MHT CET 2026 PCM May 12 Shift 1 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. If $\vec{A} = 5\hat{i} + 2\hat{j}$ and $\vec{B} = a\hat{i} + 3\hat{j}$ are perpendicular to each other, the value of 'a' is

(A) $\frac{-6}{5}$ (B) $\frac{6}{5}$

(C) $\frac{4}{5}$ (D) $\frac{-4}{5}$

2. A particular physical quantity is given by $X = 2\pi\sqrt{\frac{a}{b}}$ and the measured value of 'a' is 40 unit with 0.01 unit accuracy. The value of 'b' is $\frac{98}{10}$ unit with 1 unit accuracy. The % error in X is nearly

(A) 4% (B) 5%

(C) 6% (D) 7%

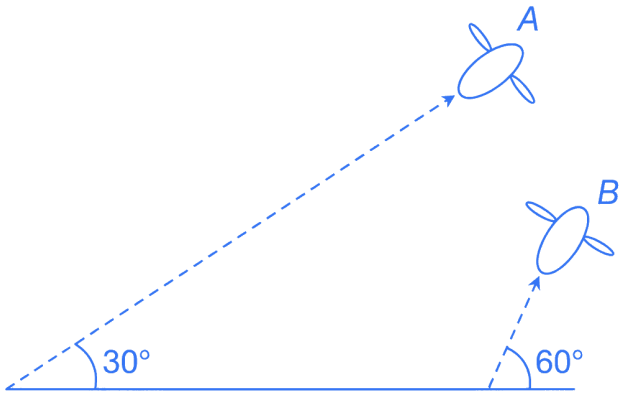
3. Two particles A and B are moving in uniform circular motion in concentric circles of radii r_A and r_B with speeds v_A and v_B respectively. T_A and T_B are the time periods of rotation of the particles respectively and their relation is $T_A = 3T_B$. The ratio of angular speed of B to that of A will be

(A) $r_B : 3r_A$ (B) $3r_B : r_A$

(C) 1 : 3 (D) 3 : 1

4. Airplanes A and B are flying with constant velocity in the same vertical plane at angles 30° and 60° with respect to the horizontal as shown in the figure. The speed of A is $100\sqrt{3}$ m/s. At time $t = 0$ s, an observer in A finds B at a distance of 500 m. This observer sees B moving with a constant velocity perpendicular to the line of motion of A. If at $t = t_0$, A just escapes being hit by B, t_0 in second is

$\{\sin(30)^\circ = 0.5, \cos(30)^\circ = 3^{0.5}/2\}$



(A) 2 (B) 3

(C) 4 (D) 5

5. Four solid spheres, each of diameter $\sqrt{5}$ cm and mass 0.5 kg are placed with their centres at the corners of a square of side 4 cm. The M.I. of the system about the diagonal of the square is $N \times 10^{-4}$ kg-m^2, then N is

(A) 9 (B) 7

(C) 5 (D) 3

6. In the case of rotational dynamics, which of the following statements is correct? {S = linear displacement, α = angular acceleration, r = radius vector, a = linear acceleration, L = angular momentum, p = linear momentum, θ = angular displacement}

1. $S = r \times \theta, a = r \times \alpha, L = p \times r$
2. $S = \theta \times r, a = \alpha \times r, L = r \times p$
3. $S = r \cdot \theta, a = r \cdot \alpha, L = p \cdot r$
4. $S = \omega \times r, a = r \times p, L = r \times f$

(A) 4 (B) 3

(C) 2 (D) 1

7. Which of the following sentence is true?

a. Moment of a couple is independent of the axis of rotation or the points of application of forces.

b. Moment of a couple produces translational acceleration.

c. Moment of a couple can be balanced by single force.

d. Moment of a couple depends upon the axis of rotation or the points of application of forces.

(A) d (B) c

(C) b (D) a

8. Four particles, each of mass M and equidistant from each other, move along a circle of radius R under the action of their gravitational attraction, the speed of each particle is $\{\sin(45)^0 = \cos(45)^\circ = 1/(2)^{0.5}\}$

(A) $\sqrt{\frac{GM}{R}}$

(B) $\sqrt{2\sqrt{2}\frac{GM}{R}}$

(C) $v = \sqrt{\frac{GM}{R}(1 + 2\sqrt{2}\ )}$

(D) $v = \frac{1}{2}\sqrt{\frac{GM}{R}(1 + 2\sqrt{2})}$

9. A vessel contains oil (density= 0.6 g/cm^3) over mercury (density= 13.6 g/cm^3). A homogeneous sphere floats with half its volume immersed in mercury and the remaining half in oil. The density of the material of the sphere in g/cm^3 is

(A) 6.8 (B) 6.3

(C) 7.1 (D) 7.2

10. In a hydraulic press, the small cylinder has a diameter of d_1 cm, while the large cylinder has a diameter of d_2 cm. If a force F_1 is applied to a piston of small cylinder, then the force on the piston of large cylinder F_2 is

(A) $\frac{d_1^2}{d_2^2}\frac{1}{F_1}$ (B) $\frac{d_1^2}{d_2^2}F_1$

(C) $\frac{d_2^2}{d_1^2}\frac{1}{F_1}$ (D) $\frac{d_2^2}{d_1^2}F_1$

11. A rectangular film of liquid is expanded from (6 cm $\times$5 cm) to (8 cm $\times$9 cm). If the work done is 4×10^{-4} J, the surface tension of the liquid is

(A) $0.04\frac{N}{m}$ (B) $0.05\frac{N}{m}$

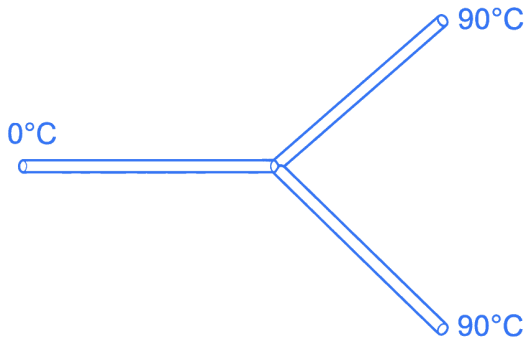
(C) $0.06\frac{N}{m}$ (D) $0.07\frac{N}{m}$

12. Three spheres, P, Q and R, having radii 4 m, 5 m and 6 m respectively, are coated with lamp black on their outer surfaces. The wavelengths corresponding to maximum intensity (radiated) are 400 nm, 500 nm and 600 nm respectively. If the powers radiated by them are P_P, P_Q and P_R respectively, then $P_P : P_Q : P_R$ is

(A) $\frac{1}{4} : \frac{1}{5} : \frac{1}{6}$ (B) $\frac{1}{16} : \frac{1}{25} : \frac{1}{36}$

(C) $\frac{1}{64} : \frac{1}{125} : \frac{1}{216}$ (D) $\frac{1}{256} : \frac{1}{625} : \frac{1}{1296}$

13. Three rods made of the same material and the same cross-sectional areas have been joined as shown in the figure. Each rod is of the same length. The temperature of the junction is



(A) 60°C (B) 45°C

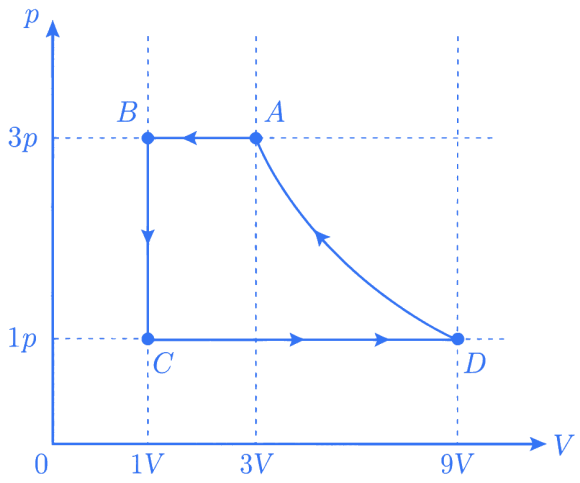
(C) 30°C (D) 20°C

14. For any thermodynamic process, the work done by the system depends

(A) only on intial state of the system. (B) both on initial and final state of the system.

