MHT CET 2022 PCM Aug 5 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 2022**, 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 van is moving with a speed of 108 km/hr on a level road where the coefficient of friction between the tyres and the road is 0.5 . For the safe driving of the van, the minimum radius of curvature of the road shall be (Acceleration due to gravity, $g = 10\ \mathrm{m/s^2}$)

(A) 40 m
(B) 180 m
(C) 120 m
(D) 80 m

2. The work done by a force on body of mass 5 kg to accelerate it in the direction of force from rest to 20 m/s in 10 second is

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

3. A 4 kg mass and a 1 kg mass are moving with equal energies. The ratio of the magnitude of their linear momenta is

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

4. A wall is hit elastically and normally by ' n ' balls per second. All the balls have the same mass ' m ' and are moving with the same velocity ' u '. The force exerted by the balls on the wall is

(A) $2\mathrm{mnu}^2$
(B) 2mnu
(C) $\frac{1}{2}\mathrm{mnu}^2$
(D) mnu

5. A mass tied to a string is whirled in a horizontal circular path with a constant angular velocity and its angular momentum is L. if the string is now halved, keeping angular velocity same, then the angular momentum will be

(A) L
(B) $\frac{\mathrm{L}}{4}$
(C) 2 L
(D) $\frac{\mathrm{L}}{2}$

6. The relative angular speed of hour hand and second hand of a clock is (in rad/s)

(A) $\frac{311\pi}{578}$
(B) $\frac{421\pi}{11600}$
(C) $\frac{719\pi}{21600}$
(D) $\frac{919\pi}{15600}$

7. A satellite of mas ' m ' is revolving around the earth of mass ' M ' in an orbit of radius ' r '. The angular momentum of the satellite about the centre of orbit will of

(A) $\sqrt{\mathrm{GMmr}}$
(B) $\sqrt{\mathrm{Mvr}}$
(C) $\sqrt{\mathrm{GMm}}$
(D) $\sqrt{\mathrm{GMm^2r}}$

8. Two satellites A and B rotate around a planet's orbit having radii 4R and R respectively. If the speed of satellite A is 3 V then the speed of satellite B is

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

9. A liquid drop having surface energy ' E ' is spread into 216 droplets of the same size. The final surface energy of the droplets is

(A) $3E$
(B) 8E
(C) $2E$
(D) 6E

10. Which one of the following statements is 'NOT' True about the angle of contact of a liquid?

(A) Any increase in the temperature of the liquid does not decrease its angle of contact.
(B) If an impurity is added in the liquid then it's angle of contact changes.
(C) Angle of contact depends upon the nature of liquid and solid in contact.
(D) At a given temperature, the angle of contact is constant for a solid-liquid surface.

11. A metal wire of density ' e ' floats on water surface horizontally. If it is NOT to sink in water, then maximum radius of wire is (T = surface tension of water, g = gravitational acceleration)

(A) $\frac{\pi \mathrm{eg}}{\mathrm{T}}$
(B) $\frac{\mathrm{T}}{\pi \mathrm{eg}}$
(C) $\sqrt{\frac{2\,\mathrm{T}}{\pi \mathrm{eg}}}$
(D) $\sqrt{\frac{\pi eg}{T}}$

12. The coefficient of linear expansion of brass and steel rods are α_1 and α_2 respectively. Lengths of brass and steel rods are l_1 and l_2 respectively. If $(l_2 - l_1)$ is maintained same at all temperatures, which one of the following relations is correct?

(A) $\alpha_1 l_2 = \alpha_2 l_1$
(B) $\alpha_1^2 l_2 = \alpha_2^2 l_1$
(C) $\alpha_{12} l_2^2 = \alpha_2 l_1^2$
(D) $l_1 \alpha_1 = l_2 \alpha_2$

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

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

14. In which thermodynamic process, there is no exchange of heat between the system and surroundings?

(A) Isochoric (B) Adiabatic

(C) Isothermal (D) Isobaric

15. In an adiabatic expansion of a gas initial and final temperatures are T_1 and T_2 respectively then the change in internal energy of the gas is $[\mathrm{R} = \text{gas constant}, \mathrm{Y} = \text{ adiabatic ratio }]$

(A) zero (B) $\frac{nR}{\gamma-1}(T_1 - T_2)$

(C) $\frac{\mathrm{nR}}{\mathrm{Y}-1}(\mathrm{T}_2 - \mathrm{T}_1)$ (D) $\mathrm{nR}(\mathrm{T}_1 - \mathrm{T}_2)$

16. If ' v ' is velocity and ' a ' is acceleration of a particle executing linear simple harmonic motion. Which one of the following statements is correct?

(A) when ' a ' is maximum, v is maximum (B) when ' a ' is maximum, v is zero

(C) when ' a ' is zero, v is zero (D) ' a ' is zero for any value of ' v '

17. The maximum speed of a particle in S.H.M. is V. The average speed is

(A) $\frac{\mathrm{V}}{\pi}$ (B) $\frac{3V}{\pi}$

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

18. For a particle performing S.H.M. the equation $\left(\frac{\mathrm{d}^2\mathrm{x}}{\mathrm{dt}^2}\right) + \alpha \mathrm{x} = 0$. Then the time period of the motion will be

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

(C) $2\pi\sqrt{\alpha}$ (D) $\frac{2\pi}{\sqrt{\alpha}}$

19. An equation of a simple harmonic progressive wave is given by $y = A\sin(100\pi t - 3x)$. The distance between two particles having a phase difference of $\left(\frac{\pi}{3}\right)$ in meter is

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{9}$

(C) $\frac{\pi}{18}$ (D) $\frac{\pi}{3}$

20. The ratio of the speed of sound in helium gas to that in nitrogen gas at the same temperature is $\left(\gamma_{\mathrm{He}} = \frac{5}{3}, \gamma_{\mathrm{N_2}} = \frac{7}{5}, M_{\mathrm{He}} = 4, M_{\mathrm{N_2}} = 28\right)$

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

(C) $\sqrt{\frac{2}{7}}$ (D) $\sqrt{\frac{5}{3}}$

21. For a particular sound wave propagating in air, a path difference between two points is 0.54 m which is equivalent to phase difference of (1.8π). If the velocity of sound wave in air is 330 m/s, the frequency of this wave is

(A) 660 Hz. (B) 550 Hz.

(C) 110 Hz (D) 367 Hz.

