MHT CET 2019 PCM May 2 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 2019**, 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 stone of mass 1 kg is tied to a string 2 m long and it's rotated at constant speed of 40 ms^{-1} in a vertical circle. The ratio of the tension at the top and the bottom is [Take $g = 10\ ms^{-2}$]

(A) $\frac{81}{79}$ (B) $\frac{79}{81}$
(C) $\frac{19}{12}$ (D) $\frac{12}{19}$

2. 2. Two coils have a mutual inductance of 0.01 H . The current in the first coil changes according to equation, $I = 5 \sin 200\pi t$. The maximum value of emf induced in the second coil is

(A) $10\pi V$ (B) 0.1π V
(C) πV (D) 0.01π V

3. The radius of the earth and the radius of orbit around the sun are 6371 km and 149×10^6 km respectively. The order of magnitude of the diameter of the orbit is greater than that of earth by

(A) 10^3 (B) 10^2
(C) 10^4 (D) 10^5

4. Two open pipes of different lengths and same diameter in which the air column vibrates with fundamental frequencies ' n_1 ', and ' n_2 ' respectively. When both pipes are joined to form a single pipe, its fundamental frequency will be

(A) $\frac{n_1+n_2}{n_1 n_2}$ (B) $\frac{n_1 n_2}{2n_2+n_1}$
(C) $\frac{2n_2+n_1}{n_1 n_2}$ (D) $\frac{n_1 n_2}{n_1+n_2}$

5. If ' C_P ' and ' C_V ' are molar specific heats of an ideal gas at constant pressure and volume respectively. If ' λ ' is the ratio of two specific heats and ' R ' is universal gas constant then ' C_p ' is equal to

(A) $\frac{R\gamma}{\gamma-1}$ (B) γR
(C) $\frac{1+\gamma}{1-\gamma}$ (D) $\frac{R}{\gamma-1}$

6. In a series LCR circuit $R = 300\Omega, L = 0.9\text{H}$, $C = 2\mu\text{ F}, \omega = 1000\text{rad/s}$. The impedance of the circuit is

(A) 500Ω (B) 1300Ω
(C) 400Ω (D) 900Ω

7. The quantity which does not vary periodically for a particle performing SHM is

(A) acceleration (B) total energy
(C) displacement (D) velocity

8. Which of the following combinations of 7 identical capacitors each of 2μ F gives a resultant capacitance of $10/11\mu$ F ?

(A) 3 in parallel and 4 in series (B) 2 in parallel and 5 in series
(C) 4 in parallel and 3 in series (D) 5 in parallel and 2 in series

9. Bohr model is applied to a particle of mass ' m ' and charge ' q ' is moving in a plane under the influence of a transverse magnetic field ' B '. The energy of the charged particle in the nth level will be (h = Planck's constant)

(A) $2nhqB/\pi$m (B) $nhqB/2\pi$ m
(C) $nhqB/4\pi$ m (D) $nhqB/\pi$m

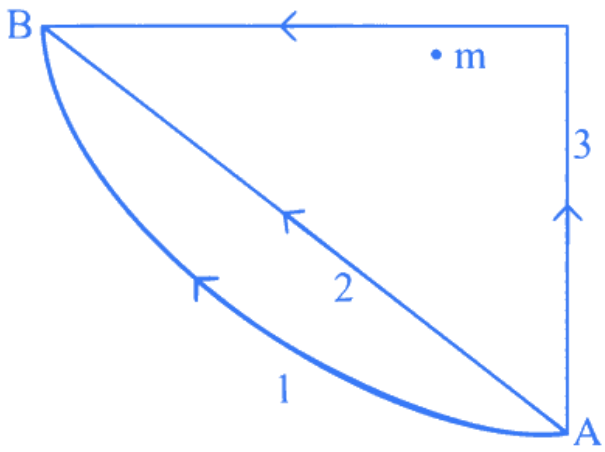
10. In moving coil galvanometer, strong horse shoe magnet of concave shaped pole pieces is used to

(A) increase space for rotation of coil (B) reduce weight of galvanometer
(C) produce magnetic field which is parallel to plane of coil at any position (D) make magnetic induction weak at the centre.

11. Two identical wires of substances ' P ' and ' Q ' are subjected to equal stretching force along the length. If the elongation of ' Q ' is more than that of ' P ', then

(A) both P and Q are equally elastic (B) P is more elastic than Q
(C) P is plastic and Q is elastic (D) Q is more elastic than P

12. If W_1, W_2 and W_3 represent the work done in moving a particle from A to B along three different paths 1,2 and 3 (as shown in fig) in the gravitational field of the point mass ' m '. Find the correct relation between ' W_1 ', ' W_2 ' and ' W_3 '



(A) $W_1 < W_3 < W_2$ (B) $W_1 < W_2 < W_3$
(C) $W_1 = W_2 = W_3$ (D) $W_1 > W_3 > W_2$

13. Assuming that the junction diode is ideal, the current in the arrangement shown in figure is



(A) 30 mA (B) 40 mA
(C) 20 mA (D) 10 mA

14. The equation of simple harmonic progressive wave is given by $Y = a\sin 2\pi(bt - cx)$. The maximum particle velocity will be twice the wave velocity if

(A) $c = \pi a$ (B) $c = \frac{1}{2\pi a}$
(C) $c = \frac{1}{\pi a}$ (D) $c = 2\pi a$

15. In a fundamental mode,the time required for the sound wave to reach upto the closed end of a pipe filled with air is ' t ' second. The frequency of vibration of air column is

(A) $(2t)^{-1}$ (B) $4(t)^{-1}$
(C) $2(t)^{-1}$ (D) $(4t)^{-1}$

16. Two small drops of mercury each of radius ' R ' coalesce to form a large single drop. The ratio of the total surface energies before and after the change is

(A) $2^{2/3} : 1$ (B) $\sqrt{2} : 1$
(C) $2^{1/3} : 1$ (D) $2 : 1$

17. If radius of the solid sphere is doubled by keeping its mass constant, the ratio of their moment of inertia about any of its diameter is

(A) $1 : 8$ (B) $2 : 5$
(C) $2 : 3$ (D) $1 : 4$

18. For a metallic wire, the ratio of voltage to corresponding current is

(A) independent of temperature. (B) increases with rise in temperature.
(C) increases or decreases with rise in temperature depending upon the metal. (D) decreases with rise in temperature.