(C) on the initial state and final state and on the path along which the change takes place. (D) only on intermediate state.

15. One mole of a mono-atomic ideal gas is taken through a cycle ABCDA as shown in the P-V diagram, then



(A) for process A to B, heat is lost and internal energy increases. (B) for process B to C, heat is lost and internal energy increases.

(C) for process C to D, heat is gained and internal energy increases. (D) for process D to A, heat is gained and internal energy increases.

16. The difference between two molar specific heats of a gas is 7000 J-kg^{-1}-K^{-1}. If the ratio of two specific heats of gas is 7/5, the molar specific heat of the gas at constant pressure in J-kg^{-1}-K^{-1} is

(A) 17500 (B) 18500

(C) 24500 (D) 25500

17. The pressure of a given mass of a gas is decreased by 20% at constant temperature, then its volume will

(A) decrease by 20%. (B) increase by 20%.

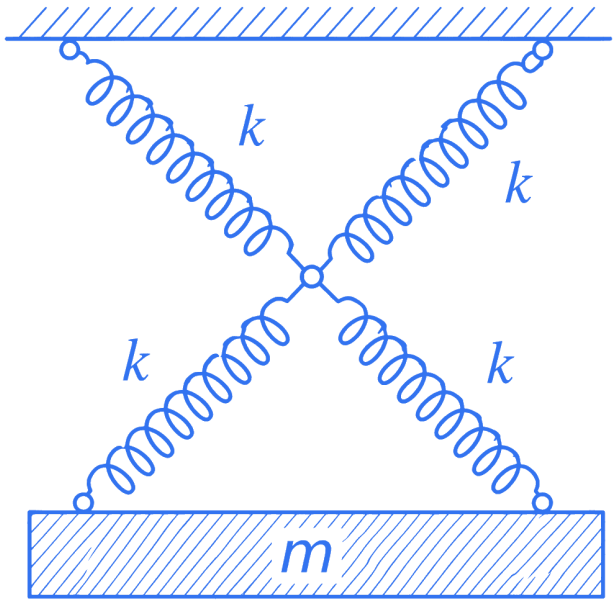
(C) decrease by 25%. (D) increase by 25%

18. A particle performing S.H.M., has a period of 12 s. The particle starts from a mean position. The ratio of distances travelled by the particle in the first and second second is $\{\cos(\pi/6) = \frac{\sqrt{3}}{2}\}$

(A) $\frac{\sqrt{3}}{2}$ (B) $\frac{1}{2}$

(C) $\frac{\sqrt{3}-1}{\sqrt{3}}$ (D) $\frac{1}{\sqrt{3}-1}$

19. A simple harmonic oscillator having four identical springs (as shown in figure) has a time period T_1. Another similar simple harmonic oscillator of the same mass m but the four identical springs with spring constants $2k$ has a time period T_2, then $\frac{T_1}{T_2}$ is



(A) 2 : 1 (B) 1 : $\sqrt{2}$

(C) $\sqrt{2}$: 1 (D) 1 : 2

20. Two particles performing simple harmonic motions of maximum accelerations, 1 m/s^2 and 100 m/s^2, have the same amplitudes. The ratio of their angular frequencies is

(A) 1 : 100 (B) 1 : 10

(C) 1 : 1000 (D) 1 : 1

21. A simple harmonic progressive wave is given by the equation $y = a\sin 2\pi\left(nt - \frac{x}{\lambda}\right)$. If the wave velocity is equal to $\frac{1}{6}\times$ (maximum particle velocity), then the wavelength λ is {a = amplitude, n = frequency, t = time, y = displacement, x = distance}

(A) $\frac{\pi a}{2}$ (B) $\frac{\pi a}{3}$

(C) $\frac{3\pi a}{2}$ (D) $\frac{2\pi a}{3}$

22. Two simple harmonic progressive waves have displacements $y_1 = 5\sin\left(\frac{2\pi x}{\lambda} - \omega t\right)$ and $y_2 = 5\cos\left(\frac{2\pi x}{\lambda} - \omega t + \frac{\pi}{6}\right)$. The phase difference between the two waves is

(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{6}$

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

23. A pipe closed at one end vibrating in the sixth overtone is in unison with the open pipe vibrating in its sixth overtone. The ratio $l_c : l_o$ is {l_c = vibrating length of pipe closed at one end, l_o = vibrating length of pipe open at both ends}

(A) 13 : 14 (B) 14 : 13

(C) 11 : 12 (D) 12 : 11

24. A whistle giving out 400 Hz approaches a stationary observer at a speed of 34 m/s. The frequency heard by the observer (in Hz) is nearly (speed of sound= 340 m/s)

(A) 400 (B) 500

(C) 444 (D) 555

25. The equal charges (say 'q') are placed at a distance of $4r$ and a third charge $(-2q)$ is placed at a mid-point. The potential energy of the system is (ϵ_0 = permittivity of free space)

(A) $\frac{-9q^2}{8\pi\epsilon_0 r}$ (B) $\frac{9q^2}{8\pi\epsilon_0 r}$

(C) $\frac{-7q^2}{16\pi\epsilon_0 r}$ (D) $\frac{7q^2}{16\pi\epsilon_0 r}$

26. A charge q is placed at the centre of the line joining two equal charges Q. The system of the three charges will be in equilibrium if q is equal to

(A) $\frac{-Q}{2}$ (B) $\frac{-Q}{4}$

(C) $\frac{Q}{4}$ (D) $\frac{Q}{2}$

27. A parallel plate air capacitor consists of two metal plates of area A and separation d. A slab of thickness t and dielectric constant $2k$ is inserted between the plates with its faces parallel to the plates. The effective capacitance of the system is (ϵ_0 = permittivity of free space)

(A) $\frac{\epsilon_0 A}{(d-t)+\frac{t}{2k}}$ (B) $\frac{\epsilon_0 A}{(d-t)-\frac{t}{k}}$

(C) $\frac{\epsilon_0 A}{(2d-t)-\frac{t}{2k}}$ (D) $\frac{\epsilon_0 A}{(d-2t)-\frac{t}{k}}$

28. When the dielectric is placed in an external electric field, the electric field inside the dielectric is

(A) larger than the external electric field.
(B) less than the external electric field.
(C) equal to the external electric field.
(D) equal to or greater than external electric field.

