Test Date: 12/08/2020

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CODE

Aakash
Medical | IIT-JEE | Foundations
(Divisions of Aakash Educational Services Limited)

Regd. Office: Aakash Tower, 8, Pusa Road, New Delhi-110005, Ph.011-47623456

Time : 3 hrs **MM : 186**

Mock Test_CoE_XII
for JEE (Advanced) - 2020

Test – 5A (Paper – 2)_Actual Pattern-2019

Topics covered:

PHYSICS : MOCK TEST on Complete Syllabus

CHEMISTRY : MOCK TEST on Complete Syllabus

MATHEMATICS : MOCK TEST on Complete Syllabus

General Instructions:

1. Read each question carefully.
2. It is mandatory to use blue/black ballpoint pen to darken the appropriate circle in the answer sheet.
3. Mark should be dark and should completely fill the circle.
4. Rough work must not be done on the answer sheet.
5. Do not use white-fluid or any other rubbing material on answer sheet.
6. Student cannot use log table and calculator or any other material in the examination hall.
7. Before attempting the question paper, student should ensure that the test paper contains all pages and no page is missing.
8. Before handing over the answer sheet to the invigilator, candidate should check that Roll No., Centre Code and Date of Birth have been filled and marked correctly.
9. Immediately after the prescribed examination time is over, the answer sheet is to be returned to the invigilator.
10. **Pattern of the questions are as under:**
    (i) The question paper consists of three parts **(Physics, Chemistry and Mathematics)**. Each part has three sections.
    (ii) **Section-1:** This section contains **8** multiple choice questions which have one or more correct answer(s). Each question carries **+4** marks for correct answer and –1 mark for wrong answer. Partial +1 mark is given for darkening a bubble corresponding to each correct option, provided NO incorrect option is darkened.
    (iii) **Section-2:** This section contains **6** questions. The answer to each of the questions is a double-digit integer, ranging from 00 to 99 (both inclusive) without being given any option. Each question carries **+3** marks for correct answer and there is no negative mark for wrong answer.
    (iv) **Section-3:** This section contains **Two** List-Match sets. Each List-Match set has **Two** Multiple Choice Questions. **List-I has Four** entries (I), (II), (III) and (IV) and **List-II** has **Six** entries (P), (Q), (R), (S), (T) and (U). **Four** options are given in each Multiple Choice Question based on **List-I and List-II** and **Only one** of these four options satisfies the condition asked in the Multiple Choice Question. Each question carries **+3 marks** for correct answer and **–1 mark** for wrong answer.

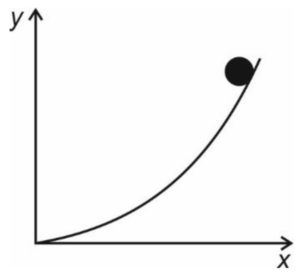
PART – I: PHYSICS

SECTION - 1

One or More Options Correct Type

This section contains 8 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **one or more is/are correct**.

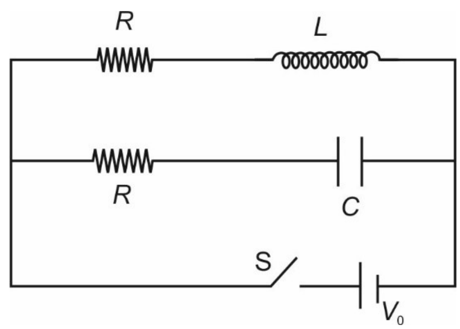
1. A small disc of mass m is released on a parabolic curve in a vertical plane such that gravity acts along negative Y-axis. The equation of parabolic curve is $x^2 = 2ay$, where a is a positive constant. Frictional force between disc and curve are sufficient for pure rolling. When the disc is released at $x = a$, then



(A) Friction force on disc is $\frac{mg}{2\sqrt{3}}$ (B) Friction force on disc is $\frac{mg}{3\sqrt{2}}$

(C) Acceleration of disc is $\frac{\sqrt{2}g}{3}$ (D) Acceleration of disc is $\frac{2g}{3\sqrt{3}}$

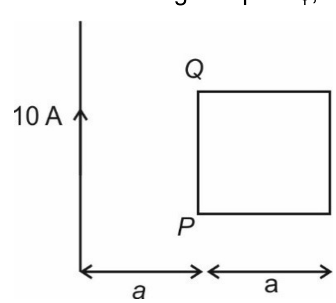
2. Two resistors, one inductor and a capacitor are connected in a circuit with a battery and switch as shown in figure. If switch 'S' is closed at $t = 0$, then $\left[\frac{2L}{R} = RC\right]$



(A) Maximum current through battery is $\frac{4V_0}{3R}$ (B) Maximum current through battery is $\frac{5V_0}{4R}$

(C) Initial current through battery is $\frac{V_0}{R}$ (D) Initial current through battery is $\frac{2V_0}{R}$

3. A square frame of resistance 0.7Ω and side length a = 10 cm and a long straight wire carrying current I = 10 ampere are located in same plane. The frame is rotated through an angle of 120° about the side PQ. Let charge flown through loop be q and final flux through loop be ϕ, then



