MHT CET 2024 PCM May 4 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 2024**, 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. According to the law of equipartition of energy the molar specific heat of a diatomic gas at constant volume where the molecule has one additional vibrational mode is

(A) $\frac{9}{2}$R (B) $\frac{5}{2}R$

(C) $\frac{3}{2}R$ (D) $\frac{7}{2}R$

2. A parallel plate air capacitor, with plate separation ' d ' has a capacitance of 9 pF . The space between the plates is now filled with two dielectrics, the first having $K_1 = 3$ and thickness $d_1 = d/3$, while the 2nd has $K_2 = 6$ and thickness $d_2 = 2\,d/3$. The capacitance of the new capacitor is :

(A) 3.8 pF (B) 20.25 pF

(C) 40.5 pF (D) 45 pF

3. The collector supply voltage is 6 V and a voltage drop across a resistor of 600Ω in the collector circuit is 0.6 V , in a circuit of transistor connected in common emitter mode. If the current gain is 20 then the base current is

(A) 0.25 mA (B) 0.05 mA

(C) 0.12 mA (D) 0.02 mA

4. The velocity of particle executing S.H.M. varies with displacement (x) as $4\,V^2 = 50 - x^2$. The time period of oscillation is $\frac{x}{7}$ second. The value of ' x ' is (Take $\pi = \frac{22}{7}$)

(A) 22 (B) 44

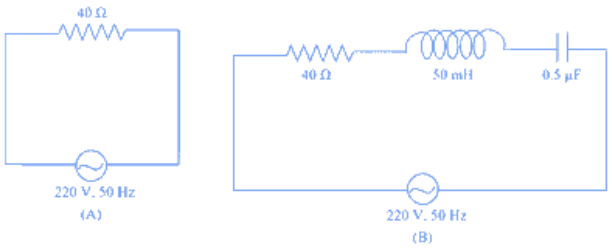
(C) 66 (D) 88

5. For a projectile, the maximum height and horizontal range are same. The angle of projection ' θ ' of the projectile is

(A) $\tan^{-1}(\frac{1}{2})$ (B) $\tan^{-1}(2)$

(C) $\tan^{-1}(\frac{1}{4})$ (D) $\tan^{-1}(4)$

6. For the given figure, choose the correct option.



(A) The r.m.s. current in circuit (B) can never be greater than that in circuit (A)

(B) The r.m.s. current in circuit (A) is always equal to that in circuit (B)

(C) The r.m.s. current in circuit (B) can be greater than in circuit (A)

(D) At resonance, current in (B) is less than that in circuit (A)

7. A disc and a ring both have same mass and radius. The ratio of moment of inertia of the disc about its diameter to that of a ring about a tangent in its plane is

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

(C) 1 : 6 (D) 1 : 8

8. Two waves $Y_1 = 0.25\sin 316t$ and $Y_2 = 0.25\sin 310t$ are propagating along the same direction. The number of beats produced per second are

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

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

9. In a meter bridge experiment, the balance point is obtained if the gaps are closed by 2Ω and 3Ω. A shunt of XΩ is added to 3Ω resistor to shift the null point by 22.5 cm. The value of ' x ' is

(A) 1Ω (B) 2Ω

(C) 3Ω (D) 4Ω

10. Water rises up to height ' X ' in a capillary tube immersed vertically in water. When the whole arrangement is taken to a depth ' d ' in a mine, the water level rises up to height ' Y '. If ' R ' is the radius of earth then the ratio $\frac{Y}{X}$ is

(A) $(1 - \frac{d}{R})^{-1}$ (B) $(1 - \frac{d}{R})$

(C) $(1 + \frac{d}{R})^{-1}$ (D) $(1 + \frac{d}{R})$

11. In an equilateral prism the ray undergoes minimum deviation when it is incident at an angle of 50°. The angle of minimum deviation is

(A) 50° (B) 40°

(C) 25° (D) 20°

12. A rotating body has angular momentum ' L '. If its frequency is doubled and kinetic energy is halved, its angular momentum will be

(A) $\frac{\mathrm{L}}{4}$ (B) $\frac{\mathrm{L}}{2}$

(C) 2L (D) 4L

13. The distance between two consecutive points with phase difference of 60° in wave of frequency 500 Hz is 0.6 m . The velocity with which wave is travelling is

(A) 1.8 km/s (B) 9 km/s

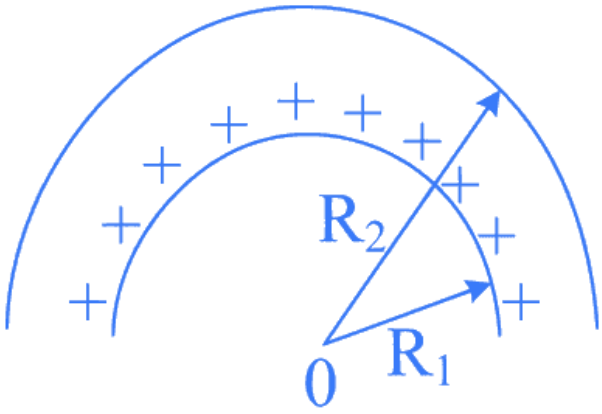
(C) 3.6 km/s (D) 2.7 km/s

14. A square loop of area 25 cm^2 has a resistance of 10Ω. The loop is placed in uniform magnetic field of magnitude 40 T . The plane of loop is perpendicular to the magnetic field. The work done in pulling the loop out of the magnetic field slowly and uniformly in 1 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

15. The electric potential at the centre of two concentric half rings of radii R_1 and R_2, having same linear charge density ' λ ' is (ε_0 = permittivity of free space)



(A) $\frac{2\lambda}{\epsilon_0}$ (B) $\frac{\lambda}{2\epsilon_0}$

(C) $\frac{\lambda}{4\epsilon_0}$ (D) $\frac{\lambda}{\epsilon_0}$

16. Which of the following person is in an inertial frame of reference?

(A) A pilot in an aeroplane which is taking off.

(B) A child revolving in a merry-go-round.

(C) A driver in a bus which is moving with constant velocity.

(D) A man in a train which is slowing down to stop.

