

**PHYSICS, CHEMISTRY & MATHEMATICS****QP CODE: 100737****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.
- \* In multiple choice questions the options are given as F,T,R & E which correspond to the options A,B,C & D respectively in the 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 (08-11)** – This section contains Four (04) 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 **+3 Marks** for correct answer and **-1 marks** for wrong answer.
- (iii) **Part-B (01-06)** This section contains **SIX (06)** questions. The answer to each question is a **NON-NEGATIVE INTEGER**. For each question, enter the correct integer corresponding to the answer. Each question carries **+4 marks** for correct answer. **There is no negative marking.**

Name of the Candidate: \_\_\_\_\_

Batch: \_\_\_\_\_ Date of Examination: \_\_\_\_\_

Enrolment Number: \_\_\_\_\_

**Forthcoming  
Exam – FTRE on  
15th Sept. 2024.****BATCH – NWCMSW425A1\_PT-1**

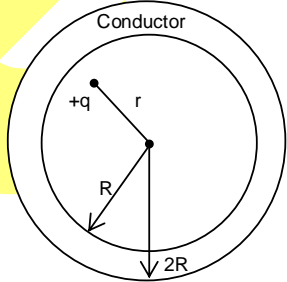
- \* In multiple choice questions the options are given as F,T,R & E which correspond to the options A,B,C & D respectively in the OMR sheet.

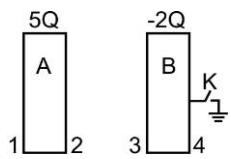
## SECTION – II : PHYSICS

### (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. A particle moves in x-y plane such that its position vector varies with time as  $\vec{r} = (2\sin 3t)\hat{i} + 2(1 - \cos 3t)\hat{j}$ . The equation of trajectory of the particle will be  
 (F)  $x^2 + y^2 = 1$  (T)  $x^2 + (2 - y)^2 = 4$   
 (R)  $(2 - x)^2 + y^2 = 4$  (E)  $(1 - x)^2 + (1 - y)^2 = 4$
2. A point charge  $q$  is placed at a distance  $r$  from the centre  $O$  of a uncharged spherical shell of inner radius  $R$  and outer radius  $2R$ . The distance  $r < R$ . The electric potential at the centre of the shell will be  
 (F)  $\frac{q}{4\pi\epsilon_0} \left( \frac{1}{r} - \frac{1}{2R} \right)$  (T)  $\frac{q}{4\pi\epsilon_0 r}$   
 (R)  $\frac{q}{4\pi\epsilon_0} \left( \frac{1}{r} + \frac{1}{2R} \right)$  (E) none of these
- 
3. The electric field at a point inside a long cylinder charged throughout its volume is given by the relation  

$$E = \frac{1}{3\epsilon_0} kr^2$$
 where  $k$  is a positive constant and  $r$  is the distance from the axis of the cylinder. The charge density  $\rho$  inside the cylinder depends on  $r$  as  
 (F)  $\rho = k$  (T)  $\rho = kr$  (R)  $\rho = kr^2$  (E)  $\rho = k\sqrt{r}$
4. Charges  $5Q$  and  $-2Q$  is given to plates A and B. Charge on surface 3 of plate B when key K is on is  
 (F)  $\frac{5Q}{2}$  (T)  $\frac{3Q}{2}$   
 (R)  $-2Q$  (E)  $-5Q$
- 

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. The force exerted by the floor of an elevator on the foot of a person standing there is more than the weight of the person if the elevator is  
 (F) going up and slowing down (T) going up and speeding up  
 (R) going down and slowing down (E) going down and speeding up.
6. From the top of a tower of height 40 m, a ball is projected upwards with a speed of  $20 \text{ ms}^{-1}$  at an angle of elevation of  $30^\circ$ . The total time taken by the ball to hit the ground is T and the time taken to come back to the same elevation is t. The horizontal distance covered by the ball is x. If  $g = 10 \text{ ms}^{-2}$ , then  
 (F)  $\frac{T}{t} = 2$  (T)  $\frac{T}{t} = \sqrt{2}$  (R)  $x = 40\sqrt{2} \text{ m}$  (E)  $x = 40\sqrt{3} \text{ m}$
7. If  $\vec{A}, \vec{B}$  and  $\vec{C}$  are non zero coplanar, choose the correct statements  
 (F)  $\vec{A} \times (\vec{B} \times \vec{C}) = 0$  (T)  $\vec{A} \cdot (\vec{B} \times \vec{C}) = 0$ .  
 (R)  $(\vec{A} + \vec{B}) \cdot (\vec{B} \times \vec{C}) = 0$ , (E)  $\vec{A} \times (\vec{B} + \vec{C}) = 0$

**(Matching List Sets)**

This section contains **FOUR (04) 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. A block of mass 'm' is hanging from the roof of an elevator with the help of a string. The tension in the string is T.

