amplitude modulation **(P Y)**
   a) the amplitude of the carrier wave varies in accordance with the amplitude of the modulating signal
   b) the amplitude of the carrier wave remains constant
   c) the amplitude of the carrier wave varies in accordance with the frequency of the modulating signal
   d) modulating frequency lies in the audio range
4. In amplitude modulation, the band width is **(P Y)**
   a) equal to the signal frequency **b) twice the signal frequency**
   c) thrice the signal frequency d) four times the signal frequency
5. In phase modulation
   a) only the phase of the carrier wave varies
   b) only the frequency of the carrier wave varies
   c) both the phase and the frequency of the carrier wave varies
   d) there is no change in the frequency and phase of the carrier wave
6. The RF channel in a radio transmitter produces **(P Y)**
   a) audio signals **b) high frequency carrier waves**
   c) both audio signal and high frequency carrier waves
   d) low frequency carrier waves
7. The purpose of dividing each frame into two fields so as to transmit 50 views of the picture per second is **(P Y)**
   a) to avoid flicker in the picture
   b) the fact that handling of higher frequencies is easier
   c) that 50Hz is the power line frequency in India
   d) to avoid unwanted noises in the signal

8. Printed documents to be transmitted by fax are converted into electrical signals by the process of **(P Y)**
a) reflection **b) scanning** c) modulation d) light variation

Previous Year Questions :

9. The radio waves after refraction from different parts of ionosphere on reaching the earth are called as
a) ground waves **b) sky waves** c) space waves d) microwaves

10. Skip distance is the shortest distance between
a) the point of transmission and the point of reception
b) the uplink station and the downlink station
c) the transmitter and the target
d) the receiver and the target

11. The audio frequency range is
a) 20 Hz to 200000 Hz b) 20 Hz to 2000 Hz
c) 20 Hz to 2000000 Hz **d) 20 Hz to 20000 Hz**

12. An FM signal has a resting frequency of 105 MHz and highest frequency of 105.03 MH_Z, when modulated by a signal. Then the carrier swing is
a) 0.03 MHz **b) 0.06 MHz** c) 0.03 kHz d) 60 MHz

13. In A.M receiver, if 900 kHz station is tuned, then the local oscillator will have to produce a frequency of
a) 600 kHz b) 455 kHz c) 10.7 MHz **d) 1355 kHZ**

14. In an AM super heterodyne receiver, the local oscillator frequency is 1.245 MHz. The tuned station frequency is
a) 455 kHz **b) 790 kHz** c) 690 kHz d) 990 kHz

15. In an A.M. receiver, the local oscillator frequency is 2750 kHz. The tuned-in station frequency is
a) 2905 kHz **b) 2295 kHz** c) 3055 kHz d) 2250 kHz

16. In the AM super heterodyne receiver system the value of the intermediate frequency is equal to
a) 445 kHz **b) 455 kHz** c) 485 kHz d) 465 kHz

17. For FM receivers, the intermediate frequency is
a) 455 kHz b) 455MHz c) 10.7 kHz **d) 10.7 MHz**

18. Vidicon camera tube works on the principle of
a) Photo conductivity b) thermoelectric effect
c) thermionic emission d) seeback effect

19. In television, blanking pulse is applied to
a) horizontal plates b) vertical plates **c) control grid** d) filament

20. In interlaced scanning time taken to scan one line is
a) 20 ms **b) 64 μs** c) 50 ms d) 100 μs

21. Digital signals are converted into analog signals using
a) Fax **b) modem** c) cable d) coaxial cable

22. The principle used for the transmission of light signals through optical fiber is
a) refraction b) diffraction c) polarization **d) total internal reflection**

23. The first man-made satellite is
a) Aryabhatta **b) Sputnik** c) venera d) Rohine

24. The maximum carrier swing allowed in frequency modulation is
a) 455 kHz b) 10.7 MHz c) 75 kHz **d) 150 kHz**

PTA Objective Questions :

1. High frequency waves follow _____
a) the ground wave propagation b) the line of sight direction
c) ionosphere propagation d) the curvature of the earth

2. The main purpose of modulation is to _____
a) combine two waves of different frequencies
b) acquire wave shaping of the carrier wave
c) transmit low frequency information over long distances effeciently
d) produces side bands

