MHT CET 2026 PCM Apr 15 Shift 1 Question Paper

Conducted by the State Common Entrance Test Cell, Maharashtra

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

General Instructions

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

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

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

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

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

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

1. The length of rod is measured by meter scale having least count 0.1 cm and diameter is measured by vernier callipers having least count 0.01 cm. Length of rod is 5.0 cm and radius 2.0 cm. The percentage error in the calculated value of the volume is

(A) 1%
(B) 2.5%
(C) 5%
(D) 7%

2. A vector $\vec{A}$ when added to the sum of the vectors $(\hat{i}-2\hat{j}+2\hat{k})$ and $(-2\hat{i}+\hat{j}-\hat{k})$ gives a unit vector along Y axis. The magnitude of vector $\vec{A}$ is

(A) $\sqrt{3}$
(B) $\sqrt{6}$
(C) $\sqrt{8}$
(D) $\sqrt{10}$

3. A stone falls from the top of a tower of height 100 m and at the same time another stone is projected vertically upwards from the ground with a velocity 25 m/s. The two stones meet after

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

4. A particle performing U.C.M. of radius $\frac{\pi}{2}$ m makes 'x' revolutions in time t. Its tangential velocity is

(A) $\frac{\pi x}{t}$
(B) $\frac{\pi^2 x}{t}$
(C) $\frac{\pi}{xt}$
(D) $\frac{xt}{\pi}$

5. Two masses m_1 and m_2 moving with velocities V_1 and V_2 in opposite directions collide elastically and after collision m_1 and m_2 move with velocities V_2 and V_1 respectively. The ratio $\frac{m_2}{m_1}$ is

(A) 0.25
(B) 0.50
(C) 0.75
(D) 1.0

6. The power (P) is supplied to rotating body having moment of inertia 'I' and angular acceleration 'α'. Its instantaneous angular velocity is

(A) $\frac{I}{P\alpha}$
(B) $\frac{\alpha}{PI}$
(C) $\frac{P\alpha}{I}$
(D) $\frac{P}{I\alpha}$

7. If the earth suddenly contracts to $\left(\frac{1}{3}\right)^{rd}$ of its present size without change in its mass, the ratio kinetic energy of the earth after and before contraction will be (Earth is assumed to be a rotating sphere about itself)

(A) 9
(B) 5
(C) 7
(D) 6

8. What should be the angular velocity of earth due to rotation about its own axis so that the weight at equator becomes $\left(\frac{3}{5}\right)^{th}$ of initial value? (g = acceleration due to gravity, R = radius of earth)

(A) $\left(\frac{R}{3g}\right)^{\frac{1}{2}}$
(B) $\left(\frac{2g}{5R}\right)^{\frac{1}{2}}$
(C) $\left(\frac{5g}{9R}\right)^{\frac{1}{2}}$
(D) $\left(\frac{3g}{2R}\right)^{\frac{1}{2}}$

9. Water rises to a height 3 cm in a capillary tube. If cross-sectional area of capillary tube is reduced to $1/3^{rd}$ of its initial area then water will rise to a height of

(A) $3\sqrt{3}$ cm
(B) $\sqrt{3}$ cm
(C) 9 cm
(D) 3 cm

10. A soap bubble of radius R is blown. After heating the solution, a second bubble of radius 2R is blown. The work required to blow the second bubble in comparison to that required for the first bubble is

(A) slightly less than 4 times
(B) exactly double
(C) slightly less than double
(D) slightly more than 4 times

11. The excess pressure inside the first soap bubble of radius R_1 is three times that inside the second soap bubble of radius R_2. The ratio of volumes of the first bubble to second bubble is

(A) 1 : 3
(B) 1 : 6
(C) 1 : 27
(D) 1 : 9

12. An ordinary body cools from 4θ to 3θ in 't' minutes. The temperature of the body after next 't' minutes is (Assume Newton's law of cooling and room temperature as θ)

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

(C) $\frac{5\theta}{3}$ (D) $\frac{8\theta}{3}$

13. A black disc has a radius 'R' and wavelength corresponding to the maximum intensity is 'λ'. The emissive power (E) for the different radii and maximum wavelengths is directly proportional to

(A) R, λ (B) R^2, λ^{-4}

(C) R^2, λ^{-2} (D) R^2, λ

14. About black body radiation, which one of the following is a WRONG statement?

(A) For all wavelengths, power radiated is same

(B) For shorter wavelengths, radiated power is more

(C) for longer wavelengths, radiated power is less

(D) All wavelengths are emitted by the black body

15. In thermodynamic isobaric process

(A) change in internal energy is zero

(B) work done is zero

(C) change in internal energy is not zero

(D) heat supplied is zero

16. A monoatomic gas is stored in a thermally insulated container and the gas is suddenly compressed to $\left(\frac{1}{8}\right)^{th}$ of its initial volume. The ratio of final pressure to initial pressure is

(A) 16 : 1 (B) 40 : 1

(C) 32 : 1 (D) 28 : 1

17. The average force applied on the walls of a closed container depends on temperature (T) as (T is the temperature of an ideal gas)

(A) T^2 (B) T^3

(C) T^1 (D) T^{-1}

18. A particle executes linear S.H.M. with amplitude 4 cm. The magnitude of velocity and acceleration is equal when it is at 3 cm from mean position. Time period is

(A) $\frac{3\pi}{\sqrt{2}}$ s (B) $\frac{6\pi}{\sqrt{7}}$ s

(C) $\frac{2\pi}{\sqrt{7}}$ s (D) $\frac{4\pi}{\sqrt{7}}$ s

19. A particle starts from mean position and performs S.H.M. with period 6 second. At what time its kinetic energy is 50% of total energy? ($\cos 45^\circ = 1/\sqrt{2}$)

