



Sri Chaitanya IIT Academy.,India.

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A right Choice for the Real Aspirant

ICON Central Office - Madhapur - Hyderabad

SEC: **Sr.Super60_NUCLEUS&STERLING_BT**

JEE-MAIN

Date: 07-10-2023

Time: 09.00Am to 12.00Pm

RPTM-10

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.

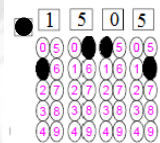
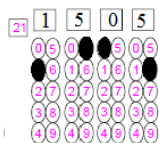
Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases.

(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: _____

**07-10-23_Sr.Super60_NUCLEUS & STERLING_BT_Jee-Main_RPTM-10_Test Syllabus****PHYSICS**

• Properties of matter: Hooke's law, Young's modulus, Modulus of rigidity and bulk modulus in mechanics. Surface energy and surface tension, angle of contact, drops, bubbles and capillary rise. Viscosity (Poiseuille's equation excluded), Stoke's law; Terminal velocity, Reynolds number
Experiments: Young's modulus - elasticity of the material Surface tension of water by capillary rise and effect of detergents, Coefficient of Viscosity of a given viscous liquid by measuring terminal velocity of a given spherical body

RPTM-10(15Q-RPTM.10 SYLLABUS+15Q CUMULATIVE SYLLABUS)**CHEMISTRY**

• 1.Group-15: Oxidation states and trends in chemical reactivity of elements of groups 15; anomalous properties of nitrogen with respect to other elements in their respective groups, Introduction; Occurrence; atomic and physical properties ;oxidation states; anomalous properties of nitrogen; Allotropes of phosphorus; preparation, properties and uses of N₂,Reactivity towards hydrogen(General discussion); Structures ,preparations, properties and uses of NH₃ and PH₃;Reactivity towards metals, Reactivity towards oxygen(General discussion);Structures ,preparations, properties and uses of oxides of nitrogen ,Structures ,preparations, properties and uses of Oxides of phosphorous, Reactivity towards halogen(General discussion);Structures ,preparations, properties and uses of PCl₃ and PCl₅,Structures ,preparations, properties and uses of oxoacids of nitrogen(nitric acid) and phosphorus; Fertilizers(not to be tested)
2.Group-16: Oxidation states and trends in chemical reactivity of elements of groups 16; anomalous properties of oxygen with respect to other elements in their respective groups, Introduction; Occurrence; atomic and physical properties ;oxidation states; anomalous properties of O₂; Allotropes of sulphur; classification of oxides(simple oxides, mixed oxides);preparation, properties and uses of O₂,Structures,preparations,properties and uses of Ozone; test for O₃, Quantitative estimation of ozone(O₃+KI+H₂O-----I₂+KOH+O₂)(I₂+Na₂S₂O₃-----Na₂S₄O₆+NaI),Reactivity towards hydrogen(General discussion);Reactivity towards Oxygen(General discussion);Structures ,preparations, properties and uses of SO₂;Structures ,preparations, properties and uses of SO₃,Reactivity towards the halogen(General Discussion)(Excluding preparations and properties of compounds of halogen of Group-16),Oxoacids of sulphur (focus on structures ,oxidation states);preparations, properties and uses of Sulphuric acid Preparation ,properties and uses of H₂S and Na₂S₂O₃(not to be tested)
3.Group-17: Oxidation states and trends in chemical reactivity of elements of groups 17; anomalous properties of fluorine with respect to other elements in their respective groups, Introduction; Occurrence; atomic and physical properties; oxidation states; Reactivity towards metals.(General Discussion), preparations, properties and uses of Cl₂; preparations, properties and uses of HCl Preparations, properties and uses of F₂,Br₂,I₂(not to be tested);preparations, properties and uses of HF,HBr,HI(not to be tested), Structures, preparation, properties and uses of Oxides of chlorine and oxoacids of chlorine(more focus on structures), preparation, properties and uses of Bleaching powder ; Structures, preparation, properties and uses of interhalogen compounds. Polyhalides; pseudohalides; pseudohalogens; basic properties of iodine(not to be tested)

RPTM-10(15Q-RPTM.10 SYLLABUS+15Q CUMULATIVE SYLLABUS)**MATHEMATICS**

• Stragith Lines, Pair of Straight Lines & Complete Circles

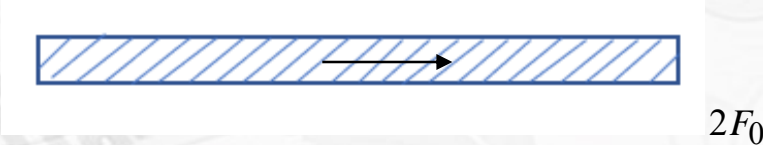
RPTM-10(15Q-RPTM.10 SYLLABUS+15Q CUMULATIVE SYLLABUS)

**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.

- A boy has a catapult made of a rubber cord of length 50cm and diameter 6.0mm. The boy stretches the cord by 20cm to catapult a pebble of mass 4gm. The pebble flies off with a speed of 5m/sec. Find the young's modulus for rubber. (Ignore the change in the cross-section of the cord in stretching)
 - $4.42 \times 10^4 \text{ N/m}^2$
 - $2.97 \times 10^4 \text{ N/m}^2$
 - $0.97 \times 10^4 \text{ N/m}^2$
 - $9.7 \times 10^4 \text{ N/m}^2$
- A constant force $2F_0$ is applied on a uniform elastic string placed over a smooth horizontal surface as shown in figure. Young's modulus of string is Y and cross-sectional area of string is S . The strain produced in the string in the direction of force is



 - $\frac{F_0 Y}{S}$
 - $\frac{F_0}{SY}$
 - $\frac{F_0}{2SY}$
 - $\frac{F_0 Y}{2S}$

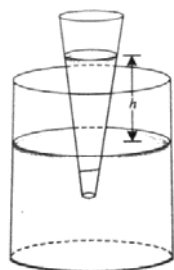
- A slightly conical wire of length L and end face radii r_1 and r_2 is stretched by two forces F each applied parallel to length in opposite directions and normal to end faces. If Y denotes the young's modulus then the elongation in the wire is
 - $\frac{F}{2\pi r_1 r_2 Y}$
 - $\frac{FL}{\pi r_1 r_2 Y}$
 - $\frac{2FL}{\pi r_1 r_2 Y}$
 - $\frac{4FL}{\pi r_1 r_2 Y}$

