



# Sri Chaitanya IIT Academy.,India.

✪ A.P ✪ T.S ✪ KARNATAKA ✪ TAMILNADU ✪ MAHARASTRA ✪ DELHI ✪ RANCHI

*A right Choice for the Real Aspirant*

ICON Central Office - Madhapur - Hyderabad

SEC: **Sr.Super60\_NUCLEUS&STERLING\_BT**

JEE-MAIN

Date: 16-09-2023

Time: 09.00Am to 12.00Pm

RPTM-07

Max. Marks: 300

## IMPORTANT INSTRUCTION:

1. Immediately fill in the Admission number on this page of the Test Booklet with **Blue/Black Ball Point Pen** only.
2. The candidates should not write their Admission Number anywhere (except in the specified space) on the Test Booklet/ Answer Sheet.
3. The test is of **3 hours** duration.
4. The Test Booklet consists of 90 questions. The maximum marks are **300**.
5. There are **three** parts in the question paper 1,2,3 consisting of **Physics, Chemistry and Mathematics** having **30 questions** in each subject and subject having **two sections**.

**(I) Section –I** contains 20 **multiple choice** questions with only one correct option.

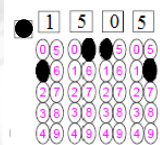
**Marking scheme:** +4 for correct answer, 0 if not attempt and -1 in all other cases.

**(II) Section-II** contains 10 **Numerical Value Type** questions. Attempt any 5 questions only, if more than 5 questions attempted, First 5 attempted questions will be considered.

- The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **nearest Integer** value (Example i.e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).

To cancel any attempted question bubble on the question number box.

For example: To cancel attempted question 21. Bubble on 21 as shown below



**Question Answered for Marking**

**Question Cancelled for Marking**

**Marking scheme:** +4 for correct answer, 0 if **not attempt** and -1 in all other cases.

6. Use **Blue / Black Point Pen only** for writing particulars / marking responses on the Answer Sheet. **Use of pencil is strictly prohibited.**
7. No candidate is allowed to carry any textual material, printed or written, bits of papers, mobile phone any electron device etc, except the Identity Card inside the examination hall.
8. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
9. On completion of the test, the candidate must hand over the Answer Sheet to the invigilator on duty in the Hall.  
**However, the candidate are allowed to take away this Test Booklet with them.**
10. **Do not fold of make any stray marks on the Answer Sheet**

Name of the Candidate (in Capital): \_\_\_\_\_

Admission Number:

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Candidate's Signature: \_\_\_\_\_

Invigilator's Signature: \_\_\_\_\_

**16-09-23\_Sr.Super60\_NUCLEUS&STERLING\_BT\_Jee-Main\_RPTM-07\_Test Syllabus****PHYSICS**

: Rigid body Dynamics 1 : Rigid body, moment of inertia, parallel and perpendicular axes theorems, moment of inertia of uniform bodies with simple geometrical shapes; Angular momentum; Torque; Dynamics of rigid bodies with fixed axis of rotation; Rolling without slipping of rings, cylinders and spheres; Equilibrium of rigid bodies

**RPTM-07(15Q-RPTM.7 SYLLABUS+15Q CUMULATIVE SYLLABUS)****CHEMISTRY**

: Biomolecules, Polymers, Chemistry in Everyday Life & POC:  
 Biomolecules: Carbohydrates: Classification; Mono- and di-saccharides (glucose and sucrose); Oxidation; Reduction; Glycoside formation and hydrolysis of disaccharides (sucrose, maltose, lactose); Anomers. Proteins: Amino acids; Peptide linkage; Structure of peptides (primary and secondary); Types of proteins (fibrous and globular). Isoelectric pH Nucleic acids: Chemical composition and structure of DNA and RNA, Vitamins  
 Polymers: Types of polymerization (addition, condensation); Homo and copolymers; Natural rubber; Cellulose; Nylon; Teflon; Bakelite; PVC; polythene, synthetic rubber, Bio-degradable polymers; Applications of polymers. Chemistry in Everyday Life: Drug-target interaction; Therapeutic action, and examples (excluding structures), of antacids, antihistamines, tranquilizers, analgesics, antimicrobials, and antifertility drugs; Artificial sweeteners (names only); Soaps, detergents, and cleansing action.  
 POC: Detection of elements (N, S, halogens); Detection and identification of the following functional groups: hydroxyl (alcoholic and phenolic), carbonyl (aldehyde and ketone), carboxyl, amino and nitro. Separation of Binary mixture, Purification and characterization of organic compounds.

**RPTM-07(15Q-RPTM.7 SYLLABUS+15Q CUMULATIVE SYLLABUS)****MATHEMATICS**

: Total Integral Calculus

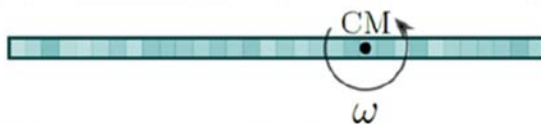
**RPTM-07(15Q-RPTM.7 SYLLABUS+15Q CUMULATIVE SYLLABUS)**

**PHYSICS****Max Marks: 100****(SINGLE CORRECT ANSWER TYPE)**

This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which ONLY ONE option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.

- Two identical solid spheres of same material have the same temperature. One of the spheres is cut into two identical pieces. These two hemispheres are then separated. The intact sphere radiates power  $Q$  at atmospheric temperature  $T_0$ . The two hemispheres together radiate power  $Q_1$  at atmospheric temperature  $T_0$ . Then the value of  $Q_1/Q$  is  
 1) 0.5                      2) 0.75                      3) 2.0                      4) 1.5
- In a football game, a player wants to throw a ball to one of his teammates, who is running on the field. Take thrower's position as origin and receiver's initial position is  $2\hat{i} + 3\hat{j}$ , where  $\hat{i}$  and  $\hat{j}$  are in the plane of field. In subsequent run, receiver's displacements are  $5\hat{i}$  then  $8\hat{j}$ , then  $-2\hat{i} + 4\hat{j}$  and then  $-6\hat{j}$ . How far is receiver from thrower?  
 1)  $\sqrt{106}$  units      2)  $\sqrt{110}$  units      3)  $\sqrt{103}$  units      4)  $\sqrt{112}$  units
- A bag is gently dropped on a conveyor belt moving at a speed of 2 m/s. The coefficient of friction between the conveyor belt and bag is 0.4. Initially, the bag slips on the belt before it stops due to friction. The distance travelled by the bag on the belt during slipping is:  
 [Take  $g = 10 \text{ m/s}^2$ ]  
 1) 2 m                      2) 0.5 m                      3) 3.2 m                      4) 0.8 m
- A thin rod has a non-uniform density. It is mounted on an axle passing through its center of mass and perpendicular to it, as shown. It is rotated about the axle. Which of the following must be true, no matter how the mass in the rod is distributed?



- The two parts have the same mass.
- The magnitudes of the momentum of the two parts are equal.
- The magnitudes of the angular momentum of the two parts, about the center of mass, are equal
- The kinetic energies of the two parts are equal.

Which of the above statements is correct:

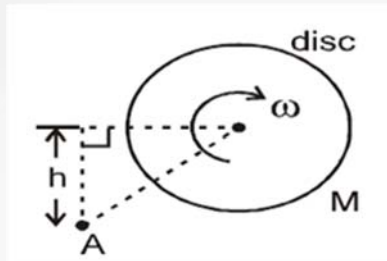
- a and b                      2) b alone                      3) a and c                      4) All the above



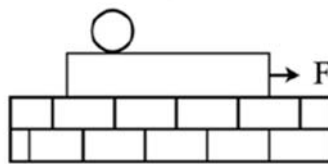




5. A uniform disc of mass  $M$  and radius  $R$  is rotating about its center of mass (the center of mass is at rest) with an angular speed  $\omega$ . The angular momentum of disc about a point A (as shown) will be



- 1)  $MR^2\omega + MhR\omega$     2)  $\frac{1}{2}MR^2\omega$     3)  $\frac{1}{2}MR^2\omega + MhR\omega$     4)  $MR^2\omega$
6. The acceleration of a particle as seen from two frames  $S_1$  and  $S_2$  have equal magnitudes  $4m/s^2$
- 1) The frames must be at rest with respect each other
- 2) The frames may be moving with respect to each other but neither should be accelerated with respect to the other
- 3) The acceleration of  $S_2$  with respect  $S_1$  to may be either zero or  $8m/s^2$
- 4) The acceleration of  $S_2$  with respect to  $S_1$  may have any value between zero and  $8m/s^2$
7. A plank with a uniform sphere placed on it is resting on a smooth horizontal plane. Plank is pulled to the right by a constant force  $F$ . If the sphere does not slip over the plank, which of the following is **incorrect**?

