

JEE MAIN-2024-25
(FULL TEST)
(Physics, Chemistry and Mathematics)



Date :-

Time :- 3:00 Hrs.

Marks :- 300

Important Instructions :

1. The test duration is of **3 hours**.
2. The Test Booklet consists of 90 questions. The maximum marks are 300.
3. There are **three** parts in the question paper consisting of **Physics, Chemistry** and **Mathematics** having 30 questions in each part of equal weightage. Each part (subject) has two sections.
 - (i) **Section-A:** This section contains 20 multiple choice questions which have only one correct answer. Each question carries **4 marks** for correct answer and **-1 mark** for wrong answer.
 - (ii) **Section-B:** This section contains 10 questions. In Section-B, attempt any **five questions out of 10**. The answer to each of the questions is a numerical value. Each question carries **4 marks** for correct answer and **-1 mark** for wrong answer. For Section-B, the answer should be rounded off to the nearest integer.

Student's Name :-

School Name :-

Student's Signature :-

Invigilator's Signature :-

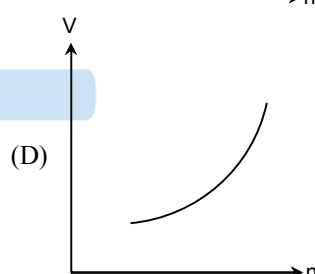
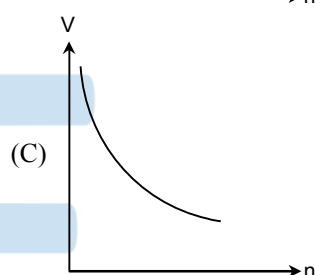
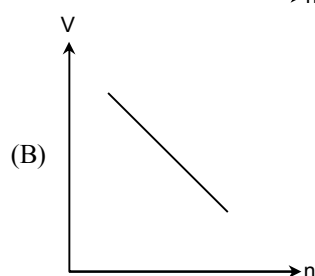
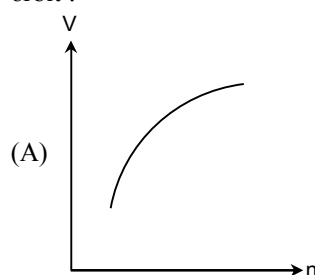
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PHYSICS

(SECTION-A)

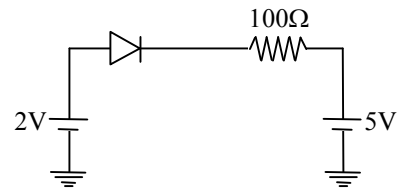
- Electric Flux is a measure of
 - the rate at which moving electric charges are crossing an area
 - the number of electric field lines passing through an area
 - the surface density of electric charge spread along the area
 - the rate at which electric field lines are spreading out in space as one moves further and further away from electric charges
- To study the dissipation of energy student plots a graph between square root of time and amplitude. The graph would be a -
 - Straight line
 - hyperbola
 - Parabola
 - Exponential
- In Fraunhofer diffraction due to a narrow slit a screen is placed 2 m away from the lens to obtain the pattern. If the slit width is 0.2 mm and the first minima are 5 mm on either maximum, The wavelength of light is
 - 2000 Å
 - 3000 Å
 - 4000 Å
 - 5000 Å
- Light is incident from glass ($\mu = 3/2$) to water ($\mu = 4/3$). For which of the following angle of deviation, there will be a unique angle of incidence:
 - $\sin^{-1}\left(\frac{2}{9}\right)$
 - $\sin^{-1}\left(\frac{1}{3}\right)$
 - $\sin^{-1}\left(\frac{4}{9}\right)$
 - $\sin^{-1}\left(\frac{5}{9}\right)$
- Two capacitors one of 6 μf and another 24 μf (uncharged initially) are joined in series and then the combination is charged to a potential difference 100V. Energy stored in 6 μf capacitor is :
 - 19.2 mJ
 - 1.2 mJ
 - 7.5 mJ
 - 12 mJ
- An unknown resistor is connected in series with a non ideal ammeter and an ideal voltmeter connected in parallel with resistance only. Then network is connected to a battery. Reading of voltmeter and ammeter is noted and then the value of resistance is computed as $\frac{\text{Reading of voltmeter}}{\text{Reading of ammeter}}$. Computed value of resistance is:
 - Less than true resistance
 - Greater than true resistance
 - equal to true resistance
 - Data insufficient (Depends actual resistance of ammeter)

