MHT CET 2025 PCM Apr 26 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 2025**, 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. In a common emitter transistor amplifier circuit, the input resistance is 1.8kΩ and output is obtained across a load resistance of 9kΩ. The alternating current gain is 70 . Corresponding to an a.c. input voltage of 6 mV , the output voltage will be

(A) 0.7 V (B) 1.4 V
(C) 2.1 V (D) 4.2 V

2. When a resistance of 100Ω is connected in series with a galvanometer of resistance ' G ', its range is ' V '. To double its range, a resistance of 1000Ω is connected in series. The value of ' G ' is

(A) 400Ω (B) 800Ω
(C) 1000Ω (D) 1200Ω

3. In case of free expansion, which one of the following statements is WRONG?

(A) It is an instantaneous change. (B) The system is not in thermodynamic equilibrium.
(C) Free expansion can be plotted on a P-V diagram. (D) It is an uncontrolled change.

4. Applying forward bias to p-n junction, the potential barrier

(A) increases. (B) decreases.
(C) remains unchanged. (D) becomes zero.

5. Light of incident frequency 3 times the threshold frequency is incident on a photosensitive material. If the incident frequency is made $\left(\frac{1}{4}\right)^{\text{th}}$ and intensity is tripled then the photoelectric current will

(A) increase. (B) decrease.
(C) be $(\frac{1}{3})^{\text{rd}}$ (D) be zero.

6. A capillary tube when immersed vertically in water, the rise of water column is upto height h_1 on earth's surface. When this arrangement is taken into a mine of depth 'd', below earth's surface, the height of the water column is h_2. If R is the radius of the earth, the ratio $\frac{h_2}{h_1}$ is

(A) $\frac{R+d}{R}$ (B) $\frac{R-d}{R}$
(C) $\frac{R}{R+d}$ (D) $\frac{R}{R-d}$

7. The work done in turning a magnet of magnetic moment ' M ' by an angle of 90° from the meridian is ' n ' times the corresponding Work done to turn it through an angle of 60° where the value of ' n ' is $(\cos 90^\circ = 0, \cos 60^\circ = 0.5)$

(A) 0.5 (B) 2
(C) 0.25 (D) 1

8. When magnetic flux changes from 6.5×10^{-2} Wb to 11×10^{-2} Wb and the change in current is 0.03 A , the coefficient of mutual inductance will be

(A) 1.0 H (B) 1.2 H
(C) 1.5 H (D) 1.8 H

9. At a place, the length of the oscillating simple pendulum is made $\frac{1}{4}$ times keeping amplitude same then the total energy will be

(A) 2 times (B) 4 times
(C) 8 times (D) 16 times

10. 125 small water drops of same size fall through air with constant velocity 4 cm/s. They coalesce to form a big drop. The terminal velocity of the big drop is

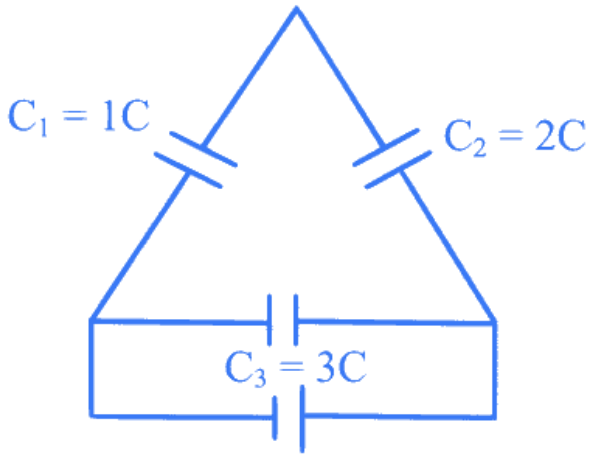
(A) 0.5 m/s (B) 1 m/s
(C) 1.5 m/s (D) 2.5 m/s

11.

$$\text{If } |\vec{a}| = \sqrt{26}\ , |\vec{b}| = 7$$
$$|\vec{a} \times \vec{b}| = 35, \text{ find } \vec{a} \cdot \vec{b}$$

(A) 4 (B) 5
(C) 6 (D) 7

12. Three capacitors are connected to a battery as shown in figure. The ratio of charge on capacitors C_3 and C_1 is



(A) 1.5 (B) 2.5
(C) 3.5 (D) 4.5

13. A spring executes S.H.M. with mass 1 kg attached to it. The force constant of the spring is 4 N/m. If at any instant its velocity is 20 cm/s, the displacement at that instant is (Amplitude of S.H.M. is 0.4 m)

(A) $\sqrt{0.11}$ m (B) $\sqrt{0.15}$ m
(C) $\sqrt{0.17}$ m (D) $\sqrt{0.19}$ m

14. The material used for solar cell should have band gap

(A) equal to zero. (B) less than 1.0 eV (non-zero).
(C) more than 1.8 eV . (D) between 1.0 eV and 1.8 eV .

15. The ratio of the distance of n^{th} bright band and m^{th} dark band from the central bright band in an interference pattern is

(A) $n : m$ (B) $m : n$
(C) $n : (m - \frac{1}{2})$ (D) $(n - \frac{1}{2}) : m$

16. An ideal gas expands adiabatically, $(\gamma = 1.5)$. To reduce the r.m.s. velocity of the molecules 4 times, the gas has to be expanded

(A) 256 times (B) 128 times
(C) 64 times (D) 8 times

17. Out of the following statements which is NOT the characteristics of electric lines of force?

(A) Electric lines of force originate from a positively charged object and end on negatively charged object.
(B) The electric lines of force do not intersect each other.
(C) The electric lines of force pass through the conductor.
(D) The electric lines of force are crowded in a region where electric intensity is large.

18. The temperature at which oxygen molecules will have same r.m.s. speed as helium molecules at 57°C is (molecular masses of oxygen and helium are 32 and 4 respectively.)