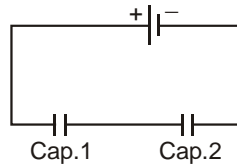
List-I		List-II	
(P)	$T > mg$	(1)	Elevator is going up with increasing speed.
(Q)	$T < mg$	(2)	Elevator is going up with decreasing speed.
(R)	$T = mg$	(3)	Elevator is going up with uniform speed.
(S)	$T \neq mg$	(4)	Elevator is going down with increasing speed.
		(5)	Elevator is a rest.

The correct option is:

- (F)  $P \rightarrow 2 ; Q \rightarrow 1,4 ; R \rightarrow 3,4 ; S \rightarrow 1,2,4$  (T)  $P \rightarrow 1 ; Q \rightarrow 2,4 ; R \rightarrow 3,5 ; S \rightarrow 1,2,4$   
 (R)  $P \rightarrow 1 ; Q \rightarrow 2,4 ; R \rightarrow 2,5 ; S \rightarrow 1,2$  (E)  $P \rightarrow 3,4 ; Q \rightarrow 4 ; R \rightarrow 1,2 ; S \rightarrow 1,4,5$

Space For Rough Work

9. Two identical capacitors are connected in series, and the combination is connected with a battery, as shown. Some changes in the capacitor 1 are now made independently after the steady state is achieved, listed in list-I. Some effects which may occur in new steady state due to these changes on the capacitor 2 are listed in list-II. Match the changes one capacitor 1 in list-I with corresponding effect on capacitor 2 in list-II.

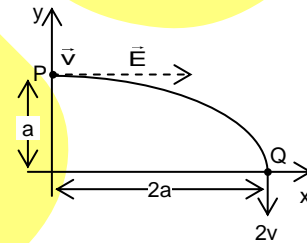


List-I		List-II	
(P)	A dielectric slab is inserted	(1)	Charge on the capacitor increases
(Q)	Separation between plates increased	(2)	Charge on the capacitor decreases
(R)	A metal plate is inserted connecting both plates	(3)	Energy stored in the capacitor increases
(S)	The left plate is grounded	(4)	Energy stored in the capacitor decreases
	A dielectric slab is inserted	(5)	No change is occurred

The correct option is:

- (F) P → 1,3 ; Q → 4 ; R → 5 ; S → 1,2      (T) P → 2 ; Q → 2,4 ; R → 1 ; S → 3  
 (R) P → 1,2 ; Q → 3 ; R → 1,4 ; S → 2      (E) P → 1,3 ; Q → 2 ; R → 1,3 ; S → 5

10. 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.

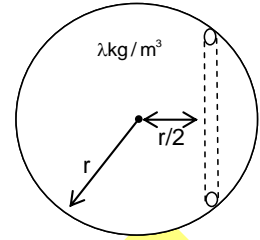
List-I		List-II	
(P)	Electric field $E$ equals	(1)	$\frac{mv^2}{qa}$
(Q)	If rate of work done by the electric field at P = $b q v$ , then $b =$	(2)	0
(R)	If rate of work done by both the fields at Q = $c q v$ , then $c =$	(3)	$\frac{3}{4} \frac{mv^2}{qa}$
(S)	If rate of work done by both the fields at P = $c q v$ , then $c =$	(4)	$\frac{5}{4} \frac{mv^2}{qa}$

The correct option is:

- (F) P → 3 ; Q → 3 ; R → 2 ; S → 3      (T) P → 3 ; Q → 2 ; R → 1 ; S → 4  
 (R) P → 4 ; Q → 3 ; R → 2 ; S → 1      (E) P → 2 ; Q → 1 ; R → 4 ; S → 3

Space For Rough Work

11. Consider a planet of radius  $r$  having density  $\lambda$ . A tunnel is dug inside it at a distance  $r/2$  from its centre as shown. An object of mass  $m$  is left in the tunnel at the surface at  $t = 0$  then



