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

13
FULL TEST

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 :- .....

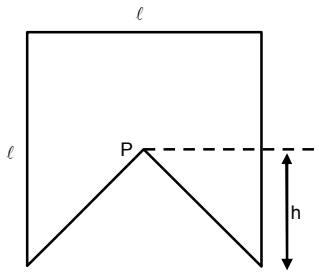
Student's Signature :- ..... **Invigilator's Signature :-** .....

PE

PHYSICS

(SECTION-A)

1. An isosceles triangle is to be cut from one edge of a square lamina of uniform mass density such that the remaining portion when suspended from apex P of the cut will remain in equilibrium in any position. The value of h is.



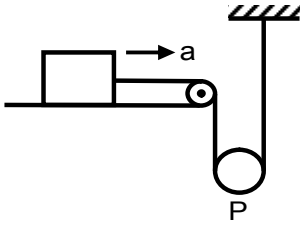
(A) $\left(\frac{2-\sqrt{2}}{2}\right)\ell$ (B) $\left(\frac{3+\sqrt{2}}{2}\right)\ell$

(C) $\left(\frac{3-\sqrt{3}}{2}\right)\ell$ (D) $\left(\frac{2+\sqrt{2}}{2}\right)\ell$

2. A particle is moved in a circle with a constant angular velocity. Its angular momentum is L. If the radius of the circle is halved keeping the angular velocity same, the angular momentum of the particle will become -

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

3. In the given figure the fixed pulley is smooth and light where as movable pulley is rough and has some mass. There is no slipping between the pulley and the string. Then magnitude of acceleration of the point P on the movable pulley is. (If block is moving with an acceleration a)



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

(C) $\sqrt{2}a$ (D) $\frac{a}{\sqrt{2}}$

4. A capillary tube with very thin walls is held vertical and is attached to an end of a light horiozontal rod which is pivoted at its midpoint. A mass is suspended through the other end to keep the rod in horizontal position. Now the lower end of the capillary tube is just brought in contact with the surface of water. An additional mass 0.157 g is attached to the other end to keep the rod in horizontal position. What is the radius of the capillary tube ? Surface tension of the water is 0.075 N/m. Contact angle between tube and water is 0º.

(A) 3.3 mm (B) 6.6 mm
(C) 9.9 mm (D) 1.1 mm

5. Light rays from a very distant source travels along +x direction and fall on two identical thin lenses with focal length F > 0 and their optical axes along x-axis. One at x = 0 and the other at x = d (< F). The rays will focus at x =

(A) $d+\frac{F(F-d)}{2F-d}$ (B) $d-\frac{F(F-d)}{d}$

(C) $d+\frac{F(F-d)}{2(F+d)}$ (D) $d+\frac{F^2}{2(F-d)}$

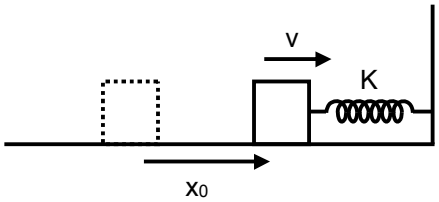
6. A horizontal tube, open at both ends contains a column of liquid. The length of this liquid column does not change with temperature. If γ = co-efficient of volume expansion of liquid and α = coefficient of linear expansion of the material of the tube. Then

(A) $\gamma = \alpha$ (B) $\gamma = 2\alpha$
(C) $\gamma = 3\alpha$ (D) $\gamma = 0$

7. The units nanometre, fermi, angstrom and attometre, arranged in decreasing order will read as-

(A) angstrom, nanometre, fermi, attometre
(B) fermi, attometre, angstrom, nanometre
(C) nanometre, angstrom, fermi, attometre
(D) attometre, angstrom, fermi, nanometer

8. Initially spring is compressed by distance x_0 from equilibrium position. At this compression block is given velocity $v = \sqrt{\frac{3K}{m}}\, x_0$. So that the compression in the spring increases and block start SHM (Spring constant K). Equation of motion of block is.



(A) $y = y = 3x_0 \sin\left(\sqrt{\frac{K}{m}}t + \frac{\pi}{3}\right)$

(B) $y = 2x_0 \sin\left(\sqrt{\frac{K}{m}}t + \frac{\pi}{6}\right)$

(C) $y = 3x_0 \sin\left(\sqrt{\frac{K}{m}}t + \frac{\pi}{6}\right)$

(D) $y = 2x_0 \sin\left(\sqrt{\frac{K}{m}}t + \frac{\pi}{3}\right)$

9. The frequency of sonometer wire is f, but when the weight producing the tension is completely immersed in water the frequency becomes $\frac{f}{2}$ and on immersing the weight in a certain liquid the frequency becomes $\frac{f}{3}$. The specific gravity of liquid is.