- The length of metallic wire obeying Hooke's law is l_1 when tension in it is T . It is l_2 when the tension is $2T$. The original length of the wire will be
 - $l_1 - 2l_2$
 - $l_1 - l_2$
 - $2l_2 - l_1$
 - $2l_1 - l_2$





5. A film of water is formed between two straight parallel wires of length 10cm each separated by 0.5 cm. If their separation is increased by 2 mm while still maintaining their parallelism how much work will have to be done of water. Surface tension of water = $7.2 \times 10^{-2} \text{ Nm}^{-1}$
- 1) $7.22 \times 10^{-6} \text{ J}$ 2) $1.44 \times 10^{-5} \text{ J}$ 3) $2.88 \times 10^{-5} \text{ J}$ 4) $5.76 \times 10^{-5} \text{ J}$
6. Under isothermal conditions two soap bubbles of radii '4a' and '5a' coalesce to form a single bubble of radius '6a'. If external pressure is P_0 , the surface tension of soap solution is equal to:
- 1) $\frac{27P_0a}{5}$ 2) $\frac{15P_0a}{4}$ 3) $\frac{27P_0a}{4}$ 4) $\frac{27P_0a}{20}$
7. A glass capillary tube is of the shape of truncated cone with an apex angle 2α so that its two ends have cross section of different radii. When dipped in water vertically. Water rises in it to a height h, where the radius of its cross section is b. If the surface tension of water is S. Its density is ρ , and its contact angle with glass is θ , the value of h will be (g is the acceleration due to gravity)



- 1) $\frac{2S}{b\rho g} \cos(\theta - \alpha)$ 2) $\frac{2S}{b\rho g} \cos(\theta + \alpha)$
- 3) $\frac{2S}{b\rho g} \cos\left(\theta - \left(\frac{\alpha}{2}\right)\right)$ 4) $\frac{2S}{b\rho g} \cos\left(\theta + \left(\frac{\alpha}{2}\right)\right)$
8. Given below are two statements: One is labelled as Assertion (A) and the other is labelled as Reason (R).
- Assertion (A):** Clothes containing oil or grease stains cannot be cleaned by water wash.
- Reason (R):** The angle of contact between the oil/grease and water is acute.





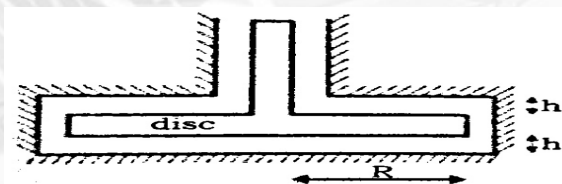
In the light of the above statements, choose the correct answer from the option given below.

- 1) Both (A) and (R) are true and (R) is the correct explanation of (A)
- 2) Both (A) and (R) are true and but (R) is not the correct explanation of (A)
- 3) (A) is true but (R) is false
- 4) (A) is true but (R) is true

9. Two balls of same density fall in a viscous medium, the radius of first ball being half the radius of second ball. The ratio of the terminal velocity of second ball to that of the first ball is

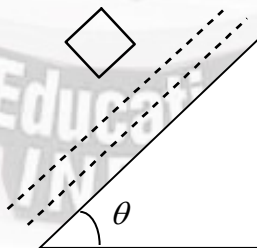
- 1) 1
- 2) 2
- 3) 4
- 4) $1/4$

10. A thin horizontal disc of radius R is located within a cylindrical cavity filled with a liquid whose viscosity is η . The distance between the disc and horizontal planes of cavity is h . The power developed by the viscous forces acting on the disc when it rotates with angular velocity 2ω (The end effects are to be neglected)



- 1) $\frac{4\pi\eta\omega^2 R^4}{h}$
- 2) $\frac{\pi\eta\omega^2 R^4}{4h}$
- 3) $\frac{\pi\eta\omega^2 R^4}{2h}$
- 4) $\frac{\pi\eta\omega^2 R^4}{h}$

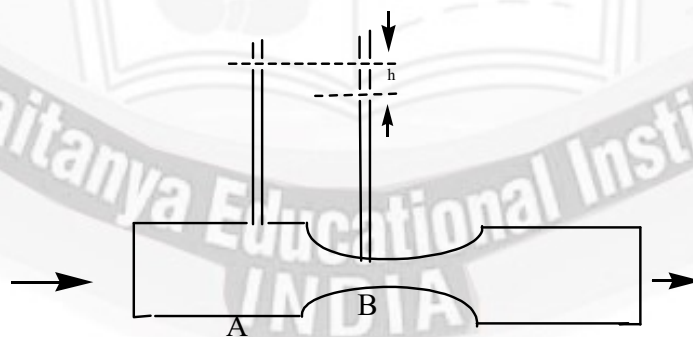
11. A cubical block of side 'a' and density ' ρ ' slides over a fixed inclined plane with constant velocity ' v '. There is a thin film of viscous fluid of thickness 't' between the plane and the block. Then the coefficient of viscosity of the thin film will be:



- 1) $\frac{\rho a g t \sin \theta}{v}$
- 2) $\frac{\rho a g t \tan^2 \theta}{v}$
- 3) $\frac{v}{\rho a g t \sin \theta}$
- 4) zero



12. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R
- Assertion A:** A spherical body of radius (5 ± 0.1) mm having a particular density is falling through a liquid of constant density. The percentage error in the calculation of its terminal velocity is 4%.
- Reason R:** The terminal velocity of the spherical body falling through the liquid is directly proportional to its radius.
- In the light of the above statements, choose the correct answer from the options given below
- 1) Both A and R are true and but R is NOT the correct explanation of A
 - 2) Both A and R are true and R is the correct explanation of A
 - 3) A is false but R is true
 - 4) A is true but R is false
13. An ice cube is floating in water above which a layer of a lighter oil is poured. As the ice melts completely, the level of upper level of oil and the level of water surface (or interface) and will
- 1) rise and fall
 - 2) fall and rise
 - 3) Not change and not change
 - 4) Not change and fall
14. Water flows through a horizontal tube as shown in the figure. If the difference of heights of water column in the vertical tubes is $h=0.04$ m, and the areas of cross section at A and B are $4 \times 10^{-4} \text{ m}^2$ and $2 \times 10^{-4} \text{ m}^2$, respectively, then the rate of flow of water across any section is



- 1)** $1.30 \times 10^{-4} m^3 / s$
- 2)** $1.46 \times 10^{-4} m^3 / s$
- 3)** $1.60 \times 10^{-4} m^3 / s$
- 4)** $2.19 \times 10^{-4} m^3 / s$