29. Two cells of e.m.f.s approximately 5 V and 10 V are to be compared using a potentiometer (sum and difference method) of length 400 cm, then,

(A) first portion of 110 cm of wire should have a potential difference of 10 V.
(B) a battery that runs the potentiometer should have a voltage of 5 V.
(C) a battery that runs the potentiometer should have a voltage of more than 15 V.
(D) a battery that runs the potentiometer should have a voltage of 10 V.

30. The value of shunt resistance that allows 5% of the main current through the galvanometer of 100Ω is nearly

(A) 4Ω.
(B) 5Ω.
(C) 7Ω.
(D) 8Ω.

31. An electron is moving with initial velocity $\vec{v} = a\hat{k}$ in a magnetic field $\vec{B} = b\hat{j}$. Its de-Broglie wavelength will

(A) decrease and increase periodically.
(B) increase with time.
(C) decrease with time.
(D) remain constant.

32. A charge q is circulating at a constant speed v with a semicircular loop of radius r. The magnetic moment of this loop is

(A) $(qv\pi r)/(\pi + 2)$
(B) $qvr/3$
(C) $(\pi rqv)/2(\pi + 2)$
(D) qvr

33. A charged particle of mass m and charge q travels on a circular path, (of radius 5 unit) is perpendicular to a magnetic field B. The time taken by a particle to complete 10 revolutions is

(A) $10\pi m/qB$
(B) $20\pi m/qB$
(C) $\pi m/qB$
(D) $5\pi m/qB$

34. Two long straight parallel wires are separated by a distance of 20 cm. Each wire carries current 5 mA in the same direction. The magnetic field at a point P midway between them is {μ_0 = permeability of free space}

(A) $0.05\mu_0$ Wb/m^2
(B) $(0.05/8)\mu_0$ Wb/m^2
(C) $(0.05/4)\mu_0$ Wb/m^2
(D) zero.

35. Two inductors, L_1 and L_2, are connected in parallel and time-varying current flows the combination. If I_1 and I_2 are the currents passing through the inductor L_1 and L_2 respectively, the ratio $\frac{I_2}{I_1}$ is

(A) $\frac{L_2}{L_1}$
(B) $\frac{L_1}{L_2}$
(C) $\frac{L_1}{L_2^2}$
(D) $\frac{L_2}{L_1^2}$

36. Two conducting circular loops of radii r and $2r$ are placed in the same plane with their centres coinciding. The mutual inductance M between them is {same current is passing through both the coils} (μ_0 = permeability of free space)

(A) $\pi\mu_0 r$
(B) $\frac{\mu_0\pi r}{4}$
(C) $\frac{\mu_0\pi r}{2}$
(D) $\frac{\mu_0\pi r}{8}$

37. A conducting rod AB of length l is rotated about point O which lies between point A and B in a uniform magnetic field $\vec{B}$ directed into the paper. If length $AO = \frac{l}{3}$, then $(V_A - V_B)$ is {ω = angular velocity}

(A) $\frac{5Bl^2\omega}{6}$
(B) $\frac{6Bl^2\omega}{5}$
(C) $\frac{Bl^2\omega}{6}$
(D) $\frac{Bl^2\omega}{3}$

38. By combining three inductances, 2 H, 4 H and 6 H, the minimum value of effective inductance that can be obtained is (in H)

(A) 12/11
(B) 11/12
(C) 5/12
(D) 12/5

39. An e.m.f. $e = E_0 \cos\omega t$ is applied to a circuit containing L, C and R in series where $X_L = 4R$ and $X_C = R$. The average power dissipated in the circuit is

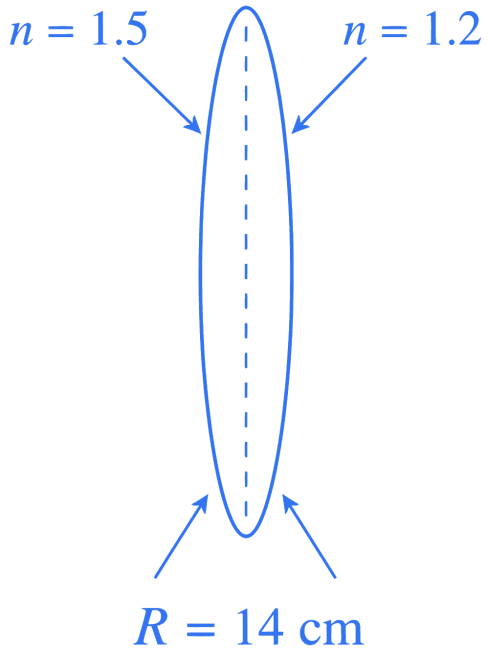
(A) $\frac{E_0^2}{20R}$
(B) $\frac{E_0^2}{10R}$
(C) $\frac{E_0^2}{5R}$
(D) $\frac{E_0^2}{2R}$

40. In a series LCR circuit, the inductance $L = 20$ mH, capacitor $C = 2\mu$F and resistance $R = 100$ ohm. The frequency at which resonance occurs is

(A) $\frac{(10)^2}{2\pi}$ (B) $\frac{(10)^3}{3\pi}$

(C) $\frac{(10)^4}{4\pi}$ (D) $\frac{10}{\pi}$

41. A bi-convex lens is formed with two thin plano-convex lenses as shown in the figure. Refractive index of the first lens is 1.5 and that of second is 1.2. Both the curved surfaces are of the same radius of curvature $R = 14$ cm. For an object distance of 40 cm, the image distance will be



(A) 280.0 cm (B) 13.3 cm

(C) 21.5 cm (D) 40.0 cm

42. Resolving power of a telescope can be increased by

(A) increasing the diameter of objective.

(B) decreasing the diameter of the objective

(C) increasing the distance between the objects which have to be seen through the telescope.

(D) decreasing the the distance between the objects which have to be seen through the telescope.

43. Unpolarized light with intensity I_0 passes through three polaroids such that the transmission axis of the last polaroid is crossed with the first. If the intensity of emerging light is $I_1 \left(I_1 = \frac{3}{32} I_0\right)$. The angle between the first two polaroids and the angle for which the transmitted intensity is maximum are respectively {given, $\cos(90) = 0$}

(A) $\frac{1}{2}\sin^{-1}\frac{\sqrt{3}}{2}$ and 45° (B) $\sin^{-1}\frac{\sqrt{3}}{2}$ and 90°

(C) $\frac{1}{2}\cos^{-1}\frac{\sqrt{3}}{2}$ and 45° (D) $\cos^{-1}\frac{\sqrt{3}}{2}$ and 90°

44. In Young's double slit experiment, the fringe width is 2.4 mm with light of wavelength 9000 A.U. If the light of wavelength 5400 A.U. is used, with no other change in the experimental set up. The change in fringe width is

(A) 0.86 mm (B) 0.96 mm

(C) 0.86 cm (D) 0.96 cm

45. A photon of energy 10 units ejects a photoelectron from a metal surface whose work function is Φ_0. If an electron(e) having maximum kinetic energy enters into a uniform magnetic field of induction(B) in a direction perpendicular to the field and describes a circular path of radius R, then radius R is {m =mass of electron}