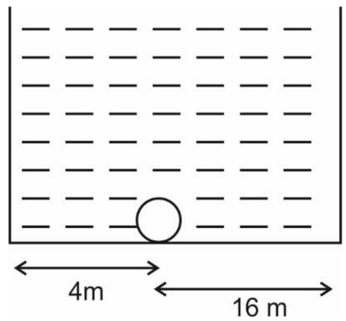
(A) $\phi = 0$

(B) $\phi = \frac{\mu_0 Ia}{4\pi}\ln(2)$

(C) $q = 2 \times 10^{-7}$ C

(D) $q = 4 \times 10^{-7}$C

4. A small spherical ball of density 5ρ is released from rest in a vessel filled with liquid of density ρ. Vessel is given acceleration of $10\hat{i}$ m/s^2. If t_0 is time taken by ball to hit the wall of vessel and a_0 be the acceleration of ball, then



(A) $a_0 = 2\text{ m/s}^2\,\hat{i}$

(B) $a_0 = -2\,\hat{i}\text{ m/s}^2$

(C) t_0 = 2s

(D) t_0 = 1s

5. A radioactive sample contains two radioactive samples A and B having decay constant λ and 2λ. Initially activity of whole sample is A_0, where activity of sample A is $\frac{A_0}{4}$. After time t_0, activity of sample A is $\frac{3}{4}^{th}$ of total activity of sample then

(A) Initial ratio of number of A to B is $\frac{2}{3}$

(B) Initial ratio of number of A to B is $\frac{4}{3}$

(C) $t_0 = \frac{2}{\lambda}\ln(3)$

(D) $t_0 = \frac{1}{\lambda}\ln(3)$

6. In the given reaction

${}_3Li^7 + {}_1H^1 \rightarrow {}_4Be^7 + {}_0H^1$, Q value is – 1.645 MeV. Proton is given minimum possible kinetic energy (K) to initiate the reaction. If K_1 is the kinetic energy of products after the reaction then

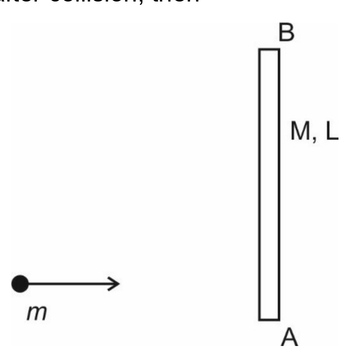
(A) K = 1.88 MeV

(B) K = 1.65 MeV

(C) K_1 = 0.235 MeV

(D) K_1 = 0.205 MeV

7. A rod AB of mass M and length L is lying on smooth horizontal surface. A particle of mass m travelling along the surface hits the end 'A' of the rod with velocity V_0 in direction perpendicular AB. If the collision is elastic and particle comes to rest after collision, then



(A) $\frac{m}{M} = \frac{1}{4}$

(B) $\frac{m}{M} = 4$

(C) Maximum tension in the rod is $\frac{9MV_0^2}{32L}$

(D) Maximum tension in the rod is $\frac{9mV_0^2}{16L}$

8. A rod of length L with sides fully insulated is of material whose thermal conductivity varies with temperature as $K = \frac{\alpha}{T}$, where α is a constant. The ends of the rod are T_1 and T_2. Temperature at mid-point of the rod is T_0

   (A) $T_0 = \sqrt{T_1 T_2}$

   (B) $T_0 = \frac{T_1 + T_2}{2}$

   (C) Temperature gradient increases along the direction of heat flow

   (D) Temperature gradient decreases along the direction of heat flow

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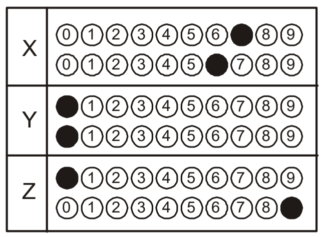
SECTION - 2
Integer Value Correct Type

This section contains 6 questions. The answer to each of the questions is a **double-digit integer,** ranging from 00 to 99. The answer will have to be appropriately bubbled in the OMR as per the instructions as follows. **Examples-** If the correct answer to question numbers X, Y and Z (say) are 76, 0 and 9 respectively, then mark 76, 00 and 09 in OMR respectively.



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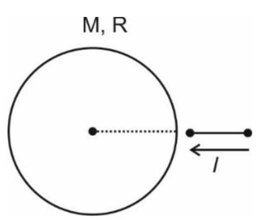
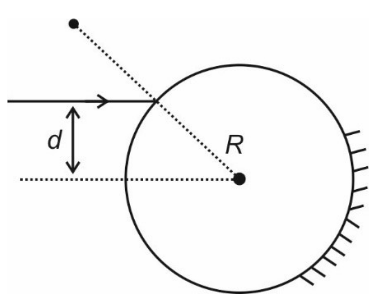
9. Two point like objects each of mass m are connected by rigid massless rod of length $l(<< R)$. the objects are placed near the surface of earth as shown. The objects are released from rest the tension in the rod is $\frac{nGMml}{R^3}$. Value of n is