(A) 0.75 s (B) 0.50 s

(C) 0.25 s (D) 3 s

20. A small sphere oscillates simple harmonically in a watch glass whose radius of curvature is 1.6 m. The period of Oscillation of the sphere is (Acceleration due to gravity $g = 10\ m/s^2$)

(A) 0.2π (B) 0.4π

(C) 0.8π (D) π

21. A wire is under tension of 2 kg wt and a wave is travelling through it with some speed. Tension in the wire is so increased that the wave travels through it with thrice the original speed. The increase in tension is (in kg wt)

(A) 4 (B) 8

(C) 16 (D) 12

22. A Pipe open at one end has length 0.8 m. At the open end of the tube a string 0.5 m long is vibrating in its first overtone and resonates with fundamental frequency of pipe. If tension in the string is 50 N, the mass of string is (Neglect end correction) (Speed of sound = 320 m/s)

(A) 2 gram (B) 5 gram

(C) 10 gram (D) 20 gram

23. A sonometer wire resonates with 4 antinodes between the two bridges for a given tuning fork when 1 kg mass is suspended from the wire. Using same fork, when mass M is suspended, the wire resonates producing 2 antinodes between the two bridges. (Distance between the bridges as before) The value of M is

(A) 2 kg (B) 3 kg

(C) 4 kg (D) 5 kg

24. The fundamental frequency of sonometer wire is 50 Hz for some length and tension. If the length is increased by 25% by keeping the tension same, then the frequency change of second harmonic is

(A) increase by 20%
(B) decrease by 20%
(C) increase by 40%
(D) decrease by 40%

25. The number of lines of force originating from a point charge of $2 \times 8.85 \times 10^{-9}$ C in a medium of dielectric constant 10 is ($\epsilon_0 = 8.85 \times 10^{-12}$ SI unit)

(A) 100
(B) 200
(C) 400
(D) 2000

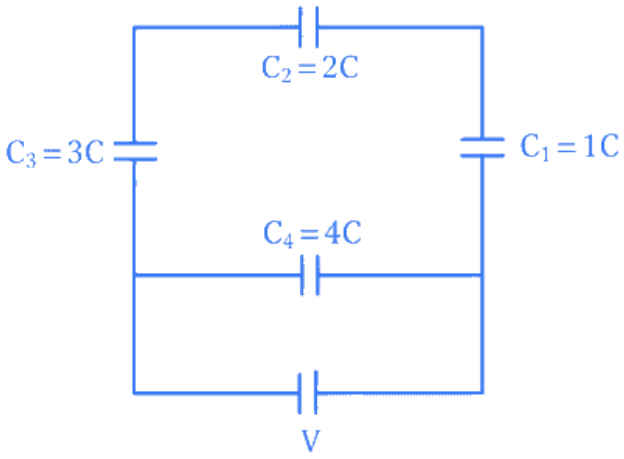
26. The potential difference that must be applied across the parallel and series combination of three identical capacitors such that the energy stored in them becomes the same. The ratio of potential difference in parallel to series combination is

(A) 1 : 3
(B) 3 : 1
(C) 9 : 1
(D) 1 : 9

27. The function of a dielectric in a capacitor is to

(A) reduce the plate area of the capacitor.
(B) to decrease the capacitance.
(C) reduce the effective potential on plates.
(D) increase the effective potential on plates.

28. Four capacitors are connected to a battery as shown in figure. The ratio of charges on capacitors C_2 and C_4 is



(A) $\frac{1}{14}$
(B) $\frac{3}{22}$
(C) $\frac{2}{9}$
(D) $\frac{4}{13}$

29. When a resistance of 200 Ω is connected in series with a galvanometer of resistance G, its range is V. To triple its range, a resistance of 2000 Ω is connected in series. The value of G is

(A) 400 Ω
(B) 500 Ω
(C) 700 Ω
(D) 900 Ω

30. If a galvanometer is shunted by $\left(\frac{1}{n-1}\right)^{th}$ of the value of its resistance, then the fraction of the total current passing through the galvanometer is

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

31. The product of magnetic susceptibility (χ) and absolute temperature (T) is constant for a

(A) diamagnetic substance.
(B) paramagnetic substance.
(C) ferromagnetic substance.
(D) paramagnetic as well as ferromagnetic substance.

32. A circular coil of 'N' turns and diameter 'd' carries current 'I'. It is unwound and rewound to make another coil of diameter '2d', current 'I' remaining the Same. The ratio of magnetic moments of the new coil to the original coil is

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

33. Lorentz magnetic force is acting on a particle of charge q moving with velocity $\vec{V}$ in magnetic field $\vec{B}$. The work done by this force on the charged particle is

(A) zero
(B) $\vec{V} \times \vec{B}$
(C) $\vec{V} \times \vec{V}$
(D) $q(\vec{V} \times \vec{B})$

34. A coil of 'n' turns and resistance $R\,\Omega$ is connected in series with a resistance $R/4$. The combination is moved for time 't' second through flux Φ_1 to Φ_2. The induced current in the circuit is

(A) $\frac{4n(\Phi_1 - \Phi_2)}{5RT}$
(B) $\frac{5n^2(\Phi_1 - \Phi_2)}{4RT}$
(C) $\frac{2n(\Phi_1 - \Phi_2)}{3RT}$
(D) $\frac{3n(\Phi_1 - \Phi_2)}{4RT}$

35. The coefficient of mutual induction is 3H and induced e.m.f. across secondary is 4 kV. Current in primary is reduced from 7A to 2A. The time required for the change of current is