(A) $\frac{4}{3}$ (B) $\frac{10}{9}$

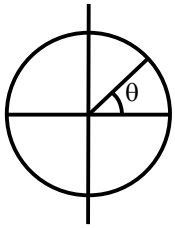
(C) $\frac{15}{12}$ (D) $\frac{32}{27}$

10. A slightly tapering wire of length ℓ and end radii 'a' and 'b' is subjected to tension F. Y is the Young's Modulus. The extension produced in the wire is.

(A) $\frac{F\ell}{\pi Yab}$ (B) $\frac{F\ell\sqrt{ab}}{\pi Y\sqrt{a^2+b^2}}$

(C) $\frac{F\ell\sqrt{ab}}{\pi Y\sqrt{a+b}}$ (D) $\frac{F\ell\sqrt{a+b}}{\pi Y\sqrt{a^2+b^2}}$

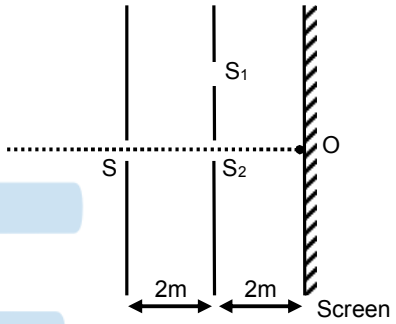
11. A non conducting ring of radius 4 cm has varying linear charge density which is given by $\lambda = 3\cos\theta$ c/m. The net electric dipole moment of the ring is given by



(A) 48π Cm (B) $12\pi \times 10^{-4}$ Cm

(C) 12π Cm (D) $48\pi \times 10^{-4}$ Cm

12. A parallel beam of light of wavelength 5000 Å is incident on slit S. Another two slit S_1 and S_2 are illuminated at distance 2m as shown in the figure. The minimum distance between S_1 and S_2 such that maximum intensity will occur at O is.



(A) $\sqrt{10}$ mm (B) 1 mm

(C) $\frac{1}{2}$mm (D) $\sqrt{5}$ mm

13. From ideal instruments current measured is I = 10.0 A, potential difference measured is V = 100.0 volt, length of wire is 31.4 cm and diameter of wire is 2.00 mm. The resistivity of wire will be (in correct significant figures) (π = 3.14)

(A) $1.00 \times 10^{-4}\ \Omega$ m

(B) $1.0 \times 10^{-4}\ \Omega$ m

(C) $1 \times 10^{-4}\ \Omega$ m

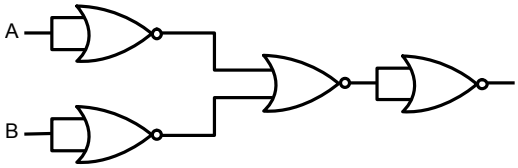
(D) $1.000 \times 10^{-4}\ \Omega$ m

14. When the light of wavelength 400 nm is incident on a metal surface of work function 2.3 eV photoelectrons are emitted. A fastest photoelectron combines with a He^{2+} ion to form He^{+} ion in its 3rd excited state and a photon is emitted in this process. Then the energy of the photon emitted during combination is. (Assume energy of He^{2+} to be zero)

(A) 4.2 eV (B) 5.7 eV

(C) 6.5 eV (D) 6.8 eV

15. The combination of the gates in figure produces



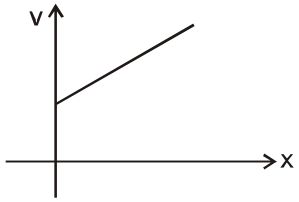
(A) AND gate (B) XOR gate
(C) NOR gate (D) NAND gate

16. The deviation produced by a prism is :
(A) Same for all wavelengths
(B) Greatest for red and least for violet
(C) Greatest for violet and least for red
(D) The prism produces no deviation

17. The first diffraction minima due to a single slit diffraction is at $\theta = 30^\circ$ for a light of wavelength 5000 Å. The width of the slit is
(A) 5×10^{-4} cm (B) 1.0×10^{-4} cm
(C) 2.5×10^{-4} cm (D) 1.25×10^{-4} cm

18. During the propagation of electromagnetic waves in a medium :
(A) Electric energy density is double of the magnetic energy density.
(B) Electric energy density is half of the magnetic energy density.
(C) Electric energy density is equal to the magnetic energy density.
(D) Both electric and magnetic energy densities are zero.

19. A particle moves along x-axis in positive direction. Its acceleration 'a' is given as $a = cx + d$, where x denotes the x-coordinate of particle, c and d are positive constants. For velocity-position graph of particle to be of type as shown in figure, the value of speed of particle at x = 0 should be.

