MHT CET 2020 PCM Oct 14 Shift 2 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 2020**, 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. Two unit vectors ' $\hat{a}_1$ 'and ' $\hat{a}_2$ ' are inclined to each other at an angle ' θ '. If $|\hat{a}_1 - \hat{a}_2| = \sqrt{3}$, then the value of $(\hat{a}_1 - \hat{a}_2) \cdot (2\hat{a}_1 - \hat{a}_2)$ is

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

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

2. The maximum error in the measurement of mass and length is 4% and 3% respectively. The error in the measurement of density of a cube will be

(A) 9% (B) 15%

(C) 13% (D) 6%

3. The angle made by a vector $\vec{B} = 3\hat{i} + 2\hat{j} + 4\hat{k}$ with y -axis is

(A) $\cos^{-1}\left(\frac{5}{\sqrt{23}}\right)$ (B) $\cos^{-1}\left(\frac{4}{\sqrt{11}}\right)$

(C) $\cos^{-1}\left(\frac{3}{\sqrt{17}}\right)$ (D) $\cos^{-1}\left(\frac{2}{\sqrt{29}}\right)$

4. A particle rotates in horizontal circle of radius 'R' in a conical funnel, with speed 'V'. The inner surface of the funnel is smooth. The height of the plane of the circle from the vertex of the funnel is (g = acceleration due to gravity)

(A) $\frac{V^2}{2g}$ (B) $\frac{V}{g}$

(C) $\frac{V^2}{g}$ (D) $\frac{V}{2g}$

5. A particle moves along a circular path with decreasing speed. Hence

(A) its resultant acceleration is towards the centre.

(B) its angular momentum remains constant.

(C) the direction of angular momentum remains constant.

(D) it moves in a spiral path with decreasing radius.

6. The kinetic e nergy acquired by a body of mass 'M' in travelling a certain distance 'd: starting from rest, under the action of constant force is

(A) inversely proportional to $\sqrt{M}$.

(B) directly proportional to M.

(C) independent of M.

(D) directly proportional to $\sqrt{M}$.

7. A solid sphere of mass 'M' and radius 'R' has moment of inertia 'I' about its diameter. It is recast into a disc of thickness 't' whose moment of inertia about an axis passing through its edge and perpendicular to its plane, remains 'I'. Radius of the disc will be

(A) $R/\sqrt{19}$ (B) $R/\sqrt{15}$

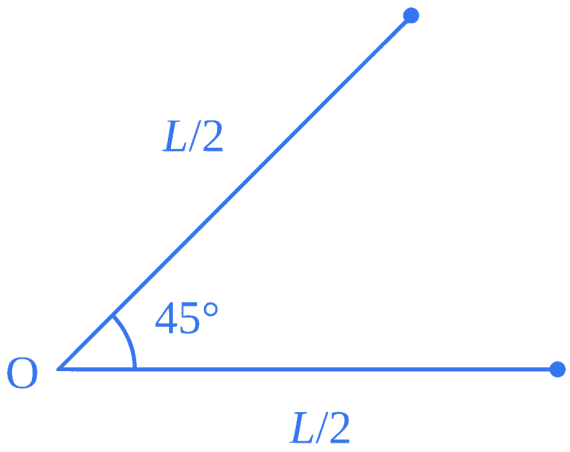
(C) $2R/\sqrt{15}$ (D) $2R/\sqrt{19}$

8. A thin circular ring of mass ' M′ and radius ' R′ is rotating about a transverse axis passing through its centre with constant angular velocity ' ω '. Two objects each of mass 'm' are attached gently to the opposite ends of a diameter of the ring. What is the new angular velocity?

(A) $\frac{M\omega}{M+2m}$ (B) $\frac{M(\omega)}{M+m}$

(C) $\frac{(M+2m)\omega}{M}$ (D) $\frac{(M-2\,m)\omega}{M+2\,m}$

9. A thin uniform rod of length 'L' and mass 'M' is bent at the middle point ' 0 ' at an angle of 45° as shown in the figure. The moment of inertia of the system about an axis passing through '0' and perpendicular to the plane of the bent rod, is



(A) $\frac{ML^2}{12}$ (B) $\frac{ML^2}{24}$

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

10. A body is projected vertically upwards from earth's surface. If its K.E. of projection is equal to half of its minimum value required to escape from the gravitational influence, then the height upto which it rises is (R = radius of the earth)

(A) $4R$ (B) R

(C) 2R (D) 3R

11. The radius of the orbit of a geostationary satellite is (mean radius of the earth is R, angular velocity about an axis in ω and accleration due to gravity on earth's surface is g)

(A) $\left(\frac{gR^2}{\omega^2}\right)^{1/3}$ (B) $\frac{gR^2}{\omega^2}$

(C) $\left(\frac{gR^2}{\omega^2}\right)^{2/3}$ (D) $\left(\frac{gR^2}{\omega^2}\right)^{1/2}$

12. A metal sphere of radius 1 m is charged with 10^{-2}C in air. Its bulk modulus is $10^{11}/4\pi^2$. The volume strain in the sphere is (ϵ_0 = pemittivity of free space)

(A) $\frac{10^{-1}}{6\in_0}$ (B) $\frac{10^{-14}}{8\epsilon_0}$

(C) $\frac{10^{-15}}{8\epsilon_0}$ (D) $\frac{10^{-12}}{4\in_0}$

13. A copper wire of length L ' and diameter ' ' is to be reshaped into another wire so as to have minimum resistance. For this we should

(A) increase L and decrease D. (B) decrease L and increase D.

(C) decrease both L and D. (D) increase both L and D.