3. In amplitude modulation
a) the amplitude of the carrier wave varies in accordance with the amplitude of the modulating signal
b) the amplitude of the carrier wave remains constant
c) the amplitude of the carrier wave varies in accordance with the frequency of the modulating signal
d) modulating frequency lies in the audio range

4. In amplitude modulation, the bandwidth is _____
a) equal to the signal frequency **b) twice the signal frequency**
c) thrice the signal frequency d) four times the signal frequency

5. In phase modulation _____
a) only the phase of the carrier wave varies
b) only the frequency of the carrier wave varies
c) both phase and frequency of the carrier wave varies
d) there is no change in frequency and phase of the carrier wave

6. The RF channel in a radio transmitter produces _____
   a) audio signals
   b) high frequency carrier wave
   c) both audio signal and high frequency carrier waves
   d) low frequency carrier waves
7. The purpose of dividing each frame into two fields so as to transmit 50 views of the picture per second is _____
   a) to avoid flicker in the picture
   b) the fact that handling of higher frequencies is easier
   c) that 50 Hz is the power line frequency in India
   d) to avoid unwanted noises in the signals
8. Propagation of electromagnetic wave depends on
   a) nature of wave b) environment c) medium **d) both (a) & (b)**
9. Printed documents to be transmitted by fax are converted into electrical signals by the process of _____
   a) reflection **b) scanning** c) modulation d) light variation
10. Communication refers to _____
    a) sending information b) receiving the information
    c) processing the information
    d) sending, receiving and processing of information electronically
11. Ground wave propagation takes place _____
    a) When the transmitting antenna is close to the ground
    b) When the receiving antenna is close to the ground
    c) when the transmitting and receiving antennas are far off from the ground
    d) when the transmitting and receiving antennas are close to the ground
12. Ground wave propagation is of prime importance for _____
    a) short wave signals only b) long wave signals only
    c) medium wave signals only **d) medium and long wave signals**
13. Space wave propagation is particularly suitable for the waves having frequency _____
    a) above 40 MHz b) below 30 MHz c) below 20 MHz **d) above 30 MHz**
14. The mechanism involved in sky wave propogation is _____
    a) reflection **b) refraction** c) interference d) polarisation
15. Long distance radio communication is possible through the _____
    a) ground wave propagation b) surface wave propagation
    c) the sky wave propagation d) all the above

16. The refractive indices of the various layers in the ionosphere varies with respect to
a) electron density only
b) frequency of the incident wave only
c) intensity of the incident wave only
d) electron density and the frequency of the incident wave

17. As the ionisation density increases for a wave approaching the given layer at an angle, the refractive index of the layer is
a) increased **b) reduced** c) increased or reduced d) constant

18. The music, speech etc., are converted into audio signals using a _____
a) loud speaker b) photocell c) diode **d) microphone**

19. The audio frequency range is
a) 20 Hz to 200000 Hz b) 20 Hz to 2000 Hz
c) 20 Hz to 2000000 Hz **d) 20 Hz to 20000 Hz**

20. The radiation of electrical energy is practicable only at _____
a) low frequencies b) very low frequencies
c) moderate frequencies **d) high frequencies**

21. Which signals can be sent through thousands of kilometers with comparatively small power?
a) audio signals b) video signals
c) High frequency signals d) low frequency signals

22. In amplitude modulation, which is changed in accordance with the intensity of the signal?
a) frequency of the carrier wave b) phase of the carrier wave
c) Amplitude of the carrier wave
d) both frequency and Phase of the carrier wave

23. Factor that determine the strength and quality of the transmitted signal is
a) Q - factor b) frequency of the carrier wave
c) frequency of the modulating wave **d) Modulation factor**

24. For effective modulation, the degree of modulation should _____
a) exceed 100% b) exceed 200%
c) never exceed 50% **d) never exceed 100%**

25. A carrier wave of amplitude 10 mV is modulated by a sinusoidal audio signal wave of amplitude 6 mV, the modulation factor is _____
a) 0.6 b) 6 c) 60 d) 0.06