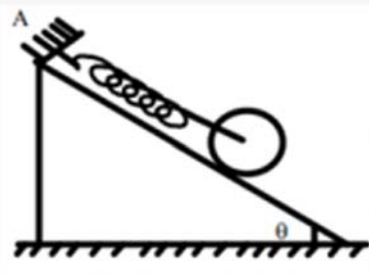


- 1) Acceleration of the center of sphere is less than that of the plank
- 2) Work done by friction acting on the sphere is equal to its total kinetic energy
- 3) The change in kinetic energy of the system is equal to work done by the force  $F$
- 4) Work done by friction on sphere is zero

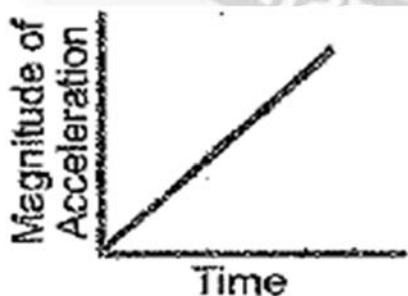
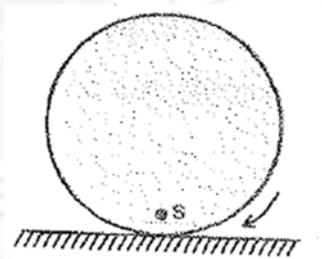




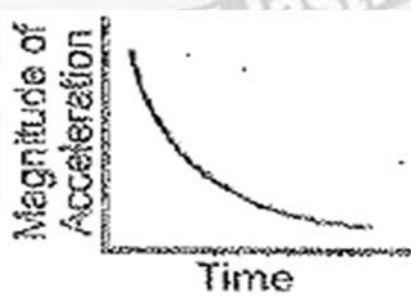
8. A uniform cylinder of mass  $M$  and radius  $R$  rolls without slipping down a slope of angle  $\theta$  with horizontal. The cylinder is connected to a spring of force constant  $K$  at the center, the other side of which is connected to a fixed support at A. Cylinder is released when the spring is unstretched. Till it comes to momentary rest for the first time, the force of friction ( $f$ ) on cylinder is



- 1) Always upwards  
2) Always downwards  
3) Initially upwards and then becomes downwards  
4) Initially down wards and then becomes upwards
9. A shown in figure, S is a point (always at a fixed distance from center of disc) on a uniform disc rolling with uniform angular velocity on a fixed rough horizontal surface. The only forces acting on the disc are its weight and contact forces exerted by the horizontal surface. Which of the following graphs best represents the magnitude of the acceleration of point S as a function of time:

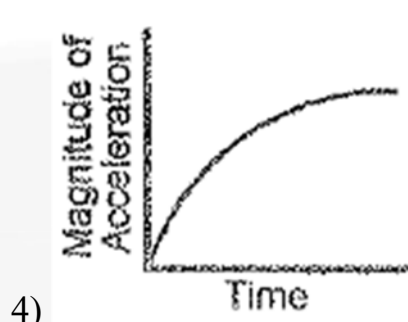
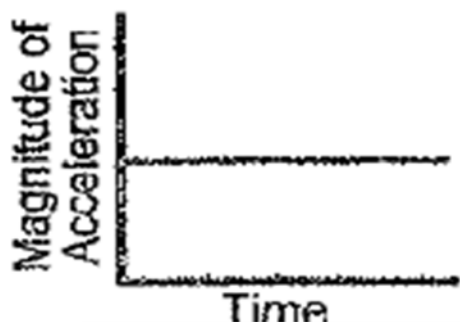


1)

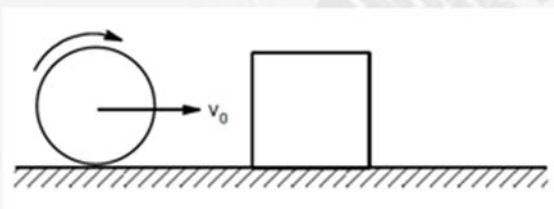


2)





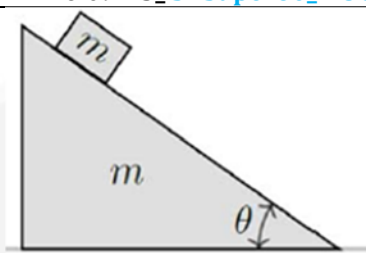
10. A cylinder of mass  $m$  rolling towards a cube of same mass on rough horizontal surface (coefficient of friction  $= \mu$ ) with velocity  $v_0$  as shown in figure. Assume elastic collision and friction is negligible between cube and cylinder. Then after collision



- 1) Cylinder will stop permanently
  - 2) Cylinder will stop momentarily and then move forward
  - 3) Cylinder will stop momentarily and then move backward
  - 4) Cylinder will never stop
11. To mop – clean a floor, a cleaning machine presses a circular mop of radius  $R$  vertically down with a total force  $F$  and rotates it with a constant angular speed about its axis. If the force  $F$  is distributed uniformly over the mop and if coefficient of friction between the mop and the floor is  $\mu$ , the torque applied by the machine on the mop is
- 1)  $\frac{\mu FR}{2}$
  - 2)  $\frac{\mu FR}{3}$
  - 3)  $\frac{\mu FR}{6}$
  - 4)  $\frac{2\mu FR}{3}$
12. A block of mass  $m$  is placed on a wedge of mass  $m$ , inclined at an angle  $\theta$ , to the horizontal the coefficients of friction between the block and wedge, and the wedge and ground, are high enough for both the block and the wedge to remain static. What is the magnitude of the friction force of the ground on the wedge?

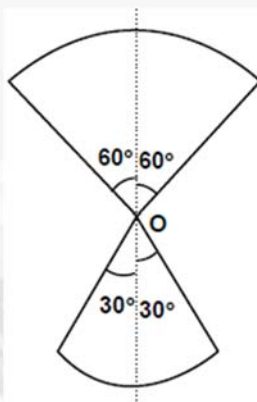






- 1)  $mg \sin \theta$       2)  $mg \cos \theta$       3)  $mg \tan \theta$       4) Zero

13. Two sectors made of same material and same radius R but angle  $120^\circ$  and  $60^\circ$  are arranged as shown with center as origin. Location of center of mass from O is



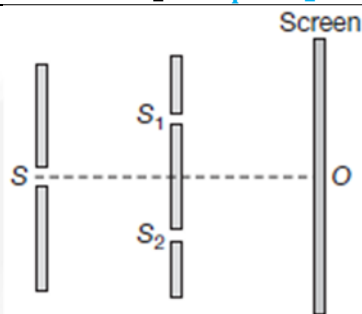
- 1)  $\frac{2R(\sqrt{3}-1)}{3\pi}$       2)  $\frac{R(\sqrt{3}-1)}{3}$       3)  $\frac{R(\sqrt{3}-1)}{\pi}$       4)  $R(\sqrt{3}-1)$

14. A thin convex lens forms real image of an object on a screen. If you add another thin lens, in contact with the convex lens, it is now observed that a real image is formed at a longer distance. Which of the following statements is correct?

- 1) The new lens added is a convex lens with a shorter focal length than the first lens.  
 2) The new lens added is a convex lens with a longer focal length than the first lens.  
 3) The new lens added is a concave lens with a shorter focal length than the first lens.  
 4) The new lens added is a concave lens with a longer focal length than the first lens.

15. Figure shows a set-up perform Young's double slit experiment. A monochromatic source of light is placed at S.  $S_1$  and  $S_2$  act as coherent sources and interference pattern is obtained on the screen. Match **Column-I** with **Column-II** keeping in mind the young's double slit experiment.



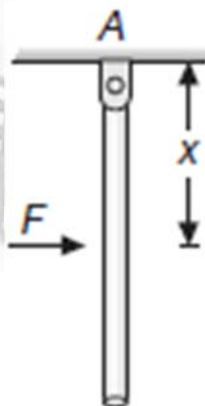


	Column-I		Column-II
A)	S is removed and two real sources of different wavelengths are placed at $S_1$ and $S_2$ .	p)	Interference fringes disappear.
B)	Width of $S_1$ is two times the width of $S_2$ .	q)	There is uniform illumination on a large part of the screen.
C)	$S_1$ is closed.	r)	The zero order fringe will not form at O
D)	A thin transparent plate is placed in front of $S_1$ . Assuming negligible absorption by the plate.	s)	Intensity of a dark fringe will be non-zero, but less than the intensity of bright fringe.