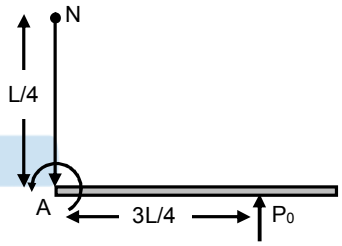


(A) $\sqrt{\frac{4d^2}{c}}$ (B) $\sqrt{\frac{d^2}{c}}$
(C) $\sqrt{\frac{2d^2}{c}}$ (D) $\sqrt{\frac{8d^2}{c}}$

20. In a large building, there are 15 bulbs of 40W, 5 bulbs of 100 W, 5 fans of 80 W and 1 heater of 1 kW. The voltage of the electric mains is 220 V. The minimum capacity of the main fuse of the building will be:
(A) 8 A (B) 10 A
(C) 12 A (D) 14 A

(SECTION-B)

21. A uniform rod of length L and mass M is placed on a smooth horizontal surface. The rod is hinged at the end A and is free to rotate in horizontal plane about a vertical axis passing through A. As shown in figure there is a nail N at a perpendicular distance $\frac{L}{4}$ from end A of rod. At t = 0 and impulse P_0 is applied at a distance $\frac{3L}{4}$ from end A. The impulse is in the horizontal plane and is perpendicular to the rod. At $t = \frac{8\pi ML}{27P_0}$, the rod returns to its initial position. If the impulse of the force exerted by the nail on the rod is $\frac{390P_0}{x}$, then value of x is

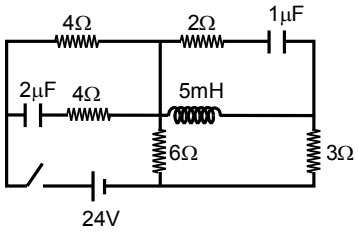


22. An open rectangular tank of height 3m and length and width respectively 5m and 3m contains water upto height 2m. It is accelerated horizontaly along the longer side. The acceleration that tank can be given so that 10% of water spills out is $\frac{108}{N}$ (in m/s^2), then the value of N is : ($g = 10\ m/s^2$)

23. A tuning fork is in unison with a sonometer wire vibrating in its fourth overtone. Mass hanged with wire is 9 kg. When additional mass is hanged wire vibrates in unison with tuning fork in its 3rd harmonic. Additional mass hanged in kg is.

24. An open tank 10 m long and 2m deep is filled upto height 1.5 m of oil of specific gravity 0.80. The tank is accelerated uniformly from rest to a speed of 10 m/sec. The shortest time (in seconds) in which this speed may be attained without spilling any oil (in sec). [$g = 10 m/s^2$]

25. In the circuit shown, the switch 'S' is closed at t = 0, then current through the battery after steady state is reached is $\frac{126}{x}$ Ampere, where value of x is :



26. A capacitor has charge 50μC. When the gap between the plates is filled with glass wool, then 120μC charge flows through the battery to capacitor. The dielectric constant of glass wool is……

27. A proton moving at 4×10^6 m/s through a magnetic field of 0.2 Tesla experience a magnetic force of magnitude 8×10^{-13} N. What is the radius of the helical path (in cm) followed by the proton ? [Take mass of the proton as 1.6×10^{-27} kg]

28. An LC circuit contains an inductance L = 1mH and a capacitor of C = 300 μF. At a time when the voltage on the capacitor is 4 V, the current in the circuit I = 6.4 A. Find the maximum current in this circuit (in A).

29. An object is moving in a circle at constant speed v. The magnitude of the rate of change of momentum of the object is proportional to v^n. Find value of n.

30. A monochromatic source of light is radiating waves of wavelength λ = 5000Å. The rays fall on a metal surface, which in turn, liberates photoelectrons. The work function of metal is 1.48 eV. The smallest de-Broglie wavelength of the emitted electron (in nm) is_____. Round off to nearest integer.

