MHT CET 2023 PCM May 11 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 2023**, 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. The magnetic flux through a circuit of resistance 'R' changes by an amount $\Delta\phi$ in the time Δt. The total quantity of electric charge 'Q' which passes during this time through any point of the circuit is

(A) $-\frac{\Delta\varrho}{\Delta t}+R$ (B) $\frac{\Delta\varrho}{\mathrm{R}}$

(C) $\frac{\Delta\varrho}{\Delta t}$ (D) $\frac{\Delta\varrho}{\Delta t}\times R$

2. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between the first dark fringe on either side of the central bright fringe is

(A) 1.2 mm (B) 2.4 mm

(C) 1.2 cm (D) 2.4 cm

3. An electron of mass 'm' and charge 'q' is accelerated from rest in a uniform electric field of strength 'E'. The velocity acquired by the electron, when it travels a distance 'L', is

(A) $\sqrt{\frac{2q\ \mathrm{m}}{\mathrm{mL}}}$ (B) $\sqrt{\frac{2\mathrm{qEL}}{\mathrm{m}}}$

(C) $\sqrt{\frac{2\mathrm{Em}}{\mathrm{qL}}}$ (D) $\sqrt{\frac{\mathrm{qE}}{\mathrm{mL}}}$

4. Two bodies have their moments of inertia I and 2I respectively about their axis of rotation. If their kinetic energies of rotation are equal, their angular momenta will be in the ratio

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

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

5. A ball kept at 20 m height falls freely in vertically downward direction and hits the ground. The coefficient of restitution is 0.4. Velocity of the ball first rebound is

$$\left[\mathrm{g}=10\ \mathrm{ms}^{-2}\right]$$

(A) 4 ms^{-1} (B) 8 ms^{-1}

(C) 12 ms^{-1} (D) 16 ms^{-1}

6. Two long conductors separated by a distance ' d' carry currents I_1 and I_2 in the same direction. They exert a force 'F' on each other. Now the current in one of them is increased to two times and its direction is reversed. The distance between them is also increased to 3 d. The new value of force between them is

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

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

7. The a.c. source is connected to series LCR circuit. If voltage across R is 40 V, that across L is 80 V and that across C is 40 V, then the e.m.f. 'e' of a.c. source is

(A) 40 V (B) $40\sqrt{2}$ V

(C) 80 V (D) 160 V

8. In the study of transistor as an amplifier if

$$\alpha=\frac{I_C}{I_E}=0.98$$

and

$$\beta=\frac{I_C}{I_B}=49$$

, where I_C, I_B and $\mathrm{I_E}$ are collector, base and emitter current respectively then

$$\left(\frac{1}{\alpha}-\frac{1}{\beta}\right)$$

is equal to

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

(C) 2 (D) 1

9. A liquid drop of radius 'R' is broken into 'n' identical small droplets. The work done is [T = surface tension of the liquid]

(A) $4\pi\mathrm{R}^2(\mathrm{n}^{\frac{2}{3}}-1)\mathrm{T}$ (B) $4\pi R^2(n^{\frac{1}{3}}-1)T$

(C) $4\pi R^2(1-n^{\frac{1}{3}})T$ (D) $4\pi\mathrm{R}^2(1-\mathrm{n}^{\frac{2}{3}})\mathrm{T}$

10. For a gas,

$$\frac{\mathrm{R}}{\mathrm{C_v}}=0\cdot4$$

, where R is universal gas constant and $\mathrm{C_v}$ is molar specific heat at constant volume. The gas is made up of molecules which are

(A) rigid diatomic (B) monoatomic

(C) non-rigid diatomic (D) polyatomic

11. Two bodies A and B at temperatures 'T_1' K and 'T_2' K respectively have the same dimensions. Their emissivities are in the ratio 1 : 3. If they radiate the same amount of heat per unit area per unit time, then the ratio of their temperatures $(T_1 : T_2)$ is

(A) 1 : 3 (B) $3^{1/4} : 1$

(C) $9^{1/4} : 1$ (D) 81 : 1

12. In a conical pendulum the bob of mass 'm' moves in a horizontal circle of radius 'r' with uniform speed 'V'. The string of length 'L' describes a cone of semi vertical angle 'θ'. The centripetal force acting on the bob is (g = acceleration due to gravity)

(A) $\frac{mgr}{\sqrt{L^2-r^2}}$ (B) $\frac{mgr}{(L^2-r^2)}$

(C) $\frac{\sqrt{L^2-r^2}}{mgL}$ (D) $\frac{mgL}{\sqrt{L^2-r^2}}$

13. A fluid of density 'ρ' is flowing through a uniform tube of diameter 'd'. The coefficient of viscosity of the fluid is 'η', then critical velocity of the fluid is

(A) inversely proportional to 'η' (B) directly proportional to 'η'

(C) directly proportional to 'd' (D) directly proportional to 'ρ'

14. The self inductance 'L' of a solenoid of length 'l' and area of cross-section 'A', with a fixed number of turns 'N' increases as

(A) both l and A increase (B) l decreases and A increases

(C) l increases and A decreases (D) both l and A decrease

15. A transverse wave in a medium is given by $y = A\sin 2(\omega t - kx)$. It is found that the magnitude of the maximum velocity of particles in the medium is equal to that of the wave velocity. What is the value of A ?

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

(C) $\frac{\lambda}{2\pi}$ (D) $\frac{\lambda}{4\pi}$

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

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

(C) $(\frac{gR^2}{\omega^2})^{\frac{1}{2}}$ (D) $\frac{gR^2}{\omega^2}$

17. According to Bohr's theory of hydrogen atom, the total energy of the electron in the n^{th} stationary orbit is

(A) directly proportional to n (B) inversely proportional to n

(C) directly proportional to n^2 (D) inversely proportional to n^2

18. In a series LCR circuit, $C = 2\mu F, L = 1mH$ and $R = 10\Omega$. The ratio of the energies stored in the inductor and the capacitor, when the maximum current flows in the circuit, is

(A) 5 : 1 (B) 3 : 2

(C) 1 : 2 (D) 1 : 5

19. In Young's double slit experiment, the fifth maximum with wavelength 'λ_1' is at a distance 'y_1' and the same maximum with wavelength 'λ_2' is at a distance 'y_2' measured from the central bright band. Then $\frac{y_1}{y_2}$ is equal to [D and d are constant]

