

FIITJEE COMMON TEST**PHYSICS, CHEMISTRY & MATHEMATICS****CODE:****Time Allotted: 3 Hours****Maximum Marks: 240**

- 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 Section.
3. **Section-I** is Physics, **Section-II** is Chemistry and **Section-III** is Mathematics.
4. Each section is further divided into three parts: **Part-A**, **Part-B** & **Part-C**
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 HB pencil 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 Three Parts.

- (i) **Part-A (01 – 8)** contains 8 multiple choice questions which have only one correct answer. Each question carries **+3 marks** for correct answer and **- 1 mark** for wrong answer.

PART – A (09 – 12) contains 4 Multiple Choice Questions which have **One or More Correct** answer.

For each question in the group **Q. 9 – 12** of **PART – A** you will be awarded

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.

- (ii) **Part -B (01 – 02)** contains 2 Matrix Match Type questions containing statements given in 2 columns. Statements in the first column have to be matched with statements in the second column. Each question carries **+8 marks** for all correct answer. For each correct row **+2 marks** will be awarded. There is no negative marking.

- (iii) **Part-C (01-06)** contains five (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**.

Name of the Candidate : _____

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

Enrolment Number : _____

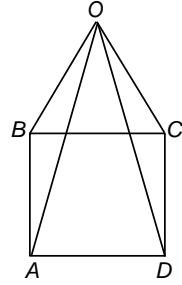
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NWCM921A4W, NWCM921A5W, NWCM921B1W, NWCM921C1W, NWCM921C2W, NWCM921D1W, NWCM921E1W,

Section – I (Physics)
PART – A
(Single Correct Choice Type)

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

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

- (A) $\frac{2r}{15}$ (B) $\frac{r}{15}$
(C) $\frac{4r}{15}$ (D) $\frac{8r}{15}$

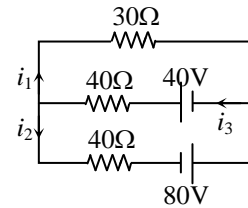


2. A uniform wire of resistance R is shaped into a regular n -sided polygon (n is even). The equivalent resistance between any two corners can have

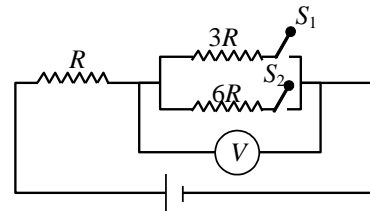
- (A) the maximum value $\frac{R}{2}$ (B) the maximum value $\frac{R}{n}$
(C) the minimum value $R\left(\frac{n-1}{n^2}\right)$ (D) the minimum value $\frac{R}{n}$

3. In the given circuit the current i_1 is

- (A) 0.4 A
(B) -0.4 A
(C) 0.8 A
(D) -0.8 A



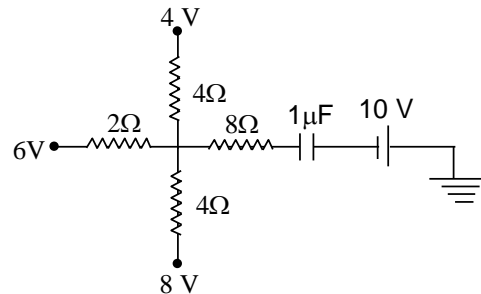
4. In the circuit shown in the figure, reading of voltmeter is V_1 when only S_1 is closed, reading of voltmeter is V_2 when only S_2 is closed and reading of voltmeter is V_3 when both S_1 and S_2 are closed. Then



- (A) $V_3 > V_2 > V_1$ (B) $V_2 > V_1 > V_3$ (C) $V_3 > V_1 > V_2$ (D) $V_1 > V_2 > V_3$

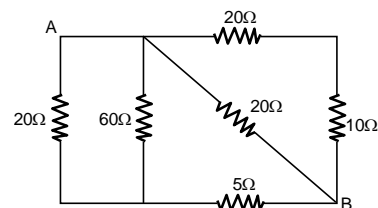
5. Figure shows a network of a capacitor and resistors. The charge on capacitor in steady state is

- (A) $4 \mu\text{C}$
(B) $6 \mu\text{C}$
(C) $10 \mu\text{C}$
(D) $16 \mu\text{C}$

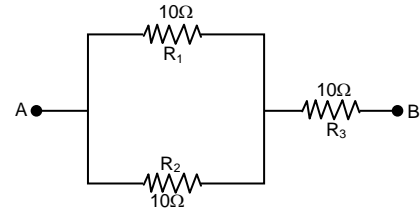


6. Equivalent resistance of the given circuit between points A and B is

- (A) 36.5Ω (B) 24.5Ω
(C) 10.5Ω (D) 7.5Ω

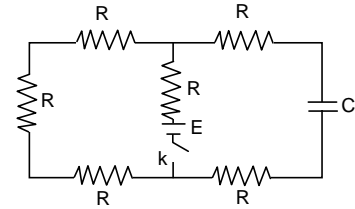


7. Three equal resistance each of 10Ω are connected as shown in figure. The maximum power consumed by each resistor is $20W$. The maximum power consumed by the combination is:



- (A) $60 W$ (B) $30 W$
(C) $15 W$ (D) $45 W$

8. In the given circuit initially the capacitor is uncharged. At $t = 0$ the key k is closed. Choose the correct option(s)

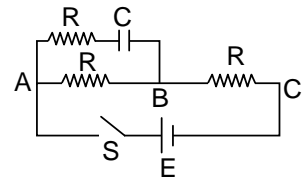


- (A) The time constant of the circuit is $\frac{11RC}{4}$.
(B) The time constant of the circuit is $\frac{11RC}{5}$.
(C) Current through the capacitor after one time constant is $\frac{4E}{11R} \left(\frac{1}{e} \right)$.
(D) Current through the capacitor after one time constant is $\frac{5E}{11R} \left(\frac{1}{e} \right)$.

(Multi Correct Choice Type)

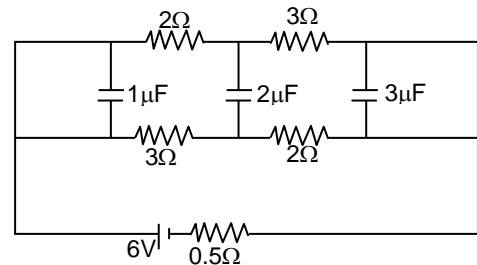
This section contains 4 **multiple choice questions**. Each question has four choices (A), (B), (C) and (D) out of which **ONE OR MORE** may be correct.

9. The switch is closed at $t = 0$ in the adjoining circuit. Which of the following is correct?



- (A) The potential difference across BC at $t = 0$ is $2E/3$
(B) The potential difference across AB at $t = \infty$ is $E/2$
(C) The potential difference across BC at $t = 0$ is $E/2$
(D) The potential difference across AB at $t = \infty$ is $2E/3$

10. In the diagram shown in steady state
(A) Charge on $1 \mu F$ capacitor is $1 \mu C$
(B) Charge on $2 \mu F$ capacitor is $2 \mu C$
(C) Charge on $3 \mu F$ is zero
(D) Potential difference across $2\mu F$ capacitor is 2 volt

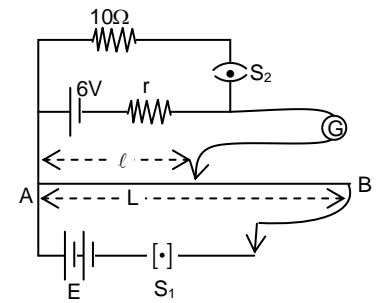


11. The potential of point A is $16V$ higher than potential of point B. Both the batteries have internal resistance 1Ω as shown in the circuit. Which of the following is/are correct statements?



- (A) The current through the 2Ω resistance is 3.5 amp.
(B) The current through the 4Ω resistance is 1.5 amp.
(C) The current through the 3Ω resistance is 1.5 amp.
(D) The potential difference between the terminals of the 9 V battery is 7 V.

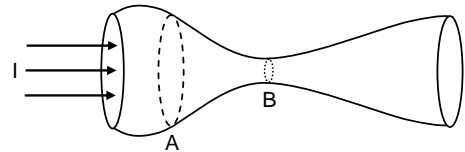
12. In the arrangement shown in the figure when the switch S_2 is open, the galvanometer shows no deflection for $\ell = L/2$. When the switch S_2 is closed, the galvanometer shows no deflection for $\ell = \frac{5}{12}L$.



- (A) Internal resistance of 6V cell is $3\ \Omega$
 (B) Internal resistance of 6V cell is $2\ \Omega$
 (C) emf E of other battery is $12\ V$
 (D) emf E of other battery is $24\ V$

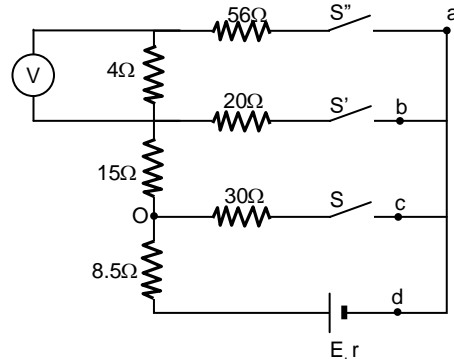
PART – B
(Matrix Match Type)

1. Consider current flowing through a conductor of non-uniform cross sectional area as shown. Consider two cross sections in the conductor at 'A' and 'B' as shown. Match the following:



Column-I		Column-II	
(A)	Current through cross section A	(P)	Is more than that at cross section B.
(B)	Current density at cross section A	(Q)	Is less than that at cross section B.
(C)	Drift speed of electrons at cross section A	(R)	Is equal to that at cross section B.
(D)	Number density of electrons at cross section A	(S)	Cannot be compared with value at B using given data.