(A) $R = \frac{\sqrt{2m(15-\Phi_0)}}{eB}$ (B) $R = \frac{\sqrt{m(10-\Phi_0)}}{eB}$

(C) $R = \frac{\sqrt{2m(10-\Phi_0)}}{eB}$ (D) $R = \frac{\sqrt{2m(10-\Phi_0)}}{5eB}$

46. Which of the following transition in hydrogen atom emits photon of highest frequency?

(A) $n = 5$ to $n = 2$ (B) $n = 2$ to $n = 5$

(C) $n = 2$ to $n = 3$ (D) $n = 3$ to $n = 2$

47. In transition 'a', three α particles and two β particles are emitted in succession from the element ${}_{86}X^{226}$. In transition 'b', two gamma rays, one β particle and two α particles are emitted in succession from element ${}_{96}Y^{236}$. The atomic number and the mass number of the new elements formed respectively are

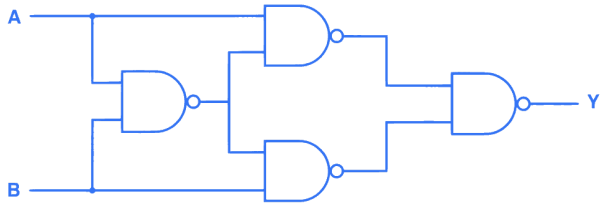
(A) a) for first transition:- atomic number = 83, mass number = 216 b) for the second transition:- atomic number = 82, mass number = 214

(B) a) for first transition:- atomic number = 80, mass number = 225 b) for the second transition:- atomic number = 90, mass number = 220

(C) a) for first transition:- atomic number = 82, mass number = 214 b) for the second transition:- atomic number = 93, mass number = 228

(D) a) for first transition:- atomic number = 80, mass number = 214 b) for the second transition:- atomic number = 90, mass number = 226

48. The truth table for the system of four NAND gates as shown in the figure is



(A)

A	B	Y
0	0	1
0	1	1
1	0	0
1	1	0

(B)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

(C)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	0

(D)

A	B	Y
0	0	0
0	1	0
1	0	1
1	1	1

49. A LED emits visible light when its

(A) junction is hot.

(B) holes and electrons recombine.

(C) depletion region widens.

(D) junction is reverse biased.

50. In one branch, 40Ω resistance and a p-n junction diode are connected in series and in another branch, 40Ω resistance is connected. Both the branches are connected in parallel to each other. The total resistance of the circuit when a) diode is forward biased and when b) diode is reverse biased respectively are {consider the p-n junction diode as an ideal diode}

(A) 40Ω and 20Ω

(B) 60Ω and 30Ω

(C) 20Ω and 40Ω

(D) 30Ω and 60Ω

51. Which of the following substances contains the maximum number of atoms?
(molar mass in g mol^{-1} - $CO_2 = 44$, $H_2 = 2$, $Cr = 51.99$, $Cl_2 = 71$)

(A) 14.0 g of Carbon dioxide.
(B) 2.0 g of dihydrogen
(C) 12.0 g of Chromium
(D) 35.5 g of chlorine gas

52. Identify a set of isoelectronic species from the following.

(A) Na^+, Cl^-, O^-, NO^+
(B) N_2O, N_2O_4, NO^+, NO
(C) Na^+, Mg^{2+}, O^-, F^-
(D) Ca^{2+}, Ar, K^+, Cl^-

53. Which of the following sets of quantum numbers is incorrect for an electron in an atom?

(A) $n = 1, l = 0, m = 0, s = +1/2$
(B) $n = 2, l = 1, m = 0, s = -1/2$
(C) $n = 3, l = 1, m = 0, s = -1/2$
(D) $n = 2, l = 2, m = 1, s = +1/2$

54. Which of the following elements of group 17 has the highest negative electron gain enthalpy?

(A) Fluorine
(B) Chlorine
(C) Bromine
(D) Iodine

55. A hot air balloon has a volume of 2800 dm^3 at 100°C. What is the volume if air cools to 27°C?

(A) 2252 dm^3.
(B) 2450 dm^3.
(C) 2656 dm^3.
(D) 2912 dm^3

56. For a certain reaction, change in enthalpy is -225 kJ and entropy change $= -150$ JK^{-1}. Find the temperature so that ΔG is zero.

(A) 350 K
(B) 1500 K
(C) 105 K
(D) 1800 K

57. Calculate $\Delta_f H$ for $C(s) + 2H_2(g) \rightarrow CH_4(g)$
i. $C(s) + O_2(g) \rightarrow CO_2(g); \Delta H_1 = -393.5$ kJ/mol
ii. $H_2(g) + 1/2O_2(g) \rightarrow H_2O(l); \Delta H_2 = -285.8$ kJ/mol
iii.
$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l); \Delta H_3 = -890.3$ kJ/mol

(A) -1855.4 kJ/mol
(B) -211 kJ/mol
(C) -74.8 kJ/mol
(D) 1068.4 kJ/mol

58. Which of the following enthalpy change is negative?

(A) Enthalpy of fusion
(B) Enthalpy of condensation
(C) Enthaly of vaporization
(D) Enthalpy of sublimation

59. Calculate the pH of 10^{-8} M HCl solution at 25°C.

(A) 8.0
(B) 7.0
(C) 6.9586
(D) 7.0414

60. What is the P^{OH} of solution having $[H_3O^+] 1 \times 10^{-4}$ at 298 K?

(A) 4
(B) 10
(C) 1
(D) 12

61. Which of the following is a strong electrolyte?

(A) Acetic acid
(B) Ammonium hydroxide
(C) Sodium chloride
(D) Carbonic acid

62. Which among F_2, Cl_2, Br_2 and I_2 exhibit disproportionation reaction?

(A) F_2 and Cl_2
(B) Cl_2, Br_2 and I_2
(C) Only I_2
(D) F_2, Cl_2 and Br_2

63. Consider the following compounds : $\underline{K}O_2$, $H_2\underline{O}_2$ and $H_2\underline{S}O_4$. The oxidation state of the underlined elements in them are, respectively,

(A) $+1, -2$ and $+4$
(B) $+4, -4$ and $+6$
(C) $+1, -1$ and $+6$
(D) $+2, -2$ and $+6$

64. What is the number of neutrons present in tritium?

(A) 1 (B) 3

(C) 2 (D) 0

65. What type of isomerism is exhibited by compounds CH_3-CH_2-O-CH_2-CH_3 and CH_3-CH_2-CH_2-O-CH_3?

(A) Metamerism (B) Tautomerism

(C) Chain isomerism (D) Position isomerism

66. Which of the following catalysts is used in the hydrogenation of vegetable oil?

(A) $NO_{(g)}$ (B) $Fe_{(s)}$

(C) $Ni_{(s)}$ (D) $K_2O, Al_2O_{3(s)}$

67. A compound is formed by two elements A and B. The elements B forms cubic close packed structure and atoms of A occupy 1/3rd of tetrahedral voids. If the formula of the compound is A_xB_y, then find the value of $(x + y)$.