(A) 3.75×10^{-3} s (B) 2.5×10^{-3} s

(C) 4.5×10^{-3} s (D) 3.5×10^{-3} s

36. A bar magnet falls from a height 'h' through a metal pipe, its acceleration after coming out of pipe is

(A) less than $9.8\ \mathrm{m/s^2}$ (B) greater than $9.8\ \mathrm{m/s^2}$

(C) equal to $9.8\ \mathrm{m/s^2}$ (D) equal to 'h' $\mathrm{m/s^2}$

37. A series LCR circuit is connected to an a.c. source of 220 V, 50 Hz. The circuit contains a resistance $R = 80\,\Omega$, an inductor of inductive reactance $70\,\Omega$ and capacitor of capacitive reactance $130\,\Omega$. The power factor of the circuit is $\frac{x}{10}$. The value of x is

(A) 8 (B) 6

(C) 4 (D) 7

38. Determine the frequency for which a $10\,\mu$F capacitor has a reactance of $2 \times 10^{-3}\,\Omega$.

(A) $\frac{25}{\pi}$ MHz (B) $\frac{20}{\pi}$ MHz

(C) 2×10^{-3} MHz (D) 10π MHz

39. A coil has inductive reactance 3 H. The ratio of its reactance when it is first connected to an a.c. source and then to d.c. source is

(A) zero (B) 3

(C) infinite (D) 1.5

40. An equiconvex lens of focal length F is cut in to two equal parts along the vertical axis. The focal length of each part will be

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

(C) $2F$ (D) F

41. A ray of light travels from air to water to glass and again from glass to air. Refractive index of water with respect to air is 'x', glass with respect to water is 'y' and air with respect to glass is 'z'. Which one of the following is correct?

(A) $xy = z$ (B) $xyz = 1$

(C) $xz = y$ (D) $yz = x$

42. When the distance of separation between the slit and screen is doubled, the angular separation between fringes in single slit diffraction pattern experiment

(A) increases (B) decreases

(C) remains same (D) first increases and then decreases

43. Light of wavelength λ is incident on a single slit of width 'a' and the distance between slit and screen is D. In diffraction pattern, if slit width is equal to the width of the central maximum then D is equal to

(A) $\frac{a^2}{2\lambda}$ (B) $\frac{a}{2\lambda}$

(C) $\frac{a^2}{\lambda}$ (D) $\frac{a}{\lambda}$

44. Light of wavelength 'λ' which is less than threshold wavelength is incident on a photosensitive material. If incident wavelength is decreased so that emitted photoelectrons are moving with some velocity then stopping potential

(A) becomes half (B) increases

(C) decreases (D) is zero

45. When the electron orbiting in hydrogen atom in its ground state moves to the third excited state, the de-Broglie wavelength associated with it

(A) will decrease (B) will increase

(C) will remain same (D) will be zero

46. If 'E' and 'L' denote the magnitude of total energy and angular momentum of revolving electron in n^{th} Bohr orbit then

(A) $E \propto L$ (B) $E \propto L^{-1}$

(C) $E \propto L^{-2}$ (D) $E \propto L^2$

47. Two different radioactive elements with half lives T_1 and T_2 have undecayed atoms N_1 and N_2 respectively, present at a given instant. The ratio of their activities at this instant is

(A) $\frac{N_1T_1}{N_2T_2}$ (B) $\frac{N_1T_2}{N_2T_1}$

(C) $\frac{N_1T_2}{T_1T_2}$ (D) $\frac{T_1T_2}{N_1N_2}$

48. Photodiode is a device

(A) in which photocurrent is dependent on reverse bias.

(B) in which photocurrent is independent of incident radiation.

(C) which is always operated in forward bias.

(D) which is always operated in reverse bias.

49. For a p-n junction diode, breakdown voltage occurs when

(A) reverse bias is decreased

(B) reverse bias is not changed

(C) reverse-bias is increased

(D) forward bias is increased

50. If p-n junction diode is forward biased then

(A) width of depletion layer decreases.

(B) width of depletion layer increases.

(C) barrier voltage increases

(D) electric conduction is not possible

51. What is the approximate mass of the precipitate formed when 50 mL of 16.9% solution of $AgNO_3$ is mixed with 50 mL of 7.45% KCl solution? (Molar mass of $AgNO_3 = 169$ g/mol, KCl = 74.5 g/mol, AgCl = 143.3 g/mol)

(A) 3.5 g
(B) 7 g
(C) 14 g
(D) 28 g

52. Calculate the de Broglie wavelength of an electron in the first Bohr orbit of a hydrogen atom if the velocity of an electron in the first orbit is 2.2×10^6 ms^{-1}. [mass of electron $= 9.1 \times 10^{-31}$ kg, plank's constant (h) $= 6.626 \times 10^{-34}$ J s]

(A) 3.31×10^{-10} m
(B) 3.01×10^{-10} m
(C) 3.62×10^{-10} m
(D) 2.71×10^{-10} m

53. Which group elements have the smallest atomic radii in their respective periods?

(A) group 15
(B) group 16
(C) group 17
(D) group 18

54. What happens to the size of atoms in p-block elements when we move from left to right in the same period?

(A) Size does not change
(B) Size increases then decreases
(C) Size increases
(D) Size decreases

55. Which of the following order of dipole moment for stated molecules is correct?

(A) $BF_3 > NF_3 > NH_3$
(B) $NF_3 > BF_3 > NH_3$
(C) $NH_3 > BF_3 > NF_3$
(D) $NH_3 > NF_3 > BF_3$

56. Calculate the compressibility factor of 1 mole of a certain real gas if it occupies 0.4 dm^3 at 300 K and 40 atm. [R = 0.082 atm $dm^3K^{-1}mol^{-1}$]

(A) 0.45
(B) 0.65
(C) 0.85
(D) 1.00

57. $C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l)$
The value of enthalpy change (ΔH) for above reaction at 27 °C is -1366.5 kJ mol^{-1}. Then value of internal energy change for the same reaction at this temperature will be

(A) -1369.0 kJ mol^{-1}
(B) -1364.0 kJ mol^{-1}
(C) -1371.5 kJ mol^{-1}
(D) -1361.5 kJ mol^{-1}

58. Which of the following processes has ΔS negative?

(A) Dissolving Sugar in Water
(B) Adsorption of a Gas on a Solid Surface
(C) $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$
(D) Sublimation of Dry Ice

59. Which of the following properties of a system depends upon the amount of matter and path?

(A) Heat
(B) Free energy
(C) Enthalpy
(D) Entropy

60. The dissociation constant of weak acid HA is 1.5×10^{-5}. Find the percent dissociation, containing 0.2 moles per 2 liters of solution.

