

## PHYSICS, CHEMISTRY & MATHEMATICS

Pattern - CPT-2

QP CODE:

PAPER - 2

Time Allotted: 3 Hours

Maximum Marks: 186

- 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.

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. Each **Section** is further divided into **Two Parts: Part-A & B** in the 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 Part.

- (i) **PART-A (01-08)** contains (8) Multiple Choice Questions which have **One or More 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.
- (ii) **Part-A (09-12)** – This section contains Two (02) List-Match Sets, each List-Match set has Two (02) Multiple Choice Questions. Each List-Match set has two lists: List-I and List-II. 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 combination chosen and **-1 marks** for wrong options chosen.
- (iii) **Part-B (01-06)** contains six (06) Numerical based questions, the answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) and each question carries **+3 marks** for correct answer. **There is no negative marking.**

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

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

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

## SECTION – I : PHYSICS

### (PART – A)

(One or More Than One Options Correct Type)

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

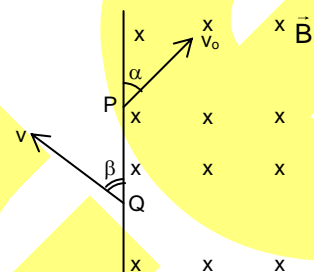
1. A particle of charge  $-q$  and mass  $m$  enters a uniform magnetic field  $\vec{B}$  (perpendicular to paper inwards) at P with a velocity  $v_0$  at an angle  $\alpha$  and leaves the field at Q with velocity  $v$  at angle  $\beta$  as shown in figure. Then

(A)  $\alpha = \beta$

(B)  $v = v_0$

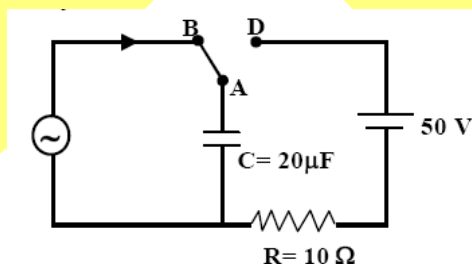
(C)  $PQ = \frac{2mv_0 \sin \alpha}{Bq}$

(D) particle remains in the field for time  $t = \frac{2m(\pi - \alpha)}{Bq}$



1. **ABCD**

2. At time  $t = 0$ , terminal A in the circuit shown in the figure is connected to B by a key and an alternating current  $I(t) = I_0 \cos(\omega t)$ , with  $I_0 = 1\text{ A}$  and  $\omega = 500\text{ rad/s}$  starts flowing in it with the initial direction shown in the figure. At  $t = \frac{7\pi}{6\omega}$ , the key is switched from B to D. Now onwards only A and D are connected. A total charge  $Q$  flows from the battery to charge the capacitor fully. If  $C = 20\ \mu\text{F}$ ,  $R = 10\ \Omega$  and the battery is ideal with emf of  $50\text{ V}$ , identify the correct statement(s).



(A) Magnitude of the maximum charge on the capacitor before  $t = \frac{7\pi}{6\omega}$  is  $1 \times 10^{-3}\text{ C}$

(B) The current in the left part of the circuit just before  $t = \frac{7\pi}{6\omega}$  is clockwise

(C) Immediately after A is connected to D, the current in R is  $10\text{ A}$

(D)  $Q = 2 \times 10^{-3}\text{ C}$

2. **CD**

3. In the circuit shown in figure  $C_1 = 1\ \mu\text{F}$  and  $C_2 = 2\ \mu\text{F}$ . Capacitor  $C_1$  is charged to  $100\text{ V}$  and  $C_2$  is charged to  $20\text{ V}$ . After charging they are connected as shown. When the switches  $S_1$ ,  $S_2$  and  $S_3$  all are closed