22. Air column in two identical tubes is vibrating. Tube A has one end closed and tube B has both ends open. Neglecting end correction, the ratio of the fundamental frequency of air column in tube A to that in tube B is

(A) 1 : 4 (B) 4 : 1

(C) 1 : 2 (D) 2 : 2

23. A string is vibrating in its fifth overtone between two rigid supports 2.4 m apart. The distance between successive node and antinode is

(A) 0.8 m (B) 0.2 m

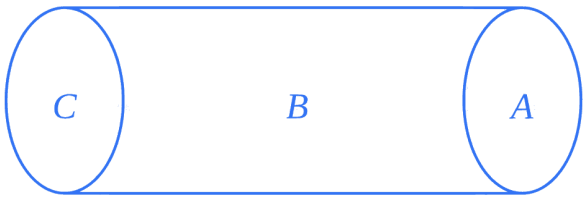
(C) 0.1 m (D) 0.6 m

24. Two point charges q_1 and q_2 are ' l ' distance apart. If one of the charges is doubled and the distance between them is halved, the magnitude of force becomes n times, where n is

(A) 8 (B) 1

(C) 2 (D) 16

25. A hollow cylinder has a charge q coulomb within it. If ϕ is the electric flux associated with the surface B, the flux linked with the plane surface A will be



(A) $\frac{\phi}{2}$ (B) $\frac{\phi}{\epsilon_0} - \phi$

(C) $\frac{1}{2}\left(\frac{\mathrm{q}}{\epsilon_0} - \phi\right)$ (D) $\frac{q}{2\epsilon_0}$

26. Three isolated metal spheres A, B, C have radius R, 2R, 3R respectively, and the same charge, $Q.U_A, U_B$ and U_C be the energy density just outside the surface of the spheres. The relation between $\mathrm{U_A}, \mathrm{U_B}$ and $\mathrm{U_C}$ is

(A) $\mathrm{U_A} > \mathrm{U_B} < \mathrm{U_C}$ (B) $\mathrm{U_A} > \mathrm{U_B} > \mathrm{U_C}$

(C) $\mathrm{U_A} < \mathrm{U_B} < \mathrm{U_C}$ (D) $\mathrm{U_A} < \mathrm{U_B} > \mathrm{U_C}$

27. Four identical condensers are connected in parallel and then in series. The ratio of equivalent capacitance in series to that in parallel combination is

(A) 1 : 4 (B) 4 : 1

(C) 16 : 1 (D) 1 : 16

28. A galvanometer of resistance G has voltage range V_g. Resistance requirec to convert it to read voltage up to V is

(A) $\frac{G \cdot V_g}{V} - G$ (B) $\left(\frac{G+V_g}{V}\right) \cdot G$

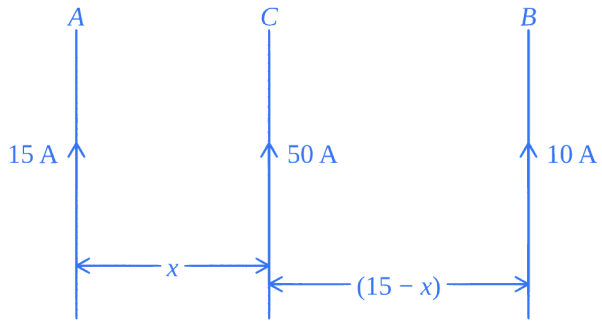
(C) $\left(\frac{V-V_g}{V}\right) \cdot G$ (D) $G \cdot \left[\frac{V}{V_g} - 1\right]$

29. In metre bridge experiment, the null point is obtained at 20 cm from left end of the wire, when resistance X is balanced against another resistance $Y (X < Y)$. To balance a resistance $4X$ against Y, the new position of the null point from the same end will be

(A) 40 cm (B) 80 cm

(C) 60 cm (D) 50 cm

30. Three long straight and parallel wires carrying currents are arranged as shown



The wire C which carries a current of 50 A is so placed that it experiences no force. The distance of wire C from wire A is

(A) 3 cm (B) 5 cm

(C) 9 cm (D) 7 cm

31. Two long parallel wires separated by distance ' d ' carry currents I_1 and I_2 in the same direction. They exert a force F on each other. Now the current in one of the wire is increased to three times and its direction is made opposite. The distance between the wires is doubled. The magnitude of force between them is

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

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

32. A magnetizing field of 1000 A/m produces a magnetic flux of 2.4×10^{-5} Wb in an iron bar of cross-sectional area 0.3 cm^2. The magnetic permeability of the iron bar in the SI unit is

(A) 8×10^{-4} (B) 2.5×10^{-4}

(C) 4×10^{-4} (D) 5×10^{-4}

33. If ' N ' is the number of turns in a circular coil, the value of its self-inductance varies as

(A) N^1 (B) N^3

(C) N^2 (D) N^0

34. Two coils P and S have a mutual inductance of 3×10^{-3}H. If the current in the coil, P is $I = 20 \sin(50\pi t)$A, then the maximum value of the e.m.f. induced in coil S is

(A) 15.70 V (B) 9.42 V

(C) 3.14 V (D) 6.25 V

35. A metal disc of radius ' R ' rotates with an angular velocity ' ω ' about an axis perpendicular to its plane passing through its centre in a magnetic field of induction ' B ' acting perpendicular to the plane of the disc. The induced e.m.f. between the rim and axis of the disc is (magnitude only)

(A) $\frac{R\omega^2 R^2}{2}$ (B) $\frac{R\omega R}{2}$

(C) $\frac{B\omega^2 R}{2}$ (D) $\frac{B\omega R^2}{2}$

36. In LCR series resonance circuit, choose the wrong statement.

(A) At resonance, impedance is minimum.

(B) At resonance, circuit is purely inductive

(C) At resonance current has a maximum value.

(D) Resonance occurs at $X_L = X_C$.

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

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

(C) $\left(\frac{1-2\pi fCR}{4\pi^2 f^2 C}\right)$ (D) $\left(\frac{4\pi^2 f^2 C}{1-2\pi fCR}\right)$

38. A condenser of capacity ' C ' is charged to a potential difference of ' V_1 '. The plates of the condenser are then connected to an ideal inductor of inductance ' L '. The current through an inductor when the potential difference across the condenser reduces to ' V_2 ' is

(A) $\frac{C\left(V_1^2-V_2^2\right)}{L}$ (B) $\frac{C\left(V_1^2+V_2^2\right)}{L}$

(C) $\left[\frac{C\left(V_1^2-V_2^2\right)}{L}\right]^{\frac{1}{2}}$ (D) $\left[\frac{C\left(V_1-V_2\right)}{L}\right]^{\frac{1}{2}}$

39. To a bird in air, a fish in water appears to be at 30 cm from the surface. If refractive index of water with respect to air is $\frac{4}{3}$, the real distance of bird from the surface is

(A) 60 cm (B) 30 cm

(C) 40 cm (D) 50 cm

40. Two thin lenses have a combined power of $+9D$. When they are separated by a distance of 20 cm, then their equivalent power becomes $+\frac{27}{5}$ D. Their individual power (in diopter) is respectively

(A) 2,7 (B) 1,8

(C) 4,8 (D) 3,6

41. A light wave of wavelength ' λ 'is incident on a slit of width ' d '. The resulting diffraction pattern is observed on screen at a distance of ' D '. If linear width of the principal maximum is equal to width of the slit, then the distance D is

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

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

42. Consider the following statements about interference of light. A-When crest of one wave coincides with crest of another wave at point, this point is a point of destructive interference. B-Two coherent sources emit wave of same frequency with constant phase difference. Choose the correct option from the following.

