MHT CET 2026 PCM Apr 18 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. If a unit vector is represented by $\vec{U} = 0.9\,\hat{i} - 0.2\,\hat{j} + m\hat{k}$, then the value of m is

(A) 0.85 (B) $\sqrt{0.15}$

(C) 1 (D) $\sqrt{0.77}$

2. The maximum error in the measurement of the density and mass of the uniform cube are 8% and 2% respectively. Hence, the maximum error in the measurement of length will be

(A) 2% (B) 4%

(C) 6% (D) 8%

3. For a projectile motion, the range R is 'n' times the maximum height H. So the angle of projection is

(A) $\sin^{-1}\left(\frac{2}{n}\right)$ (B) $\cos^{-1}\left(\frac{4}{n}\right)$

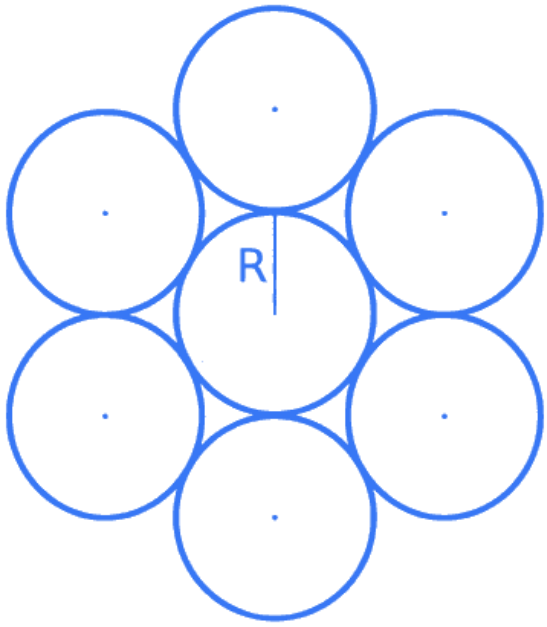
(C) $\tan^{-1}\left(\frac{4}{n}\right)$ (D) $\tan^{-1}\left(\frac{2}{n}\right)$

4. An inextensible string passing over a smooth pulley connects two blocks of masses m_1 and m_2 ($m_2 > m_1$) vertically. If the acceleration of the system is $\left(\frac{g}{n}\right)$, then the ratio of masses $\left(\frac{m_2}{m_1}\right)$ is

(A) $\frac{n}{n+1}$ (B) $\frac{n}{n-1}$

(C) $\frac{n+1}{n-1}$ (D) $\frac{n+1}{n}$

5. Given identical rings are arranged in a hexagonal plane pattern so as to touch each neighbouring ring as shown in figure. Each ring has mass M and radius R. The moment of inertia of the system of seven rings about an axis passing through the centre of central ring and normal to plane of all rings is



(A) $31MR^2$ (B) $19MR^2$

(C) $11MR^2$ (D) $7MR^2$

6. A kathak dancer is standing on horizontal surface with folded hands. In the begining dancer is rotating about his central axis and his kinetic energy is 'K' at that time. The kathak dancer now stretches his arms so that the moment of inertia of the dancer becomes three times and the angular velocity becomes one-third. The kinetic energy of the dancer now is

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

(C) $3K$ (D) $6K$

7. A solid sphere rolls without slipping on an inclied plane at an angle θ. The ratio of total kinetic energy to its rotational kinetic energy is

(A) $\frac{5}{2}$ (B) $\frac{7}{2}$

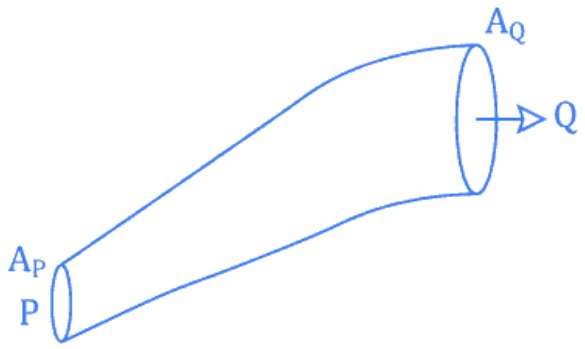
(C) $\frac{5}{4}$ (D) $\frac{5}{7}$

8. The acceleration due to gravity at a height 'h' above the surface of earth is 'g_h'. At the depth 90 km below the earth's surface the acceleration due to gravity is also 'g_h'. The value of 'h' is

(A) 180 km (B) 120 km

(C) 90 km (D) 45 km

9. An incompressible fluid (ideal fluid) is flowing through non uniform cross-sectional tube PQ as shown in the figure from end P to end Q. If K_P and K_Q are the kinetic energy per unit volume of the fluid at end P and end Q respectively, then



(A) $K_P = \frac{1}{2}K_Q$ (B) $K_P = K_Q$

(C) $K_P < K_Q$ (D) $K_P > K_Q$

10. In case of fluid flowing on horizontal surface the flow of fluid becomes unsteady when Reynolds number (Rn) is

(A) less than 499 (B) between 500 - 999

(C) between 1000 - 1999 (D) greater than 2000

11. If the shape of the liquid surface is curved, then

(A) the pressure on convex side is equal to atmosphereic pressure. (B) the pressure on the convex side is equal to pressure on concave side.

(C) the pressure on the concave side is greater than that on the convex side. (D) the pressure on the concave side is lesser than that on the convex side.

12. A black body radiates maximum energy at wavelength 'λ' at temperature T_1 and its emissive power is E. When the temperature of the body is changed to T_2, it radiates maximum energy at wavelength $\frac{2\lambda}{3}$, then the emissive power will become

(A) $\frac{99}{16}E$ (B) $\frac{81}{16}E$

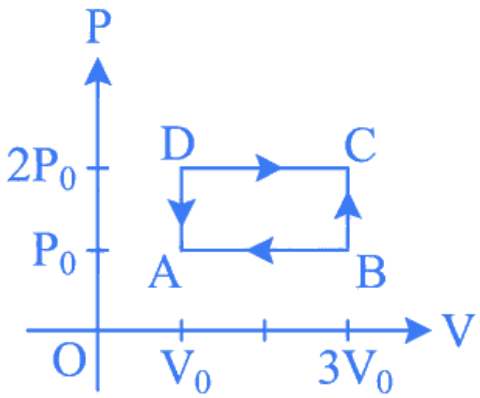
(C) $\frac{63}{16}E$ (D) $\frac{45}{16}E$

13. A body cools from a temperature 3θ to 2θ in 10 minute. The room temperature is θ. The temperature of the body at the end of the next 10 minute is 'x'. Assuming that Newton's law of cooling is applicable, the value of 'x' will be

(A) $\frac{9}{5}\theta$ (B) $\frac{7}{4}\theta$

(C) $\frac{3}{2}\theta$ (D) $\frac{4}{3}\theta$

14. An ideal monoatomic gas is taken around the cycle ABCDA as shown in the P.V diagram. The work done during the cycle is



