12th Physics

**ONE MARKS − PHYSICS**

1. **ELECTRO STATICS**

01. Four charges $+q$, $+q$, $-q$ and $-q$, respectively are placed at the corners A, B, C
and 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

02. 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 of

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

03. A glass rod rubbed with the silk acquires a charge of $+8 \times 10^{-12}$ C. The number of electrons it has gained or lost

(a) $5 \times 10^{-7}$ gained  
(b) $5 \times 10^{-7}$ lost  
(c) $2 \times 10^{-8}$ lost  
(d) $-8 \times 10^{-12}$ lost

04. Electric potential energy (U) of two point charges is

(a) $\frac{q_1 q_2}{4\pi \varepsilon_0 r^2}$  
(b) $\frac{q_1 q_2}{4\pi \varepsilon_0 r}$  
(c) $p\cos \theta$  
(d) $p\sin \theta$

05. If a point lies at a distance $x$ from the midpoint 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) $\frac{1}{x^{3/2}}$

06. The unit of permittivity is

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

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

(a) only a net force  
(b) only a torque  
(c) both a net force and torque  
(d) neither a net force nor a torque

08. The electric field outside the plates of two oppositely charged plane sheets of charge density $\sigma$ is

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

09. 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 $q$

10. 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) 2N

11. Which of the following quantities is scalar?

(a) dipole moment  
(b) electric force  
(c) electric field  
(d) electric potential

12. 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

13. The number of electric lines of force originating from a charge of 1 C is

(a) $1.129 \times 10^{11}$  
(b) $1.6 \times 10^{19}$  
(c) $6.25 \times 10^{18}$  
(d) $8.85 \times 10^{12}$

14. The work done in moving 500 μC charge between two points on equipotential surface is

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

15. The electric field outside the plates of two oppositely charged sheets of charge density $\sigma$ is

(a) $\frac{+\sigma}{2\varepsilon_0}$  
(b) $\frac{-\sigma}{2\varepsilon_0}$  
(c) $\frac{\sigma}{\varepsilon_0}$  
(d) zero
16. The charges in an electrostatic field are analogous to which in a gravitational field?
   a) distances    b) forces    c) masses    d) points

17. An ebonite rod rubbed with fur acquires a charge of $2.56 \times 10^{18}$ C. The number of electrons it has gained or lost is:
   a) 8    b) 16    c) 80    d) 160

18. When a glass rod is rubbed with a silk acquires charge.
   a) positive charge    b) negative charge    c) first positive and then negative    d) no charge

19. The electrostatic attraction and repulsion between charged bodies is the basic principle of:
   a) Xerox copying machine, b) ink jet printer, c) electrostatic paint spraying, d) all the above

20. Which of the following is not an insulator?
   a) ebonite    b) mica    c) oil    d) gold

21. The repulsive force between two like charge of 1 coulomb separated by a distance of 1 m in vacuum is equal to
   a) $9 \times 10^9$ N    b) $9 \times 10^9$ N    c) $9 \times 10^9$ N    d) only 9 N

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

23. Equation of electric charges is
   a) $q = \frac{eV}{r^2}$    b) $q = eV$    c) $e = \frac{q}{n}$    d) $e = \frac{q}{4\pi\varepsilon_0 r^2}$

24. Three identical balls of charges $-4.8 \times 10^{-16}$ C, $9.6 \times 10^{-16}$ C and $4.2 \times 10^{-16}$ C respectively are brought in contact and then separated. The number of electrons on each ball after contact is
   a) 1875 electrons in excess    b) 1875 electrons in excess
   c) 1875 electrons in deficit    d) 1875 electrons in deficit

25. An isolated point charge is given charge q. The electric field at a distance r is
   a) $\frac{q^2}{4\pi\varepsilon_0 r^2}$    b) $\frac{q}{4\pi\varepsilon_0 r}$    c) $\frac{q^3}{4\pi\varepsilon_0 r^2}$    d) $\frac{q}{4\pi\varepsilon_0 r^2}$

26. The dielectric constant for a medium other than air
   a) less than one    b) greater than one    c) equal to one    d) zero

27. Force between two charges is 0.5 N. If the distance between them is doubled then the force will be
   a) 1 N    b) 0.125 N    c) 0.2 N    d) 0.25 N

28. The relative permittivity is one for
   a) water    b) air    c) glass    d) mica

29. The permittivity $\varepsilon_0$ of vacuum equals
   a) $9 \times 10^9$ N m$^{-2}$ C$^{-2}$    b) $\frac{1}{9 \times 10^9}$ N$^{-1}$ m$^2$
   c) $9 \times 10^9$ C$^2$ N$^{-1}$ m$^2$    d) $\frac{1}{4\pi \times 9 \times 10^9}$ C$^2$ N$^{-1}$ m$^2$

30. Two point charges of equal magnitude are separated by 12 cm in air. An attractive force of 90 N acts on each charge. Then the two charges are
   a) -12 mC and -12 mC    b) +12 mC and -12 mC
   c) +10 mC and -10 mC    d) +6 mC and -6 mC

31. If a proton is moved against the coulomb force of an electric field
   a) work is done by the electric field    b) energy is used from outside source
   c) the strength of the field is decreased    d) energy of the system is decreased

32. The dielectric constant of the medium is
   a) $\varepsilon_0 \varepsilon_r$    b) $\varepsilon / \varepsilon_0$    c) $\varepsilon_0 / \varepsilon$    d) $\frac{1}{\varepsilon_0 \varepsilon_r}$

33. The value of permittivity in free space is
   a) $8.852 \times 10^{-12}$ C$^2$ N$^{-1}$ m$^2$    b) $8.852 \times 10^{-12}$ C$^2$ N$^{-1}$ m$^2$
   c) $88.52 \times 10^{-12}$ C$^2$ N$^{-1}$ m$^2$    d) $8.852 \times 10^{-12}$ C$^2$ N$^{-1}$ m$^2$
34. Unit of \( \varepsilon_0 \) is
   a) \( \text{C}^2 \text{N}^{-1} \text{m}^2 \)  
   b) \( \text{C} \text{N}^2 \text{m}^{-2} \)  
   c) no unit  
   d) \( \text{C}^{-1} \text{N} \text{m} \)

35. When two point charges +6 C and -5 C experience a force 2.7 \( \times 10^{11} \) N. The distance between them is
   a) 1 m  
   b) 0.5 m  
   c) 2 m  
   d) 5 m

36. Coulomb is defined as the quantity of charge which when placed at a distance of 1 m in air or vacuum from an equal and similar charge experience a force of
   a) 9 \( \times 10^9 \) N  
   b) \( -9 \times 10^9 \) N  
   c) 10 \( \times 10^9 \) N  
   d) 9 \( \times 10^9 \) N

37. The law that governs the force between electric charges is
   a) Amperes law  
   b) Faraday’s law  
   c) Coulomb’s law  
   d) Ohm’s law

38. Four point charges \( q_A = -2 \) mC, \( q_B = -5 \) mC, \( q_C = 2 \) mC, \( q_D = -5 \) mC are located at the corners of the side ABCD of side 10 cm. What is the force on a charge of 1 mC at the centre of the square
   a) 6.3 \( \times 10^6 \) N  
   b) \( -2.5 \times 10^6 \) N  
   c) -6.3 \( \times 10^6 \) N  
   d) zero

39. If the distance between two charges is doubled the electrostatic force between the charges will be
   a) Four times  
   b) Four times less  
   c) will increase two times  
   d) will decrease two times

40. The electric force experienced by a charge \( q \), due to other charges \( q_1, q_2, q_3 \ldots \), \( q_n \) is calculated using
   a) the law of conservation of charge  
   b) the gauss theorem  
   c) the principle of superposition  
   d) none of the above

41. Unit of electric field is
   a) \( \text{NC}^2 \)  
   b) \( \text{NC} \)  
   c) \( \text{Vm}^{-1} \)  
   d) \( \text{Vm} \)

42. Which of the following is a scalar quantity?
   a) velocity  
   b) force  
   c) electric flux  
   d) electric field

43. A charge experience a force of 0.02 N in an electric field of intensity 5 \( \times 10^3 \) V/m. The value of
   a) 0.4 C  
   b) 0.4 mC  
   c) 4 C  
   d) 5 \( \times 10^4 \) C

44. An electric charge 1.6 \( \times 10^{-9} \) C is situated in a uniform electric field of intensity 120,000 V/m. The force on it is
   a) 1.88 \( \times 10^{-14} \) N  
   b) 1.92 \( \times 10^{-14} \) N  
   c) 1.6 \( \times 10^{-19} \) N  
   d) 1.2 \( \times 10^{-5} \) N

45. Lines of force is represented by the path followed by ___ in an electric field.
   a) positive charge  
   b) unit positive charge  
   c) unit negative charge  
   d) none of these

46. The tangent to the line of force at any point gives the ____ of the electric field.
   a) force  
   b) magnitude  
   c) direction  
   d) flux

47. Who introduced the concept of field lines to visualize electric and magnetic fields?
   a) Thales  
   b) Michael faraday  
   c) coulomb  
   d) Franklin

48. Number of lines per unit area is proportional to the magnitude of
   a) electric potential  
   b) electric field intensity  
   c) electric force  
   d) volume charge density

49. The number of electric lines of force originating from a charge of 1 \( \mu \) C is
   a) 1.129 \( \times 10^9 \)  
   b) 1.6 \( \times 10^{19} \)  
   c) 6.25 \( \times 10^{18} \)  
   d) 8.85 \( \times 10^{12} \)

50. Each unit positive charge gives rise to ____ lines of force in free space.
   a) \( q / \varepsilon_0 \)  
   b) \( 1 / \varepsilon_0 \)  
   c) \( \varepsilon_0 \)  
   d) \( 1 / 2 \varepsilon_0 \)

51. Two charges +2.5 \( \mu \)C and -2.5 \( \mu \)C are separated by a distance of 5 cm. The electric dipole moment is
   a) 12.5 Cm  
   b) 1.25 \( \times 10^7 \) Cm  
   c) 1.25 \( \times 10^7 \) Cm  
   d) 10^7 Cm

52. The magnitude of electric dipole moment is
   a) \( p = 2 \mu \)q  
   b) \( q = p \mu \)  
   c) \( q = p.2 \)d  
   d) \( p = q.2 \)

53. The unit of electric dipole moment is
   a) \( \text{V m}^{-1} \)  
   b) \( \text{C m}^{-1} \)  
   c) \( \text{Vm} \)  
   d) \( \text{C m} \)

54. A system of two equal and opposite charges separated by small distance is called
   a) polar molecule  
   b) non polar molecule  
   c) dipole  
   d) multi polar molecule

55. Electric dipole moment acts from
   a) \( -q \) to \( +q \)  
   b) \( +q \) to \( -q \)  
   c) \( -q \) to \( +q \)  
   d) \( +q \) to \( +q \)

56. Which of the following is a scalar quantity?
   a) electric dipole moment  
   b) electric field intensity  
   c) electric potential  
   d) current density
57. An electric dipole placed in an external electric field experiences
   a) attractive force b) repulsive force c) a torque d) no force

58. The direction of electric field at a point on the equatorial line due to an electric dipole is
   a) along the equatorial line towards the dipole b) along the equatorial line away from the dipole
   c) parallel to the axis of the dipole and opposite to the direction of the dipole d) parallel to the axis of the dipole and in the direction of the dipole

59. The two point charges +10 mC and -10 mC are placed from 5 mm apart. The electric field at a point 5 cm from its centre along the equatorial line is
   a) 3.6 x 10^6 V/m b) 3.6 V/m c) 3.6 x 10^4 V/m d) 3.6 x 10^5 V/m

60. An electric dipole of charges 2 x 10^{-10} C and -2 x 10^{-10} C are separated by a distance of 5 mm. They are placed at an angle of 60° to an uniform electric field intensity of 10 V/m. The torque exerted by the field is
   a) 8.66 x 10^{-12} Nm b) 0.866 x 10^{-14} Nm c) 177.37 x 10^{-12} Nm d) 0

61. Torque on a dipole in a uniform electric field is maximum when the angle between \( \vec{P} \) and \( \vec{E} \) is
   a) 0° b) 90° c) 45° d) 180°

62. In the absence of an external field the dipole moments of polar molecules of a dielectric a) orient themselves in random directions and no net dipole moment is observed b) do not orient themselves in random directions and no net dipole moment is observed c) orient themselves in random directions and net dipole is observed d) none of the above

63. The molecule having dipole moment 3.4 x 10^{-30} C m is placed in an electric field of 2 x 10^4 N C^{-1}
   The maximum torque that can act on the molecule is
   a) 6.8 x 10^{-26} Nm b) 6.8 x 10^{-20} Nm c) 6.8 x 10^{-26} Nm d) 6.8 x 10^{-20} Nm

64. Electric potential energy of an electric dipole in an electric field is given as
   a) PE \sin \theta b) –PE \sin \theta c) –PE \cos \theta d) PE \cos \theta

65. Electric potential energy of an electric dipole in an electric field is maximum when \( \theta = \)
   a) 180° b) 90° c) 0° d) 45°

66. The unit of potential difference is
   a) ampere b) volt c) coulomb d) farad

67. The potential at a point due to a charge of 100 mC at a distance of 90m is
   a) 10^2 V b) 10^3 V c) 10^4 V d) 10^5 V

68. The electric field E and potential V at a point are related to one another as
   a) \( E = \frac{-dv}{dx} \) b) \( E = \frac{dv}{dx} \) c) \( E = \frac{-dv}{dx} \) d) \( dx = \frac{dv}{dx} \)

69. The potential at a point due to a charge of 100 micro coulomb at a distance of 9 meters is
   a) 100 V b) 9 x 10^3 V c) 10^5 V d) 10^9 V

70. \( \text{V m}^{-1} \) is the unit of
   a) electric potential b) electric flux c) electric field intensity d) electric dipole

71. In the relation \( E = \frac{dV}{dx} \), the negative sign indicates that the potential
   a) decreases in the direction of electric field b) increases in the direction of electric field
   c) no change d) decreases in the direction opposite to the direction of electric field

72. When a point P lies on the axial line of the dipole on the side of the positive charge then the potential is
   a) \( \frac{P}{4\pi\varepsilon_0 r^2} \) b) \( -\frac{P}{4\pi\varepsilon_0 r^2} \) c) \( \frac{P}{4\pi\varepsilon_0 r^2} \) d) zero

73. When a point p lies on the axial line of the dipole on the side of the negative charge, the potential is
   a) \( \frac{P}{4\pi\varepsilon_0 r^2} \) b) \( -\frac{P}{4\pi\varepsilon_0 r^2} \) c) \( \frac{P}{4\pi\varepsilon_0 r^2} \) d) zero
74. In case of uniform field equipotential surfaces are the  
   a) parallel planes  
   b) perpendicular planes  
   c) curved lines  
   d) concentric circle

75. The electric potential energy of the system of charges $q_1$ and $q_2$ is
   a) $\frac{P}{4\pi \varepsilon_0 r^2}$  
   b) $-\frac{P}{4\pi \varepsilon_0 r^2}$  
   c) $\frac{P}{4\pi \varepsilon_0 r^3}$  
   d) $\frac{q_1q_2}{4\pi \varepsilon_0 r}$

76. An electron initially at rest is accelerated through p.d. of 1 volt. The energy acquired by electrons is
   a) 1 J  
   b) $1.6 \times 10^{-19} J$  
   c) $10^{-19} J$  
   d) $1.6 \times 10^{-19} J$

77. In bringing an electron, towards another electron, the electrostatic potential energy of the system
   a) remains same  
   b) becomes zero  
   c) increases  
   d) decreases

78. The workdone in moving 4 μ C 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) $4 \times 10^3 V$

79. In an equipotential surface which is same at all points?
   a) electrical intensity  
   b) electric force  
   c) electrical potential  
   d) electric flux

80. The equipotential surfaces of an isolated point charges are
   a) concentric spheres  
   b) plane surfaces  
   c) concentric circles  
   d) none of the above

81. 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) 8 V  
   b) 2V  
   c) 0.1V  
   d) 0.5 V

82. The electric field lines are ______ to an equipotential surface
   a) tangential  
   b) normal  
   c) curvilinear  
   d) parallel

83. Potential energy of two equal negative point charges of magnitude 2μ C placed 1 m apart in air is
   a) 2J  
   b) 0.36 J  
   c) 4J  
   d) 0.036 J

84. The unit of electric flux is
   a) Nm$^2$C  
   b) NmC$^{-1}$  
   c) Nm$^2$C$^{-2}$  
   d) Nm$^2$C$^{-1}$

85. According to Gauss’s theorem
   a) $\phi = \frac{q}{\varepsilon_0}$  
   b) $\phi = \frac{q}{\varepsilon_0}$  
   c) $\varepsilon_0 = \phi / q$  
   d) $q^2 = \varepsilon_0 \phi$

86. Electric field due to an infinite long straight charged wire E is
   \[
   \frac{\lambda}{4\pi \varepsilon_0 r} \quad \frac{\phi q}{2\pi \varepsilon_0 r} \quad \frac{\lambda}{3\pi \varepsilon_0 r} \quad \frac{\lambda}{4\pi \varepsilon_0 r^2} 
   \]

87. Unit of surface charge density is
   a) Cm$^{-1}$  
   b) Cm$^3$  
   c) NC$^{-1}$  
   d) Cm$^{-2}$

88. A charge Q is placed at the centre of a cube. The electric flux through all the 6 faces of the cube is
   a) $\frac{Q}{6\varepsilon_0}$  
   b) $\frac{Q}{8\varepsilon_0}$  
   c) $\frac{Q}{\varepsilon_0}$  
   d) $\frac{Q}{3\varepsilon_0}$

89. Unit of linear charge density is
   a) Cm$^{-1}$  
   b) Cm$^3$  
   c) NC$^{-1}$  
   d) Cm$^{-2}$

90. The electric field inside a conductor
   a) is zero  
   b) radially inwards  
   c) radially outwards  
   d) none of the above

91. Induced charges are
   a) charges created without any contact with another charge  
   b) charges which contact with each other  
   c) charges which are influenced by near by charge  
   d) none of the above

92. The electric field at a point of distance r from centre inside a charged shell of radius R is
   a) $\frac{q}{4\pi \varepsilon_0 r}$  
   b) $\frac{q}{4\pi r}$  
   c) $\frac{q}{4\pi \varepsilon_0 R^2}$  
   d) zero
93. The electric field due to a uniformly charged spherical shell of radius R at an outside point Distance r from its centre is

\[ a) \frac{q}{4\pi r^2} \quad b) \frac{q}{4\pi \varepsilon_0 r^2} \quad c) \frac{q}{4\pi \varepsilon_0 R^2} \quad d) \text{zero} \]

94. Capacitor stores

a) magnetic energy  
\quad b) chemical energy  
\quad c) electrical energy  
\quad d) heat energy

95. When the charging source is disconnected, the charges given to the plates of an ideal capacitor

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

96. The unit of capacitance is

a) joule  
\quad b) newton  
\quad c) tesla  
\quad d) farad

97. One micro farad is equal to

a) \(10^{-6}\) F  
\quad b) \(10^{-5}\) F  
\quad c) \(10^6\) F  
\quad d) \(10^{-7}\) F

98. Which of the following is not a dielectric?

a) mica  
\quad b) copper  
\quad c) ebonite  
\quad d) oil

99. Capacitors use the principle of

a) self induction  
\quad b) mutual induction  
\quad c) electrostatic induction  
\quad d) dielectric polarization

100. Which of the following does not have a permanent electric dipole moment?

a) nitrogen  
\quad b) water  
\quad c) ammonia  
\quad d) carbon-di-oxide

101. Which of the following have a permanent dipole moment?

a) N\(_2\)O  
\quad b) O\(_2\)  
\quad c) N\(_2\)  
\quad d) \(\mu_2\)

102. The dipole moment of polar molecule is

a) zero  
\quad b) permanent  
\quad c) varying  
\quad d) infinity

103. The ammonia molecule like electric dipole, because the centres of positive and negative charge

a) coincide  
\quad b) do not coincide  
\quad c) Both (a) and (b) are wrong  
\quad d) Both (a) and (b) are correct

104. If a dielectric slab is introduced between the plates of a capacitor, the dielectric slab gets

a) positive charge  
\quad b) polarised  
\quad c) negative charge  
\quad d) neutralized

105. If a dielectric slab is introduced between the plates of a capacitor the potential

a) increases  
\quad b) decreases  
\quad c) do not change  
\quad d) none of the above

106. If \(P\) is the induced dipole moment of a polar molecule and \(E\) is the external electric field, then

a) \(P = E\)  
\quad b) \(P \propto E\)  
\quad c) \(P \propto 1/E\)  
\quad d) \(PE^2\)

107. The unit of molecular polarisability is

a) \(C\sqrt{m^2}\)  
\quad b) \(C\sqrt{m}\)  
\quad c) \(C m^{-1}\)  
\quad d) \(C m^2 v^{-1}\)

108. The capacitance of a parallel plate capacitor is 2mF. A slab of dielectric constant 3 and thickness \(\frac{3}{4} d\) is introduced into the capacitor. The new capacitance is

a) 2 mF  
\quad b) 6 mF  
\quad c) 4 mF  
\quad d) 8 mF

109. The equivalent capacitance of two capacitors in series 1.5 \(\mu\)F. The capacitance of one of them is 4 \(\mu\)F. The value of capacitance of the other is

a) 2.4 \(\mu\)F  
\quad b) 0.24 \(\mu\)F  
\quad c) 0.417 \(\mu\)F  
\quad d) 4.17 \(\mu\)F

110. The capacitance of a parallel plate capacitor increases from 2 \(\mu\)F to 20 \(\mu\)F when a dielectric is filled between the plates. The dielectric constant of the dielectric is

a) 2  
\quad b) 20  
\quad c) 10  
\quad d) 40

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

a) 3 \(\mu\)F  
\quad b) \(\frac{36}{13}\) \(\mu\)F  
\quad c) 13 \(\mu\)F  
\quad d) 7 \(\mu\)F

112. When two capacitor are connected in series to a source of emf, then each of them will have same

a) voltage  
\quad b) electric field  
\quad c) charge  
\quad d) voltage and electric field
113. When a number of capacitors are connected in parallel, then the effective capacitance is equal to
   a) sum of the capacitance of the individual capacitor
   b) sum of the reciprocal of the capacitance of the individual capacitor
   c) product of the capacitance of the individual capacitor
   d) product of the reciprocal of the capacitances of the individual capacitor

114. The energy stored in a capacitor is given by
   a) \( U = \frac{1}{2} CV^2 \)
   b) \( U = \frac{1}{2} mv^2 \)
   c) \( U = \frac{1}{2} C V^2 \)
   d) \( U = \frac{1}{2} CV^2 \)

115. In the distribution of charges on a conductor which of the following is correct?
   a) smaller the radius, larger the charge density
   b) greater the radius, larger the charge density
   c) smaller the radius, smaller the charge density
   d) none of the above

116. Find out the shape of the conductor in which the electric charge is distributed uniformly throughout the surface
   a) Dumb-bell
   b) cone
   c) sphere
   d) ellipsoid

117. The energy recovered if a capacitor is allowed to discharge is
   a) \( CV^2 \)
   b) \( CV \)
   c) \( \frac{1}{2} CV^2 \)
   d) \( \frac{1}{4} CV^2 \)

118. Two charged metal spheres of the radii 2 cm and 5 cm are connected by a wire. The ratio of the surface charge density is
   a) 2
   b) 0.4
   c) 2.54
   d) 5

119. A lightning arrestor works on the principle of
   a) corona discharge
   b) diffusion of charge
   c) discharge of electricity
   d) separation of charges

120. Van de Graaff generator can produce voltage of the order of
   a) \( 10^4 \) V
   b) \( 10^5 \) V
   c) \( 10^6 \) V
   d) \( 10^7 \) V

121. In a Vande Graff generator the comb D is maintained at a positive potential of the order of
   a) \( 10^3 \) V
   b) \( 10^5 \) V
   c) \( 10^6 \) V
   d) \( 10^4 \) V

122. In a Van de Graaff generator the belt acquires charges from comb by
   a) electrostatic induction
   b) electromagnetic induction
   c) conduction
   d) action of points

123. Which of the following cannot be accelerated using Van de Graff generator?
   a) \( \alpha \)-particle
   b) electron
   c) proton
   d) deuteron
2. CURRENT ELECTRICITY

01. 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

02. According to Faraday’s law of electrolysis, when a current is passed, the mass of ions deposited at the cathode is independent of
   (a) current  (b) charge
   (c) time  (d) resistance

03. 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 1/4th
   (c) will become 4 times  (d) will remain the same

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

05. If the resistance of the coil is 2 Ω at 0°C and α = 0.004/oC, then the resistance at 100°C is
   (a) 1.4 Ω  (b) 0 Ω  (c) 4 Ω  (d) 2.8 Ω

06. When two 2 Ω resistances are in parallel, the effective resistance is
   (a) 2 Ω  (b) 4 Ω  (c) 1 Ω  (d) 0.5 Ω

07. The material through which electric charge can flow easily is
   (a) quartz  (b) mica  (c) germanium  (d) copper

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

09. 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

10. When n resistors of equal resistances (R) are connected in series, the effective resistances is
    (a) n/ R  (b) R/ n  (c) 1/ nR  (d) nR

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

12. The external energy that makes the free electrons to move in a conductor is
    (a) magnetic force  (b) gravitational force  (c) coulomb’s force  (d) electromotive force