17. A charged particle of charge ' q ' is accelerated by a potential difference ' V ' enters a region of uniform magnetic field ' B ' at right angles to the direction of field. The charged particle completes semicircle of radius ' r ' inside magnetic field. The mass of the charged particle is

(A) $\frac{\mathrm{r}^2 q B^2}{2\ \mathrm{V}}$ (B) $\frac{r^2 q^2 B^2}{\sqrt{2}V}$

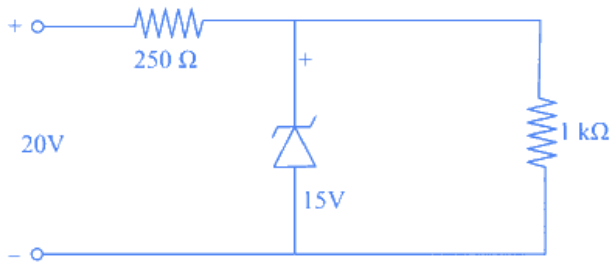
(C) $\frac{\mathrm{qrB}}{2\ \mathrm{V}}$ (D) $\frac{\mathrm{q}^2 \mathrm{r}^2\ \mathrm{B}^2}{\mathrm{V}}$

18. A simple pendulum of length l_1 has time period T_1. Another simple pendulum of length l_2 ($l_1 > l_2$) has time period T_2. Then the time period of the pendulum of length ($l_1 - l_2$) will be

(A) $T_1 - T_2$ (B) $\sqrt{\frac{T_1}{T_2}}$

(C) $\sqrt{\mathrm{T}_1^2 - \mathrm{T}_2^2}$ (D) $\sqrt{\frac{T_2}{T_1}}$

19. A zener diode, having breakdown voltage 15 V is used in a voltage regulator circuit as shown. The current through the zener diode is



(A) 20 mA (B) 5 mA

(C) 10 mA (D) 15 mA

20. If ' R ' is the radius of earth \& ' g ' is acceleration due to gravity on earth's surface, then mean density of earth is

(A) $\frac{4\pi G}{3gR}$ (B) $\frac{3\pi R}{4gG}$

(C) $\frac{3\ \mathrm{g}}{4\pi \mathrm{RG}}$ (D) $\frac{\pi RG}{12\ \mathrm{g}}$

21. In LCR series circuit if the frequency is increased, the impedance of the circuit

(A) increases
(B) decreases
(C) either increases or decreases
(D) first decreases then become minimum and then increases.

22. A potentiometer wire of length 1 m is connected in series with 495Ω resistance and 2 V battery. If $0.2\mathrm{mV/cm}$ is the potential gradient, then the resistance of the potentiometer wire is

(A) 8Ω
(B) 6Ω
(C) 7Ω
(D) 5Ω

23. A carnot engine, whose efficiency is 40% takes heat from a source maintained at temperature 600 K . It is desired to have an efficiency 60% , then the intake temperature for the same exhaust (sink) temperature should be

(A) 1800 K
(B) 1200 K
(C) 900 K
(D) 600 K

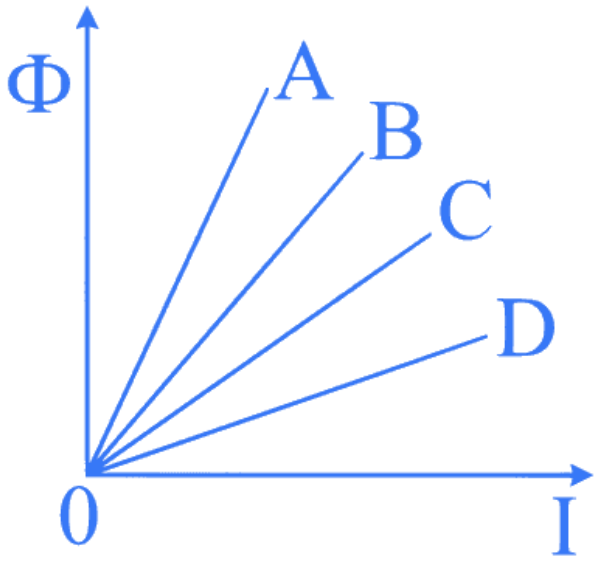
24. A person is observing a bacteria through a compound microscope. For better analysis and to improve the resolving power he should

(A) increase the wavelength of light.
(B) increase the refractive index of the medium between the object and objective lens.
(C) decrease the focal length of the eye-piece.
(D) decrease the diameter of the objective lens.

25. Two rods of same length \& material transfer a given amount of heat in 12 s when they are joined end to end. But when they are joined length wise parallel to each other they will transfer same amount of heat in same condition in time

(A) 24 s
(B) 3 s
(C) 1.5 s
(D) 48 s

26. A graph of magnetic flux (ϕ) versus current (1) is shown for four inductors A, B, C, D. Smaller value of self inductance is for inductor



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

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

(A) $\frac{\mathrm{mV}^2}{5\mathrm{R}}$
(B) $\frac{\mathrm{mV}^2}{3\mathrm{R}}$
(C) $\frac{\mathrm{mV}^2}{7\mathrm{R}}$
(D) $\frac{mV^2}{9R}$

28. A ray of light is incident normally on a glass slab to thickness 5 cm and refractive index 1.6. The time taken to travel by a ray from source of light to surface of slab is same as to travel through glass slab. The distance of source from the surface is

(A) 5 cm
(B) 8 cm
(C) 12 cm
(D) 24 cm

29. The magnetic moments associated with two closely wound circular coils A and B of radius $r_A = 10$ cm and $r_B = 20$ cm respectively are equal if (N_A, I_A and N_B, I_B are number of turns and current of A and B respectively)

(A) $2N_A\mathrm{I_A} = \mathrm{N_B I_B}$
(B) $\mathrm{N_A} = 2\,\mathrm{N_B}$
(C) $\mathrm{N_A I_A} = 4\,\mathrm{N_B I_B}$
(D) $4N_AI_A = N_BI_B$

30. Focal length of objective of an astronomical telescope is 1.5 m . Under normal adjustment, length of telescope is 1.56 m . Focal length of the eyepiece is

(A) 0.06 m (B) 1.04 m
(C) 2.34 m (D) 3.06 m

31. The surface of water in a water tank of cross section area 750 cm^2 on the top of a house is ' h ' m above the tap level. The speed of water coming out through the tap of cross section area 500 mm^2 is 30 cm/s. At that instant $\frac{dh}{dt}$ is $x = 10^{-3}$ m/s. The value of ' x ' will be

(A) 2 (B) 3
(C) 4 (D) 6

32. A string A has twice the length, twice the diameter, twice the tension and twice the density of another string B. The overtone of A which will have the same fundamental frequency as that of B is

(A) first (B) second
(C) third (D) fourth

33. An inductor of inductance 2μH is connected in series with a resistance, a variable capacitor and an a.c. source of frequency 5 kHz . The value of capacitance for which maximum current is drawn into the circuit is $\frac{1}{x}$F, where the value of ' x ' is (Take $\pi^2 = 10$)

(A) 500 (B) 1000
(C) 2000 (D) 4000

34. Three identical polaroids P_1, P_2 and P_3 are placed one after another. The pass axis of P_2 and P_3 are inclined at an angle 60° and 90° with respect to axis of P_1. The source has an intensity I_0. The intensity of transmitted light through P_3 is $\left(\cos 60^\circ = 0.5, \cos 30^\circ = \frac{\sqrt{3}}{2}\right)$

