MHT CET 2026 PCM Apr 11 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. The period of oscillation of a simple pendulum is given by $T = 2\pi\sqrt{\frac{l}{g}}$ where l is about 80 cm and is known to have 0.1 cm accuracy. The period is about 1.5 s. The time of 50 oscillations is measured by a stop watch of least count 0.1 s. The percentage error in g is nearly

(A) 0.8 (B) 0.4
(C) 0.1 (D) 1

2. A car passes three points A, B and C at 3 m/s, 6 m/s and 9 m/s respectively in a straight line with uniform acceleration. If distance $AB = 60$ m then find the distance BC.

(A) 100 m (B) 75 m
(C) 200 m (D) 125 m

3. A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration a_c is varying with time t as, $a_c = k^2rt^2$. The power delivered to the particle by the forces acting on it is (K = constant)

(A) $m^2k^2r^2t^2$ (B) mk^2r^2t
(C) $2\pi mk^2r^2t$ (D) $\frac{mk^4r^2t^5}{3}$

4. The position vector of a particle is $\vec{r} = a\cos\omega t\hat{i} + a\sin\omega t\hat{j}$. Calculate the angle between its position vector and the velocity vector.
(
$\cos 0 = 1, \cos 90 = 0, \cos 60 = 0.5, \sin 30 = 0.5,$
$\sin 0 = 0$
)

(A) 30° (B) 60°
(C) 90° (D) 0°

5. Two massless springs of spring constants K_1 and K_2 are connected one after the other forming a single chain, suspended vertically and a certain mass is attached to the free end. If x_1 and x_2 are their respective extensions and 'F' is their stretching force, the total extension produced is

(A) $F(K_1 + K_2)$ (B) $F(1/K_1 - 1/K_2)$
(C) $F(K_1 - K_2)$ (D) $F(1/K_1 + 1/K_2)$

6. A wheel is rotating at 600 rpm about its axis of rotation. When the power is cut off, it comes to rest in half a minute. Its angular retardation expressed in rad/s^2 is (retardation is uniform)

(A) $\frac{2\pi}{3}$ (B) $\frac{\pi}{4}$
(C) π (D) $\frac{\pi}{6}$

7. A flywheel rotating about a fixed axis has a kinetic energy of 500 joule, if its angular frequency is 5 Hz, then calculate the moment of inertia of the wheel about the axis of rotation. ($\pi^2 = 10$)

(A) 0.6 kg m^2 (B) 1 kg m^2
(C) 0.75 kg m^2 (D) 0.15 kg m^2

8. Given below are two statements:
Statement I: Acceleration due to earth's gravity decreases as you go 'up' or 'down' from earth's surface.
Statement II: Acceleration due to earth's gravity is same at a height 'h' and depths 'd' from earth's surface, if $h = d$.
In the light of above statements, choose the most appropriate answer from the options given below.

(A) Statement I is incorrect but statement II is correct
(B) Both statement I and statement II are incorrect
(C) Statement I is correct but statement II is incorrect
(D) Both Statement I and II are correct.

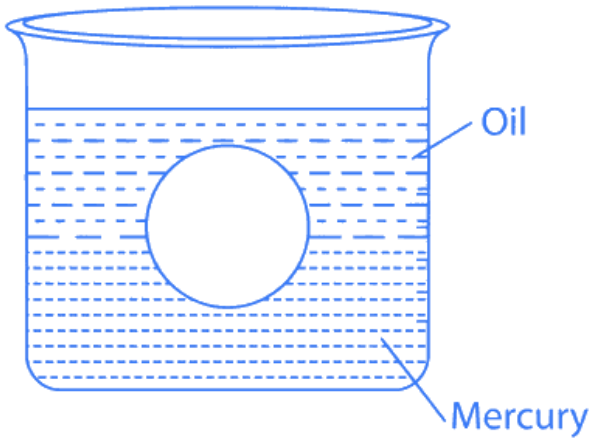
9. Two rain drops of same radius 'r' falling with same terminal velocity 'V' merge and form bigger drop of radius 'R'. The terminal velocity of big drop is

(A) $\frac{VR^2}{r^2}$ (B) $\frac{2VR}{r}$
(C) $\frac{VR}{r}$ (D) Vr^2/R^2

10. A spherical ball of radius 1 mm and density 10.5 g/cc is dropped in glycerine of coefficient of viscosity 9.8 poise and density 1.5 g/cc. Viscous force on the ball when it attains constant velocity is 3696×10^{-x} N. The value of x is
(Given, $g = 9.8\ \text{m/s}^2$ and $\pi = \frac{22}{7}$)

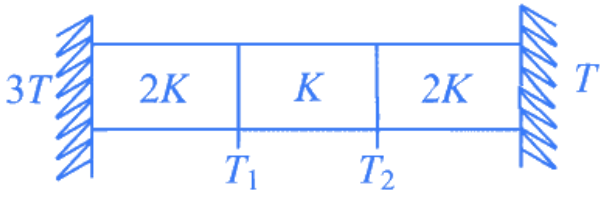
(A) 5 (B) 6
(C) 7 (D) 8

11. A vessel contains oil (density $= 0.8\ \text{gm/cm}^3$) over mercury (density $= 13.6\ \text{gm/cm}^3$). A homogeneous sphere floats with half of its volume immersed in mercury and the other half in oil. The density of the material of the sphere in gm/cm^3 is



(A) 12.8 (B) 7.2
(C) 6.4 (D) 3.3

12. Three identical heat conducting rods are connected in series as shown in the figure. The rods on the side have thermal conductivity $2K$ while that in the middle has thermal conductivity K. The left end of the combination is maintained at temperature $3T$ and the right end at T. The rods are thermally insulated from outside. In steady state, temperature at the left junction is T_1 and that at the right junctions is T_2. The ratio T_1/T_2 is



(A) $\frac{3}{2}$ (B) $\frac{4}{3}$
(C) $\frac{5}{3}$ (D) $\frac{4}{5}$

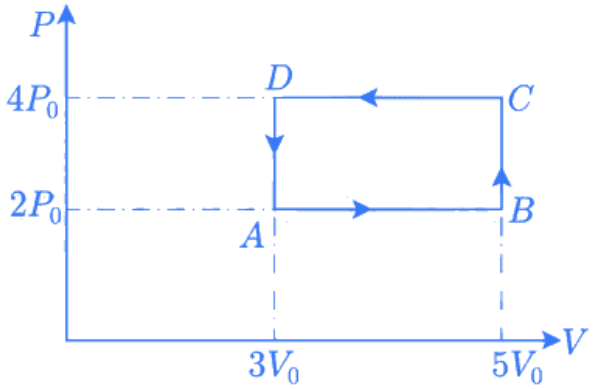
13. A wire of length L and diameter d is used in a bulb. The temperature of wire is T and power radiated by the wire is P. Its emissivity is (σ = Stefan's constant) (Assume that emissivity of wire material is same at all wavelength)

(A) $\frac{P}{\sigma T^4 \pi d L}$ (B) $\frac{P}{\sigma T^2 \pi d L}$
(C) $\frac{P}{\sigma T^2 \pi d^2 L^2}$ (D) $\frac{P^2}{\sigma T^4 \pi d L}$

14. The energy spectrum of a black body exhibits a maximum of wavelength λ_0. The temperature of the black body is now changed such that the energy is maximum at wavelength $\frac{3\lambda_0}{2}$. The ratio of power radiated by the black body will be

(A) $\frac{16}{9}$ (B) $\frac{16}{81}$
(C) $\frac{64}{27}$ (D) $\frac{4}{3}$

15. An ideal gas undergoes cyclic process ABCDA as shown in given p-V diagram. What is the magnitude of amount of work done by the gas?