19. In air, a charged soap bubble of radius ' R ' breaks into 27 small soap bubbles of equal radius ' r '. Then the ratio of mechanical force acting per unit area of big soap bubble to that of a small soap bubble is

(A) $\frac{1}{81}$ (B) $\frac{3}{1}$
(C) $\frac{1}{3}$ (D) $\frac{9}{1}$

20. Two parallel conductors carrying unequal currents in the same direction .....

(A) neither attract nor repel each other (B) repel each other
(C) attract each other (D) will have rotational motion.

21. A layer of atmosphere that reflects medium frequency radio waves which is ineffective during night, is

(A) F-layer (B) E-layer
(C) stratosphere (D) thermosphere

22. A transverse wave is propagating on the string. The linear density of a vibrating string is 10^{-3} kg/m. The equation of the wave is $Y = 0.05\sin(x + 15t)$ where x and Y are measured in metre and time in second. The tension force in the string is

(A) 0.2 N (B) 0.250 N
(C) 0.225 N (D) 0.325 N

23. The kinetic energy of a revolving satellite (mass m) at a height equal to thrice the radius of the earth (R) is

(A) $\frac{mgR}{8}$ (B) $\frac{mgR}{16}$
(C) $\frac{mgR}{2}$ (D) $\frac{mgR}{4}$

24. A particle executes the simple harmonic motion with an amplitude ' A '. The distance travelled by it in one periodic time is

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

(C) $2A$ (D) $4A$

25. A galvanometer has resistance of 100Ω and a current of 10 mA produces full scale deflection in it. The resistance to be connected in series, to get a voltmeter of range 50 volt is

(A) 3900Ω (B) 4000Ω

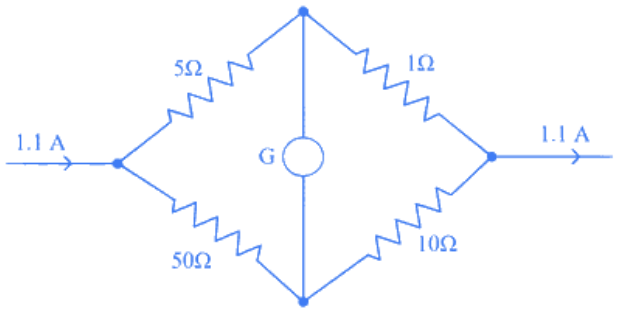
(C) 4600Ω (D) 4900Ω

26. The angle made by orbital angular momentum of electron with the direction of the orbital magnetic moment is

(A) 120° (B) 60°

(C) 180° (D) 90°

27. The circuit in 1Ω resistor in the following circuit is



(A) 1 A (B) 0.5 A

(C) 1.1 A (D) 0.8 A

28. The wavelength of the first line in Balmer series in the hydrogen spectrum is ' λ '. What is the wavelength of the second line in the same series?

(A) $\frac{20}{27}\lambda$ (B) $\frac{3}{16}\lambda$

(C) $\frac{5}{36}\lambda$ (D) $\frac{3}{4}\lambda$

29. Work done in stretching a wire through 1 mm is 2 J . What amount of work will be done for elongating another wire of same material, with half the length and double the radius of cross section, by 1 mm ?

(A) 2 J (B) 4 J

(C) 8 J (D) 16 J

30. The resultant $\mathbf{R}$ of $\mathbf{P}$ and $\mathbf{Q}$ is perpendicular to $\mathbf{P}$. Also $|\mathbf{P}| = |\mathbf{R}|$. The angle between $\mathbf{P}$ and $\mathbf{Q}$ is $[\tan 45^\circ = 1]$

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

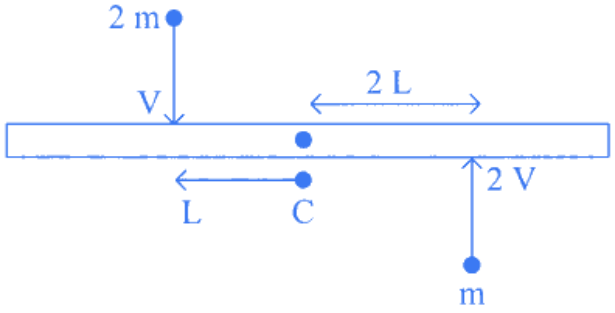
(C) $\frac{\pi}{4}$ (D) $\frac{3\pi}{4}$

31. A telescope has large diameter of the objective. Then its resolving power is

(A) independent of the diameter of the objective (B) low

(C) zero (D) high

32. A uniform rod of length ' 6 L ' and mass ' 8 m ' is pivoted at its centre ' C '. Two masses ' m ' and ' $2m$' with speed $2v, v$ as shown strikes the rod and stick to the rod. Initially the rod is at rest. Due to impact, if it rotates with angular velocity ' ω ' then ' ω ' will be