- Which of the following curve may represent the speed of the electron lying in n^{th} hydrogen orbit :



- Two uniform solid spheres of identical radius and materials of specific gravity 4 and 8 respectively, are released in water of sufficient depth. Ratio of the terminal velocity of heavier sphere to terminal velocity of lighter sphere is :
 - 2
 - $\frac{7}{3}$
 - $\frac{5}{3}$
 - 1
- In an experiment of photoelectric effect the wavelength of the incident radiation is λ (less than threshold wavelength). The wave length of the incident radiation is reduced to $\frac{1}{3}$ rd of the initial value and the maximum kinetic energy of the photoelectron observed to be 4 times the previous value. The threshold wavelength for the metal plate is:
 - 2λ
 - 3λ
 - 4λ
 - 5λ

10. Current through the ideal diode is –

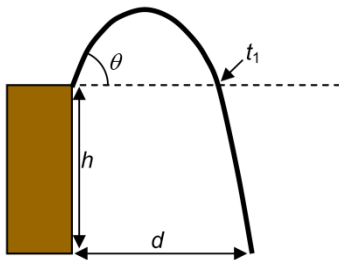


- (A) zero
(B) 20 A
(C) $\frac{1}{20}$ A
(D) $\frac{1}{50}$ A

11. A student is performing the experiment of Resonance Column. The diameter of the column tube is 4cm. The frequency of the tuning fork is 512 Hz. The air temperature is 38°C in which the speed of sound is 336 m/s. The zero of the meter scale coincides with the top end of the Resonance Column tube. When the first resonance occurs, the reading of the water level in the column is

- (A) 14.0 cm
(B) 15.2 cm
(C) 16.4 cm
(D) 17.6 cm

12. A projectile is launched from a cliff a height h above the ground at an angle θ above the horizontal. After a time t_1 has elapsed since the launch, the projectile passes the level of the cliff top moving downward. It eventually lands on the ground a horizontal distance d from its launch site. Value of $\tan\theta$ in terms of the other given quantities and the acceleration of gravity (g) will be : (Ignore air resistance).



- (A) $\tan\theta = \frac{t_1^2 g \left[1 + \sqrt{1 + \frac{8h}{gt_1^2}} \right]}{4d}$
 (B) $\tan\theta = \frac{t_1^2 g \left[1 + \sqrt{1 + \frac{4h}{gt_1^2}} \right]}{4d}$
 (C) $\tan\theta = \frac{t_1^2 g \left[1 + \sqrt{1 + \frac{4h}{gt_1^2}} \right]}{2d}$
 (D) $\tan\theta = \frac{t_1^2 g \left[1 + \sqrt{1 + \frac{8h}{gt_1^2}} \right]}{2d}$

13. Time taken by a 836 W heater to heat one liter of water from 10°C to 40°C is :

- (A) 50 s
(B) 100 s
(C) 150 s
(D) 200 s

14. If two soap bubbles of different radii are connected by a tube :

- (A) air flows from the bigger bubble to the smaller bubble till the sizes become equal
 (B) air flows from bigger bubble to the smaller bubble till the sizes are interchanged
 (C) air flows from the smaller bubble to the bigger bubble
 (D) there is no flow of air

15. A ball of correct diameter 3.761 cm is placed between the jaws of a screw gauge but it gives the diameter reading of 3.754 cm. When diameter of another ball is measured by the same screw gauge, its reading comes out to be 7.000 cm, correct diameter of the second ball is:

- (A) 7.007 cm
(B) 6.993 cm
(C) 7.000 cm
(D) 7.754 cm

16. Two particles, each of mass m and charge Q are attached at the ends of an insulating uniform rod of mass $2m$ and length b . The rod is rotated at constant angular speed ω about an axis passing through its center of mass and perpendicular to the rod. The ratio of magnetic moment of the system to its angular momentum is

