

FIITJEE INTERNAL TEST

PHYSICS, CHEMISTRY & MATHEMATICS

QP CODE: 101121

RIT-7

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 option(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 – Class – XII (CTY426 Batches)

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. Consider a cube as shown in the figure-I, with uniformly distributed charge in its entire volume. Intensity of electrical field and potential at one of its vertex P are E_0 and V_0 respectively. A portion of half the size (half edge length) of the original cube is cut and removed as shown in the figure-II. Find modulus of electric field and potential at the point P in the new structure.

Figure-I

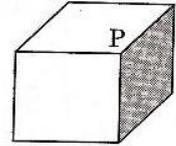
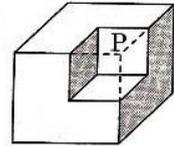
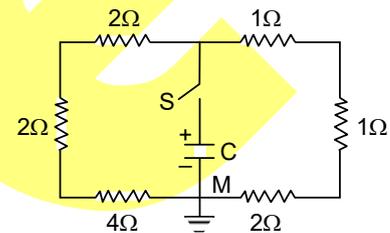


Figure-II



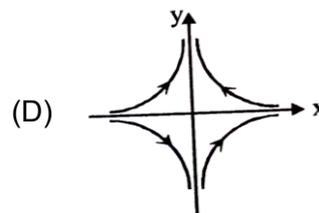
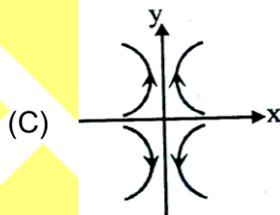
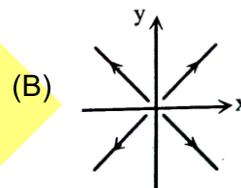
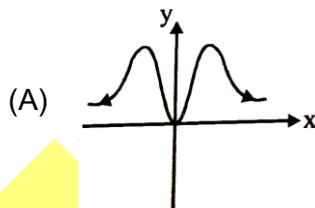
- (A) $\frac{E_0}{2}$ and $\frac{3V_0}{4}$ (B) $\frac{3E_0}{4}$ and $\frac{V_0}{2}$
 (C) $\frac{3E_0}{4}$ and $\frac{7V_0}{8}$ (D) $\frac{7E_0}{8}$ and $\frac{7V_0}{8}$

2. A capacitor of capacity $6 \mu\text{F}$ and initial charge $160 \mu\text{C}$ is connected with key S and resistance as shown in figure. Point M is earthed. If key is closed at $t = 0$; then the current through resistance $R = (1\Omega)$ at $t = 16 \mu\text{s}$ is :



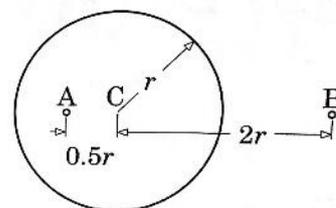
- (A) $\frac{10}{3e}$ A (B) $\frac{10}{e}$ A
 (C) $\frac{20}{3e}$ A (D) None of these

3. In a certain region of space. The potential field depends on x and y coordinates as $V = (x^2 - y^2)$. The corresponding electric field lines x - y plane are correctly represented by



Space For Rough Work

4. Consider a thin conducting shell of radius r carrying total charge q . Two point charges q and $2q$ are placed on points A and B, which are at distances $0.5r$ and $2r$ from the centre C of the shell respectively. If the shell is earthed, how much charge will flow to the earth?
- (A) $2q$
 (B) $3q$
 (C) $4q$
 (D) More than $2q$ and less than $3q$

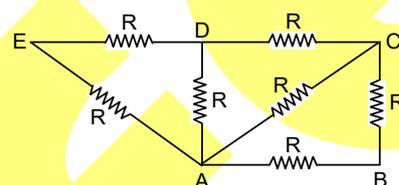


(One or More Than One Options Correct Type)

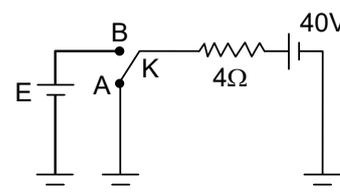
This section contains 3 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONE** or **MORE THAN ONE** is correct.