14. Two wires A and B having same length and material are stretched by the same force. Their diameters are in the ratio 1 : 3. The ratio of energy density of wire A to that of wire B when stretched, is

(A) 27 : 1 (B) 9 : 1

(C) 81 : 1 (D) 3 : 1

15. A capillary tube is vertically immersed in water, water rises upto a height 'h $_1$ '. When the whole arrangement is taken to a depth 'd' in a mine, the water level rises upto height 'h_2 '. The ratio h_1/h_2 is (R = radius of earth)

(A) $\left(1+\frac{2\,d}{R}\right)$ (B) $\left(1-\frac{d}{R}\right)$

(C) $\left(1+\frac{d}{R}\right)$ (D) $\left(1-\frac{2d}{R}\right)$

16. Let 'R_1 ' and 'R_2 ' are radii of two mercury drops. A big mercury drop is formed from them under isothermal conditions. The radius of the resultant drop is

(A) $R=\sqrt{R_1^2-R_2^2}$ (B) $R=\frac{R_1+R_2}{2}$

(C) $R=\sqrt{R_1^2+R_2^2}$ (D) $R=\left(R_1^3+R_2^3\right)^{\frac{1}{3}}$

17. A liquid kept in a cylindrical vessel is rotated about vertical axis through the centre of circular base. The difference in the heights of the liquid at the centre of vessel and its edge is (R = radius of vessel, ω = angular velocity of rotation, g = acceleration due to gravity)

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

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

18. A metal rod of length L and cross-sectional area A is heated through T°C. What is the force required to prevent the expansion of the rod lengthwise? (Y= Young's modulus of material of the rod, α = coefficient of linear expansion of the rod.)

(A) $YA\alpha/T(1+\alpha T)$ (B) $YA\alpha T/(1-\alpha T)$

(C) $YA\alpha T/(1+\alpha T)$ (D) $YA\alpha/(1-\alpha T)$

19. A black rectangular surface of area A emits energy E per second at 27°C. If length and breadth is reduced to $\left(\frac{1}{3}\right)^{rd}$ of initial value and temperature is raised to 327°C then energy emitted per second becomes

(A) 2E/9 (B) E/9

(C) 16E/9 (D) 4E/9

20. The ratio of the specific heats $\frac{C_p}{C_v}=\gamma$ in terms of degrees of freedom 'n' is given by

(A) $\left(1+\frac{n}{2}\right)$ (B) $\left(1+\frac{1}{n}\right)$

(C) $\left(1+\frac{10}{3}\right)$ (D) $\left(1+\frac{2}{n}\right)$

21. A particle performs S.H.M. from the mean position. Its amplitude is 'A' and total energy is 'E'. At a perticular instant its kinetic energy is $\frac{3E}{4}$. The displacement of the particle at that instant is

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

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

22. The length of the seconds pendulum is decreased by 0.3 cm when it is shifted from place A to place B. If the acceleration due to gravity at place A is 981 cm/s^2, the acceleration due to gravity at place B is (Take $\pi^2=10$)

(A) 975Cm/S^2 (B) 978 cm/s^2

(C) 984 cm/s^2 (D) 981Cm/s^2

23. A spring executes S.H.M. with mass 10 kg attached to it. The force constant of the spring is 10 N/m. If at any instant its velocity is 40 cm/s, the displacement at that instant is (Amplitude of S.H.M. = 0.5 m)

(A) 0.3 m (B) 0.2 m
(C) 0.4 m (D) 0.45 m

24. A transverse wave is travelling on a string with velocity 'V'. The extension in the string is ' x'. If the string is extended by 50%, the speed of the wave along the string will be nearly (Hooke's law is obeyed)

(A) (0.7)V (B) (1.22)V
(C) (1.1)V (D) $(0.9)V$

25. The air column in an organ pipe closed at one end is made to vibrate so that there are 2 nodes and antinodes each. The mode of vibration is called

(A) 3rd overtone (B) 1st overtone
(C) fundamental (D) 2nd overtone

26. In 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) $\frac{1}{3t}$ (B) $\frac{1}{t}$
(C) $\frac{1}{4t}$ (D) $\frac{1}{2t}$

27. When the observer moves towards a stationary source with velocity V_1, the apparent frequency of emitted note is F_1. When observer moves away from the source with velocity V_1, the apparent frequency is F_2. If V is the velocity of sound in air and $F_1/F_2 = 2$ then V/V_1 is equal to

(A) 5 (B) 6
(C) 4 (D) 3

28. Scale of galvanometer divided into 100 equal divisions has a current sensitivity 10 div./mA and voltage sensitivity 4 div./mV. The resistance of galvanometer is

(A) 5Ω (B) 2.50
(C) 10Ω (D) 7.5Ω

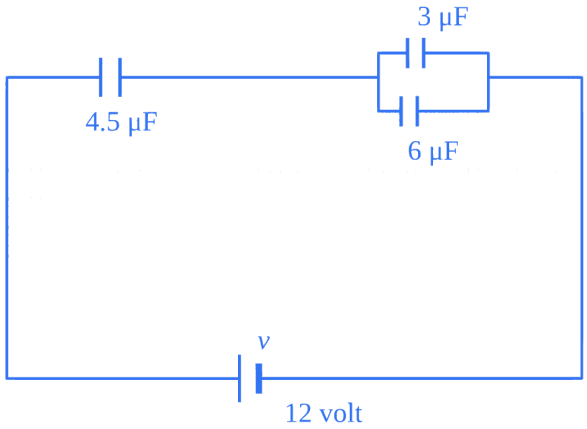
29. A potentiometer wire has length 4 m and resistance 5Ω. It is connected in series with 495Ω resistance and a cell of e.m.f. 4 V. The potential gradient along the wire is

(A) 0.03 V/m (B) 0.01V/m
(C) 0.02 V/m (D) 0.04 V/m

30. A galvanometer has resistance ' G′ and range 'V_g′. How much resistance is required to read voltage upto ' V ' volt?

(A) $\frac{G(V+V_g)}{V}$ (B) $G\left(\frac{V}{V_g}-1\right)$
(C) $\frac{G(V-V_g)}{V}$ (D) $\mathbf{G}V_g$

31. In the circuit shown, the potential difference across the 4.5μF capacitor is



(A) $\frac{8}{3}$ volt (B) 8 volt
(C) 6 volt (D) 4 volt

32. Two parallel wires of equal lengths are separated by a distance of 3 m from each other. The currents flowing through first and second wire is 3 A and 4.5 A respectively in opposite directions. The resultant magnetic field at mid-point of both the wires is (μ_0 = permeability of free space)