(A) $\frac{\lambda_1}{\lambda_2}$ (B) $\frac{\lambda_2}{\lambda_1}$

(C) $\frac{\lambda_1^2}{\lambda_2^2}$ (D) $\frac{\lambda_2^2}{\lambda_1^2}$

20. Bohr model is applied to a particle of mass 'm' and charge 'q' moving in a plane under the influence of a transverse magnetic field 'B'. The energy of the charged particle in the n^{th} leve will be [h = Planck's constant]

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

(C) $\frac{nhqB}{\pi m}$ (D) $\frac{2nhqB}{\pi m}$

21. A rectangular block of mass 'm' and crosssectional area A, floats on a liquid of density 'ρ'. It is given a small vertical displacement from equilibrium, it starts oscillating with frequency 'n' equal to (g = acceleration due to gravity)

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

(C) $\frac{1}{2\pi}\sqrt{\frac{m}{Apg}}$ (D) $2\pi\sqrt{\frac{m}{Apg}}$

22. Two spherical conductors of capacities $3\mu F$ and $2\mu F$ are charged to same potential having radii 3 cm and 2 cm respectively. If 'σ_1' and 'σ_2' represent surface density of charge on respective conductors then

$$\frac{\sigma_1}{\sigma_2}$$

is

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

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

23. A circular arc of radius 'r' carrying current 'I' subtends an angle

$$\frac{\pi}{16}$$

at its centre. The radius of a metal wire is uniform. The magnetic induction at the centre of circular arc is

$$\left[\mu_0 = \right.$$

permeability of free space]

(A) $\frac{\mu_0 I}{32r}$ (B) $\frac{\mu_0 I}{16r}$

(C) $\frac{\mu_0 I}{64r}$ (D) $\frac{\mu_0 I}{8r}$

24. A sound of frequency 480 Hz is emitted from the stringed instrument. The velocity of sound in air is 320 m/s. After completing 180 vibrations, the distance covered by a wave is

(A) 60 m (B) 90 m

(C) 120 m (D) 180 m

25. A sonometer wire 'A' of diameter 'd' under tension 'T' having density 'ρ_1' vibrates with fundamental frequency 'n'. If we use another wire 'B' which vibrates with same frequency under tension '2 T' and diameter '2D' then density 'ρ_2' of wire 'B' will be

(A) $\rho_2 = 2\rho_1$ (B) $\rho_2 = \rho_1$

(C) $\rho_2 = \frac{\rho_1}{2}$ (D) $\rho_2 = \frac{\rho_1}{4}$

26. The upper end of the spring is fixed and a mass 'm' is attached to its lower end. When mass is slightly pulled down and released, it oscillates with time period 3 second. If mass 'm' is increased by 1 kg, the time period becomes 5 second. The value of 'm' is (mass of spring is negligible)

(A) $\frac{3}{8}$ kg (B) $\frac{5}{9}$ kg

(C) $\frac{8}{13}$ kg (D) $\frac{9}{16}$ kg

27. What should be the diameter of a soap bubble, in order that the excess pressure inside it is 25.6 Nm^{-2} ? [surface tension of soap solution

$$= 3 \cdot 2 \times 10^{-2}\ Nm^{-2}\Big]$$

(A) 2 cm (B) 1.5 cm

(C) 1 cm (D) 0.5 cm

28. If temperature of gas molecules is raised from 127°C to 527°C, the ratio of r.m.s. speed of the molecules is respectively

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

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

29. The ratio of energy required to raise a satellite to a height 'h' above the earth's surface to that required to put it into the orbit at the same height is (

$$R =$$

radius of earth)

(A) $\frac{2h}{R}$ (B) $\frac{h}{R}$

(C) $\frac{R}{h}$ (D) $\frac{R}{2h}$

30. According to Boyle's law, the product PV remains constant. The unit of PV is same as that of

(A) energy (B) force

(C) impulse (D) momentum

31. When a metallic surface is illuminated with radiation of wavelength 'λ', the stopping potential is 'V'. If the same surface is illuminated with radiation of wavelength '2λ', the stopping potential is '

$$\left(\frac{V}{4}\right)$$

'. The threshold wavelength for the metallic surface is

(A) $\frac{5}{2}\lambda$ (B) 3λ

(C) 4λ (D) 5λ

32. Three identical capacitors of capacitance 'C' each are connected in series and this connection is connected in parallel with one more such identical capacitor. Then the capacitance of whole combination is

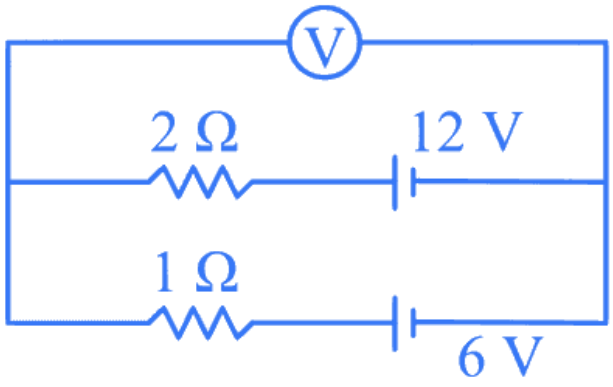
(A) 3C (B) 2C

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

33. In Young's double slit experiment, green light is incident on two slits. The interference pattern is observed on a screen. Which one of the following changes would cause the observed fringes to be more closely spaced?

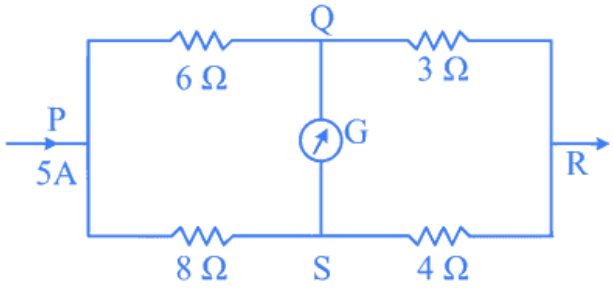
(A) Reducing the separation between the slits
(B) Using blue light instead of green light
(C) Using red light instead of green light
(D) Moving the screen away from the slits

34. Two batteries, one of e.m.f. 12 V and internal resistance 2Ω and other of e.m.f. 6 V and internal resistance 1Ω, are connected as shown in the figure. What will be the reading of the voltmeter 'V'?



