MHT CET 2024 PCM May 11 Shift 1 Question Paper

Conducted by the State Common Entrance Test Cell, Maharashtra

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

General Instructions

(i) This **PCM** paper is from **MHT CET 2024**, conducted by the **State Common Entrance Test Cell, Maharashtra**.

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

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

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

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

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

1. For a particle moving in vertical circle, the total energy at different positions along the path [The motion is under gravity]

(A) may increase or decrease.
(B) decreases.
(C) is conserved.
(D) increases.

2. When the number of turns in a coil is doubled without any change in the length of the coil, its self-inductance

(A) becomes 4 times.
(B) becomes 2 times.
(C) gets halved.
(D) remains unchanged.

3. A small particle carrying a negative charge of 1.6×10^{-19}C is suspended in equilibrium between two horizontal metal plates 8 cm apart having a potential difference of 980 V across them. The mass of the particle is $\left[g = 9.8\ m/s^2\right]$

(A) 2×10^{-16} kg
(B) 2.2×10^{-16} kg
(C) 20×10^{-16} kg
(D) 4×10^{-16} kg

4. Two spheres S_1 and S_2 have same radii but temperatures T_1 and T_2 respectively. Their emissive power is same and emissivity in the ratio 1:4. Then the ratio $T_1 : T_2$ is

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

5. The acceleration due to gravity at the surface of the planet is same as that at the surface of the earth, but the density of planet is thrice that of the earth. If 'R' is the radius of the earth, the radius of the planet will be

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

6. A big water drop is formed by the combination of ' n ' small water droplets of equal radii. The ratio of the surface energy of ' n ' droplets to the surface energy of the big drop is

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

7. An inductance of $\frac{300}{\pi}$mH, a capacitance of $\frac{1}{\pi}$mF and a resistance of 20Ω are connected in series with an a.c. source of 240 V, 50 Hz. The phase angle of the circuit is

(A) $\tan^{-1}(0)$
(B) $\tan^{-1}(\frac{1}{\sqrt{3}})$
(C) $\tan^{-1}(1)$
(D) $\tan^{-1}(\sqrt{3})$

8. A simple pendulum of length ' L ' has mass ' M ' and it oscillates freely with amplitude ' A '. At extreme position, its potential energy is

(A) $\frac{MgA^2}{L}$
(B) $\frac{2MgA^2}{L}$
(C) $\frac{MgA}{2L}$
(D) $\frac{MgA^2}{2L}$

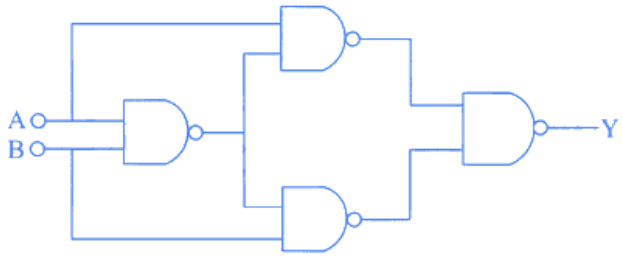
9. In Fraunhofer diffraction pattern, slitwidth is 0.5 mm and screen is at 2 m away from the lens. If wavelength of light used is 5500 $\mathring{A}$, then the distance between the first minimum on either side of the central maximum is (θ is small and measured in radian)

(A) 1.1 mm
(B) 2.2 mm
(C) 4.4 mm
(D) 5.5 mm

10. A bullet is fired on a target with velocity V . Its velocity decreases from V to V/2. When it penetrates 30 cm in a target. Through what thickness it will penetrate further in the target before coming to rest?

(A) 5 cm
(B) 8 cm
(C) 10 cm
(D) 12 cm

11. Following combination of gates is equivalent to

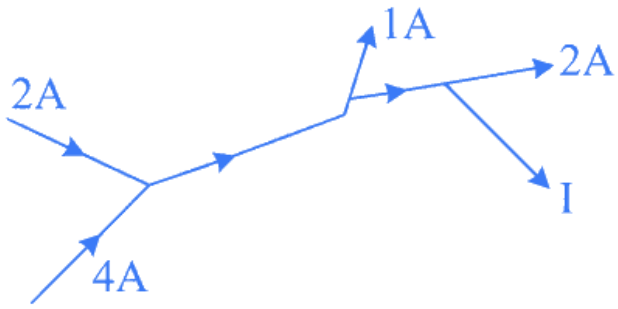


(A) NAND gate
(B) OR gate
(C) NOR gate
(D) X-OR gate

12. A boat is moving due east in a region where the earth's magnetic field is 3.6×10^{-5} N/Am due north and horizontal. The boat carries a vertical conducting rod 2 m long. If the speed of the boat is 2.00 m/s, the magnitude of the induced e.m.f. in the rod is

(A) 1.4 mV (B) 0.72 mV
(C) 0.54 mV (D) 0.144 mV

13. In the following electrical network, the value of I is



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

14. An inclined plane makes an angle 30° with horizontal. A solid sphere rolls down from the top of the inclined plane from rest without slipping has a linear acceleration along the plane equal to (where g is acceleration due to gravity) (given $\sin 30^\circ = 0.5$)

(A) $\frac{5g}{14}$ (B) $\frac{5g}{4}$
(C) $\frac{2g}{3}$ (D) $\frac{g}{3}$

15. An ink mark is made on a piece of paper. A glass slab of thickness ' t ' is placed on it. The ink mark appears to be raised up through a distance ' x ' when viewed at nearly normal incidence. If the refractive index of material of glass slab is ' μ ' then thickness of glass slab ' t ' is given by

(A) $\frac{(\mu-1)}{\mu x}$. (B) $\frac{\mu x}{(\mu-1)}$
(C) $\frac{(\mu-1)x}{\mu}$ (D) $\frac{\mu}{(\mu-1)x}$

16. The ratio of energies of photons produced due to transition of electron of hydrogen atom from its (a) second to first energy level and (b) highest energy level to second level is

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

17. The magnetic flux near the axis and inside the air core solenoid of length 80 cm carrying current ' I ' is 1.57×10^{-6} Wb. Its magnetic moment will be [cross-sectional area of a solenoid is very small as compared to its length, $\mu_0 = 4\pi \times 10^{-7}$ SI unit]$(\pi = 3.14)$