(A) 1.22%
(B) 1.18%
(C) 1.14%
(D) 1.26%

61. The solubility of sparingly soluble salts MX_1, MX_2 and MX_3 is 1×10^{-3} mol/L. Hence, their respective solubility products are

(A) 1×10^{-6}, 4×10^{-9} and 27×10^{-12}
(B) 1×10^{-9}, 4×10^{-9} and 32×10^{-12}
(C) 1×10^{-9}, 8×10^{-8} and 32×10^{-12}
(D) 1×10^{-6}, 8×10^{-8} and 27×10^{-12}

62. Identify the strongest base according to Bronsted-Lowry theory from following.

(A) Cl^-
(B) CH_3COO^-
(C) NO_3^-
(D) HSO_4^-

63. Identify the alkali metal having the smallest atomic size from following.

(A) Sodium
(B) Potassium
(C) Rubidium
(D) Caesium

64. Identify the compound formed when But-2-ene is treated with $KMnO_4$ in dilute H_2SO_4.

(A) Butanoic acid
(B) Acetic acid
(C) Butanal
(D) Butanol

65. Which one of the following compound will show addition of HBr to alkene according to markownikoff's rule?

(A) But-2-ene
(B) Hex-3-ene
(C) Ethene
(D) 2-methyl propene

66. When a mixture of two different alkyl halides reacts with metallic sodium in dry ether, the formation of a possible number of alkanes are-

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

67. Identify the product of reforming reaction of n-hexane in the presence of V_2O_5 over alumina.

(A) Benzene (B) Cyclohexane
(C) Methyl benzene (D) Phenol

68. An element crystallises in fcc unit cell with cell edge length of 3.608×10^{-8} cm, the density of element is 8.92 gcm^{-3}. Calculate the atomic mass of element ($N_A = 6.022 \times 10^{23}$).

(A) 60 g/mol (B) 65 g/mol
(C) 63 g/mol (D) 108 g/mol

69. Calculate the number of unit cells present in 1 g metal if the product of the density of metal and the volume of unit cell is 2.5×10^{-22} g.

(A) 1.0×10^{21} (B) 2.0×10^{21}
(C) 3.0×10^{21} (D) 4.0×10^{21}

70. Which of the following is NOT a characteristic of Schottky defect?

(A) After defect stoichiometry, the crystal remains unchanged. (B) After defect neutrality, the crystal's structure remains unchanged.
(C) After defect density of crystal remains unchanged (D) It is a vacancy defect.

71. Calculate the van't Hoff factor of a centimolar solution of potassium ferrocyanide if it is 60% dissociated at 300 K.

(A) 3.4 (B) 3.9
(C) 3.1 (D) 3.7

72. 5 g urea is dissolved in 100 g water. Find the amount of glucose to be dissolved in 120 g of water so that the boiling points of both solutions will be the same.
[Molar mass of urea = 60 g mol^{-1} & Molar mass of glucose = 180 g mol^{-1}]

(A) 17 g (B) 19 g
(C) 18 g (D) 20 g

73. Which of the following solutes has the ratio of theoretical molar mass to the experimentally observed molar mass is 3?

(A) KCl (B) K_2SO_4
(C) $MgSO_4$ (D) $Al_2(SO_4)_3$

74. The molar conductivity of 0.01 M monobasic acid at 25 °C is 15 ohm^{-1} cm^2 mol^{-1}. The molar conductivity of the same acid at infinite dilution is 375 ohm^{-1} cm^2 mol^{-1}. Calculate $[H^+]$ in solution.

(A) 2.0×10^{-4} M (B) 3.0×10^{-4} M
(C) 4.0×10^{-4} M (D) 5.0×10^{-4} M

75. Which from following statements regarding mercury battery is NOT true?

(A) It is a primary dry cell. (B) It consists of Zn anode amalgamated with mercury.
(C) The electrolyte is strongly acidic. (D) In this Hg is obtained by reduction of HgO

76. The molar conductivity of 0.04 M AB_2 type salt solution at 300 K is 200 $\Omega^{-1}cm^2mol^{-1}$. Find the conductivity.

(A) 0.006 $\Omega^{-1}cm^{-1}$ (B) 0.008 $\Omega^{-1}cm^{-1}$
(C) 0.01 $\Omega^{-1}cm^{-1}$ (D) 0.015 $\Omega^{-1}cm^{-1}$

77. The time required for 90% completion of a certain first order reaction is 1 hour. Calculate the time required for 99.9% completion of the same reaction.

(A) 2 hours. (B) 1 hour.
(C) 3 hours. (D) 0.5 hour.

78. The rate of the reaction $2A + 3B \rightarrow 2C + D$ is 6×10^{-4} mol dm^{-3} s^{-1}, when $[A] = [B] = 0.3$ mol dm^{-3}. If the reaction is of first order for A and zeroth order for B, then find the rate constant.

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

79. What is the value of the slope of a graph obtained by plotting the concentration of reactant $(A)_t$ versus time for zero order reaction?