List-I		List-II	
(P)	Time taken by the object to reach the mid of the tunnel	(1)	Zero
(Q)	Magnitude of velocity of object at the centre of the tunnel	(2)	$g$
(R)	Normal reaction applied by wall of the tunnel on the object	(3)	$\sqrt{\frac{3\pi}{16G\lambda}}$
(S)	Acceleration of object when it reach the mid of the tunnel	(4)	$\frac{2}{3}\pi G\lambda r m$
		(5)	$(\sqrt{\pi 6\lambda}) r$

The correct option is:

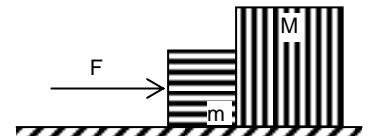
- (F)  $P \rightarrow 3 ; Q \rightarrow 5 ; R \rightarrow 2 ; S \rightarrow 1$   
 (R)  $P \rightarrow 3 ; Q \rightarrow 4 ; R \rightarrow 1 ; S \rightarrow 2$

- (T)  $P \rightarrow 3 ; Q \rightarrow 5 ; R \rightarrow 4 ; S \rightarrow 1$   
 (E)  $P \rightarrow 2 ; Q \rightarrow 5 ; R \rightarrow 4 ; S \rightarrow 3$

### (PART – B)

(Non – Negative Integer)

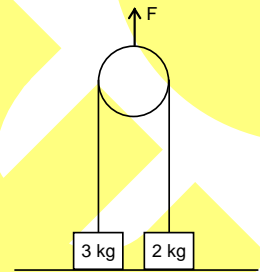
- Power supplied to a particle of mass 2kg varies with time as  $P = \frac{3t^2}{2}$  watt, where  $t$  is in seconds. If velocity of particle at  $t = 0$  is  $v = 0$ , the velocity of particle at  $t = 2$ sec will be (in m/s).
- Two blocks of mass  $m = 1$ kg and  $M = 2$ kg are in contact on a frictionless table. A horizontal force  $F (=3\text{N})$  is applied to  $m$ . The force (In N) of contact between the blocks will be



Space For Rough Work

3. A passenger is standing 20m behind from a bus. The bus begins to move with constant acceleration  $0.9 \text{ m/s}^2$ . To catch the bus, the passenger runs at a constant speed  $v$  towards the bus. What must be the minimum speed (in m/s) of the passenger so that he may catch the bus?
4. A particle of mass  $m$  is moving in a circular path of constant radius  $r(1\text{m})$  such that its centripetal acceleration  $a_c$  is varying with time  $t$  as  $a_c = k^2rt^2$ , where  $k$  is a constant, then power delivered to the particle by the forces acting on it at  $t = 5 \text{ sec}$ . (take  $mk^2 = 1 \text{ unit}$ )
5. A block of mass  $1 \text{ kg}$  lies on a horizontal surface in a truck. The coefficient of static friction between the block and the surface is  $0.6$ . If the acceleration of the truck is  $5 \text{ m/s}^2$ , then what frictional force acting on the block ( in newton.)

6. For the give figure, find the acceleration of the  $3\text{kg}$  block when  $F = 50 \text{ N}$ . (Both string and pulley are ideal).



Space For Rough Work

- \* In multiple choice questions the options are given as F,T,R & E which correspond to the options A,B,C & D respectively in the OMR sheet.

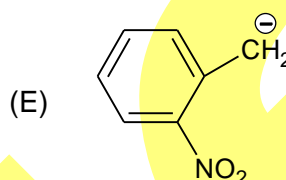
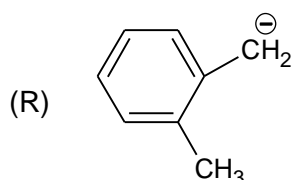
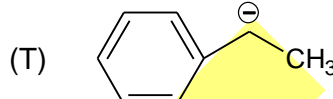
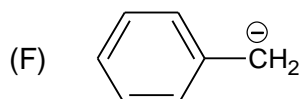
## SECTION – I : CHEMISTRY

(PART – A)

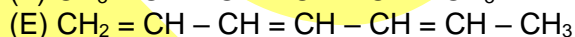
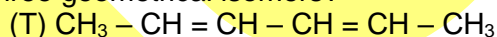
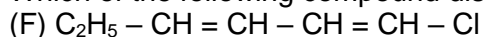
(Single Correct Answer Type)

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

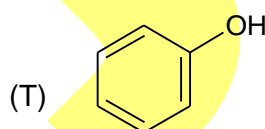
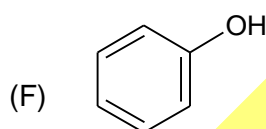
1. Which of the following carbanion is most stable?