(A) 0.25 Am^2 (B) 0.50 Am^2
(C) 1 Am^2 (D) 1.2 Am^2

18. Two identical light waves having phase difference ϕ propagate in same direction. When they superpose, the intensity of resultant wave is proportional to

(A) $\cos^2(\frac{\varrho}{4})$ (B) $\cos^2(\frac{\varrho}{3})$
(C) $\cos^2(\frac{\varrho}{2})$ (D) $\cos^2\varrho$

19. Two gases A and B having same initial state (P, V, n, T). Now gas A is compressed to $\frac{V}{8}$ by isothermal process and other gas B is compressed to $\frac{V}{8}$ by adiabatic process. The ratio of final pressure of gas A and B is (Both gases are monoatomic, $\gamma = 5/3$)

(A) $\frac{1}{8}$ (B) $\frac{1}{4}$
(C) $\frac{1}{64}$ (D) $\frac{1}{12}$

20. If ' n_c ' and ' n_h ' are the number of electrons and number of holes respectively in a semiconductor heavily doped with phosphorous then

(A) $n_e \gg n_h$ (B) $n_e \ll n_h$
(C) $n_e \leq n_h$ (D) $n_e = n_h$

21. The frequency of two tuning forks A and B are respectively 1.4% more and 2.6% less than that of the tuning fork C . When A and B are sounded together, 10 beats are produced in 1 second. The frequency of tuning fork C is

(A) 250 Hz (B) 300 Hz
(C) 340 Hz (D) 400 Hz

22. With an alternating voltage source frequency ' f ', inductor ' L ', capacitor ' C ' and resistance ' R ' are connected in series. The voltage leads the current by 45°. The value of ' L ' is $(\tan 45^\circ = 1)$

(A) $(\frac{1+2\pi fCR}{4\pi^2 f^2 C})$ (B) $(\frac{1-2\pi fCR}{4\pi^2 f^2 C})$
(C) $(\frac{4\pi^2 f^2 C}{1+2\pi fCR})$ (D) $(\frac{4\pi^2 f^2 C}{1-2\pi fCR})$

23. When three capacitors of equal capacities are connected in parallel and one of the same capacity, capacitor is connected in series with the combination. The resultant capacity is 4.5μ F. The capacity of each capacitor is

(A) 5μ F (B) 7μ F

(C) 6μ F (D) 8μ F

24. Two vessels separately contain two ideal gases A and B at the same temperature, pressure of A being twice that of B . Under such conditions, the density of A is found to be 1.5 times the density of B. The ratio of molecular weights of A and B is

(A) 1 : 2 (B) 2 : 3

(C) 3 : 4 (D) 2 : 1

25. The depth 'd' at which the value of acceleration due to gravity becomes $\frac{1}{n-1}$ times the value at the earth's surface is (R = radius of the earth)

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

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

26. If the frequency of incident radiation (ν) is increased, keeping other factors constant, the stopping potential ($\nu > \nu_0$, threshold frequency)

(A) increases (B) decreases

(C) remains constant (D) suddenly becomes zero

27. A resonance tube closed at one end is of height 1.5 m . A tuning fork of frequency 340 Hz is vibrating above the tube. Water is poured in the tube gradually. The minimum height of water column for which resonance is obtained is (Neglect end correction, speed of sound in air = 340 m/s)

(A) 75 cm (B) 50 cm

(C) 30 cm (D) 25 cm

28. Water rises in a capillary tube of radius ' r ' up to height ' h '. The mass of water in capillary is ' m '. The mass of water that will rise in capillary of radius r/3 will be

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

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

29. Charges 3Q, q and Q are placed along x -axis at positions $x = 0, x = \frac{1}{3}$ and $x = 1$ respectively. When the force on charge Q is zero, the value of q is

(A) $\frac{Q}{3}$ (B) $-\frac{Q}{3}$

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

30. A bar magnet has length 4 cm , cross-sectional area 2 cm^2 and magnetic moment 6Am^2. The intensity of magnetisation of bar magnet is

(A) 9×10^5 A/m (B) 7.5×10^5 A/m

(C) 4.5×10^5 A/m (D) 3.0×10^5 A/m

31. At the poles of earth, a stretched wire of a given length vibrates in unison with a tuning fork. At the equator of earth, for same setting, to produce resonance with same fork, the vibrating length of wire

(A) should be decreased. (B) should be increased.

(C) should be same. (D) should be three times the original.

32. A particle performing S.H.M. starts from equilibrium position and its time period is 12 second. After 2 seconds its velocity is πm/s. Amplitude of the oscillation is

[$\sin 30^\circ = \cos 60^\circ = 0 \cdot 5, \sin 60^\circ = \cos 30^\circ = \sqrt{3}/2$]

(A) 6 m (B) 12 m

(C) $12\sqrt{3}$ m (D) $6\sqrt{3}$ m

33. For a light ray to undergo total internal reflection (i = angle of incidence, i_c = critical angle)

(A) light travels from denser to rarer medium and $i < i_c$. (B) light travels from rarer to denser medium and $i < i_c$.

(C) light travels from denser to rarer medium and $i > i_c$. (D) light travels from rarer to denser medium and $i > i_c$.

34. With gradual increase in frequency of an a.c. supply, the impedance of an LCR series circuit

(A) increases. (B) decreases.

(C) remains constant (D) first decreases, becomes minimum and then increases.

35. Two parallel plate air capacitors of same capacity ' C ' are connected in series to a battery of emf ' E '. Then one of the capacitors is completely filled with dielectric material of constant ' K '. The change in the effective capacity of the series combination is

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

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

36. Assuming that the earth is revolving around the sun in circular orbit of radius R , the angular momentum is directly proportional to R^n. The value of ' n ' is

(A) 2 (B) 1.5

(C) 1 (D) 0.5

37. With what velocity an observer should move relative to a stationary source so that a sound of triple the frequency of source is heard by an observer?

(A) Same as velocity of sound towards the source. (B) Same as velocity of sound away from the source.

(C) Half the velocity of sound towards the source. (D) Twice the velocity of sound towards the source.

