Mathematics-Model Question Paper

1. [BT:C] The function $f(x) = \log(x + \sqrt{x^2 + 1}$ is
   - (A) an even function
   - (B) a periodic function
   - (B) an odd function
   - (D)neither an even nor an odd function

2. [BT:K] Let R = {(1,3), (4,2), (2,4), (2,3), (3,1)} be a relation on the set A = {1,2,3,4}. Then the relation R is

   - (A) a function
   - (B) transitive
   - (C) not symmetric
   - (D) reflexive

3. [BT:K] If $f: \mathbb{R} \to S$ is defined by $f(x) = \sin x - \sqrt{3} \cos x + 1$ then interval of S is

   - (A) [0,3]
   - (B) [-1,1]
   - (C) {0,1]
   - (D) [-1,3]

4. [BT:K] The argument of $-1 - i$ is

   - (A) $\dfrac{\pi}{4}$
   - (B) $\dfrac{3\pi}{4}$
   - (C) $-\dfrac{3\pi}{4}$
   - (D) $-\dfrac{\pi}{4}$

5. [BT:K] The modulus of $z = 1 + \cos\theta + i\sin\theta$ is

   - (A) $\sqrt{2}$
   - (B) $\sqrt{2}\sin\theta$
   - (c) $\sqrt{3}$
   - (D) $2\cos\dfrac{\theta}{2}$

6. [BT:C]   If $x^2 + y^2 = 1$ then $\dfrac{1+x+iy}{1+x-iy}$ is

   - (A) $x-iy$
   - (B) $-x-iy$
   - (C) $-x+iy$
   - (D) $x+iy$

7. [BT:A] If $1 - i$ is a root of equation $x^2 + ax + b = 0$ then the values of a and b are respectively
   - (A) 2,1
   - (B) -2,2
   - (C) 2,2
   - (D) 2, -2

8. [BT:K] The product of the matrices $\begin{bmatrix} 7 & 5 & 3 \end{bmatrix}\begin{bmatrix} 7 \\ 3 \\ 2 \end{bmatrix}$ is equal to

   - (A) 70
   - (B) [49]
   - (C) [15]
   - (D) [70]

9. [BT:K] If A is a square matrix of order 3 then $|kA|$ is

   - (A) $k|A|$
   - (B) $-k|A|$
   - (C) $k^3 |A|$
   - (D) $-k^3|A|$

10. [BT:K]   If A is a scalar matrix with scalar $k \neq 0$, of order 3, then A^{-1} is

   - (A) $\dfrac{1}{k^2} I$
   - (B) $\dfrac{1}{k^3} I$
   - (C) $\dfrac{1}{k} I$
   - (D) $k I$

11. [BT:K] If I is the unit matrix of order n, where $k \neq 0$ is a constant, the $adj(kI) =$

      (A) k^n *(adj I)*   (B) k *(adj I)*   (C) k^2*(adj I)*   (D) k^{n-1}*(adj I)*

12. [BT:C] If $nPr = 720\, nCr$, then the value of r is

      (A) 6   (B) 5   (C) 4   (D) 7

13. [BT:K] How many triangles can be formed by joining the vertices of a hexagon?

      (A) 120   (B) 60   (C) 20   (D) 10

14. [BT:A] If $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 10 & 1 \end{bmatrix}$ then which one of the following holds for all $n \geq 1$, by the principle of mathematical induction

      (A) $A^n = nA + (n-1)I$ (B) $A^n = nA - (n-1)I$

      (C) $A^n = 2^{n-1}A + (n-1)I$ (D) $A^n = 2^{n-1}A - (n-1)I$

15. [BT:A] The sum of the coefficients in the expansion of $(1-x)^{10}$ is

      (A) 0   (B) 1   (C) 10^2 (D) 1024

16. [BT:K] The total number of terms in the expansion of $[(a+b)^2]^{18}$ is

      (A) 11   (B) 36   (C) 37   (D) 35

17. [BT:C] If the nth term of an A.P. is $(2n-1)$, then the sum of n terms is

      (A) $n^2 - 1$ (B) $(2n-1)$ (C) n^2 (D) $n^2 + 1$

18. [BT:C] What number must be added to 5, 13 and 29 so that sum may from a G.P.?