5. Consider the following circuit:
 Each resistance is 'R'. Match the following:

- (A) Effective resistance between A & B $\left(\frac{13}{21}\right)R$
 (B) Effective resistance between A & C $\left(\frac{10}{21}\right)R$
 (C) Effective resistance between A & D $\left(\frac{10}{21}\right)R$
 (D) Effective resistance between A & E $\left(\frac{13}{21}\right)R$



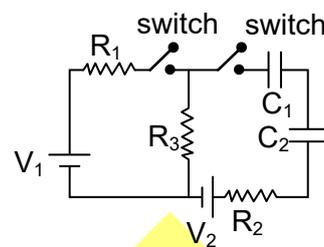
6. For the circuit as shown, find the correct options :
- (A) The emf of battery E will be 20 V so that ratio of currents flowing through 4Ω resistor in position A to position B of the key K is 2
 (B) The emf of battery E will be 32 V so that ratio of currents flowing through 4Ω resistor in position A to position B of the key K is 2
 (C) The emf of battery E will be 24 V so that ratio of currents flowing through 4Ω resistor in position A to position B of the key K is 2.5
 (D) The emf of battery E will be 30 V so that ratio of currents flowing through 4Ω resistor in position A to position B of the key K is 4.



Space For Rough Work

7. In the given circuit $C_1 = C$, $C_2 = 2C$, $V_1 = V_2 = V$ & $R_1 = R_2 = R_3 = R$ and all switches are closed at $t = 0$ then choose the incorrect statement at time $t = RC$ (initially all capacitors are uncharged)

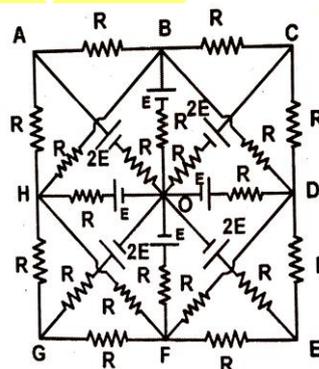
- (A) Current through V_1 is less than $\frac{V}{2Re} [e - 1]$
- (B) Power delivered by V_2 is less than $\frac{V^2}{3eR}$
- (C) Current through V_1 is greater than $\frac{V}{2Re} [e - 1]$
- (D) Power delivered by V_2 is greater than $\frac{V^2}{3eR}$



(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. Consider the circuit shown in the figure. Given $E = 5$ Volts and $R = 1\Omega$. Take $V_0 = 0$ volt.

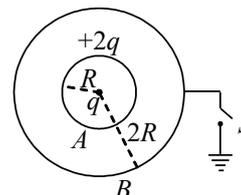


List-I		List-II	
(P)	Current through OA in amperes	(1)	7
(Q)	Current through AB in amperes	(2)	8
(R)	Potential at A in volts	(3)	1
(S)	Potential at B in volts	(4)	2

The correct option is:

- (A) $P \rightarrow 3$; $Q \rightarrow 4$; $R \rightarrow 3$; $S \rightarrow 1$
- (B) $P \rightarrow 4$; $Q \rightarrow 3$; $R \rightarrow 1$; $S \rightarrow 2$
- (C) $P \rightarrow 4$; $Q \rightarrow 3$; $R \rightarrow 2$; $S \rightarrow 1$
- (D) $P \rightarrow 3$; $Q \rightarrow 1$; $R \rightarrow 4$; $S \rightarrow 2$

9. Two concentric conducting shells A and B have radii R and $2R$. A charge q is placed at the centre of the shells and a charge $2q$ is given to shell A.



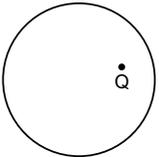
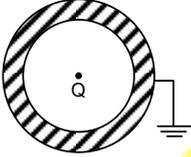
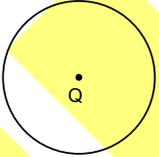
List-I		List-II	
(A)	Charge on inner surface of shell A when switch is open	(1)	$-3q$
(B)	Charge on inner surface of shell B when switch is open	(2)	zero
(C)	Charge on outer surface of shell A when switch is closed	(3)	$-q$
(D)	Charge on outer surface of shell B when switch is closed	(4)	$3q$
		(5)	$2q$

The correct option is:

(A) $P \rightarrow 3 ; Q \rightarrow 1 ; R \rightarrow 2 ; S \rightarrow 4$
 (C) $P \rightarrow 3 ; Q \rightarrow 4 ; R \rightarrow 1 ; S \rightarrow 3$

(B) $P \rightarrow 3 ; Q \rightarrow 1 ; R \rightarrow 4 ; S \rightarrow 2$
 (D) $P \rightarrow 2 ; Q \rightarrow 1 ; R \rightarrow 4 ; S \rightarrow 3$

10.