38. Two long straight parallel wires are separated by a distance '2d'. Each wire carries a current 'I' in the same direction. The magnetic field at a point 'P' midway between them is

(A) $\frac{2\mu_0 I}{r}$ (B) zero

(C) $\frac{\mu_0 I}{4r}$ (D) $\frac{\mu_0 I}{2r}$

39. If 'T' is the half life of a radioactive substance then its instantaneous rate of change of activity is proportional to

(A) T (B) T^{-2}

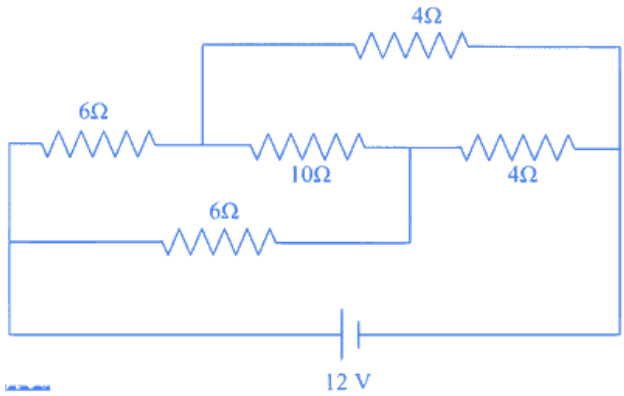
(C) T^{+2} (D) T^{-1}

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

(A) $\frac{mV^2}{3R}$ (B) $\frac{mV^2}{5R}$

(C) $\frac{mV}{7R}$ (D) $\frac{5mV}{3R}$

41. The current drawn from the battery in the given network is (Internal resistance of the battery is negligible)



(A) 1.2 A (B) 2.4 A

(C) 4 A (D) 4.8 A

42. Rails of material of steel are laid with gaps to allow for thermal expansion. Each track is 10 m long, when laid at temperature 17°C. The maximum temperature that can be reached is 45°C. The gap to be kept between the two segments of railway track is

$$\left(\alpha_{\text{steel}} = 1.3 \times 10^{-5}/^{\circ}\text{C}\right)$$

(A) 1.68 mm (B) 2.06 mm

(C) 3.64 mm (D) 4.32 mm

43. If the potential difference used to accelerate electrons is doubled. By what factor does the de-Broglie wavelength (λ) associated with the electrons change?

(A) λ is increased to $\sqrt{2}$ times. (B) λ is increased to $\frac{1}{\sqrt{2}}$ times.

(C) λ is decreased to $\frac{1}{\sqrt{2}}$ times. (D) λ is decreased to $\sqrt{2}$ times.

44. In an adiabatic process for an ideal gas, the relation between the universal gas constant ' R ' and specific heat at constant volume ' C_v ' is $R = 0.4C_v$. The pressure ' P ' of the gas is proportional to the temperature ' T ', of the gas as T^k. The value of constant ' K ' is

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

(C) 5 (D) 5

45. A p-n junction diode cannot be used

(A) as a rectifier.

(B) for converting light energy to electrical energy.

(C) for getting light radiation.

(D) for increasing the amplitude of an a.c. signal.

46. A particle performs linear S.H.M. at a particular instant, velocity of the particle is ' u ' and acceleration is ' a_1 ' while at another instant velocity is ' V ' and acceleration is ' a_2 ' $(0 < a_1 < a_2)$. The distance between the two position is

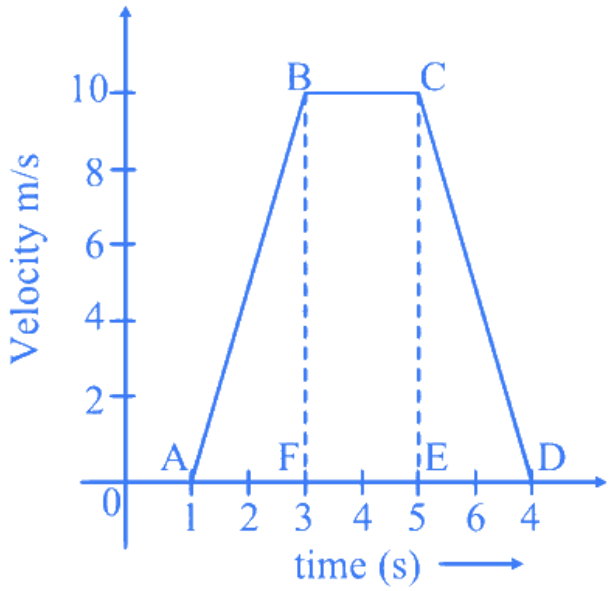
(A) $\frac{v^2-u^2}{a_1-a_2}$

(B) $\frac{v^2+u^2}{a_1+a_2}$

(C) $\frac{u^2+v^2}{a_1-a_2}$

(D) $\frac{u^2-v^2}{a_1+a_2}$

47. For the velocity-time graph shown in the figure below, the distance covered by the body in last two second of its motion is ' S_1 '. What is the ratio of ' S_1 ' to the total distance covered by it



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

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

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

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

48. The coefficient of mutual induction is 2 H and induced e.m.f. across secondary is 2 kV Current in the primary is reduced from 6 A to 3 A . The time required for the change of current is

(A) 3×10^{-3} s

(B) 3×10^{-2} s

(C) 6×10^{-3} s

(D) 6×10^{-2} s

49. The work done in blowing a soap bubble of radius R is W_1 at room temperature. Now the soap solution is heated. From the heated solution another soap bubble of radius 2 R is blown and the work done is W_2. Then

(A) $W_2 = 0$

(B) $W_2 = 4\ W_1$

(C) $W_2 < 4\ W_1$

(D) $W_2 = W_1$

50. When the same monochromatic ray of light travels through glass slab and through water, the number of waves in glass slab of thickness 5 cm is same as in water column of height 6 cm . If refractive index of glass is 1.56 , then refractive index of water is

(A) 1.28

(B) 1.29

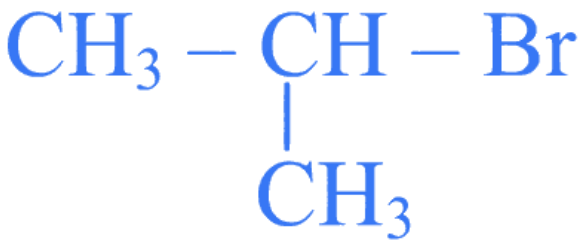
(C) 1.30

(D) 1.32

51. Identify the major product (99%) formed when $(CH_3)_3$ CH is treated with Br_2 in UV light.

(A) $(CH_3)_3CHCH_2Br$

(B) $(CH_3)_3 - C - Br$



(C)

