FIITJEE

ALL INDIA TEST SERIES

PART TEST – II

JEE (Main)-2025

TEST DATE: 01-12-2024

Time Allotted: 3 Hours **Maximum Marks: 300**

General Instructions:

- The test consists of total 75 questions.
- Each subject (PCM) has 25 questions.
- This question paper contains **Three Parts.**
- **Part-A** is Physics, **Part-B** is Chemistry and **Part-C** is Mathematics.
- Each part has only two sections: **Section-A and Section-B**.

  Section-A (01 – 20, 26 – 45, 51 – 70) *contains 60 multiple choice questions which have* ***only one correct answer****. Each question carries* ***+4 marks*** *for correct answer and* ***–1 mark*** *for wrong answer.*

  Section-B (21 – 25, 46 – 50, 71 – 75) *contains 15 Numerical based questions. The answer to each question is rounded off to the nearest integer value. Each question carries* ***+4 marks*** *for correct answer and* ***–1 mark*** *for wrong answer.*

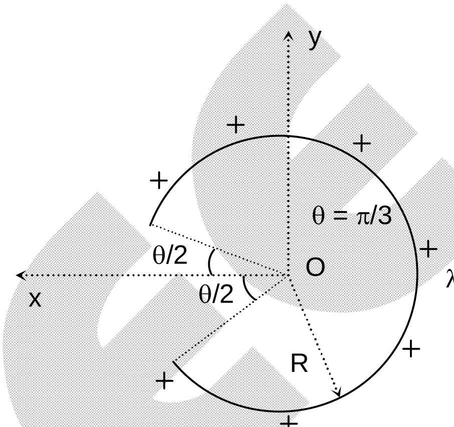
Physics

PART – A

SECTION – A
(One Options Correct Type)

*This section contains **20 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.*

1. If section of wire from a uniformly charged ring with linear charge density λ is removed as shown, then electric field vector at center of ring will be $\left[K = \frac{1}{4\pi\varepsilon_0}\right]$



(A) $\frac{K\lambda}{R}(-\hat{i})$

(B) $\frac{K\lambda}{R}\hat{i}$

(C) $\frac{K\lambda\sqrt{3}}{R}(-\hat{i})$

(D) $\frac{K\lambda\sqrt{3}}{R}(\hat{i})$

2. Calculate the magnetic field at distance 'y' from the centre on the axis of a disc of radius r and uniform surface charge density σ, if the disc rotates with angular velocity ω about Y-axis.

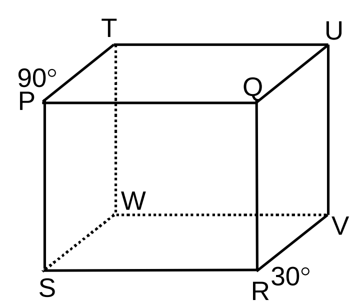
(A) $\frac{\mu_0\sigma\omega}{3}\left(\frac{r^2-2y^2}{\sqrt{r^2-y^2}}+2y\right)$

(B) $\frac{\mu_0\sigma\omega}{2}\left(\frac{r^2+y^2}{\sqrt{r^2-y^2}}\right)$

(C) $\frac{\mu_0\sigma\omega}{2}\left(\frac{r^2+2y^2}{\sqrt{r^2+y^2}}-2y\right)$

(D) $\frac{2\mu_0\sigma\omega}{3}\left(\frac{r^2+2y^2}{\sqrt{r^2+y^2}}-2y\right)$

3. 12 identical rods made of same material are arranged in the form of a cube. The temperature of 'P' and 'R' are maintained at 90°C and 30°C respectively. Then the temperature of point ' V ', when steady state is reached,



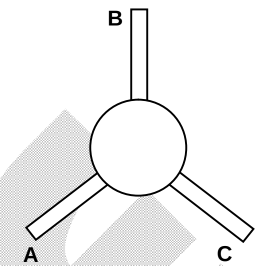
(A) 65°C
(B) 60°C
(C) 20°C
(D) 50°C

4. A plane thick wall having uniform surface temperature along planes are 0°K and T_0K(T_0 = 300K) at x = 0 and x = x_0 respectively. Thermal conductivity varies linearly with temperature $K = K_0(1 + T)$ The temperature of wall at the plane x = $2x_0$ is approximately: (where T is in kelvin)

(A) 300 K
(B) 400 K
(C) 425 K
(D) 450 K

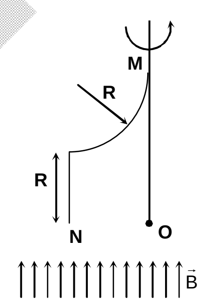
5. A bulb rated as (20W, 10V) is connected across 20V cell. What resistance is required to glow it with full intensity?
(A) 4Ω (B) 5Ω
(C) 8Ω (D) 2.5Ω

6. A metallic block of mass 1 kg and specific heat $1\,cal/gm^{\circ}C$ is connected to three identical rods as shown in diagram. Temperature of A, B and C are maintained at 10°C, 5°C and 3°C respectively. Find the final temperature of 1 kg block on Celsius Scale. (Neglect any heat loss due to radiation)
(A) 3°C (B) 6°C
(C) 7°C (D) 9°C