List-I		List-II	
(P)	Electrically neutral thick conducting spherical shell, with point charge at its centre. 	(1)	Electric field everywhere inside the cavity due to charges induced on the inner surface of conductor is zero.
(Q)	Electrically neutral thin conducting spherical shell, with point charge to the right of its centre 	(2)	Electric field every where inside the cavity due to charges induced on the outer surface of conductor is zero
(R)	Electrically neutral thick conducting spherical shell, with point charge to the right of its centre. Shell is earth. 	(3)	Electric potential at the centre of the cavity due to charge induced on inner & outer surface of conductor is zero.
(S)	Electrically neutral thin conducting spherical shell, with point charge at its centre 	(4)	Electricity potential everywhere inside the cavity due charges induced on the inner and outer surface conductor is zero.

The correct option is:

(A) $P-1,2 ; Q-3 ; R-2 ; S-1,3,4$
 (C) $P-1,2 ; Q-2,3 ; R-2 ; S-1,2,3,4$

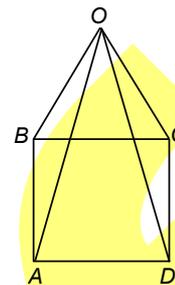
(B) $P-1 ; Q-2,3 ; R-2 ; S-1,2,4$
 (D) $P-1,2 ; Q-2 ; R-2 ; S-1,2,3,4$

Space For Rough Work

(PART – B)

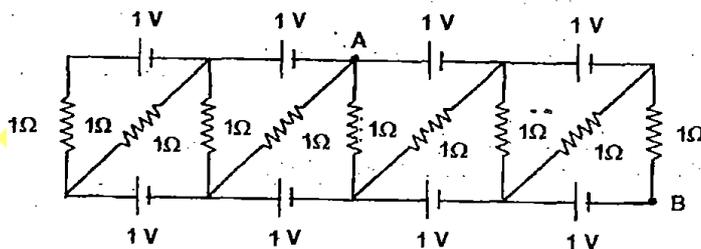
This section contains **SIX (06)** numerical based questions. The answer to each question is a NUMERICAL VALUE. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.

1. Eight identical resistances 3 ohm, each are connected along edges of a pyramid having square base $ABCD$ as shown in figure. The equivalent resistance between A and D is r . Find out $10r$.



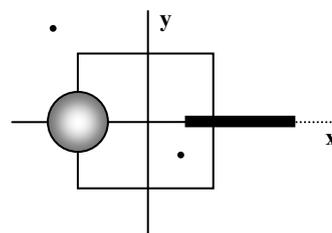
2. An electric field given by $\vec{E} = 4\hat{i} - 3(y^2 + 2)\hat{j}$ pierces Gaussian cube of side 1m placed at origin such that its three sides represents x , y and z axes. The net charge enclosed within the cube is $n\epsilon_0$, the value of 'n' is

3. Consider the circuit shown in the figure. If the potential difference between points A and B is $(22/n)$ volts then find the value of n . All the cells are ideal and emf of each cell is 1 volts.

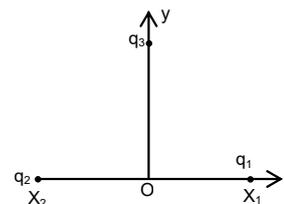


4. A hollow charged metal sphere has a radius r . If the potential difference between its surface and a point at distance $3r$ from its centre is V then the electric intensity at distance $3r$ from the centre is $\frac{V}{\lambda r}$. Find the value of λ .

5. A disk of radius $a/4$ having a uniformly distributed charge $-(6\epsilon_0)$ Coulombs is placed in the x - y plane with its centre at $(-a/2, 0, 0)$. A rod of length a carrying a uniformly distributed charge $-(8\epsilon_0)$ Coulombs is placed on the x -axis from $x = a/4$ to $x = 5a/4$. Two point charges $+(12\epsilon_0)$ Coulombs and $+(3\epsilon_0)$ Coulombs are placed at $(a/4, -a/4, 0)$ and $(-3a/4, 3a/4, 0)$, respectively. Consider a cubical surface formed by six surfaces $x = \pm a/2, y = \pm a/2, z = \pm a/2$. The electric flux through this cubical surface in SI unit is



6. Two point charge $q_1 = q_2 = 2\mu\text{C}$ are fixed at $x_1 = +3\text{m}$ and $x_2 = -3\text{m}$ as shown. A third particle of mass 1gm and charge $q_3 = -3.75\mu\text{C}$ is released from rest at $y = 4\text{m}$. Find the speed (in m/s) of the particle as it reaches the origin (ignore gravity).