(A) $-k$ (B) $1/2k$
(C) $k/2.303$ (D) $2.303/k$

80. Which of the following nano structures includes nanotubes as an example?

(A) Zero dimensional
(B) One dimensional
(C) Two dimensional
(D) Three dimensional

81. Match **List I** with **List II**

List I	List II
(A). Brownian Motion	(I). Removal of impurities from the colloidal sols using a semipermeable membrane.
(B). Tyndall Effect	(II). Movement of colloidal particles under the influence of an electric field.
(C). Electrophoresis	(III). Random movement of colloidal particles due to kinetic energy.
(D). Dialysis	(IV). Scattering of light by colloidal particles

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

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

82. Identify the factor responsible for the greater range of oxidation states in actinoids.

(A) actinoid contraction
(B) radioactive nature of actinoids
(C) 5f, 6d and 7s levels having comparable energies
(D) 4f and 5d levels being close in energies

83. Which of the following factors may be regarded as the main cause of lanthanide contraction?

(A) Poor shielding of one of 4f electron by another in the sub-shell.
(B) Effective shielding of one of 4f electrons by another in the subshell
(C) Poorer shielding of 5d electrons by 4f electrons
(D) Greater shielding of 5d electrons by 4f electrons

84. What is the value of spin only magnetic moment for Cu^{2+} in BM?

(A) 2.84
(B) 3.87
(C) 1.73
(D) 0.0

85. The sum of coordination number and oxidation number of M in $[M(en)_2C_2O_4]Cl$ is

(A) 9
(B) 8
(C) 7
(D) 6

86. In the coordination complex, Potassium hexacyanoferrate(II), the central atom/ion acts as,

(A) Bronsted-Lowry acid
(B) Lewis base
(C) Lewis acid
(D) Bronsted-Lowry base

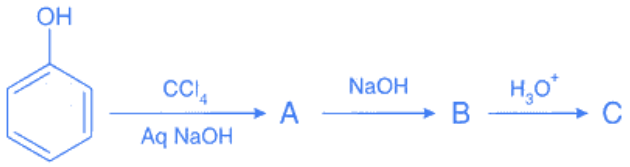
87. Which of the following halogen derivative forms a poisonous phosgene, when come in contact with air and light?

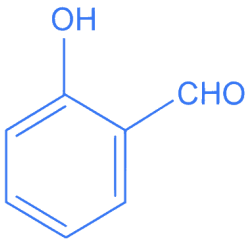
(A) $CHCl_3$
(B) PCl_3
(C) C_6H_5Cl
(D) CH_2Cl_2

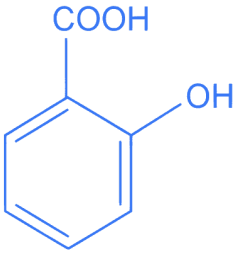
88. What is the general molecular formula of alkyl halides?

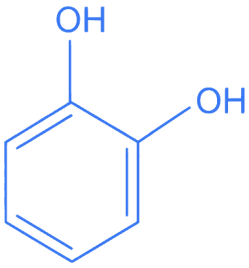
(A) $C_nH_{2n+2}X$
(B) $C_nH_{2n+1}X$
(C) $C_nH_{2n}X$
(D) $C_nH_{2n-2}X$

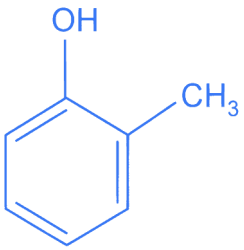
89. In the following sequence of the reaction, the final product "C" is-



(A) 

(B) 

(C) 

(D) 

90. Which of the following is a dihydric alcohol?

(A) Glycerol (B) Ethylene glycol
(C) Sorbitol (D) Methanol

91. What happens when phenol reacts with bromine water?

(A) Brown coloured liquid is obtained (B) Colourless gas evolves
(C) White precipitate formed (D) Pink colored solution is obtained

92. Which of the following statements is true regarding Cannizzaro reaction?

(A) Some aldehydes are converted to the respective alcohols and the salt of the respective carboxylic acid. (B) Alcohol is converted into aldehyde
(C) Primary amine is converted into isocyanide (D) Acid is converted into amine

93. Aldehydes are more reactive than ketone towards nucleophilic attack because of?

(A) less steric hindrance in ketone (B) presence of two alkyl group on ketone decreases its electrophilicity
(C) presence of one alkyl group on aldehyde decreases its electrophilicity (D) alkyl group have electron withdrawing effect.

94. Identify the product 'B' in the following reaction

$CH_3 - I \xrightarrow{KCN} A \xrightarrow{Na/C_2H_5OH} B$

(A) CH_3-CH_2-CN (B) CH_3-CH_2-CH_3
(C) CH_3-CH_2-NH_2 (D) CH_3-NH-C_2H_5

95. Identify Hinsberg's reagent from following.

(A) benzene sulfonic acid (B) benzene sulphonyl chloride
(C) p-toluene sulphonyl chloride (D) chlorosulphuric acid

96. Which component of DNA carries genetic information?

(A) Phosphate group (B) Sugar backbone
(C) Sequence of nitrogenous bases (D) Hydrogen bonds

97. Which of the following is confirmed by the reaction of glucose with hydroxylamine?

(A) Straight chain of six carbon atoms (B) Carbonyl group
(C) Primary alcoholic group (D) Secondary alcoholic group

98. Which of the following polymers has ester linkage?

(A) Orlon (B) Dacron
(C) Teflon (D) Neoprene

collegedunia

99. Which properties from following is improved by vulcanization of rubber?

(A) Plasticity
(B) Solubility in water
(C) Tensile strength
(D) Electrical conductivity

100. Which of the following cleansing agents contains cationic detergent?

(A) Hair conditioner
(B) Liquid detergent
(C) Household detergent
(D) Toothpaste

101. If ω is a complex cube root of unity, then the value of the expression

$$2\left(1+\frac{1}{\omega}\right)\left(1+\frac{1}{\omega^2}\right)+3\left(2+\frac{1}{\omega}\right)\left(2+\frac{1}{\omega^2}\right)+\ \ldots$$
$$+(n+1)\left(n+\frac{1}{\omega}\right)\left(n+\frac{1}{\omega^2}\right)$$

is...