2. Which of the following compound displays three geometrical isomers?

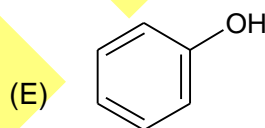


3. Which of the following is most reactive towards electrophilic substitution reaction?



(Solvent = Toluene)

(Solvent = Water)

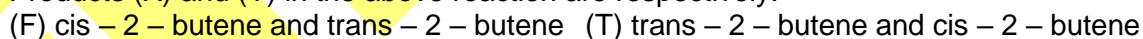


(Solvent = Carbon disulfide)

(Solvent = Nitrobenzene)

4.  $X \xleftarrow[\text{Liquid NH}_3]{\text{Na}} H_3C - C \equiv C - CH_3 \xrightarrow{H_2/Ni} Y$

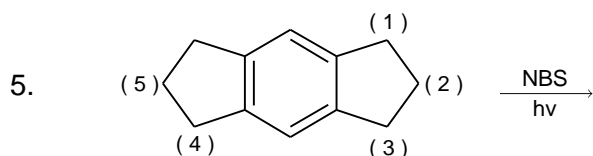
Products (X) and (Y) in the above reaction are respectively.



Space For Rough Work

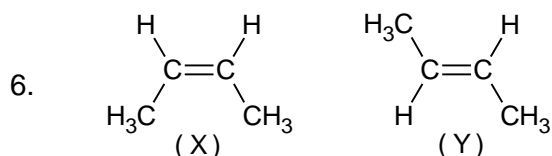
**(One or More Than One Options Correct Type)**

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**.



At which of the following carbon atom(s) do/does bromination(s) of the above compound take place?

- (F) 1 (T) 2  
(R) 3 (E) 4



Choose the correct property/properties of (X) and (Y)

- (F) Boiling point:  $X > Y$  (T) Melting point:  $X < Y$   
(R) Heat of hydrogenation:  $X > Y$  (E) Dipole moment:  $X > Y$

7. The molecular formula of a monocarboxylic acid is  $C_5H_{10}O_2$ . Choose correct statement regarding the isomers of the acid.

(F) The isomer having highest acidic strength is  $CH_3CH_2CH_2CH_2COOH$ .

(T) The isomer with least acidic strength is  $H_3C - \overset{\overset{CH_3}{|}}{C} - COOH$   
 $\quad \quad \quad |$   
 $\quad \quad \quad CH_3$

(R) The IUPAC name of the isomer with highest value of  $K_a$  is n-pentanoic acid.

(E) The isomer having the highest value of  $p^{K_a}$  contains a  $4^\circ$  - carbon atom

*Space For Rough Work*



**(Matching List Sets)**

This section contains **FOUR (04)** 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 reaction mechanisms mentioned in List-I with their characteristics mentioned in List-II.

List - I		List - II	
(P)	$S_N1$	(1)	Reaction intermediate is formed
(Q)	$S_N2$	(2)	Polar solvents are preferable
(R)	$E_1$	(3)	Inversion takes place
(S)	$E_2$	(4)	Rate of reaction also depends on concentration of nucleophile or base
		(5)	Reaction takes place in a single step

The correct option is:

(F) (P)  $\rightarrow$  (4), (Q)  $\rightarrow$  (2), (R)  $\rightarrow$  (5), (S)  $\rightarrow$  (1)

(T) (P)  $\rightarrow$  (3), (Q)  $\rightarrow$  (1), (R)  $\rightarrow$  (2), (S)  $\rightarrow$  (4)

(R) (P)  $\rightarrow$  (3), (Q)  $\rightarrow$  (2), (R)  $\rightarrow$  (1), (S)  $\rightarrow$  (4)

(E) (P)  $\rightarrow$  (5), (Q)  $\rightarrow$  (2), (R)  $\rightarrow$  (4), (S)  $\rightarrow$  (1)

9. Match the alcohols mentioned in List-I with their properties mentioned in List-II.

List - I		List - II	
(P)	$CH_3CH_2OH$	(1)	Oxidizes to acetaldehyde with a mild oxidizing agent ( $CrO_3$ )
(Q)	$CH_3CH(OH)CH_3$	(2)	Oxidizes to ketone with mild as well as strong oxidizing agents under normal conditions
(R)	$CH_3CH_2CH(OH)CH_3$	(3)	Contains chiral carbon atoms
(S)	$CH_3CH_2CH_2CH_2OH$	(4)	Forms only one alkene on dehydration reaction
		(5)	Forms more than one alkene on dehydration reaction

