MHT CET 2025 PCM Apr 20 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 2025**, 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.

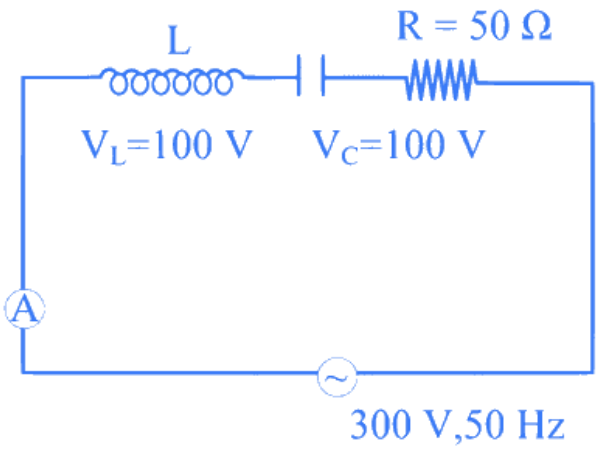
(v) Correct answers earn **1 mark in Physics and Chemistry** and **2 marks in Mathematics**.

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

1. Two raindrops reach the earth with different terminal velocities having the ratio 9 : 4. The ratio of their volumes is

(A) $\frac{8}{27}$ (B) $\frac{9}{4}$
(C) $\frac{3}{2}$ (D) $\frac{27}{8}$

2. The reading of the ammeter in the following circuit is



(A) 3 A (B) 6 A
(C) 12 A (D) 9 A

3. A wheel initially at rest, begins to rotate about its axis with constant angular acceleration. If it rotates through an angle θ_1 in first 2 s and a further angle θ_2 in the next 2 s , the ratio $\theta_1 : \theta_2$ is

(A) 1 : 6 (B) 6 : 1
(C) 3 : 1 (D) 1 : 3

4. The density of a cube is measured by measuring its mass and length of its sides. The \% error in the measurement of mass and length are 5% and 6% respectively. The percentage error in the measurement of density is

(A) 21% (B) 23%
(C) 25% (D) 27%

5. A mass attached to a spring performs S.H.M. whose displacement is $x = 3 \times 10^{-3} \cos 2\pi t$ metre. The time taken to obtain maximum speed for the first time is

(A) $\frac{1}{12}$ s (B) $\frac{1}{8}$ s
(C) $\frac{1}{4}$ s (D) $\frac{1}{2}$ s

6. If a gas is compressed isothermally then the r.m.s. velocity of its molecules

(A) increases. (B) decreases.
(C) remains the same. (D) first increases and then decreases.

7. Three vectors are expressed as $\vec{a} = 4\hat{i} - \hat{j}, \vec{b} = -3\hat{i} + 2\hat{j}$ and $\vec{c} = -\hat{k}$. The unit vector along the direction of sum of these vectors is

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

8. Four polaroids are placed such that the optic axis of each is inclined at an angle of 30° the optic axis of the preceding one. If unpolarised light of intensity ' I_0 ' falls on the first polaroid, the intensity of light transmitted from the fourth polaroid is $\left[\cos 30^\circ = \frac{\sqrt{3}}{2}\right]$

(A) $\frac{9I_0}{32}$ (B) $\frac{27I_0}{128}$
(C) $\frac{35I_0}{128}$ (D) $\frac{27I_0}{32}$

9. Two bodies A and B move in same straight line starting from same position. Body moves with constant velocity ' u ' and body B moves with constant acceleration ' a '. When their velocities become equal, the distance between them is

(A) $\frac{u}{2a}$ (B) $\frac{u^2}{4a}$
(C) $\frac{u^2}{a}$ (D) $\frac{u^2}{2a}$

10. The ratio of angular momentum of an electron in n^{th} orbit of hydrogen atom to the velocity of electron in n^{th} orbit is proportional to

(A) n^2 (B) $\frac{1}{n^2}$
(C) n^3 (D) $\frac{1}{n^3}$

11. An element $\overrightarrow{\Delta l} = \Delta xi$ is placed at the origin and carries a current of 10 A . The magnitude of magnetic field on the Y axis at a distance of 0.5 m if $\Delta x = 1$ cm is $\left(\frac{\mu_0}{4\pi} = 10^{-7}\right.$ SI unit $)\,(\sin 90^\circ = 1)$

(A) 2×10^{-7} T (B) 10^{-8} T
(C) 4×10^{-8} T (D) 2×10^{-8} T

12. In an n-p-n transistor amplifier, the collector current is 9 mA . If 90% of the electrons emitted reach the collector, then

(A) $\alpha = 9, \beta = 0.9$ (B) $\alpha = 0.9, \beta = 90$

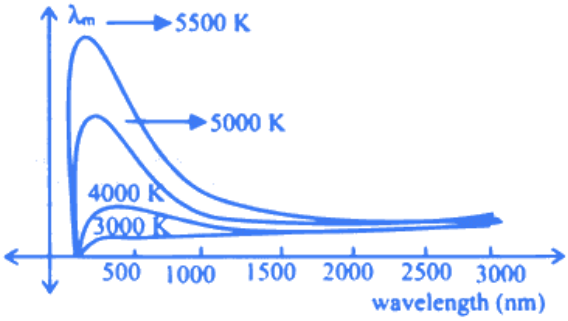
(C) $\alpha = 0.9, \beta = 9$ (D) $\alpha = 90, \beta = 0.9$

13. The closed and open organ pipe have same length and when they are vibrating simultaneously in first overtone produce 3 beats. The length of open pipe is made $\left(\frac{1}{3}\right)^{\text{rd}}$ and that of closed pipe is made 3 times the original, the number of beats produced will be (Neglect end correction)

(A) 14 (B) 17

(C) 18 (D) 12

14. The following graph represents the radiant power versus wavelength of the black body. The area under the curve represents



(A) the maximum wavelength emitted by the object.

(B) the minimum wavelength emitted by the object.

(C) the total energy emitted per unit time by the black body at some particular wavelength

(D) the total energy emitted per unit time per unit area by the black body at all wavelengths.

15. An a.c. e.m.f. of peak value = 230 V and frequency 50 Hz is connected to a circuit with R = 11.5Ω, L = 2.5H and a capacitor all in series. The value of capacitance is ' C ' for the current in the circuit to be maximum. The value of C and maximum current are respectively $\left(\pi^2 = 10\right)$.