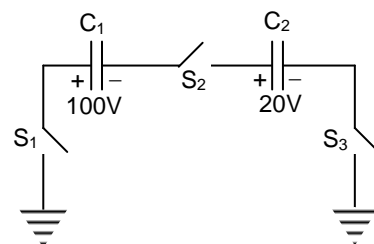
(A) no charge will flow through  $S_2$

(B)  $80\ \mu\text{C}$  charge will flow through  $S_1$  in downward direction

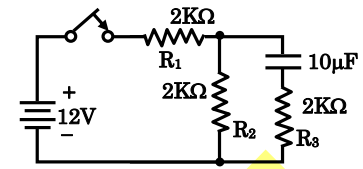
(C)  $80\ \mu\text{C}$  charge will flow through  $S_2$  in upward direction

(D)  $80\ \mu\text{C}$  charge will flow through  $S_3$  in upward direction

3. **BCD**

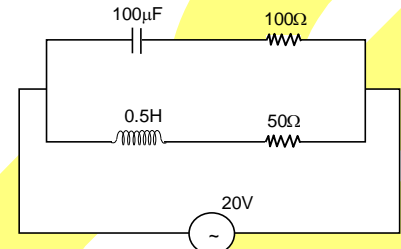


4. In the circuit shown, the switch is turned on at  $t = 0$ . Then,  
 (A) at  $t = 0$ , current supplied by battery is 4 mA  
 (B) at  $t = 0$ , current in  $R_3$  is 2 mA  
 (C) in the steady state current supplied by battery is 3 mA  
 (D) in the steady state current in  $R_3$  is zero



4. **ABCD**

5. In the given circuit, the AC source has  $\omega = 10$  rad/s. Considering the inductor and capacitor to be ideal, the  
 (A) the current through the circuit,  $I$  is 0.3 A  
 (B) the current through the circuit,  $I$  is  $0.3\sqrt{2}$  A  
 (C) the voltage across  $100\ \Omega$  resistor =  $10\sqrt{2}$  V  
 (D) the voltage across  $50\ \Omega$  resistor = 10 V



5. **AC**

6. A non-conducting solid sphere of radius  $R$  is uniformly charged. The magnitude of the electric field due to the sphere at a distance  $r$  from its centre  
 (A) Increases as  $r$  increases for  $r < R$   
 (B) decreases as  $r$  increases for  $0 < r < \infty$   
 (C) decreases as  $r$  increase for  $R < r < \infty$   
 (D) is discontinuous at  $r = R$

6. **AC**

7. The mutual inductance  $M_{12}$  of coil 1 w.r.t. coil 2 is:  
 (A) increases when they are brought together.  
 (B) depends upon the current passing through the coils  
 (C) increases when one them is rotated about an axis.  
 (D) is the same  $M_{21}$  of coil 2 w.r.t. coil 1.

7. **AD**

8. A positively charged thin metal ring of radius  $R$  is fixed in the  $x$ - $y$  plane with its centre at the origin  $O$ . A negatively charged particle  $P$  is released from rest at the point  $(0, 0, z_0)$  where  $z_0 > 0$ . Then the motion of  $P$  is  
 (A) periodic for all values of  $z_0$  satisfying  $0 < z_0 < \infty$   
 (B) simple harmonic for all values of  $z_0$  satisfying  $0 < z_0 \leq R$   
 (C) approximately simple harmonic provided  $z_0 \ll R$   
 (D) such that  $P$  crosses  $O$  and continues to move along the negative  $z$ -axis towards  $z = -\infty$

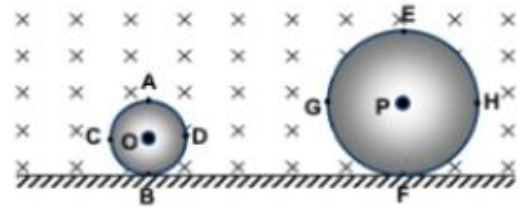
8. **AC**

This section contains **2 List-Match Sets**, each List-Match set has **2 Multiple Choice Questions**. Each List-Match set has two lists: List-I and List-II. Four options are given in each Multiple Choice Question based On List-I and List-II and **ONLY ONE** of these four options satisfies the condition asked in the Multiple Choice Question.

**Answer Q. 9 and Q. 10 by appropriately matching the lists based on the information given in the paragraph.**

Two conducting discs of radius  $R$  and  $2R$  are rolling without slipping on a horizontal conducting surface such that the speed of centre of mass of both the discs is same in a uniform magnetic field  $B$  as shown.