The correct option is:

(F) (P)  $\rightarrow$  (3), (Q)  $\rightarrow$  (2), (R)  $\rightarrow$  (4), (S)  $\rightarrow$  (2)

(T) (P)  $\rightarrow$  (1), (Q)  $\rightarrow$  (4), (R)  $\rightarrow$  (3), (S)  $\rightarrow$  (5)

(R) (P)  $\rightarrow$  (1), (Q)  $\rightarrow$  (5), (R)  $\rightarrow$  (4), (S)  $\rightarrow$  (3)

(E) (P)  $\rightarrow$  (2), (Q)  $\rightarrow$  (4), (R)  $\rightarrow$  (1), (S)  $\rightarrow$  (3)

Space For Rough Work

10. Match the species mentioned in list-I with the electronic effect they exert when attached to benzene ring, mentioned in list-II.

List – I		List – II	
(P)	CH <sub>3</sub>	(1)	–I effect
(Q)	OH	(2)	+I effect
(R)	Cl	(3)	–R effect
(S)	NO <sub>2</sub>	(4)	+R effect
		(5)	Hyperconjugation

The correct option is:

- (F) (P) → (4), (Q) → (2), (R) → (1), (S) → (3)  
 (T) (P) → (5), (Q) → (4), (R) → (1), (S) → (3)  
 (R) (P) → (2), (Q) → (5), (R) → (3), (S) → (1)  
 (E) (P) → (3), (Q) → (1), (R) → (4), (S) → (1)

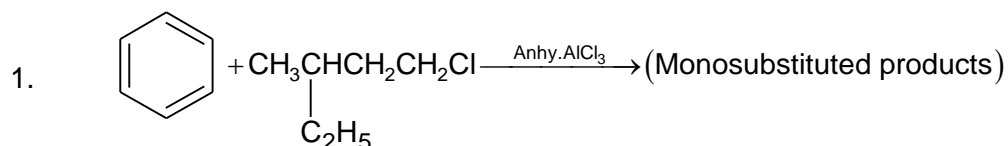
11. Match the list.

List – I (Reactions)		List – II (Major product or one of the products)	
(P)	$\text{C}_2\text{H}_5\overset{\text{O}}{\parallel}\text{CCH}_3 \xrightarrow[\substack{(3) \text{Conc. H}_2\text{SO}_4/\Delta \\ (4) \text{O}_3 \\ (5) \text{Zn/H}_2\text{O}}]{\substack{(1) \text{CH}_3\text{MgBr} \\ (2) \text{H}_2\text{O/H}^+}}$	(1)	CH <sub>3</sub> CHO
(Q)	$\text{C}_2\text{H}_5\overset{\text{O}}{\parallel}\text{CCH}_3 \xrightarrow[\substack{(2) \text{Conc. H}_2\text{SO}_4/\Delta \\ (3) \text{KMnO}_4/\text{H}^+}]{(1) \text{LiAlH}_4}$	(2)	C <sub>2</sub> H <sub>5</sub> OH
(R)	$\text{C}_2\text{H}_5\overset{\text{O}}{\parallel}\text{CCH}_3 \xrightarrow[\substack{(2) \text{H}_2\text{O/NaOH}}]{(1) \text{CF}_3\text{COOOH}}$	(3)	CH <sub>3</sub> COOH
(S)	$\text{C}_2\text{H}_5\overset{\text{O}}{\parallel}\text{CCH}_3 \xrightarrow[\substack{(3) \text{Alcoholic KOH}/\Delta \\ (4) \text{Cold 1\%alkaline KMnO}_4 \\ (5) \text{HIO}_4}]{(1) \text{NaBH}_4}$	(4)	CH <sub>3</sub> COCH <sub>3</sub>
		(5)	CH <sub>3</sub> CH <sub>2</sub> CHO

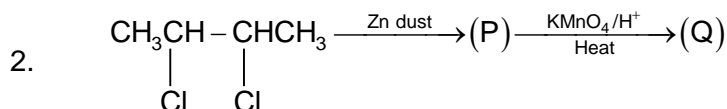
The correct option is:

- (F) (P) → (2), (Q) → (3), (R) → (1), (S) → (4)  
 (T) (P) → (4), (Q) → (2), (R) → (1), (S) → (5)  
 (R) (P) → (4), (Q) → (3), (R) → (2), (S) → (1)  
 (E) (P) → (2), (Q) → (1), (R) → (3), (S) → (5)

Space For Rough Work

**(PART – B)****(Non – Negative Integer)**

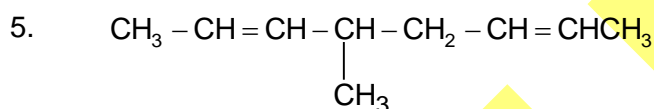
How many monosubstituted products including stereoisomer(s) is/are formed in above reaction?



