MHT CET 2026 PCM Apr 11 Shift 2 Question Paper

Conducted by the State Common Entrance Test Cell, Maharashtra

Time Allowed: 180 Minutes **Total Questions: 150** **Maximum Marks: 200**

General Instructions

(i) This **PCM** paper is from **MHT CET 2026**, conducted by the **State Common Entrance Test Cell, Maharashtra**.

(ii) Answer all **150 multiple choice questions**: **50 Physics**, **50 Chemistry** and **50 Mathematics**.

(iii) Each question offers **four choices**, with **one correct answer**.

(iv) Allow **90 minutes for Physics and Chemistry together**, followed by **90 minutes for Mathematics**. The first group closes before the second opens.

(v) Correct answers earn **1 mark in Physics and Chemistry** and **2 marks in Mathematics**.

(vi) There is **no negative marking**. Unanswered questions score zero.

1. A quantity P is related as $X^{-2}Y^{-3/2}Z^{2/5}$ where X,Y,Z are independent parameters which have fractional errors of $0.1, 0.2$ and 0.5 respectively in measurement. The maximum fractional error in P is

(A) 0.7 (B) 0.1
(C) 0.8 (D) 0.6

2. The vectors $(\vec{A}+\vec{B})$ and $(\vec{A}-\vec{B})$ are perpendicular to each other. This is possible under the condition

(A) $|\vec{A}| = |\vec{B}|$ (B) $\vec{A}\cdot\vec{B} = 0$
(C) $\vec{A}\times\vec{B} = 0$ (D) $\vec{A}\cdot\vec{B} = 1$

3. The angular speed of the minute hand of a clock in degrees per second is

(A) 0.6 (B) 0.1
(C) 0.12 (D) 1

4. In non uniform circular motion, the ratio of radial acceleration to tangential acceleration is (V is the velocity, r is the radius and α is the angular acceleration)

(A) $\frac{\alpha r}{V}$ (B) $\frac{V^2}{r^2\alpha}$
(C) $\frac{r^2\alpha}{V^2}$ (D) $\frac{r\alpha^2}{V^2}$

5. A mass M moving with velocity V along X-axis collides and sticks to another mass 2M which is moving along Y-axis with velocity 3V. The velocity of the combination, after the collision is

(A) $V\hat{i}+2V\hat{j}$ (B) $\frac{V}{3}\hat{i}+2V\hat{j}$
(C) $V\hat{i}+3V\hat{j}$ (D) $2V\hat{i}+4V\hat{j}$

6. The moment of inertia of a ring about an axis passing through its centre and perpendicular to its plane is I. It is rotating with angular velocity ω. Another identical ring is gently placed on it so that their centres coincide. If both rings are rotating about the same axis then loss in kinetic energy is

(A) $I\omega^2$ (B) $\frac{I\omega^2}{2}$
(C) $\frac{I\omega^2}{4}$ (D) $\frac{I\omega^2}{8}$

7. Let M and L be the mass and length of thin uniform rod respectively. In first case, axis of rotation is passing through centre and perpendicular to length of rod. In second case axis of rotation is passing through one end and perpendicular to length of rod. The ratio of radius of gyration in first case to second case is

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$
(C) $\frac{1}{8}$ (D) $\frac{1}{6}$

8. The density of a planet is three times that of earth and radius 2.5 times that of earth. If g_p and g_e represents acceleration due to gravity on planet and earth respectively then ratio g_p to g_e is

(A) 7.5 (B) 3.5
(C) 6.5 (D) 9.5

9. A liquid drop having surface energy E is sprayed into 512 droplets of the same size. Then the final surface energy is

(A) $4E$ (B) $8E$
(C) $2E$ (D) E

10. In a capillary tube of radius 'R', a straight thin metal wire of radius 'r' is inserted symmetrically and one end of the combination is dipped vertically in water such that lower end of the capillary and thin wire are at same level. If 'T' is the surface tension of water and 'ρ' is the density of water then the rise of water in the capillary is

(A) $\frac{T}{(R-r)\rho g}$ (B) $\frac{2T}{(R-r)\rho g}$
(C) $\frac{4T}{(R+r)\rho g}$ (D) $\frac{T}{(R+r)\rho g}$

11. Due to surface tension, the excess pressure inside a smaller drop is 9 units. If 27 smaller drops combine then excess pressure inside the bigger drop is

(A) 3 units (B) 9 units
(C) 18 units (D) 6 units

12. A body cools in 7 minutes from 60°C to 40°C. What time (in minutes) does it take to cool from 40°C to 28°C, if its surrounding temperature is 10° C ? (Newton's law of cooling holds good)

(A) 3.5 (B) 10

(C) 11 (D) 7

13. A rigid diatomic gas undergoes adiabatic change. Its pressure P and temperature T are related as $P \propto T^x$ where x is

(A) 1.5 (B) 2.5

(C) 3.5 (D) 4.5

14. If ΔQ is the amount of heat supplied to 'n' moles of a rigid diatomic gas at constant pressure, ΔU is the change in internal energy and ΔW is the work done then $\Delta W : \Delta U : \Delta Q$ is

(A) 2 : 5 : 7 (B) 1 : 4 : 7

(C) 2 : 3 : 4 (D) 3 : 5 : 9

15. An insulated container contains a monoatomic gas of molar mass 'm'. The container is moving with velocity 'V'. If it is stopped suddenly, the change in temperature of the gas is (R-gas constant)

(A) $\frac{mv^2}{R}$ (B) $\frac{mv^2}{2R}$

(C) $\frac{mv^2}{3R}$ (D) $\frac{mv^2}{5R}$

16. Carnot engine operating between temperatures T_1 and T_2 has efficiency 0.2. When T_2 is lowered by 45 K, its efficiency becomes 0.5. Temperatures T_1 and T_2 are respectively

(A) 150 K, 120 K (B) 120 K, 150 K

(C) 60 K, 80 K (D) 80 K, 60 K

17. For a gas, $\frac{R}{C_v} = 0.4$ where R is the universal gas constant and C_v is the molar specific heat at constant volume. The gas is made up of molecules which are

(A) monoatomic (B) polyatomic

(C) non rigid diatomic (D) rigid diatomic

18. An oscillating pendulum suspended from the roof of a lift which is at rest has time period T_1. When lift moves up with acceleration 'a' its time period is T_2. When lift moves down with acceleration 'a' its time period is T_3. The relation between T_1, T_2 and T_3 is