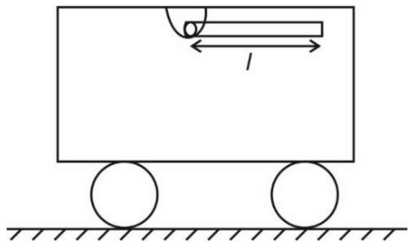
10. Two small balls having same mass and charge are located on the same vertical line at height 20 m, 40 m respectively. They are given same horizontal velocity 10 m/s in same direction. The first ball hits the ground at a distance 10 m from the initial vertical line. Height of second ball at that instant (in m) will be

11. A ray of light passing through the glass sphere as shown in figure. Suffers two refraction & one reflection if $d = \frac{\sqrt{3}R}{2}$ and refractive index of material of glass sphere is $\sqrt{3}$, then deviation (in degree), suffered by emergent ray is 3n. Value of n is

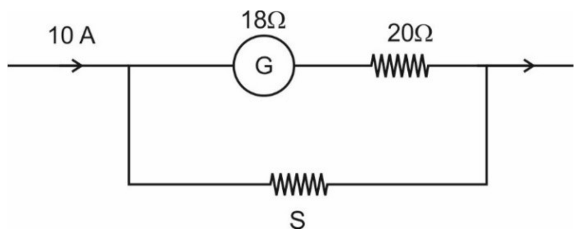


12. The frame of mass 3m is initial at rest. A rod of mass m pivots freely at end A. Initially rod is in horizontal position. Angular velocity of the rod when it is vertical is $\frac{nV_0}{3l}$, where V_0 is velocity of frame. Value of n is

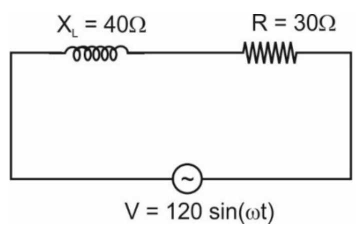
[All surface are smooth]



13. Full scale deflection current for galvanometer is 1A. What should be the value of shunt resistance (in Ω) so that galvanometer shows half scale deflection?



14. In a given LR circuit it at a given instant voltage across inductor is 72V, then voltage across resistor at that instant is $n\sqrt{7}\,V$. Value of n is



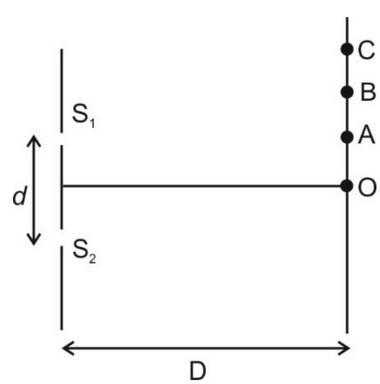
SECTION - 3

Matching Lists Type

This section contains **Two** List-Match sets. Each List-Match set has **Two** Multiple Choice Questions. **List-I has Four** entries (I), (II), (III) and (IV) and **List-II** has **Six** entries (P), (Q), (R), (S), (T) and (U). **Four** options are given in each Multiple Choice Question based on **List-I and List-II** and **Only one** of these four options satisfies the condition asked in the Multiple Choice Question.

Answer Q. 15 and Q. 16 by appropriately matching the lists based on the information given in the paragraph.

In standard YDSE, illuminated by light of wavelength λ, intensity due to each slit on screen is I_0. Three point A, B, C are located on the screen at a distance of $\frac{\lambda D}{6d}, \frac{\lambda D}{3d}, \frac{\lambda D}{2d}$ from O on the same side. Match the entries in List I with List II



List – I		List – II	
I.	Intensity at O	(P)	$4I_0$
II.	Intensity at A	(Q)	$2I_0$
III.	Intensity at B	(R)	I_0
IV.	Intensity at C	(S)	$3I_0$
		(T)	$\frac{I_0}{2}$
		(U)	Zero

15. Match the correct option

(A) I→ (P); II→(S); III→(R); IV→(U)

(B) I→ (P); II→(R); III→(S); IV→(U)

(C) I→ (P); II→(R); III→(U); IV→(S)

(D) I→ (P); II→(S); III→(U); IV→(R)

16. If a transparent strip is placed in path of S_1 such that central maximum is shifted to A, then

(A) I→ (S); II→(P); III→(Q); IV→(T)

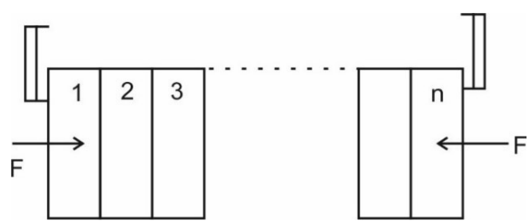
(B) I→ (S); II→(P); III→(S); IV→(R)

(C) I→ (S); II→(P); III→(Q); IV→(S)

(D) I→ (S); II→(P); III→(S); IV→(U)

Answer Q. 17 and Q. 18 by appropriately matching the lists based on the information given in the paragraph.

n identical books each of mass 0.4 kg are to be hold by two hands applying a minimum horizontal force 'F'. Coefficient of friction between hand and books is 0.40 and coefficient of friction between books is 0.20. [g = 10 m/s^2]



