

Competishun

52/6, Opposite Metro Mas Hospital, Shipra Path, Mansarovar

Date: 24/12/2023

Time: 3 hours

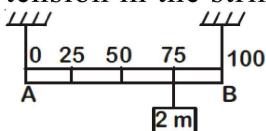
Max. Marks: 300

MFST-7 (23-24)

Physics

Single Choice Question

- Q1** Shown in the figure is rigid and uniform one meter long rod AB held in horizontal position by two strings tied to its ends and attached to the ceiling. The rod is of mass 'm' and has another weight of mass 2 m hung at a distance of 75 cm from A. The tension in the string at A is



- a) 0.5 mg b) 2 mg c) 0.75 mg d) 1 mg

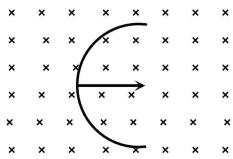
- Q2** If speed V, area A and force F are chosen as fundamental units, then the dimension of Young's modulus will be

- a) $FA^{-1}V^0$ b) FA^2V^{-1} c) FA^2V^{-2} d) FA^2V^{-3}

- Q3** A particle of mass m and charge q moves with a constant velocity v along the positive x direction. It enters a region containing a uniform magnetic field B directed along the negative z direction, extending from $x = a$ to $x = b$. The minimum value of v required so that the particle can just enter the region $x > b$ is :-

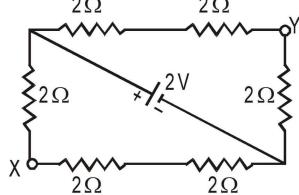
- a) $\frac{qbB}{m}$ b) $\frac{q(b-a)B}{m}$ c) $\frac{qaB}{m}$ d) $\frac{q(b+a)B}{2m}$

- Q4** A straight wire of length L is bent into a semicircle. It is moved in a uniform magnetic field with speed v with diameter perpendicular to the field. The induced emf between the ends of the wire is



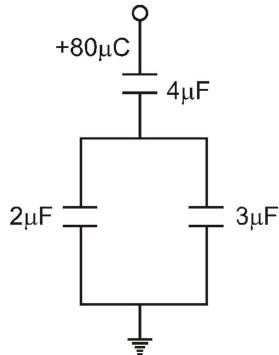
- a) BLv b) $2BLv$ c) $2\pi BLv$ d) $\frac{2BvL}{\pi}$

Q5 $V_X - V_Y$ will be :



- a) $2/3$ b) $4/3$ c) $8/9$ d) $5/8$

Q6 In the given circuit, a charge of $+80 \mu\text{C}$ is given to the upper plate of the $4\mu\text{F}$ capacitor. Then in the steady state, the charge on the upper plate of the $3\mu\text{F}$ capacitor is :



- a) $+32 \mu\text{C}$ b) $+40 \mu\text{C}$ c) $+48 \mu\text{C}$ d) $+80 \mu\text{C}$

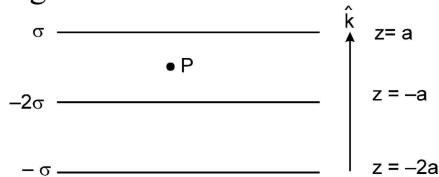
Q7 A current of i ampere is flowing in an equilateral triangle of side a . The magnetic induction at the centroid will be -

- a) $\frac{\mu_0 i}{3\sqrt{3}\pi a}$ b) $\frac{3\mu_0 i}{2\pi a}$ c) $\frac{5\sqrt{2}\mu_0 i}{3\pi a}$ d) $\frac{9\mu_0 i}{2\pi a}$

Q8 An electric current i is flowing in a circular coil of radius a . At what distance from the centre on the axis of the coil will the magnetic field be $1/8$ th of its value at the centre -

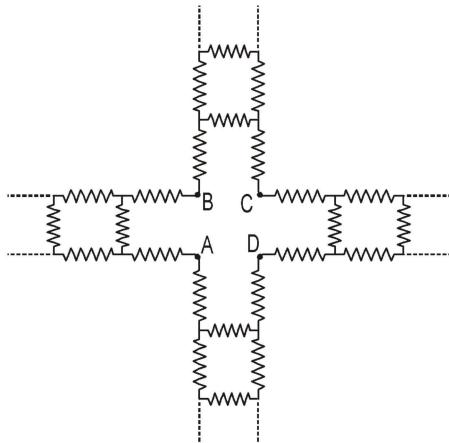
- a) $3a$ b) $\sqrt{3}a$ c) $\frac{a}{3}$ d) $\frac{a}{\sqrt{3}}$

Q9 Three large parallel plates have uniform surface charge densities as shown in the figure. Find out electric field intensity at point P.