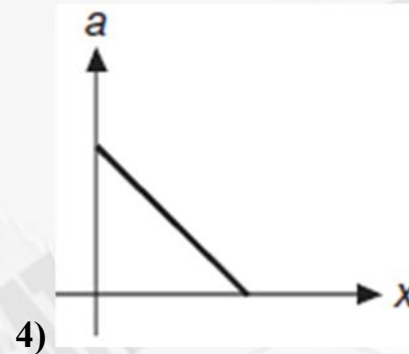
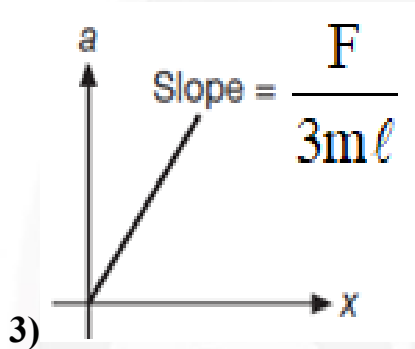
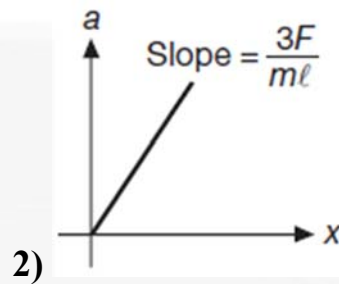
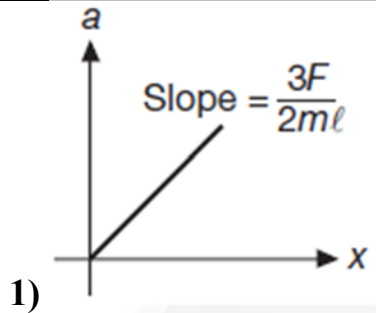
1) A – (p) B – (r,s) C – (p) D – (q,r) 2) A – (p,q) B – (s) C – (p,q) D – (r)

3) A – (p,q) B – (r,s) C – (p) D – (q) 4) A – (q,r) B – (s) C – (p) D – (p,q)

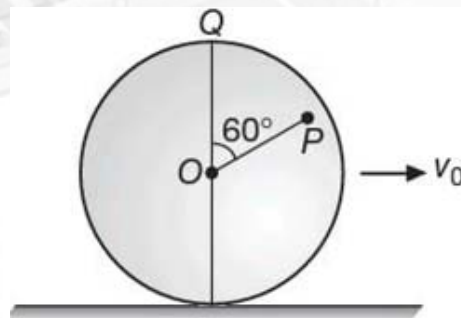
16. A rod of mass  $m$  and length  $\ell$  is hinged at one end A as shown. A force  $F$  is applied at a distance  $x$  from A. The acceleration of center of mass ( $a$ ) varies with  $x$  as :







17. A disc of radius  $r$  rolls without slipping on a rough horizontal floor. If velocity of its centre of mass is  $v_0$ , then velocity of point P at distance  $\frac{r}{2}$  such that  $\angle POQ = 60^\circ$  as shown in the figure is



- 1)  $v_0$       2)  $\frac{v_0}{2}$       3)  $\frac{v_0\sqrt{7}}{2}$       4)  $\frac{v_0\sqrt{3}}{2}$
18. A spherical body of radius  $R$  is allowed to roll without slipping down an incline to reach the bottom with a speed  $v_0$ . The incline is then made smooth by waxing and the body is allowed to slide without rolling to reach the bottom with a speed of  $\frac{5v_0}{4}$ . The radius of gyration of the body about an axis passing through its center is
- 1)  $\frac{2}{5}R$       2)  $\frac{3}{4}R$       3)  $\frac{4}{3}R$       4)  $\frac{5}{2}R$





19. Assertion (A): Lighter and heavier bodies moving with same momenta and experiencing same retarding force have equal stopping times.  
Reason (R): For a given force and momentum, stopping time is independent of mass
- 1) Both assertion and reason are true and reason is correct explanation of assertion.
  - 2) Both assertion and reason are true but reason is not the correct explanation of assertion.
  - 3) Assertion is true but reason is false
  - 4) Both assertion and reason are false
20. Assertion (A): Light from an object falls on a concave mirror forming a real image of the object. If both the object and mirror are immersed in water, there is no change in position of the image  
Reason (R): The formation of image by reflection does not depend on surrounding medium, so there is no change in position of image.
- 1) If both A and R are true and R is the correct explanation of A.
  - 2) If both A and R are true but R is not the correct explanation of A
  - 3) If A is true but R is false.
  - 4) If A is false but R is true

**(NUMERICAL VALUE TYPE)**

Section-II contains 10 **Numerical Value Type** questions. Attempt any 5 questions only. First 5 attempted questions will be considered if more than 5 questions attempted. The Answer should be within **0 to 9999**. If the Answer is in **Decimal** then round off to the **nearest Integer** value (Example i.e. If answer is above **10** and less than **10.5** round off is **10** and If answer is from **10.5** and less than **11** round off is **11**).

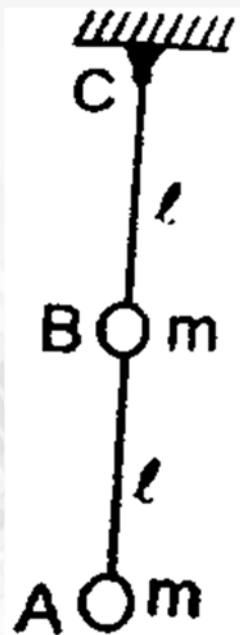
**Marking scheme:** +4 for correct answer, 0 if **not attempt** and -1 in all other cases.

21. A pulley of radius 1.5m is rotated about its axis by a force  $F = (12t - 3t^2) N$  applied tangentially (while  $t$  is measured in seconds). If moment of inertia of the pulley about its axis of rotation is  $4.5 \text{ kg m}^2$ , the number of rotations made by the pulley before its direction of motion is reversed, will be  $\frac{K}{\pi}$ . The value of  $K$  is \_\_\_\_.

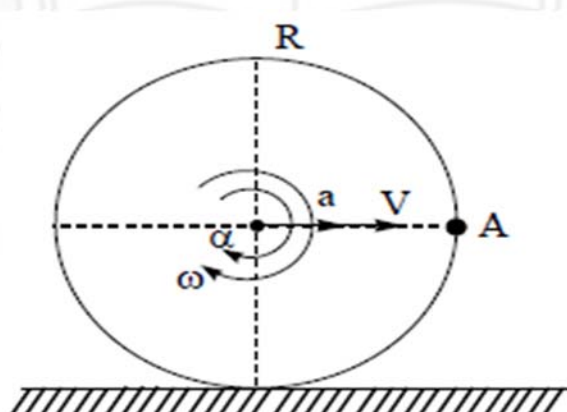




22. A weightless rod of length  $2l$  carries two equal masses 'm', one secured at lower end A and the other at the middle of the rod at B. The rod can rotate in vertical plane about a fixed horizontal axis passing through C. The horizontal velocity that must be imparted to the mass at A so that it just completes the vertical circle is  $\sqrt{\frac{P}{5}} gl$ . Then the value of P is \_\_\_\_\_?



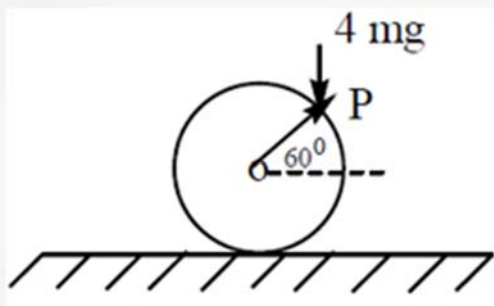
23. A uniform circular disc of radius 'R' is rolling without slipping on a rough horizontal surface with a constant acceleration 'a'. Then the radius of curvature of trajectory of point 'A' of the disc relative to the ground at the given instant as shown in the figure is found to be  $a\sqrt{b} R$ . Then  $a + b =$



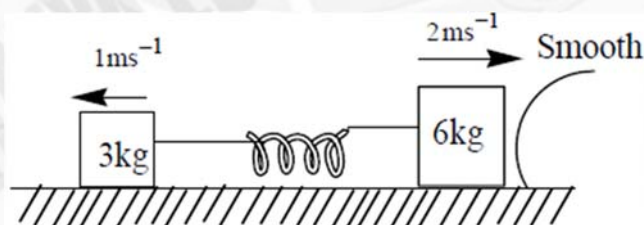




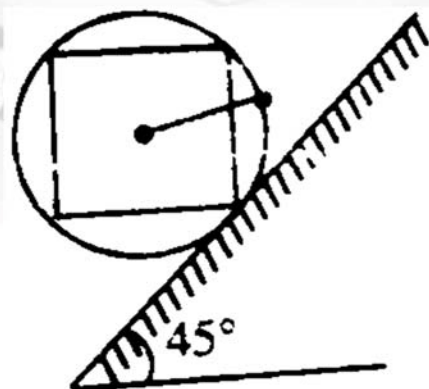
24. A solid sphere of mass  $m$  and radius  $R$  is lying on a rough horizontal plane. A constant force  $4mg$  acts vertically at point  $P$  such that  $OP$  makes an angle  $60^\circ$  with horizontal. Minimum coefficient of friction is  $n \times 10^{-2}$  so that sphere starts pure rolling. Then the value of  $n$  is \_\_\_\_\_



25. Two blocks of masses  $3\text{kg}$  and  $6\text{kg}$  are placed on a smooth horizontal surface. They are connected by a light spring of force constant  $k = 200\text{Nm}^{-1}$ . Initially the spring is unstretched. The indicated velocities are imparted to the blocks. The maximum extension (in cm) of the spring is:



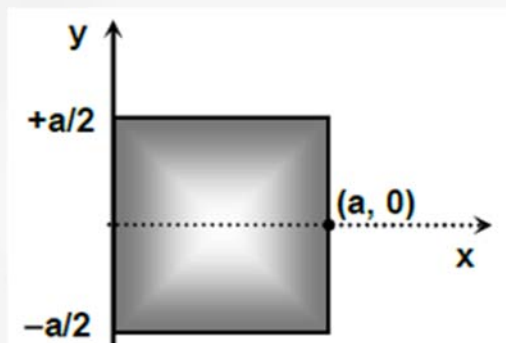
26. Four identical rods, each of mass  $m$  are welded at their ends to form a square and the corners are then welded to a light metal hoop of radius  $r$ . If the rigid assembly of rods and hoop is allowed to roll down the inclined rough surface and the minimum value of the coefficient of static friction which will prevent slipping is  $-\frac{k}{10}$ . Find the value of  $k$ .