(A) 2μ F, 10 A (B) 4μ F, 20 A

(C) 6μ F, 10 A (D) 8μ F, 20 A

16. The time period of a satellite of earth is 24 hours. If the separation between the earth and the satellite is decreased to one fourth of the previous value then its new time period will become

(A) 3 hours (B) 6 hours

(C) 24 hours (D) 12 hours

17. A simple pendulum with bob of mass m and conducting wire of length L swings under gravity through an angle θ. The component of earth's magnetic field in the direction perpendicular to swing is B . Maximum e.m.f. induced across the pendulum is (g = acceleration due to gravity)

(A) $2\text{BL}(\sqrt{\text{gL}})(\sin\frac{\theta}{2})$ (B) $\text{BL}(\sqrt{\text{gL}})(\sin\frac{\theta}{2})$

(C) $\text{BL}(\sqrt{\text{gL}})^2(\sin\frac{\theta}{2})$ (D) $2\text{BL}(\sqrt{\text{gL}})(\sin^2\frac{\theta}{2})$

18. In a cyclic process, work done by the system is

(A) more than the heat given to the system.

(B) equal to the heat given to the system.

(C) zero.

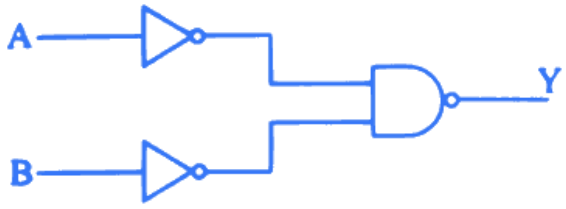
(D) independent of the heat given to the system.

19. A metal sphere cools at a rate of 1.5°C/min when its temperature is 80°C. When the temperature of the sphere is 40°C, its rate of cooling is 0.3°C/min. The temperature of the surrounding (θ_0) is

(A) 30°C (B) 35°C

(C) 25°C (D) 27°C

20. The resultant logic gate from the combination of following gates is



(A) OR (B) NAND

(C) AND (D) NOR

21. A force acting on a body of mass 5 Kg is $(4\hat{i} - 2\hat{j} + 3\hat{k})$N. If the body is initially at rest then the magnitude of its velocity at the end of 10 second in m/s will be

(A) $3\sqrt{35}$ (B) $2\sqrt{29}$

(C) $\sqrt{19}$ (D) $3\sqrt{23}$

22. The length of closed and open pipe is same. The ratio of frequency of n^{th} overtone for closed pipe to that of open pipe is (Neglect end correction)

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

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

23. An e.m.f. $e = E_0 \cos \omega t$ is applied to a circuit containing L, C and R in series where $X_L = 3R$ and $X_C = R$. The average power dissipated in the circuit is

(A) $\frac{E_0^2}{5R}$ (B) $\frac{E_0^2}{10R}$

(C) $\frac{E_0^2}{15R}$ (D) $\frac{E_0^2}{20R}$

24. The temperature of an air bubble while rising from bottom to surface of a lake remains constant but diameter is doubled. If pressure on the surface is h meter of mercury column and relative density of mercury is ' ρ ' then the depth of the lake is

(A) $5\ h\rho$ (B) $7\ h\rho$

(C) $\frac{3h}{\rho}$ (D) $\frac{4h}{\rho}$

25. The apparent wavelength of light from a star moving away from the earth is 0.02% more than the actual wavelength. The velocity of star is [c = velocity of light $= 3 \times 10^8$ m/s]

(A) 30 km/s (B) 60 km/s

(C) 90 km/s (D) 120 km/s

26. A parallel plate air capacitor has capacitance C_P. It is equally filled with parallel layers of materials of dielectric constants K_1 and K_2. Now its capacity becomes C_K. The ratio C_P to C_K is

(A) $K_1 + K_2$ (B) $\frac{K_1+K_2}{K_1K_2}$

(C) $\frac{K_1+K_2}{2K_1K_2}$ (D) $\frac{2K_1K_2}{K_1+K_2}$

27. The change in the internal energy of the mass of gas, when the volume changes from V to 2 V at constant pressure P is $\left(\gamma = \frac{C_p}{C_v}\right)$

(A) $\frac{V}{P(\gamma-1)}$ (B) $\frac{P}{V(\gamma-1)}$

(C) $\frac{PV}{\gamma+1}$ (D) $\frac{PV}{\gamma-1}$

28. If the length of the potentiometer wire is increased by keeping constant potential difference across the wire, then

(A) the null point is obtained at shorter distance.

(B) the potential gradient is increased.

(C) the null point is obtained at larger distance.

(D) there is no change in the null point.

29. A solid sphere rolling without friction on a horizontal surface with a constant speed of 2 m/s, rolls up on an inclined ramp which is inclined at 30°. The maximum distance travelled by the sphere on the inclined ramp is (acceleration due to gravity $g = 10\ m/s^2, \sin 30^\circ = \frac{1}{2}$)

(A) 56 cm (B) 25 cm

(C) 47 cm (D) 30 cm

30. In Young's double slit experiment with monochromatic light of wavelength 600 nm , the distance between the slits is 10^{-3} m. For changing the fringe width by 3×10^{-5} m

a. the screen is moved away from the slit by 5 cm .

b. the screen is moved 5 cm towards the slits.

c. the screen is moved 3 cm towards the slits.

d. the screen is moved away from the slits by 3 cm .

(A) both (c) and (d) (B) both (a) and (b)

(C) only (a) (D) only (c)

31. An achromatic convergent doublet of two lenses in contact has a power +2 D . The convex lens has power +5 D . The ratio of the dispersive powers of the convergent and divergent lenses is (in magnitude)

(A) 3 : 5 (B) 2 : 5

(C) 4 : 5 (D) 5 : 6

32. Two bar magnets A and B are geometrically similar but the magnetic moment of A is twice that of B. T_1 is the time period of oscillation when their like poles are kept together. When unlike poles are kept together, the time period of oscillation is T_2. The ratio $T_1 : T_2$ will be

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

(C) $1 : \sqrt{3}$ (D) $\sqrt{3} : 1$

33. A particle executes a linear S.H.M. In two of its positions the velocities are V_1, V_2 and accelerations are a_1 and a_2 respectively $(0 < a_1 < a_2)$. The distance between the positions is

(A) $\frac{V_1^2 - V_2^2}{a_1 - a_2}$ (B) $\frac{V_2^2 - V_1^2}{a_1 - a_2}$

(C) $\frac{V_1^2 - V_2^2}{a_1 + a_2}$ (D) $\frac{v_2^2 - v_1^2}{(a_1^2 + a_2^2)}$

34. An ideal transformer converts 220 a.c. to 3.3 kV a.c. to transmit a power of 4.4 kW . If primary coil has 600 turns then alternating current in secondary coil is

(A) $\frac{5}{3}$ A (B) $\frac{1}{4}$ A

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

35. Only 4% of the total current in the circuit passes through a galvanometer. If the resistance of the galvanometer is G , then the shunt resistance connected to the galvanometer is

(A) $\frac{G}{25}$ (B) $\frac{G}{24}$

(C) 24 G (D) 25 G

36. In hydrogen atom spectrum, when an electron jumps from second excited state to the first excited state, the wavelength of radiation emitted is ' λ '. If the electron jumps from the third excited state to the second orbit, the wavelength of radiation emitted will be $\frac{20\lambda}{x}$. The value of x is