- a) $-\frac{4\sigma}{\epsilon_0} \hat{k}$ b) $\frac{4\sigma}{\epsilon_0} \hat{k}$ c) $-\frac{2\sigma}{\epsilon_0} \hat{k}$ d) $\frac{2\sigma}{\epsilon_0} \hat{k}$

- Q10** Four infinite ladder network containing identical resistances of $R \Omega$ each, are combined as shown in figure. The equivalent resistance between A and B is R_{AB} and between A and C is R_{AC} . Then the value of $\frac{R_{AB}}{R_{AC}}$ is :



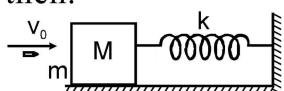
a) $\frac{3}{4}$

b) $\frac{4}{3}$

c) 2

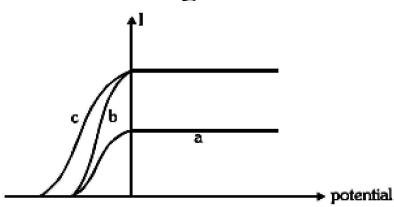
d) $\frac{1}{2}$

- Q11** A bullet of mass $m = 1\text{kg}$ strikes a block of mass $M = 2\text{kg}$ connected to a light spring of stiffness $k = 3\text{N/m}$ with a speed $V_0 = 3\text{m/s}$. If the bullet gets embedded in the block then.



- a) linear momentum of bullet and block system is not conserve during impact because spring force is impulsive.
- b) linear momentum of bullet and block system is not conserve during impact because spring force is nonimpulsive.
- c) Maximum compression in the spring is 2m.
- d) The maximum compression in the spring is 1m.

- Q12** In photoelectric experiment the plot between anode potential and photoelectric current is shown in figure. Which of the following is correct ?

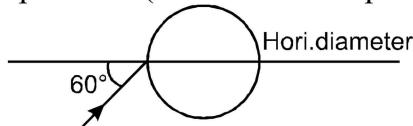


- a) Frequency of light corresponding to 'a' is same as that 'b' and is different for 'c'
- b) Frequency of light corresponding to 'a' is different from 'b' but the intensities are same
- c) Frequency of light corresponding to 'b' is same as that 'c' but intensities are different.
- d) Frequency of light for all 'a', 'b' and 'c' are same

Q13 When a certain metallic surface was illuminated by light of 300 nm the stopping potential is found to $3V_0$. When a wavelength of 600 nm is incident on the surface the stopping potential is found to be V_0 . Then the threshold wavelength for the metal would be :

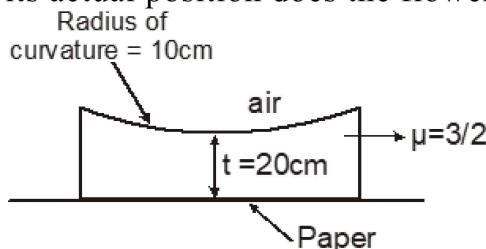
- a) 1200 nm b) 700 nm c) 800 nm d) 1000 nm

Q14 A ray of light falls on a transparent sphere as shown in figure. If the final ray emerges from the sphere parallel to the horizontal diameter, then the refractive index of the sphere is (consider that sphere is kept in air) :



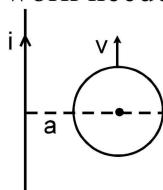
- a) $\sqrt{2}$ b) $\sqrt{3}$ c) $\frac{3}{\sqrt{2}}$ d) 2

Q15 A planoconcave lens is placed on a paper on which a flower is drawn. How far above its actual position does the flower appear to be ?



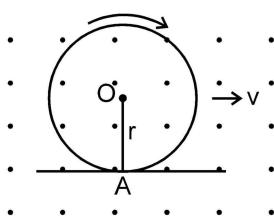
- a) 10 cm b) 12 cm c) 50 cm d) none of these

Q16 A circular loop of radius r is moved with a velocity v as shown in the diagram. The work needed to maintain its velocity constant is :



- a) $\frac{\mu_0 i v r}{2\pi a}$ b) $\frac{\mu_0 i v r}{2\pi(a+r)}$ c) $\frac{\mu_0 i v r}{2\pi} \ln\left(\frac{2r+a}{a}\right)$ d) zero

Q17 A conducting ring of radius r with a conducting spoke is in pure rolling on a horizontal surface in a region having a uniform magnetic field B as shown, v being the velocity of the centre of the ring. Then the potential difference $V_0 - V_A$ is