List – I		List – II	
I.	F (in N)	(P)	140
II.	Normal contact force between two consecutive books (in N) is	(Q)	100
III.	Friction force between books 1 and 2 (in N) is	(R)	120
IV.	Least value of friction force between any two books (in N) is	(S)	20
		(T)	Zero
		(U)	2

17. If 12 books can be hold by applying minimum force 'F' then

(A) I→ (Q); II→(Q); III→(S); IV→(T)
(B) I→ (Q); II→(R); III→(S); IV→(U)
(C) I→ (R); II→(R); III→(S); IV→(T)
(D) I→ (R); II→(Q); III→(T); IV→(S)

18. If coefficient of friction between hand and book is 0.30 and maximum 12 of the books can be hold by applying force 'F', then

(A) I→ (P); II→(Q); III→(S); IV→(T)
(B) I→ (Q); II→(Q); III→(S); IV→(T)
(C) I→ (Q); II→(Q); III→(T); IV→(U)
(D) I→ (R); II→(R); III→(S); IV→(T)

PART – II: CHEMISTRY

SECTION - 1

One or More Options Correct Type

This section contains 8 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **one or more is/are correct**.

19. Which of the following statement(s) is/are correct?

(A) The rate of a process is always proportional to the change in free energy of the same process
(B) The molecularity of an elementary reaction is equal to sum of the stoichiometric coefficients of the reactants
(C) The first order reaction goes on for an infinitely long time
(D) The activation energy is directly proportional to the temperature

20. Identify the correct statement(s)

(A) Addition of 9 g of water to 100 gm of 112% labelled Oleum sample still has $\frac{1}{6}$ mol of unreacted SO_3
(B) An oleum sample labelled as 105.625% has 25% SO_3 in it.
(C) An oleum sample with 130% labelling cannot be prepared
(D) 100 gm sample of 105.6% labelled Oleum requires at least 6 gm of water to completely react with SO_3 present in it.

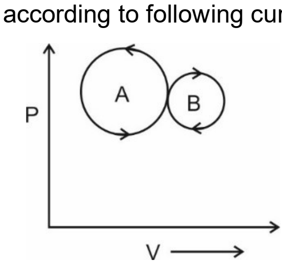
21. An FCC lattice is made up of hollow sphere of B. Spheres of solid (A) are present inside the hollow spheres of B. Radius of A is half of that of B. What is the ratio of total volume of spheres of B unoccupied by A in a unit cell to the total volume of unit cell made up of B?

(A) $\frac{7\sqrt{2}\pi}{48}$
(B) $\frac{7\sqrt{3}\pi}{48}$
(C) $\frac{7\sqrt{3}\pi}{64}$
(D) $\frac{7\sqrt{3}\pi}{16}$

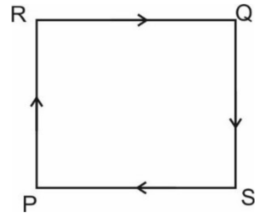
22. Which of the following ppt is/are soluble in excess of NaOH but insoluble in excess of NH_4OH?

(A) $Pb(OH)_2$
(B) $Zn(OH)_2$
(C) $Sn(OH)_2$
(D) $Sn(OH)_4$

23. Consider a body allowed to do work according to following curve



Area of circle A = 40 units and that of B = 36 units. Total work done = X units



When a system moves from state P to Q along with path PRQ as shown in figure, 5 units of heat flows into the system and system does 3 units of work. If y units of heat flows into the system along the path PSQ and work done by the system is 2 units

Identify the correct statement(s)

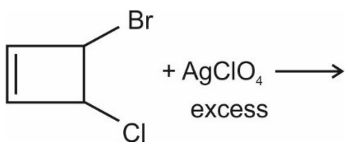
(A) The value of x = y

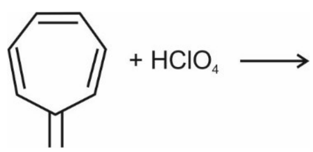
(B) The value of x + y = 8

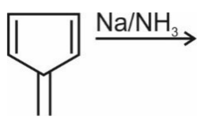
(C) The value of (x) (y) = 16

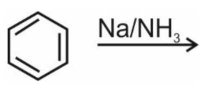
(D) The value of $x \neq y$

24. Which of the following reaction(s) is/are possible?

(A) 

(B) 

(C) 

(D) 

25. Which of the following option(s) represent the correct increasing order of properties mentioned with

(A) Thermal stability : $BeCO_3 > MgCO_3 > CaCO_3 > BaCO_3$

(B) Polarizing Power: $Be^{+2} > Mg^{2+} > Ca^{2+} > K^+$

(C) Basic strength: LiOH < NaOH < KOH < RbOH

(D) Lattice energy: $BeCO_3 > MgCO_3 > CaCO_3 > BaCO_3$

26. Consider the hydrolysis of Racemic mixture of 3-Chloro-1-butene.

Identify the correct statement(s)