15. The specific heat of a substance varies with temperature $t(^{\circ}C)$ as
 $c = 0.20 + 0.14t + 0.023t^2$ (cal / gm $^{\circ}C$) Heat required to raise the temperature of 1 gm of the substance from $5^{\circ}C$ to $15^{\circ}C$ is
 1) 24 cal 2) 41 cal 3) 85 cal 4) 100 cal
16. A thermally insulated vertical cylinder of cross-section area A contains 2 moles of an ideal monatomic gas under a piston of mass M which can move without friction. A heater supplying heat to the gas at constant rate P J/s, is switched on at $t=0$. The velocity of the piston is given by [Take atmospheric pressure as p_0]
 1) $\frac{2P}{5[p_0A + Mg]}$ 2) $\frac{3P}{5[p_0A + Mg]}$ 3) $\frac{3P}{2[p_0A + Mg]}$ 4) $\frac{P}{p_0A + mg}$
17. Given below are two statements:
Statement I: The temperature of a gas is $-73^{\circ}C$. When the gas is heated to $527^{\circ}C$, the root mean square speed of the molecules is tripled.
Statement II: The product of pressure and volume of an ideal gas will be equal to the translational kinetic energy of the molecules.
 In the light of the above statements, choose the correct answer from options given below:
 1) Statement I is false but statement II is true
 2) Both Statement I and Statement II are true
 3) Both Statement I and Statement II are false
 4) Statement I is true but Statement II is false
18. Given below are two statements:
Statement I: An elevator can go up or down with uniform speed when its weight is balanced with the tension of its cable.
Statement II: Force exerted by the floor of an elevator on the foot of a person standing on it is more than his / her weight when the elevator goes down with decreasing speed.

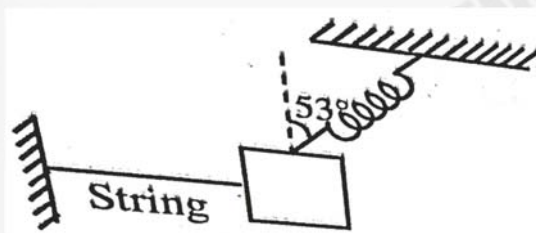




In the light of the above statements, choose the correct answer from the options given below.

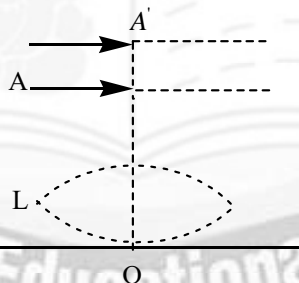
- 1) Statement I is false but statement II is true
- 2) Statement I is true but Statement II is false
- 3) Both Statement I and Statement II are false
- 4) Both Statement I and Statement II are true

19. The block shown in figure is in equilibrium. Find acceleration of the block just after the string is cut.



- 1) $3g/5$
- 2) $4g/5$
- 3) $4g/3$
- 4) g

20. A thin convex lens L (refractive index = 1.5) is placed on a plane mirror M. When a pin is placed at 'A', such that $OA = 18\text{cm}$, its real inverted image is formed at 'A' itself, as shown in figure. When a liquid of refractive index μ_l is put between the lens and the mirror. The pin has to be moved to A' , such that $OA' = 24\text{cm}$, to get its inverted real image at A' itself. The value of μ_l will be



- 1) $\sqrt{2}$
- 2) $4/3$
- 3) $5/4$
- 4) $3/2$

(NUMERICAL VALUE TYPE)

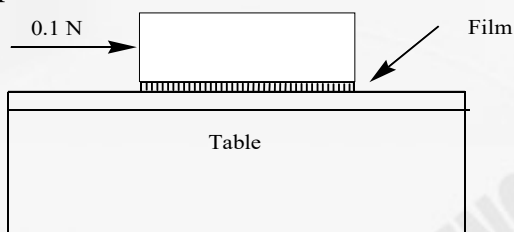
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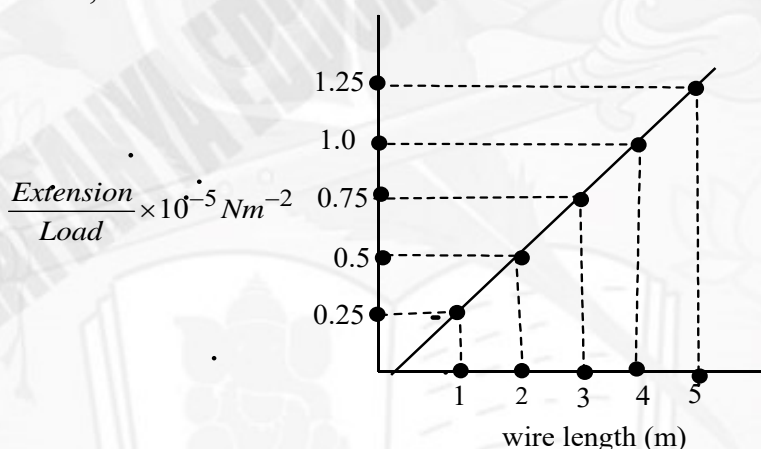




21. A metal block of base area 0.20m^2 is placed on a table, as shown in figure. A liquid film of thickness 0.20 mm is inserted between the block and the table. The block is pushed by a horizontal force of 0.1 N and moves with constant speed. If the viscosity of the liquid is 5.0×10^{-3} poiseuille, the speed of block is $\text{-----} \times 10^{-3}\text{ m/s}$.

