MHT CET 2026 PCM Apr 19 Shift 2 Question Paper

Conducted by the State Common Entrance Test Cell, Maharashtra

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

General Instructions

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

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

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

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

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

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

1. A cuboid has volume $V = l \times l \times \sqrt{l}$, where l is the length of one side. When the length l is measured by a meter scale of least count 1 mm, the relative percentage error in the measurement of its volume is 6.25%. Then the relative percentage error in measurement of its length and the value of the length l is

(A) 2% and 2 cm
(B) 2.5% and 4 cm
(C) 1.8% and 3.6 cm
(D) 1% and 3 cm

2. A particle is performing U.C.M. along a circle of radius R. In half the period of revolution, its displacement and distance covered are respectively

(A) $\sqrt{2}R, 2\pi R$
(B) $2R, \pi R$
(C) $2R, 2\pi R$
(D) $R, \pi R$

3. The equation of the trajectory of a ball projected at an angle θ with the horizontal, is given as $y = x - \frac{gx^2}{2}$
The initial velocity of the ball is
[Given : $\tan 45^\circ = 1$, $\cos 45^\circ = \frac{1}{\sqrt{2}}$]

(A) $2\sqrt{2}\,\text{m/s}$
(B) $2\,\text{m/s}$
(C) $\sqrt{2}\,\text{m/s}$
(D) $\frac{1}{\sqrt{2}}\,\text{m/s}$

4. A stone of mass 40 g is tied to a light inextensible string of length 50 cm and whirled in a vertical circle at the rate of 30 revolutions per minute. The tension in the string when it is at the lowest point of the circle is
(Take gravitational acceleration, $g = 10\,\text{m/s}^2$ and $\pi^2 = 10$)

(A) 0.4 N
(B) 0.5 N
(C) 0.6 N
(D) 0.7 N

5. A body of mass 'm' attached at the end of a string is just completing the loop in a vertical circle. The apparent weight of the body at the lowest point in its path is
(g = gravitational acceleration)

(A) $6\,mg$
(B) $3\,mg$
(C) $1\,mg$
(D) zero

6. Two particles of masses 2 g and 4 g are situated at the opposite ends, A and B of a wooden bar respectively. Let $l(AB) = 9$ cm. The center of mass of the system will be

(A) 6 cm from B.
(B) 3 cm from A.
(C) 2 cm from B.
(D) 6 cm from A.

7. A force of $3\hat{i} + 2\hat{j} - \hat{k}$ N acts on a particle with position vector $\hat{i} + \hat{j} - \hat{k}$ m. The magnitude of torque of given force is

(A) $\sqrt{5}\,\text{N}\,m$
(B) $\sqrt{8}\,\text{N}\,m$
(C) $\sqrt{6}\,\text{N}\,m$
(D) $\sqrt{10}\,\text{N}\,m$

8. A satellite is revolving around a planet in a circular orbit close to its surface. Let ρ be mean density and R be the radius of the planet; then the period of the satellite is
(G = Universal constant of gravitation).

(A) $\sqrt{\frac{4\pi}{\rho G}}$
(B) $\sqrt{\frac{2\pi}{\rho G}}$
(C) $\sqrt{\frac{\pi}{\rho G}}$
(D) $\sqrt{\frac{3\pi}{\rho G}}$

9. A metal wire of length 'L' and density 'd' floats horizontally on the free surface of water. The maximum radius of the wire does not sink in water is
[T = surface tension of water , g = gravitational acceleration]

(A) $\sqrt{\frac{2dg}{\pi T}}$
(B) $\sqrt{\frac{2T}{\pi dg}}$
(C) $\sqrt{\frac{\pi dg}{2T}}$
(D) $\sqrt{\frac{T}{\pi dg}}$

10. The energy needed for breaking a liquid drop of radius 'R' into 'n' droplets each of radius 'r' is
[T = surface tension of the liquid]

(A) $4\pi T R^2 \left[\frac{R}{r} - 1\right]$
(B) $4\pi T R \left[\frac{R}{r} - 1\right]$
(C) $4\pi T \left[\frac{R^2}{r^2} - 1\right]$
(D) $4\pi T \left[1 + \frac{R^3}{r}\right]$

11. In most liquids, with rise in temperature surface tension of liquid

(A) decreases
(B) increases
(C) remains unchanged
(D) first decreases and then increases

12. Out of the following, which statement is NOT true about black body radiation ?

(A) Intensity is more for shorter wavelengths (λ).
(B) Intensity is same for all wavelengths (λ).
(C) Intensity is less for longer wavelengths (λ).
(D) A black body emits all wavelengths (λ).

13. 15 g of ice at 0°C is added to a vessel containing water at 40°C. The mass of water and water equivalent of the vessel is 60 g. Assuming that negligible heat is taken from the surroundings, the final temperature of the mixture will be
[$L_{ice} = 80\,cal/g$, $S_{water} = 1\,cal/g$]

(A) 30°C
(B) 22°C
(C) 16°C
(D) 10°C

14. An ideal gas having pressure P, volume V and temperature T undergoes a thermodynamic process in which $dW = 0$ and $dQ < 0$. Then, for the gas

(A) T will increase.
(B) V will increase.
(C) T will decrease.
(D) P may increase or decrease.

15. An ideal gas at pressure 'P' and temperature 'T' is enclosed in a vessel of volume 'V'. Some gas leaks through a hole from the vessel and the pressure of the enclosed gas falls to P^1. Assuming that the temperature of the gas remains constant during the leakage, the number of moles of the gas that have leaked is

(A) $\frac{P^1V}{RT}$
(B) $\frac{V}{RT}(P - P^1)$
(C) $\frac{2V}{RT}(P + P^1)$
(D) $\frac{V}{RT}(P + P^1)$

16. Assuming the expression for the pressure exerted by the gas, it can be shown that pressure is

(A) $\left(\frac{2}{3}\right)^{rd}$ of kinetic energy per unit volume of a gas.
(B) $\left(\frac{3}{4}\right)^{th}$ of kinetic energy per unit volume of a gas.
(C) $\left(\frac{1}{3}\right)^{rd}$ of kinetic energy per unit volume of a gas.
(D) $\left(\frac{3}{2}\right)^{nd}$ times kinetic energy per unit volume of a gas.