(A) $6P_0V_0$ (B) $4P_0V_0$
(C) $2P_0V_0$ (D) P_0V_0

16. Two samples A and B of gas initially at the same pressure and temperature. They are compressed from volume V to $\frac{V}{2}$ (A isothermally and B adiabatically). The relation between pressure of the gas A (P_A) and pressure of gas B (P_B) is

(A) $P_A < P_B$ (B) $P_A > P_B$
(C) $P_A = P_B$ (D) $P_A = 2P_B$

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17. A vessel has 6 gram of hydrogen at pressure P and temperature 500 K. A small hole is made in it so that hydrogen leaks out. How much hydrogen leaks out if the final pressure is $\frac{P}{2}$ and the temperature falls to 300 K?

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

18. A particle executes simple harmonic motion between $x = -A$ and $x = +A$. If time taken by particle to go from $x = 0$ to $\frac{A}{2}$ is 2s, then time taken by particle in going from $x = \frac{A}{2}$ to A is

(A) 3 s (B) 2 s
(C) 1.5 s (D) 4 s

19. There is a body having mass m and performing SHM with amplitude 'a'. There is a restoring force $F = -Kx$, where x is the displacement. The total energy of the body depends upon which of the following?

(A) K, a, x (B) K, a, v
(C) K, x (D) K, a

20. What is the effect of humidity on sound waves when humidity increases?

(A) Speed of sound waves is more. (B) Speed of sound waves is less.
(C) Speed of sound waves remains same. (D) Speed of sound waves becomes zero.

21. A tuning fork of frequency n produces x beats per second when sounded with a vibrating sonometer string. What must have been the frequency of the string, when a slight increase in tension produces lesser beats per second than before?

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

22. A string of length 0.5 m and mass 10^{-3} kg is tightly clamped at its ends. The tension in the string is 0.8 N. Identical wave pulses are produced at one end at equal intervals of time Δt. What is the minimum value of Δt which allows constructive interference between successive pulses?

(A) 0.40 s (B) 0.20 s
(C) 0.10 s (D) 0.05 s

23. Which of the following statements is NOT TRUE?
a. Work done to move a charge on an equipotential surface is not zero.
b. Equipotential surfaces are the surfaces where the potential is constant.
c. Equipotential surfaces for a uniform electric field are parallel and equidistant from each other.
d. Electric field is always perpendicular to an equipotential surface.

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

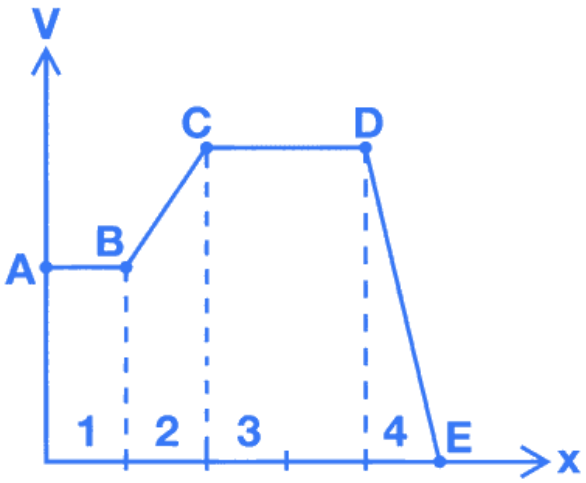
24. Two metal sphere of radius R and $3R$ have same surface charge density σ. If they are brought in contact and then separated, the surface charge density on smaller and bigger sphere becomes σ_1 and σ_2, respectively. The ratio $\frac{\sigma_1}{\sigma_2}$ is.

(A) $\frac{1}{9}$ (B) 9
(C) $\frac{1}{3}$ (D) 3

25. Three charges q, Q and $+4q$ are placed in a straight line of length d at points at distance 0, $\frac{d}{3}$, $\frac{2d}{3}$ respectively. In order to make the net force on q be zero, the value of Q should be

(A) $\frac{-q}{2}$ (B) $\frac{-3q}{2}$
(C) $\frac{-4q}{3}$ (D) $\frac{-4q}{9}$

26. Following figure indicates the electric potential V as a function through 4 regions on x-axis. Which of the following is correct for the electric field E in these regions?



(A) $E_1 < E_2 < E_3 < E_4$

(B) $E_2 = E_4$ and $E_1 < E_2$

(C) $E_1 = E_3$ and $E_2 < E_4$

(D) $E_1 > E_2 > E_3 > E_4$

27. A parallel plate capacitor has plate area 40 cm^2 and plates separation 2 mm. The space between the plates is filled with a dielectric medium of a thickness 1 mm and dielectric constant 5. The capacitance of the system is

(A) $24\epsilon_0$ F

(B) $\frac{3}{10}\epsilon_0$ F

(C) $\frac{10}{3}\epsilon_0$ F

(D) $10\epsilon_0$ F

28. In a metre bridge experiment the balance point is obtained if the gaps are closed by 2 Ω and 3Ω. A shunt of X Ω is added to 3 Ω resistor to shift the balancing point by 22.5 cm. The value of X is

(A) 1

(B) 2

(C) 3

(D) 4

29. A galvanometer has a current range of 10 mA and a voltage range of 0.75 V. To convert this galvanometer into an ammeter of range 10 A, what is the shunt resistance?