(A) Both statements A and B are wrong. (B) Statement A is correct while statement B is wrong.

(C) Statement B is correct while statement A is wrong. (D) Both statements A and B are correct.

43. A diffraction pattern is obtained by making blue light incident on a narrow slit. If blue light is replaced by red light then

(A) there is no change in diffraction pattern. (B) diffraction band become broader.

(C) diffraction bands disappear. (D) diffraction bands become narrower.

44. A photon of energy ' E ' ejects photoelectrons from a metal surface whose work function is W_0. If this electron enters into a uniform magnetic field with induction ' B ' in a direction perpendicular to the field and describes a circular path of radius ' r ', then the radius is given by

(A) $\sqrt{\frac{2e(E-W_0)}{mB}}$ (B) $\frac{\sqrt{2(E-W_0)m}}{eB}$

(C) $\sqrt{\frac{2m(E-W_0)}{mB}}$ (D) $\sqrt{2m(E-W_0)eB}$

45. A photoelectric surface is illuminated successively by monochromatic light of wavelength ' (λ) ' and ' $\left(\frac{\lambda}{2}\right)$. If the maximum kinetic energy of the emitted photoelectrons in the first case is one-third that in the second case, the work function of the surface of the material is (c = speed of light, h = Planck's constant.)

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

(C) $\frac{hc}{\lambda}$ (D) $\frac{hc}{3\lambda}$

46. In hydrogen atoms, radius of the smallest orbit of the electron is a_0, the radius of the third orbit is

(A) $\frac{a_0}{9}$ (B) $3a_0$

(C) $6a_0$ (D) $9a_0$

47. An electron jumps from the 4^{th} orbit to the 2^{nd} orbit of hydrogen atoms. Given the Rydberg's constant $R_H = 10^7\ m^{-1}$. frequency in Hz of the emitted radiation is $(c = 3 \times 10^8\ m/s)$

(A) $\frac{3}{16} \times 10^5$ (B) $\frac{9}{16} \times 10^{15}$

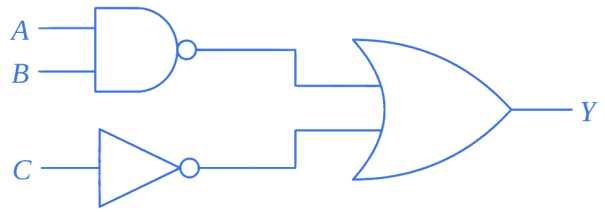
(C) $\frac{9}{16} \times 10^5$ (D) $\frac{9}{16} \times 10^{15}$

48. In a p-type semiconductor,

(A) holes are majority carriers and trivalent atoms are dopants. (B) electrons are minority carriers and pentavalent atoms are dopants.

(C) electrons are majority carries and pentavalent atoms are dopants. (D) holes are minority carriers and trivalent atoms are dopants.

49. The output Y when all the three inputs A, B, C are first low and then high will be



(A) 1,0
(B) 1,1
(C) 0,0
(D) 0,1

50. A transistor is used as a common emitter amplifier with a load resistance 2kΩ. The input resistance is 150Ω, Base current is changed by 20μA which results in a change in collector current by 1.5 mA. The voltage gain of the amplifier is

(A) 1100
(B) 1000
(C) 900
(D) 12000

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51. What is the quantity of sugar charcoal obtained when 34.2 g sugar is charred using required quantity of conc. sulphuric acid under ideal conditions?

(A) 114 g (B) 14.4 g
(C) 11.0 g (D) 10.5 g

52. What is the density of water in kgdm^{-3} if it's density in $\text{g}^{\text{cm}^{-3}}$ is 0.863 ?

(A) 4.60 (B) 7.86
(C) 8.63 (D) 0.863

53. Calculate the wave number of photon emitted during transition from the orbit $n = 2$ to $n = 1$ in hydrogen atom $\left(R_H = 109677\ \text{cm}^{-1}\right)$

(A) $72740\ \text{cm}^{-1}$ (B) $92820\ \text{cm}^{-1}$
(C) $82258\ \text{cm}^{-1}$ (D) $83560\ \text{cm}^{-1}$

54. Identify the correct increasing order of energies of molecular orbitals for F_2 molecule.

(A) $^*1\,s < \sigma 1\,s < {}^*2\,s < \sigma 2\,s$
(B) $\sigma 1\,s < \sigma^* 1\,s < \sigma 2\,s < \sigma^* 2\,s$
(C) $\sigma 1\,s < \sigma 2\,s < {}^*\sigma 1\,s < {}^*\sigma 2\,s$
(D) $\sigma 1\,s < \sigma 1\,s < \sigma 2\,s < \sigma 2\,s$

55. Which among the following is correct decreasing order of covalent character of ionic bond?

(A) $AlCl_3 > MgCl_2 > NaCl$
(B) $AlCl_3 > NaCl > MgCl_2$
(C) $MgCl_2 > MgCl_2 > AlCl_3$
(D) $NaCl > MgCl_2 > AlCl_3$

56. Calculate final volume of a gas when pressure of 60 mL gas is increased from 1 to 1.5 atm, keeping temperature constant.

(A) $5 \times 10^{-2}\text{dm}^3$ (B) $2 \times 10^{-2}\text{dm}^3$
(C) $3 \times 10^{-2}\text{dm}^3$ (D) $4 \times 10^{-2}\text{dm}^3$

57. If 65 kJ of work is done on the system and it releases and it releases 25 kJ of heat. What is change in internal energy of the system?

(A) 16.25 kJ (B) 40 kJ
(C) 90 kJ (D) 2.6 kJ

58. Under isothermal condition a gas expands from 0.2dm^3 to 0.8dm^3 against a constant pressure of 2 bar at 300 K. Find the work done by the gas.