- (A) $\frac{Q}{2m}$
(B) $\frac{2Q}{m}$
(C) $\frac{3Q}{8m}$
(D) $\frac{3Q}{4m}$

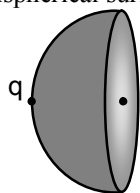
17. At a certain location on earth, when a magnetic needle is placed in a randomly chosen vertical plane P_1 , it shows an apparent dip of $\theta_1 = 30^\circ$ in equilibrium. When this needle is placed in other vertical plane P_2 perpendicular to P_1 , it shows an apparent dip of $\theta_2 = 45^\circ$ in equilibrium. Angle between earth's magnetic field and horizontal plane at that location is:

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

18. The position of a particle in x-y plane is given by $x = 8 \sin \pi t$ and $y = -2 \cos 2\pi t$. Then choose the correct option:

- (A) the path of the particle is parabola
 (B) the path of the particle is ellipse
 (C) the path of the particle is symmetric about x-axis
 (D) the acceleration of the particle is directed towards the origin

19. A point charge q is placed at the centre of the surface of a hemispherical surface as shown in the figure. The electric flux linked with the curved hemispherical surface is nearest to :



- (A) $\frac{q}{\epsilon_0}$ (B) $\frac{q}{2\epsilon_0}$
 (C) $\frac{q}{\sqrt{2}\epsilon_0}$ (D) $\frac{q}{2\sqrt{2}\epsilon_0}$

20. A very long cylindrical galaxy of length L is made of uniformly distributed mass and has radius R ($R \ll L$). A star outside the galaxy is orbiting the galaxy in a plane perpendicular to axis of the galaxy and passing through its centre. If the time period of star is T and distance from the galaxy axis is r , then:

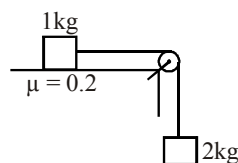
- (A) $T^2 \propto r^3$ (B) $T \propto r^3$
 (C) $T \propto r$ (D) $T \propto \sqrt{r}$

(SECTION-B)

21. Find the ratio of de-Broglie wavelength of an proton to that of a α -particle being subjected to the same magnetic field so that the radii of their paths are equal to each other, assuming that the field induction vector \vec{B} is perpendicular to the velocity vectors of the α -particle and the proton.
22. A 500 W heating unit is designed to operate from a 115 volt line. If the line voltage drops to 110 volt, the percentage drop in heat output is x %. Find x .
23. Two pendulums of same amplitude but time period 6s and 18s start oscillating simultaneously from two opposite extreme positions. The time (in seconds) after which they will be in phase is T then the value of $3T$ is.
24. 4 moles of H_2 at 500 K is mixed with 2 moles of He at 400K. The mixture attains a temperature T and volume V . Now the mixture is compressed adiabatically to a volume V' and temperature T' . If $\frac{T'}{T} = \left(\frac{V}{V'}\right)^n$, find the value of $26n$.

25. A source of sound of frequency 1.8 kHz moves uniformly along a straight line at a distance 250 m from observer. The velocity of source is $0.8 C$ where C is the velocity of sound. Find out the frequency of sound received by observer (in kHz) at the moment when the source gets closest to him.

26. The system shown is released from rest. Find the distance (in m) travelled by the hanging block in 1 sec.



27. In a glass tube filled with a gas and closed by a mercury column of length 8 cm, if you hold the tube such that its open end is up, the length of the gas column is 4cm, but if you hold the tube with its open end down, the length of the gas column is 5 cm. What is the atmospheric pressure (in cm) of mercury column?

28. The potential energy 'U' of a particle varies with distance 'x' from a fixed origin as $U = \frac{Ax}{x^2 + B}$. where A and B are dimensional constants. Find the dimension of length in AB.

29. Light is emitted by hydrogen atoms in visible region of spectrum it's wavelength is 656 nm. Taking $R_H = 1.097 \times 10^7 /m$, What is the value of 'n' from which the line originates.

30. A block of mass m and a sphere of same mass $m = 16$ kg are projected on a smooth level ground with equal kinetic energies along parallel tracks. Both of them have same kinetic energy of 35 J. The sphere rolls purely on the ground. Find the distance between their centers (in m) after $(\sqrt{70} + \sqrt{50})$ sec if they started from the same initial line.