(A) $\frac{100}{999}\Omega$

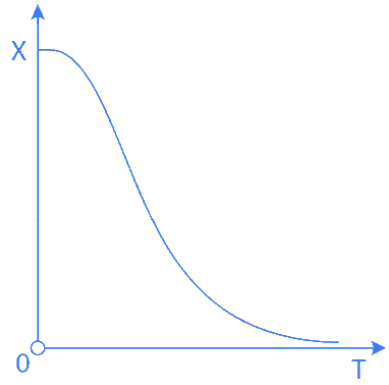
(B) $\frac{50}{999}\Omega$

(C) $\frac{200}{999}\Omega$

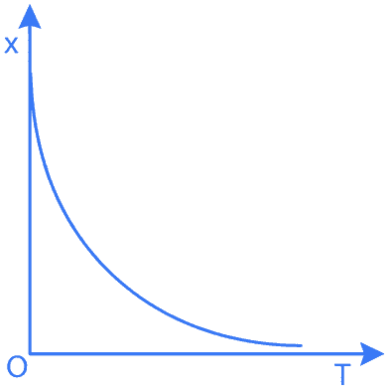
(D) $\frac{75}{999}\Omega$

30. Which of the following figure best represents the variation of magnetic susceptibility (χ) with temperature for a diamagnetic substance?

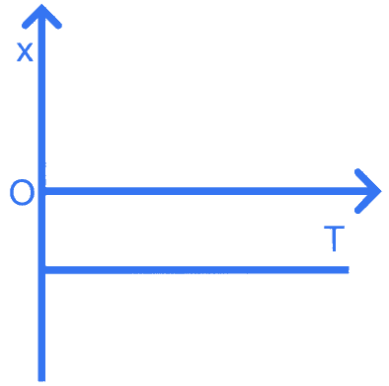
(A)



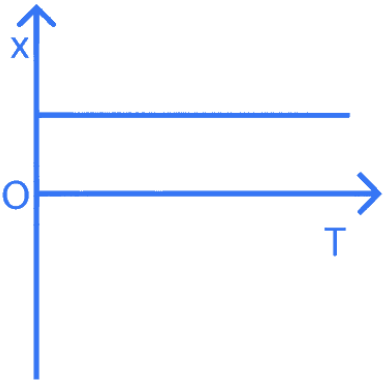
(B)



(C)



(D)



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31. A wire of length L is bent in the form of a circular coil and current 'i' is passed through it. This coil is kept in magnetic field. The torque acting on the coil will be maximum, when the number of turns is ___

(A) 1 (B) 2

(C) 4 (D) As large as possible

32. Two long parallel wires carrying currents 8A and 15A in opposite directions are placed at a distance of 7 cm from each other. A point P is at equidistant from both the wires such that the lines joining the point P to the wires are perpendicular to each other. The magnetic field at P is ___ $\times 10^{-6}$ T. (Given: $\sqrt{2} = 1.4$, $\mu_0 = 4\pi \times 10^{-7}$ SI unit)

(A) 62 (B) 65

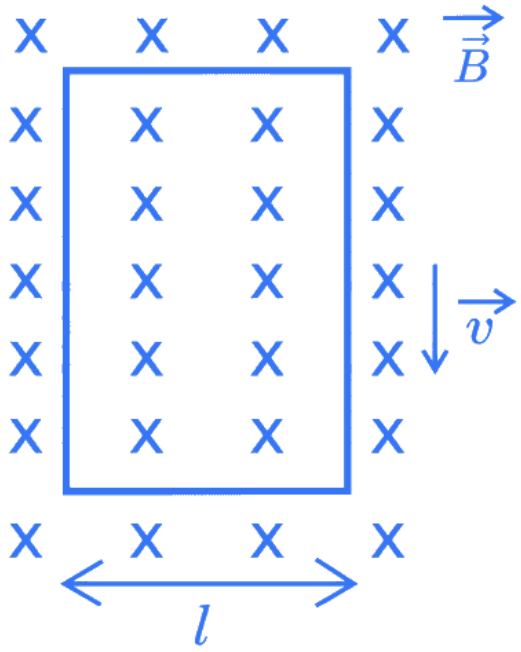
(C) 68 (D) 70

33. A square loop of area 25 cm^2 has a resistance of 10 Ω. The loop is placed in uniform magnetic field of magnitude 40 T. The plane of the loop is perpendicular to the magnetic field. The work done in pulling the loop out of the magnetic field slowly and uniformly in one second will be

(A) 2.5×10^{-3} J (B) 1.0×10^{-3} J

(C) 1.0×10^{-4} J (D) 5×10^{-3} J

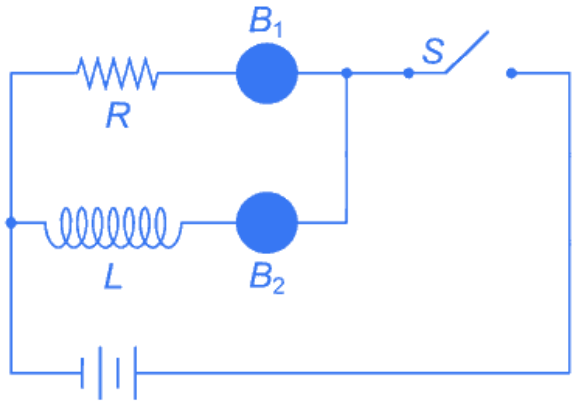
34. A long rectangular conducting loop of width 'l' mass 'm' and resistance 'R' is placed partly in a perpendicular magnetic field 'B'. With what velocity should it be pushed downwards so that it may continue to fall without any acceleration? (g = acceleration due to gravity)



(A) $\frac{B^2 l^2 R^2}{mg}$ (B) $\frac{mgR}{B^2 l^2}$

(C) $\frac{mgl}{B^2 R^2}$ (D) $\frac{mgR^2}{Bl}$

35. The following figure represents two bulbs B_1 and B_2, resistor R and an inductor L. When the switch S is turned off, which of the following statement is true?



(A) B_1 becomes off promptly but B_2 with some delay

(B) B_2 becomes off promptly but B_1 with some delay

(C) Both B_1 and B_2 becomes off with same delay

(D) Both B_1 and B_2 becomes off promptly

36. An inductor of reactance 100 Ω, a capacitor of reactance 50 Ω, and a resistor of resistance 50 Ω are connected in series with an AC source of 10 V, 50 Hz. Average power dissipated by the circuit is ____

(A) 1 W (B) 2 W

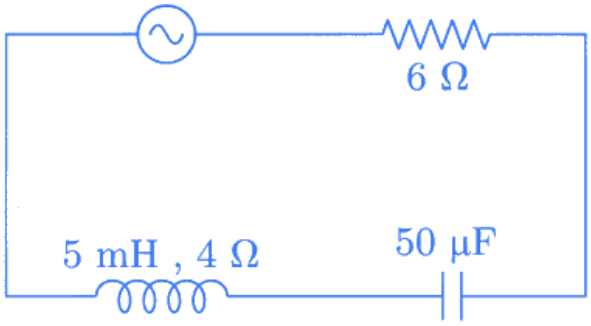
(C) 3 W (D) 4 W

37. In an AC circuit $E = 50\sin(500t)$, $I = 600\sin\left(500t + \frac{\pi}{3}\right) mA$. What is the power dissipated in the circuit? $[\cos 60^\circ = 0.5]$

(A) 10 W (B) 75 W

(C) 7.5 W (D) 50 W

38. In the circuit shown below, the ac source has voltage $V = 30\cos(\omega t)$ volt with $\omega = 2000$ rad/s. What will be the amplitude of the current?



