
# 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** **Paper -1(Adv-2021-P1-Model)** **Date: 03-09-2023**

**Time: 09.00Am to 12.00Pm** **RPTA-05** **Max. Marks: 180**

03-09-2023_Sr.Super60_NUCLEUS&STERLING_BT_Jee-Adv(2021-P1)_RPTA-05_Syllabus

**PHYSICS** : NLM, Friction, Circular motion, WPE Newton's laws of motion; Inertial and uniformly accelerated frames of reference; Static and dynamic friction; Kinetic and potential energy; Work and power, Uniform circular motion, Conservation of mechanical energy

**CHEMISTRY** : Alcohols, Phenols , Ethers & Amines:

Alcohols : Physical properties; Reactions: esterification, dehydration (formation of alkenes and ethers); Reactions with: sodium, phosphorus halides, $ZnCl_2$/concentrated HCl, thionyl chloride; Conversion of alcohols into aldehydes, ketones and carboxylic acids

Phenols: Physical properties; Preparation, Electrophilic substitution reactions of phenol (halogenation, nitration, sulphonation); Reimer-Tiemann reaction, Kolbe reaction; Esterification; Etherification; Aspirin synthesis; Oxidation and reduction reactions of phenol.

Ethers : Preparation, Properties &Reactions

Amines: Basicity of substituted anilines and aliphatic amines, Preparation from nitro compounds, nitriles and amides; Reactions: Hoffmann bromamide degradation, Gabriel phthalimide synthesis; Reaction with nitrous acid, Azo coupling reaction of diazonium salts of aromatic amines; Sandmeyer and related reactions of diazonium salts; Carbylamine reaction, Hinsberg test, Alkylation and acylation reaction

**MATHEMATICS** : Definite Integration

**Name of the Student:** _____ **H.T. NO:** | | | | | | | |

# JEE-ADVANCE-2021-P1-Model

**Time:3Hr's** **IMPORTANT INSTRUCTIONS** **Max Marks: 180**

## PHYSICS:

| Section | Question Type | +Ve Marks | - Ve Marks | No.of Qs | Total marks |
|---|---|---|---|---|---|
| Sec – I(Q.N : 1 – 4) | Questions with Single Correct Choice | +3 | -1 | 4 | 12 |
| Sec – II(Q.N : 5 – 10) | Paragraph Questions with Numerical Value Answer Type | +2 | 0 | 6 | 12 |
| Sec – III(Q.N : 11 – 16) | Questions with Multiple Correct Choice with partial mark | +4 | -2 | 6 | 24 |
| Sec – IV(Q.N : 17 – 19) | Questions with Non-negative Integer Value Type | +4 | 0 | 3 | 12 |
| **Total** | | | | **19** | **60** |

## CHEMISTRY:

| Section | Question Type | +Ve Marks | - Ve Marks | No.of Qs | Total marks |
|---|---|---|---|---|---|
| Sec – I(Q.N : 20 – 23) | Questions with Single Correct Choice | +3 | -1 | 4 | 12 |
| Sec – II(Q.N : 24 – 29) | Paragraph Questions with Numerical Value Answer Type | +2 | 0 | 6 | 12 |
| Sec – III(Q.N : 30 – 35) | Questions with Multiple Correct Choice with partial mark | +4 | -2 | 6 | 24 |
| Sec – IV(Q.N : 36– 38) | Questions with Non-negative Integer Value Type | +4 | 0 | 3 | 12 |
| **Total** | | | | **19** | **60** |

## MATHEMATICS:

| Section | Question Type | +Ve Marks | - Ve Marks | No.of Qs | Total marks |
|---|---|---|---|---|---|
| Sec – I(Q.N : 39 – 42) | Questions with Single Correct Choice | +3 | -1 | 4 | 12 |
| Sec – II(Q.N : 43 – 48) | Paragraph Questions with Numerical Value Answer Type | +2 | 0 | 6 | 12 |
| Sec – III(Q.N : 49 – 54) | Questions with Multiple Correct Choice with partial mark | +4 | -2 | 6 | 24 |
| Sec – IV(Q.N : 55 – 57) | Questions with Non-negative Integer Value Type | +4 | 0 | 3 | 12 |
| **Total** | | | | **19** | **60** |

**PHYSICS** **Max Marks: 60**

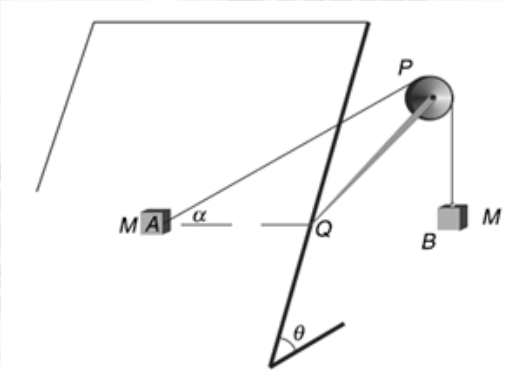
## SECTION – I
## (SINGLE CORRECT ANSWER TYPE)

This section contains 4 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which ONLY ONE option can be correct.

**Marking scheme: +3 for correct answer, 0 if not attempted and –1 in all other cases. Section 1 (Max Marks: 12)**

- Section 1 contains Four questions
- Each Question has Four Options and Only One of these four will be the correct answer.
- For each question, choose the option corresponding to the correct answer
- The Marking scheme to evaluate Answer to each question will be :
- Full Marks: **+3** (If the answer is correct)
- Zero Marks: **0** (If the question is unanswered)
- Negative Marks: -1 (In all other cases)

**1.** Block *A* of mass *M* is placed on an inclined plane, connected to a string, passing over a pulley as shown in the fig. The other end of the string also carries a block *B* of mass *M*. The system is held in the position shown such that triangle *APQ* lies in a vertical plane with horizontal line *AQ* in the plane of the inclined surface.

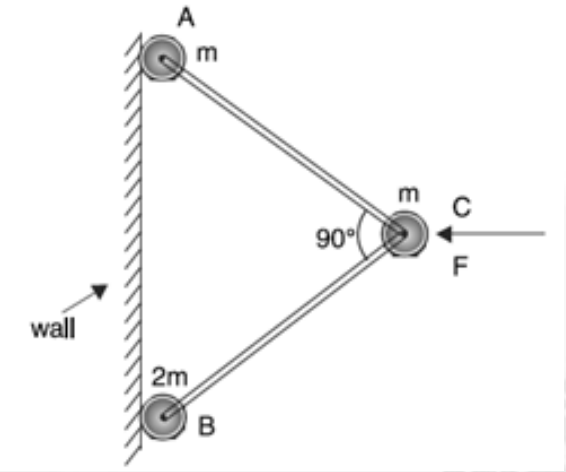



Find the minimum coefficient of friction between the inclined surface and block A such that the system remains at rest after it is released. Take $\theta = \alpha = 45^o$