(A) $\left[\frac{n(n+1)}{2}\right]^2+n$ (B) $\left[\frac{n(n+1)}{2}\right]^2-n$

(C) $\left[\frac{n(n+1)}{2}\right]^2$ (D) $\left[\frac{n(n-1)}{2}\right]^2$

102. The number of five-digit numbers formed using the digits $2, 3, 5, 7, 9$ without repetition and which are greater than 24000 are

(A) 120 (B) 117

(C) 114 (D) 96

103. In $\triangle ABC$, with the usual notations, $\angle C = 90^\circ$, then $\sin(A-B)$ is equal to....

(A) $\frac{a^2+b^2}{a^2-b^2}$ (B) $\frac{a^2+c^2}{a^2-c^2}$

(C) $\frac{b^2+c^2}{b^2-c^2}$ (D) $\frac{a^2-b^2}{a^2+b^2}$

104. If $P=\tan 20^\circ$, then the value of $\frac{\tan 160^\circ-\tan 110^\circ}{1+\tan 160^\circ\tan 110^\circ}$ in terms of P, is...

(A) $\frac{1+P^2}{2P^2}$ (B) $\frac{1+P^2}{2P}$

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

105. If $\cos(p\theta)+\cos(q\theta)=0$ and $p\neq q$, then the general value of θ (where n is any integer) is...

(A) $\frac{(3n+1)\pi}{p-q}$ (B) $\frac{(2n+1)\pi}{p\pm q}$

(C) $\frac{(n\pm 1)\pi}{p\pm q}$ (D) $\frac{(n+2)\pi}{p+q}$

106. If a triangle ABC has vertices $A(1,-6), B(2,-3)$ and $C(3,-2)$, then the coordinates of its orthocenter are....

(A) $(-6,1)$ (B) $(6,1)$

(C) $(-2,3)$ (D) $(3,2)$

107. If θ is the acute angle between the lines represented by the equation $x^2-3xy+2y^2=0$, then $\frac{3\sin\theta+2\cos\theta}{3\sin\theta-2\cos\theta}=$

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

(C) -3 (D) 3

108. The triangle formed by the lines $2x^2-3xy-2y^2=0$ and $3x-y=7$ is...

(A) Right angled but not isosceles (B) isosceles with base angle 30°

(C) Right angled with one angle 60° (D) Right angled isosceles

109. The centre and radius of the circle $(a+1)x^2+3y^2-6x+9y+a+4=0$ are respectively ...

(A) $\left(-1,\frac{3}{2}\right),\frac{\sqrt{5}}{2}$ (B) $\left(-1,-\frac{3}{2}\right),\frac{\sqrt{5}}{2}$

(C) $\left(1,-\frac{3}{2}\right),\frac{\sqrt{5}}{2}$ (D) $\left(1,\frac{3}{2}\right),\frac{\sqrt{5}}{2}$

110. If the line $4x+3y=7$ touches the hyperbola $x^2-y^2=7$, then the sum of the co-ordinates of the point of contact is...

(A) 4 (B) 7

(C) 1 (D) 0

111. If $\lim\limits_{x\to 0}\frac{(4^x-1)^3}{\tan\left(\frac{x}{4}\right)\log\left(1+\frac{x^2}{3}\right)}=96(\log a)^b$, then $(a+b)=$

(A) 5 (B) 7

(C) 3 (D) 4

112. The dual of the converse of the inverse of the logical statement $p\to(q\to r)$ is equivalent to...

(A) $\sim[p\vee(r\to q)]$ (B) $p\vee(r\to q)$

(C) $\sim[p\vee(q\to r)]$ (D) $p\vee(q\to r)$

113. The statements p, q and r have truth values True, False and False respectively. The truth values of a logical statement $[\sim(p\wedge\sim q)\vee(q\vee\sim r)]$ and its dual are, respectively.....

(A) True, True (B) True, False

(C) False, True (D) False, False

114. In $\triangle ABC$ with usual notations, if $1+\tan\left(\frac{A}{2}\right)\tan\left(\frac{B}{2}\right)=\frac{k}{s}$ (where s is the semi-perimeter), then the value of k is...

(A) 2 (B) $a+b-c$

(C) $a+b$ (D) $s-c$

115. Let $A=\begin{bmatrix}2k-1 & 1 & 1\\ 0 & 2k-1 & 1\\ 0 & 0 & 2k-1\end{bmatrix}$ and $B=\begin{bmatrix}0 & 2k-1 & 1\\ 1-2k & 0 & k\\ -1 & -k & 0\end{bmatrix}$ where k is a real number. If $\det(\text{adj}A)+\det(\text{adj}B)=11^6$, then the value of $k-5$ is equal to...

(A) 1 (B) 2

(C) 4 (D) 6

116. If $A=\begin{bmatrix}\cos\theta & -\sin\theta\\ \sin\theta & \cos\theta\end{bmatrix}$, then the matrix A^{-3} when $\theta=\frac{\pi}{6}$ is equal to...

(A) $\begin{bmatrix}0 & 1\\ -1 & 0\end{bmatrix}$ (B) $\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$

(C) $\begin{bmatrix}0 & -1\\ 1 & 0\end{bmatrix}$ (D) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

117. If $\tan^{-1}\left[\frac{\sqrt{5-2\sqrt{6}}}{1+\sqrt{6}}\right]=\frac{\pi}{3}-\tan^{-1}(k)$, then $\sec^{-1}(k)=...$

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

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

118. If $f(x-y)+f(x+y)=2f(x)f(y)$ for all $x,y\in\mathbb{R}$, then $f(x)$ is .....

(A) an odd function (B) an even function

(C) neither even nor odd function (D) a periodic function

119. If the function f is continuous at $x=1$, where $f(x)=\frac{1+\cos(\pi x)}{\pi(1-x)^2}$, for $x\neq 1$, then the value of $f(1)$ is....

