

Mock Advanced Test-5 Paper-2

TIME : 3 hrs

M.M. : 243

Read the following Instructions very carefully before you proceed.

A. General

1. This booklet is your Question Paper. Do not break the seals of this booklet before being instructed to do so by the invigilators.
2. Blank papers, clipboards, log tables, slide rules, calculators, cameras, cellular phones, pagers, and electronic gadgets are NOT allowed inside the examination hall.
3. **Using a black ball point pen, darken the bubbles on the upper original sheet.** Apply sufficient pressure so that the impression is created on the bottom sheet.
4. DO NOT TAMPER WITH/MUTILATE THE OMR OR THE BOOKLET.
5. Read carefully the Instructions printed at the beginning of each section.

B. Filling the Right Part of the OMR

6. For answering a question, an ANSWER SHEET (OMR SHEET) is provided separately. Please fill your **Test Code**, **Roll No.** and **Group** properly in the space given in the ANSWER SHEET.

C. Question Paper Format & Marking Scheme

The question paper consists of **3 Subjects** (Physics, Chemistry and Mathematics). Each subject consists of two sections i.e., Section-I & II.

7. **Section I** contains 3 types of questions [**Type 1, Type 2 & Type 3**]
 - **Type 1** contains **5 Single Correct Answer Type Questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE CHOICE** is correct.
Marking scheme [3 Marks for Correct answer & -1 NEGATIVE MARKING for wrong]
 - **Type 2** contains **6 Multiple Correct Answer Type Questions**. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE OR MORE CHOICES may be correct**.
Marking scheme [5 Marks for Correct answer & -2 NEGATIVE MARKING for wrong]
 - **Type 3** contains **4 Multiple Choice Questions** relating to two paragraphs with 2 questions on each paragraph. Each question of a particular paragraph has four choices (A), (B), (C) and (D) out of which **ONLY ONE CHOICE is correct**.
Marking scheme [4 Marks for Correct answer & -1 NEGATIVE MARKING for wrong]
8. **Section II** contains **5 Single Integer Value Type Questions**. The answer to each of the questions is a single-digit integer, ranging from 0 to 9 (both inclusive)
Marking scheme [4 Marks for Correct answer & NO NEGATIVE MARKING for wrong]

SECTION-I/TYPE-1

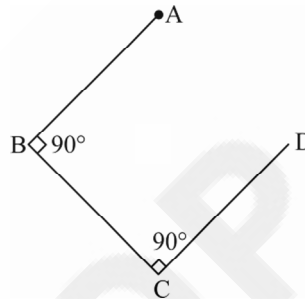
SINGLE CORRECT ANSWER

This section contains 5 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

1. Three identical rods are hinged at point A as shown.

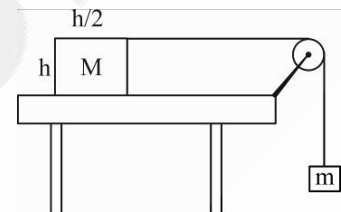
The angle made by rod AB with vertical is :

- (A) $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$ (B) $\tan^{-1}\left(\frac{3}{4}\right)$
 (C) $\tan^{-1}(1)$ (D) $\tan^{-1}\left(\frac{4}{3}\right)$



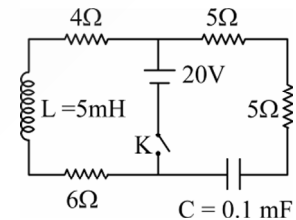
2. A cylinder of height h , diameter $h/2$ and mass M and with a homogenous mass distribution is placed on a horizontal table. One end of a string running over a pulley is fastened to the top of the cylinder, a body of mass m is hung from the other end and the system is released. Friction is negligible everywhere. At what minimum ratio m/M will the cylinder tilt?

- (A) 1 (B) 2
 (C) 3 (D) 4



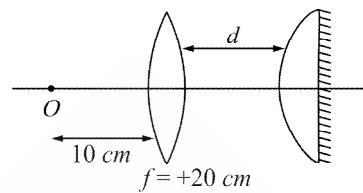
3. In the circuit shown, the key (K) is closed at $t = 0$, the current through the key at the instant $t = 10^{-3} \ln 2$, is :

- (A) 2 A (B) 3.5 A
 (C) 2.5 A (D) Zero



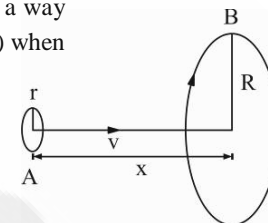
SPACE FOR ROUGH WORK

4. A convex lens of focal length 20 cm and another plano-convex lens of focal length 40 cm are placed co-axially (see figure). The plano-convex lens is silvered on plane surface. What should be the distance d (in cm) so that final image of the object 'O' is formed on O itself:



- (A) 10
(B) 15
(C) 20
(D) 25

5. Loop A of radius $r \ll R$ moves towards loop B with a constant velocity v in such a way that their planes are always parallel. What is the distance between the two loops (x) when the induced $e.m.f.$ in loop A maximum?