26. A 5 MHz sinusoidal carrier wave of amplitude 10 mV is modulated by a 5 kHz sinusoidal audio signal wave of amplitude 6 mV. Find the lower and upperside band frequencies _____
a) 4.995 MHz, 5.005 MHz b) 9.995 MHz, 10.005 MHz
c) 4.5 MHz, 5.5 MHz d) 10 MHz, 15 MHz

27. The magnitude of both the upper and lower side bands is _____
a) 2 times the carrier amplitude E_c b) 1/2 times the carrier amplitude E_c
c) 'm' times the carrier amplitude E_c **d) m/2 times the carrier amplitude E_c**

28. If the modulation factor 'm' is equal to unity, then each side band has amplitude equal to _____
a) 2 times the carrier amplitude b) $\sqrt{2}$ times the carrier amplitude
c) $1/\sqrt{2}$ times the carrier amplitude **d) half of the carrier amplitude**

29. The human voice or music contains waves with frequency range of _____
a) 3 - 30 Hz b) 30 - 300 Hz c) 3000 - 30000 Hz **d) 300 - 3000 Hz**

30. Which modulation facilitates highest transmission speeds on a given bandwidth?
a) Amplitude modulation b) frequency modulation
c) phase modulation d) all the above

31. For the purpose of coupling the transmitter and the receiver to the space link, We use _____
a) amplifier b) oscillator **c) antenna** d) FAX

32. Transmitting antenna converts the _____
a) electrical signal into electrical energy
b) electric signal into magnetic energy
c) electrical signal into electromagnetic energy
d) electromagnetic energy into electrical signal

33. Receiving antenna converts the _____
a) electrical signal into electromagnetic energy
b) electrical signal into electrical energy
c) electromagnetic energy into electrical signal
d) electromagnetic energy into magnetic signal

34. The intermediate frequency used in the AM radio receiver is _____
a) 10.7 MHz b) 475 KHz c) 455 Hz **d) 455 KHz**

35. If 900 kHz station is tuned, then the local oscillator will have to produce a frequency of _____
a) 600 kHz b) 455 kHz c) 10.7 MHz **d) 1355 kHz**

36. For superheterodyne FM receivers, the intermediate frequency is
a) 455 Hz b) 45 kHz c) 10.7 kHz **d) 10.7 MHz**

37. In FM broadcast, the frequency deviation of sound signal is
a) 25 kHz b) 50 kHz **c) 75 kHz** d) 100 kHz

38. In TV transmission sound signals are _____
a) amplitude modulated **b) frequency modulated**
c) phase modulated d) none of the above

39. Vidicon camera tube works on the principle of _____
a) photoconductivity b) thermoelectric effect
c) thermionic emission d) seebeck effect

40. When exposed to light, the resistance of the photo conductive material _____
a) decreases b) increases c) increases or decreases d) is not altered

41. In Vidicon camera tube the front face of the target plate is coated with the _____
a) antimony tri sulphide b) aluminium oxide
c) zinc sulfide **d) tin oxide**

42. In Vidicon camera tube on the back of the target plate is coated with the photosensitive material _____
a) antimony tri sulphide b) zinc sulphide
c) tin oxide d) aluminium oxide

43. The frequency of scanning is _____
a) 20 per second b) 50 per second c) 100 per second **d) 25 per second**

44. How many synchronizing pulses are used for scanning?
a) one b) two **c) three** d) four

45. Blanking pulse used for TV scanning is
a) High frequency saw tooth potential b) Low frequency saw tooth potential
c) High positive potential **d) High negative potential**

46. In TV scanning, blanking pulse is applied to
a) horizontal deflector plates b) vertical deflector plates
c) control grid d) filament

47. In interlaced scanning, the vertical scanning frequency is _____
a) 10 fields per second b) 25 fields per second
c) 50 fields per second d) 100 fields per second

48. In radar receiver, the returning echo pulse appears slightly displaced from the transmitted pulse which measures _____ of the target
a) nature b) shape c) power **d) range**

49. A signal which can take any value with in the given range
a) digital signal **b) analog signal** c) AM signal d) FM signal

50. In TV transmission, the picture should not be scanned during the return journey of the scanning. This is done by _____
a) vertical scanning pulse b) Horizontal scanning pulse
c) blanking pulse d) triggering pulse

51. The greatest technical problem is analog communication
a) noice b) nature of signal
c) wider band width d) power of system