(A) 18 (B) 27

(C) 21 (D) 36

37. A hollow cylinder has a charge ' q ' coulomb within it. If ' ϕ ' is the electric flux in unit of V-m associated with the curved surface C , the flux linked with the plane surface ' A ' in unit of V-m will be [ε_0 = permittivity of free space]



(A) $\frac{\varrho}{3}$ (B) $(\frac{q}{\epsilon_0} - \varrho)$

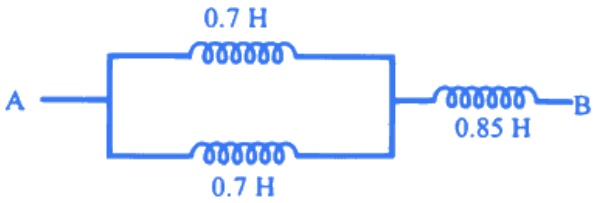
(C) $\frac{1}{2}(\frac{q}{\epsilon_0} - \varrho)$ (D) $\frac{q}{2\epsilon_0}$

38. A mass x gram is suspended from a light spring. It is pulled in downward direction and released so that mass performs S.H.M. of period T. If mass is increased by Y gram, the period becomes $\frac{4T}{3}$. The ratio of Y/x is

(A) 7 : 9 (B) 5 : 4

(C) 3 : 2 (D) 8 : 7

39. Three inductances are connected as shown in the figure. The equivalent inductance between A and b is



(A) 2.25 H (B) 1.20 H

(C) 0.225 H (D) 0.120 H

40. A disc of mass ' m ' and radius ' r ' rolls down an inclined plane of height ' h '. When it reaches the bottom of the plane, its rotational kinetic energy is (g = acceleration due to gravity)

(A) $\frac{mgh}{3}$ (B) $\frac{mgh}{6}$

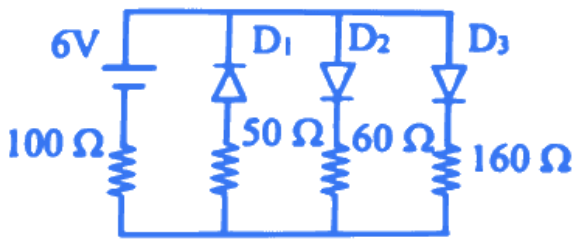
(C) $\frac{mgh}{2}$ (D) $\frac{mgh}{4}$

41. The frequency of a stretched uniform wire of length L under tension is in resonance with the fundamental frequency of a closed pipe of same length. If the tension in the wire is increased by 8 N , it is in resonance with the first overtone of the same closed pipe. The initial tension in the wire is

(A) 4 N (B) $\frac{1}{2}$ N

(C) 2 N (D) 1 N

42. In the following circuit shown in figure, three diodes are connected each with forward resistance 40Ω and infinite backward resistance. The current through 100Ω resistance is



(A) 18 mA (B) 36 mA

(C) 9 mA (D) 27 mA

43. Three concentric charged metallic spherical sheets A, B and C have radii a, b, c potentials V_A, V_B, V_C and charge densities $+\sigma, -\sigma$ and $+\sigma$ respectively. The value of potential V_A is ($\varepsilon_0 =$ permittivity of free space)

(A) $\frac{\sigma}{\epsilon_0}(a+b+c)$ (B) $\frac{\sigma}{\epsilon_0}(-a+b-c)$

(C) $\frac{\sigma}{\epsilon_0}(a-b+c)$ (D) $\frac{\sigma}{3\epsilon_0}(a+b+c)$

44. On a photosensitive material, when frequency of incident radiation is increased by 20%, maximum kinetic energy of emitted photoelectrons increases from 0.4 eV to 0.7 eV . The work function of the material is

(A) 3.5 eV (B) 1.1 eV

(C) 0.48 eV (D) 0.22 eV

45. A parallel plate capacitor with plate area A and plate separation d is charged by constant current I. A plane surface of area $\frac{A}{2}$, parallel to the plates is drawn simultaneously between the plates. The displacement current through this area is

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

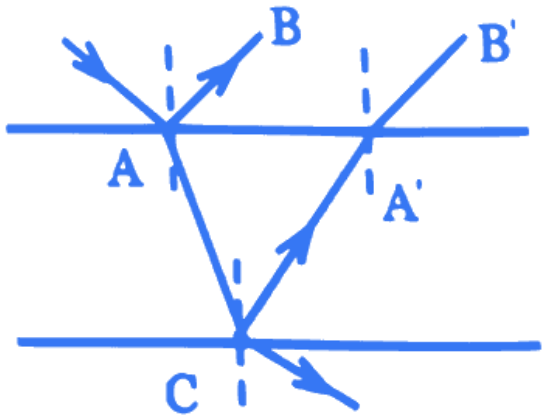
(C) $\frac{I}{4}$ (D) $\frac{I}{8}$

46. A liquid drop having surface energy E is sprayed into 512 droplets of same size. The final surface energy is

(A) 12 E (B) 4 E

(C) 8 E (D) 6 E

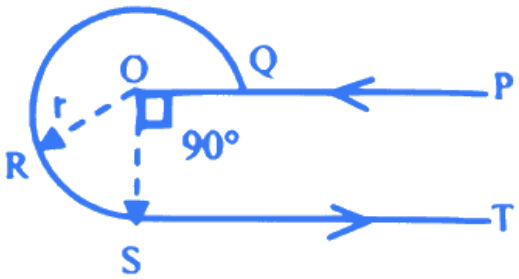
47. A ray of light of intensity ' I ' is incident on a parallel glass slab at a point ' A ' as shown in figure. It undergoes partial reflection and refraction. At each reflection 25% of incident energy is reflected. The rays AB and AB undergo interference. The ratio $\frac{I_{max}}{I_{min}}$ is



(A) 7:1 (B) 49 : 1

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

48. A current ' I ' is flowing in a conductor PQRST as shown in figure. The radius of curved path QRS is ' R ' and length of straight portion PQ and ST is very large. The magnetic field at the centre [O] of the curved part is ($\mu_0 =$ permeability of free space)



(A) $\frac{\mu_0 i}{4\pi r}(\frac{3\pi}{2}+1)(-\hat{k})$ (B) $\frac{\mu_0 i}{4\pi r}(\frac{3\pi}{2}+1)\hat{k}$

(C) $\frac{\mu_0 i}{4\pi r}[\frac{3\pi}{2}-1](-\hat{k})$ (D) $\frac{\mu_0 i}{4\pi r}[\frac{3\pi}{2}-1]\hat{k}$

49. A light of wavelength λ is incident on a photosensitive surface of negligible work function. The photoelectrons emitted from the surface have de-Broglie wavelength λ_1. Then ratio $\lambda : {\lambda_1}^2$ is
(h = Planck's constant, c = velocity of light, m = mass of electron)

(A) 4mc : h (B) $2c : h$

(C) 2mc : h (D) 2mh : c

50. Pure water rises through a height h in a capillary tube of internal radius r . Surface tension of water is T . The pressure difference between the water level in the container and the lowest point of the concave meniscus is

(A) $\frac{r}{T}$ (B) $\frac{T}{r}$

(C) $\frac{2T}{r}$ (D) $\frac{r}{2T}$

51. Assume the cell reaction,

$$A_{(s)} + B^{+2}_{(aq)} \longrightarrow A^{+2}_{(aq)} + B_{(s)}$$

if $\Delta G^{\circ} = -386$ kJ at 298 K . What is E^{0}_{Cell} ?