(A) 1320 K (B) 2240 K
(C) 2640 K (D) 3230 K

19. A single slit diffraction pattern is formed with white light. For what wavelength of light the 4^{th} secondary maximum in diffraction pattern coincides with the 3^{rd} secondary maximum in the pattern of light of wavelength ' λ '?

(A) $\frac{5\lambda}{7}$ (B) $\frac{7\lambda}{9}$
(C) $\frac{3\lambda}{4}$ (D) $\frac{9\lambda}{13}$

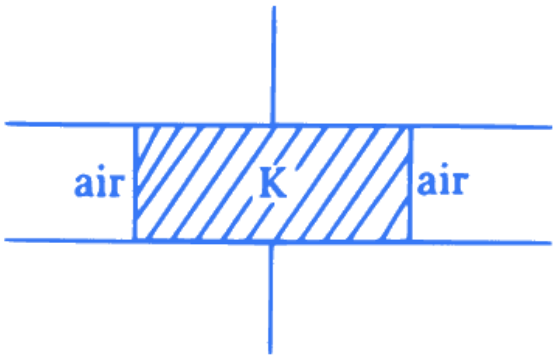
20. A resistor of 50Ω, inductor of self inductance $\left(\frac{2}{\pi^2}\right)$ H and a capacitor of unknown capacity are connected in series to an a.c. source of 100 V, 50 Hz supply. When the voltage and current are in phase, the value of capacitance is

(A) 10μ F (B) 20μ F
(C) 40μ F (D) 50μ F

21. A rigid body rotates about a fixed axis with variable angular velocity $(\alpha - \beta t)$ at time t, where α and β are constants. The angle through which it rotates before it comes to rest is

(A) $\frac{\alpha}{\beta}$ (B) $\frac{\alpha^2}{\beta}$
(C) $\frac{\alpha^2}{2\beta}$ (D) $\frac{\alpha}{2\beta}$

22. The capacity of air filled parallel plate capacitor is C_0. One-half of the space between the plates is filled with a dielectric constant ' K ' as shown in figure. The new capacity becomes C_n. The ratio C_n to C_0 is



(A) $(\frac{K+1}{2})$ (B) $(\frac{K+1}{3})$
(C) $(\frac{K+1}{4})$ (D) $4(K+1)$

23. Two black spheres P&Q have radii in the ratio 4 : 3. The wavelength of maximum intensity of radiation are in the ratio 4 : 5 respectively. The ratio of radiated power by P to Q is

(A) $\frac{625}{144}$ (B) $\frac{125}{81}$
(C) $\frac{25}{9}$ (D) $\frac{5}{3}$

24. A monochromatic ray of light is incident normally on a thin prism of refracting angle A . The ray is deviated through an angle $(1.15)^\circ$ in passing through the prism. The ray reflected internally from the second face emerges from the first face making an angle of $(6.3)^\circ$ with the incident ray. The refractive index of the prism is

(A) 1.625 (B) 1.575
(C) 1.525 (D) 1.515

25. The wavelength ' λ ' of a photon and the de-Broglie wavelength of an electron have same value. the ratio of kinetic energy of the electron to the energy of a photon is
(m = mass of electron, c = velocity of light, h = Planck's constant)

(A) $\frac{2\lambda mc}{h}$ (B) $\frac{\lambda mc}{h}$
(C) $\frac{h}{2\lambda mc}$ (D) $\frac{h}{\lambda mc}$

26. The heat energy that must be supplied to 14 gram of nitrogen at room temperature to raise its temperature by 48°C at constant pressure is (Molecular weight of nitrogen $= 28$, $R =$ gas constant, $C_p = \frac{7}{2}R$ for diatomic gas)

(A) 76 R (B) 84 R
(C) 90 R (D) 96 R

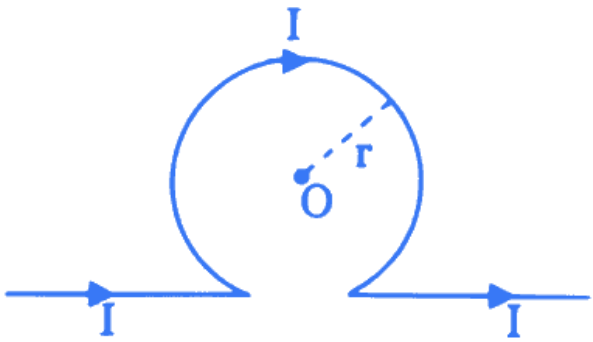
27. Charges of 2μC and -3μC are placed at two points A and B separated by distance of 1 m . The distance of the point from A where net potential is zero is

(A) 0.667 m (B) 0.5 m
(C) 0.4 m (D) 0.6 m

28. The difference in length between two rods A and B is 60 cm at all temperatures. If $\alpha_A = 18 \times 10^{-6}/^\circ$C and $\alpha_B = 27 \times 10^{-6}/^\circ$C, then the length of rod A and rod B at 0°C is respectively

(A) $l_A = 120$ cm, $l_B = 60$ cm.
(B) $l_A = 180$ cm, $l_B = 120$ cm.
(C) $l_A = 240$ cm, $l_B = 180$ cm.
(D) $l_A = 270$ cm, $l_B = 210$ cm.