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

(C) 3 A (D) 3.3 A

39. For large magnifying power of a telescope

(A) object must be large (B) focal length of objective is large

(C) focal length of eyepiece is large (D) focal length of objective and eyepiece must be large

40. A ray of light is incident of the surface of a glass plate at an angle of incidence equal to Brewster's angle Φ. If μ denotes the refractive index of glass w.r.t. air, then what will be the angle between reflected and refracted rays?

(A) $90^\circ - \sin^{-1}(\sin\Phi/\mu)$

(B) 90°

(C) $\sin^{-1}(\mu\cos\Phi)$

(D) $90^\circ + \Phi$

41. Two polaroid A and B placed in such a way that the pass-axis of polaroid are perpendicular to each other. Now, another polaroid C is placed between A and B bisecting angle between them. If intensity of unpolarised light is I_0 then intensity of transmitted light after passing through polaroid B will be

(A) $\frac{I_0}{4}$ (B) $\frac{I_0}{2}$

(C) $\frac{I_0}{8}$ (D) zero

42. In a Young's double slit experiment, the intensities at two points, for the path difference $\frac{\lambda}{4}$ and $\frac{\lambda}{3}$ (λ being the wavelength of light used) are I_1 and I_2 respectively. If I_0 denotes the intensity produced by each one of the individual slits, then $\frac{I_1 + I_2}{I_0} =$

$\left(\cos 45^\circ = \frac{1}{\sqrt{2}}, \cos 60 = \frac{1}{2}\right)$

(A) 2 (B) 3

(C) 4 (D) 5

43. Two light waves amplitudes in the ratio 3 : 1 produce interference. The ratio of the maximum to minimum intensity is

(A) 9 : 4 (B) 16 : 9

(C) 3 : 2 (D) 4 : 1

44. Photoelectric emission is observed from a metallic surface for frequencies v_1 and v_2 of the incident light rays ($v_1 > v_2$). If the maximum values of kinetic energy of the photoelectrons emitted in the two cases are in the ratio of k : 1, then what is the threshold frequency of the metallic surface?

(A) $\frac{v_1 - v_2}{k}$ (B) $\frac{v_1 - v_2}{k - 1}$

(C) $\frac{kv_1 - v_2}{k - 1}$ (D) $\frac{kv_2 - v_1}{k - 1}$

45. A photon and an electron have equal energy E. The ratio of λ(electron) to λ(photon) is proportional to

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

(C) $1 : E$ (D) $1 : E^2$

46. The kinetic energy of the electron in an orbit of radius r in hydrogen atom is proportional to (e = electronic charge)

(A) $\frac{e^2}{2r^2}$ (B) $\frac{e^2}{r}$

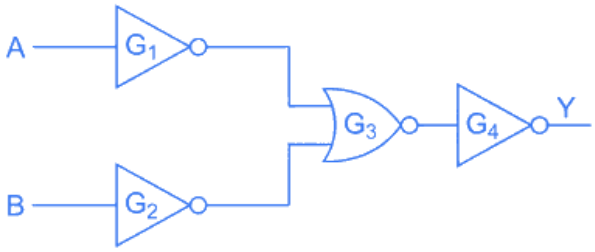
(C) $\frac{e^2}{2r}$ (D) $\frac{e^2}{r^2}$

47. The number of revolutions per second made by an electron in the first Bohr orbit of hydrogen atom is (h = Planck's constant, m is the mass of electron and r is the radius of the orbit.)

(A) $h/4\pi^2mr^2$ (B) $h/4\pi^2mr$

(C) $h/4\pi mr$ (D) $h/4\pi^2m^2r^2$

48. What does the following combination of gates produce?



(A) NAND gate (B) NOR gate

(C) XOR gate (D) AND gate

49. In common emitter transistor amplifier, the output resistance is 500 kΩ and the current gain $\beta = 50$. If power gain of amplifier is 5×10^6, what is the input resistance?

(A) 325Ω (B) 150Ω

(C) 350Ω (D) 250Ω

50. When the conductivity of a semiconductor is only due to breaking of covalent bonds, the semiconductor is called

(A) extrinsic. (B) intrinsic.

(C) p-type. (D) n-type.

51. Calculate the mass of 100 molecules of oxygen in amu and in grams.

(A) 3200 u and 5.314×10^{-21} g
(B) 1600 u and 2.657×10^{-21} g
(C) 32 u and 1.328×10^{-21} g
(D) 8 u and 3.978×10^{-21} g

52. Match **List I** with **List II**

List I **Element**	**List II** **Number of Neutron**
(A). $^{24}_{12}Mg$	(I). 5
(B). $^{27}_{13}Al$	(II). 12
(C). $^{9}_{4}Be$	(III). 6
(D). $^{12}_{6}C$	(IV). 14

Choose the **correct** answer from the options given below:

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

53. Which of the following hydrides of Group 16 elements has highest reducing property?

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

54. Identify the shape of IF_5 molecule from the following options.

(A) Trigonal bipyramidal
(B) Square planar
(C) Hexagonal
(D) Square pyramidal

55. According to the kinetic molecular theory of gases, the average kinetic energy of gas molecules:

(A) Increases with increase in pressure
(B) Decreases with increase in volume
(C) Is directly proportional to the absolute temperature
(D) Is the same for all gases at the same volume

56. Calculate the enthalpy change for the following reaction, using given bond energy (kJ/mol)
(C-H = 414, H-O = 463, H-Cl = 431, C-Cl = 326 and C-O = 335)
$CH_3OH_{(g)} + HCl_{(g)} \rightarrow CH_3Cl_{(g)} + H_2O_{(g)}$

(A) $-23\ kJmol^{-1}$
(B) $-42\ kJmol^{-1}$
(C) $-59\ kJmol^{-1}$
(D) $-51\ kJmol^{-1}$

57. Calculate the work done when 1 mole of an ideal gas is expanded reversibly and isothermally from initial pressure 10 bar to final pressure 1 bar at constant temperature 300 K. [$R = 8.314\ J\ K^{-1}\ mol^{-1}$]

(A) -5.744 kJ
(B) -5.123 kJ
(C) -6.514 kJ
(D) -4.981 kJ

58. Which of the following processes exhibits, $\Delta U = 0$?

(A) Adiabatic process
(B) Isothermal process
(C) Isobaric process
(D) Isochoric process

59. Which of the following aqueous solution of salt have $pH < 7$ at 298 K?

(A) KNO_3
(B) Na_2CO_3
(C) CH_3COONH_4
(D) $CuCl_2$

60. What happens when solid Na_2CO_3 dissolved in water?

(A) an increase in $[OH^-]$
(B) no change in pH
(C) an increase in $[H^+]$ ions
(D) turns blue litmus red.