(A) $\frac{V}{5L}$ (B) zero

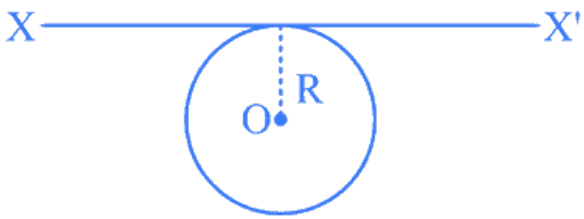
(C) $\frac{8v}{6L}$ (D) $\frac{11v}{3L}$

33. If $\sqrt{A^2+B^2}$ represents the magnitude of resultant of two vectors $(\mathbf{A}+\mathbf{B})$ and $(\mathbf{A}-\mathbf{B})$, then the angle between two vectors is

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

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

34. A thin metal wire of length 'L' and uniform linear mass density 'ρ' is bent into a circular coil with 'O' as centre. the moment of inertia of a coil about the axis XX' is



(A) $\frac{3\rho L^3}{8\pi^2}$ (B) $\frac{\rho L^3}{4\pi^2}$

(C) $\frac{3\rho L^2}{4\pi^2}$ (D) $\frac{\rho L^3}{8\pi^2}$

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35. The dimensions of torque are same as that of

(A) moment of force (B) pressure.
(C) acceleration (D) impulse

36. . For a transistor, the current ratio ' β_{dc} ' is defined as the ratio of

(A) collector current to emitter current. (B) collector current to base current.
(C) base current to collector current. (D) emitter current to collector current.

37. A clock pendulum having coefficient of linear expansion. $\alpha = 9 \times 10^{-7}/^{\circ}\mathrm{C}^{-1}$ has a period of 0.5 s at 20°C. If the clock is used in a climate, where the temperature is 30°C, how much time does the clock lose in each oscillation? (g = constant)

(A) 25×10^{-7} s (B) 5×10^{-7} s
(C) 1.125×10^{-6} s (D) 2.25×10^{-6} s

38. Two capillary tubes of different diameters are dipped in water. The rise of water is

(A) zero in both the tubes. (B) same in both the tubes.
(C) more in the tube of larger diameter. (D) more in the tube of smaller diameter.

39. A thin hollow prism of refracting angle 3°, filled with water gives a deviation of 1°. The refractive index of water is

(A) 1.59 (B) 1.33
(C) 1.46 (D) 1.51

40. A body is projected vertically from the surface of the earth of radius ' R ' with velocity equal to half of the escape velocity. The maximum height reached by the body is

(A) $\frac{R}{5}$ (B) $\frac{R}{3}$
(C) $\frac{R}{2}$ (D) $\frac{R}{4}$

41. In biprism experiment, the distance between source and eyepiece is 1.2 m, the distance between two virtual sources is 0.84 mm. Then the wavelength of light used if eyepiece is to be moved transversely through a distance of 2.799 cm to shift 30 fringes is

(A) 6533 $\overset{o}{A}$ (B) 6537 $\overset{o}{A}$
(C) 6535 $\overset{o}{A}$ (D) 6351 $\overset{o}{A}$

42. When photons of energy hv fall on a metal plate of work function ' W_0 ', photoelectrons of maximum kinetic energy ' K ' are ejected. If the frequency of the radiation is doubled, the maximum kinetic energy of the ejected photoelectrons will be

(A) $K + W_0$ (B) $K + hv$
(C) K (D) 2K

43. If a star emitting yellow light is accelerated towards earth, then to an observer on earth it will appear

(A) becoming orange. (B) shining yellow.
(C) gradually changing to blue. (D) gradually changing to red.

44. The magnitude of the magnetic induction at a point on the axis at a large distance (r) from the centre of a circular coil of ' n ' turns and area ' A ' carrying current (I) is given by

(A) $B_{\text{axis}} = \frac{\mu_0}{4\pi} \cdot \frac{nA}{1r^3}$ (B) $B_{\text{axis}} = \frac{\mu_0}{4\pi} \cdot \frac{2nlA}{r^3}$
(C) $B_{\text{axis}} = \frac{\mu_0}{4\pi} \cdot \frac{2nl}{Ar^3}$ (D) $B_{\text{axis}} = \frac{\mu_0}{4\pi} \cdot \frac{nlA}{r^3}$

45. A metal sphere of radius ' R ' and density ' ρ_1 ' is dropped in a liquid of density ' σ ' moves with terminal velocity ' v '. Another metal sphere of same radius and density ' ρ_2 ' is dropped in the same liquid, its terminal velocity will be

(A) $v[\rho_2 + \sigma)/(\rho_1 + \sigma)]$ (B) $v[\rho_1 + \sigma)/(\rho_2 + \sigma)]$
(C) $v[\rho_2 - \sigma)/(\rho_1 - \sigma)]$ (D) $v[\rho_1 - \sigma)/(\rho_2 - \sigma)]$

46. If α is the coefficient of performance of a refrigerator and ' Q ' is heat released to the hot reservoir, then the heat extracted from the cold reservoir ' Q_2 ' is

(A) $\frac{\alpha Q_1}{\alpha - 1}$ (B) $\frac{\alpha - 1}{\alpha} Q_1$
(C) $\frac{\alpha Q_1}{1 + \alpha}$ (D) $\frac{1 + \alpha}{\alpha} Q_1$

47. The real force ' F ' acting on a particle of mass m ' performing circular motion acts along the radius of circle ' r ' and is directed towards the centre of circle. The square root of magnitude of such force is (T = periodic time)

(A) $\frac{2\pi}{T}\sqrt{mr}$ (B) $\frac{Tmr}{4\pi}$
(C) $\frac{2\pi T}{\sqrt{mr}}$ (D) $\frac{T^2 mr}{4\pi}$

48. Dimensions of Gyromagnetic ratio are

(A) $[L^1 M^0 T^1 I^1]$ (B) $[L^0 M^{-1} T^1 I^1]$
(C) $[L^1 M^0 T^0 I^{-1}]$ (D) $[L^{-1} M^0 T^1 I^1]$

49. The maximum velocity of the photoelectron emitted by the metal surface is ' v '. Charge and mass of the photoelectron is denoted by ' e ' and ' m ' respectively. The stopping potential in volt is

(A) $\frac{v^2}{2(\frac{m}{e})}$ (B) $\frac{v^2}{2(\frac{e}{m})}$

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

50. The equi-convex lens has a focal length ' f '. If the lens is cut along the line perpendicular to the principal axis and passing through the pole, what will be the focal length of any half part?