**A)** $\frac{\sqrt{3+2\sqrt{2}}}{\sqrt{2}-1}$ **B)** $\frac{\sqrt{3-2\sqrt{2}}}{\sqrt{2}+1}$ **C)** $\frac{\sqrt{5-2\sqrt{2}}}{\sqrt{2}-1}$ **D)** $\frac{\sqrt{5-2\sqrt{2}}}{\sqrt{2}+1}$

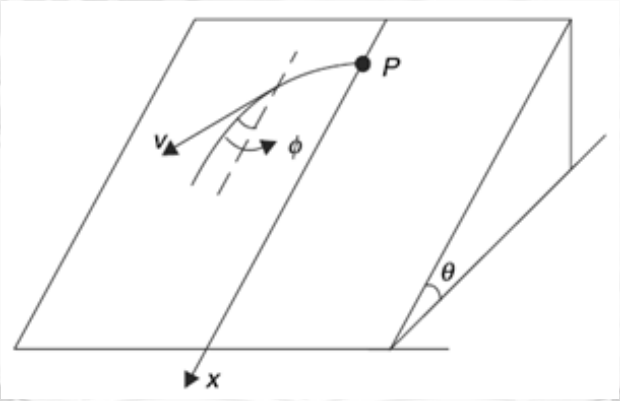
**2.** Three small discs are connected with two identical massless rods as shown in fig. the rods are pinned to the discs such that angle between them can change freely. The system is placed on a smooth horizontal surface with discs A and B touching a smooth wall and the angle *ACB* being $90^o$. A force F is applied to the disc C in a direction perpendicular to the wall. Find acceleration of disc B immediately after the force starts to act. Masses of discs are $m_A = m; m_B = 2m; m_C = m$

[Wall is perpendicular to the plane of the fig.]



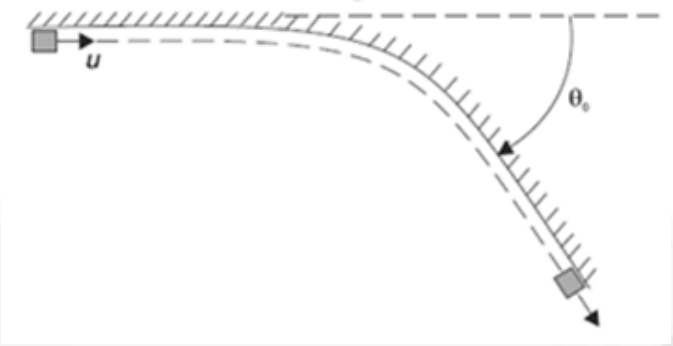

**A)** $\frac{F}{m}$ **B)** $\frac{F}{3m}$ **C)** $\frac{F}{5m}$ **D)** $\frac{F}{7m}$

**3.** A small disc P is placed on an inclined plane forming an angle $\theta$ with the horizontal and imparted an initial velocity $v_0$. Find how the velocity of disc depends on the angle $\phi$ which its velocity vector makes with x axis (see figure). The coefficient of friction is $\mu = \tan\theta$ and $\phi_{initial} = \frac{\pi}{2}$.




**A)** $\frac{v_0}{1+\cos\phi}$ **B)** $\frac{v_0}{1+\sin\phi}$ **C)** $\frac{2v_0}{1+\sin\phi}$ **D)** $\frac{2v_0}{1+\cos\phi}$

**4.** A small object is sliding on a smooth horizontal floor along a vertical wall. The wall makes a smooth turn by angle $\theta_0$. Coefficient of friction between the wall and the block is $\mu$. Speed of the object before the turn is u. find its speed (v) just after completing the turn. [The turn is smooth and there are no sharp corners]




**A)** $ue^{-\mu\theta_0}$ **B)** $ue^{\frac{-\mu\theta_0}{2}}$ **C)** $ue^{-2\mu\theta_0}$ **D)** $ue^{-\mu(\ln 2)(\theta_0)}$

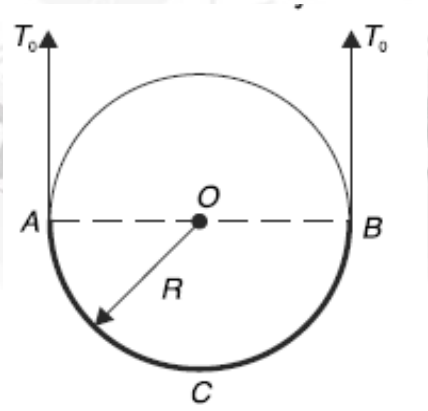
## SECTION 2

- This section contains **THREE (03)** questions stems.
- There are **TWO (02)** questions corresponding to each question stem.
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value corresponding to the answer in the designated place using the mouse and the on-screen virtual numeric keypad.
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated according to the following marking scheme:
- ***Full Marks:* +2** If ONLY the correct numerical value is entered at the designated place;
- **Zero Marks:0** in all other cases

## Question Stem for Question Nos. 5 and 6

**Question Stem**

A smooth cylinder is fixed with its axis horizontal. Radius of the cylinder is R. A uniform rope (ACB) of linear mass density $\lambda$ (kg/m) is exactly of length $\pi R$ and is held in semi-circular shape in vertical plane around the cylinders as shown in the figure. Two massless strings are connected at the ends of the rope and are pulled up vertically with 2 forces $T_0$ each to keep the rope in contact with cylinder. Take $g = 10 m/s^2$



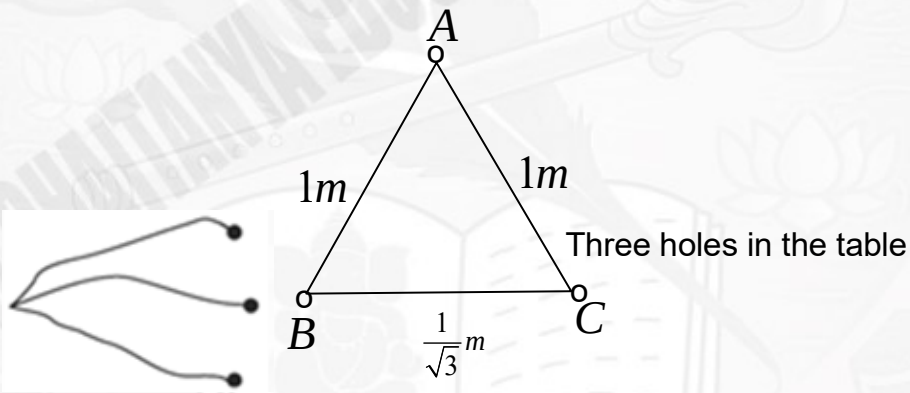
**5.** Find minimum value of $T_0$ so that rope does not lose contact with the cylinder at any point and express it as $k\lambda gR$. What is the value of k?

**6.** If required $T_0$ is applied, then Find Tension in the rope at $30^0$ measured anticlockwise from the location where there is maximum chance of string loosing contact with the cylinder. Express it as $c\lambda gR$. Find c?