CHEMISTRY

SECTION-A

31. Which of the following species is paramagnetic ?
 (A) NO⁻ (B) O₂²⁻ (C) CN⁻ (D) CO

32. Which hydrogen is most polar ?
 (A) LiH (B) CsH (C) HF (D) HI

33. ZnO shows yellow colour on Heating due to
 (A) d-d transition
 (B) C-T spectra
 (C) Higher polarisation caused by Zn²⁺ ion
 (D) F- centres

34. Which among the following will be named as dibromidobis (ethylene diamine) chromium (III) bromide?

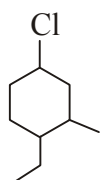
- (A) [Cr(en)₃]Br₃ (B) [Cr(en)₂Br₂]Br
 (C) [Cr(en)Br₄]⁻ (D) [Cr(en)Br₂]Br

35. The octahedral complex of a metal ion M³⁺ with four monodentate ligands L₁, L₂, L₃ and L₄ absorb wavelengths in the region of red, green, yellow and blue, respectively. The increasing order of ligand strength of the four ligands is :

- (A) L₄ < L₃ < L₂ < L₁ (B) L₁ < L₃ < L₂ < L₄
 (C) L₃ < L₂ < L₄ < L₁ (D) L₁ < L₂ < L₄ < L₃

36. Which of the following statement is not correct.

- (A) Cyclobutane is a planar compound
 (B) Trans cyclohexadecene is relatively more stable than its cis form
 (C) Cis form of 1, 3, 5-trimethylcyclohexane is relatively more stable than its trans form
 (D) Cis 1, 2-dichloroethene is relatively more stable than its trans form.



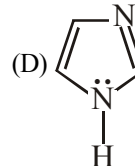
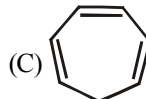
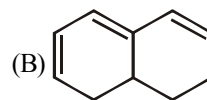
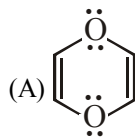
37. name of the compound is

- (A) 5-chloro-2-ethyl-1-methyl-cyclohexane
 (B) 1-chloro-4-ethyl -3-methyl cyclohexane
 (C) 1-ethyl-2-methyl-4-chloro cyclohexane
 (D) 4-chloro-1-ethyl-2-methyl cyclohexane

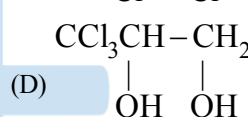
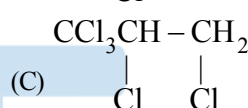
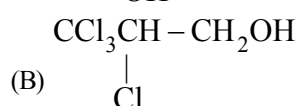
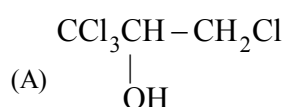
38. Which of the following compounds can exist in optically active form

- (A) 1-butanol (B) 2-butanol
 (C) 3-pentanol (D) 4-heptanol

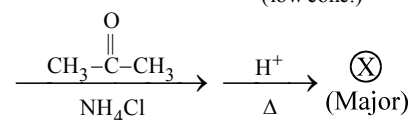
39. Which of the following is aromatic?



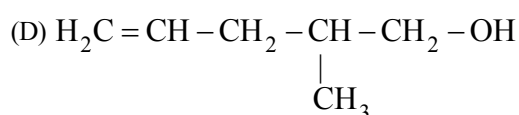
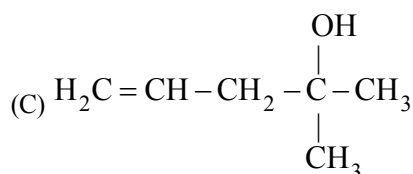
40. CCl₃CH=CH₂ $\xrightarrow{\text{Cl}_2 + \text{H}_2\text{O}}$ A. A is