Space For Rough Work

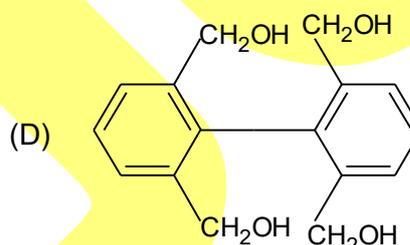
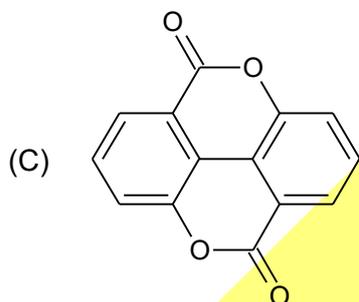
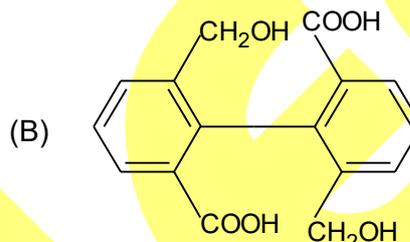
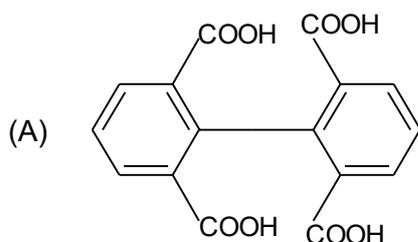
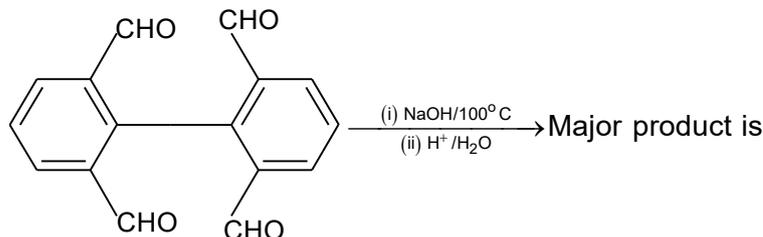
SECTION – II: CHEMISTRY

(PART – A)

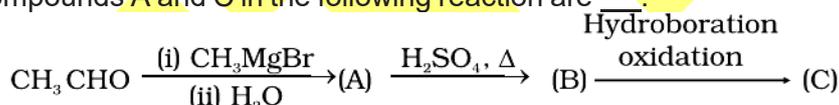
(Single Correct Answer Type)

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.



2. Compounds A and C in the following reaction are _____.



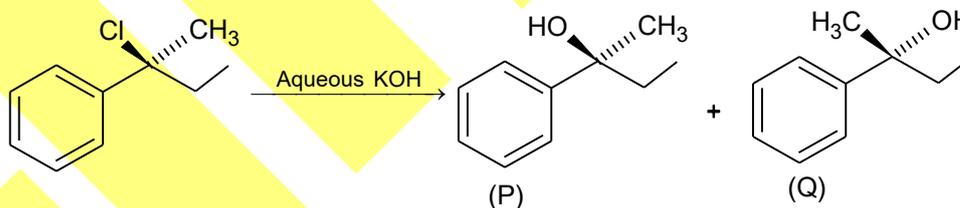
(A) identical

(B) positional isomers

(C) functional isomers

(D) optical isomers

3.



In above reaction (P) and (Q) are formed in equal quantities. Addition of which compound increases the product yield?