(A) $-P_0V_0$ (B) $2P_0V_0$

(C) $-2P_0V_0$ (D) $6P_0V_0$

15. An ideal gas with pressure P, volume V and temperature T is expanded isothermally to volume 2V and a final pressure P_i. The same gas is expanded adiabatically to a volume 2V then the final pressure is P_a. In terms of γ, the ratio of the two specific heats for the gas, the ratio P_i/P_a is

(A) 2^{γ} (B) $2^{1-\gamma}$

(C) $2^{\gamma-1}$ (D) 2γ

16. At a pressure P and temperature T, 7 gram of oxygen occupies a volume V. The equation of state will be (Molecular weight of Oxygen = 32)

(A) $PV = \left(\frac{2}{7}\right) RT$ (B) $PV = \left(\frac{7}{2}\right) RT$

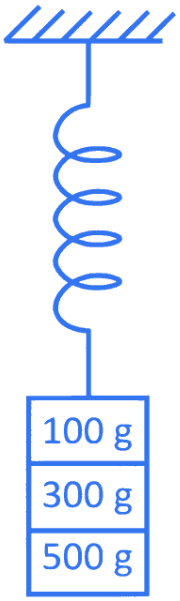
(C) $PV = \left(\frac{7}{16}\right) RT$ (D) $PV = \left(\frac{7}{32}\right) RT$

17. When the r.m.s. velocity of a gas is denoted by 'v' at temperature 'T'. Out of the following relations, the true one is

(A) $v \cdot T^2 = \text{constant}$ (B) $\frac{v}{T^2} = \text{constant}$

(C) $v^2 T = \text{constant}$ (D) $\frac{v^2}{T} = \text{constant}$

18. Three masses 100g, 300g and 500g are suspended at the end of a spring as shown in figure and are in equilibrium. When the 500 g mass is removed, the system oscillates with a period of 3 second. When the 300 g mass is also removed, it will oscillate with a period of



(A) 1.0 s (B) 1.5 s

(C) 2.0 s (D) 2.5 s

19. Two particles A and B of equal masses are suspended from two massless springs of spring constants K_A and K_B respectively. The maximum velocities of the particles during oscillations are equal. The ratio of the amplitude of 'B' to that of 'A' is

(A) $K_A : K_B$ (B) $\sqrt{K_A} : \sqrt{K_B}$

(C) $K_B : K_A$ (D) $\sqrt{K_B} : \sqrt{K_A}$

20. A particle of mass 'm' is executing S.H.M. about the origin on x-axis with frequency $\sqrt{\frac{Ka}{\pi m}}$, where K is a constant and a is the amplitude of S.H.M. If 'x' is the displacement of a particle at time 't', the potential energy of a particle will be

(A) $\frac{1}{2} K a x^2$ (B) $\pi K a x^2$

(C) $2\pi K a x^2$ (D) $2 K a x^2$

21. In an organ pipe closed at one end produces a fundamental note of frequency 'ν'. The pipe is cut into two pipes of equal length. The fundamental frequencies produced in the two pipes are

(A) ν , 2ν (B) $\frac{\nu}{2}$, ν

(C) 2ν , 4ν (D) $\frac{\nu}{2}$, 2ν

22. The fundamental frequency 'n' of the tuning fork is 288 Hz, it will not resonate with the frequency

(A) 288 Hz (B) 576 Hz

(C) 844 Hz (D) 864 Hz

23. A wire of length 'L' and linear density 'm' is stretched between two rigid supports with tension 'T'. It is observed that wire resonates in the P^{th} harmonic at a frequency of 320 Hz and resonates again at next higher frequency of 400 Hz in two successive modes. The value of 'P' is

(A) 2 (B) 4

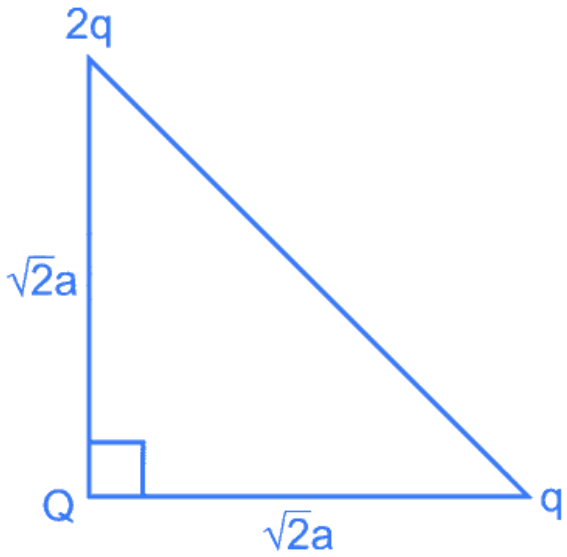
(C) 8 (D) 10

24. A person standing between two parallel cliffs fires a gun and hears two echoes, first echo after 1 second and second echo after 3 second. The distance between the two cliffs is (The velocity of sound = 330 m/s)

(A) 330 m (B) 660 m

(C) 990 m (D) 1320 m

25. Three point charges Q, $+2q$ and $+q$ are placed at the vertices of a right-angled isosceles triangle of length $\sqrt{2}a$ as shown in figure. The net electrostatic potential energy of the configuration is zero, if Q is equal to



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

(B) $-\frac{\sqrt{2}}{3}q$

(C) $-\frac{\sqrt{3}}{2}q$

(D) $-\sqrt{\frac{2}{3}}q$

26. Two equal point charges exert a force F on each other when they are placed distance 'd' apart in air. When they are placed distance 'D' apart in a medium of dielectric constant K, they exert the same force. The distance D is equal to

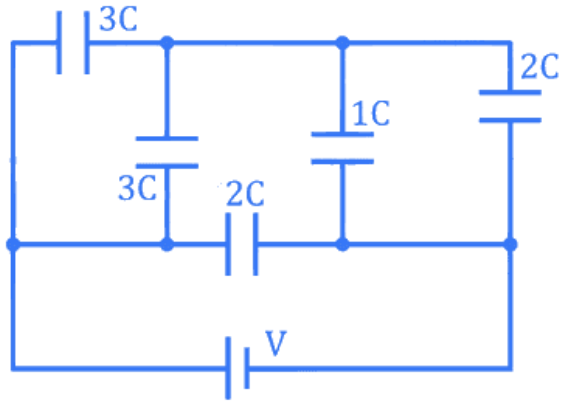
(A) $\frac{d}{\sqrt{K}}$

(B) $d\sqrt{K}$

(C) d^2K

(D) $\frac{K}{d^2}$

27. Figure shows a network of five capacitors connected to a supply voltage 'V'. The equivalent capacitance and the energy stored in the network is respectively



(A) $4C$, $2CV^2$

(B) $6C$, $3CV^2$

(C) $9C$, $4CV^2$

(D) $11C$, $9CV^2$

28. Three identical capacitors connected in series have net capacitance 'x'. Then they are connected in parallel. The ratio of energy stored in series configuration to that in parallel configuration is (if both configurations are connected to the same source)