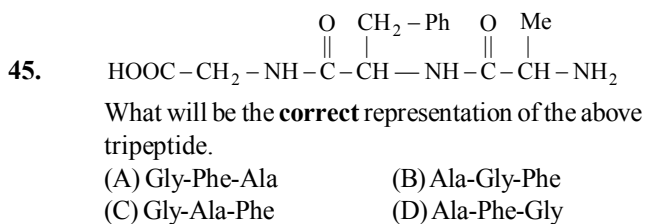
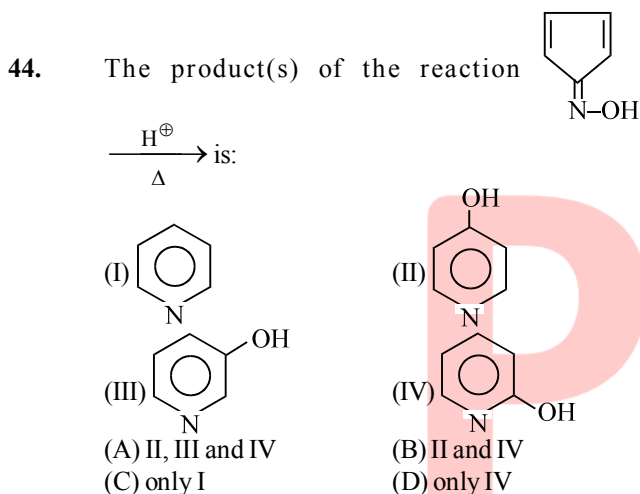
41. $\text{CH}_3-\text{CH}=\text{CH}_2 \xrightarrow[\text{(low conc.)}]{\text{Br}_2, \text{h}\nu}$ $\xrightarrow[\text{Dry ether}]{\text{Mg}}$



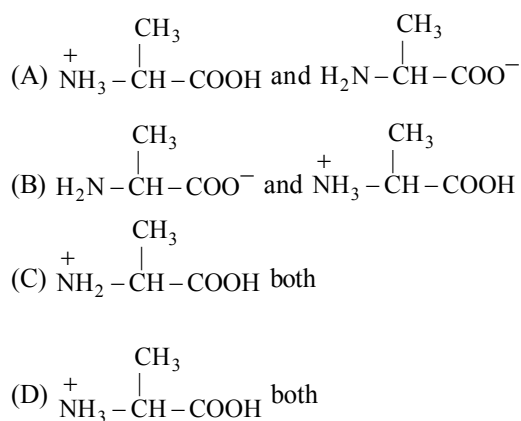
End product of above reaction is



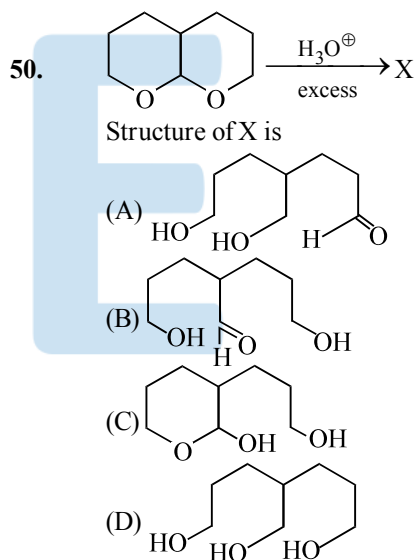
42. Hydrolysis of one mole of Peroxo-disulphuric acid produces.
 (A) Two moles of sulphuric acid
 (B) Two moles of peroxomono-sulphuric acid
 (C) One mole of sulphuric acid, one mole of peroxomono-sulphuric acid
 (D) One mole of sulphuric acid, one mole of peroxomono-sulphuric acid and one mole of hydrogen peroxide.
43. The dipole moment of H_2O_2 is more than that of H_2O but H_2O_2 is not a good solvent because
 (A) it has a very high dielectric constant so that ionic compounds cannot be dissolved in it
 (B) it does not act as an oxidising agent
 (C) it acts as a reducing agent
 (D) it dissociates easily and acts as an oxidising agent in chemical reactions



46. Structures of alanine at $\text{pH} = 2$ and $\text{pH} = 10$ are respectively



47. Which one is an outer orbital complex?
 (A) $[\text{Ni}(\text{NH}_3)_6]^{2+}$ (B) $[\text{Mn}(\text{CN})_6]^{4-}$
 (C) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (D) $[\text{Fe}(\text{CN})_6]^{4-}$
48. Co-ordination compounds have great importance in biological systems. In this context, which statement is incorrect?
 (A) Carboxypeptidase-A is an enzyme and contains zinc.
 (B) Haemoglobin is the red pigment of blood and contains iron.
 (C) Cyanocobalmin is B_{12} and contains cobalt.
 (D) Chlorophylls are green pigments in plants and contain calcium.
49. On oxidation of alcohol with $\text{H}^+\text{K}_2\text{Cr}_2\text{O}_7$, maximum yield of carbonyl compound will be obtained in
 (A) 1° alcohol
 (B) 2° alcohol
 (C) 3° alcohol
 (D) equal in 1° & 2° alcohol



