FIITJEE INTERNAL Phase Test

PHYSICS, CHEMISTRY & MATHEMATICS

QP CODE: 101039 **Paper-1**

Time Allotted: 3 Hours **Maximum Marks: 180**

- Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.
- You are not allowed to leave the Examination Hall before the end of the test.

INSTRUCTIONS

Caution: Question Paper CODE as given above MUST be correctly marked in the answer OMR sheet before attempting the paper. Wrong CODE or no CODE will give wrong results.

A. General Instructions

1. Attempt ALL the questions. Answers have to be marked on the OMR sheets.
2. This question paper contains **Three Sections.**
3. **Section-I** is Physics, **Section-II** is Chemistry and **Section-III** is Mathematics.
4. All the section can be filled in **PART-A & B** of OMR.
5. Rough spaces are provided for rough work inside the question paper. No additional sheets will be provided for rough work.
6. Blank Papers, clip boards, log tables, slide rule, calculator, cellular phones, pagers and electronic devices, in any form, are not allowed.

B. Filling of OMR Sheet

1. Ensure matching of OMR sheet with the Question paper before you start marking your answers on OMR sheet.
2. On the OMR sheet, darken the appropriate bubble with ***Blue/Black Ball Point Pen*** for each character of your Enrolment No. and write in ink your Name, Test Centre and other details at the designated places.
3. OMR sheet contains alphabets, numerals & special characters for marking answers.

C. Marking Scheme For All Two Parts.

(i) **Part-A (01-04) –** Contains Four (04) multiple choice questions which have ONLY ONE CORRECT answer Each question carries **+3 marks** for correct answer and **-1 marks** for wrong answer.

(ii) **PART–A** (**05–07)** contains (**3**) Multiple Choice Questions which have **One or More Than One Correct** answer.
Full Marks: **+4** If only the bubble(s) corresponding to all the correct options(s) is (are) darkened.
Partial Marks: **+1** For darkening a bubble corresponding **to each correct option,** provided NO incorrect option is darkened.
Zero Marks: **0** If none of the bubbles is darkened.
***Negative Marks*: –1 In all other cases.**
For example, if **(A), (C) and (D)** are all the correct options for a question, darkening all these three will result in **+4 marks**; darkening only **(A) and (D)** will result in **+2 marks**; and darkening **(A) and (B)** will result in **–1** marks, as a wrong option is also darkened.

(iii) **Part-A (08-10) –** This section contains Three (03) Matching List Sets. Each set has **ONE** Multiple Choice Question. Each set has **TWO** lists: **List-I** and **List-II**. **List-I** has **Four** entries (P), (Q), (R) and (S) and **List-II** has **Five** entries (1), (2), (3), (4) and (5). **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 **+4 Marks** for correct answer and **-1 marks** for wrong answer.

(iii) **Part-B –** This section contains **SIX (06)** questions numerical based questions. The answer to each question is a **NUMERICAL VALUE.** If the numerical value has more than two decimal places, truncate/round-off the value to **TWO** decimal places. Each question carries **+4 marks** for correct answer. **There is no negative marking.**

Name of the Candidate: _____

Batch: _____ **Date of Examination:** _____

Enrolment Number: _____

BATCHES – Two Year CRP426(R & W) _PT-4

SECTION – I: PHYSICS

(PART – A)

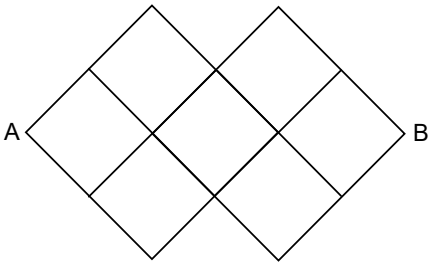
(Single Correct Answer Type)

This section contains **4 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. An ideal battery of EMF ε is connected in series with an ammeter and a voltmeter of unknown internal resistance. If a certain resistance is connected in parallel with voltmeter. The voltmeter and ammeter readings becomes 1/n and n times of their respective initial readings. What is initial reading of voltmeter ?

(A) $\frac{\varepsilon}{(n+1)}$ (B) $\frac{\varepsilon n}{(n+1)}$ (C) $\frac{\varepsilon n}{(n-1)}$ (D) $\frac{(n+1)\varepsilon}{n}$

2. In the shown wire frame, each side of a square (the smallest square) has a resistance R. Equivalent resistance of the circuit between the points A and B is



(A) R
(B) 2R
(C) 4R
(D) 8R

3. Four point charge q, –q, 2Q and Q are placed in order at the corners A, B, C and D of a square. If the field at the mid – point of CD is zero then the value of q/Q is

(A) 1 (B) $\frac{5}{\sqrt{2}}$ (C) $\frac{2\sqrt{2}}{5}$ (D) $\frac{5\sqrt{5}}{2}$