2. In the given circuit, the battery has an emf $E = 75\ V$ and an internal resistance $r = 1.5\ \Omega$, Voltmeter is an ideal one. If all the switches are closed simultaneously, then

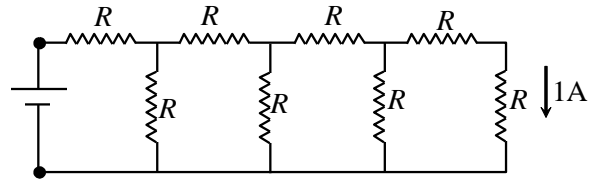


Column – I		Column – II	
(A)	Current in $30\ \text{ohm}$ (In A)	(P)	1.5
(B)	Current in $20\ \text{ohm}$ (In A)	(Q)	0.5
(C)	Potential difference across $4\ \Omega$ (In V)	(R)	0.75
(D)	Current in $15\ \Omega$ (In A)	(S)	1.125

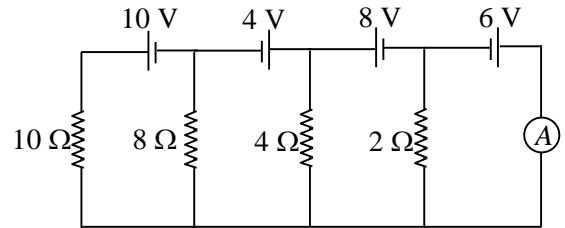
PART – C
(Numerical Based)

This section contains 06 Numerical based questions, the answer of which maybe positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -0.30, 30.27, -127.30)

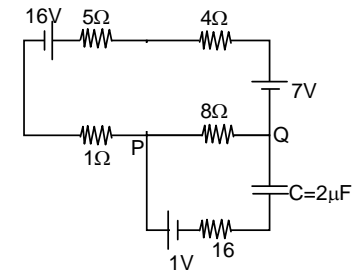
1. A finite chain of resistors is shown in the figure. All the resistors in the chain are of the same value. A current of 1A flows through the last resistor. The current supplied by the battery in ampere is $10x$. The value of 'x' is



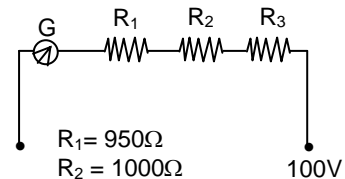
2. Find the reading of the ideal ammeter connected in the given circuit. Assume that the cells have negligible internal resistance.



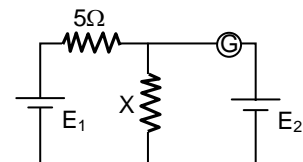
3. The charge (in μF) appearing on the capacitor in the circuit under steady state condition is



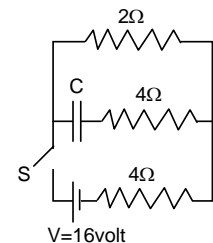
4. A galvanometer has an internal resistance of $50\ \Omega$ and current required for full scale deflection is $1\ \text{mA}$. The series resistance R_3 required (as shown in figure) to use it as a voltmeter with given range, as indicated in figure is $n \times 10^4\ \Omega$. Find the value of 'n'.



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



6. In the circuit shown the capacitor is initially uncharged. The switch S is closed at time $t = 0$. The internal resistance of the battery is negligible and the capacitance of the capacitor C is $2\ \mu\text{F}$. Calculate Initial current (in Ampere) through $2\ \Omega$ resistance.



space for rough work

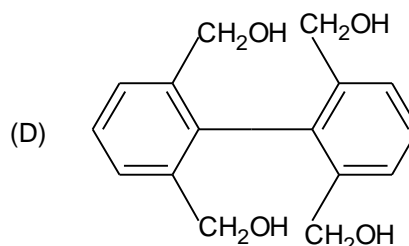
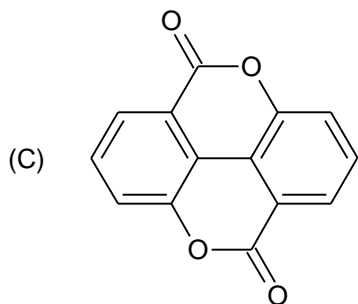
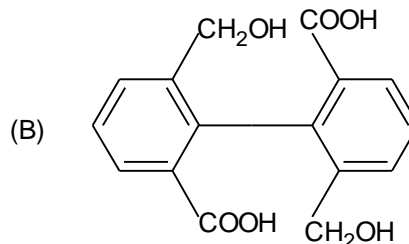
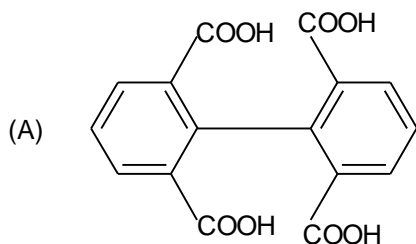
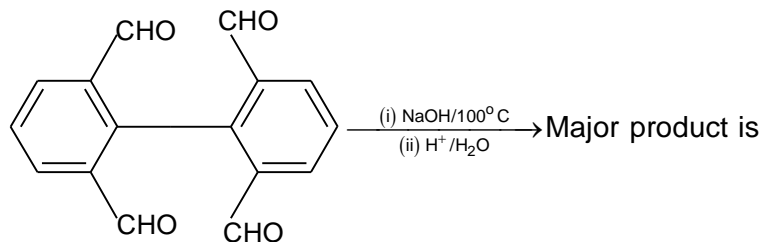
Section – II (Chemistry)