(A) $T_1 = \frac{2T_2T_3}{\sqrt{T_2^2 + T_3^2}}$ (B) $T_1 = \frac{\sqrt{2}T_2T_3}{\sqrt{T_2^2 + T_3^2}}$

(C) $T_1 = \frac{2T_2^2T_3^2}{\sqrt{T_2 + T_3}}$ (D) $T_1 = \frac{\sqrt{2}T_2^2T_3^2}{\sqrt{T_2 + T_3}}$

19. A mass 0.4 kg performs S.H.M. with a frequency $\frac{16}{\pi}$ Hz. At a certain displacement it has kinetic energy 2 J and potential energy 1.2 J. The amplitude of oscillation is

(A) 0.125 m (B) 0.1 m

(C) 0.05 m (D) 0.15 m

20. A mass attached to a spring performs S.H.M. whose displacement is $x = 3 \times 10^{-3} \cos 2\pi t$ m. The time taken to obtain maximum speed for the first time is (in s)

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

(C) $\frac{1}{4}$ (D) $\frac{1}{8}$

21. The closed and open organ pipe have same length and when they are vibrating simultaneously in first overtone produce 3 beats. The length of open pipe is made $\left(\frac{1}{3}\right)^{rd}$ and closed pipe is made 3 times the original, the number of beats produced will be {neglect end correction}

(A) 8 (B) 10

(C) 17 (D) 14

22. Two uniform wires of same material are vibrating under the same tension. If the first overtone of the first wire is equal to the second overtone of the second wire and radius of first wire is twice the radius of second wire then the ratio of length of first to second wire is

(A) $\frac{1}{4}$ (B) $\frac{1}{3}$

(C) $\frac{2}{3}$ (D) $\frac{1}{2}$

23. The equation of a progressive wave is $Y = 3\sin\left[\pi\left(\frac{t}{3} - \frac{x}{5}\right) + \frac{\pi}{4}\right]$ where X and Y are in metre and time in second. Which of the following is correct?

(A) Velocity = 1.5 m/s (B) Amplitude = 30 cm

(C) Wavelength = 10 m (D) Frequency = 0.2 Hz

24. A source of sound is moving towards a stationary observer with velocity 'V_S' and then moves away with velocity 'V_S'. Assume that medium through which the sound waves travel is at rest. If 'V' is the velocity of sound and 'n' is the frequency emitted by the source then the difference between the apparent frequencies heard by the observer is

(A) $\frac{2nVV_s}{V^2 - V_s^2}$ (B) $\frac{nVV_s}{V^2 - V_s^2}$

(C) $\frac{nVV_s}{V_s^2 + V^2}$ (D) $\frac{2nVV_s}{V_s^2 + V^2}$

25. If the radius of the spherical Gaussian surface is increased then the electric flux due to a point charge enclosed by the surface

(A) increases (B) remains unchanged

(C) is zero (D) decreases

26. The earth is assumed to be a charged conducting sphere having volume 'V' and surface area 'A'. The capacitance of the earth in free space is (ϵ_0 = permittivity of free space)

(A) $2\pi\epsilon_0 V/A$ (B) $4\pi\epsilon_0 V/A$

(C) $8\pi\epsilon_0 V/A$ (D) $12\pi\epsilon_0 V/A$

27. Initially, 'n' identical capacitors are joined in parallel, are charged to potential 'V'. Now they are separated and joined in series. Then

(A) potential difference and total energy of the combination remain the same

(B) potential difference remains the same and energy increases 'n' times

(C) potential difference becomes 'nv' and energy remains the same

(D) potential difference is 'nv' and energy increases 'n' times.

28. Three parallel plate air capacitors are connected in parallel. Each capacitor has plate area A/3 and separation between the plates is d, 2d and 3d respectively. The equivalent capacity of the combination is (ϵ_0-permittivity of free space)

(A) $\frac{9\epsilon_0 A}{17d}$ (B) $\frac{11\epsilon_0 A}{17d}$

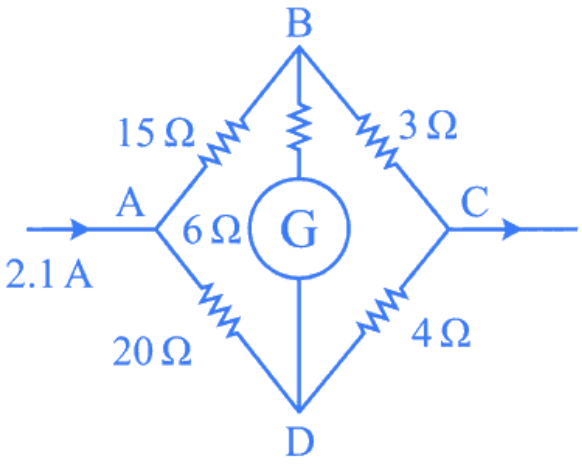
(C) $\frac{11\epsilon_0 A}{18d}$ (D) $\frac{9\epsilon_0 A}{14d}$

29. In potentiometer experiment, null point is obtained at a particular point for a cell on potentiometer wire 'x' cm long. If length of potentiometer wire is increased by few cm without changing the cell, the balancing length will (Driving source is not changed)

(A) decrease (B) increase

(C) not change (D) become zero

30. In the following network, the current flowing through 15 Ω resistance is



(A) 2.1 A (B) 0.9 A

(C) 1.2 A (D) 1.5 A

31. A circular coil of N turns and diameter D carries current I. It is unwound and rewound to make another coil of diameter 2D, current I remaining the same. The ratio of magnetic moments of the original coil to the new coil is

(A) 2 : 1 (B) 4 : 1

(C) 1 : 2 (D) 1 : 4

32. A wire AB is carrying steady current I_1 and is kept on the table. Another wire CD carrying current I_2 is held directly above as shown in figure. When the wire CD is left free and it remains suspended at its position, its mass per unit length is (g=acceleration due to gravity, μ_0 = permeability of free space)



(A) $\frac{\mu_0 I_1 I_2}{2\pi r g}$ (B) $\frac{\mu_0 I_1 I_2}{4\pi r g}$
(C) $\frac{\mu_0 I_1 I_2}{\pi r g}$ (D) $\frac{\mu_0 I_1 I_2}{\pi r^2 g}$

33. Two parallel wires of equal lengths are separated by a distance of 3 m from each other. The currents flowing through first and second wire is 3 A and 4.5 A respectively in opposite directions. The resultant magnetic field at mid point of both the wires is (μ_0=permeability of free space)