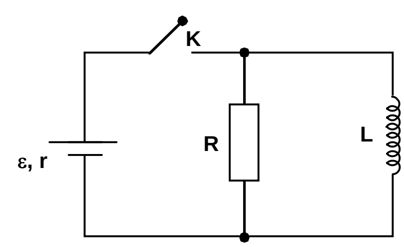


7. In the atmosphere of a planet there are only two gases Helium and oxygen in the mass ratio 1 : 4 respectively. The value of $\gamma = \frac{C_P}{C_V}$ of the mixture is given by $\gamma = 1 + \frac{K}{11}$. Find the value of K.
(A) 2 (B) 4
(C) 6 (D) 8

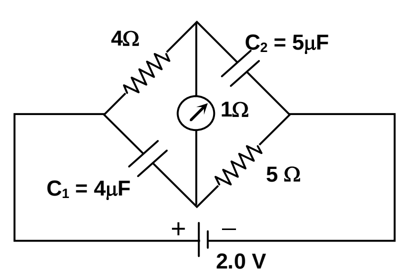
8. The given assembly made of a conducting wire is rotated with a constant angular velocity ω = 2 rad/s about a vertical axis MO as shown in the figure. The magnetic field $\vec{B} = 2$ Tesla exists vertically upwards as shown in the figure. Find the potential difference between points M and N, $|v_M - v_N|$ (only the magnitude) (R = 2m)
(A) 3 (B) 5
(C) 6 (D) 8



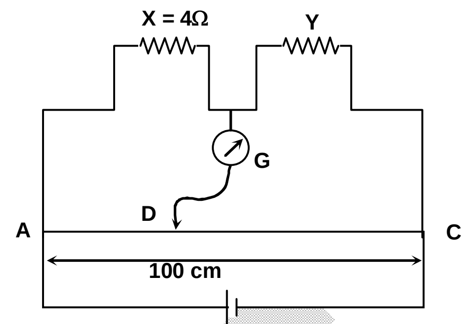
9. An electric circuit consists of a battery with an EMF ε and an internal resistance r, an inductor with an inductance L and a resistor with a resistance R = 3r (see the figure). The switch K is closed and then opened at the moment when the current through the source is $\frac{\varepsilon}{2r}$. Find charge flows through the resistor when the switch is closed. (Before the switch was closed, there was no current in the circuit.)
(A) $\frac{\varepsilon L}{3r^2}$ (B) $\frac{\varepsilon L}{2r^2}$
(C) $\frac{\varepsilon L}{r^2}$ (D) $\frac{\varepsilon L}{9r^2}$



10. In the circuit shown, the cell is ideal, with emf = 2V. The resistance of the coil of the galvanometer G is 1Ω. In steady state
(A) No current flows in G
(B) 0.3 A current flow in G
(C) Potential difference across C_1 is 2 V
(D) Potential difference across C_2 is 1.2 V

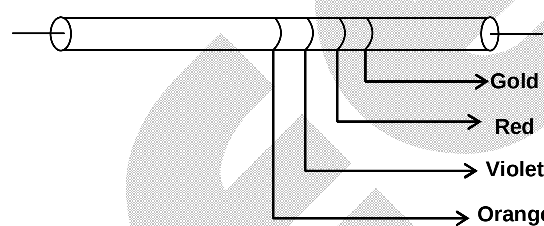


11. Figure shows a metre bridge. Wire AC has uniform cross-section. The length of wire AC is 100 cm. X is a standard resistor of 4 Ω and Y is a coil. When Y is immersed in melting ice the null point is at 40 cm from point A. When the coil Y is heated to 100°C, a 78 Ω resistor has to be connected in parallel with Y in order to keep the bridge balanced at the same point. Temperature coefficient of resistance of the coil is



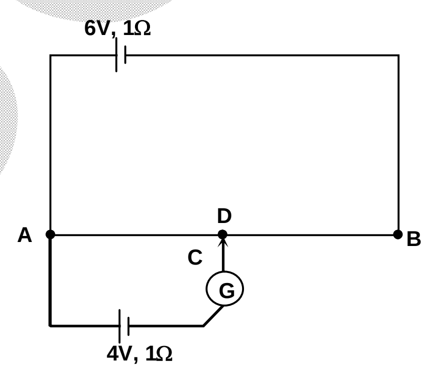
(A) $6.3\times10^{-4}K^{-1}$ (B) $4.3\times10^{-4}K^{-1}$
(C) $8.3\times10^{-4}K^{-1}$ (D) $2.3\times10^{-4}K^{-1}$

12. The colours coding on a carbon resistor is shown in the given figure. The resistance value of the given resistor is:



(A) (3700 ± 370) Ω
(B) (3700 ± 185) Ω
(C) (7400 ± 370) Ω
(D) (7400 ± 740) Ω

13. A 6 volt battery of internal resistance 1Ω is connected across a uniform wire AB of length 100 cm. The positive terminal of another battery of emf 4 V and internal resistance 1Ω is joined to the point A as shown. Find the distance of point D from A in centimeter if it is the balance point (Resistance of AB = 5Ω)

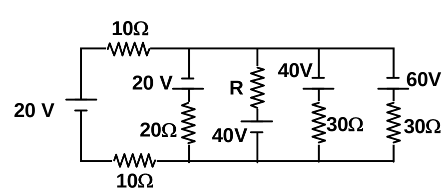


(A) 20 (B) 40
(C) 60 (D) 80

14. A point charge Q is placed inside an uncharged conducting spherical shell of inner radius 2R and outer radius 3R at a distance of R from the centre of the shell. The electric potential at the centre of the shell will be $\frac{1}{4\pi\varepsilon_0}\frac{pQ}{qR}$, where p and q are co-prime numbers. Find the value of (p + q)

(A) 5 (B) 7
(C) 11 (D) 13

15. In the given circuit, it is required that the thermal power generated in R is maximum. Find the required value of R in ohms.