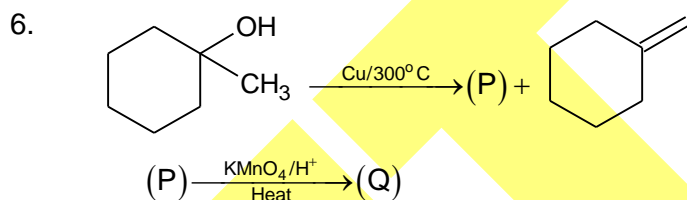
Two mole of (Q) is formed in above reaction. What is the molar mass of (Q) in  $\text{g mol}^{-1}$ .

3. The molar mass of polyhydric alcohol is (X)  $\text{g mol}^{-1}$ . Reaction of (X) with Na metal forms a product which molar mass if (Y)  $\text{g mol}^{-1}$ .  
If  $(Y) - (X) = 176$ , how many OH group are present in(X)?

4. A geminal dicarboxylic acid(X) upon heating products a monocarboxylic acid(Y). What is the difference in molar mass between (X) and (Y) in  $\text{g mol}^{-1}$ ?



How many stereoisomer(s) is/are possible for the above compounds?



How many  $\text{sp}^2$ -hybridized carbon atom(s) is/are present in (P)?

*Space For Rough Work*

- \* In multiple choice questions the options are given as F,T,R & E which correspond to the options A,B,C & D respectively in the OMR sheet.

## 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  $f(x) = \sqrt{x^2 - [x]^2}$ , where  $[x]$  = the greatest integer less than or equal to  $x$ , is  
 (F) R (T)  $[0, +\infty)$   
 (R)  $(-\infty, 0]$  (E) None of these
  
2.  $\int_0^\pi x f(\sin x) dx$  is equal to  
 (F)  $\pi \int_0^\pi f(\sin x) dx$  (T)  $\frac{\pi}{2} \int_0^{\pi/2} f(\sin x) dx$   
 (R)  $\pi \int_0^{\pi/2} f(\cos x) dx$  (E)  $\pi \int_0^\pi f(\cos x) dx$
  
3. The number of points, where the function  $f(x) = \max(|\tan x|, \cos|x|)$  is non – differentiable in the interval  $(-\pi, \pi)$  is  
 (F) 4 (T) 6  
 (R) 3 (E) 2
  
4. A function  $g(x)$  is defined as  $g(x) = \frac{1}{4} f(2x^2 - 1) + \frac{1}{2} f(1 - x^2)$  and  $f'(x)$  is an increasing function, then  $g(x)$  is increasing in the interval  
 (F)  $(-1, 1)$  (T)  $\left(-\sqrt{\frac{2}{3}}, 0\right) \cup \left(\sqrt{\frac{2}{3}}, \infty\right)$   
 (R)  $\left(-\sqrt{\frac{2}{3}}, \sqrt{\frac{2}{3}}\right)$  (E) None of these

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  $f(x) = 2x - \sin x$  and  $g(x) = \sqrt[3]{x}$ , then  
 (F) range of  $\text{gof}$  is  $\mathbb{R}$  (T)  $\text{gof}$  is one – one  
 (R) both  $f$  and  $g$  are one – one (E) both  $f$  and  $g$  are onto
6. If  $f(x) = \int_1^x 2(t-1)(t-2)^3 + 3(t-1)^2(t-2)^2 dt$ , then  
 (F)  $f(x)$  attains maximum at  $x = 2$  (T)  $f(x)$  attains minimum at  $x = 1$   
 (R)  $f(x)$  has a point of inflection at  $x = 2$  (E)  $f(x)$  attains maximum at  $x = 1$
7. Let  $y = \sqrt{x + \sqrt{x + \sqrt{x + \dots + \infty}}}$ , then  $\frac{dy}{dx}$  is equal to:  
 (F)  $\frac{1}{2y-1}$  (T)  $\frac{x}{x+2y}$  (R)  $\frac{1}{\sqrt{1+4x}}$  (E)  $\frac{y}{2x+y}$

**(Matching List Sets)**

This section contains **FOUR (04) 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 each entry in **List – I** to the correct entry in **List – II**.

