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O R G A N I C C H E M I S T R Y

S H I S H M I S H R A
R . R A M U P E T K A M S E T T Y

IIT-JEE Advanced⁺⁺ level Papers

BLACK BOOK

ORGANIC CHEMISTRY

ATDB.uno

ASHISH MISHRA
DR. RAMU PETKAMSETTY



BlueRoseONE^{co}
Stories Matter

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PAPER-1

SECTION - I (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

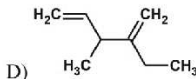
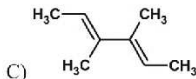
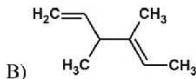
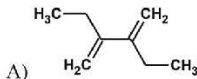
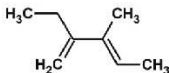
Negative Marks: -2 In all other cases.

1. The IUPAC name(s) of the following compound is (are):

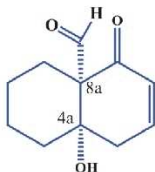


- A) 1-chloro-2-bromocyclohexa-1,3-diene
B) 1-bromo-2-chlorocyclohexa-1,3-diene
C) 2-bromo-3-chlorocyclohexa-1,3-diene
D) 2-chloro-1-bromocyclohexa-1,3-diene

2. Which of the following is **NOT** the chain isomer of

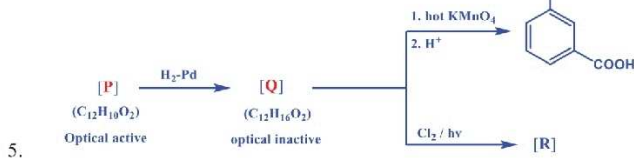
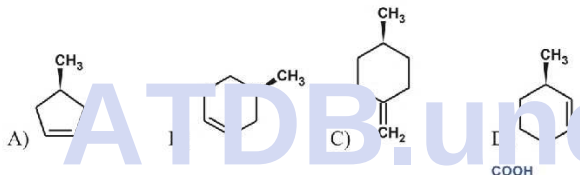


3. Absolute stereochemistry of the given compound is?



- A) 4a*R*, 8a*S* B) 4a*R*, 8a*R* C) 4a*S*, 8a*S* D) 4a*S*, 8a*R*

4. The reactant in which diastereomeric mixture is not obtained as a major product on reaction with $\text{Br}_2 / \text{CCl}_4$ is



P gives CO_2 gas with NaHCO_3 .

Correct statement(s) is(are) for the above reactions:

- A) Total monochloro products obtained by $\text{Cl}_2/h\nu$ of compound (Q) including stereoisomers are 7.
- B) IUPAC name of (P) is 3-(1-Ethynylprop-2-enyl) benzene carboxylic acid.
- C) Compound (Q) gives effervescence of CO_2 with sodium bicarbonate
- D) One monochloro product of Q is achiral

6. The energy profile for the two possible mechanisms of the following reaction,



Are given below

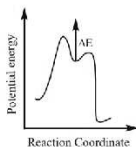


Figure-X

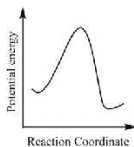
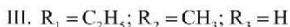
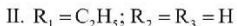
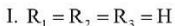


Figure-Y

Consider the following substrates (I to IV) for the above reaction



Choose the CORRECT statement(s).

A) The reaction mechanism changes from the one shown in figure Y to that in figure X, as one changes the substrate from I to IV.

B) Considering the mechanism corresponding to figure X for substrates I to IV, the correct order of ΔE is : $\Delta E_{\text{I}} > \Delta E_{\text{II}} > \Delta E_{\text{III}} > \Delta E_{\text{IV}}$.

C) The reaction for substrate I follows 2nd order kinetics and that for IV follows 1st order kinetics.

D) If OH^- is taken in large excess, reaction may not follow mechanism corresponding to energy profile in figure X.

7. Arrange the following compounds in increasing order of C-OH bond length

Methanol, Phenol, p-methoxyphenol

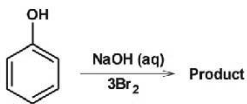
A) p-methoxyphenol < phenol < methanol

B) Phenol < p-methoxyphenol < methanol

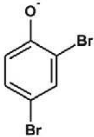
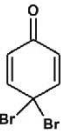
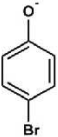
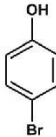
C) Methanol < p-methoxyphenol < phenol

D) Methanol < phenol < p-methoxyphenol

8.