(A) 1 V (B) 1.5 V

(C) 2 V (D) 2.5 V

52. Calculate the volume occupied by a particle in bcc unit cell if the volume of unit cell is 8.2×10^{-23} cm^3.

(A) 5.576×10^{-23} cm^3 (B) 1.517×10^{-23} cm^3

(C) 2.788×10^{-23} cm^3 (D) 3.936×10^{-23} cm^3

53. Identify the name of reaction for aryl halide with alkyl halide and sodium metal in dry ether to give substituted aromatic compounds.

(A) Wurtz reaction (B) Wurtz-Fittig reaction

(C) Fittig reaction (D) Finkelstein reaction

54. Which among the following compounds forms pink colouration on addition of Schiff's reagent?

(A) Propanol (B) Propanone

(C) Propanal (D) Propanoic acid

55. Calculate work done if 1 mole of an ideal gas compressed isothermally and reversibly from 12 dm^3 to 6dm^3 at 300 K. $\left[R = 8.314 JK^{-1}\ mol^{-1}\right]$

(A) 1.729 kJ (B) 3.458 kJ

(C) 5.187 kJ (D) 6.916 kJ

56. Calculate the number of unit cells in 1 cm^3 volume of an element if unit cell edge length is 4.0×10^{-8} cm.

(A) 2.63×10^{22} (B) 1.56×10^{22}

(C) 3.34×10^{22} (D) 4.50×10^{22}

57. Which from following compounds contains complex cations and anions?

(A) Tetraamminecopper(II)ion

(B) Triamminetrinitrocobalt(III)

(C) Tetraamminedibromoplatinum(IV) bromide

(D) Sodium hexafluoroaluminate(III)

58. If concentration of reactant ' A ' is increased by 10 times, rate of reaction increases 100 times. What is order of reaction if rate law is $r = k[A]^x$?

(A) 1 (B) 1.5

(C) 2 (D) 3

59. Which from following lanthanoids exhibits +4 oxidation state in F^7 configuration?

(A) Ce (B) Yb

(C) Eu (D) Tb

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

(A) KCN (B) $NaNO_3$

(C) NaCl (D) KCl

61. A container consisting mixture of 28 g N_2, 8 gHe and 40 g Ne at 25°C. If the total pressure exerted by the gaseous mixture is 20 bar , What is the partial pressure exerted by N_2 ?

(A) 2 bar (B) 5 bar

(C) 4 bar (D) 8 bar

62. Select the incorrect statement about N_2 molecule.

(A) It is more stable than O_2 molecule. (B) It consists more electrons in bonding molecular orbitals than O_2

(C) Its bond order is 3 (D) It is diamagnetic

63. Identify the correct decreasing order of boiling point for hydrides of halogens.

(A) HF > HCl > HBr > HI

(B) HI > HBr > HCl > HF

(C) HF > HI > HBr > HCl

(D) HI > HF > HBr > HCl

64. Find out number of carbon atoms present in 0.35 mole of glucose.

(A) 3.011×10^{24} (B) 6.022×10^{24}

(C) 1.264×10^{24} (D) 2.044×10^{24}

65. Find the expected value of ΔT_b for 1 m$AlCl_3$ solution in water if solution of nonelectrolyte of same concentration has ΔT_b value ' x ' K .

(A) x K
(B) $2x$ K
(C) $3x$ K
(D) $4x$ K

66. Which of the following change takes place at positive electrode during working of dry cell?

(A) $Zn_{(s)}$ is oxidised to $Zn^{+2}{}_{(aq)}$
(B) $Zn^{+2}_{(aq)}$ is reduced to $Zn_{(s)}$
(C) $MnO_{2(s)}$ is reduced to $Mn_2O_{3(s)}$
(D) $Mn_2O_{3(s)}$ is oxidised to $MnO_{2(s)}$

67. 4 gram of NaOH is added in water to form 500 mL solution at 298 K . What is pH of solution? (Molar mass of NaOH $= 40$ g mol^{-1})

(A) 8.6990
(B) 10.3010
(C) 10.6990
(D) 13.3010

68. A compound contains atoms of x, y and z elements. Oxidation numbers of x, y and z are $+3$, $+5$ and -2 respectively. Identify the possible formula of this compound.

(A) XYZ_2
(B) $Y_2(XZ_3)_2$
(C) $X_3(YZ_4)_3$
(D) $X_3(Y_4Z)_2$

69. Which of the following compound is used for preparation of quicklime?

(A) Caustic soda
(B) Sodium carbonate
(C) Calcium carbonate
(D) Magnesium carbonate

70. Which from following gases is adsorbed to greater extent if adsorbent remains same at similar conditions of temperature and pressure?

(A) O_2
(B) SO_2
(C) N_2
(D) H_2

71. Which of the following is effectively used to remove E. coli bacteria from water?

(A) Silver nanoparticles
(B) Carbon black nanoparticles
(C) TiO_2 nanoparticles
(D) Silicon nanoparticles

72. What is order and molecularity of following reaction?

$$NO_{2(g)} + NO_{2(g)} \longrightarrow 2NO_{(g)} + O_{2(g)}$$

(A) order 1 , molecularity 2
(B) order 2, molecularity 2
(C) order 2 , molecularity 3
(D) order zero, molecularity 2

73. The solubility of salt BA_2 is 4×10^{-4} moldm^{-3}.
What is solubility product of the salt?

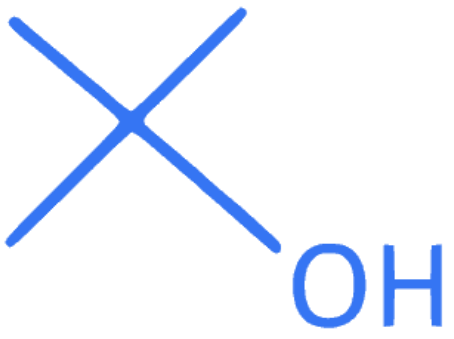
(A) 1.55×10^{-8}
(B) 2.56×10^{-10}
(C) 3.60×10^{-8}
(D) 6.41×10^{-10}