31. Stability of the species Li_2, Li_2^- and Li_2^+ increases in the order of :

(A) $Li_2 < Li_2^+ < Li_2^-$ (B) $Li_2^- < Li_2^+ < Li_2$

(C) $Li_2 < Li_2^- < Li_2^+$ (D) $Li_2^- < Li_2 < Li_2^+$

32. Among the following oxoacids, the correct decreasing order of acid strength is :

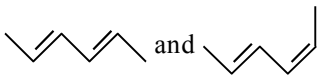
(A) $HOCl > HClO_2 > HClO_3 > HClO_4$

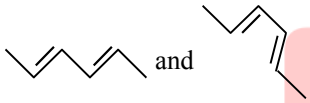
(B) $HClO_4 > HOCl > HClO_2 > HClO_3$

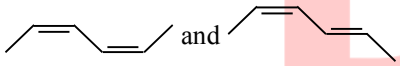
(C) $HClO_4 > HClO_3 > HClO_2 > HOCl$

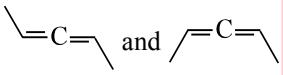
(D) $HClO_2 > HClO_4 > HClO_3 > HOCl$

33. Which of the following pairs of structures represent conformational isomers?

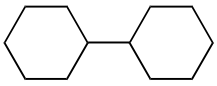
(A)  and

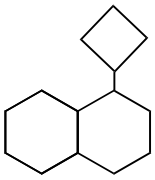
(B)  and

(C)  and

(D)  and

34. Which of the following is/are a bicyclo compound(s):

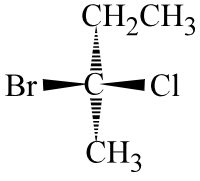
(I)  (II) 

(III)  (IV) 

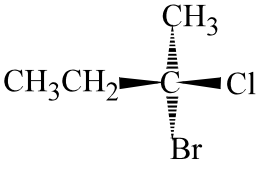
(A) III only (B) III and IV only

(C) II, III and IV (D) I, II, III and IV

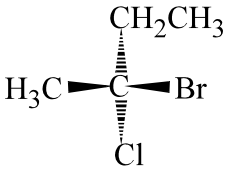
35. Which of the following depict the same stereoisomer?



(I)



(II)

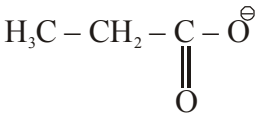


(III)

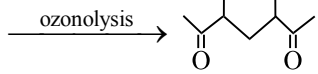
(A) I and II (B) I and III

(C) II and III (D) I, II and III

36. What is C – O bond order for

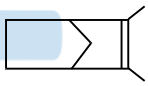
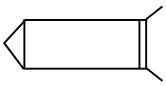


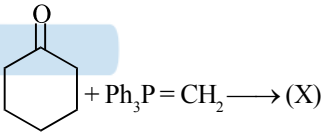
(A) 2 (B) 1.5 (C) 0.5 (D) 1

37. Sentene 

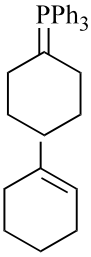
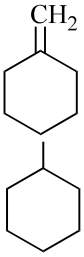
Which is the correct structure of Sentene

(A)  (B) 

(C)  (D) 

38. 

Product (X) is

(A)  (B) 

(C) (D)

39. Concentrated nitric acid reacts with iodine to give

(A) HOI (B) HI

(C) $HOIO_2$ (D) $HOIO_3$

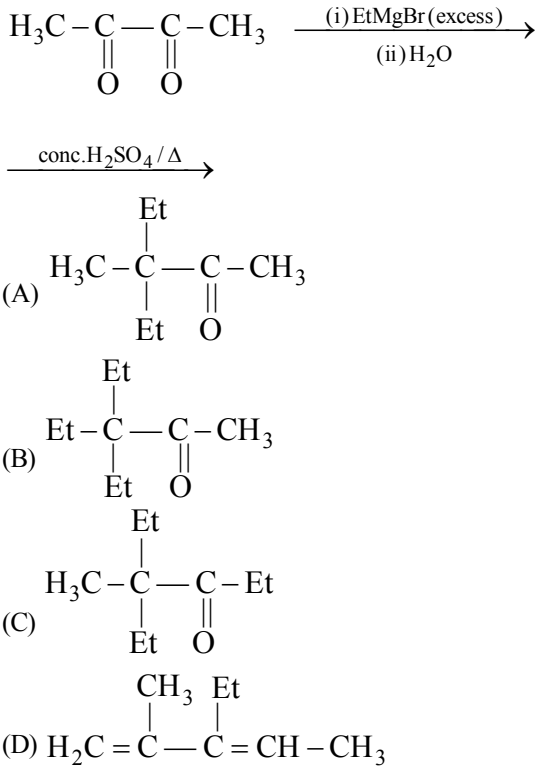
40. Which of following molecule can show Lewis acidity.

(I) CO_2 (II) Br_2 (III) $SnCl_2$

(IV) HF (V) NMe_3

(A) III, IV (B) I, II, III

(C) I, III, IV (D) II, III, V

41. 