## Question Stem for Question Nos. 7 and 8

**Question Stem**

Three identical masses are attached to the ends of light strings, the other ends of which are connected together as shown in the figure. Each of the three strings has a length of 3m. The three masses are dropped through three holes $(A,B,C)$ in a table and the system is allowed to reach equilibrium. Each mass is 3 kg. Take reference for potential energy at table level.




**7.** Locate a point K inside the $\Delta ABC$ such that $AK+BK+CK$ is minimum. If it is expressed as $\frac{1}{2}\left(1+\sqrt{\frac{p}{q}}\right)$. Find $p/q$

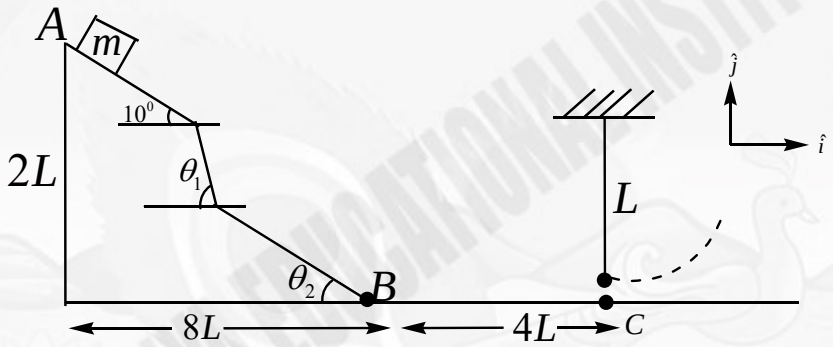
**8.** Calculate minimum potential energy of system under equilibrium conditions. If it is expressed as $-255\left(1-\sqrt{\frac{r}{s}}\right)$. *find* $s/r$

# Question Stem for Question Nos. 9 and 10

## Question Stem

Mass(m) is released from top of fixed inclined plane having coefficient of friction $\mu$ from A to B as shown in figure.. Horizontal surface has coefficient $2\mu$ from B to C. When block reaches C, it entangles in the ideal massless string of length L without loss of any energy and starts circular motion. At a later instant, motion ceases to be circular.

Given $\mu = \frac{1}{64}$. Assume all corners to be gradual enough so that there are no collisions and block remains in contact with the incline surface from A to B. (Diagram not to scale)




**9.** The magnitude of the change in its velocity from C to the position, where the string is horizontal is $(K)\sqrt{gL}$. Find the K?

**10.** When the block leaves the circular path, its velocity vector is $\sqrt{\frac{gL}{8}}\left(-p\hat{i}+q\hat{j}\right)$. Find the $p+q$

## SECTION 3

- This section contains **SIX (06)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme:
- ***Full Marks: +4*** If only (all) the correct option(s) is (are) chosen;
- ***Partial Marks: +3*** If all the four options are correct but **ONLY** three options are chosen,
- ***Partial Marks: +2*** If three or more options are correct but **ONLY** two options are chosen, both of which are correct:
- ***Partial Marks: +1*** If two or more options are correct but **ONLY** one option is chosen and it is a correct option;
- ***Zero Marks: 0*** If unanswered;
- ***Negative Marks: -2*** In all other cases.
- For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to the correct answer, then

Choosing ONLY (A), (B) and (D) will get +4 marks;
Choosing ONLY (A), will get +1 mark;
Choosing ONLY (B), will get +1 mark;
Choosing ONLY (D), will get +1 mark;
Choosing no option(s) (i.e. the question is unanswered) will get 0 marks and

Choosing any other option(s) will get -2 marks.

**11.** A balloon starts rising from the earth's surface. The ascension rate is constant and equal to $v_0$.Due to the wind, the balloon gathers a horizontal velocity component $v_x = ky$, where k is constant and y is the height of ascent. Find the dependence of the following quantities on y.

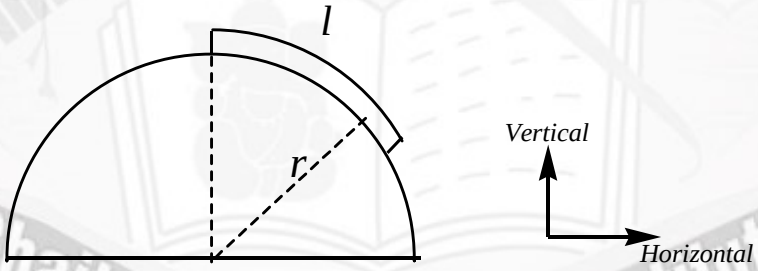
**A)** Tangential acceleration at any y is $\frac{k^2 y v_0}{\sqrt{v_0^2 + k^2 y^2}}$

**B)** Centripetal acceleration at any y is $\frac{kv_0}{\sqrt{1+\left(\frac{ky}{v_0}\right)^2}}$

**C)** Radius of curvature at an y is $R_C = \frac{v_0}{k}\left(1+\left[\frac{ky}{v_0}\right]^2\right)^{3/2}$

**D)** The curvature of path decreases as the balloon rises.

**12.** A uniform rope of length $l$ is held motionless on a frictionless hemisphere of radius r with one end of the rope at the top of the hemisphere. The hemisphere is made immobile by gluing it on a horizontal floor. The rope is now released. Immediately after the rope is released




**A)** Only the weight of corresponding vertical projection of string length is effectively responsible to cause the acceleration of rope.

**B)** The angular position measured from horizontal where maximum tensile force is developed is $\cos^{-1}\left(\frac{r}{l}\left(1-\cos\frac{l}{r}\right)\right)$

**C)** If just sufficient uniform coefficient of friction is present between rope and hemisphere to prevent sliding of rope, then tension developed in rope at all points is zero.

**D)** Minimum coefficient of friction required between rope & hemisphere to prevent slipping of rope is $\tan\left(\frac{\ell}{2r}\right)$. Ignore any component of Rope Tension in radial direction.

**13.** The incorrect options in the following is/are:

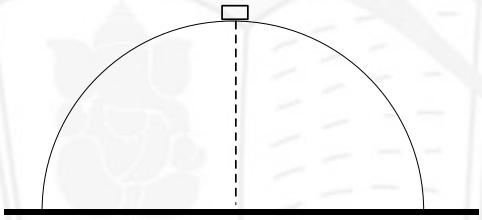
**A)** Work done by kinetic friction is always negative.

**B)** When an athlete runs with acceleration, the gain in kinetic energy of the athlete is due to work done by frictional force between his shoe and ground. Here work done by friction is positive.

**C)** Total Work done by internal tension force in any system is always zero.

**D)** In the elongation of spring, Work done by spring is negative irrespective of the reference frame.

**14.** A hemispherical bowl is placed in inverted position on frictionless horizontal floor and a small disk is placed on the top of the bowl as shown in the figure. The disk and the bowl are of equal mass and there is no friction between them. The disk is slightly pushed horizontally so that it starts sliding on the bowl with negligible speed.