	<b>List – I</b>		<b>List – II</b>
(P)	The number of solutions of the equation $x \cdot 2^x = x + 1$ is	(1)	4
(Q)	$\lim_{n \rightarrow \infty} \left( \frac{1 + \sqrt[n]{4}}{2} \right)^n$ is equal to	(2)	8
(R)	The number of points at which $g(x) = \frac{1}{1 + \frac{1}{f(x)}}$ is not differentiable where $f(x) = \frac{1}{1 + \frac{1}{x}}$ , is	(3)	2
(S)	$f\left(x + \frac{1}{2}\right) + f\left(x - \frac{1}{2}\right) = f(x)$ for all $x \in \mathbb{R}$ , then period of $f(x)$ is	(4)	3
		(5)	1

The correct option is

- (F)  $P \rightarrow (4)$   $Q \rightarrow (2)$   $R \rightarrow (5)$   $S \rightarrow (1)$  (T)  $P \rightarrow (2)$   $Q \rightarrow (4)$   $R \rightarrow (1)$   $S \rightarrow (5)$   
 (R)  $P \rightarrow (3)$   $Q \rightarrow (3)$   $R \rightarrow (4)$   $S \rightarrow (4)$  (E)  $P \rightarrow (1)$   $Q \rightarrow (5)$   $R \rightarrow (3)$   $S \rightarrow (4)$

*Space For Rough Work*

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

	<b>List - I</b>		<b>List – II</b>
(P)	The number of discontinuity points of $[2\sin x]$ is	(1)	1
(Q)	The sum of all real values of $x$ satisfying the equation $(x^2 - 5x + 5)^{x^2 + 4x - 60} = 1$ is	(2)	3
(R)	$\int_0^{\pi/2} \sin^7 x \, dx = \frac{4\lambda}{35}$ then $\lambda =$	(3)	6
(S)	If $f(x)$ is monotonic and differentiable such that $f(1) = 2$ , $f(2) = 3$ then value of $\int_1^2 f(x) \, dx + \int_{f(1)}^{f(2)} f^{-1}(x) \, dx$ is	(4)	4
		(5)	5

The correct option is

(F)  $P \rightarrow (4)$   $Q \rightarrow (2)$   $R \rightarrow (5)$   $S \rightarrow (1)$

(T)  $P \rightarrow (2)$   $Q \rightarrow (2)$   $R \rightarrow (4)$   $S \rightarrow (4)$

(R)  $P \rightarrow (2)$   $Q \rightarrow (4)$   $R \rightarrow (3)$   $S \rightarrow (5)$

(E)  $P \rightarrow (1)$   $Q \rightarrow (5)$   $R \rightarrow (3)$   $S \rightarrow (4)$

10. The anti derivative of

	<b>List - I</b>		<b>List – II</b>
(P)	$f(x) = \frac{1}{(a^2 + b^2) - (a^2 - b^2)\cos x}$	(1)	$\frac{1}{ab} \tan^{-1}\left(\frac{a}{b} \tan \frac{x}{2}\right) + C$
(Q)	$f(x) = \frac{1}{a^2 \sin^2 x + b^2 \cos^2 x}$	(2)	$\frac{1}{a^2 \sin \alpha} \tan^{-1}\left(\frac{\tan x}{\sin \alpha}\right) + C, \alpha = \cos^{-1} \frac{b}{a}$
(R)	$f(x) = \frac{1}{a \cos x + b \sin x}$	(3)	$\frac{1}{ab} \tan^{-1}\left(\frac{a}{b} \tan x\right) + C$
(S)	$f(x) = \frac{1}{a^2 - b^2 \cos^2 x}$	(4)	$\frac{1}{\sqrt{a^2 + b^2}} \log(a^2 > b^2) \left  \tan \frac{1}{2} \left( x + \tan^{-1} \frac{a}{b} \right) \right  + C$
		(5)	$\tan^{-1}\left(\frac{a}{b} \tan \frac{x}{2}\right) + C$

The correct option is

(F)  $P \rightarrow (4)$   $Q \rightarrow (2)$   $R \rightarrow (5)$   $S \rightarrow (1)$

(T)  $P \rightarrow (2)$   $Q \rightarrow (4)$   $R \rightarrow (1)$   $S \rightarrow (5)$