(D) $CH_3 - (CH_2)_2 - CH_2Br$

52. Which among the following pair of properties are intensive?

(A) surface tension and viscosity

(B) mass and temperature

(C) internal energy and boiling point

(D) heat capacity and specific heat

53. Which of the following equations gives angular momentum of an electron in a stationary orbit?

(A) $mvr = \frac{2\pi}{h} \times n$

(B) $mvr = n \times \frac{h}{2\pi}$

(C) $mvh = n \times \frac{r}{2\pi}$

(D) $mv = (\frac{h \times r}{2\pi})n$

54. Which element from following has lowest ionization enthalpy (IE_1) ?

(A) Cu

(B) Sc

(C) Mn

(D) Zn

55. Which alkyl halide has highest bond enthalpy of C – X bond?

(A) $CH_3 - Cl$

(B) $CH_3 - F$

(C) $CH_3 - Br$

(D) $CH_3 - I$

56. Calculate van't Hoff factor (i) of 0.2 m aqueous solution of an electrolyte if it freezes at -0.660 K. $(K_f = 1.84$ K kg mol$^{-1})$

(A) 1.97

(B) 1.79

(C) 0.242

(D) 0.557

57. Identify reagent used for preparation of benzophenone from benzonitrile?

(A) C_6H_5MgBr

(B) CH_3MgCl (in dry ether)

(C) $(CH_3)_2Cd$

(D) $AlH(i - Bu)_2$

58. Which of the following is an elementary reaction?

(A) $C_2H_5I_{(g)} \longrightarrow C_2H_{4(g)} + HI_{(g)}$

(B) $2NO_2Cl_{(g)} \longrightarrow 2NO_{2(g)} + Cl_{2(g)}$

(C) $2NO_{2(g)} + F_{2(g)} \longrightarrow 2NO_2F_{(g)}$

(D) $2NO_{(g)} + Cl_{2(g)} \longrightarrow 2NOCl_{(g)}$

59. Which compound from following contains N atom in its ring?

(A) Furan

(B) Thiophene

(C) THF

(D) Pyrrole

60. 2 moles of an ideal gas expands isothermally from $5dm^3$ to $10dm^3$ at a constant external pressure of 1.5 bar. Calculate work done.

(A) $7.5dm^3$ bar

(B) $-7.5dm^3$ bar

(C) $22.5dm^3$ bar

(D) $-22.5dm^3$ bar

61. What is the wave number of lowest transition associated with Lyman series?

(A) $\overline{v} = R_H(\frac{3}{4})$

(B) $\overline{v} = R_H(\frac{5}{36})$

(C) $\overline{v} = R_H(\frac{4}{3})$

(D) $\overline{v} = R_H(\frac{36}{5})$

62. Vapour pressure of a pure solvent is 550 mm of Hg . By addition of a non volatile solute it decreases to 510 mm of Hg . Calculate the mole fraction of solute in solution.

(A) 0.215

(B) 0.072

(C) 0.610

(D) 0.512

63. Identify the product obtained when excess of benzoyl chloride is treated with dimethyl cadmium.

(A) Acetophenone

(B) Benzoic acid

(C) Benzophenone

(D) Benzaldehyde

64. Rate constant of a reaction,

$$2NO_2Cl_{2(g)} \longrightarrow 2NO_{2(g)} + Cl_{2(g)}$$

is 4.7672 minute $^{-1}$. Calculate half life of reaction.

(A) 0.0727 minute

(B) 0.1454 minute

(C) 0.2181 minute

(D) 0.4362 minute

65. Which from following compounds is obtained when glucose is heated with HI for longer time?

(A) Glucose cyanohydrin
(B) Glucose oxime
(C) n-Hexane
(D) Saccharic acid

66. In Haber's process of production of ammonia, K_2O is used as

(A) catalyst
(B) inhibitor
(C) promotor
(D) adsorbate

67. An ideal gas expands against constant external pressure of 2 bar from 5 lit to 8 lit and absorbs 10 kJ of heat. What is ΔU of the system?

(A) 10600 J
(B) 9400 J
(C) -10600 J
(D) -9400 J

68. Which of the following compounds follows octet rule?

(A) H_2SO_4
(B) NO_2
(C) SCl_2
(D) SF_6

69. Identify the type of hybridization present in $[Ni(CN)_4]^{2-}$.

(A) $sp^3\, d^2$
(B) dsp^2
(C) sp^3
(D) d^2sp^3

70. Identify the false statement among the following.

(A) Ideal solution obey Raoult's law over entire range of temperature and concentration.
(B) For ideal solution $\Delta_{mix} V = 0$.
(C) Non ideal solution do not obey Raoult's law over the entire range of concentration.
(D) Vapour pressure of non ideal solution always lies between vapour pressure of pure components.

71. Which from the following statement is NOT correct regarding Mendius reduction?

(A) It is useful for preparation of $R - NH_2$.
(B) In this alkyl cyanides are reduced.
(C) In this sodium and ethanol is used for reduction.
(D) In this method one carbon atom is lost in the form of CO_2.

72. Initial concentration of reactant in a first order reaction is 0.08 mol dm^{-3} What concentration would remain after 40 minute?

$$\left(\text{given } \frac{[A]_0}{[A]_t} = 5.00\right)$$

(A) 0.008 mol dm^{-3}
(B) 0.08 mol dm^{-3}
(C) 0.016 mol dm^{-3}
(D) 0.032 mol dm^{-3}

73. Which from following amines has highest pK_b value?

(A) Arylamine
(B) Tertiary alkanamine
(C) Secondary alkanamine
(D) Primary alkanamine

74. What is oxidation number of S in SO_3^{2-} ?

(A) -2
(B) -3
(C) $+4$
(D) $+6$

75. When fused NaCl undergoes electrolysis the product formed at cathode is

(A) $Cl_{2(g)}$
(B) $Na_{(s)}$
(C) $Na - Hg_{(l)}$
(D) $H_{2(g)}$

76. Which element from following exhibits highest number of various different possible oxidation states?

(A) Fe
(B) Cr
(C) Mn
(D) Ni

77. Which among the following has lowest boiling point?

(A) Chloromethane
(B) Bromomethane
(C) Dibromomethane
(D) Tribromomethane

78. A buffer solution is prepared by mixing 0.01 M HCN and 0.02 MNaCN . If K_a for HCN is 6.6×10^{-10}, what is the concentration of H^+ions in solution?