29. An infinitely long straight conductor carrying current ' I ' is bent into a shape as shown in figure. The radius of the circular loop is ' r '. The magnetic induction at the centre of the loop at point ' O ' is
(μ_0 = permeability of free space)



(A) zero (B) $\frac{\mu_0 I}{4\pi r}(\pi - 1)$
(C) $\frac{\mu_0 I}{2\pi r}(\pi + 1)$ (D) $\frac{\mu_0 I}{2\pi r}(\pi - 1)$

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30. Let R_1, R_2 and R_3 be the radii of three mercury drops. A big mercury drop is formed from them under isothermal conditions. The radius of the resultant drop is

(A) $(R_1^3 + R_2^3 + R_3^3)^{\frac{1}{3}}$ (B) $(R_1^2 + R_2^3 - R_3^3)^{\frac{1}{3}}$

(C) $(R_1^3 + R_2^3 + R_3^3)$ (D) $(R_1 + R_2 + R_3)^3$

31. Fundamental frequency of sonometer wire is ' n '. If the tension and length are increased 3 times and diameter is increased twice, the new frequency will be

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

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

32. Moment of inertia of a solid sphere about its diameter is 'I'. It is then casted into 27 small spheres of same diameter. The moment of inertia of each small sphere about its diameter is

(A) $\frac{\mathrm{I}}{44}$ (B) $\frac{\mathrm{I}}{188}$

(C) $\frac{\mathrm{I}}{204}$ (D) $\frac{\mathrm{I}}{243}$

33. Two circuits A and B are connected to identical d.c. sources each of e.m.f. 10 volt. Self-inductances of circuits A and B are respectively $\mathrm{L_A} = 10\mathrm{H}$ and $\mathrm{L_B} = 10\mathrm{mH}$. The total resistance of each circuit is 40Ω. The ratio of energy consumed in circuit A and circuit B to build up the current to steady value is

(A) 800 (B) 1000

(C) 1200 (D) 1400

34. The ratio of the frequencies of two simple pendulums is 4 : 3 at the same place. The ratio of their respective lengths is

(A) 3 : 4 (B) 4 : 3

(C) 9 : 16 (D) 16 : 9

35. A source of sound emits sound wave of frequency ' f ' and moves towards an observer with a velocity $\frac{\mathrm{V}}{3}$ where V is the velocity of sound. If the observer moves away from the source with a velocity $\frac{\mathrm{V}}{5}$ the apparent frequency heard by him will be

(A) $\frac{15}{2}\mathrm{f}$ (B) $\frac{8}{15}\mathrm{f}$

(C) $\frac{6}{5}\mathrm{f}$ (D) $\frac{15}{18}\mathrm{f}$

36. In Young's double slit experiment, the distance between the slits is 2 mm and the slits are 1 m away, from the screen. Two interference patterns can be obtained on the screen due to light of wavelength ' λ_1 ' and ' λ_2 ' respectively. The separation on the screen between the 3^{rd} order bright fringes on the two interference patterns is ($\lambda_2 = 1.5\lambda_1$)

(A) $(0.75 \times 10^{+3})\lambda_1$ (B) $(1.75 \times 10^{+3})\lambda_1$

(C) $(2.00 \times 10^{+3})\lambda_1$ (D) $(2.25 \times 10^{+3})\lambda_1$

37. L, C and R are connected in series to an a. c. source. Which one of the following is true?
Phase relation between current and voltage is such that

(A) both are out of phase with each other in ' R '.

(B) both are in phase in ' L ' and out of phase in ' C '.

(C) both are out of phase in ' L ' and in phase in 'C'.

(D) both are out of phase in both ' C ' and ' L '.

38. A bar of iron having magnetic moment $2.4\mathrm{Am}^2$ weighs 66 g . If the density of the material of the bar is $7700\ \mathrm{kg/m}^3$, the intensity of magnetisation in Am^{-1} is

(A) 1.4×10^5 (B) 2.8×10^5

(C) 1.4×10^4 (D) 2.8×10^4

39. The error in the measurement of length and mass is 3% and 4% respectively. The error in the measurement of density will be

(A) 6% (B) 13%

(C) 9% (D) 15%

40. The potentiometer wire is 5 m long and potential difference of 4 V is maintained between the ends. The e.m.f. of the cell which balances against a length of 200 cm of the potentiometer wire is

(A) 0.4 V (B) 0.8 V

(C) 1.2 V (D) 1.6 V

41. Moment of inertia of the rod about an axis passing through the centre and perpendicular to its length is ' I_1 '. The same rod is bent into a ring and its moment of inertia about the diameter is ' I_2 '. Then I_1/I_2 is

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

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

42. A body weighs 45 N on the surface of the earth. The gravitational force on a body due to earth at a height equal to half the radius of earth will be

(A) 20 N (B) 22.5 N
(C) 30 N (D) 36 N

43. An air column is of length 17 cm . The ratio of frequencies of 5^{th} overtone if the air column is closed at one end to that open at both ends is (velocity of sound in air $= 340\ \text{ms}^{-1}$)

(A) $\frac{9}{11}$ (B) $\frac{5}{7}$
(C) $\frac{11}{12}$ (D) $\frac{13}{9}$

44. In Paschen series, wavelength of first line is ' λ_1 ' and for Brackett series, wavelength of first line is ' λ_2 ' then ratio $\frac{\lambda_1}{\lambda_2}$ is

(A) $\frac{7}{400}$ (B) $\frac{9}{144}$
(C) $\frac{81}{175}$ (D) $\frac{108}{509}$

45. A sphere of mass ' m ', moving with velocity ' $3u$ ' collides head-on with another identical sphere at rest. If ' e ' is coefficient of restitution then what will be the ratio of velocity of the second sphere to that of first sphere after collision?