PART – A

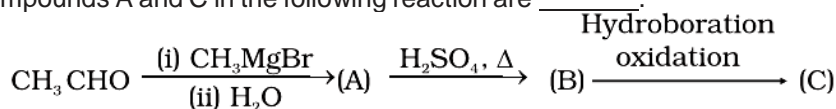
(Single Correct Choice Type)

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

1.

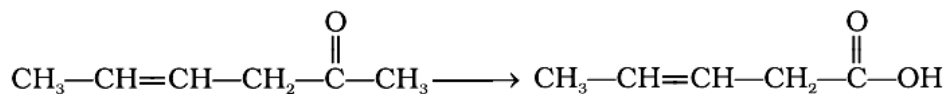


2. Compounds A and C in the following reaction are _____.



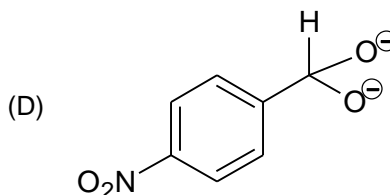
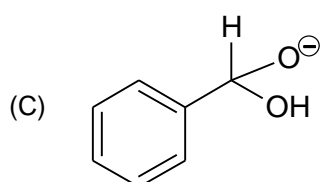
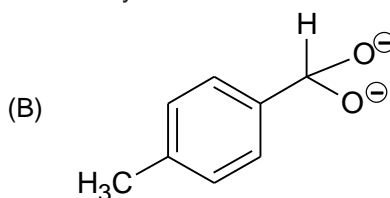
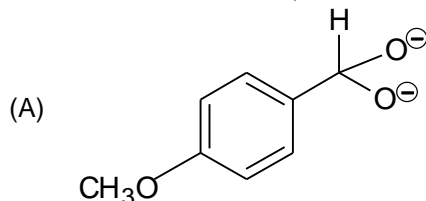
(A) identical (B) positional isomers (C) functional isomers (D) optical isomers

3. Which is the most suitable reagent for the following conversion?

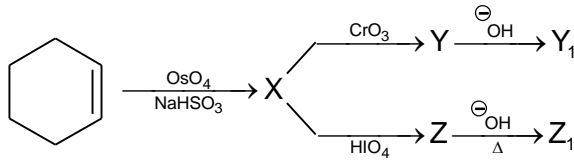
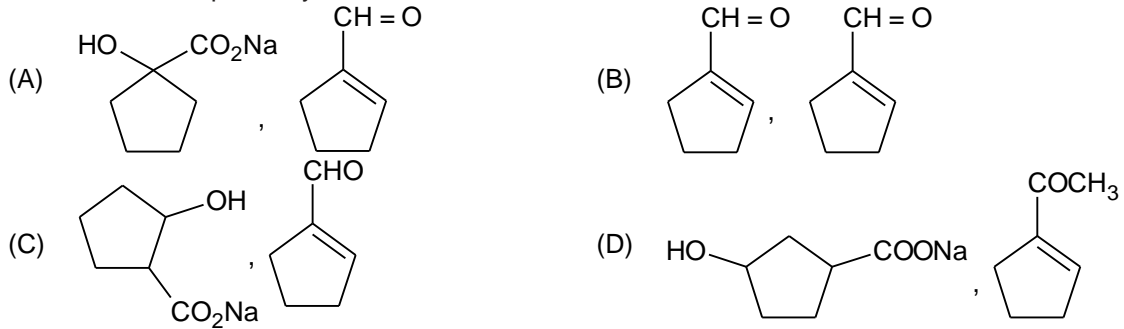


(A) Tollen's reagent (B) Benzoyl peroxide
(C) I_2 and NaOH solution (D) Sn and NaOH solution

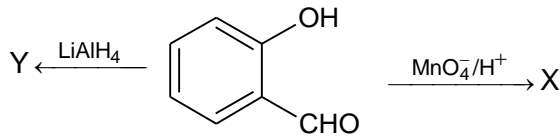
4. In a cannizzaro reaction, the intermediate that will be best hydride donor is



5.

Y₁ and Z₁ are respectively:

6.