(A) $\frac{3\mu_0}{2\pi}$ (B) $\frac{7\mu_0}{2\pi}$
(C) $\frac{\mu_0}{2\pi}$ (D) $\frac{5\mu_0}{2\pi}$

33. The magnitude of magnetic fields at a distacne 'r' from the centre of a short bar magnet, in longitudinal position to transverse position is in the ratio

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

34. The relation between total magnetic field (B), magnetic intensity (H), permeability of free space (μ_0) and susceptibility (x) is

(A) $\frac{B}{H} = \mu_0(1+x)$ (B) $\frac{H}{B} = \mu_0(1-x)$

(C) $\frac{B}{H} = \mu_0(1-x)$ (D) $\frac{H}{B} = \mu_0(1+x)$

35. In series LCR circuit, resistance is 18Ω and impedance is 33Ω. An r.m.s. voltage of 220 V is applied across the circuit. The true power consumed in a.c. circuit is

(A) 400 V (B) 600 V

(C) 800 V (D) 200 V

36. In a capactive circuit, the reactance of capacitor at frequency 'f' is ' X_c'. What will be its reactance at frequency 4f?

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

(C) $\frac{X_C}{8}$ (D) X_C

37. In which layer of the atmosphere, the water vapour is present?

(A) Troposphere (B) Ionosphere

(C) Mesosphere (D) Stratosphere

38. Out of the fundamental forces in nature, maximum and minimum range is respectively for

(A) gravitational force, weak nuclear force. (B) gravitational force, electromagnetic force.

(C) strong nuclear force, electromagnetic force. (D) electromagnetic force, gravitational force.

39. A ray of light is incident at an angle of incidence 'i' on one surface of a thin prism of small angle 'A'. The ray emerges normally from the opposite surface. If the refractive index of the material of the prism is ' μ ', the angle of incidence 'i' is nearly equal to

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

(C) μA (D) $\frac{A}{2\mu}$

40. The magnifying power of an refracting type of astronomical telescope is 'm'. If focal length of the eyepiece is doubled, the magnifying power will become

(A) $\frac{m}{4}$ (B) $\frac{n}{2}$

(C) 2 m (D) m

41. When unpolarised light is passed through crossed polaroids, then light passing through first polaroid

(A) also passes through second polaroid. (B) partially passes through second polaroid.

(C) is blocked by second polaroid. (D) passes with greater intensity.

42. Light waves from two coherent sources arrive at two points on a screen with path difference of zero and $\lambda/2$. The ratio of the intensities at the points is

(A) two : one (B) one:two

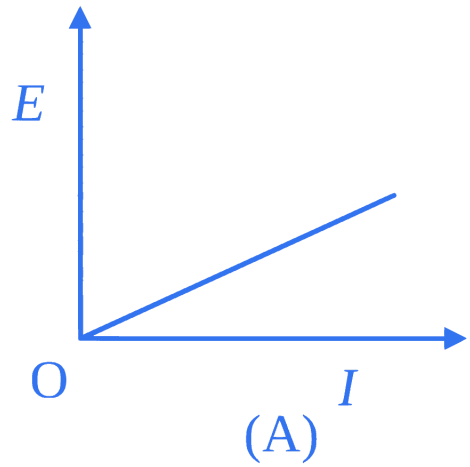
(C) one: one (D) infinity: one

43. If two sources emit light waves of different amplitudes then in interference pattern

(A) fringes disappear after short time. (B) brightness of fringes is less.

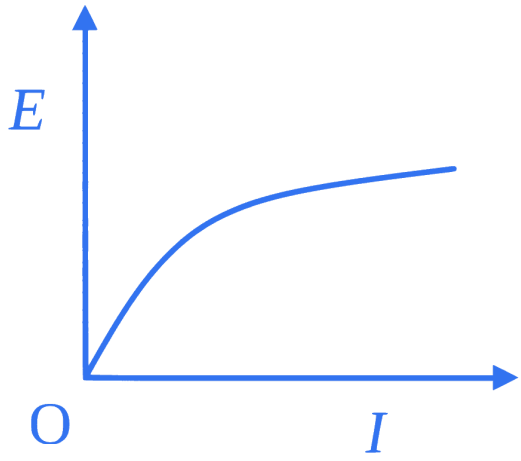
(C) there is some intensity of light in the region of destructive interference. (D) fringe width will be less.

44. Out of the following graphs, which graph shows the correct variation of maximum kinetic energy (E) of photo electron with intensity of incident radiation (I)? (A)



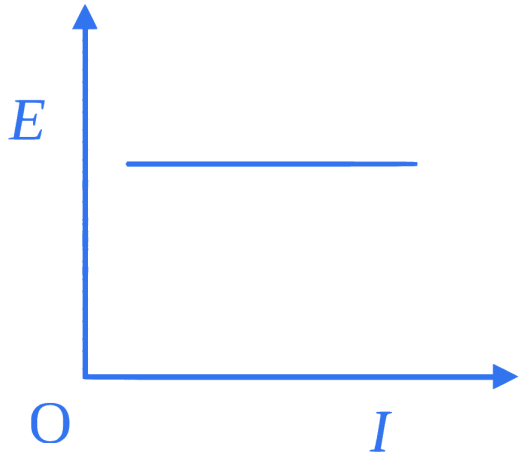
(A)

(B)

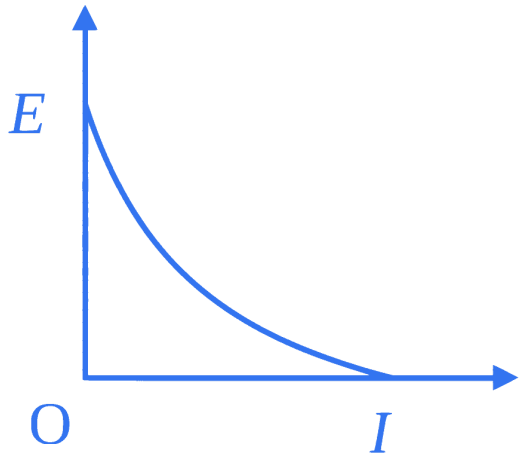


(C)