(A) Reaction occurs through S_N1

(B) 6 Stereoisomers are produced with degree of unsaturation equal to one

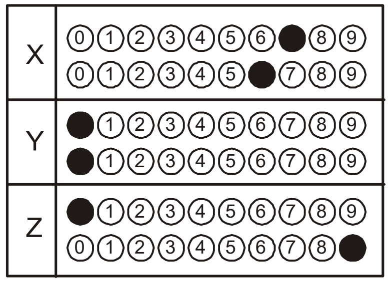
(C) Intermediate formed is Chiral

(D) At least two optically inactive products formed

SECTION - 2

Integer Value Correct Type

This section contains 6 questions. The answer to each of the questions is a **double-digit integer,** ranging from 00 to 99. The answer will have to be appropriately bubbled in the OMR as per the instructions as follows. **Examples-** If the correct answer to question numbers X, Y and Z (say) are 76, 0 and 9 respectively, then mark 76, 00 and 09 in OMR respectively.



27. The solubility of AgCN in an acidic buffer is 1.5×10^{-5} M. Given K_{SP} of AgCN = 9×10^{-15} and Ka of HCN is 4×10^{-10}. The pH of the buffer is

28. Amongst the following the total number of compounds which liberate either an acidic gas or a paramagnetic gas on heating

    $FeSO_4$, $NaNO_3$, $AgNO_3$, $Pb(NO_3)_2$, N_2O, NH_4NO_2 , NH_4HS

29. Amongst the following the total number of species which undergo hydrolysis in water under normal conditions is

    XeF_6, SF_6, SeF_6, XeF_4, SF_4, CCl_4, CF_4, $SiCl_4$, P_4O_6, $SOCl_2$, CHI_3, PH_3

30. The total number of isomers which are primary amines with molecular formula C_4H_7N and can have only one π-bond is (including stereoisomers)

31. A container of volume 5L in which NH_3 is present exerting a pressure of 0.48 atm at 300 K. In which 0.01 mol of $CuSO_4$ is added after a sufficient long time there is a formation of blue paramagnetic compound. The pressure inside the container becomes P atm. The value of $\frac{1000\,P}{144}$ is [R = 0.08 atm L mol^{-1} K^{-1}]

32. An acidic solution of Cu^{+2} salt containing 1.27 g of Cu^{+2} is electrolysed until all the copper is deposited. The electrolysis is continued for 10 more minutes with the volume of solution kept at 100 ml and the current at 1.5 amp. The pH of the final solution is found to be X. The value of 10 X is [Cu = 63.5 g/mol, log2 = 0.3]

SECTION - 3

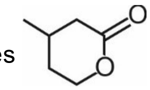
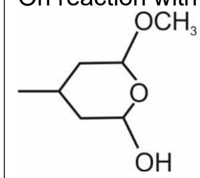
Matching Lists Type

This section contains **Two** List-Match sets. Each List-Match set has **Two** Multiple Choice Questions. **List-I has Four** entries (I), (II), (III) and (IV) and **List-II** has **Six** entries (P), (Q), (R), (S), (T) and (U). **Four** options are given in each Multiple Choice Question based on **List-I and List-II** and **Only one** of these four options satisfies the condition asked in the Multiple Choice Question.

Answer Q. 33 and Q. 34 by appropriately matching the lists based on the information given in the paragraph.

Compound (A), $C_6H_{12}O_2$, Optically active oxidised by $[Ag(NH_3)_2]^+$ to an optically active compound (B). A on oxidation with CrO_3 in Pyridine gives optically inactive compound (C) which on treating with ZnHg/HCl gave 3-Methylpentane. A on oxidation with H_2CrO_4 gave optically inactive compound (D)

List – I (Compounds from the above mentioned Reaction sequence)		**List – II (Characteristics)**	
I.	A	(P)	Two stereoisomers are possible

II.	B	(Q)	On reaction with dil. H_2SO_4 it gives 
III.	C	(R)	On reaction with $^{-}OCH_3$ it gives 
IV.	D	(S)	Compound has two aldehyde groups
		(T)	Compound has two carboxylic groups
		(U)	Compound cannot show geometrical isomerism

33. Which of the following option has the correct combination considering List I and List II?

(A) I→ (P, U); II→(P, Q, U)

(B) I→ (P, Q, U); II→(P, U)

(C) I→ (P); II→(P, Q)

(D) I→ (U); II→(P, Q)

34. Which of the following option has the correct combination considering List I and List II?

(A) III→(R, S); IV→(T, U)

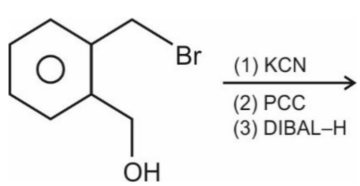
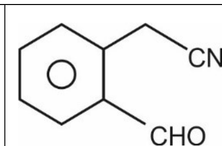
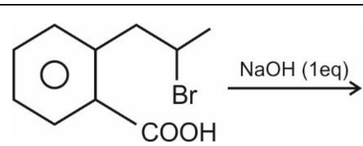
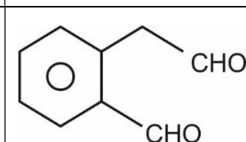
(B) III→(T, U); IV→(R, S, U)