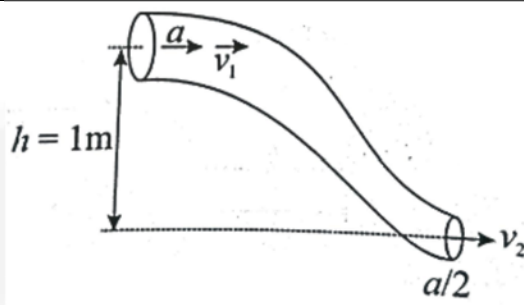


22. In an experiment to determine the Young's modulus, steel wires of five different lengths (1,2,3,4 and 5 m) but of same cross section (2 mm^2) were taken and curves between extension and load were obtained. The slope (extension/load) of the curves were plotted with the wire length and the following graph is obtained. If the Young's modulus of given steel wires is $x \times 10^{10}\text{ Nm}^{-2}$, then the value of x is -----

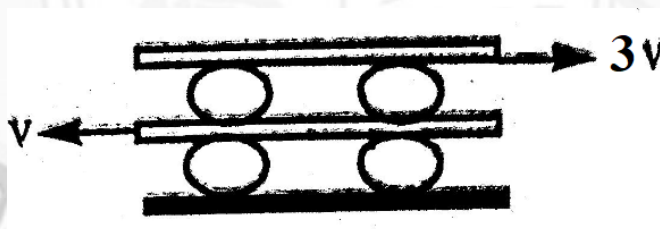


23. A Spherical drop of liquid splits into 216 identical spherical drops. If U_i is the surface energy of the original drop and U_f is the total surface energy of the resulting drops, the ratio (ignoring evaporation) $\frac{U_f}{U_i} =$
24. An ideal fluid of density 1000kgm^{-3} , flows smoothly through a bent pipe (as shown in figure) that tapers in cross - sectional area from a to $\frac{a}{2}$. The pressure difference between the wide and narrow sections of pipe is 4100 Pa (Pressure is greater at wider end). At wider section the velocity of fluid is $\sqrt{\frac{x}{5}}\text{ ms}^{-1}$. Then, $x = \text{-----}$ ($g = 10\text{ m/s}^2$)





25. A body of mass 10kg is under a force which causes displacement in it which is given by $s = \frac{t^2}{4}m$, where 't' is time. The work done by the force in 2s is (in J)
26. Two light waves of wavelengths 800 and 600 nm are used in Young's double slit experiment to obtain interference fringes on a screen placed 7 m away from plane of slits. If the two slits are separated by 0.35 mm, then shortest distance from the central bright maximum to the point where the bright fringes of the two wavelength coincide will be-----mm.
27. The same size images are formed by a convex lens when the object is placed at 18 cm or 8 cm from the lens. The focal length of convex lens is -----cm.
28. A system of uniform cylinders and plates is shown. All the cylinders are identical and there is no slipping at any contact. Velocity of lower and upper plates is v and $3v$ respectively as shown. Then the ratio of angular speeds of the upper cylinders to lower cylinders is-----



29. When a hollow sphere is rolling without slipping on a rough horizontal surface then the percentage of its total kinetic energy which is rotational is-----
30. On a X temperature scale, water freezes at $-125^\circ X$ and boils at $375.0^\circ X$. On a Y temperature scale water freezes at $-70.0^\circ Y$ and boils at $-30.0^\circ Y$. The value of temperature on X scale equals to the temperature of $40.0^\circ Y$ on Y-scale is ----- $^\circ X$

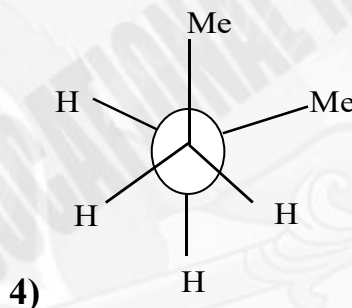
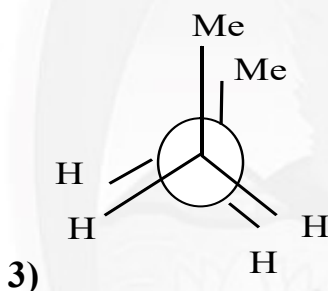
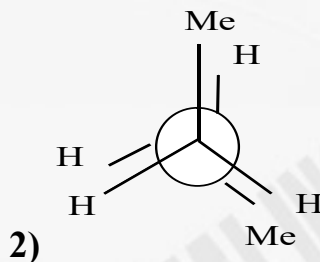
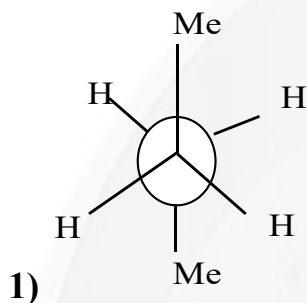


**CHEMISTRY****Max Marks: 100****(SINGLE CORRECT ANSWER TYPE)**

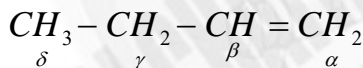
This section contains 20 multiple choice questions. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which ONLY ONE option can be correct.

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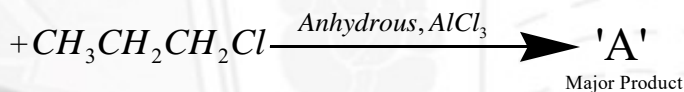
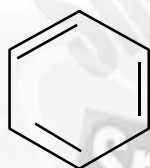
31. Which of the following conformation will be the most stable?



32. Which hydrogen in compound is easily replaceable during bromination reaction in presence of light:

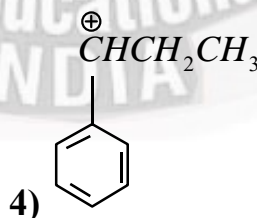
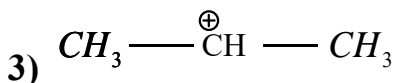
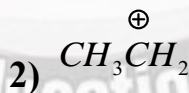


1) β - hydrogen 2) γ - hydrogen 3) δ - hydrogen 4) α - hydrogen



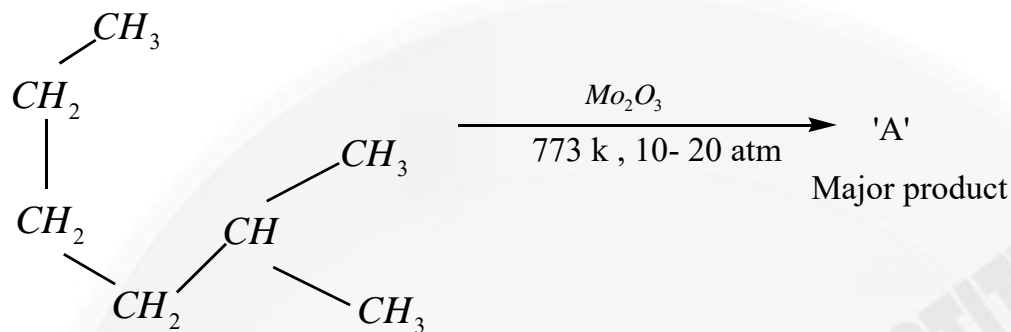
33.



