MHT CET 2026 PCM May 20 Shift 1 Question Paper

Conducted by the State Common Entrance Test Cell, Maharashtra

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

General Instructions

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

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

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

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

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

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

1. Let $\vec{P} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{Q} = -\hat{i} - \hat{j} - \hat{k}$. The angle between $(\vec{P} - \vec{Q})$ and $\vec{P}$ is

(A) 90° (B) 30°

(C) 60° (D) 0°

2. Mass and volume of a body are found to be (6.00 ± 0.03) kg and (2.00 ± 0.02) m^3 respectively. Then the density of the body is

(A) 3 ± 0.010 kg/m^3 (B) 3 ± 0.015 kg/m^3

(C) 3 ± 0.020 kg/m^3 (D) 3 ± 0.045 kg/m^3

3. A body moving with uniform acceleration travel 16 m in the third second of its motion and 24 m in the fifth second of its motion. The velocity of the body in 10 second is

(A) 42 m/s (B) 46 m/s

(C) 50 m/s (D) 56 m/s

4. The kinetic energy of light body and a heavy body is same. Which one of the following statement is true?

(A) Both bodies have same momentum (B) Heavy body has greater momentum

(C) Lighter body has greater momentum (D) A body having high velocity has greater momentum

5. If 'm' is the mass of the body moving with velocity 'v' having kinetic energy 'E', then the linear momentum of the body is

(A) $E\sqrt{m}$ (B) $m\sqrt{E}$

(C) $2E\sqrt{m}$ (D) $\sqrt{2mE}$

6. At the corners of an equilateral triangle of side L, point masses, each of mass 2 kg are placed. The moment of inertia of the system about an axis along any one side is (in kg$-m^2$)

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

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

7. The moment of inertia of two rotating bodies 'X' and 'Y' are I_1 and I_2 respectively where $I_2 > I_1$. If K_x and K_y are their rotational kinetic energies and their angular momenta are equal, then

(A) $K_x = K_y$ (B) $K_x > K_y$

(C) $K_x < K_y$ (D) $K_x = \frac{K_y}{2}$

8. The geostationary satellite is revolving round the earth of mean radius R. If g is the acceleration due to gravity at earth's surface, ω is the angular speed of rotation of earth about its own axis and r is the radius of orbit of a satellite, then the correct relation between r, ω, g and R is

(A) $r^2 = \frac{gR^2}{w^3}$ (B) $R^2 = \frac{r^3w^2}{g}$

(C) $R^3 = \frac{r^2w}{g^2}$ (D) $R = \sqrt{\frac{rw^3}{g}}$

9. 729 water droplets of equal radii combine to form a big drop. The ratio of final surface energy to the total initial surface energy is

(A) 729 : 1 (B) 8 : 1

(C) 1 : 81 (D) 1 : 9

10. Water rises to a height of 2.2 cm in glass capillary tube. The height to which water will rise in another capillary having one-fourth area of cross-section as that of the first is.

(A) 4.2 cm (B) 4.4 cm

(C) 3.4 cm (D) 5.2 cm

11. If a capillary tube is immersed in water, rise of water in capillary is h_1. When the whole arrangement is taken to a depth d in a mine, the water level rises to h_2. The ratio $\frac{h_2}{h_1}$ is (R=radius of earth)

(A) $\frac{R+d}{4}$ (B) $\frac{R-d}{R}$

(C) $\frac{R}{(R+d)}$ (D) $\frac{R}{(R-d)}$

12. Temperature of two stars are in the ratio 3 : 2 . If wavelength of maximum intensity of first star is 4200Å, the corresponding wavelength for second star is

(A) 2100Å (B) 3000Å

(C) 6300Å (D) 7000Å

13. Identify the INCORRECT statement about the black body radiation

(A) Intensity is same for all wavelengths. (B) Intensity is maximum for a particular wavelength.

(C) Intensity is less for longer wavelengths. (D) A black body emits all wavelengths.

14. 540 gram of ice at 0°C is mixed with 540 gram of water at 90°C. The final temperature of the mixture will be [Latent heat of fusion of water = 80 cal/g]

(A) 10°C (B) 15°C

(C) 5°C (D) 30°C

15. Two bodies 'X' and 'Y' at temperatures T_1 K and T_2 K respectively have the same dimensions. Their emissivities e_1 and e_2 are in the ratio of 1 : 6 . If their emissive powers are same, the relation between their temperatures is

(A) $T_1 : T_2 = 4^{1/4} : 1$ (B) $T_1 : T_2 = 5^{1/4} : 1$

(C) $T_1 : T_2 = 6^{1/4} : 1$ (D) $T_1 : T_2 = 7^{1/4} : 1$

16. In case of 'free expansion', which one of the following statements is 'WRONG'?

(A) It is an instantaneous change. (B) The system is not in thermodynamic equilibrium.

(C) Free expansion can be plotted in a p-v diagram. (D) It is an uncontrolled change.

17. An ideal gas having pressure P, volume V and temperature T undergoes a thermodynamic process in which $dW = 0$ and $dQ < 0$. Then, for the gas

(A) V will increase (B) T will increase

(C) P first decreases and then increases (D) T will decrease

18. A spring of force constant 180 N/m is loaded with a mass 0.20 kg. The amplitude of oscillations is 4 cm. When mass comes to equillibrium position, its velocity in m/s is

(A) 12 (B) 1.2

(C) 0.12 (D) 0.012

19. The bob of a simple pendulum is a hollow sphere with a small hole in the bottom. It is filled with sand and set into oscillation. Its periodic time (T) is measured at regular intervals. As the sand starts coming out we find that.

(A) T increases with time (B) T does not change with time

(C) T first decreases and then increases (D) T first increases and then decreases

20. A simple pendulum performs simple harmonic motion about $x = 0$ with an amplitude 'A' and angular frequency ω. The speed of pendulum at $x = \frac{A}{8}$ will be.