- (A) R
(B) $\frac{R}{\sqrt{2}}$
(C) $\frac{R}{2}$
(D) $R\left(1 - \frac{1}{\sqrt{2}}\right)$

SPACE FOR ROUGH WORK

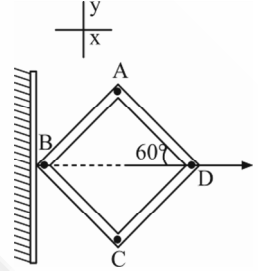
SECTION-I/TYPE-2

MULTIPLE CORRECT ANSWERS

This section contains 6 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct :

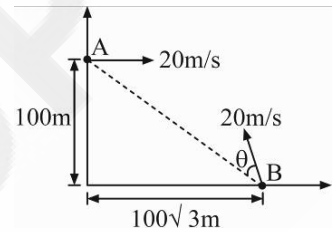
6. $ABCD$ is a wire frame of identical wires hinged at points A, B, C and D in which point D is given velocity v as shown in figure. Choose the correct statement(s) :

- (A) Velocity of point A along x -axis will be $v/2$
- (B) speed of point A will be v
- (C) speed of point A along x -axis will be $2v$
- (D) velocity of point A will be equal to velocity of point C



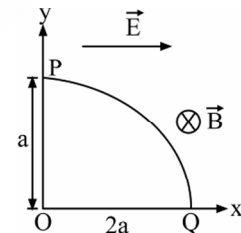
7. Two small balls A and B are launched in the same vertical plane simultaneously, with same speed of 20 m/s at $t = 0$. Ball A has an initial horizontal velocity and ball B has initial velocity at an angle θ above the line joining A and B as shown. If the projectiles collide in mid-air at time t , then :

- (A) $\theta = 30^\circ$
- (B) $\theta = 60^\circ$
- (C) $t = \frac{20}{\sqrt{3}}\text{ s}$
- (D) $t = \frac{10}{\sqrt{3}}\text{ s}$



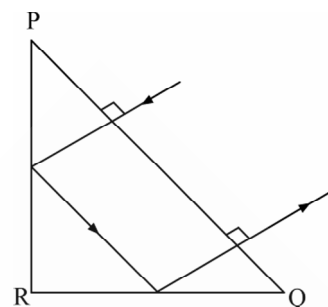
8. A particle with charge $+q$ and mass m , moving under the influence of a uniform electric field $E\hat{i}$ and a uniform magnetic, field $B\hat{k}$, follows a trajectory from P to Q as shown. The velocities at P and Q are $v\hat{i}$ and $-2v\hat{j}$. Which of the following is/are correct.

- (A) $E = \frac{3}{4} \left(\frac{mv^2}{qa} \right)$
- (B) The rate of work done by the electric field at P is $\frac{3}{4} \left(\frac{mv^3}{a} \right)$
- (C) The rate of work done by the electric field at P is 0.
- (D) The rate of work done by both the fields at Q is 0



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9. A right-angled prism is made up of a material of refractive index μ . It is desired that a light ray incident normally on PQ emerges parallel to the incident direction after suffering two total internal reflections. For which of the following conditions is this possible.



- (A) $\mu = 1.5$
 (B) $\mu = 1.2$
 (C) $\mu = 1.7$
 (D) $\mu = 1.3$

10. An electron is orbiting in a circular orbit of radius r under the influence of a constant magnetic field B . Assuming that Bohr's postulates regarding the quantization of angular momentum holds good of this electron. [h = Planck's constant, e = charge on electron and m = mass of electron]

- (A) Radius of n^{th} orbit of the electron will be $\sqrt{\frac{nh}{\pi Be}}$
 (B) Kinetic energy of the electron in the n^{th} orbit will be $\frac{nhBe}{4\pi m}$.
 (C) The potential energy of interaction between the magnetic moment of the orbital current due to the electron moving in n^{th} orbit and the magnetic field is $\frac{nhBe}{2\pi m}$
 (D) Radius of n^{th} orbit of the electron will be $\sqrt{\frac{nh}{2\pi Be}}$

11. An upright U-tube manometer with its limbs 0.6 m high and spaced 0.3 m apart contains a liquid to a height of 0.4 m in each limb. If the U-tube is rotated at 10 radians/second about a vertical axis at 0.1 m from one limb. Choose the correct options. (z_1 is height of liquid in limb closer to axis of rotation and z_2 in other limb)