13. In a conductor, the direction of conventional current is ___ to the direction of flow of electrons
    (a) opposite  (b) same  (c) perpendicular  (d) parallel

14. Current is a _____ quantity.
    (a) vector  (b) scalar  (c) neither a scalar nor a vector  (d) either scalar or vector

15. In the absence of an electric field, the free electrons in a metal moves
    (a) in the same direction  (b) at a steady speed  (c) in opposite direction  (d) at random

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

17. Force experienced by a free electron in an electric field E is
    (a) eE  (b) E/e  (c) e/t  (d) Ee^2

18. Acceleration experienced by an electron of mass “m” and charge “e” in an electric field “E” is
    (a) \( \frac{eE}{m} \)  (b) \( \frac{e}{m} \)  (c) \( \frac{ME}{m} \)  (d) \( \frac{em}{m} \)

19. Unit of mobility of electron is
    (a) ms^-1  (b) mv^-1 s^-1  (c) m^2v^-1 s^-1  (d) m^2v^-1 s^-1

20. Drift velocity is
    (a) directly proportional to E  (b) inversely proportional to E
    (c) independent of E  (d) directly proportional to E^2

21. The drift velocity is of the order of
    (a) 0.1 ms^-1  (b) 0.1 cms^-1  (c) 1.0 cms^-1  (d) 1 kms^-1

22. The unit of current density is
    (a) cs^-1  (b) cs^-1 m^-2  (c) Am^-2  (d) Am^-2
23. The relation between current and drift velocity
   a) \( I = nAeV_d \)
   b) \( V_d = Jne \)
   c) \( V_d = neJA \)
   d) \( J = neV_d \)

24. The relation between current density and drift velocity
   a) \( I = nJeV_d \)
   b) \( V_d = Jne \)
   c) \( V_d = neJA \)
   d) \( J = neV_d \)

25. The average relaxation time is
   a) time between two successive collisions
   b) the time taken for deflection
   c) the time taken for scattering
   d) all the above

26. According to Ohm’s law
   a) \( V = IR \)
   b) \( I = VR \)
   c) \( R = VI \)
   d) \( P = VI \)

27. When a current of 5A flows through a resistance of 100 \( \Omega \) the potential across the resistance is
   a) 5000 V
   b) 500 V
   c) 50 V
   d) 20 V

28. Conductors which obey Ohm’s law are called
   a) dielectrics
   b) superconductors
   c) ohmic conductors
   d) semiconductors

29. The graph drawn between \( V \) and \( I \) is a straight line for
   a) insulator
   b) conductor
   c) semiconductor
   d) all the above

30. The conductivity of the material is given by
   a) \( \sigma = \frac{RA}{\lambda} \)
   b) \( \sigma = \frac{\lambda}{RA} \)
   c) \( \sigma = \frac{\lambda}{RA} \)
   d) \( \sigma = \frac{\lambda}{RA} \)

31. The specific resistance of a wire depends upon
   a) its length
   b) its radius
   c) its shape
   d) material of the wire

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

33. Two resistances of a given material having the same length are in the ratio 2:3. If the area of cross section of the first wire is \( 10^6 \) m\(^2\) the area of cross section of the other is
   a) \( 10^6 \) m\(^2\)
   b) \( 2 \times 10^6 \) m\(^2\)
   c) \( 10^3 \) mm\(^2\)
   d) \( 1.5 \times 10^6 \) m\(^2\)

34. The resistivity of the wire
   a) varies directly as the length of the wire
   b) varies inversely as the square of its radius
   c) varies inversely as the length of the wire
   d) independent of both length and area of cross section

35. The resistivity of a conductor does not depend on
   a) its temperature
   b) its material
   c) its length and area of cross section
   d) both (a) and (b)

36. The reciprocal of resistivity is
   a) resistivity
   b) conductivity
   c) super conductivity
   d) conductance

37. The unit of resistance is
   a) ohm
   b) ohm m\(^{-1}\)
   c) ohm m
   d) mho

38. The conductance of a conductor of resistance 2 milli ohm is
   a) 2 mho
   b) 500 ohm
   c) 500 mho
   d) 200 ohm

39. The conductance of the conductor is directly proportional to
   a) square of the radius
   b) length
   c) 1/length
   d) both a & c

40. A conducting wire of length \( l \) is stretched twice to its original length. Then the ratio of the initial resistance to the new resistance is
   a) 1:1
   b) 1:4
   c) 1:3
   d) 1:2

41. Resistance of a metal wire of length 10 cm is 2 ohms. If the wire is stretched uniformly to 50 cm the resistance is
   a) 25 ohm
   b) 10 ohm
   c) 5 ohm
   d) 50 ohm

42. When a wire is stretched such that its length increases by \( n \) times of its original length, Then its resistance
   a) increases by \( n^2 \) times
   b) increases by \( n \) times
   c) decreases by \( n \) times
   d) decreases by \( n^2 \) times

43. The unit of resistance is
   a) ohm
   b) ohm m\(^{-1}\)
   c) ohm m
   d) mho
44. The unit of resistivity is 
   a) ohm               b) ohm m⁻¹       c) ohm m        d) mho
45. The unit of conductance is 
   a) ohm               b) ohm m⁻¹       c) ohm m⁻¹      d) mho
46. The unit of conductivity is 
   a) mho m⁻¹           b) ohm m⁻¹       c) ohm m⁻¹      d) mho m
47. Materials having the resistivity of the order of $10^6 - 10^8 \, \Omega \text{m}$ are classified as 
   a) insulators        b) conductors    c) semi conductors d) none of these
48. Materials having the resistivity of the order of $10^8 - 10^{14} \, \Omega \text{m}$ are classified as  
   a) insulators        b) conductors    c) semi conductors d) none of these
49. Materials having the resistivity of the order of $10^2 - 10^4 \, \Omega \text{m}$ are classified as 
   a) insulators        b) conductors    c) semi conductors d) none of these
50. The resistivity of metals and alloys is of the order of 
   a) $10^6 - 10^8 \, \Omega \text{m}$    b) $10^8 - 10^{10} \, \Omega \text{m}$ c) $10^8 - 10^{14} \, \Omega \text{m}$ d) zero
51. As the temperature decreases, the resistivity of metals 
   a) remains constant    b) decreases    c) increases    d) becomes zero
52. The resistance of a metallic wire of length 10 cm is 2 ohm, if the wire is stretched to 40 cm, 
   the new resistance is 
   a) 6 ohm               b) 16 ohm      c) 32 ohm       d) 64 ohm
53. Super conductivity was first observed by 
   a) Kammerling Onnes  b) Michael faraday  c) Benjamin franklin  d) Coulomb
54. The super conductors have zero 
   a) resistance        b) conductance   c) permeability       d) permittivity
55. The temperature at which the resistance of a conductor suddenly drops to zero is 
   a) critical temperature b) curie temperature  c) inversion temperature d) neutral temperature
56. Super conductivity was observed, when the temperature of mercury was cooled to 
   a) 14.2 k                b) 4.2 k        c) 4.2⁰ k        d) 14.2⁰ k
57. At the critical temperature the resistance of a superconductor 
   a) increases rapidly b) decreases rapidly  c) remains constant d) increases slowly
58. 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 7%  c) 10% , 5% , 1% and 2% d) 10% , 5% , 2% and 1%
59. The colour code on a corbon resistor is red-red-black. The resistance of the resistor is 
   a) 2.2 ohm               b) 22 ohm      c) 220 ohm      d) 2.2 Kilo ohm
60. The brown ring at one end of a carbon resistor indicates a tolerance of 
   a) 1%                      b) 2%                 c) 5%                   d) 10%
61. The tolerance of carbon resistors without a colour ring is 
   a) 20%                      b) 10%                 c) 2%                   d) 25%
62. 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
63. The value of carbon resistor with the colour code of yellow, violet and orange is 
   a) 37 KΩ                  b) 4.7 KΩ         c) 47 KΩ          d) 3.7 KΩ
64. In a network with constant source of emf, if more resistance are connected in parallel, 
   the power supplied would be 
   a) increased      b) decreased    c) remaining same d) either increased or decreased
65. Two resistance of resistance 3Ω and 5Ω are connected in parallel, the effective resistance is 
   a) 15/8Ω              b) 8/15Ω             c) 8 KΩ              d) 35 KΩ
66. Three resistence 2Ω, 4Ω and 6Ω are connected in series, the effective resistance is 
   a) 4.2 Ω              b) 12 Ω           c) 6.4 Ω              d) 1.2 Ω
67. As the temperature decreases, the resistance of the conductor 
   a) decreases           b) increases      c) increases and then decreases d) remains constant
68. If \( R_0 \) and \( R_t \) are the resistances of a conductor at \( 0^\circ \text{C} \) and \( t^\circ \text{C} \) respectively, then the Temperature coefficient of resistance is

\[
\alpha = \frac{R_t - R_0}{R_0 - R_t} = \frac{R_t - R_0}{R_0t - R_0t} = \frac{R_0 - R_t}{R_0t}
\]

69. The unit of temperature coefficient of resistance is

a) \(^\circ\text{C}\)  

b) ohm  

c) mho  

d) \(^\circ\text{C}\)

70. The resistance of a wire at \( 0^\circ \text{C} \) is \( 6\Omega \). If its resistance at \( 50^\circ \text{C} \) is \( 7.5\Omega \) the temperature coefficient of resistance of the wire is

a) 0.002/\(^\circ\text{C}\)  

b) 0.005/\(^\circ\text{C}\)  

c) -0.002/\(^\circ\text{C}\)  

d) -0.005/\(^\circ\text{C}\)

71. The resistance of a conductor is \( 5\Omega \) at \( 50^\circ \text{C} \) and \( 6\Omega \) at \( 100^\circ \text{C} \). Then the resistance at \( 0^\circ \text{C} \) is

a) \( 0\Omega \)  

b) 3.5\(\Omega \)  

c) 4\(\Omega \)  

d) 8\(\Omega \)

72. In the case of insulators, as the temperature increases, resistivity

a) decreases  

b) increases  

c) remains constant  

d) becomes zero

73. The temperature coefficient of alloy is

a) low  

b) high  

c) infinity  

d) zero

74. As temperature increases, the resistance of insulators and semiconductors

a) increases  

b) decreases  

c) remains same  

d) either increases or decreases

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

a) metal  

b) alloy  

c) thermometer  

d) thermistors

76. Manganin wire has ___ temperature coefficient of resistance

a) low  

b) high  

c) zero  

d) infinite

77. Internal resistance of a cell can be measured using

a) galvanometer  

b) ammeter  

c) voltmeter  

d) Wheatstone’s bridge

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

a) increases  

b) decreases  

c) does not change  

d) becomes zero

79. A cell has a potential difference of 5 V in an open circuit, but it falls to 3.5 V when a current of 2 A is drawn from it. The internal resistance of a cell is

a) 7.5 \(\Omega\)  

b) 3.5 \(\Omega\)  

c) 5 \(\Omega\)  

d) 0.75 \(\Omega\)

80. The algebraic sum of currents at any junction in an electric circuit is

a) positive  

b) zero  

c) maximum  

d) infinity

81. In a Wheatstone’s bridge, \( P = 1000\Omega \), \( Q = 10000\Omega \) and \( R = 20\Omega \). If the galvanometer shows zero deflection, then the value of \( S = \)

a) 20\(\Omega \)  

b) 200\(\Omega \)  

c) 2\(\Omega \)  

d) 2000\(\Omega \)

82. Meter bridge is a modified form of

a) potentiometer  

b) multimeter  

c) galvanometer  

d) Wheatstone’s network

83. Potentiometer measures potential differences more accurately because

a) it uses sensitive galvanometer for null deflection  

b) it uses high resistance wire  

c) it measures the potential difference in the closed circuit  

d) open circuit

84. Principle of potentiometer is

a) \( E \alpha \lambda \)  

b) \( E \alpha \lambda^2 \)  

c) \( E \alpha \frac{1}{\lambda} \)  

d) \( E \alpha \lambda^3 \)

85. The equation for electric power (\( P \)) is

a) \( P = VI \)  

b) \( P = VI \)  

c) \( P = V^2R \)  

d) \( P = I^2RT \)

86. The electrical energy is measured by

a) joule hour  

b) joule per second  

c) watt hour  

d) watt

87. A bulb is labeled as 250V, 100W. The resistance of the filament of the bulb is

a) 350 \(\Omega\)  

b) 525 \(\Omega\)  

c) 150 \(\Omega\)  

d) 25 \(\Omega\)

88. 1 KW hour is equal to

a) 36 \(\times 10^4\) J  

b) 3.6 \(\times 10^4\) J  

c) 3600 J  

d) 3.6 \(\times 10^4\) J

89. 36 \(\times 10^4\) J is equivalent to

a) 1.5 unit  

b) 1 unit  

c) 1 watt  

d) 1 W h
90. An iron box of 400 W is used 45 minutes per day. What is the energy consumed by it per day?
   a) 0.3 kwh   b) 0.3 wh   c) 300 kwh   d) 200 kwh
91. The mass of a substance liberated at the electrodes is given by
   a) \( m = Zlt \)   b) \( m = qlt \)   c) \( m = zqt \)   d) \( m = \frac{q}{z} \)
92. According to Faraday’s laws of electrolysis, the mass of the metal deposited depends on
   a) resistivity   b) resistance   c) conductivity   d) current
93. In electrolysis, if the duration of the passage of current is doubled, the mass liberated is
   a) halved   b) increased by four times   c) remains the same   d) doubled
94. The unit of electrochemical equivalent is
   a) kg \( C^{-1} \)   b) C kg\(^{-1} \)   c) kg C   d) kg C\(^{-2} \)
95. Which of these is not a primary cell?
   a) Daniel cell   b) Lechlance cell   c) Lithium button cell   d) dry cell
96. The electrolyte used in voltaic cell is
   a) copper sulphate solution   b) concentrated sulphuric acid
   c) ammonium chloride solution   d) dilute sulphuric acid
97. Primary cells are
   a) rechargeable   b) not rechargeable
   c) huge in size   d) provide more power
98. Specific gravity of electrolyte in secondary cell while charging and discharging should be
   a) 1.08 to 1.12   b) 1.28 to 1.12
   c) 1.78 to 2.28   d) 1.86 to 3.1
99. The ratio of emf produced by Lechlanche cell and Daniel cell is
   a) 1.72   b) 1.389   c) 1.552   d) 2.339
100. The internal resistance of Lechlanche cell is
    a) 1.5\( \Omega \)   b) 1.08\( \Omega \)   c) 6\( \Omega \)   d) 2.2\( \Omega \)
101. Electrolyte used in lead – acid accumulator is
    a) lead acid   b) HCl   c) dil. \( H_2SO_4 \)   d) \( HNO_3 \)
3. EFFECTS OF ELECTRIC CURRENT

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

02. In a tangent galvanometer, for a constant current, the deflection is 30°. The plane of the coil is rotated through 90°. Now for the same current, the deflection will be
   (a) 30°  
   (b) 60°  
   (c) 90°  
   (d) 0°

03. In a thermocouple, the temperature of the cold junction is 20°C, the neutral temperature is 270°C. The temperature of inversion is
   (a) 520°C  
   (b) 540°C  
   (c) 500°C  
   (d) 510°C

04. Which of the following equation represents Biot – savart law?
   (a) \( dB = \frac{\mu_0 I}{4\pi} \frac{dl}{r^2} \)  
   (b) \( dB = \frac{\mu_0 I}{4\pi} \frac{dl}{r^2} \sin \theta \)  
   (c) \( dB = \frac{\mu_0 I}{4\pi} \frac{dl}{r^2} x \frac{\rho}{r} \)  
   (d) \( dB = \frac{\mu_0 I}{4\pi} \frac{dl}{r^2} \)

05. Peltier coefficient at a junction of a thermocouple depends on
   (a) the current in the thermocouple  
   (b) the time for which current flows  
   (c) the temperature of the junction  
   (d) the charges that passes through the thermocouple

06. A galvanometer of resistance G Ω is shunted with S Ω. The effective resistance \( R_a \) of the combination is
   (a) G  
   (b) S  
   (c) G but greater than S  
   (d) less than both G and R

07. Nichrome wire is used as the heating element because it has
   (a) low specific resistance  
   (b) low melting point  
   (c) high specific resistance  
   (d) high conductivity

08. The 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

09. Magnetic induction due to an infinitely long straight conductors placed in a medium of permeability \( \mu \) is
   (a) \( \frac{\mu_0 I}{4\pi a} \)  
   (b) \( \frac{\mu_0 I}{2\pi a} \)  
   (c) \( \frac{\mu I}{2\pi a} \)  
   (d) \( \frac{\mu I}{4\pi a} \)

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

11. Joule’s law of heating is
   (a) \( H = \frac{I^2}{R} t \)  
   (b) \( H = V^2 R t \)  
   (c) \( H = V I t \)  
   (d) \( H = I R^2 t \)

12. 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

13. Phosphor- 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

14. Which of the following is not thermo electric effect?
   a) Seebeck effect  
   b) Peltier effect  
   c) Joule effect  
   d) Thomson effect

15. The heat developed in half a minute in a resistor of resistance 5Ω is 15,000 Joules, the current through the resistor is
   (a) 5 ampere  
   (b) 100 ampere  
   (c) 40 ampere  
   (d) 10 ampere

16. Electric arc and electric welding work on the principle of _____ effect of current.
   a) chemical  
   b) heating  
   c) lighting  
   d) mechanical
17. The heating element that does not oxidize readily is an alloy of metals made of
   a) Nickel and Iron
   b) Nickel and Chromium
   c) Copper and Manganin
   d) Nickel and Copper

18. Fuse wire is an alloy of
   a) 37% lead and 63% tin
   b) 63% lead and 37% tin
   c) 37% copper and 63% tin
   d) 63% copper and 37% tin

19. Fuse wire has
   a) high resistance only
   b) low melting point only
   c) low specific resistance
   d) high resistance and low melting point

20. Melting point of tungsten is
   a) 3380 K
   b) 3380°C
   c) 4500°C
   d) 2730 K

21. In a bulb, the filament is usually enclosed in a glass bulb containing some
   a) inert gas at low pressure
   b) inert gas at high pressure
   c) inert gas at low temperature
   d) none of the above

22. Joule heating effect is undesirable in
   a) galvanometer
   b) calorimeter
   c) transformer
   d) transformer and dynamo

23. The thermo emf generated in a thermo couple of the order of
   a) volts
   b) milli volts
   c) micro volts
   d) nanovolts

24. The direction of thermo emf in Cu – Fe thermo couple is from
   a) Cu to Fe at hot junction
   b) Cu to Fe at cold junction
   c) Fe to Cu at hot junction
   d) none of the above

25. In the following thermoelectric couples, mention the pair in which the thermo – emf
    produced is larger?
   a) Bi - Sb
   b) Cu - Sn
   c) Au - Cd
   d) Pt – Sn

26. In the following thermoelectric couples, mention the pair in which the thermo – emf
    produced is minimum?
   a) Bi - Sb
   b) Cu - Fe
   c) Bi - Ni
   d) Bi - Fe

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

28. Thermo emf is given by
   a) \( v = \theta + \frac{1}{2} \beta \theta^2 \)
   b) \( v = \alpha \theta + \frac{1}{2} \beta \theta^2 \)
   c) \( v = \alpha \theta^2 + \frac{1}{2} \beta \theta \)
   d) \( v = \alpha \theta - \frac{1}{2} \beta \theta^2 \)

29. For small difference in temperature the graph showing the variation of thermo emf with temperature is
   a) parabola
   b) circle
   c) ellipse
   d) straight line

30. For large difference in temperature the graph showing the variation of thermo emf with temperature is
   a) parabola
   b) circle
   c) ellipse
   d) straight line

31. For a given thermocouple, the neutral temperature is
   a) maximum
   b) minimum
   c) zero
   d) a constant

32. The temperature of inversion depends upon the
   a) temperature of hot junction
   b) temperature of cold junction
   c) neutral temperature
   d) a constant

33. Beyond the temperature of inversion, the thermo emf
   a) decreases
   b) is zero
   c) is constant
   d) increases

34. At the neutral temperature, thermo emf is
   a) zero
   b) minimum
   c) maximum
   d) infinity

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

36. Peltier effect is the converse of
   a) Joule effect
   b) Raman effect
   c) Thomson effect
   d) Seebeck effect

37. In a thermocouple peltier coefficient is
   a) more at hot junction
   b) more at cold junction
   c) same at hot and cold junction
   d) none of the above
38. The unit of peltier coefficient is
   a) ampere    b) volt    c) ohm    d) mho

39. Which effect is irreversible?
   a) Seebeck effect    b) Joule heating effect    c) Peltier effect    d) Thomson effect

40. Thermo emf does not depend on
   a) the material of the two conductors    b) temperature of hot junction    c) length of the conductors    d) temperature of cold junction

41. The peltier coefficient of a thermo couple is 3 mV the heat liberated or absorbed in any one junction is 3.6 J. When a current of 4A is sent through the thermocouple. What is the time of flow of current?
   a) 3000 minute    b) 300 second    c) 30 minute    d) 30 second

42. The unit of Thomson coefficient is
   a) volt    b) volt per meter    c) ampere per °K    d) volt per °C

43. Which of the following does not have negative Thomson effect?
   a) Hg    b) Co    c) Pt    d) Cd

44. Which of the following does not have positive Thomson effect?
   a) Sn    b) Br    c) Au    d) Ag

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

46. In a thermopile, the deflection in the galvanometer is
   a) inversely proportional to intensity or radiation    b) directly proportional to intensity or radiation    c) directly proportional to current of radiation    d) directly proportional to difference of radiation

47. Thermopile works on the principle of
   a) Joule heating effect    b) Thomson effect    c) Peltier effect    d) Seebeck effect

48. Who discovered that a magnetic field is associated with a current carrying conductor?
   a) Huygens    b) Kirchoff    c) Oersted    d) Faraday

49. The direction of the magnetic field in a current carrying conductor is given by
   a) End rule    b) Biot – savart law    c) Tangent law    d) Maxwell’s right hand cork screw rule

50. Which law is used to calculate the magnetic induction due to current carrying conductor?
   a) Kirchoff’s law    b) Gauss law    c) Biot – Savart law    d) Ampere’s law

51. A straight wire of diameter 0.5 mm varying a current of 1 A is replaced by another wire of 1 mm Diameter carrying same current. The strength of the magnetic field at a point is
   a) Twice the original value    b) half the original value    c) One – fourth of the original value    d) Unchanged

52. Magnetic induction due to infinitely long straight conductor placed in air medium is
   a) \( \frac{\mu_0 I}{2\pi a} \)    b) \( \frac{\mu_0 I}{2\pi a} \)    c) \( \frac{2\pi a}{\mu I} \)    d) \( \frac{2\pi a}{\mu_0 I} \)

53. The magnetic field at a distance from a long wire carrying current is 0.4 Ampere. The magnetic field at a distance 4 cm is
   a) 0.1 T    b) 0.2 T    c) 0.8 T    d) 1.6 T

54. Magnetic flux density at the centre of a circular loop of diameter 20 cm carrying a current 5A kept in air is
   a) 4 x 10^-7 T    b) 3.14 x 10^-7 T    c) 10^-7 T    d) 2 x 10^-7 T

55. A current of 2A flows through a circular coil of area 4\( \pi \) x 10^-2 m^2. The magnetic field at the Centre the coil is
   a) 62.8 x 10^-5 T    b) 628 x 10^-9 T    c) 6.28 x 10^-6 T    d) 3.14 x 10^-6 T

56. Field at the centre of the current carrying circular coil is
   a) directly proportional to its radius    b) inversely proportional to its radius    c) directly proportional to the square of its raidus    d) inversely proportional to the square of its raidus
57. In a tangent galvanometer the angle between the planes of the circular coil and the circular scale is
   a) $0^\circ$ b) $25^\circ$ c) $90^\circ$ d) $180^\circ$
58. Magnetic needle of a tangent galvanometer is kept small because, the magnetic field is
   a) very large at the centre
   b) consider to be small and uniform at the centre
   c) radial at the centre
   d) such that it is convenient to handle small needle
59. 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
60. What is the reduction factor of a tangent galvanometer having 6 turn coil of diameter 30 cm,
   If the earth’s magnetic induction is $6.28 \times 10^{-5}$ T?
   a) 2 b) 3.5 c) 1.5 d) 2.5
61. The tangent galvanometer is most sensitive at a deflection of
   a) $30^\circ$ b) $60^\circ$ c) $30^\circ$ to $60^\circ$ d) $45^\circ$
62. A current of 1 A flowing through a Tangent galvanometer produce a deflection of 30$^\circ$.
   The current needed to produce a deflection of 45$^\circ$ is
   a) $\sqrt{3}/2$ A b) $1/\sqrt{3}$ A c) $\sqrt{3}$ A d) 1 A
63. In a tangent galvanometer a current 1 A, produces a deflection of 30$^\circ$. The required current to
   produce a deflection of 60$^\circ$ is
   a) 3 A b) 2 A c) $\sqrt{3}$ A d) $1/\sqrt{3}$ A
64. In a tangent galvanometer
   a) $\tan \theta = kl$ b) $K = I \tan \theta$ c) $K = 1/\tan \theta$ d) $I = k \tan \theta$
65. The unit of reduction factor of tangent galvanometer is
   a) no unit b) tesla c) ampere d) ampere / degree
66. At a place the reduction factor of tangent galvanometer is
   a) maximum b) minimum c) a constant d) zero
67. The reduction factor of tangent galvanometer is
   a) $2K = 1/\tan \theta$ b) $\tan \theta = kl$ c) $K = G \tan \theta$ d) $K = Bh \frac{2\pi}{\mu_{0}}$
68. Biot – sauvart law expressed in on alternative way is called
   a) end rule b) Gauss law c) Ampere circuital law d) Fleming left hand rule
69. With in the magnetic field the line integral does not depend on
   a) the shape of the path b) the position of the wire c) both (a) and (b) d) (a) or (b)
70. A long closely wound helical coil is called
   a) circular loop b) coil c) solenoid d) toroid
71. The value of magnetic field at a point outside of a solenoid is
   a) finite b) infinity c) zero d) nearly zero
72. A solenoid of 1.5 m length and 4.0 cm diameter possesses 100 turns per cm. A current of 5 ampere
   Is flowing through it. The magnetic induction along its axis inside the solenoid is
   a) $2\pi x 10^{-2}$ tesla b) $2\pi x 10^{-3}$ tesla c) $2\pi x 10^{-2}$ weber d) $2\pi x 10^{-3}$ weber
73. At the interior midpoint of the solenoid, the magnetic field is
   a) weak b) strong c) weak and along the axis of the solenoid d) strong and along the axis of the solenoid
74. The direction of magnetic field due to a solenoid is given by
   a) right hand palm rule b) left hand palm rule c) Ampere’s swimming rule d) Ampere’s circuital law
75. The magnetic polarity of a current carrying solenoid is given by
   a) Right hand palm rule b) Ampere’s circuital law c) Maxwell’s cork screw rule d) End rule
76. A long solenoid of length 3 m has 4000 turns. Find the current through the solenoid if the
   Magnetic field produced at the centre of the solenoid along its axis is $8 \times 10^{-3}$ T
   a) 4.77 A b) 47.7 A c) $4.77 \times 10^{-1}$ A d) 4.7 $\times 10^{2}$ A
77. An ideal solenoid is one  
   a) Whose length and radius are same  
   b) Whose length is short compared to its radius  
   c) Whose length is large compared to its radius  
   d) Whose radius is three times its length  