(A) $\frac{\mu_0}{2\pi}$ (B) $\frac{5\mu_0}{2\pi}$
(C) $\frac{7\mu_0}{2\pi}$ (D) $\frac{9\mu_0}{2\pi}$

34. A coil having 'n' turns and resistance 'R' is connected with a galvanometer of resistance '2R'. This combination is moved in time 't' from flux ϕ_1 to ϕ_2 Wb. The induced current in the circuit is

(A) $\frac{n(\phi_1-\phi_2)}{Rt}$ (B) $\frac{n(\phi_2-\phi_1)}{Rt}$
(C) $\frac{n(\phi_2-\phi_1)}{3Rt}$ (D) $\frac{n(\phi_2-\phi_1)}{2Rt}$

35. A light bulb connected in series with a capacitor and an a.c.source is glowing with certain brightness. On reducing the value of capacitance and frequency respectively, the brightness of the bulb

(A) is reduced, is reduced (B) is more, is more
(C) is more, is reduced (D) is reduced, is more

36. In an a.c. circuit containing L, C and R in series, the ratio of apparent power to the true power is
(Z= impedance of the circuit and R= resistance)

(A) RZ (B) $\cos\phi$
(C) $\cot\phi$ (D) $\frac{Z}{R}$

37. In series LCR circuit, resistance is 18 Ω and impedance 33 Ω. An r.m.s. Voltage of 220 V is applied across the circuit. The true power consumed in a c. circuit is

(A) 400 W (B) 600 W
(C) 200 W (D) 800 W

38. An ideal transformer converts 220V a.c. to 3.3 KV a.c. to transmit a power of 4.4 KW. If primary coil has 600 turns then alternating current in the secondary coil is

(A) $\frac{4}{3}$ A (B) $\frac{3}{4}$ A
(C) $\frac{1}{3}$ A (D) $\frac{2}{3}$ A

39. Alternating current of peak value $\left(\frac{2}{\pi}\right)$ A flows through the primary coil of a transformer. The coefficient of mutual inductance between primary and secondary coils is 1 H. The peak em.f. induced in secondary coil is (Frequency of a. c. is 50 Hz)

(A) 25 V (B) 50 V
(C) 100 V (D) 200 V

40. A thin prism in air produces the angle of minimum deviation δ. If the prism is immersed in water, the angle of minimum deviation for the same ray is (refractive index of water is 4/3 and that of glass prism is 3/2)

(A) δ (B) $\frac{\delta}{2}$
(C) $\frac{\delta}{4}$ (D) 2δ

41. In biprism experiment, the 4^{th} dark band is formed opposite to one of the slits. The wavelength of light used is (D=distance between source and screen, d= the distance between the slits)

(A) $\frac{d^2}{9D}$ (B) $\frac{d^2}{11D}$
(C) $\frac{d^2}{14D}$ (D) $\frac{d^2}{7D}$

42. In Young's double slit experiment, in an interference pattern, a minimum is observed exactly in front of one slit. The distance between the two coherent sources is 'd' and 'D' is the distance between source and screen. The possible wavelengths used are inversely proportional to

(A) $D, 2D, 3D, \ldots$ (B) $D, 3D, 5D, \ldots$

(C) $\frac{1}{D}, \frac{2}{D}, \frac{3}{D}, \ldots$ (D) $\frac{1}{D^2}, \frac{2}{D^2}, \frac{3}{D^2}, \ldots$

43. Converging lens of telescope 5 cm in diameter has focal length 25 cm. In the focal plane of the lens the distance between the centres of the Fraunhofer diffraction pattern is (wavelength of light used = 5000 Ã_x0085_, Rayleigh's criterion is satisfied)

(A) 25000 Ã_x0085_ (B) 28000 Ã_x0085_

(C) 30500 Ã_x0085_ (D) 32000 Ã_x0085_

44. Photoelectrons are emitted from two similar metal plates when wavelengths λ_1 and λ_2 are incident on them ($\lambda_1 = 1.5\lambda_2$). If maximum kinetic energy of emitted photoelectrons is E_1 and E_2 respectively then

(A) $E_1 < 2E_2/3$ (B) $E_1 = 2E_2/3$

(C) $E_1 = E_2/3$ (D) $E_1 = 2E_2$

45. According to de-Broglie hypothesis, the ratio of the wave-length of a photon and that of an electron having same energy 'E' is (m = mass of electron, c = velocity of light)

(A) $\frac{1}{C}\sqrt{\frac{E}{2m}}$ (B) $C\sqrt{\frac{E}{2m}}$

(C) $C\sqrt{\frac{2m}{E}}$ (D) $\sqrt{\frac{2mC}{E}}$

46. Bohr model is applied to a particle of mass 'm' and charge 'q' moving in a plane under the influence of a transverse magnetic field B. The energy of the charged particle in the n^{th} level will be (h=Planck's constant)

(A) $\frac{2nhqB}{\pi m}$ (B) $\frac{nhqB}{\pi m}$

(C) $\frac{nhqB}{2\pi m}$ (D) $\frac{nhqB}{4\pi m}$

47. In Bohr's theory of hydrogen atom, 'r' is the radius of the orbit, 'V' is the speed of electron and E is the total energy of the electron. Out of the following which physical quantity is inversely proportional to principal quantum number?

(A) $\frac{1}{Vr}$ (B) Vr

(C) V^2r (D) Vr^2

48. In common emitter mode of transistor, the d.c. current gain is 20, the emitter current is 7 mA. The collector current is

(A) $\frac{14}{3}$ mA (B) $\frac{20}{3}$ mA

(C) $\frac{7}{3}$ mA (D) $\frac{8}{3}$ mA

49. In the case of NAND gate, if A and B are inputs and Y is the output then

(A) $Y = \overline{A+B}$ (B) $Y = A \cdot B$

(C) $Y = \overline{A \cdot B}$ (D) $Y = A + B$

50. In energy band diagram of insulators, a band gap and the conduction band is respectively

(A) very high, empty (B) very low, empty

(C) very high, completely filed (D) very low, partially filled

51. Calculate the volume of 99 g of CO_2 at STP ?

(A) 22.4 L
(B) 50.4 L
(C) 67.2 L
(D) 89.6 L

52. What are the total number of electrons present in s and p orbitals respectively in the argon?

(A) 12 and 6
(B) 8 and 12
(C) 6 and 12
(D) 18 and 6

53. Which of the following compounds is most acidic in nature?

(A) H_2O
(B) H_2S
(C) H_2Se
(D) H_2Te

54. Identify the different types of bonds present in quaternary ammonium salts.

(A) Covalent
(B) Ionic
(C) Covalent and co-ordinate
(D) covalent, co-ordinate and ionic

55. A syringe has a volume of 10.0 cm^3 at a pressure of 1 atm. If the end is sealed and the plunger is pushed down (constant temperature), what will be the final volume when the pressure becomes 3.5 atm?