- (A) $z_1 = 0.325\text{ m}$ (B) $z_1 = 0.316\text{ m}$ (C) $z_2 = 0.425\text{ m}$ (D) $z_1 + z_2 = 0.8\text{ m}$

SPACE FOR ROUGH WORK

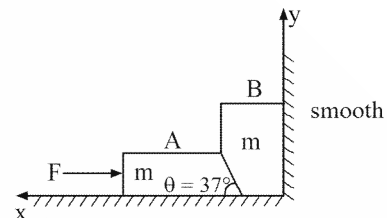
SECTION-I/TYPE-2
LINK COMPREHENSION TYPE

This section contains 4 multiple choice questions relating to two paragraphs with two questions on each paragraph. Each question has four choices A, B, C and D out of which ONLY ONE CHOICE is correct.

Paragraph for Questions 12 - 13

Two smooth blocks are placed at a smooth corner as shown. Both the blocks are having mass m . We apply a force F on the small block m .

Block A presses the block B in the normal direction, due to which pressing force on vertical wall will increase and pressing force on the horizontal wall decrease, as we increase F . ($\theta = 37^\circ$ with horizontal).



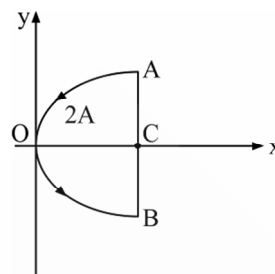
As soon as the pressing force on the horizontal wall by block B become zero, it will loose contact with the ground. If the value of F is further increased, the block B will accelerate in upward direction and simultaneously the block A will move toward right.

12. What is minimum value of F , to lift block B from ground?
- (A) $\frac{25}{12}mg$ (B) $\frac{5}{4}mg$ (C) $\frac{3}{4}mg$ (D) $\frac{4}{3}mg$
13. The value of force F so that block B moves with acceleration g in upward direction.
- (A) $2mg$ (B) $\frac{12}{7}mg$ (C) $6mg$ (D) $\frac{17mg}{6}$

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Paragraph for Questions 14 - 15

A conducting wire is bent into a loop AOB as shown in the figure. The segment AOB is parabolic given by the equation $y^2 = 2x$, while segment BA is a straight line parallel to the y -axis. ($OC = 2m$). The magnetic field in the region is $\vec{B} = -8\hat{k}$ tesla and the current in the wire is $2A$.



14. The field created by the current in the loop at point C will be :

- (A) $-\frac{\mu_0}{4\pi}\hat{k}$ (B) $-\frac{\mu_0}{2\pi}\hat{k}$ (C) $-\frac{\mu_0\sqrt{2}}{4\pi}\hat{k}$ (D) None of these

15. If the loop were rotated about the z -axis with an angular velocity of 1 rad/sec. then magnitude of emf induced across the straight segment AC will be :

- (A) $32 V$ (B) $8 V$ (C) $16 V$ (D) $4 V$

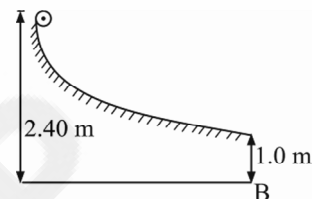
SPACE FOR ROUGH WORK

SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

This section contains 5 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

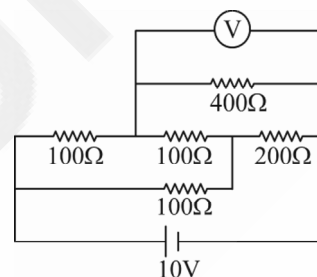
1. The period of oscillation of a simple pendulum is $2\pi\sqrt{L/g}$. Measured value of L is 20.0 cm known to 1 mm accuracy and time for 100 oscillations of the pendulum is found to be 90 s using a wrist watch of 1 s resolution. What is the percentage error in the determination of g to the nearest integer?

2. A small sphere rolls down without slipping from the top of a track in a vertical plane. The track has an elevated section and a horizontal part. The horizontal part is 1.0 metre above the ground level and the top of the track is 2.4 metres above the ground. Find the distance (in m) on the ground with respect to the point B (which is vertically below the end of the track as shown in figure) where the sphere lands.



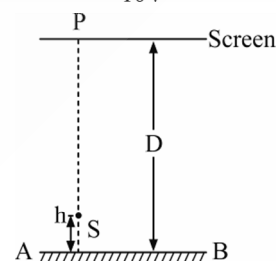
3. An electrical circuit is shown in Fig. The potential difference across the resistor of 400 ohm, as measured by the voltmeter V of resistance

400 ohm is x volts then find $\frac{20}{x}$.