(A) 4 (B) 3

(C) 2 (D) 5

68. What is the maximum number of nearest neighbors for a given lattice point in the hcp structure?

(A) 4 (B) 6

(C) 8 (D) 12

69. Calculate the amount of KCl that should be added to 100 g of pure water to decrease the freezing point of water by 0.3535 K, if K_f for water is 1.86 K kg mol^{-1}.
[Degree of dissociation of KCl $(\alpha) = 0.9$, Molar mass of KCl = 74.5 g/mol]

(A) 7.45 g (B) 0.745 g

(C) 3.725 g (D) 0.3725 g

70. Calculate the temperature of the solution in which a solution containing 10 g solute in 0.4 dm^3 has an osmotic pressure of 3.4 atm.
[Molar mass of solute = 180 g mol^{-1}, $R = 0.082$ atm dm^3 $K^{-1}mol^{-1}$]

(A) 25.5°C. (B) 20.2°C.

(C) 27.5°C. (D) 30.7°C.

71. Which of the following binary solution exhibits higher vapor pressure than the vapour pressure of its pure components at same temprecure?

(A) Benzene + Toluene (B) Phenol + aniline

(C) ethanol + acetone (D) chloroform + acetone

72. What is the mole fraction of ethanol in solution containing 46 g of ethanol and 180 g of water?
(Molar mass of ethanol = 46 g mol^{-1}, Molar mass of water = 18 g mol^{-1})

(A) 0.25 (B) 0.09

(C) 0.15 (D) 0.05

73. What is the SI unit of molar conductivity?

(A) S m^2mol^{-1} (B) $\Omega^{-1}cm^2mol^{-1}$

(C) $Sm^{-2}mol^{-1}$ (D) $\Omega^{-1}cm^{-2}mol^{-1}$

74. Calculate E^o_{cell} of the following cell at 298 K.
$Pb_{(s)}|Pb^{+2}_{(aq)}||Ag^{+}_{(aq)}|Ag_{(s)}$
$E^oPb^{+2}/Pb = -0.126$ V, $E^oAg^{+}/Ag = +0.799$ V

(A) −0.925 V (B) 0.936 V

(C) 0.925 V (D) 0.673 V

75. The standard electrode potential for $Ag^{+}_{(aq)} + e^- \rightarrow Ag_{(s)}$ is 0.79 V. What is the standard potential for the reaction: $2Ag_{(s)} \rightarrow 2Ag^{+}_{(aq)} + 2e^-$.

(A) +1.58 V (B) −1.58 V

(C) +0.79 V (D) −0.79 V

76. In a reaction, $2A_{(g)} \rightarrow$ Products, the rate law is $r = k[A]^2$. Calculate the rate constant if the rate of reaction is 6.5×10^{-6} mol L^{-1} S^{-1} and $[A]$ is 2×10^{-3} mol/L.

(A) 1.625 $mol^{-1}L\ s^{-1}$ (B) 2.521 $mol^{-1}L\ s^{-1}$

(C) 3.125 $mol^{-1}L\ s^{-1}$ (D) 2.015 $mol^{-1}L\ s^{-1}$

77. What is the half life of a first order reaction if the value of the rate constant is $3.0 \times 10^{-2}s^{-1}$?

(A) 0.231 s (B) 2.31 s

(C) 23.1 s (D) 231 s

78. Which of the following types of nanostructures, the thin film is?

(A) zero dimensional nano structure (B) one dimensional nano structure

(C) two dimensional nano structure (D) three dimensional nano structure

79. What is the number of metallic allotrops of polonium?

(A) 3 (B) 2

(C) 4 (D) 5

80. Which one of the following ions exhibits d-d transition and paramagnetism?

(A) MnO_4^- (B) MnO_4^{-2}

(C) CrO_4^{-2} (D) $Cr_2O_7^{-2}$

81. Which of the following electronic configurations is of an element lanthanum?

(A) $[Xe]4f^35d^06s^2$ (B) $[Rn]5f^46d^17s^2$

(C) $[Xe]4f^75d^16s^2$ (D) $[Xe]4f^05d^16s^2$

82. Which of the following type of isomerism is found in compounds $[Co(NH_3)_5(NO_2)]$ and $[Co(NH_3)_5(ONO)]$?

(A) Geometrical isomerism (B) linkage isomerism

(C) Optical isomerism (D) Coordination isomerism

83. What is the number of electron pairs involved in the formation of coordinate bonds in cisplatin?

(A) 6 (B) 4

(C) 2 (D) 3

84. Why does Chlorobenzene exhibit very low reactivity towards nucleophilic substitution reaction?

(A) Formation of phenyl cation is highly stable. (B) It contains a strong C-Cl bond with partial double-bond character.

(C) It easily forms SN^1 intermediate. (D) The C-Cl bond in chlorobenzene is very weak.

85. Which of the following compounds is obtained using Wurtz synthesis?

(A) $R_2C = CR_2$ (B) $H_3C\text{-}CH_3$

(C) R-COOH (D) R-OH

86. Identify the product obtained when alkyl magnesium halides are reacted with water.

(A) Haloforms (B) Alkyl halides

(C) Alcohols (D) Alkanes

87. Identify false statements regarding the properties of alcohol and phenol.

(A) Aqueous solution of alcohol is neutral to litmus. (B) An aqueous solution of phenol turns blue litmus red.

(C) Alcohols and phenols do not form intermolecular hydrogen bonds. (D) Phenols and lower alcohols have appreciable solubility in water.

88. Identify the increasing order of boiling points for the compounds stated below.

(A) n-Propyl alcohol
(B) n-Butyl alcohol
(C) Isopropyl alcohol
(D) Isobutyl alcohol

(A) $(A) < (B) < (C) < (D)$.

(B) $(C) < (A) < (D) < (B)$.

(C) $(B) < (D) < (A) < (C)$.

(D) $(C) < (A) < (B) < (D)$.

89. Which of the following reactions is NOT used for preparation of alkyl halide?

(A) $CH_3\text{-}CH_2\text{-}OH + HBr \xrightarrow{NaBr/H_2SO_4}$

(B) $CH_3\text{-}CH_2\text{-}OH + HCl$ (anhydrous $ZnCl_2$) $\rightarrow$

(C) $CH_3\text{-}CH_2\text{-}OH + NaCl \rightarrow$

(D) $CH_3\text{-}CH_2\text{-}OH + PCl_3 \rightarrow$

90.

$$C = O_{\text{(Carbonyl group in aldehydes and ketones)}} + 4[H] \xrightarrow[\Delta]{\text{Zn-Hg, conc. HCl}} \underset{\text{(Methylene group)}}{-CH_2} + H_2O$$

Identify the name of above reaction.

(A) Mendius reduction (B) Clemmensen Reduction

(C) Wolf-Kishner reduction (D) Hofmann degradation

91. Which of the following statements regarding aldol condensation is TRUE?

(A) It is a nucleophilic addition elimination reaction. (B) It is self redox reaction.

(C) It is a disproportionation reaction. (D) It is exhibited by lower aldehydes only.