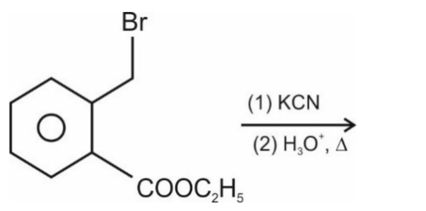
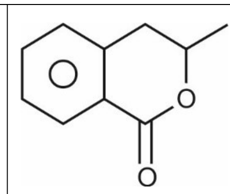
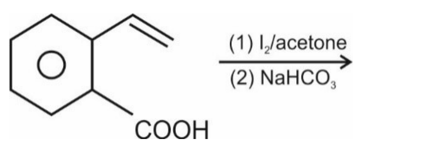
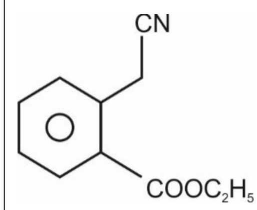
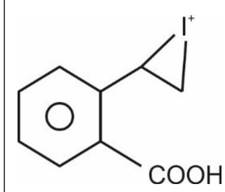
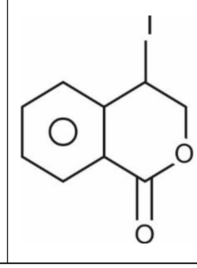
(C) III→(R, S, U); IV→(T, U)

(D) III→(T, U); IV→(R, U)

Answer Q. 35 and Q. 36 by appropriately matching the lists based on the information given in the paragraph.

List I includes staring materials and reagent of selected chemical reaction. List II gives structures of compounds that may be formed as an intermediate product or final product from the reaction List I

List – I		**List – II**	
I.		(P)	
II.		(Q)	

III.		(R)	
IV.		(S)	
		(T)	
		(U)	

35. Which of the following options has correct combination considering List I and List II?

(A) I$\rightarrow$ (P, R)

(B) I$\rightarrow$ (P, Q)

(C) II$\rightarrow$(S)

(D) II$\rightarrow$(R, S)

36. Which of the following option has correct combination considering List I and List II?

(A) III$\rightarrow$(S)

(B) III$\rightarrow$(R)

(C) IV$\rightarrow$(R, T, U)

(D) IV$\rightarrow$(R, T)

PART – III: MATHEMATICS

SECTION - 1

One or More Options Correct Type

This section contains 8 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **one or more is/are correct**.

37. The correct statement(s) is/are

(A) $2\sin\frac{A}{2} = -\sqrt{1-\sin A} - \sqrt{1+\sin A}$, when $\frac{A}{2} = \frac{19\pi}{11}$

(B) $2\sin\frac{A}{2} = -\sqrt{1-\sin A} - \sqrt{1+\sin A}$, when $\frac{A}{2} = \frac{29\pi}{28}$

(C) $2\sin\frac{A}{2} = +\sqrt{1-\sin A} - \sqrt{1+\sin A}$, when $\frac{A}{2} = \frac{31\pi}{28}$

(D) $2\sin\frac{A}{2} = -\sqrt{1-\sin A} + \sqrt{1+\sin A}$, when $\frac{A}{2} = \frac{11\pi}{20}$

38. Which of the following is true?

(A) The least natural number 'a' for which $x + ax^{-2} > 2,\ \forall\ x \in (0, \infty)$ is 2

(B) The least value of the expression $x^2 + 4y^2 + 3z^2 - 2x - 12y - 6z + 14$ is 2

(C) If $\sin\theta + \cos\theta = 1$then the minimum value of $(1 + \operatorname{cosec}\theta)(1 + \sec\theta)$ is 9

(D) If $a, b \in R$ are distinct numbers satisfying $|a - 1| + |b - 1| = |a| + |b| = |a + 1| + |b + 1|$ then the minimum value of $|a - b|$ is 2

39. Consider the Fibonacci sequence 0,1,1,2,3,5,8…whose terms are related by $t_{n+2} = t_{n+1} + t_n$; $n = 0,1,2,\ldots$. (where $t_0 = 0$ and $t_1 = 1$) we can form a matrix by taking three consecutive terms as $f(n) = \begin{bmatrix} t_{n+1} & t_n \\ t_n & t_{n-1} \end{bmatrix}; n = 1,2,3....$ which satisfies $f(n) = f(n-1)A; n = 2,3,4....$, where A is a fixed matrix.

Now, choose correct statement(s).

(A) Sum of all the elements of A is 3

(B) $f(n) = A^{n-1}$

(C) $\det(f(11)) = -1$

(D) $\det(f(10) = -1$

40. Which of the following is/are correct?

(A) Consider the sequence a_n given by $a_1 = \frac{1}{2}, a_{n+1} = a_n^2 + a_n\ \ \forall n \in N$. Let $S_n = \frac{1}{a_1 + 1} + \frac{1}{a_2 + 1} + \ldots + \frac{1}{a_n + 1}$ then $[S_{2017}] = 1$ (where [.] denotes the greatest integer function)

(B) If the A.M., G.M., H.M, of the first and last terms of the series 100, 101, 102, … n, where $100 < n < 500$, are the terms of the series itself then hundreds place of n is 4

(C) If $\sum_{r=1}^{20}(r^2 + r)$ is divisible by 7^n then maximum value of n is 3

(D) For an arithmetic sequence of positive integers, if the sum of the first ten terms is equal to 58th term then the least possible value of the first term of that sequence is 4

41. Consider one side AB of a square ABCD, (read in order) on the line $y = 2x + 3$ and the other two vertices C, D on the parabola $y^2 = 4x$, then which of the following option(s) is/are correct?