(A) 3.3×10^{-6}M
(B) 3.3×10^{-10}M
(C) 1.32×10^{-6}M
(D) 1.32×10^{-10}M

79. Which reagent from following is used for preparation of aliphatic aldehyde from nitriles?

(A) CrO_2Cl_2 in CS_2
(B) CrO_3 in acetic anhydride
(C) $SnCl_2, HCl$
(D) Co, HCl, anhydrous $AlCl_3$

80. n-type of semiconductor is formed when

(A) Silicon doped with phosphorous
(B) Silicon doped with boron
(C) Germanium doped with boron
(D) Germanium doped with aluminium

81. Which from following polymer contains este linkage?

(A) Nylon 6
(B) Polyacrylonitrile
(C) Teflon
(D) PHBV

82. Which of the following element is used in photoelectric cell?

(A) Beryllium
(B) Caesium
(C) Liquid sodium
(D) Calcium

83. The resistance of conductivity cell filled with 0.1 M KCl solution is 100 ohm and conductivity is 1.70×10^{-4} S cm^{-1}. What is the cell constant of the cell?

(A) 1.70 cm^{-1}
(B) 0.058 cm^{-1}
(C) 0.017 cm^{-1}
(D) 0.012 cm^{-1}

84. What type of hybridisation is involved in central atom of hydrides of group 16 elements?

(A) $sp^3 d^2$
(B) sp^3
(C) sp^2
(D) sp

85. Which from following compounds is used to prepare a refrigerant R-22?

(A) Monochloromethane
(B) Dichloromethane
(C) Trichloromethane
(D) Tetrachloromethane

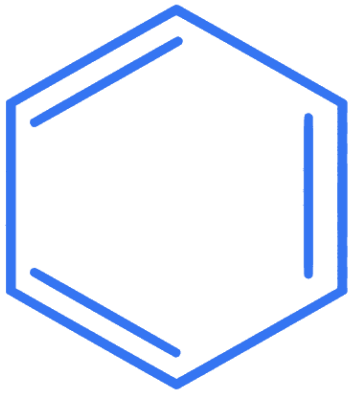
86. A monobasic acid is 5% dissociated in its 0.02 M solution. Calculate the dissociation constant of acid.

(A) 2×10^{-2}
(B) 4×10^{-4}
(C) 5×10^{-5}
(D) 2.5×10^{-4}

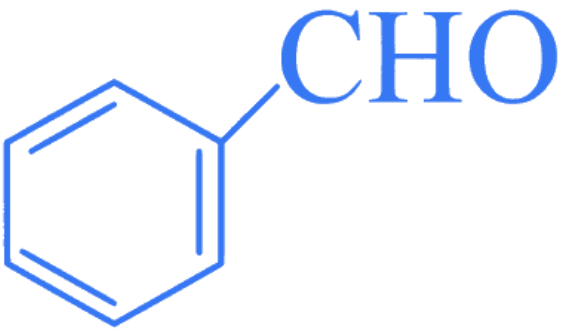
87. Identify product obtained in following reaction.

$$C_6H_5OH \xrightarrow{CrO_3} \text{Product}$$

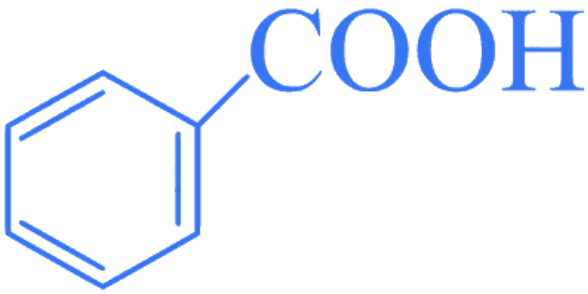
(A)



(B)



(C)



(D)



88. Metallic silver has fcc structure. If radius of Ag atom is 144 pm . What is the edge length of unit cell?

(A) 4.07×10^{-8} cm
(B) 3.22×10^{-8} cm
(C) 2.63×10^{-8} cm
(D) 2.23×10^{-8} cm

89. Which from following polymers needs dihydric alcohol and aromatic dicarboxylic acid for its synthesis?

(A) Nylon 6
(B) Dacron
(C) Bakelite
(D) Polyacrylamide

90. Identify fibrous protein from following.

(A) Legumelin (B) Myosin

(C) Insulin (D) Serum albumin

91. Which of the following has dipole-induced dipole interaction as inter molecular force?

(A) $NH_3 + C_6H_6$ (B) $NaCl + H_2O$

(C) $CH_4 + C_2H_6$ (D) $HF + H_2O$

92. The conductivity of 0.02 M KCl solution is 0.00250 ohm $^{-1}$ cm^{-1}. What is its molar conductivity?

(A) 125 ohm^{-1} cm^2 mol^{-1}

(B) 0.05 ohm^{-1} cm^2 mol^{-1}

(C) 725 ohm^{-1} cm^2 mol^{-1}

(D) 800 ohm^{-1} cm^2 mol^{-1}

93. Which of the following pair of compounds cannot demonstrate law of multiple proportion?

(A) NO, NO_2 (B) CO, CO_2

(C) H_2O, H_2O_2 (D) Na_2S, NaF

94. Which among the following P-block elements forms colourless and odourless hydride?

(A) Oxygen (B) Nitrogen

(C) Sulphur (D) Selenium

95. What is the number of unpaired electrons present in $[CoF_6]^{3-}$?

(A) 4 (B) 3

(C) 2 (D) 1

96. Which from following is called as Lucas reagent?

(A) Conc. $HCl + ZnCl_2$ (B) Neutral $FeCl_3$ solution in water

(C) $NaNO_2 + HCl$ (dil.) (D) $CHCl_3 + NaOH$

97. Which among the following salts turns red litmus blue in its aqueous solution?

(A) Na_2SO_4 (B) CH_3COONa

(C) NH_4NO_3 (D) $CuCl_2$

98. Which reagent from following is used in Reimer-Tiemann reaction?

(A) CO_2, 6 atm H_3O^+ (B) $CHCl_3$, aq. $NaOH, H_3O^+$

(C) CS_2 (at low temperature) (D) $Na_2Cr_2O_7/H_2SO_4$

99. What is the number of octahedral voids present in 0.2 mol of a compound forming hcp structure?

(A) 1.204×10^{23} (B) 2.387×10^{23}

(C) 3.011×10^{23} (D) 3.321×10^{23}

100. What is the percentage atom economy when formula weight of product obtained is 70 u and the sum of formula weight of reactant is 140 u ?