4. A point source S emitting light of wavelength 600 nm is placed at a very small height h above a flat reflecting surface AB (see figure). The intensity of the reflected light is 36% of the incident intensity. Interference fringes are observed on a screen placed parallel to the reflecting surface at a very large distance D from it.

If the ratio of the maximum to the minimum intensities in the interference fringes formed near point P (shown in the figure) is k then find $\frac{k}{8}$.



5. A star initially has 10^{40} deuterons. It produces energy via the process ${}_1H^2 + {}_1H^2 \longrightarrow {}_1H^3 + P$, and ${}_1H^2 + {}_1H^3 \longrightarrow {}_2He^4 + n$. The average power radiated by the star is 10^{16} W. If time in which the deuteron supply of the star is exhausted is given by $x \times 10^{12}$ s then find $\frac{100x}{129}$

The masses of the nuclei are as follows :

$$M({}_1H^2) = 2.014 \text{ amu} ; M(p) = 1.007 \text{ amu} ; M(n) = 1.008 \text{ amu} ; M({}_2He^4) = 4.001 \text{ amu}.$$

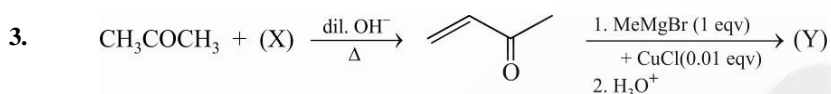
SPACE FOR ROUGH WORK

SECTION-I/TYPE-1

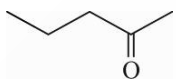
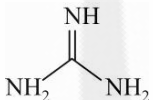
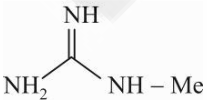
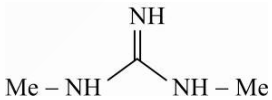
SINGLE CORRECT ANSWER

This section contains 5 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

- The number of structural isomers of C_7H_{16} is :
 (A) 4 (B) 7 (C) 8 (D) 9
- Calcium is obtained by :
 (A) Electrolysis of an aqueous solution of $CaCl_2$ (B) Electrolysis of molten $CaCl_2$
 (C) Roasting of lime stone (D) Reduction of $CaCl_2$ with coke.



Which of the following is an incorrect statement about the given reaction sequence?

- (X) is $H_2C=O$
 - First reaction is cross aldol condensation
 - $MeMgBr$ undergoes attack on carbonyl carbon
 - (Y) is 
- A binary liquid solution contains 40% of (A) and is in equilibrium with its vapour that contains 60 mole % of (A). The ratio of vapour pressure of pure (A) and pure (B) will be :
 (A) 2 : 3 (B) 7 : 4 (C) 2 : 1 (D) 9 : 4
 - Which of the following compound is most basic?
 (A)  (B)  (C) 
 (D) $(CH_3)_2NH$

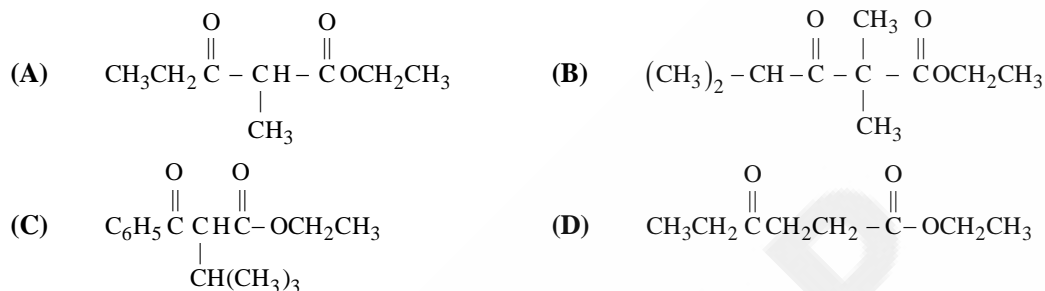
SPACE FOR ROUGH WORK

SECTION-I/TYPE-2

MULTIPLE CORRECT ANSWERS

This section contains 6 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct :

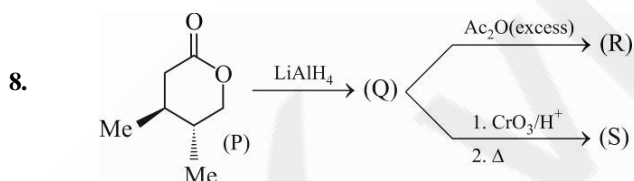
6. Which of the following keto esters is(are) cannot be prepared by a Claisen condensation ?