42. Which one of the following is non-reducing sugar?

(A) Glucose (B) Arabinose

(C) Fructose (D) Sucrose

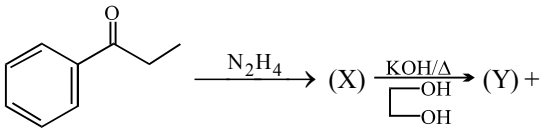
43. Chiral C-atoms in glucose and fructose are :

(A) 4 in each

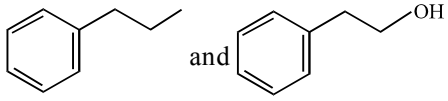
(B) 3 in each

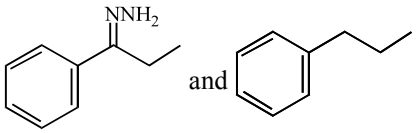
(C) 4in glucose and 3 in fructose

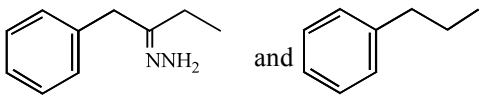
(D) 3 in glucose and 4 in fructose

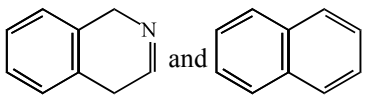
44. 

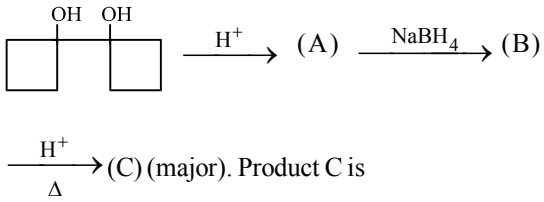
N_2. the structures of (X) and (Y) are

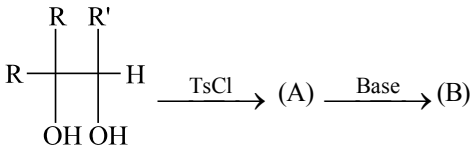
(A) 

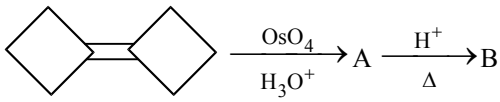
(B) 

(C) 

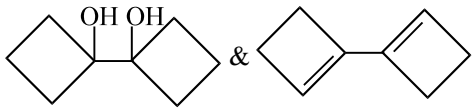
(D) 

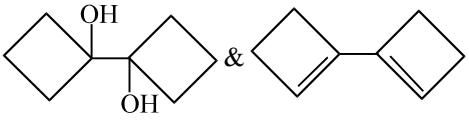
45. 

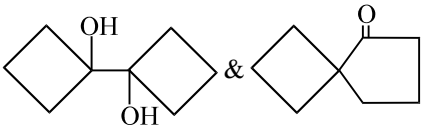
46. 

47. 

A & B are respectively:

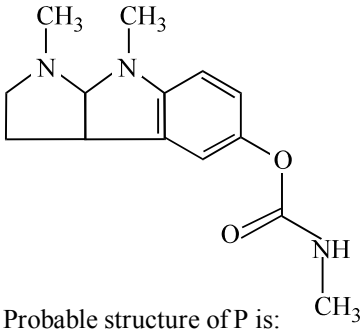
(A) 

(B) 

(C) 

(D) 

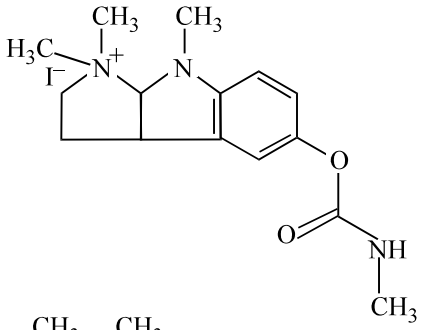
48.



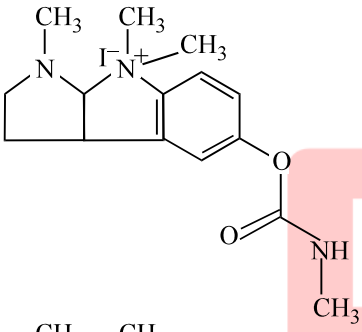
$\xrightarrow[1\text{mole}]{CH_3I}$ P

Probable structure of P is:

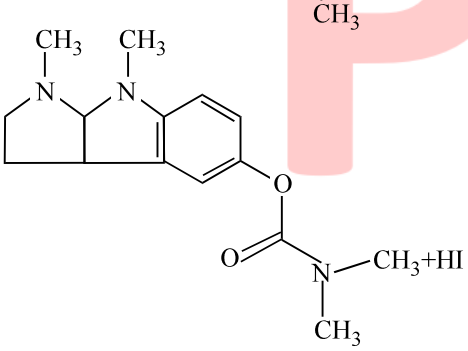
(A)