(A) 2 (B) 4
(C) 6 (D) 8

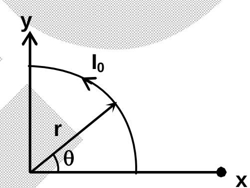
16. There are two concentric and coplanar non-conducting rings of radii R and $4R$. The charge is distributed uniformly on both rings. The charge on smaller ring is q and charge on larger ring is $-8q$. A particle of mass 10 g and charge $-q$ is projected along the axis from infinity. The minimum speed (in m/s) of charge at infinity to reach the common centre of rings is $\left(\text{Take } \frac{Kq^2}{R} = \frac{2\sqrt{5}}{3}\text{J}\right)$

(A) 20 (B) 40
(C) 60 (D) 80

17. If electrostatic potential at point (x, y) is given by $V = -\left(\frac{3x+4y}{\sqrt{\pi\varepsilon_0}}\right)$ volts, then the electrostatic energy stored (in Joule) in spherical volume of radius 30 cm centered at (0, 0, 1) will be

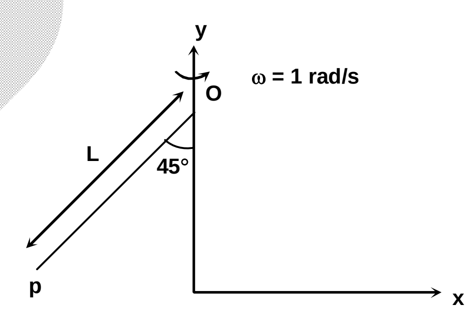
(A) 0.45 (B) 0.90
(C) 0.60 (D) 0.80

18. A wire carrying current I_0 is in shape of a curve which is represented in polar co-ordinate system as $r = b + \frac{c}{\pi}\theta\left(0 \le \theta \le \frac{\pi}{2}\right)$, where *b* and *c* are positive constant. The magnetic field at the origin due to wire is



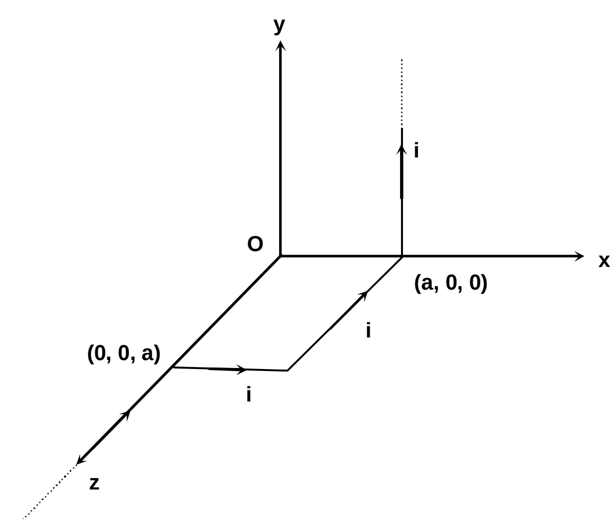
(A) $\frac{\mu_0 I_0}{4c}\ell n\left(1+\frac{c}{2b}\right)$ (B) $\frac{\mu_0 I_0}{4c}\ell n\left(1+\frac{c}{b}\right)$
(C) $\frac{\mu_0 I_0}{4c}\ell n\left(1+\frac{2c}{b}\right)$ (D) $\frac{\mu_0 I_0}{4c}\ell n\left(1+\frac{b}{c}\right)$

19. A conducting rod *OP* of length *L* = 1 m is made to rotate about fixed axes along *y*-axes passing through its one end *O* as shown. If uniform magnetic field $\vec{B} = 4\hat{j}$ tesla exist in the region, then induced emf across the ends of rod is



(A) 2 volt
(B) 4 volt
(C) 1 volt
(D) 6 volt

20. Magnetic field at point *O* due to current carrying wire shown in figure is



(A) $\frac{\mu_0 i}{4\pi a}(\hat{k}+\sqrt{2}\hat{j})$
(B) $\frac{\mu_0 i}{2\pi a}(\hat{k}+\sqrt{2}\hat{j})$
(C) $\frac{\mu_0 i}{4\pi a}(\hat{j}+\sqrt{2}\hat{k})$
(D) $\frac{\mu_0 i}{2\pi a}(\hat{k}-\sqrt{2}\hat{j})$

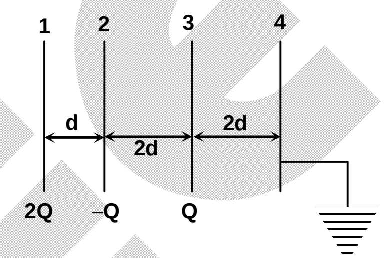
SECTION – B

(Numerical Answer Type)

*This section contains **05** Numerical based questions. The answer to each question is rounded off to the nearest integer value.*

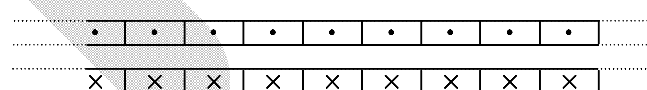
21. Consider a charge distribution which has the constant density ρ everywhere inside a cube of edge b and zero everywhere outside that cube. The electric potential is zero at infinite distance from the cube, V_0 is the potential at the centre of the cube and V_1 is the potential at a corner of the cube. The value of $\frac{V_0}{V_1}$ is

22. Charges 2Q, $-$Q and Q are given to conducting plates 1, 2 and 3 respectively and plate 4 is earthed as shown. Area of each plate is A. Potential (in V) of plate 3 is (Given, $\frac{Qd}{A\varepsilon_0} = 2$ volt)



23. A resistor dissipates 200 J of energy in 1 s, when a current of 2 A is passed through it. Now when the current is half, the amount of thermal energy dissipated in 8 s is $n \times 10^2$ joule. The value of n is

24. Two large parallel current sheets having linear current densities J and $-$J are placed as shown. If the energy stored in a cuboid of size ($L \times 2L \times 3L$) between the sheets is $N\mu_0 J^2 L^3$, then find the N.