7. When 0.1 mole of AgNO_3 is mixed with 1 L of 3M NH_3 , which of the following concentrations are correctly indicated?

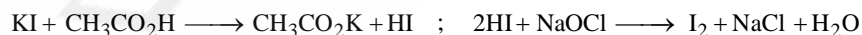
$$[K_f \text{ of } \text{Ag}(\text{NH}_3)^+ \text{ is } 2 \times 10^3 \text{ \& } K_f \text{ of } \text{Ag}(\text{NH}_3)_2^+ \text{ is } 1.6 \times 10^8]$$

- (A) $[\text{Ag}(\text{NH}_3)_2^+] = 0.1 \text{ M}$ (B) $[\text{Ag}(\text{NH}_3)^+] = 4.46 \times 10^{-7} \text{ M}$
 (C) $[\text{NH}_3] = 2.8 \text{ M}$ (D) $[\text{Ag}^+] = 7.97 \times 10^{-11} \text{ M}$



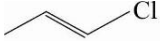
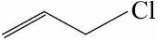
With regard to the given scheme, the correct statement(s) about (P), (Q), (R) and (S) is(are) :

- (A) (Q) is optically active
 (B) (S) gives effervescences on treatment with aqueous NaHCO_3
 (C) Molecular formula of (R) is $\text{C}_{11}\text{H}_{20}\text{O}_4$
 (D) (P) is soluble in aqueous HCl
9. 25 ml of household bleach solution was mixed with 30 ml of 0.5 M KI and 10 ml of 4 M acetic acid. In the titration of the liberated iodine, 48 ml of 0.25 N $\text{Na}_2\text{S}_2\text{O}_3$ was used to reach the end point. Which of the following is(are) correct? The reactions involved are as follows :



- (A) Molarity of household bleach solution is 0.24 M
 (B) Milli equivalents of acetic acid left are 25
 (C) Milli equivalents of I_2 liberated are 12
 (D) $\text{Na}_2\text{S}_2\text{O}_3$ reacts with I_2 and bleach solution both

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10. The reagent(s) that can be used to distinguish between  and  is(are) :
- | | |
|---|--|
| (A) Br ₂ in CCl ₄ | (B) Cold alkaline KMnO ₄ |
| (C) Alcoholic AgNO ₃ | (D) Ammoniacal Cu ₂ Cl ₂ |
11. Tertiary structure of a protein involves :
- | | |
|--------------------|----------------------------|
| (A) Hydrogen bonds | (B) Disulfide bonds |
| (C) Peptide bonds | (D) Coulombic interactions |

SPACE FOR ROUGH WORK

SECTION-1/TYPE-2
LINK COMPREHENSION TYPE

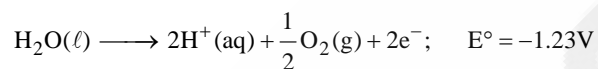
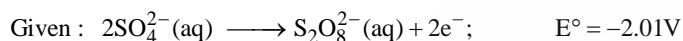
This section contains 4 multiple choice questions relating to two paragraphs with two questions on each paragraph. Each question has four choices A, B, C and D out of which ONLY ONE CHOICE is correct.

Paragraph for Questions 12 - 13

Electrode potential is developed in an electrochemical cell when there is a charge separation between the electrode and the electrolyte solution. The electrode potentials are useful in deciding the discharge of an ion at a given electrode during electrolysis.

Higher is the oxidation potential of an anion/species, higher is the ease of its oxidation and higher is the reduction potential of an ion/species, more is its reduction tendency.

12. A 1 M solution of H_2SO_4 is electrolysed, select right statement with respect to concentration of H_2SO_4 solution, products at anode and cathode respectively:

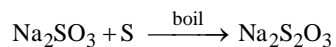


- (A) Concentration of H_2SO_4 remain constant, H_2 and O_2
 (B) Concentration of H_2SO_4 increases, O_2 and H_2
 (C) Concentration of H_2SO_4 decreases, O_2 and H_2
 (D) Concentration of H_2SO_4 remain constant, $\text{S}_2\text{O}_8^{2-}$ and H_2
13. When a solution of AgNO_3 (1M) is electrolyzed using a platinum anode and a copper cathode. What are the products obtained at two electrodes?
- Given : $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34\text{V}$, $E^\circ_{\text{O}_2/\text{H}_2\text{O}, \text{H}^+} = +1.23\text{V}$,
 $E^\circ_{\text{H}^+/\text{H}_2} = 0.0\text{V}$; $E^\circ_{\text{Ag}^+/\text{Ag}} = +0.8\text{V}$
- (A) $\text{Cu} \longrightarrow \text{Cu}^{2+}$ at anode and $\text{Ag}^+ \longrightarrow \text{Ag}$ at cathode
 (B) $\text{H}_2\text{O} \longrightarrow \text{O}_2$ at anode and $\text{Cu}^{2+} \longrightarrow \text{Cu}$ at cathode
 (C) $\text{H}_2\text{O} \longrightarrow \text{O}_2$ at anode and $\text{Ag}^+ \longrightarrow \text{Ag}$ at cathode
 (D) $\text{NO}_3^- \longrightarrow \text{N}_2\text{O}_5 + \text{O}_2$ at anode and $\text{Ag}^+ \longrightarrow \text{Ag}$ at cathode