17. An ideal gas ($\gamma = 1.5$) is expanded adiabatically. To reduce the root mean square velocity of molecules two times, the gas should be expanded

(A) 20 times
(B) 16 times
(C) 12 times
(D) 8 times

18. A spring force constant 180 N/m is loaded with a mass 0.2 kg. The amplitude of oscillations is 4 cm. When mass comes to equilibrium position, its velocity is

(A) 0.012 m/s
(B) 0.12 m/s
(C) 1.2 m/s
(D) 12 m/s

19. A particle executing linear S.H.M. has velocities V_1 and V_2 at distance x_1 and x_2 respectively, from the mean position, its angular velocity is

(A) $\sqrt{\frac{V_2^2 - V_1^2}{x_1^2 - x_2^2}}$
(B) $\sqrt{\frac{V_2^2 - V_1^2}{x_2^2 - x_1^2}}$
(C) $\sqrt{\frac{V_2^2 - V_1^2}{x_1 x_2}}$
(D) $\sqrt{\frac{V_1 V_2}{x_1 + x_2}}$

20. In a resonance tube open at one end, the end correction is 1.1 cm. If the shortest length of resonating air column with a tuning fork is 18 cm, the next resonating length will be

(A) 45.9 cm
(B) 49.6 cm
(C) 51.3 cm
(D) 56.2 cm

21. For stationary wave, $y = 12\cos\left(\frac{\pi x}{10}\right)\sin(36\pi t)$ cm, the distance between a node and the successive antinode is

(A) 20 cm
(B) 12 cm
(C) 10 cm
(D) 5 cm

22. Two waves of same frequency (n) approaching each other with same velocity of 18 m/s interfere. The distance between two consecutive antinodes is

(A) $\frac{18}{n}$
(B) $\frac{10}{n}$
(C) $\frac{9}{n}$
(D) $\frac{n}{18}$

23. The equation of a progressive wave is given by $y = 6\cos(100t - 4x)$ where y is in μm, x in metre and t in second. The ratio of the maximum particle velocity to the velocity of wave is

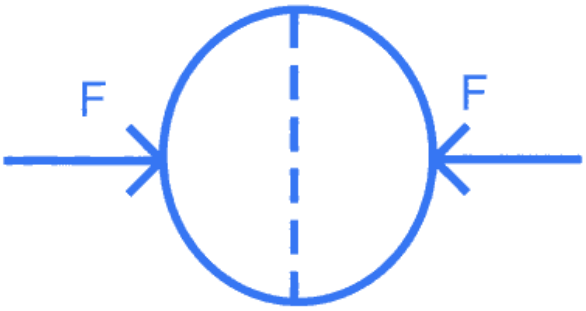
(A) 1.5×10^{-5}
(B) 2.0×10^{-6}
(C) 2.4×10^{-5}
(D) 2.8×10^{-6}

24. A body sends a wave 150 mm long through medium P and 0.30 m long in medium Q. If velocity of the wave in medium P is 80 cm s^{-1}, the velocity of wave in medium Q is

(A) 4.0 m s^{-1} (B) 3.2 m s^{-1}

(C) 2.0 m s^{-1} (D) 1.6 m s^{-1}

25. An uniformly charged thin spherical shell of radius 'R' has uniform surface charge density 'σ'. It is made of two hemispherical identical shells held together by pressing them with force 'F' as shown. F is proportional to
[ϵ_0 = permittivity of free space]



(A) $\frac{1}{\epsilon_0}\frac{\sigma^2}{R^2}$ (B) $\frac{1}{\epsilon_0}\frac{\sigma^2}{R}$

(C) $\frac{1}{\epsilon_0}\sigma^2 R^2$ (D) $\frac{1}{\epsilon_0}\sigma^2 R$

26. Two equal positive charges each of value 'q' are placed at points A and B, where $AB = 3x$. A third charge $-3q$ is placed at point C at a distance x from A on AB. The potential energy of the system is nearly (ϵ_0 = permittivity of free space)

(A) $\frac{q^2}{4\pi\epsilon_0 x}$ (B) $\frac{-2q^2}{4\pi\epsilon_0 x}$

(C) $\frac{3q^2}{4\pi\epsilon_0 x}$ (D) $\frac{-4q^2}{4\pi\epsilon_0 x}$

27. A particle of mass 'm' and charge 'q', initially at rest, is accelerated by a uniform electric field 'E' through a distance 'D' and is then allowed to approach a fixed static charge 'Q' of the same sign. The distance of the closest approach of the charge q is
[ϵ_0 = permittivity of free space]

(A) $Q/4\pi\epsilon_0 D$ (B) $Q/4\pi\epsilon_0 ED$

(C) $Q/2\pi\epsilon_0 D^2$ (D) $Q/4\pi\epsilon_0 E$

28. In an oscillating LC circuit the maximum charge on the capacitor is Q. When the energy is stored equally between the electric and magnetic fields, the charge on the capacitor (q) is

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

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

29. A parallel plate air capacitor has capacity 'C' farad, potential 'V' volt and energy 'E' joule. When the gap between the plates is completely filled with dielectric

(A) V increases, E decreases. (B) V decreases, E increases.

(C) both V and E increase. (D) both V and E decrease.

30. When a galvanometer is shunted by a resistance 'S', its current capacity increases 'n' times. If the same galvanometer is shunted by another resistance 'S^1', its current capacity will increase to 'n^1'. The value of n in terms of n^1, S and S^1 is

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

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

31. The resistances in the two gaps of a balanced meter bridge are 'X' Ω and '3X' Ω respectively. If the resistances are interchanged the balance point shifts by

(A) 25 cm (B) 33.3 cm

(C) 50 cm (D) 75 cm

32. A current carrying circular coil of radius 'R' produces magnetic field B_1 at an axial point P at a distance 'x' from its centre and B_2 at point Q placed at its centre respectively . If $B_2 = 8B_1$, the value of x is

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

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

33. The magnetic induction produced inside an ideal solenoid, depends on which of the following quantities ?
(a) number of turns per unit length.
(b) radius of the wire.
(c) current flowing throught it.
(d) permeability of the medium.

(A) (a), (b) and (d) (B) (a), (b) and (c)

(C) (b), (c) and (d) (D) (a), (c) and (d)

34. Two coils P and S have a mutual inductance of (π) mH. The secondary coil S has resistance $4\,\Omega$ and self inductance $(60/\pi)$ mH. If the current in the primary is $I_p = 12\sin(50\pi t)$, then the maximum value of the current induced in coil S is [Take $\pi^2 = 10$]

(A) 2 A
(B) 1.8 A
(C) 1.5 A
(D) 1.2 A

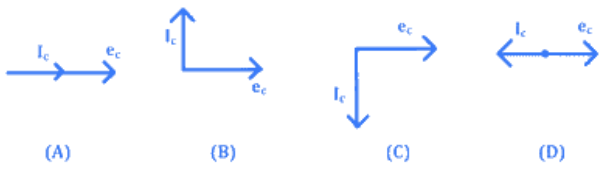
35. A solenoid is connected to a battery so that a steady current flows through it. If an iron core is inserted into the solenoid, then the current in the coil

(A) will not change
(B) will increase
(C) will decrease
(D) may increase or decrease depending upon the direction of the current

36. The magnetic energy stored in an inductor of inductance 4 H carrying a current of 1.5 A is

(A) 4.5 mJ
(B) 3 μJ
(C) 45 μJ
(D) 4500 mJ

37. When a.c. source is connected across a pure capacitor, the correct phase relation between current and emf is shown in figure.