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

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

51. Which of following methods is used to separate wolframite and stannic oxide present in cassiterite?

(A) Hydraulic washing using Wilfley table
(B) Froth flotation
(C) Hydraulic classifier
(D) Magnetic separation

52.

In the reaction,

$MnO_4^{-1}(aq) + Br^{-1}(aq) \longrightarrow MnO_2(s) + BrO_3^{-1}(aq)$

,the correct change in oxidation number of the species involved is

(A) Br^{+5} to Br^{-1}
(B) Mn^{+7} to Mn^{+2}
(C) Mn^{+7} to Mn^{+3}
(D) Br^{-1} to Br^{+5}

53. How many isoprene units are present in abscisic acid?

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

54. Action of hydrogen iodide on anisole gives,

(A) phenol and iodomethane
(B) iodobenzene and methanol
(C) phenol and methanol
(D) iodobenzene and iodomethane

55. Which among the following compounds is used to decaffeinate coffee?

(A) Iodoform
(B) Carbon tetrachloride
(C) Methylene dichloride
(D) Chloroform

56. Which complex among the following gives a white precipitate on treatment with an aqueous solution of barium chloride?

(A) $[Pt(NH_3)_4Br_2]Cl_2$
(B) $[Co(NH_3)_5SO_4]NO_2$
(C) $[Co(NH_3)_5NO_2]SO_4$
(D) $[Pt(NH_3)_4Cl_2]Br_2$

57. When $CuSO_4$ solution in water is treated with concentrated HCl it turns

(A) violet
(B) yellow
(C) purple
(D) green

58. Which of the following polymer is used in paints?

(A) Gutta percha
(B) Melamine
(C) Buna-S
(D) Novolac

59. Three moles of an ideal gas are expanded isothermally from a volume of 300 cm^3 to 2.5 L at 300 K against a pressure of 1.9 atm . The work done in joules is

(A) -423.56 J
(B) $+423.56$ J
(C) -4.18 J
(D) $+4.8$ J

60. Which among the following is used in the treatment of cancer?

(A) cis$[Pt(en)_2Cl_2]$
(B) cis$[PtCl_2(NH_3)_2]$
(C) trans$[Pt(en)_2Cl_2]$
(D) trans $[Pt(NH_3)_2Cl_2]$

61. Which among the following pairs of compounds is not isomorphous?

(A) $NaNO_3$ and $CaCO_3$
(B) K_2SO_4 and K_2SeO_4
(C) NaCl and KCl
(D) NaF and MgO

62. Which among the following compounds is used as selective weed killer?

(A) Picric acid
(B) 2,4-dichlorophenoxy acetic acid
(C) 2, 4, 6-trichlorophenoxy acetic acid
(D) Salol

63. Calculate the difference between heat of combustion of carbon monoxide gas at constant pressure and at constant volume at 27°C? $(R = 2 calK^{-1}\ mol^{-1})$

(A) 54 cal
(B) -600 cal
(C) -300 cal
(D) 27 cal

64. The conductivity of an electrolytic solution decreases on dilution due to

(A) decrease in number of ions per unit volume
(B) increase in ionic mobility of ions
(C) increase in percentage ionisation
(D) increase in number of ions per unit volume

65. Identify B in the following reaction,

$$\text{Acetaldoxime} \xrightarrow[\text{alcohol}]{\text{Na}} A \xrightarrow[\text{HCl}]{\text{NaNO}_2} B + H_2O + N_2 \uparrow$$

(A) $CH_3CH_2CH_2OH$ (B) C_2H_5OH

(C) C_2H_5Cl (D) $C_2H_5NH_2$

66. Which among the following solids shows Frenkel defect?

(A) NaCl (B) C_sCl

(C) KCl (D) AgCl

67. A cold drink bottle contains 200 mL liquid, in which CO_2 is 0.1 molar. Considering CO_2 as an ideal gas the volume of the dissolved CO_2 at S.T.P is

(A) 22.4 L (B) 0.224 L

(C) 2.24 L (D) 0.448 L

68. In the reaction,

$2nR - X \xrightarrow[\text{Dry ether}]{+2n\text{Na}}$ product

The product obtained is

(A) 2n-alkene (B) n-sodium halide

(C) n-alcohol (D) n-alkane

69. The bacteriostatic antibiotic from the following is

(A) tetracycline (B) aminoglycosides

(C) penicillin (D) ofloxacin

70. Nitroalkanes are obtained in laboratory from primary or secondary alkyl halides by the action of

(A) $AgNO_2$ (B) $NaNO_3$

(C) $AgNO_3$ (D) HNO_3

71. Which of following bonds has maximum bond length?

(A) $C - O$ (B) $C - H$

(C) $C - C$ (D) $C - N$

72. Which of the following sets of components form homogeneous mixture?

(A) Phenol + Water (B) Sugar + Benzene

(C) Silver chloride + Water (D) Ethyl alcohol + Water

73. Which among the following compounds in crystalline form is used for making Nicol's prism?

(A) $CaSO_4$ (B) Na_2AlF_6

(C) $CaCO_3$ (D) Al_2O_3

74. Two electrolytic cells are connected in series containing $CuSO_4$ solution and molten $AlCl_3$. If in electrolysis 0.4 moles of 'Cu' are deposited on cathode of first cell. The number of moles of 'Al' deposited on cathode of the second cell is