The stable carbocation formed in the above reaction is





34. Identify A in the given chemical reaction.

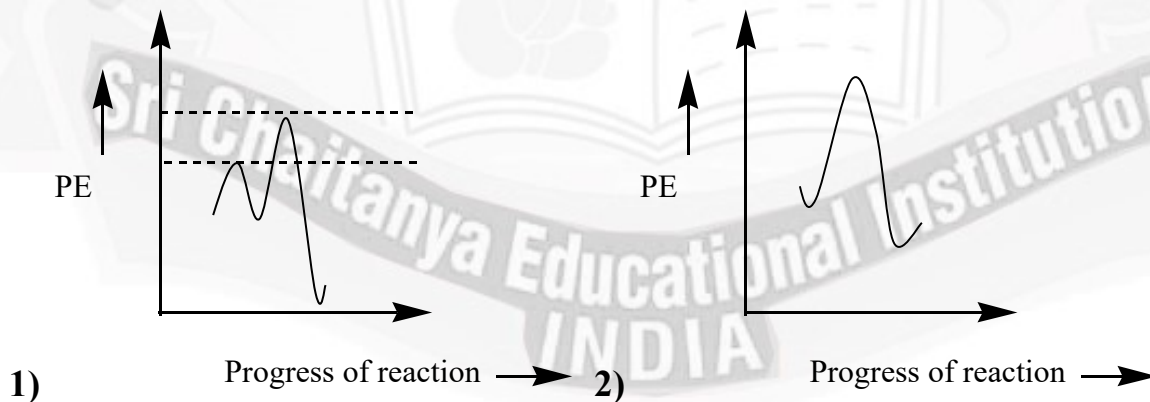


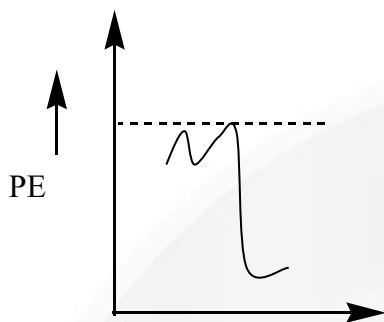
- 1)  2)  3)  4) 

35. The compounds A and B in the following reaction are , respectively:

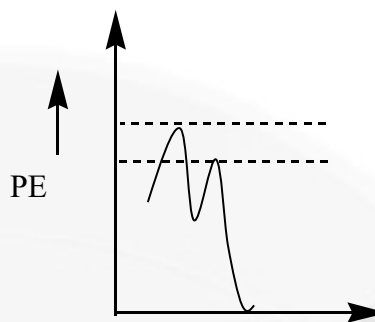


- 1) A= Benzyl alcohol, B= Benzyl isocyanide
2) A= Benzyl alcohol, B= Benzyl cyanide
3) A= Benzyl chloride, B= Benzyl cyanide
4) A= Benzyl chloride, B= Benzyl isocyanide
36. Which of the following potential energy (PE) diagrams represents the S_N1 reaction?



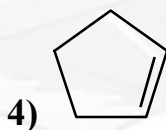
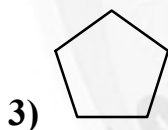
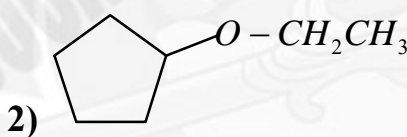
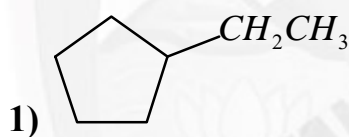
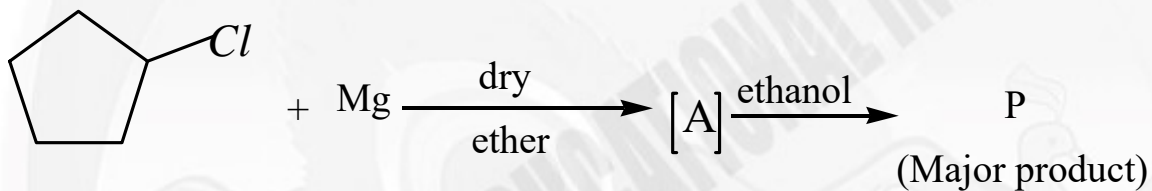


3) Progress of reaction →

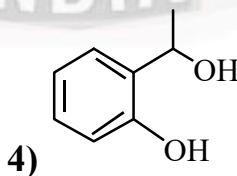
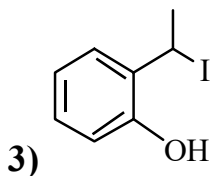
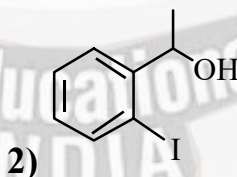
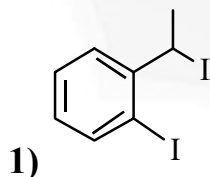
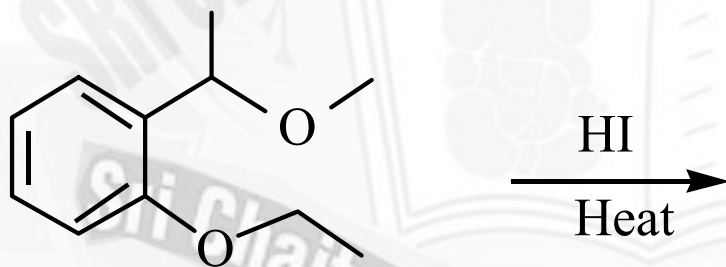


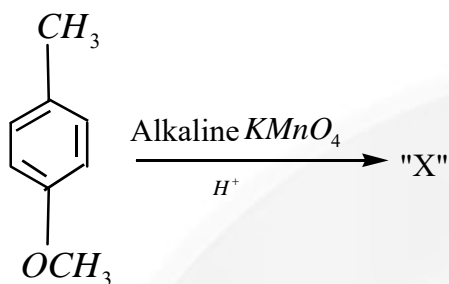
4) Progress of reaction →

37. In the following sequence of reaction the P is:



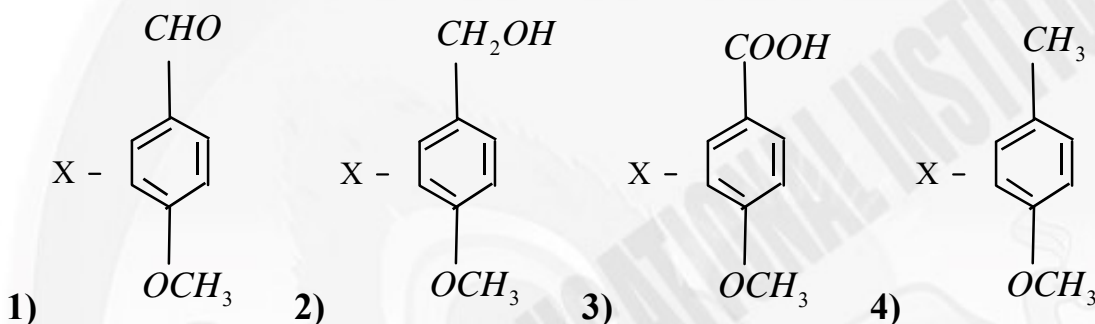
38. The major product formed in the following reaction is :





39.