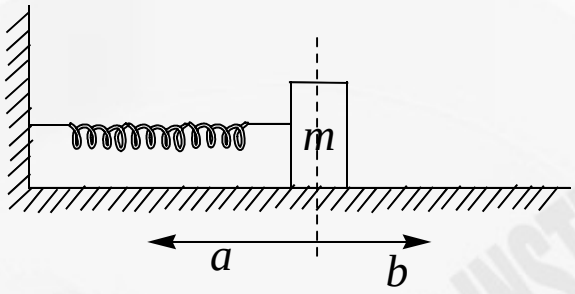
**A)** Momentum of hemisphere + disc system will remain conserved until they get separated

**B)** At the time of separation, velocity of disc and hemisphere are same.

**C)** At time of separation, the angle that disc makes with vertical is $\cos^{-1}\left(\sqrt{3}-1\right)$

**D)** At time of separation, Pseudo force on disc in frame of centre of mass of hemisphere will be zero but Pseudo force on hemisphere in frame of disc is non-zero

**15.** The spring is compressed by a distance ' a ' and released. The block again comes to rest when the spring is elongated by a distance 'b' from natural length. From the point of maximum compression to maximum elongation, Find



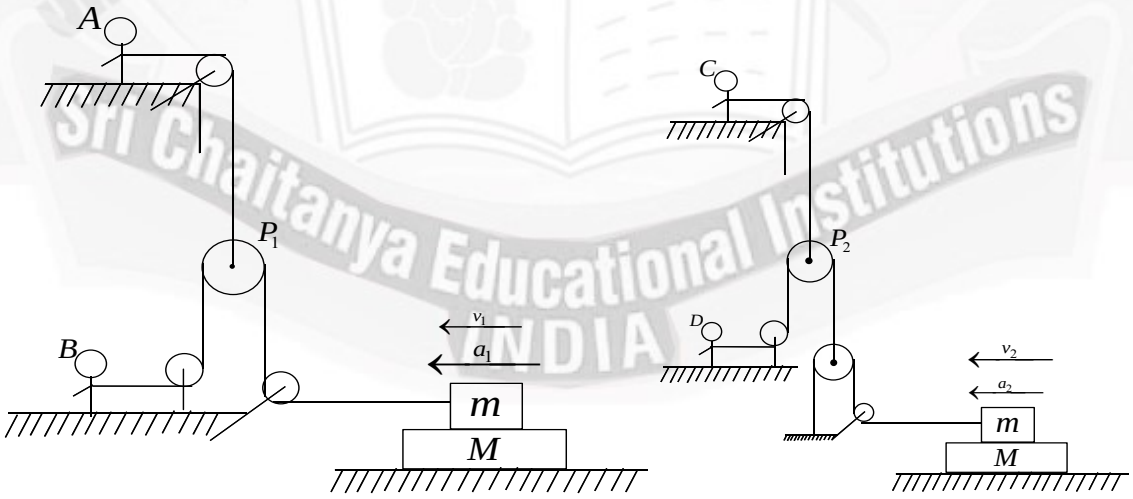

**A)** Work done by the spring on the block $=\frac{1}{2}k(a+b)^2$

**B)** Work done by the spring on the block $=\frac{1}{2}k\left(a^2-b^2\right)$

**C)** Coefficient of friction $=\frac{k(a-b)}{2mg}$

**D)** Coefficient of friction $=\frac{k(a+b)}{2mg}$

**16.** All surfaces are rough and have same $\mu$ . Pulleys & strings are ideal & massless and smooth. In both cases block move together & have same acceleration i.e., $a_1=a_2$ & same velocity i.e. $v_1=v_2$. Man A, B, C, D remain stationary. A & C manage to the keep pulley $P_1$ & $P_2$ at rest.



**A)** Power supplied by man $D$ > power by man B

**B)** Friction force acting on man C from ground > friction force acting on man A from ground

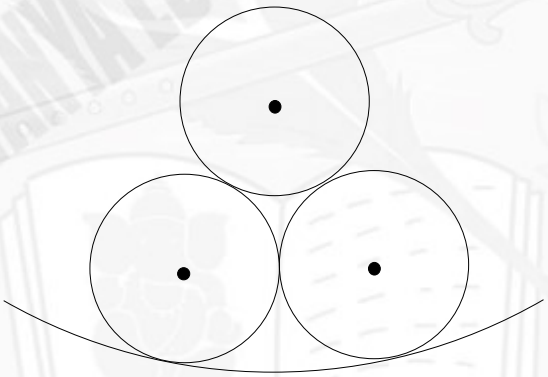
**C)** Friction below feet of man B does move work than friction below feet of man D

**D)** Work done by static friction on M with respect to ground is positive.

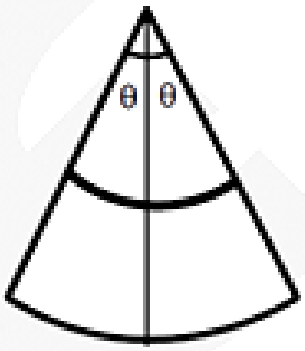
## SECTION 4

- This section contains **THREE (03)** question.
- The answer to each question is a **NON-NEGATIVE INTEGER.**
- For each question, enter the correct integer corresponding to the answer the using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme:
- ***Full Marks*** **: +4** If ONLY the correct integer is entered;
- ***Zero Marks*** **: 0** In all other cases.

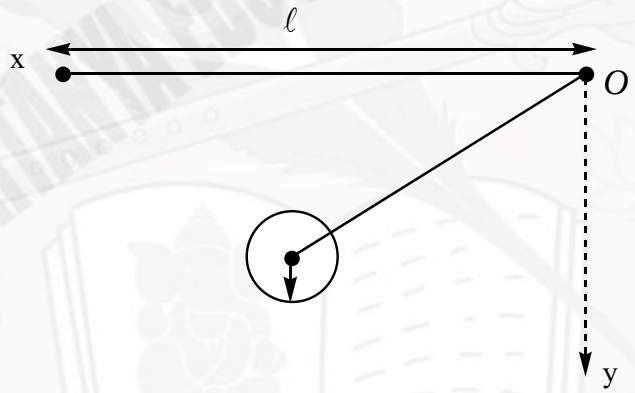
**17.** Three identical smooth cylinders, each of mass m and radius r are resting in equilibrium within a fixed smooth cylinder of radius R (only a part of this cylinder has been shown in the figure). Find the largest value of R in terms of r, for the small cylinders to remain in equilibrium. If R is expressed as $R = r\left(1+2\sqrt{K}\right)$, what is value of $K$ ?