78. \( \oint \mathbf{B} \cdot d\mathbf{l} = \mu_0 I_0 \) is the mathematical representation of  
   a) Biot – Savart law  
   b) Ampère’s Swimming rule  
   c) Ohm’s law  
   d) Ampère’s circuital law  

79. A straight conductor of length 0.3 m is placed in a uniform magnetic field of induction \( 8 \times 10^{-4} \) T normal to the lines of force. A current of 2.5 A flows through it. The magnetic Lorentz force action on the conductor is  
   a) 6 N  
   b) \( 6 \times 10^{-2} \) N  
   c) \( 6 \times 10^{-4} \) N  
   d) \( 6 \times 10^{-3} \) N  

80. Magnitude and direction of Lorentz force is given by the expression  
   a) \( \mathbf{F} = q (\mathbf{V} \times \mathbf{B}) \)  
   b) \( \mathbf{F} = V (q \times B) \)  
   c) \( \mathbf{F} = q (\mathbf{B} \times \mathbf{V}) \)  
   d) \( \mathbf{F} = B (q \times V) \)  

81. The force acting on the charged particles at rest inside a magnetic field is  
   a) greater than zero  
   b) less than zero  
   c) zero  
   d) infinity  

82. When the charge moves either parallel or anti parallel to the field, the magnetic Lorentz force experienced is  
   a) zero  
   b) infinity  
   c) minimum  
   d) maximum  

83. The Lorentz force on a charged particle moving perpendicular to a magnetic field is  
   a) zero  
   b) infinity  
   c) minimum  
   d) maximum  

84. The period of rotation and angular frequency of the charged particle moving inside the Magnetic field does not depend on  
   a) velocity of the particle  
   b) radius of the circular path  
   c) both (a) and (b)  
   d) mass of the particle  

85. If a charged particle, moving in a magnetic field, increases its velocity, then its radius of the magnetic field circle will  
   a) remain constant  
   b) decrease  
   c) increase  
   d) either decrease or increase  

86. A proton enters into a magnetic field with a velocity of \( 2.5 \times 10^7 \) ms\(^{-1} \) making an angle of 30° with the direction of the magnetic field of 2.5 tesla. Then the force on the proton is  
   a) \( 5 \times 10^{-12} \) N  
   b) \( 7.5 \times 10^{-12} \) N  
   c) \( 2.5 \times 10^{-12} \) N  
   d) \( 1.25 \times 10^{-12} \) N  

87. The magnetic field of induction applied to a cyclotron is 0.3 T. The frequency of the RF oscillator required accelerating a particle of mass \( 1.67 \times 10^{-27} \) kg and charging \( 1.6 \times 10^{-19} \) coulomb is  
   a) 45.7 HZ  
   b) 4.57 kHz  
   c) 4.57 MHz  
   d) 45.7 kHz  

88. Cyclotron cannot accelerate  
   a) electrons  
   b) \( \alpha \) - particles  
   c) proton  
   d) deuteron  

89. The device to accelerate charged particles to high energies is  
   a) Cyclotron  
   b) Vande graff generator  
   c) Thermopile  
   d) Toroid  

90. The direction of the force on a current carrying conductor placed in a magnetic field is given by  
   a) Ampère’s Circuital law  
   b) Fleming’s Right Hand Rule  
   c) End Rule  
   d) Fleming’s Left Hand Rule  

91. A conductor of length 2m is placed in a magnetic field of magnetic induction \( 3.8 \times 10^{-5} \) T. The current through the conductor is 2A. What will be the force acting on the conductor if the conductor makes an angle 60° to the direction of the magnetic field?  
   a) \( 0.1316 \times 10^{-3} \) N  
   b) \( 1.316 \times 10^{-5} \) N  
   c) \( 13.16 \times 10^{-3} \) N  
   d) \( 131.6 \times 10^{-5} \) N  

92. Force acting on the current carrying conductor placed along the direction of the magnetic field is  
   a) zero  
   b) BI\( l \)  
   c) - BI\( l \)  
   d) infinite  

93. Force acting on the current carrying conductor placed perpendicular to the direction of the magnetic field is  
   a) zero  
   b) BI\( l \)  
   c) - BI\( l \)  
   d) infinite  

94. When a charged particle enters in a uniform magnetic field, its kinetic energy.  
   a) remains constant  
   b) increases  
   c) decreases  
   d) becomes zero
95. Two parallel wires carrying same current in the opposite direction will experience
   a) an attractive force     b) magnetic force     c) electric force     d) repulsive force
96. Two parallel wires carrying same current in the same direction will experience
   a) an attractive force     b) magnetic force     c) electric force     d) repulsive force
97. The force per unit length between two conductor carrying 1 A current each and separated
   by a distance 1 m is
   a) $2 \pi \times 10^{-7}$ N    b) $2 \times 10^{-7}$ N    c) $4 \pi \times 10^{-7}$ N    d) $2 \times 10^{-7}$ N
98. Two parallel wires carrying current experience force between them because of
   a) potential difference between them     b) mutual inductance between them
   c) electric forces between them     d) magnetic forces between them
99. The torque experienced by a rectangular current loop placed parallel to a uniform magnetic field is
   a) maximum     b) zero     c) finite minimum     d) infinity
100. The torque on a current carrying coil placed parallel to a magnetic field is
     a) zero     b) $NBIA$     c) $NBIA \cos \theta$     d) infinite
101. The torque experienced by a rectangular current loop placed perpendicular to a uniform magnetic field is
     a) maximum     b) zero     c) finite minimum     d) infinity
102. A current of 50 mA through the coil of a galvanometer rotates the coil through an angle of $\frac{\pi}{10}$ rad.
     What is the galvanometer constant if there are 500 turns in the coils?
     a) $\frac{\pi}{500}$ mA / rad     b) $\frac{1}{\pi}$ mA / rad     c) $\frac{500}{\pi}$ mA / rad     d) $\frac{50}{18}$ mA
103. The deflection per unit voltage of a galvanometer is called
     a) current sensitivity     b) deflection sensitivity
     c) voltage sensitivity     d) none of the above
104. When the number of turns of a moving coil galvanometer is increased, the voltage sensitivity
     a) remains unchanged     b) decreases     c) becomes zero     d) increases
105. Current sensitivity of a moving coil galvanometer is
     a) $C_{nBA}$     b) $C_{BD}$     c) $\frac{nBA}{C}$     d) $\frac{CA}{nB}$
106. Suspended coil galvanometers can measure current of the order of
     a) $10^4$ A     b) $10^5$ A     c) $10^6$ A     d) $10^7$ A
107. The deflection produced when unit current passes through a galvanometer is called
     a) current sensitivity     b) voltage sensitivity
     c) deflection sensitivity     d) none of the above
108. An ammeter of range 10 mA has a resistance of 10 ohm. By connecting 990 ohm in series, what is the range of voltimeter?
     a) 0.1 V     b) 1 V     c) 10 V     d) 0.01 V
109. A Galvanometer can be converted into ammeter by connecting a
     a) low resistance in parallel     b) low resistance in series
     c) high resistance in parallel     d) high resistance in series
110. A galvanometer of resistance 60 $\Omega$, which can take a maximum current of 0.01 A is connected in a circuit carrying a current of 1 A. The minimum resistance of the shunt connected across the galvanometer is _______ ohm
     a) 60/99     b) 60/90     c) 60/100     d) 60/0.9
111. The full – scale deflection of a galvanometer is 1 mA. To convert it into an ammeter of range 0 to 1 A the shunt resistance should be _______ ohm.
     a) $\frac{999}{100}$     b) $\frac{99}{10}$     c) $\frac{100}{999}$     d) $\frac{99}{100}$
112. An ammeter of resistance 0.8 $\Omega$ can measure current up to 1A. The shunt resistance connected with ammeter so that it can measure currents up to 5A is
     a) 2 $\Omega$     b) 0.2 $\Omega$     c) 20 $\Omega$     d) 4 $\Omega$
113. A Galvanometer can be converted into voltmeter by connecting a
     a) low resistance in parallel     b) low resistance in series
     c) high resistance in parallel     d) high resistance in series
114. A Galvanometer of resistance 50 $\Omega$ is shunted with a wire of 10 ohm. The current through the Galvanometer when a current of 12 A flows in the circuit is
     a) 1 A     b) 4 A     c) 6 A     d) 2 A
115. In circuit ammeter should be connected in
   a) parallel   b) series   c) series or parallel   d) none of the above

116. The resistance of an ideal ammeter is
   a) large resistance   b) infinite resistance   c) zero resistance   d) small resistance

117. The resistance of an ideal voltmeter is
   a) large resistance   b) infinite resistance   c) zero resistance   d) small resistance

118. In circuit voltmeter should be connected in
   a) parallel   b) series   c) series or parallel   d) none of the above

119. An ammeter of resistance 0.8 Ω can measure current up to 2A. What must be the shunt resistance to enable the ammeter to measure currents up to 10 A?
   a) 0.1 Ω   b) 0.2 Ω   c) 0.3 Ω   d) 0.4 Ω

120. A galvanometer of resistance 100 Ω gives full scale deflection for 200 μA. Find the resistance to be attached so that it gives full scale deflection of 5 V.
   a) 49.3 x 10² Ω in the parallel   b) 49.3 x 10³ Ω in series   c) 24.9 x 10² Ω in parallel   d) 24.9 x 10³ Ω in series

121. Shunting means connected with the galvanometer.
   a) low resistance in series   b) low resistance in parallel   c) high resistance in parallel   d) high resistance in series

122. Gyromagnetic ratio of an electron is
   a) 8 x 10¹⁰ C kg⁻¹   b) 8.8 x 10¹⁰ C kg⁻¹   c) 8.8 x 10¹⁰ C kg⁻¹   d) 8.8 x 10¹⁰ kg⁻¹ C

123. The value of Bohr magnetron is
   a) 9.27 x 10⁻²⁴ Am²   b) 9.27 x 10⁻²⁴ Am²   c) 9.27 x 10²⁴ Am⁻¹   d) 9.27 x 10⁻²⁴ Am⁻¹

124. The magnetic moment of a current loop
   a) M = I/A   b) M = IA   c) M = I²A   d) M = IA²

125. All the magnetic phenomena is only because of circulating electric current this is
   a) Ampere’s hypothesis   b) Coulomb’s hypothesis   c) Planck’s hypothesis   d) Biot’s hypothesis

126. The value of Planck’s constant is
   a) 1.60 x 10⁻¹⁹ C   b) 8.854 x 10⁻¹² Nm² Kg⁻²   c) 6.625 x 10⁻³⁴ Js   d) 9.27 x 10⁻²⁴ Am²

127. The direction of the magnetic moment of a current loop is
   a) perpendicular to the plane of the loop   b) parallel to the plane of the loop   c) antiparallel to the plane of the loop   d) both (b) & (c)

128. Bohr magnetron is given by the expression
   a) \( \frac{eh}{2\pi m} \)   b) \( \frac{eh}{4\pi m} \)   c) \( \frac{nh}{2\pi m} \)   d) \( \frac{nh}{4\pi m} \)

129. A simple current loop behaves like a
   a) solenoid   b) toroid   c) inductance   d) bar magnet

130. A wire of length 2m carry a current of 1 ampere is bend to form a circle. The magnetic moment of the coil is
   a) 2π   b) \( \frac{\pi}{2} \)   c) \( \frac{\pi}{4} \)   d) \( \frac{1}{\pi} \)
4. ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENT

01. Transformer works on
   (a) AC only  (b) DC only  (c) both AC and DC  (d) AC more effectively than DC

02. Electromagnetic induction is not used in
   (a) transformer  (b) room heater  (c) AC generator  (d) choke coil

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

04. The unit henry can also be written as
   (a) Vs A⁻¹  (b) Wb A⁻¹  (c) Ω s  (d) all

05. Lenz’s law is in accordance with the law of
   (a) conservation of charges  (b) conservation of flux  (c) conservation of momentum  (d) conservation of energy

06. Which of the following cannot be stepped up in a transformer?
   (a) input current  (b) input voltage  (c) input power  (d) all

07. A DC of 5 A produces the same heating effect as an AC of
   (a) 50 A rms current  (b) 5 A peak current  (c) 5 A rms current  (d) none of these

08. 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

09. 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 the coil is
   (a) 0.3 H  (b) 0.003 H  (c) 30 H  (d) 4.8 H

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

11. The self inductance of a straight conductor is
    (a) zero  (b) infinity  (c) very large  (d) very small

12. In an ac circuit
    (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 √2 time of peak current

13. In an Ac circuit the applied emf e = E₀ sin (ωt + π / 2) leads the current I = I₀ sin (ωt - π / 2) by
    (a) π / 2  (b) π / 4  (c) π  (d) 0

14. A coil of area of cross section 0.5 m² with 10 turns is in a plane which is perpendicular to an uniform magnetic field of 0.2 Wb / m². The flux through the coil
    (a) 100 Wb  (b) 10 Wb  (c) 1 Wb  (d) zero

15. Faraday showed that the emf can be generated by
    a) heating the conductor  b) moving the conductor
    c) changing the flux  d) all the above

16. The angle between the area vector A and the plane of the area A is _____
    a) π  b) 2 π  c) π/2  d) 0

17. The number of lines of force crossing unit area normally is
    a) magnetic flux  b) magnetic intensity  c) flux density  d) total flux

18. The emf got by varying magnetic field is known as
    a) Thermo emf  b) induced emf  c) changing emf  d) stable emf

19. A coil of area of cross section 0.04 cm² with 50 turns is in a plane which is perpendicular to an uniform magnetic field or 300 NA/m. Flux through the coil is
    a) 0.6 Wb  b) 6 Wb  c) 0.06 Wb  d) 0.006 Wb

20. Magnetic flux is proportional to induced emf. This statement is
    a) correct  b) incorrect  c) partly correct  d) partly incorrect

21. A field of induction 20 T acts at right angles to a coil of area 20 m² with 50 turns. The flux linked with the coil is
    a) 200 wb  b) 0 wb  c) 20000 wb  d) 200 wb

22. If the flux associated with a coil varies at the rate of 1 Wb/min, then the induced emf is
    a) 1 V  b) 1/60 V  c) 60 V  d) 0
23. The direction of induced current produced in a circuit is given by
   a) Faraday’s law     b) Oersted’s law     c) Lenz’s law     d) Ampere’s circuital law

24. 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

25. Unit of self induction is
   a) volt     b) ohm     c) henry     d) ampere

26. A current of 1 A flowing through a coil of inductance 1 H is switched off in one millisecond, then the induced emf is
   a) +100 V     b) - 100 V     c) +1000 V     d) – 1000 V

27. The unit of self inductance is
   a) \( \text{turns} \cdot \text{ampere} \cdot \text{Weber} \)     b) \( \text{ampere} \cdot \text{turns} \cdot \text{Weber} \)
   c) \( \text{volt} \cdot \text{turns} \cdot \text{Weber} \)     d) \( \text{ampere} \cdot \text{turns} \cdot \text{Weber} \)

28. If the rate of change of current is doubled in a coil, then the value of self inductance is
   a) halved     b) doubled     c) not changed     d) increased exponentially

29. An emf of 3V is induced when the current in the coil changes at the rate of 80 A/S. The coefficient of self induction of the coil is
   a) 0.0375 H     b) 0.375 H     c) 0.365 H     d) 0.0365 H

30. At what rate must the current change in a 65 mH coil to have 1 volt self induced emf?
   a) 25 AS⁻¹     b) 17 AS⁻¹     c) 25.4 AS⁻¹     d) 15.4 AS⁻¹

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

32. For a long solenoid, self inductance is
   a) \( \frac{\mu_0 N^2 \lambda}{A} \)     b) \( \frac{\mu_0 A}{\lambda N^2} \)     c) \( \frac{\mu_0 A \lambda}{N^2} \)     d) \( \frac{\mu_0 N^2 A}{\lambda} \)

33. Henry equals
   a) \( \text{Wb} \)     b) \( \text{Ws} \)     c) micron     d) tesla

34. Energy stored in an inductor is
   a) \( \frac{1}{2} L_i^2 \)     b) \( \frac{1}{2} LL_i^2 \)     c) \( LI^2 \)     d) LW

35. The energy stored in a coil of inductance 5H and resistance 20 W, when the emf applied to the coil
   a) 12.5 J     b) 62.5 J     c) 15.6 J     d) 125 J

36. The coefficient of mutual induction between a pair of coils depends on
   a) Size and shape of the coil
   b) Number of turns and permeability of material on which the coils are wound
   c) Proximity of the coils
   d) All the above

37. The coefficient of mutual inductance of a pair of coils is 4mH. 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 mV in the same coil     b) 20 mV in the other coil
   c) 20 V in the same coil     d) 20 V in the other coil

38. If two coils have a common axis, the coefficient of mutual induction is
   a) zero     b) small     c) infinite     d) large

39. The mutual induction between a pair of coils is very large if they are wound on
   a) copper     b) wood     c) ebonite     d) soft iron core

40. Mutual induction of two long solenoids is
   a) \( \frac{N_1 A \lambda}{N^2} \)     b) \( \frac{N_1 N_2 A}{\lambda} \)     c) \( \frac{\mu_0 A}{N_1 N_2} \)     d) \( \frac{\mu_0 N_1 N_2 A}{\lambda} \)

41. Induced emf can be produced by changing
   a) magnetic induction     b) area enclosed by coil
   c) orientation of coil with respect to field     d) all of these
42. When a conductor of length \( l \) moving with velocity \( v \) in a uniform magnetic field \( B \),
The induced emf is given by
a) \( e = N A B o \)  
    b) \( e = \frac{dB}{dt} \)  
    c) \( e = \frac{\partial B}{\partial t} \)  
    d) \( e = - B \lambda v \)

43. 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 \( 4 \times 10^{-4} \) T, then the induced emf across the wingspan is
a) 28 V  
    b) 1.4 V  
    c) 14 V  
    d) 2.8 V

44. If a straight conductor of length \( l \) and of resistances \( R \) is moving perpendicular to a uniform magnetic
field of flux density \( B \) with a velocity \( v \) then the induced current will be
a) \( \frac{B O R}{V} \)  
    b) \( \frac{B O V}{R} \)  
    c) \( \frac{B O R}{\lambda} \)  
    d) \( \frac{B O R}{B} \)

45. Maximum value of induced emf is
a) NAB  
    b) NA  
    c) NAB  
    d) NA

46. When the armature rotates between the magnetic poles the axis of rotation is ______
to magnetic field.
a) parallel  
    b) perpendicular  
    c) along  
    d) across

47. In a generator, direction of induced current is given by
a) Fleming’s Left hand rule  
    b) Lenz’s law  
    c) Fleming’s Right hand rule  
    d) Swimming rule

48. \( e = 310 \sin (314t) \), frequency is
a) 5 Hz  
    b) 314 Hz  
    c) 50 Hz  
    d) 500 Hz

49. In the case of high power dynamos, the field magnet is a
a) an electromagnet  
    b) a high power magnet  
    c) a permanent magnet  
    d) a low power temporary magnet

50. In a three phase AC generator, the three coils are inclined at an angle of
a) 180\(^\circ\)  
    b) 45\(^\circ\)  
    c) 90\(^\circ\)  
    d) 120\(^\circ\)

51. In a penta (five) phase AC generator the phase difference between the emf’s and current in the coil is
a) 120\(^\circ\)  
    b) 72\(^\circ\)  
    c) 160\(^\circ\)  
    d) 90\(^\circ\)

52. A poly phase generator produces voltage waves equal to
a) number of rotations of the coil per second  
    b) number of phases  
    c) number of end of the coils  
    d) all the above

53. Direction of eddy current is given by
a) Faraday  
    b) Ampere  
    c) Lenz  
    d) Volta

54. Eddy current can be minimized by using
a) thin sheets  
    b) thin laminated sheets  
    c) thin solid metal  
    d) laminated sheets

55. In an induction furnace, material to be melted is placed in a varying magnetic field of
a) low frequency  
    b) medium frequency  
    c) frequency  
    d) high frequency

56. Induction motors are used in
a) Generator  
    b) Fans  
    c) Grinders  
    d) Refrigerators

57. Principle of transformer is
a) self induction  
    b) resonance  
    c) electro magnetic induction  
    d) joule heating effect

58. The quantity that remains unchanged in a transformer is
a) voltage  
    b) current  
    c) frequency  
    d) none of these

59. Transformer ratio \( k = 1 \) for ____ transformer
a) step up  
    b) step down  
    c) ideal  
    d) dual

60. In step-up transformer the output voltage is 11 kV 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

61. In a step up transformer, the following condition is satisfied
a) \( N_2 > N_1 \)  
    b) \( E_2 > E_1 \)  
    c) \( I_2 > I_1 \)  
    d) \( E_2 > E_1 \)

62. In a step down transformer, the following condition is satisfied
a) \( N_2 \times N_1 \)  
    b) \( I_2 > I_1 \)  
    c) \( E_2 > E_1 \)  
    d) \( K < 1 \)

63. In step-down transformer the input voltage is 22 KV and the output voltage is 550V. The ratio of
number of turns in the primary to that in the secondary is
a) 1:40  
    b) 1:20  
    c) 40:1  
    d) 20:1
64. In step-up transformer the input voltage is 220 V and the output voltage is 11 kV. The ratio of number of turns of primary to secondary is
   a) 50:1    
   b) 1:50    
   c) 25:1    
   d) 1:25

65. In a transformer a shell type core is used to minimise
   a) eddy current loss  
   b) copper loss     
   c) loss due to flux leakage  
   d) hysteresis loss

66. When a transformer works, sound is produced. This is due to
   a) heating of the core  
   b) vibration of the core  
   c) rotation of the core  
   d) none of these

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

68. Which of the following cannot be stepped down in a transformer
   a) input voltage  
   b) input power  
   c) input current  
   d) all of these

69. Power loss due to joule heating is also called as
   a) flux leakage  
   b) copper loss  
   c) eddy current loss  
   d) hysteresis loss

70. An ideal transformer has a power input of 10 KW. The secondary current is 25A. 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) 2000 V  
   b) 1500 V  
   c) 100 V  
   d) 200 V

71. Long distance power transmission lines are made of
   a) mumetal  
   b) copper  
   c) aluminium  
   d) silicon steel

72. Power loss is maximum in transmission lines when
   a) voltage is less ; current is more  
   b) voltage & current more  
   c) voltage is more ; current is less  
   d) voltage & current less

73. 11 KW power is transmitted at 20 KV, current is
   a) 0.5 A  
   b) 0.005 A  
   c) 0.05 A  
   d) 5 A

74. Power produced at Neyveli power station is
   a) 400 W  
   b) 400 KW  
   c) 400 GW  
   d) 400 MW

75. Frequency range of radio waves is
   a) 100 – 100 KHz  
   b) 100 KHz – 1 MHz  
   c) 100 KHz – 100 MHz  
   d) 1 MHz – 100 MHz

76. A D.C of 8A produces same heating effect as an A.C of
   a) 8 A current  
   b) 8 A r.m.s. current  
   c) 8 A peak current  
   d) none of these

77. An electrical instrument is marked 220 V. The maximum voltage it can withstand
   a) 311 V  
   b) 221 V  
   c) 300 V  
   d) 240 V

78. A generator produces an emf given by e = 141 sn 88 t. The frequency and rms value of voltage are
   a) 50 Hz and 49.5 V  
   b) 7 Hz and 49.5 V  
   c) 50 Hz and 99.7 V  
   d) 14 Hz and 99.7 V