(A) $\frac{1-e}{1+e}$ (B) $\frac{1+e}{1-e}$
(C) $\frac{e+1}{e-1}$ (D) $\frac{e-1}{e+1}$

46. A magnetic field 4×10^{-2} T acts at right angles to a coil of area $100\ \text{cm}^2$ with 50 turns. The average e.m.f. induced in the coil is 0.1 V , when it is removed from the field in time ' t '. The value of ' t ' is

(A) 0.02 second (B) 0.05 second
(C) 0.2 second (D) 2 second

47. The ratio of energies of photons produced due to transition of electron of hydrogen atom from its (i) third to 2^{nd} energy level and (ii) highest energy level to 3^{rd} level is

(A) 3 : 2 (B) 5 : 4
(C) 5 : 3 (D) 8 : 3

48. In Sonometer experiment, the frequency of a tuning fork used is 288 Hz . Harmonics will 'NOT' be produced at the frequency

(A) 288 Hz (B) 576 Hz
(C) 844 Hz (D) 864 Hz

49. A boy throws a ball vertically upwards from a bridge with velocity 5 m/s. It strikes water surface after 2 s . The height of the bridge is (Take $g = 10\ \text{m/s}^2$)

(A) 20 m (B) 15 m
(C) 12 m (D) 10 m

50. In series LCR circuit $C = 2\mu$ F, L = 5mH and $R = 5\Omega$. The ratio of energy stored in the inductor to that in capacitor, when maximum current flows through the circuit is

(A) 200 : 1 (B) 100 : 1
(C) 300 : 1 (D) 500 : 1

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51. The solubility product of AgBr is 4.9×10^{-13} at a certain temperature. Calculate the solubility.

(A) 4×10^{-6} moldm^{-3} (B) 4×10^{-7} moldm^{-3}
(C) 7×10^{-7} moldm^{-3} (D) 3×10^{-8} moldm^{-3}

52. Which of the following reagents is used to convert $C \equiv C$ triple bond to $C = C$ double bond to give Cis isomer of alkene?

(A) $ZnCl_2/HCl$ (B) Pd -C/quinoline
(C) Na / liquid NH_3 (D) Na/Hg in H_2O

53. Which of the following changes takes place at positive electrode during recharging of lead accumulator?

(A) Pb is oxidised to $PbSO_4$ (B) $PbSO_4$ is oxidised to PbO_2
(C) $PbSO_4$ is reduced to Pb (D) PbO_2 is reduced to $PbSO_4$

54. Identify neutral aminoacid from following list represented by three letter symbols.

(A) Arg (B) Asp
(C) Leu (D) His

55. Which from following is a weak field ligand?

(A) EDTA (B) CO
(C) F^- (D) NH_3

56. Identify the order of following reaction?

$$2NO_{2(g)} \rightarrow 2NO_{(g)} + O_{2(g)}$$

(A) 1 (B) 1.5
(C) 2 (D) 3

57. Identify the products of following reaction?

Formaldehyde + Benzaldehyde $\xrightarrow[\text{ii) } H_3O^+]{\text{i) conc. NaOH}}$ Products

(A) Phenylmethanol and methanol (B) Methanol and benzoic acid
(C) Methanoic acid and phenylmethanol (D) Methanoic acid and benzoic acid

58. What is the coordination number of a particle in simple cubic close packed structure?

(A) 12 (B) 4
(C) 6 (D) 8

59. Which from following polymers does NOT contain either -COO - or $-CO-NH-$ linkage in it?

(A) Perspex (B) Polyacrylamide
(C) Glyptal (D) Thermocol

60. Which of the following does NOT exhibit haloform reaction?

(A) Ethanal (B) Propanal
(C) Propanone (D) Butanone

61. What is the expected order of basic strength of different compounds from following.

(A) $R_3\,N < R_2NH < R - NH_2 < NH_3$
(B) $NH_3 < R - NH_2 < R_2NH < R_3\,N$
(C) $R_2NH < R_3\,N < R - NH_2 < NH_3$
(D) $NH_3 < R_3\,N < R_2NH < R - NH_2$

62. Calculate the change in internal energy of the system if work done by the system is 18 joule and absorbs heat 50 joule in a particular reaction.

(A) 20 J (B) 32 J
(C) 48 J (D) 68 J

63. Equal masses of helium and oxygen are mixed in an empty container at 25°C. What is the fraction of the total pressure exerted by helium?

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$
(C) $\frac{8}{9}$ (D) $\frac{7}{9}$

64. What is the number of oxygen atoms bonded to chlorine in its strongest oxoacid?

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

65. Dissociation constant of 0.01 M weak acid is 10^{-4}. What is percent dissociation of acid?

(A) 2% (B) 6%
(C) 10% (D) 1.5%

66. Which among the following gases is least adsorbed on solid at similar conditions of temperature and pressure?

(A) Cl_2 (B) NH_3
(C) SO_2 (D) H_2

67. Which from following compounds contains complex anions?

(A) Sodium hexanitrocobaltate(III)

(B) Triamminetrinitrocobalt(III)

(C) Pentaammineaquacobalt(III)iodide

(D) Hexaamminecobalt(III) chloride

68. What are the positions of ' N ' atoms present in purine ring of nucleic acids?

(A) 1,3 and 5 (B) 1,3 and 9

(C) 1,5,7 and 9 (D) 1,3,7 and 9

69. Identify the product ' A ' formed in the following reaction.



(A) 2,3-dibromopentane (B) 2-Bromo-3-methylbutane

(C) 3-Bromo-2-methylbutane (D) 2,3-dibromo-2-methylbutane

70. Rate of the reaction $A + B \longrightarrow$ product is 3.6×10^{-2} moldm^{-3} s^{-1} and rate law is $r = k[A][B]^2$. What is rate constant of the reaction if $[A] = 0.2M$ and $[B] = 0.1M$?