(A) Pyridine

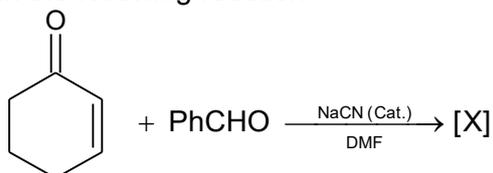
(B) AgNO₃

(C) HCl

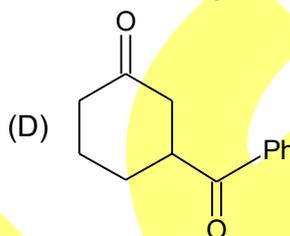
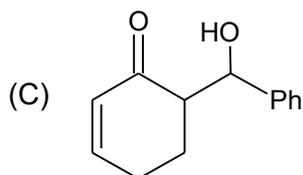
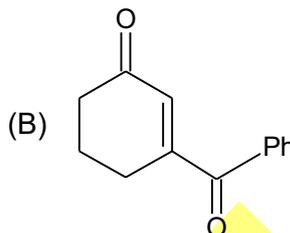
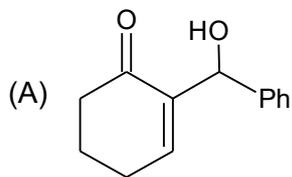
(D) C₂H₅OH

Space For Rough Work

4. In the following reaction



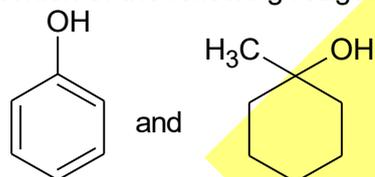
The major product [X] is:



(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 of the following reagent(s) can be used to distinguish between



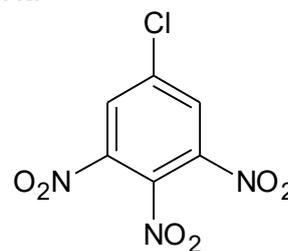
(A) FeCl_3

(B) $\text{K}_2\text{Cr}_2\text{O}_7/\text{H}^+$

(C) $\text{Br}_2/\text{H}_2\text{O}$

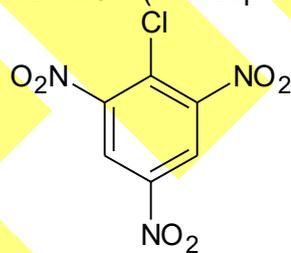
(D) Na

6. Which of the following compound(s) is/are more reactive than

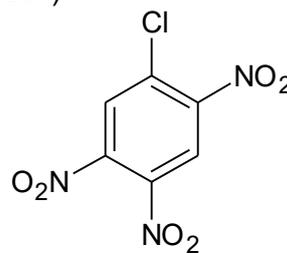


towards NaOH (Nucleophilic substitution reaction)

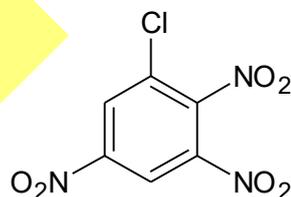
(A)



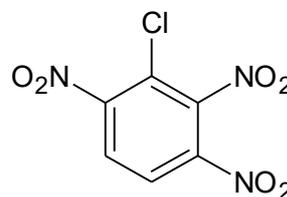
(B)

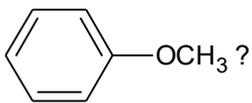


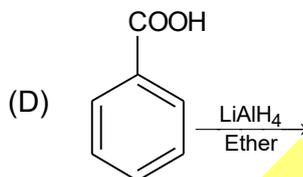
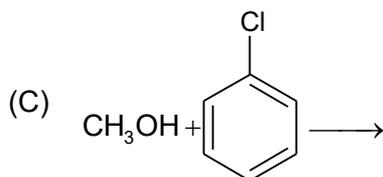
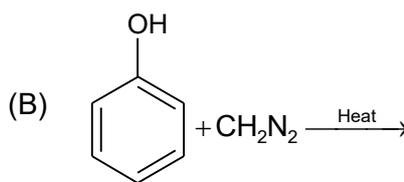
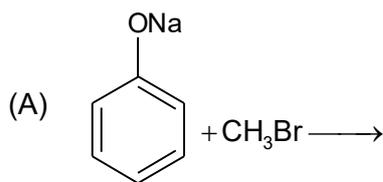
(C)



(D)



7. Which of the following reaction(s) can produce  ?



(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 reactions given in list-I with the suitable reagents given in list-II.