79. A fuse wire has a current rating of 5 A. Then the peak value of the current in the fuse wire is
   a) 1A  
   b) 0.7 A  
   c) 7.07 A  
   d) 70.7 A

80. The equation of a25 cycle current sine wave having rms value of 30 A is
   a) 30 \sqrt{2} \sin 157 t  
   b) 30 \sin 160 t  
   c) 30 \sin 157 t  
   d) 30 \sin 150 t

81. The frequency of A.C for guided rocket is
   a) 400 Hz  
   b) 50 Hz  
   c) 400 KHz  
   d) 100 KHz to 100 MHz

82. Power dissipation in an AC circuit in which voltage and current are given by
   \[ e = 300 \sin \left( \omega t + \frac{\pi}{2} \right) \] and \[ I = 6 \sin \omega t \]
   a) 750 watt  
   b) 375 watt  
   c) 0 watt  
   d) 1500 watt

83. The effective value of alternating current is
   a) \( I_0 \)  
   b) 0.707 \( I_0 \)  
   c) \( I_0 \sqrt{2} \)  
   d) 2 \( I_0 \)

84. The effective value of alternating voltage is
   a) \( E_0 \)  
   b) \( -E_0 \)  
   c) 0.707 \( E_0 \)  
   d) 2 \( E_0 \)
85. The peak value of 200 V AC supply is
   a) 382 V    b) 283 V    c) 238 V    d) 310 V

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

87. In an A.C circuit with resistor, applied voltage and current are _____ with each other.
   a) leads by \( \frac{\pi}{2} \)  b) leads by \( \pi \)   c) in phase   d) lags by \( \frac{\pi}{2} \)

88. The emf in an AC containing only inductance will ______
   a) be ahead of current by \( \pi/2 \)  b) lag behind the current \( \pi/2 \)
   c) have current in phase with the applied voltage   d) always be out of phase

89. An A.C circuit with an inductor offers inductive reactance 628 W whose self induction
   constant 2H. Frequency is
   a) 100 Hz    b) 200 Hz    c) 10 Hz    d) 50 Hz

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

91. Grouping of inductances is similar to grouping of
   a) capacitors  b) resistors  c) cells  d) generators

92. The frequency at which a 2H inductor has an inductive reactance of 880 ohms is
   a) 100 Hz    b) 25 Hz    c) 125 Hz    d) 70 Hz

93. The frequency at which a 1 henry inductor has a reactance of 314 ohm is
   a) 500 Hz    b) 50 Hz    c) 5 Hz    d) 0.05 Hz

94. In an a.c circuit with an inductor
   a) voltage lags current by \( \pi/2 \)  b) voltage and circuit are in phase
   c) voltage leads current by \( \pi \)  d) current lags voltage by \( \pi/2 \)

95. In an AC circuit, the current \( I = I_0 \sin(\omega t - \pi/2) \) lags behind the emf \( e = E_0 \sin(\omega t + \pi/2) \) by
   a) 0  b) \( \pi/4 \)  c) \( \pi/2 \)  d) \( \pi \)

96. In an inductor, work done is stored as _____ energy is the coil.
   a) electric  b) magnetic  c) electric potential  d) magnetic potential

97. The resistance offered by a pure inductor to dc is
   a) \( L \)  b) zero  c) \( \frac{1}{\omega L} \)  d) infinite

98. In an A.C circuit with the increase in frequency the inductive reactance
   a) decreases  b) remains constant  c) increases  d) first increase and decreases

99. In an A.C. circuit with capacitor, voltage ___ current by \( \frac{\pi}{2} \)
   a) lags  b) leads  c) overtakes  d) in phase

100. Capacitive reactance is _____ to frequency
   a) directly proportional  b) independent  c) equal  d) reciprocal

101. In an A.C 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

102. If in an RLC circuit, \( X_L = 500 \Omega \) \( X_C = 326.8 \Omega \) \( R = 100 \Omega \) then \( \phi \) ______
   a) 45\(^\circ\)  b) 90\(^\circ\)  c) 60\(^\circ\)  d) 30\(^\circ\)

103. In R.L.C circuit, if \( X_L > X_C \), induced current is
   a) \( I_0 \sin(\omega t) \)  b) \( I_0 \sin(\omega t + \phi) \)  c) \( I_0 \sin(\omega t - \phi) \)  d) \( R=Z \)

104. In RLC series A.C. circuit the phase difference between current and voltage is 30\(^\circ\).
     The reactance of the circuit is \( 17.32 \Omega \). The value of resistance is
     a) 30 \( \Omega \)  b) 10 \( \Omega \)  c) 17.32 \( \Omega \)  d) 1.732 \( \Omega \)

105. In a resonant circuit, at resonance
     a) current is minimum  b) current is maximum
     c) impedance is maximum  d) none of these

106. In RLC circuit when \( X_L > X_C \), the current
     a) is zero  b) is in phase with the voltage
     c) leads the voltage  d) none of these
107. A capacitor, an inductor and a 30 Ω resistor are connector in series with a 220 V, 50 AC.

If the reactance of the circuit is 40 Ω what is the rms value of the current in the circuit?

a) 50 A  b) 4.23 A  c) 4.40 A  d) 6.50 A

108. For an acceptor circuit

a) X_L > X_C  b) X_L < X_C  c) X_L = X_C  d) X_L = 0

109. In acceptor circuit impedance to current at the resonant frequency is

a) minimum  b) maximum  c) zero  d) infinite

110. The maximum current is an acceptor circuit is

a) R / V  b) V / R  c) V / R^2  d) R / V^2

111. The Q factor of an A.C circuit containing a resistance R, inductance L and a capacitor C is

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

112. Q factor has values lying between ____ for normal frequencies

a) 0 to 10  b) 10 to 100  c) 10 to 50  d) 50 to 100

113. For a sharply tuned circuit Q – value is

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

114. The average power of A.C circuit is ______ of the circuit

a) apparent power  b) power factor  c) true power  d) Q-factor

115. The average power consumed over one cycle in an A.C circuit is

a) \text{E}_{\text{rms}} \text{I}_{\text{rms}}  b) \text{E}_{\text{rms}} \text{I}_{\text{rms}} \cos \phi  c) \text{E}_{\text{rms}} \text{I}_{\text{rms}} \sin \phi  d) \text{E}_0 \text{I}_0 \cos \phi

116. To control current in an A.C circuit _____ coil is used.

a) inductor  b) choke  c) spring  d) helical

117. The core used in audio frequency chokes is

a) iron  b) carbon  c) lead  d) steel

118. The power factor of a choke coil having inductance ‘L’ and resistance ‘r’ is given by

a) \frac{r}{\sqrt{r^2 + \omega^2 L^2}}  b) \frac{r^2 + \omega^2 L^2}{r}  c) \frac{\sqrt{r^2 + \omega^2 L^2}}{r}  d) \frac{r}{\sqrt{r^2 + \omega^2 L^2}}

119. Choke coils are commonly seen in____

a) fluorescent tubes  b) incandescent bulbs

c) stabilizer circuits  d) radio
5. ELECTROMAGNETIC WAVES AND WAVE OPTICS

01. In Newton’s ring experiment, if the radii of m\text{th} and (m+4)\text{th} dark rings are \sqrt{5}\text{mm} and \sqrt{7}\text{ mm} respectively, then the value of ‘m’ is
   (a) 2  
   (b) 4  
   (c) 1  
   (d) 10

02. 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  
   (c) diffraction pattern becomes narrower and crowded together  
   (d) diffraction pattern becomes broader and farther apart

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

04. The refractive index of the medium, for the polarizing angle 60° is
   (a) 1.732  
   (b) 1.414  
   (c) 1.5  
   (d) 1.468

05. When a drop of water is introduced between the glass plate and convex lens in Newton’s rings system, the ring system
   (a) contracts  
   (b) expands  
   (c) remains same  
   (d) first expands, then contracts

06. A light of wavelength 6000 Å is incident normally on a grating 0.005 m wide with 2500 lines. Then the maximum order is
   (a) 3  
   (b) 2  
   (c) 1  
   (d) 4

07. The path difference between two monochromatic light waves of wavelength 4000 Å is 2 x 10^{-7} m. The phase difference between them is
   (a) \pi  
   (b) 2\pi  
   (c) 3\pi / 2  
   (d) \pi / 2

08. A beam of monochromatic light enters from vacuum into a medium of refractive index \mu. 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

09. 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 other source is
   (a) 4500 Å  
   (b) 6000 Å  
   (c) 5000 Å  
   (d) 4000 Å

10. In an electromagnetic wave
   (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

11. Refractive index of glass is 1.5. Time taken for light to pass through a glass plate of thickness 10 cm is
   (a) 2 x 10^{-5} s  
   (b) 2 x 10^{-10} s  
   (c) 5 x 10^{-8} s  
   (d) 5 x 10^{-10} s

12. In an electromagnetic wave the phase difference between electric field \vec{E} and magnetic field \vec{B} is
   (a) \pi / 4  
   (b) \pi / 2  
   (c) \pi  
   (d) zero

13. If the wavelength of the light is reduced to one fourth, 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

14. Atomic spectrum should be
   (a) pure line spectrum  
   (b) emission band spectrum  
   (c) absorption spectrum  
   (d) absorption band spectrum

15. The existence of electromagnetic waves was confirmed experimentally by
   a) Hertz  
   b) Maxwell  
   c) Planck  
   d) Huygens

16. Variations in both electric and magnetic field occur simultaneously in the perpendicular planes and attain the maxima and minima at
   a) 0.1 s between the fields  
   b) 1 s between the fields  
   c) 10 s between the fields  
   d) the same time

26
17. Which of the following is not an electromagnetic wave?
   a) X-rays    b) sound wave    c) UV-rays    d) IR radiation

18. Electromagnetic disturbance can be propagated in space ______
   a) with the help of air medium only   b) with the help of other medium only
   c) with the help of gravitational force only   d) without the help of material medium

19. Velocity of electromagnetic waves through vacuum is
   a) \( \sqrt{\frac{\mu_0}{\varepsilon_0}} \)   b) \( \frac{1}{\sqrt{\mu_0 \varepsilon_0}} \)   c) \( \sqrt{\frac{\mu_0}{\varepsilon_0}} \)   d) \( \frac{\varepsilon_0}{\mu_0} \)

20. The unit of \( \mu_0 \varepsilon_0 \) is
   a) m s\(^{-1}\)   b) m\(^2\) s\(^{-2}\)   c) s m\(^{-1}\)   d) s\(^2\) m\(^{-2}\)

21. The physical properties of electromagnetic waves are determined by
   a) frequency    b) wavelength    c) method of excitation    d) medium

22. Electromagnetic waves are not deflected in electric and magnetic fields because
   a) they travel with very high velocity    b) they are chargeless waves
   c) they travel even in vacuum    d) they are transverse in nature

23. In Hertz’s experimental set up the metal plates act as a______
   a) capacitor    b) inductor    c) conductor    d) resistor

24. In Hertz’s experimental set up the wires act as a______
   a) capacitor    b) inductor    c) conductor    d) resistor

25. The frequency of the electromagnetic wave generated in Hertz experiment is
   a) \( 10^7 \) Hz    b) 50 KHz    c) 3 \times 10^8 \) Hz    d) 50 MHz

26. In electromagnetic spectrum electromagnetic waves are orderly distributed according to their______
   a) wavelength only   b) frequency only   c) (a) or (b)   d) velocity

27. The radiations used in physiotherapy are
   a) ultraviolet rays    b) infrared rays    c) radio waves    d) microwaves

28. Which of the following does not give continuous spectrum?
   a) incandescent solids    b) free excited atoms
   c) liquids    d) electric filament lamp

29. The spectrum of carbon arc is
   a) continuous    b) line    c) band    d) line absorption

30. Which of the following does not emit band spectrum?
   a) mercury vapour    b) calcium salts in bunsen burner
   c) carbon-di-oxide gas    d) ammonia gas

31. Solar spectrum is an example of
   a) line emission spectrum    b) band absorption spectrum
   c) molecular spectrum    d) line absorption spectrum

32. Electric filament lamp gives rise to
   a) line spectrum    b) continuous spectrum
   c) band spectrum    d) line absorption spectrum

33. When the light emitted directly from a source is examined with a spectrometer the spectrum
   a) absorption    b) emission    c) pure    d) dull

34. When white light is passed through iodine vapour or dilute solution of blood, the spectrum obtained is called______ spectrum.
   a) continuous absorption    b) line absorption
   c) band absorption    d) emission

35. Wavelength of two sodium lines D\(_1\) and D\(_2\) are
   a) 8590 A\(^0\) and 8596 A\(^0\)    b) 5893 A\(^0\) and 5890 A\(^0\)
   c) 5896 A\(^0\) and 5890 A\(^0\)    d) 6958 A\(^0\) and 6950 A\(^0\)

36. A pure green glass when placed in the path in the path of white light gives______
   a) continuous emission spectrum    b) continuous absorption spectrum
   c) line emission spectrum    d) line absorption spectrum

37. Certain substance exhibit fluorescence even after the exciting radiation is removed. This type of delayed fluorescence is called______
   a) fluorescence    b) phosphorescence
   c) phot electric effect    d) Raman effect
38. Light behaves as
   a) particle in high energy region and waves in low energy region
   b) waves in high energy region and particles in low energy region
   c) particle in high energy region and low energy region
   d) waves in high energy region and low energy region

39. Light waves are transverse in nature. It is proved by the phenomenon of
   a) Interference  b) polarisation  c) diffraction  d) rectilinear propagation

40. Electromagnetic theory failed to account for ______
   a) interference of light  b) diffraction of light  c) photo electric emission  d) polarization of light

41. Energy is emitted and absorbed in multiples of discrete packets of energy called ______
   a) interference of light  b) diffraction of light  c) photo electric emission  d) polarization of light

42. “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

43. Energy associated with each photon is given by
   a) E = h  b) E = n^2  c) E = mc^2  d) E = hm^2

44. Photo electric effect was explained by ______ theory
   a) quantum  b) wave  c) corpuscular  d) electromagnetic

45. Unit of refractive index of a medium is
   a) radian m^-1  b) radian m  c) radian  d) no unit

46. The phenomenon responsible for the blue colour of the sky is
   a) scattering  b) refraction  c) reflection  d) dispersion

47. The stoke’s lines are given by ______
   a) Tyndal effect  b) Rayleigh effect  c) Raman effect  d) Doppler effect

48. If A denotes the amount of scattering then the wavelength is proportional
   a) inversely to A^4  b) directly to A^4  c) directly to A^1/4  d) inversely to A^1/4

49. The scattering of light by the colloidal particles is called ______ scattering.
   a) Tyndal  b) Raman  c) Huygens  d) molecular

50. Raman shift or Raman frequency is given by the relation ______
   a) Δν = υ₀ - υₛ  b) Δν = υ₀ + υₛ  c) Δν = υ₀υₛ  d) Δν = υ₀ / υₛ

51. For Antistoke’s lines the Raman frequency Δν is ______
   a) negative  b) positive  c) zero  d) infinity

52. For Stoke’s line the Raman frequency Δν is ______
   a) negative  b) positive  c) zero  d) infinity

53. In Stoke’s lines energy of a 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

54. 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) Antistoke’s line

55. Raman shift is
   a) independent of the frequency of incident light
   b) charactersotic of the substance
   c) independent of charaterstic of the substance
   d) both (a) and (b)

56. In Raman spectrum Antistoke’s lines are lines of ______
   a) same wavelength as that of incident radiation  b) greater wavelengths
   c) shorter wavelengths  d) particular wavelengths

57. Raman effect supports ______
   a) Corpuscular theory  b) Electro magnetic theory
   c) Wave theory  d) Quantum theory

58. Sodium D line (5896 Å) is incident on a liquid. The frequency of scattered photon is 50 x 10^{11} Hz
   The Raman shift is
   a) 88 x 10^{11} Hz  b) 88 x 10^{13} Hz  c) 8.8 Hz  d) 88 Hz
59. Which spectrum used to analyse the chemical constitution is
a) emission    b) absorption    c) interference    d) Raman

60. Locus of all the particles of the medium which are in the same state of vibration is a
a) wave    b) wave front    c) plane    d) circle

61. Each point in a given wavefront acts as a source of secondary wavelets according to ____ principle
a) Newton’s    b) Huygens    c) Rayleigh’s    d) Young’s

62. The wavefront emitted by a point source of light at a finite distance in an isotropic medium is
a) circular    b) cylindrical    c) plane    d) spherical

63. According to Huygens the light waves ___
a) are longitudinal    b) are transverse    c) are electromagnetic    d) are both longitudinal and transverse

64. For the propagation of light through vacuum, Huygens _____
a) assumed the existence of a hypothetical medium called ether
b) assumed light as particles
c) assumed light as electromagnetic waves
d) assumed light as mechanical waves

65. According to Huygens, light possesses _____ energy
a) electromagnetic    b) mechanical    c) electrical    d) magnetic

66. For each value of angle of incidence, a refracted ray is possible for which, angle of refraction (r) is
a) less than 90°    b) equal to 90°    c) equal to unity    d) greater than 90°

67. The angle of incidence at which the angle of refraction is 90° is called ______
a) total reflecting angle    b) sensitive angle    c) critical angle    d) none of above

68. 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) 3/2    b) 1 / √2    c) √2    d) 2

69. If c is the velocity of light in vacuum, the velocity of light in medium with refractive index of m is
a) mc    b) c / μ    c) μ / c    d) 1 / μc

70. If C_a and C_m are the velocities of light in free space and in a medium respectively the refractive index of the medium is
a) C_a / C_m    b) C_m / C_a    c) C_m - C_a    d) C_m + C_a

71. It is possible to observe total internal reflection when a ray travels from
a) air to water    b) air into glass
b) water into glass    d) glass into water

72. When the superposition of the waves produces an increased resultant intensity at a point it is said to be
a) destructive interference    b) constructive interference
c) diffraction    d) beats

73. Path difference a corresponds to a phase difference _____
a) φ = 2π / δ    b) φ = 2π x 1 / δ    c) φ = 2π x 1 / δ    d) φ = 2π x δ

74. According to the superposition principle the resultant displacement vector _____
a) Y = Y_1 + Y_2    b) Y = Y_1 - Y_2    c) Y = Y_1 / Y_2    d) Y = Y_2 / Y_1

75. At points where crest meets trough the displacement will be
a) minimum    b) maximum    c) zero    d) equal to the amplitude of the wave

76. The intensity of light corresponding to destructive metereference is ______
a) I_max α(a_1 + a_2)^2    b) I_min (a_1 - a_2)^2    c) I_max α(a_1 - a_2)^2    d) I_min (a_1 + a_2)^2

77. When the distance between the source and the screen is increased in Young’s double slit Experiment the fringe
a) width increases    b) width decreases    c) disappears    d) width remains constant

78. The distance between any two consecutive bright or dark bands is called
a) path difference    b) wavelength    c) bandwidth    d) amplitude

79. In Young’s experiment the ratio of maximum and minimum intensities in the fringe system is 9:1. The ratio of amplitudes of coherent sources is
a) 9:1    b) 3:1    c) 2:1    d) 1:1
80. Two waves having intensity in the ratio 25:4 produce interference. The ratio of the maximum to minimum intensity is
   a) 5 : 2  b) 7 : 3  c) 49 : 9  d) 9 : 49
81. To form sustained interference pattern
   a) the two sources should be coherent
   b) the two sources should be narrow
   c) the two sources should lie very close to each other
   d) All the above conditions must be satisfied
82. In Young’s double slit experiment for constructive interference, path difference must be equal to
   a) (2n – 1)  b) nλ  c) (n-1)  d) (2n + 1)
83. 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
84. The condition for brightness during interference due to transmitted light on a thin film is
   a) 2μ sin r = nλ  b) 2μ cos r = nλ  c) 2μ cos σ = nλ  d) 2μ sin r = (2n – 1) ½
85. What is the reason for the appearance of different colours in a soap bubble?
   a) interference due to multiple reflection  b) electromagnetic spectrum of solar radiation
   c) scattering caused by the spherical surface  d) Newton’s rings
86. Newton’s rings experiment confirms
   a) wave theory  b) corpuscular theory  c) theory of relativity  d) quantum theory
87. If a monochromatic light is used the centre of the Newton’s ring is
   a) bright  b) dark  c) neither dark nor bright  d) seven colours
88. The radii of the dark rings in Newton’s rings system are in the ratio
   a) 1 : 2 : 3  b) √2 : √2 : √3  c) √1 : √3 : √5  d) 1 : 3 : 4
89. The phenomenon of light used in the formation of Newton’s rings is
   a) diffraction  b) interference  c) refraction  d) polarization
90. When the order of Newton’s rings increases the rings get
   a) separated apart  b) closer and closer  c) overlapped on each other  d) disappeared
91. In Newton’s rings experiment, the radius of the n th dark ring is proportional to
   a) n  b) n²  c) √n  d) n³
92. The diameter of the fourth dark ring in Newton’s rings experiment when light of wavelength
   4000 A used is 1.6 mm. The radius of curvature of the lens used is
   a) 4m  b) 0.4m  c) 4cm  d) 4mm
93. In Newton’s rings experiment the ratio of the radii of the 4 th and 9 th ring is
   a) 4 : 9  b) 2 : 3  c) 16 : 81  d) 3 : 2
94. The diameter of the 10 th dark rings in Newton’s rings experiment viewed normally by reflected light
   Is 0.6 cm. If the wavelength of light used is 6x 10⁻⁵ cm the radius of curvature of the convex surface
   of the lens is
   a) 155 cm  b) 150 cm  c) 156 cm  d) 145 cm
95. What is the approximate radius of the plano – convex lens used in a Newton’s rings experiment if
   the wavelength of light used is 5645 A and the radii of the 10 th and 20 th rings are 3.36 mm and 5.82 mm
   respectively?
   a) 1 m  b) 2 m  c) 3 m  d) 4 m
96. The center of Newton’s rings in dark because
   a) the thickness of air film at the centre is zero
   b) the ray reflected by the glass plate undergoes a phase change π
   c) no light fall at the centre
   d) the centre is covered by black paper
97. In Newton’s rings experiment, light of wavelength 5890 A is used. The order of the dark ring
   produced where the thickness of the air film is 0.589 mm is
   a) 2  b) 3  c) 4  d) 5
98. The bending of light rays at any edge is known as
   a) interference  b) diffraction  c) polarisation  d) refraction
99. The amount of bending depends upon the
   a) wavelength  b) frequency  c) intensity  d) phase
30
100. A plano convex lens is placed on an optically flat glass and is illuminated by monochromatic light of wavelength 5400 Å. The radius of the 8th dark ring is 3.6 x 10^{-3} m. The radius of curvature of the lens is
a) 3 cm  b) 3 m  c) 3 mm  d) 0.3 m
101. Fresnel suggested that light waves are ______
a) longitudinal nature  b) transverse in nature
c) electromagnetic in nature  d) solid particles in nature
102. In Fresnel diffraction the wave front undergoing diffraction is ______
a) spherical  b) plane  c) elliptical  d) irregular
103. In Fraunhofer diffraction, the wavefront is
a) spherical or cylindrical  b) plane wavefront
c) cylindrical wavefront  d) elliptical wavefront
104. Diffraction effects are more pronounced in the case of sound waves than in the case of light waves as
a) sound waves have greater wavelength than light wave
b) sound waves are longitudinal
c) velocity of sound waves is less than the velocity of light waves
d) sound waves have shorter wavelength than light waves
105. The dark lines found in the solar spectrum are called ______
a) Fresnel lines  b) Fraunhofer lines
c) Raman lines  d) solar lines
106. If 10000 rulings are present in one metre length of a plane diffraction grating then the grating element is equal to ______
a) 1 x 10^{-5} m  b) 1 x 10^{-4} m  c) 1 x 10^{-3} m  d) 1 x 10^{-7} m
107. The formula to calculate the wavelength of light using diffraction grating is ______
a) \frac{1}{\sin \theta} = N\lambda  
\sin \theta = \frac{\lambda}{N\sin \theta}  
\lambda = \frac{\sin \theta}{N\sin \theta}  
\frac{N\lambda}{m\sin \theta}
b) \sin \theta = \frac{\lambda}{N\sin \theta}  
c) \lambda = \frac{\sin \theta}{N\sin \theta}  
d) \frac{N\lambda}{m\sin \theta}
108. A parallel beam of wavelength 4176 Å is incident normally on a plane diffraction grating producing a second order maximum at a diffraction angle of \sin^{-1}(0.4167). What is the number of lines per cm in the grating?
a) 5000  b) 6000  c) 1000  d) 7000
109. A plane transmission diffraction grating has 6000 lines/cm. The wavelength of light used to produce the first order diffraction at an angle of 30° is
a) 8000 Å  b) 8500 Å  c) 8333 Å  d) 7000 Å
110. The reciprocal of the grating element gives ______
a) the wavelength of the monochromatic light used
b) the path difference between any two waves
c) the number of grating elements per unit width
d) order of diffraction
111. In a plane diffraction grating, the unit of grating element is
a) no unit  b) metre  c) m⁻¹  d) degree
112. 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
113. The polarising angle for water is 53°4. Its refractive index is ______
a) 1.55  b) 1.66  c) 1.33  d) 1.49
114. When a polarizer is rotated the intensity of the light varies but never reduces to zero because light is
a) partially plane polarised  b) un polarized
c) completely polarised  d) none of the above
115. In case of partially polarized light, when the analyser 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
116. The angle of incidence for which the reflected ray is completely plane polarised is
a) angle of reflection  b) angle of refraction
c) angle of polarisation  d) critical angle
117. When a ray of light is incident on a glass surface at polarising angle of 57.5° the angle between the incident ray and reflected ray is
a) 57.5°  b) 32.5°  c) 115°  d) 90°
118. Unpolarised 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   b) remains uniformly dark
   c) varies between maximum and minimum   d) varies between maximum and zero