92. Which of the following aldehydes exhibits Cannizzaro reaction when heated with strong alkali?

(A) Benzaldehyde (B) Acetaldehyde
(C) Propionaldehyde (D) Butyraldehyde

93. Which of the following reagents forms semicarbazone when treated with ketones?

(A) Hydroxyl amine (B) Hydrazine
(C) Phenyl hydrazine (D) Semicarbazide

94. Which of the following amines is obtained by using Gabriel phthalimide synthesis?

(A) Ar-NH_2 (B) R-NH_2
(C) $(R)_2$-NH (D) $(R)_3$-N

95. Identify IUPAC name for aniline.

(A) Phenyl amine (B) Amino benzene
(C) Benzyl amine (D) Benzenamine

96. Which of the following statements regarding proteins are correct?
(A) Serum albumin is a globular protein.
(B) Myosin is a globular protein.
(C) Insulin is a fibrous protein.
(D) Legumelin is a globular protein.

(A) (A) and (D) only. (B) (A), (B) and (C) only.
(C) (A), (B), (C) and (D). (D) (C) and (D) only.

97. Which of the following compounds exists as dipolar ion?

(A) Ketones (B) α-Amino acids
(C) Carbohydrates (D) Fatty acids

98. Which of the following compounds is used to obtain bakelite?

(A) Melamine and formaldehyde (B) 1, 3 - butadiene and styrene
(C) Phenol and formaldehyde (D) Chloroprene and neoprene

99. Which of the following polymers is known as nylon?

(A) polyesters (B) polythene
(C) polystyrene (D) Polyamide polymers

100. Which of the following is used as pain-killer?

(A) dettol (B) chloroxylenol
(C) paracetamol (D) 2, 4, 6-trichlorophenol

101. The Range of the function $y = \log(\sin x)$, defined for all x such that $\sin x > 0$ is ...

(A) $(-\infty, 0]$ (B) $(-\infty, 0)$

(C) R (D) $(0, \infty)$

102. If $\sin x \cos x = \frac{1}{4}$, then the general solution of the equation is ...

(A) $x = \frac{n\pi}{2} + (-1)^n \frac{\pi}{6}, n \in Z$

(B) $x = \frac{n\pi}{2} + (-1)^n \frac{\pi}{12}, n \in Z$

(C) $x = \frac{n\pi}{4} + (-1)^n \frac{\pi}{12}, n \in Z$

(D) $x = \frac{n\pi}{2} + (-1)^n \frac{\pi}{3}, n \in Z$

103. If $\tan\theta + \tan 2\theta + \tan 3\theta = \tan\theta \tan 2\theta \tan 3\theta$, then the most general value of θ for which all terms in the equation are defined is ...

(A) $\theta = \frac{n\pi}{6}, n \in Z$ (B) $\theta = \frac{n\pi}{3}, n \in Z$

(C) $\theta = \frac{n\pi}{2}, n \in Z$ (D) $\theta = n\pi \pm \frac{\pi}{3}, n \in Z$

104. In ΔABC, with usual notations, if $\sin B - \cos C = \cos A$, then

(A) a^2, b^2, c^2 form an Arithmetic Progression (B) b^2, c^2, a^2 form a Geometric Progression

(C) $a^2 = b^2 + c^2$ (D) $b^2 = a^2 + c^2$

105. In ΔABC, with usual notations, if $1 - \tan\frac{A}{2} \cdot \tan\frac{C}{2} = \frac{b}{k}$, then $k =$ ...

(A) s (B) $2s$

(C) $(s - a)$ (D) $(s - a)(s - b)$

106. If $n \in Z$, then the expression $\frac{2^n}{(1-i)^{2n}} + \frac{(1+i)^{2n}}{2^n}$ is equal to ...

(A) 0 (B) 2

(C) $[1 + (-1)^n]i^n$ (D) $2i^n$

107. If $\frac{(n+3)!}{(n^2-4)(n+1)!} = \frac{11}{6}$, for $n \in N, n \neq 2$, then the value of $3n - 20$ is equal to ...

(A) 8 (B) 10

(C) 4 (D) 5

108. A line passes through the points $O(0, 0), A(3, 3)$. Then the polar coordinates of point A are ...

(A) $\left(3\sqrt{3}, \frac{\pi^c}{4}\right)$ (B) $\left(3\sqrt{2}, \frac{\pi^c}{3}\right)$

(C) $\left(3\sqrt{2}, \frac{\pi^c}{4}\right)$ (D) $\left(2\sqrt{2}, \frac{\pi^c}{4}\right)$

109. The coordinates of the foot of the perpendicular from the point $(2, 3)$ on the line $x + y - 11 = 0$ are ...

(A) $(-6, 5)$ (B) $(5, 6)$

(C) $(-5, 6)$ (D) $(6, 5)$

110. If the sum of the slopes of the line represented by $x^2 + kxy - 3y^2 = 0$ is twice their product, then the acute angle between the lines $x^2 + kxy \operatorname{cosec}\alpha + y^2 = 0$ is ...

(A) α (B) 2α

(C) $\frac{\pi}{2} + \alpha$ (D) $\frac{\pi}{2} - \alpha$

111. The standard parametric equations of the circle $x^2 + y^2 - 4x - 6y - 12 = 0$ are ...

(A) $x = 2 + 5\cos\theta, y = 3 + 5\sin\theta$

(B) $x = -2 + 5\cos\theta, y = -3 + 5\sin\theta$

(C) $x = 2 + 12\cos\theta, y = 3 + 12\sin\theta$

(D) $x = 3 + 5\cos\theta, y = 2 + 5\sin\theta$

112. The area of the triangle formed by the vertex and the endpoints of the latus rectum of the parabola $x^2 = -18y$ is ...

(A) $\frac{81}{4}$ square units. (B) $\frac{81}{2}$ square units

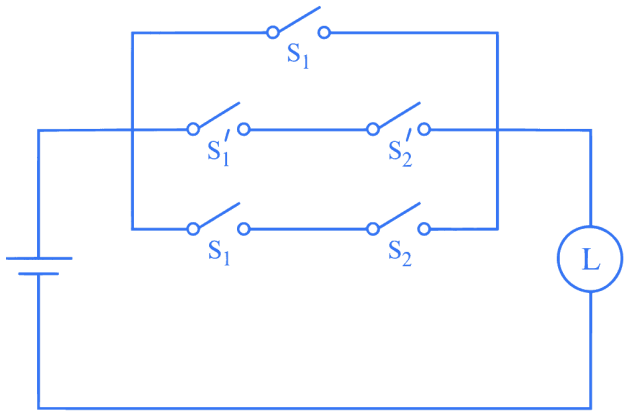
(C) $\frac{81}{3}$ square units (D) 81 square units

113. $\lim_{x\to 1}\left[\frac{2^{2x-2} - 2^x + 1}{\sin^2(x-1)}\right] =$

(A) 1 (B) $(\log 2)^2$

(C) $\log 2$ (D) $2\log 2$

114. Symbolic form of the circuit



is equivalent to .....

(A) $p \to q$ (B) $p \vee q$

(C) $\sim (p \wedge q)$ (D) $q \to p$

115. The dual statement of "$x = 1$ only if $x^2 = x$" is

(A) $x = 1$ and $x^2 = x$ (B) $x \neq 1$ or $x^2 = x$

(C) $x \neq 1$ and $x^2 = x$ (D) $x = 1$ or $x^2 \neq x$

116. If the truth values of p, q, r, s are respectively T, F, F, T then the truth values of the compound statements $\sim (p \to \sim q)$ and $(\sim r \wedge s) \to (p \wedge \sim q)$ are respectively ... and .....