61. What happens when $CuSO_4$ is dissolved in water?
Identify correct statements from the following

(A) Anion of the salt react with water.
(B) Its solution will turn red litmus into blue.
(C) The pH of the solution will be less than 7.
(D) The $CuSO_4$ will not undergo hydrolysis reaction.

62. Which of the following is obtained when dihydrogen reacts with the alkali metals at high temperature?

(A) Alkoxides
(B) Metal hydrides
(C) Peroxides
(D) Metal nitrites

63. What type of isomerism is exhibited by neopentane?

(A) position (B) chain
(C) geometrical (D) tautomerism

64. Which from following is obtained as major product when methoxybenzene is treated with nitrating mixture?

(A) 2-Nitroanisole (B) 4-Nitroanisole
(C) 4-Nitrophenol (D) 2-Nitrophenol

65. Which of the following compounds is carcinogenic and toxic?

(A) Alkane (B) Alkyne
(C) Benzene (D) Alkene

66. Pt has FCC structure with an edge length of unit cell 392 pm. What is the radius of Pt?

(A) 138.6 pm (B) 175.6 pm
(C) 185.6 pm (D) 205.6 pm

67. In a cubic unit cell of an ionic compound, the eight corners are occupied by anions and cations at the center of the cube. Calculate the volume of the unit cell if density of the unit cell is 4 g cm^{-3}. [Molar mass of compound $= 168.6$ g mol^{-1} and $N_A = 6.022 \times 10^{23}$]

(A) 5.0×10^{-23} cm^3 (B) 6.0×10^{-23} cm^3
(C) 7.0×10^{-23} cm^3 (D) 8.0×10^{-23} cm^3

68. What is the total number of spheres that surrounds the tetrahedral hole in the close-packed three-dimensional structure?

(A) 2 (B) 4
(C) 6 (D) 8

69. Which of the following is a green alternative for dry cleaning solvents?

(A) Benzene (B) Carbon tetrachloride
(C) Perchloroethylene (D) Supercritical CO_2

70. Vapour pressure of CCl_4 at 25°C is 143 mm Hg. If 0.5 g of a non-volatile solute is dissolved in 100 cm^3 of CCl_4. Find the vapour pressure of the solution.
(Density of $CCl_4 = 1.58$ g/cm^3 and molecular weight of solute is 65)

(A) 141.93 mm (B) 194.39 mm
(C) 199.34 mm (D) 143.99 mm

71. The solubility of N_2 gas in water at 25°C and 1 bar is 6.85×10^{-4} mol L^{-1}. Calculate the solubility of N_2 gas in water at the same temperature when the partial pressure of N_2 is 0.70 bar

(A) 5.138×10^{-4} mol L^{-1}
(B) 5.480×10^{-4} mol L^{-1}
(C) 4.795×10^{-4} mol L^{-1}
(D) 4.875×10^{-4} mol L^{-1}

72. Identify from the following pair of solutions that exhibits the same osmotic pressure.
[molar mass of urea $= 60$ g mol^{-1} and molar mass of glucose $= 180$ g mol^{-1}]

(A) 6 g/L urea solution and 18 g/L glucose solution. (B) 12 g/L urea solution and 18 g/L glucose solution.
(C) 18 g/L urea solution and 18 g/L glucose solution. (D) 6 g/L urea solution and 6 g/L glucose solution.

73. At 298 K, the specific conductance (κ) of a 0.0020 M NaCl solution is 2.50×10^{-4} S cm^{-1}. Calculate the molar conductivity (Λ_m) of the solution in S cm^2 mol^{-1}.

(A) 125 (B) 62.5
(C) 12.5 (D) 250

74. Which of the following statements is correct regarding electrolysis of molten NaCl?

(A) Pale green Cl_2 gas released at anode (B) Molten silvery white sodium is deposited at cathode
(C) Decomposition of NaCl into Na metal and Cl_2 gas (D) Both options A and B

75. Which of the following statements is true about the voltaic cell?

(A) It converts chemical energy into electrical energy. (B) It converts electrical energy into chemical energy.
(C) The anode of voltaic cells is positive. (D) The cathode of voltaic cell is negative.

76. Identify the function of salt bridge.

(A) As cathode (B) As anode
(C) To connect two half cells. (D) To measure electrode potential.

77. A first order reaction complete 60% in 20 minutes. How long will the reaction take to complete 84%?

(A) 54 min (B) 68 min

(C) 40 min (D) 76 min

78. The rate constant for a first order reaction is 60 s^{-1}. How much time will it take to reduce the concentration of the reactant to $1/20^{th}$ of its initial value?

(A) 0.0529 s (B) 0.0852 s

(C) 0.0499 s (D) 0.0357 s

79. Which of the following statements is NOT true about the rate constant?

(A) It is proportionality constant in rate law that relates reaction rate to reactant concentrations.

(B) It is independent of concentration of reactant.

(C) It varies with temperature.

(D) Greater the value of rate constant slower is the reaction.

80. Which of the following assertions about the extent of physisorption is correct?

(A) Increases with increase in temperature

(B) Decreases with increase in surface area

(C) Decreases with increase in the strength of Van der Waals forces

(D) Decreases with increase in temperature

81. Which of the following is not characteristics of interhalogen compounds?

(A) Covalent nature

(B) Volatile but not explosive

(C) Form addition products with unsaturated hydrocarbons.

(D) Behave as strong reducing agent.