List-I gives the combinations of some points where as List-II gives the magnitude of potential difference across these points.



List - I		List - II (potential difference)	
(I)	OP	(P)	Zero
(II)	AE	(Q)	$\frac{3BvR}{2}$
(III)	AP	(R)	$3 BvR$
(IV)	BF	(S)	$6 BvR$
		(T)	$4 BvR$
		(U)	$12 BvR$

9. If both the discs are moving away from each other. The speed of centre of mass of each disc is  $2v$ . Then the correct match for the point in List-I with the potential difference given in List-II.

(A) I  $\rightarrow$  Q, II  $\rightarrow$  S, III  $\rightarrow$  R, IV  $\rightarrow$  P

(B) I  $\rightarrow$  S, II  $\rightarrow$  U, III  $\rightarrow$  R, IV  $\rightarrow$  P

(C) I  $\rightarrow$  S, II  $\rightarrow$  Q, III  $\rightarrow$  P, IV  $\rightarrow$  U

(D) I  $\rightarrow$  Q, II  $\rightarrow$  T, III  $\rightarrow$  R, IV  $\rightarrow$  P

9. **A**

10. If both the discs are moving towards each other. The speed of centre of mass of each disc is  $2v$ . Then the correct match for the point in List-I with the potential difference given in List-II.

(A) I  $\rightarrow$  Q, II  $\rightarrow$  S, III  $\rightarrow$  R, IV  $\rightarrow$  P

(B) I  $\rightarrow$  R, II  $\rightarrow$  U, III  $\rightarrow$  S, IV  $\rightarrow$  P

(C) I  $\rightarrow$  R, II  $\rightarrow$  Q, III  $\rightarrow$  P, IV  $\rightarrow$  U

(D) I  $\rightarrow$  Q, II  $\rightarrow$  T, III  $\rightarrow$  R, IV  $\rightarrow$  P

10. **B**

Answer Q. 11 and Q. 12 by appropriately matching the lists based on the information given in the paragraph.

The overall efficiency of a transformer is 90%. The transformer is rated for an output of 9000 watt. The iron losses at full load are 700 watt. The primary coil has a resistance of 1 ohm.

List – I		List – II (Voltage in Secondary & Current in Primary)	
(I)	Primary voltage is 1000 V.	(P)	100 Volts, 9 amp
(II)	Primary voltage is 1500 V.	(Q)	200 Volts, 4.5 amp
(III)	Primary voltage is 2000 V.	(R)	250 Volts, 1 amp
(IV)	Primary voltage is 2500 V.	(S)	500 Volts, 5 amp

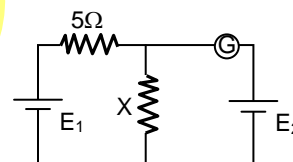
11. If ratio of turns in primary to secondary coil is 5 : 1, then  
 (A) (I) (Q)                      (B) (II) (Q)                      (C) (III) (R)                      (D) (IV) (Q)
11. **A**
12. If ratio of turns in primary to secondary coil is 4 : 1 then  
 (A) (III) (S)                      (B) (IV) (P)                      (C) (II) (Q)                      (D) (IV) (Q)
12. **A**

### (PART – B)

(Integer Type)

Part-C (01-06) contains six (06) Numerical based questions, the answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) and each question carries **+4 marks** for correct answer and **there will be no negative marking**.

1. In the circuit shown, the battery  $E_1$  is ideal and has an e.m.f. 12 V. Battery  $E_2$  has an e.m.f. of 2 V. If the galvanometer  $G$  reads zero, find the value of resistance  $X$  (In  $\Omega$ ).

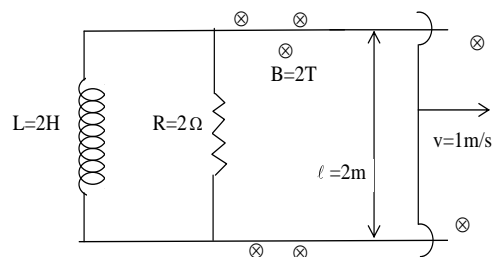


1. **1**

2. An LCR series circuit with  $100\Omega$  resistance is connected to an ac source of 200 v and angular frequency 300 rad/s. When only capacitance is removed, the current lags behind, the voltage by  $60^\circ$  when only the inductance is removed, the current leads the voltage by  $60^\circ$ . If the power dissipated in the LCR circuit is 80 k watt then  $k =$  \_\_\_\_\_.