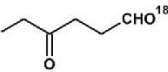
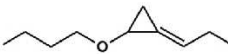
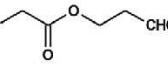
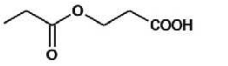


The intermediate(s) formed in the above reaction is/ are :

- A) 
 B) 
 C) 
 D) 

9.



- A) 
 B) 
 C) 
 D) 

SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

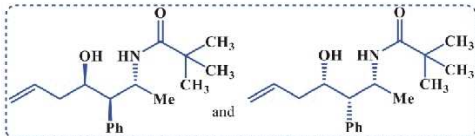
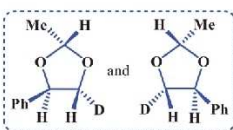
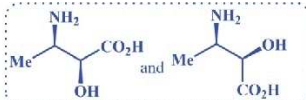
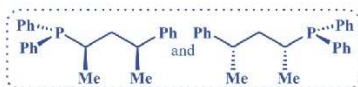
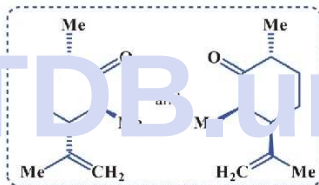
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

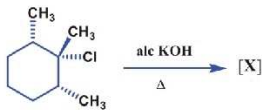
Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

10. The degree of unsaturation (double bond equivalent) for a compound with molecular formula $C_{14}H_{12}O_2$ is
11. Total number of constitutional isomers (only position isomers) possible for trimethyl cyclohexane is
12. Among the following the total number of set(s) of diastereomeric pair(s) is?

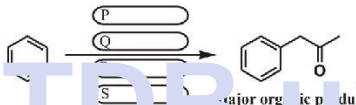


13. Find the number of unsaturated products formed in given reaction



14. Choose the appropriate reagent sequence from the given reagents pool to complete the synthetic conversation. Make sure to use strictly four reagents, not more not less. Note: you can simply mention the numerical values corresponding to the reagents in the boxes P, Q, R, S, respectively and also consider major organic product in each step.

What is the value of $[P + Q + R - S]$



- | | | | |
|---|--|--|---|
| 1. CH_3MgCl , H_2O , H^+ | 2. H_2O , H^+ , H_2SO_4 | 3. H_2O , H^+ , H_2SO_4 | 4. H_2O , H^+ , H_2SO_4 |
| 5. H_2O , H^+ , H_2SO_4 | 6. H_2O , NaOH , H_2O | 7. HBr | 8. H_2O , H_2SO_4 , HgSO_4 |
| 9. $\text{H}_3\text{C}-\text{Mg}-\text{Cl}$, AlCl_3 | 10. PCC | | |

15. If [X] is the number of different compounds produced on monochlorination of cis-1,2-dimethyl cyclopentane then find $\left[\frac{X}{2}\right]$? (Including stereoisomers).

SECTION- III
(MATRIX MATCH WITH NUMERICAL)

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

FOUR options are given representing matching of elements from **LIST-I** and **LIST-II**.

For each question, choose the option corresponding to the correct matching.

For each question, choose the option corresponding to the correct matching.

Full Marks : +3 If **ONLY** the option corresponding to the correct matching is chosen.

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks : -1 in all other cases.

16. Match the column

	List-I (Compound)		List-II (IUPAC names)
P)		1)	1-Bromo-4-chloro cyclohexene
Q)		2)	4-Bromo-1-chloro cyclohexene
R)		3)	1-Bromo-2-chloro cyclohexene
S)		4)	6-Bromo-1-chloro cyclohexene

Note: Correctly match **P, Q, R, S** with 1, 2, 3 & 4 and give your answer in integer values

If

P	Q	R	S
4	1	2	3

Then your answer is [4123]

ANSWERS

1	2	3	4	5	6	7	8	9	10
C	D	D	A	ABCD	ACD	B	AC	A	9
11	12	13	14	15	16	17	18	19	20
6	3	3	3	6	3412				

PAPER-2

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

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Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks: -2 In all other cases.