(A) $\frac{I_0}{8}$ (B) $\frac{3I_0}{16}$
(C) $\frac{3I_0}{32}$ (D) $\frac{I_0}{32}$

35. A semiconductor device X is connected in series with a battery and a resistor. The current of 10 mA is found to pass through the circuit. If the terminals of X are connected in reverse manner, the current drops to almost zero. X may be

(A) a zener diode (B) a p-n junction diode
(C) an intrinsic semiconductor (D) an extrinsic semiconductor

36. A solid cylinder of mass M and radius R is rotating about its geometrical axis. A solid sphere of the same mass and same radius is also rotating about its diameter with an angular speed half that of the cylinder. The ratio of the kinetic energy of rotation of the sphere to that of the cylinder will be

(A) 1 : 4 (B) 1 : 5
(C) 2 : 3 (D) 3 : 2

37. A circular coil of resistance R, area A, number of turns ' N ' is rotated about its vertical diameter with angular speed ' ω ' in a uniform magnetic field of magnitude ' B '. The average power dissipated in a complete cycle is

(A) $\frac{N^2 A^2 B^2 \omega^2}{2R}$ (B) $\frac{BNA\omega}{R}$
(C) $\frac{N^2 AB}{2R\omega^2}$ (D) $\frac{BA\omega}{2NR}$

38. The excess pressure inside a spherical drop of water A is four times that of another drop B. Then the ratio of mass of drop A to that of drop B is

(A) 1 : 4 (B) 1 : 8
(C) 1 : 16 (D) 1 : 64

39. A parallel plate capacitor has plate area 40 cm^2 and plate separation 2 mm . The space between the plates is filled with a dielectric medium of thickness 1 mm and dielectric constant 5 . The capacitance of the system is (ε_0 = permittivity of vacuum)

(A) $24\epsilon_0$ F (B) $\frac{3}{10}\epsilon_0$ F
(C) $\frac{10}{3}\epsilon_0$ F (D) $10\epsilon_0$ F

40. The height ' h ' above the earth's surface at which the value of acceleration due to gravity (g) becomes $\left(\frac{g}{3}\right)$ is (R = radius of the earth)

(A) $(\sqrt{3}+1)R$ (B) $(\sqrt{3}-1)R$
(C) $\sqrt{3}$R (D) $3\sqrt{R}$

41. In an isobaric process of an ideal gas, the ratio of work done by the system to the heat supplied $\left(\frac{W}{Q}\right)$ is

(A) $\frac{1}{\gamma-1}$ (B) γ
(C) $\frac{\gamma}{\gamma-1}$ (D) $\frac{\gamma-1}{\gamma}$

42. The threshold frequency of a metal is ' F_0 '. When light of frequency $2F_0$ is incident on the metal plate, the maximum velocity of photoelectron is ' V_1 '. When the frequency of incident radiation is increased to ' 5 F_0 ', the maximum velocity of photoelectrons emitted is ' V_2 '. The ratio of V_1 to V_2 is

(A) $\frac{1}{8}$ (B) $\frac{1}{16}$

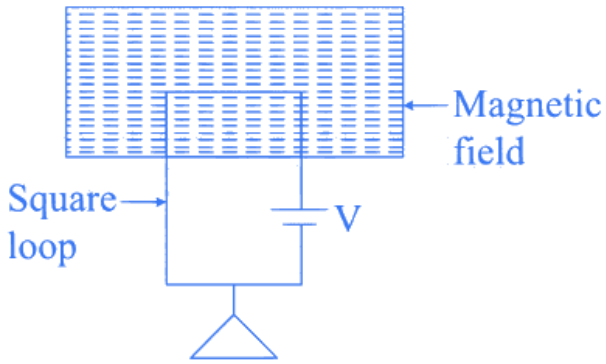
(C) $\frac{1}{4}$ (D) $\frac{1}{2}$

43. A charged particle is moving in a uniform magnetic field in a circular path with radius ' R '. When the energy of the particle is doubled, then the new radius will be

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

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

44. A massless square loop of wire of resistance ' R ' supporting a mass ' M ' hangs vertically with one of its sides in a uniform magnetic field ' B ' directed outwards in the shaded region. A d.c. voltage ' V ' is applied to the loop. For what value of ' V ' the magnetic force will exactly balance the weight of the supporting mass ' M '? (side of loop = L, g = acceleration due to gravity)



(A) $\frac{Mg}{LBR}$ (B) $\frac{LB}{MgR}$

(C) $\frac{MgR}{LB}$ (D) $\frac{LR}{MgB}$

45. A sphere is at temperature 600 K . In an external environment of 200 K , its cooling rate is ' R ' When the temperature of the sphere falls to 400 K , then cooling rate ' R ' will become

(A) $\frac{3}{16}R$ (B) $\frac{9}{16}R$

(C) $\frac{16}{9}R$ (D) $\frac{16}{3}R$

46. A progressive wave of frequency 400 Hz is travelling with a velocity 336 m/s. How far apart are the two points which are 60° out of phase?

(A) 0.14 m (B) 0.21 m

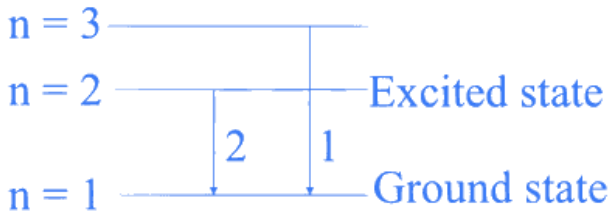
(C) 0.24 m (D) 0.28 m

47. Two bodies A and B of equal mass are suspended from two separate massless springs of spring constants K_1 and K_2 respectively. The two bodies oscillate vertically such that their maximum velocities are equal. The ratio of the amplitude of B to that of A is

(A) $\frac{K_1}{K_2}$ (B) $\frac{K_2}{K_1}$

(C) $\sqrt{\frac{K_1}{K_2}}$ (D) $\sqrt{\frac{K_2}{K_1}}$

48. For hydrogen atom, ' λ_1 ' and ' λ_2 ' are the wavelengths corresponding to the transitions 1 and 2 respectively as shown in figure. The ratio of ' λ_1 ' and ' λ_2 ' is $\frac{x}{32}$. The value of ' x ' is



(A) 3 (B) 9

(C) 27 (D) 81

49. A metallic sphere ' A ' isolated from ground is charged to $+50\mu C$. This sphere is brought in contact with other isolated metallic sphere ' B ' of half the radius of sphere ' A '. Then the charge on the two isolated spheres A \& B are in the ratio

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

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

50. For a photosensitive material, work function is ' W_0 ' and stopping potential is ' V '. The wavelength of incident radiation is (h = Planck's constant, c = velocity of light, e = electronic charge)

(A) $\frac{h^2c^2}{W_0+eV}$ (B) $\frac{hc}{W_0}$

(C) $\frac{hcV}{W_0}$ (D) $\frac{hc}{W_0+eV}$

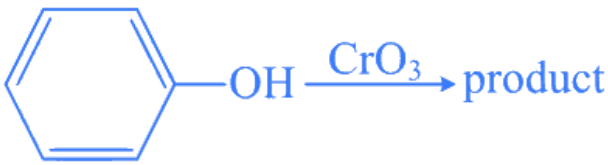
51. Calculate wave length for emission of a photon having wave number 11516 cm^{-1}.