(A) $\frac{\sqrt{61}A\omega}{8}$ (B) $\frac{\sqrt{62}A\omega}{8}$

(C) $\frac{\sqrt{63}A\omega}{8}$ (D) $\frac{\sqrt{65}A\omega}{8}$

21. Two vibrating metal wires of the same material of length 'L' and '3L' and have radii '2r' and 'r' respectively. They are stretched under same tension. Both the wires vibrate in their fundamental modes. The ratio $\frac{n_1}{n_2}$ is [n_1 and n_2 are the frequencies of first and second wire respectively]

(A) 1 : 1 (B) 1.5 : 1

(C) 2 : 1 (D) 2.5 : 1

22. A body sends waves 150 mm long through medium P and 0.30 m long in medium Q. If the velocity of wave in medium P is 80 cm/s, the velocity of wave in medium Q in m/s is

(A) 1.6 (B) 2.0

(C) 3.2 (D) 3.8

23. There are two wires vibrating with same frequency of 500 Hz. Tension in one wire is increased by 'x' % so that 5 beats per second are heard. The value of 'x' in % is

(A) 5 (B) 4

(C) 3 (D) 2

24. A pipe open at both ends has length 1 m. The air column in a pipe cannot resonate for a frequency (Neglect end correction, speed of sound in air = 340 m/s)

(A) 510 Hz (B) 340 Hz

(C) 170 Hz (D) 85 Hz

25. An electric charge of magnitude '$2e$' and mass '$2m$' is moving in an electric field 'E'. The acceleration imparted to the charge is

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

(C) $\frac{eE}{2m}$ (D) $\frac{me}{2E}$

26. Polar molecules are those in which

(A) they have symmetric shape.

(B) centre of mass of positive charges does not coincide with centre of mass of negative charges.

(C) they have no permanent dipole moments.

(D) centre of mass of positive charges coincide with centre of mass of negative charges.

27. Three equal $(+q)$ charges are placed in air at the vertices of equilateral triangle. If the side of equilateral triangle is l, the net potential energy of the system is $\left[K = \frac{1}{4\pi\epsilon_0}\right]$

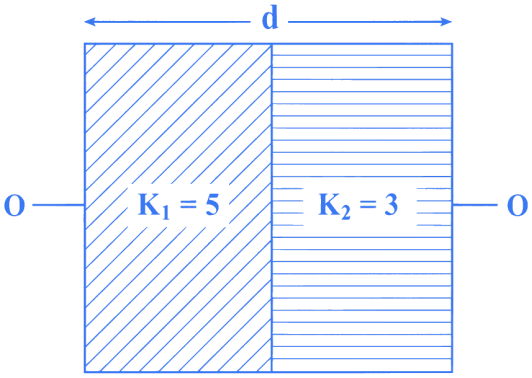
(A) $\frac{kq^2}{l}$

(B) $\frac{2kq^2}{l}$

(C) $\frac{3kq^2}{l}$

(D) $\frac{4kq^2}{l}$

28. Air capacitor has capacitance C_1. The space between two plates of capacitor is filled with two dielectric as shown in figure. The new capacitance of the capacitor is C_2. Then $\frac{C_1}{C_2}$ is [d = distance between two plates, K_1 and K_2 are dielectric constants of first and second dielectrics respectively]



(A) $\frac{11}{30}$

(B) $\frac{8}{30}$

(C) $\frac{7}{30}$

(D) $\frac{13}{30}$

29. A voltmeter with series resistance R has a range $(0 - V_1)$ volt. With a series resistance of $4R$, its range becomes $(0 - V_2)$ volt. The relation between V_1 and V_2 is

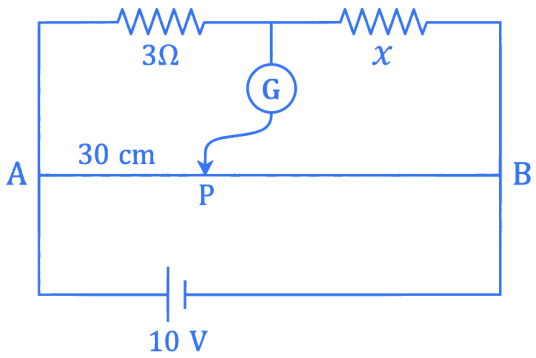
(A) $V_2 = 4V_1$

(B) $V_2 < 4V_1$

(C) $V_2 > 4V_1$

(D) $V_2 = \frac{V_1}{4}$

30. A balanced meter bridge is shown in the circuit diagram. The meter bridge wire has resistance $2\frac{\Omega}{cm}$. The current drawn from the battery is (Internal resistance of the battery is negligible)



(A) 0.6 A

(B) 0.8 A

(C) 0.95 A

(D) 1.05 A

31. A rectangular coil of n turns has area $\vec{A}$ and it is placed in uniform magnetic field $\vec{B}$. If the current passing through the coil is 'I' then the torque acting on the coil is

(A) $\frac{I}{n}(\vec{A} \times \vec{B})$

(B) $nI(\vec{A} \cdot \vec{B})$

(C) $nI(\vec{A} \times \vec{B})$

(D) $\frac{n}{I}(\vec{A} \cdot \vec{B})$

32. A circular coil having n turns, each of radius 'r' carries a current I. The magnetic field at a distance $x = \sqrt{8}r$ from its centre along the axis of the coil is (μ_0 = permeability of free space)

(A) $\frac{\mu_0 nI}{51r}$

(B) $\frac{\mu_0 nI}{52r}$

(C) $\frac{\mu_0 nI}{53r}$

(D) $\frac{\mu_0 nI}{54r}$

33. A coil having effective area 'A' is held with its plane normal to a magnetic field of induction 'B'. The magnetic induction is quickly reduced to 25% of its initial value in 2 second. Then e.m.f. induced across the coil will be