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

35. Potential difference between the points P and Q is nearly



(A) 17 V
(B) 14 V
(C) 12 V
(D) 8 V

36. A coil having effective area 'A' is held with its plane normal to a magnitude field of induction 'B '. The magnetic induction is quickly reduced to 25% of its initial value in 1 second. The e.m.f. induced in the coil (in volt) will be

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

37. The path difference between two waves, represented by

$$y_1 = a_1 \sin\left(\omega t - \frac{2\pi x}{\lambda}\right)$$

and

$$y_2 = a_2 \cos\left(\omega t - \frac{2\pi x}{\lambda} + \phi\right)$$

is

(A) $\frac{\lambda}{2\pi}(\varrho)$
(B) $\frac{\lambda}{2\pi}(\varrho + \frac{\pi}{2})$
(C) $\frac{2\pi}{\lambda}(\varrho - \frac{\pi}{2})$
(D) $\frac{2\pi}{\lambda}(\varrho)$

38. An electromagnetic wave, whose wave normal makes an angle of 45° with the vertical, travelling in air strikes a horizontal liquid surface. While travelling through the liquid it gets deviated through 15°. What is the speed of the electromagnetic wave in the liquid, if the speed of electromagnetic wave in air is 3×10^8 m/s ?

$$\left(\sin 30^\circ = 0.5, \sin 45^\circ = \frac{1}{\sqrt{2}}\right)$$

(A) $\frac{\sqrt{2}}{3} \times 10^8$ m/s
(B) 1.5×10^8 m/s
(C) 2.1×10^8 m/s
(D) 2.5×10^8 m/s

39. The difference in length between two rods A and B is 60 cm at all temperatures. If

$$\alpha_A = 18 \times 10^{-6}/^\circ C$$

and

$$\beta_B = 27 \times 10^{-6}/^\circ C$$

, the lengths of the two rods are

(A) $l_A = 200$ cm, $l_B = 140$ cm
(B) $l_A = 180$ cm, $l_B = 120$ cm
(C) $l_A = 160$ cm, $l_B = 100$ cm
(D) $l_A = 120$ cm, $l_B = 60$ cm

40. A parallel plate capacitor is charged by a battery and battery remains connected. The dielectric slab of constant 'K' is inserted between the plates and then taken out. Then electric field between the plates

(A) remains the same
(B) increases
(C) decreases
(D) becomes zero

41. From a disc of mass 'M' and radius 'R', a circular hole of diameter 'R' is cut whose rim passes through the centre. The moment of inertia of the remaining part of the disc about perpendicular axis passing through the centre is

(A) $\frac{13MR^2}{32}$
(B) $\frac{11MR^2}{32}$
(C) $\frac{9MR^2}{32}$
(D) $\frac{7MR^2}{32}$

42. If p-n junction diode is in forward bias then

(A) width of depletion layer increases
(B) electric conduction is not possible at all
(C) barrier voltage increases
(D) width of depletion layer decreases

43. The orbital magnetic moment associated with orbiting electron of charge 'e' is

(A) inversely proportional to angular momentum
(B) directly proportional to mass of electron
(C) directly proportional to angular momentum
(D) inversely proportional to charge on electron

44. An ideal gas expands adiabatically.

$$(\gamma = 1 \cdot 5)$$

To reduce the r.m.s. velocity of the molecules 3 times, the gas has to be expanded

(A) 81 times
(B) 27 times
(C) 9 times
(D) 3 times

45. A metal surface of work function $1 \cdot 13$ eV is irradiated with light of wavelength 310 nm. The retarding potential required to stop the escape of photoelectrons is [Take

$$\frac{hc}{e} = 1240 \times 10^{-9} \text{SI}$$

units]

(A) 1.13 V
(B) 2.87 V
(C) 3.97 V
(D) 4.23 V

46. Two cars A and B start from a point at the same time in a straight line and their positions are represented by

$$R_A(t) =$$

at $+bt^2$ and

$$R_B(t) = xt - t^2$$

. At what time do the cars have same velocity?

(A) $\frac{x-a}{2(b+1)}$
(B) $\frac{x+a}{2(b-1)}$
(C) $\frac{x-a}{(b+1)}$
(D) $\frac{x+a}{(b-1)}$

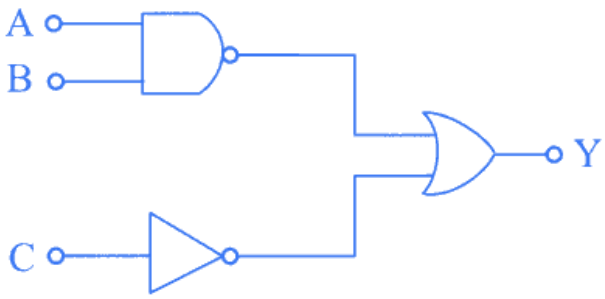
47. The a.c. source of e.m.f. with instantaneous value 'e' is given by

$$e = 200 \sin(50t)$$

volt. The r.m.s. value of current in a circuit of resistance 50Ω is

(A) 0.2828 A
(B) 2.828 A
(C) 28.28 A
(D) 282.8 A

48. In the digital circuit the inputs are as shown in figure. The Boolean expression for output Y is



(A) $\bar{A} + B + \bar{C}$
(B) $\bar{A} \cdot B \cdot \bar{C}$
(C) $\bar{A} \cdot B + \bar{C}$
(D) $\bar{A} + B \cdot \bar{C}$

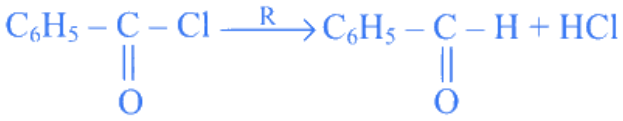
49. A double convex lens of focal length 'F' is cut into two equal parts along the vertical axis. The focal length of each part will be

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

50. Two progressive waves are travelling towards each other with velocity 50 m/s and frequency 200 Hz. The distance between the two consecutive antinodes is

(A) 0.125 m
(B) 0.150 m
(C) 0.175 m
(D) 0.200 m

51. Identify the reagent 'R' used in the following reaction.



(A) CO, HCl
(B) H_2, Pd-$BaSO_4$
(C) H_2O
(D) DIBAL-H

52. Which among the following phenols has highest melting point?

(A) o-Nitrophenol
(B) p-Nitrophenol
(C) p-Cresol
(D) Phenol

53. Identify the element having general electronic configuration ns^1 from following.

(A) Ca
(B) Sr
(C) Ba
(D) Fr

54. Which of the following enzyme is found in saliva?

(A) Amylase
(B) Lipase
(C) Glucose isomerase
(D) Proteoses

55. Which from following molecules exhibits lowest thermal stability?

(A) H_2O
(B) H_2Te
(C) H_2Se
(D) H_2S

56. The common name of Benzene-1,3-diol is:

(A) catechol
(B) resorcinol
(C) quinol
(D) pyrogallol

57. For a reaction $A + B \rightarrow$ product, if [A] is doubled keeping [B] constant, the rate of reaction doubles. Calculate the order of reaction with respect to A.