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

38. In series LCR circuit $R = 10\,\Omega$ and impedance is $30\,\Omega$. An r.m.s. voltage 210 V, is applied across the circuit. The true power consumed in AC circuit is

(A) 360 W
(B) 420 W
(C) 490 W
(D) 600 W

39. Light travels a distance 'x' in time 't_0' in air and '$4x$' in time 't_1' in another denser medium. The critical angle for this medium is

(A) $\sin^{-1}\left(\frac{t_1}{t_0}\right)$
(B) $\sin^{-1}\left(\frac{4t_0}{t_1}\right)$
(C) $\sin^{-1}\left(\frac{4t_1}{t_0}\right)$
(D) $\sin^{-1}\left(\frac{t_0}{4t_1}\right)$

40. In a biprism experiment, a steady interference pattern is observed on the screen kept at a distance of 100 cm using a light of wavelength 5000 Ã_x0085_. Without changing the distance between the virtual images of the slit, the source of light is replaced by a source of wavelength 6400 Ã_x0085_. Now, to reduce the fringe width by 20% of its initial value, the screen should be moved

(A) towards the source by 37.5 cm
(B) towards the source by 62.5 cm
(C) away from the source by 62.5 cm
(D) away from the source by 37.5 cm

41. A ray of light is incident at polarising angle θ on air-glass interface. If λ_a and λ_g are the wavelengths of light in air and glass respectively then

(A) $\lambda_a = \lambda_g \cot\theta$
(B) $\lambda_g = \lambda_a \cot\theta$
(C) $\lambda_a = \lambda_g \tan^2\theta$
(D) $\lambda_g = \lambda_a \tan^2\theta$

42. In biprism experiment, the maximum intensity is I_0. If the path difference between the two interfering waves is $\frac{\lambda}{3}$, then intensity at the point on the screen is
[$\sin 30^\circ = \cos 60^\circ = 0.5$, $\sin 60^\circ = \cos 30^\circ = \sqrt{3}/2$]

(A) $\frac{I_0}{4}$
(B) $\frac{I_0}{3}$
(C) $\frac{I_0}{2}$
(D) I_0

43. When light of wavelength 'λ' is incident on a photosensitive surface, the stopping potential is 'V'. When a light of wavelength 1.5λ is incident on the same surface, the stopping potential is '$\frac{V}{4}$'. Threshold wavelength for the surface is

(A) $\frac{6}{5}\lambda$
(B) $\frac{7.5}{4}\lambda$
(C) $\frac{7.5}{9}\lambda$
(D) $\frac{9}{5}\lambda$

44. If the ionisation energy for the hydrogen atom is 13.6 eV, then the energy required to excite it from the ground state to the next higher state is nearly

(A) $-10.2\,eV$
(B) $-3.4\,eV$
(C) $10.2\,eV$
(D) $13.6\,eV$

45. The de-Broglie wavelength of an electron moving in the n^{th} Bohr orbit of radius 'r' is

(A) $n\pi r$ (B) $\frac{nr}{\pi}$

(C) $\frac{2\pi r}{n}$ (D) $\frac{nr}{2\pi}$

46. The magnetic moment of electron due to orbital motion is proportional to
(n = principal quantum number)

(A) n (B) n^2

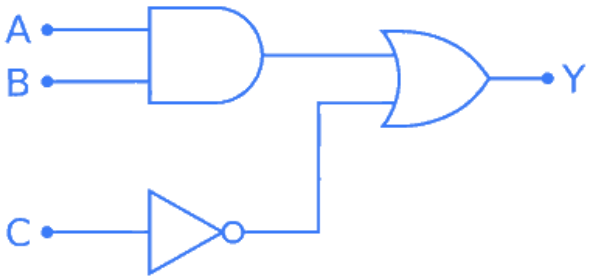
(C) $\frac{1}{n}$ (D) $\frac{1}{n^2}$

47. A radioactive element has rate of disintegration 16,000 disintegrations per minute at a particular instant. After four minutes, it becomes 2000 disintegrations per minute. The decay constant per minute is

(A) $0.25 \log_e 2$ (B) $0.50 \log_e 3$

(C) $0.75 \log_e 2$ (D) $0.8 \log_e 3$

48. The Boolean expression for the given combination of logic gates is



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

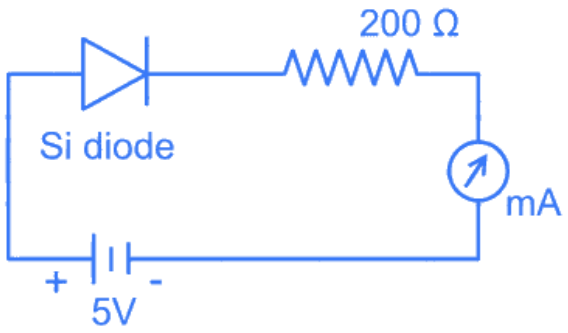
(C) $Y = (A + B) + C$ (D) $Y = (A \cdot B) + \bar{C}$

49. In a transistor, comparing the doping of emitter, base and collector, the part which is heavily doped and that which is lightly doped are respectively

(A) collector and emitter (B) emitter and base

(C) collector and base (D) emitter and collector

50. In the following electrical circuit, the reading in the milliammeter is
(Take knee voltage of silicon diode = 0.7 V)



(A) 25.5 mA (B) 21.5 mA

(C) 18.5 mA (D) 15.8 mA

51. Chlorine has two isotopes Cl^{37} and Cl^{35} with percentage abundance of 25% and 75% respectively. Find average atomic mass of chlorine ?

(A) 35
(B) 37
(C) 35.5
(D) 36

52. Calculate the shortest wavelength in hydrogen spectrum emission of Lymen series ($R_H = 109677\,cm^{-1}$)

(A) 9.117×10^{-6} cm
(B) 9.241×10^{-6} cm
(C) 9.360×10^{-6} cm
(D) 9.482×10^{-6} cm

53. What is the number of bond pair of electrons and lone pair of electrons present in the valence shell of chalcogens in their hydride ?

(A) 2 - Bond pair and 1- lone pair of electrons
(B) 2 - Bond pair and 2- lone pair of electrons
(C) 3 - Bond pair and 1- lone pair of electrons
(D) 3 - Bond pair and 2- lone pair of electrons

54. Which of the following is favourable condition for the formation of ionic bond ?

(A) Low ionization enthalpy of metal and low negative value of electron gain enthalpy of non metal.
(B) Low ionization enthalpy of metal and high negative value of electron gain enthalpy of non metal.
(C) High ionization enthalpy of metal and high negative value of electron gain enthalpy of non metal.
(D) High ionization enthalpy of metal and low negative value of electron gain enthalpy of non metal.