(A) 35.0 cm^3
(B) 2.86 cm^3
(C) 0.286 cm^3
(D) 3.50 cm^3

56. The equilibrium constant for a reaction is 100 . What will be the value of standard Gibbs energy change at 298 K ? ($R = 8.314$ J $K^{-1}mol^{-1}$)

(A) -11.411 KJ/mol
(B) -5.744 KJ/mol
(C) -570.584 KJ/mol
(D) -57.058 KJ/mol

57. The bond dissociation enthalpy of H_2, Cl_2 and HCl are 434, 242 and 431 kJ mol^{-1} respectively. Calculate the enthalpy of formation of HCl.

(A) -93 kJ mol^{-1}
(B) 245 kJ mol^{-1}
(C) 93 kJ mol^{-1}
(D) -245 kJ mol^{-1}

58. 2.8 g of KOH is dissolved in a 500 mL solution at 298 K. What is the p^H of solution ? (molar mass of KOH = 56 g/mol)

(A) 1
(B) 8
(C) 11
(D) 13

59. What is the solubility of $BaSO_4$ in g /dm^3 if its solubility product is 1.0×10^{-10} at 25°C. [Molar mass of $BaSO_4 = 233$ g/mol]

(A) 2.33×10^{-3} g/dm^3
(B) 4.66×10^{-3} g/dm^3
(C) 3.48 g/dm^3
(D) 1.16×10^{-3} g/dm^3

60. What is the normal pH of human blood?

(A) 7.0
(B) 6.9
(C) 7.4
(D) 8.1

61. Find the oxidation number of Cl in ClO_4^{-1}

(A) -9
(B) $+7$
(C) -7
(D) $+9$

62. Which alkaline earth metal carbonate decomposes most easily?

(A) $MgCO_3$
(B) $CaCO_3$
(C) $SrCO_3$
(D) $BaCO_3$

63. What is the difference in terms of molar masses of second and fourth members of homologous series?

(A) 12
(B) 24
(C) 28
(D) 36

64. Cyclohexene on oxidation by $KMnO_4$ in dilute H_2SO_4 produces

(A) benzene-1,4-dicarboxylic acid
(B) pent-2-enoic acid
(C) hexane-1,6-dioic acid
(D) benzene-1,2-dicarboxylic acid

65. Which of the following types of reactions is used to prepare Alkyl benzene?

(A) Swartz reaction
(B) Sandmeyer reaction
(C) Finkelstein reaction
(D) Wurtz Fittig reaction

66. 200 mL of ethylene gas and 150 mL of HCl gas were allowed to react at 1 bar. Pressure to form gaseous ethyl chloride. What is the work done during the reaction?

(A) 15 J
(B) 30 J
(C) 150 J
(D) 300 J

67. Which of the following compounds does not decolourise Br_2 water?

(A) Ethene (B) Ethyne

(C) Benzene (D) Cyclohexene

68. In a fcc arrangement of A and B atoms in which 'A' atoms are at the corners of the unit cell and 'B' atoms are at the face centers. One of the 'A' atoms is missing from one corner in unit cell. What is the simplest formula of a compound ?

(A) A_7B_8 (B) A_7B_3

(C) AB_3 (D) A_7B_{24}

69. A compound forms bcc unit cell with edge length 400 pm. Determine the molar mass of the compound if the density of compound is 3.5 g cm^{-3} $[N_A = 6.022 \times 10^{23}]$

(A) 65.2 g mol^{-1} (B) 67.4 g mol^{-1}

(C) 69.8 g mol^{-1} (D) 71.6 g mol^{-1}

70. What is the number of neighbouring spheres for any particle in the fcc crystal lattice ?

(A) 6 (B) 8

(C) 10 (D) 12

71. Identify a solution which contains solid as solute and liquid as solvent.

(A) Hydrogen in Palladium (B) Sea water

(C) Gels (D) Amalgum of mercury with metals

72. A solution of 50g of solute 'X' is dissolved in 150 g of 'Y' solvent boils at 357.27 K. What is the molar mass of solute?
(Given K_b and boiling point pure solvent is 2.77 K kg/mol and 350.06 K respectively.)

(A) 132 g/mol (B) 128 g/mol

(C) 150 g/mol (D) 15 g/mol

73. The partial pressure of a gas at 25°C is 0.18 atm, calculate the concentration of the gas dissolved at the same temperature,
If K_H is 0.15 mol dm^{-3} atm^{-1}

(A) 0.027 M (B) 1.8 M

(C) 4.5 M (D) 0.45 M

74. The standard potential of Cu^{+2}/Cu is 0.34 V at 298 K. Calculate its potential at the same temperature when the Cu^{+2} ion concentration is 0.1 M.

(A) 0.64 V (B) 0.34 V

(C) 0.31 V (D) 0.37 V

75. Which from following options is true when an electrolyte solution is diluted ?

(A) both Λ and k increases (B) both Λ and k decreases

(C) Λ increases and k decreases (D) Λ decreases and k increases

76. Match List I with List II.

List I (Conversion)	**List II (Number of Faraday required)**
A. 1 mole of H_2O to O_2	I. $3F$
B. 1 mol of MnO_4^- to Mn^{2+}	II. $2F$
C. 1.5 mol of Ca from molten $CaCl_2$	III. $1F$
D. 1 mol of FeO to Fe_2O_3	IV. $5F$

Choose the correct answer from the options given below :

(A) A-II, B-IV, C-I, D-III (B) A-III, B-IV, C-I, D-II

(C) A-II, B-III, C-I, D-IV (D) A-III, B-IV, C-II, D-I

77. The half life of first order reaction is 850 s. The initial concentration of the reactant is 0.06 mol dm^{-3}. What concentration would remain after 1200 s ?