**18.** A rubber band has mass m and force constant k. When relaxed, the band forms a ring of radius r. The band is placed horizontally on a vertical frictionless cone as shown (angle $2\theta$ is given). The radius R of the ring formed by the band is $R = r + \frac{mg}{\alpha\pi^2 k}\cot\theta$. Find the value of $\alpha$




**19.** A simple pendulum of length $\ell$ is suspended by a nail on a vertical wall at point O. Another nail is to be fixed on the wall such that if the pendulum is released from its initial horizontal position, it just completes a vertical circle round that nail as shown. The locus of the point where the second nail can be fixed is $k\left(x^2+y^2\right)=(3\ell-2y)^2$. Find the value of $k$.



CHEMISTRY **Max. Marks: 60**

## SECTION 1

- This section contains **Four (04)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme:
- *Full Marks* : +3 If ONLY the correct option is chosen;
- *Zero Marks* : 0 If the none of the options is chosen (i.e. the question is unanswered);
- *Negative Marks* : -1 In all other cases.

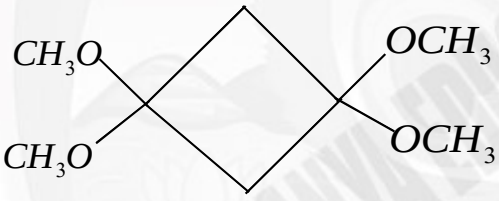
**20.** I) benzene 1,2-diol II) benzene 1,3-diol

III) benzene 1,4-diol IV) Phenol

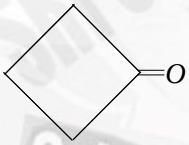
The increasing order of boiling points of above mentioned Phenol(s) is

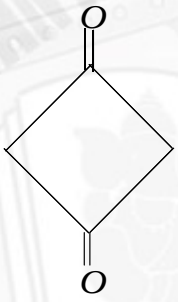
**A)** I<II<III<IV **B)** I<II<IV<III **C)** IV<I<II<III **D)** IV<II<I<III

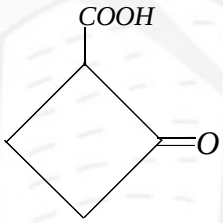
**21.**

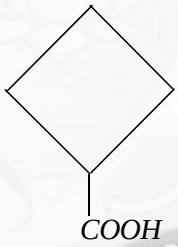



$\xrightarrow{H_3O^+}$ $A$: Product $A$ is.

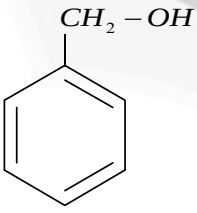
**A)** 

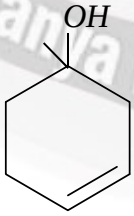

**B)** 


**C)** 

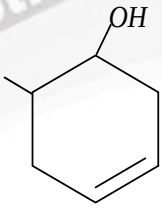

**D)** 


**22.** Which of the given compound is the most reactive towards dehydration reaction?

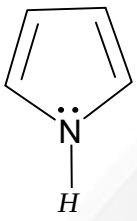
**A)** 

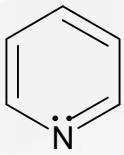

**B)** 

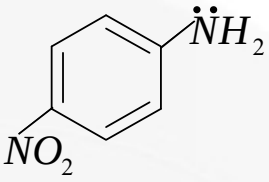

**C)** 

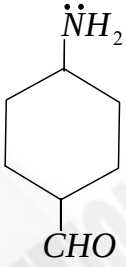

**D)** 

**23.** Which of the following is Most basic in nature?

A) 

B) 

C) 

D) 

## SECTION 2

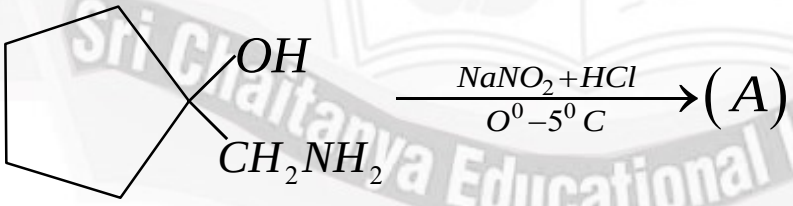
- This section contains **THREE (03)** questions stems.
- There are **TWO (02)** questions corresponding to each question stem.
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value corresponding to the answer in the designated place using the mouse and the on-screen virtual numeric keypad.
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated according to the following marking scheme:
- ***Full Marks*** **: +2** If ONLY the correct numerical value is entered at the designated place;
- ***Zero Marks*** **: 0** In all other cases.

## Question Stem for Question Nos. 24 and 25

**Question Stem**

Nitrous acid reacts with all classes of amines. The nature of products obtained from these reactions depends on whether the amine is primary, secondary or tertiary. It also depends on whether the amine is aliphatic or aromatic. Aliphatic primary amines react with nitrous acid $(NaNO_2 + HCl)$ to from alcohol as the major product. In addition to alcohol, alkene and alkyl halide are also formed as minor products. Certain cyclic primary amines undergo either ring expansion or ring contraction on treatment with nitrous acid. This reaction is called Demjanov ring expansion or contraction.

**24.**



What is the molecular weight in gm/mol

**25.** 14.75g of n-propyl amine reacts with $HNO_2$ to give product (B) what amount of product is obtained in grams ?

## Question Stem for Question Nos. 26 and 27

**Question Stem:**

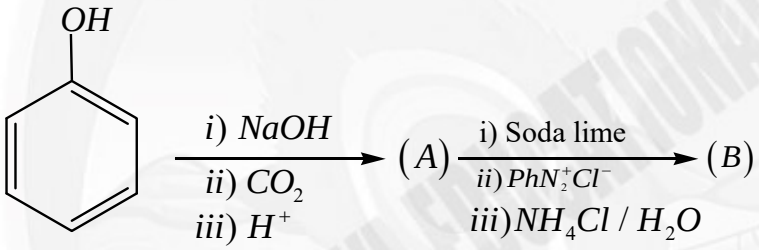
3-ethyl -2-Pentene(X) under go reaction with $Hg(OAC)_2 / H_2O$ followed by $NaBH_4$ gives product (Y); but when (X) is reacted with $Br_2 / H_2O$ gives product (Z) and (X) with $HBr / H_2O_2$ gives product (P).

**26.** How many sigma $(\sigma)$ bonds are present in product (P)?

**27.** How many rearrangement steps involved during the product (Y) formation?

## Question Stem for Question Nos. 28 and 29

**Question Stem:**




**28.** What is the value of D.B.E (double bound equivalent )of $(A)$?

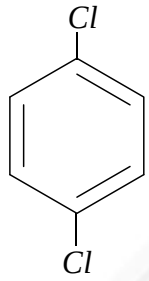
**29.** How many Lone pairs are present in product $(B)$?