74. Which among the following compounds has lowest boiling point?

(A) 

(B) 

(C) 

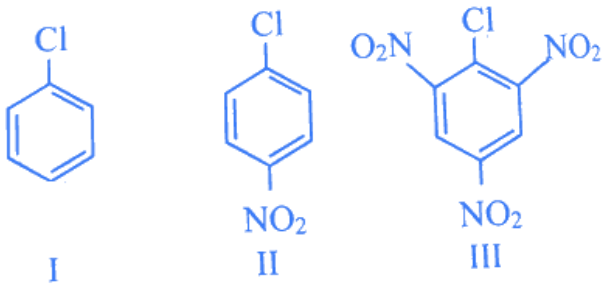
(D) 

75. What is shape of BrF_5 molecule?

(A) Trigonal pyramidal (B) Square planar

(C) Square pyramidal (D) Bent ' T ' shape

76. The correct order of reactivity for reaction involving cleavage of C-X bond in following compounds is



I II III

(A) I > II > III (B) II > III > I

(C) III > I > II (D) III > II > I

77. Which from following is a strong field ligand?

(A) CN^- (B) SCN^-

(C) I^- (D) $C_2O_4^{2-}$

78. Calculate vapour pressure of pure volatile liquid B at given temperature if mole faction of liquid B and vapour pressure of pure volatile liquid A are 0.4 and 400 mm Hg respectively.

$$\left[P_{total} = 600 \text{ mmHg}\right]$$

(A) 750 mm Hg (B) 800 mm Hg

(C) 850 mm Hg (D) 900 mm Hg

79. Identify the monomer used in preparation of polyacrylonitrile?



(A)

(B) $F_2C = CF_2$

(C) $H_2C = CH - CN$

(D) $H_2C = CH - CH = CH_2$

80. Identify the product ' B ' in following reaction.

Ethanal $\xrightarrow{\text{dil NaOH}} A \xrightarrow[H_2O]{\Delta} B$

(A) 3-Hydroxybutanal (B) 4-Hydroxybutanal

(C) But-2-enal (D) But-3-enal

81. What are the positions of ' N ' atoms present in pyrimidine ring of nucleic acids?

(A) 1 and 5 (B) 1 and 3

(C) 1,3 and 5 (D) 3 and 5

82. Identify the major product obtained when anisole reacts with bromine in acetic acid.

(A) o-bromoanisole (B) m -bromoanisole

(C) p-bromoanisole (D) 2,4,6-tribromoanisole

83. Calculate the molality of nonvolatile solution if solution freezes at $-0.95^\circ C$

[K_f for water, $= 1.86 \text{ K mol}^{-1}$, freezing point of water $= 0^\circ C$]

(A) $0.032 \text{ mol kg}^{-1}$ (B) $0.041 \text{ mol kg}^{-1}$

(C) 0.51 mol kg^{-1} (D) $0.065 \text{ mol kg}^{-1}$

84. Which from following is the most stable species?

(A) NH_4^+ (B) $R - \overset{+}{N}H_3$

(C) $R_2\overset{+}{N}H_2$ (D) $R_3\overset{+}{N}H$

85. Half life of a first order reaction is 3 minute. What is the time required to reduce the concentration of reactant by 90% of its initial concentration?

(A) 4.12 minute (B) 7.32 minute

(C) 9.97 minute (D) 12.05 minute

86. Identify neutral amino acid from following list represented by three letter symbols.

(A) Trp (B) Arg

(C) Lys (D) Glu

87. Which from following statement is correct regarding emf of cell for the cell reaction,

$$Cd_{(s)} + Cu^{+2}_{(aq)} \longrightarrow Cd^{+2}_{(aq)} + Cu_{(s)}$$

if concentration of Cd^{+2} is 10 times greater than concentration of $Cu^{+2}_{(aq)}$ at 298 K .

(A) greater than E^0_{cell} cell by 0.0592 V (B) less than E^0_{cell} by 0.0592 V

(C) greater than E^0_{cell} by 0.0296 V (D) less than E^0_{cell} by 0.0296 V

88. Which from following polymers when blended with cotton develops terycot?

(A) Dacron (B) Nylon 6

(C) Polyacrylonitrile (D) Nylon 6,6

89. Which from following compounds is an example of secondary amine?

(A) Ethane-1, 2-diamine

(B) Propan-2-amine

(C) N-Methylmethanamine

(D) N,N-Dimethylmethanamine

90. Which cation from following develops least magnetic moment?

(A) Cu^{2+} (B) Cr^{3+}

(C) Co^{2+} (D) Fe^{2+}

91. Identify false statement regarding aspirin.

(A) It contains amide linkage.

(B) It is obtained from salicylic acid.

(C) It has fewer side effects than salicylic acid.

(D) It has stomach irritating side effects.

92. Which from following compounds has highest boiling point?

(A) Acetaldehyde (B) Propionaldehyde

(C) Butyraldehyde (D) Valeraldehyde

93. Which of the following dopants is used in germanium to form n-type semiconductor?

(A) As (B) B

(C) In (D) Ga

94. Identify from following physical transformations that exhibits decrease in entropy.

(A) $H_2O_{(s)} \longrightarrow H_2O_{(l)}$ (B) $H_2O_{(l)} \longrightarrow H_2O_{(g)}$

(C) $H_2O_{(s)} \longrightarrow H_2O_{(g)}$ (D) $H_2O_{(g)} \longrightarrow H_2O_{(\ell)}$

95. "No two electrons in an atom can have the identical set of four quantum numbers." The statement is known as

(A) Pauli's exclusion principle.

(B) Hund's rule.

(C) Aufbau rule.

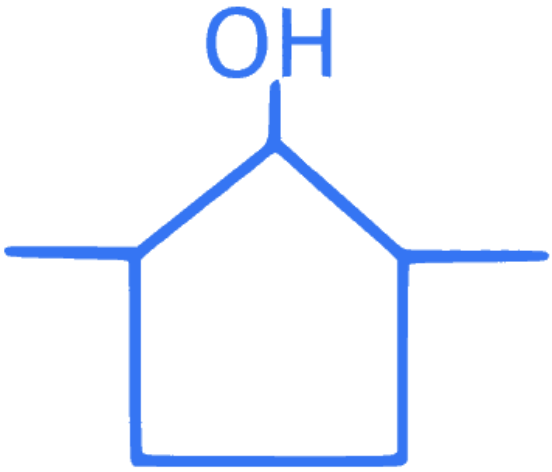
(D) Heisenberg uncertainty principle.