(A) 216 nm
(B) 434 nm
(C) 868 nm
(D) 642 nm

52. Half life of a first order reaction is 1 hour. What fraction of it will remain after 3 hour?

(A) $\frac{1}{8}$
(B) $\frac{1}{9}$
(C) $\frac{1}{16}$
(D) $\frac{1}{64}$

53. Identify the product of following reaction.



(A) Benzene
(B) Benzoic acid
(C) Benzaldehyde
(D) p-Benzoquinone

54. Calculate vapour pressure of a solution containing mixture of 2 moles of volatile liquid A and 3 moles of volatile liquid B at room temperature. $(P_A^\circ = 420, P_B^\circ = 610$ mm Hg$)$

(A) 600 mm Hg
(B) 570 mm Hg
(C) 534 mm Hg
(D) 480 mm Hg

55. Which from following statements about neoprene is false?

(A) It is a copolymer and polymerization occurs in presence of MgO .
(B) It is a synthetic rubber.
(C) It is used to prepare hose pipes for transport of gasoline.
(D) The monomer involved in its preparation is unsaturated.

56. Identify neutral sphere complex from following.

(A) Pentaamminecobalt(III) sulphate
(B) Potassiumtrioxalatoaluminate(III)
(C) Diamminedichloroplatinum(II)
(D) Potassiumhexacyanoferrate(III)

57. Which from following statements is CORRECT about saccharic acid?

(A) It contains two carboxyl and four hydroxyl groups.
(B) It contains one carboxyl group and five hydroxyl groups.
(C) It contains two carboxyl groups and five hydroxyl groups.
(D) It contains three carboxyl and two hydroxyl groups.

58. Identify ferromagnetic substance from following.

(A) NaCl
(B) C_6H_6
(C) CrO_2
(D) H_2O

59. Which from following compounds is used to prepare adipic acid using enzymes in green technology developed by Drath and Frost?

(A) Ribose
(B) Glucose
(C) Ribulose
(D) Benzene

60. Which from following pairs of compounds exhibits metamerism?

(A) But-2-ene and But-1-ene
(B) Methoxymethane and Ethanol
(C) Ethoxyethane and Methoxypropane
(D) Butane and 2-Methylpropane

61. Identify a mineral of zinc from following.

(A) Siderite
(B) Calamine
(C) Chalcocite
(D) Limonite

62. Identify the element having lowest first ionization enthalpy.

(A) Po
(B) Te
(C) Br
(D) Kr

63. Calculate molar mass of an element having density 8.6 g cm^{-3} if it forms bec structure $[a^3 \times N_A = 22.0\ cm^3\ mol^{-1}]$

(A) 106.18 g mol^{-1}
(B) 94.6 g mol^{-1}
(C) 88.25 g mol^{-1}
(D) 80.16 g mol^{-1}

64. Which from following mixtures in water acts as a basic buffer?

(A) $NH_4OH + NH_4Cl$

(B) $C_6H_5COOH + C_6H_5COONa$

(C) $HCOOH + HCOOK$

(D) $CH_3COOH + CH_3COONa$

65. Which from following molecules does not have lone pair of electrons in valence shell of central atom?

(A) NH_3 (B) H_2O

(C) SO_2 (D) BF_3

66. Calculate the molar mass of non volatile solute when 1 g of it is dissolved in 100 g solvent decreases its freezing point by 0.2 K . $\left[K_f = 1.2 \text{ K kg mol}^{-1}\right]$

(A) 55 g mol^{-1} (B) 60 g mol^{-1}

(C) 65 g mol^{-1} (D) 70 g mol^{-1}

67. Which from following statements is NOT true about lyophilic colloids?

(A) The particles of dispersed phase have greater affinity for the dispersion medium.

(B) These are reversible.

(C) These are self stabilized.

(D) Coagulation occurs even by adding very small amount of electrolytes.

68. Calculate the pH of a buffer solution containing 0.35 M weak acid and 0.70 M of its salt with strong base if pK_a is 4.56 .

(A) 6.11 (B) 3.72

(C) 4.86 (D) 5.65

69. Which of the following alkenes does NOT exhibit cis-trans isomerism?

(A) But-1-ene (B) But-2-ene

(C) 3,4-Dimethylhex-3-ene (D) Pent-2-ene

70. Which of the following reactions occurs at cathode during discharging of lead accumulator?

(A) $PbSO_{4(s)} + 2e^- \longrightarrow Pb_{(s)} + SO^{2-}_{4\,(aq.)}$

(B) $Pb_{(s)} + SO^{2-}_{4(oq)} \longrightarrow PbSO_{4(s)} + 2e^-$

(C) $PbO_{2(s)} + 4H^+_{(aq)} + SO^{2-}_{4(qq)} + 2e^- \longrightarrow PbSO_{4(s)} + 2H_2O_{(1)}$

(D) $PbSO_{4(s)} + 2H_2O_{(1)} \longrightarrow PbO_{2(s)} + 4H^+_{(aq)} + SO^{2-}_{4(aq)} + 2e^-$