(A) 10 mol^{-2}dm^6 s^{-1} (B) 18 mol^{-2}dm^6 s^{-1}

(C) 24 mol^{-2}dm^6 s^{-1} (D) 4.8 mol^{-2}dm^6 s^{-1}

71. Find out the total number of electrons present in 3.2 g methane?

(A) 6.022×10^{23} (B) 1.204×10^{24}

(C) 3.201×10^{23} (D) 4.821×10^{22}

72. Which among the following salt turns blue litmus red in its aqueous solution?

(A) $CuSO_4$ (B) Na_2CO_3

(C) Na_2SO_4 (D) $NaNO_3$

73. Which lanthanoid from following may exhibit +4 oxidation state with f^0 configuration?

(A) Eu (B) Tb

(C) Ce (D) Lu

74. Which among the following compounds does NOT form intermolecular hydrogen bonding?

(A) Ethoxyethane (B) Butane

(C) Phenol (D) Butan-1-ol

75. What is the common name of Benzene-1,3-diol?

(A) Catechol (B) Resorcinol

(C) Quinol (D) Pyrogallol

76. Identify a medicinal compound having amide linkage.

(A) Aspirin (B) Methylsalicylate

(C) Curcumin (D) Paracetamol

77. Which among the following has highest boiling point?

(A) Butyric acid (B) Valeric acid

(C) Acetic acid (D) Formic acid

78. What is the numerical value of osmotic pressure of 1 M urea solution if numerical value of osmotic pressure of 0.5 M urea solution is ' x '?

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

(C) $2x$ (D) $3x$

79. Calculate vapour pressure of volatile liquid A at given temperature if mole fraction and vapour pressure of volatile liquid B are 0.4 and 900 mm Hg respectively [P_{total} = 600 mmHg]

(A) 450 mm Hg (B) 560 mm Hg

(C) 500 mm Hg (D) 400 mm Hg

80. Identify from following the correct set of thermodynamic conditions for a reaction to be nonspontaneous at all temperatures.

(A) $\Delta H < 0$ and $\Delta S < 0$ (B) $\Delta H > 0$ and $\Delta S > 0$

(C) $\Delta H < 0$ and $\Delta S > 0$ (D) $\Delta H > 0$ and $\Delta S < 0$

81. "It is impossible to determine simultaneously the exact position and exact momentum of an electron." This statement is called

(A) Pauli's exclusion principle (B) Hund's rule

(C) Aufbau rule (D) Heisenberg uncertainty principle

82. Which of the following statements is false about oxygen and sulphur?

(A) Atoms of oxygen and sulphur consist two unpaired electrons in valence shell.

(B) Oxygen and sulphur show $-2, +4$ and $+6$ oxidation states.

(C) Oxygen is gas while sulphur is solid at room temperature.

(D) Hydride of oxygen is more stable than hydride of sulphur.

83. Calculate rate constant of a first order reaction having pre exponential factor $1.6 \times 10^{13}\ s^{-1}$. $\left(E_a/2.303RT = 21\right)$

(A) 1.6×10^{-13}

(B) 3.2×10^{-13}

(C) 3.2×10^{-8}

(D) 1.6×10^{-8}

84. What is the difference in molar mass of Undecane and Dodecane?

(A) $10\ g\ mol^{-1}$

(B) $20\ g\ mol^{-1}$

(C) $140\ g\ mol^{-1}$

(D) $14\ g\ mol^{-1}$

85. Which cation from following exhibits no magnetic moment?

(A) Cr^{3+}

(B) Sc^{3+}

(C) Cu^{2+}

(D) V^{3+}

86. Identify the product when chlorobenzene is heated with nitrating mixture.

(A) Only 1-chloro-4-nitrobenzene

(B) Only 1-chloro-2-nitrobenzene

(C) Mixture of 1-chloro-2-nitrobenzene and 1-chloro-4-nitrobenzene

(D) 2,4,6-trinitrochlorobenzene

87. Which of the following compounds does not exhibit optical isomerism?

(A) 3-Iodohexane

(B) 2-Iodopentane

(C) 2-Iodo-2-methylbutane

(D) 2-Iodo-3-methylbutane

88. Calculate % by mass of a H_2O_2 solution that is 67.2 by volume.

(A) 13.60% by mass

(B) 20.40% by mass

(C) 22.44% by mass

(D) 17.60% by mass

89. For the cell reaction, $A_{(s)} + B^{+2}_{(eq)} \longrightarrow A^{+2}_{(eq)} + B_{(s)}$ if equilibrium constant of reaction is 10^4 at 298 K . What is standard emf of cell?

(A) 0.0592 V

(B) 0.1184 V

(C) 0.1776 V

(D) 0.2368 V

90. What are the compounds used to obtain nylon salt?

(A) Adipic acid and ammonia

(B) Terephthalic acid and hexamethylenediamine

(C) Adipic acid and hexamethylenediamine

(D) β-hydroxybutyric acid and hexamethylenediamine

91. Which from following compounds is an example of primary amines?

(A) N -methylmethanamine

(B) 4-Bromobenzenamine

(C) N-Phenylbenzenamine

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

92. Identify the technique used to know binding nature of nanomaterials?

(A) SEM

(B) TEM

(C) XRD

(D) FTIR

93. Which from following compounds is obtained when phenol reacts with dilute nitric acid at low temperature?

(A) o-Nitrophenol only

(B) p-Nitrophenol only

(C) 2, 4, 6-trinitrophenol

(D) Mixture of ortho and para nitrophenols

94. In the equation, $BiO_3^- + 6H^+ + xe^- \rightarrow Bi^{3+} + 3H_2O$ What is the value of x ?

(A) 2

(B) 3

(C) 4

(D) 6

95. The compound forming ccp structure contains 9.6×10^{23} atoms. Find the number of tetrahedral voids formed in it.

(A) 1.00×10^{24}

(B) 1.68×10^{24}

(C) 1.92×10^{24}

(D) 1.56×10^{24}

96. Identify a pair of molecules having similar shapes of both members.

(A) NH_3, SO_2 (B) XeF_4, SF_4

(C) H_2O, SCl_2 (D) PCl_5, BrF_5

97. Calculate the molality of the solution of non-volatile solute if it freezes at $-0.36^{\circ}C$.
$[K_f$ for solvent $= 1.86$ K kg mol$^{-1}]$

(A) 0.218 mol kg^{-1} (B) 0.193 mol kg^{-1}

(C) 0.401 mol kg^{-1} (D) 0.520 mol kg^{-1}

98. Calculate ΔS_{Iotal} for a certain reaction if $\Delta H = -150$ kJ and $\Delta S = 32 JK^{-1}$ at 300 K .

(A) $266.00 JK^{-1}$ (B) $532.00 JK^{-1}$

(C) $798.00 JK^{-1}$ (D) $468.00 JK^{-1}$

99. If $E^{-}\left(Cu^{+2}_{(aq)} \mid Cu_{(s)}\right) = +0.34$ V. What is potential for $Cu_{(s)} \rightarrow Cu^{+2}_{(aq)}(0.1M) + 2e^{-}$ at 298 K ?