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

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

117. If $A = \begin{bmatrix} \sin\alpha & -\cos\alpha \\ \cos\alpha & \sin\alpha \end{bmatrix}$ and $S = \left\{\alpha : \alpha \in \left(\frac{\pi}{2}, \frac{3\pi}{2}\right), A + A^{-1} = I\right\}$, then $\alpha = ...$

(A) $\frac{2\pi}{3}$ (B) $\frac{3\pi}{4}$

(C) $\frac{5\pi}{6}$ (D) π

118. Let A be an invertible matrix. Identify the correct statement(s) from the following.
(I) $A(\text{adj } A^{-1}) = \frac{1}{|A|}A^2$ (II) $(\text{adj } A^{-1})^{-1} = \frac{1}{|A|}A^{-1}$
(III) $(\text{adj } A) = \frac{1}{|A|}A^{-1}$

(A) only (I) (B) only (I) and (II)

(C) only (III) (D) only (II) and (III)

119. Let $f(x)$ be a function defined by $f(x) = \begin{cases} \int_0^x (|t-2|+3)dt, & x > 4 \\ 2x + 8, & x \leq 4 \end{cases}$ then $f(x)$ is ...

(A) continuous and differentiable everywhere

(B) neither continuous nor differentiable at $x = 4$

(C) continuous everywhere, but not differentiable at $x = 4$

(D) Differentiable at $x = 4$, but not continuous.

120. If the function defined by $f(x) = \begin{cases} ax^2 + bx + 1, & |2x-3| \geq 2 \\ 3x + 2, & \frac{1}{2} < x < \frac{5}{2} \end{cases}$ is continuous in its domain, then the values of a and b respectively are

(A) $\frac{-4}{5}, \frac{27}{5}$ (B) $\frac{5}{4}, -\frac{27}{5}$

(C) $1, \frac{27}{5}$ (D) $3, 11$

121. If $x = at^2$ and $y = 2at, t \neq 0$ then ...

(A) $x\frac{d^2x}{dy^2} + a = 0$ (B) $2a\frac{d^2x}{dy^2} - 1 = 0$

(C) $\frac{d^2x}{dy^2} - 2a = 0$ (D) $\frac{d^2x}{dy^2} - 1 = 0$

122. If $x = a\sin t - b\cos t, y = a\cos t + b\sin t$ and it is given that $\frac{d^2y}{dx^2} = 0$, then

(A) $x^2 + y^2 = a$ (B) $x^2 + y^2 = b$

(C) $x^2 + y^2 = 1$ (D) $x^2 + y^2 = 0$

123. If $y = (x-1)(x-2)(x-3)\cdots(x-100)$ and the value of $\frac{dy}{dx}$ at $x = 5$ is equal to $\lambda\left(\frac{100!}{100C_5}\right)$, then $\lambda = ...$

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

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

124. A man of height 2 meters walks at a uniform speed of 6 km/hr away from a lamp post of height 6 meters, then the rate at which the length of the shadow is increasing is ...

(A) 7 km/hr (B) 10 km/hr

(C) 3 km/hr (D) 23 km/hr

125. The sum of abscissa of the points on the curve $y = x^3 - 3x^2 + x - 2$ at which the tangent is parallel to the line $y = x$ is ___

(A) -6 (B) 2

(C) 0 (D) 6

126. For which of the following functions is Rolle's theorem not applicable?

(A) $f(x) = \log(x^2+2) - \log 3, on[-1,1]$

(B) $f(x) = 3 + (x-1)^{2/3}, on[0,3]$

(C) $f(x) = e^{1-x^2}, on[-1,1]$

(D) $f(x) = \sqrt{4-x^2}, on[-2,2]$

127. For $x \neq 0$, the value of $I = \int \frac{x^2-1}{(x^4+3x^2+1)\tan^{-1}\left(x+\frac{1}{x}\right)}dx$ is ...

(A) $\log\left(\tan^{-1}\left(x+\frac{1}{x}\right)\right)+c$

(B) $\log\left(\tan^{-1}\left(x-\frac{1}{x}\right)\right)+c$

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

(D) $\log\left(\tan^{-1}\left(\frac{1}{x}-x\right)\right)+c$

128. If $I_1 = \int \frac{e^x}{e^{2x}+e^x+1}dx$ and $I_2 = \int \frac{1}{e^{-2x}+e^{-x}+1}dx$, then $I_1 - I_2 =$

(A) $-\frac{1}{2}\log|e^{2x}+e^x+1| + \sqrt{3}\ \tan^{-1}\left(\frac{2e^x+1}{\sqrt{3}}\right)+c$

(B) $-\frac{1}{2}\log|e^{2x}+e^x+1| + \frac{\sqrt{3}}{2}\log\left|\frac{2e^x+1-\sqrt{3}}{2e^x+1+\sqrt{3}}\right|+c$

(C) $-\frac{1}{2}\log|e^{2x}+e^x+1| - \sqrt{3}\tan^{-1}\left(\frac{2e^x+1}{\sqrt{3}}\right)+c$

(D) $-\frac{1}{2}\log|e^{2x}+e^x+1| - \frac{\sqrt{3}}{2}\log\left|\frac{2e^x+1-\sqrt{3}}{2e^x+1+\sqrt{3}}\right|+c$

129. If $f(x) = \int \frac{x^2}{(1-x^2)(1+\sqrt{1-x^2})}dx$ and $f(0) = 2$, then $f\left(\frac{1}{2}\right) = ...$

(A) $\frac{1}{2}\log 3 - \frac{\pi}{3} + 2$ (B) $\frac{1}{2}\log 3 + \frac{\pi}{3} + 2$

(C) $\frac{1}{2}\log 3 - \frac{\pi}{6} + 2$ (D) $\frac{1}{2}\log 3 + \frac{\pi}{6} + 2$

130. If $\int \sin^4 x \cdot e^{\log(\cos x)}dx = \frac{1}{k}\sin^k x + C$, for $x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$, then ...

(A) $k = 4$ (B) $k = 0$

(C) $k = 1$ (D) $k = 5$

131. $\int_0^4 \sqrt{\frac{4-x}{4+x}}dx =$

(A) $2\pi - 4$ (B) $2\pi + 4$

(C) $2\pi - 2$ (D) $2\pi + 2$

132. If n is an odd natural number and $I_n = \int_0^1 e^x(x-1)^n dx$, then the value of $I_n + nI_{n-1}$ is equal to ...

(A) 2 (B) 0

(C) 1 (D) -1

133. The area (in sq. units) of the region bounded by the line $7x - 5y = 35$, the x-axis and the lines $x = -2$ and $x = 3$ is ...

(A) $\frac{63}{2}$ (B) $\frac{315}{2}$

(C) $\frac{63}{5}$ (D) $\frac{65}{2}$

134. The parabolas $y^2 = 4x$ and $x^2 = 4y$ divide the square region bounded by the lines $x = 4, y = 4$ and the coordinate axes. If $A1, A2, A3$ are respectively the areas of these parts numbered from top to bottom, then $A1 : A2 : A3$ is ...