1. Choose the **CORRECT** statement(s) regarding given reaction scheme



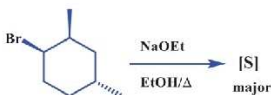
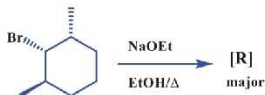
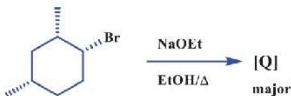
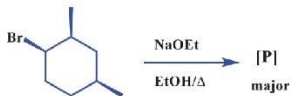
- A) [M] has a chiral center with absolute configuration S
- B) [N] can show geometrical isomerism
- C) The precipitate which filtered off in above scheme has S₄ element of symmetry
- D) [M] has eight carbons in its principal chain with locant at fourth position.

2. Choose the **CORRECT** statement(s) regarding Vanillin



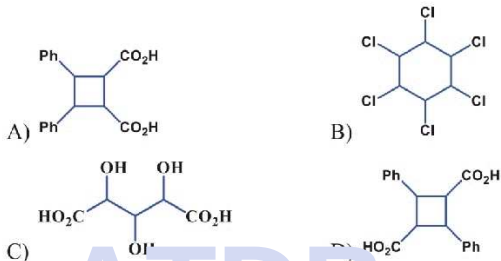
- A) **[P]** can be obtained as a major when 3,4-dihydroxy benzaldehyde treated with one equivalent of NaOH and one equivalent of MeBr
- B) **[P]** can be obtained as a one of the product when 2-methoxy phenol is treated with chloroform and aq KOH
- C) Positional isomer of **[P]** can be obtained when 3,4-dihydroxy benzaldehyde treated with one equivalent of NaOH and one equivalent of MeBr
- D) **[P]** can be obtained when 4-methoxy benzaldehyde treated two equivalent of NaOH and one equivalent of MeBr followed by cyclization

3. Choose the correct options regarding major organic products of the given elimination reactions

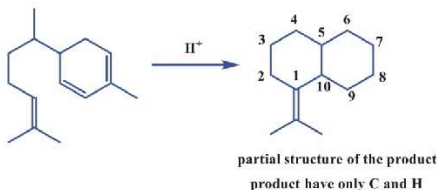


- A) **[P]** & **[Q]** are identical
- B) **[P]** & **[R]** are enantiomers
- C) **[Q]** & **[S]** are enantiomers
- D) **[Q]** & **[R]** are enantiomers

4. A term meso describing an achiral member of a collection of diastereomers that also includes at least one chiral member, they are optically inactive. Meso compounds may be acyclic as well as cyclic stereoisomers. A meso compound is achiral because at least one of its conformer has either a plane or a centre of symmetry, which among the following can have meso isomers

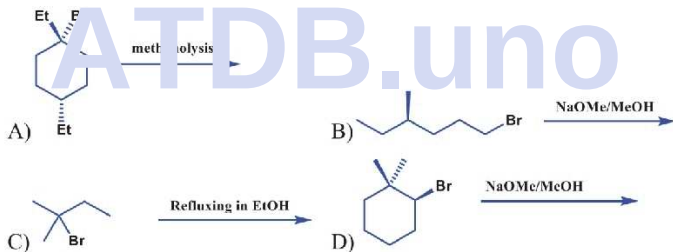


5. The compound [A] with $[\text{M}]^{\text{r}}$ ($\text{C}_3\text{H}_6\text{O}$) gives two organic products upon acidic hydrolysis, identify correct statements regarding to the products and reactant
- A) The reactant [A] can give addition product with HCN
- B) One of the isomer of [A] is optically active
- C) Both products react with Grignard reagent
- D) One of the products gives positive iodoform
6. In the below given reaction partial structure (**without methyl substituents and double bond**) of the final product is given; identify the correct statement(s) regarding the product