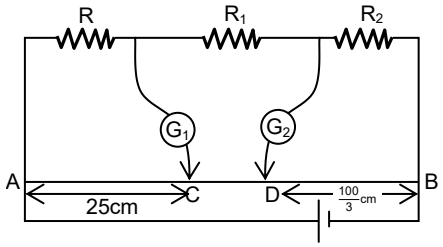
4. A long straight wire along the z-axis carries a current I in the negaive z-direciton. The magnetic vector field $\vec{B}$ at a point havng coordinates (x, y) in the z = 0 plane is

(A) $\frac{\mu_0 I(y\hat{i}-x\hat{j})}{2\pi(x^2+y^2)}$ (B) $\frac{\mu_0 I(x\hat{i}+y\hat{j})}{2\pi(x^2+y^2)}$ (C) $\frac{\mu_0 I(x\hat{j}-y\hat{i})}{2\pi(x^2+y^2)}$ (D) $\frac{\mu_0 I(x\hat{i}-y\hat{j})}{2\pi(x^2+y^2)}$

(One or More Than One Options Correct Type)

This section contains **3 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D), out of which **ONE** or **MORE THAN ONE is correct.**

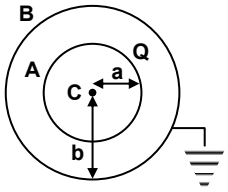
5. The diagram show is a modified meter bridge, which is used for measuring two unknown resistances R_1 and R_2 at the same time. When only the first galvanometer is used, balance point is found at point C. Now the first galvanometer is removed and the second galvanometer is used, which gives balance point D. Using the details given in the diagram, find out the value of R_1 and R_2



(A) $R_1 = 5R/3$ (B) $R_2 = 4R/3$ (C) $R_1 = 4R/3$ (D) $R_2 = 5R/3$

Space For Rough Work

6. A conducting sphere A of radius a, with charge Q, is placed concentrically inside a conducting shell B of radius b. B is earthed. C is the common centre of A and B.



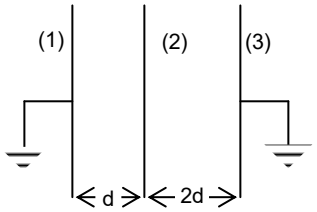
(A) The field at a distance r from C, where $a \le r \le b$, is $k\frac{Q}{r^2}$.

(B) The potential at a distance r from C, where $a \le r \le b$, is $k\frac{Q}{r}$.

(C) The potential difference between A and B is $kQ\left(\frac{1}{a}-\frac{1}{b}\right)$.

(D) The potential at a distance r from C, where $a \le r \le b$, is $kQ\left(\frac{1}{r}-\frac{1}{b}\right)$

7. Three identical plates of area A are arranged as shown. a charge +Q is given to plate (2). Then,



(A) charge +2Q/3 appears on plate 1
(B) charge −2Q/3 appears on plate 1
(C) charge −Q/3 appears on plate 3
(D) charge on plate 1 + charge on plate 3 = 0

(Matching List Sets)

This section contains **Three (03)** Matching List Sets. Each set has **ONE** Multiple Choice Question. Each set has **TWO** lists: **List-I** and **List-II**. **List-I** has **Four** entries (P), (Q), (R) and (S) and **List-II** has **Five** entries (1), (2), (3), (4) and (5). **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.

8. If a parallel plate capacitor of capacitance C is charged with battery of emf V volt through a resistance R

List-I		List-II	
(P)	The separation between the plates of capacitor is increased, keeping battery connected	(1)	Charge on the capacitor increases
(Q)	The separation between the plates of capacitor is decreased, keeping battery connected	(2)	Charge on the capacitor decreases
(R)	The separation between the plates of capacitor is increased, keeping battery disconnected	(3)	Electric potential energy between the space of the plates of the capacitor decreases
(S)	The separation between the plates of capacitor is decreased, keeping battery disconnected	(4)	Electric potential energy between the space of the plates of the capacitor increases
		(5)	Potential difference between the plates remains constant

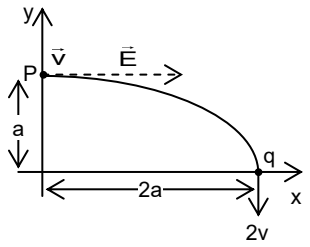
The correct option is:

(A) P → 1,4,5 ; Q → 3,4 ; R → 3 ; S → 2 (B) P → 2,3,5 ; Q → 1,4,5 ; R → 4 ; S → 3

(C) P → 2,3,5 ; Q → 1,5 ; R → 3 ; S → 1 (D) P → 3,5 ; Q → 1,4 ; R → 2,4 ; S → 1

Space For Rough Work

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



Match the entries of List-I with the entries of List-II.