25. Two spheres A and B having radii 3 cm and 5 cm respectively are coated with carbon black on their outer surfaces. The wavelengths of maximum Intensity of emission of radiation are 300 nm and 500 nm respectively. The respective powers radiated by them are in the ratio of $\frac{25}{K}$. Find the value of K.

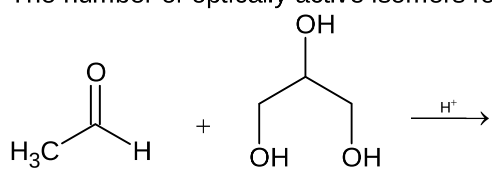
Chemistry

PART – B

SECTION – A
(One Options Correct Type)

*This section contains **20 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.*

26. The number of optically active isomers formed in the following reaction is:



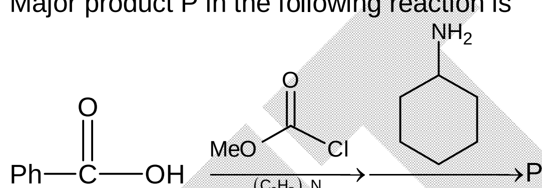
(A) 2
(B) 4
(C) 6
(D) 7

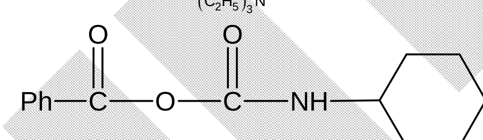
27. Consider the following sequence of reaction

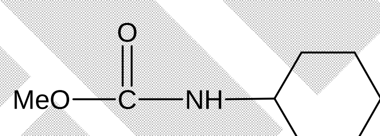
$$Me-C\equiv C-H \xrightarrow[H_2SO_4]{HgSO_4} P \xrightarrow{NaBH_4} Q$$

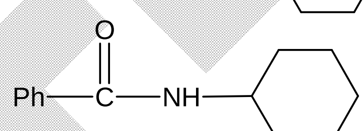
Product Q gives
(A) Instant turbidity with Lucas reagent
(B) Red colour in Victor-Mayer test
(C) Yellow precipitate in idodoform test
(D) Yellow precipitate with Brady's reagent

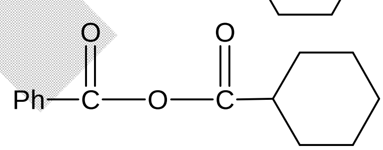
28. Major product P in the following reaction is



(A)


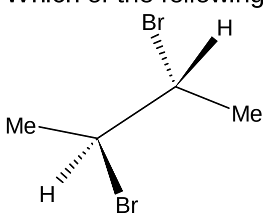
(B)


(C)


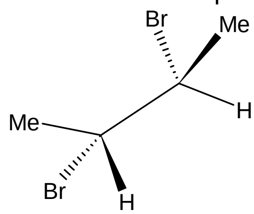
(D)


29. Cellulose is a polysaccharide composed of
(A) $\beta-D-$glucose
(B) $\alpha-D-$glucose
(C) $\beta-D-$galactose
(D) Both (A) and (B)

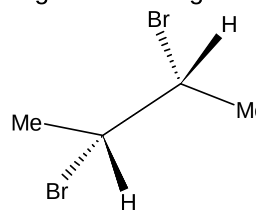
30. Which of the following pair is enantiomeric pair among the following compounds



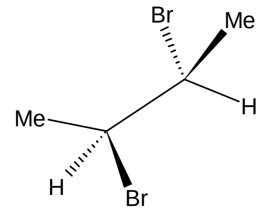
(i)



(ii)



(iii)

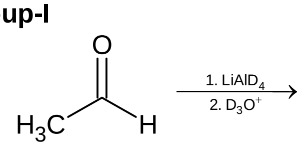
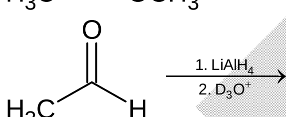


(iv)

(A) (i) and (ii)
(B) (i) and (iii)
(C) (ii) and (iv)
(D) (iii) and (iv)

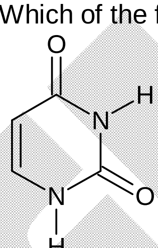
31. In the Finkelstein reaction, the solvent medium, reactant and product are respectively.
(A) acetone, alkyl chloride, alkyl iodide
(B) water, alkyl chloride, alkyl iodide
(C) acetone, alkyl iodide, alkyl chloride
(D) water, alkyl iodide, alkyl chloride

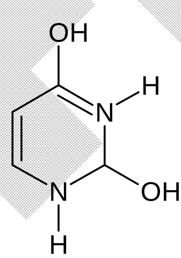
32. Match the reactant in group-I to product in group-II:

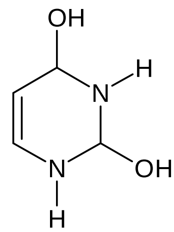
Group-I	**Group-II**
P. 	1. CH_3CHDOD
Q. 	2. CH_3CH_2OD
R. 	3. CH_3CD_2OH

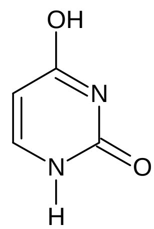
(A) P – 3, Q – 1, R – 2
(B) P – 1 Q – 3 R – 2
(C) P – 1, Q – 2, R – 3
(D) P – 2, Q – 3, R – 1

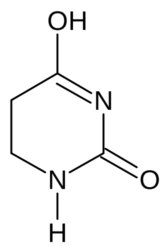
33. Which of the following molecule is one of the tautomer of the following structure shown below



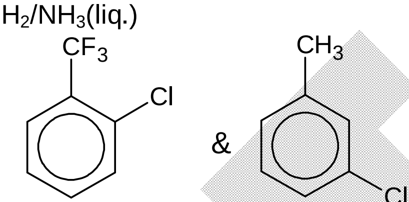
(A)


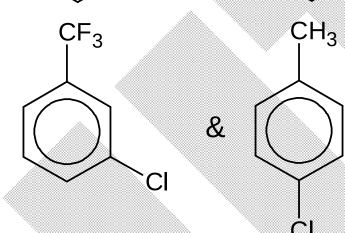
(B) 

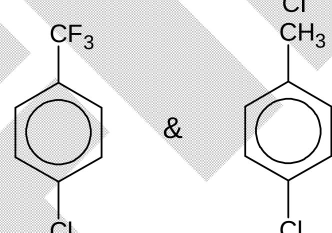
(C) 

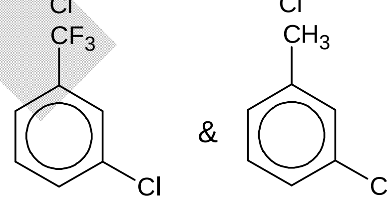
(D) 

34. Which of the following pair will give IPSO substitution as major product on reaction with $NaNH_2/NH_3$(liq.)

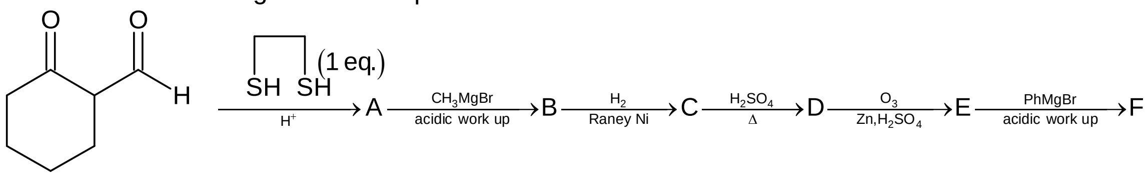
(A) 

(B) 

(C) 

(D) 

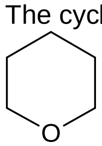
35. Consider the following reaction sequence

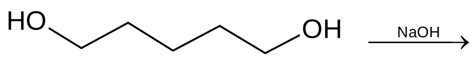


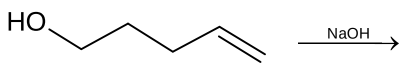
Number of stereoisomers of product 'F' is:
(A) 2
(B) 3
(C) 4
(D) 5

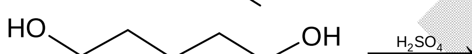
36. Cyanogen on hydrolysis with dil. HCl gives
(A) Formic acid
(B) Acetic acid
(C) Oxalic acid
(D) Malonic acid

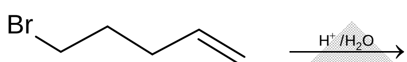
37. The cyclic ether 'X' can be synthesized by which of the following method

 (X)

(A) 

(B) 

(C) 

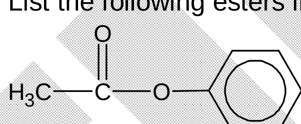
(D) 

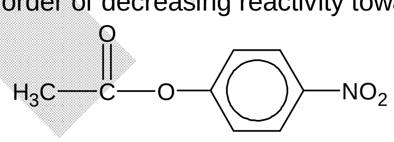
38. The IUPAC name of the following compound is

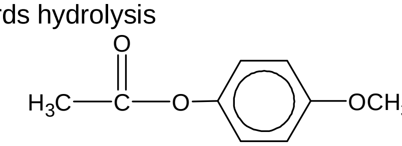
$$H_3C-CH_2-\underset{}{\overset{\overset{\displaystyle CH_2}{\|}}{C}}-CH(CH_3)_2$$

(A) ethylisopropyl ethane
(B) 2-isopropyl but-1-ene
(C) 2-methyl-3-ethyl but-3-ene
(D) 2-ethyl-3-methyl but-1-ene

39. List the following esters in order of decreasing reactivity towards hydrolysis

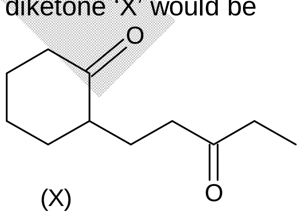

(i)

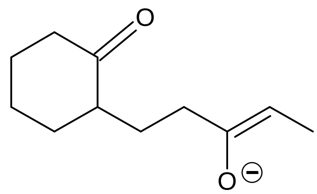

(ii)