55. Which is the correct decreasing order of boiling points for different compounds from following ?

(A) $CH_3Cl > CH_3Br > CH_2Br_2 > CHBr_3$
(B) $CH_3Br > CH_2Br_2 > CHBr_3 > CH_3Cl$
(C) $CH_2Br_2 > CHBr_3 > CH_3Br > CH_3Cl$
(D) $CHBr_3 > CH_2Br_2 > CH_3Br > CH_3Cl$

56. Which from following gases is least soluble in water under same conditions of temperature and pressure ?

(A) HCl
(B) CO_2
(C) NH_3
(D) O_2

57. Calculate standard Gibbs energy for any gaseous reaction if values of K_p and R respectively are 3.5×10^{17} ; $8.314\,JK^{-1}mol^{-1}$

(A) $-100.1\,kJ\ mol^{-1}$
(B) $-79.5\,kJ\ mol^{-1}$
(C) $-71.4\,kJ\ mol^{-1}$
(D) $-89.5\,kJ\ mol^{-1}$

58. Calculate the work done for the following reaction at 27 °C
$C_2H_{4(g)} + H_{2(g)} \longrightarrow C_2H_{6(g)}$ ($R = 8.314\,JK^{-1}mol^{-1}$)

(A) 2494.2 J
(B) 124.71 J
(C) 3741.3 J
(D) 187.07 J

59. Which from following is NOT a state function ?

(A) Volume
(B) Pressure
(C) Work
(D) Temperature

60. Calculate the $[H_3O^+]$ if pH of the solution is 4.25

(A) 6.123×10^{-5} M
(B) 5.623×10^{-5} M
(C) 4.508×10^{-5} M
(D) 4.085×10^{-5} M

61. If $[H_3O^+]$ of a solution is 1×10^{-4}. What is the value of pOH at 298 K ?

(A) 4
(B) 10
(C) 12
(D) 14

62. Calculate the molar concentration of weak monobasic acid if $K_a = 1.8 \times 10^{-5}$ and degree of dissociation is 0.01 ?

(A) 1.8×10^{-1}
(B) 1.8×10^{-2}
(C) 5.55×10^{-3}
(D) 5.55×10^{-4}

63. Which of the following equimolar solutions is the best conductor of electricity at same temperature ?

(A) CH_3COOH
(B) NH_4OH
(C) HCl
(D) $C_6H_{12}O_6$

64. Which of the following statements is false regarding hydrogen ?

(A) It has two isotopes.

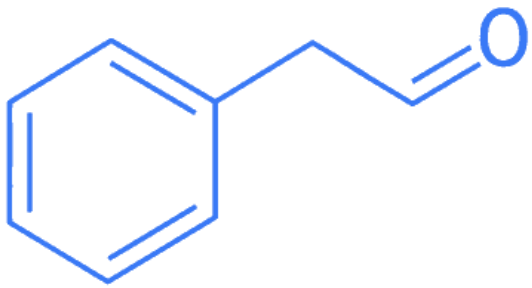
(B) In periodic table hydrogen is placed separately above group 1.

(C) When one electron is lost it forms proton.

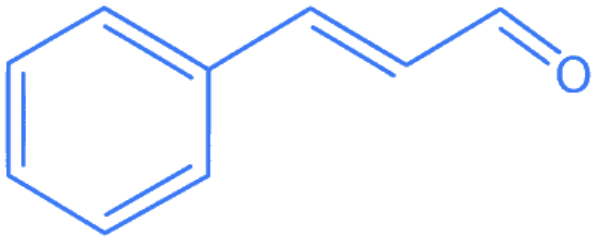
(D) It does not exist freely.

65. Which among the following is an aromatic aldehyde ?

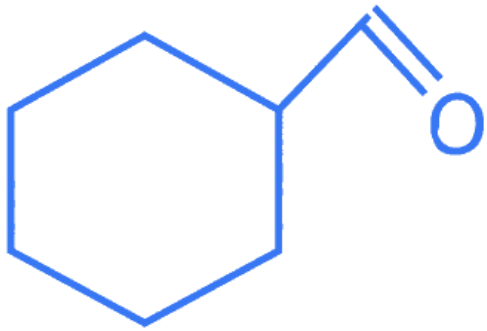
(A)



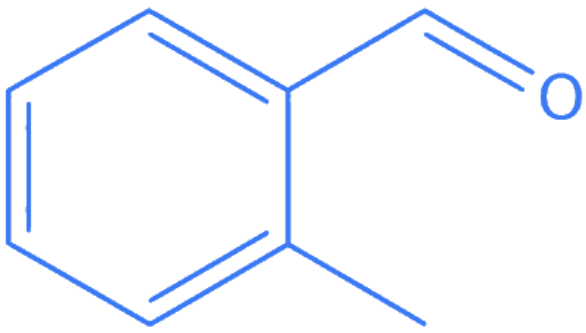
(B)



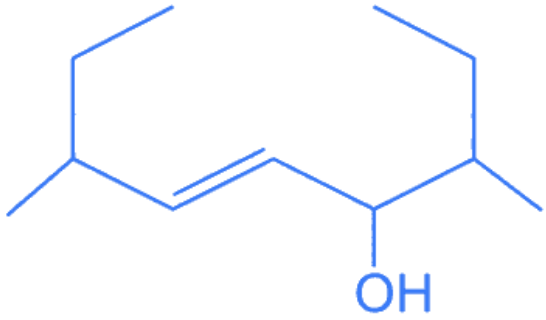
(C)



(D)



66. What is IUPAC name of the following compound ?



(A) 2,6-diethylhept-4-en-3-ol

(B) 2-ethyl-6-methyloct-3-en-5-ol

(C) 3,7-Dimethylnon-5-en-4-ol

(D) 7-ethyl-3-methyl-oct-5-en-4-ol

67. Which among the following is allylic halide ?

(A) $CH_3 - CH_2 - CH_2 - X$

(B) $C_6H_5CH_2 - X$

(C) $CH_2 = CH - CH_2 - X$

(D) $CH_3 - CH = CH - X$

68. IUPAC name of glycerol is -

(A) Propane - 1, 2-diol.

(B) Propane - 1, 3-diol.

(C) Propane - 1,2,3-triol.

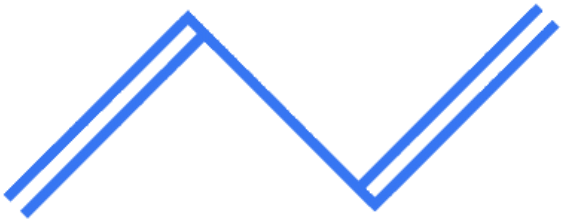
(D) Propene - 1,2,3-triol.