2. **5**

3. The given figure shows an inductor and resistance fixed on a conducting wire. A movable wire PQ starts moving on the fixed rails from  $t = 0$  with constant velocity 1 m/s. A constant magnetic field ( $B = 2T$ ) exist perpendicular to the plane of paper. If work done by the external force on the wire PQ in 2 second is  $12.8x$  Joule, then  $x =$



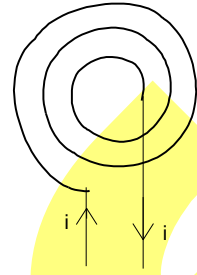
3. **2.5**

4. An inductor of inductance 2 mH is connected across a charged capacitor of capacitance  $5 \mu\text{F}$  and the resulting LC circuit is set oscillating at its natural frequency. Let  $Q$  denote the instantaneous charge on the capacitor and  $I$  the current in the circuit. It is found that the maximum value of charge is  $200 \mu\text{C}$ . When charge =  $100 \mu\text{C}$  the value of  $\left| \frac{dI}{dt} \right|$  is  $10^n \text{ As}^{-1}$ .

Find the value of 'n/5'.

4. **0.8**

5. A thin insulate wire forms a plane spiral of  $N = 100$  turns carrying a current  $I = 2.3$  A. The inner and outer radii are equal to  $a = 5$  cm and  $b = 10$ cm. Find the magnetic field ( $\ln 2 = 0.69$ ) at the centre of spiral



5. **2**

6. Two long parallel straight conductors carry currents  $i_1$  and  $i_2$  ( $i_1 > i_2$ ), when currents are in same direction, the magnetic field at a point midway between the wires is  $30 \mu\text{T}$ . If the direction of  $i_2$  is reversed, the field becomes  $50 \mu\text{T}$ . Find the ratio of currents  $\frac{i_2}{i_1}$ .

6. **0.25**

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*Space For Rough Work*

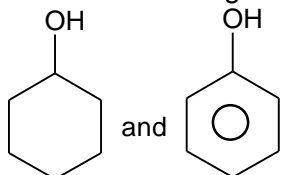
## SECTION - II : CHEMISTRY

### (PART – A)

(One or More Than One Options Correct Type)

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

1. Which of the following reagent distinguish(es) the following two compounds?



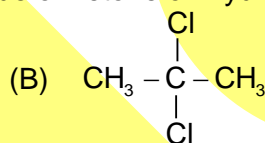
(A) Na  
(C)  $\text{FeCl}_3$

(B)  $\text{NaHCO}_3$   
(D)  $\text{HCl/Anhy. ZnCl}_2$

1. **CD**

2. Which of the following dihalides form aldehyde or ketone on hydrolysis?

(A)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHCl}_2$

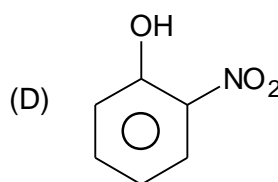
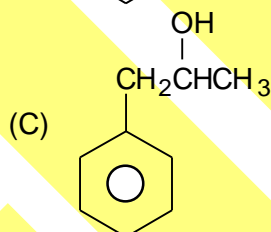
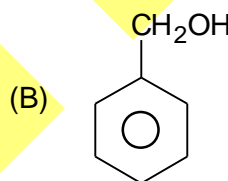
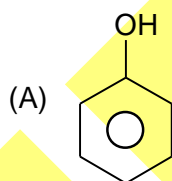


(C)  $\text{ClCH}_2\text{CH}_2\text{Cl}$

(D)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$

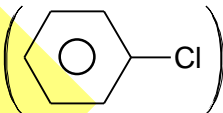
2. **AB**

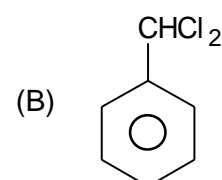
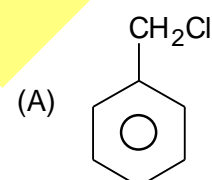
3. Which of the following substance(s) is/are more acidic than  ?