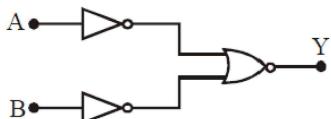


- a) $\frac{Bvr}{2}$ b) $\frac{3Bvr}{2}$ c) $\frac{-Bvr}{2}$ d) $\frac{3Bvr}{2}$

- Q18** A rectangular loop of sides ‘ a ’ and ‘ b ’ is placed in xy -plane. A very long wire is also placed in xy -plane such that side of length ‘ a ’ of the loop is parallel to the wire. The distance between the wire and the nearest edge of the loop is ‘ d ’. The mutual inductance of this system is proportional to :

a) a **b)** b **c)** $1/d$ **d)** current in wire

- Q19** Which logic gate is represented by the following combination of logic gates –



a) OR b) NAND c) AND d) NOR

- Q20** The magnetic field of a plane electromagnetic wave is

$$\vec{B} = 3 \times 10^{-8} \sin[200\pi(y + ct)] \hat{i} T$$

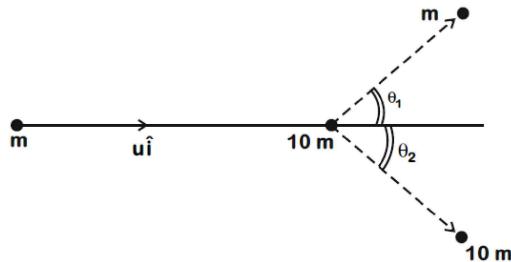
where $c = 3 \times 10^8 \text{ ms}^{-1}$ is the speed of light.

The corresponding electric field is

- a) $\vec{E} = -9\sin[200\pi(y + ct)]\hat{k}V/m$
 - b) $\vec{E} = 9\sin[200\pi(y + ct)]\hat{k}V/m$
 - c) $\vec{E} = -10^{-6}\sin[200\pi(y + ct)]\hat{k}V/m$
 - d) $\vec{E} = 3 \times 10^{-8}\sin[200\pi(y + ct)]\hat{k}V/m$

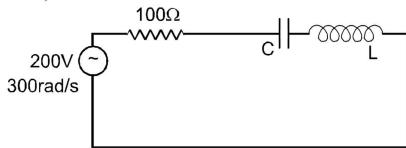
Numerical

- Q21** A particle of mass m is moving along the x -axis with initial velocity $u\hat{i}$. It collides elastically with a particle of mass $10m$ at rest and then moves with half its initial kinetic energy (see figure). If $\sin\theta_1 = \sqrt{n} \sin\theta_2$, then value of n is _____.

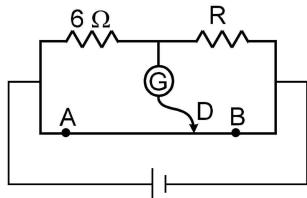


- Q22** A light ray enters a solid glass sphere of refractive index $\mu = \sqrt{3}$ at an angle of incidence 60° . The ray is both reflected and refracted at the farther surface of the sphere. The angle (in degrees) between the reflected and refracted rays at this surface is _____.

- Q23** Train A and train B are running on parallel tracks in the opposite directions with speeds of 36 km/hour and 72 km/hour, respectively. A person is walking in train A in the direction opposite to its motion with a speed of 1.8 km/hour. Speed (in ms^{-1}) of this person as observed from train B will be close to : (take the distance between the tracks as negligible)
- Q24** In the LCR circuit shown if only L is removed, the current leads the supply voltage by 30° . If only C is removed, the current lags the voltage by 60° . The resonant frequency is $\frac{50x}{\sqrt{3}\pi}$ Hz, then write the value of 'x'.



- Q25** The meter-bridge wire AB shown in figure is 50 cm long. When AD = 30 cm, no deflection occurs in the galvanometer. Find R (in Ω).

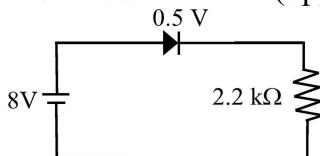


- Q26** In an experiment four quantities a, b, c and d are measured with percentage error 1%, 2%, 3% and 4% respectively. Quantity P is calculated as follows:

$$P = \frac{a^3 b^2}{c d}$$

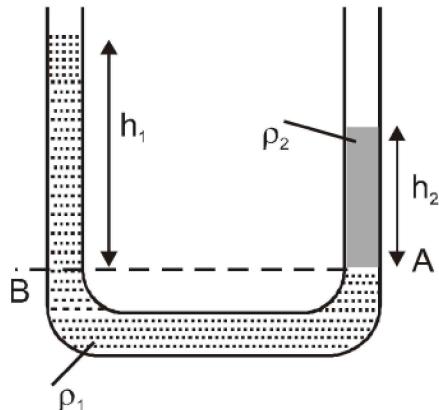
% error in P is:

- Q27** In the circuit, if the forward voltage drop for the diode is 0.5V, the current (in mA) in the circuit will be (approximately) –



- Q28** Two point charges 10^{-5} C and -10^{-5} C are released from large separation. Their masses are 100gm and 200gm. Find the velocity of approach (in m/s) of them when they are separated by distance 3m.