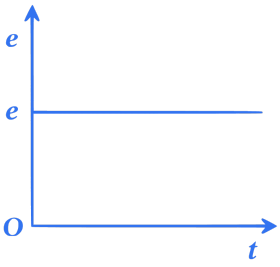
(A) $\frac{AB}{2}$

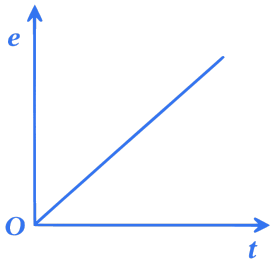
(B) $\frac{AB}{4}$

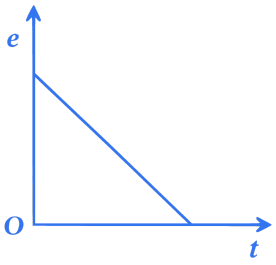
(C) $\frac{3AB}{4}$

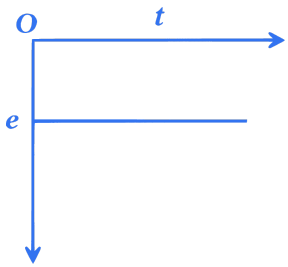
(D) $\frac{3AB}{8}$

34. The current flowing through an inductor of self-inductance L is continuously increasing at constant rate. The variation of induced e.m.f. (e) versus time t is shown graphically by

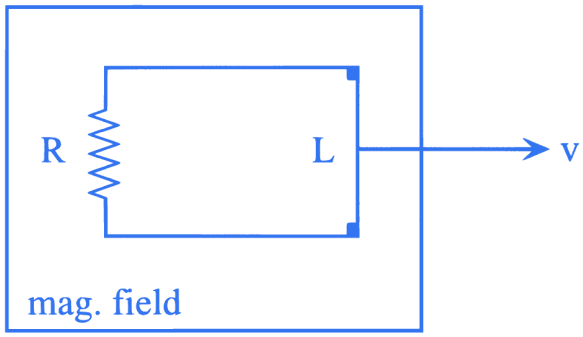
(A) 

(B) 

(C) 

(D) 

35. A long metal rod of length 'L' completes the circuit. The area of the coil is perpendicular to magnetic field 'B'. Total resistance of the circuit is 'R'. The force needed to move the rod in the direction as shown with constant speed 'V' is

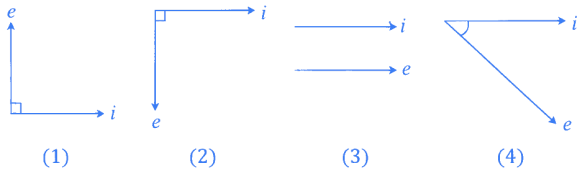


(A) $\frac{BL^2V^2}{2R}$ (B) $\frac{BL^2V}{4R}$
(C) $\frac{B^2VL^2}{R}$ (D) $\frac{BLV}{R}$

36. A bar magnet falls from a height through a metal pipe. Its acceleration will be (g = acceleration due to gravity)

(A) less than g (B) greater than g
(C) equal to g (D) zero

37. The correct phasor diagram for an a.c. circuit containing only pure capacitor.



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

38. A resistor of 200Ω, an inductor of self inductance $\left(\frac{2}{\pi^2}\right)$ H and a capacitor of unknown capacity are connected in series to an a.c. source of 100 V and 50 Hz. When the current and voltage are in phase the capacitance and the power dissipated is

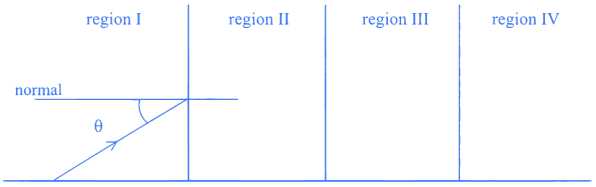
(A) 2×10^{-5} F, 25 W (B) 4×10^{-5} F, 100 W
(C) 5×10^{-5} F, 50 W (D) 3×10^{-5} F, 200 W

39. The focal length of a glass convex lens in air is f_a and that in water is f_w. The refractive index from air to glass is $\frac{3}{2}$ and that from air to water is $\frac{4}{3}$. The ratio $f_a : f_w$ is

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

(C) 1 : 4 (D) 1 : 8

40. A beam of light is travelling from region I to region IV. The refractive indices in regions I, II, III and IV are n, $\frac{n}{2}$, $\frac{n}{3}$ and $\frac{n}{4}$ respectively. The angle of incidence for which the beam just misses entering region IV is [$\sin 90^\circ = 1$]



(A) $\sin^{-1}(1)$ (B) $\sin^{-1}\left(\frac{1}{2}\right)$

(C) $\sin^{-1}\left(\frac{1}{3}\right)$ (D) $\sin^{-1}\left(\frac{1}{4}\right)$

41. In the Young's double slit experiment, when a glass plate of thickness 't' is introduced in the path of one of the slits, the intensity at the position where the central maximum occurred previously remains unchanged. The minimum thickness of glass plate is [refractive index of glass plate = 1.5, wavelength of light in vacuum is λ]

(A) 2λ (B) $\frac{2\lambda}{3}$

(C) $\frac{\lambda}{3}$ (D) λ

42. The interference pattern is obtained with two coherent light sources of intensity (I_1 and I_2) ratio 'β'. In the interference pattern, the ratio $\left(\frac{I_{max}+I_{min}}{I_{max}-I_{min}}\right)$ will be $\left(\beta = \frac{I_2}{I_1}\right)$

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

(C) $\frac{\beta+1}{2\sqrt{\beta}}$ (D) $\frac{(\beta+1)^2}{2(\sqrt{\beta})}$

43. Light of incident frequency three times the threshold frequency is incident on a photo sensitive material. If the incident frequency is made $\left(\frac{1}{3}\right)^{rd}$ and intensity is doubled then photoelectric current will

(A) be zero (B) be halved

(C) be increased (D) be decreased

44. The wavelength 'λ' of photon and the de-Broglie wavelength of an electron have same value. The ratio of kinetic energy of electron to the energy of a photon is (m=mass of electron, h = Planck's constant, c = velocity of light)

(A) $\frac{h}{2\lambda mc}$ (B) $\frac{h\lambda}{2mc}$

(C) $\frac{2c}{hm\lambda}$ (D) $\frac{m\lambda}{2hc}$

45. The relation between magnetic moment (M) of revolving electron of charge (e) and mass (m) having principle quantum number (n) is (h = Planck's constant)