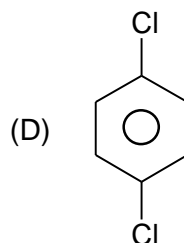
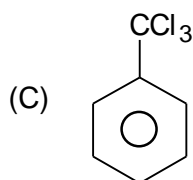


3. **ABD**

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

 towards Friedel Craft reaction?





4. **AB**

5. Which of the following groups or atoms exert  $-I$  as well as  $+R$  effect?

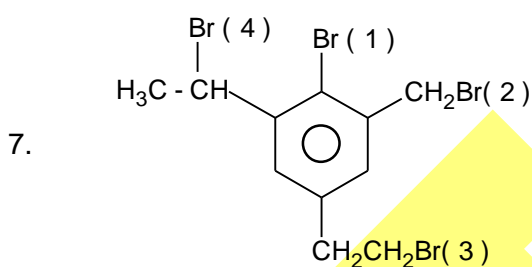
- (A)  $\text{NO}_2$  (B)  $\text{OH}$   
(C)  $\text{Cl}$  (D)  $\text{NO}$

5. **BCD**

6. Which of the following solution(s) is/are decolourized by  $\text{CH}_2 = \text{CH}_2$ ?

- (A)  $\text{Br}_2/\text{CCl}_4$  (B)  $\text{KMnO}_4/\text{OH}^-/\text{Cold}$   
(C)  $\text{KMnO}_4/\text{H}^+/\Delta$  (D)  $\text{Cl}_2/\text{H}_2\text{O}$

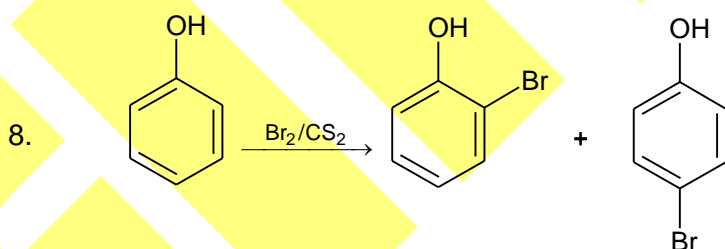
6. **ABCD**



Choose correct statement(s) regarding the bromine atom(s) of above reaction?

- (A)  $\text{Br}(1)$  is least reactive towards nucleophilic substitution reaction.  
(B) Ionization of  $\text{Br}(4)$  forms the most stable carbocation as compared to removal of other bromine atoms.  
(C) Both  $\text{S}_{\text{N}}1$  and  $\text{S}_{\text{N}}2$  takes place with equal ease for  $\text{Br}(2)$  atom.  
(D) Ionisation of  $\text{Br}(3)$  forms a  $1^\circ$ -carbocation.

7. **ABCD**



Which of the following can be used as solvent for the above reaction?

- (A) Nitrobenzene (B) Chlorobenzene  
(C) Aniline (D) Toluene

8. **AB**



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Match the following & answer accordingly:

List – I		List– II	
(I)	$S_N1$	(P)	A reaction intermediate is formed
(II)	$S_N2$	(Q)	Bimolecular reaction
(III)	E2	(R)	Almost 100% racemisation takes place
(IV)	E1	(S)	Reactivity order of alkyl halides is: $3^\circ > 2^\circ > 1^\circ > CH_3X$
		(T)	Inversion of configuration takes place
		(U)	Reactivity order of alkyl halide is $CH_3X > 1^\circ > 2^\circ > 3^\circ$

9. The correct matching between list-I and list-II is  
 (A) I  $\rightarrow$  Q (B) II  $\rightarrow$  T  
 (C) III  $\rightarrow$  R (D) IV  $\rightarrow$  U

9. B

10. The correct matching between list-I and list-II is  
 (A) I  $\rightarrow$  T (B) II  $\rightarrow$  R  
 (C) III  $\rightarrow$  Q (D) IV  $\rightarrow$  P