(A) 160 J (B) -120 J
(C) -40 J (D) 20 J

59. What is change in internal energy if a system gains xJ of heat and yJ work is done on it?

(A) $x - y$ (B) $-x + y$
(C) $-x - y$ (D) $x + y$

60. Which among the following species can act as an acid as well as base according to Lowry theory?

(A) Cl^{-1} (B) H_3O^+
(C) HSO_4^- (D) SO_4^{2-}

61. What is the pH of the solution containing $1.342 \times 10^{-3}\text{MH}^+$ ions? $(\log 1.342 = 0.1277)$

(A) 1.28 (B) 3.57
(C) 2.87 (D) 2.38

62. The degree of dissociation of weak acid is 7.2×10^{-4}. What is the value of it's percent dissociation in 0.025 M solution?

(A) 0.072% (B) 8.2%
(C) 0.062% (D) 0.80%

63. How many mole of electron are required fro the reduction of 1 mole of Cr^3+ to $Cr_{(s)}$?

(A) 3 (B) 6
(C) 1 (D) $\frac{6.022 \times 10^{23}}{3}$

64. Which is an oxidizing agent in following reaction? $Fe_{(s)} + Cu^{2+}_{aq} \rightarrow Fe^{2+}_{(s)_{aq}} Cu_{(x)}$

(A) Fe^{2+}_{aq} (B) Cu^{2+}_{aq}
(C) $Fe_{(s)}$ (D) $Cu_{(s)}$

65. Which among the following elements is used in nuclear reactors as moderator?

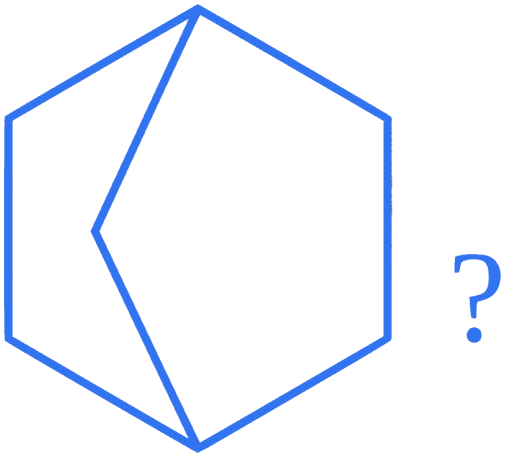
(A) Mg (B) Ca
(C) Be (D) K

66. What is the product formed when $CH_3 - CH = CH_2$ is treated with B_2H_6 followed by the action of H_2O_2

(A) $CH_3CH_2CH_3$ (B) CH_3CH_2CHO

(C) $CH_3CH_2CH_2OH$ (D) $CH_3CH(OH)CH_3$

67. What is the number of primary carbon atoms is the compound



(A) 2 (B) Zero

(C) 1 (D) 3

68. Identify the correct decreasing order of ease of dehydrohalogenation alkyl halides.

(A) $1^\circ > 3^\circ > 2^\circ$ (B) $1^\circ > 2^\circ > 3^\circ$

(C) $3^\circ > 2^\circ > 1^\circ$ (D) $2^\circ > 3^\circ > 1^\circ$

69. Which among the following statements is against to the principles of green chemistry?

(A) Protecting and deprotecting functional groups in organic reactions reduces the number of steps.

(B) Unnecessary derivatization should be minimized.

(C) Use of biodegradable polymers help to clean the environment.

(D) Use of renewable resource ensures the sharing of resources by future generations.

70. What is the co-ordination number of hcp crystal lattice?

(A) 4 (B) 12

(C) 6 (D) 8

71. Calculate the molar mass of metal having density 22.24 g cm^{-3}, crystallizes to form unit cell containing 4 particles. $\left(a^3 = 5.6 \times 10^{-23}\ cm^3\right)$

(A) 280.2 g mol^{-1} (B) 140 g mol^{-1}

(C) 210.6 g mol^{-1} (D) 187.4 g mol^{-1}

72. Calculate the number of atoms in 20 gram metal which crystalises to simple cubic structure having unit cell length 340pm. (density of metal $= 9.8\ g\ cm^{-3}$)

(A) 5.81×10^{22} (B) 5.19×10^{22}

(C) 5.42×10^{22} (D) 4.95×10^{22}

73. Calculate the pressure of gas if the solubility of gas in water at 25°C is $6.85 \times 10^4\ moldm^{-3}$ (Henry's law constant is $6.85 \times 10^4\ moldm^{-3}bar^{-1}$)

(A) 0.853 bar (B) 1.5bar

(C) 0.5 bar (D) 1 bar

74. What is the relation between molar mass of solute and boiling point elevation?

(A) $M_2 = \frac{1000\ K_b W_2}{\Delta T_b W_1}$ (B) $M_2 = \frac{1000 \Delta T_b W_2}{K_b W_1}$

(C) $M_2 = \frac{\Delta T_b W_1}{1000\ K_b W_2}$ (D) $M_2 = \frac{1000\ K_b W_1}{\Delta T_b W_2}$

75. What is the molar mass of solute when 2.3 gram non-volatile solute dissolved in 46 gram benzene at 30°C ? (Relative lowering of vapour pressure is 0.06 and molar mass of benzene is 78 gram mol^{-1})

(A) 65 gram mol^{-1} (B) 80grammol^{-1}

(C) 72 gram mol^{-1} (D) 48grammol^{-1}

76. Which from following equation is correct for relation between strandard cell potential and equilibrium constant?

(A) $E^0_{cell} = \log_{10} K^{\frac{n}{0.0592}}$

(B) $E^0_{cell} = \frac{0.0592}{n} \log_{10} K$

(C) $E_{cell} = \frac{0.0592}{n} \log_{10} K$

(D) $E_{cell} = \log_{10} K^{\frac{n}{0.0592}}$

77. What is standard reduction potential of $Cu^{2+}|Cu_{(s)}$ if E° of following cell is 0.46 ? $Cu_{(s)}|cu^{2+}_{(aq)}||Ag^+_{(aq)}|Ag_{(s)}; E^\circ_{Ag^+/Ag} = 0.80v|$

(A) 1.56 V (B) 0.34 V

(C) 1.44 V (D) 1.26 V

78. Ammonia and oxygen react at high temperature as in reaction, $4NH_{3(g)} + 5O_{2(g)} \rightarrow 4NO_{(g)} + 6H_2O_{(g)}$ If rate of formation of NO is 3.6×10^{-3} mol L^{-1} sec^{-1}. Calculate the rate of formation of water.

(A) 5.4×10^{-3} mol $L^{-1}sec^{-1}$

(B) 6.0×10^{-3} mol L^{-3} sec^{-1}

(C) 1.8×10^{-3} mol L^{-1} sec^{-1}

(D) 3.6×10^{-3} mol L^{-1} sec^{-1}

79. Calculate rate constant of zero order reaction if it is 90% completed in 90 second?

(A) 0.1 $moldm^{-3}$ s^{-1}

(B) 1.0 $moldm^{-3}$ s^{-1}

(C) 0.9 $moldm^{-3}$ s^{-1}

(D) 0.09 $moldm^{-3}$ s^{-1}

80. Time required for completion of 90% of a first order reaction is ' t '. What is the time required for completion of 99.9% of the reaction?