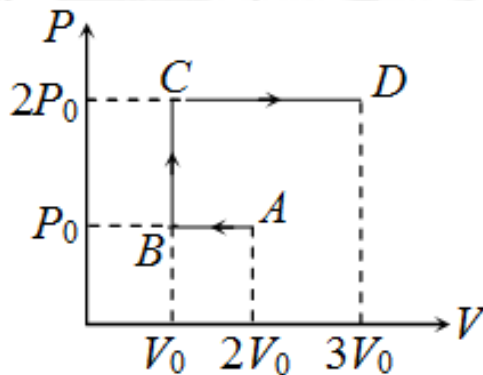


27. A square laminar sheet with side  $a$  and mass  $M$ , has mass per unit area given by

$$\sigma(x) = \sigma_0 \left[ 1 - \frac{x}{a} \right]. \text{ Moment of inertia of the Sheet about Y-axis is } \frac{Ma^2}{n} \text{ where } n \text{ is}$$



28. A ball is moving with velocity of  $2\text{m/s}$  towards a heavy wall moving towards the ball with a velocity of  $1\text{m/s}$ . Assuming the collision to be elastic, magnitude of velocity of the ball immediately after the collision in  $\text{m/s}$  is :
29. A body of mass  $m = 4\text{ kg}$  starts moving with velocity  $v_0$  in a straight line in such a way that work is being done on it at the rate which is proportional to the square of velocity as given by  $P = \beta v^2$  where  $\beta = \frac{0.693}{2}$ . The time (in seconds) elapsed before which velocity of body is doubled is
30. P-V diagram of an ideal gas is as shown. Work done by the gas in the process ABCD is found to be  $xP_0V_0$ . Then  $x =$

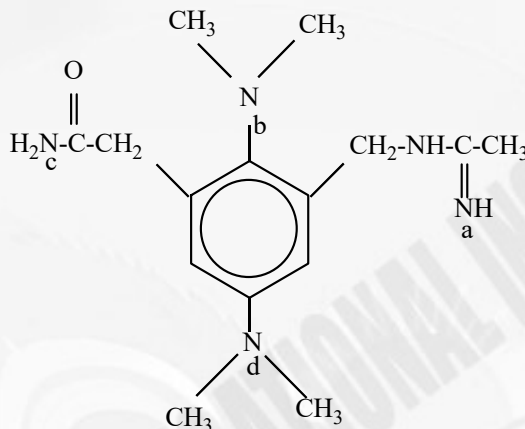


**CHEMISTRY****Max Marks: 100****(SINGLE CORRECT ANSWER TYPE)**

This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which ONLY ONE option can be correct.

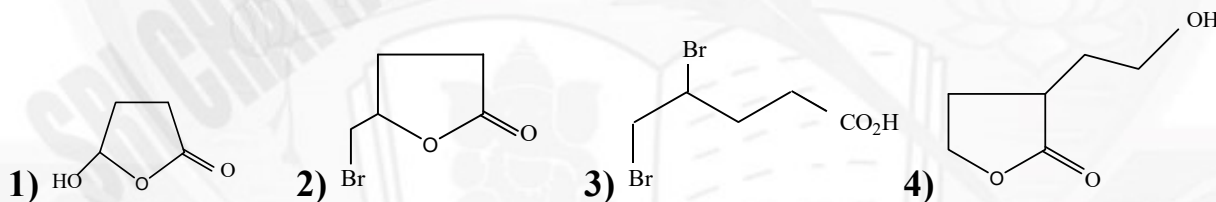
Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.

31. Basicity order of N in following compound is:

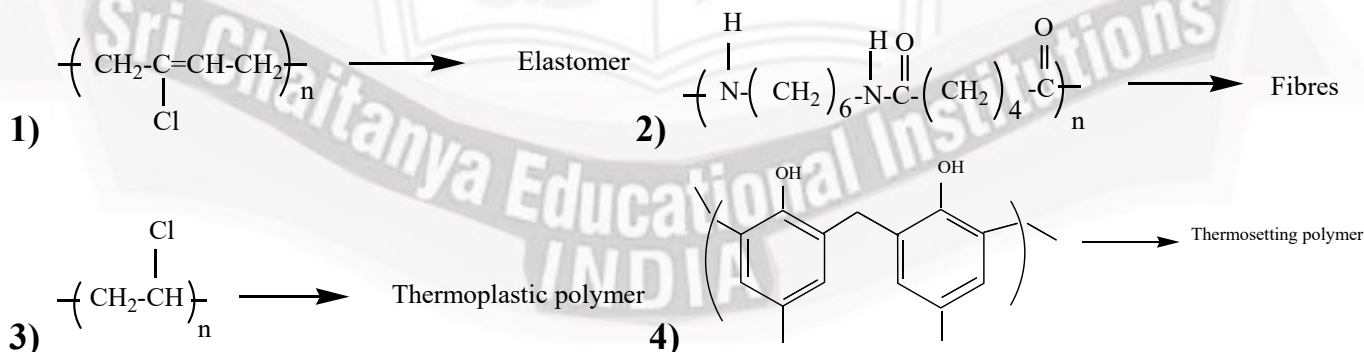


- 1)  $b > d > a > c$     2)  $a > b > d > c$     3)  $a > b > c > d$     4)  $a > c > b > d$

32.



33. How many of the following is (are) correct



1) 1

2) 2

3) 3

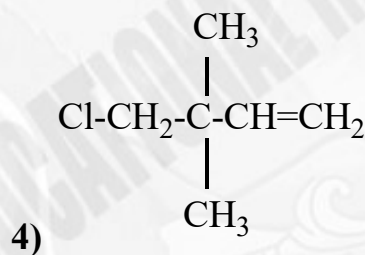
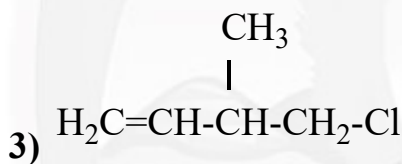
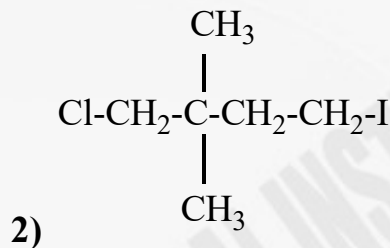
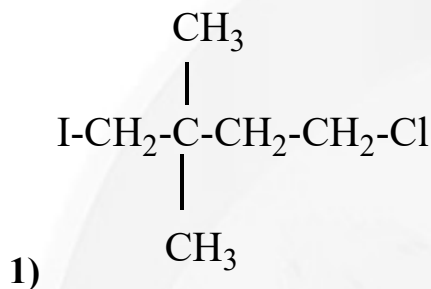
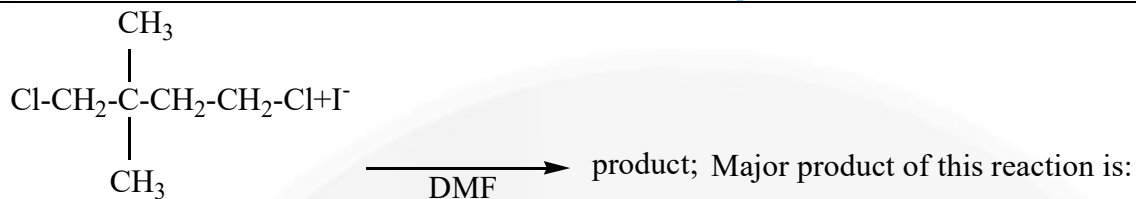
4) 4



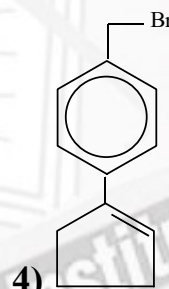
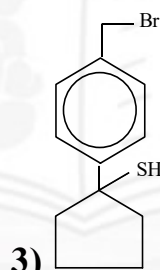
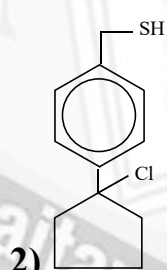
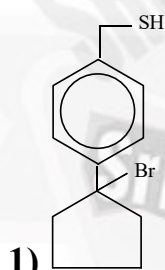
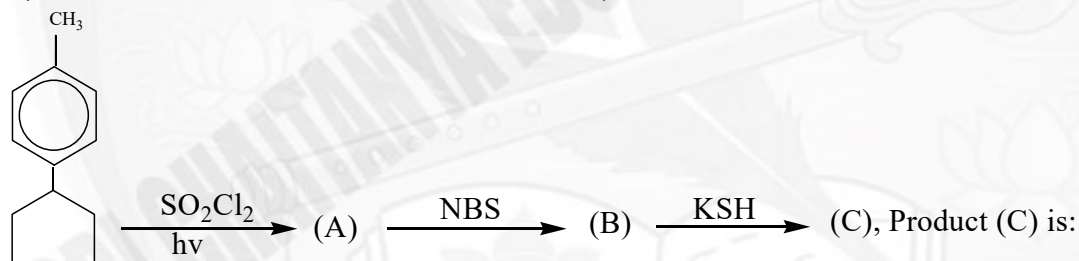