      (A) 2   (B) 3   (C) 4   (D) 5

19. [BT:C] The value of $\lim_{x \to 1} \dfrac{x^{1/3}-1}{x-1}$ is

      (A) 2/3   (B) –2/3   (c) 1/3   (D) –1/3

20. [BT:K] The function $f(x) = |x| + |x - 1|$ is
(A) continuous at $x = 0$ only
(C) continuous at both $x = 0$ and $x = 1$
(B) continuous at $x = 1$ only
(D) discontinuous at $x = 0,1$

21. [BT:A] The c of Lagrange's Mean Value theorem for the function
$f(x) = x^2 + 2x - 1, a = 0, b = 1$ is

(A) -1 (B) 1 (C) 0 (D) 0.5

22. [BT:K] At $x = 0$ the function $f(x) = |x|$ has

(A) neither maximum nor minimum (C) maximum
(B) minimum   (D) point of inflexion

23. [BT:C] The equation of the tangent to the curve $y = \dfrac{x^3}{5}$ at $(-1, -1/5)$ is
(A) $5y + 3x = 2$ (B) $5y - 3x = 2$ (C) $3x - 5y = 2$ (D) $3x + 3y = 2$

24. [BT:C] The value of $\int \dfrac{dx}{a^2 - x^2}$ is
(A) $\dfrac{1}{2a} \log\left(\dfrac{a+x}{a-x}\right) + c$ (B) $\dfrac{1}{2a} \log\left(\dfrac{x-a}{x+a}\right) + c$

(C) $\dfrac{1}{a} \tan^{-1}\dfrac{x}{a} + c$ (D) $\dfrac{1}{2a} \tan^{-1}\dfrac{x}{a} + c$

25. [BT:C] The value of $\int 2^x \, dx$ equals

(A) $\dfrac{2^{x+1}}{x+1} + c$ (B) $\dfrac{2^x}{\log 2} + c$ (C) $2^x \log 2 + c$ (D) $2^{x-1} \log 2 + c$

26. [BT:A] The value of $\int_0^1 x(1-x)^4 dx$ is

(A) $1/12$ (B) $1/30$ (C) $1/24$ (D) $1/20$

27. [BT:C] The value of $\int_0^{2\pi} \cos^3 2x \, dx$ is

(A) $2/3$ (B) $1/3$ (C) 0 (D) $2\pi/3$

28. [BT:K] The area bounded by the line $y = x$, the x-axis, the ordinates $x = 1$, $x = 2$ is

(A) $3/2$ (B) $5/2$ (C) $1/2$ (D) $7/2$

29. [BT:K] The degree of the differential equation $\sqrt{1 + \left(\dfrac{dy}{dx}\right)^{1/2}} = \dfrac{d^2y}{dx^2}$

(A) 1 (B) 2 (C) 4 (D) 6

30. [BT:K]   The differential equation of all non-vertical lines in plane is

(A) $\frac{dy}{dx} = 0$ (B) $\frac{d^2y}{dx^2} = 0$ (C) $\frac{dy}{dx} = m$ (D) $\frac{d^2y}{dx^2} = m$

31. [BT:K] The integrating factor of $\frac{dy}{dx} + 2\frac{y}{x} = e^{4x}$ is
(A) log x (B) x^2 (C) e^x (D) x

32. [BT:K]   Solution of $\frac{dx}{dy} + mx = 0$ where $m < 0$ is
(A) $x = ce^{my}$ (B) $x = ce^{-my}$ (C) $x = my + c$ (D) $x = c$

33. [BT:K] The length of the diameter of a circle with centre (2,1) and passing through the point (-2,1) is

(A) 4   (B) 8   (C) $4\sqrt{5}$ (D) 2

34. [BT:K] The slop of the straight line $2x-3y+1 = 0$ is

(A)   - 2/3   (B) – 3/2   (C) 2/3   (D) 3/2

35. [BT:C]   If $2x+3y=0$ and $3x-2y=0$ are the equations of two diameters of a circle, then its centre is

(A) (1, -2)   (B) (2,3)   (C) (0,0)   (D) (-3,2)

36. [BT:K]   The eccentricity of the rectangular hyperbola is
(A) 1   (B) $\sqrt{2}$ (C) 2   (D) $2\sqrt{2}$

37. [BT:C] The line $5x-2y+4k = 0$ is a tangent to $4x^2-y^2 = 36$ then k is

(A)   4/9   (B) 2/3   (C) 9/4   (D) 81/16

38. [BT:C] The lines $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{-k}$ and $\frac{x-1}{k} = \frac{y-4}{2} = \frac{z-5}{1}$ are coplanar if

(A) k=0 or -1   (B) k=0 or -3   (C) k=3 or -3   (D) k =3 or -1

39. [BT:K]   The conjugate lines through a focus of an ellipse are at an angle

(A) $30°$ (B) $45°$ (C) $60°$ (D) $90°$

40. [BT:C]   A line makes an angle of 45° with OX and 60° with OY, what (acute) angle does it make with OZ?