96. Which among the following functional groups is reduced by diborane?

(A) -COOR (B) -COOH

(C) $-NO_2$ (D) -X

97. What it the IUPAC name of following compounds?



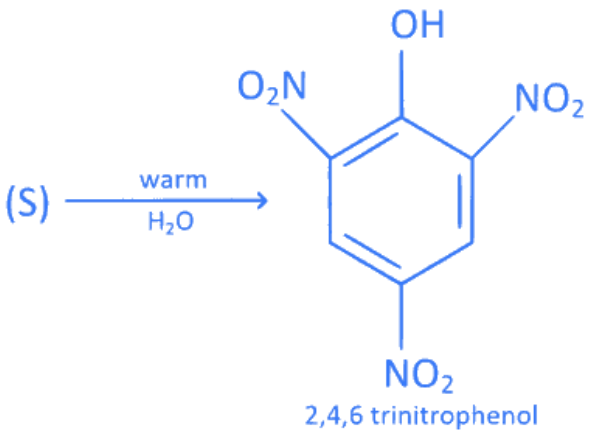
(A) 2,5-Dimethylpentan-1-ol

(B) 1,3-Dimethylpentan-2-ol

(C) 2,5-Dimethylcyclopentanol

(D) 1,3-Dimethylcyclopentan-2-ol

98. Identify the substrate ' S ' in the following reaction,



(A) p-Nitrochlorobenzene

(B) o-Nitrochlorobenzene

(C) 2,4-dinitrochlorobenzene

(D) 2,4,6-trinitrochlorobenzene

99. Propene on hydroboration followed by oxidation with alkaline peroxide forms.

(A) Tri-n-propylborane (B) Tri iso propylborane

(C) Propan-1-ol (D) Propan-2-ol

100. Calculate the standard enthalpy change of following reaction.

$$C_2H_{4(g)} + 3O_{2(g)} \longrightarrow 2CO_{2(g)} + 2H_2O_{(l)}$$

If $\Delta_f H^\circ (C_2H_4) = -52 \text{ kJ mol}^{-1}$

$$\Delta_f H^\circ (CO_2) = -390 \text{ kJ mol}^{-1}$$

$$\Delta_f H^\circ (H_2O) = -286 \text{ kJ mol}^{-1}$$

(A) -650 kJ (B) -1300 kJ

(C) -1950 kJ (D) -1500 kJ

101. If $3\sin 2\theta = 2\sin 3\theta$ and $0 < \theta < \pi$, then the value of $\sin\theta$ is equal to

(A) $\frac{\sqrt{17}}{4}$ (B) $\frac{5\sqrt{2}}{4}$

(C) $\frac{3\sqrt{2}}{4}$ (D) $\frac{\sqrt{15}}{4}$

102. The number of integral values of k for which $x^2 + y^2 + \mathrm{k}x + (1 - \mathrm{k})y + 5 = 0$ represents a circle whose radius cannot exceeds 5 , are

(A) 16 (B) 15

(C) 14 (D) 12

103. In a triangle ABC with usual notations if $|\overline{\mathrm{BC}}| = 8, |\overline{\mathrm{CA}}| = 7, |\overline{\mathrm{AB}}| = 10$ then the projection of $\overline{\mathrm{AB}}$ on $\overline{\mathrm{AC}}$ is

(A) $\frac{14}{85}$ units (B) $\frac{1}{85}$ units

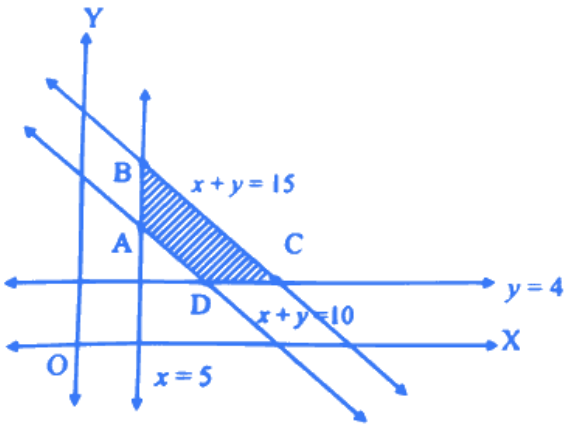
(C) $\frac{85}{14}$ units (D) $\frac{7}{85}$ units

104. If $\bar{a} = \hat{i} + \hat{j}, \bar{b} = 2\hat{i} - \hat{k}$ then the point of intersection of the lines $\bar{\mathrm{r}} \times \bar{\mathrm{a}} = \bar{\mathrm{b}} \times \bar{\mathrm{a}}$ and $\bar{\mathrm{r}} \times \bar{\mathrm{b}} = \bar{\mathrm{a}} \times \bar{\mathrm{b}}$ is

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

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

105. A scholarship amount is given by $\mathrm{z} = 550x + 300y$ and is to be distributed among x boys and y girls. From the graph given below the maximum amount of scholarship is _____



(A) 7250 (B) 9250

(C) 4250 (D) 5750

106.

$$\int \log(2+x)^{2+x} dx =$$

(A) $\frac{(2+x)^2}{2}\log(\frac{2+x}{\sqrt{\mathrm{e}}}) + \mathrm{c}$, where c is the constant of integration

(B) $\frac{(2+x)^2}{2}\log(\frac{2+x}{\mathrm{e}}) + \mathrm{c}$, where c is the constant of integration

(C) $\frac{2+x}{2}\log(\frac{2+x}{\sqrt{\mathrm{e}}}) + \mathrm{c}$, where c is the constant of integration

(D) $\frac{2+x}{2}\log(2+x)\sqrt{\mathrm{e}} + \mathrm{c}$, where c is the constant of integration

107. If the projection of $\bar{a}$ on $\bar{b} + \bar{c}$ is twice the projection of $\bar{b} + \bar{c}$ on $\bar{a}$ also if $|\bar{b}| = 2\sqrt{2}, |\bar{c}| = 4$ and the angle between $\overline{\mathrm{b}}$ and $\overline{\mathrm{c}}$ is $\frac{\pi}{4}$ then $|\overline{\mathrm{a}}| =$

(A) $2\sqrt{10}$ (B) $3\sqrt{10}$

(C) $4\sqrt{10}$ (D) $5\sqrt{10}$

108. The equation of the plane passing through the point of intersection of the planes $2x - y + z - 3 = 0$ and $4x - 3y + 5z + 9 = 0$ and parallel to the line $\frac{x+1}{2} = \frac{y+3}{4} = \frac{z-3}{5}$ is $\alpha x + \beta y + \gamma z + d = 0$ Then $\alpha + \beta + \gamma + d =$

(A) 48 (B) -48

(C) 84 (D) 45

109. If the points $\mathrm{A}(1,1,2), \mathrm{B}(2,1,\mathrm{p}), \mathrm{C}(1,0,3)$ and $D(2,2,0)$ are coplanar then the value of p is

(A) 0 (B) -1

(C) 1 (D) 2

110.

$$\int \frac{\mathrm{e}^{\tan^{-1}2x}}{1+4x^2} =$$

(A) $4\mathrm{e}^{\tan^{-1}2x} + \mathrm{c}$, where c is the constant of integration