(A) 0.023 mol dm^{-3} (B) 0.035 mol dm^{-3}

(C) 5.25 mol dm^{-3} (D) 6.25 mol dm^{-3}

78. Half life period of a first order reaction is 1386 seconds. The rate constant of the reaction is

(A) $5.5 \times 10^{-2} \times s^{-1}$ (B) $0.5 \times 10^{-3} \times s^{-1}$

(C) $5 \times 10^{-2} \times s^{-1}$ (D) $5 \times 10^{-3} \times s^{-1}$

79. What is the order of the following reaction ?
$2H_2O_2(l) \rightarrow 2H_2O(l) + O_2(g)$, if rate $= k[H_2O_2]$

(A) 0 (B) 1

(C) 2 (D) 3

80. Which of the following nanomaterial has all the three dimensions < 100 nm?

(A) Nanotubes (B) Nanowires

(C) Nanoshells (D) Thin films

81. Identify the gas adsorbed by solid to the largest extent at their respective critical temperature.

(A) $N_{2(g)}$ (B) $O_{2(g)}$

(C) $H_{2(g)}$ (D) $SO_{2(g)}$

82. Match the Xenon compounds in Column-1 with its structure in Column-II.

Column â_x0080__x0093_ I	Column â_x0080__x0093_ II
(a) XeF_4	(i) pyramidal
(b) XeF_6	(ii) square planar
(c) $XeOF_4$	(iii) distorted octahedral
(d) XeO_3	(iv) square pyramidal

(A) (a) - (ii), (b) - (iii), (c) - (i), (d) - (iv) (B) (a) - (iii), (b) - (iv), (c) - (i), (d) - (ii)

(C) (a) - (i), (b) - (ii), (c) - (iii), (d) - (iv) (D) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

83. Which of the following lanthanoids is radioactive?

(A) Tm (B) Dy

(C) Eu (D) Pm

84. Which transition series includes elements Co and Mo respectively?

(A) 4d and 5d (B) 5d and 6d

(C) 3d and 4d (D) 3d and 6d

85. Which of the following is an ambident ligand ?

(A) Ethylene diamine (B) Cl^-

(C) EDTA (D) SCN

86. Which of the following sets of ligands does NOT contain ambident ligand in it?

(A) Oxalate ion, NO_2^-, NCS^- (B) $C_2O_4^{2-}$, Ethylene diamine, H_2O

(C) NO_2^-, $C_2O_4^{2-}$, $EDTA^{4-}$ (D) $EDTA^{4-}$, NCS^-, Oxalate ion

87. What type of color is observed when a compound absorbs red coloured light?

(A) Red (B) Blue

(C) Orange (D) Yellow

88. Which of the following compounds is formed when chloroform is exposed to air and light?

(A) Phosgene. (B) Phosphine.

(C) Carbon dioxide (D) Carbon tetrachloride

89. Identify the major product of dehydrohalogenation of CH_3-CH_2-CH(Br)-CH_3.

(A) CH_3-CH_2-CH=CH_2

(B) H_3C-CH=CH-CH_3

(C) CH_3-$(CH_2)_2CH_3$

(D) CH_3-$(CH_2)_2CHO$

90. An organic compound with the molecular formula C_6H_6O dissolves in NaOH, gives a characteristic colour with neutral $FeCl_3$ and on treatment with bromine water gives a tri bromo derivative. Which is that compound among the following?

(A) Alcohol (B) Ether

(C) Ketone (D) Phenol

91. What type of mechanism is followed by dehydration of alcohol to form ether?

(A) Nucleophilic substitution unimolecular reaction (B) Nucleophilic substitution bimolecular reaction

(C) Electrophilic substitution reaction (D) Electrophilic addition reaction

92. The number of primary isomeric alcohols of the molecular formula $C_4H_{10}O$ is

(A) 1 (B) 2

(C) 3 (D) 4

93. In Gatterman reaction, which of the following catalyst is used?

(A) CO, HCl and anhyd. $AlCl_3$ (B) Copper powder and HBr

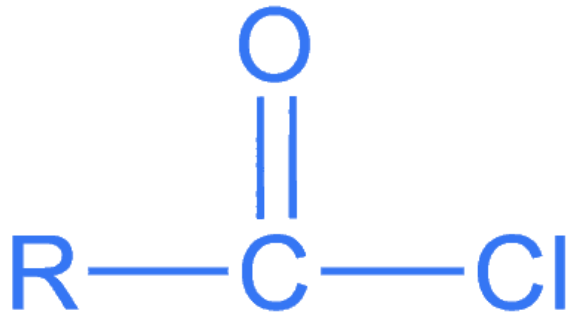
(C) Cu + Aq. $NaNO_2$ (D) KOH + Br_2

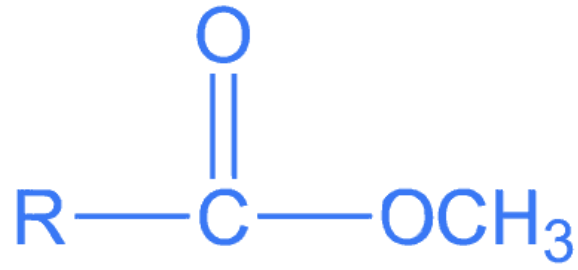
94. When ethanal and propanal undergo aldol condensation with dilute NaOH, the pair of products obtained by cross condensation reaction is

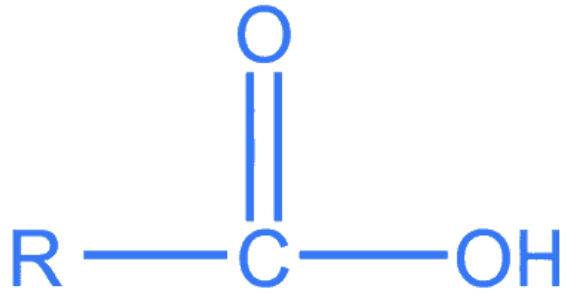
(A) but-2-enal and 2-methylpent-2-enal (B) but-2-enal and pent-2-enal

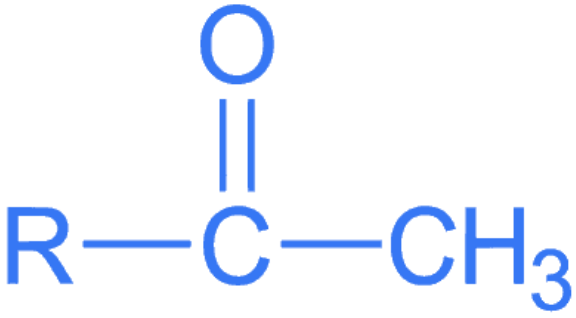
(C) 2-methylbut-2-enal and pent-2-enal (D) 2-methylbut-2-enal and 2-methylpent-2-enal

95. Which of the following species is used in Friedel - Craft reaction?

(A) 