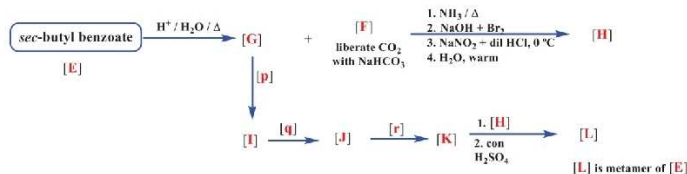


- A) There is a double bond between C7 and C8 carbon atoms
 B) There is a double bond between C8 and C9 carbon atom
 C) There are methyl groups at 4th and 9th positions
 D) All are correct

7. Which among the following can yield the more stereochemically pure product?



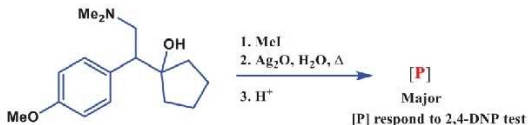
8. Choose the correct options regarding the given scheme?



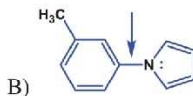
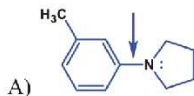
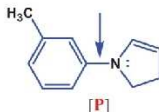
- A) [p] = SOCl_2 [q] = Mg/dry ether [r] = 1. HCHO; 2. H^+
 B) [p] = $\text{KBr} + \text{H}_2\text{SO}_4$ [q] = AgCN / DMF [r] = $\text{H}_3\text{O}^+ / \Delta$

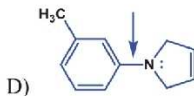
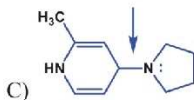
- C) [p] = PBr_3 [q] = Mg/dry ether [r] = $1. \text{CO}_2$; $2. \text{H}^+$
 D) [p] = HBr [q] = NaCN / DMF [r] = $\text{H}_3\text{O}^+ / \Delta$

9. Choose the correct option about [P]



- A) [P] can exhibit geometrical isomerism
 B) [P] can respond to iodoform test
 C) [P] on reaction with $1. \text{H}_2\text{O}$ gives two geometrical isomers
 D) All
10. Which among the following the rotational energy barrier around the indicated C-N bond is more than the [P]





SECTION- II (NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

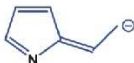
Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

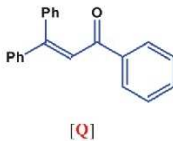
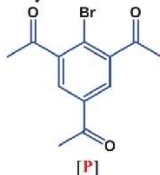
11. Organic compound [M] has the following data
- Molecular weight is 149, it contains only 3 elements
 - it can rotate plane polarized light (chiral)
 - [M] is oxidized with hot alkaline KMnO_4 produces benzoic acid
 - [M] can be prepared by treating carbonyl compound with methyl aniline followed by NaBH_4

Write the number of possible structures for [M] (excluding stereo isomers)

12. Write the number of resonating structures for the given carbanion where negative charge on the 2° carbon atom.



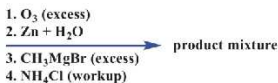
13. If x is the number of different types of protons in structure [P] and y is the different types of protons (only structurally different but not magnetically) in structure [Q] what is the value of y/x



14. In the below reaction product mixture contains ---- number of alcohols



consider only given
canonical form (complete ozonolysis)



SECTION - III (COMPREHENSION TYPE)

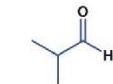
This section contains Paragraphs Questions. Based on each paragraph, there are 2 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Paragraph For Questions 15 & 16

Compound [P] with molecular formula $\text{C}_4\text{H}_8\text{O}$ reacts with dilNaOH gives [Q] ($\text{C}_8\text{H}_{14}\text{O}$). [Q] Gives positive tollens test and also gives positive bromine water test. [Q] on treatment with H_2/Pd gives [R], [R] on reaction with acetic acid in presence of $\text{con H}_2\text{SO}_4$ gives [S]. [S] on condensation with para-anisaldehyde gives [T] (% of C in T is 74.45)

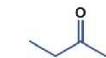
15. Choose the **CORRECT** statement among the following



[P]



[P]



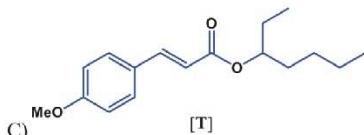
[P]

D) A & B

16. Choose the **CORRECT** statement among the following

A) [S] can rotate the plane polarized light

B) [R] is having 7 carbons in its principal chain (as per IUPAC)



C)

[T]

D) All

ANSWERS

1	2	3	4	5	6	7	8	9	10
AD	BCD	AC	ABC	BCD	B	B	CD	C	AD
11	12	13	14	15	16				
3	3	2.33	15	B	A				

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PAPER-3

SECTION - I (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

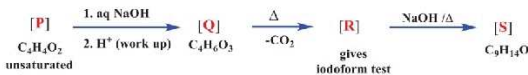
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

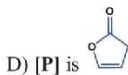
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks: -2 In all other cases.