(B) $\mathrm{e}^{\tan^{-1}2x} + \mathrm{c}$, where c is the constant of integration

(C) $\frac{\mathrm{e}^{\tan^{-1}2x}}{2} + \mathrm{c}$, where c is the constant of integration

(D) $2\mathrm{e}^{\tan^{-1}2x} + \mathrm{c}$, where c is the constant of integration

111. If the equation of the median through vertex $A(3,k)$ of $\triangle ABC$ with vertices $B(2,1)$ and $C(-4,5)$ is $x+4y=p$, then $k=$ where p and k are constants

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

112. If $\bar{a}$ and $\bar{b}$ are unit vectors and θ is the angle between them, then $\tan\frac{\theta}{2}=$

(A) $|\bar{a}-\bar{b}|$ (B) $|\vec{a}+\vec{b}|$
(C) $\frac{|\vec{a}+\vec{b}|}{|\vec{a}-\vec{b}|}$ (D) $\frac{|\bar{a}-\bar{b}|}{|\bar{a}+\bar{b}|}$

113. A manufacturer produces x items per week at a total cost of ₹ $\left(x^2+78x+2500\right)$. The price per unit is given by $8x=600-p$ where ' p ' is the price of each unit. Then the maximum profit obtained is

(A) ₹ 5069 (B) ₹ 15138
(C) ₹ 7569 (D) ₹ 2500

114. If the equation $kxy+10x+8y+16=0$ represents a pair of lines, then

(A) $k=5$ only (B) $k=0$ only
(C) $k=0$ or $k=5$ (D) the value of k does not exist

115. If the differential equation $\frac{dy}{dx}+\frac{x}{y}=\frac{a}{y}$ where a is constant, represents a family of circles then the radius of the circle is

(A) $a+2c$, where c is the constant of integration (B) $\sqrt{a^2+2c}$, where c is the constant of integration
(C) a^2+2c, where c is the constant of integration (D) $\sqrt{a+c}$, where c is the constant of integration

116. If $2f(x)+3f\left(\frac{1}{x}\right)=x^2+1, x\neq 0$ and $y=5x^2f(x)$, then y is strictly increasing in

(A) $(0,\frac{1}{2})$ (B) $(\frac{-2}{5},0)$
(C) $(\frac{1}{2},\frac{\sqrt{5}}{2})$ (D) $(\frac{-1}{2},0)$

117. The possible values of $\theta\in(0,\pi)$ such that $\sin\theta+\sin(4\theta)+\sin(7\theta)=0$ are

(A) $\frac{\pi}{4},\frac{5\pi}{12},\frac{\pi}{2},\frac{2\pi}{3},\frac{3\pi}{4},\frac{8\pi}{9}$ (B) $\frac{2\pi}{9},\frac{\pi}{4},\frac{\pi}{2},\frac{2\pi}{3},\frac{3\pi}{4},\frac{35\pi}{36}$
(C) $\frac{2\pi}{9},\frac{\pi}{4},\frac{\pi}{2},\frac{2\pi}{3},\frac{3\pi}{4},\frac{8\pi}{10}$ (D) $\frac{2\pi}{9},\frac{\pi}{4},\frac{4\pi}{9},\frac{\pi}{2},\frac{3\pi}{4},\frac{8\pi}{9}$

118. AOB is the positive quadrant of the ellipse $\frac{x^2}{25}+\frac{y^2}{9}=1$ in which $OA=5, OB=3$. The area between the arc AB and the chord AB of the ellipse in sq. units is

(A) $\frac{3}{5}(\pi-2)$ (B) $\frac{15}{2}(\pi-2)$
(C) $\frac{3}{10}(\pi-2)$ (D) $\frac{15}{4}(\pi-2)$

119. In a triangle ABC , the sides a, b, c are such that they are the roots of the equation $x^3-11x^2+38x-40=0$ Then

$$\frac{\cos A}{a}+\frac{\cos B}{b}+\frac{\cos C}{c}=$$

(A) $\frac{3}{4}$ (B) 1
(C) $\frac{9}{16}$ (D) $\frac{1}{16}$

120. In a triangle ABC with usual notations if $a=13, b=14, c=15$ Then $\sin A=$

(A) $\frac{4}{5}$ (B) $\frac{3}{5}$
(C) $\frac{1}{2}$ (D) $\frac{4}{7}$

121.

$$\int_0^3 \frac{dx}{(x+2)\sqrt{x+1}}=$$

(A) $\tan^{-1}(\frac{1}{3})$ (B) $2\tan^{-1}(\frac{1}{3})$
(C) $3\tan^{-1}(\frac{1}{3})$ (D) $4\tan^{-1}(\frac{1}{3})$

122. If $2\tan^{-1}(\cos x)=\tan^{-1}(2\operatorname{cosec} x)$, then the value of x is

(A) $-\frac{\pi}{4}$ (B) 0
(C) $\frac{\pi}{8}$ (D) $\frac{\pi}{4}$

123. The particular solution of the differential equation $\cos\left(\frac{dy}{dx}\right)=7, y=1$ at $x=0$ is

(A) $\cos(\frac{7}{x})=1$ (B) $\cos(\frac{y}{x-1})=7$
(C) $\cos(\frac{y-1}{x})=7$ (D) None

124. In a triangle ABC, with usual notations, $3b=a+c$, then $\cot\frac{A}{2}\cdot\cot\frac{C}{2}=$

(A) 1 (B) 2
(C) $\frac{1}{2}$ (D) 4

125.

$$\int_0^{\frac{\pi}{2}} \frac{dx}{1+(\cot x)^{101}}=$$

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

126. The solution of $\left(1+y^2\right)+\left(x-e^{\tan^{-1}y}\right)\frac{dy}{dx}=0$ is

(A) $2xe^{\tan^{-1}y}=e^{2\tan^{-1}y}+k$, where k is the constant of integration

(B) $x\cdot e^{\tan^{-1}y}=e^{\tan^{-1}y}+k$, where k is the constant of integration

(C) $x\cdot e^{2\tan^{-1}y}=e^{\tan^{-1}y}+k$, where k is the constant of integration

(D) $x=2+k\cdot e^{-\tan^{-1}y}$, where k is the constant of integration

127. If $\begin{bmatrix}1&3&3\\1&4&4\\1&3&4\end{bmatrix}\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}12\\15\\13\end{bmatrix}$, then the value of $x^2+y^2+z^2=$

(A) 6 (B) 12

(C) 3 (D) 14

128. The rate of reduction of a persons assets is proportional to the square root of the existing assets. The assets reduced from 25 lakhs to 6.25 lakhs in 2 years. This rate of reduction of his assets will make him bankrupt in

(A) 3 years (B) 5 years

(C) 4 years (D) 6 years

129. The distance of the point $(2,4,0)$ from the point of intersection of the lines $\frac{x+6}{3}=\frac{y}{2}=\frac{z+1}{1}$ and $\frac{x-7}{4}=\frac{y-9}{3}=\frac{z-4}{2}$ is