(A) 0.6 moles (B) 0.27 moles

(C) 0.18 moles (D) 0.4 moles

75. Mandelonitrile is obtained by the reaction between hydrogen cyanide and

(A) propionaldehyde (B) benzaldehyde

(C) acetaldehyde (D) acetone

76. The ionic charges on chromate ion and dichromate ion respectively is

(A) $-2, -2$ (B) $-3, -2$

(C) $-2, -4$ (D) $-4, -2$

77. In the reaction, $C_6H_5COCH_3 \xrightarrow[\text{Zn}-\text{Hg/ conc. HCl}]{[H]} X$, X is

(A) toluene (B) methyl benzene

(C) benzylalcohol (D) ethyl benzene

78. What is the percentage of carbon in urea? (Atomic mass $C = 12, H = 1, N = 14, O = 16$)

(A) 20% (B) 26.6%

(C) 6.67% (D) 46.0%

79. α - butylene when subjected to hydroboration oxidation reaction, yields

(A) iso-butyl alcohol (B) sec-butyl alcohol

(C) n-butyl alcohol (D) tert-butyl alcohol

80. Calculate van't Hoff-factor for 0.2 m aqueous solution of KCl which freezes at -0.680°C. $\left(K_f = 1.86 \text{ K kg mol}^{-1}\right)$

(A) 3.72 (B) 1.83

(C) 6.8 (D) 1.86

81. Which among the following sets of compounds is used as raw material for the preparation of sodium carbonate by Solvay process?

(A) $NaOH, HCl, CO_2$

(B) $NH_4Cl, H_2O, NaCl$

(C) $NaCl, NH_3, Ca(OH)_2$

(D) $NaCl, CaCO_3, H_2SO_4$

82. What is the $H-S-H$ bond angle in H_2S ?

(A) 104.5° (B) 92.1°

(C) 91° (D) 90°

83. ' K is Henry's constant and has the unit

(A) atm $mol^{-1}dm^3$ (B) $mol^{-1}dm^3$ atm^{-1}

(C) atm mol dm^{-3} (D) mol dm^{-3} atm^{-1}

84. For the conversion of oxygen to ozone in the atmosphere, nitric oxide in gaseous phase acts as

(A) enzyme catalyst (B) inhibitor

(C) homogeneous catalyst (D) heterogeneous catalyst

85. Which among the following group 15 elements does not exhibit allotropy?

(A) N (B) As

(C) Sb (D) Bi

86. Which among the following oxides of nitrogen is called nitrogen sesquioxide?

(A) NO_2 (B) N_2O_3

(C) N_2O_4 (D) N_2O_5

87. For the elementary reaction $2SO_2(g) + O_2(g) \longrightarrow 2SO_3(g)$, identify the correct among the following relations

(A) $\frac{-d[SO_2(g)]}{dt} = \frac{-d[O_2(g)]}{dt}$

(B) $\frac{+1}{2}\frac{d[SO_3(g)]}{dt} = \frac{d[SO_2(g)]}{dt}$

(C) $\frac{+d[SO_3(g)]}{dt} = \frac{-2d[O_2(g)]}{dt}$

(D) $\frac{+d[SO_2(g)]}{dt} = \frac{-d[O_2(g)]}{dt}$

88. For a process, entropy change of a system is expressed as

(A) $H - TS$ (B) $\frac{q_{rev}}{T}$

(C) $\frac{T}{q_{rev}}$ (D) $q_{rev} \times T$

89. Which among the following is not a semi-synthetic polymer?

(A) Terylene (B) Viscose-rayon

(C) Cupra-ammonium silk (D) Acetate rayon

90. Bassemerisation is used in the extraction of

(A) iron (B) copper

(C) aluminium (D) zinc

91. Which among the following reaction is an example of a zero order reaction?

(A) $C_{12}H_{22}O_{11}(aq) + H_2O(I) \longrightarrow C_6H_{12}O_6(aq) + C_6H_{22}O_6(aq)$

(B) $2NH_3(g) \xrightarrow{Pt} N_2(g) + 3H_2$

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

(D) $H_2(g) + I_2(g) \longrightarrow 2HI(g)$

92. The resistance of $\frac{1}{10}M$ solution is 25×10^3 ohm. What is the molar conductivity of solution? (cell constant $= 1.25\ cm^{-1}$)

(A) 3.5 $ohm^{-1}\ cm^2\ mol^{-1}$

(B) 5.00 $ohm^{-1}\ cm^2\ mol^{-1}$

(C) 2.50 $ohm^{-1}\ cm^2\ mol^{-1}$

(D) 2.00 $ohm^{-1}\ cm^2\ mol^{-1}$

93. If the van't Hoff-factor for 0.1 M $Ba(NO_3)_2$ solution is 2.74 , the degree of dissociation is

(A) 0.87 (B) 0.74

(C) 0.91 (D) 87

94. What happens when ionic hydrides of s-block elements in molten state are electrolysed?

(A) Hydride ion migrates at cathode (B) Dihydrogen is liberated at cathode

(C) Hydride ion reforms metal hydride (D) Dihydrogen is liberated at anode

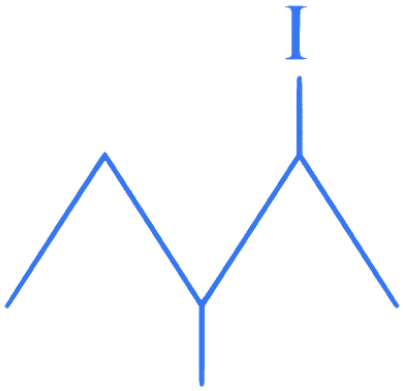
95. Which of following is not a property of red phosphorus?