SECTION-B

51. For the reaction $\text{A}(\text{g}) \rightarrow \text{B}(\text{g}) + \text{C}(\text{g})$, the value of ΔG was -5154.3 Joules at partial pressures of 2, 1, 1 atm for A, B and C respectively, in a container of volume 'V' litres at Temperature 300 K. Find the total pressure in the same container at equilibrium in **atm**.
USE: $R = 8.3 \text{ J/K mole}$; $\log 2 = 0.3$
 $\Rightarrow 10^{0.3} = 2$; $\frac{\ln X}{\log X} = 2.3$
52. How many millimoles of MgCl_2 should be added to just precipitate $\text{Mg}(\text{OH})_2$ in 500 ml buffer solution containing 0.1 M NH_4OH & 0.1 M $(\text{NH}_4)_2\text{SO}_4$?
 {Given : $K_b(\text{NH}_4\text{OH}) = 10^{-5}$; $K_{sp}[\text{Mg}(\text{OH})_2] = 10^{-11}$ }

53. 2 moles of an ideal gas is expanded from (2 bar, 1L) to 1 bar isothermally. Calculate magnitude of minimum possible work in the change (in Joules).
[Given : 1 bar L = 100 J]
54. If Ag_2O (s) is exposed to atmosphere having pressure 1 atm and temperature 27°C . Under these conditions comment whether it will dissociate spontaneously or not.

$$2\text{Ag}_2\text{O}(\text{s}) \rightleftharpoons 4\text{Ag}(\text{s}) + \text{O}_2(\text{g})$$
Given: ΔH_f° (kJ/mol) ΔS° (J/Kmol) at 27°C
- | | | |
|---------------------------|-----|-------|
| Ag(s) | 0 | 42.0 |
| Ag_2O (s) | -30 | 121.0 |
| O_2 (g) | 0 | 204.0 |
- (Air consist of 20% O_2 by volume)
Take : $R = 8.3 \text{ JK}^{-1}\text{mol}^{-1}$
55. Consider the elementary reaction $\text{A} + \text{B} \rightarrow \text{products}$. The reaction has a temperature coefficient value of 2.0 at 25°C . At what temperature (in $^\circ\text{C}$) should the reaction be carried out if inspite of **halving** the concentrations of each reactants the rate of reaction is double of that at 25°C with original concentration taken .
56. An element A form two oxides. The weight ratio of A and O in oxides are $x : y$ and $y : x$ respectively. If equivalent weight of A in first oxide is $\frac{32}{3}$. What is equivalent weight of A in second oxides?
57. The vapour pressure of an aqueous solution of CaCl_2 at 25°C is 20 mm Hg. The vapour pressure of pure water at the same temperature is 21.08 mm Hg. Find freezing point depression (ΔT_f) of solution.
[Given : $K_f = 2 \text{ K kg mol}^{-1}$]
58. Assuming same expression of colligative property to be applicable for solid in solid solution, calculate what will be the melting point of an alloy of lead and tin if 12gm of tin is present for every 100 gm of lead. The molal depression constant of lead is $8.5 \text{ K-Kg mole}^{-1}$.
[Given : Atomic mass Sn = 120, Pb = 208, Melting point of Pb = 327°C]
[Express your answer in Kelvin]
59. Find \wedge_m^∞ (in $\Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$) for SrCl_2 in water at 25° from the following data.
- | | | |
|--|------|-----|
| Conc. C (mole/L) | 0.25 | 1 |
| \wedge_m ($\Omega^{-1} \text{ cm}^2 / \text{mol}$) | 260 | 250 |
60. Electrons in a sample of H-atoms make transitions from state $n = X$ to some lower excited state. The emission spectrum from the sample is found to contain only the lines belonging to a particular series. If one of the photons had an energy of 0.6375 eV, then find out value of X.
[Take $0.6375 \text{ eV} = \frac{3}{4} \times 0.85 \text{ eV}$]