71. Identify the product obtained when ethers are dissolved in cold concentrated sulphuric acid.

(A) Alkanols (B) Alkanoic acids

(C) Alkyl hydrogen sulphate (D) Oxonium salts

72. Identify the chiral molecule from following.

(A) 2-Iodopropane (B) 2-Iodo-2-methylbutane

(C) 2-Iodo-3-methylbutane (D) 3-Iodopentane

73. Which compound from following contains iodine with highest oxidation number?

(A) KIO_3 (B) KI

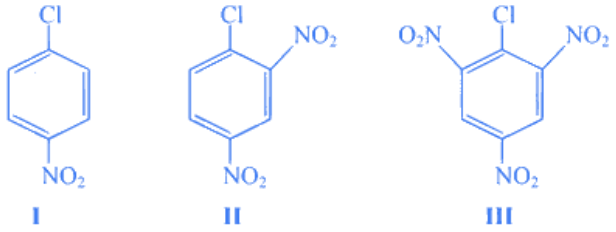
(C) IF_5 (D) KIO_4

74. How many isomers of $C_4H_{11}N$ are secondary amines?

(A) One (B) Two

(C) Three (D) Four

75. The correct order of reactivity for reactions involving cleavage of C – Cl bond in following compounds is



(A) I > II > III (B) II > III > I

(C) III > I > II (D) III > II > I

76. Which of the following is Stephen reaction?

(A) $R-COCl \xrightarrow[Pd_2-BaSO_4]{H_2} R-CHO+HCl$

(B) $R-CN \xrightarrow[ii)\ H_3O^+]{i)\ SnCl_2.HCl} R-CHO+NH_4Cl$

(C) $R-CHO \xrightarrow[\Delta]{Zn-Hg\ conc.\ HCl} R-CH_3+H_2O$

(D) $R-CHO \xrightarrow[ii)\ KOH,HO_2-CH_2-CH_2-OH]{i)H_2\ N} R-CH_2-R$

77. How many isotopes of nitrogen are found?

(A) 2 (B) 3

(C) 4 (D) 6

78. Which of the following colours is developed when alkali metal is dissolved in liquid ammonia?

(A) dark red (B) violet

(C) deep blue (D) green

79. What is IUPAC name of Acrylic acid?

(A) Propanoic acid (B) Prop-2-enoic acid

(C) 2-Methylpropanoic acid (D) 2-Hydroxypropanoic acid

80. Which of the following statements is correct regarding isobars?

(A) These have same number of neutrons. (B) These are the atoms of different elements.

(C) These have same atomic number. (D) These have different mass number.

81. Calculate the volume of gas at 1.25 atmosphere, if volume occupied by gas at 1 atmosphere and at same temperature is 25 mL .

(A) 15 mL (B) 20 mL

(C) 25 mL (D) 35 mL

82. In the Arrhenius plot of logk versus $1/T$ find the value of intercept on y axis

(A) $\log_{10}A$ (B) $\frac{-Ea}{R}$

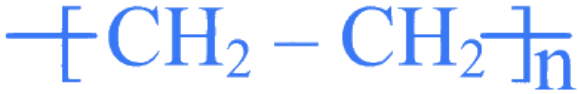
(C) lnk (D) R/E_a

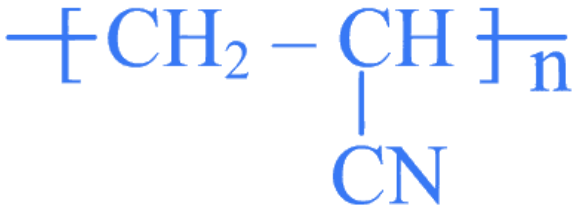
83. Which of the following compounds when treated with ammoniacal silver nitrate exhibits silver mirror test?

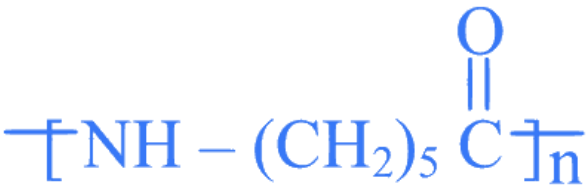
(A) Ethanol (B) Ethanal

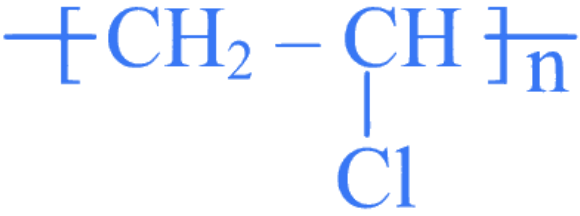
(C) Ethoxyethane (D) Ethanoic acid

84. Which from following polymers is not obtained by addition polymerisation method?

(A) 

(B) 

(C) 

(D) 

85. Which of the following symbols represent heat of reaction at constant volume?

(A) ΔH (B) dq

(C) ΔS (D) ΔU

86. For the reaction,

$$3I^-_{(aq.)} + S_2O^{2-}_{8(aq.)} \longrightarrow 2SO^{2-}_{4(aq.)} + I^-_{3(aq.)}$$

rate of formation of $SO^{2-}_{4(aq.)}$ is 0.044 mol dm^{-3} s^{-1}. Calculate rate of consumption of $I^-_{(aq.)}$.

(A) 0.022 mol dm^{-3} s^{-1} (B) 0.044 mol dm^{-3} s^{-1}

(C) 0.066 mol dm^{-3} s^{-1} (D) 0.088 mol dm^{-3} s^{-1}

87. Identify a ligand having two donor atoms but uses a pair of electrons of either donor atom to form coordinate bond.

(A) Aqua (B) Ethylenediamine

(C) Sulphato (D) Nitrito

88. Which of the following solutions on complete dissociation exhibits maximum elevation in boiling point?

(A) 0.1 m KCl (B) 0.05 m NaCl

(C) 0.1 m $BaCl_2$ (D) 0.1 m $MgSO_4$

89. Calculate the entropy change for melting 1 g ice at 0°C in $Jg^{-1}\,K^{-1}$ if heat of fusion of ice at 0°C is 80 $J\,K^{-1}$.

(A) 0.039 (B) 0.293

(C) 8.0 (D) 27.3

90. Which pair of elements from following has halt filled d-orbital in observed electronic configuration?

(A) Cu and Mn (B) Mn and Cr

(C) Zn and Co (D) Cu and Zn

91. Calculate the radius of metal atom if it forms bec unit cell having edge length 530 pm.

(A) 229.5 pm (B) 187.4 pm

(C) 459.0 pm (D) 265.2 pm

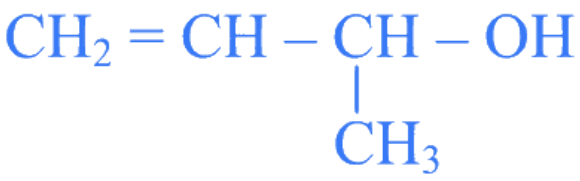
92. Calculate the concentration of weak monobasic acid if its degree of dissociation and dissociation constant are 5.0×10^{-4} and 5.0×10^{-9} respectively.

(A) 0.1 M (B) 0.02 M

(C) 0.03 M (D) 0.04 M

93. Which of the following is a secondary allylic alcohol?

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



(B)

(C) $CH_3 - CH = CH - CH_2 - OH$

(D) $CH_2 = CH - C(CH_3)_2 - OH$

94. Which of the following set of properties is correct when one mole of a gas is heated keeping volume constant by increasing temperature and supplying 500 J of heat?