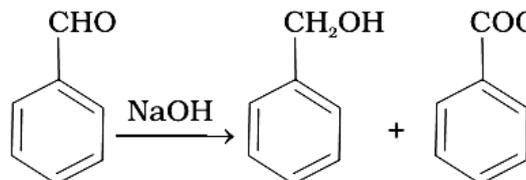
List – I (Reactions)		List – II (Reagents)	
(P)	Benzophenone → Diphenylmethane	(1)	LiAlH ₄
(Q)	Benzaldehyde → 1-Phenylethanol	(2)	DIBAL - H
(R)	Cyclohexanone → Cyclohexanol	(3)	Zn(Hg)/Conc. HCl
(S)	Phenyl benzoate → Benzaldehyde	(4)	CH ₃ MgBr
		(5)	C ₆ H ₅ MgBr

The correct option is:

- (A) (P) → (3), (Q) → (4), (R) → (1), (S) → (2)
 (B) (P) → (1), (Q) → (2), (R) → (3), (S) → (4)
 (C) (P) → (4), (Q) → (5), (R) → (2), (S) → (1)
 (D) (P) → (5), (Q) → (3), (R) → (4), (S) → (2)

Space For Rough Work

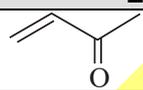
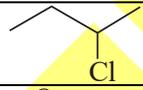
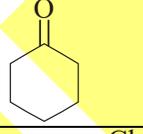
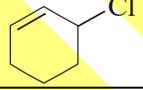
9. Match the example given in list-I with the name of the reaction in list-II.

List-I (Example)		List-II (Reaction)	
(P)	$\text{CH}_3\text{-C}(=\text{O})\text{-Cl} + \text{H}_2 \xrightarrow{\text{Pd-C/BaSO}_4} \text{CH}_3\text{-C}(=\text{O})\text{-H}$	(1)	Aldol condensation
(Q)		(2)	Cannizaro's reaction
(R)	$\text{CH}_3\text{-CN} \xrightarrow[\text{(ii) H}_2\text{O/H}^+]{\text{(i) SnCl}_2/\text{HCl}} \text{CH}_3\text{CHO}$	(3)	Rosemund's reduction
(S)	$2\text{CH}_3\text{CHO} \xrightarrow{\text{NaOH}} \text{CH}_3\text{-CH=CHCHO}$	(4)	Stephen's reaction
		(5)	Bayer Villiger reaction

The correct option is:

- (A) (P) → (3), (Q) → (5), (R) → (1), (S) → (2)
 (B) (P) → (3), (Q) → (2), (R) → (4), (S) → (1)
 (C) (P) → (1), (Q) → (3), (R) → (5), (S) → (1)
 (D) (P) → (2), (Q) → (4), (R) → (3), (S) → (1)

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

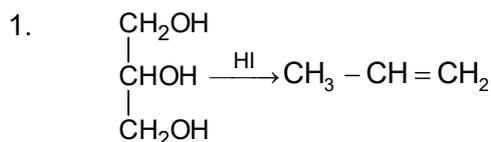
The correct option is:

- (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)

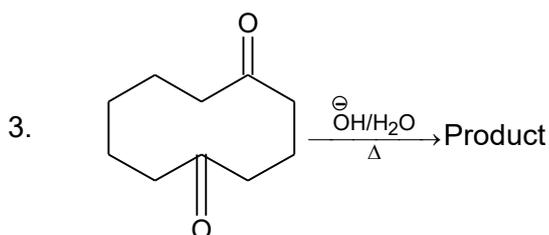
This section contains **SIX (06)** numerical based questions. The answer to each question is a NUMERICAL VALUE. If the numerical value has more than two decimal places, truncate/round-off the value to TWO decimal places.



How many moles of HI is consumed in the above reaction per mole of reactant?

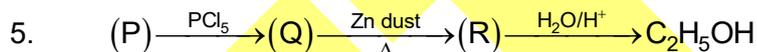


Calculate $\frac{N}{6}$, if N is different type of product(s) is/are formed in the above reaction without considering stereoisomers]

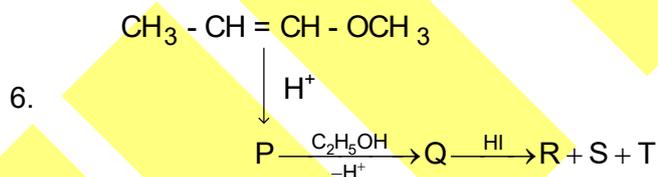


Calculate the value of $\frac{\text{Molecular mass of the final product}}{51}$

4. An organic compound P(C₈H₈O) responds to FeCl₃ test and produce H₂ gas when reacts with sodium metal. Zinc dust distillation of (P) produces Q(C₈H₈) which is an aromatic compound. Ozonolysis of (Q) produces benzaldehyde and another aldehyde(R)? What is the degree of unsaturation of (P)?