(B) 

(C) 

(D) 

96. What type of saccharide the maltose is?

(A) Polysaccharide
(B) Disaccharide
(C) Trisaccharide
(D) Monosaccharide

97. Buna - S is an example of ,

(A) elastomer
(B) fibre
(C) thermoplastic polymer
(D) thermosetting polymer

98. Which of the following is the monomer of Teflon polymer?

(A) $FCH = CH_2$
(B) $FCH = CHF$
(C) $CF_3 = CF_3$
(D) $CF_2 = CF_2$

99. Which of the following statement about enzyme is correct ?

(A) They alter the equilibrium constant of reactions
(B) They increase the activation energy of reactions
(C) They are specific in their action
(D) They are consumed in the reaction

100. What is the result when soap is used in hard water?

(A) Micelles
(B) Scum
(C) Emulsion
(D) Gel

101. If α and β are the roots of the equation $x^2 + x + 1 = 0$ then $\alpha^{2026} + \beta^{2026} =$

(A) -1 (B) 0

(C) 1 (D) 2

102. The number of ways that 8 beads of different colours can be strung to form a necklace is

(A) 5040 (B) 2520

(C) 2840 (D) 5080

103. In ΔABC, if $\angle A = 90^\circ$, then $\sin(B - C) =$

(A) $\frac{a^2 - c^2}{a^2 + c^2}$ (B) $\frac{c^2 - a^2}{c^2 + a^2}$

(C) $\frac{b^2 - c^2}{b^2 + c^2}$ (D) $\frac{c^2 - b^2}{c^2 + b^2}$

104. The value of $\cos^2 10^\circ - \cos 10^\circ \cos 50^\circ + \cos^2 50^\circ$ is equal to....

(A) $\frac{1}{4}$ (B) $\frac{1}{2}$

(C) $\frac{3}{4}$ (D) 1

105. The general solution of $\cos 4\theta = \cos 3\theta$ is $\theta =$.....

(A) $\frac{2n\pi}{7}, n \in Z$ (B) $\frac{2n\pi}{5}, n \in Z$

(C) $n\pi, n \in Z$ (D) $\frac{4n\pi}{3}, n \in Z$

106. The line $2x + y = 4$ intersects X and Y axes at points A and B respectively. Let $C(p, q)$ be the point such that the lines AC and BC are perpendicular. The distance of point C from the midpoint of segment AB is...

(A) $\sqrt{2}$ (B) $\sqrt{5}$

(C) $2\sqrt{2}$ (D) $2\sqrt{5}$

107. If the distance between the lines represented by $(x - 2y)^2 + k(x - 2y) = 0$ is 3 units and $k > 0$ then the equations of the lines are

(A) $x - 2y = 0$ and $x - 2y + \sqrt{3} = 0$. (B) $x - 2y = 0$ and $x - 2y + \sqrt{5} = 0$.

(C) $x - 2y = 0$ and $x - 2y + 3\sqrt{3} = 0$. (D) $x - 2y = 0$ and $x - 2y + 3\sqrt{5} = 0$.

108. If the slope of one of the two lines given by $\frac{x^2}{a} + \frac{2xy}{h} + \frac{y^2}{b} = 0$ is twice that of the other, then $h^2 : ab = ...$

(A) $1 : 2$ (B) $2 : 1$

(C) $8 : 9$ (D) $9 : 8$

109. If the equation $3x^2 + (3 - p)xy + qy^2 - 2px = 8pq$ represents a circle, then the area (in sq. units) of this circle is

(A) 5π (B) 9π

(C) 25π (D) 81π

110. The ellipse $4x^2 + 9y^2 = 1$ intersects positive Y-axis at point A. If S and S' are its foci, then the area (in sq. units) of $\Delta SAS'$ is _____

(A) $\frac{\sqrt{5}}{12}$ (B) $\frac{\sqrt{5}}{18}$

(C) $2\sqrt{5}$ (D) $3\sqrt{5}$

111. $\lim_{x \to 1} \left[\frac{x - 2}{x^2 - x} - \frac{1}{x^3 - 3x^2 + 2x} \right] =$

(A) 3 (B) 4

(C) 2 (D) 1

112. If $A = \{1, 2, 3, 4, 5, 6\}$ then which of the following is not true?

(A) $\exists x \in A$ such that $x + 3 = 9$. (B) $\exists x \in A$ such that $x + 2 < 9$.

(C) $\forall x \in A, x + 6 \geq 10$. (D) $\exists x \in A$ such that $x + 6 < 10$.

113. Consider the following statements
r: If $p \to q$ is false then $p \vee q$ is false.
s: If $p \leftrightarrow q$ is false then $p \vee q$ is false.
The truth values of $r \to s$ and $s \to r$ are respectively ____

(A) T, T (B) T, F

(C) F, T (D) F, F

114. In triangle ABC, with usual notations, if the angles are in Arithmetic Progression and $3c^2 = 2b^2$, then the measure of angle A is

(A) $\frac{5\pi}{12}$ (B) $\frac{7\pi}{12}$

(C) $\frac{5\pi}{6}$ (D) $\frac{7\pi}{6}$

115. If $A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$ then which of the following is true ?

(A) $A^2 = A^{-1}$ (B) $A = -(\text{adj}A)$

(C) $A^{-1} = A$ (D) $A^{-1} = -A$

116. If $\begin{bmatrix} 2 & 1 & -1 \\ -1 & 2 & 1 \\ 1 & -1 & 2 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 4 \\ 0 \\ -2 \end{bmatrix}$ then the distance of point $P(a, b, c)$ from the plane $2x + y + 2z = 10$ is

(A) 2 units. (B) 3 units.

(C) 4 units. (D) 5 units.

117. If $\cot(\cos^{-1} x) = \sec\left(\tan^{-1} \frac{a}{\sqrt{b^2 - a^2}}\right)$, then the value of x is

(A) $\frac{b}{\sqrt{2b^2 + a^2}}$ (B) $\frac{\sqrt{2b^2 - a^2}}{b}$

(C) $\frac{\sqrt{2b^2 + a^2}}{b}$ (D) $\frac{b}{\sqrt{2b^2 - a^2}}$

118. If $g(x) = x^2 + x - 2$ and $\frac{1}{2}(g \circ f)(x) = 2x^2 - 5x + 2$ then $f(x)$ is equal to

(A) $2x + 3$ (B) $2x - 3$

(C) $2x^2 + 3x + 2$ (D) $2x^2 - 3x - 2$

119. Let the function f be defined by $f(x) = \frac{x - |x|}{x}$, for $x \neq 0$ and $f(0) = 2$ then f is

(A) continuous nowhere (B) continuous for all x except at $x = 0$

(C) continuous everywhere (D) continuous for all x except at $x = 1$

120. The derivative of $\tan^{-1}\left(\frac{\sqrt{1 + x^2} - 1}{x}\right)$ with respect to $\sin^{-1}\left(\frac{2x}{1 + x^2}\right)$ is...