44. (continued)



(D)



(A) (D)
(B) (B)
(C) (A)
(D) (C)

45. When light of wavelength ' λ ' is incident on photosensitive surface, photons of power 'P' are emitted. The number of photons (n) emitted in 't' second is (h= Planck's constant, c = velocity of light in vacuum)

(A) $\frac{hC}{P\lambda t}$
(B) $\frac{P\lambda t}{h_C}$
(C) $\frac{P\lambda}{htc}$
(D) $\frac{hP}{\lambda tC}$

46. Ratio of centripetal acceleration for an electron revolving in 3^{rd} orbit to 5^{th} Bohr orbit of hydrogen atom is

(A) $\frac{424}{21}$
(B) $\frac{625}{81}$
(C) $\frac{125}{4}$
(D) $\frac{775}{61}$

47. An electron of mass 'm' is revolving around the nucleus in a circular orbit of radius 'r' has angular momentum 'L'. The magnetic field produced by the electron at the centre of the orbit is (e = electric charge, μ_0 = permeability of free space)

(A) $\frac{\mu_0 eL}{4\pi mr^2}$ (B) $\frac{\mu_0 eL}{4\pi mr^3}$

(C) $\frac{\mu_0 eL}{2\pi mr^2}$ (D) $\frac{\mu_0 eL}{2\pi mr^3}$

48. An electron makes a transition from an excited state to the ground state of a ydrogen like atom. out of the following statements which one is correct?

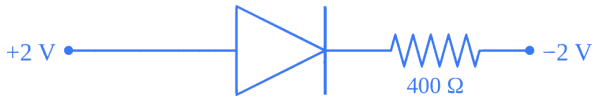
(A) K.E., P.E. and T.E. decreases.

(B) K.E. decreases, P.E. increases but total energy remains the same.

(C) E. increases but P.E. and T.E. decreases.

(D) K.E. and T.E. decreases but P.E. increases.

49. For an ideal diode, the current in the following arrangement is



(A) 10A (B) 10 mA

(C) 20 mA (D) 1 mA

50. In transistor amplifier, base-emitter junction is forward biased and collector emitter junction is reverse biased. The current gain is

(A) $\frac{\Delta I_E}{\Delta I_B}$ (B) $\frac{\Delta I_B}{\Delta I_E}$

(C) $\frac{\Delta I_B}{\Delta I_C}$ (D) $\frac{\Delta I_C}{\Delta I_B}$

51. What is the molality of a solution containing 300mg of urea (molar mass 60) dissolved in 30 g of water?

(A) 0.133 m
(B) 0.825 m
(C) 0.498 m
(D) 0.166 m

52. The molecular mass of an organic monobasic acid is 129 and value of n is 2, what is empirical formula mass of compound?

(A) $158 \cdot 0$
(B) $193 \cdot 5$
(C) $64 \cdot 5$
(D) 258

53. The volume of dihydrogen required for complete hydrogenation of $0.5dm^3$ of ethene at S.T.P. is

(A) $1 \cdot 0dm^3$
(B) $0 \cdot 5dm^3$
(C) $0 \cdot 75dm^3$
(D) $0 \cdot 25dm^3$

54. What is the electronic configuration of third element of group-2 in periodic table?

(A) $[Ne]3\ S^1$
(B) $[Ne]3\ S^2$
(C) $[Ar]4\ S^1$
(D) $[Ar]4\ S^2$

55. Which of the following molecule does not obey octet rule?

(A) N_2
(B) NaCl
(C) Cl_2
(D) SF_6

56. If one 's', three $^4p'$ and one 'd' atomic orbitals take part in hybridization, then number of hybrid orbitals formed are

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

57. At what new pressure 100 mL of a gas at pressure of 720 mm will occupy volume of 84 mL keeping temperature constant?

(A) $857 \cdot 14$ mm
(B) $712 \cdot 14$ mm
(C) $816 \cdot 60$ mm
(D) $604 \cdot 82$ mm

58. Relation between ΔH and ΔU for the reaction $2SO_{3(g)} \longrightarrow 2SO_{2_{(g)}} + O_{2_{(g)}}$ is

(A) $\Delta H - \Delta U = 2RT$
(B) $\Delta H - \Delta U = RT$
(C) $\Delta H + \Delta U = -RT$
(D) $\Delta H + \Delta U = RT$

59. What is the quantity of heat evolved when 6 g carbon combines with sulphur to form CS_2 according to the reaction $C + S_2 \rightarrow CS_2 \Delta H = -92KJmol^{-1}$

(A) 22KJ
(B) 32KJ
(C) 46KJ
(D) 11KJ

60. Which of the following conditions indicates the reaction is spontaneous?

(A) $\Delta S < 0, \Delta H > 0, \Delta G > 0$ at all temperature
(B) $\Delta S < 0, \Delta H > 0, \Delta G > 0$ at low temperature
(C) $\Delta S > 0, \Delta H < 0, \Delta G < 0$ at all temperature
(D) $\Delta S < 0, \Delta H > 0, \Delta G > 0$ at high temperature

61. The sum of oxidation states of all atoms in $Cr_2O_7^{2-}$ ion is

(A) Zero
(B) -2
(C) +2
(D) -1

62. What is molecular formula of allyl chloride?

(A) C_3H_3Cl
(B) C_3H_5Cl
(C) C_3H_7Cl
(D) C_3H_6Cl

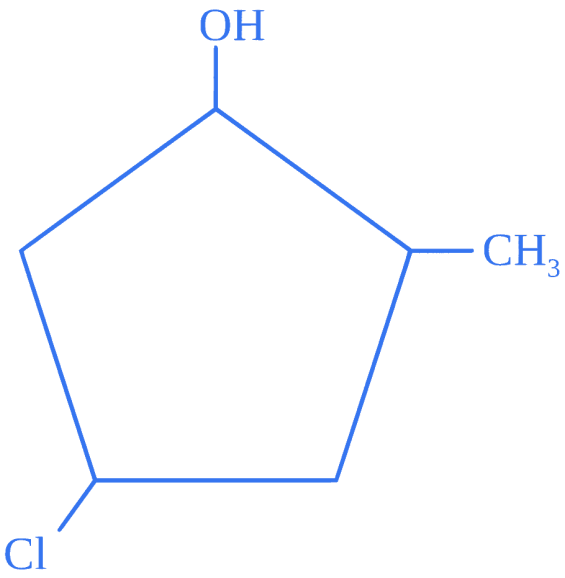
63. The IUPAC name of isobutyl bromide is