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

(C) 2 units (D) $2\sqrt{3}$ units

130. The approximate value of $\cos(59^\circ 30')$ is (given $1^\circ=0.0175^c, \sin 60^\circ=0.8660$)

(A) 0.5076 (B) 0.5176

(C) 0.5256 (D) 0.5150

131. The co-ordinates of the point where the line joining the points $(2,-3,1)$ and $(3,-4,-5)$ and intersects the plane $2x+y+z=7$ are

(A) $(-1,2,7)$ (B) $(1,2,3)$

(C) $(2,1,2)$ (D) $(1,-2,7)$

132.

$$\int e^x\frac{(x-1)}{(x+1)^3}\,dx=$$

(A) $e^x(x+1)^2+c$, where c is the constant of integration (B) $e^x(x+1)^3+c$, where c is the constant of integration

(C) $\frac{e^x}{(x+1)^2}+c$, where c is the constant of integration (D) $\frac{e^x}{(x+1)^3}+c$, where c is the constant of integration

133. If the curve $y=ax^2-6x+b$ passes through $(0,4)$ and has its tangent parallel to the X-axis at $x=\frac{3}{2}$, then the values of a and b respectively are

(A) $-2,-4$ (B) 2,4

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

134. The negation of $(p\wedge\sim q)\rightarrow(p\vee\sim q)$ is

(A) a tautology (B) a contingency

(C) a contradiction (D) equivalent to $p\wedge q$

135. If $a\left(4+x^2\right)=x$ and $y-x^3=a^2$ then $\frac{dy}{dx}$ at $x=1$ is

(A) $\frac{441}{125}$ (B) $\frac{18}{125}$

(C) $\frac{378}{125}$ (D) $\frac{381}{125}$

136. The equivalent statement of "If three vertices of a triangle are represented by cube roots of unity, then the triangle is an equilateral triangle" is

(A) Three vertices of a triangle are represented by cube roots of unity and the triangle is not an equilateral triangle. (B) If a triangle is an equilateral triangle then the three vertices of a triangle are represented by cube roots of unity.

(C) If three vertices of triangle are not represented by cube roots of unity then the triangle is not an equilateral triangle. (D) If a triangle is not an equilateral triangle then the three vertices of the triangle can not be represented by cube roots of unity.

137.

$$f(x)=\begin{cases}[x^2]-[-x^2], & x\neq 3\\ k & ,x=3\end{cases}$$

is continuous at $x=3$, then k = where $[\cdot]$ is greatest integer function

(A) 0 (B) 1

(C) -1 (D) Does not exist

138. $\lim\limits_{x\to 0}\frac{(7^x-1)^4}{\tan\left(\frac{x}{k}\right)\cdot\log\left(1+\frac{x^2}{3}\right)\cdot\sin 4x}=3(\log 7)^3$, then k =

(A) $4(\log 7)^{-1}$ (B) $\frac{1}{4}(\log 7)^{-1}$

(C) $4\log(\frac{1}{7})$ (D) $\frac{1}{4}\log 7$

139. If $x^y+y^x=a^b$, then $\frac{dy}{dx}$ at $x=1,y=2$ is

(A) $-2(1+\log 2)$ (B) $2(1+\log 2)$

(C) $2+\log 2$ (D) $1+\log 2$

140. The value of $\frac{(\cos\theta+i\sin\theta)^4}{(\sin\theta+i\cos\theta)^5}=$ where $i=\sqrt{-1}$

(A) $\cos\theta-i\sin\theta$ (B) $\cos 9\theta-i\sin 9\theta$

(C) $\sin\theta-i\cos\theta$ (D) $\sin 9\theta-i\cos 9\theta$

141. If $f(x)=2x^3+mx^2-13x+n$ and 2,3 are the roots of the equation $f(x)=0$ then the value of $4m+5n$ is

(A) 30 (B) 100

(C) 130 (D) 150

142. 4 red balls and 5 green balls are selected from n balls. If the sum of both the selections is greater than ${}^{n+1}C_4$ then the value of n is equal to

(A) $n>8$ (B) $n<8$

(C) $n>10$ (D) $n>12$

143. Two numbers are selected at random, without replacement from the first 6 positive integers. Let X denote the larger of the two numbers. Then E(X) =

(A) $\frac{14}{3}$ (B) $\frac{3}{14}$

(C) $\frac{14}{5}$ (D) $\frac{15}{41}$

144. For $k=1,2,3$ the box B_k contains k red balls and $(k+1)$ white balls. Let $P(B_1)=\frac{1}{2}, P(B_2)=\frac{1}{3}$ and $P(B_3)=\frac{1}{6}$.A box is selected at random and a ball is drawn from it. If a red ball is drawn from it, then the probability that it comes from box B_2 is

(A) $\frac{35}{78}$ (B) $\frac{14}{39}$

(C) $\frac{10}{13}$ (D) $\frac{12}{13}$

145. A random variable X takes the values $0,1,2,3,$ with probability $P(X=x)=k(x+1)\left(\frac{1}{5}\right)^x$, where k is a constant. Then $P(X=0)$ is

(A) $\frac{16}{25}$ (B) $\frac{7}{25}$

(C) $\frac{19}{25}$ (D) $\frac{18}{25}$

146. If $u=\frac{\tan^{-1}x}{\tan^{-1}x+1}$ and $v=\tan^{-1}\left(\tan^{-1}x\right)$ then $\frac{du}{dv}=$

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

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

147. If $\bar{a}=\frac{1}{\sqrt{10}}(3\hat{i}+\hat{k})$ and $\bar{b}=\frac{1}{7}(2\hat{i}+3\hat{j}-6\hat{k})$ then the value of $(2\bar{a}-\bar{b})\cdot[(\bar{a}\times\bar{b})\times(\bar{a}+2\bar{b})]=$

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

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

148. If the line $\frac{x+1}{1}=\frac{y-k}{11}=\frac{z-4}{-5}$ lies in the plane $2x+py+7z-41=0$ which is perpendicular to the plane $x+4y-2z+13=0$ then k =

(A) 3 (B) -3

(C) -5 (D) 5

149. The equations of two ellipses are $\frac{x^2}{4}+\frac{y^2}{2}=1$ and $\frac{x^2}{36}+\frac{y^2}{b^2}=1$. If the product of their eccentricities is $\frac{\sqrt{2}}{3}$, then the product of the length of the major axis and minor axis of the second ellipse is

(A) $12\sqrt{5}$ (B) 720

(C) $6\sqrt{20}$ (D) $48\sqrt{5}$

150. A fair coin is tossed 99 times. If X is the number of times head occur then P[X = r] is maximum when r =

(A) 48 (B) 49

(C) 51 (D) 52

- End of Question Paper -