- Q29** Two immiscible liquids are poured in a U-tube having densities $\rho_1 = 1.0 \times 10^3 \text{ kg/m}^3$ and $\rho_2 = 3.0 \times 10^3 \text{ kg/m}^3$. Find the ratio of heights (of the liquids above their interface) $\frac{h_1}{h_2}$.



- Q30** A nail is located at a certain distance vertically below the point of suspension of a simple pendulum. The pendulum bob is released from the position where the string makes an angle of 90° from the vertical. If the distance (in metre) of the nail from the point of suspension is r such that the bob will just perform revolution with the nail as centre. Assume the length of pendulum to be $\ell = 10 \text{ m}$. Then find r ($g = 10 \text{ m/s}^2$)

Chemistry**Single Choice Question****Q31** Match the following :

Test/Method

(i) Lucas Test

(ii) Dumas method

(iii) Kjeldahl's

(iv) Hinsberg test

Reagent

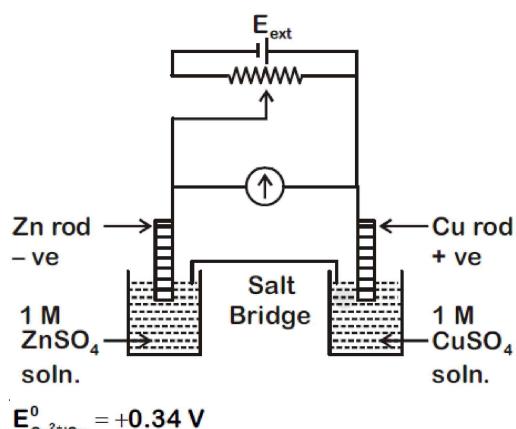
(a) $C_6H_5SO_2Cl$ / aq. KOH(b) HNO_3 / $AgNO_3$ (c) CuO/CO_2 method(d) Conc. HCl and $ZnCl_2$ (e) H_2SO_4

a) (i)-(b), (ii)-(d), (iii)-(e), (iv)-(a)

c) (i)-(b), (ii)-(a), (iii)-(c), (iv)-(d)

b) (i)-(d), (ii)-(c), (iii)-(e), (iv)-(a)

d) (i)-(d), (ii)-(c), (iii)-(b), (iv)-(e)

Q32

Identify the incorrect statement from the option below for the above cell:

- a) If $E_{ext} < 1.1 \text{ V}$, Zn dissolves at anode and Cu deposits at cathode
- b) If $E_{ext} = 1.1 \text{ V}$, no flow of e^- or current occurs
- c) If $E_{ext} > 1.1 \text{ V}$, e^- flows from Cu to Zn
- d) If $E_{ext} > 1.1 \text{ V}$, Zn dissolves at Zn electrode and Cu deposits at Cu electrode

Q33 $C(s) + O_2(g) \rightarrow CO_2(g) + 400 \text{ kJ}$ $C(s) + \frac{1}{2} O_2(g) \rightarrow CO(g) + 100 \text{ kJ}$ When coal of purity 60% is allowed to burn in presence of insufficient oxygen, 60% of carbon is converted into 'CO' and the remaining is converted into 'CO₂'. The heat generated when 0.6 kg of coal is burnt is _____.

- a) 1600 kJ b) 3200 kJ c) 4400 kJ d) 6600 kJ

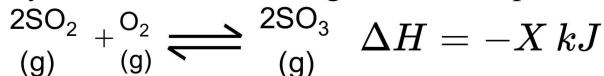
Q34 $BF_3 + F^- \rightarrow BF_4^-$ What is the hybridization state of B in BF_3 and BF_4^- :

- a) sp^2 , sp^3 b) sp^3 , sp^3 c) sp^2 , sp^2 d) sp^3 , sp^3d

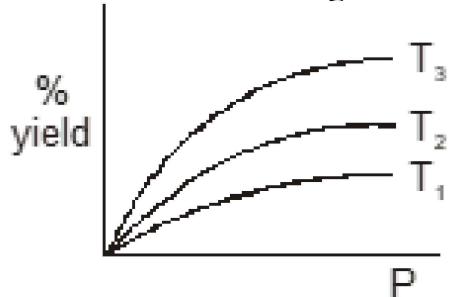
Q35 For BF_3 molecule which of the following is true ?

- a) B-atom is sp^2 hybridised.
- b) There is a $\text{p}\pi-\text{p}\pi$ back bonding in this molecule.
- c) Observed B–F bond length is found to be less than the expected bond length.
- d) All of these

Q36 % yield of the following reaction is plotted against pressure at a definite temperature.



Which of the following order is correct ?