119. The polarising angle of water is _____
   a) 52° 5'   b) 53° 5'
   c) 57° 5'   d) 47° 5'

120. The polarising angle of glass is _____
   a) 52° 5'   b) 53° 5'
   c) 57° 5'   d) 47° 5'

121. Glass is _____
   a) only a polariser   b) only an analyser
   c) a polarizer as well as an analyser   d) neither a polarizer nor an analyser

122. Polarisation by reflection was discovered by_____
   a) Fresnel   b) Malus
   c) Brewster   d) Nicol

123. According to Brewster's law the refractive index of a medium _____
   a) \( \mu = \sin ip \)   b) \( \mu = \cos ip \)
   c) \( \mu = \tan ip \)   d) \( \mu = \frac{1}{\tan ip} \)

124. The pile of plates is a device used for _____
   a) producing polarized light   b) measuring temperature
   c) producing coherent waves   d) producing parallel beams

125. The angle of inclination of the pile of plates to the axis of the tube is _____
   a) 57.5°   b) 32.5°
   c) 132.5°   d) 45°

126. The angle of incidence of light in the pile of plates is _____
   a) 57.5°   b) 32.5°
   c) 132.5°   d) 45°

127. Double refraction was discovered by _____
   a) Malus   b) Brewster
   c) Bartholinous   d) Fresnel

128. Double refraction is exhibited by
   a) glass   b) gas
   c) calcite   d) liquid

129. The refractive index of calcite crystal for sodium light corresponding to the ordinary ray _____
   a) varies from 1.486 to 1.658   b) 1.658
   c) 1.568   d) 1.868

130. The refractive index of calcite crystal for sodium light corresponding to the extraordinary ray _____
   a) varies from 1.486 to 1.658   b) 1.658
   c) 1.568   d) 1.868

131. The plane of vibration and plane of polarization of polarized light are
   a) at right angles to each other   b) parallel to each other
   c) inclined to each other at an acute angle   d) inclined to each other at an obtuse angle

132. Which one of the following is used to give a three dimensional view in stereoscopic motion picture?
   a) polaroid   b) grating
   c) prism   d) glass slab

133. Rotation of plane of polarization is known as
   a) polarization   b) partial polarization
   c) diffraction   d) optical activity

134. An example of biaxial crystal
   a) Quartz   b) Mica
   c) Ice   d) Calcite

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

136. The direction in which the ordinary ray and extraordinary ray travels with equal velocity in a doubly Refracting crystal is known as _____
   a) axis of the crystal   b) optic axis
   c) axis of rotation   d) axis of polarization

137. Nicol prism can be used _____
   a) only as a polariser   b) only as an analyser
   c) as a polariser as well as an analyser   d) as neither a polariser nor an analyser

138. The adjacent angles of a Nicol prism are _____
   a) 75°, 105°   b) 72°, 108°
   c) 78°, 102°   d) 72°, 118°

139. The ordinary ray inside a Nicol prism suffers _____
   a) reflection   b) total internal reflection
   c) refraction   d) diffraction

140. A Nicol Prism has its length and breadth in the ratio _____
   a) 3:1   b) 2:1
   c) 1:3   d) 2:3
141. The refractive index for Canada balsam is ____
   a) 1.486  b) 1.5  c) 1.628  d) 1.55

142. K – polaroids are prepared in a thin film of ____
   a) nitrocellulose  b) alcohol  c) mercury  d) polyvinyl alcohol

143. A Nicol prism is based on the principle of ____
   a) refraction  b) reflection  c) double refraction  d) diffraction

144. Along the direction of the optic axis of a calcite crystal the ordinary ray travel with
   a) the same velocity as that extraordinary ray
   b) half the velocity of the extraordinary ray
   c) two times the velocity of the extraordinary ray
   d) \( \sqrt{2} \) times the velocity of the extraordinary ray

145. Polaroids are used to ____
   a) increase glare  b) avoid glare
   c) filter the entire light  d) none of the above

146. Which phenomenon is used in the construction of polaroids?
   a) phosphorescence  b) Fluorescence
   c) selective absorption  d) all the above

147. The optical rotation depends on
   a) concentration of solution  b) wavelength of light used
   c) temperature of the solutions  d) all the above

148. Of the following, optically active material is ____
   a) sodium chloride  b) calcium chloride
   c) sodium  d) chlorine

149. Specific rotation is given by
   a) \( \frac{\theta}{c} \)  b) \( \frac{\theta}{c} \)
   c) \( \frac{c}{\theta} \)  d) \( \frac{\lambda}{\theta} \)

150. Unit of specific rotation is
   a) decimeter  b) degree
   c) degree  d) degree/decimeter/unit concentration
01. In hydrogen atom, which of the following transition produce spectral line of maximum frequency?
(a) 2 → 1  (b) 6 → 2  (c) 4 → 3  (d) 5 → 2

02. 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 λ_1, λ_2, λ_3, λ_4 are the wavelength of radiations corresponding to the transitions C to B, B to A and C to respectively, which of the following statement is correct?
(a) λ_3 = λ_1 + λ_2  
(b) λ_3 = \frac{λ_1 \cdot λ_2}{λ_1 + λ_2}  
(c) λ_1 = λ_2 = λ_3 = 0  
(d) λ_3^2 = λ_1^2 + λ_2^2

03. The ratio of the radii of the first three Bohr orbit is
(a) 1 : 1/2 : 1/3  
(b) 1 : 2 : 3  
(c) 1 : 4 : 9  
(d) 1 : 8 : 27

04. A Coolidge tube operates at 24800 V. The maximum frequency of X-radiation emitted from Coolidge tube is
(a) 6 x 10^{18} Hz  
(b) 3 x 10^{18} Hz  
(c) 6 x 10^8 Hz  
(d) 3 x 10^5 Hz

05. According to Rutherford atom model, the spectral lines emitted by an atom is
(a) line spectrum  
(b) continuous spectrum  
(c) continuous absorption spectrum  
(d) band spectrum

06. X-ray 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

07. 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, electric field and magnetic field are mutually perpendicular. The speed of the electron is
(a) 60 m\text{s}^{-1}  
(b) 10.3 x 10^{7} \text{ms}^{-1}  
(c) 1.5 x 10^{7} \text{ms}^{-1}  
(d) 0.67 x 10^{7} \text{ms}^{-1}

08. In hydrogen atom, which of the following transitions produce spectral line of maximum wavelength
(a) 2 → 1  
(b) 4 → 1  
(c) 6 → 5  
(d) 5 → 2

09. The energy of a photon of characteristics X-ray from a Coolidge tube comes from
(a) the kinetic energy of the 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

10. The elliptical orbits of electron in the atom were proposed by
(a) J.J. Thomson  
(b) Bohr  
(c) Sommerfeld  
(d) de Broglie

11. The chromium ions doped in the ruby rod
(a) absorbs red light  
(b) absorbs green light  
(c) absorbs blue light  
(d) emits green light

12. According to Bohr’s postulates, which of the following quantities take discrete values?
(a) kinetic energy  
(b) potential energy  
(c) angular momentum  
(d) momentum

13. In an X-ray tube, the intensity of the 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

14. 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

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. 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.
17. Gases can be made to conduct electricity 
a) by applying a large potential difference across a gas column at very low pressure
b) by allowing X – rays to pass through the gases
c) by the above two methods
d) by applying a large potential difference across a gas column at very large pressure
18. The study of electric discharge through gases gives valuable information regarding the structure of 
a) molecules b) atoms c) nucleus of an atom d) molecules and atoms
19. When the pressure in the discharge tube is of the order of 10 mm of Hg _____ is produced 
a) Faraday’s dark space b) Crooke’s dark space
c) Positive column d) black discharge
20. When the pressure in the discharge tube is 0.01 mm of Hg _____ fills the whole tube.
a) positive column b) Crooke’s dark space
c) Faraday’s dark space d) black discharge
21. In a discharge tube fluorescent will take place at a pressure of 
a) 0.01 mm of Hg b) 0.1 mm of Hg c) 0.001 mm of Hg d) 1 mm of Hg
22. At a pressure of 0.01 mm of Hg the walls of the discharge tube fluorescent with ____ colour.
a) blue b) green c) red d) yellow
23. The rays discovered from greenish glow in the discharge tube is 
a) a rays b) b rays c) cathode rays d) positive rays
24. Cathode rays possess 
a) potential energy b) kinetic energy
c) momentum d) Both (b) and (c)
25. The velocity of canal ray is ____ the velocity of cathode rays/
a) lasser than b) greater than c) equal to d) $\frac{1}{10}$th of
26. The direction of deflection of electrons under the influence of magnetic field can be obtained by 
a) Fleming’s left hand rule b) Fleming’s right hand rule
c) End rule d) maxwell’s corkscrew rule
27. Two parallel plates separated by 5 cm in air are at a potential difference of 500V. The force acting on an electron is 
a) $1.6 \times 10^{-19}$ N b) 500 N c) $1.6 \times 10^{-15}$ N d) $1.6 \times 10^{-15}$ N
28. Given the charge of electron is $1.6 \times 10^{-19}$ C. What is the energy gained by the cathode ray particles when a voltage of 800 V is applied between the electrodes of a cathode ray tube? 
a) $2 \times 10^{-23}$J b) $8 \times 10^{-17}$J c) $1.28 \times 10^{-18}$J d) $1.28 \times 10^{-16}$J
29. In Thomson’s experiment for the measurement of e/m of an electron the beam remains un 
deflected when the electric field $E = 20$ V cm$^{-1}$ and the magnetic field $B = 10^{-4}$ T. The beam 
was originally accelerated through a potential difference of 1000 V. The value of specific 
charge of the electron is 
a) $2 \times 10^{11}$ c kg$^{-1}$ b) $10^{11}$ c kg$^{-1}$ c) $5 \times 10^{11}$ c kg$^{-1}$ d) $0.5 \times 10^{11}$ c kg$^{-1}$
30. The velocity ratio of two cathode ray is 1:2. They are applied to same electric field. 
What is the deflection ratio of the two cathode rays? 
a) 1:2 b) 1:4 c) 4:1 d) 1:8
31. The force experience by the electron in a electric field is 
a) $Ee$ b) $BeV$ c) $EeV$ d) $mv^2$
32. The electron with speed of $2.5 \times 10^7$ m/s suffers a deflection in a magnetic field of induction 
$2 \times 10^{-3}$ T. Then the electric field that would give the same deflection is 
a) $5 \times 10^3$ V/m b) $1.5 \times 10^4$ V/m c) $12.5 \times 10^2$ V/m d) $5 \times 10^4$ V/m
33. Given that the charge on an electron is $1.6 \times 10^{-19}$ 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) $2 \times 10^{-23}$ J b) $8 \times 10^{-17}$ J c) $1.28 \times 10^{-18}$ J d) $1.28 \times 10^{-16}$ J
34. The order of electron (e) proton (p), neutron (n) and alpha particle (a) when arranged according 
to the increasing magnitude of their charge per unit mass is 
a) e, p, n, $\alpha$ b) n, p, e, $\alpha$ c) n, p, $\alpha$, e d) n, $\alpha$, p, e
35. The value of e/m in Thomson’s method is 
a) $1.7592 \times 10^{11}$ c/kg b) $1.7952 \times 10^{11}$ c/kg 
c) $1.7592 \times 10^{11}$ c/kg d) $1.7259 \times 10^{11}$ c/kg
36. Millikan’s experiment determines
   a) specific charge of an electron   b) charge of an electron
   c) charge density of an electron   d) mass of an electron
37. If the total charge on an oil drop in Millikan’s experiment is 17.622 x 10^{-19} C then the total charge on an oil drop will be
   a) 10   b) 11   c) 12   d) 13
38. The ratio of specific charge of electron to that of a positron is
   a) 1:2   b) 1:1   c) 2:1   d) 1:4
39. An electron moves through an electric field intensity 9 x 10^{13} V/m. If the mass of the electron is 9 x 10^{-31} kg, then the acceleration of the electron is
   a) 1.71 x 10^{15} m/s^2   b) 1.6 x 10^{15} m/s^2
   c) 1.6 x 10^{-15} m/s^2   d) 1.58 x 10^{-15} m/s^2
40. The charge on an oil drop is 12.82 x 10^{-19} C, then the number of elementary charges are
   a) 6   b) 2   c) 8   d) 10
41. In Millikan’s method the downward force acting on the oil drop is
   a) gravitational force   b) viscous force   c) force of deflection   d) coulomb force
42. In Millikan’s experiment the potential applied between the plate is of the order of
   a) 100 V   b) 1000 V   c) 10,000 V   d) 500 V
43. The mass of a charged oil drop is 1 mg. If the oil drop is stationary in an electric field of 500 V cm^{-1} then the charge on the oil drop is
   a) 1.96 x 10^{-10} C   b) 1.96 x 10^{-19} C
   c) 1.96 x 10^{-12} C   d) 2.3 x 10^{-12} C
44. According to Thomson’s model, the wavelength of the spectral line emitted by hydrogen atom is
   a) 1500 A   b) 1300 A
   c) 1100 A   d) 900 A
45. In Rutherford a – scattering experiment some a particles passed straight through the gold foil or were scattered by small angles. This observation led to the conclusion that
   a) an atom has a lot of empty space   b) a molecule has a lot of empty space
   c) a nucleus has a lot of empty space   d) a particles lose energy when incident on gold foil
46. The distance of closest approach is equal to
   a) \( \frac{ze^2}{4\pi\varepsilon_0 m} \)   b) \( \frac{ze^2}{4\pi\varepsilon_0 n^2} \)
   c) \( 2ze^2 / 4\pi\varepsilon_0 m^{\frac{1}{2}} \)   d) \( 4ze^2 / 4\pi\varepsilon_0 m^2 \)
47. The distance of closest approach kinetic energy of particle will appear as
   a) heat energy   b) electro static potential energy
   c) electro magnetic energy   d) light energy
48. According to Rutherford atom made __unit
   a) continuous spectrum   b) line spectrum
   c) band spectrum   d) all the above
49. According to Rutherford the size of the nucleus is
   a) \( 10^{10} \) m   b) \( 10^{14} \) m   c) \( 10^{16} \) m   d) \( 10^{12} \) m
50. According to Bohr’s atom model the electro magnetic it orbit is an integral multiple of the quantity
   a) \( \frac{h}{2\pi} \)   b) \( \frac{h}{4\pi} \)
   c) \( \frac{2\pi}{n} \)   d) \( \frac{\lambda}{h} \)
51. The frequency of photon having the energy of 100 ev
   a) 1.2 x 10^{16} Hz   b) 2.4 x 10^{16} Hz
   c) 4.8 x 10^{16} Hz   d) 9.6 x 10^{16} Hz
52. The unit of Rydberg constant is
   a) m   b) no unit   c) m^{-3}   d) m^{-1}
53. Wavelength of Balmer second line is 4861 A. What will be wavelength of first line?
   a) 5470 A   b) 6562 A   c) 8235 A   d) 9789 A
54. In hydrogen spectrum the spectral series visible to human eye is ___ series
   a) Lyman   b) Brackett   c) Balmer   d) Pfund
55. Lyman series lie in the region
   a) ultra violet   b) visible   c) infrared   d) far infrared
56. The series of hydrogen spectral lines found in the infrared region is
   a) Balmer   b) Brackett   c) Prout   d) Lyman
57. In Bohr atom model electrostatic force of attraction between the nuclear and electron is balance by
   a) nuclear force   b) electromotive force  
   c) centripetal force   d) magnetic force
58. The wavelength of radiation emitted when an electron jumps from an energy level of 6.9 eV to 4.9 eV is
   a) 2500 Å    b) 6015 Å  c) 4972 Å  d) 5896 Å
59. 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 x 10^8 metre   d) in a distance of 1 metre
60. If R is the Rydberg constant, the minimum wavelength hydrogen spectrum is
   a) \( \frac{1}{R} \)   b) \( \frac{R}{4} \)   c) \( \frac{4}{R} \)   d)...
61. The energy of photon whose frequency is 6.4 x 10^15 Hz is
   a) 26.5 eV    b) 26.52 J  c) 2.652 eV   d) 2.652 J
62. The radii of the Bohr’s orbit of hydrogen atom are proportional to
   a) integer   b) square of integers
   c) square root of integers   d) reciprocal of integers
63. If the wave number of a spectral line of paschen series is \( \frac{5}{144} \) times the Rydberg’s constant
   a) n = 2    b) n = 3    c) n = 4   d) n = 5
64. If the wave number of a spectral line of Brackett series of hydrogen atom is 9/400 times the Rydberg constant, what is the state from which the transition has taken place?
   a) n = 6    b) n = 5    c) n = 4   d) n = 7
65. The shortest wavelength in Lyman series of spectrum is 911.6 Å. Then longest wavelength in this series will be
   a) 1125 Å  b) 1215 Å  c) 1235 Å  d) 0.1325 Å
66. The value of Rydberg’s constant is
   a) 1.094 x 10^7 m^-1  b) 1.094 x 10^7 m^-1
   c) 1.094 x 10^7 m^-1  d) 1.094 x 10^7 m^-1
67. 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
68. 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
69. Radius of first orbit of hydrogen atom is 0.53 Å then the radius of third orbit is
   a) 59 Å  b) 4.774 Å  c) 1.06 Å  d) 2.12 Å
70. The ratio of wave number of series limit in Balmer series to bracket series is
   a) 9    b) 25    c) 16   d) 4
71. When an electron jumps from an orbit of higher energy E2 to an orbit of lower energy E1, the frequency of radiation occurring is given by
   a) \( \frac{E_1 - E_2}{h} \)   b) \( \frac{E_2 - E_1}{h} \)
   c) \( \frac{E_1 + E_2}{h} \)   d) \( \frac{E_1 + E_2}{h^2} \)
72. If \( \lambda_n \) is the wavelength of the n^{th} line of Paschen spectral series of hydrogen then \( \lambda_3/\lambda_2 = \)
   a) \( \frac{20}{27} \)  b) \( \frac{25}{28} \)  c) \( \frac{64}{75} \)  d) \( \frac{75}{64} \)
73. The wavelengths 5896 Å, 5890 Å called D1 and D2 lines are emitted by _____ vapour lamp
   a) Neon  b) sodium  c) mercury  d) xenon
74. The ionization potential of the hydrogen atom 18.6 eV. The energy of the atom in the n=2 state is
   a) -3.4 eV  b) -3.4 eV   c) 3.4 eV  d) 13.6 eV
75. The energy required to transfer the electron hydrogen atom from the ground state to the second excited state is
   a) 13.6 eV    b) 3.4 eV  c) 10.2 eV   d) 12.09 eV
76. The first excitation potential energy of 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

77. The energy of electron in the first orbit of hydrogen. Its potential energy is
   a) 13.6 eV  b) 13.6 eV  c) 3.4 eV  d) 27.2 eV

78. The wavelength of D\textsubscript{1} and D\textsubscript{2} lines emitted by sodium ammon lamp is
   a) 589.6 nm, 589 nm  b) 589 nm, 589.6 nm  c) 589.3 nm, 589 nm  d) 589.6 nm, 589.3 nm

79. To remove an electron from the first orbit to outside the hydrogen atom the energy required is
   a) threshold energy  b) thermionic work function  c) ionization energy  d) photoelectric work function

80. Electrons in outer orbits have
   a) more total energy  b) less total energy  c) zero energy  d) least energy

81. According to Sommerfeld atom model the number of permissible sub shells for the principal quantum number n is
   a) n  b) n+1  c) n-1  d) 2n+1

82. According to Sommerfeld, since the orbit of the electron is elliptical the velocity of the electron is
   a) Maximum when the electron is nearest to the nucleus and minimum when it is farthest from the nucleus
   b) Maximum when the electron is nearest to the nucleus or farthest from the nucleus
   c) Minimum when the electron is nearest to the nucleus or farthest from the nucleus
   d) Minimum when the electron is nearest to the nucleus and maximum when it is farthest from the nucleus

83. According to the statement is not correct?
   a) For a given principal quantum number n, l varies from 0 to (n-1)
   b) For a given value of n there are n possible subshells
   c) For a given value of n, the number of elliptical shaped subshells is (n+1)
   d) The path of an electron is rosette

84. The shape of 3s, 3p, 3d sub shells respectively are
   a) elliptical, elliptical, circular  b) elliptical, circular, elliptical
   c) circular, elliptical, elliptical  d) circular, circular, elliptical

85. Sommerfeld model explains the
   a) Zeeman effect  b) distribution and arrangement of electrons in atom
   c) intensities of spectral line  d) back ground of fine structure of spectral lines

86. 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 orbit is
   a) \( \frac{b}{a} = \frac{i+1}{n} \)  b) \( a = \frac{i-1}{n} \)  c) \( \frac{a}{b} = \frac{i+1}{n} \)  d) \( \frac{a}{b} = \frac{i-1}{n} \)

87. In Sommerfeld atomic model the sub shell corresponds to n = 1, l = 0 is _____ is shape.
   a) circle  b) elliptical  c) parabola  d) sphere

88. The wavelength of x-ray is about
   a) 0.5 Å to 1 Å  b) 5 Å to 10 Å  c) 0.5 Å to 10 Å  d) 0.05 Å to 0.5 Å

89. Wavelength of X-ray depends upon
   a) the target material used  b) thickness of the target material
   c) kinetic energy of the electrons producing them  d) the number of electrons striking the target

90. In an X-ray tube the intensity of the 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

91. The energy of a photon of characteristic X-ray Coolidge tube comes from
   a) the kinetic energy of the 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

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92. If the anode voltage in a Coolidge tube is 3100 V, the minimum wavelength of continuous X-ray is
   a) 0.4 Å
   b) 4 Å
   c) 10 Å
   d) 0.1 Å

93. For a given operating voltage the minimum wavelength of X-ray is
   a) the same for all metals
   b) not same for all metal
   c) zero for some metals
   d) high for certain metal

94. X-ray beam coming from an X-ray tube will be
   a) monochromatic
   b) having all wavelengths smaller than a certain maximum wavelength
   c) having all wavelengths larger than a certain maximum wavelength
   d) having all wavelength lying between a minimum and maximum wavelength

95. For a first order X-ray diffraction, the wavelength of the X-ray is equal to the interplanar distance at a glancing angle of
   a) 15°
   b) 60°
   c) 45°
   d) 30°

96. During a Bragg spectrometer experiment a crystal produces two successive maxima for glancing angles 30° and 45° respectively for a monochromatic X-ray of wavelength 1 Å. The lattice distance is
   a) 1 Å
   b) 1.414 Å
   c) \( \frac{1}{0.414} \) Å
   d) 2.404 Å

97. If the minimum wavelength of continuous X-ray is 0.5 Å, the voltage applied to the anode is
   a) 12400 V
   b) 3100 V
   c) 24000 V
   d) 24800 V

98. Which of the following statements are correct?
   i) Intensity of X-rays depends upon the kinetic energy of the electron
   ii) The penetrating power of X-rays depends upon the velocity of the electron
   iii) Frequency of the Kα line is less than the frequency of Kβ line
   iv) Optical grating in three dimensional
   a) (i) and (iii)
   b) (ii) and (iv)
   c) (i) and (iv)
   d) (iii) and (iv)

99. 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) 74°

100. Absorption coefficient of X-rays is
    a) \( \mu = \frac{dl}{ds} \)
    b) \( \mu = \frac{l}{dl} \)
    c) \( \mu = \frac{1}{lds} \)
    d) \( \mu = \frac{l}{ldx} \)

101. A crystal diffracts monochromatic X-rays. If the angle of diffraction on first order is 30°, then that for second order will be
    a) 90°
    b) 15°
    c) 60°
    d) 45°

102. If the minimum wavelength of X-rays produced in a Coolidge tube is 1 Å, the operating potential is
    a) 20 kV
    b) 0.2 kV
    c) 2 kV
    d) 10 kV

103. A Coolidge tube operates at 18600 V. The maximum frequency of X-radiation emitted from it is
    a) 4.5 x 10^{18} Hz
    b) 45 x 10^{18} Hz
    c) 4.05 x 10^{19} Hz
    d) 45.5 x 10^{18} Hz

104. The laue experiment established
    a) that X-rays are electro magnetic waves of short wavelength
    b) the atoms in a crystal are arranged in three dimensional space
    c) both (a) and (b)
    d) X-rays can exhibit photoelectric effect.