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

58. Identify the salt that undergoes hydrolysis and forms acidic solution from following.

(A) Na_2CO_3
(B) NH_4NO_3
(C) NH_4CN
(D) KCN

59. Which from following sentences is NOT correct?

(A) ΔG° is an extensive property.
(B) E°_{cell} is an intensive property.
(C) Electrical work is equal to nFE_{cell}.
(D) For a chemical reaction to be spontaneous E^0_{cell} must be negative.

60. A solution of nonvolatile solute is obtained by dissolving 1.5 g in 30 g solvent has boiling point elevation 0.65 K. Calculate the molal elevation constant if molar mass of solute is 150 g mol^{-1}.

(A) 1.95 K kg mol^{-1}
(B) 2.23 K kg mol^{-1}
(C) 1.52 K kg mol^{-1}
(D) 2.72 K kg mol^{-1}

61. A weak base is 1.42% dissociated in its 0.05 M solution. Calculate its dissociation constant.

(A) 5.5×10^{-5}
(B) 4.0×10^{-5}
(C) 1.8×10^{-5}
(D) 1.0×10^{-5}

62. What is the value of percent atom economy when an organic compound of formula weight 75 u is obtained from reactants having sum formula weight 225 u ?

(A) 13.5
(B) 33.3
(C) 40.4
(D) 70.5

63. Calculate ΔS_{total} for the following reaction at 300 K.

$$NH_4NO_{3(s)} \longrightarrow NH^+_{(aq)} + NO^-_{3(aq)}$$

$(\Delta H = 28.1 \text{ kJ mol}^{-1}, \Delta S_{sys} = 108.7 \text{ J K}^{-1} \text{ mol}^{-1})$

(A) 15.1 J K^{-1} mol^{-1}
(B) 93.6 J K^{-1} mol^{-1}
(C) 84.3 J K^{-1} mol^{-1}
(D) 202.3 J K^{-1} mol^{-1}

64. Which from following properties is NOT exhibited by LDP?

(A) It is crystalline.
(B) It is moisture resistant.
(C) LDP films are extremely flexible.
(D) It is poor conductor of electricity.

65. Identify the FALSE statement about ideal solution from following.

(A) Ideal solutions obey Raoult's law over entire range of concentration.

(B) No heat is evolved or absorbed when two components forming an ideal solution are mixed.

(C) Volume of ideal solution is same as sum of volumes of two components taken for mixing.

(D) The vapour pressure of ideal solution is either higher or lower than vapour pressure of pure components.

66. Which from following is NOT an example of amorphous solid?

(A) Glass

(B) Plastic

(C) Rubber

(D) Diamond

67. Which of the following statements is NOT true about Bohr atomic model?

(A) An electron in hydrogen atom can move around the nucleus in one of the many possible orbits of fixed radius and energy.

(B) The energy of an electron in the orbit does not change with time.

(C) An electron can move only in those orbits for which angular momentum is integral multiple of $\frac{h}{2\pi}$.

(D) This model can explain the ability of atoms to form molecules by chemical bonds.

68. Calculate the rate constant of the first order reaction if 80% of the reactant reacted in 15 minute.

(A) 0.11 minute^{-1}

(B) 0.22 minute^{-1}

(C) 0.34 minute^{-1}

(D) 0.42 minute^{-1}

69. Calculate the degree of dissociation of 0.01 M acetic acid at

$$25^{\circ}\text{C}\left[\Lambda_c = 15.0\Omega^{-1}\ \text{cm}^2\ \text{mol}^{-1}\right.$$

and

$$\left.\Lambda_0 = 300\Omega^{-1}\ \text{cm}^2\ \text{mol}^{-1}\right]$$

(A) 0.042

(B) 0.035

(C) 0.025

(D) 0.05

70. Which element from following does NOT exhibit spin only magnetic moment in +3 state?

(A) Cr

(B) V

(C) Ti

(D) Sc

71. Identify the final product formed on ammonolysis of benzyl chloride followed by the reaction with two moles of CH_3I.

(A) $C_6H_5CH_2NHCH_3$

(B) $C_6H_5CH_2NH_2$

(C) $C_6H_5N(CH_3)_2$

(D) $C_6H_5CH_2N(CH_3)_2$

72. Which from following elements is isoelectronic with Na^+?

(A) F

(B) O

(C) Mg

(D) Ne

73. Which of the following is positively charged sol?

(A) Haemoglobin in blood

(B) Sol of starch

(C) Gelatin

(D) 'Ag' sol

74. When tert-butyl bromide is heated with silver fluoride, the major product obtained is:

(A) 1-Fluoro-2-methylpropane

(B) 2-Fluoro-2-methylpropane

(C) 1-Fluorobutane

(D) 2-Fluorobutane

75. Which among the following is NOT a feature of S_N2 mechanism?

(A) Single step mechanism

(B) Backside attack of nucleophile

(C) Formation of planar carbocation intermediate

(D) Involves simultaneous bond breaking and bond forming

76. What is the pH of 0.005 M NaOH solution?

(A) 2.30

(B) 12.6

(C) 11.7

(D) 3.2

77. What is the oxidation number of sulfur in H_2SO_5 ?

(A) +4

(B) +6

(C) +8

(D) +5

78. If N_2 gas is compressed at 2 atmosphere from 9.0 L to 3.0 L at 300 K, find the final pressure at same temperature.

(A) 1.66 atm

(B) 3.32 atm

(C) 6.0 atm

(D) 9.0 atm

79. What is the number of moles of secondary carbon atoms in n mole isopentane?

(A) 4n (B) 3n

(C) 2n (D) n

80. Which from following substances consists of total 1 mole atoms in it? (Molar mass of $NH_3 = 17, H_2O = 18, N_2 = 28, CO_2 = 44$)

(A) 4.25 g NH_3 (B) 1.8 g H_2O

(C) 2.8 g N_2 (D) 4.4 g CO_2

81. Identify the formula of potassium trioxalatoaluminate(III).

(A) $K_3[Al(C_2O_4)_3]$ (B) $Al[K_3(C_2O_4)_3]$

(C) $K_3[Al(C_2O_4)_3]^{2-}$ (D) $K_4[Al_3(C_2O_4)_3]^{2+}$

82. If, Aniline

$$\frac{\text{i) } NaNO_2 + HCl, 273\ K}{\text{ii) } H_2O, \Delta}$$

Product.
Identify the product of above reaction.