(A) $q = w = 500\,J, \Delta U = 0$

(B) $q = \Delta U = 500\,J, w = 0$

(C) $q = \Delta U = -500\,J, w = 0$

(D) $q = 500\,J, \Delta U = w = 0$

95. The conductivity of 0.005 M NaI solution at 25°C is $6.07 \times 10^{-4}\Omega^{-1}\,cm^{-1}$. Calculate its molar conductivity

(A) $121.4\Omega^{-1}\,cm^2\,mol^{-1}$

(B) $110.1\Omega^{-1}\,cm^2\,mol^{-1}$

(C) $201.1\Omega^{-1}\,cm^2\,mol^{-1}$

(D) $241.4\Omega^{-1}\,cm^2\,mol^{-1}$

96. Which of the following is correct decreasing order of boiling point of compounds?

(A) $CH_3Cl > CH_3Br > CH_2Br_2 > CHBr_3$

(B) $CH_3Br > CH_2Br_2 > CHBr_3 > CH_3Cl$

(C) $CHBr_3 > CH_2Br_2 > CH_3Br > CH_3Cl$

(D) $CH_3Br > CH_3Cl > CHBr_3 > CH_2Br_2$

97. What is the value of electronegativity of oxygen?

(A) 4.0 (B) 3.5

(C) 2.48 (D) 3.2

98. What is IUPAC name of Ethylmethylisopropylamine?

(A) N -Methyl-N-isopropylethanamine

(B) N -Ethyl-N-methyl propan-1-amine

(C) N-Ethyl-N-methylpropan-2-amine

(D) N -Ethyl- N -isopropylmethanamine

99. Calculate the amount of electricity required in coulombs to convert 0.08 mol of MnO_4^- to Mn^{2+}.

(A) 96500 C (B) 38600 C

(C) 48250 C (D) 19300 C

100. Which of the following one letter symbol is used to represent aspartic acid?

(A) D (B) R

(C) A (D) S

101. Suppose A is any 3×3 non-singular matrix and $(A - 3I)(A - 5I) = 0$ where $I = I_3$ and $O = O_3$. Here O_3 represent zero matrix of order 3 and I_3 is an identity matrix of order 3 . If $\alpha A + \beta A^{-1} = 4I$, then $\alpha + \beta$ is equal to

(A) 13 (B) 7

(C) 12 (D) 8

102. The lines $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{-k}$ and $\frac{x-1}{k} = \frac{y-4}{2} = \frac{z-5}{1}$ are coplanar if

(A) $k = 1$ or $k = -1$ (B) $k = 0$ or $k = -3$

(C) $k = 3$ or $k = -3$ (D) $k = 0$ or $k = 3$

103. The variance of first 50 even natural numbers is

(A) 833 (B) 473

(C) $\frac{437}{4}$ (D) $\frac{833}{4}$

104. The statement pattern $[p \wedge (q \vee r)] \vee [\sim r \wedge \sim q \wedge p]$ is equivalent to

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

(C) q (D) p

105. If $8f(x) + 6f\left(\frac{1}{x}\right) = x + 5$ and $y = x^2 f(x)$, then $\frac{dy}{dx}$ at $x = -1$ is

(A) 14 (B) -14

(C) $\frac{1}{14}$ (D) $-\frac{1}{14}$

106. The number of ways in which 5 boys and 3 girls can be seated on a round table, if a particular boy B_1 and a particular girl G_1 never sit adjacent to each other, is

(A) 7! (B) 5×6 !

(C) 6×6 ! (D) 5×7 !

107. The value of $\cot\left(\text{cosec}^{-1}\frac{5}{3} + \tan^{-1}\frac{2}{3}\right)$ is

(A) $\frac{5}{17}$ (B) $\frac{6}{17}$

(C) $\frac{3}{17}$ (D) $\frac{4}{17}$

108. $\int \left(1 + x - \frac{1}{x}\right) e^{x+\frac{1}{x}} dx$ equal to

(A) $(x+1)e^{x+\frac{1}{x}} + c$, (where c is a constant of integration)

(B) $-xe^{x+\frac{1}{x}} + c$, (where c is a constant of integration)

(C) $(x-1)e^{x+\frac{1}{x}} + c$, (where c is a constant of integration)

(D) $xe^{x+\frac{1}{x}} + c$, (where c is a constant of integration)

109. The function $f(x) = \frac{\log_e(\pi+x)}{\log_e(e+x)}$ is

(A) increasing on $(0, \infty)$.

(B) increasing on $(0, \frac{\pi}{e})$, decreasing on $(\frac{\pi}{e}, \infty)$.

(C) decreasing on $(0, \infty)$.

(D) decreasing on $(0, \frac{\pi}{e})$, increasing on $(\frac{\pi}{e}, \infty)$

110. Let $y = y(x)$ be the solution of the differential equation $\sin x \frac{dy}{dx} + y \cos x = 4x, x \in (0, \pi)$. If $y\left(\frac{\pi}{2}\right) = 0$, then $y\left(\frac{\pi}{6}\right)$ is equal to

(A) $-\frac{4}{9}\pi^2$ (B) $\frac{4}{9\sqrt{3}}\pi^2$

(C) $\frac{-8}{9\sqrt{3}}\pi^2$ (D) $-\frac{8}{9}\pi^2$

111. The value of $I = \int \frac{x^2}{(a+bx)^2} dx$ is

(A) $\frac{1}{b^3}[a + bx + 2a\log|a + bx| - \frac{a^2}{a+bx}] + c$, (where c is the constant of integration)

(B) $\frac{1}{b^3}[a + bx - 2a\log|a + bx| + \frac{a^2}{a+bx}] + c$, (where c is the constant of integration)

(C) $\frac{1}{b^3}[a + bx - 2a\log|a + bx| - \frac{a^2}{a+bx}] + c$, (where c is the constant of integration)

(D) $\frac{1}{b^3}[a + bx + 2a\log|a + bx| + \frac{a^2}{a+bx}] + c$, (where c is the constant of integration)

112. Let $\overline{a} = \alpha\hat{i} + 3\hat{j} - \hat{k}, \overline{b} = 3\hat{i} - \beta\hat{j} + 4\hat{k}$ and $\overline{c} = \hat{i} + 2\hat{j} - 2\hat{k}$, where $\alpha, \beta \in \mathbb{R}$, be three vectors. If the projection of $\overline{a}$ on $\overline{c}$ is $\frac{10}{3}$ and $\overline{b} \times \overline{c} = -6\hat{i} + 10\hat{j} + 7\hat{k}$, then the value of $2\alpha + \beta$ is

(A) 3 (B) 4

(C) 5 (D) 6

113. If $4ab = 3h^2$, then the ratio of the slope of lines represented by $ax^2 + 2\,hxy + by^2 = 0$ is

(A) $\sqrt{3} : 1$ (B) $1 : \sqrt{3}$

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

114. If $\sin\left(\cot^{-1}(x+1)\right) = \cos\left(\tan^{-1} x\right)$ then considering positive square roots, x has the value