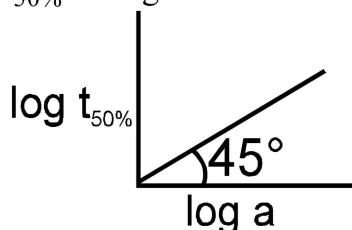


- a) $T_1 > T_2 > T_3$
- b) $T_3 > T_2 > T_1$
- c) $T_1 = T_2 = T_3$
- d) $T_1 < T_2 < T_3$

Q37 The entropy change can be calculated by using the expression $\Delta S = \frac{q_{rev}}{T}$. When water freezes in a glass beaker, choose the correct statement amongst the following :

- a) ΔS (system) decreases but ΔS (surroundings) remains the same.
- b) ΔS (system) increases but ΔS (surroundings) decreases.
- c) ΔS (system) decreases but ΔS (surroundings) increases.
- d) ΔS (system) decreases and ΔS (surroundings) also decreases.

Q38 What will be the order of reaction and rate constant for a chemical change having $\log t_{50\%}$ vs \log concentration of (A) curves as :



- a) 0, 1/2
- b) 1, 1
- c) 2, 2
- d) 3, 1

Q39 Questions given below consist of two statements each printed as Assertion (A) and Reason (R); while answering these questions you are required to choose any one of the following four responses:

Assertion : Al(OH)_3 is amphoteric in nature.

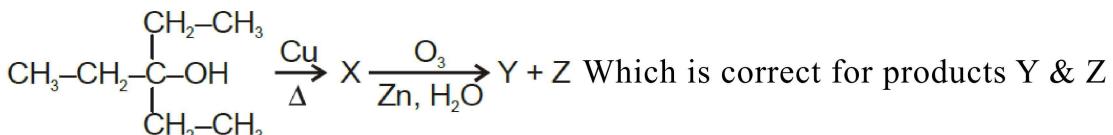
Reason : It can not be used as an antacid.

- a) if both (A) and (R) are true and (R) is the correct explanation of (A)
- b) if both (A) and (R) are true but (R) is not correct explanation of (A)
- c) if (A) is true but (R) is false
- d) if (A) is false and (R) is true

Q40 Match List-I with List-II and select the correct answer using the codes given below the lists (ℓ and m are respectively the azimuthal and magnetic quantum no.)

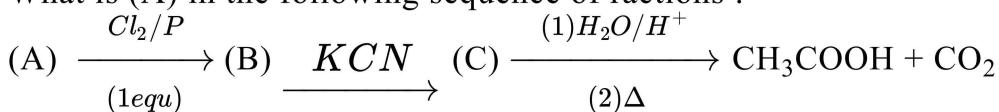
List-I	List-II
(A) Number of value of ℓ for an energy level	(1) 0, 1, 2, (n - 1)
(B) Value of ℓ for a particular type of orbital	(2) $+\ell$ to $-\ell$ through zero
(C) Number of values of m for $\ell = 2$	(3) 5
(D) Value of 'm' for a particular type of orbital	(4) n

- a) A → 4; B → 1; C → 2; D → 3 b) A → 4; B → 1; C → 3; D → 2
 c) A → 1; B → 4; C → 2; D → 3 d) A → 1; B → 4; C → 3; D → 2

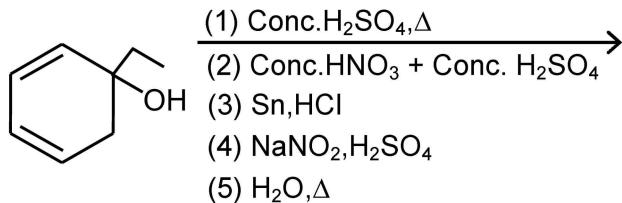
Q41

- a) Both can give Tollen's test positive
 b) Both can give Iodoform test positive
 c) Both can form two oximes each on reaction with NH₂OH
 d) Only one can give iodoform test positive

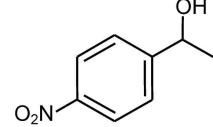
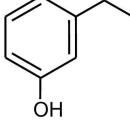
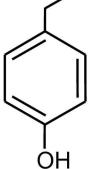
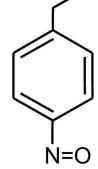
Q42 What is (A) in the following sequence of reactions :



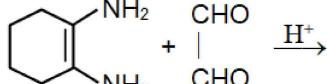
- a) CH₃-CH=O b) CH₃-CH₂-Br c) CH₃-CH₂-OH d) None of these

Q43

Final major product is :

- a)  b) 
 c)  d) 

Q44 Which of the following reaction is not give aromatic product?