Considering the above chemical reaction, identify the product “X”:



40. **Statement -I:** The sum of the number of $\text{—}\overset{\text{O}}{\parallel}{\text{C}}\text{—}$ groups and the number of peptide linkages in given structure of peptide chain Asp-Gly-Lys is 6

Statement – II: The number of hetero atoms within the cyclic ring system of the monomer of Nylon6 is one

- 1) Statement -I & II both are correct
- 2) Statement -I & II both are incorrect
- 3) Statement -I is correct, Statement – II- incorrect
- 4) Statement -I is incorrect, Statement – II- correct

41. **Statement-I:** Beryllium halide is IIA group metallic dihalide, Which is covalent in nature

Statement-II: Beryllium chloride has dimer state in solid state but it exhibit chain structure in vapour state

- 1) Statement -I & II both are correct
- 2) Statement -I & II both are incorrect
- 3) Statement -I is correct, Statement – II- incorrect
- 4) Statement -I is incorrect, Statement – II- correct





42. Match the following

	LIST-I		LIST-II
A)	$Ca(OH)_2 + Cl_2$	P)	Quick lime
B)	$Be(OH)_2 + 2HCl + H_2O$	Q)	$BeCl_2 + CO$
C)	$CaCO_3$ heating at 1070 to 1270K	R)	$[Be(OH)_4]Cl_2$
D)	$BeO + C + Cl_2$ heated at 600 - 800K	S)	$CaCl_2 + Ca(OCl)_2 + 2H_2O$

1) A-S, B-R, C-P, D-Q

2) A-Q, B-P, C-R, D-S

3) A-P, B-Q, C-R, D-S

4) A-R, B-S, C-Q, D-P

43. Match the following

	COULMN-I		COLUMN-II
A)	Guanine	P)	Purine
B)	Thymine	Q)	Pyrimidine
C)	Uracil	R)	RNA
D)	RIBOSE	S)	DNA

1) $A \rightarrow Q; B \rightarrow R; C \rightarrow P; D \rightarrow Q$

2) $A \rightarrow P, R, S; B \rightarrow Q, S; C \rightarrow Q, R; D \rightarrow R$

3) $A \rightarrow Q; B \rightarrow P, R; C \rightarrow Q; D \rightarrow S$

4) $A \rightarrow Q; B \rightarrow P; C \rightarrow R; D \rightarrow S$

44. Match the following

	COULMN-I		COLUMN-II
A)	Glucose	P)	Dextrose
B)	Sucrose	Q)	Disaccharide
C)	Lactose	R)	Reducing
D)	Starch	S)	Non - reducing

1) $A \rightarrow P, R; B \rightarrow Q, S; C \rightarrow Q, R; D \rightarrow S$

2) $A \rightarrow S; B \rightarrow R; C \rightarrow P, S; D \rightarrow R$

3) $A \rightarrow Q; B \rightarrow P, R; C \rightarrow P, R; D \rightarrow S$

4) $A \rightarrow Q, S; B \rightarrow R; C \rightarrow P, R; D \rightarrow P$

45. Assertion (A): All halogens exhibit +1, +3, +5, +7 Oxidation states except Fluorine

Reason(R): Fluorine is most electronegative element with -1 oxidation state and F_2 has least bond dissociation Enthalpy among the halogens

1) Both assertion and reason are correct & 'R' is correct explanation of A

2) Both assertion and reason are correct & 'R' is not correct explanation of A

3) A is true & R is false

4) A is false & R is true



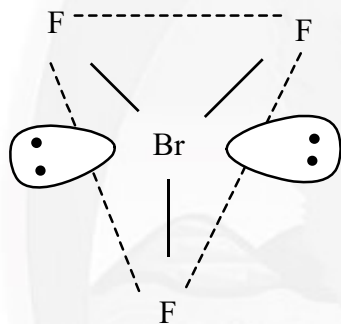


46. **Assertion (A):** Cl_2 can be manufactured by oxidation of $HCl_{(g)}$ at 723K. In the presence of cupric chloride as catalyst

Reason (R): Cl_2 is obtained during electrolysis of brine (concentrated $NaCl$ solution)

- 1) Both assertion and reason are correct & 'R' is correct explanation of A
- 2) Both assertion and reason are correct & 'R' is not correct explanation of A
- 3) A is true & R is false
- 4) A is false & R is true

47. **Assertion (A):**



is stable structure of BrF_3

Reason (R): The two lone pair occupy the equatorial position to minimize lone pair-lone pair and the bond pair – lone pair repulsions which are greater than the bond pair – bond pair repulsions.

- 1) Both assertion and reason are correct & 'R' is correct explanation of A
- 2) Both assertion and reason are correct & 'R' is not correct explanation of A
- 3) A is true & R is false
- 4) A is false & R is true

48. **Statement – I:** O_3 is the thermodynamically unstable

Statement – II: The two oxygen bond lengths in the O_3 molecule are identical due to Resonance

- 1) Statement -I & II both are correct
- 2) Statement -I & II both are incorrect
- 3) Statement -I is correct, Statement – II- incorrect
- 4) Statement -I is incorrect, Statement – II- correct





49. **Statement – I:** The Moist SO_2 behave as oxidizing Agent

Statement – II : The $H_2S_2O_8$ has 4 “oxo “groups with one Peroxy bond

- 1) Statement -I & II both are correct
- 2) Statement -I & II both are incorrect
- 3) Statement -I is correct, Statement – II- incorrect
- 4) Statement -I is incorrect, Statement – II- correct

50. Correct statement is

- 1) $H_2O < H_2S < H_2Se < H_2Te$ Reducing power
- 2) $H_2Te < H_2S < H_2Se < H_2O$ Bond angle
- 3) $H_2O < H_2S < H_2Se < H_2Te$ Thermal stability
- 4) $H_2O > H_2S > H_2Se > H_2Te$ Boiling point