52. Any form of information, that has been put into digital form is called
a) signal b) amplitude c) power **d) data**

53. In twisted pair cable, wire is twisted to
a) decreasing external noise b) speedy data trasfer
c) increasing external noise d) both (a) & (b)

54. Fax machine cannot be used for transmitting
a) sound messages b) live scenes and motion
c) either (a) or (b) **d) both (a) & (b)**

55. A modem is used for _____
a) modulation only b) demodulation only
c) modulation and demodulation d) printing the information

56. Optical fiber works on the principle of _____
a) total internal reflection b) refraction
c) reflection d) polarisation

57. Satellite orbiting the earth will be geo - stationary when it is at a height of
a) 36, 000 km from the earth b) 3600 km from the earth
c) 360 km from the earth d) 36 km from the earth

58. For uplink transmission commercial communication satellites use
a) 5 MHz bandwidth near 6 GHz b) 50 MKz bandwidth near 6 GHz
c) 500 MHz bandwidth near 5 GHz **d) 500 MKz bandwidth near 6 GHz**

59. For downlink transmission commercial communication satellites use _____
a) 500 MKz bandwidth near 4 GHz b) 50 MHz bandwidth near 4 GHz
c) 500 MKz bandwidth near 5 GHz d) 5 MKz bandwidth near 4 GHz

60. In actual practice the band width used for uplink transmission by the satellite is
a) 5.725 - 7.075 GHz b) 3.4 - 4.8 GHz
c) 6.725 - 7.075 GHz d) 5.725 - 6.075 GHz

Three Mark Questions:

Book Back Questions :

1. What are the different types of radio wave propagation? **(P Y)**
2. What is meant by skip distance? **(P Y)**
3. What is the necessity of modulation? **(P Y)**
4. What is meant amplitude modulation? **(P Y)**
5. Define modulation factor. **(P Y)**
6. Define bandwidth.
7. What are the limitations of amplitude modulation?
8. What is phase modulation.
9. Define directivity.
10. What is meant by scanning?
11. What is interlaced scanning? **(P Y)**
12. What are the different types of wire and cable used for tele communication system?
13. What are the advantages of fiber optic communication system? **(P Y)**

Previous Year Questions :

14. What is meant by skip zone?
15. Mention the advantages of frequency modulation.
16. Write any three applications of radar?
17. What are the advantages of Digital Communication?
18. What is fax? Mention its use.
19. Write any three merites of satellite communication.

Five Mark Questions:

Book Back Questions :

1. Explain the ground wave propagation.
2. Explain the wave propagation in ionosphere.
3. Explain amplitude modulation.
4. Draw the block diagram of AM radio transmitter. **(P Y)**
5. Explain frequency modulation. **(P Y)**
6. Explain the function of FM transmitter with neat block diagram. **(P Y)**
7. Explain the principle of radar. **(P Y)**
8. What are the application of radar.
9. Explain the principle of modem.

Previous Year Questions :

10. Explain space wave propagation of radio waves.
11. Explain the function of an AM radio transmitter with the help of a block diagram.
12. With the help of a neat block diagram, explain the function FM transmitter.
13. With the help of black diagram, explain the operation of an FM super heterodyne receiver.
14. State the principle of Radar. What are the applications of Radar?
15. What are the advantages and disadvantages of digital communication?
16. Write a short note on fiber optical communication and mention its advantages.
17. Mention the merits and demerits of satellite communication.
18. A 10 MHz sinusoidal carrier wave of amplitude 10 mV is modulated by a 5 kHz sinusoidal audio signal wave of amplitude 6 mV. Find the frequency components of the resultant modulated wave and their amplitudes. **(Eg)**
19. What are the advantages and disadvantages of frequency modulation?

Ten Mark Questions

Book Back Questions :

1. Explain the function of vidicon camera tube. **(P Y)**
2. Explain the functions of various units in the monochrome television transmission. **(P Y)**
3. With the help of block diagram, explain the function of monochrome TV receiver. **(P Y)**

Previous Year Questions :

4. Make an analysis of amplitude modulated wave. Plot the frequency spectrum.
5. With the help of a functional block diagram, explain the operation of a super heterodyne AM receiver.
6. With the help of a block diagram, explain the function of a RADAR system.