(A) Minimum length of intercept of the line CD on x-axis is $5\sqrt{5} - 11$

(B) Minimum possible area of the square ABCD can be $\left(\sqrt{5} - 2\right)^2$

(C) Maximum possible area of the square ABCD can be $25\left(\sqrt{5} + 2\right)^2$

(D) Point of intersection of tangents at points C and D if CD makes minimum intercept on x-axis is $\left(5\sqrt{5} - 11, 1\right)$

42. Players A and B alternatively toss a biased coin, with A going first. A wins if A tosses a tail before B tosses a head otherwise B wins. If the probability of a head is P, the value of P for which the game is fair to both players is greater than or equal to

(A) $2 - \sqrt{3}$

(B) $\frac{1}{\sqrt{2}}$

(C) $\sqrt{3} - 1$

(D) $\frac{\sqrt{5} - 1}{2}$

43. Let O is the origin and also the center of two concentric circles having radii of the inner and the outer circle as a and b respectively. A line OPQ is drawn to cut the inner circle at P and the outer circle in Q. PR is drawn parallel to the y-axis and QR is drawn parallel to the x-axis. Let S be the locus of R, then which of the following options is/are correct?

(A) If the foci of S lie on the inner circle, then ratio of the radii of inner and outer circle is $\frac{1}{2}$

(B) If the foci of S is lie on the inner circle, then eccentricity of S is $\frac{1}{\sqrt{2}}$

(C) Let P_1 be any point on S and F_1, F_2 be foci of S, then eccentricity of locus of incentre of triangle $P_1F_1F_2$ is $\sqrt{2\sqrt{2}-2}$ if focii of S lies on inner circle.

(D) Let P_2 be any point of S and focii F_1, F_2 of S lie on inner circle, then eccentricity of locus of centroid of ΔPF_1F_2 is $\frac{1}{7}\sqrt{3\left(9-4\sqrt{2}\right)}$

44. The line L is drawn through the point (1, 1) to intersect L_1: $x + 2y = 1$ and L_2: $x + 2y = 3$ at P & Q respectively. Line perpendicular to L from P intersects L_2 at R and Line perpendicular to L from Q intersect L_1 at S. If the area of parallelogram PRQS is least then which of the following is/are correct

(A) The equation of line L can be $y + 3x = 4$

(B) The equation of line L can be $3y - x = 2$

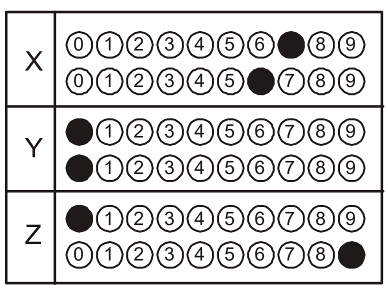
(C) Least area of parallelogram PRQS = $\frac{16}{5}$ square unit

(D) Equation of line L can be $3y - x = 4$

SECTION - 2

Integer Value Correct Type

This section contains 6 questions. The answer to each of the questions is a **double-digit integer,** ranging from 00 to 99. The answer will have to be appropriately bubbled in the OMR as per the instructions as follows. **Examples-** If the correct answer to question numbers X, Y and Z (say) are 76, 0 and 9 respectively, then mark 76, 00 and 09 in OMR respectively.



45. Let $A_n = \int_{\frac{1}{n+1}}^{\frac{1}{n}} \frac{\tan^{-1} nx}{\sin^{-1} nx}dx$ and $\lim_{n\to\infty} n^2 A_n = L$ then $8L$ is equal to

46. Let $f(x) = \begin{cases} \{x^3\} & -1 \le x < 1 \\ |x-2| & 1 \le x < 3 \\ \text{sgn}\left(x^2 - x - 1\right) & 3 \le x \le 4 \end{cases}$; where {.} denotes the fractional part function. If n_1 is the number of points of discontinuity of $f(x)$ in [–1, 4] and n_2 is the number of points of non-differentiability in (–1, 4) then $n_1 . n_2$ is equal to

47. In a triangle ABC with BC = 20, $\angle C = 30°$, D is a point on the side BC, such that $\angle ADC = 135°$. Area of the ΔABC is 50 square units. If BD : DC can be expressed as $a+\sqrt{b}$ (where a, $b \in N$) then $a + b$ is