61. The curve given by $x + y = e^{xy}$ has a tangent parallel to the y-axis at the point
 (A) (0,1) (B) (1, 0)
 (C) (1,1) (D) None of these
62. The condition that the parabolas $y^2 = 4ax$ and $y^2 = 4c(x - b)$ have a common normal other than x-axis (a, b, c being distinct positive real numbers) is -
 (A) $\frac{b}{a-c} < 2$ (B) $\frac{b}{a-c} > 2$
 (C) $\frac{b}{a-c} < 1$ (D) $\frac{b}{a-c} > 1$
63. 10 apples are distributed at random among 6 persons. The probability that atleast one of them will receive none, is
 (A) $\frac{6}{143}$ (B) $\frac{{}^{14}C_4}{{}^{15}C_5}$
 (C) $\frac{137}{143}$ (D) None of these
64. If $\int \frac{dx}{(x+2)(x^2+1)} = a \log(1+x^2) + b \tan^{-1} x + \frac{1}{5} \log|x+2| + C$, then
 (A) $a = -\frac{1}{10}, b = -\frac{2}{5}$
 (B) $a = \frac{1}{10}, b = -\frac{2}{5}$
 (C) $a = -\frac{1}{10}, b = \frac{2}{5}$
 (D) $a = \frac{1}{10}, b = \frac{2}{5}$
65. The equation of the base of an equilateral triangle ABC is $x + y = 2$ and the vertex is (2, -1). The area of the triangle ABC is
 (A) $\frac{\sqrt{2}}{6}$ (B) $\frac{\sqrt{3}}{6}$
 (C) $\frac{\sqrt{3}}{8}$ (D) none
66. The greatest value of x^2y^3 , when $3x + 4y = 5$, is
 (A) $\frac{3}{8}$ (B) $\frac{3}{16}$
 (C) $\frac{6}{5}$ (D) None of these
67. If the angle of a triangle are 30° and 45° and the included side is $(\sqrt{3}+1)$ cm, then the area of the triangle is
 (A) $\frac{1}{2}(\sqrt{3}+1)$ (B) $\frac{1}{4}(\sqrt{3}+1)$
 (C) $\frac{1}{2}(\sqrt{3}-1)$ (D) $\frac{1}{4}(\sqrt{3}-1)$
68. A cone of maximum volume is inscribed in a given sphere, then ratio of height of the cone to diameter of the sphere is
 (A) $\frac{2}{3}$ (B) $\frac{3}{4}$
 (C) $\frac{1}{3}$ (D) $\frac{1}{4}$
69. If $y^2 = p(x) =$ a polynomial of degree 3, then $2 \frac{d}{dx} \left(y^3 \frac{d^2y}{dx^2} \right)$ equal to
 (A) $p''(x) + p'(x)$
 (B) $p''(x) \cdot p''(x)$
 (C) $p(x) \cdot p''(x)$
 (D) None of the above
70. Equation of latus rectum of hyperbola $(10x-5)^2 + (10y-2)^2 = 9(3x+4y-7)^2$ is
 (A) $y - \frac{1}{5} = -\frac{3}{4} \left(x - \frac{1}{2} \right)$
 (B) $y - \frac{1}{5} = \frac{3}{4} \left(x - \frac{1}{2} \right)$
 (C) $y + \frac{1}{5} = -\frac{3}{4} \left(x + \frac{1}{2} \right)$
 (D) $y + \frac{1}{5} = \frac{3}{4} \left(x + \frac{1}{2} \right)$
71. Out of the two roots of $x^2 + (1-2\lambda)x + (\lambda^2 - \lambda - 2) = 0$ one root is greater than 3 and the other root is less than 3, then the limits of λ are
 (A) $\lambda < 2$ (B) $2 < \lambda < 5$
 (C) $\lambda > 5$ (D) $\lambda = \frac{5}{2}$

72. Let $y = f(x)$ be a continuous function such that $\frac{dy}{dx} = |x - 1|$. If $y(0) = 0$ then $y(3)$ equals

- (A) $\frac{-3}{2}$ (B) $\frac{3}{2}$ (C) $\frac{5}{2}$ (D) 2

73. The equation of a line inclined at an angle $\frac{\pi}{4}$ to the axis of X , such that the two circles $x^2 + y^2 = 4, x^2 + y^2 - 10x - 14y + 65 = 0$ intercept equal lengths on it, is

- (A) $2x - 2y - 3 = 0$
 (B) $2x - 2y + 3 = 0$
 (C) $x - y + 6 = 0$
 (D) $x - y - 6 = 0$