(A) o-Nitroaniline (B) m-Nitroaniline

(C) p-Nitroaniline (D) Phenol

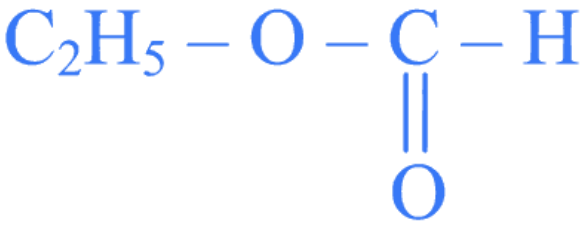
83. Identify nonbenzenoid aromatic compound from following.

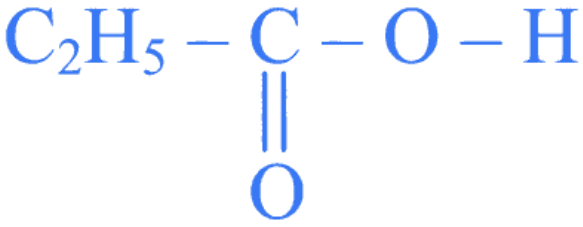
(A) Aniline (B) Tropone

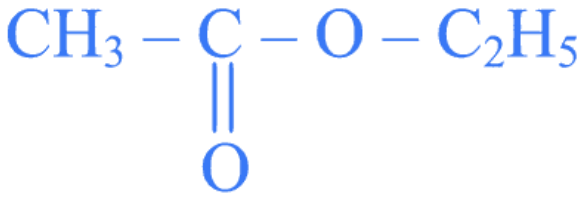
(C) Naphthalene (D) Phenol

84. Methyl propanoate on hydrolysis with dil NaOH forms a salt which on further acidification with conc. HCl forms _____.

(A) $CH_3 - COOH$

(B) 

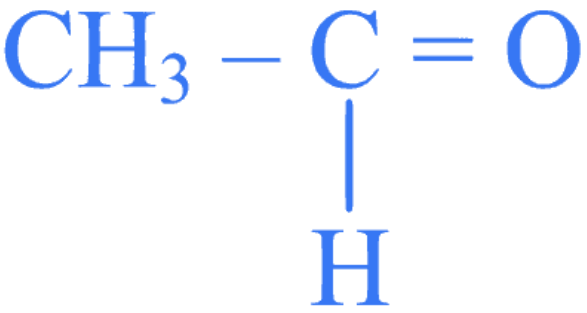
(C) 

(D) 

85. Identify the product obtained in the following reaction.

$$(CH_3CO)_2O \xrightarrow{H_2O} \text{Product}$$

(A) CH_3COCH_3

(B) 

(C) $CH_3 - OH$

(D) CH_3COOH

86. Identify the expression for average rate for following reaction.

$$N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$$

(A) $\frac{-\Delta[N_2]}{\Delta t} = -\frac{1}{3}\frac{\Delta[H_2]}{\Delta t} = \frac{1}{2}\frac{\Delta[NH_3]}{\Delta t}$

(B) $-\frac{1}{3}\frac{\Delta[N_2]}{\Delta t} = \frac{\Delta[H_2]}{\Delta t} = \frac{1}{2}\frac{\Delta[NH_3]}{\Delta t}$

(C) $\frac{-\Delta[N_2]}{\Delta t} = \frac{-\Delta[H_2]}{\Delta t} = \frac{\Delta[NH_3]}{\Delta t}$

(D) $-\frac{1}{2}\frac{\Delta[N_2]}{\Delta t} = \frac{-\Delta[H_2]}{\Delta t} = \frac{1}{3}\frac{\Delta[NH_3]}{\Delta t}$

87. The reaction of aryl halide with alkyl halide and sodium metal in dry ether to form substituted aromatic compounds is known as:

(A) Wurtz reaction
(B) Fittig reaction
(C) Wurtz Fittig reaction
(D) Friedel Craft's reaction

88. Identify anionic complex from following.

(A) Pentaammineaquacobalt(III) iodide
(B) Pentaamminecarbonatocobalt(III) chloride
(C) Tetracyanonickelate(II) ion
(D) Triamminetrinitrocobalt(III)

89. Identify 'A' and 'B' in the following reaction.

$$CH_3Br \xrightarrow{AgNO_2} A \xrightarrow{Sn/HCl} B$$

(A) CH_3NO_2 and CH_3Cl
(B) CH_3NO_2 and CH_3NH_2
(C) CH_3NH_2 and CH_3Cl
(D) CH_3NH_2 and $CH_3CH_2NO_2$

90. Calculate the molar mass of metal having density 9.3 g cm^{-3} that forms simple cubic unit cell.

$$\left[a^3 \cdot N_A = 22.6\ cm^3\ mol^{-1}\right]$$

(A) 210.2 g mol^{-1}
(B) 105.3 g mol^{-1}
(C) 52.6 g mol^{-1}
(D) 70.2 g mol^{-1}

91. Calculate the E°_{cell} for

$$Zn_{(s)}\left|Zn^{++}_{(IM)}\right|\left|Cd^{++}_{(IM)}\right|Cd_{(s)}$$

at

$$25^\circ C\left[E^0_{Zn} = -0.763\ V; E^\circ_{Cd} = -0.403\ V\right]$$

(A) 0.36 V
(B) 1.17 V
(C) −0.36 V
(D) −1.17 V

92. What is the work done during oxidation of 4 moles of $SO_{2(g)}$ to $SO_{3(g)}$ at 27°C?

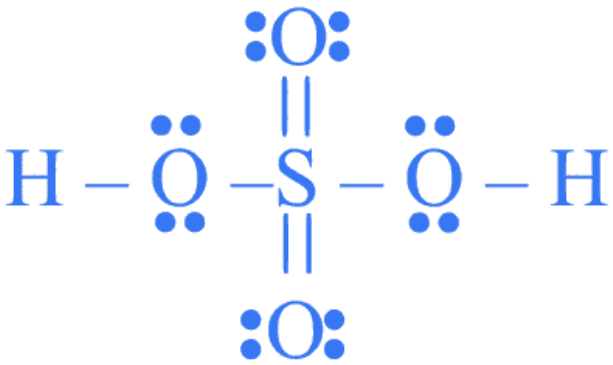
$$\left(R = 8.314\ J\ K^{-1(g)}mol^{-1}\right)$$

(A) 4.988 kJ
(B) −1.125 kJ
(C) 3.234 kJ
(D) −4.988 kJ

93. Identify the type of system if boiling water is kept in a half filled closed vessel.

(A) Homogeneous closed system
(B) Heterogeneous closed system
(C) Homogeneous isolated system
(D) Heterogeneous isolated system

94. What is the formal charge on sulfur in following Lewis structure?



(A) 2
(B) −2
(C) 0
(D) −1

95. Identify weakest halogen acid from following.

(A) HCl
(B) HI
(C) HF
(D) HBr

96. Which of the following phenomena is NOT explained by the open chain structure of glucose?

(A) Formation of pentaacetate of glucose with acetic anhydride.
(B) Formation of oxime with hydroxylamine.
(C) Formation of silver mirror with Tollen's regent.
(D) Existence of α and β forms of glucose.