82. Identify the set of paramagnetic ions among the following.

(A) V^{+2}, Co^{+2}, Ti^{+4} (B) $Ni^{+2}, Cu^{+2}, Zn^{+2}$

(C) $Ti^{+2}, Cu^{+2}, Mn^{+3}$ (D) Sc^{+3}, Ti^{+3}, V^{+3}

83. Why zinc does not exhibit variable oxidation states?

(A) Completely filled $4s$ subshell

(B) Completely filled $3d$ subshell

(C) Incomplete $3d$ subshell

(D) Incomplete $4s$ subshell

84. Identify the hybridization in central metal of $[Fe(CO)_5]$ complex.

(A) dsp^3 (B) sp^3d^2

(C) d^2sp^3 (D) sp^3

85. In a complex compound, central metal ion is

(A) Arrhenius acid (B) Arrhenius base

(C) Lewis acid (D) Lewis base

86. Which one of the following factors proceeds more rapidly, unimolecular nucleophilic substitution reaction?

(A) Aprotic solvent

(B) Stronger nucleophile

(C) Weaker nucleophile

(D) Polar protic solvent

87. Wurtz reaction is NOT possible with

(A) $(CH_3)_3CCl$ (B) CH_3Br

(C) C_2H_5-Cl (D) $(C_2H_5)_2$-CH-I

88. The major product 'B' in the below mentioned reaction is-



(A) Bromoethane (B) 1-Bromopropane

(C) 2-Bromopropane (D) Carbontetrabromide

89. Which from following is a suitable method for preparation of ether?

(A) Reacting sodium methoxide and tertiary butyl bromide

(B) Reacting sodium tertiarybutoxide and methyl bromide

(C) Reacting methyl alcohol and ethene

(D) Reacting methyl alcohol and methyl bromide

90. The molecule with a maximum boiling point is

(A) $CH_3 - CH(OH) - CH_2 - CH_2 - OH$

(B) $CH_3 - CH_2 - Br$

(C) $CH_3 - CH_2 - CH_2 - Br$

(D) $CH_3 - C(CH_3)(Cl) - OH$

91. Which of the following reactions is an example of a disproportionation reaction?

(A) Wolf-Kishner reduction.

(B) Aldol condensation.

(C) Clemmenson reduction.

(D) Cannizzaro reaction.

92. Acetaldehyde, when heated in the presence of sodium hydroxide and iodine forms

(A) Sodium formate

(B) Sodium acetate

(C) Ethanol

(D) Iodoethane

93. Identify the product obtained when Grignard reagent reacts with alkyl cyanide followed by acid hydrolysis.

(A) an aldehyde

(B) a ketone

(C) a primary alcohol

(D) a secondary alcohol

94. Which of following amines exhibits carbylamine test?

(A) Tertiary amine

(B) Secondary amine

(C) Primary amine

(D) Both Secondary and Tertiary amine

95. Identify the product obtained when RCN is treated with sodium and alcohol.

(A) $RCONH_2$

(B) $RCOONH_4$

(C) RCH_2NH_2

(D) $R(CH_2)_3NH_2$

96. The reaction of glucose with acetic Anhydride, confirms the

(A) straight chain structure of glucose

(B) presence of carbonyl group

(C) presence of keto group

(D) presence of five hydroxyl group

97. The secondary structure of protein is determined by

(A) co-ordinate bond

(B) covalent bond

(C) ionic bond

(D) hydrogen bond

98. Which of the following compounds are used to obtain terylene polymer?

(A) Ethane-1,2-diol and Benzene-1,3 dicarboxylic acid

(B) Propane-1, 2-diol and Benzene-1, 4 dicarboxylic acid

(C) Ethane-1,2-diol and Benzene-1, 4 dicarboxylic acid

(D) Ethane-1,2-diol and Benzene-1, 2 dicarboxylic acid

99. Which of the following polymers is also called as dacron?

(A) Teflon

(B) PVC

(C) Bakelite

(D) Terylene

100. What type of drug the aspirin is?

(A) Analgesic

(B) Antimicrobial

(C) Anti-oxidant

(D) Antibiotic

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

(A) $\exists x \in A$, such that $x + 4 \leq 9$

(B) $\exists x \in A$, such that $12 - x = 7$

(C) $\forall x \in A, x + 3 \geq 4$

(D) $\exists x \in A$, such that $x + 2 < 3$

102. If $-1 + \sqrt{-3} = re^{i\theta}$, then the value of θ is

(A) $-\frac{2\pi}{3}$

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

(C) $-\frac{\pi}{3}$

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

103. There are 5 boys and 3 girls seated in a row for a photograph. The number of ways in which a photograph can be taken if the girls occupy only odd places is...

(A) 5040

(B) 2880

(C) 720

(D) 40320

104. The value of the expression $\tan(x - 9\pi)$ is equal to:

(A) $-\tan x$

(B) $-\cot x$

(C) $\tan x$

(D) $\cot x$

105. The principal solutions of $\operatorname{cosec}(\theta) = -2$ are...

(A) $\frac{\pi}{6}, \frac{5\pi}{6}$

(B) $\frac{5\pi}{6}, \frac{7\pi}{6}$

(C) $\frac{7\pi}{6}, \frac{11\pi}{6}$

(D) $\frac{\pi}{6}, \frac{11\pi}{6}$

106. The equation of a line passing through the point of the intersection of the lines $x - y + 1 = 0$ and $2x + 3y - 8 = 0$ and having x intercept 3 is

(A) $x + y + 3 = 0$

(B) $x + y - 3 = 0$

(C) $x - y + 3 = 0$

(D) $-x + y - 2 = 0$

107. If the equation $x^2 - ky^2 - 4x + 6y - 5 = 0$ represents a pair of straight lines, then their point of intersection is

(A) $(1, 2)$

(B) $(2, 3)$

(C) $(3, 4)$

(D) $(4, 5)$

108. The equation of a circle which passes through the points $(2, 3)$ and $(4, 5)$ and whose center lies on the straight line $y - 4x + 3 = 0$ is

(A) $x^2 + y^2 - 4x - 10y + 25 = 0$

(B) $x^2 + y^2 - 4x - 10y - 25 = 0$

(C) $x^2 + y^2 - 4x + 10y - 25 = 0$

(D) $x^2 + y^2 + 4x - 10y + 25 = 0$

109. The value of $\lim_{x \to 3} \frac{[x] - 3}{x - 3}$, where $[\cdot]$ denotes the greatest integer function, is.....

(A) ∞

(B) 1

(C) 0

(D) does not exist

110. If the truth value of the compound statement $[(p \vee q) \wedge (q \to r) \wedge (\sim r)] \to (p \wedge q)$ is False then the truth values of $p \to q$ and $q \to p$ are respectively.....

(A) (T, T)

(B) (T, F)

(C) (F, T)

(D) (F, F)

111. The statement pattern $(p \vee q) \to \sim r$ is logically equivalent to

(A) $(\sim p \vee \sim q) \vee \sim r$

(B) $(\sim p \wedge \sim q) \wedge \sim r$

(C) $(\sim p \wedge \sim q) \vee \sim r$

(D) $(\sim p \vee \sim q) \wedge \sim r$

112. In $\triangle ABC$, with usual notations, if $\cos A = \frac{1}{2}, a = 3, \angle B = \frac{\pi^c}{6}$, then the values of b and c are.....