74. The differential equation of the family of hyperbolas with asymptotes as the line $x + y = 1$ and $x - y = 1$ is:

- (A) $yy' + x = 0$ (B) $yy' = (x - 1)$
 (C) $yy'' + y' = 0$ (D) $y' + xy = 0$

75. Solution of $\sec^2 y \frac{dy}{dx} + x \tan y = x^3$ is

- (A) $\tan y = x^2 + ce^{-x^2}$
 (B) $\tan y = x^2 - 2 + ce^{-x^2}$
 (C) $\tan y = x^2 - 2 + ce^{-x^2/2}$
 (D) none of these

76. $\lim_{x \rightarrow -\infty} \left\{ x + \sqrt{x^2 + 3x \cos \frac{1}{|x|}} \right\}$ equals

- (A) $3/2$ (B) $-3/2$
 (C) -1 (D) None of these

77. If $A = \begin{bmatrix} 0 & 5 \\ 0 & 0 \end{bmatrix}$ and $f(x) = 1 + x + x^2 + \dots + x^{16}$, then $f(A)$ is equal to -

- (A) 0 (B) $\begin{bmatrix} 1 & 5 \\ 0 & 1 \end{bmatrix}$
 (C) $\begin{bmatrix} 1 & 5 \\ 0 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 0 & 5 \\ 1 & 1 \end{bmatrix}$

78. A function f is defined by $f(x) = |x|^m |x - 1|^n \forall x \in \mathbb{R}$. The maximum value of the function is $(m, n \in \mathbb{N})$ -

- (A) 1 (B) $m^n n^m$
 (C) $\frac{m^m n^n}{(m+n)^{m+n}}$ (D) $\frac{(mn)^{mn}}{(m+n)^{m+n}}$

79. If z_1, z_2, z_3 are the complex numbers, such that $|z_1| = |z_2| = |z_3| = \left| \frac{1}{z_1} + \frac{1}{z_2} + \frac{1}{z_3} \right| = 1$, then

- $|z_1 + z_2 + z_3|$ is -
 (A) equal to 1 (B) less than 1
 (C) greater than 1 (D) equal to 3

80. If the three angles of a quadrilateral are $60^\circ, 60^\circ$ and $\frac{5\pi}{6}$. Then the fourth angle is-

- (A) 90° (B) 92° (C) 96° (D) 98°

(SECTION-B)

81. The least integral value of a for which the equation $x^2 - 2(a-1)x + (2a+1) = 0$ has both the roots positive, is

82. A GP consists of an even number of terms. If the sum of all the terms is 5 times the sum of the terms occupying odd places, then the common ratio will be equal to

83. A $(p, 0), B(4, 0), C(5, 6), D(1, 4)$ are the vertices of a quadrilateral ABCD. If $\angle ADC$ is obtuse, the maximum integral value of p is

84. $\frac{dy}{dx} - \frac{2xy}{1+x^2} = 0$ and $y(0) = 1$ then $y(1) =$

85. ABC is a triangle. E and F are mid points of AC and AB respectively. If the area of ΔABC is λ times the area of ΔFCE , then $\lambda =$

86. A line with direction ratios $(2, 1, 2)$ intersects the lines $\vec{r} = -\vec{j} + \lambda(\vec{i} + \vec{j} + \vec{k})$ and $\vec{r} = -\vec{i} + \mu(2\vec{i} + \vec{j} + \vec{k})$ at A and B, then $AB =$

87. The number of integer values of m , for which the x coordinate of the point of intersection of the lines $3x + 4y = 9$ and $y = mx + 1$ is also an integer is.

88. Values of x for which the sixth term of the expansion of

$$E = \left[3^{\log_3 \sqrt{9^{|x-2|}}} + 7^{\frac{1}{5} \log_7 [(4) \cdot 3^{|x-2|} - 9]} \right] \text{ is } 567, \text{ is/are}$$

:

89. An ellipse of eccentricity $\frac{2}{3}$ is inscribed in an ellipse of equal eccentricity and area equals to 9 square units in such a way that both the ellipse touch each other at end of their common major axis. If length of major axis of smaller ellipse is equal to length of minor axis of bigger ellipse, find the area of the bigger ellipse outside the smaller ellipse.

90. If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ and $\det(A^n - I) = 1 - \lambda^n$, $n \in \mathbb{N}$, then λ is equal to

PE