(A) 1 : 3

(B) 3 : 1

(C) 1 : 9

(D) 9 : 1

29. When cell of E.M.F. 'E_1' is connected to potentiometer wire the balancing length is 'l_1'. Another cell of E.M.F. 'E_2' ($E_1 > E_2$) is connected along with E_1 so as two cells oppose each other, the balancing length is 'l_2'. The ratio $E_1 : E_2$ is

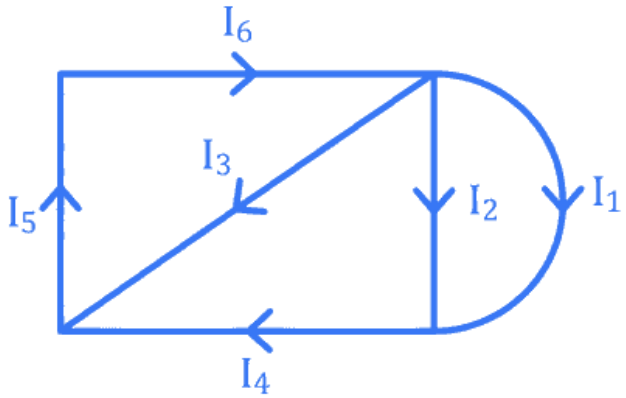
(A) $(l_1) : (l_1 + l_2)$

(B) $(l_1) : (l_1 - l_2)$

(C) $(l_1 + l_2) : (l_1)$

(D) $(l_1 + l_2) : (l_1 - l_2)$

30. In the following network,
$I_1 = -0.4\,\text{A}$, $I_4 = 1\,\text{A}$, $I_5 = 0.4\,\text{A}$
The values of I_2, I_3 and I_6 are respectively



(A) $1.4\,\text{A}$, $0.4\,\text{A}$, $-0.6\,\text{A}$
(B) $0.4\,\text{A}$, $-0.6\,\text{A}$, $1.4\,\text{A}$
(C) $1.4\,\text{A}$, $-0.6\,\text{A}$, $0.4\,\text{A}$
(D) $-0.6\,\text{A}$, $1.4\,\text{A}$, $0.4\,\text{A}$

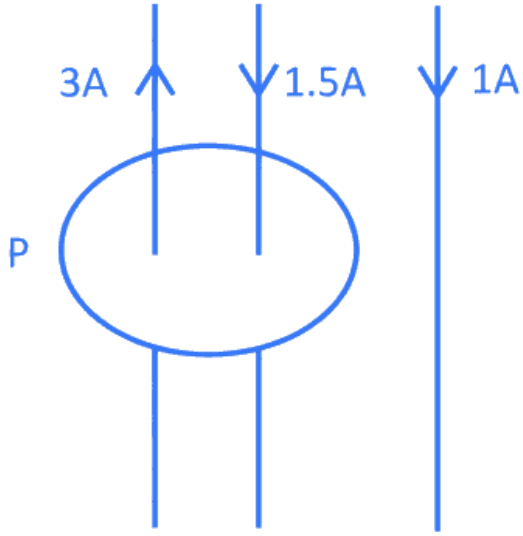
31. A particle of charge 'q' and mass 'm' moves in a circular orbit of radius 'r' with angular speed 'ω'. The ratio of the magnitude of its magnetic moment to that of its angular momentum depends upon

(A) q and m
(B) ω and m
(C) ω and q
(D) ω , q and m

32. A straight long wire is carrying current I. The ratio of magnetic field due to this wire at perpendicular distance 2 cm and 5 cm respectively from the wire is

(A) 2 : 5
(B) 3 : 5
(C) 7 : 3
(D) 5 : 2

33. Two wires with current 3A and 1.5A are enclosed in a circular loop P. Third parallel wire with current 1A is situated outside the loop as shown. All the wires are perpendicular to the plane of the circular loop. The value of $\oint \vec{B} \cdot \vec{dl}$ around the loop is (μ_0 = permeability of free space)



(A) $5.5\,\mu_0$
(B) $2.5\,\mu_0$
(C) $1.5\,\mu_0$
(D) $0.5\,\mu_0$

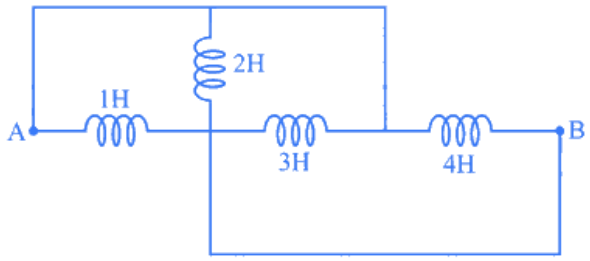
34. Two coils A and B have 180 and 360 turns respectively. The current of 1A flows through both the coils. Due to current of 1A in coil A, flux per turn of 0.8×10^{-3} Wb is linked with coil A. Due to current of 1A in coil B, flux per turn of 1×10^{-3} Wb is linked with coil B. The self inductance of coil A is L_A and the self inductance of coil B is L_B . The ratio L_A to L_B is

(A) $\frac{1}{5}$
(B) $\frac{2}{5}$
(C) $\frac{3}{2}$
(D) $\frac{5}{2}$

35. If current of 4 A produces magnetic flux of 3×10^{-3} Wb through a coil of 400 turns, the energy stored in the coil will be

(A) 1.2 J
(B) 2.4 J
(C) 24 J
(D) 240 J

36. The equivalent inductance between A and B is equal to

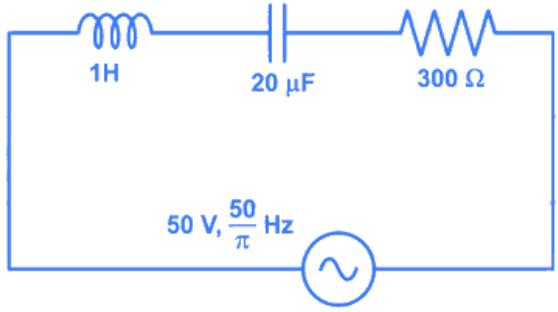


(A) 10 H
(B) 5 H
(C) $\frac{12}{25}$ H
(D) $\frac{2}{5}$ H

37. A series combination of resistor 'R' and capacitor 'C' is connected to an a.c. source of angular frequency 'ω'. Keeping the voltage same, if the frequency is changed to $\left(\frac{\omega}{3}\right)$ the current becomes half of the original current. Then the ratio of capacitive reactance and resistance is

(A) $\sqrt{6}$
(B) $\sqrt{0.3}$
(C) $\sqrt{3}$
(D) $\sqrt{0.6}$

38. In the series LCR circuit shown in figure the impedance is



(A) 300 Ω
(B) 500 Ω
(C) 700 Ω
(D) 900 Ω

39. In an LCR series circuit, the potential difference across the terminals of the inductor, capacitor and resistor is 60 V, 30 V and 40 V respectively. Then supply voltage will be equal to