(R)  $P \rightarrow (2)$   $Q \rightarrow (4)$   $R \rightarrow (3)$   $S \rightarrow (5)$

(E)  $P \rightarrow (1)$   $Q \rightarrow (3)$   $R \rightarrow (4)$   $S \rightarrow (2)$

Space For Rough Work

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

List - I		List - II	
(P)	If $L = \lim_{x \rightarrow -1} \frac{\sqrt[3]{(7-x)} - 2}{(x+1)}$ , then $12L =$	(1)	-2
(Q)	If $L = \lim_{x \rightarrow \frac{\pi}{4}} \frac{\tan^3 x - \tan x}{\cos\left(x + \frac{\pi}{4}\right)}$ , then $\frac{-L}{8} =$	(2)	2
(R)	If $L = \lim_{x \rightarrow 1} \frac{(2x-3)(\sqrt{x}-1)}{2x^2+x-3}$ , then $20L =$	(3)	$\frac{1}{2}$
(S)	If $L = \lim_{x \rightarrow \infty} \frac{\log x^n - [x]}{[x]}$ , where $n \in \mathbb{N}$ , (where $[x]$ denotes greatest integer less than or equal to $x$ ), then $-2L =$	(4)	-1
		(5)	1

The correct option is

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

(T)  $P \rightarrow (2)$   $Q \rightarrow (4)$   $R \rightarrow (1)$   $S \rightarrow (5)$

(R)  $P \rightarrow (2)$   $Q \rightarrow (4)$   $R \rightarrow (3)$   $S \rightarrow (5)$

(E)  $P \rightarrow (1)$   $Q \rightarrow (5)$   $R \rightarrow (3)$   $S \rightarrow (4)$

### (PART – B)

(Non – Negative Integer)

- If  $f(x)$  is a polynomial satisfying  $f(x) \cdot f\left(\frac{1}{x}\right) = f(x) + f\left(\frac{1}{x}\right)$ , and  $f(3) = 28$ , then  $f(4)$  is given by  $K$ , where  $\frac{K}{13}$  equals to
- The maximum value of the function  $f(x) = 2x^3 - 15x^2 + 36x - 48$  on the set  $A = \{x \mid x^2 + 20 \leq 9x\}$  is
- The slope of the tangent to the curve represented by  $x = t^2 + 3t - 8$  and  $y = 2t^2 - 2t - 5$  at the point  $M(2, -1)$  is  $m$ , then  $7m$  equals to
- Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  is function which is defined by  $f(x) = \max\{x, x^3\}$ . The number of points on which  $f(x)$  is not differentiable is,
- The value of  $\lim_{x \rightarrow 0} \frac{\sin(\log(1+x))}{\log(1+\sin x)}$  is:
- Let  $f(x) = (\sin x)^{\frac{1}{\pi-2x}}$ ,  $x \neq \frac{\pi}{2}$ . If  $f(x)$  is continuous at  $x = \frac{\pi}{2}$ , then  $f\left(\frac{\pi}{2}\right)$  is:

Space For Rough Work

# FIITJEE INTERNAL TEST

BATCH – NWCMSW425A1

Phase – I (Paper-1)

Code: 100737

JEE ADVANCED LEVEL

ANSWER KEY

ANSWER KEYS

**Physics**

PART – A

- |       |       |       |      |
|-------|-------|-------|------|
| 1. T  | 2. F  | 3. T  | 4. E |
| 5. TR | 6. FE | 7. TR | 8. T |
| 9. E  | 10. F | 11. T |      |

PART – B

- |      |      |      |      |
|------|------|------|------|
| 1. 2 | 2. 2 | 3. 6 | 4. 5 |
| 5. 5 | 6. 0 |      |      |

**Chemistry**

PART – A

- |        |         |         |      |
|--------|---------|---------|------|
| 1. E   | 2. T    | 3. T    | 4. R |
| 5. FRE | 6. FTRE | 7. FTRE | 8. R |
| 9. T   | 10. T   | 11. R   |      |

PART – B

- |      |       |      |       |
|------|-------|------|-------|
| 1. 6 | 2. 60 | 3. 8 | 4. 44 |
| 5. 8 | 6. 2  |      |       |

**Mathematics**

PART – A

- |         |       |       |      |
|---------|-------|-------|------|
| 1. E    | 2. R  | 3. F  | 4. T |
| 5. FTRE | 6. RE | 7. FR | 8. R |
| 9. T    | 10. E | 11. F |      |

PART – B

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