What is the molar mass in g mol⁻¹ unit of (P) if it contains two carbon atoms?



P is an oxonium ion and S and T are CH₃I and C₂H₅I. What is the molar mass of R in g mol⁻¹ unit?

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 domain of the function $\cos^{-1}\left(\frac{2\sin^{-1}\left(\frac{1}{4x^2-1}\right)}{\pi}\right)$ is:
- (A) $\mathbb{R} - \left\{-\frac{1}{2}, \frac{1}{2}\right\}$ (B) $(-\infty, -1] \cup [1, \infty) \cup \{0\}$
 (C) $(-\infty, \frac{-1}{2}) \cup (\frac{1}{2}, \infty) \cup \{0\}$ (D) $(-\infty, \frac{-1}{\sqrt{2}}] \cup [\frac{1}{2}, \infty) \cup \{0\}$
2. If α is the positive root of the equation, $p(x) = x^2 - x - 2 = 0$, then $\lim_{x \rightarrow \alpha^+} \frac{\sqrt{1 - \cos(p(x))}}{x + \alpha - 4}$ is equal to:
- (A) $\frac{1}{\sqrt{2}}$ (B) $\frac{1}{2}$ (C) $\frac{3}{\sqrt{2}}$ (D) $\frac{3}{2}$
3. Let f and g be two functions defined by $f(x) = \begin{cases} x+1, & x < 0 \\ |x-1|, & x \geq 0 \end{cases}$ and $g(x) = \begin{cases} x+1, & x < 0 \\ 1, & x \geq 0 \end{cases}$. Then $(g \circ f)(x)$ is
- (A) Differentiable everywhere
 (B) Continuous everywhere but not differentiable exactly at one point
 (C) Not continuous at $x = -1$
 (D) Continuous everywhere but not differentiable at $x = 1$
4. Let $f(x) = 15 - |x - 10|; x \in \mathbb{R}$. Then the set of all values of x , at which the function, $g(x) = f(f(x))$ is not differentiable, is:
- (A) $\{5, 10, 15, 20\}$ (B) $\{10, 15\}$ (C) $\{5, 10, 15\}$ (D) $\{10\}$

Space For Rough Work

(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 $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ be functions satisfying $f(x+y) = f(x) + f(y) + f(x)f(y)$ and $f(x) = xg(x)$ for all $x, y \in \mathbb{R}$. If $\lim_{x \rightarrow 0} g(x) = 1$, then which of the following statement is/are true
- (A) f is differentiable at every $x \in \mathbb{R}$
 (B) If $g(0) = 1$, then g is differentiable at every $x \in \mathbb{R}$
 (C) The derivative $f'(1)$ is equal to 1
 (D) The derivative $f'(0)$ is equal to 1
6. Let $S = (0, 1) \cup (1, 2) \cup (3, 4)$ and $T = \{0, 1, 2, 3\}$. Then which of the following statements is (are) true?
- (A) There are infinitely many functions from S to T
 (B) There are infinitely many strictly increasing functions from S to T
 (C) The number of continuous functions from S to T is at most 120
 (D) Every continuous function from S to T is differentiable
7. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be a function. We say that f has
- Property 1; if $\lim_{h \rightarrow 0} \frac{f(h) - f(0)}{\sqrt{|h|}}$ exists and is finite, and
- Property 2; if $\lim_{h \rightarrow 0} \frac{f(h) - f(0)}{h^2}$ exists and is finite.
- Then which of the following options is/are correct?
- (A) $f(x) = x|x|$ has Property 2
 (B) $f(x) = x^{2/3}$ has Property 1
 (C) $f(x) = \sin x$ has Property 2
 (D) $f(x) = |x|$ has Property 1

Space For Rough Work

(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 following.