105. In Bragg’s spectrometer experiment the glancing for the fourth order spectrum of the X-ray was found to be 30°, what will be the glancing angle for occurrence of the first order maximum?
    a) \( \sin^{-1} 0.25 \)
    b) \( \sin^{-1} 0.217 \)
    c) \( \sin^{-1} 0.5 \)
    d) \( \sin^{-1} 0.125 \)

106. The glancing angle of monochromatic X-ray of wavelength 1 Å is 30°. The lattice space between the second order reflection is
    a) 2 x 10^{-10} m
    b) 2 x 10^{-9} m
    c) 2 x 10^{-10} cm
    d) 2 x 10^{-9} cm

107. The device used measure wavelength of X-ray is
    a) Bain bridge mass spectrometer
    b) spectrometer
    c) Bragg’s spectrometer
    d) none of the above

108. When the electron jumps from M shell to the vacant K shell, it contributes
    a) Kα line
    b) Kβ line
    c) Lα line
    d) Lβ line

109. The part of X – ray spectrum which is a line spectrum is called
a) pure spectrum b) impure spectrum
c) absorption spectrum d) characteristics spectrum

110. Which law was helpful in determining the atomic number of rare earth elements?
a) Moseley’s law b) periodic law c) Pauli’s law d) Bragg’s law

111. The minimum wavelength of x – ray spectra is
a) \( \lambda_{\text{min}} = \frac{12400}{V} \, \AA \)
b) \( \lambda_{\text{min}} = \frac{V}{12400} \, \AA \)
c) \( \lambda_{\text{min}} = 12400 \times V \, \AA \)
d) \( \lambda_{\text{min}} = \frac{eV}{\hbar} \, \AA \)

112. Moseley’s law led to the discovery of chemical element
a) Helium b) Iodine c) Rhenium d) Radon

113. Moseley’s law _____
a) \( v = a (z - b) \) b) \( \sqrt{v} = a (z - b)^2 \) c) \( \sqrt{v} = a (z - b) \) d) \( n = a (z + b)^2 \)

114. The life time of meta stable state is
a) \( 10^{-5} \) s b) \( 10^{-3} \) s c) \( 10^{-4} \) s d) \( 10^{-8} \) s

115. The frequency of the spectral line in the characteristic X – ray spectrum of an element is proportional to
a) its atomic number b) square of its atomic number
b) its atomic weight c) square of its atomic weight

d. For optical fibre communication we use

a) Ruby laser b) semi conductor laser c) He-Ne laser d) Maser

117. 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

118. The meta stable state energies of helium and neon atoms respectively are
a) 20.61 eV, 13.6 eV b) 20.66 ev, 12.75 eV
c) 10.2 eV, 12.09 eV d) 20.61 ev, 20.66 eV

119. In He-Ne laser, the transition is from
a) 20.66 eV level to 18.70 eV level b) 20.66 ev to ground state level
c) 20.66 eV level to 13.6 eV level d) 20.66 eV level to 20.61 eV level

120. The wavelength of light emitted in He-Ne laser is
a) 5500 \( \AA \) b) 6943 \( \AA \) c) 6328 \( \AA \) d) 6325 \( \AA \)

121. The life time of atoms for Laser in the exoited state is
a) \( 10^{-5} \) S b) \( 10^{-3} \) S c) \( 10^{-4} \) S d) \( 10^{-8} \) S

122. In holography, which of the following is (are) recorded on the photographic film?
a) Frequency and amplitude b) Phase and frequency
c) Phase and amplitude d) Frequency only

123. Maser materials are
a) chromium ions doped as impurities in ionic crystal
b) gadolinium ions doped as impurities in ionic crystal
c) ammonia gas
d) all the above
7. DUAL NATURE OF RADIATION AND MATTER – RELATIVITY

01. The work function of a photoelectric material is 3.3eV. The threshold frequency will be equal to
   (a) 8x \(10^{14}\)Hz    (b) 8x \(10^{10}\)Hz    (c) 5x \(10^{20}\)Hz    (d) 4x \(10^{15}\)Hz

02. If the KE of a moving particle is \(E\), then the deBroglie wavelength is
   (a) \(\lambda = \frac{h}{\sqrt{2mE}}\)    (b) \(\lambda = \sqrt{2mE} / h\)    (c) \(\lambda = \frac{h}{\sqrt{2mE}}\)    (d) \(\lambda = h / E \sqrt{2m}\)

03. At the threshold frequency, the velocity of the electrons is
   (a) zero    (b) maximum    (c) minimum    (d) infinite

04. According to relativity, length of a 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 depending on the speed of the rod

05. A photon of frequency \(\nu\) is incident on a metal surface of threshold frequency \(\nu_0\).
   The kinetic energy of the emitted photoelectron is
   (a) \(h (\nu - \nu_0)\)    (b) \(h \nu\)    (c) \(h \nu_0\)    (d) \(h (\nu + \nu_0)\)

06. The momentum of the electron having wavelength 2Å is
   (a) 3.3 \(\times 10^{24}\) kg m s\(^{-1}\)    (b) 6.6 \(\times 10^{24}\) kg m s\(^{-1}\)    (c) 3.3 \(\times 10^{-24}\) kg m s\(^{-1}\)    (d) 6.6 \(\times 10^{-24}\) kg m s\(^{-1}\)

07. The stopping potential of a metal surface is independent of
   (a) frequency of incident radiation    (b) intensity of incident radiation    (c) the nature of the metal surface    (d) velocity of the electrons emitted.

08. The wavelength of the matter wave is independent of
   (a) mass    (b) velocity    (c) momentum    (d) charge

09. 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

10. If 1 kg of a substance is fully converted into energy, then the energy produced is
   (a) 9 \(\times 10^{16}\) J    (b) 9 \(\times 10^{24}\) J    (c) 1 J    (d) 3 \(\times 10^8\) J

11. The particles emitted during photoelectric effect are found to be
   a) protons    b) neutrons    c) electrons    d) positrons

12. The wave associated with a moving particle is called
   a) particle wave    b) mechanical wave    c) deBroglie wave    d) Planck’s wave

13. Photoelectric current increase linearly with the
   a) frequency of incident radiation    b) the nature of metal surface    c) intensity of incident radiation    d) none of the above

14. The number of photo electrons emitted per second is proportional to the
   a) frequency of incident radiation    b) intensity of incident radiation    c) wavelength of incident radiation    d) all the above

15. Number of ejected photoelectron increases with increases
   a) in intensity of light    b) in wavelength of light    c) in frequency of light    d) none of the above

16. The maximum photoelectric current is called
   a) eddy current    b) saturation current    c) instantaneous current    d) thermonic current

17. The photon which is just photoelectric current is called
   a) photoelectric    b) threshold    c) stopping    d) minimum

18. The energy required to bring the electrons of maximum velocity to rest is
   a) \(e\nu\)    b) \(e\nu_0\)    c) \(h\nu\)    d) \(mv^2\)

19. The stopping potential depends upon
   a) photoelectric current    b) intensity of incident radiation    c) material of anode    d) velocity of the fastest electron

20. When the frequency of incident radiation increases the value of stopping potential
   a) will decrease    b) will increase    c) remains same    d) will not increase
21. For a given frequency of incident radiation, the stopping potential is independent of
a) frequency  b) intensity  c) wavelength  d) kinetic energy

22. What happens when the light intensity incident on a photoelectric surface is doubled?
a) The frequency of emitted photoelectrons is double
b) The number of photoelectrons is doubled
c) The number of photoelectrons becomes four times
d) There is no effect at all

23. The shape of the graph drawn between the frequency of incident and the corresponding
stopping potential is
a) an ellipse  b) a straight line  c) a parabola  d) a curve

24. The value of stopping potential with the frequency of light is equal to the threshold frequency is
a) maximum  b) zero  c) minimum  d) infinity

25. The threshold frequency differs ______
a) with different intensities  b) with different applied voltages
c) with different materials of cathode  d) with all

26. Light of frequency 1.5 times the threshold frequency is incident or photosensitive material.
If the frequency is halved and intensity is doubled photoelectric current becomes
a) quadrupled  b) doubled  c) halved  d) zero

27. The maximum kinetic energy of photoelectrons emitted by a photosensitive surface depends on
a) the polarization of radiation  b) the frequency of incident radiation
c) the intensity of radiation  d) the stopping potential

28. The phenomenon of photoelectric effect is
a) adiabatic process  b) thermal process
c) instantaneous  d) phenaneous process

29. Electromagnetic theory could not explain
a) reflection  b) photoelectric effect
c) interference  d) diffraction

30. Each discrete bundle of energy is known as ______
a) electron  b) energy bundle  c) neutron  d) photon

31. A photon
a) is a particle  b) is a wave  c) has dual nature  d) none of these

32. The wave nature of light could not explain
a) interference  b) diffraction  c) emission of radiation  d) polarization

33. The particle nature of light could not explain
a) emission of radiation  b) polarization
c) absorption of radiation  d) interaction of light with matter

34. The minimum amount of energy required to liberate an electron from the metal is called
a) cut off potential  b) critical potential
c) photoelectric work function  d) ionization potential

35. The mathematical form of Einstein’s photoelectric equation is
a) $h\nu = \frac{1}{2} mv^2$  b) $h\nu - h\nu_0 = \frac{1}{2} mv^2$
c) $h\nu = w - \frac{1}{2} mv^2$  d) $h\nu = w + h\nu_0$

36. The work function of a metal is
a) $1 \times 10^{15}$ Hz  b) $1 \times 10^{19}$ Hz  c) $1 \times 10^{15}$ Hz  d) $10 \times 10^{19}$ Hz

37. A metal has a work function of 1.5 eV The longest wavelength which can produce the
photoelectron is
a) 4142 Å  b) 16566 Å  c) 8383 Å  d) 2761 Å

38. Two photons, each of energy 2.5 eV are simultaneously the metal surface. If the work
Function of the metal is 4.5 eV then from the surface of 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

39. On a metal surface two photons of energy 1 eV and 2.5 eV 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
40. Photo electric cell converts
   a) light energy in to electrical energy       b) light energy in to sound energy
   c) electrical energy in to light energy     d) sound energy in to electric energy

41. In the photo emissive cell the anode is made up of ______
   a) copper      b) gold      c) platinum  d) zinc

42. 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

43. The current produced by a photoelectric cell is _____ the incident light
   a) proportional to the intensity     b) inversely proportional to the intensity
   c) independent of the intensity     d) portional to the frequency

44. 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

45. The frequency of a photon whose energy is 8.25 eV is
   a) 2 x 10^{15} Hz    b) 2 x 10^{16} Hz   c) 2 x 10^{14} Hz   d) 2 x 10^{17} Hz

46. The de Broglie wavelength of an electron having a kinetic energy of 20 eV is
   a) 2.75 nm         b) 2.75 A^0        c) 27.5 nm       d) 0.275 A^0

47. The de Broglie wavelength of a particle of mass 1 gram moving with a velocity of 2000 km s^{-1}
   a) 3.313 A^0         b) 3.313 x 10^{-6} m      c) 3.313 x 10^{-7} m    d) 3 x 10^{-6} m

48. The de Broglie wavelength of a proton moving with 1/15 the velocity of light is
   a) 3 x 10^{-14} m     b) 2 x 10^{-15} m  c) 2 x 10^{-14} m    d) 3 x 10^{-16} m

49. De Broglie wavelength associated with an electron is
   a) \frac{12.27}{V} A^0      b) \frac{1.227}{V} A^0       c) \frac{1.227}{\sqrt{V}} A^0      d) \frac{12.27}{\sqrt{V}} A^0

50. The wavelength of electrons accelerated by a potential difference of about 60,000 V is
   a) 3 x 10^{-12} m      b) 5 x 10^{-12} m  c) 5 x 10^{-10} m       d) 4 x 10^{-10} m

51. If the radius of first Bohr orbit of hydrogen atom is r, then the de Broglie wavelength of electron
   in this orbit is
   a) 3r             b) 2pr           c) 3pr           d) 4pr

52. If the radius of second Bohr orbit of hydrogen atom is r, then the de Broglie wavelength of electron
   in this orbit is
   a) 3r             b) 2pr           c) 3pr           d) 4\pi r

53. If the radius of third Bohr orbit of hydrogen atom is r, then the de Broglie wavelength of
   electron in this orbit is
   a) \frac{3\pi r}{2}           b) \frac{2\pi r}{3}       c) \frac{3\pi r}{4}   d) 4\pi

54. Angular momentum of an electron in a stable orbit is equal to _____
   a) nh             b) mr\omega          c) mr^2\omega      d) m\omega^2 r

55. The resolving power of a microscope is _____
   a) directly proportional to the wavelength     b) inversely proportional to the wavelength
   c) independent of wavelength                  d) infinity

56. The electron microscope is based on the principle of
   a) photoelectric effect      b) dual nature electrons
   c) particle nature of electron    d) wave nature moving electron

57. The resolving power of an electron microscope will be _____ than of an optical microscope
   a) 10,000 time greater      b) 1,00,000 time greater
   c) 1,00,000 times lesser    d) 10,000 times lesser

58. The wavelength of electrons accelerated by a potential of 60,000 volts about
   a) 1.67 A^0              b) 5 x 10^{-12}     c) 10^{-12} A^0    d) 1 A^0

59. The wavelength of electrons accelerated by a potential of 60,000 multi times that of visible light?
   a) 10^7 times greater    b) 10^{10} times similer
   c) 10^{10} times greater d) 10^5 times similer
60. In electron microscope, the electron beam is varying the
a) wavelength of electron    b) current through the energizing coil
c) velocity of electron      d) thickness colloidal film

61. Electron microscope is operated in
a) high pressure     b) high vacuum
b) normal pressure    d) none of the above

62. The focal length of the magnetic lens used in an electric microscope depends upon _____
a) the mass of the electrons    b) size of the electrons
c) the velocity of the electrons d) none of the above

63. Who profounded the special theory of relativity?
a) Max Planck    b) de Broglie     c) WL. Bragg       d) Einstein

64. In Newton’s mechanics which of the following is treated as absolute?
a) mass     b) time     c) length & space d) all the above

65. According to the special theory of relativity the only constant in all frames is
a) mass     b) length     c) time d) velocity of light

66. 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

67. Newton’s laws are not valid in
a) Inertial frames b) Non-inertial frames c) all frames d) all the above

68. The length of the rod moving with a velocity v relative to the observer at rest is contracted by a factor
a) 1 - \( \frac{v^2}{c^2} \)  b) \( \sqrt{1 - \frac{v^2}{c^2}} \)  c) \( \frac{1}{\sqrt{1 - \frac{c^2}{v^2}}} \)  d) 1 - \( \frac{c^2}{v^2} \)

69. The length of the rod measured by a stationary observer is 1m. The length of the same rod for an observer moving at a speed of 2 x 10^8 ms^-1 is
a) 1m  b) 0.7453 m  c) 7.543 m  d) 74.53 m

70. For a fast moving observer a circular object will appears as
a) Parabola b) an ellipse c) square d) straight line

71. A clock in a stationary frame measures 5 second. The frame in a moving frame, which moves with a velocity of 1.5 x 10^8 m s^-1 is
a) 4.77 S  b) 5 S  c) 5.77 S  d) 57.7 S

72. The particle of rest mass 1.5 gram is moving with a speed of 2.4 x 10^8 ms^-1. It mass when it is in motion is
a) 2.5 gram  b) 1.5 gram  c) 0  d) 2 gram

73. When a material particle of rest mass m_0 attains speed C, its mass becomes
a) 0  b) 2m_0  c) 4m_0  d) \( \infty \)

74. The mass of an electron accelerated by a cyclotron
a) decreases at high velocity b) increases at high velocity
c) becomes zero at high velocity d) becomes infinity at high velocity

75. If 2 kg of a substance is fully converted into energy, the produced is
a) 3 x 10^4 J  b) 18 x 10^16 J  c) 9 x 10^16 J  d) 81 x 10^8 J

76. Einstein’s mass energy equivalence is not formed in
a) pair production b) nuclear fission  c) pair  d) electro plating

77. Einstein’s mass energy equivalence is
a) \( E = mc^2 \)  b) \( E = m^2 c \)  c) \( E = mc \)  d) \( E = m^2 c^2 \)

78. The rest mass of a photon is
a) positive  b) finite  c) infinite  d) zero

79. An energetic photon can create
a) an electron – proton pair  b) electron – electron pair
c) neutron – neutron pair  d) electron – photon pair

80. When an electron meets a positron, the number of photons formed
a) 2  b) 3  c) 4  d) 1
8. NUCLEAR PHYSICS

01. 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

02. Nuclear fission can be explained by
   (a) shell model   (b) liquid drop model   (c) quark model  (d) Bohr atom model

03. The half life period of N\(^{13}\) is 10.1 minutes. Its life time is
   (a) 5.05 minutes  (b) 20.2 minutes      (c) \(\frac{10.1}{0.693}\) minutes  (d) infinity

04. The ionization power is maximum for
   (a) neutrons      (b) \(\alpha\) - particles (c) \(\gamma\) - rays  (d) \(\beta\) - particles

05. 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

06. The nucleons in a nucleus are attracted by
   (a) gravitational force   (b) electrostatic force (c) nuclear force  (d) magnetic force

07. The average energy released per fission is
   (a) 200 eV         (b) 200 MeV         (c) 200 meV    (d) 200 GeV

08. 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

09. In a nuclear reaction \(^{80}\text{Hg}^{198} + X \rightarrow ^{79}\text{Au}^{198} + ^{1}\text{H}\), X stands for
   (a) proton               (b) electron (c) neutron (d) deutron

10. 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

11. 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 different proton number

12. The mass defect of a certain nucleus is found to be 0.003 amu. Its binding energy is
    (a) 27.93 eV         (b) 27.93 KeV        (c) 27.93 MeV    (d) 27.93 GeV

13. The nuclei \(^{13}\text{Al}^{27}\) and \(^{14}\text{Si}^{28}\) are examples of
    (a) isotopes         (b) isobars         (c) isotones     (d) isomers

14. The binding energy of \(^{56}\text{Fe}^{26}\) nucleus is
    (a) 8.8 MeV         (b) 88 MeV          (c) 493 MeV      (d) 41.3 MeV

15. The ratio of nuclear density to the density of mercury is about
    (a) \(1.3 \times 10^{10}\)         (b) 1.3          (c) \(1.3 \times 10^{13}\)  (d) \(1.3 \times 10^{6}\)

16. Anaemia can be diagnosed by
    (a) \(^{15}\text{P}^{31}\)         (b) \(^{15}\text{P}^{32}\)         (c) \(^{28}\text{Fe}^{59}\)  (d) \(^{11}\text{Na}^{24}\)

17. The nuclear radius of \(^{4}\text{Be}^{8}\) nucleus is
    (a) \(1.3 \times 10^{-15}\) m    (b) \(2.6 \times 10^{-15}\) m  (c) \(1.3 \times 10^{-13}\) m (d) \(2.6 \times 10^{-13}\) m

18. 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

19. The radio – isotope used in agriculture is
    (a) \(^{15}\text{P}^{31}\)         (b) \(^{15}\text{P}^{32}\)         (c) \(^{11}\text{Na}^{23}\)  (d) \(^{11}\text{Na}^{24}\)

20. Mass of the proton is _____ mass of an electron
    a) 1836 times lesser than     b) 1836 times greater than
    c) equal to                   d) \(10^{39}\) times greater than

21. Mass of the neutron is
    a) lesser than mass of the proton  b) lesser than mass of an electron
    c) slightly greater than mass of the electron  d) slightly greater than mass of the proton

22. Which of the following is correct?
   a) \( m_p < m_e < m_n \)    b) \( m_e > m_p > m_n \)
   c) \( m_p > m_e > m_n \)    d) \( m_n > m_p > m_e \)

23. \(^{35}\text{Cl}\) contains
   a) 17 protons, 17 electrons and 35 neutrons    b) 17 protons, 17 electrons and 35 nucleons
   c) 17 protons, 18 electrons and 17 neutrons    d) 17 protons, 17 electrons and 18 electrons

24. The term nucleon is used to refer
   a) proton    b) neutron    c) electron    d) either proton or neutron

25. The number of electrons in \(^{15}\text{P}\) nucleus is
   a) 15    b) 16    c) 31    d) zero

26. Which of the following is different for isotopes of the same element?
   a) protons    b) electrons    c) neutrons    d) none of these

27. Isotopes have
   a) an identical electrons structure    b) have identical physical properties
   c) placed in the same location in the periodic table    d) same number of nucleus

28. Isotopes have
   a) un identical electrons structure    b) have identical physical properties
   c) placed in the same location in the periodic table    d) identical physical properties

29. Isotopes have
   a) identical physical properties    b) identical chemical properties
   c) placed in different location in the periodic table    d) not identical chemical properties

30. Isotopes have
   a) identical electronic structure    b) neutral chemical properties
   c) placed in same location in the periodic table    d) all the above

31. Isobars are
   a) different nuclei of same element    b) having similar physical and chemical properties
   c) identical nuclei of different elements    d) having different physical and chemical properties

32. Isobars are atoms of
   a) same element have same physical properties    b) different element have same physical properties
   c) different element have different physical properties    d) different element have same chemical properties

33. Isotones are atoms of
   a) different element having same number of neutrons    b) same element having same number of neutrons
   c) same element having different number of neutrons    d) different element having different number of neutrons

34. Radius of the nucleus is
   a) \( 10^{-10} \) m    b) \( 10^{15} \) m    c) \( 10^{15} \) m    d) \( 10^{-7} \) m

35. The empirical formula for the nuclear radius is
   a) \( R = A^{1/3} \)    b) \( r_0 = RA^{1/3} \)    c) \( R = r_0 A \)    d) \( R = r_0 A^{1/3} \)

36. The ratio of radii of two nuclei is 1:2, then the ratio of their mass number is
   a) 1 : 4    b) 1 : 8    c) 1 : 9    d) 1 : 16

37. The distance closest approach of alpha particles to the nucleus is a measure of nuclear
   a) density    b) charge    c) radius    d) mass

38. If the ratio of mass numbers of two atoms is 8:27, then the ratio of the diameter of two
   nucleus is
   a) 2 : 3    b) 6 : 4    c) 4 : 6    d) 3 : 2

39. The density of nucleus is independent of
   a) mass    b) mass number    c) volume    d) nuclear radius

40. Nuclear density
   a) depends on atomic number    b) is a constant
   c) depends on neutron number    d) depends on mass number
41. Nuclear density value is
   a) $1.816 \times 10^{17}$ kg m$^{-3}$  
   b) $1.816 \times 10^{17}$ kg m$^{-3}$
   c) $1.816 \times 10^{17}$ kg m$^{-3}$  
   d) $1.67 \times 10^{22}$ kg m$^{-3}$

42. The average mass of nucleon is
   a) $1.67 \times 10^{-27}$ kg  
   b) $1.67 \times 10^{27}$ g
   c) $1.816 \times 10^{17}$ kg m$^{-3}$  
   d) $1.816 \times 10^{17}$ kg

43. One amu is equal to
   a) 931 eV  
   b) mass of carbon atom
   c) $1.816 \times 10^{17}$ kg m$^{-3}$  
   d) mass of oxygen atom

44. If the speed of light were 1/3 of the present value, the energy release a given atomic
   Explosion will be decreased by a fraction
   a) $8/9$  
   b) $2/3$  
   c) $1/9$  
   d) $1/3$

45. In nuclear fission 0.1% mass is converted into energy. The energy passed by the fission of
   1 kg mass will be
   a) $9 \times 10^{16}$ J  
   b) $9 \times 10^{19}$ J
   c) $9 \times 10^{13}$ J  
   d) $9 \times 10^{17}$ J

46. Binding energy is the minimum energy required break a
   a) atom  
   b) nucleus  
   c) electron  
   d) photon

47. Binding energy of a nucleus determines the
   a) mass number  
   b) stability  
   c) isotopes  
   d) nucleons

48. Oxygen is more stable than nitrogen because
   a) the atomic number of oxygen is greater than the number of nitrogen
   b) the atomic weight of oxygen is greater than the weight of nitrogen
   c) oxygen helps burning  
   d) oxygen has equal number of protons and neutrons

49. For Uranium B.E / A is about
   a) 8.8 Mev  
   b) 7.6 Mev  
   c) 7.6 Mev  
   d) 8.5 Mev

50. If the mass defect of atom of $^1H^2$ is 0.001212 amu, then its B.E per nucleon is
   a) $1.128$ Mev  
   b) $0.564$ ev  
   c) $0.564$ Mev  
   d) $1.128$ ev

51. Average B.E per nucleon of mass number 40 to 120 is about
   a) 8.5 Mev  
   b) 8.5 Mev  
   c) 7.6 Mev  
   d) 8.8 Mev

52. The mass proton 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) 0.614 Mev  
   c) 1.52 Mev  
   d) 2.42 Mev

53. 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

54. Nuclear forces were explained by
   a) Chadwick  
   b) Bohr  
   c) Curie  
   d) Yukawa

55. Nuclear force is a
   a) long range force  
   b) short range force  
   c) repulsive force  
   d) charge based force

56. Ratio of strength of gravitational force to that of nuclear force is
   a) $10^{40}$  
   b) $10^{30}$  
   c) $10^{20}$  
   d) 1

57. If the number of protons increase by two times, the nuclear force becomes
   a) increase  
   b) decrease  
   c) remaining same  
   d) infinity

58. According to yukawa, the nuclear force arises due to the exchange of
   a) protons  
   b) positrons  
   c) mesons  
   d) baryons

59. The present view of nuclear force is that it is a
   a) fundamental force  
   b) short range force  
   c) change independent force  
   d) secondary force

60. The particles which exchange between the nucleons are responsible fro the origin
   of the nuclear force are
   a) photons  
   b) leptons  
   c) mesons  
   d) baryons