Both the products X and Y do not react with:

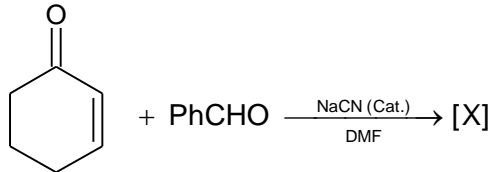
(A) Na

(B) NaOH

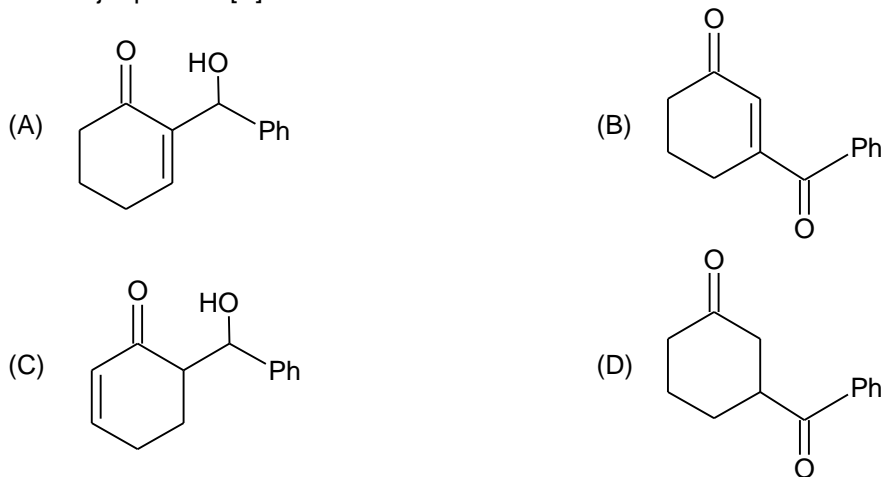
(C) NaHCO₃(D) CH₃COOH

7.

In the following reaction

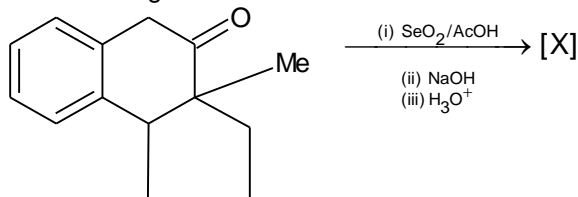


The major product [X] is:

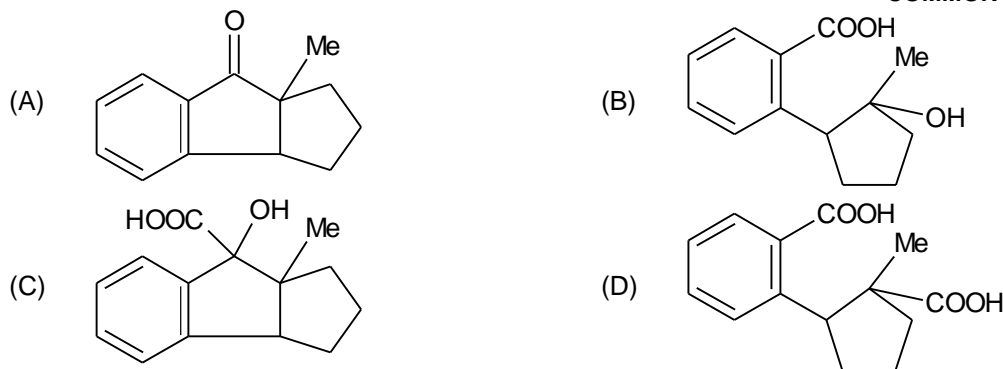


8.