List-I		List-II	
(P)	Electric field E equals	(1)	$\frac{mv^2}{qa}$
(Q)	Rate of work done by the electric field at P = b q v. where b =	(2)	0
(R)	Rate of work done by both the fields at q = c q v, where c =	(3)	$\frac{3}{4}\frac{mv^2}{qa}$
(S)	Magnetic force can not have which of the value	(4)	$\frac{5}{4}\frac{mv^2}{qa}$
		(5)	$\frac{2mv^2}{qa}$

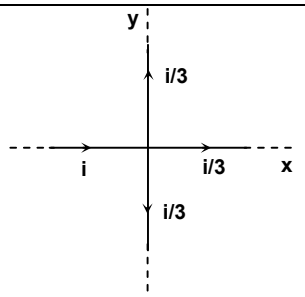
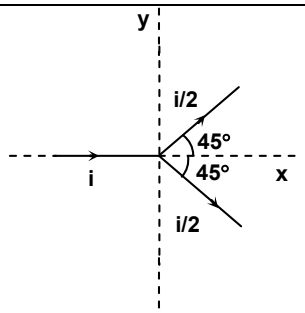
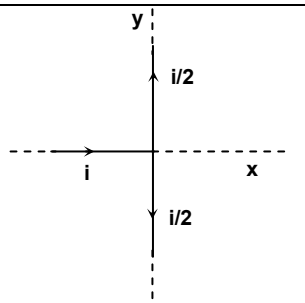
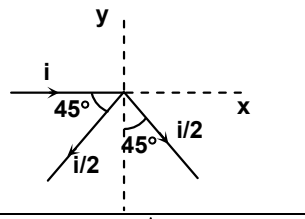
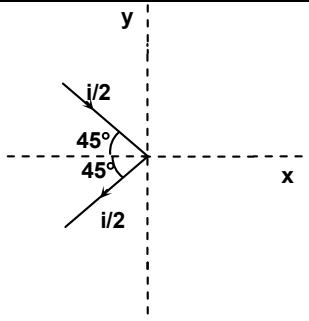
The correct option is:

(A) $P \to 3$; $Q \to 3$; $R \to 2$; $S \to 2$ (B) $P \to 3$; $Q \to 3$; $R \to 4$; $S \to 5$

(C) $P \to 3$; $Q \to 1$; $R \to 4$; $S \to 2$ (D) $P \to 5$; $Q \to 1$; $R \to 2$; $S \to 3$

Space For Rough Work

10. Match the following List-I to List-II.

List-I Statement regarding the x and y components of $\vec{B} = B_x\hat{i} + B_y\hat{j}$ at a point P(0, 0, d)		**List-II** Semi infinite wires-system	
(P)	B_x at point P is zero.	(1)	
(Q)	B_y at point P is zero.	(2)	
(R)	$\lvert\vec{B}\rvert$ at point P is $\frac{\mu_0 i}{4\pi d}$	(3)	
(S)	$\lvert\vec{B}\rvert$ at point P is $\frac{\mu_0 i}{3\pi d}$	(4)	
		(5)	

The correct option is:

(A) P $\rightarrow$ 1,2,3 ; Q $\rightarrow$ 3,5 ; R $\rightarrow$ 4 ; S $\rightarrow$ 1 (B) P $\rightarrow$ 2,4 ; Q $\rightarrow$ 3 ; R $\rightarrow$ 1,5 ; S $\rightarrow$ 3

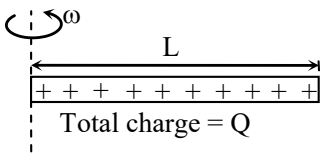
(C) P $\rightarrow$ 3,5 ; Q $\rightarrow$ 2,3 ; R $\rightarrow$ 1,4 ; S $\rightarrow$ 1 (D) P $\rightarrow$ 1,2,3 ; Q $\rightarrow$ 5 ; R $\rightarrow$ 3 ; S $\rightarrow$ 1

Space For Rough Work

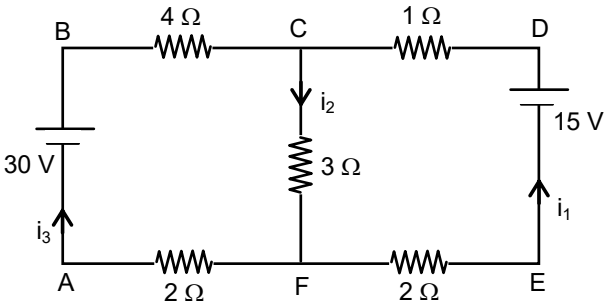
(PART – B)

This section contains **SIX (06)** numerical based questions. The answer to each question is a NUMERICAL VALUE. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.

1. A rod has a total charge Q uniformly distributed along its length L. If the rod rotates with angular velocity ω about its end, its magnetic moment is $Q\omega L^2$ 2/N. Find the value of 'N'.