(A) 0 (B) $\frac{9}{4}$

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

115. A random variable has the following probability distribution

X :	0	1	2	3	4	5	6	7
P(x) :	0	2p	2p	3p	p^2	$2p^2$	$7p^2$	2p

Then the value of p is

(A) $\frac{1}{10}$ (B) $\frac{1}{30}$

(C) $\frac{1}{100}$ (D) $\frac{3}{20}$

116. Let A and B be two events such that the probability that exactly one of them occurs is $\frac{2}{5}$ and the probability that A or B occurs is $\frac{1}{2}$, then the probability of both of them occur together is

(A) 0.1 (B) 0.2

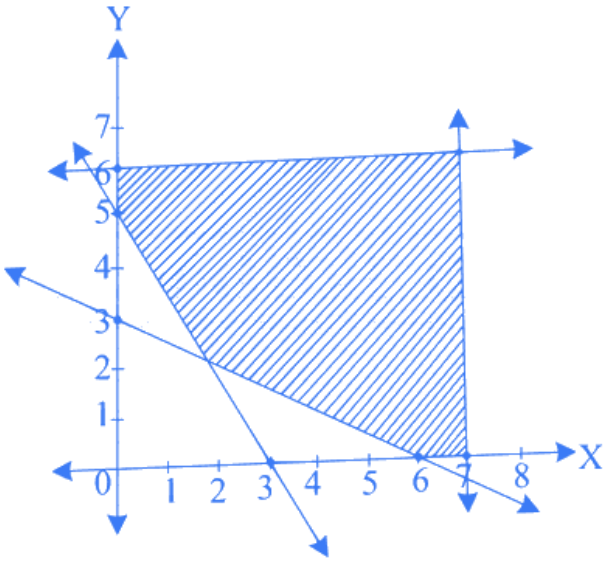
(C) 0.01 (D) 0.02

117. Let $\left(-2 - \frac{1}{3}\mathrm{i}\right)^3 = \frac{x+\mathrm{i}y}{27}, \mathrm{i} = \sqrt{-1}$, where x and y are real numbers, then $(y - x)$ has the value

(A) -91 (B) -85

(C) 85 (D) 91

118. The shaded region in the following figure is the solution set of the inequations



(A) $x + 2y \leq 6, 5x + 3y \geq 15, x \leq 7, y \leq 6, x, y \geq 0$

(B) $x + 2y \geq 6, 5x + 3y \geq 15, x \leq 7, y \leq 6, x, y \geq 0$

(C) $x + 2y \geq 6, 5x + 3y \leq 15, x \geq 7, y \leq 6, x, y \geq 0$

(D) $x + 2y \leq 6, 5x + 3y \leq 15, x \leq 7, y \geq 6, x, y \geq 0$

119. Let $\bar{p}$ and $\bar{q}$ be the position vectors of P and Q respectively, with respect to O and $|\vec{p}| = p, |\vec{q}| = q$. The points R and S divide PQ internally and externally in the ratio $2 : 3$ respectively. If OR and OS are perpendiculars, then

(A) $9p^2 = 4q^2$ (B) $4p^2 = 9q^2$

(C) $9p = 4q$ (D) $4\mathrm{p} = 9\mathrm{q}$

120. The value of a for which the volume of parallelepiped formed by $\hat{i} + a\hat{j} + \hat{k}, \hat{j} + a\hat{k}$ and $a\hat{i} + \hat{k}$ becomes minimum is

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

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

121. The approximate value of $\log_{10} 1002$ is (Given $\log_{10} \mathrm{e} = 0.4343$)

(A) 3.0117 (B) 3.0009

(C) 2.9999 (D) 3.1119

122. The sum of intercepts on coordinate axes made by tangent to the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ is

(A) a (B) $2a$

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

123. If the angles of a triangle are in the ratio $4:1:1$, then the ratio of the longest side to the perimeter is

(A) $1:6$ (B) $\sqrt{3}:(2+\sqrt{3})$

(C) $1:(2+\sqrt{3})$ (D) $2:3$

124. Considering only the Principal values of inverse functions, the set

$$A=\left\{x\geq 0\middle|\ \tan^{-1}(2x)+\tan^{-1}(3x)=\frac{\pi}{4}\right\}$$

(A) contains two elements. (B) contains more than two elements.

(C) is an empty set. (D) is a singleton set.

125. The line L given by $\frac{x}{5}+\frac{y}{b}=1$ passes through the point $(13,32)$. The line K is parallel to line L and has the equation $\frac{x}{c}+\frac{y}{3}=1$. Then the distance between L and K is _____ units.

(A) $\frac{23}{15}$ (B) $\sqrt{17}$

(C) $\frac{17}{\sqrt{15}}$ (D) $\frac{23}{\sqrt{17}}$

126. The integral $\int_{\frac{-1}{2}}^{\frac{1}{2}}\left([x]+\log_e\left(\frac{1+x}{1-x}\right)\right)dx$, where $[x]$ represent greatest integer function, equals

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

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

127. If the function $f(x)=x^3+e^{\frac{x}{2}}$ and $g(x)=f^{-1}(x)$ then the value of $g'(1)$ is

(A) 1 (B) 0

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

128. A wire of length 2 units is cut into two parts, which are bent respectively to form a square of side x units and a circle of radius of r units. If the sum of the areas of square and the circle so formed is minimum, then

(A) $2x=(\pi+4)r$ (B) $(4-\pi)x=\pi r$

(C) $x=2r$ (D) $2x=r$

129. Let $L_1:\frac{x+1}{3}=\frac{y+2}{1}=\frac{z+1}{2}$ and $L_2:\frac{x-2}{1}=\frac{y+2}{2}=\frac{z-3}{3}$ be two given lines. Then the unit vector perpendicular to L_1 and L_2 is

(A) $\frac{-\hat{i}+7\hat{j}+7\hat{k}}{\sqrt{99}}$ (B) $\frac{-\hat{i}-7\hat{j}+5\hat{k}}{5\sqrt{3}}$

(C) $\frac{-\hat{i}+7\hat{j}+5\hat{k}}{5\sqrt{3}}$ (D) $\frac{7\hat{i}-7\hat{j}-7\hat{k}}{\sqrt{99}}$

130. Let $a,b\in R$. If the mirror image of the point $p(a,6,9)$ w.r.t. line $\frac{x-3}{7}=\frac{y-2}{5}=\frac{z-1}{-9}$ is $(20,b,-a-9)$, then $|a+b|$ is equal to

(A) 88 (B) 86

(C) 90 (D) 84

131. A random variable X has the following probability distribution

X :	1	2	3	4	5
P(X) :	k^2	2k	k	2k	$5k^2$

Then $P(X>2)$ is equal to

(A) $\frac{7}{12}$ (B) $\frac{23}{36}$

(C) $\frac{1}{36}$ (D) $\frac{1}{6}$

132. The number of distinct real values of λ, for which the vectors $-\lambda^2\hat{i}+\hat{j}+\hat{k},\hat{i}-\lambda^2\hat{j}+\hat{k}$ and $\hat{i}+\hat{j}-\lambda^2\hat{k}$ are coplanar, is

(A) zero. (B) one.