(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 oxidation state of phosphorus in hypo phosphoric acid is +

52. Among the following allotropic forms of Sulphur, the number of allotropic forms, which will show paramagnetism is

- A) α - Sulphur B) β -sulphur C) S_2 -form

53. The number of $Cl = O$ bonds in perchloric acid is , “ _____ “

54. The sum of lone pairs present on the central atom of the interhalogen IF_5 and IF_7 is

55. The Oxidation state of Sulphur in peroxy disulphuric acid is ‘P’ and the number of peroxy bonds is ‘Q’ and the number of oxygen atoms with uninegative oxidation state are ‘R’. The value of $P+Q-R$ is

56. The oxidation state of Iron in ‘X’ compound is , Aqueous solution of Nitrate Salt is mixed with equal volume of freshly prepared $FeSO_4$ solution. When concentrated H_2SO_4 is added dropwise along the walls of tube without disturbing, The ‘X’ is appearing at the interface (Magnitude)





57. The number of P-O-P bonds in hypophosphoric acid is X
The number of P-O-P bonds in Pyrophosphoric acid is Y
The value of X+Y is -----
58. The number of canonical structure of Sulphur Dioxide is P. The Oxidation state of central non-metal in moderately strong oxidizing agent, from the following oxidizing agents like H_3PO_4 , HNO_3 , hot concentrated H_2SO_4 is Q
 \therefore The value of P + Q is
59. The number of incorrect statements,
(i) The electron gain enthalpy of fluorine is less negative as compared to chlorine.
(ii) F-F bond dissociation Enthalpy is very high
(iii) F^- has high hydration Enthalpy
(iv) $HF < HCl < HBr < HI \rightarrow$ Acidic strength order
(v) $HF > HCl > HBr > HI \rightarrow$ Bond length order
60. M = A metal which exhibit positive reduction potential in 3d transition series
 $M + HNO_3(conc) \rightarrow M(NO_3)_2 + P_{(gas)} + H_2O$
 $M + HNO_3(dilute) \rightarrow M(NO_3)_2 + Q_{(gas)} + H_2O$
Oxidation state of nitrogen in P and Q gases are x and y are respectively. The value of the product of $x \times y$ is



**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. Suppose $ax + by + c = 0$, where a, b, c are in A.P. be a normal to a family of circles. The equation of the circle of the family which intersects the circle $x^2 + y^2 - 4x - 4y - 1 = 0$ orthogonally is 'S' then radius of 'S' is
- 1) $\sqrt{8}$ 2) $\sqrt{7}$ 3) $\sqrt{6}$ 4) 8
62. The vertex A of $\triangle ABC$ is (3, -1). Equation of median BE and internal angular bisector CF are $6x + 10y - 59 = 0$ and $x - 4y + 10 = 0$ respectively. Then the Y- coordinate of B is
- 1) -8 2) 8 3) 0 4) 4
63. Let the tangents drawn to the circle $x^2 + y^2 = 16$ from the point $P(0, h)$ meet the X- axis at points A and B. If the area of $\triangle APB$ is minimum then h^2 is equal to
- 1) $4\sqrt{2}$ 2) $3\sqrt{3}$ 3) 30 4) 32
64. The set of all values of a^2 for which the line $x + y = 0$ bisects two distinct chords drawn from a point $P\left(\frac{1+a}{2}, \frac{1-a}{2}\right)$ on the circle $2x^2 + 2y^2 - (1+a)x - (1-a)y = 0$ is equal to
- 1) $(8, \infty)$ 2) $(0, 4)$ 3) $(4, \infty)$ 4) $(2, 7)$
65. Let sides of an isosceles triangle are $7x - y - 4 = 0$ and $x + y + 1 = 0$ if $(1, 2)$ is on the base then the perpendicular distance from origin to the base is
- 1) 2 2) 0 3) $\frac{3}{\sqrt{10}}$ 4) $\frac{5}{\sqrt{10}}$
66. The ortho centre of a triangle lies on the variable line $(1 + 2\lambda)x - (2 + \lambda)y = 4 + 5\lambda$ and circum centre lies on $(1 + 2\mu)x - (2 + \mu)y = 4\mu + 5 \forall \lambda, \mu \in R$, The centroid of this triangle is (x_1, y_1) then $x_1 + y_1$ is
- 1) $-\frac{1}{3}$ 2) $\frac{1}{3}$ 3) 0 4) 1





67. Assertion (A): The integral value of $\int_0^2 x\sqrt{2-x} dx = \frac{16\sqrt{2}}{15}$

Reason (R): The value of integral $\int_0^a x(a-x)^n dx = \frac{a^{n+2}}{(n+1)(n+2)}$

- 1) Both A and R are wrong 2) Both A and R are correct
3) A is correct and R is wrong 4) A is wrong and R is correct

68. Let $f(x)$ be a polynomial function such that $f(x) + f'(x) + f''(x) = x^5 + 64$ Then the

value of $\lim_{x \rightarrow 1} \frac{f(x)}{x-1} = k$ then the sum of the digits of k

- 1) 6 2) -15 3) 15 4) 14

69. The System of equations in 3 Unknowns is
$$\begin{pmatrix} 3 & 2 & 1 \\ 0 & 8 & 4 \\ 0 & 0 & [3\sin\theta + 4] \end{pmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ 6 \\ [\sin\theta + 3] \end{bmatrix}$$

Where $[]$ is G.I.F, Then the system Possesses

- 1) Unique Solution for every θ
2) Infinite number of solutions, for every θ
3) No Solution for every ' θ '
4) Finite number of solution but not Unique, for every θ

70. Let $A = [a_{ij}]$ be a square matrix of order 3 such that $a_{ij} = 2^{j-i}$, for all $i, j=1,2,3$ Then the

matrix $A^2 + A^3 + A^4 + \dots + A^{10} = \left(\frac{3^\lambda - 3}{2} \right) A$ then λ is

- 1) 10 2) 11 3) 12 4) 9





71. $\int \frac{x^4 - 2}{x^2 \sqrt{x^4 + x^2 + 2}} dx =$

1) $\sqrt{x^2 + \frac{2}{x^2} + 1} + C$

2) $\sqrt{x^2 + \frac{3}{x^2} + 1} + C$

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

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

72. Let M & N be the number of points on the curve $y^5 - 9xy + 2x = 0$ where the tangents to the curve are parallel to x-axis and y-axis respectively, then the value of $M + N =$ _____