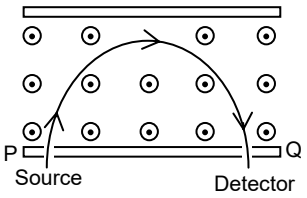


2. The figure shows a network of five resistances and two batteries



Ratio of current $\frac{i_1}{i_2}$.

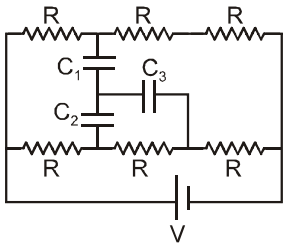
3. A uniform magnetic field with a slit system as shown in the figure is to be used as a momentum filter for high energy charged particles (enter and exit perpendicular to PQ) . With a field of B tesla it is found that the filter transmits α particle each of energy 2.2 MeV. The magnetic field is increased to 2.13B tesla and deuteron ions are passed into the filter. What is the approximate energy (In MeV) of each deuteron ions transmitted by the filter?



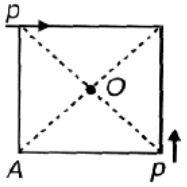
4. Two identical charged spheres are suspended by strings of equal lengths. The strings make an angle of 30° with each other. When suspended in a liquid of density 0.8 g cm^{-3}, the angle remains the same. If density of the material of the sphere is 16 g cm^{-3}, the dielectric constant of the liquid is

Space For Rough Work

5. In the shown circuit, all three capacitor are identical and have capacitance C μF each. Each resistor has resistance of R Ω. An ideal cell of emf V volts is connected as shown. Then the magnitude of potential difference across capacitor C_3 in steady state is (x)V the value of x is:



6. Two short dipoles of dipole moment p are placed at two corners of square as shown in figure. What is the ratio of magnitude of electric field at two points O and A?

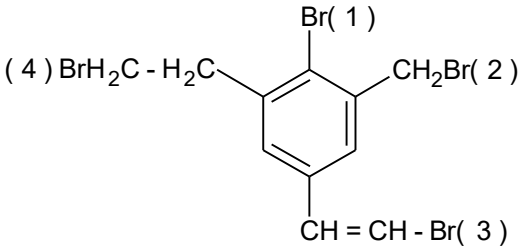


SECTION – II: CHEMISTRY

(PART – A)

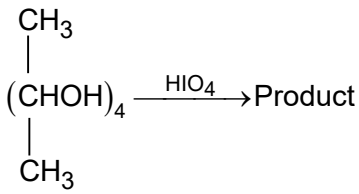
(Single Correct Answer Type)

This section contains **4 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. 

Which bromine atom in the above molecule can be easily substituted by a nucleophile?

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

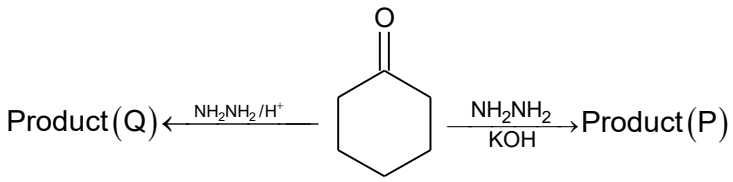
2. 

The reaction produces equal number of moles of

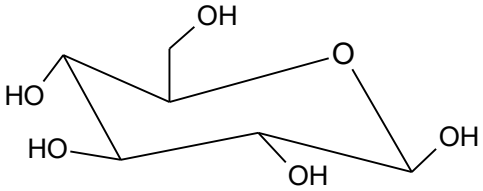
(A) HCHO and CH_3COOH (B) CH_3CHO and HCHO

(C) CH_3CHO and HCOOH (D) CH_3CH_2OH and HCOOH

Space For Rough Work

3. 

Choose correct statement
(A) Molar mass of (P) is greater than that of (Q).
(B) (P) contains only sigma covalent bonds where as (Q) contains sigma and pi-covalent bonds.
(C) Both (P) and (Q) are hydrocarbons
(D) The number of elements present in (P) and (Q) are same.

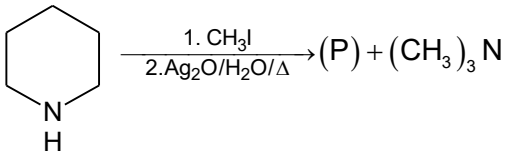
4. 