(A) $b = \sqrt{3}, c = \sqrt{3}$

(B) $b = 2\sqrt{3}, c = \sqrt{3}$

(C) $b = \sqrt{3}, c = 2\sqrt{3}$

(D) $b = \sqrt{3}, c = \frac{1}{\sqrt{3}}$

113. If $A = \frac{1}{2}\begin{bmatrix} -1 & -\sqrt{3} \\ \sqrt{3} & -1 \end{bmatrix}$ then $A^{-1} - A^2$ is not

(A) a null-matrix

(B) a unit matrix

(C) a diagonal matrix

(D) a scalar matrix

114. If $A = \begin{bmatrix} 2i & i^3 \\ i^2 & 1 \end{bmatrix}$, then A^{-1} is equal to

(A) $\begin{bmatrix} -i & 1 \\ -i & 2 \end{bmatrix}$

(B) $\begin{bmatrix} i & 1 \\ i & -2 \end{bmatrix}$

(C) $\begin{bmatrix} -i & -1 \\ i & -2 \end{bmatrix}$

(D) $\begin{bmatrix} i & -1 \\ -i & 2 \end{bmatrix}$

115. The minimum value of $(\sin^{-1} x)^2 + (\cos^{-1} x)^2$ is.....

(A) $\frac{\pi^2}{8}$ (B) $\frac{3\pi^2}{8}$

(C) $\frac{5\pi^2}{8}$ (D) $\frac{7\pi^2}{8}$

116. If

$$\tan^{-1}(1) + \tan^{-1}(3) + \tan^{-1}(5) + \tan^{-1}\left(\frac{1}{4}\right) = \pi + \tan^{-1}\left(\frac{\alpha}{2}\right)$$

, then the value of α is...

(A) $\frac{46}{41}$ (B) $\frac{23}{41}$

(C) $\frac{42}{41}$ (D) $\frac{44}{41}$

117. The domain of the function $f(x) = \sqrt{x-1} + \sqrt{3-x}$ is ...

(A) $[0, \infty)$ (B) $\mathbb{R}$

(C) $[1, 3]$ (D) $[2, 2]$

118. Let the function $f(x)$ be defined as:

$$f(x) = \begin{cases} \left[\tan\left(\frac{\pi}{4} + x\right)\right]^{\frac{1}{x}}, & x \neq 0 \\ k, & x = 0 \end{cases}$$

If $f(x)$ is continuous at $x = 0$, then the value of k is...

(A) e (B) e^2

(C) $\frac{1}{e^2}$ (D) $\frac{1}{e}$

119. If $y = f\left(\frac{3+2x}{3-2x}\right)$, where $f(x) = \tan(\log x)$ and $\frac{dy}{dx} = \left(\frac{A}{B+Cx^2}\right) \cdot \sec^2\left(\log\left(\frac{3+2x}{3-2x}\right)\right)$, then the respective values of A, B and C are .....

(A) $3, 2, -4$ (B) $12, -9, 4$

(C) $6, 6, -2$ (D) $12, 9, -4$

120. If $y = \sqrt{x^2 + 8x + 3}$, then the value of $\frac{d^2y}{dx^2}$ at $x = 3$ is

(A) $\frac{-13}{216}$ (B) $\frac{13}{216}$

(C) $\frac{15}{216}$ (D) $\frac{-15}{216}$

121. If $y = \sqrt{\tan x + \sqrt{\tan x + \sqrt{\tan x + \cdots\cdots\cdots\infty}}}$, then $\left(\frac{dy}{dx}\right)^2$ at $x = \frac{\pi}{4}$ is

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

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

122. If $y = \sqrt{x + \sqrt{x^2+1}}$, then the value of $\frac{dy}{dx}$ is

(A) $\frac{\sqrt{x^2+1}+x}{2y\sqrt{x^2+1}}$ (B) $\frac{\sqrt{x^2+1}+x}{y\sqrt{x^2+1}}$

(C) $\frac{\sqrt{x^2+1}-x}{2y\sqrt{x^2+1}}$ (D) $\frac{\sqrt{x^2+1}+x}{2y\sqrt{x^2-1}}$

123. If $y = \sin(e^{\log 2x})$, then the value of $\frac{dy}{dx}$ at $x = \frac{\pi}{2}$ is

(A) 2 (B) -2

(C) 1 (D) -1

124. The difference between the local extreme values of the function $f(x) = 2x^3 - 15x^2 + 36x + 40$ is .....

(A) 4 (B) 3

(C) 2 (D) 1

125. A wire of length 64 m is to be bent to form a rectangle such that its area is maximum, then its area is.....

(A) 156 sq.m (B) 324 sq.m

(C) 256 sq.m (D) 320 sq.m

126. The approximate value of $\sqrt[3]{63}$ is

(A) 3.9791 (B) 3.8791

(C) 3.9581 (D) 4.0205

127. The equation of the tangent to the curve $y = 3x^3 - 3x^2 + x$ at $x = 1$ is

(A) $4x - y + 3 = 0$ (B) $4x + y - 3 = 0$

(C) $4x - y - 3 = 0$ (D) $4x + y + 3 = 0$

128. $\int \frac{x+2}{x^2 - 7x + 12} dx$ is equal to

(A) $-5\log|x-3| + 6\log|x-4| + c$

(B) $-5\log|x-3| - 6\log|x-4| + c$

(C) $5\log|x-3| - 6\log|x-4| + c$

(D) $5\log|x-3| + 6\log|x-4| + c$

129. If $\int \frac{dx}{\sqrt{2ax - x^2}} = f(g(x)) + c$, where c is constant of integration, then $f(x), g(x)$ are respectively equal to