(A) $\frac{M}{n} = \frac{eh}{4\pi m}$ (B) $\frac{M}{n} = \frac{2\pi m}{eh}$

(C) $\frac{M}{4\pi} = \frac{nm}{eh}$ (D) $\frac{M}{eh} = 4\pi nm$

46. Which one of the following spectral series of hydrogen atom lies in ultraviolet region?

(A) Lyman (B) Paschen

(C) Brackett (D) Pfund

47. Which one of the following is possible nuclear reaction?

(A) ${}_5B^{10} + {}_2He^4 \rightarrow {}_7N^{13} + {}_1H^1$

(B) ${}_{11}Na^{23} + {}_1H^1 \rightarrow {}_{10}N^{20} + {}_2He^4$

(C) ${}_{93}Np^{239} \rightarrow {}_{94}Pu^{239} + {}_{-1}e^0$

(D) ${}_7N^{11} + {}_1H^1 \rightarrow {}_6C^{12} + {}_{-1}e^0$

48. In case of thermistor, which one of the following statements is 'WRONG'?

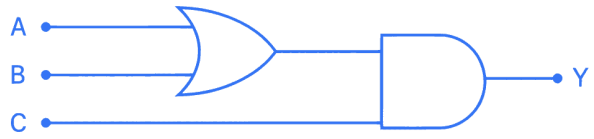
(A) Resistance of NTC thermistor decreases with increase in its temperature.

(B) Resistance of PTC thermistor decreases with increase in its temperature.

(C) NTC thermistors are commonly used as temperature sensors.

(D) PTC thermistors are generally used as resettable fuses.

49. To get output zero for the following circuit, the correct choice for the input is



a. $A = 1, B = 1, C = 0$
b. $A = 0, B = 1, C = 0$
c. $A = 1, B = 1, C = 1$
d. $A = 1, B = 0, C = 1$

(A) a and b
(B) c and d
(C) a and c
(D) b and d

50. In a two input logic gate, when one input is '1' and the other is '0' (zero), the output is '1'. But even if both inputs are '0' (zero), the output is '1'. The logic gate is

(A) an AND gate.
(B) an X-OR gate.
(C) a NAND gate.
(D) a NOR gate.

51. Which of the following gases has the maximum number of molecules?

(A) 3.5 g N_2 (B) 0.5 g H_2
(C) 3.2 g O_2 (D) 4.6 g NO_2

52. What is the energy of an electron in a hydrogen atom whose angular momentum is h/π ?

(A) -2.18×10^{-18} J (B) -5.45×10^{-19} J
(C) -2.42×10^{-19} J (D) -1.36×10^{-19} J

53. Which of the following is an example of diamagnetic species?

(A) Fe (B) Gd
(C) H_2O (D) Fe^{3+}

54. Which of the following compounds exhibits the highest boiling point?

(A) Propane. (B) Dimethyl ether.
(C) Methyl chloride. (D) Methyl cynide.

55. Which of the following pair of compounds consists equal number of lone pair of electrons in the valence shell of central atom?

(A) BrF_5 and XeF_6 (B) ICl and H_2S
(C) ClF_3 and XeF_2 (D) IF_7 and XeF_4

56. Find the entropy change of the surrounding if the standard enthalpy of formation of a substance is -447 kJ mol^{-1}

(A) 1500 J K^{-1} (B) -1500 J K^{-1}
(C) 1000 J K^{-1} (D) -1000 J K^{-1}

57. Calculate the amount of heat evolved when 33 g. $CO_2(g)$ formed if the reaction is

$CH_2O(g) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$; $\Delta H = -527$ kJ

(A) 527 kJ (B) 395.3 kJ
(C) 263.5 kJ (D) 131.8 kJ

58. Which of the following statements is correct about temperature and internal energy ?

(A) Both are extensive properties of the system. (B) Both are the intensive properties of the system.
(C) Intensive and extensive properties of the system respectively. (D) Extensive and intensive properties of the system respectively.

59. What is the pH of 0.01 M acetic acid that is 1% ionized?

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

60. Determine the $[OH^-]$ of a solution of weak base BOH having its pH 9.75 at 298 K.

(A) 6.512×10^{-5} M (B) 5.623×10^{-5} M
(C) 4.647×10^{-5} M (D) 3.540×10^{-5} M

61. Which from following buffers is used as highly effective stabilizer in the preparation of penicillin?

(A) Ammonium hydroxide and ammonium chloride (B) Acetic acid and sodium acetate
(C) Formic acid and sodium acetate (D) Citric acid and sodium citrate

62. Find out the oxidation state of oxygen in H_2O_2

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

63. Which element from group 2 of periodic table resembles with lithium for different properties ?

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

64. What type of oxide the Al_2O_3 is?

(A) Acidic oxide (B) Basic oxide
(C) Amphoteric oxide (D) Neutral oxide

65. Number of optically active stereoisomer are possible for butane-2,3-diol

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

66. Identify optically inactive compound from the following.

(A) Lactic acid
(B) Glucose
(C) Isopropyl alcohol
(D) 2-chlorobutane

67. What type of isomerism is shown by the following pair of compounds?
$CH_3 - CH_2 - NH - CH_2 - CH_3$ and
$CH_3 - NH - CH_2 - CH_2 - CH_3$

(A) Chain isomerism
(B) Position isomerism
(C) Functional isomerism
(D) Metamerism

68. Identify the reaction when toluene is converted to benzaldehyde by using chromyl chloride.

(A) Etard reaction
(B) Gattermann-Koch reaction
(C) Cannizzaro reaction
(D) Wurtz reaction

69. Ethene reacts with cold and dilute alkaline potassium permanganate to from

(A) Ethanol
(B) Ethane-1,2-diol
(C) Ethanoic acid
(D) Ethanal

70. Green chemistry helps to protect the presence of the ozone layer in,

(A) atmosphere
(B) stratosphere
(C) lithosphere
(D) homosphere

71. Calculate the density of fcc crystal structure having molar mass 58.5 g mol^{-1} and edge length 564 pm ($N_A = 6.022 \times 10^{23}$)

(A) 2.17 g/cm^3
(B) 1.89 g/cm^3
(C) 4.12 g/cm^3
(D) 3.22 g/cm^3

72. Which of the following statement is correct in the context of defects in a crystal?

(A) AgCl as well as CaF_2 has a schottky defect.
(B) AgCl as well as CaF_2 have anion Frenkel defect.
(C) AgCl has cation Frenkel defect and CaF_2 has anion Frenkel defect.
(D) AgCl has cation Frenkel defect and CaF_2 has schottky defect.