The correct statement regarding above carbohydrate is
(A) it is a non-reducing sugar
(B) CH_3OH and dry HCl converts it into a non-reducing sugar
(C) reaction of it with HIO_4 results in the cleavage of C – O bonds
(D) the O – H hydrogen atoms are substituted by CH_3 groups when the carbohydrate reacts with CH_3COCl in presence of pyridine

(One or More Than One Options Correct Type)

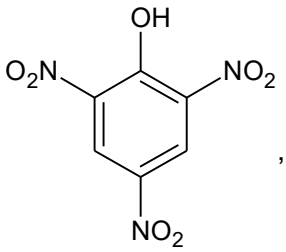
This section contains **3 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D), out of which **ONE** or **MORE THAN ONE is correct.**

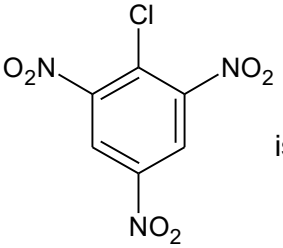
5. Which is/are more reactive than $CH_3\underset{\underset{Br}{|}}{C}HCH_2CH_3$ towards S_N2 reactions?
(A) $CH_3CH_2CH_2Br$ (B) $(CH_3)_3CBr$ (C) CH_3Br (D) $(C_2H_5)_2(CH_3)CBr$

6. 

If x moles of CH_3I is consumed in the reaction and y moles of double bonds are present in one mole of (P), then
(A) x = 3 (B) y = 4 (C) x = 2 (D) y = 2

Space For Rough Work

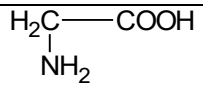
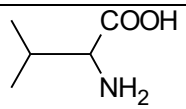
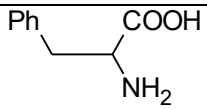
7. The correct statement(s) for picric acid  , is/are

(A) it is formed when phenol reacts with hot conc. HNO_3 and conc. H_2SO_4
(B) it evolves CO_2 gas when treated with $NaHCO_3$
(C) it is formed when  is boiled with water
(D) it is more reactive than phenol towards reaction with PCl_5

(Matching List Sets)

This section contains **Three (03)** Matching List Sets. Each set has **ONE** Multiple Choice Question. Each set has **TWO** lists: **List-I** and **List-II**. **List-I** has **Four** entries (P), (Q), (R) and (S) and **List-II** has **Five** entries (1), (2), (3), (4) and (5). **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.

8. Match the questions mentioned in list-I with their answers given in list-II.
Consider following $\alpha-$amino acids

Sr. No.	Structure of $\alpha-$amino acid	Name	Abbreviation	Pka_1 ($\alpha-COOH$)	Pka_2 ($\alpha-{}^{+}NH_3$)
1.		Glycine	Gly	2.4	9.6
2.		Valine	Val	2.3	9.7
3.		Phenylalanine	Phe	1.8	9.2

List – I		List – II	
(P)	The number of tripeptides including stereoisomers formed by Gly, Val and Phe without repetition of amino acid in a single compound is	(1)	7
(Q)	The pH of glycine at isoelectric point is	(2)	6
(R)	The pH at which phenylalanine exists as a dipolar ion is	(3)	24
(S)	the number of sp^2-carbon atoms present in phenylalanine is	(4)	5.5
		(5)	12

The correct option is:
(A) (P) → (3), (Q) → (4), (R) → (2), (S) → (5)
(B) (P) → (5), (Q) → (2), (R) → (4), (S) → (1)
(C) (P) → (3), (Q) → (2), (R) → (4), (S) → (1)
(D) (P) → (5), (Q) → (4), (R) → (2), (S) → (1)

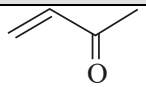
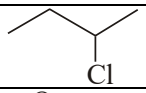
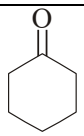
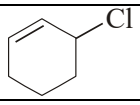
Space For Rough Work

9. Match the reactions mentioned in list-I with their characteristics mentioned in list- II.

List – I		List – II	
(P)	S_N1	(1)	A reaction intermediate is formed
(Q)	S_N2	(2)	Order of reactivity of alkyl halides is: $3^o > 2^o > 1^o$
(R)	E_1	(3)	Inversion of configuration takes place
(S)	E_2	(4)	Racemisation takes place
		(5)	Reactivity order of alkyl halide is $1^o > 2^o > 3^o$

The correct option is:
(A) (P) → (3, 4, 5), (Q) → (4), (R) → (2, 3), (S) → (1, 2)
(B) (P) → (1, 2, 3), (Q) → (3, 4), (R) → (1, 2), (S) → (4, 5)
(C) (P) → (1, 2, 4), (Q) → (3, 5), (R) → (1, 2), (S) → (2)
(D) (P) → (5), (Q) → (3, 4, 5), (R) → (1, 2), (S) → (1, 5)

10. Match the lists.

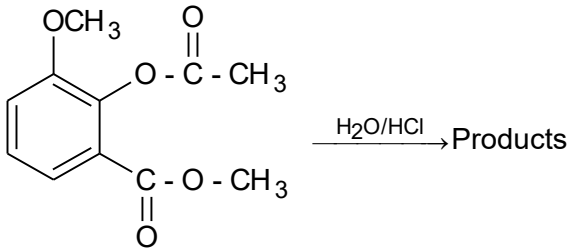
List – I		List – II	
(P)		(1)	Gives orange colour with Brady's reagent (2,4-DNP)
(Q)		(2)	Gives haloform reaction
(R)		(3)	Gives Wurtz reaction
(S)		(4)	Can give aldol reaction with dil. NaOH
		(5)	Gives white ppt. with alcoholic $AgNO_3$ solution