## SECTION 3

- This section contains **SIX (06)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme:
- ***Full Marks:* +4** If only (all) the correct option(s) is (are) chosen;
- ***Partial Marks:* +3** If all the four options are correct but **ONLY** three options are chosen,
- ***Partial Marks:* +2** If three or more options are correct but **ONLY** two options are chosen, both of which are correct:
- ***Partial Marks:* +1** If two or more options are correct but **ONLY** one option is chosen and it is a correct option;
- ***Zero Marks:* 0** If unanswered;
- ***Negative Marks:* -2** In all other cases.
- For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to the correct answer, then

Choosing ONLY (A), (B) and (D) will get +4 marks;
Choosing ONLY (A), will get +1 mark;
Choosing ONLY (B), will get +1 mark;
Choosing ONLY (D), will get +1 mark;
Choosing no option(s) (i.e. the question is unanswered) will get 0 marks and
Choosing any other option(s) will get -2 marks.

**30.** Which of the following reaction do Not give phenol major product ?

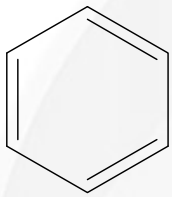


$\xrightarrow[623K,300atm]{NaOH}$

**A)**

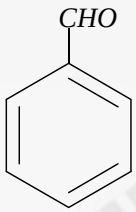
Cumene $\xrightarrow[(ii)\,H^+/H_2O]{(i)\,O_2}$ $\xrightarrow{(iii)\,NaOH}$

**B)**



$\xrightarrow[(ii)\,NaOH,\Delta]{(i)\,Oleum,\Delta}$ $\xrightarrow{(iii)\,H^+}$

**C)**



$\xrightarrow[(ii)\,H_2O]{(i)\,RMgX}$

**D)**

**31.** Ethanol on reaction with $(CH_3CO)_2O$ gives

**A)** $CH_3-COOH$ **B)** $CH_3COOC_2H_5$

**C)** $C_2H_5-O-\underset{\underset{O}{\|}}{C}-OH$ **D)** $HCOOH$

**32.**

$$CH_3-\underset{\diagdown\ \diagup}{\overset{O}{CH}}-CH_2 \xrightarrow{CH_3C\equiv C^-} (X) \xrightarrow{CH_3I} (Y) \xrightarrow{H_2/Pd/BaSO_4} (Z)$$

(Major)

Identify X, Y, Z

$Y$ is $CH_3-\underset{\underset{O-CH_3}{|}}{CH}-CH_2C\equiv CCH_3$

**A)**

$Y$ is $CH_3-CH_2-\underset{\underset{OCH_3}{|}}{CHC}\equiv CCH_3$

**B)**

$Z$ is $CH_3-\underset{\underset{O-CH_3}{|}}{CH}-CH_2-CH=CH-CH_3$

**C)**

$X$ is $CH_3-\underset{\underset{O^{\ominus}}{|}}{CHCH_2C}\equiv CCH_3$

**D)**

**33.** Which of the following reagent(s) may be used to distinguish between phenol and $CH_3CH_2OH$ .

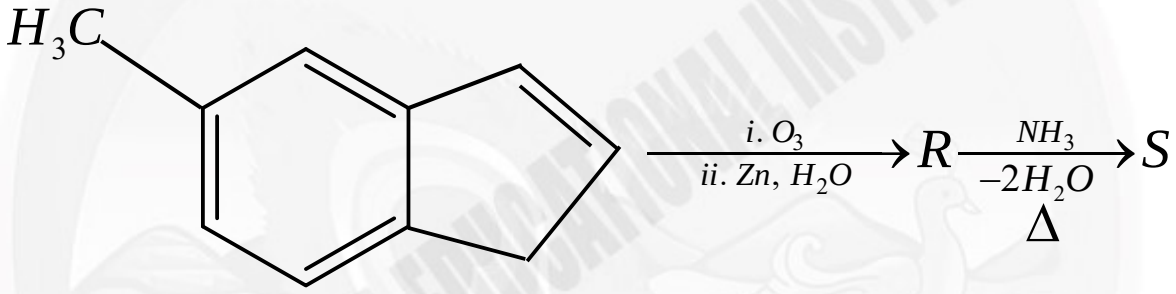
**A)** $Aq.NaOH$ **B)** Neutral $FeCl_3$ **C)** Tollen's reagent **D)** $NaHCO_3$

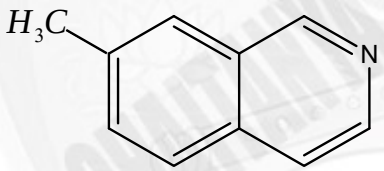
**34.** A positive carbylamine test is given by

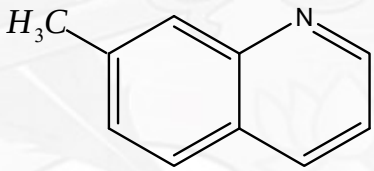
**A)** N, N-dimethylaniline **B)** 2,4- dimethylaniline

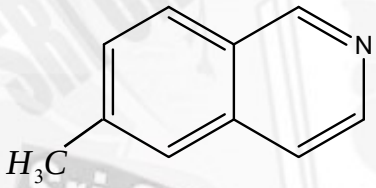
**C)** 2,N-dimethylaniline **D)** p-methylbenzylamine

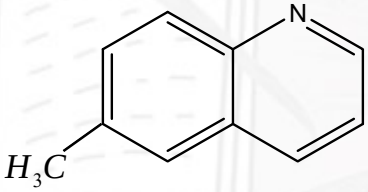
**35.** In the following reaction, the product S is




**A)** 


**B)** 

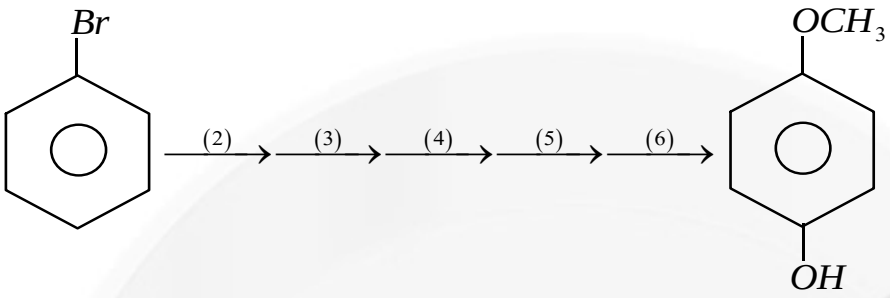

**C)** 


**D)** 


## SECTION 4

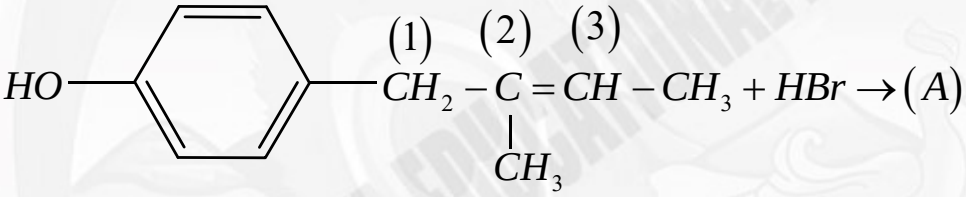
- This section contains **THREE (03)** question.
- The answer to each question is a **NON-NEGATIVE INTEGER.**
- For each question, enter the correct integer corresponding to the answer the using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated <u>according to the following marking scheme:</u>
- ***Full Marks*** **: +4** If ONLY the correct integer is entered;
- ***Zero Marks*** **: 0** In all other cases.