73. What is degree of dissociation of K_2SO_4 if the observed elevation in boiling point of electrolytic solution is 0.1352°C and normal elevation in boiling point of a non-electrolytic solution of same concentration is 0.052°C ?

(A) 0.5
(B) 0.6
(C) 0.7
(D) 0.8

74. Which of the following solutions is isotonic to 0.1 M NaCl solution at the same temperature, assuming complete dissociation of NaCl ? (Molar mass of glucose = 180 g/mol)

(A) A solution containing 18 g glucose in 500 ml solution.
(B) A solution containing 1.8 g glucose in 1000 ml solution.
(C) A solution containing 3.6 g glucose in 500 ml solution.
(D) A solution containing 7.2 g glucose in 250 ml solution.

75. Identify the correct order of solubility of NaCl, Na_2SO_4 and $NaNO_3$ in water with increase in temperature.

(A) $NaCl > Na_2SO_4 > NaNO_3$
(B) $NaNO_3 > NaCl > Na_2SO_4$
(C) $Na_2SO_4 > NaCl > NaNO_3$
(D) $NaCl > Na_2SO_4 = NaNO_3$

76. Calculate the standard emf of Zn-Cu cell if $E^{\circ}(Zn^{2+}/Zn) = -0.76$ V and $E^{0}(Cu^{2+}/Cu) = 0.34$ V

(A) 0.42 V
(B) 0.76 V
(C) 1.1 V
(D) 1.52 V

77. The molar conductivities of NaCl, HCl and C_2H_5COONa at infinite dilution are 126.45, 426.16 and 91 $ohm^{-1}cm^2$. The molar conductivity of C_2H_5COOH is

(A) 201.28 $ohm^{-1}cm^2$
(B) 698.28 $ohm^{-1}cm^2$
(C) 540.48 $ohm^{-1}cm^2$
(D) 390.71 $ohm^{-1}cm^2$

78. Identify the **FALSE** statement from the following.

(A) Standard cell potential of galvanic cell is an extensive property.

(B) Standard electrode potential is an intensive property.

(C) For spontaneous cell reaction in galvanic cell, free energy change should be negative.

(D) For spontaneous cell reaction in galvanic cell equilibrium constant of reaction should be greater than 1.

79. The half life of a first order reaction is 13.86 minutes. Calculate the time required for the reactant to be reduced to 20%.

(A) 8.05 min.

(B) 16.1 min.

(C) 32.2 min.

(D) 48.3 min.

80. What is the role of MnO_2 during the thermal decomposition of $KClO_3$?

(A) It increases the reaction's enthalpy.

(B) It increases the energy of activation of the reaction.

(C) It decreases the energy of activation of the reaction.

(D) It reduces the rate of collisions between reactant molecules.

81. Which of the following statements is NOT true for the reaction, $4A + B \rightarrow 2C + 2D$?

(A) The rate of consumption of B is $(1/4)^{th}$ the rate of consumption of A.

(B) The rate of formation of D is half the rate of consumption of A.

(C) The rate of formation of C is half the rate of consumption of B.

(D) The rate of formation of C and D are equal.

82. Identify false statement among the following regarding adsorption.

(A) It is a surface phenomenon.

(B) It is an exothermic process.

(C) Gases having low critical temperature can be readily adsorbed by solid adsorbent.

(D) Colloidal substances acts as good adsorbents.

83. Sulfuric acid is used as a dehydrating agent in the following reaction. Identify the term used for carbon left.

$C_{12}H_{22}O_{11} \xrightarrow{H_2SO_4} 12C + 11H_2O$

(A) sugar charcoal

(B) charring

(C) graphite

(D) fused mixture

84. Identify the most stable oxidation state of iron by following.

(A) $+2$

(B) $+3$

(C) $+6$

(D) $+4$

85. Identify the number of lanthanoids among the following, exhibiting the $+4$ oxidation state.
Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy

(A) 5

(B) 3

(C) 4

(D) 6

86. Which of the following coordination compounds exhibits optical isomerism?

(A) Pentaamminenitrocobalt (III) iodide

(B) Diamminedichloroplatinum (II)

(C) trans-Dicyanobis (ethyleneddiamine) chromium (III) chloride

(D) Tris(ethylenediamine)cobalt(III) bromide.

87. Identify the isomerism exhibited by complex compounds $[Co(NH_3)_5SO_4]Br$ and $[Co(NH_3)_5Br]SO_4$

(A) coordination isomers

(B) geometrical isomers

(C) optical isomers

(D) ionisation isomers

88. The reactivity order of halides for dehydrohalogenation is.

(A) R-F > R-Cl > R-Br > R-I

(B) R-I > R-Br > R-Cl > R-F

(C) R-I > R-Cl > R-Br > R-F

(D) R-F > R-I > R-Br > R-Cl

89. What is the product formed when a primary alcohol undergoes catalytic dehydrogenation by passing its vapor over heated copper at 573 K ?

(A) Ketone

(B) Aldehyde

(C) Alkene

(D) Ether

90. Identify the product of the following reaction.

$CH_3CH_2CH_2OH + SOCl_2 \rightarrow P$

(A) $CH_3CH_2CH_2Cl + SO_2 + HCl$

(B) $CH_3CH_2CH_2Br$

(C) CH_3CH_2OH

(D) $CH_3CH_2CH_2OCl$

91. In haloform reaction of acetaldehyde and all methyl ketones (CH_3COR), methyl group is converted to

(A) sodium salt

(B) haloform

(C) sodium hydroxide

(D) sodium hypohalite

92. Which of the following compounds shows Silver mirror test ?

(A) Acetone

(B) Acetaldehyde

(C) Ethanol

(D) Benzophenone

93. Identify the false statement regarding amide from the following.

(A) Amide is obtained on reaction of amines with acetyl chloride.