1) 5

2) 2

3) 3

4) 1

73. Statement 1: on the interval $\left[\frac{5\pi}{4}, \frac{4\pi}{3}\right]$ The least value of the function

$$f(x) = \int_{\frac{5\pi}{4}}^x (3\sin t + 4\cos t) dt \text{ is } 0$$

Statement 2 ; $f(x)$ is a decreasing function on the interval $[a, b]$. Then the least value of

$f(x)$ is $f(b)$

1) Both statements are true

2) Both statements are false

3) Statement 1 is true and Statement 2 is false

4) Statement 1 is false and Statement 2 is true

74. The area enclosed between the curves $|x| + |y| \geq 2$ and $y^2 = 4\left(1 - \frac{x^2}{9}\right)$ is $(k\pi - 8)$ sq units

then k is

1) 4

2) 6

3) 9

4) 2





75. Let three vectors $\vec{a}, \vec{b}, \vec{c}$ be such that $\vec{a} \times \vec{b} = \vec{c}$, $\vec{b} \times \vec{c} = \vec{a}$ and $|\vec{a}| = 2$. Then which of the following is **NOT TRUE**?
- 1) $[\vec{a}\vec{b}\vec{c}] + [\vec{c}\vec{a}\vec{b}] = 8$ 2) Projection of \vec{a} on $\vec{b} \times \vec{c}$ is 2
- 3) $|3\vec{a} + \vec{b} - 2\vec{c}|^2 = 51$ 4) $\vec{a} \times ((\vec{b} + \vec{c}) \times (\vec{b} - \vec{c})) = \vec{0}$
76. Let the slope of the tangent to a curve $y = f(x)$ at (x, y) be given by $2 \tan x (\cos(x) - y)$. If the curve passes through the point $\left(\frac{\pi}{4}, 0\right)$, then the value of $f\left(\frac{\pi}{2}\right)$ is
- 1) 2 2) 0 3) 5 4) $2 + \frac{\pi}{\sqrt{2}}$
77. The length of the perpendicular drawn from the point $(2, 1, 4)$ to the plane containing the lines $\vec{r} = (\hat{i} + \hat{j}) + \lambda(\hat{i} + 2\hat{j} - \hat{k})$ and $\vec{r} = (\hat{i} + \hat{j}) + \mu(-\hat{i} + \hat{j} - 2\hat{k})$ is K then K^2
- 1) 3 2) 6 3) $\frac{1}{3}$ 4) $\frac{1}{\sqrt{3}}$
78. In a right angled triangle $BC = 5$, $AB = 4$, $AC = 3$. Let S be the circum circle. Let S_1 be the circle touching both sides AB and AC and circle S internally. Let S_2 be the circle touching the produced sides AB and AC of $\triangle ABC$, and touching the circle S externally. If r_1, r_2 are radii of circles S_1 and S_2 respectively then $r_1 r_2 =$
- 1) 12 2) 20 3) 15 4) 24
79. A circle passing through the vertex C of a rectangle ABCD and touches its sides AB and AD at M and N respectively. If \perp^{lar} distance from C to the line segment \overline{MN} is equal to 5 then area of rectangle ABCD is K then the unit place of K is
- 1) 2 2) 1 3) 5 4) 3





80. In a $\triangle ABC$ $x + y + 2 = 0$ is the perpendicular bisector of side AB and it meets AB at $(-1, -1)$. If $x - y - 1 = 0$ is \perp bisector of side AC and it meets AC at $(2, 1)$ and P is mid point of BC then distance of P from ortho centre of $\triangle ABC$ is \sqrt{k} then k is
- 1) 5 2) $\sqrt{8}$ 3) 13 4) 7

(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. $a = \max \left\{ (x+2)^2 + (y-3)^2 \right\}$ and $b = \min \left\{ (x+2)^2 + (y-3)^2 \right\}$ where (x, y) lies on the circle $x^2 + y^2 + 8x - 10y - 59 = 0$. Then $a+b=$
82. A straight line cuts off the intercepts $OA = a$ and $OB = b$ on the positive direction of x-axis and y-axis respectively if the perpendicular from origin O to this line makes an angle of $\frac{\pi}{6}$ with positive direction of y-axis and the area of $\triangle OAB$ is $\frac{98}{3}\sqrt{3}$ Then $[a^2 - b^2]$ is equal to (where $[\cdot]$ is G.I.F)
83. Let B be the centre of the circle $x^2 + y^2 - 2x + 4y + 1 = 0$. Let the tangent at Two points P and Q on the circle intersect at the point $A(3, 1)$ Then $8 \left(\frac{\text{Area of } \triangle APQ}{\text{Area of } \triangle BPQ} \right) = \lambda$ then $\frac{\lambda}{9}$ is
84. If $9 + f^{11}(x) + f^1(x) = x^2 + f^2(x)$ be a differential equation of a curve and P be the point of minima of this curve Then the number of tangents which can be drawn from P to the Circle $x^2 + y^2 = 8$ is
85. Tangents are drawn from external point $P(6, 8)$ to the circle $x^2 + y^2 = r^2$. The radius r of circle such that area of triangle formed by the tangents and chord of contact is maximum is _____





86. 'O' is the ortho centre of the triangle formed by $A(1, -3), B(7, 2), C(2, 5)$ The distance between the ortho centres of $\triangle BOC, \triangle AOB$ is \sqrt{k} Then $k+4=$ _____
87. The maximum positive integral value of b for which the origin and the point $(1, 1)$ lies on the same side of straight line $a^2x + aby + 1 = 0$ for all $a \in \mathbb{R} - \{0\}$ is _____
88. Shortest distance between the z -axis and the line $x + y + 2z - 3 = 0 = 2x + 3y + 4z - 4$ is _____
89. The value of $\lim_{x \rightarrow 0} \frac{1 + \sin x - \cos x + \log(1-x)}{x^3}, (x < 1)$ is L Then $2|L| =$ _____
90. If $f(x) = \begin{cases} |1 - 4x^2|; & 0 \leq x < 1 \\ [x^2 - 2x]; & 1 \leq x < 2 \end{cases}$ where $[.]$ is G.I.F Then the number of points where $f(x)$ is not differentiable in $(0, 2)$ is /are _____





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Category Ranks

32

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1000
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Category Ranks

181

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