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$

(C) 1 (D) 2

121. If the derivative of $\tan^{-1}(a + bx)$ with respect to x at $x = 0$ is 1, then $a^6 - b^3 =$

(A) $3a^2b - 1$ (B) $-3ab^2 + 1$

(C) $-1 - 3a^2b$ (D) $1 + 3ab^2$

122. If $x^3 + y^3 = 6$ and $\frac{d^2y}{dx^2} \cdot \frac{d^2x}{dy^2} = \frac{m}{(xy)^n}$, where $m, n \in R$ then $\frac{m}{n} =$

(A) 36 (B) 9

(C) 6 (D) 4

123. If $x = \sin(t), y = \cos(pt)$, then $(1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} =$

(A) 0 (B) $-p^2y$

(C) p^2y (D) p

124. If the function $f(x) = ax^3 + bx^2 + 11x - 6$, defined on $[1, 3]$, satisfies all the conditions of Rolle's theorem for $c = 2 + \frac{1}{\sqrt{3}}$, then

(A) $a = -1, b = \frac{1}{2}$ (B) $a = 1, b = -6$

(C) $a = -1, b = 6$ (D) $a = -2, b = 1$

125. The tangent to the curve $y^2 - xy + 9 = 0$ is vertical when

(A) $y = 0$ (B) $y = \pm\sqrt{3}$

(C) $y = \frac{1}{2}$ (D) $y = \pm 3$

126. The value of k such that the function $f(x) = \sin x - \cos x - kx + b$ is strictly decreasing for all real x is

(A) $k < 1$ (B) $k > 1$

(C) $k < \sqrt{2}$ (D) $k > \sqrt{2}$

127. $\int \frac{\sin x}{\sin 4x} dx =$

(A) $\frac{1}{4\sqrt{2}} \log\left|\frac{1 + \sqrt{2}\sin x}{1 - \sqrt{2}\sin x}\right| + \frac{1}{4}\log|\sec x + \tan x| + c$

(B) $\frac{1}{4\sqrt{2}} \log\left|\frac{1 + \sqrt{2}\sin x}{1 - \sqrt{2}\sin x}\right| - \frac{1}{4}\log|\sec x + \tan x| + c$

(C) $\frac{1}{4\sqrt{2}} \log\left|\frac{1 - \sqrt{2}\sin x}{1 + \sqrt{2}\sin x}\right| + \frac{1}{4}\log|\sec x + \tan x| + c$

(D) $\frac{1}{4\sqrt{2}} \log\left|\frac{1 - \sqrt{2}\sin x}{1 + \sqrt{2}\sin x}\right| - \frac{1}{4}\log|\sec x + \tan x| + c$

128. $\int \sqrt{4^x(4^x+4)}\,dx = \cdots$

(A) $\frac{1}{\log 2}\left[\frac{2^x}{2}\sqrt{4^x+4}+2\log|2^x+\sqrt{4^x+4}|\right]+c$

(B) $\frac{2^x}{2}\sqrt{4^x+4}+2\log|2^x+\sqrt{4^x+4}|+c$

(C) $\frac{1}{\log 2}\left[\frac{2^x}{2}\sqrt{4^x+4}+\log|2^x+\sqrt{4^x+4}|\right]+c$

(D) $\left[\frac{2^x}{\log 4}\sqrt{4^x+4}+\log|2^x+\sqrt{4^x+4}|\right]+c$

129. The value of $\int \frac{1}{x^2-5x+8}dx$ is equal to...

(A) $\frac{2}{\sqrt{7}}\tan^{-1}\left(\frac{2x+5}{\sqrt{7}}\right)+c$

(B) $-\frac{2}{\sqrt{7}}\tan^{-1}\left(\frac{2x-5}{\sqrt{7}}\right)+c$

(C) $\frac{2}{\sqrt{7}}\tan^{-1}\left(\frac{2x-5}{\sqrt{7}}\right)+c$

(D) $-\frac{2}{\sqrt{7}}\tan^{-1}\left(\frac{2x+5}{\sqrt{7}}\right)+c$

130. $\int \frac{2x}{4-3x-x^2}dx = \cdots$

(A) $\frac{8}{5}\log|4+x|-\frac{2}{5}\log|1-x|+c$

(B) $2\log|4+x|+\frac{2}{5}\log|1-x|+c$

(C) $-\log|4+x|+\frac{2}{5}\log|1-x|+c$

(D) $-\frac{8}{5}\log|4+x|-\frac{2}{5}\log|1-x|+c$

131. If $\int_2^e\left[\frac{1}{\log x}-\frac{1}{(\log x)^2}\right]dx = a+\frac{b}{\log 2}$, then values of a and b are

(A) $a=e, b=2$ (B) $a=-e, b=2$

(C) $a=e, b=-2$ (D) $a=-e, b=-2$

132. If $\int_0^k \frac{1}{1+4^x}dx = \log_2\left(\frac{4}{3}\right)$, then $k =$ _____

(A) $\frac{2}{\sqrt{3}}$ (B) $\frac{3}{2}$

(C) $\frac{\sqrt{3}}{2}$ (D) $\frac{2}{3}$

133. The area bounded by the curve $y = x\left|\sin\left(\frac{x}{2}\right)\right|$ and the X-axis between the lines $x=0$ and $x=4\pi$ (in square units), is....