(B) Amide is more basic than amine

(C) Acylation of amine is a nucleophilic substitution reaction.

(D) The acylation reaction is carried out in presence of base.

94. Which of the following compounds on respective treatment form salfanilic acid ?

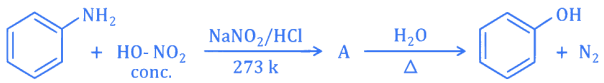
(A) Sulfuric acid and benzaldehyde

(B) Sulfuric acid and aniline

(C) Sulfuric acid and ethyl amine

(D) Sulfuric acid and acetanilide

95. Identify A in the following reaction.



(A) Cumene hydroperoxide

(B) Sodium benzene sulfonate

(C) Sodium phenoxide

(D) Benzene diazonium chloride

96. Which of the following arrangements represents the primary structure of proteins?

(A) The three - dimensional folding of the polypeptide chain.

(B) The sequence of amino acids linked by peptide bond.

(C) The interactions between different polypeptide chains.

(D) The formation of alpha helix and beta pleated sheets,

97. Which of the following is Polysachharide?

(A) Cellulose

(B) Sucrose

(C) Galactose

(D) Maltose

98. Which of the following polymers is obtained from-hexamethylene diammonium adipate?

(A) Nylon 6

(B) Nylon 6,6

(C) Dacron

(D) Melamine

99. Among the given polymers, the transparent polymer used in safety Equipments like helmets is

(A) PVC

(B) BUNA-N

(C) Perspex

(D) Polycarbonate

100. An antibiotic that contains arsenic is

(A) prontosil

(B) chloramphenicol

(C) salvarsan

(D) thymol

101. The digit present at the unit place of the sum $(1! + 2! + 3! + 4! + \ldots + 2026!)$ is

(A) 0 (B) 1

(C) 2 (D) 3

102. If $f(x) = \log_e\left(\frac{1-x}{1+x}\right)$, $|x| < 1$, then $f\left(\frac{4x}{4+x^2}\right)$ is equal to

(A) $2f(x)$ (B) $-2f(x)$

(C) $2f\left(\frac{x}{2}\right)$ (D) $-2f\left(\frac{x}{2}\right)$

103. In $\triangle ABC$, with usual notations, if $\sin 2A + \sin 2B = \sin 2C$, then the type of the triangle is

(A) Isosceles triangle (B) Equilateral triangle

(C) Right angled triangle (D) Scalene triangle

104. If $\sec 2\theta = p + \tan 2\theta$ then, the value of $\cos^2\theta$ is

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

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

105. In $\triangle ABC$, with usual notations, if $A = 60^\circ$ and $a = 4$, then the maximum possible area (in sq. units) of $\triangle ABC$ is...

(A) 4 (B) $4\sqrt{3}$

(C) 8 (D) $8\sqrt{3}$

106. If α and β are complex cube roots of unity, then the difference between the values of $\alpha^2 + \beta^2 + \alpha\beta$ and $\alpha^4 + \beta^4 + \alpha^{-1}\beta^{-1}$ is

(A) 2 (B) -2

(C) 4 (D) 0

107. If two sides of a triangle are the roots of the equation $x^2 - \sqrt{10}x + 2 = 0$ and angle between them is 60°, then the third side is

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

(C) $\sqrt{3}$ (D) 3

108. If p_1 and p_2 are the lengths of perpendiculars from the origin to the lines $x\sec\theta + y\csc\theta = a$ and $x\cos\theta - y\sin\theta = a\cos(2\theta)$ respectively, then $4p_1^2 + p_2^2 =$

(A) $2a^2$ (B) $4a^2$

(C) a^2 (D) $3a^2$

109. If the equation $ax^2 - y^2 + 2y + c = 1$ represents a pair of perpendicular lines, then the values of a and c respectively are...

(A) $1, -1$ (B) $0, 1$

(C) $1, 0$ (D) $2, 3$

110. The area of the triangle (in sq. units) formed by the pair of lines $x^2 - 4y^2 - 8x + 16 = 0$ and the line $x = 2$ is

(A) 1 (B) 2

(C) 4 (D) 8

111. If the length of the tangent segment from the point $(8, -3)$ to the circle $x^2 + y^2 - 2x + ky - 23 = 0$ is $\sqrt{10}$, then the value of k is

(A) 10 (B) 8

(C) 24 (D) 34

112. If the line $4x - 3y + k = 0$ touches the ellipse $5x^2 + 9y^2 = 45$, then the value of k is

(A) 21 (B) $\pm 3\sqrt{21}$

(C) ± 3 (D) 63

113. If $f(x) = \frac{10^x + 7^x - 14^x - 5^x}{1 - \cos x}$, for $x \neq 0$ and $f(0) = k$ is continuous at $x = 0$, then the value of k is _____

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

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

114. If $f(9) = 36$, $u(9) = 9$, $f'(9) = 12$, $u'(9) = 4$, then $\lim_{x\to 9} \frac{\sqrt{f(x)} - 2\sqrt{u(x)}}{\sqrt{x} - 3} = \ldots$

(A) 2 (B) -2

(C) 3 (D) Does not exist

115. The logical statement $\sim[(p \to q) \leftrightarrow (p \wedge \sim q)]$ is

(A) a fallacy (B) equivalent to $p \wedge q$

(C) equivalent to $p \vee q$ (D) a tautology

116. If p, q, r are statements with truth values F, T, F respectively then the truth values of $(p \wedge q) \leftrightarrow \sim p$ and $q \to (p \vee \sim r)$ are respectively _____

(A) T, F (B) T, T

(C) F, F (D) F, T

117. If $\sum_{x=1}^{2025} \tan^2(\sec^{-1} x) = \frac{2024 \times 2025 \times k}{6}$, then $k = \ldots$

(A) 2027 (B) 2030

(C) 4055 (D) 4061

118. Let $X = \begin{bmatrix} 4 & 2 \\ -1 & 3 \end{bmatrix}$, $Y = \begin{bmatrix} -1 & 2 \\ 1 & -3 \end{bmatrix}$, then $(XY)^{-1}$ is equal to