(A) +0.3696 V (B) -0.3696 V

(C) +0.3104 V (D) -0.3104 V

100. Calculate the edge length of bcc unit cell if radius of a particle present in it is 186 pm .

(A) 4.296×10^{-8} cm (B) 7.301×10^{-8} cm

(C) 3.715×10^{-8} cm (D) 5.419×10^{-8} cm

101. The general solution of the differential equation $\frac{dy}{dx} = \cot x \cdot \cot y$ is

(A) $\cos x = c\operatorname{cosec} y$, where c is the constant of integration.

(B) $\sin x = c\operatorname{sec} y$, where c is the constant of integration.

(C) $\sin x = x\cos y$, where c is the constant of integration.

(D) $\cos x = c\sin y$, where c is the constant of integration.

102. The probability that a person is not a sportsperson is $\frac{1}{6}$. Then the probability that out of the 6 members of the family, 5 are sportspersons is

(A) $(\frac{5}{6})^5$

(B) $6(\frac{5}{6})^5$

(C) $5(\frac{5}{6})^6$

(D) $(\frac{5}{6})^6$

103. If $\tan(\pi\cos\theta) = \cot(\pi\sin\theta)$, then $\sin\left(\frac{\pi}{4} + \theta\right) =$

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

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

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

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

104. The line MN whose equation is $x - y - 2 = 0$ cuts the X -axis at M and co-ordinates of N are $(4, 2)$. The line MN is rotated about M through 45° in anticlockwise direction. The equation of the line MN in the new position is

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

(B) $y = 2$

(C) $x = -2$

(D) $x = 2$

105. The money invested in a company is compounded continuously. If $Rs\,400$ invested today becomes ₹800 in 6 years, then at the end of 30 years, it will become (in ₹)

(A) 18101.76

(B) 12800

(C) 9050.88

(D) 12804

106. The least distance of the point $A(10, 7)$ from the circle $x^2 + y^2 - 4x - 2y - 20 = 0$ is length of seg AM . If MM′ is the diameter of the circle, then the lengths of AM and AM′ are respectively _____ , _____units

(A) 5,10

(B) 5,15

(C) 4,15

(D) 2,10

107. If the foot of the perpendicular drawn from the origin to a plane is $P(-1, -1, 2)$, then equation of the plane is

(A) $x + y - 2z + 6 \doteq 0$

(B) $2x + y + z + 1 = 0$

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

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

108. In a triangle ABC, with usual notations, if $a = 5$, $b = 7\sin A = \frac{3}{4}$, then total number of triangles possible are

(A) 1

(B) 0

(C) 2

(D) 5

109. If $\sin^{-1}(4x) + \sin^{-1}(4\sqrt{3}x) = -\frac{\pi}{2}$, then the value of x is

(A) $\pm\frac{1}{8}$

(B) $\pm\frac{1}{6}$

(C) $\pm\frac{2}{3}$

(D) $\pm\frac{1}{4}$

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

(A) 5

(B) 3

(C) 4

(D) 6

111. The equation of the directrix of the parabola $y^2 + 4y + 4x + 2 = 0$ is

(A) $x = -1$

(B) $x = 1$.

(C) $x = \frac{-3}{2}$

(D) $x = \frac{3}{2}$

112. If $f(x) = \sqrt{1 + \cos^2(x^2)}$, then $f'\left(\frac{\sqrt{\pi}}{2}\right)$ is

(A) $\frac{\sqrt{\pi}}{6}$

(B) $-\sqrt{\frac{\pi}{6}}$

(C) $\frac{\pi}{\sqrt{6}}$

(D) $\sqrt{\frac{\pi}{6}}$

113. The modulus of the square root of the complex number $6 + 8i$ (where $i = \sqrt{-1}$) is

(A) $\sqrt{5}$

(B) $2\sqrt{5}$

(C) $\sqrt{2} \cdot \sqrt{5}$

(D) $2\sqrt{10}$

114. If $[x]^2 - 5[x] + 6 = 0$, where [.] denotes the greatest integer function, then

(A) $x \in (2, 4)$

(B) $x \in [2, 4]$

(C) $x \in [2, 4)$

(D) $x \in (2, 4]$

115. The area of smaller part between the circle $x^2+y^2=4$ and the line $x=1$ is _____ sq.units.

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

(C) $\frac{4\pi}{3}+\sqrt{3}$ (D) $\frac{5\pi}{3}+\sqrt{3}$

116. If the function $f(x)=\begin{cases}\frac{\cos ax-\cos bx}{\cos cx-\cos bx} & ,\text{ if } x\neq 0\\ -1 & ,\text{ if } x=0\end{cases}$ is continuous at $x=0$, then $a^2,\ b^2, c^2$ are in

(A) Geometric progression (B) Arithmetic progression

(C) Harmonic progression (D) Arithmetico-Geometric progression

117.