48. Consider $f(x)=\begin{vmatrix}5 & 7 & 3\\ 2 & 9g^2(x) & 2x^2\\ x & 3g(x)-x^2 & 1\end{vmatrix}-\begin{vmatrix}2 & 4 & 5\\ 2x^2 & 2 & 9g^2(x)\\ 1 & x & 3g(x)-x^2\end{vmatrix}+\begin{vmatrix}2 & x & 0\\ 9g^2(x) & 3g(x)-x^2 & -2\\ 2x^2 & 1 & -1\end{vmatrix}$, where $g(x)$ is a polynomial function such that $M=\int_0^1 f(x)dx$ is minimum. If the number of points of inflection on the graph of the function $y = \phi(x)$, where $\phi(x)=\int_0^x\left(\int_0^t g(y)dy-\left(e^t-e^{-t}\right)\right)dt$ is n. then, $10M - 3n$ is equal to

49. Let $x, y, z \in \{1,2,3,4,5\}$ then number of different value of $\dfrac{x^3}{(x-z)(x-y)}+\dfrac{y^3}{(y-x)(y-z)}+\dfrac{z^3}{(z-x)(z-y)}$ is equal to

50. Let $a \in (1,4)$ and $\int_0^a [x]dx=\int_0^{[a]} x\,dx$, where [.] denotes the greatest integer function. If sum of all possible values of a is N, then value of $[N]$ is

SECTION - 3

Matching Lists Type

This section contains **Two** List-Match sets. Each List-Match set has **Two** Multiple Choice Questions. **List-I has Four** entries (I), (II), (III) and (IV) and **List-II** has **Six** entries (P), (Q), (R), (S), (T) and (U). **Four** options are given in each Multiple Choice Question based on **List-I and List-II** and **Only one** of these four options satisfies the condition asked in the Multiple Choice Question.

Answer Q. 51 and Q. 52 by appropriately matching the lists based on the information given in the paragraph.

Let $\hat{x}$, $\hat{y}$ and $\hat{z}$ be unit vectors such that $\hat{x}+\hat{y}+\hat{z}=\vec{a}$, $\hat{x}\times(\hat{y}\times\hat{z})=\vec{b}$, $(\hat{x}\times\hat{y})\times\hat{z}=\vec{c}$, $\vec{a}.\hat{x}=\frac{3}{2}$, $\vec{a}.\hat{y}=\frac{7}{4}$ and $|\vec{a}|=2$

List – I		**List – II**	
I.	$(\hat{x}+\hat{z}).\hat{y}+\hat{z}.\hat{x}$ is equal to	(P)	$\frac{3}{4}$
II.	$\hat{x}=k\left(3\vec{a}+4\vec{b}+8\vec{c}\right)$ then k is equal to	(Q)	$\frac{1}{2}$
III.	$\hat{y}=\lambda\vec{c}$ then $\left\lvert\frac{1}{\lambda}\right\rvert=$	(R)	$\frac{1}{3}$
IV.	$\hat{z}=\mu\left(\vec{c}-\vec{b}\right)$ then $\left\lvert\frac{1}{\mu}\right\rvert=$	(S)	$\frac{1}{4}$
		(T)	$\frac{5}{4}$
		(U)	1

(where k, λ, μ are real numbers)

51. Which of the following is only CORRECT combination?

(A) I$\rightarrow$ (U) (B) II$\rightarrow$(P)

(C) I$\rightarrow$ (S) (D) II$\rightarrow$(R)

52. Which of the following is only CORRECT combination?

(A) III$\rightarrow$(T) (B) IV$\rightarrow$(T)

(C) III$\rightarrow$(S) (D) IV$\rightarrow$(S)

Answer Q. 53 and Q. 54 by appropriately matching the lists based on the information given in the paragraph.

Suppose n_1 denotes the number of values of $x = x_1$ belonging to the domain of $f(x)$ and lying in the interval $(0, 2\pi)$ at which $f(x)$ is discontinuous.

n_2 denotes the number of values of $x = x_1$ belonging to the domain of $f(x)$ and lying in the interval $(0, 2\pi)$ at which $f(x)$ is discontinues but $\lim\limits_{x\to x_1^+} f(x) = f(x_1)$

n_3 denotes the number of values of $x = x_1$ belonging to the domain of $f(x)$ and lying in the interval $(0, 2\pi)$ at which $f(x)$ is discontinues but $\lim\limits_{x\to x_1^-} f(x) = f(x_1)$ and [.] represents the greatest integer function. Match List I with list II

List – I		**List – II**	
I.	If $n_1 = 2$, then $f(x)$ can be	(P)	$[\sin x]$
II.	If $n_1 = 3$, then $f(x)$ can be	(Q)	$[\sin x] + [\cos x]$
III.	If $n_2 = 1$, then $f(x)$ can be	(R)	$[\sin x] – [\cos x]$
IV.	If $n_3 = 1$, then $f(x)$ can be	(S)	$[\sin x]/ [\cos x]$
		(T)	$[\sin x]. [\cos x]$
		(U)	$[\cos x]$

53. Which of the following is only CORRECT combination?

(A) I$\rightarrow$ (Q) (B) II$\rightarrow$(R)

(C) I$\rightarrow$ (R) (D) II$\rightarrow$(S)

54. Which of the following is only CORRECT combination?

(A) III$\rightarrow$(P, Q, U) (B) IV$\rightarrow$(P, S, U)

(C) III$\rightarrow$(Q, S, T) (D) III$\rightarrow$(P, T, U)

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