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

(C) $\frac{\pi}{6}$ (D) $\frac{\pi}{9}$

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

(A) 4 (B) e

(C) e^2 (D) 9

121. If $y=\cos^{-1}(\sin x)$, where $\frac{\pi}{2}<x<\pi$, then $\frac{dy}{dx}=...$

(A) -1 (B) 0

(C) 1 (D) 2

122. If $y=\left(\frac{ax+b}{cx+d}\right)$, then $2\frac{dy}{dx}\cdot\frac{d^3y}{dx^3}$ is equal to

(A) $\left(\frac{d^2y}{dx^2}\right)^2$ (B) $3\frac{d^2y}{dx^2}$

(C) $3\left(\frac{d^2y}{dx^2}\right)^2$ (D) $3\frac{d^2x}{dy^2}$

123. Let $f(x)=3x^3+4e^{\frac{x}{2}}$ and $g(x)=f^{-1}(x)$. Then the value of $g'(4)$ is equal to...

(A) 4 (B) 2

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

124. If the function $f(x)=ax^3-bx^2-8x-4$ satisfies Roll's theorem in $[1,3]$, if $f'(2)=0$ then $a-b$ is equal to...

(A) 2 (B) -2

(C) 0 (D) 1

125. The co-ordinates of the point on the curve $y=x\log x$ at which the normal is parallel to the line $2x-2y=3$ are...

(A) $(0,0)$ (B) (e,e)

(C) $(e^2,2e^2)$ (D) $(e^{-2},-2e^{-2})$

126. If $\int\frac{1}{\cos^3 x\sqrt{\sin 2x}}dx=p(\tan^2 x+q)\sqrt{\tan x}+c$, then the values of p and q respectively are

(A) $p=\frac{\sqrt{2}}{5},q=\frac{1}{5}$ (B) $p=\frac{\sqrt{2}}{3},q=3$

(C) $p=\frac{\sqrt{2}}{5},q=5$ (D) $p=\frac{2}{\sqrt{5}},q=\sqrt{5}$

127. If $\int \sqrt{2}\sqrt{1+\sin x}\,dx = -4\cos(ax+b)+c$, then the value of a, b respectively are...

(A) $\frac{1}{2}, \frac{\pi}{2}$ (B) $\frac{1}{2}, \frac{\pi}{4}$

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

128. $\int \frac{\sqrt{x-2}}{x}dx =$

(A) $2\sqrt{x-2} - 2\sqrt{2}\tan^{-1}\left(\frac{\sqrt{x-2}}{\sqrt{2}}\right)+c$

(B) $2\sqrt{x-2} + 2\sqrt{2}\tan^{-1}\left(\frac{\sqrt{x-2}}{\sqrt{2}}\right)+c$

(C) $2\sqrt{x-2} - 2\sqrt{2}\tan^{-1}\left(\frac{\sqrt{x-2}}{2}\right)+c$

(D) $2\sqrt{x-2} + 2\sqrt{2}\tan^{-1}\left(\frac{\sqrt{x-2}}{2}\right)+c$

129. If $f(x)$ and $g(x)$ are integrable functions then $\left[\int f(x)dx\right]\left[\int g(x)dx\right] =$

(A) $\int [f(x)g'(x) + f'(x)g(x)]\,dx$

(B) $\int [f(x)g'(x) - f'(x)g(x)]\,dx$

(C) $\int \left[f(x)\int g(x)dx + g(x)\int f(x)dx\right]dx$

(D) $\int \left[f(x)\int g(x)dx - g(x)\int f(x)dx\right]dx$

130. If an antiderivative of $f(x)$ is e^x and an antiderivative of $g(x)$ is $\cos x$, then $\int f(x)\cos x\,dx + \int g(x)e^x\,dx =$

(A) $e^x \sin x + c$ (B) $e^x(f(x)+g(x))+c$

(C) $e^x \cos x + c$ (D) $e^x + c$

131. $\int_0^{\log 10}\left[\frac{e^x\sqrt{e^x-1}}{e^x+8}\right]dx =$

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

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

132. The value of the integral $\int_{-\pi/2}^{\pi/2}\left(\frac{x^2\cos x}{1+e^x}\right)dx$ is equal to $\left(\frac{\pi^2}{A}\right) - B$. Then $\left(\frac{A}{B}\right) =$

(A) -2 (B) 2

(C) 6 (D) -6

133. The area of the smaller region bounded by the circle $x^2+y^2=4$ and the line $x=1$ is...

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

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

134. If the area bounded by the curve $x^2 = by$ and the lines $y=1, y=4$ in the first quadrant is 28 sq. units, then the value of b is...

(A) 36 (B) 6

(C) 9 (D) 3

135. The solution of the differential equation $\frac{dy}{dx} = e^{x-y} + x^2e^{-y}$ is...

(A) $y = e^x + c$ (B) $e^y = e^x + x^3 + c$

(C) $e^y = e^x + \frac{x^3}{3} + c$ (D) $e^y = e^x + 2x + c$

136. If the differential equation $\begin{vmatrix} f(x) & f'(x) \\ f'(x) & f''(x)\end{vmatrix} = 0$ for all x and $f(0)=1, f'(0)=2$, then...

(A) $f'(x) = -f(x)$ (B) $f'(x) = f(x)$

(C) $f'(x) = 2f(x)$ (D) $f'(x) = 0$

137. The solution of the differential equation $x^2\frac{dy}{dx} - xy = 1$ is...

(A) $2xy - 2cx^2 - 1 = 0$ (B) $2xy + 2cx^2 + 1 = 0$

(C) $2xy - 2cx^2 + 1 = 0$ (D) $2x^2y - 2cx + 1 = 0$

138. If $\bar{a}$ and $\bar{b}$ are unit vectors and θ $(0 < \theta < \pi)$ is the angle between them, then the value of $\frac{|\bar{a}+\bar{b}|}{|\bar{a}-\bar{b}|}$ is equal to...