97. Which from following polymers is obtained from isoprene?

(A) Teflon
(B) Natural rubber
(C) Viscose rayon
(D) Cuprammonium rayon

98. Find the radius of an atom in fcc unit cell having edge length 405pm.

(A) 202.5 pm
(B) 175.3 pm
(C) 143.2 pm
(D) 181.0 pm

99. Which from following cations in their respective oxidation states develops colourless aqueous solution?

(A) Fe^{3+}
(B) Fe^{2+}
(C) Cu^{2+}
(D) Cu^{+}

100. Calculate osmotic pressure of 0.2 M aqueous KCl solution at 0°C if van't Hoff factor for KCl is 1.83.

$$\left[R = 0.082\ dm^3\ atm\ mol^{-1}\ K^{-1}\right]$$

(A) 8.2 atm (B) 9.4 atm

(C) 10.6 atm (D) 6.5 atm

101. If

$$f(x) = 3^x; g(x) = 4^x$$

, then

$$\frac{f'(0) - g'(0)}{1 + f'(0)g'(0)}$$

is

(A) $\frac{\log(\frac{3}{4})}{1+(\log 3)(\log 4)}$ (B) $\frac{\log(\frac{3}{4})}{1+\log 12}$

(C) $\frac{\log 12}{1+\log 12}$ (D) $\frac{\log(\frac{3}{4})}{1-\log 12}$

102. If

$$x = \frac{5}{1-2i}, i = \sqrt{-1}$$

, then the value of $x^3 + x^2 - x + 22$ is

(A) 7 (B) 9

(C) 17 (D) 39

103. Two cards are drawn successively with replacement from a well-shuffled pack of 52 cards. Then mean of number of tens is

(A) $\frac{1}{13}$ (B) $\frac{1}{169}$

(C) $\frac{2}{13}$ (D) $\frac{4}{169}$

104.

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

(A) $\log(\sec(\frac{x^2+1}{2})) + c$, where c is a constant of integration.

(B) $\log(\frac{x^2+1}{2}) + c$, where c is a constant of integration.

(C) $\log(\sin(\frac{x^2+1}{2})) + c$, where c is a constant of integration.

(D) $2\log(x^2+1) + c$, where c is a constant of integration.

105. If the lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $x - 3 = \frac{y-k}{2} = z$ intersect, then the value of k is

(A) $\frac{3}{2}$ (B) $\frac{-2}{9}$

(C) $\frac{-2}{3}$ (D) $\frac{9}{2}$

106.

For all real x, the minimum value of $\frac{1-x+x^2}{1+x+x^2}$ is

(A) 0 (B) 1

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

107. If

$\bar{a} = \hat{i} + 4\hat{j} + 2\hat{k}, \bar{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}, \bar{c} = 2\hat{i} - \hat{j} + 4\hat{k}$

, then a vector $\bar{d}$ which is parallel to vector $\bar{a} \times \bar{b}$ and which

$$c \cdot d = 15$$

, is

(A) $30\hat{i} - \hat{j} - 14\hat{k}$ (B) $90\hat{i} - 3\hat{j} - 42\hat{k}$

(C) $90\hat{i} + \hat{j} - 7\hat{k}$ (D) $30\hat{i} - 3\hat{j} + 7\hat{k}$

108. If the vertices of a triangle are $(-2, 3), (6, -1)$ and $(4, 3)$, then the co-ordinates of the circumcentre of the triangle are

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

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

109. The solution of

$$\frac{dx}{dy} + \frac{x}{y} = x^2$$

is

(A) $\frac{1}{y} = cx - x\log x$, where c is a constant of integration.

(B) $\frac{1}{x} = cy - y\log y$, where c is a constant of integration.

(C) $\frac{1}{x} = cx - x\log y$, where c is a constant of integration.

(D) $\frac{1}{y} = cx - y\log x$, where c is a constant of integration.

110. If

$$\int \frac{\cos 8x + 1}{\cot 2x - \tan 2x}\, dx = A\cos 8x + c$$

, where c is an arbitrary constant, then the value of A is

(A) $\frac{1}{16}$ (B) $\frac{1}{8}$

(C) $\frac{-1}{8}$ (D) $\frac{-1}{16}$

111. The set of all points, where the derivative of the functions

$$f(x) = \frac{x}{1 + |x|}$$

exists, is

(A) $(-\infty, \infty)$ (B) $[0, \infty)$

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

112. In triangle ABC with usual notations

$$b = \sqrt{3}\ , c = 1,\ m\angle A = 30^\circ$$

, then the largest angle of the triangle is

(A) 135° (B) 90°

(C) 60° (D) 120°

113. A fair die is tossed twice in succession. If X denotes the number of fours in two tosses, then the probability distribution of X is given by

(A)

$X = x_i$	0	1	2
P_i	$\frac{1}{36}$	$\frac{25}{36}$	$\frac{5}{18}$

(B)

$X = x_i$	0	1	2
P_i	$\frac{25}{36}$	$\frac{1}{36}$	$\frac{5}{18}$

(C)

$X = x_i$	0	1	2
P_i	$\frac{25}{36}$	$\frac{5}{18}$	$\frac{1}{36}$

(D)

$X = x_i$	0	1	2
P_i	$\frac{5}{18}$	$\frac{1}{36}$	$\frac{25}{36}$

114. If

$$f(x) = \frac{3x+4}{5x-7}$$

and

$$g(x) = \frac{7x+4}{5x-3}$$

, then

$$f(g(x)) =$$

(A) $\frac{x^3+1}{x^2+2}$ (B) $41x$

(C) $g(f(x))$ (D) $\frac{5x-7}{41}$

115. If the function f is given by

$$f(x) = x^3 - 3(a-2)x^2 + 3ax + 7$$

, for some $a \in \mathbb{R}$, is increasing in $(0, 1]$ and decreasing in $[1, 5)$, then a root of the equation

$$\frac{f(x) - 14}{(x-1)^2} = 0 (x \neq 1)$$

is

(A) -7 (B) 6

(C) 7 (D) 5

116. The unit vector perpendicular to each of the vectors $\bar{a} + \bar{b}$ and $\bar{a} - \bar{b}$, where

$$\bar{a} = \hat{i} + \hat{j} + \hat{k}$$

and

$$b = 3\hat{i} - 2\hat{j} + 5\hat{k}$$

is

(A) $\frac{-14\hat{i}+4\hat{j}+10\hat{k}}{\sqrt{312}}$ (B) $\frac{14\hat{i}-4\hat{j}+10\hat{k}}{\sqrt{312}}$