(A) 10 V
(B) 50 V
(C) 70 V
(D) 130 V

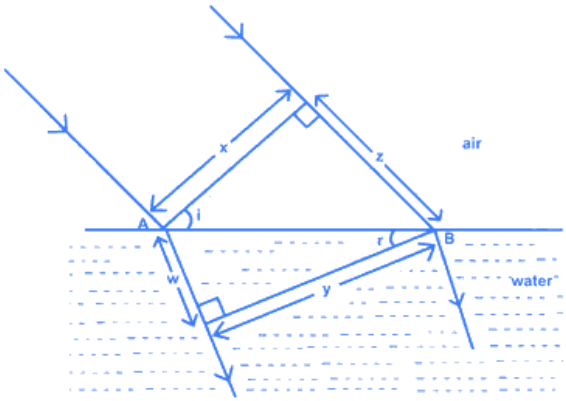
40. Refractive index of a glass convex lens is 1.5. The radius of curvature of each of the two surfaces of the lens is 40 cm. The ratio of the power of the lens when immersed in a liquid of refractive index 1.25 to that when placed in air is

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

41. In a biprism experiment, fifth dark fringe is obtained at a point. A thin transparent film of refractive index 'μ' is placed in one of the interfering paths. Now 7^{th} bright fringe is obtained at the same point. If 'λ' is the wavelength of light used, the thickness of film is equal to

(A) $1.5(\mu - 1)\lambda$
(B) $\frac{1.5\,\lambda}{(\mu - 1)}$
(C) $2.5(\mu - 1)\lambda$
(D) $\frac{2.5\,\lambda}{(\mu - 1)}$

42. A plane wavefront of width x, is incident on an air-water interface and the corresponding refracted wavefront has a width y as shown in figure. The refreactive index of air with respect to water in terms of distances w and z is



(A) $\frac{w}{z}$
(B) $\frac{z}{w}$
(C) $\sqrt{\frac{w}{z}}$
(D) $\sqrt{\frac{z}{w}}$

43. In an optical instrument- microscope, the wavelength of light used are $\lambda_1 = 6800$ Ã_x0085_ and $\lambda_2 = 5100$ Ã_x0085_. The ratio of the resolving power of microscope corresponding to 'λ_1' to that for 'λ_2' is

(A) 9 : 16
(B) 5 : 4
(C) 4 : 3
(D) 3 : 4

44. The maximum kinetic energies of photoelectrons emitted are K_1 and K_2 when light of wavelength λ_1 and λ_2 respectively are incident on a metallic surface. If $\lambda_1 = 3\lambda_2$ then

(A) $K_1 = \frac{K_2}{3}$ (B) $K_1 < \frac{K_2}{3}$

(C) $K_1 = 3K_2$ (D) $K_1 = \frac{2}{3}K_2$

45. The de Broglie wavelength of the electron in the ground state is λ_1 and that in the $n = 3$ level is λ_3 then λ_3 is given by

(A) $\frac{\lambda_1}{3}$ (B) $\frac{\lambda_1}{2}$

(C) $2\lambda_1$ (D) $3\lambda_1$

46. If the difference between $(n+1)^{th}$ Bohr radius and n^{th} Bohr radius is given by $(n-1)^{th}$ Bohr radius, then the value of n is

(A) 4 (B) 3

(C) 2 (D) 1

47. Two samples A and B contain equal amount of radioactive substances. If $\left(\frac{1}{8}\right)^{th}$ of sample A and $\left(\frac{1}{128}\right)^{th}$ of sample B, remain after 9 hours, then the ratio of half life period of B to that of A is

(A) 9 : 7 (B) 7 : 3

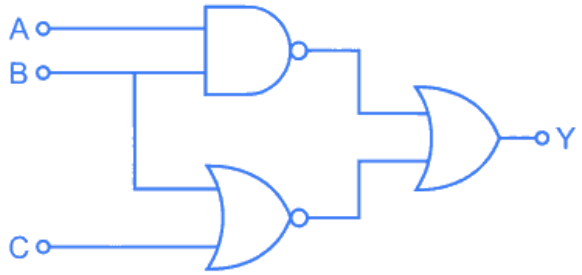
(C) 3 : 7 (D) 3 : 1

48. In an NPN transistor, the collector current is 28 mA. If 80% electrons reach the collector, its base current in mA is

(A) 7 mA (B) 14 mA

(C) 28 mA (D) 35 mA

49. The output Y of the given logic circuit is



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

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

50. For intrinsic semiconductor, if n_h and n_e represent the number of holes per unit volume and the number of free electrons per unit volume respectively then

(A) $n_h < n_e$ (B) $n_h > n_e$

(C) $n_h = n_e$ (D) $n_h \neq n_e$

51. Find the number of molecules present in 70 g dinitrogen.

(A) 1.5055×10^{24} (B) 1.5055×10^{23}

(C) 3.011×10^{24} (D) 3.011×10^{23}

52. Which from following colours has highest energy if wave lengths of violet, blue, yellow and red light are 410 nm, 470 nm, 580 nm and 750 nm respectively ?

(A) Blue (B) Violet

(C) Yellow (D) Red

53. Select the incorrect statement from the following.

(A) NH_3 and NF_3 both are polar molecules

(B) NH_3 and NF_3 both have pyramidal shape

(C) In NH_3 and NF_3 the orbital dipole due to lone pair is in the same direction as that of resultant dipole moment of other three bonds

(D) Dipole moment of NH_3 is greater than NF_3

54. Which from following gases is least soluble in water at same temperature and pressure ?

(A) NH_3 (B) CO_2

(C) HCl (D) N_2

55. Which of the following ethers is gaseous at room temperature ?

(A) 1 - Methoxypropane (B) 1 - Ethoxypropane

(C) Methoxyethane (D) Ethoxyethane

56. A container contains mixture of He and Ne gases at certain temperature. He is 20 % by mass of mixture. What is the ratio of partial pressure of Helium to Neon ?

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

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

57. 1 mole of an ideal gas is compressed isothermally and reversibly from initial pressure x kPa to final pressure $2x$ kPa at 300 K. Find the work done ($R = 8.314$ J $K^{-1}mol^{-1}$)

(A) 1432 J (B) 1865 J

(C) 1296 J (D) 1729 J

58. Which of the following is the correct expression of the first law of thermodynamics for adiabatic processes ?

(A) $W = -Q$

(B) $-\Delta U = -W$

(C) $\Delta U = QV$

(D) $\Delta U = Q_P - P_{ext}\,\Delta V$

59. Calculate the standard enthalpy change for the following reaction,
$2C_2H_6(g) + 7O_2(g) \longrightarrow 4CO_2(g) + 6H_2O(l)$
Given, $\Delta_f H^\circ(C_2H_6) = -85$ kJ mol^{-1}
$\Delta_f H^\circ(CO_2) = -390$ kJ mol^{-1}
$\Delta_f H^\circ(H_2O) = -285$ kJ mol^{-1}

(A) -2900 kJ (B) -3100 kJ

(C) -3000 kJ (D) -3200 kJ

60. The solubility of salt AX_2 is 6×10^{-12} mol dm^{-3}. What is solubility product of the salt ?

(A) 2.06×10^{-24} (B) 2.48×10^{-24}

(C) 4.32×10^{-34} (D) 8.64×10^{-34}

61. An organic monobasic acid has dissociation constant 1.96×10^{-8}. What is its percentage dissociation in 0.01 M solution ?