In the following reaction

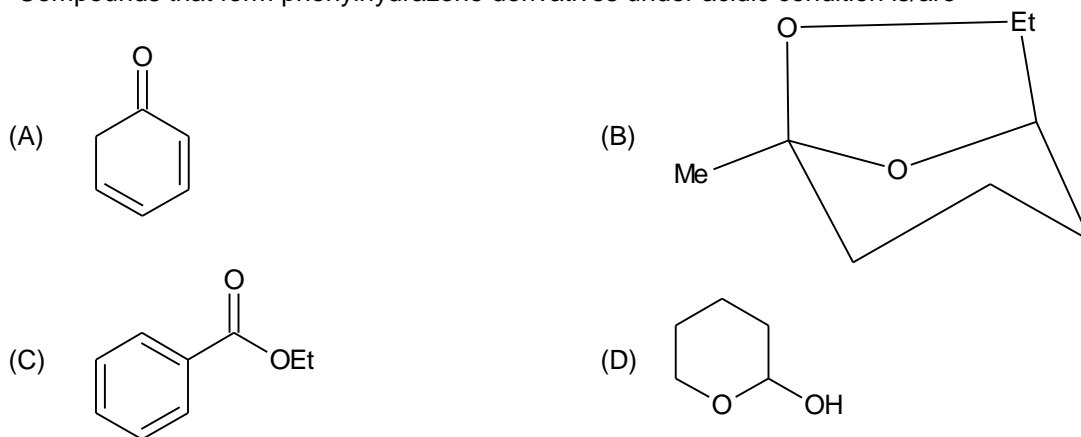


The major product [X] is

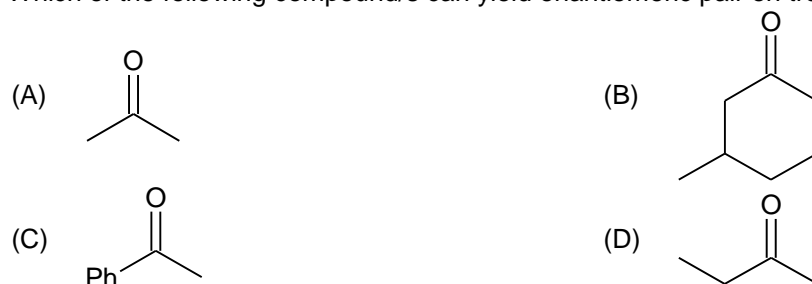
**(Multi Correct Choice Type)**

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

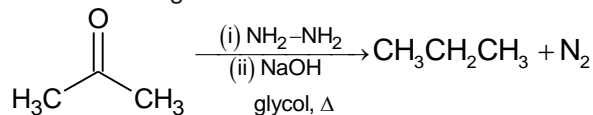
9. Compounds that form phenylhydrazone derivatives under acidic condition is/are



10. Which of the following compound/s can yield enantiomeric pair on treatment with HCN

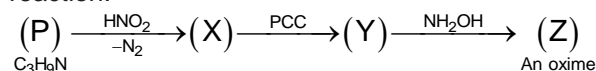


11. Which of the following statements are correct about Wolff-Kishner reduction?



- (A) Hydrazone intermediate is formed.
 (B) In basic medium, migration of double bond occurs with the loss of N_2 .
 (C) Reaction is favoured thermodynamically due to loss of N_2 .
 (D) Reaction is not favoured thermodynamically due to the migration of double bond.

12. If compound(Y) does not reduce Fehling's solution, then choose the correct option for the following reaction:



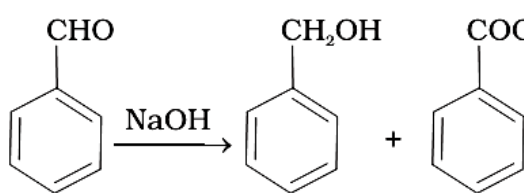
- (A) Both(X) and (Y) will give iodoform test
 (B) (Z) can show geometrical isomerism
 (C) (Z) on reaction with H_2SO_4 forms 2° amide
 (D) P is a secondary amine

PART – B
(Matrix Match Type)

1. Match the reactions given in Column I with the suitable reagents given in Column II.

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

2. Match the example given in Column I with the name of the reaction in Column II.

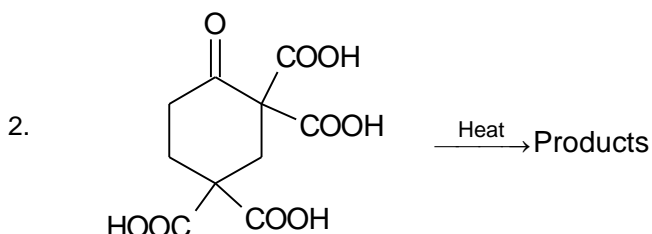
Column – I (Example)		Column – II (Reaction)	
(A)	$\text{CH}_3\text{—C(=O)—Cl} + \text{H}_2 \xrightarrow{\text{Pd-C/BaSO}_4} \text{CH}_3\text{—C(=O)—H}$	(P)	Aldol condensation
(B)	 <p style="text-align: center;"> $\text{C}_6\text{H}_5\text{CHO} \xrightarrow{\text{NaOH}} \text{C}_6\text{H}_5\text{CH}_2\text{OH} + \text{C}_6\text{H}_5\text{COO}^- \text{Na}^+$ </p>	(Q)	Cannizaro's reaction
(C)	$\text{CH}_3\text{—CN} \xrightarrow[\text{(ii) H}_2\text{O/H}^+]{\text{(i) SnCl}_2/\text{HCl}} \text{CH}_3\text{CHO}$	(R)	Rosemund's reduction
(D)	$2\text{CH}_3\text{CHO} \xrightarrow{\text{NaOH}} \text{CH}_3\text{—CH=CHCHO}$	(S)	Stephen's reaction

PART – C
(Numerical Based)

This section contains 06 Numerical based questions, the answer of which may be positive or negative numbers or decimals (e.g. 6.25, 7.00, -0.33, -30, 30.27, -127.30)

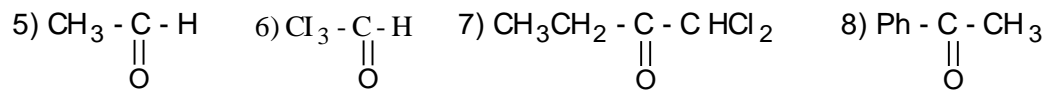
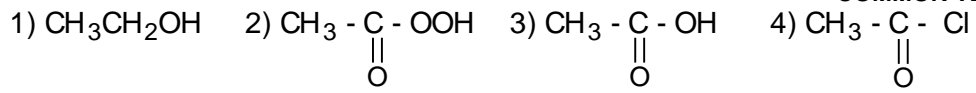


Calculate $\frac{N}{6}$, if N is different type of product(s) is/are formed in the above reaction without considering stereoisomers]

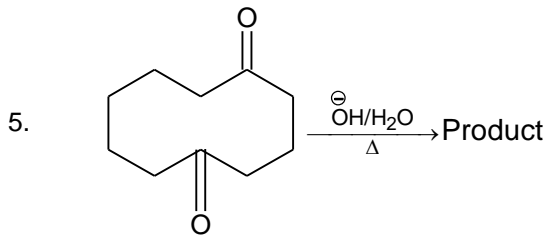


Half of no. of moles of CO₂ formed in above reaction is?