(A) 2-methyl-1-bromo propane
(B) 1-bromo-2-methyl propane
(C) 2-bromo-2-methyl propane
(D) 2-bromo-1-methyl propane

64. What is IUPAC name of acrolein?

(A) Prop-2-enal
(B) 2-methyl but-2-enal
(C) 3-methyl but-2-enal
(D) But-2-enal

65. What is the IUPAC name of following compound?



(A) 3 - chloro −5− methyl cyclopentanol

(B) 1− chloro −3− methyl cyclopentan −4− ol

(C) 4− chloro −2− methyl cyclopentanol

(D) 4-chloro −2 - hydroxy −1 - methylcyclopentane

66. Which among the following is allylic secondary alcohol?

(A) But-2-en-1-ol

(B) But-3-en-2-ol

(C) 2 -Methyl but-3-en-2-ol

(D) Prop-2-en-1-ol

67. What is molecular formula of 3-bromopropene?

(A) $C_3\ H_6Br$

(B) $C_3\ H_7Br$

(C) $C_3\ H_5Br$

(D) C_3H_3Br

68. What is the source of an alkane if it's molar mass is 240 g mol^{-1} and the percentage by mass of hydrogen is 15% ?

(A) Gasoline

(B) Diesel

(C) Petrol

(D) Coatings on green leaves

69. Aluminium crystallises in a face centred cubic structure, it's atomic radius is 125pm. What is the edge length of unit cell?

(A) 280pm

(B) 353.5pm

(C) 335.5pm

(D) 288.6pm

70. An element crystallises in a fcc lattice with cell edge 250pm. Calculate the density of an element (at.mass $= 90 \cdot 3$)

(A) $23 \cdot 12\ g\ cm^{-3}$

(B) $19 \cdot 20\ g\ cm^{-3}$

(C) $48 \cdot 40\ g\ cm^{-3}$

(D) $38.40\ g\ cm^{-3}$

71. An element with density $2 \cdot 8\ g\ cm^{-3}$ forms fec unit cell having edge length 4×10^{-8} cm. Calculate molar mass of the element.

(A) $33 \cdot 0\ g\ mol^{-1}$

(B) $22 \cdot 0\ g\ mol^{-1}$

(C) $27 \cdot 0\ g\ mol^{-1}$

(D) $36 \cdot 0\ g\ mol^{-1}$

72. What is the value of K_f if 30 g urea (molar mass 60) dissolved in $0.5dm^3$ of water decreases freezing point by $0 \cdot 15°C$?

(A) $0 \cdot 15\ K\ kg\ mol^{-1}$

(B) $0.030Kkgmol^{-1}$

(C) $0.30Kkgmol^{-1}$

(D) $0.015Kkgmol^{-1}$

73. Vapour pressure of solvent 'A' is 0.90 atm, when a non volatile solute is added, vapour pressure drops to 0.60 atm, what is mole fraction of A in solution?

(A) 0.300

(B) 0.333

(C) 0.500

(D) 0.667

74. How many electrons flow when a current of 5 amp is passed through a cell for 200 sec?

(A) 9.65×10^{21}

(B) $1 \cdot 60 \times 10^{21}$

(C) $3 \cdot 12 \times 10^{21}$

(D) $6 \cdot 24 \times 10^{21}$

75. If the conductivity of 0.08M KCl solution is $2 \times 10^{-2}\Omega^{-1}$, what is the molar conductivity of the solution?

(A) $350\ \Omega^{-1}Cm^2mol^{-1}$

(B) $250\ \Omega^{-1}Cm^2mol^{-1}$

(C) $25.0\ \Omega^{-1}Cm^2mol^{-1}$

(D) $0.25\ \Omega^{-1}Cm^2mol^{-1}$

76. The reaction $N_2O_5 \longrightarrow 2NO_2 + \frac{1}{2}O_2$ is first order in N_2O_5 having rate constant $6 \cdot 2 \times 10^{-4}\ s^{-1}$. What is the value of rate of reaction when concentration of N_2O_5 is $1 \cdot 25\ mol\ L^{-1}$?

(A) $7 \cdot 75 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$

(B) $8 \cdot 15 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$

(C) $4 \cdot 96 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$

(D) $2 \cdot 01 \times 10^{-4}\ mol\ L^{-1}\ s^{-1}$

77. The rate constant for first order reaction is $0.02232\ \text{min}^{-1}$. Calculate the time required for 75% completion of the reaction.

(A) $62 \cdot 12$ min
(B) 28.31 min
(C) 12.77 min
(D) $48 \cdot 12$ min

78. Which of the following is an example of hydrophobic sol?

(A) Rubber in benzene
(B) Cellulose acetate in acetone
(C) Metal sulphide
(D) Starch in water

79. What is the approximate ratio of roasted ore, coke and lime stone respectively in the charge to be added into blast furnace for extraction of iron?

(A) 5 : 12 : 3
(B) 12 : 3 : 5
(C) 12 : 5 : 3
(D) 5 : 3 : 12

80. What is the formula of pyrolusite ore?

(A) $PbCrO_4$
(B) Cu_2O
(C) Cr_2O_3
(D) MnO_2

81. What is the role of tuyers used in blast furnace for extraction of iron?

(A) It enables the even distribution of charge.
(B) To blow a blast of preheated air in to the furnace.
(C) It is used to remove molten slag and iron.
(D) It prevents loss of hot gases.