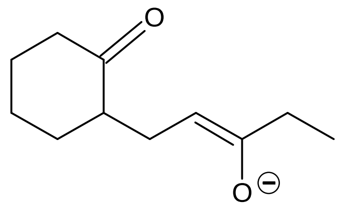

(iii)

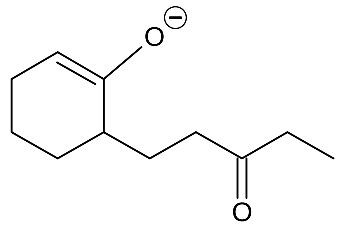
(A) i > ii > iii
(B) ii > iii > i
(C) ii > i > iii
(D) iii > i > ii

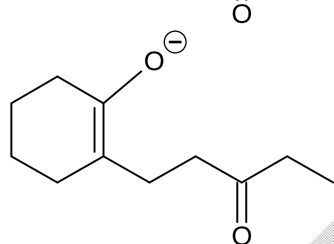
40. Enolate responsible for the formation of a stable intramolecular aldol product from the following diketone 'X' would be


(X)

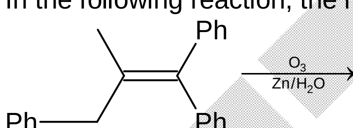
(A)


(B)


(C)


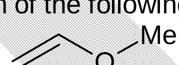
(D)


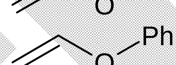
41. In the following reaction, the mixture of products obtained can be distinguished by

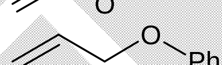


(A) Tollen's test
(B) Fehling solution
(C) Iodoform test
(D) None of these

42. Which of the following ether can not be synthesized by Williamson synthesis?

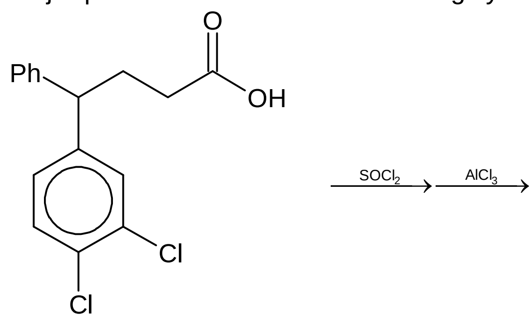
(A)


(B)


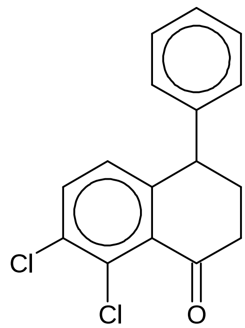
(C)


(D)

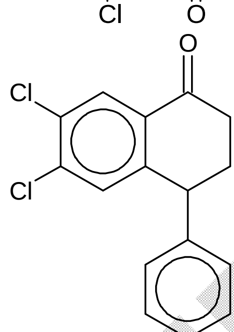

43. Major product obtained in the following synthesis is



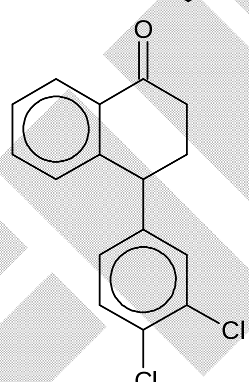
(A)



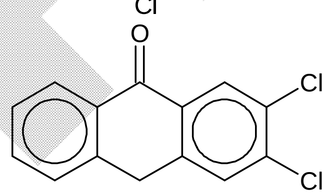
(B)



(C)



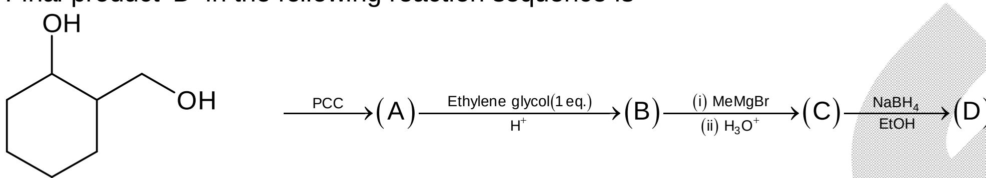
(D)

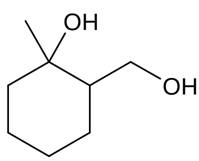


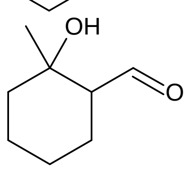
44. Which of the following will exhibit geometrical isomerism?
(i) 2,5-dichloro-3-hexene
(ii) 1-phenyl-2-butene
(iii) 3-phenyl-1-butene
(iv) 1,4-dichloro-2-pentene

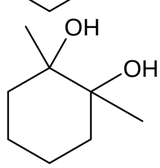
(A) (i) and (ii) (B) (iii) and (iv)
(C) (i), (ii) and (iv) (D) (ii) and (iv)

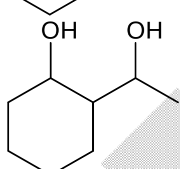
45. Final product 'D' in the following reaction sequence is



(A)


(B)


(C)


(D)


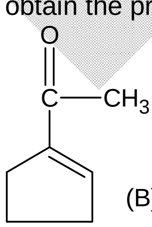
SECTION – B

(Numerical Answer Type)

*This section contains **05** Numerical based questions. The answer to each question is rounded off to the nearest integer value.*

46. 3.64 g of 1,1,2,2-tetrachloropropane is heated with zinc dust and the product was bubbled through excess of ammonical $AgNO_3$, the mass of silver salt precipitated is(in gm) [Round off to nearest integer]____________
(Atomic mass, C = 12, Cl = 35.5, H = 1, Ag = 108, N = 14, O = 16)

47. The reactant 'A' undergoes intramolecular aldol reaction when heated in presence of NaOH to obtain the product 'B'



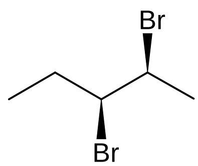
(B)

The number of methylene unit in 'A' is

48. A strand of DNA has the sequence $5' - ATATGCGC - 3'$. The number of hydrogen bond it will form with it's complimentary strand is__________

49. How many of the following are copolymer:
Bakelite, Nylon, Buna-S, Melamine, Polystyrene, Orlon, Polyethylacrylate, Terylene.