(A) 60°   (B) 45°   (C) 30°   (D) 80°

41. [BT:K] If $\vec{a}$ is a nonzero vector and k is a scalar such that $|k\vec{a}|=1$ then k is equal to

(A) $|\vec{a}|$ (B) 1   (C) $\frac{1}{|\vec{a}|}$ (D) $\pm\frac{1}{|\vec{a}|}$

42. [BT:C] If $\quad m\vec{i} + 2\vec{j} + \vec{k}$ and $4\vec{i} - 9\vec{j} + 2\vec{k}$ are perpendicular then m is

(A) -4 (B) 8   (C) 4   (D) 12

43. [BT:C] If $|\vec{a}| = 3$, $|\vec{b}| = 4$ and $\vec{a} \circ \vec{b} = 9$ then $|\vec{a} \times \vec{b}|$ is

(A) $3\sqrt{7}$ (B) 63   (C) 69   (D) $\sqrt{69}$

44. [BT:A] The value of $(\vec{a} \times \vec{b})^2$ is

(A) $\vec{a}^2 \vec{b}^2 - (\vec{a} \cdot \vec{b})^2$ (B) $\vec{a}^2 + \vec{b}^2 + 2(\vec{a}^2 \cdot \vec{b}^2)$

(C) $(\vec{a}^2)(\vec{b}^2)$ (D) $\vec{a}^2 \vec{b}^2 \cos\theta$

45. [BT:C] If $f(x) = \begin{cases} kx^2, & 0 < x < 3 \\ 0, & \text{otherwise} \end{cases}$ is the probability density function then the value of k is

(A) 1/3   (B) 1/6   (C) 1/9   (D) 1/12

46. [BT:A] A trigonometric equation $\sin^{-1} x = 2 \sin^{-1} a$ has solution for

(A) $|a| < \frac{1}{\sqrt{2}}$ (B) all real values of a.   (C) $|a| < \frac{1}{2}$ (D) $|a| > \frac{1}{2}$.

47. [BT:A] A person standing on the bank of a river observes that the angle of elevation of the top of a tree on the opposite band of the river is 60° and when he retires 40 meters away from the tree the angle of the elevation becomes 30°, then the breadth of the river is

(A) $20m$ (B) $30\ m$ (C) $40\ m$ (D) $60\ m$

48. [BT:C] A random variable X has the following probability mass function:
$P(X=-2)=k/6$, $P(X=3)=k/4$ and $P(X=1)=k/12$. Then the value of k is

(A) 1   (B) 2   (C) 3   (D) 4

49 [BT:C] A box contains 6 red and 4 white balls. If 3 balls are drawn at random, the probability of getting 2 white balls is

(A) 1/20   (B) 18/125   (C) 4/25   (D) 3/10

50. [BT:C] If the mean and standard deviation of a binomial distribution with parameters n and p are 12 and 2 respectively. Then the value of p is

(A) 1/2   (B) 1/3   (C) 2/3   (D) 1/4

Answers(Mathematics)

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

Physics - Model Question Paper

51. [BT:K]   Bodies which do not allow the charges to pass through it are called_____.

(A) Conductors (B) Insulator (C) Semiconductor (D) Superconductor.

52. [BT:K] Two equal and opposite charges separated by a small distance constitute an_____.

(A) Electric Dipole (B) Electric Quadrapole
(B) (C) Electric Octapole (D) Electric Potential.

53. [BT:K]   _____ is defined as the rate of flow of charges across any cross-sectional area of A conductor.

(A) Current (B) Velocity (C) Resistivity (D) None of the above.

54. [BT:C] Electromagnetic waves are_____.

(A) Transverse (B) Longitudinal (C) May be Transverse or Longitudinal
(D) Neither Transverse nor Longitudinal.

55. [BT:C] What is polarizer?

(A) A device which examines a plane polarized light
(B) A device which produces a plane polarized light.
(C) The instrument used for the measurement of potential difference
(D) A device used to perform constructive Interference of Light.

56. [BT:C] The cathode rays are_____.