82. Which among the following oxides is amphoteric in nature?

(A) Cl_2O_7
(B) CaO
(C) B_2O_3
(D) SnO

83. P_4O_{10} reacts with water to produce

(A) $H_3P(OH)_3$
(B) H_3PO_3
(C) H_3PO_4
(D) $H_4P(OH)_3$

84. Which among the following is mineral of Sulphur?

(A) Fluorapatite
(B) Carnalite
(C) Cinnabar
(D) Sylvine

85. Which among the following is NOT a mineral of chlorine?

(A) Horn silver
(B) Cryolite
(C) Carnalite
(D) Sylvine

86. Which of the following elements exhibits oxidation states other than +3?

(A) Ce
(B) Gd
(C) Lu
(D) La

87. What is IUPAC name of $[CoCl_2(en)_2]^+$?

(A) Bis (ethylenediammine) dichloro cobalt (III) ion
(B) Dichloro ethylenediamine cobalt (I)
(C) diamine cobalt (I) dichloride
(D) Ethylene diamine cobalt chloride

88. Which from following complexes, the central metal ion does NOT obey EAN rule? (Atomic number - Pt = 78, Cu = 29, Zn = 30, Fe = 26)

(A) $[7n(NH_3)_4]^{2+}$
(B) $[Cu(NH_3)_4]^{2+}$
(C) $[Pt(NH_3)_6]^{4+}$
(D) $[Fe(G)_6]^{4-}$

89. An aqueous solution of sodium nitrite on boiling with α - chlorosodium propionate gives

(A) 1-Nitropropane
(B) Nitroethane
(C) 2-Nitropropane
(D) Nitromethane

90. Identify 'A' and 'B' respectively in following reaction Toluene $\xrightarrow{\frac{Cl_2}{hv}} A \xrightarrow{\frac{H_2O}{\Delta}} B$

(A) Benzoyl chloride and benzoic acid
(B) Benzoyl chloride and benzaldehyde
(C) Benzyl chloride and benzoic acid
(D) Benzyl chloride and benzaldehyde

91. Which of the following alcohols is NOT prepared by acid catalyzed hydration of alkenes?

(A) Ethanol
(B) Propan-2-ol
(C) Propan-1-ol
(D) Methylpropan-2-ol

92. Chromyl chloride converts methyl group to a chromium complex, which on acid hydrolysis gives corresponding aldehyde. This reaction is called

(A) Stephen reaction
(B) Wolff-Kishner reaction
(C) Etard reaction
(D) Rosenmund reaction

93. Which of the following reaction does NOT involve replacement of diazonium group?

(A) Reaction with potassium iodide
(B) Reaction with aniline
(C) Reaction with cuprous chloride in HCl
(D) Reaction with hypophosphorus acid

94. Primary nitroalkanes on boiling with hydrochloric acid undergo hydrolysis to form

(A) Alcohol and nitrous acid
(B) Carboxylic acid and hydroxyl amine
(C) Aldehyde and hydroxyl amine
(D) Ketone and nitrous acid

95. Identify the number of oxygen atoms present in saccharic acid?

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

96. How many moles of acetic acid is obtained in the reaction when one mole glucose is treated with excess acetic anhydride?

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

97. Which of the following properties is of thermoplastic polymer?

(A) These can't be recycled.
(B) These are either linear or branched chain polymers.
(C) These can't be remoulded.
(D) These do not become soft on heating.

98. Which of the following compounds contain -Co-NH-linkage?

(A) Vinylcyanide
(B) Dimethylterephthalate
(C) caprolactum
(D) Hexamethylenediamine

99. Which of the following artificial sweetener contain chlorine in it's molecular formula?

(A) Saccharine
(B) Alitame
(C) Aspartame
(D) Sucrulose

100. Which from following methods is NOT used to preserve food?

(A) Removel of heat
(B) Irradiation
(C) Addition of water
(D) Addition of heat

101. If $f(x)=\frac{3x+4}{5x-7}, x\neq\frac{7}{5}$ $g(x)=\frac{7x+4}{5x-3}, x\neq\frac{3}{5}$ then $(g\circ f)(3)=$

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

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

102. $\frac{\cos 12^\circ-\sin 12^\circ}{\cos 12^\circ+\sin 12^\circ}+\frac{\sin 147^\circ}{\cos 147^\circ}=$

(A) -2 (B) 0

(C) -1 (D) 1

103. If $\tan\theta+\sin\theta=a$ and $\tan\theta-\sin\theta=b$, then the values of $\cot\theta$ and $\operatorname{cosec}\theta$ are respectively

(A) $\frac{1}{a+b},\frac{1}{a-b}$ (B) $\frac{2}{a+b},\frac{2}{a-b}$

(C) $\frac{2}{a-b},\frac{2}{a+b}$ (D) $\frac{1}{a-b},\frac{1}{a+b}$

104. Which of the following have the same value (a) $\sin 120^\circ$ (b) $\cos 930^\circ$ (c) $\tan 840^\circ$ (d) $\cot(-1110^\circ)$

(A) only (a) and (b) (B) All $(a),(b),(c),(d)$

(C) only (a) and (c) (D) only (c) and (d)

105. In $\triangle ABC$, if $\frac{\cos A}{a}=\frac{\cos B}{b}=\frac{\cos c}{c}$ with usual notations, then the triangle is

(A) an isosceles triangle (B) an equilateral triangle

(C) a right angled scalene triangle (D) a scalene triangle

106. In a triangle ABC with usual notations, $\frac{\cos A-\cos C}{a-c}+\frac{\cos B}{b}=$

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

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

107. In a triangle ABC with usual notations, if $\tan A$, $\tan B$, $\tan C$ are in H.P., then a^2,b^2,c^2 are in

(A) $\boldsymbol{A_nP}$. (B) Not in A. P.