(A) 30% (B) 35%

(C) 50% (D) 75%

101.

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

(A) $\frac{2}{9}\log(x-1)+\frac{1}{3}\times\frac{1}{x-1}+\frac{2}{9}\log(x+2)+c$, where c is a constant of integration

(B) $\frac{2}{9}\log(x-1)-\frac{1}{3}\times\frac{1}{(x-1)}+\frac{2}{9}\log(x+2)+c$, where c is a constant of integration

(C) $\frac{2}{9}\log(x-1)+\frac{1}{3}\times\frac{1}{x-1}-\frac{2}{9}\log(x+2)+c$, where c is a constant of integration

(D) $\frac{2}{9}\log(x-1)-\frac{1}{3}\times\frac{1}{x-1}-\frac{2}{9}\log(x+2)+c$, where c is a constant of integration

102. Let Z be a complex number such that $|Z|+Z=2+i$ (where $i=\sqrt{-1}$), then $|Z|$ is equal to

(A) $\frac{4}{5}$ (B) $\frac{\sqrt{41}}{4}$

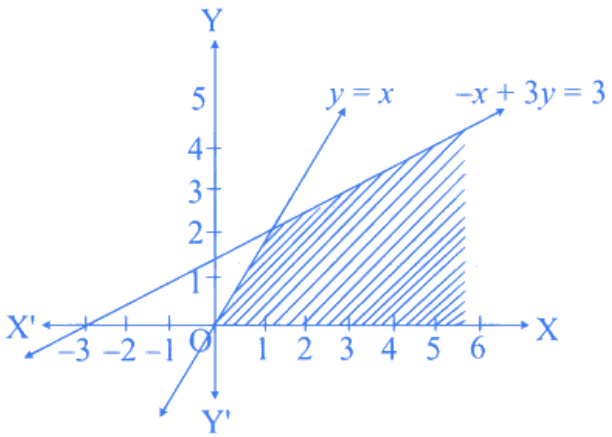
(C) $\frac{5}{3}$ (D) $\frac{5}{4}$

103. _____ numbers greater than a million can be formed with the digits 2, 3, 0, 3, 4, 2, 3.

(A) 60 (B) 420

(C) 360 (D) 120

104. For the following shaded region, the linear constraints are



(A) $x-y\le 0,-x+3y\le 3,x\ge 0,y\ge 0$

(B) $x-y\ge 0,-x+3y\ge 3,x\ge 0,y\ge 0$

(C) $x-y\ge 0,-x+3y\le 3,x\ge 0,y\ge 0$

(D) $x-y\le 0,-x+3y=3,x\ge 0,y\ge 0$

105.

$$\lim_{x\to 2}\left(\frac{5^x+5^{3-x}-30}{5^{3-x}-5^{\frac{x}{2}}}\right)=$$

(A) $\frac{-16}{3}$ (B) $\frac{8}{3}$

(C) $\frac{-8}{3}$ (D) $\frac{16}{3}$

106.

If

$$\int (7x-2)\sqrt{3x+2}$$

$$dx = A(3x+2)^{\frac{5}{2}}+B$$

$$(3x+2)^{\frac{3}{2}}+c$$

(where c is a constant of integration), then the values of A and B are respectively

(A) $\frac{14}{45},\frac{40}{27}$ (B) $\frac{14}{15},\frac{-40}{9}$

(C) $\frac{14}{15},\frac{40}{9}$ (D) $\frac{14}{45},\frac{-40}{27}$

107. If $y=\sin^{-1}\left(\frac{\log x^2}{1+(\log x)^2}\right)$, then $\left(\frac{dy}{dx}\right)_{\text{at } x=1}=$

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

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

108. If $f(x)=\begin{cases}\frac{a}{2}(x-|x|) & ,\\ 0, & \text{for } x<0\\ 0, & \text{for } x=0\\ bx^2\sin\left(\frac{1}{x}\right) & \text{for } x>0\end{cases}$

is continuous at $x=0$, then

(A) a is any real value and b is any real value

(B) a is only rational value and b is any real value

(C) a is only irrational value and b is any real value

(D) a is only rational value and b is only rational value

109. The p.m.f. of a random variable X is given by

$$P[X=x]=\frac{\binom{5}{x}}{2^5},\ \text{if } x=0,1,2,3,4,5$$

$$=0,\ \text{otherwise}$$

Then which of the following is not correct?

(A) $P[X=0]=P[X=5]$

(B) $P[X\le 1]=P[X\ge 4]$

(C) $P[X\le 2]=P[X\ge 3]$

(D) $P[X\le 2]>P[X\ge 3]$

110. If $f(x) = (1+x)\left(1+x^2\right)\left(1+x^4\right)\left(1+x^8\right)$, then $f'(1) =$

(A) 60 (B) 240
(C) 80 (D) 120

111.

$$\int_{0.2}^{3.5} [x]dx =$$

(where $[x]$ = greatest integer not greater than x)

(A) 4 (B) 4.2
(C) 4.5 (D) 4.4

112. Let p, q and r be the statements
p : X is an equilateral triangle
q : X is isosceles triangle
r: $q \vee \sim p$,
then the equivalent statement of r is

(A) If X is not an equilateral triangle, then X is not an isosceles triangle
(B) X is neither isosceles nor equilateral triangle
(C) X is isosceles but not an equilateral triangle
(D) If X is not an isosceles triangle, then X is not an equilateral triangle.

113. The bacteria increase at the rate proportional to the number of bacteria present. If the original number N doubles in 8 hours, then the number of bacteria in 24 hours will be

(A) 8 N (B) 16 N
(C) 32 N (D) 64 N

114. If $f(x) = x^3 - 6x^2 + 9x + 3$ is monotonically decreasing function, then x lies in

(A) $(3, \infty)$ (B) $(1, 3)$
(C) $[3, \infty)$ (D) $[0, 3]$

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

(A) $x \in [2, 3)$ (B) $x \in [2, 3]$
(C) $x \in [2, 4]$ (D) $x \in [2, 4)$

116. The perpendicular distance of the origin from the plane $2x + y - 2z - 18 = 0$ is

(A) 18 units (B) 9 units
(C) 6 units (D) 4 units

117. Let p : A man is judge. q : He is honest. The inverse of $p \to q$ is

(A) If a man is judge, then he is honest.
(B) If a man is not judge, then he is not honest.
(C) If a man is honest, then he is judge.
(D) If a man is not honest then, he is not judge.