(A) A stream of electrons (B) A stream of positive ions (C) A stream of uncharged particles (D) None of the above.

57. [BT:A] 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 mass number.

58. [BT:K] What are α-rays?

        (A) It is a helium nucleus consisting of two protons and two neutrons.
        (B) It carries one unit of negative charge and mass equal to that of an electron
        (C) They are electromagnetic waves of very short wavelength
        (D) It is a stream of uncharged particle.

59. [BT:C] The process of breaking up of the nucleus of a heavier atom in to 2 fragments with the release of large amount of energy is called_____.

        (A) Nuclear Fission (B) Nuclear Fusion (C) Chain Reaction
        (D) Controlled Chain reaction.

60. [BT:K] When the positive terminal of the battery is connected to the P-side and negative terminal to the N-side then the PN junction diode is said to be_____.

        (A) Reverse biased (B) Forward biased (C) Avalanche Breakdown
        (D) Avalanche Effect.

61. [BT:C] _____gates are called Universal gates.

        (A) NOT and NOR (B) AND and NOR (C) NAND and NOR (D) OR and NOT.

62. [BT:K] When the frequency of carrier wave is changed in accordance with the intensity of the signal, the process is called_____

        (A) Amplitude Modulation (B) Frequency Modulation (C) Band width
        (D) None of the above.

63. [BT:A] Four charges +q, +q, –q and –q respectively are placed at the corners A,B,C and D of a square of side 'a'.The Electric potential at the centre 'O'of the square is_____.

        (A) $q/4\pi\epsilon_0 a$ (B) $4q/4\pi\epsilon_0 a$ (C) Zero (D) 4q.

64. [BT:C] The phenomenon of producing an induced emf due to the changes in the magnetic Flux associated with a closed circuit is known as _____.

        (A) Electromagnetic Induction (B) Thermoelectric current (C) Photo-electric current
        (D) Magnetic Induction.

65. [BT:K] The ratio of longitudinal stress to longitudinal strain is known as_____.

        (A) Young's Modulus of the material (B) Bulk Modulus of the material
        (C) Rigidity Modulus of the material (D) Moment of Inertia.

66. [BT:K] The bending of the waves around the edges of an obstacle is called_____.

        (A) Interference (B) Diffraction (C) Refraction (D) Polarisation.

67. [BT:A] Which of the following quantity is scalar?

        (A) Electric Force (B) Electric field (C) Electric Potential (D) All the above.

68. [BT:C] The material through which electric charge can flow easily is _____.

        (A) Rubber (B) Quartz (C) Copper (D) Glass.

69. [BT:K] The unit used to express the mass of the nucleus is _____.

(A) Atomic mass unit (B) Metre (C) Centimetre (D) Millimetre.

70. [BT:K] Best example for semiconductor is _____.

(A) Germanium (B) Copper (C) Wood (D) Rubber.

71. [BT:K] The SI unit of Electric field strength is _____.

(A) Newton/Coulomb (B) Coulomb (C) Newton (D) Coulomb metre.

72. [BT:C] _____ gate or Invertor is a device whose output is 1 when its input is 0 and whose output is 0 when its input is 1.

(A) OR Gate (B) AND Gate (C) NOT Gate (D) None of the above.

73. [BT:C] The ejection of electrons from the surface of the metal under the action of light is called _____.

(A) Gravitation effect (B) Magnetic effect (C) Photo-electric effect (D) Peltier Effect.

74. [BT:K] The rate of change of displacement is _____.

(A) Velocity (B) Dispersion (C) Energy (D) Acceleration.

75. [BT:C] The property of a conductor which enables to induce an emf in it when the current in the circuit changes is called _____

(A) Self-Induction (B) Mutual Induction (C) Thermal Conduction
(D) Thermoelectric current.

Answers(Physics)

51(B)   52(A)   53(A)   54(A)   55(B)   56(A)   57(C)   58(A)   59(A)   60(B)

61(C)   62(B)   63(C)   64(A)   65(A)   66(B)   67(C)   68(C)   69(A)   70(A)

71(A)   72(C)   73(C)   74(A)   75(A)

Chemistry - Model Question Paper

76. [BT:A] Picric acid and benzoic acid can be distinguished by the aqueous solution of _____.

(A) $NaHCO_3$ (B) Na_2CO_3 (C) NaOH   (D) $FeCl_3$

77. [BT:K] Air pollution is caused by _____.

(A) industries (B) automobiles (C) pollen grains (D) All of these

78. [BT:K] Soaps are obtained by_____.