(C) H.P (D) $\boldsymbol{G}$.P

108. $\frac{1^2}{2}+\frac{1^2+2^2}{3}+\frac{1^2+2^2+3^2}{4}+\frac{1^2+2^2+3^2+4^2}{5}+\ldots\ldots\ldots\ldots$ upto 8 terms $=$

(A) 76 (B) 74

(C) 78 (D) 72

109. If $A(0,4,0),B(0,0,3)$ and $C(0,4,3)$ are the vertices of ΔABC, then its incentre is

(A) (2,0,3) (B) (3,0,2)

(C) (0,3,2) (D) (0,2,3)

110. The equation of a line passing through the point of intersection of the lines $-2y+8=0$ and $3x-y+4=0$ and having x and y intercept zero is

(A) $4x-5y=0$ (B) $5x-4y=0$

(C) $5x+4y=0$ (D) $4x+5y=0$

111. If one of the lines given by $kx^2+xy-y^2=0$ bisects the angle between the co-ordinate axes, then values of k are

(A) 1,2 (B) 1,3

(C) 0,2 (D) $-2,2$

112. The joint equation of pair of lines passing through (2,3) and parallel to the lines $x^2-y^2=0$

(A) $x^2-y^2-4x+6y-5=0$

(B) $x^2-y^2-4x+6y=0$

(C) $x^2-y^2-4x+6y+17=0$

(D) $x^2-y^2-4x+6y+2=0$

113. The equation of a circle passing through origin and making x -intercept 3 and y - intercept -5 is

(A) $x^2+y^2+3x+5y=0$

(B) $x^2+y^2+3x-5y=0$

(C) $x^2+y^2-3x+5y=0$

(D) $x^2+y^2-3x-5y=0$

114. If $P(\theta)$ lies on the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ and S and S' are foci of the hyperbola, then $SP.S'P=$

(A) $a^2\tan^2\theta-b^2\sec^2\theta$ (B) $a^2\tan^2\theta+b^2\sec^2\theta$

(C) $a^2\sec^2\theta+b^2\tan^2\theta$ (D) $a^2\sec^2\theta-b^2\tan^2\theta$

115. If the symbolic form of the switching circuit is $[\sim \mathrm{pv}(\mathrm{p} \wedge \sim \mathrm{q})]\mathrm{vq}$, then the current flows through the circuit onlyif

(A) irrespective of status of the switches
(B) one switch should be open and other should be closed
(C) both switches should be closed
(D) both switches should be open

116. If $(\sim \mathrm{p} \wedge \mathrm{q}) \rightarrow \mathrm{r}$ is false then the truth values of p, q, r are respectively

(A) **F, T, F**
(B) F, T, T
(C) T, T, F
(D) F, F, T

117. Given $\mathrm{A} = \{1, 2, 3, 4, 5\}$, $\mathrm{B} = \{1, 4, 5\}$. If R is a relation from A to B such that $(x, y) \in \mathrm{R}$ with $x > y$, then range of R is

(A) {1,4}
(B) {4,5}
(C) {1,4,5}
(D) {2,4}

118. If $A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$, then

(A) A is not invertible
(B) $A = A^{-1}$
(C) $A^{-1} = 2A$
(D) $A^{-1} = I$

119. The value of x such that the matrix $\begin{bmatrix} x & 2 & 3 \\ 4 & 5 & 6 \\ 2 & 3 & 5 \end{bmatrix}$ is not invertible is

(A) $\frac{-10}{7}$
(B) $\frac{7}{10}$
(C) $\frac{-7}{10}$
(D) $\frac{10}{7}$

120. If the function $f(x) = \frac{\log 10 + \log(0.1 + 2x)}{2x}$ if $x \neq 0 = k$ if $x = 0$ is continuous at $x = 0$, then $k + 2 =$

(A) 2
(B) 10
(C) 12
(D) 11

121. If $f(x) = e^x g(x), g(0) = 4, g'(0) = 2$, then $f'(0) =$

(A) 4
(B) 6
(C) 1
(D) 2

122. If $y = e^{\sin\left(\mathrm{cosec}^{-1} x\right)}$, then $\frac{dy}{dx} =$

(A) $\frac{e^{\frac{1}{x}}}{x^2}$
(B) $-\frac{e^{\frac{1}{x}}}{x^2}$
(C) 0
(D) $e^{\cos\left(\mathrm{cosec}^{-1} x\right)}$

123. The function $f(x) = \log x - \frac{2x}{x+2}$

(A) $x \in (-\infty, 1)$
(B) $x \in (-1, \infty)$
(C) $x \in (-\infty, 0)$
(D) $x \in (0, \infty)$

124. The approximate value of $\log_{10} 99$ is (Given $\log_{10} \mathrm{e} = 0.4343$)

(A) 1.9657
(B) 1.9857
(C) 1.1.9957
(D) 1.9757

125. If the displacement of a particle at a point is given by $s = 3t^2 - 12t + 14$, then the displacement of the particle when its velocity becomes zero is

(A) 14 units
(B) 4 units
(C) 0 units
(D) 2 units

126. $\int \left[\frac{1 - \log x}{1 + (\log x)^2}\right]^2 dx =$

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

127. $\int \frac{\sin x}{\sin\left(x - \frac{\pi}{4}\right)} dx =$

(A) $\frac{1}{\sqrt{2}}\left[x + \log\left|\sin\left(x - \frac{\pi}{4}\right)\right|\right] + c$
(B) $x + \log\left|\sin\left(x - \frac{\pi}{4}\right)\right| + c$
(C) $x - \log\left|\sin\left(x - \frac{\pi}{4}\right)\right| + c$
(D) $\frac{1}{\sqrt{2}}\left[x - \log\left|\sin\left(x - \frac{\pi}{4}\right)\right|\right] + c$

128. $\int \left[\log(1 + \cos x) - x \tan\left(\frac{x}{2}\right)\right] dx =$

(A) $x \log|x| + c$
(B) $x \log|1 + \sin x| + c$
(C) $x \log\left|\tan\frac{x}{2}\right| + c$
(D) $x \log|1 + \cos x| + c$

129. $\int_{-1}^{1} \left[\sqrt{1 + x + x^2} - \sqrt{1 - x + x^2}\right] dx =$

(A) 2
(B) 5
(C) 1
(D) 0

130. $\int_0^{\frac{\pi}{2}} \frac{dx}{1+\cos x} =$

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

131. $\int_0^{\pi} \frac{x \cos x \cdot \sin x}{\cos^3 x + \cos x} dx =$

(A) $\frac{\pi}{4}$
(B) $\frac{\pi^2}{4}$
(C) $\frac{\pi}{8}$
(D) $\frac{\pi^2}{8}$