118. If equation of normal to the curve $x = \sqrt{t}$, $y = t - \frac{1}{\sqrt{t}}$ at $t = 4$ is

(A) $8x + 2y = 23$ (B) $34x - 8y = 40$
(C) $8x + 6y = 37$ (D) $8x + 34y = 135$

119. If three fair coins are tossed, then variance of number of heads obtained, is

(A) 0.25 (B) 3
(C) 0.75 (D) 1.5

120. The plane $2x + 3y + 4z = 1$ meets X-axis in A, Y -axis in B and Z -axis in C . Then the centroid of $\triangle ABC$ is

(A) $(2, 3, 4)$ (B) $(\frac{1}{2}, \frac{1}{3}, \frac{1}{4})$
(C) $(\frac{1}{6}, \frac{1}{9}, \frac{1}{12})$ (D) $(\frac{3}{2}, \frac{3}{3}, \frac{3}{4})$

121. If $x^2 + y^2 = t + \frac{1}{t}, x^4 + y^4 = t^2 + \frac{1}{t^2}$, then $\frac{dy}{dx} =$

(A) $\frac{1}{x^3 y}$ (B) $\frac{1}{xy^3}$
(C) $-\frac{1}{xy^3}$ (D) $-\frac{1}{x^3 y}$

122. The general solution of $\frac{dy}{dx} + \sin\left(\frac{x+y}{2}\right) = \sin\left(\frac{x-y}{2}\right)$ is

(A) $\log\tan(\frac{y}{2}) = C - 2\sin x$
(B) $\log\tan(\frac{y}{4}) = C - 2\sin(\frac{x}{2})$
(C) $\log\tan(\frac{y}{2} + \frac{\pi}{4}) = C - 2\sin x$
(D) $\log\tan(\frac{y}{2} + \frac{\pi}{4}) = C - 2\sin(\frac{x}{2})$

123. If A and B are two independent events such that $P(A') = 0.75, P(A \cup B) = 0.65$ and $P(B) = p$, then value of p is

(A) $\frac{9}{14}$ (B) $\frac{7}{15}$
(C) $\frac{5}{14}$ (D) $\frac{8}{15}$

124. If the lines $\frac{x+1}{-10} = \frac{y+k}{-1} = \frac{z-4}{1}$ and $\frac{x+10}{-1} = \frac{y+1}{-3} = \frac{z-1}{4}$ intersect each other, then the value of k is

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

125. The approximate value of $(3.978)^{\frac{3}{2}}$ is

(A) 7.934 (B) 8.934

(C) 7.022 (D) 8.866

126. The value of $\tan^{-1}\left\{\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right\}+\frac{1}{2}\cos^{-1}x$ is

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

(C) 0 (D) $\frac{\pi}{3}$

127. Let $\overline{\mathrm{a}}, \overline{\mathrm{b}}$ and $\overline{\mathrm{c}}$ be three non-zero vectors such that no two of them are collinear and $(\overline{\mathrm{a}} \times \overline{\mathrm{b}}) \times \overline{\mathrm{c}}=\frac{1}{3}|\overline{\mathrm{b}}||\overline{\mathrm{c}}|\overline{\mathrm{a}}$. If ' θ ' is the angle between the vectors $\bar{b}$ and $\bar{c}$, then value of $\sin\theta$ is

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

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

128. In an experiment with 15 observations for x , the following results were available $\sum x^2=2830, \sum x=170$. One observation 20 was found to be wrong and was replaced by the correct value 30 . Then the corrected variance is

(A) 78 (B) 210

(C) 225 (D) 88

129. The area of the region lying in the first quadrant by $y=4x^2, x=0, y=2, y=4$ is

(A) $\frac{1}{6}[8-2\sqrt{2}]$ sq.units (B) $\frac{1}{3}[8-2\sqrt{2}]$ sq.units

(C) $[8-2\sqrt{2}]$ sq.units (D) $[8+2\sqrt{2}]$ sq.units

130. The equation of the line passing through the point $(3,1,2)$ and perpendicular to the lines $\frac{x-1}{1}=\frac{y-2}{2}=\frac{z-3}{3}$ and $\frac{x}{-3}=\frac{y}{2}=\frac{z}{5}$ is

(A) $\frac{x+3}{2}=\frac{y+1}{7}=\frac{z+2}{4}$ (B) $\frac{x-3}{-2}=\frac{y-1}{7}=\frac{z-2}{4}$

(C) $\frac{x-3}{2}=\frac{y-1}{-7}=\frac{z-2}{4}$ (D) $\frac{x-3}{2}=\frac{y-1}{5}=\frac{z-2}{4}$

131. Let $A=\begin{bmatrix}1 & -1 & 1\\ 2 & 1 & -3\\ 1 & 1 & 1\end{bmatrix}$ and $B=\begin{bmatrix}4\\0\\2\end{bmatrix}$ such that AX = B, then X =

(A) $\begin{bmatrix}-1\\2\\1\end{bmatrix}$ (B) $\begin{bmatrix}2\\-1\\1\end{bmatrix}$

(C) $\begin{bmatrix}-1\\1\\2\end{bmatrix}$ (D) $\begin{bmatrix}-2\\1\\-1\end{bmatrix}$

132. If $\bar{x}=\frac{\bar{b}\times\bar{c}}{[\bar{a}\bar{b}\bar{c}]}, \bar{y}=\frac{\bar{c}\times\bar{a}}{[\bar{a}\bar{b}\bar{c}]}$ and $\overline{\mathrm{z}}=\frac{\overline{\mathrm{a}}\times\overline{\mathrm{b}}}{[\overline{\mathrm{a}}\overline{\mathrm{b}}\overline{\mathrm{c}}]}$ where $\overline{\mathrm{a}}, \overline{\mathrm{b}}, \overline{\mathrm{c}}$ are non-coplanar vectors, then value of $\bar{x}\cdot(\overline{\mathrm{a}}+\overline{\mathrm{b}})+\bar{y}\cdot(\overline{\mathrm{b}}+\overline{\mathrm{c}})+\overline{\mathrm{z}}\cdot(\overline{\mathrm{c}}+\overline{\mathrm{a}})$ is