- a) Me-CH=CH₂ $\xrightarrow[\text{Fe tube}]{\text{Red hot}}$
 b) C₆H₁₄ $\xrightarrow[\text{Cr}_2\text{O}_3 \cdot \Delta]{\text{Al}_2\text{O}_3}$
 c)  $\xrightarrow[\text{KOH}]{\text{CHCl}_3}$
 d) 

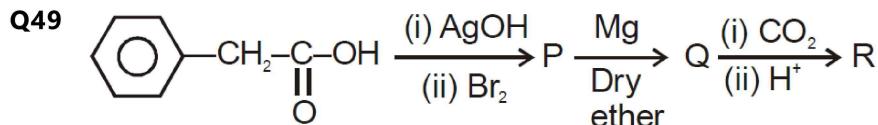
Q45 In a thermodynamics process helium gas obeys the law $T/P^{2/5} = \text{constant}$. The heat given to 'n' moles of He in order to raise the temperature from T to 2T is
 a) 8 RT b) 4 RT c) 16 RT d) Zero

Q46 How many gram of glucose should be dissolved in 500 gram of water in order to produce a solution with 105°C difference between the freezing point and the boiling point ? For water, $K_f = 1.9 \text{ K-Kg/mol}$ and $K_b = 0.6 \text{ K-Kg/mol}$
 a) 60 b) 120 c) 180 d) 240

Q47 Which of the following statement(s) is(are) correct with reference to the ferrous and ferric ions
 a) Fe^{3+} gives brown colour with potassium ferricyanide
 b) Fe^{2+} gives blue precipitate with potassium ferricyanide
 c) Fe^{3+} gives red colour with potassium thiocyanate
 d) All are correct

Q48 Which set of quantum numbers are not possible from the following

- | | |
|---|---|
| a) $n = 3, l = 2, m = 0, S = -\frac{1}{2}$ | b) $n = 3, l = 2, m = -2, S = -\frac{1}{2}$ |
| c) $n = 3, l = 3, m = -3, S = -\frac{1}{2}$ | d) $n = 3, l = 0, m = 0, S = -\frac{1}{2}$ |



Product R is :

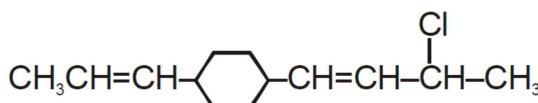
- | | |
|----|----|
| a) | b) |
| c) | d) |

Q50 Conversion of to is carried out by

- | | |
|---|--|
| a) aq. NaOH, Δ | b) (i) Cl_2, hv (ii) NaOH |
| c) (i) Peroxyacid (ii) dil. H_2SO_4 | d) (i) Conc. $\text{H}_2\text{SO}_4, \Delta$ (ii) dil. KMnO_4 |

Numerical

- Q51** Potassium chlorate is prepared by the electrolysis of KCl in basic solution. If only 60% of the current is utilized in the reaction, the time (rounded to the nearest hour) required to produce 10 g of KClO_3 using a current of 2 A is _____.
 (Given : F = 96,500 C mol⁻¹; molar mass of KClO_3 = 122 g mol⁻¹)
- Q52** A solution of phenol in chloroform when treated with aqueous NaOH gives compound P as a major product. The mass percentage of carbon in P is _____. (to the nearest integer)
 (Atomic mass : C = 12; H = 1; O = 16)
- Q53** For the reaction $3 \text{A(g)} + \text{B(g)} \rightleftharpoons 2 \text{C(g)}$ at a given temperature, $K_c = 9.0$. What must be the volume of the flask, if a mixture of 2.0 mol each of A, B and C exist in equilibrium?
- Q54** A soft drink was bottled with a partial pressure of CO_2 of 3 bar over the liquid at room temperature. The partial pressure of CO_2 over the solution approaches a value of 30 bar when 44 g of CO_2 is dissolved in 1 kg of water at room temperature. The approximate pH of the soft drink is $\text{_____} \times 10^{-1}$.
 (First dissociation constant of $\text{H}_2\text{CO}_3 = 4.0 \times 10^{-7}$; log 2 = 0.3; density of the soft drink = 1 g mL⁻¹)
- Q55** The number of chiral carbon(s) present in peptide, Ile-Arg-Pro, is _____.
 (Ile = isoleucine, Arg = arginine, Pro = proline)
- Q56** The number of chiral carbons present in sucrose is _____.
 (Sucrose = $\text{C}_12\text{H}_{22}\text{O}_11$)
- Q57** If 75% of a first order reaction was completed in 90 minutes, 60% of the same reaction would be completed in approximately (in minutes) _____.
 (Take : log 2 = 0.30; log 2.5 = 0.40)
- Q58** The electron gain enthalpy of a hypothetical element 'A' is -3 eV per atom. How much energy in kCal is released when 10 g of 'A' are completely converted to A⁻ ions in gaseous state?
 (Take : 1 eV per atom = 23 kCal mol⁻¹, Molar mass of A = 30 g)
- Q59** A solution is 10^{-4} M in Cl^- , 10^{-5} M in Br^- , 10^{-3} M in I^- . AgNO_3 (s) is added slowly to the solution. The minimum concentration of Ag^+ required to start precipitation of all three ions is 10^{-x} then the value of x is : [Given, $K_{\text{SP}}(\text{AgCl}) = 10^{-10}$, $K_{\text{SP}}(\text{AgBr}) = 10^{-13}$, $K_{\text{SP}}(\text{AgI}) = 10^{-17}$]
- Q60** How many stereoisomers are possible for the