(C) two. (D) three.

133. If $f(x)=\log_e\left(\frac{1-x}{1+x}\right),|x|<1$, then $f\left(\frac{2x}{1+x^2}\right)$ is equal to

(A) $2f(x^2)$ (B) $-2f(x)$

(C) $(f(x))^2$ (D) $2f(x)$

134. Let the vectors $\bar{a},\bar{b},\bar{c}$ and $\bar{d}$ be such that $(\bar{a}\times\bar{b})\times(\bar{c}\times\bar{d})=\bar{0}$. Let P_1 and P_2 be the planes determined by the pair of vectors $\bar{a},\bar{b}$ and $\bar{c},\bar{d}$ respectively, then the angle between P_1 and P_2 is

(A) 0 (B) $\frac{\pi}{4}$

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

135. If $I=\int e^{\sin\theta}\left(\log\sin\theta+\operatorname{cosec}^2\theta\right)\cos\theta d\theta$, then I is equal to

(A) $e^{\sin\theta}(\log\sin\theta+\operatorname{cosec}^2\theta)+c$, (where c is a constant of integration)

(B) $e^{\sin\theta}(\log\sin\theta+\operatorname{cosec}\theta)+c$, (where c is a constant of integration)

(C) $e^{\sin\theta}(\log\sin\theta-\operatorname{cosec}\theta)+c$, (where c is a constant of integration)

(D) $e^{\sin\theta}(\log\sin\theta-\operatorname{cosec}^2\theta)+c$, (where c is a constant of integration)

136. The equation of the circle which has its centre at the point $(3,4)$ and touches the line $5x+12y-11=0$ is

(A) $x^2+y^2-6x-8y+9=0$

(B) $x^2+y^2-6x-8y+25=0$

(C) $x^2+y^2-6x-8y-9=0$

(D) $x^2+y^2-6x-8y-25=0$

137. A plane which is perpendicular to two planes $2x-2y+z=0$ and $x-y+2z=4$, passes through $(1,-2,1)$. The distance of the plane from the point $(1,2,2)$ is

(A) 0 units (B) 1 units

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

138. The value of the expression $\sqrt{3}\,\text{cosec}\,20^\circ-\sec 20^\circ$ is equal to

(A) 2 (B) $\frac{2\sin 20^\circ}{\sin 40^\circ}$

(C) 4 (D) $4\frac{\sin 20^\circ}{\sin 40^\circ}$

139. Let $\bar{a},\bar{b}$ and $\bar{c}$ be three vectors having magnitude 1,1 and 2 respectively. If $\bar{a}\times(\bar{a}\times\bar{c})+\bar{b}=\bar{0}$, then the acute angle between $\bar{a}$ and $\bar{c}$ is

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$

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

140. The area bounded between the curves $y=ax^2$ and $x=ay^2(a>0)$ is 1 sq. units, then the value of a is

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

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

141. The integral $\int \sec^{\frac{2}{3}}x\cdot\text{cosec}^{\frac{4}{3}}x\,dx$ is equal to

(A) $3(\tan x)^{-\frac{1}{3}}+c$, (where c is the constant of integration)

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

(C) $-3(\cot x)^{\frac{1}{3}}+c$, (where c is the constant of integration)

(D) $-3(\tan x)^{\frac{1}{3}}+c$, (where c is the constant of integration)

142. If sum of two numbers is 3 , then the maximum value of the product of first number and square of the second number is

(A) 6 (B) 4

(C) 5 (D) 3

143. Given that the slope of the tangent to a curve $y=y(x)$ at any point (x,y) is $\frac{2y}{x^2}$. If the curve passes through the centre of the circle $x^2+y^2-2x-2y=0$, then its equation is

(A) $x\log|y|=x-1$

(B) $x\log|y|=-2(x-1)$

(C) $x\log|y|=2(x-1)$

(D) $x^2\log|y|=-2(x-1)$

144. If $y=\left((x+1)(4x+1)(9x+1)\ldots\left(n^2x+1\right)\right)^2$, then $\frac{dy}{dx}$ at $x=0$ is

(A) $\frac{n(n+1)(2n+1)}{4}$ (B) $\frac{n(n+1)(2n+1)}{6}$

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

145. A multiple choice examination has 5 questions. Each question has three alternative answers of which exactly one is correct. The probability, that a student will get 4 or more correct answers just by guessing, is

(A) $\frac{10}{3^5}$ (B) $\frac{17}{3^5}$

(C) $\frac{13}{3^5}$ (D) $\frac{11}{3^5}$

146. A wet substance in the open air loses its moisture at a rate proportional to the moisture content. If a sheet hung in the open air loses half its moisture during the first hour, then the time t , in which 99% of the moisture will be lost, is

(A) $\frac{2\log 10}{\log 2}$ (B) $\frac{\log 10}{\log 2}$

(C) $\frac{3\log 10}{\log 2}$ (D) $\frac{1}{2}\frac{\log 10}{\log 2}$

147. $\lim\limits_{x\to 0}\frac{(1-\cos 2x)(3+\cos x)}{x\tan 4x}$ has the value

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

(C) 4 (D) 3

148. Let $a,b\in(a\neq 0)$. If the function f is defined as

$$f(x)=\begin{cases}\frac{2x^2}{a} & ,0\le x<1\\ a & ,1\le x<\sqrt{2}\\ \frac{2b^2-4b}{x} & ,\sqrt{2}\le x<\infty\end{cases}$$

is continuous in the interval $[0,\infty)$, then an ordered pair (a,b) is

(A) $(-\sqrt{2},1-\sqrt{3})$ (B) $(\sqrt{2},-1+\sqrt{3})$

(C) $(\sqrt{2},1-\sqrt{3})$ (D) $(-\sqrt{2},1+\sqrt{3})$

149. If $(p \wedge \sim q) \wedge (p \wedge r) \rightarrow \sim p \vee q$ is false, then the truth values of p, q and r are respectively

(A) $\mathrm{T}, \mathrm{T}, \mathrm{T}$ (B) $\mathrm{F}, \mathrm{F}, \mathrm{F}$

(C) $\mathrm{T}, \mathrm{F}, \mathrm{T}$ (D) $\mathrm{F}, \mathrm{T}, \mathrm{F}$

150. In $\triangle ABC$, with usual notations, if $b = 3$, $c = 8$, $m\angle A = 60^\circ$, then the circumradius of the triangle is _____ units.

(A) $\frac{7}{3}$ (B) $\frac{7\sqrt{2}}{3}$

(C) $\frac{7}{\sqrt{3}}$ (D) $\frac{7\sqrt{3}}{2}$

- End of Question Paper -