The correct option is:
(A) (P) → (1, 2, 4), (Q) → (3, 5), (R) → (1, 4), (S) → (3, 5)
(B) (P) → (1, 3, 5), (Q) → (1, 2), (R) → (2, 5), (S) → (4, 5)
(C) (P) → (1, 2), (Q) → (2, 4, 5), (R) → (3, 5), (S) → (1, 2)
(D) (P) → (1, 5), (Q) → (1, 3, 5), (R) → (1, 2), (S) → (1, 5)

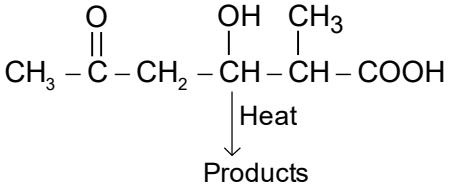
Space For Rough Work

(PART – B)

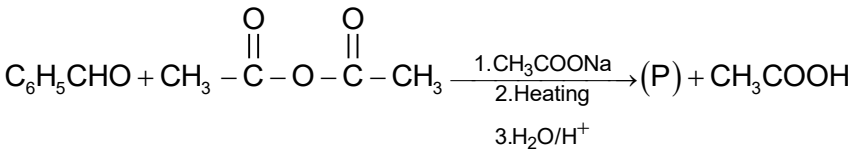
This section contains **SIX (06)** numerical based questions. The answer to each question is a NUMERICAL VALUE. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.

1. 

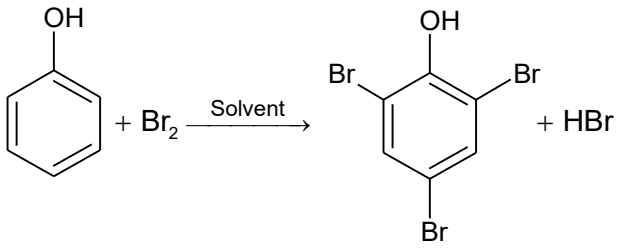
What is the molar mass of the simplest organic product formed in above reaction in g mol^{-1} unit?

2. 

How many maximum number of isomeric product(s) including stereoisomers are formed in above reaction?

3. 

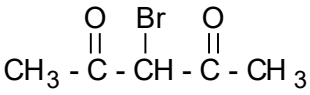
If x is the number of stereoisomers shown by (P)
y is the number of sp^2-carbon in (P) and
z is the number of hydrogen atoms in (P), then
the value of $\left(\frac{x+y+z}{10}\right)$ is

4. 

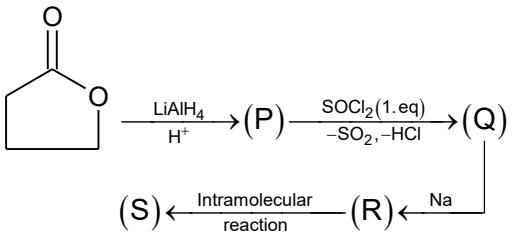
(Precipitate)

If the molar mass of the solvent (out of CH_3NH_2, H_2O, CH_3OH, C_2H_5OH, C_6H_6, CCl_4 and CS_2) which forms immediate precipitate in above reaction, is M, what is the value of $\frac{M}{5}$?

Space For Rough Work

5. 

The above compound reacts with one equivalent of KCN to form compound(P). Hydrolysis of (P) in acidic medium forms compound(Q). heating of (Q) forms compound(R) and evolves a gas which reacts with CH_3MgBr/H_3O^+ to form CH_3COOH. The monoenols of (R) is stabllised by forming cyclic structures due to intramolecular hydrogen bonding. How many sides are there in the cyclic structure?

6. 

How many hydrogen atom(s) is/are present in (S)?

Space For Rough Work

SECTION – III: MATHEMATICS

(PART – A)

(Single Correct Answer Type)

This section contains **4 multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONLY ONE is correct.**

1. The value of $\lim\limits_{x\to 0}\dfrac{\sqrt{\frac{1}{2}(1-\cos 2x)}}{x}$ is:

   (A) 1 (B) –1 (C) 0 (D) None of these

2. The value of the integral $\int\limits_{-\pi/2}^{\pi/2}\dfrac{dx}{(1+e^x)(\sin^6 x+\cos^6 x)}$ is equal to:

   (A) 2π (B) 0 (C) π (D) $\dfrac{\pi}{2}$

3. Let $n \geq 2$ be a natural number and $0 < \theta < \pi/2$. Then $\int\dfrac{(\sin^n\theta-\sin\theta)^{\frac{1}{n}}\cos\theta}{\sin^{n+1}\theta}d\theta$ is equal to: (where C is a constant of integration)