(A) 4π (B) 8π

(C) 12π (D) 16π

134. If the area enclosed between the curves $y^2=4kx$ and $y=kx, k>0$ is $\frac{2k}{3}$ sq. units then $k=$

(A) 1 (B) 1.5

(C) 2 (D) 3

135. The solution of the differential equation $2x\frac{dy}{dx}-y=3$ represents a family of

(A) straight lines (B) circles

(C) parabola (D) ellipse

136. The solution of the differential equation $x\frac{dy}{dx}+y=x^3y^6$, is...

(A) $y^5=\frac{5}{2}x^{-3}+cx^5$ (B) $y^5=\frac{5}{2}x^3+cx^5$

(C) $\frac{1}{y^5}=\frac{5}{2}x^{-3}+cx^5$ (D) $\frac{1}{y^5}=\frac{5}{2}x^3+cx^5$

137. If $\bar{a}=\hat{i}+\hat{j}+\hat{k}, \bar{b}=\hat{i}-\hat{j}+2\hat{k}$ and $\bar{c}=x\hat{i}+(x-2)\hat{j}-\hat{k}$ are three vectors in which $\bar{c}$ lies in the plane of $\bar{a}$ and $\bar{b}$, then $x=\cdots$

(A) 0 (B) 1

(C) -4 (D) -2

138. If $|\bar{a}|=4, |\bar{b}|=3$ and $\bar{a}\cdot\bar{b}=8$ then $[\bar{a}\ \ \bar{a}+\bar{b}\ \ \bar{a}\times\bar{b}] =$

(A) 96 (B) 80

(C) 64 (D) 120

139. Let $\bar{a},\bar{b},\bar{c}$ be the unit vectors such that $\bar{a}$ is perpendicular to $\bar{b}$ and the angle between $\bar{b}$ and $\bar{c}$ is 120°. If $\bar{a}+\bar{c}$ is perpendicular to $\bar{b}+\bar{c}$ then

(A) $(\bar{a}+\bar{c})\cdot(\bar{b}-\bar{c})=1$

(B) $(\bar{a}-\bar{c})\cdot(\bar{b}-\bar{c})=-2$

(C) $(\bar{a}-\bar{c})\cdot(\bar{b}+\bar{c})=1$

(D) $(\bar{a}-\bar{c})\cdot(\bar{b}-\bar{c})=2$

140. Let x_0 be the point of local maxima of $f(x)=\bar{a}\cdot(\bar{b}\times\bar{c})$ where $\bar{a}=x\hat{i}-2\hat{j}+3\hat{k}, \bar{b}=-2\hat{i}+x\hat{j}-\hat{k}$ and $\bar{c}=7\hat{i}-2\hat{j}+x\hat{k}$ then the value of $\bar{a}\cdot\bar{c}$ at $x=x_0$ is

(A) 26 (B) 0

(C) -15 (D) -26

141. The parallelopiped is determined by vectors $\bar{a} = -2\hat{i} + 5\hat{j} + 3\hat{k}$, $\bar{b} = \hat{i} + 3\hat{j} - 2\hat{k}$, $\bar{c} = -3\hat{i} + \hat{j} + 4\hat{k}$. The altitude of parallelopiped on the parallelogram base determined by vectors $\bar{b}$ and $\bar{c}$ is

(A) $\frac{2\sqrt{3}}{5}$ (B) $\frac{2}{5}$

(C) 12 (D) $\frac{5\sqrt{3}}{2}$

142. The vector equation of the plane passing through the point $A(-2, 7, 5)$ and parallel to the vectors $4\hat{i} - \hat{j} + 3\hat{k}$ and $\hat{i} + \hat{j} + \hat{k}$ is ...

(A) $\bar{r} \cdot (-2\hat{i} + 7\hat{j} + 5\hat{k}) = 26$

(B) $\bar{r} \cdot (4\hat{i} - \hat{j} + 3\hat{k}) = 27$

(C) $\bar{r} \cdot (4\hat{i} - \hat{j} + 5\hat{k}) = 26$

(D) $\bar{r} \cdot (-4\hat{i} - \hat{j} + 5\hat{k}) = 26$

143. The point of intersection of the two lines $\frac{x-3}{3} = \frac{y-3}{-1}, z - 1 = 0$ and $\frac{x-6}{2} = \frac{z-1}{3}, y - 2 = 0$ is....

(A) $(0, 0, 0)$ (B) $(1, 2, 6)$

(C) $(3, -1, 0)$ (D) $(6, 2, 1)$

144. If the centroid of a tetrahedron $OABC$ is $(1, 2, -1)$, where O is the origin, $A(a, 2, 3), B(1, b, 2), C(2, 1, c)$ are the other vertices, then the distance of the point $P(a, b, c)$ from the origin is...

(A) 42 units (B) $\sqrt{107}$ units

(C) 25 units (D) 15 units

145. If the lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{x-3}{1} = \frac{y-c}{2} = \frac{z}{1}$ intersect, then the radius of circle $x^2 + y^2 - 4x + 10y + c = 0$ is

(A) $\frac{9}{\sqrt{2}}$ (B) $\frac{9}{2}$

(C) $\frac{7}{\sqrt{2}}$ (D) $\frac{7}{2}$

146. The corner points of the feasible region determined by a system of linear constraints are $(0, 3), (1, 1)$ and $(3, 0)$. If the objective function is $z = px + qy$, where $p, q > 0$, then the condition on p and q such that the minimum of z occurs at both $(3, 0)$ and $(1, 1)$ is _____

(A) $p = 3q$ (B) $3p = q$

(C) $p = \frac{q}{2}$ (D) $p = 2q$

147. If $X \sim B(n, p)$, then the value of $\frac{P(X = k)}{P(X = k - 1)}$ is

(A) $\left(\frac{n-k}{k}\right)\frac{p}{q}$ (B) $\left(\frac{n-k+1}{k}\right)\frac{p}{q}$

(C) $\left(\frac{n-k}{k-1}\right)\frac{p}{q}$ (D) $\left(\frac{n-k+1}{k-1}\right)\frac{p}{q}$

148. A player tosses two fair coins, he wins Rs. 5 if two heads appear, Rs. 3 if one head appears and Rs. 2 if no head appears, then the variance of the winning amount is

(A) 1.1875 (B) 1.8175

(C) 1.1785 (D) 1.8157

149. The probability mass function of a random variable X is given by

$P(X = x) = \frac{^5C_x}{2^5}$, for $x = 0, 1, 2, 3, 4, 5$ and $= 0$, otherwise.

Then which of the following is correct?

(A) $p(x \leq 2) = p(x \geq 3)$

(B) $p(x \leq 2) > p(x \geq 3)$

(C) $p(x \leq 2) < p(x \geq 3)$

(D) $p(x \leq 2) = 2p(x \geq 3)$

150. If events A and B are such that $P(A) = \frac{1}{4}$, $P(A \cap B) = \frac{1}{10}$ and $P(A/B) = 2P(B/A)$ then $P(B) =$.....

(A) $\frac{1}{2}$ (B) $\frac{1}{5}$

(C) $\frac{1}{8}$ (D) $\frac{2}{5}$

- End of Question Paper -