(A) 1.40 % (B) 0.14 %

(C) 2.4 % (D) 0.19 %

62. Which of the following aqueous salt solutions has the least pH value ?

(A) Na_2CO_3 (B) $CuCl_2$

(C) CH_3COONa (D) $NaNO_3$

63. What is the oxidation number of carbon in oxalic acid ?

(A) +2 (B) +3

(C) +4 (D) +6

64. What is the general formula of halide salts of alkali metals if M is a metal atom ?

(A) MX (B) MX_2

(C) M_3X_2 (D) M_2X_3

65. Which from following compounds is NOT optically active?

(A) 3 - Bromohexane
(B) 2 - Bromo - 2 - methylbutane
(C) 2 - Bromopentane
(D) 2 - Bromo - 3 - methylbutane

66. Which from following compounds does NOT contain double bond in it ?

(A) Tetrahydrofuran
(B) 4 H - Pyran
(C) Pyrrole
(D) Thiophene

67. Which of the following is NOT terminal alkyne ?

(A) Ethyne
(B) Propyne
(C) But - 1 - yne
(D) But - 2 - yne

68. The major product of the following reaction is



(A) 3 - iodo - 3 - methylhexane
(B) 4 - iodo - 4 - methylhexane
(C) 3 - iodo - 4 - methylhexane
(D) 4 - iodo - 3 - methylhexane

69. Calculate the number of unit cell in 0.5 g metal if the product of volume and density of unit cell is 6.65×10^{-23} g

(A) 6.340×10^{21}
(B) 7.518×10^{21}
(C) 5.625×10^{21}
(D) 8.492×10^{21}

70. What is the total number of adjacent unit cells shared by each face particle of fcc unit cell ?

(A) 1
(B) 2
(C) 4
(D) 8

71. A metal forms fcc structure. Calculate the volume of fcc unit cell in cm^3 if void volume is 1.66×10^{-23} cm^3.

(A) 4.912×10^{-23} cm^3
(B) 8.151×10^{-23} cm^3
(C) 9.346×10^{-23} cm^3
(D) 6.385×10^{-23} cm^3

72. Calculate the mole fraction of solute in solution if vapour pressure of a solution and pure solvent are 27 mm Hg and 30 mm Hg respectively at 298 K.

(A) 0.9
(B) 0.1
(C) 0.4
(D) 0.6

73. Calculate the molar mass of nonelectrolyte solute when 6 gram of it is dissolved in 1 dm^3 water has osmotic pressure 2.4 atm at 300 K ($R = 0.0821$ atm dm^3 K^{-1} mol^{-1})

(A) 45.0 g mol^{-1}
(B) 74.12 g mol^{-1}
(C) 61.58 g mol^{-1}
(D) 90.28 g mol^{-1}

74. A galvanic cell consist copper electrode and standard hydrogen electrode. If $E^\circ\left(Cu^{+2}_{(aq)}|Cu_{(s)}\right) = +0.34\,V$, then identify a reaction taking place at positive electrode during working of cell.

(A) $Cu_{(s)} \longrightarrow Cu^{+2}_{(aq)} + 2e^-$
(B) $Cu^{+2}_{(aq)} + 2e^- \longrightarrow Cu_{(s)}$
(C) $H_2(g) \longrightarrow 2H^+_{(aq)} + 2e^-$
(D) $H^+_{(aq)} + 2e^- \longrightarrow H_2(g)$

75. If standard reduction potential of Zn, Ni and Fe are $-0.76\,V$, $-0.23\,V$ and $-0.44\,V$ respectively. For the reaction (Stated below) to be spontaneous find out electrodes X and Y considering above electrode potentials
$X_{(s)} + Y^{+2}_{(aq)} \longrightarrow X^{+2}_{(aq)} + Y_{(s)}$

(A) X = Ni , Y = Fe
(B) X = Ni , Y = Zn
(C) X = Fe , Y = Zn
(D) X = Zn , Y = Ni

76. If standard reduction potential of four electrodes A, B, C, D are $+2.5\,V, +3.0\,V, -2.0\,V$ and $-1.5\,V$ respectively. When is the standard emf of cell maximum?

(A) 'A' is anode and 'B' is cathode
(B) 'B' is anode and 'D' is cathode
(C) 'C' is anode and 'B' is cathode
(D) 'B' is anode and 'C' is cathode

77. Which of the following is an example of fractional order reaction ?

(A) $2H_2O_2(g) \longrightarrow 2H_2O(l) + O_2(g)$
(B) $H_2(g) + I_2(g) \longrightarrow 2HI(g)$
(C) $CH_3CHO(g) \longrightarrow CH_4(g) + CO(g)$
(D) $2NO(g) + 2H_2(g) \longrightarrow N_2(g) + 2H_2O(l)$

78. What is the time required for 75 % completion of a first order reaction if rate constant is 23.03 $minute^{-1}$?

(A) 12.00 s
(B) 3.6 s
(C) 36 s
(D) 6.0 s

79. For a reaction A $\longrightarrow$ product, $k = 2 \times 10^{-2}\ s^{-1}$. If the initial concentration of A is $1.0\ mol\ dm^{-3}$ find the value of $\log \frac{1}{[A]_t}$ after 100 second ?

(A) 0.135 (B) 0.270
(C) 0.430 (D) 0.868

80. Which of the following is an example of macromolecular colloid?

(A) Proteins (B) Detergents
(C) Soap (D) S_8 sulphur molecules

81. Which of the following reactions exhibits the reducing property of ozone ?

(A) $NO(g) + O_3(g) \longrightarrow NO_2(g) + O_2(g)$

(B) $2KI(aq) + H_2O(l) + O_3(g) \longrightarrow 2KOH(aq) + I_2(g) + O_2(g)$

(C) $H_2O_2(l) + O_3(g) \longrightarrow H_2O(l) + 2O_2(g)$

(D) $PbS(s) + 4O_3(g) \longrightarrow PbSO_4(s) + 4O_2(g)$

82. What is the oxidation state of chlorine in its weakest oxoacid?

(A) $+1$ (B) -1
(C) $+3$ (D) -3

83. Which from following pair of elements in their respective oxidation states have same number of unpaired electrons ?

(A) Fe^{2+} and Mn^{2+} (B) Co^{2+} and Ni^{2+}
(C) Fe^{2+} and Cr^{2+} (D) Co^{2+} and Fe^{2+}

84. Which lanthanoid from following exhibits f^{14} configuration in $+3$ state?

(A) Tm (B) Lu
(C) Ce (D) Dy

85. What is EAN for metal ion in $[Fe(CN)_6]^{3-}$?

(A) 37 (B) 36
(C) 35 (D) 34

86. Which of the following is a correct increasing order of ligand field strength ?

(A) EDTA $<$ $C_2O_4^{2-}$ $<$ H_2O $<$ en

(B) en $<$ H_2O $<$ EDTA $<$ $C_2O_4^{2-}$

(C) $C_2O_4^{2-}$ $<$ H_2O $<$ EDTA $<$ en

(D) H_2O $<$ en $<$ $C_2O_4^{2-}$ $<$ EDTA

87. Identify substrate 'S' in the following reaction.

S $\xrightarrow{\text{Na / dry ether}}$ 3, 4 - diethyl - 3, 4 - dimethyl hexane

(A) 3 - chloro - 2 - methylpentane (B) 2 - chloro - 3 - methylpentane
(C) 3 - chloro - 3 - methylpentane (D) 2 - chloro - 2 - methylpentane