50. Number of monochlorinated product (including stereoisomers) of the following compound is:



Mathematics PART – C

SECTION – A
(One Options Correct Type)

*This section contains **20 multiple choice questions**. Each question has **four choices** (A), (B), (C) and (D), out of which **ONLY ONE** option is correct.*

51. If $x_1^2 + x_2^2 + 2x_2 + 1 = 0$ and $y_1^2 + y_2^2 + 2y_2 + 2y_1 + 2 = 0$, then the equation of the line joining (x_1, y_1) and (x_2, y_2) is
(A) $x = 0$
(B) $x = -1$
(C) $y = 1$
(D) $y = -1$

52. Ram is drawing a Christmas tree he starts with in isosceles triangle AB_0C_0 with $AB_0 = AC_0 = 41$ and $B_0C_0 = 18$, then he draws points B_1 and C_1 on sides AB_0 and AC_0, respectively, such that $B_iB_{i+1} = 1$ and $C_iC_{i+1} = 1$ ($B_{41} = C_{41} = A$). Finally he uses a green crayon to color in triangles $B_iC_iC_{i+1}$ for i from 0 to 40. The total area that he colour is
(A) $\frac{7560}{41}$
(B) $\frac{7460}{41}$
(C) $\frac{7360}{41}$
(D) $\frac{7260}{41}$

53. Let P be any point on ellipse $3x^2 + 4y^2 = 12$ and S, S′ are its foci then the locus of the centroid of triangles PSS′ is a conic C. Which of the following statements is incorrect about C:
(A) length of lotus rectum equals 1
(B) locus of point of intersection of perpendicular tangents is $x^2 + y^2 = 7/9$.
(C) equation of auxiliary circle is $x^2 + y^2 = 4/9$
(D) area of quadrilateral formed by tangents at the extremities of latus rectum equals 16/3.

54. Let $P(x_1, y_1)$ (where $y_1 > 0$) be any point on the parabola $y^2 = 4x$, with focus at S. Also normal drawn to the parabola at P cuts the circles described on the focal radius of the point P as diameter at Q. In length of PQ is $\sqrt{10}$, then the find the perpendicular distance to the point P from the line $x + 1 = 0$
(A) 7
(B) 12
(C) 10
(D) 9

55. Let the line $L = ax + by + c = 0$ is tangent to the parabola $y^2 = 8x$ at a point where product of abscissa and ordinate is equal to – 1. The y intercept of line L is equal to n and the number of tangents to $y = \sin(x + y)$; $x \in [-2\pi, 2\pi]$ which are parallel to L is equal to m. the value of m + n is equal to
(A) 1
(B) – 1
(C) 2
(D) – 2

56. If two orthogonal circles pass through the point (0, 5) and (0, – 5) and touch the line $y = \sqrt{2}x + c$, then sum of the digits of the greatest integer which is less than or equal to the absolute value of c is
(A) 3
(B) 5
(C) 2
(D) 1

57. Tangents are drawn from any point on the director circles of ellipse $S_1 : x^2 + \frac{y^2}{8} = 1$ to auxiliary circle of hyperbola $S_2 : \frac{x^2}{8} - y^2 = 1$. The locus of mid point of the chord of contact is a circle. Let the line y – 4 = 2(x – c) cuts the circles orthogonally. The locus of the point (h, k) for which the line hx + ky = 1 touches the ellipse S_1 is $ax^2 + by^2 = 1$. The eccentricity of the conjugate hyperbola of hyperbola S_2, is e. The value of (a + b + c + e) is equal to $\frac{p}{q}$, where p and q are relative prime, then the value of p + q is

(A) 10 (B) 12
(C) 14 (D) 15

58. The tangent at a point P on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ pass through the point (0, –b) and the normal at point P passes through the point $\left(2\sqrt{2}a, 0\right)$. If e denote the eccentricity of hyperbola then find the value of e^2.

(A) 2 (B) 3
(C) 4 (D) 5

59. From any point P on the circle $x^2 + y^2 = 1$, tangents are drawn to a variable circle centered at a variable point C(3 + cosθ, 4 + sinθ). The tangents touches the variable circle at two variable points A and B. C_1 be the locus of point C. Then minimum value of diameter of circumcircle of ΔPAC is

(A) 4 (B) 5
(C) 3 (D) 2

60. Triangle ABC has side lengths AB = 3, AC = 2 and angle ∠CBA = 30º. Let the possible lengths of BC be l_1 and l_2, where $l_2 > l_1$. Then the value of $\frac{l_2}{l_1}$ is

(A) $\frac{16+3\sqrt{21}}{10}$ (B) $\frac{17+3\sqrt{21}}{10}$
(C) $\frac{15+3\sqrt{21}}{10}$ (D) $\frac{14+3\sqrt{21}}{10}$