Mathematics

Single Choice Question

- Q61** Let $\alpha = \frac{-1+i\sqrt{3}}{2}$. If $a = (1+\alpha)\sum_{k=0}^{100} \alpha^{2k}$ and $b = \sum_{k=0}^{100} \alpha^{3k}$, then a and b are the roots of the quadratic equation
- a) $x^2 - 101x + 100 = 0$ b) $x^2 - 102x + 101 = 0$
 c) $x^2 + 101x + 100 = 0$ d) $x^2 + 102x + 101 = 0$
- Q62** The Mean and variance of 20 observations are found to be 10 and 4, respectively. On rechecking, it was found that an observation 9 was incorrect and the correct observation was 11. The correct variance is
- a) 3.98 b) 4.02 c) 3.99 d) 4.01
- Q63** If the roots of the equation $(a-1)(x^2+x+1)^2 = (a+1)(x^4+x^2+1)$ are real and distinct then the value of $a \in$
- a) $(-\infty, 3]$ b) $(-\infty, -2) \cup (2, \infty)$
 c) $[-2, 2]$ d) $[-3, \infty)$
- Q64** Let the points of intersections of the lines $x - y + 1 = 0$, $x - 2y + 3 = 0$ and $2x - 5y + 11 = 0$ are the mid points of the sides of a triangle ABC. Then the area of the triangle ABC is _____.
- a) 3 b) 4 c) 5 d) 6
- Q65** Concentric circles of radii 1, 2, 3, ..., 100 cm are drawn. The interior of the smallest circle is coloured red and the angular regions are coloured alternately green and red, so that no two adjacent regions are of the same colour. Then, the total area of the green regions in sq. cm is equal to
- a) 1000π b) 5050π c) 4950π d) 5151π
- Q66** Fifteen identical balls have to be put in five different boxes. Each box can contain any number of balls. The total number of ways of putting the balls into the boxes so that each box contains at least two balls is equal to
- a) 9C_5 b) ${}^{10}C_5$ c) 6C_5 d) ${}^{10}C_6$
- Q67** If the coefficients of r^{th} and $(r+1)^{\text{th}}$ terms in the expansion of $(3+7x)^{29}$ are equal, then r equals
- a) 15 b) 21 c) 14 d) None of these
- Q68** If A and B are two square matrices such that $B = -A^{-1}BA$, then $(A+B)^2$ is equal to
- a) $A^2 + B^2$ b) O c) $A^2 + 2AB + B^2$ d) $A + B$
- Q69** $\lim_{x \rightarrow \infty} \{(x+5)\tan^{-1}(x+5) - (x+1)\tan^{-1}(x+1)\}$ is equal to
- a) π b) 2π c) $\pi/2$ d) None of these

- Q70** Let e_1 and e_2 be the eccentricities of the ellipse, $\frac{x^2}{25} + \frac{y^2}{b^2} = 1$ ($b < 5$) and the hyperbola, $\frac{x^2}{16} - \frac{y^2}{b^2} = 1$ respectively satisfying $e_1 e_2 = 1$. If α and β are the distances between the foci of the ellipse and the foci of the hyperbola respectively, then the ordered pair (α, β) is equal to :
- a) (8, 10) b) $\left(\frac{24}{5}, 10\right)$ c) $\left(\frac{20}{3}, 12\right)$ d) (8, 12)
- Q71** The solution of the differential equation $x^2 \frac{dy}{dx} \cos \frac{1}{x} - y \sin \frac{1}{x} = -1$, where $y \rightarrow -1$ as $x \rightarrow \infty$ is
- a) $y = \sin \frac{1}{x} - \cos \frac{1}{x}$ b) $y = \frac{x+1}{x \sin \frac{1}{x}}$ c) $y = \cos \frac{1}{x} + \sin \frac{1}{x}$ d) $y = \frac{x+1}{x \cos \frac{1}{x}}$
- Q72** If $I = \int (\sqrt{\tan x} + \sqrt{\cot x}) dx$, then I equals:
- a) $\sqrt{2} \sin^{-1} (\sin x + \cos x) + C$ b) $\sqrt{2} \cos^{-1} (\sin x - \cos x) + C$
 c) $\sqrt{2} \sin^{-1} (\sin x - \cos x) + C$ d) $\sqrt{2} \cos^{-1} (\sin x + \cos x) + C$
- Q73** The value of $\int_{-\pi/2}^{\pi/2} \frac{\sin^2 x \, dx}{1 + e^x}$ is-
- a) $\frac{\pi}{8}$ b) $\frac{\pi}{4}$ c) $\frac{\pi}{6}$ d) $\frac{\pi}{3}$
- Q74** The area of the figure bounded by the curves $y = |x - 1|$ and $y = 3 - |x|$ is -
- a) 2 b) 3 c) 4 d) None of these
- Q75** \vec{a} and \vec{c} are unit vectors and $|\vec{b}| = 4$. Then angle between \vec{a} and \vec{c} is $\cos^{-1}(1/4)$ and $\vec{b} - 2\vec{c} = \lambda \vec{a}$. The value of λ is.
- a) 3, -4 b) 1/4, 3/4 c) -3, 4 d) -1/4, 3/4
- Q76** The radius of the circle $\left| \frac{z-i}{z+i} \right| = 5$ is given by-
- a) $\frac{13}{12}$ b) $\frac{5}{12}$ c) 5 d) 625
- Q77** In a non-leap year, the probability of getting 53 Sunday or 53 Tuesday or 53 Thursday is
- a) $\frac{1}{7}$ b) $\frac{2}{7}$ c) $\frac{3}{7}$ d) $\frac{4}{7}$
- Q78** The area of the polygon, whose vertices are the non-real roots of the equation $\bar{z} = iz^2$ is :
- a) $\frac{3\sqrt{3}}{4}$ b) $\frac{3\sqrt{3}}{2}$ c) $\frac{3}{2}$ d) $\frac{3}{4}$