(A) 1 : 2 : 3 (B) 3 : 2 : 1

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

135. The differential equation of the family of all straight lines touching the circle $x^2 + y^2 = 1$ is ...

(A) $\left(x - y\frac{dy}{dx}\right)^2 = 1 + \left(\frac{dy}{dx}\right)^2$

(B) $\left(y - x\frac{dy}{dx}\right)^2 = 1 + \left(\frac{dy}{dx}\right)^2$

(C) $\left(x + y\frac{dy}{dx}\right)^2 = 1 + \left(\frac{dy}{dx}\right)^2$

(D) $\left(y + x\frac{dy}{dx}\right)^2 = 1 + \left(\frac{dy}{dx}\right)^2$

136. If the function $y = f(x)$ satisfies the differential equation $x\frac{dy}{dx} = xy + y$ and $y(1) = e$, then which of the following is true?

(A) $f(x)$ is not continuous at $x = 0$ (B) $f(x)$ is decreasing in $(-1, \infty)$

(C) $f(x)$ is increasing in $(-1, \infty)$ (D) $f(x)$ has maxima at $x = 1$

137. If $yf(x) = g(x) + c$ where c is an arbitrary constant such that $\frac{dy}{dx} + yg(x) = f(x)$ and $[f(x)]^2 - [g(x)]^2 = 1$, then $\int f(x) \cdot g(x)dx = ...$

(A) $g(x) + c$ (B) $-g(x) + c$

(C) $f(x) + c$ (D) $-f(x) + c$

138. Let $\bar{a} = \hat{i} + \hat{j} + \hat{k}$ and $\bar{b} = \hat{i} - \hat{j} + 2\hat{k}$. If a vector $\bar{c}$ is coplanar with $\bar{a}$ and $\bar{b}$ such that $\bar{c} \cdot \bar{a} = 1$ and $\bar{c}$ is perpendicular to $\bar{b}$, then $\bar{c}$ is equal to ...

(A) $\frac{1}{3}(2\hat{i} + \hat{j} + \hat{k})$ (B) $\frac{1}{5}(2\hat{i} - \hat{j} + 4\hat{k})$

(C) $\frac{1}{7}(2\hat{i} + 4\hat{j} + \hat{k})$ (D) $\frac{1}{7}(2\hat{i} - 4\hat{j} - \hat{k})$

139. If $4\hat{i}+7\hat{j}+8\hat{k}, 2\hat{i}+3\hat{j}+4\hat{k}$ and $2\hat{i}+5\hat{j}+7\hat{k}$ are the position vectors of the vertices A, B and C respectively of the triangle ABC, then the largest angle of the triangle is (are) ...

(A) A (B) C

(C) A and C (D) B and C

140. For any vector, $\bar{a}$ if $\hat{i}\times(\bar{a}\times\hat{i})+\hat{j}\times(\bar{a}\times\hat{j})+\hat{k}\times(\bar{a}\times\hat{k})=m\bar{a}$, then the value of m is ...

(A) 2 (B) 3

(C) 1 (D) -1

141. Let O be the origin in 3D space. If the vertices $A(2,p,-3), B(q,-2,5)$, and $C(-5,1,r)$ of a triangle satisfy the vector relation $\overline{PA}+\overline{PB}+\overline{PC}=3\overline{PO}$ for any point P in space, then the values of (p,q,r) respectively are ...

(A) $(1,3,2)$ (B) $(1,3,-2)$

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

142. If $\bar{a},\bar{b}$ and $\bar{c}$ are three non-coplanar vectors and λ is a real number such that $[\lambda(\bar{a}+\bar{b})\lambda^2\bar{b}\lambda\bar{c}]=[\bar{a}\bar{b}+\bar{c}\bar{b}]$, then there is (are) ...

(A) exactly three values of λ (B) exactly two values of λ

(C) exactly one value of λ (D) no value of λ

143. Let $\bar{a}=\lambda\hat{i}+4\hat{j}$ and $\bar{b}=\hat{i}+\lambda\hat{j}$ where $\lambda\in Z$ such that $|\bar{a}|<6$. The number of possible values of λ for which $\bar{a}$ and $\bar{b}$ are non-collinear is ___

(A) 7 (B) 9

(C) 3 (D) 5

144. A line passing through $A(1,3,2)$ and parallel to the line $\frac{x-2}{1}=\frac{y-4}{2}=\frac{z-6}{1}$ intersects the plane $x-y+3z-6=0$ at point B. Another line through B and perpendicular to the plane $x-y+3z-6=0$ intersects the plane $2x-y+z+4=0$ at the point C. Then the equation of median of ΔABC through the vertex A is ...

(A) $\frac{x-1}{5}=\frac{y-3}{1}=\frac{z-2}{-1}$ (B) $\frac{x-1}{1}=\frac{y-3}{5}=\frac{z-2}{-1}$

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

145. The ratio in which the plane $\bar{r}\cdot(\hat{i}-2\hat{j}+3\hat{k})=17$ divides the line segment joining the points $(-1,4,7)$ and $(3,-5,8)$ is ...

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

(C) 3 : 8 (D) 1 : 4

146. If the lines $\bar{r}=(\hat{i}-\hat{j}+2\hat{k})+\lambda(\hat{i}+2\hat{k})$ and $\frac{x-p}{2}=y+2=z+1$ intersect, then the value of p is ...

(A) -1 (B) 1

(C) -2 (D) 2

147. A company sells two types of notebooks, A and B. Each notebook requires two processes: printing and binding. Notebook A requires 2 minutes for printing and 1 minute for binding. Notebook B requires 4 minutes for printing and 2 minutes for binding. The company can spend 6 hours on printing and 2 hours on binding. If the profit made on notebooks A and B is Rs. 2 and Rs. 5 respectively, then the Linear Programming Problem (LPP) to maximize the total profit z is ...

(A) maximize $z=2x+5y$ subject to $2x+y\le 360, 4x+2y\le 120, x\ge 0, y\ge 0$

(B) maximize $z=2x+5y$ subject to $2x+y\le 120, 4x+2y\le 360, x\ge 0, y\ge 0$

(C) maximize $z=2x+5y$ subject to $2x+4y\le 360, x+2y\le 120, x\ge 0, y\ge 0$

(D) maximize $z=2x+5y$ subject to $2x+4y\le 120, x+2y\le 360, x\ge 0, y\ge 0$

148. Given that $X\sim B(20,p)$ if $E(X)=8$ then $Var(X)$ is

(A) $\frac{8}{5}$ (B) $\frac{2}{5}$

(C) $\frac{24}{5}$ (D) $\frac{4}{5}$

149. If $P(X)$ and $F(X)$ are the probability mass function and cumulative distribution function of discrete random variable X where $X=\{0,1,2,3,\ldots,10\}$ and a,b are integers such that $0<a<b<10$, then the conditional probability $P(X\ge a/X\le b)$ is equal to ...

(A) $1-\frac{F(a-1)}{F(b)}$ (B) $1-\frac{F(a)}{F(b)}$

(C) $1-\frac{F(a)}{F(b-1)}$ (D) $1-\frac{F(a-1)}{F(b-1)}$

150. The number is selected randomly from the integers 1 to 100. The probability that the number selected has exactly three factors is ...

(A) $\frac{1}{25}$ (B) $\frac{1}{20}$

(C) $\frac{9}{100}$ (D) $\frac{1}{10}$

- End of Question Paper -