88. Select the correct decreasing order of acid strength for the following compounds.
a) Ethanol b) 2-Methyl propan-2-ol c) Phenol d) p - Nitrophenol

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

89. Which of the following isomers of C_4H_9OH has lowest boiling point ?

(A) n - Butyl alcohol (B) Isobutyl alcohol
(C) sec-Butyl alcohol (D) tert Butyl alcohol

90. Identify the 'product' in the following reaction.

Pent - 3 - enenitrile $\xrightarrow[H_3O^+]{Al\ H\ (i\text{-}Bu)_2}$ Product

(A) Pent - 3 - en - 1 - amine (B) Pentanal
(C) Pent - 3 - enal (D) Pent - 3 - en -1 - ol

91. Identify the product obtained when isopropyl magnesium chloride in dry ether reacts with dry ice forming a complex, hydrolysed further.

(A) Propanoic acid (B) Propanal
(C) 2 - Methylpropanoic acid (D) 2 - Methylpropanol

92. What is the number of moles of hydrogen atoms needed to obtain one mole ethanamine from acetamide using $LiAl\ H_4$ /ether as reducing agent.

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

93. Identify 'B' in the following reaction
Ethyl cyanide $\xrightarrow{H_2O}$ A $\xrightarrow{H_2O\ /\ dil\ HCl}$ B + NH_3

(A) Ethanoic acid (B) Ethanamide
(C) Propanoic acid (D) Propanamide

94. Which from following amines when heated with ethanolic KOH and chloroform does NOT produce foul smell ?

(A) Benzenamine

(B) N , N - Dimethyl aniline

(C) Propan - 2 - amine

(D) Phenylmethanamine

95. Identify glycosidic linkage in lactose.

(A) $\alpha - 1,4$ (B) $\beta - 1,4$

(C) $\alpha - 1,6$ (D) $\beta - 2,6$

96. Identify a protein present in nails

(A) Legumelin (B) Keratin

(C) Myosin (D) Insulin

97. Identify the use of LDP from following.

(A) Manufacture of buckets (B) Preparation of pipes for irrigation

(C) For making nonstick cook ware (D) For making tyrecords

98. What is a starting material used to obtain viscose rayon ?

(A) Styrene (B) Cellulose

(C) Acrylamide (D) Bisphenol

99. Which of the following is the use of HDPE ?

(A) To obtain shopping bags (B) To prepare shampoo bottles

(C) For making carpet (D) To obtain food container

100. Which from following plants is useful to extract analgesic compound from it ?

(A) Turmeric (B) Cinnamon

(C) Wintergreen (D) Plants of citrus fruits

101. The difference between the roots of the equation $x^2 + 2x + 4 = 0$ is ... (where $i = \sqrt{-1}$)

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

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

102. In a test, there are 7 questions of the type 'True or False'. No student got all the answers correct. If the sequence of answers for every student is unique, then the maximum number of students who appeared for the test is ...

(A) 128 (B) 126

(C) 127 (D) 125

103. Let $f_k(x) = \frac{1}{k}(\cos^k x + \sin^k x)$ where $k \in N$, then $f_6(x) - f_4(x) = \ldots$

(A) $\frac{1}{6}$ (B) $-\frac{1}{12}$

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

104. The coordinates of the orthocenter of the triangle whose sides are represented by the lines $4x - 7y + 10 = 0$, $x + y = 5$ and $7x + 4y = 15$ are ...

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

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

105. The combined equation of lines parallel to the coordinate axes and passing through the point of intersection of lines represented by $x^2 - 6xy + 5y^2 + 10x - 14y + 9 = 0$ is ...

(A) $xy + 2x + y + 2 = 0$

(B) $xy + 2x - y - 2 = 0$

(C) $xy - 2x + y - 2 = 0$

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

106. The number of circles passing through the origin and touching the lines $x + y = 1$ and $x - y = 1$ is ...

(A) 1 (B) 2

(C) 3 (D) 4

107. A parabola has its focus on the positive X-axis and the Y-axis as its directrix. If $P(\alpha, 4)$ is a point on this parabola such that the tangent to the parabola at point P passes through the origin, then the distance of P from origin is

(A) 4 (B) $\sqrt{20}$

(C) 5 (D) $\sqrt{32}$

108. If $\lim\limits_{x \to k} \frac{x^3 - k^3}{x^2 - k^2} = \lim\limits_{x \to 0} \frac{1 - \cos(2x)}{x \sin x}$, then the value of k is ...

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

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

109. In a switching circuit, if the combination $(S_1 \wedge S_2)$ is connected in parallel to the combination $(S_1' \wedge S_2')$, then the room is lit only when ...

(A) S_1 is ON and S_2 is OFF (B) S_1 is OFF and S_2 is ON

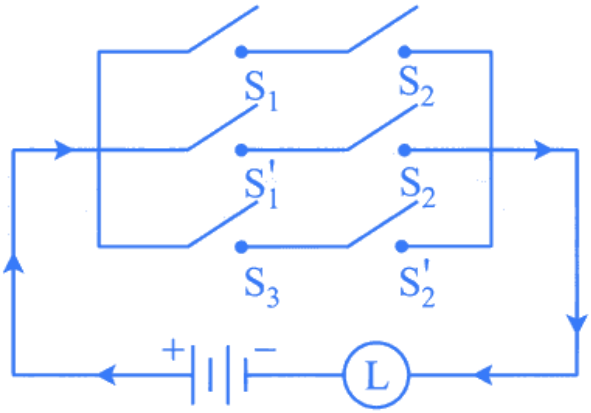
(C) S_1 and S_2 both ON or S_1 and S_2 both OFF (D) The room is always lit.

110. If the truth value of the statement pattern $(\sim p \wedge q) \vee (\sim p \wedge \sim q) \vee (p \wedge \sim q)$ is F, then the truth values of $(p \vee \sim q)$ and $(p \to q)$ are ... respectively.

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

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

111. The minimum number of switches in the simplified form of the following switching circuit is



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

112. In $\triangle ABC$, with usual notations, if Δ denotes the area of triangle ABC then the value of $2s(b+c-a)\tan\left(\frac{A}{2}\right)$ is equal to ...

(A) Δ (B) 2Δ
(C) 3Δ (D) 4Δ

113. If matrix A and its inverse A^{-1} are given by $A=\begin{bmatrix}0 & 1 & 2\\ 1 & 2 & 3\\ 3 & x & 1\end{bmatrix}$ and $A^{-1}=\begin{bmatrix}\frac{1}{2} & -\frac{1}{2} & \frac{1}{2}\\ -4 & 3 & y\\ \frac{5}{2} & -\frac{3}{2} & \frac{1}{2}\end{bmatrix}$, then the polar co-ordinates of the points whose Cartesian co-ordinates are (x,y) are ...