(A) $\begin{bmatrix} \frac{11}{14} & \frac{-2}{14} \\ \frac{-4}{14} & \frac{-2}{14} \end{bmatrix}$ (B) $\begin{bmatrix} \frac{-11}{14} & \frac{2}{14} \\ \frac{-4}{14} & \frac{-2}{14} \end{bmatrix}$

(C) $\begin{bmatrix} \frac{-11}{14} & \frac{-2}{14} \\ \frac{4}{14} & \frac{-2}{14} \end{bmatrix}$ (D) $\begin{bmatrix} \frac{-11}{14} & \frac{-2}{14} \\ \frac{-4}{14} & \frac{-2}{14} \end{bmatrix}$

119. If $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$, then which of the following is not true?

(A) $A^{-1} = A^2$ (B) A^2 is a triangular matrix.

(C) A is a non-singular matrix. (D) A^3 is an identity matrix.

120. If $y = f\left(\frac{2x-1}{x^2+1}\right)$ and $f'(x) = \sin x^2$, then $\frac{dy}{dx}$ is equal to

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

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

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

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

121. If $h(x) = 2g\{3g[4g(5g(x))]\}$ such that $g(0) = 0$ and $g'(0) = 2$ then $h'(0) =$

(A) 1920 (B) 0

(C) 120 (D) 1900

122. If $y^{1/n} + y^{-1/n} = 2x$, then $(x^2-1)\frac{d^2y}{dx^2} + x\frac{dy}{dx} = \ldots$

(A) n^2y (B) $-n^2y$

(C) 0 (D) y

123. Let $y^2 = a\cos^2 x + b\sin^2 x$ be such that $a + b = 2024$ and $a > 0, b > 0$ follows $y^4 + y^3y'' = k$. If λ is the maximum possible value of k, then $\lambda =$

(A) $(506)^2$ (B) 506

(C) $(1012)^2$ (D) 1012

124. Let $f(x) = (a+2)x^3 - 3ax^2 + 9ax - 5$. If $f(x)$ is strictly decreasing for all $x \in R$, then the interval in which a lies is

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

(C) $(0, \infty)$ (D) $(-\infty, -5)$

125. If $f(x) = 5x^3 + 2x^2 - 3x + 1$ has a local maxima and a local minima at $x = \sin\theta, \pi < \theta < \frac{3\pi}{2}$ and $x = \cos\phi, \frac{3\pi}{2} < \phi < 2\pi$ respectively, then $(\tan\theta)(\tan\phi) = \ldots$

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

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

126. Let the curve $y = e^{2x} + x^2$ cuts the Y-axis at the point P. If the tangent and normal to the curve at point P intersect the X-axis at points R and Q respectively, the area of triangle PQR is.....

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

(C) $\frac{5}{4}$ (D) $\frac{5}{2}$

127. If $\int \frac{\cos\frac{x}{2} - \sin\frac{x}{2}}{\sqrt{8 - \sin x}} dx = 2\sin^{-1}\left(\frac{\phi(x)}{3}\right) + c$, then $[\phi(x)]^2$ is equal to _____

(A) $1 + \cos x$ (B) $1 + \sin x$

(C) $1 - \sin x$ (D) $1 - \cos x$

128. If $\int \frac{x+1}{x(1+xe^x)^2} dx = \log\left|\frac{xe^x}{1+xe^x}\right| + f(x) + c$, then $f(x) =$

(A) $\frac{1}{1+xe^x}$ (B) $\frac{x}{1+xe^x}$

(C) $\frac{xe^x}{1+x}$ (D) $\frac{xe^x}{1+e^x}$

129. If $\int g(x)dx = f(x)$ then $\int \frac{g(x)}{9-[f(x)]^2} dx$ is equal to

(A) $\frac{1}{6}\log\left|\frac{3-g(x)}{3-f(x)}\right| + c$ (B) $\frac{1}{3}\log\left|\frac{3+f(x)}{3-f(x)}\right| + c$

(C) $\frac{1}{6}\log\left|\frac{3+f(x)}{3-f(x)}\right| + c$ (D) $\frac{1}{3}\log\left|\frac{3+f(x)}{3+g(x)}\right| + c$

130. If $\int \frac{2\tan x+3}{3\tan x+4}dx = Ax + B\log|3\sin x + 4\cos x| + c$, then the values of A and B respectively are

(A) $-\frac{18}{25}, \frac{1}{25}$ (B) $-\frac{18}{25}, -\frac{1}{25}$
(C) $\frac{18}{25}, -\frac{1}{25}$ (D) $\frac{18}{25}, \frac{1}{25}$

131. If $\int_{\alpha}^{2026-\alpha} \frac{(2026-x)^2}{x^2+(2026-x)^2}dx = 100$, then $\alpha =$

(A) 913 (B) 1013
(C) 1113 (D) 1213

132. $\int_0^2 |4x-5|dx =$

(A) $\frac{17}{4}$ (B) $\frac{-17}{4}$
(C) $\frac{4}{17}$ (D) $\frac{-4}{17}$

133. The area bounded by the curves $y = |x|$ and $y = 4 - |x|$ is ..... sq units.

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

134. The area between the parabola $y = 2x - x^2$ and the X-axis is .....

(A) $\frac{2}{3}$ (B) $\frac{4}{3}$
(C) $\frac{8}{3}$ (D) $\frac{16}{3}$

135. If $x\frac{dy}{dx} = y(\log y - \log x + 1)$ and its solution is $y = [h(x)]e^{cx}$, then $h(x) = \ldots$

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

136. The solution of the differential equation $x^2ydx - (x^3+y^3)dy = 0$ is

(A) $\log|y| - \frac{x^3}{2y^3} = c$ (B) $\log|y| + \frac{x^3}{2y^3} = c$
(C) $\log|y| - \frac{x^3}{4y^3} = c$ (D) $\log|y| - \frac{x^3}{3y^3} = c$

137. The differential equation which represents the family of curves $(a+bx)e^{y/x} = x$, (where a and b are arbitrary constants); is

(A) $x\frac{d^2y}{dx^2} = x\frac{dy}{dx} - y$

(B) $x^3\frac{d^2y}{dx^2} = \left(x\frac{dy}{dx} - y\right)^2$

(C) $x^2\frac{d^2y}{dx^2} = x\frac{dy}{dx} - y$

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

138. If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors satisfying $\vec{a} - (\sqrt{3})\vec{b} + \vec{c} = \vec{0}$, then the angle between $\vec{a}$ and $\vec{c}$ is...