(A) t

(B) 2t

(C) $3t$

(D) $t/2$

81. Which from following is an example of multimolecular collids?

(A) Starch

(B) S_8 molecule

(C) Plastic

(D) Cellulose

82. Which among the following is an actinoid element?

(A) Gd

(B) Lu

(C) Pr

(D) Pa

83. Which from following pair of elements have one electron in 5d-subshell in observed electronic configuration?

(A) Sm($Z = 61$) and Eu($Z = 63$)

(B) Lu($Z = 7$) and Dy($Z = 71$)

(C) Gd ($Z = 64$) and Lu($Z = 71$)

(D) Ce($Z = 58$) and Nd($Z = 60$)

84. Identify anionic complex from following.

(A) Bis (ethylene diamine) dithiocyanato platinum (IV)

(B) Pentaamminecarbonatocobalt (III) chloride

(C) Pentacarbonyliron (0)

(D) Sodiumhexanitrocobaltate (III)

85. Identify correct pair of properties of $[Co(NH_3)_6]^{3+}$ complex ion.

(A) Low spin, diamagnetic

(B) High spin, paramagnetic

(C) High spin, diamagnetic

(D) Low spin, paramagnetic

86. Choose the false statement from following about SN^1 reaction mechanism.

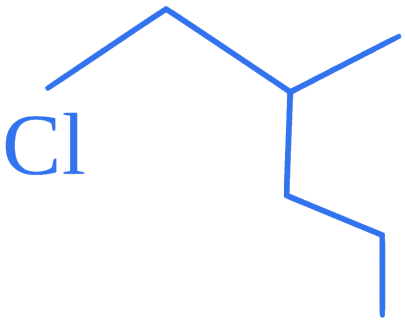
(A) Intermediate formed during the reaction is a carbocation.

(B) It is single step mechanism.

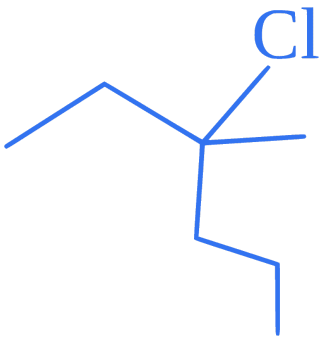
(C) Concentration of nucleophile does not affect the rate of reaction.

(D) Racemization takes place if reaction is carried out at chiral carbon in optically active substance.

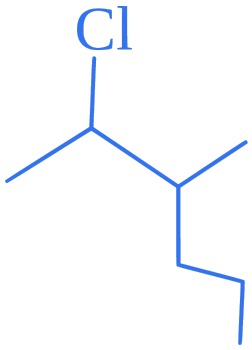
87. Identify the compound that undergoes SN^1 mechanism most fastly.



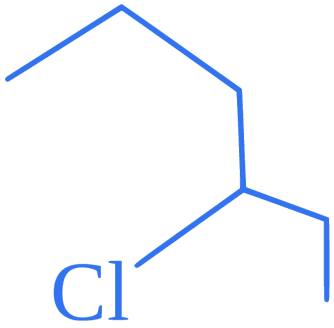
(A)



(B)



(C)



(D)

88. Which among the following reactions does NOT form alkyl halides?

(A) Alcohol reacts with halogen in presence of sunlight.

(B) Alcohol reacts with HCl in presence of anhydrous $ZnCl_2$.

(C) Alcohol reacts with HBr in presence of $NaBr, H_2SO_4$.

(D) Alcohol reacts with HI in presence of NaI/H_3PO_4.

89. What is the intermediate product obtained in the preparation of phenol from aniline?

(A) Anilnium cation

(B) Benzene diazonium chloride

(C) Benzene

(D) Sodium phenoxide

90. Which among the following is not a characteristic of alcohols?

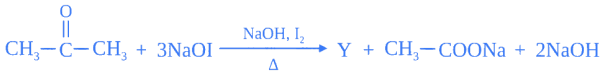
(A) Alcohols are polar molecules due to presence of $-OH$ group.

(B) Boiling point of alcohols increases with increase in their molecular mass.

(C) Lower members of alcohols are insoluble in water as well as in organic solvents.

(D) Methanol is toxic liquids.

91. Identify the product Y in the following reaction.



(A) CH_4

(B) CH_3OH

(C) CH_3

(D) CHI_3

92. Identify the product B in the following reaction. Benzoyl chloride $+H_2O \rightarrow B + HCl$

(A) Acetophenone

(B) Benzaldehyde

(C) Benzoic acid

(D) Benzene

93. Which among the following carboxylic acids is found in Lemon?

(A) Citric acid

(B) Acetic acid

(C) Formic acid

(D) L- Lactic acid

94. The reagent used in Hofmann elimination reaction is

(A) $Na - Hg/H_2O$

(B) HNO_2

(C) Moist Ag_2O

(D) $LiAlH_4$

95. Which of the following reactions does not match correctly with its name?

(A) $R-NH_2+3R-X\rightarrow$ Hofmann exhaustive alkylation

(B) $R-CO-NH_2+Br_2+4KOH\rightarrow$: Hofmann degradation

(C) $R-CO-NH_2+4[H]\xrightarrow{LiA1H_4}$: Mendius reduction

(D) $R-CH_2-N^{\oplus}-(R)_3X^{\oplus}\xrightarrow[\xrightarrow{(ii)},-H_2{}^0]{(i)\text{ moist }Ag_2{}^0}$: Hofmann elimination

96. Which among the following amino acids NOT synthesized in our body?

(A) Valine (B) Tyrosine

(C) Proline (D) Alanine

97. Identify the product obtained when sucrose is treated with conc. H_2SO_4.

(A) Saccharic acid (B) Gluconic acid and fructose

(C) Glucose and fructose (D) Sugar charcoal and water

98. Which among the following nitrogen bases of polynucleotides is NOT derived from pyrimidine?

(A) Guanine (B) Uracil

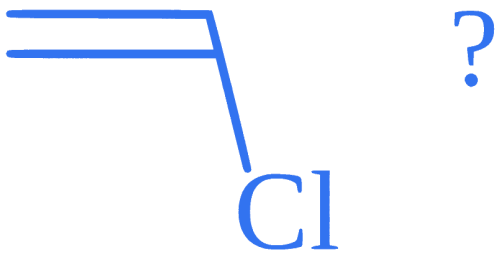
(C) Cytosine (D) Thymine

99. Identify the use of Buna-S from following.

(A) To obtain raincoat (B) To obtain gaskets

(C) To obtain waterpipes (D) To obtain tyres

100. Which from following polymers is obtained using



(A) Glyptal (B) Buna-S

(C) PVC (D) Polyacrylonitrile

101. If $f(x) = \cos(\log x)$, then $f(x) \cdot f(y) - \frac{1}{2}\left(f\left(\frac{x}{y}\right) + f(xy)\right)$ has the value