(A) Insoluble in carbon disulphide (B) It does not show chemiluminescence by action of air

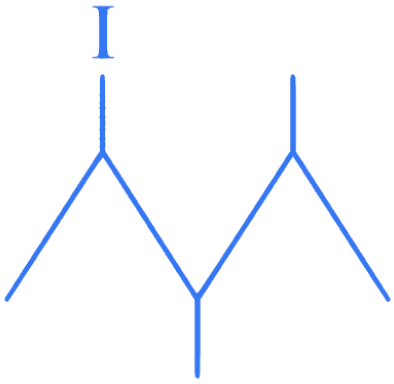
(C) It forms phosphine when treated with hot sodium hydroxide solution (D) It is non-poisonous

96. The bond line formula of 1-iodo -2, 3-dimethyl pentane is

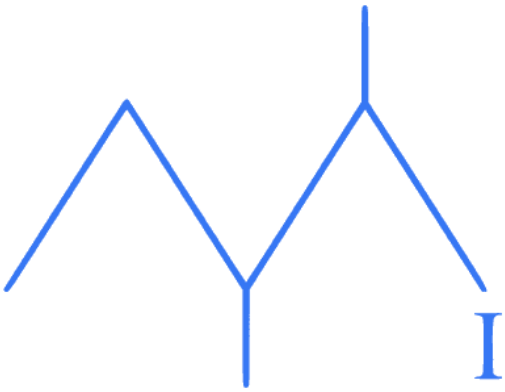
(A)



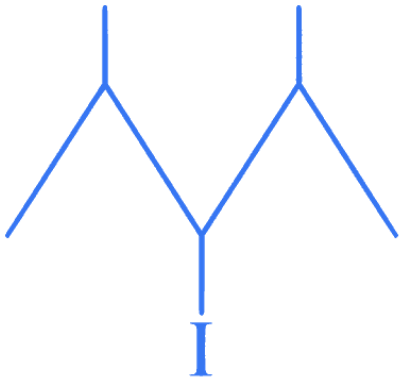
(B)



(C)



(D)



97. When propene reacts with HCl in presence of peroxide, the product is

(A) 1-chloro propane
(B) 1, 1-dichloro propane
(C) 2-chloro propane
(D) 1, 2-dichloro propane

98. Which hydride among the following is strongest reducing agent?

(A) AsH_3
(B) BiH_3
(C) PH_3
(D) SbH_3

99. Which of the following is not as antiseptic compound?

(A) Boric acid
(B) Iodoform
(C) Hydrogen peroxide
(D) Potassium sulphite

100. β-pleated sheets of polypeptide chains are present in

(A) secondary structure
(B) primary structure
(C) tertiary structure
(D) quaternary structure

101. If $P(x_1, y_1)$ is a point on the hyperbola $x^2 - y^2 = a^2$, then SP. S'P = ...

(A) $\frac{x_1^2 - y_1^2}{a^2}$ (B) $\frac{x_1^2 + y_1^2}{a^2}$

(C) $x_1^2 - y_1^2$ (D) $x_1^2 + y_1^2$

102. If $f(x) = \cos^{-1}\left[\frac{1-(\log x)^2}{1+(\log x)^2}\right]$, then $f'(e) = \ldots$

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

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

103. The order of the differential equation of all circles whose radius is 4 , is .....

(A) 1 (B) 2

(C) 3 (D) 4

104. If $A = \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$ and $A = A^{-1}$, then $x = \ldots\ldots$

(A) 0 (B) 4

(C) 2 (D) 1

105. Which of the following function is not continuous at $x = 0$?

(A) $f(x) = (1+2x)^{1/x}, \quad x \neq 0$
$= e^2, \quad x = 0$

(B) $f(x) = \sin x - \cos x, \quad x \neq 0$
$= -1, \quad x = 0$

(C) $f(x) = \frac{e^{1/x}-1}{e^{1/x}+1}, \quad x \neq 0$
$= -1, \quad x = 0$

(D) $f(x) = \frac{e^{5x}-e^{2x}}{\sin 3x}, \quad x \neq 0$
$= 1, \quad x = 0$

106. It is observed that 25% of the cases related to child labour reported to the police station are solved. If 6 new cases are reported, then the probability that atleast 5 of them will be solved is

(A) $(\frac{1}{4})^6$ (B) $\frac{19}{1024}$

(C) $\frac{19}{2048}$ (D) $\frac{19}{4096}$

107. For a GP, if $S_n = \frac{4^n - 3^n}{3^n}$, then t_2 = ...

(A) $\frac{1}{9}$ (B) $\frac{2}{9}$

(C) $\frac{7}{9}$ (D) $\frac{4}{9}$

108. The area of the region bounded by the curve $y = 2x - x^2$ and the line $y = x$ is ..... units. square

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

(C) $\frac{1}{3}$ (D) $\frac{7}{6}$

109. The general solution of $x\frac{dy}{dx} = y - x\tan\left(\frac{y}{x}\right)$ is .....

(A) $x^2\sin(\frac{x}{y}) = c$ (B) $x\sin(\frac{x}{y}) = c$

(C) $x\sin(\frac{y}{x}) = c$ (D) $x^2\sin(\frac{y}{x}) = c$

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

(A) r (B) q

(C) p $\wedge$ q (D) p

111. A bag contains 6 white and 4 black balls. Two balls are drawn at random. The probability that they are of the same colour is .....