**36.**



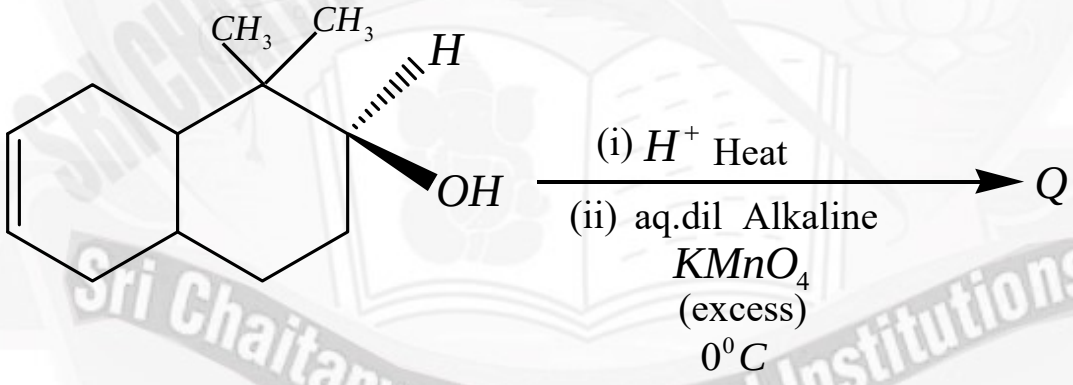

If reagent used in step-3 is $CH_3ONa / CH_3OH$ So, $Sn / HCl$ Should be used at which step?

**37.**




On which carbon bromine will be present in the major product (A)

**38.** Number of Hydroxyl group(s) present in the product Q is____



MATHEMATICS **Max. Marks: 60**

## SECTION 1

- This section contains **Four (04)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated according to the following marking scheme:
- *Full Marks* : +3 If ONLY the correct option is chosen;
- *Zero Marks* : 0 If the none of the options is chosen (i.e. the question is unanswered);
- *Negative Marks* : -1 In all other cases.

**39.** $\int_0^4 \left\{\frac{x}{4}\right\}\left(1+\left[\tan\left(\frac{\{x\}}{1+\{x\}}\right)\right]\right)dx = \left(\text{The greatest integer function is denoted by } [x]\right)$

where as the fractional part function is denoted by $\{x\}$.

**A)** 0 **B)** 1 **C)** 2 **D)** 4

**40.** $\int_0^2 e^x(x^4+8x^3+18x^2+16x+5)dx$

A) $81e^2-1$ B) $81e^2-8$ C) $81e^2-27$ D) $81e^2+1$

**41.** $\int_{-3/2}^{-1/2}(x^5+5x^4+10x^3+8x^2+x)dx$

**A)** $\frac{5}{6}$ **B)** $\frac{4}{5}$ **C)** $\frac{6}{7}$ **D)** $\frac{7}{8}$

**42.** $\int_2^{12}\frac{\sqrt{x+\sqrt{x+\sqrt{x+.....\infty}}}}{\sqrt{x\sqrt{x\sqrt{x.....\infty}}}}dx$

**A)** $\ln 6+\int_3^7\frac{x^2}{x^2-1}dx$ **B)** $\frac{1}{2}\ln 6+\int_3^7\frac{x^2}{x^2-1}dx$

**C)** $\frac{1}{2}\ln 6+\int_3^7\frac{x^2}{x^2+1}dx$ **D)** $\frac{1}{2}\ln 6+\int_3^7\frac{x}{x^2+1}dx$

## SECTION 2

- This section contains **THREE (03)** questions stems.
- There are **TWO (02)** questions corresponding to each question stem.
- The answer to each question is a **NUMERICAL VALUE.**
- For each question, enter the correct numerical value corresponding to the answer in the designated place using the mouse and the on-screen virtual numeric keypad.
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated according to the following marking scheme:
- ***Full Marks: +2*** If ONLY the correct numerical value is entered at the designated place;
- ***Zero Marks: 0*** In all other cases.

## Question Stem for Question Nos. 43 and 44

**Question Stem:**

Given that $\int_{-\infty}^{\infty} e^{-x^2}\,dx = \sqrt{\pi} = 1.77$

**43.** $\int_{-\infty}^{\infty} e^{4-x^2-\frac{4}{x^2}}\,dx$

**44.** $\lim\limits_{n\to\infty} \sqrt{n}\cdot\int_{-1/2}^{1/2}(1-4x^2+x^4)^n dx$

## Question Stem for Question Nos. 45 and 46

**Question Stem:**

Use coefficient of $t^r$ in the expansion $\int_0^1((1-x)+tx)^n\,dx$, where $r \le n$

and $\binom{x}{k} = \frac{x(x-1)(x-2).....(x-k+1)}{k!}$

**45.** $100\int_0^1 \binom{207}{7} x^{200}(1-x)^7\,dx$

**46.** $\int_0^{2024} \binom{x}{2025} dx$

## Question Stem for Question Nos. 47 and 48

**Question Stem:**

Given that $\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6} = 1.64$

**47.** $\int_0^1 x\left[\frac{1}{x}\right]dx$ (The greatest integer function is denoted by $[x]$)

**48.** $\int_0^1 \frac{(x+1)\log(x)}{x^3-1}dx$

## SECTION 3

- This section contains **SIX (06)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme:
- ***Full Marks*** **: +4** If only (all) the correct option(s) is (are) chosen;
- ***Partial Marks*** **: +3** If all the four options are correct but **ONLY** three options are chosen,
- ***Partial Marks*** **: +2** If three or more options are correct but **ONLY** two options are chosen, both of which are correct:
- ***Partial Marks*** **: +1** If two or more options are correct but **ONLY** one option is chosen and it is a correct option;
- ***Zero Marks*** **: 0** If unanswered;
- ***Negative Marks: -2*** In all other cases.
- For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to the correct answer, then

Choosing ONLY (A), (B) and (D) will get +4 marks;
Choosing ONLY (A), will get +1 mark;
Choosing ONLY (B), will get +1 mark;
Choosing ONLY (D), will get +1 mark;
Choosing no option(s) (i.e. the question is unanswered) will get 0 marks and
Choosing any other option(s) will get -2 marks.