(A) saponification of oils or fats (B) alkaline hydrolysis of glycerol
(C) acidic hydrolysis of esters of fatty acids and glycerol (D) All of these

79. [BT:K] Ascorbic acid is the chemical name of _____.

(A)vitamin D (B) vitamin A   (C) vitamin C   (D) vitamin B_6

80. [BT:A] The process involving heating of rubber with sulphur is called_____.

(A) galvanization (B) vulcanization   (C) bessemerization   (D) sulphonation

81. [BT:C] Ethyl alcohol on oxidation with $K_2Cr_2O_7$ gives_____.

(A) acetic acid (B) acetaldehyde   (C) formaldehyde (D) formic acid

82. [BT:K] Lucas test is performed for_____.

(A) amines (B) alcohols   (C) ethers   (D) alkyl halides

83. [BT:C].   Ethene is obtained from ethyl bromide by_____.

(A) Nucleophlic substitution   (B) hydrolysis   (C) simple heating
(D) dehydrohalogenation

84. [BT:C].   Which of the following is an example of elimination reaction?

(A) Chlorination of methane (B) Dehydration of ethanol
(C) Nitration of benzene   (D) Hydroxylation of ethylene

85. [BT:K] Which   of the following is an aromatic hydrocarbon?

(A) cyclo pentene   (B) cyclo hexane   (C) naphthalene   (D) 1,3-butadiene

86. [BT:K] According to Werner's theory the secondary valencies of a central metal atom
correspond to its_____.

(A) oxidation state   (B) coordination number (C) sum of the two
(D) none of these

87. [BT:C] Most common oxidation states shown by cerium are_____.

(A) +2,+4 (B) +3,+4   (C) +3,+5 (D) +2,+3

88.[BT:K]. Quartz is the crystalline variety of

(A) Si (B) SiO_2 (C) Na_2SiO_3 (D) SiC

89.[BT:K]. Heavy water is used in atomic reactor as_____.

(A) coolant (B) moderator (C) both coolant and moderator
(D) neither coolant nor moderator

90. [BT:C] The main function of roasting is_____.

(A) reduction (B) oxidation (C) concentration (D) separation

91. [BT:A] The shortest c-c bond distance is found in_____.

(A) Diamond (B) Ethane (C) Benzene (D) Acetyline

92. [BT:K] Which is of the following has the largest radius?

(A) K$^+$ (B) Cl$^-$ (C) O^{2-} (D) Cr^{3+}

93. [BT:C]. The principal and azimuthal quantum number of electrons in 4f orbitals are_____.

   (A) 4,2   (B) 4,4   (C) 4,3   (D) 3,4

94. [BT:K] Which of the following indicates the charge on colloidal particles?

   (A) Brownian movement (B) electrophoresis (C) electrolysis (D) tyndall effect

95. [BT:C] Effect of temperature on reaction rate is given by_____.

   (A) Clausius-Clapeyron equation (B) Gibbs-Helmholtz equation
    (C) Arrhenius equation   (D) Kirchoffs equation

96. [BT:C] Which of the following has highest value of standard reduction potential

   (A) F$_2$ (B) Cl$_2$ (C) Br$_2$ (D) I$_2$

97. [BT:A] BF$_3$ is_____.

   (A) Lewis acid   (B) Lewis base (C) Bronsted acid (D) Arrhenius acid

98. [BT:K] For the manufacture of ammonia by the reaction N$_2$+3H$_2$ ⇔ 2NH$_3$+21.9kcal the favourable condition are _____.

   (A) low temperature, low pressure and catalyst
   (B) low temperature, high pressure and catalyst
   (C) high temperature, low pressure and catalyst
   (D) high temperature, high pressure and catalyst

99. [BT:C] ΔH neutralization is always _____.

   (A) positive (B) negative (C) zero   (D) can be positive or negative

100. [BT:C]   The molar solution of sulphuric acid is equal to _____.

   (A) N solution   (B) 2 N solution   (C) N/2 solution   (D) 3 N solution

 Answers (Chemistry)

76. (D)   77. (D)   78. (A)   79. (C)   80. (B)   81. (A)   82. (B)   83. (D)   84. (B)   85. (C)

86. (B)   87. (B)   88. (B)   89. (C)   90. (B)   91. (D)   92. (C)   93. (C)   94. (B)   95. (C)

96. (A)   97. (A)   98. (B)   99. (B)   100. (B)