   (A) $\dfrac{n}{n^2-1}\left(1-\dfrac{1}{\sin^{n-1}\theta}\right)^{\frac{n+1}{n}}+C$ (B) $\dfrac{n}{n^2+1}\left(1-\dfrac{1}{\sin^{n-1}\theta}\right)^{\frac{n+1}{n}}+C$

   (C) $\dfrac{n}{n^2-1}\left(1+\dfrac{1}{\sin^{n-1}\theta}\right)^{\frac{n+1}{n}}+C$ (D) $\dfrac{n}{n^2-1}\left(1-\dfrac{1}{\sin^{n+1}\theta}\right)^{\frac{n+1}{n}}+C$

4. Let $f(x)=x^3+x^2$ and $g(x)$ be the inverse of $f(x)$, then the value of $g'(2)=$

   (A) $\dfrac{1}{3}$ (B) $\dfrac{1}{4}$ (C) $\dfrac{1}{5}$ (D) $\dfrac{1}{6}$

(One or More Than One Options Correct Type)

This section contains **3 multiple choice questions.** Each question has 4 choices (A), (B), (C) and (D), out of which **ONE** or **MORE THAN ONE is correct.**

5. Let f: R $\to$ R be given by f(x) = (x – 1) (x – 2) (x – 5). Define $F(x)=\int\limits_0^x f(t)dt,\ x>0$.

   Then which of the following option is/are correct?

   (A) F has a local minimum at x = 1

   (B) F has a local maximum at x = 2

   (C) $F(x)\neq 0$ for all $x\in(0,5)$

   (D) F has two local maxima and one local minimum in $(0,\infty)$

Space For Rough Work

6. Let $f(x)=\begin{cases} 0, & \text{for} \quad x=0 \\ x^2\sin\left(\frac{\pi}{x}\right), & \text{for} \quad -1<x<1,\ (x\neq 0) \\ x|x|, & \text{for} \quad x\geq 1 \text{ or } x\leq -1 \end{cases}$

then

(A) $f(x)$ is an odd function (B) $f(x)$ is an even function

(C) $f(x)$ is neither odd nor even (D) $f'(x)$ is an even function

7. If $\int \frac{x(x+1)\left(2x^2-x+1\right)}{\left(x^3+x^2+x-1\right)^3}dx=\frac{1}{Af^2(x)}+C$ where $f(1)=2$ then

(A) A equals –2 (B) Range of function f is $(-\infty,\infty)$

(C) f has a point of inflexion at x = 1 (D) f is many one function

(Matching List Sets)

This section contains **Three (03)** Matching List Sets. Each set has **ONE** Multiple Choice Question. Each set has **TWO** lists: **List-I** and **List-II**. **List-I** has **Four** entries (P), (Q), (R) and (S) and **List-II** has **Five** entries (1), (2), (3), (4) and (5). **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.

8. Observe the following columns:

	List – I	List – II	
(P)	If $\int e^x\left(\log_e(3x+2)+\frac{9}{(3x+2)^2}\right)dx=e^x\left(\log_e(3x+2)+\frac{m}{nx+r}\right)+C.$ Then $m+n+r$ (where m, n, r are prime numbers), where $m<0, n>0, r>0$.	(1)	5
(Q)	If $\int\frac{\cos 9x+\cos 6x}{2\cos 5x-1}dx=A\sin 4x+B\sin x+C$ (where C is constant of integration), then $A+B$	(2)	1
(R)	If $\int\sqrt[3]{\frac{\sin^{2016}x}{\cos^{2022}x}}dx=\frac{1}{p}(\tan x)^q+C$, then $\frac{p}{q}=$	(3)	$\frac{5}{4}$
(S)	If $\int\frac{\left(x^2+1\right)^{3/2}.\left(x^2-1\right)}{x^{7/2}}dx=\frac{1}{m}\left(x+\frac{1}{x}\right)^n+C$, then $m+n=$	(4)	2
		(5)	6

The correct option is

(A) P→(4) Q → (3) R→(2) S→(1) (B) P→(1) Q → (3) R→(5) S→(2)

(C) P→(2) Q → (4) R→(4) S→(4) (D) P→(1) Q → (5) R→(3) S→(4)