	List - I		List - II
(P)	$\lim_{x \rightarrow 0} \frac{\sqrt{1+x \sin x} - \sqrt{\cos 2x}}{\tan^2 \frac{x}{2}}$	(1)	-3
(Q)	$\lim_{x \rightarrow 1} \frac{\sin^2(x^3 + x^2 + x - 3)}{1 - \cos(x^2 - 4x + 3)}$	(2)	6
(R)	$\lim_{x \rightarrow 0} \frac{6x^2 (\cot x)(\csc 2x)}{\sec\left(\cos x + \pi \tan\left(\frac{\pi}{4 \sec x}\right) - 1\right)}$ has the value equal to	(3)	8
(S)	If $\lim_{x \rightarrow -2^+} \frac{(2(a-3)(x+2) - 6 \sin^{-1}(x+2)) \tan^{-1}(5x+10)}{(x+2)^2}$ then, the value of a is equal to	(4)	12
		(5)	18

The correct option is

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

9. Match the following:

	List - I		List - II
(P)	Number of points where the function $f(x) = \begin{cases} 1 + \left[\cos \frac{\pi x}{2} \right], & 1 < x < 2 \\ 1 - \{x\}, & 0 \leq x < 1 \\ \sin \pi x , & -1 \leq x < 0 \end{cases}$ and $f(1) = 0$ is continuous but non - differentiable (where $[.]$ GIF and $\{.\}$ is FPF)	(1)	0
(Q)	$f(x) = \begin{cases} x^2 e^{1/x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$, then $f'(0^-) =$	(2)	1
(R)	The number of points at which $g(x) = \frac{1}{1 + \frac{2}{f(x)}}$ is not differentiable, where $f(x) = \frac{1}{1 + \frac{1}{x}}$, is	(3)	2
(S)	Number of points where tangent does not exist for the curve $y = \operatorname{sgn}(x^2 - 1)$	(4)	3
		(5)	4

The correct option is

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

10. Match the following:

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

The correct option is

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

(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.

- Consider a function $f : \mathbb{N} \rightarrow \mathbb{R}$, satisfying $f(1) + 2f(2) + 3f(3) + \dots + xf(x) = x(x+1)f(x); x \geq 2$ with $f(1) = 1$. Then $\frac{1}{f(2022)} + \frac{1}{f(2028)}$ is equal to
- Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be a continuous function such that $f(3x) - f(x) = x$. If $f(8) = 7$, then $f(14)$ is equal to
- $\lim_{x \rightarrow 0} \left(\frac{(x+2\cos x)^3 + 2(x+2\cos x)^2 + 3\sin x(x+2\cos x)}{(x+2)^3 + 2(x+2)^2 + 3\sin(x+2)} \right)^{\frac{100}{x}}$ is equal to
- Let $a, b \in \mathbb{R}, b \neq 0$. Define a function $f(x) = \begin{cases} a \sin \frac{\pi}{2}(x-1), & \text{for } x \leq 0 \\ \frac{\tan 2x - \sin 2x}{bx^3}, & \text{for } x > 0 \end{cases}$
If f is continuous at $x = 0$, then $10 - ab$ is equal to _____
- If $y(x) = (x^x)^x, x > 0$ then $\frac{d^2y}{dx^2} + 20$ at $x = 1$ is equal to
- Let R be a relation from the set $\{1, 2, 3, \dots, 60\}$ to itself such that $R = \{(a, b) : b = pq \text{ where } p, q \geq 3 \text{ are prime numbers}\}$. Then, the number of elements in R is:

Space For Rough Work

FIITJEE INTERNAL TEST

BATCHES – Class – XII (CTY426 Batches)

RIT – 7

Code: 101121

JEE ADVANCED LEVEL

ANSWER KEY

ANSWER KEYS

Physics

PART – A

- | | | | |
|---------|-------|--------|------|
| 1. A | 2. C | 3. D | 4. B |
| 5. ABCD | 6. AC | 7. ABD | 8. C |
| 9. B | 10. C | | |

PART – B

- | | | | |
|-------|------|------|------|
| 1. 16 | 2. 3 | 3. 9 | 4. 6 |
| 5. 7 | 6. 6 | | |

Chemistry

PART – A

- | | | | |
|--------|---------|-------|------|
| 1. B | 2. B | 3. B | 4. D |
| 5. ABC | 6. ABCD | 7. AB | 8. A |
| 9. B | 10. A | | |

PART – B

- | | | | |
|-------|---------|---------|------|
| 1. 4 | 2. 0.66 | 3. 2.94 | 4. 5 |
| 5. 62 | 6. 58 | | |

Mathematics

PART – A

- | | | | |
|--------|--------|-------|------|
| 1. D | 2. C | 3. B | 4. C |
| 5. ABD | 6. ACD | 7. BD | 8. C |
| 9. B | 10. D | | |

PART – B

- | | | | |
|---------|--------|------|-------|
| 1. 8100 | 2. 10 | 3. 1 | 4. 14 |
| 5. 16 | 6. 660 | | |