69. Which from following structures represents 1,3 butadiene ?

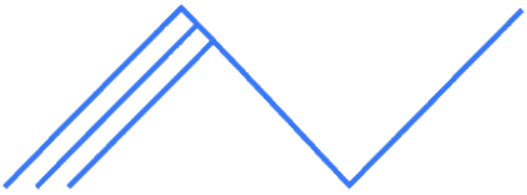
(A)



(B)



(C)

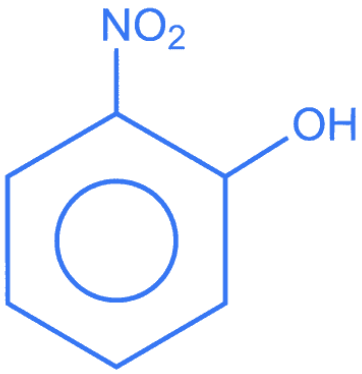


(D)



70. Which of the following is NOT a phenol ?

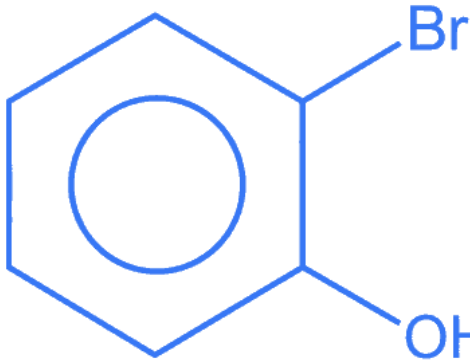
(A)



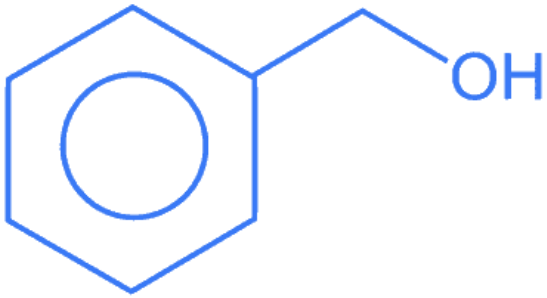
(B)



(C)



(D)



71. Find the number of structural isomers possible for hexane ?

(A) Two (B) Four
(C) Three (D) Five

72. Which of the following hydrocarbons has stronger London dispersion forces ?

(A) Methane (B) Ethane
(C) n-pentane (D) neo-pentane

73. Identify the major product of following reaction.

$$\text{Propene} \xrightarrow[\text{Peroxide}]{\text{HBr}} ?$$

(A) 1 - Bromopropane
(B) 2 - Bromopropane
(C) 3 - Bromopropene
(D) 2 - Bromopropan-1-ol

74. Calculate the total volume of simple cubic unit cell in cm^3 if void volume is $2.0 \times 10^{-23}\ cm^3$

(A) 4.2×10^{-23}
(B) 3.8×10^{-23}
(C) 3.4×10^{-23}
(D) 4.6×10^{-23}

75. Which of the following statements is true about schottky defect ?

(A) The density of a substance decreases.
(B) The electrical neutrality of the substance changes.
(C) It is found in ionic compounds with larger difference between sizes of cation and anion.
(D) It develops when smaller cations occupy interstial sites from their normal sites.

76. In ionic solid, anions are arranged in hcp array and cations occupy $\frac{1}{2}$ tetrahedral voids. What is the formula of ionic compound ?
[Consider A = Cation ; B = anion]

(A) AB_2
(B) AB
(C) A_2B
(D) AB_3

77. Calculate the molality of aqueous solution of electrolyte that freezes at $-0.93\,^\circ C$ if K_f for water and van't Hoff factor respectively are $1.86\,K\,kg\,mol^{-1}$ and 1.25. (Freezing point of water $= 0\,^\circ C$)

(A) 0.2 m
(B) 0.5 m
(C) 0.3 m
(D) 0.4 m

78. Calculate the solubility of certain gas in solvent with pressure 3 atm at 25°C (Henry's law constant is $3.0 \times 10^{-2}\,mol\,dm^{-3}\,atm^{-1}$)

(A) 0.07 M
(B) 0.08 M
(C) 0.09 M
(D) 0.1 M

79. What is molar conductivity of CH_3COOH at zero concentration if the molar conductivities of H_2SO_4, K_2SO_4 and CH_3COOK at zero concentrations are respectively x, y and z $\Omega^{-1}cm^2mol^{-1}$?

(A) $\frac{(x-y)}{2} + z$
(B) $(x - y + 2z)$
(C) $(x + y - z)$
(D) $\frac{(x-y)}{2} + 2z$

80. What must be the molarity of $BaCl_2$ solution to have molar conductivity $240\,\Omega^{-1}cm^2mol^{-1}$ and conductivity $0.012\,\Omega^{-1}cm^{-1}$ at 25°C ?

(A) 0.01 M
(B) 0.02 M
(C) 0.05 M
(D) 0.1 M

81. Half life of a first order reaction is 900 second. If initial concentration of reactant is $0.08\,mol\,dm^{-3}$ find concentration that remains after 35 minute ?

(A) $0.159\,mol\,dm^{-3}$
(B) $0.0159\,mol\,dm^{-3}$
(C) $1.05\,mol\,dm^{-3}$
(D) $0.759\,mol\,dm^{-3}$

82. Consider the reaction,
$3I^-_{(aq)} + S_2O_8^{2-}{}_{(aq)} \longrightarrow I^-_{3\,(aq)} + 2SO_4^{2-}{}_{(aq)}$
If the rate of formation of SO_4^{2-} at a particular time is $2.2 \times 10^{-2}\,mol\,dm^{-3}\,s^{-1}$. Calculate the rate of consumption of I^-.

(A) $1.1 \times 10^{-2}\,mol\,dm^{-3}\,s^{-1}$
(B) $2.2 \times 10^{-2}\,mol\,dm^{-3}\,s^{-1}$
(C) $3.3 \times 10^{-2}\,mol\,dm^{-3}\,s^{-1}$
(D) $4.4 \times 10^{-2}\,mol\,dm^{-3}\,s^{-1}$

83. For a first order reaction, half life is 5 hour. What time is required to reduce 10 g of reactant to 2.5 g ?

(A) 3 hour
(B) 4 hour
(C) 5 hour
(D) 10 hour

84. Which of following forces is responsible for physisorption ?

(A) Coulombic force
(B) Electrostatic force
(C) London force of dispersion
(D) Hydrogen bonding

85. Which of the following ranges of particle size defines nano scale ?

(A) 10-100 nm
(B) 1000-2000 nm
(C) 1-100 nm
(D) 100-1000 nm

86. Which of the following is the correct decreasing order of bond dissociation enthalpy of halogens ?

(A) $F_2 > Cl_2 > Br_2 > I_2$

(B) $I_2 > Br_2 > Cl_2 > F_2$

(C) $Cl_2 > Br_2 > F_2 > I_2$

(D) $Br_2 > I_2 > F_2 > Cl_2$

87. Which from following is NOT an inner transition element ?

(A) Rf (B) Ac

(C) Lu (D) Ho

88. Identify species having metal atom in +6 oxidation state from following

(A) MnO_4^- (B) $[Cr(CN)_6]^{3-}$

(C) Cr_2O_3 (D) CrO_2Cl_2

89. Which element from following is NOT regarded as transition element ?

(A) Cu (B) Sc

(C) Cd (D) Au

90. Which from following coordinate complexes contains neutral ligand ?

(A) Pentacarbonyliron (0) (B) Hexacyanoferrate (II) ion

(C) Trioxalatocobaltate (III) ion (D) Sodium hexanitrocobaltate (III)