SPACE FOR ROUGH WORK

Paragraph for Questions 14 - 15

Sodium thiosulphate is prepared by boiling sodium sulphate with flowers of sulphur.



The most important thiosulphate is $\text{Na}_2\text{S}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$, which is used in photography (where it is known as 'hypo') and in medicine. $\text{Na}_2\text{S}_2\text{O}_3$ is also used in the bleaching industry to destroy any excess Cl_2 on fabrics after they have been passed through a bleach bath.

Sodium thiosulphate on reaction with H_2SO_4 forms sodium sulphate and $\text{H}_2\text{S}_2\text{O}_3$, which is unstable and decomposes the moment it is formed $\text{H}_2\text{S}_2\text{O}_3 \longrightarrow \text{H}_2\text{SO}_3 + \text{S}$.

14. An aqueous solution of Cl_2 on reaction with $\text{Na}_2\text{S}_2\text{O}_3$ gives :
- | | |
|------------------------------|---------------------------|
| (A) Sodium tetrathionate | (B) Sodium sulphide |
| (C) Sodium hydrogen sulphate | (D) Sodium peroxysulphate |
15. The most suitable method to prepare thiosulphuric acid is :
- | |
|--|
| (A) BY adding acid to sodium thiosulphate |
| (B) By passing H_2S in SO_2 in absence of H_2O at -78°C |
| (C) By oxidizing a cooled aqueous solution of SO_2 with MnO_2 |
| (D) By passing H_2S in SO_3 in ether at -78°C |

SPACE FOR ROUGH WORK

SECTION - II
SINGLE INTEGER VALUE CORRECT TYPE

This section contains 5 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

- The number of atoms lying in the same plane in Buta-1, 2, 3-triene are_____.
- The equilibrium constant for the reaction,
$$[\text{Al}(\text{H}_2\text{O})_6]^{3+}(\text{aq}) + \text{H}_2\text{O}(\ell) \rightleftharpoons [\text{Al}(\text{H}_2\text{O})_5(\text{OH})^{2+}](\text{aq}) + \text{H}_3\text{O}^+(\text{aq})$$
 is 2×10^{-5} .
The pH of 0.05 M aqueous solution of AlCl_3 is _____.
- The rate of decomposition of a gas A was 7.25 in some units, when 5% of it had reacted and it was 5.14 in the same unit, when 20% had undergone decomposition. The order of the reaction is _____.
- The number of compounds that liberate di-nitrogen gas on heating, among the following are $\text{B}(\text{NO}_3)_2$, $\text{Ba}(\text{N}_3)_2$, NH_4NO_2 , NH_4NO_3 , $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$, NH_4ClO_4 , $(\text{NH}_4)_2\text{SO}_4$, NH_4Br , $\text{Zn}(\text{NO}_3)_2$, AgNO_3 , $\text{Hg}(\text{NO}_3)_2$, NH_3 , Li_3N .
- For an ideal gas undergoing reversible adiabatic process, $PV^\gamma = \text{constant}$, where γ is called adiabatic exponent. The value of adiabatic exponent is 1.5. The value of C_v for the ideal gas is _____.

SPACE FOR ROUGH WORK

SECTION-I/TYPE-1

SINGLE CORRECT ANSWER

This section contains 5 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONLY ONE Choice is Correct:

1. $I_1 = \int_0^1 (1 + (2015)x^{2015}) e^{x^{2015}} dx$ and $I_2 = \int_0^1 e^{-x^2} dx + \int_1^{1/e} \sqrt{-\ln x} dx$ then $I_1 + I_2$ is :

- (A) e (B) $\frac{1}{e}$ (C) $\frac{e^2 + 1}{e}$ (D) 1

2. The latus rectum of the hyperbola $9x^2 - 16y^2 - 18x - 32y - 151 = 0$ is :

- (A) $9/4$ (B) 9 (C) $3/2$ (D) $9/2$

3. If $a_1, a_2, a_3, \dots, a_{2n+1}$ are in A.P., then $\frac{a_{2n+1} - a_1}{a_{2n+1} + a_1} + \frac{a_{2n} - a_2}{a_{2n} + a_2} + \dots + \frac{a_{n+2} - a_n}{a_{n+2} + a_n}$ is equal to :