10. D

Match the following & answer accordingly:

List – I		List– II	
(I)	$CH_3CH_2CH_2CH_2OH$	(P)	Forms one alkene on dehydration reaction
(II)	$CH_3CH_2\underset{\substack{  \\ OH}}{CH}CH_3$	(Q)	Forms more than one alkene on dehydration reaction
(III)	$CH_3\underset{\substack{  \\ CH_3}}{CH}CH_2OH$	(R)	Forms aldehyde when heated on copper at $300^\circ C$
(IV)	$\begin{array}{c} CH_3 \\   \\ CH_3 - C - OH \\   \\ CH_3 \end{array}$	(S)	Forms ketone when heated on copper at $300^\circ C$
		(T)	Forms alkene when heated on Cu at $300^\circ C$
		(U)	Highest boiling point among the four compounds

11. The correct matching between list-I and list-II is  
 (A) I  $\rightarrow$  S (B) II  $\rightarrow$  Q  
 (C) III  $\rightarrow$  T (D) IV  $\rightarrow$  U

11. B

12. The correct matching between list-I and list-II is  
 (A) I  $\rightarrow$  P (B) II  $\rightarrow$  R  
 (C) III  $\rightarrow$  S (D) IV  $\rightarrow$  T

12. D

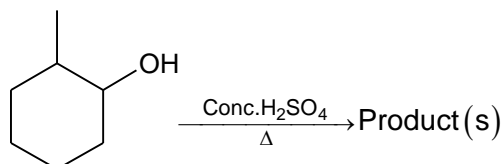
**(PART – B)****(Integer Type)**

**Part-C (01-06)** contains six (06) Numerical based questions, the answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) and each question carries **+4 marks** for correct answer and **there will be no negative marking**.

1. How many 2°(secondary) carbon atom(s) is/are present in the most acidic isomer having formula  $C_5H_{10}O_2$ ?

1. **3**

2.



How many unsaturated hydrocarbon(s) containing cyclohexyl ring is/are formed in the above reaction?

[Do not consider stereoisomers]

2. **3**

3.  $CH_3OCH_2CH_3 \xrightarrow{HI}$  Product(s)

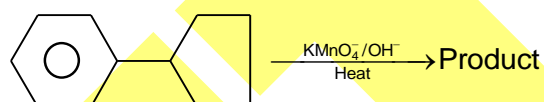
How many maximum number of product(s) is/are formed in the above reaction?

3. **4**

4. How many carbon atom(s) is/are present in alanine?

4. **3**

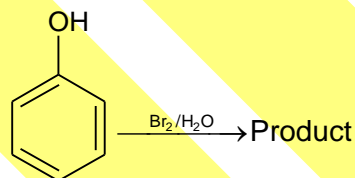
5.



The number of carbon atom(s) present in the aromatic product of above reaction is:

5. **7**

6.



If the fraction of hydrogen atoms of Phenol undergo reaction is  $x : y$ , then the value of  $\frac{x+y}{y}$  is