91. Which from following complexes is an example of MA_4BC type distereoisomers ?

(A) $[Pt(NH_3)(H_2O)\,Cl_2]$

(B) $[Pt(NH_3)_4\,ClBr]^{2+}$

(C) $Pt(NH_3)_2\,Cl_2$

(D) $[Co(NH_3)_4\,Cl_2]^+$

92. Identify the product B in following reaction.

$$CH_3Br \xrightarrow{KCN} A \xrightarrow[C_2H_5OH]{Na} B$$

(A) Ethane (B) Ethanamine

(C) Ethanol (D) Methanol

93. What is the product formed on Rosenmund reduction of benzoyl chloride ?

(A) Benzene (B) Benzyl alcohol

(C) Benzaldehyde (D) Chlorobenzene

94. Identify the reagent used in following reaction.

$$\text{Benzoic acid} \xrightarrow[\Delta]{\text{Reagent}} \text{Benzoyl chloride} + \text{phosphorous oxychloride} + \text{Hydrogen chloride}$$

(A) PCl_3 (B) HCl

(C) PCl_5 (D) $SOCl_2$

95. Which from following reactions occurs by removal of -CO- group from amide ?

(A) Gabriel phthalimide synthesis (B) Ammonolysis of halides

(C) Mendius reduction (D) Hofmann degradation

96. Which from following pairs of carbohydrates contains galactose in both of them as one of the constituent ?

(A) Sucrose and maltose (B) Maltose and lactose

(C) Lactose and Raffinose (D) Sucrose and lactose

97. Which from following amino acids has a unique structure so that the side chain connects to the back bone of amino acid at two points ?

(A) Histidine (B) Proline

(C) Tryptophan (D) Tyrosine

98. Which from following contains mainly saturated fats ?

(A) Margarine (B) Olive oil

(C) Safflower oil (D) Fish oil

99. Which from following polymers is classified as branched chain polymer?

(A) High density polythene (B) Low density polythene

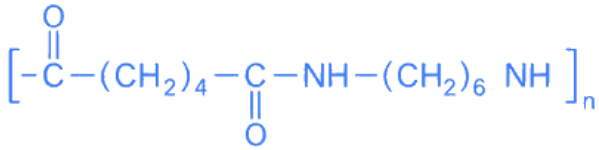
(C) PVC (D) Melamine

100. Which from following polymers is obtained by condensation polymerisation method ?

(A) $[\,CF_2 - CF_2\,]_n$

(B) $[\,CH_2 - CH_2\,]_n$

(C) $[\,NH - (CH_2)_5 - CO\,]_n$

(D) 

101. If $z = \sum_{n=0}^{2026} i^n$, where $i = \sqrt{-1}$, then one of the values of $\sqrt{z}$ is...

(A) $e^{i\frac{\pi}{4}}$ (B) $\frac{1}{\sqrt{2}}e^{i\frac{\pi}{4}}$

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

102. Point A$(5, 12)$ rotated about the origin O in the XY-plane through an angle of 30° in the anti-clockwise direction to a new position B. The ordinate of point B is...

(A) $6\sqrt{3} + \frac{5}{2}$ (B) $\frac{5\sqrt{3}}{2} - 6$

(C) $\frac{5\sqrt{3}}{2} + 6$ (D) $6\sqrt{3} - \frac{5}{2}$

103. If ${}^nC_4, {}^nC_5$ and ${}^nC_6$ are in arithmetic progression (A.P.), then the value of n is...

(A) 5 or 11 (B) 7 or 14

(C) 8 or 15 (D) 6 or 13

104. The family of straight lines $4ax + 3by + c = 0$ such that $a + b + c = 0$ (where a, b, c are real constants) are concurrent at the point...

(A) $(4, 3)$ (B) $\left(\frac{1}{2}, \frac{1}{3}\right)$

(C) $\left(\frac{1}{4}, \frac{1}{3}\right)$ (D) $\left(\frac{1}{3}, \frac{1}{2}\right)$

105. If two lines represented by $x^2 - (1 + \sqrt{3})xy + \sqrt{3}y^2 = 0$ make angles α and β with the X-axis, then $\tan(\alpha + \beta)$ is...

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

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

106. Let PA and PB be the tangent segments drawn from point P$(6, 8)$ to the circle with the centre at origin O. The radius of circle for which the area of quadrilateral PAOB is maximum, is...

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

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

107. A circle passes through the point $(0, 1)$ and touches the parabola $y = x^2$ at the point $(1, 1)$. The centre of the circle is...

(A) $\left(-\frac{1}{2}, -\frac{5}{2}\right)$ (B) $\left(\frac{1}{2}, -\frac{5}{2}\right)$

(C) $\left(\frac{1}{2}, \frac{5}{4}\right)$ (D) $\left(-\frac{1}{2}, \frac{5}{4}\right)$

108. The eccentricity of the ellipse represented by the equation $7x^2 + 16y^2 - 14x + 64y - 377 = 0$ is...

(A) $\frac{3}{4}$ (B) $\frac{\sqrt{7}}{4}$

(C) $\frac{1}{2}$ (D) $\frac{3}{8}$

109. If $\lim_{x \to 1} \frac{x^3 + ax^2 + bx + c}{x^2 - 2x + 1} = 2026$ then the value of $a - c$ is...

(A) 2 (B) 1

(C) -1 (D) -2

110. If the truth value of $[(p \vee q) \wedge (q \to r) \wedge (\sim r)] \to (p \wedge q)$ is false, then which of the following is **NOT** true?

(A) Truth value of $p \to q$ is False (B) Truth value of $p \to r$ is False.

(C) Truth value of $(\sim q) \to p$ is False. (D) The truth value of $(\sim p) \wedge r$ is False.

111. If p, q, r are simple propositions with truth values T, F, T respectively, then which of the following is not a true statement?

(A) $[q \wedge (p \to q)] \to p$

(B) $(p \wedge q) \to (q \vee \sim p)$

(C) $[(\sim p \vee q) \wedge \sim r] \leftrightarrow p$

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

112. If $\sim p \to q$ is false and $q \leftrightarrow r$ is false, then the truth value of (p, q, r) is...

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

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

113. In $\triangle ABC$, with usual notations, $(a+b+c)(b+c-a)(c+a-b)(a+b-c) = 3b^2c^2$, then $\angle A =$

(A) 60° or 120° (B) 30° or 150°

(C) 45° or 135° (D) 30° or 90°

114. If ABC is a triangle of area Δ with $a = 2, b = \frac{7}{2}, c = \frac{5}{2}$, where a, b, c are the lengths of the sides of the triangle opposite to angles A, B and C respectively, then $\frac{2\sin A - \sin 2A}{2\sin A + \sin 2A}$ is equal to...