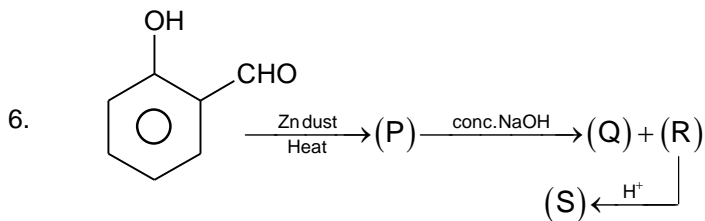
3. How many of the following compound can show positive iodoform test:



4. If X moles of HCHO can be consumed by one mole of CH_3CHO in presence of NaOH to form a product that contains an CHO group in presence of other functional group(s). What is the value of $\frac{X}{4}$



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



The difference between the number of carbon atoms between (R) and (S) is:

Section – III (Mathematics)**PART – A****(Single Correct Choice Type)**

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

1. The number of critical points of $f(x) = |(x-1)(x-2)|$ is
 (A) 2 (B) 3 (C) 1 (D) none of these

2. The slope of the tangent to the curve $y = \frac{ax}{b-x}$ at the point (1, 1) is 2. The values of a, b are respectively:
 (A) -1, 2 (B) -1, -2
 (C) 1, -2 (D) 1, 2

3. Equation of normal to the curve $y = \sin x$ at $(\pi, 0)$ is
 (A) $x + y = \pi$ (B) $x + y + \pi = 0$
 (C) $x - y = \pi$ (D) $x - y + \pi = 0$

4. For the every value of x the function $f(x) = \frac{1}{5^x}$ is
 (A) Decreasing (B) Increasing
 (C) Neither increasing nor decreasing (D) Increasing for $x > 0$ and decreasing for $x < 0$

5. If the function $f(x) = 2x^2 - kx + 5$ is increasing on $[1, 2]$, then k lies in the interval
 (A) $(-\infty, 4)$ (B) $(4, \infty)$
 (C) $(-\infty, 8)$ (D) $(8, \infty)$

6. If $f(x) = \max\{\sin x, \cos x\} \forall x \in (-2\pi, 2\pi)$ then number of critical points of f are
 (A) 5 (B) 7
 (C) 9 (D) none of these

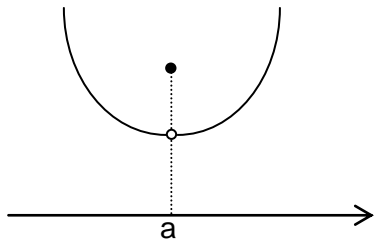
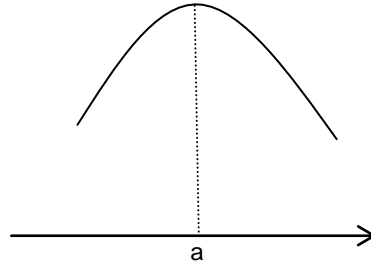
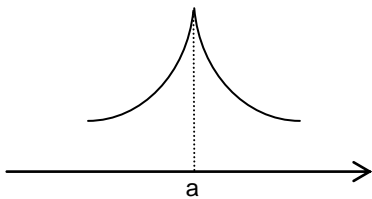
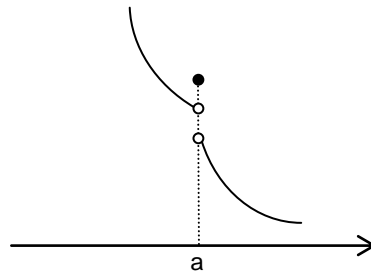
7. If f is decreasing and odd function, then $f^{-1}(x)$ is
 (A) odd and decreasing (B) odd and increasing
 (C) even and decreasing (D) even and increasing

8. The function $f(x) = x^{100} + \sin x - 1$ is strictly decreasing in
 (A) $(0, 1)$ (B) $\left(\frac{\pi}{2}, \pi\right)$ (C) $\left(0, \frac{\pi}{2}\right)$ (D) None of these

(Multi Correct Choice Type)

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

9. Which of the following graphs of a function $f(x)$ have a local-maxima at $x = a$?

**(A)****(B)****(C)****(D)**

10. The function $f(x) = 2x^2 - \ln x$
- (A) is strictly decreasing for $x \in \left(-\infty, -\frac{1}{2}\right)$
- (B) is strictly increasing for $x \in \left(-\frac{1}{2}, 0\right)$
- (C) is strictly decreasing for $x \in \left(0, \frac{1}{2}\right)$
- (D) is strictly increasing for $x \in \left(\frac{1}{2}, \infty\right)$

11. Which of the following statements are correct?
- (A) All stationary points are critical points.
- (B) A tangent cannot cross the curve at its point of contact.
- (C) A monotonic function cannot have any critical point.
- (D) The local maximum value of a function may not be its greatest value in an interval.