(A) 3 (B) 1

(C) -1 (D) 0

133. If in a triangle ABC, with usual notations, the angles are in A.P. and $b:c=\sqrt{3}:\sqrt{2}$, then angle A =

(A) 30° (B) 60°

(C) 75° (D) 45°

134. The rate of change of the volume of a sphere with respect to its surface area, when its radius is 2 cm , is

(A) 0.1 $\mathrm{cm}^3/\mathrm{cm}^2$ (B) $\frac{1}{2}$ $\mathrm{cm}^3/\mathrm{cm}^2$

(C) 1 $\mathrm{cm}^3/\mathrm{cm}^2$ (D) 2 $\mathrm{cm}^3/\mathrm{cm}^2$

135. If angle θ in $[0,2\pi]$ satisfies both the equations $\cot\theta=\sqrt{3}$ and $\sqrt{3}\sec\theta+2=0$, then θ is equal to

(A) $\frac{\pi}{6}$ (B) $\frac{7\pi}{6}$

(C) $\frac{5\pi}{6}$ (D) $\frac{11\pi}{6}$

136. The area of the triangle with vertices $(1,2,0)$, $(1,0,2)$ and $(0,3,1)$ is

(A) $\sqrt{3}$ sq. units (B) $\sqrt{6}$ sq. units

(C) $\sqrt{5}$ sq. units (D) $\sqrt{7}$ sq. units

137. The particular solution of the differential equation, $xy\frac{dy}{dx}=x^2+2y^2$ when $y(1)=0$ is

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

(C) $x^2+y^2=x^4$ (D) $x^2+2y^2=x^4$

138. The equation of the tangent to the circle, given by $x=5\cos\theta, y=5\sin\theta$ at the point $\theta=\frac{\pi}{3}$ on it , is

(A) $x-\sqrt{3}y=-5$ (B) $x+\sqrt{3}y=10$

(C) $\sqrt{3}x+y=5\sqrt{3}$ (D) $\sqrt{3}x-y=0$

139. The joint equation of two lines through the origin, each making an angle with measure of 30° with the positive Y -axis, is

(A) $x^2-3y^2=0$ (B) $2x^2-3y^2=0$

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

140. With usual notations, if the lengths of the sides of a triangle are 7 cm, $4\sqrt{3}$ cm and $\sqrt{13}$ cm, then the measures of the smallest angle is

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

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

141. If the volume of tetrahedron whose vertices are $A \equiv (1,-6,10), B \equiv (-1,-3,7), C \equiv (5,-1,k)$ and $D \equiv (7,-4,7)$ is 11 cu . units, then the value of k is

(A) 7 (B) 5

(C) 3 (D) 1

142. If the slope of one of the lines given by $\mathrm{K}x^2 + 6xy + y^2 = 0$ is three times the order, then the value of K is

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

(C) $\frac{27}{4}$ (D) $\frac{4}{27}$

143.

$$\cos^3\left(\frac{\pi}{8}\right)\cos\left(\frac{3\pi}{8}\right) + \sin^3\left(\frac{\pi}{8}\right)\sin\left(\frac{3\pi}{8}\right) =$$

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

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

144. If $\bar{a}$ and $\bar{b}$ are two unit vectors such that $5\bar{a} + 4\bar{b}$ and $\bar{a} - 2\bar{b}$ are perpendicular to each other, then the between $\bar{a}$ and $\bar{b}$ is

(A) $\frac{2\pi}{3}$ (B) $\cos^{-1}(\frac{2}{3})$

(C) $\frac{\pi}{3}$ (D) $\cos^{-1}(\frac{1}{3})$

145. The value of $\int \frac{\cos^3 x}{\sin^2 x + \sin x}\,\mathrm{d}x$ is

(A) $\log(\sin x) - \sin x + \mathrm{c}$, where c is a constant of integration.

(B) $\log(\sin x) - \cos x + \mathrm{c}$, where c is a constant of integration.

(C) $\log(\sin x) + \sin x + \mathrm{c}$, where c is a constant of integration.

(D) $\log(\cos x) - \cos x + \mathrm{c}$, where c is a constant of integration.

146. Let $\mathrm{P} \equiv (-5,0), \mathrm{Q} \equiv (0,0)$ and $\mathrm{R} \equiv (2, 2\sqrt{3})$ be three points. Then the equation of the bisector of the angle PQR is

(A) $x - \frac{\sqrt{3}}{2}y = 0$ (B) $\frac{\sqrt{3}}{2}x - y = 0$

(C) $x + \sqrt{3}y = 0$ (D) $\sqrt{3}x + y = 0$

147.

$$\cos\left[\sin^{-1}\left(\frac{3}{5}\right) + \cos^{-1}\left(\frac{12}{13}\right)\right] =$$

(A) $\frac{36}{65}$ (B) $\frac{12}{65}$

(C) $\frac{33}{65}$ (D) $\frac{3}{65}$

148. If $x \in [-1,1]$, then the value of $\int \mathrm{e}^{\sin^{-1}x}\left(\frac{x+\sqrt{1-x^2}}{\sqrt{1-x^2}}\right)\mathrm{d}x$ is

(A) $e^{\sin^{-1}x} + c$, where c is constant of integration.

(B) $\mathrm{e}^{\sin^{-1}x} \cdot \sin x + \mathrm{c}$, where c is constant of integration.

(C) $\mathrm{e}^{\sin^{-1}x} \cdot \cos x + \mathrm{c}$, where c is constant of integration.

(D) $\mathrm{e}^{\sin^{-1}x} \cdot x + \mathrm{c}$, where c is constant of integration.

149. The probability that a person who undergoes a bypass surgery will recover is 0.6 . the probability that of the six patients who undergo similar operations, half of them will recover is _____.

(A) 0.2762 (B) 0.1852

(C) 0.2074 (D) 0.7235

150. The distance ' s ' in meters covered by a body in t seconds is given by $s = 3t^2 - 8t + 5$. The body will stop after

(A) 1 sec (B) $\frac{3}{4}$sec

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

- End of Question Paper -