(A) -2 (B) -1

(C) 0 (D) $\frac{1}{2}$

102. If $\cot\alpha = \frac{1}{2}$ and $\sec\beta = -\frac{5}{3}$ where a $\in \left(\pi, \frac{3\pi}{2}\right)$ and $\beta \in \left(\frac{\pi}{2}, \pi\right)$, then $\tan(\alpha + \beta)$ has the value

(A) $\frac{3}{11}$ (B) $\frac{22}{9}$

(C) $\frac{9}{11}$ (D) $\frac{2}{11}$

103. If $\arg(z) < 0$, then $\arg(-z) - \arg(z)$ equals

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

(C) π (D) $-\pi$

104. It is required to seat 5 men and 4 women in a row so that the men occupy odd places. Then the number of arrangements that are possible is

(A) 144 (B) 362880

(C) 2880 (D) 1140

105. The equation of a line, whose perpendicular distance from the origin is 5 units and the angle, which the perpendicular to the line from the origin makes, is 210° with positive X-axis, is

(A) $-x\sqrt{3} + y + 10 = 0$ (B) $x\sqrt{3} + y - 10 = 0$

(C) $x\sqrt{3} + y + 10 = 0$ (D) $x\sqrt{3} - y + 10 = 0$

106. If the lines $x^2 - 4xy + y^2 = 0$ and $x + y = 10$ contain the sides of an equilateral triangle, then the area of equilateral triangle is

(A) $\frac{5\sqrt{2}}{\sqrt{3}}$ sq. units (B) $\frac{25\sqrt{2}}{\sqrt{3}}$ sq. units

(C) $\frac{50}{\sqrt{3}}$ sq. units (D) $\frac{25}{\sqrt{3}}$ sq. units

107. The equation of the circle whose centre lies on the line $x - 4y = 1$ and which passes through the points $(3, 7)$ and $(5, 5)$ is

(A) $x^2 + y^2 + 6x - 2y + 90 = 0$

(B) $x^2 + y^2 + 6x + 2y + 90 = 0$

(C) $x^2 + y^2 + 6x + 2y - 90 = 0$

(D) $x^2 + y^2 - 6x + 2y - 90 = 0$

108. Let $f(x) = 5 - |x - 2|$ and $g(x) = |x + 1|$, $x \in R$. If $f(x)$ attains maximum value at α and $g(x)$ attains minimum value at β, then $\lim_{x\to-\alpha\beta} \frac{(x-1)(x^2-5x+6)}{(x^2-6x+8)}$ is equal to

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

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

109. $\lim_{x\to0} \frac{\sin^2 x}{\sqrt{2}-\sqrt{1+\cos x}}$ equals

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

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

110. Consider the statement " $P(n) : n^2 - n + 37$ is prime." then, which one of the following is true?

(A) P(3) is false, but P(5) is true. (B) $P(5)$ is false, but $P(3)$ is true.

(C) Both P(3) and P(5) are true. (D) Both P(3) and P(5) are false.

111. The logical statement $(p \wedge \sim q) \vee q \vee (\sim p \wedge q)$ is equivalent to

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

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

112. The logical statement $\sim (p \vee q) \vee (\sim p \wedge q)$ is equivalent to

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

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

113. If for some positive $x\hat{I}R$, the frequency distribution of the marks obtained by 20 students in a certain test, is as follows

Marks	2	3	5	7
Frequency	$(x+1)^2$	$2x - 5$	$x^2 - 3x$	x

Then the mean of the marks is

(A) 3.0 (B) 2.5

(C) 2.8 (D) 3.2

114. If $\sin\left(\sin^{-1}\frac{1}{5} + \cos^{-1}x\right) = 1$, then the value of x is

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

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

115. Considering only the Principal values of inverse function, the set $\left\{x \geq 0 / \tan^{-1}(2x) + \tan^{-1} 3x = \frac{\pi}{4}\right\}$

(A) is a singleton set.
(B) contains more than two elements.
(C) contains two elements.
(D) is an empty set.

116. $\tan^{-1} \frac{1}{3} + \tan^{-1} \frac{1}{5} + \tan^{-1} \frac{1}{7} + \tan^{-1} \frac{1}{8}$ has the value

(A) $\frac{\pi}{4}$
(B) $\frac{\pi}{6}$
(C) $\frac{\pi}{2}$
(D) $\frac{\pi}{3}$

117. The value of $\cos\left(2\cos^{-1} x + \sin^{-1} x\right)$ at $x = \frac{1}{5}$, where $0 \leq \cos^{-1} x \leq \pi$ and $-\frac{\pi}{2} \leq \sin^{-1} x \leq \frac{\pi}{2}$, is

(A) $-\frac{\sqrt{6}}{5}$
(B) $\frac{\sqrt{6}}{5}$
(C) $-\frac{2\sqrt{6}}{5}$
(D) $\frac{2\sqrt{6}}{5}$

118. The element in the third row and second column of the inverse of the matrix $\begin{bmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{bmatrix}$ is

(A) 1
(B) -2
(C) 2
(D) 0

119. If $\mathrm{A} = [\mathrm{a_{ij}}]_{3\times3} = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 5 \\ 2 & 4 & 7 \end{bmatrix}$ and Aij is a cofactor of $\mathrm{a_{ij}}$, then $a_{11}A_{21} + a_{12}A_{22} + a_{13}A_{23}$ is equal to

(A) -1
(B) 2
(C) 0
(D) 1

120. If $\mathrm{f(x)} = \frac{\mathrm{x}}{2} - 1$, then on the interval $[0, \pi]$ where [.] represents greatest integer function

(A) $\tan[\mathrm{f(x)}]$ is continuous but $\frac{1}{\mathrm{f(x)}}$ is not continuous.
(B) $\tan[\mathrm{f(x)}]$ and $\frac{1}{\mathrm{f(x)}}$ are both continuous.
(C) $\tan[\mathrm{f(x)}]$ and $\frac{1}{\mathrm{f(x)}}$ are both discontinuous.
(D) $\tan[\mathrm{f(x)}]$ is discontinuous and $\frac{1}{\mathrm{f(x)}}$ is continuous.