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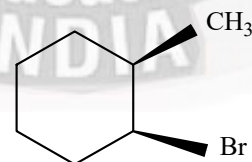
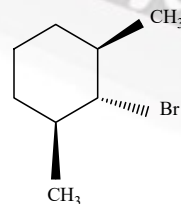
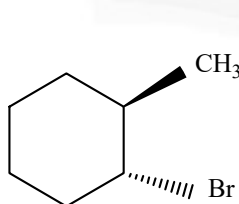


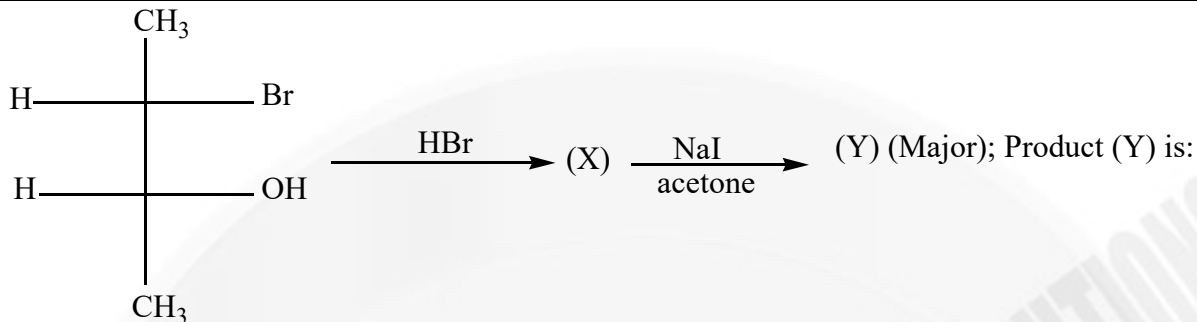
35.



36.

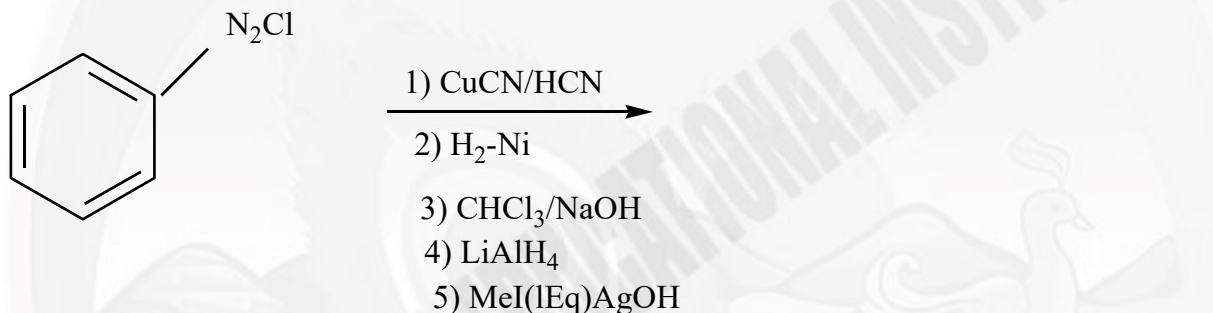
Rank the following in order of decreasing rate in an E2 reaction:

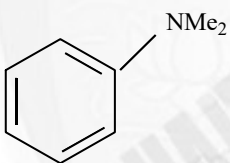
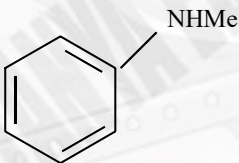
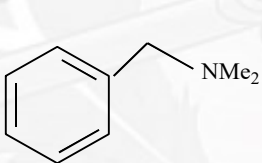
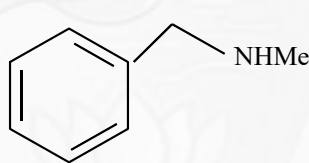
1)  $a > b > c$ 2)  $c > a > b$ 3)  $a > c > b$ 4)  $b > a > c$ 



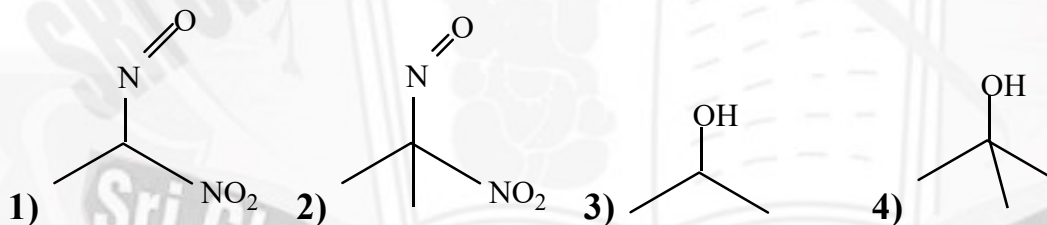
37. 1) cis-2-butene    2) trans-2-butene    3) 1-butene    4) Iso-butene

38. Product of following reaction is



- 1)     2)     3)     4) 

39. Which of the following compound gives red colouration with NaOH solution



40. An ester A ( $\text{C}_4\text{H}_8\text{O}_2$ ) on treatment with excess  $\text{CH}_3\text{MgBr}$  followed by treatment with  $\text{H}^+$  gives an alcohol B as the only product. How many of the following Statement is/are true?  
 Statement 1. A on basic hydrolysis gives formate ion as one of the products

Statement 2. Alcohol B does not give positive iodoform test

Statement 3. A on acidic hydrolysis gives acetic acid as one of the product

Statement 4. Alcohol B gives precipitate with Luca's reagent immediately

- 1) 1    2) 2    3) 3    4) 4



41. Antibiotics are now defined as:
- 1) Chemical substances not produced by microorganisms (bacteria, fungi and molds) that inhibit the growth or even destroy microorganisms.
  - 2) Purely synthetic compounds that inhibit the growth of microorganisms.
  - 3) Substances produced wholly or partly by chemical synthesis, which in low concentrations inhibits the growth or destroys microorganisms by intervening in their metabolic processes.
  - 4) Substance produced to kill bacteria.
42. 29.5 mg of an organic compound containing nitrogen was digested according to kjeldahl's method and the evolved ammonia was absorbed in 20ml of 0.1M HCl solution. The excess of the acid required 15ml of 0.1M NaOH solution for complete neutralization. What will be the percentage of nitrogen in the compound?
- 1) 19.7
  - 2) 23.7
  - 3) 27.7
  - 4) 29.7
43. Match List I with List II

**List I****(Monomers Unit)**

- (a) Caprolactum
- (b) 2Chloro-1,3-butadiene
- (c) Isoprene
- (d) Acrylonitrile

**List II****(Polymer)**

- (i) Natural rubber
- (ii) Buna-N
- (iii) Nylon 6
- (iv) Neoprene

Choose the correct answer from the options given below

- 1) (a)  $\rightarrow$  (iv), (b)  $\rightarrow$  (iii), (c)  $\rightarrow$  (ii), (d)  $\rightarrow$  (i)
- 2) (a)  $\rightarrow$  (iii), (b)  $\rightarrow$  (iv), (c)  $\rightarrow$  (i), (d)  $\rightarrow$  (ii)
- 3) (a)  $\rightarrow$  (i), (b)  $\rightarrow$  (ii), (c)  $\rightarrow$  (iii), (d)  $\rightarrow$  (iv)
- 4) (a)  $\rightarrow$  (ii), (b)  $\rightarrow$  (i), (c)  $\rightarrow$  (iv), (d)  $\rightarrow$  (iii)







44. How many statement (s) is/are correct?

Statement 1: All proteins are polyamides formed by joining amino acids together.

Statement 2: All L-amino acids except cysteine have the S-configuration.

Statement 3:  $Br_2 / H_2O$  can be used to differentiate between aldose & ketose.

Statement 4: Monosaccharides doesn't undergoes mutarotation.

- 1) 1                      2) 2                      3) 3                      4) 4

45. Select the incorrect statement.

1) Elastomers have the weakest intermolecular forces.

2) Buna-N is an elastomer with crosslinks.

3) Some fibres have crystalline nature.

4) Thermoplastic polymers have stronger intermolecular forces than fibers.

46. **Statement 1** : Amylose chain adopts a helical arrangement.

**Statement 2** : Presence of  $\alpha - (1 \rightarrow 4')$  – glycosidic bonds force to adopt a helical shape.

1) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.

2) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.

3) Statement-1 is true, statement-2 is false.

4) Statement-1 is false, statement-2 is true.

47. **Statement 1** : Proline is optical inactive.

**Statement 2** : Proline is imino acid.

1) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.

2) Statement-1 is true, statement-2 is true: and statement-2 is NOT the correct explanation for statement-1.

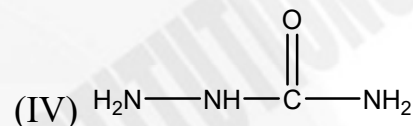
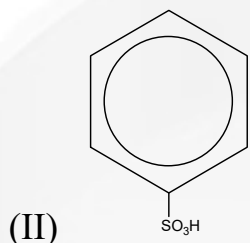
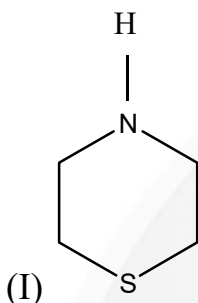
3) Statement-1 is true, statement-2 is false.