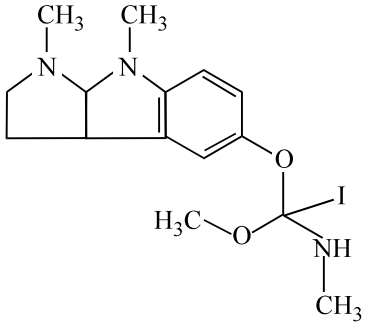
(B)



(C)



(D)



49. $Cu + 4HNO_3\,(conc.) \longrightarrow$

Which of the following gaseous product is form in above reaction -

(A) NO (B) N_2O (C) NO_2 (D) N_2O_3

50. Which of the following compounds produces N_2 gas on heating?

(A) NH_4NO_3 (B) $(NH_4)_2SO_4$

(C) $Zn(NO_3)_2$ (D) $Ba(N_3)_2$

(SECTION-B)

51. Assume that the decomposition of HNO_3 can be represented by the following equation

$4HNO_3\,(g) \rightleftharpoons 4NO_2(g) + 2H_2O\,(g) + O_2\,(g)$

and that at a given temperature 400 K and pressure 30 atm the reaction approaches equilibrium. At equilibrium partial pressure of HNO_3 is 2 atm. Calculate K_C in $(mol/L)^3$ at 400 K.

(Use R = 0.08 atm-L/mol.K)

52. For a AB_2 type sparingly soluble salt in water the elevation in boiling point is 0.0015°C. What is K_{sp} of AB_2 [$K_b\,(H_2O) = 0.5$]

Fill your answer by multiplying it with 10^{10}.

53. Calculate the strength of H-bond between $F^-(g)$ and $CH_3COOH\,(g)$ from the given data.

$\Delta H_{solution}$ [KF. $CH_3COOH(s)$] in glacial acetic acid = –3 kJ/mole

$\Delta H_{solution}$ [KF(s)] in glacial acetic acid = +35 kJ/mole

Lattice Enthalpy KF(s) = +797 kJ/mole

Lattice enthalpy of $KF.CH_3COOH(s)$ = +734 kJ/mole

$\Delta H_{vaporization}$ [$CH_3COOH(l)$] = +21 kJ/mole

54. When 1.36 g of sodium acetate trihydrate (M = 136) was mixed into 100 ml of 0.2 M HCl (aq) at 25°C in a solution calorimetry, its temperature fell by 0.4°C. The cooling occurred due to reaction:

$H_3O^+\,(aq) + CH_3COONa \cdot 3H_2O\,(s) \longrightarrow Na^+\,(aq) + CH_3COOH(aq) + 4H_2O$

The heat capacity of calorimeter was 90 J/K and heat capacity density of the acid solution is 4.00 (J/Kml). Calculate $|\Delta H_f^\circ\, Na^+(aq)|$ in kJ/mole.

$\Delta H_f^o\,[CH_3COOH\,(aq)] = -485$ kJ/mole

$\Delta H_f^o\,[H_2O\,(l)] = -285$ kJ/mole

$\Delta H_f^o\,[CH_3COONa \cdot 3H_2O\,(s)] = -1600$ kJ/mole

55. For the reaction $3A(g) \longrightarrow 2B(g) + 2C(g)$, starting with pure A, pressure after 9 min was 387.5 mm of Hg and after a long time was 400 mm of Hg. Calculate half life of A in min.

56. Calculate number of moles of iodine containing product formed due to oxidation of one mole of iodide using per manganate ion in faintly alkaline solution.

57. Time taken for two samples of the same substance for 20% completion are 40 sec. and 160 sec at 0.4 M and 0.1 M concentrations respectively, the order of reaction is -

58. How many of the following solutions show negative deviation from Rault's law?

(a) Ethylalcohol + Methyl alcohol

(b) Acetone + Ethanol

(c) Acetone + Aniline

(d) $CCl_4 + CHCl_3$

(e) Acetone + CS_2

(f) $CH_3OH + CH_3COOH$

(g) $H_2O + HNO_3$

(h) Water + Ethanol

(i) Chloroform + Benzene

(j) Water + HCl

59. Half cells Zn | Zn^{2+} (1 litre, 0.1 M) and Cu | Cu^{2+} (1 litre, 1M) are connected to form as cell.
Calculate the concentration of Cu^{2+} in solution when cell potential becomes 0.8 volt.