- (A) $\frac{n(n+1)}{2} \times \frac{a_2 - a_1}{a_{n+1}}$ (B) $\frac{n(n+1)}{2}$
 (C) $(n+1)(a_2 - a_1)$ (D) None of these

4. If $S = \begin{bmatrix} \frac{\sqrt{3}-1}{2\sqrt{2}} & \frac{\sqrt{3}+1}{2\sqrt{2}} \\ -\left(\frac{\sqrt{3}+1}{2\sqrt{2}}\right) & \frac{\sqrt{3}-1}{2\sqrt{2}} \end{bmatrix}$ and $A = \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$ and $P = S(\text{adj } A)S^T$ then if $\sum_{r=1}^{2015} (S^T P^r S) = \begin{bmatrix} A & B \\ C & D \end{bmatrix}$ then total

- number of factors of $(A + B + C + D)$ is :
 (A) 12 (B) 48 (C) 120 (D) None of these

5. $\begin{vmatrix} 1 & \cos \alpha & \cos \beta \\ \cos \alpha & 1 & \cos \gamma \\ \cos \beta & \cos \gamma & 1 \end{vmatrix} = \begin{vmatrix} 0 & \cos \alpha & \cos \beta \\ \cos \alpha & 0 & \cos \gamma \\ \cos \beta & \cos \gamma & 0 \end{vmatrix}$, if $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma =$

- (A) 26 (B) 1 (C) 0 (D) $1/3$

SPACE FOR ROUGH WORK

SECTION-I/TYPE-2

MULTIPLE CORRECT ANSWERS

This section contains 6 Multiple Choice Questions. Each Question has 4 choices A, B, C & D, out of which ONE or MORE Choices may be Correct :

6. If $f(x) = \begin{cases} x^2 (\text{sgn}[x] + \{x\}) & , 0 \leq x \leq 2 \\ \sin x + |x-3| & , 2 < x < 4 \end{cases}$, where $[.]$ and $\{.\}$ represent integer and fractional part functions

respectively, then :

- (A) $f(x)$ is differentiable at $x = 1$ (B) $f(x)$ is continuous but non-differentiable at $x = 1$
 (C) $f(x)$ is non-differentiable at $x = 2$ (D) $f(x)$ is discontinuous at $x = 2$

7. Let n be odd integer and $x = {}^nC_1 + {}^nC_2 + {}^nC_3 + {}^nC_4 + \dots + {}^nC_{n-1} + {}^nC_n$ then $\int_{-\pi}^{\pi} \frac{\sin^x t + t^3}{\cos^x t} dt$ is :

- (A) $\int_{-\pi}^{\pi} \frac{x \ln |x|}{1+x^2} dx$ (B) $\int_{-1}^1 \frac{1}{x^2} dx$ (C) 0 (D) $\int_{-1}^1 \frac{\sin x}{1+x^2} dx$

8. Let $f: R \rightarrow [-1, \infty)$ and $f(x) = \ln \left(\left[\left| \sin 2x \right| + \left| \cos 2x \right| \right] \right)$, where $[.]$ in greatest integer function then :

- (A) $f(x)$ has range Z (the set of integers) (B) $f(x)$ is periodic
 (C) $f(x)$ is one-one (D) $f(x)$ is into function

9. Let $y^2 = 3x^2 + 2x + 1$ and $I_n = \int \frac{x^n}{y} dx$, then $a_1 I_{10} + a_2 I_9 + a_3 I_8 = x^9 y$ for :

- (A) $a_1 = 30$ (B) $a_2 = 17$
 (C) $a_3 = 9$ (D) $a_1 - a_2$ is a prime number

SPACE FOR ROUGH WORK

10. Consider the circle $x^2 + y^2 - 10x - 6y + 30 = 0$. Let O be the centre of the circle and tangent at A(7, 3) and B(5, 1) meet at C. Let S = 0 represents family of circles passing through A and B, then :
- (A) Area of quadrilateral OACB = 4
- (B) The radical axis for the family of circles S = 0 is $x + y = 10$
- (C) The smallest possible circle of the family S = 0 is $x^2 + y^2 - 12x - 4y + 38 = 0$
- (D) The coordinates of point C is (7, 1)
11. The equation of the plane(s) which is equally inclined to the lines $\frac{x-1}{2} = \frac{y}{-2} = \frac{z+2}{-1}$ and $\frac{x+3}{8} = \frac{y-4}{1} = \frac{z}{-4}$ and passing through the origin is(are) :
- (A) $14x - 5y - 7z = 0$
- (B) $2x + 7y - z = 0$
- (C) $3x - 4y - z = 0$
- (D) $x + 2y - 5z = 0$

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SECTION-I/TYPE-2
LINK COMPREHENSION TYPE

This section contains 4 multiple choice questions relating to two paragraphs with two questions on each paragraph. Each question has four choices A, B, C and D out of which ONLY ONE CHOICE is correct.