(A) $\frac{3}{4\Delta}$ (B) $\left(\frac{3}{4\Delta}\right)^2$

(C) $\frac{45}{4\Delta}$ (D) $\left(\frac{45}{4\Delta}\right)^2$

115. If matrix $A = \begin{bmatrix} -1 & 2025 & 2026 \\ 0 & 2 & 2027 \\ 0 & 0 & -1 \end{bmatrix}$, then the sum of all elements in $\text{adj}(A^{-1})$ is equal to...

(A) 1013 (B) 2026

(C) 3039 (D) 6078

116. The inverse of the matrix $A = \begin{bmatrix} 2 & -1 & 4 \\ 4 & -3 & 1 \\ 1 & 2 & 1 \end{bmatrix}$ is $B = \frac{1}{37}\begin{bmatrix} -5 & 9 & 11 \\ -3 & -2 & 14 \\ 11 & -5 & k \end{bmatrix}$, then the value of k is...

(A) 1 (B) -1

(C) 2 (D) -2

117. The value of $\sin^{-1}\left(\sin\frac{5\pi}{6}\right) + \cos^{-1}\left(\cos\frac{7\pi}{6}\right) + \tan^{-1}\left(\tan\frac{2\pi}{3}\right)$ is equal to...

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

(C) $\frac{5\pi}{3}$ (D) π

118. Let $f(x) = 1 - \frac{1}{x}, g_2(x) = f(f(x)), g_3(x) = f(f(f(x)))$ and so on. If $\int x \cdot g_{2026}(x)\,dx = \int g_{2025}(x)\,dx + h(x) + c$, then $h(x) =$...

(A) x (B) $-x$

(C) $\log x$ (D) $-\log x$

119. If $g(x) = 1 - \sqrt{x}$ and $f(g(x)) = 5 + 4\sqrt{x} + x$, then the value of $f(6)$ is...

(A) 5 (B) 10

(C) 15 (D) 20

120. If the function $f(x) = \left(\frac{5x-8}{8-3x}\right)^{\frac{3}{2x-4}}$, for $x \neq 2$ is continuous at $x = 2$, then the value of $f(2)$ is...

(A) e^{12} (B) e^6

(C) e^3 (D) $e^{\frac{3}{2}}$

121. If $x^m + y^m = k, (m \neq 1)$ and $y'' = \frac{ax^b}{y^c}$ such that $a + b + c = 0$, then the value of k is...

(A) 1 (B) 2

(C) 3 (D) m

122. If $y = \sin^{-1}\left(\frac{25-x^2}{25+x^2}\right)$, then $y'(1)$ is...

(A) $-\frac{5}{13}$ (B) $\frac{5}{13}$

(C) $\frac{13}{5}$ (D) $\frac{2}{7}$

123. If $f(x)$ and $g(x)$ are inverse functions of each other and $f(x) = x + e^x$, then $g'(x) =$...

(A) $\frac{1}{1+e^{g(x)}}$ (B) $\frac{e^{g(x)}}{1+e^{g(x)}}$

(C) $\frac{1}{1+g(x)}$ (D) $e^{g(x)}$

124. If $3y^2 - 2xy - x = 0$, then the value of $\frac{dy}{dx}$ at $y = 2$ is...

(A) $\frac{5}{36}$ (B) $\frac{35}{36}$

(C) $\frac{25}{36}$ (D) $\frac{36}{25}$

125. Rolle's theorem holds for monic quadratic polynomial $f(x)$ on the interval $[\alpha, \alpha+3]$ where $f(\alpha) = 0$. Similarly, $g(x) = f(x) + 2$ also follows Rolle's theorem in the interval $[\beta, 3]$ where $g(3) = 0$, such that the value of c is the same for both $f(x)$ and $g(x)$. Then the value of $(f \circ g)(\alpha)$ is...

(A) -4 (B) 4

(C) -2 (D) 2

126. If the rate of increase of surface area of a spherical balloon is $5\,\text{cm}^2/\text{sec}$ and rate of increase of volume of a spherical balloon is $10\,\text{cm}^3/\text{sec}$, then the radius of the balloon at that time is...

(A) 3 cm (B) 5 cm

(C) 6 cm (D) 4 cm

127. The value of integral $\int x^3 \cos x\, dx$ is...

(A) $x^3\sin x + x^2\cos x - 6x\sin x + 6\cos x + c$

(B) $x^3\sin x + 3x^2\sin x - 6x\sin x - 6\cos x + c$

(C) $x^3\sin x + 3x^2\cos x - 6x\sin x - 6\cos x + c$

(D) $x^3\sin x + 3x^2\cos x - 6x\sin x + 6\cos x + c$

128. If u and v are functions of x, then $\int \frac{1}{v^3}\left(uv\frac{du}{dx} - u^2\frac{dv}{dx}\right)dx =$

(A) $\log uv + c$ (B) $\log\frac{u}{v} + c$

(C) $\frac{v^2}{2u^2} + c$ (D) $\frac{u^2}{2v^2} + c$

129. If $f(x) = |5x - 3|$ is defined on interval $[0, 1]$, then the value of $\int_0^1 f(x)\,dx$ is...

(A) $\frac{13}{10}$ (B) $\frac{9}{10}$

(C) $\frac{3}{10}$ (D) $\frac{17}{10}$

130. The value of integral $\int_0^\infty \frac{1}{1+e^x}\,dx$ is...

(A) $\log 2$ (B) $\log\left(\frac{2}{e}\right)$

(C) $-\log e$ (D) $\log\left(\frac{4}{e}\right)$

131. If $f(x)$ is an antiderivative of $\frac{x+1}{\sqrt{x-1}}$ with respect to x, then value of $f(5) - f(2)$ is...

(A) 4 (B) $\frac{14}{3}$

(C) 7 (D) $\frac{26}{3}$

132. The area (in sq. units) of the region bounded by the curve $y = 2x - x^2$ and the X-axis is...

(A) $\frac{4}{3}$ (B) $\frac{8}{3}$

(C) $\frac{20}{3}$ (D) $\frac{2}{3}$

133. The area (in square units) of the region bounded by the circle $x^2 + y^2 = 9$ and the parabola $y^2 \le 8x$ is...

(A) $\frac{8\sqrt{2}}{3} + \frac{9\pi}{2} - 2\sqrt{2} - 9\sin^{-1}\frac{1}{3}$

(B) $\frac{8\sqrt{2}}{3} + \frac{9\pi}{2} + 2\sqrt{2} + 9\sin^{-1}\frac{1}{3}$

(C) $\frac{4\sqrt{2}}{3} + \frac{9\pi}{4} - \sqrt{2} - \frac{9}{2}\sin^{-1}\frac{1}{3}$

(D) $\frac{4\sqrt{2}}{3} + \frac{9\pi}{4} + \sqrt{2} + \frac{9}{2}\sin^{-1}\frac{1}{3}$

134. The differential equation of all lines where the length of the normal from the origin is p and the inclination of the normal is α is... (where p and α are arbitrary constants)

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

(C) $\frac{dy}{dx} = -\cot\alpha$ (D) $\frac{d^2y}{dx^2} = \csc^2\alpha$

135. If the solution of the differential equation $(1+x^3)\frac{dy}{dx} + 6x^2y = 1 + x^2$ is $y = \frac{1}{(1+x^3)^s}\left[x + \frac{x^p}{p} + \frac{x^q}{q} + \frac{x^r}{r} + c\right]$, then the LCM of p, q, r and s is...