Given : $E^{o}_{Cu^{2+}/Cu} = 0.34$;

$E^{o}_{Zn/Zn^{2+}} = 0.76$; $\frac{2.303\,RT}{F} = 0.06$

[Fill your answer by multiplying it with 10^{12}]

60. A sample of hydrogen atoms in ground state absorbs light of x nm. If the excited sample emits the radiations of six different photon energies but the detector of these emitted radiations has not detected ultraviolet radiations, then the value of **'x'** is

(**Given :** $R_H = \frac{1}{96} \times 10^9\ m^{-1}$)

61. If $a(\ell+m)^2+2b\ell m+c=0$ and $a(\ell+n)^2+2b\ell n+c=0$, then mn equals to :-

(A) $\ell^2+\frac{c}{a}$ (B) $\ell^2-\frac{c}{a}$

(C) $\frac{\ell^2}{a}+c$ (D) $ac+\ell^2$

62. A number of 5 digit is to be formed with the digits 0, 1, 2, 3, 4 without repetition. The probability that it is a number divisible by 4, is

(A) 1/3 (B) 5/16
(C) 1/4 (D) 4/15

63. Let $f(x)=x-[x], x\neq 0, x\in R$ and [.] is greatest integer function, then the number of solutions of $f(x)+f\left(\frac{1}{x}\right)=1$ is :

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

64. If $ax^2 + bx + c = 0$ and $cx^2 + bx + a = 0$ (a, b, c $\in$ R) have a common non-real roots, then-
(A) $-2|a| < 5b < 2|a|$
(B) $-2|c| < b < 2|c|$
(C) $a = \pm c$
(D) None of the above

65. The maximum sum of the A.P. 40, 38, 36, 34,….is
(A) 390 (B) 420
(C) 460 (D) None of these

66. Let A and B be two 2 × 2 matrices. Consider the statements
(i) $AB = O \Rightarrow A = O$ or $B = O$
(ii) $AB = I_2 \Rightarrow A = B^{-1}$
(iii) $(A + B)^2 = A^2 + 2AB + B^2$
Then
(A) (i) is false, (ii) and (iii) are true
(B) (i) and (iii) are false, (ii) is true
(C) (i) and (ii) are false, (iii) is true
(D) (ii) and (iii) are false, (i) is true

67. If $\sum_{i=0}^{2n}\lambda_i(a-2)^i=\sum_{i=0}^{2n}\mu_i(a-3)^i$ and $\lambda_i=1\forall i\geq n$ then :-
(A) $\mu_n = {}^{2n+1}C_n$
(B) $\mu_n = {}^{2n+1}C_3$
(C) $\mu_n = {}^{2n+1}C_n + {}^{2n+1}C_{2n}$
(D) $\mu_n = \sum_{i=n+1}^{2n}\lambda_i$

68. If hyperbola $\frac{x^2}{b^2}-\frac{y^2}{a^2}=1$ passes through the focus of ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ then eccentricity of hyperbola is -

(A) $\sqrt{2}$ (B) $\frac{2}{\sqrt{3}}$
(C) $\sqrt{3}$ (D) None of these

69. If $\begin{vmatrix} x^n & x^{n+2} & x^{n+3} \\ y^n & y^{n+2} & y^{n+5} \\ z^n & z^{n+2} & z^{n+3} \end{vmatrix} = (x-y)(y-z)(z-x)\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$, $(x, y, z$ are distinct real number), then n is equal to :-
(A) -2 (B) -1 (C) 0 (D) 1

70. If $\sqrt{\sin x}+\cos x=0$, then x is:-

(A) $\sin^{-1}\left(\frac{\sqrt{5}-1}{2}\right)$

(B) $\pi-\sin^{-1}\left(\frac{\sqrt{5}-1}{2}\right)$

(C) $\sin^{-1}\left(\frac{1-\sqrt{5}}{2}\right)$

(D) $\cos^{-1}\sqrt{\frac{\sqrt{5}-1}{2}}$

71. The points (3, 2, 0), (5, 3, 2) and (–9, 6, –3), are the vertices of a triangle ABC. AD is the internal bisector of $\angle$ BAC which meets BC at D, then the co-ordinates of D, are

(A) $\left(\frac{17}{16},\frac{57}{16},\frac{19}{8}\right)$ (B) $\left(\frac{19}{8},\frac{57}{16},\frac{17}{16}\right)$

(C) $\left(0,0,\frac{17}{16}\right)$ (D) $\left(\frac{17}{16},0,0\right)$

72. If $\cos^{-1}\frac{x}{3}+\cos^{-1}\frac{y}{2}=\frac{\theta}{2}$, then the value of $4x^2-12xy\cos\frac{\theta}{2}+9y^2$ is :-

(A) 36 (B) $36-36\cos\theta$
(C) $18-18\cos\theta$ (D) $18+18\cos\theta$

73. A point where function $f(x)$ is not continuous where $f(x) = [\sin [x]]$ in $(0, 2\pi)$ [.] denotes greatest integer $\leq$ x is -