(A) $\sin^{-1} x, \frac{x-a}{a}$ (B) $\sin^{-1} x, \frac{x+a}{a}$

(C) $\tan^{-1} x, \frac{x-a}{a}$ (D) $\tan^{-1} x, \frac{x+a}{a}$

130. $\int \frac{x}{x+2} dx$ is equal to

(A) $x + 2\log(x+2) + c$

(B) $x + \log(x+2) + c$

(C) $x - \log(x+2) + c$

(D) $x - 2\log(x+2) + c$

131. If $[\cdot]$ denotes the greatest integer function, then $\int_1^4 x[x]dx$ is equal to

(A) 34 (B) -17

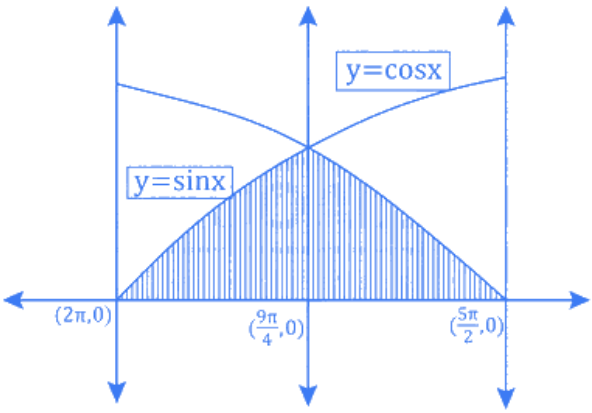
(C) -34 (D) 17

132. If $\int_1^a (2x+1)dx = 5$, then the sum of the values of a is..

(A) 1 (B) -1

(C) 7 (D) -7

133. The area of the shaded region is ... sq.units.



(A) $2 - \sqrt{2}$ (B) $2 + \sqrt{2}$

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

134. $\int_0^3 \sqrt{9 - x^2} dx =$

(A) $\frac{3\pi}{4}$ (B) $\frac{9\pi}{4}$

(C) $\frac{7\pi}{4}$ (D) $\frac{5\pi}{4}$

135. The particular solution of the differential equation $xdy + 2ydx = 0$, when $x = 2$ and $y = 1$ is

(A) $x\sqrt{y} = 2$ (B) $x\sqrt{y} = -2$

(C) $\sqrt{x}y = 2$ (D) $x\sqrt{y} = 1$

136. The differential equation representing the family of curves $x \sin x + y^3 = 4ax$ is

(A) $\frac{dy}{dx} = \frac{y^3 + x^2 \cos x}{3xy^2}$ (B) $\frac{dy}{dx} = \frac{y^3 - x^2 \cos x}{3xy^2}$

(C) $\frac{dy}{dx} = \frac{y^3 - x^2 \cos x}{3xy}$ (D) $\frac{dy}{dx} = \frac{y^3 - x^2 \cos x}{3x^2 y}$

137. The order and degree of the differential equation $\sqrt{2 + \left(\frac{d^2y}{dx^2}\right)^3} = \left(\frac{d^3y}{dx^3}\right)^{5/2}$ respectively are

(A) 2, 3 (B) 3, 5

(C) 3, 2 (D) 5, 3

138. The vector $\bar{a} + 3\bar{b}$ is perpendicular to $7\bar{a} - 5\bar{b}$ and the vector $\bar{a} - 4\bar{b}$ is perpendicular to $7\bar{a} - 2\bar{b}$. Then the angle between $\bar{a}$ and $\bar{b}$ is

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

(C) $\frac{\pi}{6}$ (D) $\frac{\pi}{3}$

139. If $7\hat{j} + 10\hat{k}, -\hat{i} + 6\hat{j} + 6\hat{k}$ and $-4\hat{i} + 9\hat{j} + 6\hat{k}$ are the position vectors of the vertices A, B and C repectively of $\triangle ABC$. Then the position vector of the point where the bisector of the angle A meets side BC is

(A) $(2 + 3\sqrt{2}\ )\hat{i} + (3 + 3\sqrt{3}\ )\hat{j} + 6\hat{k}$

(B) $(2 - 3\sqrt{2})\hat{i} + (3 + 3\sqrt{2})\hat{j} + 6\hat{k}$

(C) $(2 - 3\sqrt{2})\hat{i} + (3 - 3\sqrt{2})\hat{j} + 6\hat{k}$

(D) $(2 - 3\sqrt{2})\hat{i} + (3 + 3\sqrt{2})\hat{j} - 6\hat{k}$

140. If a, b, c are distinct non-negative numbers and the vectors $a\hat{i} + a\hat{j} + c\hat{k}, \hat{i} + \hat{k}, c\hat{i} + c\hat{j} + b\hat{k}$ lie in the same plane, then the value of c is...

(A) The arithmetic mean of a and b (B) The geometric mean of a and b

(C) The harmonic mean of a and b (D) 0

141. Let $A(2,3,0)$, $B(0,3,2)$ and $C(4,0,3)$ be vertices of a triangle, then the area of the triangle is

(A) $\frac{\sqrt{171}}{2}$ sq. units (B) $\frac{\sqrt{172}}{2}$ sq. units

(C) $\frac{\sqrt{173}}{2}$ sq. units (D) $\frac{\sqrt{174}}{2}$ sq. units

142. If D and E are the midpoints of the sides BA and BC of triangle ABC, then $\overline{AE}+\overline{DC}=$

(A) $\overline{AC}$ (B) $\frac{3}{2}\overline{BC}$

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

143. If the points $(1,1,\mu)$ and $(-3,0,1)$ are equidistant from the plane $\vec{r}\cdot(3\hat{i}+4\hat{j}-12\hat{k})+13=0$, then the value of μ are

(A) $1,\frac{-7}{3}$ (B) $1,\frac{7}{3}$

(C) $-1,\frac{7}{3}$ (D) $1,\frac{3}{7}$

144. If the lines $\frac{x-1}{2}=\frac{y+1}{3}=\frac{z-1}{4}$ and $\frac{x-2}{1}=\frac{y+m}{2}=\frac{z-2}{1}$ intersect each other, then the value of m is....

(A) 1 (B) 2

(C) -1 (D) 4

145. If the lines

$L_1:\frac{x-1}{-3}=\frac{y-2}{2k}=\frac{z-3}{2}, L_2:\frac{x-1}{3k}=\frac{y-5}{1}=\frac{z-6}{-5}$

are perpendicular to each other, then the equation of a plane containing the line L_1 and parallel to the line L_2 for the value of k that satisfies this condition is ...

(A) $31x+21y+46z-211=0$

(B) $602x-1155y-747z+3949=0$

(C) $43x+105y-154z+209=0$

(D) $2x-3y+5z-11=0$

146. A plane meets the coordinate axes at points A, B and C, such that the centroid of a triangle ABC is $\left(2,-\frac{2}{3},\frac{1}{2}\right)$. The perpendicular distance from the origin to this plane is...

(A) $\frac{6}{\sqrt{26}}$ (B) $\frac{5}{\sqrt{26}}$

(C) $\frac{4}{\sqrt{26}}$ (D) $\frac{3}{\sqrt{26}}$

147. The point at which the maximum value of $x+y$ subject to constraints $x+2y\leq 70$ and $2x+y\leq 95, x\geq 0, y\geq 0$ is.

(A) $(47.5,0)$ (B) $(0,95)$

(C) $(0,35)$ (D) $(40,15)$

148. Let $X\sim B(n,p)$. If $E(X)=2$ and $\text{Var}(X)=1$, then the probability of getting at most one success is .....

(A) 0.0625 (B) 0.2500

(C) 0.3125 (D) 0.6875

149. If the following function is probability density function of r.v. X

$f(x)=kx^2(1-x)$, for $0<x<1=0$, otherwise, then the value of k is

(A) -12 (B) $\frac{1}{12}$

(C) $\frac{1}{6}$ (D) 12

150. Two cards are drawn at random from a standard pack of 52 cards. Then the probability that the draw consists of exactly one face card and exactly one ace card is...

(A) $\frac{7}{221}$ (B) $\frac{5}{221}$

(C) $\frac{8}{221}$ (D) $\frac{9}{221}$

- End of Question Paper -