(A) $\left(2,\frac{7\pi}{4}\right)$ (B) $\left(\sqrt{2},\frac{\pi}{4}\right)$
(C) $\left(\sqrt{2},\frac{7\pi}{4}\right)$ (D) $\left(2,\frac{\pi}{4}\right)$

114. Let $A=\begin{bmatrix}-3 & 2\\ 1 & 4\end{bmatrix}$ and if $A^2-2A+I=\begin{bmatrix}18 & p\\ q & 11\end{bmatrix}$, then ...

(A) $p=-2,\ q=-1$ (B) $p=2,\ q=1$
(C) $p=-1,\ q=-2$ (D) $p=1,\ q=2$

115. For $x>0$ and $(x\log x)<1$, if $y=\cot^{-1}\left(\frac{x-\log x^{x^2}}{\log e^{x^2}+\log x^x}\right)$, then $\frac{dy}{dx}=\ldots$

(A) $\frac{1}{1+x^2}+\frac{2}{x[1+(\log x)^2]}$
(B) $\frac{1}{1+x^2}+\frac{1}{x[1+(\log x)^2]}$
(C) $\frac{-1}{1+x^2}+\frac{1}{x[1+(\log x)^2]}$
(D) $\frac{1}{1+x^2}+\frac{1}{[1+(\log x)^2]}$

116. For $x>0$, if
$\sin(\cos^{-1}x+\tan^{-1}x)-\cos(\sin^{-1}x+\tan^{-1}x)=\sin(\cot^{-1}2)$
then $x=$

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

117. If $\tan^{-1}ax+\tan^{-1}3x=\frac{\pi}{4}$, where $3ax^2<1$, then value of a for $x=\frac{1}{6}$ is ...

(A) 2 (B) 3
(C) 4 (D) 9

118. $\sec^2(\tan^{-1}3)-\tan^2(\sec^{-1}3)=$

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

119. The domain of the function $f(x)=\sqrt{\frac{x}{1+x}}$ is ...

(A) $(-\infty,-1)\cup[0,\infty)$ (B) $(-\infty,-1]\cup[0,\infty)$
(C) $(-\infty,-1)\cap[0,\infty)$ (D) all R

120. If $f(x)=\frac{3^x+3^{-x}-2}{\tan x\cdot\log(1+x)}$ for $x\neq 0$, is continuous at $x=0$, then the value of $f(0)$ is equal to ...

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

121. If $\int f'(x) \cdot e^{x^2}\, dx = (x-1) \cdot e^{x^2} + k$, where k is constant of integration, then $f(x) = \ldots$

(A) $2x^3 - \frac{x^2}{2} + x + c$, where c is constant of integration.

(B) $\frac{x^3}{2} + 3x^2 + 4x + c$, where c is constant of integration.

(C) $x^3 + 4x^2 + 6x + c$, where c is constant of integration.

(D) $\frac{2x^3}{3} - x^2 + x + c$, where c is constant of integration.

122. Let $y = \sqrt[p]{x^3 y}$. If $\frac{dy}{dx} = \frac{3}{2}$ when $y = 1$, then the value of p is equal to $\ldots$

(A) 1 (B) 2

(C) 3 (D) 4

123. If $f'(x) = \sin^2 x$ and $y = f\left(\frac{2x-1}{x^2+1}\right)$, then $\frac{dy}{dx}$ at $x = 1$ is

(A) $\frac{1}{4}\sin\left(\frac{1}{2}\right)$ (B) $\frac{1}{4}\sin^2\left(\frac{1}{2}\right)$

(C) $\sin^2\left(\frac{1}{4}\right)$ (D) $\frac{1}{2}\sin^2\left(\frac{1}{2}\right)$

124. If $f : R \to R$ is an even function then

(A) $f'(0) = 1$ (B) $f'(x)$ is an even function

(C) $f(0) = 0$ (D) $f'(x)$ is an odd function

125. Let $g(x) = f(x) + f(1-x)$ and $f''(x) < 0, 0 \le x \le 1$, then $\ldots$

(A) $g(x)$ increases on $\left[\frac{1}{2}, 1\right]$ and $g(x)$ decreases on $\left[0, \frac{1}{2}\right]$

(B) $g(x)$ decreases on $[0, 1]$

(C) $g(x)$ increases on $[0, 1]$

(D) $g(x)$ decreases on $\left[\frac{1}{2}, 1\right]$ and $g(x)$ increases on $\left[0, \frac{1}{2}\right]$

126. If the function $f(x) = ax^2 + bx + \sin x$ satisfies all the conditions of Rolle's theorem on $[0, \pi]$ and the slope of the tangent to the curve $y = f(x)$ at $x = \frac{\pi}{4}$ is zero, then $a - b =$

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

(C) $\frac{\sqrt{2}(\pi-1)}{\pi}$ (D) $\frac{\sqrt{2}(\pi+1)}{\pi}$

127. If a particle moves such that the displacement (s) is proportional to the square of the velocity (v), then its acceleration (a) is

(A) proportional to s^2 (B) proportional to $1/s$

(C) proportional to $1/s^2$ (D) a constant

128. If $\int e^{x+\tan^{-1} x}\left(\frac{x^2+2}{\sec^2(\tan^{-1} x)}\right) dx = e^{f(x)} + c$, then $\ldots$

(A) $f(x)$ is strictly decreasing on R.

(B) $f(x)$ is strictly increasing on R^+ and strictly decreasing on R^-.

(C) $f(x)$ is strictly increasing on R.

(D) $f(x)$ is strictly decreasing on R^+ and strictly increasing on R^-.

129. Let $f(x) = x$, $f_1(x) = f(\log x)$, $f_2(x) = f_1(\log x)$, $f_3(x) = f_2(\log x)$, $\ldots$ and so on. Then $\int \frac{1}{f(x)\, f_1(x)\, f_2(x) \ldots f_{2026}(x)}\, dx = \ldots$

(A) $f_{2025}(x) + c$ (B) $2025 f_{2025}(x) + c$

(C) $f_{2027}(x) + c$ (D) $2027 f_{2027}(x) + c$

130. If $\int_0^2 x(2-x)^b\, dx = \frac{32}{7}$, where $b \in N$ then $b =$

(A) 5 (B) 6

(C) 7 (D) 8

131. $\int_0^2 |4x - 5|\, dx = \ldots$

(A) $\frac{17}{4}$ (B) $\frac{18}{3}$

(C) $\frac{1}{25}$ (D) $\frac{13}{2}$

132. If the area bounded by $y = x^3 + ax$ (where $a > 0$), the x-axis and the lines $x = -2$ and $x = 1$ is $\frac{37}{4}$ square units, then ...