61. Radio activity is unaffected by
   a) electric and magnetic fields  
   b) excessive heating and cooling  
   c) change in pressure  
   d) all the above
62. For α rays, ionizing power is how many times greater than β rays
   a) 100       b) 1000      c) 10000      d) 500
63. For α rays, ionizing power is how many times greater than γ rays?
   a) 100       b) 1000      c) 10000      d) 500
64. The penetrating power is maximum for
   a) α - particles   b) β - particles   c) gamma ray   d) protons
65. The ray diffracted by crystals in the same way like X - rays diffracted
   a) α rays  b) β rays   c) γ rays   d) none of these
66. The ionization power is minimum for
   a) α rays    b) β rays    c) γ rays    d) electrons
67. In α decay, atomic number
   a) increases by two    b) decreases by two   c) increases by four   d) decreases by four
68. In α decay, mass number
   a) increases by two    b) decreases by two   c) increases by four   d) decreases by four
69. In β decay, atomic number
   a) increases by one    b) decrease by two   c) no change   d) decrease by four
70. In β decay, mass number
   a) increases by one    b) decrease by one   c) no change   d) decrease by two
71. The number of α and β particles emitted when an isotope $^{238}_{92}$U undergoes α and β decays to
    Form $^{206}_{82}$Pb are respectively
   a) 6,8    b) 4,3    c) 8,6    d) 3,4
72. An element $^{X}_{Z}$ 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
73. In γ decay,
   a) only the energy level of the nucleus changes    b) atomic number changes
   c) mass number changes    d) atomic number increases by one
74. When Radium disintegrate into Radon, the energy emission is
   a) 1.87 Mev    b) 0.187 ev    c) 0.187 Mev    d) 1.87 ev
75. The displacement law governing radio active are framed by
   a) Rutherford    b) Soddy    c) Bohr    d) Soddy & fajan
76. Radio active disintegration is independent of
   a) physical condition    b) chemical condition
   c) number of atoms    d) both physical and chemical conditions
77. Rate of Radio active disintegration is directly proportional to
   a) physical condition    b) chemical condition
   c) number of atoms    d) both physical and chemical conditions
78. A radio active material of mass 40 milligram becomes 5 milligram in 6 hours, then the half period of the element is
   a) 1 hour  b) 20 minutes  c) 2 hours  d) 3 hours
79. The half of a radio active element is 56 seconds. How long does it takes for 7/8th of it to be lost in decay
   a) 156 seconds  b) 158 seconds  c) 168 minutes  d) 168 seconds
80. The half of a radio active sample is 30 hours. How long does it takes for 25% of the sample to un decay?
   a) 45 hours  b) 60 hours  c) 90 hours  d) infinity
81. The half life period of a substance is 30 days. Its disintegration constant is
   a) 0.231 day$^{-1}$    b) 0.231 day    c) 231 day    d) 0.231 day$^{-1}$
82. The half life period of a certain radio active element with constant 0.0693 per day
   a) 10 minutes  b) 10 days  c) 3.6 days  d) ¾ hours
83. In 175 gram in 200 gram of a radio active element decays in 3 hours half – life period is
   a) 1.5 hours  b) 1 hour  c) 3 hours  d) ¾ hours
84. A radio active sample produces 5 disintegration per second. Its act is
   a) 5 curie  b) 5 mili curie  c) 5 bequeral  d) 5 roentgen
85. A radio active substance is allowed to decay for a time equal to its half life. Then the
   fraction of the element that has decayed is
   a) \( \frac{1}{e} \)  b) \( e^{-1/e} \)  c) \( e \)  d) \( e^{-1} \)
86. Neutrons are the constituent particles of all except
   a) \( ^{1}H^{1} \)  b) \( ^{1}H^{2} \)  c) \( ^{1}H^{3} \)  d) \( ^{2}He^{4} \)
87. Chemical properties of an element is determined the number of
   a) electrons  b) protons  c) neutrons  d) protons and neutrons
88. The chemical properties of an atom depends upon the number
   a) electrons orbiting around its nucleus  b) protons in its nucleus
   c) neutrons in its nucleus  d) nucleons
89. Which one of the following particle can be added to of an atom without changing its
   chemical properties?
   a) proton  b) positron  c) \( \beta \) - particle  d) neutron
90. The half life of an isolated neutron is
   a) 13 minutes  b) 10.1 minutes  c) 5600 years  d) 6.5 minutes
91. Free neutron decays
   a) proton  b) electron  c) anti neutrino  d) all the above
92. The energy of slow neutron is
   a) 0 to 1000 eV  b) 0.025 eV  c) 0.5 MeV to 10 MeV  d) 0 to 1000 MeV
93. The energy of fast neutron is
   a) 0 to 1000 ev  b) 0.5 ev to 10 ev  c) 0.5 Mev to 10 Mev  d) 0.5 Mev to 10 Mev
94. The average energy of thermal neutron is
   a) 0.25 ev  b) 0.025 MeV  c) 0.45 MeV  d) 0.025 ev
95. In the following nuclear reaction \( ^{7}N^{14} + \alpha n \rightarrow X + ^{1}H^{1} \) the element X is
   a) \( ^{6}N^{14} \)  b) \( ^{6}C^{14} \)  c) \( ^{6}O^{14} \)  d) \( ^{6}C^{13} \)
96. When a neutron changes into a proton the particle emitted is
   a) electron  b) positron  c) pion  d) meson
97. Who found that the radiations emitted during the bombardment of beryllium with a particles can
   knock out protons from paraffin?
   a) Bothe  b) Becker  c) Curie  d) Curie Juliet
98. When \( ^{7}B^{10} \) is bombarded with neutron an \( \alpha \) - particle is emitted, the residual nucleus is
   a) \( ^{6}Li^{7} \)  b) \( ^{1}H^{2} \)  c) \( ^{1}H^{3} \)  d) \( ^{2}He^{4} \)
99. A deuteron is bombarded on \( ^{16}O^{16} \) nucleus, an \( \alpha \) - particle is emitted. The product nucleus is
   a) \( ^{15}N^{14} \)  b) \( ^{9}N^{13} \)  c) \( ^{9}Be^{9} \)  d) \( ^{9}B^{10} \)
100. The particle emitted only during artificial radio activity is
   a) electron  b) proton  c) positron  d) neutron
101. Half life of nitrogen is about
   a) 13 minutes  b) 10.1 minutes  c) 5600 years  d) 3 minutes
102. Half life of radio active phosphorous is about
   a) 13 minutes  b) 10.1 minutes  c) 5600 years  d) 3 minutes
103. In the following nuclear reaction, \( ^{13}Al^{13} + \alpha n \rightarrow X + ^{11}H^{4} \) the X is
   a) \( ^{12}Si^{30} \)  b) \( ^{13}P^{30} \)  c) \( ^{15}P^{29} \)  d) \( ^{15}Si^{29} \)
104. Isotope used to locate brain tumour is
   a) \( ^{24}Na^{1} \)  b) \( ^{1}I^{131} \)  c) \( ^{59}Fe^{9} \)  d) \( ^{32}P^{12} \)
105. Radio cobalt is used in the treatment of
   a) blood circulation  b) cancer  c) anaemia  d) skin disease
106. Radio Iodine is used for the treatment of
   a) brain tumour  b) Thyroid gland  c) blood circulation  d) both a and b
107. Radio sodium is used for the treatment of
   a) brain tumour  b) Thyroid gland  c) blood circulation  d) both a and b
108. Radio phosphorous is used for the treatment of
   a) blood circulation  b) Thyroid gland  c) skin diseases  d) Therapy
109. How many pairs of ions are produced in one of air for one milli roentgen radiation?
   a) $1.6 \times 10^{10}$  
   b) $1.16 \times 10^{10}$  
   c) $1.6 \times 10^9$  
   d) $1.6 \times 10^{12}$

110. Half life of Carbon 14 is
   a) 5570 years  
   b) 13 minutes  
   c) 10 minutes  
   d) infinity

111. The ratio of C$^{14}$ and C$^{12}$ in the atmosphere
   a) $10^2 : 1$  
   b) $10^4 : 1$  
   c) $1 : 10^2$  
   d) $1 : 10^4$

112. The power of radiation, which produces leukemia is
   a) 250 mR  
   b) 100 mR  
   c) 600 R  
   d) 100 R

113. The radiation at which it causes death is
   a) 100 R  
   b) 600 R  
   c) 250 R  
   d) 250 mR

114. The safe limit of receiving radiation is
   a) 250 R per week  
   b) 250 mR per week  
   c) 100 R per week  
   d) 100 mR per week

115. With spiral type accelerators the particles are accelerated to energy in the order of
   a) few MeV  
   b) $10^6$ eV  
   c) $10^9$ eV  
   d) $10^{-9}$ eV

116. Which of the following is an electro static accelerator?
   a) cyclotron  
   b) synchrotron  
   c) cock croft Walton  
   d) Linear accelerator

117. Which of the following is synchronous accelerator?
   a) cock croft Walton  
   b) Van de graff generator  
   c) linear accelerator  
   d) none of these

118. Synchronous accelerator can accelerate particles to energy of the order of
   a) MeV  
   b) 100 eV  
   c) GeV  
   d) eV

119. Two elements, which are fissionable by neutrons of all energies are
   a) $\text{U}^{235}$ and $\text{Pu}^{239}$  
   b) $\text{U}^{238}$ and $\text{Pu}^{239}$  
   c) $\text{U}^{235}$ and $\text{U}^{238}$  
   d) $\text{U}^{235}$ and $\text{U}^{236}$

120. Average number of neutrons released per fission of uranium is
   a) 2  
   b) 3  
   c) 2.5  
   d) 3.5

121. Natural uranium consists of
   a) 99.28 % of $\text{U}^{235}$ and 0.72 % of $\text{U}^{238}$ 
   b) 99.28 % of $\text{U}^{235}$ and 0.72 % of $\text{U}^{239}$ 
   c) 99.28 % of $\text{U}^{238}$ and 0.72 % of $\text{U}^{239}$ 
   d) 99.28 % of $\text{U}^{238}$ and 0.72 % of $\text{U}^{235}$

122. 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

123. In fast breeder reactors
   a) heavy water is used as moderator  
   b) graphite is used as moderator  
   c) ordinary water is used as moderator  
   d) no moderator is required

124. In a nuclear reactor, cadmium rods are used to
   a) speed up neutrons  
   b) slow down neutrons  
   c) absorbs neutrons  
   d) none of the above

125. Research reactors
   a) supplies neutrons  
   b) products  
   c) convert fertile into fissile  
   d) produce the power

126. In the PWR reactors, the fuel used is
   a) high enriched uranium  
   b) low enrich uranium  
   c) uranium oxide  
   d) oxides of produce and uranium

127. Which of the following is not a moderator?
   a) Liquid sodium  
   b) Ordinary water  
   c) Graphite  
   d) Heavy water

128. The coolant and moderator are the same in the
   a) PHWR and PFBR  
   b) PEBR and FBTR  
   c) PHWR and PWR  
   d) PWR and FBTR

129. The moderator used in nuclear reactor is
   a) Cadmium  
   b) Boron carbien  
   c) Heavy water  
   d) Uranium ($\text{U}^{235}$)

130. The fuel used in Kamini reactor is
   a) $\text{U}^{238}$  
   b) $\text{Pu}^{233}$  
   c) $\text{Pu}^{239}$  
   d) low enriched uranium

131. A good moderator is one which slow down the
   a) inelastic collision  
   b) elastic collision  
   c) cattering  
   d) absorption
132. In pressurized heavy water reactors the fuel used
   a) uranium  b) uranium carbide  c) uranium oxide  d) enriched uranium

133. Hydrogen bomb is based in the principle of
   a) nuclear fission  b) nuclear fusion  c) chain reaction  d) carbon-nitrogen cycle

134. The interior temperature of the sun is about
   a) 50 million °C  b) 1.4 x 10^7 K  c) 10^8 K  d) 10^7 K

135. Total energy radiated by the sun is about
   a) 3.8 x 10^{-26} J/S  b) 3.8 x 10^{26} J/S  c) 8.3 x 10^{26} J/S  d) 8.3 x 10^{26} J/S

136. Energy of the primary cosmic rays is of the order of
   a) 10^9 eV  b) 10^8 eV  c) 10^7 MeV  d) 10^9 MeV

137. Primary cosmic rays consists of
   a) 9% protons, 90% helium nuclei and remaining heavy nuclei
   b) 90% protons, 9% helium nuclei and remaining helium nuclei
   c) 90% protons, 9% helium nuclei and remaining heavy nuclei
   d) protons, helium nuclei and heavy nuclei are equal proportions

138. Intensity of cosmic rays
   a) minimum at the poles  b) maximum at the equator
   c) minimum at the equator  d) zero at the equator

139. Intensity of cosmic rays at the equator is
   a) zero  b) minimum  c) maximum  d) infinity

140. Cosmic ray intensity is constant between
   a) 0° to 42°  b) 42° to 90°  c) at equator  d) 0°

141. Cosmic ray intensity is maximum at a height of about
   a) 20 Km  b) 10 Km  c) 15 Km  d) 7 Km

142. In pair production, which of the following pairs are formed?
   a) protons and positrons  b) protons and electrons
   c) electrons and positrons  d) protons and neutrons

143. Annihilation is an example for the conversion of
   a) mass into energy  b) energy into mass
   c) heat into light  d) light into heat

144. Which of the following particles is a lepton?
   a) Electron  b) Proton  c) Neutron  d) p – Meson

145. Particles having mass equal to or less than about 207 times of an electrons are
   a) measons  b) leptons  c) baryons  d) hyperons

146. Which possess energy and spin even through they are mass less particles?
   a) Neutrino  b) Anti neutron  c) Neutrino & Antineutrino  d) Positron

147. Neutrino & Antineutrino are associated with the emission of
   a) alpha rays  b) beta rays  c) gamma rays  d) x-rays

148. Rest mass of mesons vary between
   a) 250 m_e to 100 m_e  b) 1 m_e to 1000 m_e
   c) 250 m_e to 3275 m_e  d) 500 m_e to 1000 m_e

149. Rest mass of Baryons is equal to
   a) proton  b) neutron  c) nucleon  d) all the above

150. Mass of the hyperons vary from
   a) 250 m_e to 1000 m_e  b) 1 m_e to 1000 m_e
   c) 2180 m_e to 3275 m_e  d) 500 m_e to 1000 m_e
01. The following arrangement performs the logic functions of -------- gate
   (a) AND     (b) OR     (c) NAND     (d) EXOR

02. Avalanche breakdown is primarily dependent on the phenomenon of
   (a) collision    (b) ionization    (c) doping    (d) recombination

03. The Boolean expression $ABC$ can be simplified as
   (a) $AB + \overline{C}$ (b) $A \cdot \overline{B} \cdot \overline{C}$ (c) $AB + BC + CA$ (d) $\overline{A} + \overline{B} + \overline{C}$

04. In an N – type semiconductor, there are
   (a) immobile negative ions    (b) no minority carriers
   (c) immobile positive ions    (d) holes as majority carriers

05. In the forward bias characteristic curve, a diode appears as
   (a) a high resistance    (b) a capacitor    (c) an OFF switch    (d) an ON switch

06. In a Colpitt’s oscillator circuit
   (a) capacitive feedback is used    (b) tapped coil is used
   (c) no tuned LC circuit is used    (d) no capacitor is used

07. The colour of light emitted by a LED depends on
   (a) its reverse bias    (b) the amount of forward current
   (c) its forward bias    (d) type of semiconductor material

08. An oscillator is
   (a) an amplifier with feedback    (b) a convertor of ac to dc energy
   (c) nothing but an amplifier    (d) an amplifier without feedback

09. The emitter base 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) $I_e$ will decrease
   (c) $I_c$ will increase    (d) $V_{CC}$ will increase

10. If the output (Y) of the following circuit is 1, the inputs A B C must be
    (a) 0 1 0    (b) 1 0 0    (c) 1 0 1    (d) 1 1 0

11. According to the laws of Boolean algebra, the expression $(A+AB)$ is equal to
   (a) $A$    (b) $AB$    (c) $B$    (d) $\overline{A}$

12. 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

13. 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 becomes independent of load resistance    (d) it becomes a current controlled device

14. The 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

15. 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

16. The resistivity of semiconductor lies between
   a) $10^{-2} \, \Omega \cdot cm$ and $10^{-6} \, \Omega \cdot cm$    b) $10^{-2} \, \Omega \cdot m$ and $10^{4} \, \Omega \cdot m$
   c) $10^{6} \, \Omega \cdot cm$ and $10^{9} \, \Omega \cdot m$    d) $10^{10} \, \Omega \cdot m$ and $10^{12} \, \Omega \cdot m$

17. With the increase in temperature the resistance of a semiconductor
   a) decreases    b) increases    c) remains constant    d) zero

18. A semiconductor is cooled from $T_1$ K to $T_2$ K. Its resistance
   a) decrease    b) increase    c) first decrease and then increase    d) will decrease
19. The electrical conductivity of semiconductor
   a) is independent of temperature
   b) increase with increase of temperature
   c) increases with increase of temperature
   d) first increases and then decreases with increase of temperature

20. The partially filled levels in an atom are known as
   a) valence levels
   b) forbidden levels
   c) core levels
   d) conductor levels

21. Energy bands in solids are a consequence of
   a) Ohm’s law
   b) Pauli’s exclusion principle
   c) Bohr’s theory
   d) quark’s model

22. Which of the following is not true?
   a) is occupied by the valence electrons
   b) is never empty
   c) have highest energy
   d) occupied by free electrons

23. The energy band occupied by free electrons is called
   a) conduction band
   b) valence band
   c) band gap
   d) first energy band

24. At absolute zero an intrinsic semiconductor is
   a) an insulator
   b) conductor
   c) super conductor
   d) type semiconductor

25. In any solid, valence band is
   a) completely filled
   b) partially filled
   c) an empty band
   d) either completely filled or partially filled

26. For Ge and Si the temperature at which valence band is completely filled and conduction band is completely empty is
   a) 0°C
   b) 273°C
   c) 0 K
   d) 100°C

27. The potential barrier of silicon diode is
   a) 3V
   b) 0.7V
   c) 1.1V
   d) 10V

28. For germanium crystal, the forbidden energy gap is
   a) 1.12 x 10⁻¹⁹ J
   b) 1.76 x 10⁻¹⁹ J
   c) 1.6 x 10⁻¹⁹ J
   d) Rop

29. The forbidden energy gap is
   a) the region filled with energy levels
   b) the region where no energy level exists
   c) the same for all solids
   d) the region which is partially filled with electrons and partially filled with holes

30. The forbidden energy gap in the energy bands of Germanium at room temperature is about
   a) 1.1 eV
   b) 0.7 eV
   c) 0.67 eV
   d) 6.7 eV

31. When the temperature increases the forbidden energy gap of the semiconductor
   a) increases
   b) decreases
   c) becomes zero
   d) remains the same

32. At absolute zero silicon acts as
   a) non-metal
   b) metal
   c) insulator
   d) none of these

33. When the conductivity of a semi-conductor is only due to breaking of the covalent bond, the semi-conductor is called
   a) donor
   b) acceptor
   c) intrinsic
   d) extrinsic

34. The purest form of semiconductor is called
   a) normal semiconductor
   b) intrinsic semiconductor
   c) extrinsic semiconductor
   d) none

35. The impurity to be added to an intrinsic semiconductor is of the
   a) 10 parts per million
   b) 1 part per million
   c) 100 parts per million
   d) 1000 parts per million

36. Of the following, the donor atoms are
   a) Si and Ge
   b) Al and Ga
   c) Bi and Al
   d) B and In

37. A hole in a P – type semiconductor is
   a) an excess electron
   b) a mission electron
   c) a missing atom
   d) a donor level

38. An N-type and P-type silicon can be obtained by doping pure silicon with
   a) sodium and magnesium
   b) phosphoro and boron respectively
   c) boron and phosphorous respectively
   d) indium and sodium respectively
39. If \( n_e \) and \( n_h \) are the number of electrons and a phosphorous doped semiconductor then
   a) \( n_e = n_h \)  
   b) \( n_e > n_h \)  
   c) \( n_e < n_h \)  
   d) \( n_e \neq n_h \)

40. A doped semiconductor is called
   a) extrinsic semiconductor  
   b) intrinsic semiconductor  
   c) perfect insulator  
   d) perfect semiconductor

41. In PN junction diode, the depletion region
   a) contain electrons  
   b) contain holes  
   c) does not have mobile charges  
   d) contain neutrons

42. In the depletion region of an unbiased PN junction are
   a) only electrons  
   b) only holes  
   c) both electrons and holes  
   d) only immobile ions

43. In a PN junction diode, in the reverse biasing
   a) no current flows  
   b) large current flows  
   c) potential barrier across the junction increases  
   d) resistance of the depletion region decreases

44. When an impurity atom of 5 valence electrons is doped with the pure semiconductor, the donor level will lie slightly below
   a) conduction band  
   b) acceptor level  
   c) valence band  
   d) forbidden energy gap

45. In N-type semiconductor, the donor energy level lies
   a) close to the conduction band  
   b) above the conduction band  
   c) close to the valence band  
   d) above the valence band

46. In P-type semiconductor the acceptor energy level lies
   a) close to the conduction band  
   b) above the conduction band  
   c) close to the valence band  
   d) above the valence band

47. In N-type semiconductor the majority carriers of charge are
   a) holes  
   b) electrons  
   c) electrons and holes  
   d) neutrons

48. In P-type semiconductors, the majority carriers of charge are
   a) holes  
   b) electrons  
   c) electrons and holes  
   d) neutrons

49. In P-type semiconductors, the majority and minority charge carriers are respectively
   a) protons and electrons  
   b) electrons and protons  
   c) electrons and holes  
   d) holes and electrons

50. In P-type semiconductors there are
   a) immobile negative ions  
   b) no minority carrier  
   c) immobile positive ions  
   d) holes as minority carriers

51. In PN junction diode, the depletion region doesn’t have
   a) electrons  
   b) holes  
   c) mobile charges  
   d) none

52. A PN junction diode is said to be forward biased when
   a) P is connected to positive and N to negative terminal  
   b) P is connected to negative and N to positive terminal  
   c) both P and N are connected to positive terminals  
   d) both P and N are connected to negative terminals

53. In forward biased PN diode, if the applied potential is more than the barrier
   a) the depletion region widens  
   b) potential disappears  
   c) both disappears  
   d) none of these

54. When a PN junction diode is reverse biased
   a) the depletion region widens  
   b) the potential barrier disappears  
   c) both (a) and (b) are valid  
   d) none of these

55. The reverse bias current in a PN junction diode the order of
   a) few ampere  
   b) few micro ampere  
   c) few milli ampere  
   d) few nano ampere

56. When a PN junction is forward biased there is
   a) an increase in the minority carrier current  
   b) an increase in the number of minority charge current  
   c) a lowering of the potential barrier across the junction  
   d) an increase in the potential barrier across the junction
57. The reverse biasing of the junction diode
   a) increases the potential barrier   b) decreases the potential barrier
   c) does not change the potential barrier   d) changes the number of charge carriers

58. The reverse bias current in a PN junction diode depends on the
   a) potential barrier   b) barrier width   c) junction voltage   d) junction temperature

59. In the forward biased PN – junction the current is of the order of
   a) ampere   b) milli ampere   c) micro ampere   d) nano ampere

60. Which of the following is not true regarding a PN junction diode?
   a) It is a passive device   b) Its forward characteristic is not a straight line
   c) It does not obey Ohm’s law   d) It is a non linear conductor of electricity

61. For a PN junction diode, the voltage at which the current starts to increase rapidly is
   a) leakage voltage   b) potential barrier   c) knee voltage   d) saturation voltage

62. The symbol of LED is ______
   a)   b)   c)   d)

63. The source voltage is 9 volt and the source resistance is 1k Ω. the current through the silicon diode is
   a) 3.8 mA   b) 4.2 mA   c) 0.38 A   d) 8.3 mA

64. Diode acts as a rectifier, because it offers
   a) high resistance for reverse bias and forward bias   b) low resistance for reverse bias and forward bias
   c) high resistance for reverse bias and low resistance for forward bias   d) low resistance for reverse bias and low resistance for forward bias

65. Rectification means converting
   a) ac voltage in to dc voltage   b) ac current into dc current
   c) both (a) and (b)   d) none

66. A diode can be used as
   a) an amplifier   b) an oscillator   c) a rectifier   d) a modulator

67. On increasing the reverse bias to a large value in a PN junction,
   a) increases slowly   b) remains   c) suddenly increases   d) decrease

68. Find the voltage across the resistor as shown in the figure
   a) 2.4 V   b) 2.0 V   c) 1.8 V   d) 0.7 V

69. Avalanche breakdown takes place when
   a) both sides of the PN junction are lightly doped   b) the depletion layer becomes large
   c) both (a) and (b) are true   d) the depletion layer becomes narrow

70. Zener breakdown takes place when
   a) both sides on the PN junction are heavily doped   b) the depletion layer is wide
   c) the depletion layer is narrow   d) both (a) and (c) are true

71. Zener breakdown will occur if
   a) impurity level is low   b) impurity level is high
   c) impurity is less in N-side   d) impurity is less in P-side

72. Zener breakdown is independent of
   a) applied voltage   b) load resistance   c) number of diodes   d) none of these

73. The main cause of Zener breakdown is
   a) high doping   b) low doping
   c) production of electron hole pair due to thermal agitation   d) collision ionization

74. Zener diode is
   a) forward biased lightly doped diode   b) operated exclusively in the break down region
   c) reverse biased heavily doped diode   d) both (b) and (c) are valid
75. At the Zener voltage, the current
   a) becomes zero  b) decreases  
   c) increases enormously  d) changes sign

76. A Zener diode working in the ____ region can act as voltage regulators
   a) normal  b) saturated  c) breakdown  d) constant voltage

77. Filter circuits give almost
   a) a.c voltage  b) steady d.c voltage  
   c) fluctuating a.c voltage  d) fluctuating d.c voltage

78. In a transistor, which of the following is false?
   a) Base and collector are lightly doped regions
   b) Collector region is physically larger in size
   c) Emitter base junction is reverse biased and the collector base junction is forward biased
   d) Emitter and collector cannot be interchanged