(A) $\frac{5}{7}$ (B) $\frac{1}{7}$

(C) $\frac{7}{15}$ (D) $\frac{1}{15}$

112.

$$\int \frac{\cos x + x\sin x}{x^2 + x\cos x} dx =$$

.....

(A) $\log|\frac{x\sin x}{x+\cos x}| + c$

(B) $\log|\frac{x}{x+\cos x}| + c$

(C) $\log|\cos x + x\sin x| + c$

(D) $\log|x^2 + x\cos x| + c$

113. A stone is dropped into a pond. Waves in the form of circles are generated and radius of outermost ripple increases at the rate of 5 cm/sec. Then area increased after 2 seconds is .....

(A) 100π cm^2/sec (B) 40 cm^2/sec

(C) 50 cm^2/sec (D) 25 cm^2/sec

114. If $f(x) = 3x - 2$ and $g(x) = x^2$, then $(f \circ g)(x) =$

(A) $3x^2 - 2$ (B) $3x^2 + 2$

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

115. Which of the following is not equivalent to $p \to q$.

(A) p only if q (B) q is necessary for p

(C) q only if p (D) p is sufficient for q

116. The value of $\int_{-3}^{3} \left(ax^5 + bx^3 + cx + k\right) dx$, where a, b, c, k are constants, depends only on

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

(C) a and b (D) a and k

117. The general solution of the differential equation of all circles having centre at $A(-1, 2)$ is .....

(A) $x^2 + y^2 + x - 2y + c = 0$

(B) $x^2 + y^2 - 2x + 4y + c = 0$

(C) $x^2 + y^2 - x + 2y + c = 0$

(D) $x^2 + y^2 + 2x - 4y + c = 0$

118. If A is non-singular matrix such that $(A - 2I)(A - 4I) = 0$ then $A + 8A^{-1} =$ .....

(A) I (B) 0

(C) 3I (D) 6I

119. If $G(3, -5, r)$ is centroid of triangle ABC where $A(7, -8, 1), B(p, q, 5)$ and $C(q + 1, 5p, 0)$ are vertices of a triangle then values of p, q, r are respectively .....

(A) $6, 5, 4$ (B) $-4, 5, 4$

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

120.

$$\int \frac{1}{(x^2+1)^2} dx = \ldots$$

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

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

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

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

121. If $\theta = \frac{17\pi}{3}$ then, $\tan\theta - \cot\theta = \ldots$

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

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

122. Derivative of $\log_{e^2}(\log x)$ with respect to x is

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

(C) $\frac{1}{x \cdot \log x^2}$ (D) $\frac{2}{\log x}$

123. In $\triangle ABC$; with usual notations, if $\cos A = \frac{\sin B}{\sin C}$ then the triangle is .....

(A) Acute angled triangle (B) Equilateral triangle

(C) Obtuse angled triangle (D) Right angled triangle

124. For a GP, if $(m+n)^{\text{th}}$ term is p and $(m-n)^{\text{th}}$ term is q, then m^{th} term is .....

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

(C) $\frac{p}{q}$ (D) $\frac{q}{p}$

125. A random variable X has following probability distribution

$X = x$	1	2	3	4	5	6
$P(X = x)$	K	3K	5K	7K	8K	K

Then $P(2 \le X < 5) = \ldots\ldots$

(A) $\frac{3}{5}$ (B) $\frac{7}{25}$

(C) $\frac{23}{25}$ (D) $\frac{24}{25}$

126. The equation of normal to the curve $y = \log_\theta x$ at the point $P(1, 0)$ is .....

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

(C) $x - y = 1$ (D) $x + y = 1$

127. The values of x in $\left(0, \frac{\pi}{2}\right)$ satisfying the equation $\sin x \cos x = \frac{1}{4}$ are .....

(A) $\frac{\pi}{6}, \frac{\pi}{12}$ (B) $\frac{\pi}{12}, \frac{5\pi}{12}$

(C) $\frac{\pi}{8}, \frac{3\pi}{8}$ (D) $\frac{\pi}{8}, \frac{\pi}{4}$

128. If $\mathbf{a}+\mathbf{b}, \mathbf{b}+\mathbf{c}$ anc $\mathbf{c}+\mathbf{a}$ are coterminous edges of a parallel opiped then its volume is .....

(A) $3[\mathbf{acb}]$ (B) 0

(C) $2[\ \mathbf{a}\quad \mathbf{b}\quad \mathbf{c}]$ (D) $4[\ \mathbf{b}\quad \mathbf{a}\quad \mathbf{c}]$

129. If the c.d.f (cumulative distribution function) is given by $F(x) = \frac{x-25}{10}$, then $P(27 \le x \le 33) = \ldots\ldots$

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

(C) $\frac{1}{5}$ (D) $\frac{1}{10}$

130. The joint equation of pair of straight lines passing through origin and having slopes $(1+\sqrt{2})$ and $\left(\frac{1}{1+\sqrt{2}}\right)$ is .....

(A) $x^2 - 2\sqrt{2}\ xy + y^2 = 0$

(B) $x^2 - 2\sqrt{2}xy - y^2 = 0$

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

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

131. The angle between lines $\frac{x-2}{2} = \frac{y-3}{-2} = \frac{z-5}{1}$ and $\frac{x-2}{1} = \frac{y-3}{2} = \frac{z-5}{2}$ is .....