**49.** $\int_0^{\frac{\pi}{2}} x\tan 2x\ln(\tan x)dx =$

**A)** $\frac{\pi}{2}\int_0^{\frac{\pi}{2}} \tan 2x\ln(\tan x)dx$

**B)** $\frac{\pi}{4}\int_0^{\frac{\pi}{2}} \tan 2x\ln(\tan x)dx$

**C)** $\frac{\pi}{8}\int_{-1}^{1} \frac{\ln(1-x)}{x}dx$

**D)** $\frac{\pi}{8}\int_0^{\pi} \tan x\ln(1-\cos x)\,dx$

**50.** $\int_0^{\infty} \frac{\tan^{-1}(x)}{(1+x)\sqrt{x}}dx =$

**A)** $\int_0^{\infty} \frac{\arctan(1/x)}{\sqrt{x}(1+x)}\,dx$

**B)** $\frac{\pi}{4}\int_0^{\infty} \frac{dx}{\sqrt{x}(1+x)}$

**C)** $\frac{\pi}{2}\int_0^{\infty} \frac{dx}{\sqrt{x}(1+x)}$

**D)** $\frac{\pi^2}{4}$

**51.** $\int_0^{\infty} \frac{x-1}{x^8-1}dx =$

**A)** $\frac{1}{2}\int_0^{\infty} \frac{dx}{x^4-1} - \int_0^{\infty} \frac{dx}{x^8-1}$

**B)** $\int_0^{\infty} \frac{1}{x^4+1}dx$

**C)** $\frac{1}{2}\int_0^{\infty} \frac{1}{x^4+1}dx$

**D)** $\frac{\pi}{4\sqrt{2}}$

**52.** $\int_0^{\infty} \frac{1}{\left(1+x^{2023}\right)\left(1+x^2\right)} dx =$

**A)** $\frac{\pi}{2}$

**B)** $\frac{\pi}{4}$

**C)** $\int_0^{\infty} \frac{x^{2023}}{\left(1+x^{2023}\right)\left(1+x^2\right)} dx$

**D)** $\int_0^{\infty} \frac{1}{1+4x^2} dx$

**53.** $\int_{\frac{1}{2}}^{2} \log\left(\frac{\log\left(x+\frac{1}{x}\right)}{\log\left(x^2-x+\frac{17}{4}\right)}\right) dx =$

**A)** $\int_{1/2}^{2} \log\log\left(x+\frac{1}{x}\right) dx - \int_0^{3/2} \log\log(x^2+4) dx$

**B)** $\int_{1/2}^{2} \log\log\left(x+\frac{1}{x}\right) dx - \int_{1/2}^{2} \log\log\left(x^2-x+\frac{17}{4}\right) dx$

**C)** $\int_{1/2}^{2} \left(\log\log\left(x+\frac{1}{x}\right) - \log\log\sqrt{x^2-x+\frac{17}{4}} - \log 2\right) dx$

**D)** $-\frac{3}{2}\log 2$

**54.** $\int_0^{1/\sqrt{3}} \sqrt{x+\sqrt{x^2+1}}\, dx =$

**A)** $\int_0^{\pi/6} \sqrt{\tan(\theta)+\sec(\theta)}\sec^2(\theta) d\theta$

**B)** $\frac{1}{2} + \frac{1}{4}\int_0^{\pi/6} \sqrt{\tan(\theta)+\sec(\theta)}\sec^2(\theta) d\theta$

**C)** $\frac{1}{\sqrt[4]{3}} - \frac{1}{2}\int_0^{\pi/6} \sqrt{\tan(\theta)+\sec(\theta)}\, d\left(\sec(\theta)\right)$

**D)** $\frac{2}{3}$

## SECTION 4

- This section contains **THREE (03)** question.
- The answer to each question is a **NON-NEGATIVE INTEGER.**
- For each question, enter the correct integer corresponding to the answer the using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme:
- ***Full Marks*** **: +4** If ONLY the correct integer is entered;
- ***Zero Marks*** **: 0** In all other cases.

**55.** $\int_{-9}^{9} \underbrace{\left|\left|\left|x\right|-1\right|-1\right|-1.....-1}_{9 \text{ times}} dx =$

**56.** $\lim_{n\to\infty} \int_0^{\infty} \left(1+\frac{t}{n}\right)^{-n} \cdot \cos\left(\frac{t}{n}\right) dt =$

**57.** $\int_0^9 \{x[x]\} dx = \begin{pmatrix} \text{The greatest integer function is denoted by } [x] \\ \text{where as the fractional part function is denoted by } \{x\}. \end{pmatrix}$

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8th - 12th Class
Sri Chaitanya
2 RANK


KALRA RISHI
HT.No. 237047209
AITS Student
3 RANK


RAGHAV GOYAL
HT.NO. 237020329
9th - 12th Class
Sri Chaitanya
4 RANK


BIKKINA ABHINAV CHOWDARY
HT.NO. 236163128
4th - 12th Class
Sri Chaitanya
7 RANK

### 32 TOP RANKS BELOW 100 IN ALL-INDIA OPEN CATEGORY


RANK 12
DASARI SAKETH NAIDU
HT.No. 236060148


RANK 14
GUTHIKONDA ABHIRAM
HT.No. 236129121


RANK 17
P GNANA KOUSIK REDDY
HT.No. 236133520


RANK 18
D VENKATA YUGESH
HT.No. 236049359


RANK 19
MOULIK JINDAL
HT.No. 237021004


RANK 22
D PRATAP SINGH
HT.NO. 232006139


RANK 23
SHAIK SAHIL CHANDA
HT.No. 236132870


RANK 26
SONI MAYANK
HT.No. 232097025


RANK 33
GOYAL NAMAN
HT.No. 232029345


RANK 37
SUMEDH SS
HT.No. 231029088


RANK 38
V DEERAJ SATHVIK REDDY
HT.No. 236057151


RANK 44
V VERGIYA KAUSHAL
HT.No. 231004058


RANK 46
SUTHAR HARSHAL
HT.No. 231005060


RANK 58
ABHI JAIN
HT.No. 232091036


RANK 61
RIDAM JAIN
HT.No. 232068021


RANK 62
SUTHAR HARSH
HT.No. 232100028


RANK 63
SOJITRA DIPEN
HT.No. 231017001


RANK 65
D PANEENDRANADHA REDDY
HT.No. 236050298


RANK 67
GUNDA SUSHANTH
HT.No. 236129732


RANK 68
HARSH TAYA
HT.No. 237021178


RANK 69
KRISH GUPTA
HT.No. 232068189


RANK 73
KUNCHAKURTHY VIVEK
HT.No. 236134093


RANK 81
N DHARMA TEJA REDDY
HT.No. 236050138


RANK 84
S VENKAT KOUNDINYA
HT.No. 236130679


RANK 87
MRUNAL SHRIKANT
HT.No. 231104138


RANK 92
SAMOTA APURVA
HT.No. 232099210


RANK 97
N PRINCE BRANHAM REDDY
HT.No. 236064112

BELOW 20 All India Open Category Ranks » 10 RANKS (50%)
BELOW 100 All India Open Category Ranks » 32
BELOW 1000 All India Open Category Ranks » 181
BELOW 100 All India Category Ranks Count » 89
BELOW 1000 All India Category Ranks Count » 699

NUMBER OF RANKS QUALIFIED 3,621*

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