61. Let A(α_1, β_1), B(α_2, β_2), C(α_3, β_3) be the vertices of triangle ABC with BC = a, AB = c, AC = b. If algebraic sum of perpendicular distances from

$$L\left(\frac{3a\alpha_1}{a+b+c}, \frac{3a\beta_1}{a+b+c}\right), M\left(\frac{3b\alpha_2}{a+b+c}, \frac{3b\beta_2}{a+b+c}\right), N\left(\frac{3c\alpha_3}{a+b+c}, \frac{3c\beta_3}{a+b+c}\right)$$

to a variable line is zero, then all such lines passes through

(A) orthocentre of ΔABC (B) centroid of ΔABC
(C) circum centre of ΔABC (D) incentre of ΔABC

62. If $\sqrt{4+\sqrt{8-\sqrt{32+\sqrt{768}}}} = a\sqrt{2}\cos\left(\frac{11\pi}{b}\right)$ where a and b are natural numbers, then $\frac{b}{a}$ is divisible by

(A) 5 (B) 4
(C) 16 (D) 18

63. A variable parabola C whose focus is S(0, 0) and passing through P(3, 4). Equation of tangent at P to the parabola is $3x + 4y - 25 = 0$. A chord through S parallel to tangent at P intersects the parabola at A and B. Which of the following are incorrect ?
(A) length of AB is 20 units
(B) latus rectum of parabola is 20 units
(C) only one real normal can be drawn from the point (–3, –4)
(D) only one real normal can be drawn from the point (–6, –8)

64. If P is an integer and m_1, m_2, m_3 are the slopes of all three straight lines represented by equation $y^3 + (2p + 5)xy^2 - 6x^2y - 2px^3 = 0$ which are also integers, then which of the following can holds not good
(A) $P + \sum_{i=1}^{3} m_i = -1$
(B) $P + \sum_{i=1}^{3} m_i = -5$
(C) $P + \sum_{i=1}^{3} m_i = 0$
(D) $P + \sum_{i=1}^{3} m_i = 32$

65. The line $3x + 6y = P$ intersects the curve $2x^2 + 2xy + 3y^2 = 1$ at points A and B. The circle on AB as diameter passes through the origin. The possible value of P is
(A) 3
(B) 4
(C) –4
(D) 5

66. Let O be centre S, S′ be foci of hyperbola of tangent at any point P on hyperbola cuts asymptotes at M and N then OM + ON equals
(A) |SP – S′P|
(B) SP + S′P
(C) SS′
(D) distance between vertices

67. A circle with centre $(3x_1, 3y_1)$ and of variable radius cuts the hyperbola $x^2 - y^2 = 36$ at the points P, Q, R and S. If the locus of centroid of a ΔPQR is $(x - 2x_1)^2 - (y - 2y_1)^2 = \lambda$, then the value of λ is
(A) 3
(B) –2
(C) 4
(D) –3

68. RP and RQ are tangents to parabola $y^2 = 8x$ and normals at P and Q intersect at a point T on the parabola. The locus of circumcentre of ΔRPQ is a parabola whose
(A) vertex is (1, 0)
(B) foot of perpendicular from focus on directrix is $\left(\frac{5}{4}, 0\right)$
(C) length of latus rectum is 1
(D) focus is $\left(\frac{7}{4}, 0\right)$

69. A normal chord drawn to a parabola $y^2 = 4x$ at any point P intersects the parabola again at R, then the minimum distance of R from the vertex of the parabola is equal to
(A) $4\sqrt{2}$
(B) $4\sqrt{3}$
(C) $4\sqrt{5}$
(D) $4\sqrt{6}$

70. Let ΔABC be a triangle with BA < AC, BC = 10 and BA = 8. Let H be the orthocentre of ΔABC. Let F be the point on segment AC such that BF = 8. Let T be the point of intersection of FH and the extension of line BC. Suppose that BT = 8. Find the area of ΔABC
(A) $14\sqrt{7}$
(B) $15\sqrt{7}$
(C) $16\sqrt{7}$
(D) $17\sqrt{7}$

SECTION – B

(Numerical Answer Type)

*This section contains **05** Numerical based questions. The answer to each question is rounded off to the nearest integer value.*

71. The exact value of $\cos\frac{2\pi}{28}\text{cosec}\frac{3\pi}{28}+\cos\frac{6\pi}{28}\text{cosec}\frac{9\pi}{28}+\cos\frac{18\pi}{28}\text{cosec}\frac{27\pi}{28}$ is equal to

72. If $\frac{\sin x}{\sin y}=\frac{1}{2},\frac{\cos x}{\cos y}=\frac{3}{2}$ where x, y $\in\left(0,\frac{\pi}{2}\right)$ and then $\tan\left(\frac{x+y}{2}\right)=\frac{\sqrt{3}}{\sqrt{3+k}}$, then k is equals to

73. The difference of slopes of the lines represented by $x^2(\tan^2\theta + \cos^2\theta) - 2xy\tan\theta + y^2\sin^2\theta = 0$ is

74. If $\frac{1}{\sin 45°\sin 46°}+\frac{1}{\sin 47°\sin 48°}+\frac{1}{\sin 49°\sin 50°}+........+\frac{1}{\sin 133°\sin 134°}=\frac{1}{\sin n°}$, then n equals to

75. The number of points on the line 3x + 4y = 5 which are at a distance of $\sec^2\theta + 2\text{cosec}^2\theta$, $\theta \in R$ (1, 3) is