4) Statement-1 is false, statement-2 is true.





48. Which of the following compounds(s) will give blue colour when it is converted into Lassaigne's extract and  $FeSO_4$  is added followed by  $FeCl_3$ .



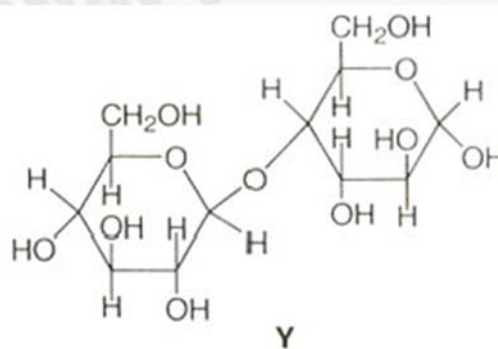
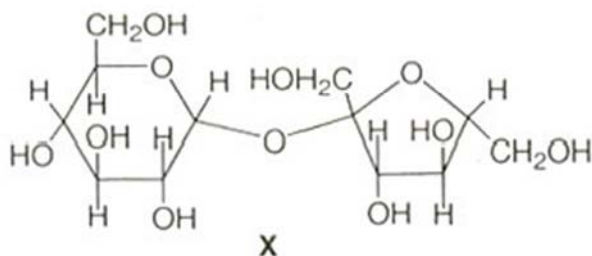
1) I and IV

2) IV Only

3) I,II&IV

4) I,II,III&IV

49. The correct statement(s) about the following sugars X and Y is/are



- 1) X is a reducing sugar and Y is a non-reducing sugar
  - 2) X is a non-reducing sugar and Y is a reducing sugar
  - 3) The glucosidic linkages in X and Y are  $\alpha$  and  $\alpha$ , respectively
  - 4) The glucosidic linkages in X and Y are  $\beta$  and  $\alpha$ , respectively
50. STATEMENT 1 : Maltose is a reducing sugar which gives two moles of D-glucose on hydrolysis  
STATEMENT 2 : Maltose has a 1,4-  $\beta$ -glycosidic linkage.
- 1) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1
  - 2) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1
  - 3) Statement-1 is true, statement-2 is false.
  - 4) Statement-1 is false, statement-2 is true





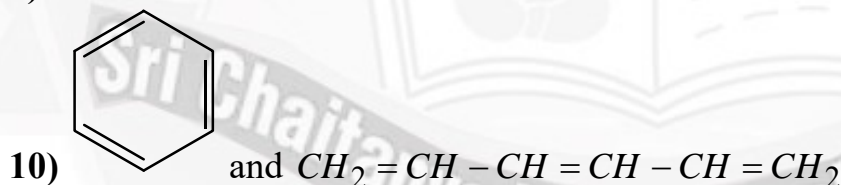
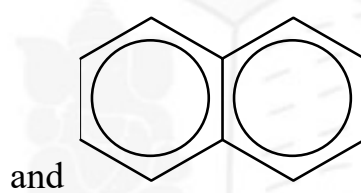
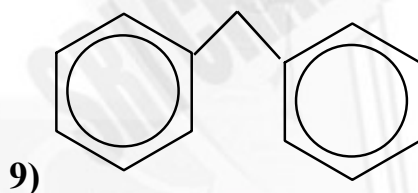
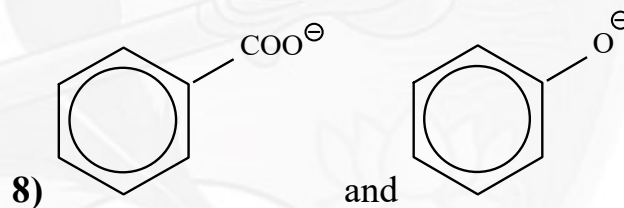
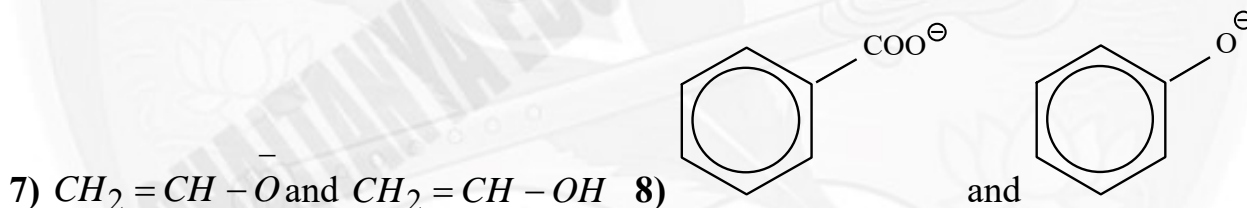
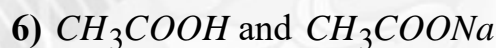
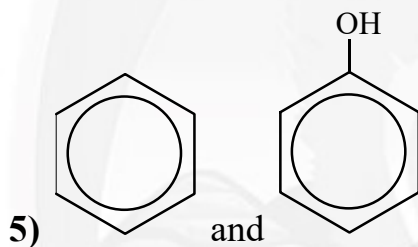
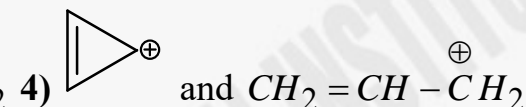
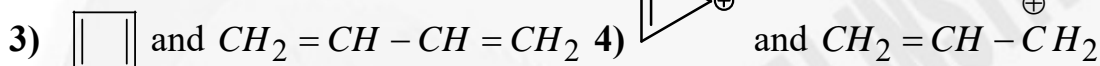
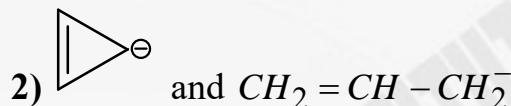
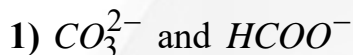
## (NUMERICAL VALUE TYPE)

Section-II contains 10 Numerical Value Type questions. Attempt any 5 questions only. First 5 attempted questions will be considered if more than 5 questions attempted. The Answer should be within 0 to 9999. If the Answer is in Decimal then round off to the nearest Integer value (Example i.e. If answer is above 10 and less than 10.5 round off is 10 and If answer is from 10.5 and less than 11 round off is 11).

Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases.

51. The number of chiral carbons in chloramphenicol is/are

52. In how many of the following pairs first one has higher resonance energy?



53. Calculate the total number of cyclic isomeric carbonyl compounds of molecular formula  $\text{C}_5\text{H}_8\text{O}$  which can't show geometrical isomerism. (Excluding stereo).

54. How many is/are incorrect?

1) Isoelectric point is the pH at which an amino acid exists primarily in its neutral form.

2) Isoelectric point is the average of  $pK_a$ , values of  $\alpha$  -COOH and amino  $\alpha$  - $\text{NH}_3^+$  groups [valid only for neutral amino acid]







3) Glycine is characterized by two  $pK_a$ , values.

4) For neutral amino acid the concentration of zwitter ion is maximum at its isoelectric point.

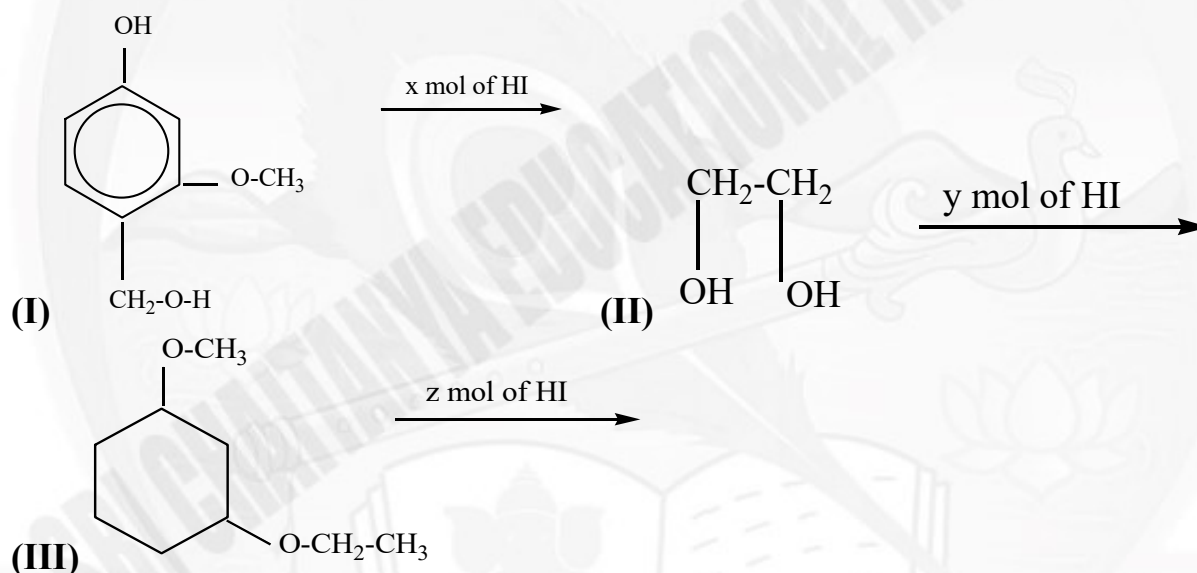
5) High density polythene is a linear polymer

6) Low density polythene is a branched chain polymer

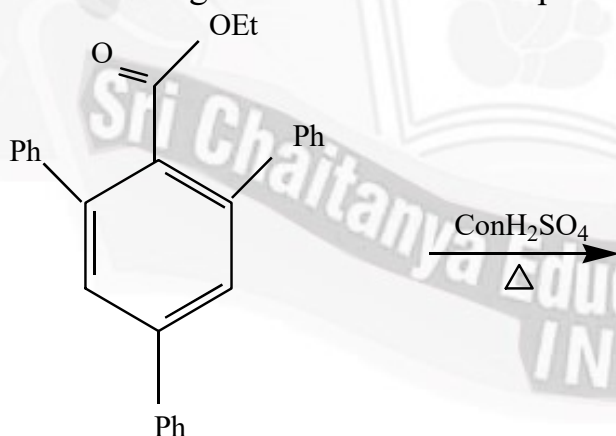
7) Chain growth polymers are also known as addition polymer.