121. If $y = (x^x)x$, then $\frac{dy}{dx} =$

(A) $x^{x^2}(1 + \log x)$
(B) $x \cdot x^{x^2}(1 + \log x)$
(C) $x^{x^2}(1 + 2\log x)$
(D) $x \cdot x^{x^2}(2\log x + 1)$

122. $\frac{d}{dx}\left(\sin^{-1}\left(3x - 4x^3\right)\right), \frac{1}{2} < x < 1$ is

(A) $\frac{1}{3\sqrt{1-x^2}}$
(B) $\frac{-3}{\sqrt{1-x^2}}$
(C) $\frac{-1}{3\sqrt{1-x^2}}$
(D) $\frac{3}{\sqrt{1-x^2}}$

123. If $x = \sec\theta - \cos\theta$ and $y = \sec^n\theta - \cos^n\theta$, then $\left(\frac{dy}{dx}\right)^2$ is equal to

(A) $\frac{\mathrm{n^2(y^2-4)}}{\mathrm{x^2}}$
(B) $\frac{\mathrm{n^2(y^2+4)}}{\mathrm{x^2+4}}$
(C) $\frac{n^2y^2}{x^2} - 4$
(D) $\frac{\mathrm{n^2(y^2-4)}}{\mathrm{x^2-4}}$

124. If $\mathrm{y} = y = e^{\cos^{-1}\left(\sqrt{1-x^2}\right)}$, then $\frac{1}{y}\frac{dy}{dx}$

(A) $\frac{\sqrt{1-x^2}}{2}$
(B) $\sqrt{1-x^2}$
(C) $\frac{1}{\sqrt{1-x^2}}$
(D) $\frac{1}{2\sqrt{1-x^2}}$

125. A stone is dropped in a quiet lake and it is observed that waves move in circles, If the radius of a circular wave increases at the rate $2\ \mathrm{cm/sec}$, then the rate of increase in its area at the instant when its radius is 10 cm, is $\mathrm{cm^2/sec}$.

(A) 40π
(B) 80π
(C) 10π
(D) 20π

126. The maximum value of the function $f(x) = 3x^3 - 18x2 + 27x - 40$ on the set $S = \left\{x \in Rx^2 + 30 \leq 11x\right\}$ is

(A) 122
(B) 222
(C) 810
(D) 162

127. $\int \frac{x+1}{x(1+xe^x)^2}\,\mathrm{d}x =$ (where C is a constant of integration.)

(A) $\log(1 + xe^x) + \frac{1}{1+xe^x} + C$
(B) $\log\left(\frac{xe^x}{1+xe^x}\right) + \frac{1}{1+xe^x} + C$
(C) $\log\left(\frac{xe^x}{1+xe^x}\right) + C$
(D) $\log\left(\frac{xe^x}{1+xe^x}\right) - \frac{1}{1+xe^x} + C$

128. If $\int \frac{d\theta}{\cos^2\theta(\tan 2\theta + \sec 2\theta)} = \lambda\tan\theta + 2\log|f(\theta)| + c$ where C is a constant of integration, then the ordered pair $(\lambda, f(\theta))$ is equal to

(A) $(1, 1 - \tan\theta)$
(B) $(1, 1 + \tan\theta)$
(C) $(-1, 1 - \tan\theta)$
(D) $(-1, 1 + \tan\theta)$

129. $\int \sqrt{\frac{1-\sqrt{x}}{1+\sqrt{x}}}dx =$ (where C is a constant of integration)

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

(B) $-2\sqrt{1-x} + \cos^{-1}\sqrt{x} + \sqrt{x(1-x)}$

(C) $2\sqrt{1-x} + \cos^{-1}\sqrt{x} + \sqrt{x(1-x)}$

(D) $-2\sqrt{1-x} + \cos^{-1}\sqrt{x} - \sqrt{x(1-x)}$

130. For $-\frac{\pi}{2} < x < \frac{\pi}{2}, \int \tan^{-1}\left(\sqrt{\frac{1-\sin x}{1+\sin x}}\right)dx =$ (Where C is a constant of integration)

(A) $\frac{\pi}{4}x + \frac{x^2}{2} + C$ (B) $\frac{\pi}{4} - \frac{x^2}{2} + C$

(C) $\frac{\pi}{4} + \frac{x^2}{2} + C$ (D) $\frac{\pi}{4}x - \frac{x^2}{4} + C$

131. If $\int_a^b x^3dx = 0$ and if $\int_a^b x^2dx = \frac{2}{3}$, then a and b are respectively

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

(C) 1,1 (D) -1,1

132. Let $[t]$ denot the greatest integer less than or equal to t. Then the value of $\int_1^2 |2x - [3x]|dx$ is

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

(C) 2 (D) 0

133. $\int_0^{\frac{\pi}{2}} \frac{\sin x}{1+\cos^2 x}dx$ has the value

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

(C) $\frac{\pi}{2}$ (D) 0

134. Let $f : [-1, 2] \to [0, \infty)$ be a continuous function such that $f(x) = f(1-x), \forall x \in [-1, 2]$. If $R_1 = \int_{-1}^2 xf(x)dx$ and R_2 is the area of the region bounded by $y = f(x), x = -1, x = 2$ and the X-asis. Then

(A) $2R_1 = R_2$ (B) $R_1 = 3R_2$

(C) $R_1 = 2R_2$ (D) $3R_1 = R_2$

135. A curve passes through the point $\left(1, \frac{\pi}{6}\right)$. Let the slope of the curve at each point (x, y) be given by $\frac{y}{x} + \sec\left(\frac{y}{x}\right), x > 0$, then the equation of the curve is

(A) $\sin\left(\frac{y}{x}\right) = \log x + \frac{1}{2}$

(B) $\text{cosec}\left(\frac{y}{x}\right) = \log e + 2$

(C) $\cos\left(\frac{2y}{x}\right) = \log x + \frac{1}{2}$

(D) $\sec\left(\frac{2y}{x}\right) = \log x + 2$

136. General solution of the differential equation $\sin^3 x\frac{dx}{dy} = \sin y$ is given by

(A) $\cos y - \frac{3}{4}\cos x - \frac{1}{12}\cos 3x = C$

(B) $\cos y - \frac{3}{4}\cos x + \frac{1}{12}\cos 3x = C$

(C) $\cos y + \frac{3}{4}\cos x - \frac{1}{12}\cos 3x = C$

(D) $\cos y + \frac{3}{4}\cos x - \frac{1}{12}\cos 3x = C$

137. If $y = y(x)$ and $\frac{2+\sin x}{y+1}\left(\frac{dy}{dx}\right) = -\cos x, y(0) = 1$, then $y\left(\frac{\pi}{2}\right)$ is equal to