(A) 1 (B) 6

(C) 4 (D) 12

136. The solution of the differential equation $\frac{dy}{dx} = \cos(x+y)$ is...

(A) $\cot\left(\frac{x+y}{2}\right) = x + c$

(B) $\tan\left(\frac{x+y}{2}\right) = x + c$

(C) $-\sin(x+y) = x + c$

(D) $\sec(x-y) + x = c$

137. If $\vec{a}, \vec{b}, \vec{c}$ are three vectors such that $\vec{a} \perp (\vec{b}+\vec{c}), \vec{b} \perp (\vec{c}+\vec{a})$, and $\vec{c} \perp (\vec{a}+\vec{b})$ and $|\vec{a}| = 1, |\vec{b}| = 2, |\vec{c}| = 3$, then $|\vec{a}+\vec{b}+\vec{c}|$ is...

(A) $\sqrt{8}$ (B) 8

(C) 14 (D) $\sqrt{14}$

138. Two adjacent sides of a parallelogram ABCD are given by $\overline{AB} = 2\hat{i} + 10\hat{j} + 11\hat{k}$ and $\overline{AD} = -\hat{i} + 2\hat{j} + 2\hat{k}$. The side AD is rotated by an acute angle α in the plane of the parallelogram so that AD becomes AD'. If AD' makes a right angle with the side AB, then the cosine of the angle α is...

(A) $\frac{8}{9}$ (B) $\frac{\sqrt{17}}{9}$

(C) $\frac{1}{9}$ (D) $\frac{4\sqrt{5}}{9}$

139. The maximum volume of a parallelopiped (in cubic units) with vectors $(2a\hat{i} + \hat{k}), (a\hat{j} - a\hat{k})$, and $(3\hat{i} + a\hat{j})$, where $a \in [0, 1]$, as its coterminous edges is...

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

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

140. Let O$(0, 0)$, A$(-1, 2)$ and B$(1, 3)$ be the vertices of $\triangle$OAB. The bisector of angle O intersects side AB at point D. The value of $\vec{OD} \cdot \vec{AB}$ is equal to...

(A) $-5(\sqrt{2} + 1)$ (B) $5(1 - \sqrt{2})$

(C) $5(\sqrt{2} + 1)$ (D) $5(\sqrt{2} - 1)$

141. The perpendicular distance from the origin to the plane containing the points $(1, -2, 1), (2, -1, -3)$ and $(0, 1, 5)$ is...(in units)

(A) $\frac{1}{\sqrt{17}}$ (B) $\frac{3}{\sqrt{26}}$

(C) $\frac{5}{\sqrt{17}}$ (D) $\frac{7}{\sqrt{26}}$

142. If α, β, γ are the direction angles of the line $x = 4z + 3$ and $y = 2 - 3z$, then the value of $\cos\alpha + \cos\beta + \cos\gamma$ is...

(A) $\frac{8}{\sqrt{26}}$ (B) $\frac{6}{\sqrt{26}}$

(C) $\frac{4}{\sqrt{26}}$ (D) $\frac{2}{\sqrt{26}}$

143. The shortest distance between the lines $\vec{r} = (4\hat{i} - \hat{j}) + \lambda(\hat{i} + 2\hat{j} - 3\hat{k})$ and $\vec{r} = (\hat{i} - \hat{j} + 2\hat{k}) + \mu(\hat{i} + 4\hat{j} - 5\hat{k})$ is...

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

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

144. Let $\vec{r} \cdot (3\hat{i} - 2\hat{j} + 7\hat{k}) = 32$ is the equation of a plane and the line having direction ratios $(5, b, 3)$ is parallel to the plane, then the value of b is...

(A) $b = 13$ (B) $b = 15$

(C) $b = 16$ (D) $b = 18$

145. A line passing through the points $(1, -1, 2)$ and $(2, 0, 1)$ meets the XY plane and the YZ plane at points A and B respectively. The distance AB is equal to...

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

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

146. An airplane can carry a maximum of 250 passengers. A profit of Rs 1500 is made on each executive class ticket and a profit of Rs 900 is made on each economy class ticket. The airline reserves at least 30 seats for executive class. However at least 4 times as many passengers prefer to travel by economy class than by executive class. Let x_1 be the number of passengers of executive class and x_2 be the number of passengers of economy class. Formulate the LPP in order to maximize the profit for the airline...

(A) Maximize $z = 1500x_1 + 900x_2$ subject to
$x_1 + x_2 \leq 250$, $x_1 \leq 30$, $x_2 \leq 4x_1$,
$x_1 \geq 0, x_2 \geq 0$.

(B) Minimize $z = 150x_1 + 90x_2$ subject to
$x_1 + x_2 \leq 250$, $x_1 \geq 30$, $x_2 \geq 4x_1$,
$x_1 \geq 0, x_2 \geq 0$.

(C) Minimize $z = 1500x_1 + 900x_2$ subject to
$x_1 + x_2 \leq 250$, $x_1 \geq 30$, $x_2 \geq 4x_1$,
$x_1 \geq 0, x_2 \geq 0$.

(D) Maximize $z = 1500x_1 + 900x_2$ subject to
$x_1 + x_2 \leq 250$, $x_1 \geq 30$, $x_2 \geq 4x_1$,
$x_1 \geq 0, x_2 \geq 0$.

147. The probability that a bomb will hit the target is 0.8. Out of 6 bombs dropped, probability that at least 1 will miss the target is...

(A) $\left(\frac{1}{5}\right)^6$ (B) $1 - \left(\frac{1}{5}\right)^6$

(C) $\left(\frac{4}{5}\right)^6$ (D) $1 - \left(\frac{4}{5}\right)^6$

148. Two cards are drawn at random from a box which contains 5 cards numbered 1, 1, 2, 2 & 3. If X denotes the sum of the numbers, then the expected value of X is...

(A) 2.6 (B) 3.8

(C) 3.2 (D) 3.6

149. Bag A contains 3 white and 5 black balls while bag B contains 4 white and 3 black balls. A ball is selected at random from bag A and put in bag B. If a ball is now selected at random from bag B then the probability that this ball is white ball is...

(A) $\frac{20}{64}$ (B) $\frac{31}{64}$

(C) $\frac{35}{64}$ (D) $\frac{32}{64}$

150. The lengths of the shadows of a tree of height p, thrown by sun's rays at three different moments are p, 2p and 3p. The sum of the angles of elevation of the sun's rays at these three moments is equal to...

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

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

- End of Question Paper -