(A) (3, 0) (B) (2, 0)
(C) (1, 0) (D) None of these

74. If s is semi-perimeter of a triangle ABC (usual notations), then the value of $\left(a\sin^2\frac{B}{2}+b\sin^2\frac{A}{2}+c\right)$ is :-

(A) s (B) $\frac{s}{2}$
(C) 2s (D) s – c

75 If $\int(\sin 2x-\cos 2x)\,dx=\frac{1}{\sqrt{2}}\sin(2x-a)+b$, then

(A) $a=\frac{\pi}{4}, b=0$

(B) $a=-\frac{\pi}{4}, b=0$

(C) $a=\frac{5\pi}{4}$, b = any constant

(D) $a=-\frac{5\pi}{4}$, b = any constant

76. The bisector of the obtuse angle between the lines 12x – 5y + 7 = 0 and 3y – 4x – 1 = 0 is :-

(A) 7x – 4y + 3 = 0
(B) 4x + 7y + 11 = 0
(C) 4x – y + 3 = 0
(D) 2x – y + 1 = 0)

77. Solution of the inequality $(\log_5 x)^2+(\log_5 x)<2$ is :-

(A) $\left(\frac{1}{25},5\right)$ (B) $\left(\frac{1}{5},\frac{1}{15}\right)$
(C) $(1,\infty)$ (D) $(0,\infty)$

78. If $f(2x + 3y, 2x – 7y) = 20x$, then $f(x, y)$ equals :-

(A) 7x – 3y (B) 7x + 3y
(C) 3x – 7y (D) x – y

79. If the sets A and B defined as

$A=\{(x,y): y=e^x, x\in R\}$

$B=\{(x,y): y=\ell nx, x\in R\}$, then :-

(A) $B\subset A$ (B) $A\subset B$
(C) $A\cap B=\phi$ (D) $A\cup B=A$

80. The locus of the centre of circle which touches the x-axis and also the circle $x^2 + y^2 – 4x – 4y + 4 = 0$ externally is :-

(A) $x^2 + y^2 – 4x – 4y – 8 = 0$
(B) $x^2 – 4x – 8y + 4 = 0$
(C) $x^2 + y^2 – 4x – 5y + 6 = 0$
(D) $x^2 – 4x + 4 = 0$

(SECTION-B)

81. If P $(t^2, 2t)$ $t \in [0, 2]$ is an arbitrary point on parabola $y^2 = 4x$. Q is foot of perpendicular from focus S on the tangentat P, then maximum area of Δ PQS is-

82. A five digit number is formed by digits 1, 2, 3, 4 and 5 without repetition. If probability that the number is divisible by 4 be k, then the integral part of $(\sqrt{2}+1)^{1/k}$ is…..

83. If

$f(x)=\sin^2 x+\sin^2\left(x+\frac{\pi}{3}\right)+\cos x\cos\left(x+\frac{\pi}{3}\right)$

and $g\left(\frac{5}{4}\right)=1$, then $g\left(f\left(\frac{\pi}{8}\right)\right)$ is :-

84. If A, B, C are angles of a triangle ABC, then the value of $\begin{vmatrix}-1 & \cos C & \cos B\\ \cos C & -1 & \cos A\\ \cos B & \cos A & -1\end{vmatrix}$ is :-

85. If the solution of differential equation $x^2\frac{d^2y}{dx^2}+2x\frac{dy}{dx}=12y$ is $y = Ax^m + Bx^{-n}$ then find the value of m + n, if m & n $\in$ N.

86. The value of $\lim_{x\to\pi/2}\frac{\sin x-(\sin x)^{\sin x}}{1-\sin x+\ell n\sin x}$ is-

87. Let $\overrightarrow{OA} = \vec{a}$, $\overrightarrow{OB} = 2\vec{a} + 10\vec{b}$, $\overrightarrow{OC} = \vec{b}$ where O, A, C are non collinear points. Let ℓ denote the area of the quadrilateral OABC. Let m denotes the area of parallelogram with $\overrightarrow{OA}$ and $\overrightarrow{OC}$ as adjacent sides. If $\ell = 2\lambda m$ then find the value of λ.

88. If $\int_{\log 2}^{x} \frac{du}{(e^u - 1)^{1/2}} = \frac{\pi}{6}$, then $e^x =$

89. If $z^2 + z + 1 = 0$ then the value of $\left(z + \frac{1}{z}\right)^2 + \left(z^2 + \frac{1}{z^2}\right)^2 + \left(z^3 + \frac{1}{z^3}\right)^2 + ... + \left(z^{21} + \frac{1}{z^{21}}\right)^2$ is equal to

90. When tested, the lines (in hours) of 5 bulbs were noted as follows :

1357, 1090. 1666, 1494, 1623

The mean deviations (in hours) from their mean is