Q79

Let $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ and $A' \cdot A = I$, then the value of $x^2 + y^2 + z^2$ is-

- a) 1 b) 2 c) 1/2 d) None of these

Q80 The complex number which satisfies the equation $z + \sqrt{2}|z + 1| + i = 0$ is

- a) $2 + i$ b) $-2 + i$ c) $-2 - i$ d) $2 - i$

Numerical**Q81** The projection of the line segment joining the points $(1, -1, 3)$ and $(2, -4, 11)$ on the line joining the points $(-1, 2, 3)$ and $(3, -2, 10)$ is _____.**Q82** If $f(1) = 1$, $f'(1) = 3$, then the derivative of $f(f(f(x))) + (f(x))^2$ at $x = 1$ is :**Q83** Sum of values of p for which, the equations: $x + y + z = 1$; $x + 2y + 4z = p$ and $x + 4y + 10z = p^2$ have a solution is.**Q84** The number of terms common to the two A.P.'s $3, 7, 11, \dots, 407$ and $2, 9, 16, \dots, 709$ is _____.**Q85** Area bounded by the relation $[2x] + [y] = 5$, $x, y > 0$ is _____. (where $[\cdot]$ represents greatest integer function).**Q86** Let $f(x) = 30 - 2x - x^3$, then the number of positive integral values of x which satisfies $f(f(f(x))) > f(f(-x))$ is _____.**Q87** Two circles in the first quadrant of radii r_1 and r_2 touch the coordinate axes. Each of them cuts off an intercept of 2 units with the line $x + y = 2$. Then $r_1^2 + r_2^2 - r_1 r_2$ is equal to _____.**Q88** The no. of solution of eq. $\sin(e^x) = 5^x + 5^{-x}$ is**Q89** Let $A(4, -4)$ and $B(9, 6)$ be points on the parabola, $y^2 = 4x$. Let C be chosen on the arc AOB of the parabola, where O is the origin, such that the area of ΔACB is maximum. Then, the area (in sq. units) of ΔACB , is $\frac{p}{q}$ (where p, q are coprime) Then $p+q =$ **Q90** The number of ways of distributing 8 identical balls in 3 distinct boxes so that none of the boxes is empty is

Answer Key

Que.	1	2	3	4	5	6	7	8	9	10
Ans.	D	A	B	D	A	C	D	B	C	A
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	D	A	A	B	B	D	C	A	C	A
Que.	21	22	23	24	25	26	27	28	29	30
Ans.	10	90	30	3	4	14	3	3	3	6
Que.	31	32	33	34	35	36	37	38	39	40
Ans.	B	D	D	A	D	A	C	A	C	B
Que.	41	42	43	44	45	46	47	48	49	50
Ans.	D	D	C	A	D	C	D	C	D	D
Que.	51	52	53	54	55	56	57	58	59	60
Ans.	11	69	6	37	4	9	60	23	6	16
Que.	61	62	63	64	65	66	67	68	69	70
Ans.	B	C	B	D	B	A	B	A	B	A
Que.	71	72	73	74	75	76	77	78	79	80
Ans.	A	C	B	C	A	B	C	A	A	C
Que.	81	82	83	84	85	86	87	88	89	90
Ans.	8	33	3	14	3	2	7	0	129	21