(A) $30°$ (B) $60°$

(C) $45°$ (D) $90°$

132. If the line passes through the points $P(6,-1,2), Q(8,-7,2\lambda)$ and $R(5,2,4)$ then value of λ is .....

(A) -3 (B) 0

(C) -1 (D) 2

133. The equivalent form of the statement $\sim (p \rightarrow \sim q)$ is ...

(A) $p \wedge q$ (B) $p \wedge \sim q$

(C) $p \vee \sim q$ (D) $\sim p \vee q$

134. If $A = \{x \in R : x^2 - 5|x| + 6 = 0\}$, then $n(A) =$ .....

(A) 2 (B) 0

(C) 1 (D) 4

135. If the function $f(x) = \frac{\log(1+ax)-\log(1-bx)}{x}$ $x \neq 0$ is continuous at $x = 0$ then, $f(0) =$ .....

(A) $\log a - \log b$ (B) $a + b$

(C) $\log a + \log b$ (D) $a - b$

136. The co-ordinates of the foot of perpendicular drawn from origin to the plane $2x - y + 5z - 3 = 0$ are .....

(A) $(\frac{2}{\sqrt{30}}, \frac{-1}{\sqrt{30}}, \frac{5}{\sqrt{30}})$ (B) $(2,-1,5)$

(C) $(\frac{2}{3}, \frac{-1}{3}, \frac{5}{3})$ (D) $(\frac{1}{5}, \frac{-1}{10}, \frac{1}{2})$

137.

$$\int \frac{\sqrt{x^2 - a^2}}{x} dx = \ \ldots \ \ldots$$

(A) $\sqrt{x^2 - a^2} \ - a\cos^{-1}(\frac{a}{x}) + c$

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

(C) $\sqrt{x^2 - a^2} + a\sec^{-1}(\frac{x}{a}) + c$

(D) $\sqrt{x^2 - a^2} + \frac{1}{x}\sec^{-1}(x) + c$

138. The maximum value of $z = 9x + 11y$ subject to $3x + 2y \leq 12, 2x + 3y \leq 12, x \geq 0, y \geq 0$ is .....

(A) 44 (B) 54

(C) 36 (D) 48

139.

$$\int_0^4 \frac{1}{1+\sqrt{x}} dx = \ \ldots \ \ldots$$

(A) $\log(\frac{e^4}{6})$ (B) $\log(\frac{e^4}{3})$

(C) $\log(\frac{e^4}{9})$ (D) $\log(\frac{e^3}{4})$

140. The number of solutions of $\sin^2\theta = \frac{1}{2}$ in $[0, \pi]$ is .....

(A) three (B) four

(C) two (D) one

141. If $\mathbf{p}, \mathbf{q}$ and $\mathbf{r}$ are non-zero, non-coplanar vectors

(A) $3[pqr]$ (B) 0

(C) $[pqr]$ (D) $2[pqr]$

142. Which of the following equations has no solution?

(A) $\sec\theta = 23$ (B) $\cos\theta = \sqrt{2}$

(C) $\tan\theta = \frac{1}{7}$ (D) $\sin\theta = -\frac{1}{5}$

143. The minimum value of $z = 10x + 25y$ subject to $0 \leq x \leq 3, 0 \leq y \leq 3, x + y \geq 5$ is ...

(A) 80 (B) 95

(C) 105 (D) 30

144. If $f(x) = 3x^3 - 9x^2 - 27x + 15$, then the maximum value of $f(x)$ is .....

(A) -66 (B) 30

(C) -30 (D) 66

145. The equation of the plane passing through the point $(-1, 2, 1)$ and perpendicular to the line joining the points $(-3, 1, 2)$ and $(2, 3, 4)$ is

(A) $r \cdot (5\hat{i} + 2\hat{j} + 2\hat{k}) = 1$

(B) $r \cdot (5\hat{i} + 2\hat{j} + 2\hat{k}) = -1$

(C) $r \cdot (5\hat{i} - 2\hat{j} + 2\hat{k}) = -5$

(D) $r \cdot (5\hat{i} - 2\hat{j} - 2\hat{k}) = 1$

146. If the lengths of the transverse axis and the latusrectum of a hyperbola are 6 and $\frac{8}{3}$ respectively, then the equation of the hyperbola is .....

(A) $4x^2 - 9y^2 = 72$ (B) $4x^2 - 9y^2 = 36$

(C) $9x^2 - 4y^2 = 72$ (D) $9x^2 - 4y^2 = 36$

147. The value of $\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{8}$ is .....

(A) $\frac{11\pi}{5}$ (B) $\frac{\pi}{4}$

(C) π (D) $\frac{3\pi}{4}$

148. The joint equation of the lines passing through the origin and trisecting the first quadrant is

(A) $\sqrt{3}\ x^2 - 4xy + \sqrt{3}\ y^2 = 0$

(B) $x^2 + \sqrt{3}xy - y^2 = 0$

(C) $3x^2 - y^2 = 0$

(D) $x^2 - \sqrt{3}xy - y^2 = 0$

149. If $P(2, 2), Q(-2, 4)$ and $R(3, 4)$ are the vertices of $\triangle PQR$ then the equation of the median through vertex R is .....

(A) $x + 3y + 9 = 0$ (B) $x - 3y + 9 = 0$

(C) $x - 3y - 9 = 0$ (D) $x + 3y - 9 = 0$

150. If $x = \sqrt{a^{\sin^{-1}t}}, y = \sqrt{a^{\cos^{-1}t}}$, then $\frac{dy}{dx} = \ldots.$

(A) $\frac{-y}{x}$ (B) $\frac{x}{y}$

(C) $\frac{y}{x}$ (D) $\frac{-x}{y}$

- End of Question Paper -