8) Step growth polymer is also known condensation polymer.

55. What is the sum of x, y and z in the following when each mole of the following reactant reacts with excess of HI?

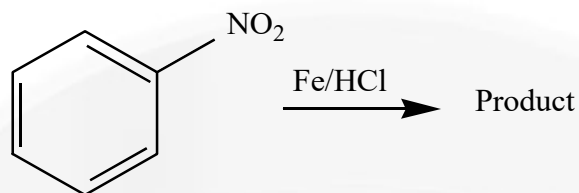


56. 'X' is the degree of unsaturation of product of the following reaction. Then value of X is

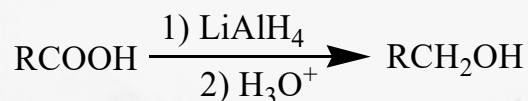




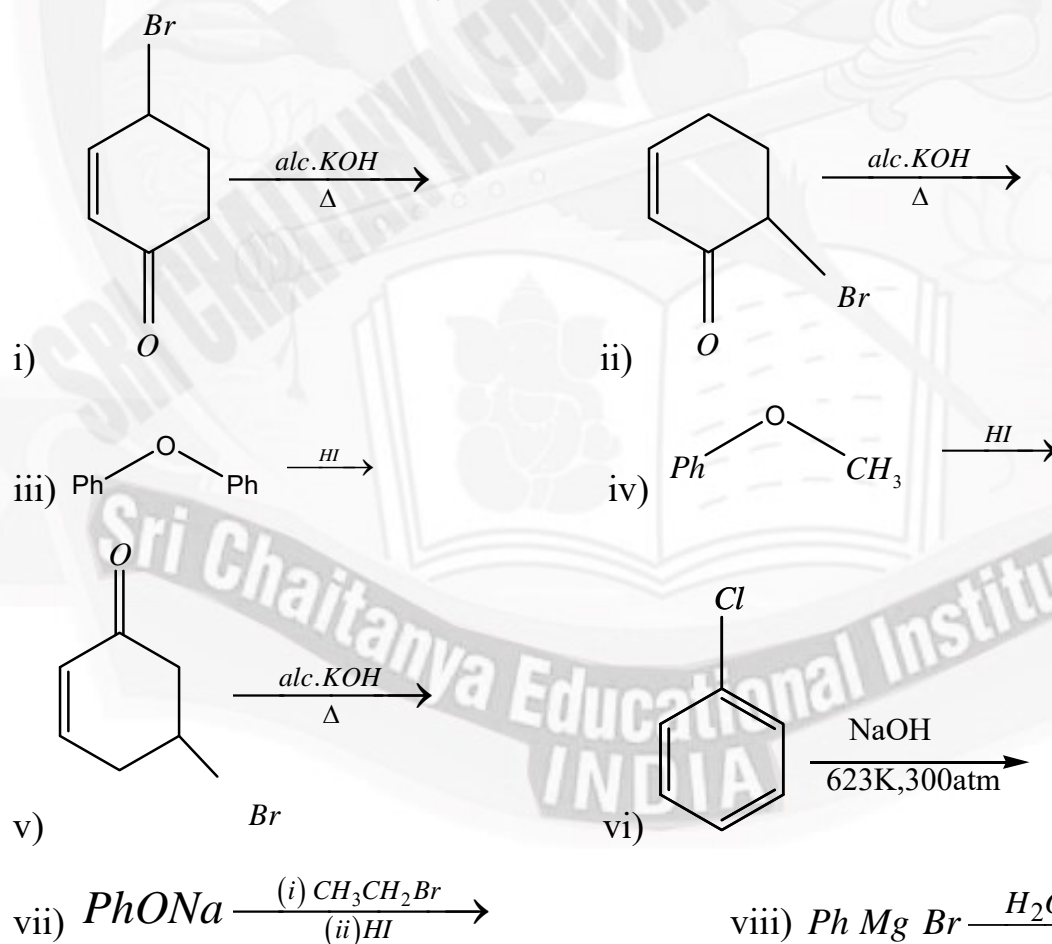
57. Equivalent weight of the nitro benzene in the following reaction is 'X'. X is



58. The number of moles of  $LiAlH_4$  required theoretically to reduce eight moles of carboxylic acid to primary alcohol



59. How many stereo isomers will be formed when  $(\pm) CH_3COCH(OH)CH_3$  reacts with  $H_2 / Ni$
60. In how many of the reaction (S). phenol is formed as product?  
(Do acidification if necessary)



**MATHEMATICS****Max Marks: 100****(SINGLE CORRECT ANSWER TYPE)**

This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which ONLY ONE option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 in all other cases.

61. The solution of  $\frac{dy}{dx} = 1 - x(y-x) - x^3(y-x)^3$  is \_\_\_\_\_
- 1)  $(y-x)^2 = ce^{x^2} - (1+x^2)$       2)  $(y-x)^{-2} = ce^{x^2} - (1+x^2)$   
 3)  $(y-x)^2 = ce^{x^2} - (1-x^2)$       4)  $(y-x)^{-2} = ce^{x^2} - (1-x^2)$
62. The solution of  $\left(1 + 2e^{\frac{x}{y}}\right)dx + 2e^{\frac{x}{y}}\left(1 - \frac{x}{y}\right)dy = 0$  is \_\_\_\_\_
- 1)  $x + 2ye^{\frac{x}{y}} = c$       2)  $x + 2ye^{\frac{y}{x}} = c$       3)  $x - 2ye^{\frac{x}{y}} = c$       4)  $y + 2ye^{\frac{y}{x}} = c$
63. Let be  $f: \left[\frac{\pi}{4}, \frac{3\pi}{4}\right] \rightarrow \mathbb{R}, f(x) = \frac{\cot^2 x - 2 \cot x + n - 1}{\cot^2 x + 2 \cot x + n + 1}$  for every natural number  $n \geq 3$ .  
 Then the number of integers in the range of  $f$  is.
- 1) 1      2) 2      3) 0      4) Infinite
64. Let  $y(x)$  be the solution of differential equation  $y - \cos x \cdot \frac{dy}{dx} = y^2(1 - \sin x) \cos x$  &  $y(0) = 1$   
 then  
 Statement-I: Integrating factor is  $\sec x \tan x$   
 Statement-II:  $y\left(\frac{\pi}{3}\right) = 2$
- 1) S-I false, S-II is True      2) S-I True, S-II True  
 3) S-I True, S-II is false      4) S-I false, S-II is false
65. **Statement -1 :** The area enclosed between the parabolas  $y^2 - 2y + 4x + 5 = 0$  and  $x^2 + 2x - y + 2 = 0$  is same as that of bounded by curves  $y^2 = -4x$  and  $x^2 = y$ .  
**Statement - 2:** Shifting of origin to point  $(h, k)$  does not change the bounded area.