Space For Rough Work

9. Match each entry in List – I to the correct entry in List – II.

List – I		List – II	
(P)	The value of $\int_{-4}^{-5} e^{(x+5)^2}dx + 3\int_{1/3}^{2/3} e^{9\left(x-\frac{2}{3}\right)^2}dx$ is	(1)	2222
(Q)	If $\int_0^{1.8}\left[x^2\right]dx = I$, then the value of $505\left(I+\sqrt{2}+\sqrt{3}\right)$ must be (where [.] denotes the greatest integer function)	(2)	0
(R)	If $\int_0^{\pi/2} f(\sin 2x)\sin x\,dx = \frac{\lambda\sqrt{2}}{208}\int_0^{\pi/4} f(\cos x)\cos x\,dx$, then the value of λ must be	(3)	1
(S)	If $I = \int_0^1 x(1-x)^{49}dx$, then the value of $\frac{1}{I}$ must be	(4)	2550
		(5)	208

The correct option is

(A) P→(4) Q → (3) R→(2) S→(1) (B) P→(2) Q → (1) R→(5) S→(4)

(C) P→(3) Q → (3) R→(4) S→(5) (D) P→(1) Q → (5) R→(3) S→(4)

10. Observe the following columns:

	List – I	List – II	
(P)	Let $f:R\to R$ defined as $f(x) = e^{\text{sgn}\,x} + e^{x^2}$, where $\text{sgn}\,x$ denotes signum function of x, then $f(x)$ is/are	(1)	Odd
(Q)	Let $f:(-1,1)\to R$ defined as $f(x) = x\left[x^4\right] + \frac{1}{\sqrt{1-x^2}}$ where $[x]$ denotes greatest integer less than $f(x)$ is/are	(2)	Even
(R)	Let $f:R\to R$ defined as $f(x) = \frac{x(x+1)\left(x^4+1\right)+2x^4+x^2+2}{x^2+x+1}$ then $f(x)$ is/are	(3)	Neither odd nor even
(S)	Let $f:R\to R$ defined as $f(x) = x+3x^3+5x^5+.....+101x^{101}$ is/are	(4)	One – One
		(5)	Many – One

The correct option is

(A) P→(1, 2) Q → (2, 4) R→(3, 5) S→(1, 5)

(B) P→(2, 5) Q → (1, 2) R→(3, 4) S→(4, 5)

(C) P→(3, 5) Q → (2, 5) R→(3, 5) S→(1, 4)

(D) P→(2, 4) Q → (1, 5) R→(3, 4) S→(1, 4)

Space For Rough Work

(PART – B)

This section contains **SIX (06)** numerical based questions. The answer to each question is a NUMERICAL VALUE. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.

1. The differential coefficient of $f(\cos x)$ w.r. to $g(\sin x)$ at $x = \frac{\pi}{3}$ if $f'\left(\frac{1}{2}\right) = g'\left(\frac{\sqrt{3}}{2}\right) = -2$ is $-\sqrt{\alpha}$ where α =_____

2. Let g be a non – negative continuous function such that $g(x) + g\left(x + \frac{5}{2}\right) = 7, \forall x \in \left(0, \frac{5}{2}\right)$. Find $4\int_0^5 g(t)\,dt$.

3. Let $f(x)$ be a differentiable function satisfying $f\left(\frac{x+y}{2}\right) = \frac{f(x)+f(y)}{2}\ \forall x, y \in R$ and $f(0) = 0$. If $\int_0^{2\pi} \left(f(x) - \sin x\right)^2 dx$ is minimized, then find the value of $f\left(-4\pi^2\right)$

4. If $y = f(x)$ satisfies the relation $\int_2^x f(t)\,dt = \frac{x^2}{2} + \int_x^2 t^2 f(t)\,dt - 2$. Then $\int_{-2}^{2} \left(f(x) + x^2\right)dx =$ _____

5. Let $\sum_{k=1}^{10} f(a+k) = 16\left(2^{10} - 1\right)$, where the function f satisfies f(x + y) = f(x) f(y) for all natural numbers x, y and f(1) = 2. Then the natural number 'a' is:

6. $\int_{-1}^{1} \frac{1}{x^3 + 1 + \sqrt{x^6 + 1}}\,dx =$ _____

Space For Rough Work

FIITJEE INTERNAL TEST

BATCHES – Two Year CRP426(R & W)

Phase Test – 4 (Paper-1)

Code: 101039

JEE ADVANCED

ANSWER KEY

ANSWER KEYS

Physics

PART – A

1.	B	2.	B	3.	D	4.	A
5.	AB	6.	ACD	7.	BC	8.	B
9.	A	10.	D				

PART – B

1.	6.00	2.	0.25	3.	5.00	4.	2.00
5.	0.22	6.	2.83				

Chemistry

PART – A

1.	B	2.	C	3.	B	4.	B
5.	AC	6.	AD	7.	ABCD	8.	C
9.	C	10.	A				

PART – B

1.	32	2.	6	3.	1.9	4.	3.6
5.	6	6.	8				

Mathematics

PART – A

1.	D	2.	C	3.	A	4.	C
5.	ABC	6.	AD	7.	ABCD	8.	A
9.	B	10.	C				

PART – B

1.	3	2.	70.00	3.	3.00	4.	5.33
5.	3	6.	1				