6. **1.5**

**Space of Rough Work**

## **SECTION - III : MATHEMATICS**

### **(PART – A)**

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

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

1. For what value of  $x$ , the matrix  $\begin{bmatrix} 3-x & 2 & 2 \\ 2 & 4-x & 1 \\ -2 & -4 & -1-x \end{bmatrix}$  is singular.
- (A)  $x = 0$  (B)  $x = 1$   
(C)  $x = 2$  (D)  $x = 3$
1. AD
2. Let  $y = (A + Bx)e^{3x}$  is a solution of the differential equation  $\frac{d^2y}{dx^2} + m\frac{dy}{dx} + ny = 0$ ,  $m, n \in \mathbb{I}$ , then
- (A)  $m = -6$  (B)  $n = -6$   
(C)  $m = 9$  (D)  $n = 9$
2. AD
3. If  $\frac{dy}{dx} = \frac{xy}{x^2 + y^2}$ ;  $y(1) = 1$ ; then a value of  $x$  satisfying  $y(x) = e$  is:
- (A)  $\sqrt{2}e$  (B)  $\frac{1}{2}\sqrt{3}e$   
(C)  $\sqrt{3}e$  (D)  $-\sqrt{3}e$
3. CD
4. The curve amongst the family of curves represented by the differential equation,  $(x^2 - y^2)dx + 2xy dy = 0$  which passes through  $(1, 1)$ , is :
- (A) a circle with centre on the  $x$ -axis  
(B) a circle with centre on the  $y$ -axis  
(C) a circle with radius = 1  
(D) a circle with radius = 2
4. AC
5. The value(s) of  $x$ , if the matrix  $\begin{bmatrix} 3 & -1+x & 2 \\ 3 & -1 & x+2 \\ x+3 & -1 & 2 \end{bmatrix}$  is singular
- (A)  $-4$  (B)  $-3$   
(C)  $-1$  (D)  $0$
5. AD
6. If the trivial solution is the only solution of the system of equations  $x - ky + z = 0$ ,  $kx + 3y - kz = 0$ ,  $3x + y - z = 0$   
Then  $k$  can be
- (A)  $-3$  (B)  $1$   
(C)  $2$  (D)  $3$

6. BD

7. In which of the following differential equation degree is not defined?

(A)  $\frac{d^2y}{dx^2} + 3\left(\frac{dy}{dx}\right)^2 = x \log \frac{d^2y}{dx^2}$

(B)  $\left(\frac{d^2y}{dx^2}\right)^2 + \left(\frac{dy}{dx}\right)^2 = x \sin\left(\frac{d^2y}{dx^2}\right)$

(C)  $x = \sin\left(\frac{dy}{dx} - 2y\right), |x| < 1$

(D)  $x - 2y = \log\left(\frac{dy}{dx}\right)$

7. AB

8. If the line  $\frac{x-2}{3} = \frac{y+1}{2} = \frac{z-1}{1}$  intersects the plane  $2x + 3y - z + 13 = 0$  at a point P and the plane  $3x + y + 4z = 16$  at a point Q, then PQ is equal to :

(A) Q(5, 1, 0)

(B) P(-1, -3, 2)

(C)  $PQ = 2\sqrt{7}$

(D)  $PQ = \sqrt{14}$

8. ABC

This section contains **2 List-Match Sets**, each List-Match set has **2 Multiple Choice Questions**. Each List-Match set has two lists: List-I and List-II. 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.

9. Observe the following columns:

	Column-I		Column-II
(I)	If acute and obtuse angle bisectors of the planes $2x - y + 2z + 3 = 0$ and $3x - 2y + 6z + 8 = 0$ are represented by A and O, then	(P)	A : $32x + 13y - 23z - 3 = 0$
(II)	If acute and obtuse angle bisectors of the planes $x - 2y + 2z - 3 = 0$ and $2x - 3y + 6z + 8 = 0$ are represented by A and O, then	(Q)	O : $x - 5y - 4z - 45 = 0$
(III)	The acute and obtuse angle bisectors of the planes $2x + y - 2z + 3 = 0$ and $6x + 2y - 3z - 8 = 0$ are represented by A and O, then	(R)	A : $23x - 13y + 32z + 45 = 0$
(IV)	Plane passing from $(1, -8, -1)$ , $\left(5, -7, \frac{5}{4}\right)$ and $(-1, -6, -4)$ is given by	(S)	O : $4x - y + 5z - 45 = 0$
		(T)	A : $13x - 23y + 32z + 3 = 0$

Which is correct option?

(A) (I) - PS

(B) (II) - QT

(C) (III) - PR

(D) (IV) - S

9. B

10. Observe the following columns:

	Column-I		Column-II
(I)	If acute and obtuse angle bisectors of the planes $2x - y + 2z + 3 = 0$ and $3x - 2y + 6z + 8 = 0$ are represented by A and O, then	(P)	A : $32x + 13y - 23z - 3 = 0$
(II)	If acute and obtuse angle bisectors of the planes $x - 2y + 2z - 3 = 0$ and $2x - 3y + 6z + 8 = 0$ are represented by A and O, then	(Q)	O : $x - 5y - 4z - 45 = 0$
(III)	The acute and obtuse angle bisectors of the planes $2x + y - 2z + 3 = 0$ and $6x + 2y - 3z - 8 = 0$ are represented by A and O, then	(R)	A : $23x - 13y + 32z + 45 = 0$
(IV)	Plane passing from $(1, -8, -1)$ , $(5, -7, \frac{5}{4})$ and $(-1, -6, -4)$ is given by	(S)	O : $4x - y + 5z - 45 = 0$
		(T)	A : $13x - 23y + 32z + 3 = 0$

Which is correct option?