132. The area bounded by the circle $x^2 + y^2 = 16$ and lines x=0 and x=2 is

(A) $\left[4\sqrt{3} + \frac{8\pi}{3}\right]$ sq. units (B) $\frac{1}{2}\left[4\sqrt{3} + \frac{8\pi}{3}\right]$ sq. units

(C) $\left[4\sqrt{3} - \frac{8\pi}{3}\right]$ sq. units (D) $\frac{1}{2}\left[4\sqrt{3} - \frac{8\pi}{3}\right]$ sq. units

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

(A) $ye^x = x + c$ (B) $ye^{2x} = x + c$

(C) $ye^x = e^{2x} + c$ (D) $ye^{2x} = e^x + c$

134. The particular solution of the differential equation $\left(y + x \cdot \frac{dy}{dx}\right) \cdot \sin xy = \cos x$ at $x = 0$ is

(A) $\sin x + \cos xy = 1$ (B) $\cos x - \sin xy = 1$

(C) $\sin x - \cos xy = 1$ (D) $\cos x + \sin xy = 1$

135. $If \frac{x}{x-y} = \log\left(\frac{a}{x-y}\right)$, then $\frac{dy}{dx} =$

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

(C) $\frac{2x-y}{x}$ (D) $\frac{x-2y}{y}$

136. The rate of decay of mass of certain substance at time tis proportional to the tt that instant. The time during which the original mass of m_0 gram will be leftht m, gram is (k is constant of proportionality

(A) $\frac{1}{k}\log\left(\frac{m_1}{m_0}\right)$ (B) $k\log\left(\frac{m_0}{m_1}\right)$

(C) $k\log\left(\frac{m_1}{m_0}\right)$ (D) $\frac{1}{k}\log\left(\frac{m_0}{m_1}\right)$

137. $y = mx + \frac{2}{m}$ is the general solution of

(A) $y\left(\frac{dy}{dx}\right)^2 = x\left(\frac{dy}{dx}\right) + 2$

(B) $y = x\frac{dy}{dx} + 2$

(C) $y\left(\frac{dy}{dx}\right) = x\left(\frac{dy}{dx}\right)^2 + 2$

(D) $y\left(\frac{dy}{dx}\right) = x + 2$

138. If the population grows at the rate 5% peryear, then the time taken for the population to become double is (Given $\log 2 = 0.6912$)

(A) 13.8275 years (B) 13.624 years

(C) 13.725 years (D) 13.8240 years

139. If $[\bar{a}\bar{b}\bar{c}] = 3$, then the volume of the parallelopiped with $2\bar{a} + \bar{b}, 2\bar{b} + \bar{c}, 2\bar{c} + \bar{a}$ as coterminus edges is

(A) 22 cubic units (B) 15 cubic units

(C) 27 cubic units (D) 25 cubic units

140. ABCD is a parallelogram, P is the midpoint of AB. If R is the point of intersection of AC and DP, then R divides AC internally in the ratio

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

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

141. If the angle between the lines whose direction ratios are $4, -3, 5$ and $3, 4, k$ is $\frac{\pi}{3}$, then $k =$

(A) ± 7 (B) ± 10

(C) ± 5 (D) ± 6

142. The equation of line passing through the points $(3, 4, -7)$ and $(6, -1, 1)$ is

(A) $\frac{x-3}{3} = \frac{y-4}{-5} = \frac{z+7}{8}$ (B) $\frac{x-3}{3} = \frac{y-4}{5} = \frac{z+7}{8}$

(C) $\frac{x-3}{-3} = \frac{y-4}{-5} = \frac{z+7}{8}$ (D) $\frac{x-3}{3} = \frac{y-4}{-5} = \frac{z-7}{8}$

143. The co-ordinates of the foot of the perpendicular from the point $(0, 2, 3)$ on the line $\frac{x+3}{5} = \frac{y-1}{2} = \frac{z+4}{3}$ are

(A) $(-2, -3, 1)$ (B) $(2, 3, -1)$

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

144. A $A(3, 2, -1)$ and $B(1, 4, 3)$, then equation of the plane which bisects segment AB perpendicularly

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

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

145. The equation of a plane passing through the intersection of two planes $x + 2y - 3z + 2 = 0$ and $6x + y + z + 1 = 0$ and parallel to the line $x - 1 = y + 2 = 7 - z$ is

(A) $5x - y + 4z + 1 = 0$

(B) $5x + y + 4z + 1 = 0$

(C) $5x - y + 4z = 1$

(D) $5x + y + 4z = 1$

146. The maximum value of $Z = 10x + 25y$ subject to $0 \le x \le 3, 0 \le y \le 3$, $x + y \le 5, x \ge 0, y \ge 0$ is

(A) 110 (B) 100

(C) 120 (D) 95

147. If $X \sim B(4, p)$ and $2P(X = 3) = 3P(X = 2)$ then value of p is

(A) $\frac{9}{13}$ (B) $\frac{4}{13}$

(C) $\frac{1}{13}$ (D) $\frac{12}{13}$

148. The probability distribution of a discrete r. v. X is

X = x	0	1	2	3	4
P(X = x)	k	$2k$	4k	$2k$	k

then value of $P(X \leq 2)$ is

(A) $\frac{1}{10}$ (B) $\frac{7}{10}$

(C) $\frac{3}{10}$ (D) $\frac{9}{10}$

149. If the error involved in making a certain measurement is continuous random variable X with probability density function $f(x) = k\left(4 - x^2\right)$ if $-2 \leq x \leq 2 \ = 0$, otherwise then, $P[-1 < X < 1] =$

(A) $\frac{13}{16}$ (B) $\frac{1}{2}$

(C) $\frac{1}{3}$ (D) $\frac{11}{16}$

150. Two dice are thrown together. The probability that sum of the numbers is divisible by 2 or 3 is

(A) $\frac{1}{6}$ (B) $\frac{3}{4}$

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

- End of Question Paper -

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