12. Which of the following statements are correct?

(A) $\sin x < x \quad \forall x \in \left(0, \frac{\pi}{2}\right)$

(B) $99^{\frac{1}{99}} > 98^{\frac{1}{98}}$

(C) $e^\pi > \pi^e$

(D) $x > \tan^{-1} x \quad \forall x \in \mathbb{R}^+$

PART – B
(Matrix Match Type)

1.

Column-I		Column-II	
(A)	The slope of tangent to the curve $2y^2 = ax^2 + b$ at $(1, -1)$ is -1 , then	(P)	$a - b = 2$
(B)	If (a, b) is the point on $9y^2 = x^3$ where the normal makes equal intercepts on the axes, then	(Q)	$a - b = \frac{7}{2}$
(C)	If the tangent at point $(1, 2)$ on the curve $y = ax^2 + bx + \frac{7}{2}$ is parallel to the line $x + 2y = 9$, then	(R)	$a - b = \frac{4}{3}$
(D)	If the tangent to the curve $xy + ax + by = 0$ at point $(1, 1)$ makes an angle $\tan^{-1} 2$ with positive x axis, then	(S)	$a - b = 3$

2. Match the functions in Column I with correct behavior in Column II

Column-I		Column-II	
(A)	$f(x) = \operatorname{sgn}(x)$	(P)	local maximum at $x = 0$
(B)	$f(x) = x - \sin x$	(Q)	local minimum at $x = 0$
(C)	$f(x) = \sin^2 x$	(R)	Increasing at $x = 0$
(D)	$f(x) = \{x\}$ ($\{.\}$ denotes fractional part)	(S)	decreasing at $x = 0$

PART – C
(Numerical Based)

This section contains 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)

- The length of subnormal of the curve $y^2 = 27x$ at any point is equal to
- The angle of intersection between the curves $x = \sqrt{y}$ and $x^3 + 6y = 7$ at $(1, 1)$ (in degrees) is
- The number of values of 'c' such that the line $3x + 4y = c$ touches the curve $\frac{x^4}{2} = x + y$ is

4. The length of a longest interval in which the function $f(x) = 3 \sin x - 4 \sin^3 x$ is increasing is $\frac{\pi}{k}$, where k is equal to
5. The volume of a cube is increasing at a rate of $7 \text{cm}^3 / \text{sec}$. The rate at which the surface area of the cube is increasing when edge length is 4cm is (in cm^2 / sec)
6. Number of critical points of the function $f(x) = xe^{x^2}$ is equal to

space for rough work

FITJEE INTERNAL TEST

BATCHES – NWCM921X1R, NWCM921A1R, NWCM921B1R, NWCM921C1R, NWCM921D1R, NWCM721O1S, NWCM921X1W, NWCM921X2W, NWCM921X3W, NWCM921X4W, NWCM921A1W, NWCM921A2W, NWCM921A3W, NWCM921A4W, NWCM921A5W, NWCM921B1W, NWCM921C1W, NWCM921C2W, NWCM921D1W, NWCM921E1W, NWCM921F1W, PANINI921-XIIG1, PANINI921-XII1 PANINI921-XII2 & PANINI921-XIIB

COMMON TEST – II

ANSWER KEY

QP Code:

Physics (Section -I)			
PART – A			
1. D	2. C	3. B	4. B
5. D	6. D	7. B	8. A
9. AB	10. BC	11. ABCD	12. BC
PART – B			
1. A → R	B → Q	C → Q	D → R
2. A → P	B → S	C → P	D → P
PART – C			
1. 2.1	2. 1.95	3. 6	4. 9.8
5. 1	6. 2		

Chemistry (Section-II)			
PART – A			
1. B	2. B	3. C	4. A
5. A	6. C	7. D	8. C
9. BD	10. BCD	11. ABC	12. AC
PART – B			
1. A → R, B → S, C → P, D → Q			
2. A → R, B → Q, C → S, D → P			
PART – C			
1. 0.66	2. 1.5	3. 6	4. 0.75
5. 2.94	6. Zero		

Mathematics (Section -III)			
PART – A			
1. B	2. A	3. C	4. A
5. A	6. B	7. A	8. D
9. ABCD	10. CD	11. AD	12. ACD
PART – B			
1. A → P	B → R	C → Q	D → S
2. A → R	B → R	C → Q	D → Q
PART – C			
1. 13.50	2. 90	3. 1	4. 3
5. 7	6. 0		