(A) $a = 4$ (B) $a = 2$

(C) $a = 10$ (D) $a = 20$

133. The rate of disintegration of a radioactive element at any time is proportional to its mass at that time, where k $(k > 0)$ is the constant of proportionality. The time during which an original mass of 1.5 gm will disintegrate to a mass of 0.5 gm is ...

(A) $k \log 3$ (B) $\frac{1}{k} \log 3$

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

134. The differential equation of the family of all parabolas whose axis is the y-axis is ...

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

(C) $\frac{d^2y}{dx^2} - x\frac{dy}{dx} = 0$ (D) $x\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$

135. The integrating factor of the differential equation $x\frac{dy}{dx} + 2y = x^2 \log x$ is

(A) x^3 (B) x^2

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

136. A spherical raindrop evaporates at a rate proportional to its surface area. The differential equation involving the rate of change of its radius r with time 't' is ... (where k is a positive constant)

(A) $\frac{dr}{dt} + k = 0$ (B) $\frac{dr}{dt} - k = 0$

(C) $\frac{dr}{dt} + kr = 0$ (D) $\frac{dr}{dt} - kr = 0$

137. The order and degree of the differential equation $\sqrt{1 + \frac{1}{\left(\frac{dy}{dx}\right)^2}} = \left(\frac{d^2y}{dx^2}\right)^{\frac{3}{2}}$ are ...

(A) Order 2, Degree 3 (B) Order 2, Degree 2

(C) Order 3, Degree 3 (D) Order 3, Degree 2

138. The equation of the plane passing through the points having position vectors $(\bar{a} + \bar{b}), (\bar{b} + \bar{c})$ and $(\bar{a} + \bar{c})$ is ...

(A) $\bar{r} \cdot (\bar{a} \times \bar{b} + \bar{b} \times \bar{c} + \bar{c} \times \bar{a}) = [\bar{a}\ \bar{b}\ \bar{c}]$

(B) $\bar{r} \cdot (\bar{a} \times \bar{b} + \bar{b} \times \bar{c} + \bar{c} \times \bar{a}) = 2[\bar{a}\ \bar{b}\ \bar{c}]$

(C) $\bar{r} \cdot (\bar{a} \times \bar{b} + \bar{b} \times \bar{c} + \bar{a} \times \bar{c}) = [\bar{a}\ \bar{b}\ \bar{c}]$

(D) $\bar{r} \cdot (\bar{a} \times \bar{b} + \bar{b} \times \bar{c} + \bar{a} \times \bar{c}) = 2[\bar{a}\ \bar{b}\ \bar{c}]$

139. If the volume of the tetrahedron whose coterminous edges are given by the vectors $\bar{a} = -2\hat{i} + 3\hat{j} - 3\hat{k}$, $\bar{b} = 4\hat{i} + 5\hat{j} + (\lambda - 10)\hat{k}$, $\bar{c} = 6\hat{i} + 2\hat{j} - 3\hat{k}$ is 11 cubic units, then the sum of the possible values of λ is ...

(A) 7 (B) 8

(C) 1 (D) 6

140. The value of $\theta \in \left(0, \frac{\pi}{2}\right)$ for which vectors $\bar{a} = (\sin\theta)\hat{i} + (\cos\theta)\hat{j}$ and $\bar{b} = \hat{i} - \sqrt{3}\hat{j} + 2\hat{k}$ are perpendicular is

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

(C) $\theta = \frac{\pi}{4}$ (D) $\theta = \frac{\pi}{2}$

141. If $|\bar{a}| = |\bar{b}| = 1, |\bar{c}| = 2$ and $\bar{a} \times (\bar{a} \times \bar{c}) + \bar{b} = \bar{0}$, then the acute angle between $\bar{a}$ and $\bar{c}$ is ...

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

(C) $\frac{\pi}{4}$ (D) $\frac{\pi}{6}$

142. The value of $|\bar{a} \cdot \bar{b}|^2 + |\bar{a} \times \bar{b}| \cdot |\bar{a} \times \bar{b}|$ is ...

(A) $-a^2b^2$ (B) a^2b^2

(C) $a^2b^2 \cos\theta$ (D) $a^2b^2 \sin\theta$

143. If $\bar{a} \cdot \bar{b} = \beta$ and $\bar{a} \times \bar{b} = \bar{c}$ then $\bar{a} =$

(A) $\frac{\bar{b} \times \bar{c} - \beta\bar{b}}{|\bar{b}|^2}$ (B) $\frac{\bar{b} \times \bar{c} - \beta\bar{c}}{|\bar{b}|^2}$

(C) $\frac{\bar{b} \times \bar{c} + \beta\bar{b}}{|\bar{b}|^2}$ (D) $\frac{\bar{b} \times \bar{c} + \beta\bar{c}}{|\bar{b}|^2}$

144. If the equation of a plane passing through $A(1, p, 2)$, $B(3, 2, 4)$ and parallel to the z axis, is $3x - 2y - q = 0$, then ...

(A) $p = -1,\ q = 5$ (B) $p = 1,\ q = -5$

(C) $p = -2,\ q = -5$ (D) $p = 2,\ q = -5$

145. The angle between the line $\bar{r} = (\hat{i} + 2\hat{j} + \hat{k}) + \lambda(\hat{i} + \hat{j} + \hat{k})$ and the plane $\bar{r} \cdot (2\hat{i} - \hat{j} + \hat{k}) = 8$ is ...

(A) $\theta = \sin^{-1}\left(\frac{\sqrt{2}}{3}\right)$ (B) $\theta = \cos^{-1}\left(\frac{\sqrt{2}}{3}\right)$

(C) $\theta = \cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$ (D) $\theta = \sin^{-1}\left(\frac{3}{\sqrt{2}}\right)$

146. The acute angle between the lines $2x = 3y = -z$ and $6x = -y = -4z$ is ...

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

(C) $\frac{\pi}{6}$ (D) $\frac{\pi}{2}$

147. The maximum value of $z = 4x + y$ subject to the constraints $x + y \leq 5, 2x + y \leq 7, 3x + 2y \leq 11, x \geq 0, y \geq 0$ is ...

(A) 13 (B) 8

(C) 11 (D) 14

148. A fair die is thrown 4 times. If getting a prime number on the die is considered as a success, then the probability of getting no success at all is ...

(A) $\frac{1}{16}$ (B) $\frac{15}{16}$

(C) $\frac{1}{81}$ (D) $\frac{16}{81}$

149. If the p. d. f. of a continuous random variable X is given by $f(x) = \begin{cases} k(9 + 8x - x^2), & \text{for } -1 \leq x \leq 4 \\ 0, & \text{otherwise} \end{cases}$ then the value of k is ...

(A) $\frac{1}{125}$ (B) $\frac{3}{250}$

(C) $\frac{3}{125}$ (D) $\frac{1}{250}$

150. In an entrance test, there are multiple choice questions. There are four possible answers to each question, only one of which is correct. The probability that a student knows the answer to a question is 90%. If he gets the correct answer to a question, then the probability that he was guessing is

(A) $\frac{37}{40}$ (B) $\frac{1}{37}$

(C) $\frac{36}{37}$ (D) $\frac{1}{9}$

- End of Question Paper -