79. The fundamental relation between the currents in a transistor circuit is
   a) \( I_E = I_C - I_B \)  b) \( I_E = I_B + I_C \)  c) \( I_B = I_E + I_C \)  d) \( I_E = I_B - I_C \)

80. If \( I_E \), \( I_C \) and \( I_B \) represent emitter current, collector current and current of a transistor then
   a) \( I_C > I_E \)  b) \( I_B > I_E \)  c) \( I_B > I_C \)  d) \( I_E > I_C \)

81. In the common collector mode the output terminal is
   a) emitter  b) base  c) collector  d) either (a) or (b)

82. In the common base configuration, current gain
   a) \( I_B / I_E \)  b) \( I_C / I_E \)  c) \( I_E / I_C \)  d) \( I_C / I_B \)

83. For a transistor current gain \( A \) is
   a) \( = 1 \)  b) \( > 1 \)  c) \( < 1 \)  d) \( \neq 0 \)

84. If \( \alpha \) and \( \beta \) are the current gains in the CB and CE configuration respectively of a transistor circuit, then
   \[ \frac{1}{\alpha} - \frac{1}{\beta} = \]
   a) \( \alpha - \beta \)  b) 2  c) \( \alpha \beta \)  d) 1

85. For most of the transistor the value of \( \beta \) lies between
   a) 50 to 300  b) 0 to 50  c) 0 to 300  d) 1000

86.Emitter region is heavily doped since it has to supply the base current
   a) minority carriers  b) majority carriers  c) ions  d) donor ions

87. The common emitter circuit has
   a) low input impedance and high power gain
   b) low input impedance and low power gain
   c) high input impedance and high power gain
   d) high input impedance and low power gain

88. In an NPN transistor circuit the emitter current is 10mA. If 90% of the electrons are able to reach the collector then the base current will be
   a) 1 mA  b) 2 mA  c) 3 mA  d) 4 mA

89. The base emitter voltage of 250 mV is applied to a transistor in common emitter configuration. If the base current is 150 mA then the input impedance is
   a) 1.6 KΩ  b) 2 KΩ  c) 3 KΩ  d) 4 KΩ

90. The initial part of the output characteristic curves of a transistor in CE mode is called
   a) saturation region  b) active region  c) cut off region  d) none

91. The part of the output characteristic curves of transistor in CE mode between the origin and the knee point is called the
   a) cut off region  b) active region  c) saturation region  d) none

92. Which of the characteristic curve is a straight line?
   a) static characteristics  b) input characteristics
   c) output characteristics  d) transfer characteristics

93. The knee point in the output characteristic curve is the point where \( I_C \) is
   a) zero  b) maximum  c) about to become constant  d) negative

94. In the output characteristic curve of a transistor the region below \( I_B = 0 \) is called
   a) saturation region  b) cut off region  c) active region  d) none
95. The phase reversal between the input and output in an amplifier using a single transistor is
   a) \( \frac{\pi}{2} \)  
   b) \( \pi \)  
   c) \( \frac{3\pi}{2} \)  
   d) \( 2\pi \)

96. In a transistor amplifier the Q – point must lies in which region of the output characteristics?
   a) active region  
   b) saturated region  
   c) cut off region  
   d) none

97. The \( \beta \) of a transistor is very sensitive to changes in
   a) voltage  
   b) current  
   c) temperature  
   d) resistance

98. For an amplifier, voltage gain is 10 and current is 5, the power gain is
   a) 2  
   b) 50  
   c) 15  
   d) 0.5

99. The input impedance of a transistor is 1000 ohms and \( \beta = 100 \) then the base – emitter voltage required for collector current of 1 mA is
   a) 1 V  
   b) 100 mV  
   c) 10 mV  
   d) 1 mV

100. In CE configuration the I\(_C\) changes from 2 mA to 4 mA. If V\(_{CE}\) is increased from 5 V to 10 V output admittance must be
    a) \( 8 \times 10^4 \) mho  
    b) \( 4 \times 10^3 \) mho  
    c) \( 2.5 \times 10^3 \) mho  
    d) \( 1.25 \times 10^3 \) mho

101. If the d.c operating point of a transistor shifts near the saturation line of the output characteristics, The signal _____ after amplification.
    a) voltage will increase  
    b) power will decrease  
    c) will be distorted  
    d) current will decrease

102. When number of amplifiers is connected in cascade the overall voltage gain is equal to _____ of individual stages
    a) sum of voltage gain  
    b) difference of voltage gain  
    c) product of voltage gain  
    d) mean voltage gain

103. 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) 25 mA

104. The phase difference between the input and output transistor is used as an amplifier.
    a) \( \frac{3\pi}{2} \)  
    b) \( \pi \)  
    c) \( \frac{\pi}{2} \)  
    d) \( 2\pi \)

105. When an operational amplifier is functioning as an increase amplifier the phase difference between input and output voltage is
    a) 0\(^0\)  
    b) 180\(^0\)  
    c) 90\(^0\)  
    d) 360\(^0\)

106. In a single stage amplifier, which of the following statement is true?
    a) \( R_1, R_2, R_E \) provides biasing and stabilization  
    b) \( C_m \) couple the signal to the base  
    c) CE provides a low reactance path to the amplified a.c signal  
    d) all the above

107. In the low frequency range of an amplifier, with the increase of frequency, the voltage gain
    a) constant  
    b) increasing  
    c) decreasing  
    d) sinusoidal

108. In an amplifier in the mid frequency range, with the increase of frequency, the voltage gain
    a) decreases  
    b) increases  
    c) is a constant  
    d) decreases and then increases

109. In the high frequency region of an amplifier as the frequency increases, the voltage gain
    a) decreases  
    b) is a constant  
    c) increases  
    d) increases and then decreases

110. In an amplifier the voltage gain at the upper cut off frequency is
    a) twice the mid frequency gain  
    b) half mid frequency gain  
    c) \( \sqrt{2} \) times the mid frequency gain  
    d) \( \sqrt{2} \) times the mid frequency gain

111. The amplifiers with power gains of 40, 50 and 60 are coupled in series. The total gain of the cascade amplifier is
    a) 150  
    b) 120000  
    c) 50  
    d) 200

112. A multi stage amplifier has the over all voltage gain of 150. The gain in reduced to 25 when a negative feed back is applied. What is the fraction of the output that is fed back to the input?
    a) \( \frac{1}{30} \)  
    b) \( \frac{1}{20} \)  
    c) \( \frac{-1}{30} \)  
    d) \( \frac{-1}{6} \)
113. The gain of the amplifier is constant at ____ range.
   a) Low frequency  b) mid frequency  
   c) high frequency  d) both low and high frequency

114. If mid frequency gain = 50 then gain of amplifier at upper cut off frequency is
   a) 70.7  b) 51.4  c) 354  d) 35.4

115. In CE single stage amplifier voltage gain at mid frequency is 10. The voltage gain at the upper cut off frequency is
   a) 10  b) 14.14  c) 7.07  d) 20

116. The advantage of negative feedback is
   a) less distortion  b) decrease and width  
   c) low input impedance  d) all the above

117. An amplifier circuit with feedback becomes an oscillator if the feedback is
   a) positive and feedback factor is zero  
   b) negative and feedback factor is unity  
   c) positive and feedback factor is unity  
   d) negative and feedback factor is infinity

118. The voltage amplification of an amplifier without feedback is 20. When a positive feedback is given with a feedback fraction of 0.01, the gain with feedback is
   a) 30  b) 25  c) 20  d) 35

119. Essential conditions for the maintenance of oscillation are
   a) \( \beta = \frac{1}{A} \) with positive feedback  
   b) \( \beta = \frac{1}{A} \) with negative feedback  
   c) \( \beta = 1 \) with positive feedback  
   d) \( \beta = A \) with negative feedback

120. Barkhausen condition for the maintenance of oscillation is
    a) \( A \beta = 1 \)  
    b) \( \beta A = 1 \)  
    c) \( \beta = A \)  
    d) both (a) and (b)

121. Condition for oscillation is
    a) \( A \beta = 1 \)  
    b) \( A = \frac{1}{\beta} \)  
    c) both (a) and (b)  
    d) \( A + \beta = 0 \)

122. A good design of an amplifier does not possess
    a) high input impedance  b) low input impedance  
    c) low current gain  d) high current gain

123. The electrical energy of a LC circuit is stored as ____ energy is the inductor and ____ energy in the capacitor
    a) electrostatic, electromagnetic  
    b) electromagnetic, electrostatic  
    c) heat, electric field  
    d) electric field, heat

124. The transistor in saturation region is
    a) a high resistance device  
    b) a capacitor  
    c) an OFF switch  
    d) an ON switch

125. A transistor has a collector current 10 mA and collector emitter voltage 12 V. Then the output power dissipation is
   a) 1.2 mw  b) 4.14 w  c) 120 mw  d) 9.4 w

126. In a non-inverting amplifier \( R_{in} = 1 \, \text{K}\Omega \) and \( R_f = 49 \, \text{K}\Omega \) then its voltage gain is
   a) 49  b) 50  c) 4900  d) 500

127. Simple form of Boolean expression \( AB + AB + BC + CA \) is
   a) \( (A + B) C \)  
   b) \( AB + C \)  
   c) \( A + BC \)  
   d) ABC

128. The Boolean expression for De Morgan’s theorem is
   a) \( A + B = \overline{A} + \overline{B} \)  
   b) \( \overline{AB} = \overline{A} + \overline{B} \)  
   c) \( \overline{A} + \overline{B} = \overline{AB} \)  
   d) \( \overline{A + B} = \overline{A} . \overline{B} \)
131. Negative Logic AND gate is
   a) positive logic NAND  b) positive logic NOR
   c) positive logic OR    d) negative logic NOT

132. Operation of the following logic gate

   a) AND gate           b) OR gate         c) NAND gate       d) EX-OR gate

133. In Boolean algebra, \((\overline{A + B}) \cdot C\) =

   a) \(\overline{A} + \overline{B} + \overline{C}\)  b) \((\overline{A} + \overline{B}) + C\)
   c) \((A \cdot B) \cdot C\)                      d) \(\overline{A} + \overline{B} + C\)

134. The output of the logic circuit given below is

   a) \(Y = A + B\)          b) \(Y = AB\)             c) \(Y = \overline{A + B}\)
   d) \(Y = \overline{A \cdot B}\)

135. A logic gate which has an output of ‘a’ when the inputs are complement to each other is

   a) AND           b) NOR             c) NAND                d) EX-OR

136. A logic gate for which there is ‘low’ output when both are ‘high’ is

   a) AND           b) NAND            c) NOR                 d) EX-OR

137. The Boolean expression to represent NAND operation is

   a) \(Y = A + B\)          b) \(Y = \overline{A \cdot B}\)
   c) \(Y = A\)               d) \(Y = AB\)

138. The output voltage of the operational amplifier given below is

   a) \(+2 \sin \omega t\)     b) \(-2 \sin \omega t\)
   c) \(-2 \sin (\omega t + 10^6)\)
   d) \(2 \sin (\omega t + 10^6)\)

139. A galvanometer has internal resistance 100 gives full scale direction for 1mA. To convert this into a voltmeter to measure up to 10 volt resistance to be corrected with it is

   a) 9900 \(\Omega\) in series           b) 9900 \(\Omega\) in parallel
   c) 900 \(\Omega\) in series            d) 900 \(\Omega\) in parallel

140. A galvanometer has internal resistance 10 gives full scale reflection for 1 mA. To convert this into a ammeter to measure upto the resistance to be connected with it is

   a) 900 \(\Omega\) in series           b) 0.1 \(\Omega\) in parallel
   c) 900 \(\Omega\) in parallel         d) 0.1 \(\Omega\) in series
10. COMMUNICATION SYSTEMS

01. High frequency waves follow
   (a) the ground wave propagation            (b) the line of sight direction
   (c) ionosphere propagation                (d) the curvature of the earth

02. 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

03. 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

04. 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 efficiently
    (d) produce side bands

05. The RF channel in a radio transmitter produces
    (a) audio signals                          (b) high frequency carrier waves
    (c) both audio signal and high frequency carrier waves  (d) low frequency carrier waves

06. The purpose of dividing each frame into two fields so as to transmit 50 views of the picture per second
    (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

07. 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

08. In amplitude modulation, the band width is
    (a) equal to the signal frequency          (b) twice the signal frequency
    (c) thrice the signal frequency            (d) four times the signal frequency

09. Ground wave propagation is on prime importance for
    a) high frequency waves                    b) medium and long wavelength signals
    c) UHF waves                                d) SHF waves

10. All medium wave signals received during daytime use
    a) Sky wave propagation                     b) Satellite propagation
    c) Wire propagation                         d) Surface wave propagation

11. 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) micro waves

12. Troposphere extends up to
    a) 5 km                                     b) 15 km                             c) 60 km                  d) 90 km

13. Long distance radio communication is possible only through
    a) ground wave propagation                  b) direct wave propagation
    c) reflected wave propagation               d) sky wave propagation

14. In the skip Zone
    a) reception is maximum                     b) reception is minimum
    c) no reception at all                      d) none of these

15. In the process of modulation which parameter of the carrier wave changes in accordance with the intensity of the signal
    a) amplitude                               b) frequency                          c) phase                  d) any one of these

16. The superposition of a signal voltage on a carrier wave is called
    a) demodulation                            b) modulation                        c) detection              d) synchronization
17. High frequency wave follow
   a) the ground wave propagation   b) the line propagation
   c) ionospheric propagation     d) the current of the earth

18. 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 efficient
   d) Produce side bands

19. 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

20. The mechanism involved in sky wave propagation is
   a) reflection    b) refraction    c) interference    d) polarization

21. The refractive indices of the various layers atmonosphere 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 increase wave

22. As the ionization density increases for a wave approprive the given layer at an angle, the
    Refractive index of the layer is
   a) increased
   b) reduced
   c) increased or reduced
   d) constant

23. The radiation of electrical energy is practicable only
   a) low frequencies    b) very low frequencies
   c) moderate frequencies    d) high frequencies

24. 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

25. In amplitude modulation, which component of the carrier wave is varied in accordance with
    the intensity of the signal?
   a) phase
   b) amplitude
   c) frequency
   d) none of these

26. In amplitude modulated wave if \( E_S \) is amplitude of signal wave and \( E_C \) is the amplitude of carrier
    Wave then modulation factor is
   a) \( E_C/E_S \)
   b) \( E_S - E_C \)
   c) \( E_C + E_S \)
   d) \( E_S / E_C \)

27. In amplitude modulated wave if the signal amplitude is 3 volt and the carrier amplitude is 4
    volt then modulation factor is
   a) 1.33
   b) 0.75
   c) 0.3
   d) 0.4

28. The modulation factor determines which parameter of the transmitted signal?
   a) amplitude
   b) frequency
   c) strength and quality
   d) phase

29. An amplitude modulated wave contains
   a) carrier wave only
   b) upper side band frequency only
   c) lower side band frequency only
   d) all of these

30. If the frequency of the signal is 340 hertz, the bandwidth of amplitude modulated wave is
    a) 340 Hz    b) 680 Hz    c) 170 Hz    d) 1020 Hz

31. If the maximum frequency of a modulating signal is 3000 HZ, the channel widthth is,
    a) 1 KHz    b) 3 KHz    c) 12 KHz    d) 6 KHz

32. In frequency modulation
   a) frequency of the carrier wave remains constant
   b) amplitude of the carrier wave remains same
   c) both of the frequency and amplitude of carrier wave vary
   d) signal is distorted

33. In frequency modulation, the change is the resting frequency either above or below is called
    a) carrier swing    b) reason frequency
    c) resting frequency    d) frequency direction

34. In frequency modulation, the total variation in frequency from to the highest is called
    a) frequency deviastion
    b) carrier
    c) resting frequency
    d) channel
35. The maximum allowed frequency deviation in frequency modulation
   a) 37.5 KHz  b) 75 KHz  c) 40 MHz  d) 600 KHz
36. The maximum allowed carrier swing in frequency modulation is
   a) 150 KHz  b) 75 KHz  c) 40 MHz  d) 800 MHz
37. The intermediate frequency in super heterodyne AM receiver is always equal to
   a) 545 KHz  b) 654 KHz  c) 445 MHz  d) 455 KHz
38. The intermediate frequency in super heterodyne FM receiver is always equal to
   a) 455 KHz  b) 10.7 MHz  c) 455 Hz  d) 50.27 MHz
39. During radio transmission the modulating generated by
   a) RF section  b) AF section  c) both  d) none of the above
40. In a FM transmitter which of the following isolate crystal oscillator from the phase modulator?
   a) AF amplifier  b) Buffer amplifier  c) lower amplifier  d) microphone
41. In a straight radio receiver, which consists of a PN
   a) RF amplifier  b) Datector  c) amplifier  d) Antenna
42. In AM super heterodyne receiver, the local oscillator is 1.245 MHz. The tuned station frequency
   a) 455 KHz  b) 790 KHz  c) 90 KHz  d) 990 KHz
43. Which section of super heterodyne AM receiver select the desired radio wave and enhances the Strength of the wave to the desire level?
   a) Mixer  b) IF amplifier  c) AF amplifier  d) RF amplifier
44. The shortcomings of straight radio receiver were overcome by ____
   a) an audio receiver  b) a AF receiver  c) super heterodyne receiver  d) a FM transmitter
45. Microphone converts
   a) electrical energy into sound energy  b) sound energy into magnetic energy
   c) sound energy into electrical energy  d) sound energy into light energy
46. The AF section in radio transmission consists of
   a) crystal oscillator  b) RF power amplifier
   c) butter amplifier  d) all of these
47. A modulator circuit consists of
   a) transistor  b) passive component
   c) transistor and passive components  d) inductors
48. In radio transmission high frequency carrier wave is generated by
   a) Hartley oscillator  b) crystal controlled oscillator
   c) multivibrator  d) Colpitt’s oscillator
49. Which of the following amplifier isolates the RF power amplifier
   a) operational amplifier  b) common emitter amplifier
   c) buffer amplifier  d) RC coupled amplifier
50. The disadvantages of single radio receiver is its
   a) poor sensitivity  b) poor fidelity
   c) high bandwidth  d) poor sensitivity and poor selectivity
51. The ability to select a particular wanted signal only and rejecting the unwanted signal is called
   a) selectivity  b) stability  c) fidelity  d) sensitivity
52. The ability to amplify the weak signal is called
   a) selectivity  b) stability  c) fidelity  d) stability
53. In TV transmission the sound signals and light signals resper
   a) amplitude modulated and frequency modulated
   b) amplitude modulated and amplitude modulated
   c) frequency modulated and amplitude modulated
   d) frequency modulated and frequency modulated
54. Vidicon camera tube works on the principle of
   a) photo synthesis  b) thermionic  c) photo resistivity  d) photo conductivity
55. When light falls of a photoconductive material its resistance
   a) remains the same  b) decreases  c) increases  d) becomes zero
56. The front portion of the target plate facing the light of vidicon camera tube is coated with
   a) antimony trisulphide  b) caesium oxide  c) tin oxide  d) aluminium oxide
57. The deflection of electron beam in a television picture tube is produced by
   a) X,Y deflection plates
   b) saw tooth voltage applied to X deflection plates
   c) a pair of coils placed outside
   d) sinusoidal voltage applied to Y deflection plates

58. In television, blanking pulse is applied to
   a) X, Y plate
   b) anode
   c) control grid
   d) filament

59. In interlaced scanning time taken to scan one line is
   a) 20 ms
   b) 64 µs
   c) 50 ms
   d) 100 ms

60. The blanking pulses are supplied to which part of the picture tube?
   a) cathode
   b) anode
   c) grid
   d) filament

61. In a 625 line system, transmitting 25 frames per second, the time taken to scan one line is
   a) 64 µs
   b) 64 ms
   c) 64 mC
   d) 0.04 s

62. The back side of target plate of vidicon came tube is coated with
   a) tin oxide
   b) phosphor
   c) antimony trisulphide
   d) antimony

63. The blanking pulse applied to the control grid of the vidicon camera type is
   a) high positive potential
   b) low positive potential
   c) high negative potential
   d) low negative potential

64. In TV transmission number of frames transmitted in one second is
   a) 50
   b) 25
   c) 100
   d) 75

65. In vidicon camera tube the white in the picture is
   a) less positive
   b) less negative
   c) more positive
   d) more negative

66. In television receiver, the face plate of a picture tube serves as
   a) an electron gun
   b) deflecting Yoke
   c) screen
   d) tuner

67. The internal metallic coating in the monochrome picture tube is called
   a) screen
   b) aquadag
   c) yoke
   d) phosphor

68. The magnetic coils around the neck of the picture tube is called
   a) deflecting yoke
   b) aquadag
   c) electron gun
   d) filament

69. In a monochrome picture tube, the intensity of the electron beam is varied by the
   a) intensity of the incident light
   b) frequency of the incident light
   c) intensity of the luminance Y signal
   d) frequency of the luminance Y signal

70. In the monochrome TV transmission, the synchronizing pulses are produced by
   a) RC circuits
   b) scanning circuit
   c) synchronizing and scanning circuits
   d) Colpitt’s oscillator

71. In TV transmission, number of frames transmitted in one second is
   a) 50
   b) 25
   c) 100
   d) 75

72. In a monochrome TV receiver, the RF audio and video signals are heterodyned into intermediate
    frequency by
   a) the mixer
   b) the local oscillator
   c) the mixer and the local oscillator
   d) IF amplifier

73. The signals sent by the TV transmitter to ensure correct scanning in the receiver are called
   a) synchronising
   b) chroma
   c) luminance
   d) video

74. In a monochrome picture type the emission of electrons when a filament is heated is called
   a) photoelectric emission
   b) ionization
   c) Compton effect
   d) thermionic emission
75. In one micro second radar pulses cover a distance of
   a) 30 m    b) 300 m
   c) 3 m     d) 3 cm

76. Which of the following is not true with regard to radar?
   a) Radar works on the principle of radio echoes
   b) Radar pulses travel with the speed of (3 x 10^8 ms^-1)
   c) Radar uses Hertz antenna
   d) The transmitting system consists of a transmitted and a pulser

77. An analog signal is a continuously varying
   a) voltage signal    b) current signal
   c) voltage (or) current signal    d) none of these

78. The greatest technical problem with an analog communication system is
   a) selectivity    b) sensitivity
   c) rectification    d) noise

79. Digital communication is used in
   a) optical fibres
   b) wave guides
   c) both in optical fibre and wave guides
   d) none of these

80. Digital signals are converted into analog signals by
   a) Fax    b) modem
   c) cable    d) coaxial cable

81. Modem is a
   a) modulator    b) demodulator
   c) both modulator and demodulator    d) detector

82. At the receiver end modem converts
   a) digital signal into analog signal
   b) analog signal into digital signal
   c) digital signal into electric signal
   d) analog signal into electric signal

83. Fax converts
   a) printed documents into electronic signals
   b) electronic documents into printed documents
   c) analog signal into digital signal
   d) digital signal into analog signal

84. Which of the following is not used in data communication?
   a) twisted pair    b) iron rod
   c) multi conductor flat cable    d) coaxial cable

85. Which of the following is the simplest and lowest cost cable?
   a) multiconductor flat cable
   b) coaxial cable
   c) twisted pair cable
   d) none of these

86. Optical fibre is used for
   a) transmission of light
   b) detection of light
   c) generation of light
   d) none of these

87. The principle used for the transmission of light signals through optical fibre is
   a) reflection
   b) total internal reflection
   c) polarisation
   d) diffraction

88. The synchronizing pulses are generated by
   a) CRT
   b) Tuner
   c) reserve
   d) antenna

89. In the analog communication, the voice signals having 1 volt transmitted into
   a) 0.1 V
   b) 0.345 V
   c) 0.1979 V
   d) 1.979 V

90. At the receiving end modem converts
   a) digital signal into analog signal
   b) analog signal into digital signal
   c) analog signal into digital signal
   d) electrical signal into analog signal
91. Coherent light can be generated with
   a) sodium vapour lamp    b) LCD
   c) LED                d) Mercury vapour lamp
92. The principle used for the transmission of light signals through optical fibre is
   a) reflection        b) total internal reflection
   c) refraction        d) diffraction
93. Which of the following does not use optical fibre?
   a) voice telephone  b) video phones
   c) cathode ray oscillograph  d) data network
94. Which wave is used in satellite communication
   a) microwave         b) radio wave
   c) medium frequency wave  d) ultrasonic waves
95. The first man made satellite is
   a) Aryabhata        b) Sputnik
   c) Vinera          d) Rohini
96. If the angular velocity of a geostationary satellite is defined that of the earth is \( \omega_e \) then
   a) \( \omega_k < \omega_e \)  b) \( \omega_k > \omega_e \)
   c) \( \omega_k = \omega_e \)      d) \( \omega_k = z\omega_e \)
97. The height of geostationary satellite above the earth is
   a) 6400 km         b) 36,000 km
   c) 500 km         d) 6.4 km
98. Geostationary satellites are used for
   a) weather forecasting  b) communication purpose
   c) remote sensing      d) navigation purpose
99. Practically the uplink frequency used in communication satellite is
   a) 2 GHz            b) 6 MHz
   c) 3.4 GHz to 4.8 GHz  d) 5.725 GHz to 7.075 GHz
100. Practically the downlink frequency used in communication satellite is
    a) 3.4 GHz to 4.8 GHz  b) 2 GHz
    c) 6 MHz             d) 5.725 GHz to 7.075 GHz