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

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

138. Let $\vec{a}, \vec{b}, \vec{c}$ be vectors of lengths $3, 4, 5$ respectively. Let $\vec{a}$ be perpendicular to $\vec{b} + \vec{c}, \vec{b}$ be perpendicular to $\vec{c} + \vec{a}$ and $\vec{c}$ be perpendicular to $\vec{a} + \vec{b}$, then the length of vector $\vec{a} + \vec{b} + \vec{c}$ is

(A) 5 (B) $5\sqrt{3}$

(C) $5\sqrt{2}$ (D) $5\sqrt{6}$

139. For any two non-zero vectors $\bar{a}$ and $\bar{b}, (a\bar{b} + b\bar{a}) \cdot (a\bar{b} - b\bar{a})$ is

(A) $2|\bar{b}|2$ (B) 0

(C) $|\bar{a}|^2$ (D) $|\bar{a}|^2 + |\bar{b}|^2$

140. A plane is parallel to two lines direction ratios are $(1, 0, -1)$ and $(-1, 1, 0)$ and it contains the point $(1, 1, 1)$. If it cuts the co-ordinate axes at A, B, C, then the volume of the tetrahedron OABC is cu. units.

(A) 9 (B) 27

(C) $\frac{9}{4}$ (D) $\frac{9}{2}$

141. The incenter and centroid of the triangle, whose vertices are $A \equiv (0, 3, 0), B \equiv (0, 0, 4)$, and $C \equiv (0, 3, 4)$, are respectively given by

(A) $(0, -2, -3), \left(0, -2, \frac{8}{3}\right)$

(B) $(0, -2, 3), \left(0, 2, -\frac{8}{3}\right)$

(C) $\left(0, 2, \frac{8}{3}\right), (0, 2, 3)$

(D) $(0, 2, 3), \left(0, 2, \frac{8}{3}\right)$

142. If $|\bar{a}| = \sqrt{26}, |\bar{b}| = 7$ and $|\bar{a} \times \bar{b}| = 35$, then $\bar{a} \cdot \bar{b}$ is-

(A) $7\sqrt{26}$ (B) 7

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

143. Let $\vec{a} = 2\hat{i} + \hat{j} - 2\hat{k}, \vec{b} = \hat{i} + \hat{j}$ and $\vec{c}$ be a vector such that $|\vec{c} - \vec{a}| = 3$. If $\vec{p} = \vec{a} \times \vec{b}$, then the angle between $\vec{p}$ and $\vec{c}$ is $\frac{\pi}{6}$ and $|\vec{p} \times \vec{c}| = 3$. Thus $\vec{a}.\vec{c}$ is equal to-

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

(C) 2 (D) 4

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

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

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

145. The equation of a plane containing the line of intersection of the planes $2x - y - 4 = 0$ and $y + 2z - 4 = 0$ and passing through the point $(1, 1, 0)$ is

(A) $x - y - z = 0$ (B) $2x - z = 2$

(C) $x - 3y - 2z = -2$ (D) $x + 3y + z = 4$

146. The angle between the lines $\bar{r} = (3\hat{i} + 2\hat{j} - 4\hat{k}) + \lambda(\hat{i} + 2\hat{j} + 2\hat{k})$ and $\bar{r} = (5\hat{i} - 2\hat{k}) + \mu(3\hat{i} + 2\hat{j} + 6\hat{k})$

(A) $\cos^{-1}\left(\frac{20}{21}\right)$ (B) $\cos^{-1}\left(\frac{4}{21}\right)$

(C) $\cos^{-1}\left(\frac{16}{21}\right)$ (D) $\cos^{-1}\left(\frac{19}{21}\right)$

147. The graphical solution set of the system of in equations

$x + y \leq 70$, $x + 2y \leq 100$, $2x + y \leq 120$, $x \geq 0$, $y \geq 0$

is given by

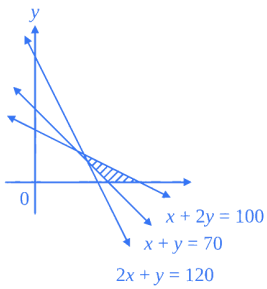


Fig. 1

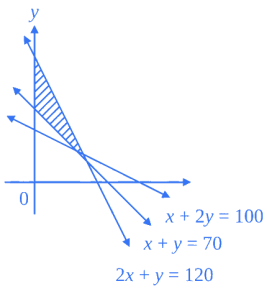


Fig. 2

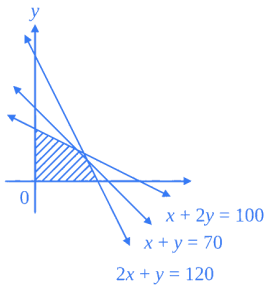


Fig. 3

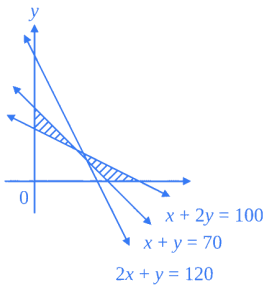


Fig. 4

(A) Fig.2 (B) Fig.1

(C) Fig.4 (D) Fig.3

148. If three distinct numbers are chosen randomly from first 100 natural numbers, then the probability that all three of them are divisible by both 2 and 3 is

(A) $\frac{4}{35}$ (B) $\frac{4}{55}$

(C) $\frac{4}{1155}$ (D) $\frac{80}{231}$

149. A bag contains 4 red and 3 black balls. One ball is drawn and then replaced in the bag and the process is repeated. Let X denote the number of times black ball is drawn in 3 draws. Assuming that at each draw each ball is equally likely to be selected, then the probability distribution of X is given by

(A)

X	0	1	2	3
$P(X)$	$\left(\frac{3}{7}\right)^3$	$\frac{12}{7}\left(\frac{3}{7}\right)^2$	$\frac{9}{7}\left(\frac{4}{7}\right)^2$	$\left(\frac{4}{7}\right)^3$

(B)

X	1	2	3
$P(X)$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$

(C)

X	0	1	2	3
$P(X)$	$\left(\frac{4}{7}\right)^3$	$\frac{12}{7}\left(\frac{4}{7}\right)^2$	$\frac{9}{7}\left(\frac{3}{7}\right)^2$	$\left(\frac{3}{7}\right)^3$

(D)

X	0	1	2	3
$P(X)$	$\left(\frac{4}{7}\right)^3$	$\frac{9}{7}\left(\frac{4}{7}\right)^2$	$\frac{12}{7}\left(\frac{3}{7}\right)^2$	$\left(\frac{3}{7}\right)^3$

150. It is observed that 30% of the students appearing for a certain entrance test are science students. If 5 students are randomly selected from this group,the probability of having 2 science students among these students is

(A) 0.3087 (B) 0.2547

(C) 0.1087 (D) 0.3437

- End of Question Paper -