(C) $\frac{14\hat{i}+4\hat{j}+10\hat{k}}{\sqrt{312}}$ (D) $\frac{-14\hat{i}-4\hat{j}+10\hat{k}}{\sqrt{312}}$

117. The logical statement

$$(\sim(\sim p \vee q) \vee (p \wedge r)) \wedge (\sim q \wedge r)$$

is equivalent to

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

(C) $(p \wedge r) \wedge \sim q$ (D) $(\sim p \wedge \sim q) \wedge r$

118. Let

$$\bar{a} = 2\hat{i} + \hat{j} - 2\hat{k}, \bar{b} = \hat{i} + \hat{j}$$

and $\bar{c}$ be a vector such that

$$|\bar{c} - \bar{a}| = 4, |(\bar{a} \times \bar{b}) \times \bar{c}| = 3$$

and the angle between $\bar{c}$ and $\bar{a} \times \bar{b}$ is

$$\frac{\pi}{6}$$

, then $\bar{a} \cdot \bar{c}$ is equal to

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

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

119. If a and b are positive number such that

$$a > b$$

, then the minimum value of

$$a\sec\theta - b\tan\theta\left(0 < \theta < \frac{\pi}{2}\right)$$

is

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

(C) $\sqrt{a^2+b^2}$ (D) $\sqrt{a^2-b^2}$

120.

If $l = \lim_{x \to 0} \frac{x}{|x| + x^2}$, then the value of l is

(A) 1 (B) -1

(C) 2 (D) non-existant

121. If

$$y = [(x+1)(2x+1)(3x+1) \ldots (nx+1)]^{\frac{3}{2}}$$

, then

$$\frac{dy}{dx}$$

at

$$x = 0$$

is

(A) $\frac{3n(n+1)}{4}$ (B) $\frac{n(n+1)}{2}$

(C) $\frac{3n(n+1)}{2}$ (D) $\frac{n(n+1)}{4}$

122. If

$$\cos x + \cos y - \cos(x+y) = \frac{3}{2}$$

, then

(A) $x + y = 0$ (B) $x = 2y$

(C) $x = y$ (D) $2x = y$

123. The joint equation of the lines pair of lines passing through the point $(3, -2)$ and perpendicular to the lines

$$5x^2 + 2xy - 3y^2 = 0$$

is

(A) $3x^2 + 2xy + 5y^2 + 14x + 26y + 5 = 0$

(B) $3x^2 + 2xy - 5y^2 - 14x - 26y - 5 = 0$

(C) $3x^2 - 2xy - 5y^2 - 14x - 26y + 5 = 0$

(D) $3x^2 - 2xy + 5y^2 + 14x + 26y - 5 = 0$

124. If the line

$$\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-2}{4}$$

meets the plane

$$x + 2y + 3z = 15$$

at the point P, then the distance of P from the origin is

(A) $\frac{7}{2}$ units

(B) $\frac{9}{2}$ units

(C) $\frac{\sqrt{5}}{2}$ units

(D) $2\sqrt{5}$ units

125. If A and B are two events such that

$$P(A) = \frac{1}{3}, P(B) = \frac{1}{5}, P(A \cup B) = \frac{1}{3}$$

, then the value of

$$P\left(A'/B'\right) + P\left(B'/A'\right)$$

is

(A) $\frac{5}{6}$

(B) 1

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

(D) $\frac{11}{6}$

126. If the general solution of the equation

$$\frac{\tan 3x - 1}{\tan 3x + 1} = \sqrt{3}$$

is

$$x = \frac{n\pi}{p} + \frac{7\pi}{q}, n, p, q, \in Z$$

, then

$$\frac{p}{q}$$

is

(A) 12

(B) $\frac{1}{12}$

(C) 3

(D) 36

127. If the area of the parallelogram with $\bar{a}$ and $\bar{b}$ as two adjacent sides is 16sq. units, then the area of the parallelogram having $3\overline{a} + 2\overline{b}$ and $\overline{a} + 3\overline{b}$ as two adjacent sides (in sq. units) is

(A) 96

(B) 112

(C) 144

(D) 128

128. The value of

$$\int (1 - \cos x) \cdot \operatorname{cosec}^2 x dx$$

is

(A) $\frac{1}{2}\tan\frac{x}{2} + c$, where c is a constant of integration.

(B) $\tan\frac{x}{2} + c$, where c is a constant of integration.

(C) $2\cot\frac{x}{2} + c$, where c is a constant of integration.

(D) $\cot\frac{x}{2} + c$, where c is a constant of integration.

129. If

$$\cos^{-1}\sqrt{p} + \cos^{-1}\sqrt{1-p} + \cos^{-1}\sqrt{1-q} = \frac{3\pi}{4}$$

, then q is

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

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

(C) 1

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

130. The slope of the tangent to a curve

$$y = f(x)$$

at $(x, f(x))$ is $2x + 1$. If the curve passes through the point $(1, 2)$, then the area (in sq. units), bounded by the curve, the X-axis and the line

$$x = 1$$

, is

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

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

(C) $\frac{5}{6}$

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

131. A rod AB, 13 feet long moves with its ends A and B on two perpendicular lines OX and OY respectively. When A is 5 feet from O, it is moving away at the rate of 3feet/sec. At this instant, B is moving at the rate

(A) $\frac{5}{4}$ft/sec upwards.

(B) $\frac{4}{5}$ft/sec upwards.

(C) $\frac{5}{4}$ft/sec downwards.

(D) $\frac{4}{5}$ft/sec downwards.