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

139. In $\triangle ABC$, P is a point on side BC such that $BP : PC = 4 : 1$ and Q is a point on the segment AP such that $AQ : QP = 3 : 2$. If $\vec{BQ}$ is expressed as $\vec{BQ} = x\vec{BA} + y\vec{BC}$, then the value of $x + y$ is:

(A) $\frac{22}{25}$ (B) $\frac{3}{5}$
(C) $\frac{17}{25}$ (D) 1

140. If $8\overline{AB} - 3\overline{AC} - 5\overline{AD} = \overline{O}$, then the ratio in which the point B divides segment CD is ....

(A) 8 : 3 (B) 8 : 5
(C) 5 : 3 (D) 3 : 4

141. If a parallelogram is constructed on vectors $\vec{a} = 3\vec{p} - \vec{q}$, $\vec{b} = \vec{p} + 3\vec{q}$ and $|\vec{p}| = |\vec{q}| = 2$ and the angle between $\vec{p}$ and $\vec{q}$ is $\frac{\pi}{3}$, then $|\vec{a}| : |\vec{b}| = \ldots$

(A) $\sqrt{5} : \sqrt{13}$ (B) $\sqrt{7} : \sqrt{13}$
(C) $\sqrt{13} : \sqrt{7}$ (D) $\sqrt{13} : \sqrt{5}$

142. If $\vec{r} = 4\hat{i} + 2\hat{j} + 7\hat{k} + \lambda(3\hat{i} - 5\hat{k})$ is the vector equation of the line passing through $(7, 2, 2)$, where λ is parameter, then the value of λ is...

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

143. If the line $\frac{x-2}{3} = \frac{y-1}{-5} = \frac{z+2}{2}$ lies in the plane $x + 3y + \alpha z + \beta = 0$, then (α, β) is

(A) $(6, 7)$ (B) $(-6, 7)$
(C) $(6, -7)$ (D) $(-6, -7)$

144. The coordinates of the foot of the perpendicular and the length of perpendicular drawn from $(0, 2, 3)$ to the line $\frac{x+3}{5} = \frac{y-1}{2} = \frac{z+4}{3}$ are respectively

(A) $(2, 3, -1), \sqrt{31}$ (B) $(2, 3, 1), \sqrt{21}$
(C) $(2, 3, -1), \sqrt{21}$ (D) $(2, 3, 1), \sqrt{31}$

145. The position vector of the point at which the line joining the points $\hat{i} + 2\hat{j} - \hat{k}$ and $3\hat{i} + 4\hat{j} - 2\hat{k}$ cuts the plane $\vec{r} \cdot (\hat{j} - \hat{k}) = -1$ is

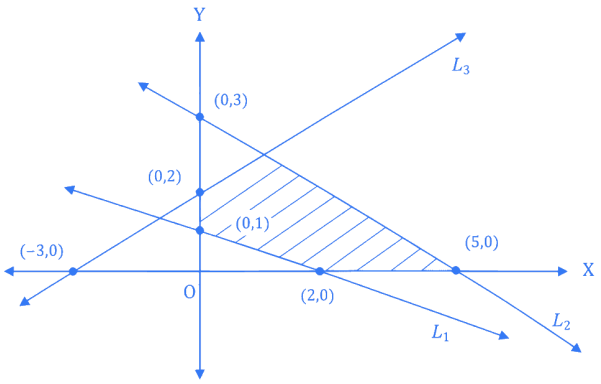
(A) $-\frac{5}{3}\hat{i} - \frac{2}{3}\hat{j} + \frac{1}{3}\hat{k}$ (B) $-\frac{5}{3}\hat{i} - \frac{2}{3}\hat{j} - \frac{1}{3}\hat{k}$
(C) $\frac{5}{3}\hat{i} - \frac{2}{3}\hat{j} + \frac{1}{3}\hat{k}$ (D) $\frac{5}{3}\hat{i} - \frac{2}{3}\hat{j} - \frac{1}{3}\hat{k}$

146. The direction cosines l, m, n of the two lines are connected by the relations $l + m + n = 0$ and $lm = 0$, then the angle between the lines is....

(A) 0 (B) 45°

(C) 60° (D) 90°

147. The correct constraints for the given feasible region are ...



(A) $x + 2y - 2 \geq 0, 3x + 5y - 15 \geq 0, 2x - 3y + 6 \geq 0, x \geq 0, y \geq 0$

(B) $x + 2y - 2 \leq 0, 3x + 5y - 15 \leq 0, 2x - 3y + 6 \leq 0, x \geq 0, y \geq 0$

(C) $x + 2y - 2 \leq 0, 3x + 5y - 15 \geq 0, 2x - 3y + 6 \geq 0, x \geq 0, y \geq 0$

(D) $x + 2y - 2 \geq 0, 3x + 5y - 15 \leq 0, 2x - 3y + 6 \geq 0, x \geq 0, y \geq 0$

148. If the random variable $X \sim B(4, 0.5)$, then probability $P(X < 3/X \geq 1) = \ldots$

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

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

149. Two numbers are selected without replacement from the first six positive integers. Let X denote the number of prime numbers obtained. The mean value of X is .....

(A) 0.6 (B) 1

(C) 1.2 (D) 0.8

150. Let a and b be the numbers obtained in two trials of tossing a fair die. The probability that the matrix $\begin{bmatrix} a & 2 \\ 6 & b \end{bmatrix}$ is not invertible is

(A) $\frac{1}{9}$ (B) $\frac{1}{18}$

(C) $\frac{1}{6}$ (D) $\frac{1}{12}$

- End of Question Paper -