(A) $\tan\frac{\theta}{2}$ (B) $\sin\frac{\theta}{2}$

(C) $\cos\frac{\theta}{2}$ (D) $\cot\frac{\theta}{2}$

139. If ABCDEF is a regular hexagon and $\overline{AB} + \overline{AC} + \overline{AD} + \overline{AE} + \overline{AF} = p\overline{AD} = q\overline{AO}$, where O is the center of the hexagon, then the values of p and q respectively are

(A) $2, 3$ (B) $4, 6$

(C) $3, 6$ (D) $3, 5$

140. The vector $\bar{r}$ whose magnitude is $3\sqrt{2}$ units and which makes angles of $\frac{\pi}{4}$ and $\frac{\pi}{2}$ with the positive y- and z-axes respectively is....

(A) $\hat{i} \pm 3\hat{j}$ (B) $\hat{i} \pm \hat{j}$

(C) $-\hat{i} \pm \hat{j}$ (D) $\pm 3\hat{i} + 3\hat{j}$

141. Let $(\bar{p} \wedge \bar{q})$ denote the angle between $\bar{p}$ and $\bar{q}$. If $\bar{a}+\bar{b}+\bar{c}=\bar{0}, |\bar{a}|=7, |\bar{b}|=5$ and $|\bar{c}|=3$ then (take $\pi=\frac{22}{7}$)

(A) $\sin(\bar{b} \wedge \bar{c})=\frac{1}{2}$ (B) $\cos(\bar{a} \wedge \bar{c})=-\frac{\pi}{4}$

(C) $\cos(\bar{b} \wedge \bar{c})=-\frac{1}{2}$ (D) $\sin(\bar{a} \wedge \bar{c})=\frac{\pi}{4}$

142. If the lines $\frac{x-5}{5m+2}=\frac{2-y}{5}=\frac{1-z}{-1}$ and $x=\frac{2y+1}{4m}=\frac{1-z}{-3}$ are perpendicular to each other, then the value of m is ...

(A) 1 (B) 0

(C) 2 (D) -1

143. For the line $\frac{x+1}{1}=\frac{y-2}{2}=\frac{z+3}{3}$, identify the incorrect statement among the following.

(A) It can be represented by equation $\frac{x+2}{1}=\frac{y}{2}=\frac{z+6}{3}$

(B) It lies in the plane $x-2y+z+8=0$

(C) It is perpendicular to the plane $x-2y+z=0$

(D) It passes through point $(0,4,0)$.

144. The direction cosines of a line which is perpendicular to the lines $\frac{x-7}{2}=\frac{y+17}{-3}=\frac{z-6}{1}$ and $\frac{x+5}{1}=\frac{y+3}{2}=\frac{z-6}{-2}$ are...

(A) $\frac{\pm 4}{3\sqrt{10}}, \frac{\mp 5}{3\sqrt{10}}, \frac{\pm 7}{3\sqrt{10}}$

(B) $\frac{\pm 4}{3\sqrt{10}}, \frac{\pm 5}{3\sqrt{10}}, \frac{\mp 7}{3\sqrt{10}}$

(C) $\frac{\mp 4}{3\sqrt{10}}, \frac{\pm 5}{3\sqrt{10}}, \frac{\pm 7}{3\sqrt{10}}$

(D) $\frac{\pm 4}{3\sqrt{10}}, \frac{\pm 5}{3\sqrt{10}}, \frac{\pm 7}{3\sqrt{10}}$

145. The equation of the plane containing the lines $\frac{x-1}{2}=\frac{y+1}{\lambda}=\frac{z}{2}$ and $\frac{x+1}{5}=\frac{y+1}{2}=\frac{z}{\lambda}$ is

(A) $x \pm y+1=0$ (B) $y \pm z+1=0$

(C) $x \pm z+1=0$ (D) $y \pm z-1=0$

146. If a unit vector makes angles $\frac{\pi}{4}$ with $\hat{i}$, $\frac{\pi}{3}$ with $\hat{j}$ and $\theta \in (0,\pi)$ with $\hat{k}$, then a value of θ is equal to...

(A) $\frac{\pi}{3}, \frac{2\pi}{3}$ (B) $\frac{\pi}{6}, \frac{5\pi}{6}$

(C) $\frac{\pi}{4}, \frac{5\pi}{4}$ (D) $\frac{5\pi}{12}, \frac{7\pi}{12}$

147. The minimum value of $Z=3x+y$, subject to the constraints $2x+3y \leq 6, x+y \geq 1, x \geq 0, y \geq 0$ is....

(A) 5 (B) 2

(C) 1 (D) 9

148. The centers for disease control have determined that when a person is given a vaccine, the probability that the person will develop immunity to a virus is 0.8. If 8 people are given this vaccine, then the probability that exactly 4 will develop immunity is...

(A) $(0.2)(0.8)^4$ (B) $(0.112)(0.8)^4$

(C) $(0.112)(0.8)^6$ (D) $(0.2)^4(0.8)^4$

149. The Variance of the following probability distribution of X is

X	0	1	2	3
P(X)	q^3	$3q^2p$	$3qp^2$	p^3

where $0<p<1, q=1-p$

(A) $3p^2q$ (B) $3pq$

(C) $3pq^2$ (D) $3q$

150. If A and B are two events such that $P(A)=\frac{2}{3}$, $P(B)=\frac{1}{2}$ and $P(A \mid B)=\frac{2}{3}$, then $P(A' \cup B)+P(A \cup B')=$

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

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

- End of Question Paper -