- 1) If both the statements are TRUE and Statement-2 is the correct explanation of Statement-1.
- 2) If both the statements are TRUE and Statement-2 is NOT the correct explanation of Statement-1.
- 3) If Statement-1 is TRUE and Statement-2 is FALSE
- 4) If Statement-1 is FALSE and Statement-2 is TRUE

66. Statement-I:  $\int_0^1 \left( \log_e (1 + \sqrt{\sin x}) \right)^2 dx < \frac{1}{2}$

Statement-II:  $\int_1^{\sqrt{3}} \sin^{-1} \left( \frac{2x}{1+x^2} \right) \left( \tan^{-1} x \right)^2 dx < \frac{\pi^3}{27} (\sqrt{3} - 1)$

- 1) Statement-I false, Statement-II is true
- 2) Statement-I True, Statement-II true
- 3) Statement-I True, Statement-II is false
- 4) Statement-I false, Statement-II is false

67.  $\int \frac{\sin 2x + 2 \tan x}{\cos^6 x + 6 \cos^2 x + 4} dx = \frac{1}{\alpha} \ln \left| \beta + \frac{\gamma}{\cos^4 x} + \frac{\delta}{\cos^6 x} \right| + c$ , then match the below

	Column-I		Column-II
a.	$\alpha$	p.	1
b.	$\beta$	q.	12
c.	$\gamma$	r.	4
d.	$\delta$	s.	6

- 1) (a, p), (b, q), (c, s), (d, r)
- 2) (a, p), (b, q), (c, r), (d, s)
- 3) (a, q), (b, p), (c, s), (d, r)
- 4) (a, q), (b, p), (c, r), (d, s)

68.  $\int \frac{dx}{x\sqrt{x^2 + 2x - 1}} =$

- 1)  $\cos^{-1} \left( \frac{1-x}{x\sqrt{2}} \right) + c$
- 2)  $\sin^{-1} \left( \frac{1-x}{\sqrt{2x}} \right) + c$
- 3)  $\cos^{-1} \left( \frac{1+x}{\sqrt{2x}} \right) + c$
- 4)  $\sin^{-1} \left( \frac{1-x}{\sqrt{2x}} \right) + c$





69. Let  $I_n = \int_0^{\frac{\pi}{2}} x(\sin x)^n dx, n \in N$  then find the value of  $\left( \frac{256I_{16} - 1}{I_{14}} \right)$
- 1) 230                      2) 224                      3) 250                      4) 240
70. A solution curve of the differential equation  $(x^2 + xy + 4x + 2y + 4) \frac{dy}{dx} - y^2 = 0, x > 0$ , passes through the point  $(1, 3)$ . Then the solution of the curve is
- 1) Intersects  $y = x + 2$  exactly at three points  
 2) Intersects  $y = x + 2$  exactly at two points  
 3) Intersects  $y = (x + 2)^2$   
 4) Does not intersect  $y = (x + 3)^2$
71. Let  $f$  is a differentiable function such that  $f(x) = 2(1 + x^2) \left( 1 + \int_0^x \frac{f(t)}{1+t^2} dt \right)$  then  $f(2) = \underline{\hspace{2cm}}$
- 1)  $e^4$                       2)  $10e$                       3)  $10e^4$                       4)  $\frac{10}{e^4}$
72. Suppose  $A(\alpha)$  denotes the area of the region bounded by  $x = 0, x = 2, y^2 = 4x$  and  $y = |\alpha x - 1| + |\alpha x - 2| + \alpha x$  then the value of  $A(1) + \frac{8\sqrt{2}}{3}$  is
- 1) 5                      2) 2                      3) 4                      4) 8
73. The general solution of the differential equation of  $\left( \frac{1}{x} - \frac{y^2}{(x-y)^2} \right) dx + \left( \frac{x^2}{(x-y)^2} - \frac{1}{y} \right) dy = 0$  is
- 1)  $\ln \left| \frac{x}{y} \right| + \frac{xy}{x-y} = C$                       2)  $\ln |xy| + \frac{xy}{x-y} = C$   
 3)  $\frac{xy}{x-y} = Ce^{\frac{x}{y}}$                       4)  $\frac{xy}{x-y} = Ce^{xy}$





74.  $S_1 : f(x) = \sin x + x$

$S_2 : g(x) = x^2 - x + 1$

1) Both  $S_1$  &  $S_2$  are false2) both  $S_1$  &  $S_2$  are true3)  $S_1$  is true,  $S_2$  is false4)  $S_1$  is false,  $S_2$  is true

$$75. \quad f(x) = \begin{cases} \sin\left(\frac{a-x}{2}\right) \tan\left[\frac{\pi x}{2a}\right] & \text{for } x > a \\ \frac{\cos\left(\frac{\pi x}{2a}\right)}{a-x} & \text{for } x < a \\ 1 & \text{for } x = a \end{cases}$$

Where  $[x]$  is the greatest integer function of  $x$  and  $a > 0$  then which of the following is true?

1)  $f(a^-) < 0$

2)  $\lim_{x \rightarrow a} f(x)$  is exist

3)  $f$  is right continues only

4)  $f(a^+) < 0$

76. Let a function  $f : (0, \infty) \rightarrow [0, \infty)$  be defined by  $f(x) = \left|1 - \frac{1}{x}\right|$ . Then,  $f$  is

1) Injective only

2) Both injective as well as surjective

3) Not injective but it is surjective

4) Neither injective nor surjective

77. If  $\frac{dy}{dx} + \frac{2^{x-y}(2^y - 1)}{2^x - 1} = 0, x > 0, y > 0, y(1) = 1$  then  $y(2)$  is equal to

1)  $2 + \log_2 3$

2)  $2 + \log_3 2$

3)  $2 - \log_3 2$

4)  $2 - \log_2 3$







78. If  $x \ln x \frac{dy}{dx} + y = 2 \ln x$ ,  $y(e) = 2$ , then  $y(e^2) =$  \_\_\_\_\_

- 1) 1                      2)  $\frac{3}{2}$                       3) 2                      4)  $\frac{5}{2}$

79. Let  $f(x)$  is differentiable on  $(0, \infty)$  such that  $f(1) = 1$  and

$$\lim_{t \rightarrow x} \frac{t^2 f(x) - x^2 f(t)}{t - x} = 1 \text{ then } f(x) \text{ is } \underline{\hspace{2cm}}$$

- 1)  $\frac{1}{3x} + \frac{2}{3}x^2$                       2)  $\frac{-1}{3x} + \frac{4}{3}x^2$                       3)  $\frac{-1}{x} + \frac{2}{x^2}$                       4)  $\frac{1}{x}$

80.  $\int \frac{\ln(e^{x^{x+1}}) + \left(\ln(x^{\sqrt{x}})\right)^2}{1 + (x \ln x)(\ln e^2 x^x)} dx = f(x) + c$  where  $c$  is integral constant and  $f(1) = 0$ , then

$e^{(e^{f(2)} - 1)}$  is equal to

- 1) 2                      2) 4                      3) 0                      4) 8

(NUMERICAL VALUE TYPE)

Section-II contains 10 Numerical Value Type questions. Attempt any 5 questions only. First 5 attempted questions will be considered if more than 5 questions attempted. The Answer should be within 0 to 9999. If the Answer is in Decimal then round off to the nearest Integer value (Example i.e. If answer is above 10 and less than 10.5 round off is 10 and If answer is from 10.5 and less than 11 round off is 11).

Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases.

81. Let  $I_1 = \int_0^1 \frac{e^x}{1+x} dx$ ,  $I_2 = \int_0^1 \frac{x^2 dx}{e^{x^3}(2-x^3)}$  then  $\left[ \frac{I_1}{I_2} \right] = \underline{\hspace{2cm}} [ \cdot ]$  is step function

82. Let  $f(x) = \begin{cases} \int_0^x (4 + |t-2|) dt & \text{for } x > 3 \\ ax^2 + bx & \text{for } x \leq 3 \end{cases}$ . If  $f(x)$  is differentiable at  $x = 3$  then  $\frac{b}{a} - 80$  is

equal to

83. A function  $y = f(x)$  has a second order derivative such that  $f^{(1)}(x) = 6(x-1)$ . If the graph passes through  $(2,1)$  and tangent at that point is  $y = 3x - 5$ , then  $f(3) =$  \_\_\_\_\_





84. Let  $y = p(x)$  be the parabola whose axis is  $y$ -axis and passing through the points  $(-1, 0)$ ,  $(0, 1)$  and  $(1, 0)$ . If the area of the region  $\{(x, y): (x+1)^2 + (y-1)^2 \leq 1, y \leq p(x)\}$  is  $A$ , then  $12(\pi - 4A)$  is equal to \_\_\_\_\_
85. A function ' $f$ ' defined  $\forall x, y \in R$ , such that  $f(1) = 2$ ,  $f(2) = 8$  and  $f(x+y) - Kxy = f(x) + 2y^2$ , ( $K$  is a non zero constant). Then  $f(K)f\left(\frac{1}{K}\right) =$  \_\_\_\_\_
86. Let  $A = \{1, 2, 3, 4\}$ ,  $B = \{a, b, c\}$  then the number of functions from  $A \rightarrow B$  which are not onto are \_\_\_\_\_
87. Let  $f: R \rightarrow R$  be a differentiable function such that its derivative  $f'$  is continuous and  $f(\pi) = -6$ . If  $F: [0, \pi] \rightarrow R$  is defined by  $F(x) = \int_0^x f(t) dt$  and  $\int_0^\pi (f'(x) + F(x)) \cos x dx = 2$ , then the value  $|f(0)|$  is \_\_\_\_\_
88. If  $f\left(\frac{3x-4}{3x+4}\right) = x+2$ ,  $\left(x \neq -\frac{4}{3}\right)$  then  $\int f(x) dx = a \ln|1-x| + bx + c$ , then  $|a+b| =$  \_\_\_\_\_
89. The area enclosed by the parabola  $(y-2)^2 = x-1$ , the tangent at  $(2, 3)$  and the  $X$  axis is \_\_\_\_\_
90. Area enclosed by  $xy^2 = 4(2-x)$  and  $Y$  axis is  $\lambda$  sq. units, then the value of  $5\cos(\lambda) =$  \_\_\_\_\_







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Category Ranks

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RANKS (50%)

BELOW  
**100** »  
All India Open  
Category Ranks

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BELOW  
**1000** »  
All India Open  
Category Ranks

**181**

BELOW  
**100** »  
All India  
Category Ranks  
Count

**89**

BELOW  
**1000** »  
All India  
Category Ranks  
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