$$\int_0^1 \tan^{-1}x\,dx=$$

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

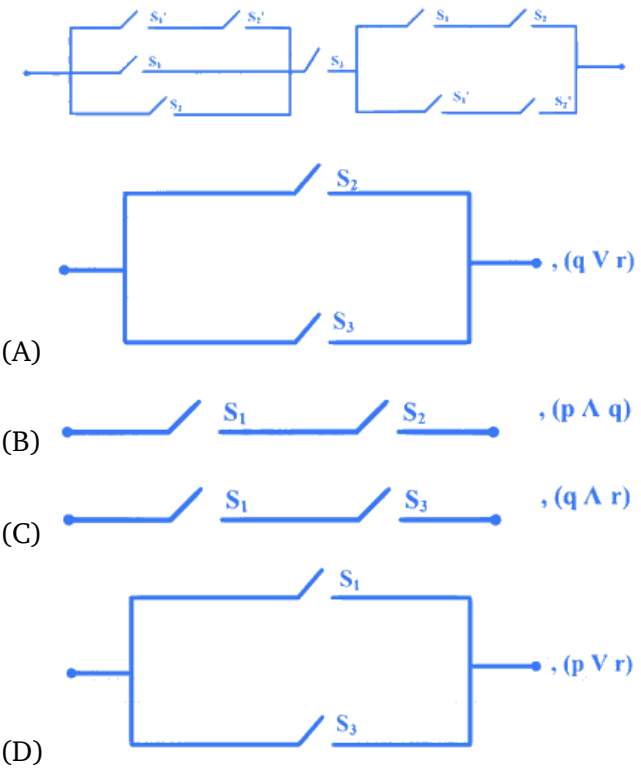
(C) $\frac{\pi}{4}+\log 2$ (D) $\frac{\pi}{4}+\log\sqrt{2}$

118. If the truth value of the expression $[(p\vee q)\wedge(q\to r)\wedge(\sim r)]\to(p\wedge q)$ is False, then truth values of p, q, r are respectively.

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

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

119. Consider statements p : S_1 is closed; q : S_2 is closed; r : S_3 is closed. The simplified equivalent circuit diagram and its logical statement for the switching circuit is respectively.



120. In a triangle ABC, with usual notations, $\cot\left(\frac{A+B}{2}\right)\cdot\tan\left(\frac{A-B}{2}\right)=$

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

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

121. In a triangle ABC , with usual notations, $(a+b+c)(a+b-c)=3ab$, then $\angle C=$

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

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

122. If $\bar{a}, \bar{b}, \bar{c}$ are three coplanar vectors such that $|\bar{a}|=1, |\bar{b}|=2, \bar{b}\cdot\bar{c}=8$, the angle between $\bar{b}$ and $\bar{c}$ is 45°, then $|\bar{a}\times(\bar{b}\times\bar{c})|=$

(A) 8 (B) $4\sqrt{2}$

(C) $\sqrt{2}$ (D) $8\sqrt{2}$

123. Let $\bar{a}, \bar{b}$ and $\bar{c}$ be vectors of magnitude 2,3 and 4 respectively. If $\bar{a}$ is perpendicular to $(\bar{b}+\bar{c})$, $\bar{b}$ is perpendicular to $(\bar{c}+\bar{a})$ and $\bar{c}$ is perpendicular to $(\bar{a}+\bar{b})$, then the magnitude of $\bar{a}+\bar{b}+\bar{c}$ is

(A) 29 (B) $\sqrt{28}$

(C) $\sqrt{29}$ (D) 28

124. If $\int \frac{(x^4+1)}{x(x^2+1)^2}dx = A\log|x| + \frac{B}{1+x^2} + c$, then A − B is (where c is the constant of integration)

(A) 0 (B) 1

(C) 2 (D) -1

125. The angle between the tangents drawn from the point $(1, 4)$ to the parabola $y^2 = 4x$, is

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{2}$

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

126. The solution for minimizing the function $z = x + y$ under an L.P.P. with constraints $x + y \geq 2, x + 2y \leq 8, y \leq 3, x, y \geq 0$ is

(A) at the point $(0, 3)$ (B) at the point $(8, 0)$

(C) at infinite number of points but bounded set (D) at unbounded set

127. The angle between lines whose direction cosines satisfy the equation $l + m + n = 0$ and $l^2 - m^2 - n^2 = 0$, is

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

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

128. The circumcenter of the triangle formed by lines $xy + 2x + 2y + 4 = 0$ and $x + y + 2 = 0$ is

(A) $(0, 0)$ (B) $(-2, -2)$

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

129. A triangle ABC is formed by $A(1, -1, 0)$, $B(3, 5, 3), C(-11, -5, 6)$. The equation of internal angle bisector of angle A is

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

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

130. If $\bar{a} = \lambda x\hat{i} + y\hat{j} + 4z\hat{k}$, $\bar{b} = y\hat{i} + x\hat{j} + 3y\hat{k}$, $\bar{c} = -z\hat{i} - 2z\hat{j} - (\lambda + 1)\hat{k}x$ are the sides of the triangle ABC , where x, y, z are not all zero, such that $\bar{a} + \bar{b} - \bar{c} = \bar{0}$, then value of λ is

(A) 0 (B) 1

(C) 2 (D) 3

131. The cumulative distribution function of a discrete random variable X is

X = x	−4	−2	0	2	4	6	8	10
F(X = x)	0.1	0.3	0.5	0.65	0.75	0.85	0.90	1

then $\frac{P(X\leq 0)}{P(X>0)} =$

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

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

132. The mirror image of the point $P(-1, 2, -4)$ in the plane $x - y - 2z + 1 = 0$ is

(A) $(3, -4, 1)$ (B) $(-3, 4, 0)$

(C) $(4, 1, 0)$ (D) $(2, -3, 0)$

133. A manufacturer sells x items at a price of rupees $\left(6 - \frac{x}{40}\right)$ each. The cost price of x items is ₹ $\left(\frac{x}{5} + 193\right)$. The maximum profit in ₹ _____ is