132. If

$$f(x) = \begin{cases} \frac{x-3}{|x-3|} + a & , \quad x < 3 \\ a + b & , \quad x = 3 \\ \frac{|x-3|}{x-3} + b, & x > 3 \end{cases}$$

Is continuous at

$$x = 3$$

, then the value of $a - b$ is

(A) -1

(B) 0

(C) 1

(D) 2

133. The equation of the tangent to the curve
$$y = \sqrt{9 - 2x^2}$$
, at the point where the ordinate and abscissa are equal, is

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

(C) $2x - y - 3\sqrt{3} = 0$ (D) $2x + y - 3\sqrt{3} = 0$

134. If
$$\mathrm{a} = 2\hat{\mathrm{i}} + 3\hat{\mathrm{j}} + 2\hat{\mathrm{k}}, \mathrm{b} = 2\hat{\mathrm{i}} + \hat{\mathrm{j}} - \hat{\mathrm{k}}$$
and
$$\mathrm{c} = 3\hat{\mathrm{i}} - \hat{\mathrm{j}}$$
are such that $\bar{a} + \lambda\bar{b}$ is perpendicular to $\bar{c}$, then the value of λ is

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

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

135. If a circle passes through points $(4, 0)$ and $(0, 2)$ and its centre lies on Y-axis. If the radius of the circle is r, then the value of $r^2 - r + 1$ is

(A) 25 (B) 21

(C) 20 (D) 10

136. If
$$\mathrm{A} = \begin{bmatrix} \mathrm{i} & 1 \\ 1 & 0 \end{bmatrix}$$
where
$$\mathrm{i} = \sqrt{-1}$$
and
$$\mathrm{B} = \mathrm{A}^{2029}$$
, then
$$\mathrm{B}^{-1} =$$

(A) $-\mathrm{A}$ (B) adjA

(C) $-\mathrm{I}$ (D) $-$adjA

137. The solution of the differential equation
$$\frac{dy}{dx} + \frac{y}{x} = \sin x$$
is

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

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

(C) $y(x + \cos x) = \sin x + c$, where c is a constant of integration.

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

138. Let $f : [-1, 2] \to [0, \infty)$ be a continuous function such that
$$\mathrm{f}(x) = \mathrm{f}(1 - x), \forall x \in [-1,2]$$
Let
$$\mathrm{R}_1 = \int_{-1}^{2} x\mathrm{f}(x)dx$$
and R_2 be the area of the region bounded by
$$y = \mathrm{f}(x), x = -1, x = 2$$
and the X-axis, then R_2 is

(A) $\frac{1}{2}R_1$ (B) $2R_1$

(C) $3R_1$ (D) $\frac{1}{3}R_1$

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

(A) $\bar{\mathrm{r}} = (\hat{\mathrm{i}} + 2\hat{\mathrm{j}} + 3\hat{\mathrm{k}}) + \lambda(4\hat{\mathrm{i}} + 7\hat{\mathrm{j}} - 13\hat{\mathrm{k}})$

(B) $\bar{\mathrm{r}} = (\hat{\mathrm{i}} + 2\hat{\mathrm{j}} + 3\hat{\mathrm{k}}) + \lambda(-4\hat{\mathrm{i}} + 7\hat{\mathrm{j}} - 13\hat{\mathrm{k}})$

(C) $\bar{\mathrm{r}} = (\hat{\mathrm{i}} + 2\hat{\mathrm{j}} + 3\hat{\mathrm{k}}) + \lambda(-4\hat{\mathrm{i}} - 7\hat{\mathrm{j}} - 13\hat{\mathrm{k}})$

(D) $\bar{\mathrm{r}} = (\hat{\mathrm{i}} + 2\hat{\mathrm{j}} + 3\hat{\mathrm{k}}) + \lambda(4\hat{\mathrm{i}} - 7\hat{\mathrm{j}} - 13\hat{\mathrm{k}})$

140. Let a random variable X have a Binomial distribution with mean 8 and variance 4. If
$$\mathrm{P}(\mathrm{X} \leq 2) = \frac{\mathrm{K}}{2^{16}}$$
, then K is

(A) 17 (B) 121

(C) 136 (D) 137

141.
$$\pi + \left(\sin^{-1}\frac{4}{5} + \sin^{-1}\frac{5}{13} + \sin^{-1}\frac{16}{65}\right)$$
is equal to

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

(C) $\frac{3\pi}{2}$ (D) $\frac{7\pi}{4}$

142. If the angles of a triangle are in the ratio $4 : 1 : 1$, then the ratio of the longest side to its perimeter is

(A) $\sqrt{3} : (2 + \sqrt{3})$ (B) $2 : (1 + \sqrt{3})$

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

143. If truth value of logical statement $(p \leftrightarrow \sim q) \to (\sim p \wedge q)$ is false, then the truth values of p and q are respectively

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

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

144. The teacher wants to arrange 5 students on the platform such that the boy B_1 occupies second position and the girls G_1 and G_2 are always adjacent to each other, then the number of such arrangements is

(A) 24 (B) 12

(C) 8 (D) 16

145. If

$$a = \hat{i} + \hat{j} + \hat{k}, b = 4\hat{i} + 3\hat{j} + 4\hat{k}$$

and

$$c = \hat{i} + \alpha\hat{j} + \beta\hat{k}$$

are linearly dependent vectors and

$$|\overline{c}| = \sqrt{3}$$

, then the values of α and β are respectively.

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

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

146. At present a firm is manufacturing 1000 items. It is estimated that the rate of change of production P w.r.t. additional number of worker x is given by

$$\frac{dp}{dx} = 100 - 12\sqrt{x}$$

. If the firm employees 9 more workers, then the new level of production of items is

(A) 1684 (B) 1648

(C) 2116 (D) 1116

147. The maximum value of

$$z = 3x + 5y$$

subject to the constraints $3x + 2y \leq 18, x \leq 4, y \leq 6, x, y \geq 0$, is

(A) 27 (B) 36

(C) 42 (D) 30

148. If

$$I = \int \sin(\log(x))dx$$

, then I is given by

(A) $-\frac{x}{2}(\sin(\log x) - \cos(\log x)) + c$, where c is a constant of integration.

(B) $\frac{x}{2}(\sin(\log x) - \cos(\log x)) + c$, where c is a constant of integration.

(C) $\frac{x}{2}(\sin(\log x) + \cos(\log x)) + c$, where c is a constant of integration.

(D) $-\frac{x}{2}(\sin(\log x) + \cos(\log x)) + c$, where c is a constant of integration.

149. If both mean and variance of 50 observations $x_1, x_2, \ldots\ldots, x_{50}$ are equal to 16 and 256 respectively, then mean of $(x_1 - 5)^2, (x_2 - 5)^2, \ldots\ldots (x_{50} - 5)^2$ is

(A) 357 (B) 387

(C) 377 (D) 397

150. The angle between the line

$$\frac{x+1}{2} = \frac{y-2}{1} = \frac{z-3}{-2}$$

and plane

$$x - 2y - \lambda z = 3$$

is

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

, then value of λ is

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

(C) $\sqrt{\frac{5}{3}}$ (D) $\frac{1}{\sqrt{3}}$

- End of Question Paper -