Paragraph for Questions 12 - 13

Read the following write up carefully and answer the following questions :

Consider two vectors $\vec{A}(t) = f(t)\hat{i} + f'(t)\hat{j}$, $\vec{B}(t) = g(t)\hat{i} + g'(t)\hat{j}$, $f(t)$ and $g(t)$ are two continuous functions

such that $f(0) = -1$, $g(1) = 2$, $g'(t) = \left| \lim_{t \rightarrow 0} \frac{\sin 2t - a \sin t}{t^3} \right|$, $f(t) = \int_0^t 2x dx + c$ then :

12. The value of t such that $\vec{A}(t)$ is parallel to $\vec{B}(t)$:
 (A) -1 (B) 1 (C) 0 (D) 2
13. The value of $g \circ f(2)$ is :
 (A) 1 (B) 2 (C) 3 (D) 4

Paragraph for Questions 14 - 15

Let $f(x) = f_1(x) - 2f_2(x)$,

where $f_1(x) = \begin{cases} \min\{x^2, |x|\}, & |x| \leq 1 \\ \max\{x^2, |x|\}, & |x| > 1 \end{cases}$

and $f_2(x) = \begin{cases} \min\{x^2, |x|\}, & |x| > 1 \\ \max\{x^2, |x|\}, & |x| \leq 1 \end{cases}$ and $g(x) = \begin{cases} \min\{f(t) : -3 \leq t \leq x\}, & -3 \leq x < 0 \\ \max\{f(t) : 0 \leq t \leq x\}, & 0 \leq x \leq 3 \end{cases}$

14. For $x \in (-1, 0)$, $f(x) + g(x)$ is :
 (A) $x^2 - 2x + 1$ (B) $x^2 + 2x - 1$ (C) $x^2 + 2x + 1$ (D) $x^2 - 2x - 1$
15. The graph of $y = g(x)$ in its domain is broken at :
 (A) 1 point (B) 2 points (C) 3 points (D) None of these

SPACE FOR ROUGH WORK

SECTION - II

SINGLE INTEGER VALUE CORRECT TYPE

This section contains 5 single Integer Value Correct type Questions. Each question has an integer answer between 0 and 9. Fill the answer bubbles in the OMR Sheet APPROPRIATELY and CAREFULLY.

- Let 'p' be an integer for which both roots of the quadratic equation $x^2 + 2(p-3)x + 9 = 0$ lie in $(-6, 1)$.
If $2, g_1, g_2, \dots, g_{19}, g_{20}, p$ are in G.P., then the value of $\frac{(g_4 \times g_{17})}{2}$ is _____.
- If $\alpha, \beta; \beta, \gamma; \gamma, \alpha$ are the roots of $a_r x^2 + b_r x + c_r = 0$ for $r = 1, 2, 3$ where $\alpha, \beta, \gamma > 0$ and $\Sigma \alpha + \Sigma \alpha\beta + \alpha\beta\gamma - \left(\prod_{r=1}^3 \left(\frac{a_r - b_r + c_r}{a_r} \right) \right)^{1/2} = -k$ then k is equal to _____.
- If $S = \sqrt{\frac{1}{2}} \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2}}} \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{\frac{1}{2}}}} \dots \dots \infty$ then the value of πS is _____.
- If $\int_a^b \left(\prod_{r=1}^n \left(\frac{x+r}{r} \right) \right)^2 \left[\sum_{r=1}^n \frac{1}{x+r} \right] dx = \frac{1}{2} \left[\left({}^{110}C_{19} \right)^2 - \left({}^{100}C_{91} \right)^2 \right]$ and $n > b > a$ then the value of $\left(\frac{a+n}{1+b} \right)$ is $(a, b, n \in I)$ _____.
- If $f(x) = \int_0^{g(x)} \frac{dt}{\sqrt{1+t^3}}$, where $g(x) = \int_0^{\cos x} (1 + \sin t^2) dt$ then the value of $f'(\pi/2)$ is equal to $|L|$ then $|L|$ is _____.

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☞ ☞ ☞ End of Mock JEE Advanced-5/PAPER-2 ☞ ☞ ☞