(A) 134.4 (B) 144.3

(C) 143.4 (D) 133.4

134. The following is p.d.f. of continuous random variable X

$$f(x) = \begin{cases} \frac{x}{8} & , \text{if } 0 < x < 4 \\ 0 & , \text{otherwise} \end{cases}$$

Then $F(0.5), F(1.7)$ and $F(5)$ is respectively

(A) $\frac{1}{64}, 1, 0.18$ (B) $0.0156, 0.18, 1$

(C) $0.18, 0.0156, 1$ (D) $1, 0.0156, 0.18$

135. The equation of the tangent to the curve $(1 + x^2)\, y = 2 - x$, where it crosses the X -axis, is

(A) $x + 5y = 2$ (B) $x - 5y = 2$

(C) $5x - y = 10$ (D) $5x + y - 10 = 0$

136. If $y = \alpha\log x + \beta x^3 - x$ has extreme values at $x = -1$ and $x = 1$, then α and β are respectively

(A) 0 and $\frac{1}{3}$ (B) 0 and $\frac{-1}{3}$

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

137. The equation of a curve passing through $(1, 0)$ and having slope of tangent at any point (x, y) of the curve as $\frac{y-1}{x^2+x}$ is

(A) $2(y - 1) + x(x + 1) = 0$

(B) $2x - (y - 1)(x + 1) = 0$

(C) $2x + (x + 1)(y - 1) = 0$

(D) $2x(y - 1) + (x + 1) = 0$

138. A box contains 8 red and x number of green balls. 3 balls are drawn at random, if the probability that 3 balls being red is $\frac{7}{15}$, then number of green balls is...

(A) 2 (B) 4

(C) 3 (D) 5

139. The number of ways in which a team of 11 players can be formed out of 25 players, if 6 out of them are always to be included and 5 of them are always to be excluded, is

(A) 2002 (B) $^{20}C_{11}$

(C) $^{20}C_6$. (D) $^{14}C_6$

140.

$$\lim_{x \to \infty} \frac{(2x+1)^{50} + (2x+2)^{50} + (2x+3)^{50} + \cdots + (2x+100)^{50}}{(2x)^{50} + (10)^{50}} =$$

(A) 50 (B) 100

(C) 25 (D) 200

141. The differential equation which represents the family of curves $y = c_1 e^{c_2 x}$, where c_1, c_2 are arbitrary constants is

(A) $y'' = y'y$ (B) $yy'' = y'$

(C) $yy'' = (y')^2$ (D) $y' = y^2$

142.

$$\int_{\frac{1}{2}}^{2} \frac{1}{x} \operatorname{cosec}^{101}\left(x - \frac{1}{x}\right) dx =$$

(A) 0 (B) 1

(C) $\frac{1}{4}$ (D) $\frac{101}{2}$

143. Matrix A is non-singular matrix and $(A - 3I)(A - 5I) = 0$, then $\frac{15}{8}A^{-1} = \ldots\ldots$

(A) I $-$ 8 A (B) 2I $-$ $\frac{1}{15}$ A

(C) I $-$ $\frac{1}{8}$ A (D) 8I $-$ 15 A

144. If the plane $\frac{x}{2} + \frac{y}{3} + \frac{z}{6} = 1$ cuts the co-ordinate axes at points A, B, C respectively, then area of the triangle ABC is

(A) $\sqrt{14}$ sq. units (B) $3\sqrt{14}$ sq. units

(C) $\frac{1}{\sqrt{14}}$ sq. units (D) $3\sqrt{13}$ sq. units

145. The number of positive integral solutions of $\tan^{-1} x + \cos^{-1}\left(\frac{y}{\sqrt{1+y^2}}\right) = \sin^{-1}\left(\frac{3}{\sqrt{10}}\right)$ are

(A) 1 (B) 2

(C) 3 (D) 4

146. If $\int \frac{dx}{x^4+5x^2+4} = A\tan^{-1} x + B\tan^{-1}\frac{x}{2} + c$ where c is a constant of integration, then

(A) A $= \frac{1}{2}$, B $= \frac{1}{4}$ (B) A $= \frac{1}{3}$, B $= -\frac{1}{6}$

(C) A $= \frac{1}{3}$, B $= \frac{1}{6}$ (D) A $= \frac{1}{2}$, B $= -\frac{1}{4}$

147.

$$\int \frac{\sqrt{\tan x}}{\sin x \cdot \cos x} dx =$$

(A) $2\sqrt{\sec x} + c$, where c is a constant of integration (B) $2\sqrt{\tan x} + c$, where c is a constant of integration

(C) $\frac{2}{\sqrt{\tan x}}$ + c, where c is a constant of integration (D) $\frac{2}{\sqrt{\sec x}}$ + c, where c is a constant of integration

148. If $f(x) = \frac{\sin^2 x}{1+\cot x} + \frac{\cos^2 x}{1+\tan x}$, then the value of $f'\left(\frac{\pi}{6}\right)$ is equal to

(A) 0 (B) $\frac{1}{2}$

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

149. If $y = \tan^{-1}\left(\sqrt{\frac{1+\sin x}{1-\sin x}}\right), 0 \leqslant x < \frac{\pi}{2}$, then $y'\left(\frac{\pi}{6}\right) =$

(A) $-\frac{1}{4}$ (B) $\frac{1}{6}$

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

150. The volume of tetrahedron with co-terminus edges $\bar{a}, \bar{b}, \bar{c}$ is $\frac{64}{3}$ cubic units, then volume of parallelopiped considering co-terminus edges given by the vectors $\bar{a} + \bar{b}, \bar{b} + \bar{c}, \bar{c} + \bar{a}$ is _____ cubic units.

(A) 384 (B) $\frac{128}{3}$

(C) 256 (D) $\frac{32}{3}$

- End of Question Paper -