- (A) (I) - PS  
(C) (III) - PS

- (B) (II) - PT  
(D) (IV) - S

10. C

11. If the solution of the differential equation  $\frac{dy}{dx} = \frac{3y - 7x - 3}{3x - 7y + 7}$  is  $(y - x - \lambda)^m (y + x - \mu)^n = C$  (where  $\lambda, \mu, m, n$  are constants), then match the following:

	Column-I		Column-II
(I)	1	(P)	$\lambda$
(II)	2	(Q)	$\mu$
(III)	7	(R)	$m$
(IV)	5	(S)	$n$
		(T)	C

Which is correct option?

- (A) (I) - PT  
(C) (III) - P

- (B) (II) - P  
(D) (IV) - ST

11. D

12. If the solution of the differential equation  $\frac{dy}{dx} = \frac{3y - 7x - 3}{3x - 7y + 7}$  is  $(y - x - \lambda)^m (y + x - \mu)^n = C$  (where  $\lambda, \mu, m, n$  are constants), then match the following:

	Column-I		Column-II
(I)	1	(P)	$\lambda$
(II)	2	(Q)	$\mu$
(III)	7	(R)	$m$
(IV)	5	(S)	$n$
		(T)	C

Which is correct option?

- (A) (I) - PQT  
(C) (III) - P

- (B) (II) - P  
(D) (IV) - S

12. A

**(PART – B)****(Integer Type)**

**Part-C (01-06)** contains six (06) Numerical based questions, the answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) and each question carries **+4 marks** for correct answer and **there will be no negative marking**.

13. Let  $\Delta = \begin{vmatrix} 1 & \sin \theta & 1 \\ -\sin \theta & 1 & \sin \theta \\ -1 & -\sin \theta & 1 \end{vmatrix}$ ;  $0 \leq \theta < 2\pi$ , then maximum value of  $\Delta$  is

13. 4

14. If vectors  $ax\hat{i} + 3\hat{j} - 5\hat{k}$  and  $x\hat{i} + 2\hat{j} + 2ax\hat{k}$  make an acute angle with each other, , for all  $x \in \mathbb{R}$ , then  $a$  belongs to the interval  $(p, q)$  then  $q =$

14. 0.24

15. Integrating factor of  $\sin x \frac{dy}{dx} + y \cos x = \sin 2x$  is  $f(x)$ , then  $f\left(\frac{\pi}{2}\right) =$

15. 1

16. The value of  $b$ , such that the scalar product of the vectors  $\hat{i} + \hat{j} + \hat{k}$  with the unit vector parallel to the sum of the vectors  $2\hat{i} + 4\hat{j} - 5\hat{k}$  and  $b\hat{i} + 2\hat{j} + 3\hat{k}$  is one, is

16. 1

17. If the line,  $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-2}{4}$  meets the plane,  $x + 2y + 3z = 15$  at a point P, and then distance of P from the origin is

17. 4.5

18. If the length of the perpendicular from the point  $(\beta, 0, \beta)$  ( $\beta \neq 0$ ) to the line,

$$\frac{x}{1} = \frac{y-1}{0} = \frac{z+1}{-1} \text{ is } \sqrt{\frac{3}{2}}, \text{ then } |\beta| \text{ is equal to:}$$

18. 1

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Space For Rough Work

# **FIITJEE COMMON TEST**

**BATCHES: Two Year CRP (2022)**

**PHASE TEST-4: PAPER-2**

**JEE ADVANCED LEVEL**

**ANSWER KEY**

**ANSWER KEYS**

**PHYSICS**

**CHEMISTRY**

**MATHEMATICS**