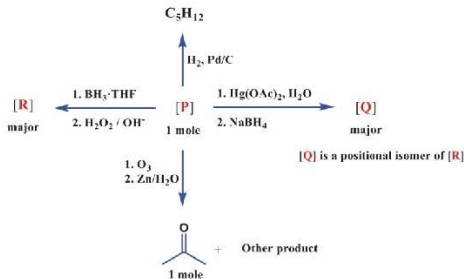
1. Choose the **CORRECT** statement(s) for the given reaction scheme



- A) [S] is a carbonyl compound which is more reactive than CH_3COCH_3 towards nucleophilic addition reactions
- B) Four stereo isomers possible for [S]
- C) Two structural isomers of [P] can satisfy the above reaction scheme



2. Choose the **CORRECT** options regarding given scheme?



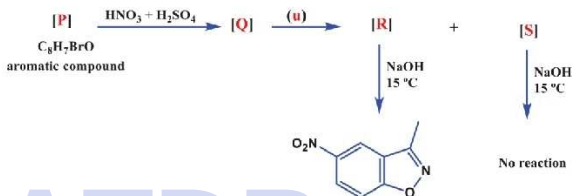


B) [P] can exhibit geometrical isomerism

C) [Q] can be oxidized with PCC

D) other product in reaction scheme is 2 moles of formaldehyde

3. Choose the **CORRECT** statements regarding given scheme



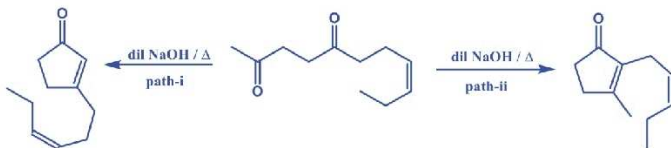
A) [R] and [S] are diastereomers

B) [U] is hydrazine hydrate

C) [P] can respond to the iodoform test

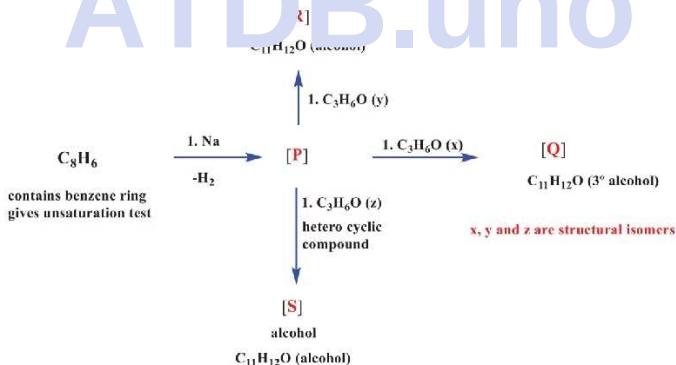
D) [Q] is 2-bromo-4-nitro acetophenone

4. Choose the **CORRECT** statement regarding given intramolecular aldol condensation



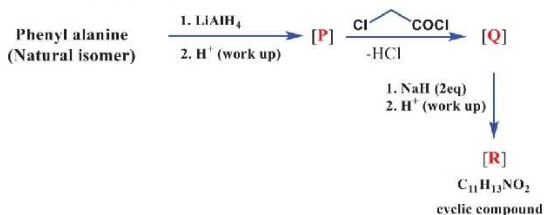
- A) Path-i is better than path-ii
 B) In path-i primary carbanion is intermediate which is more stable than the carbanion formed in path-ii which is secondary, so path-i is major path
 C) Path-ii is better than path-i
 D) In path-ii more substituted double bond is formed in final product which is more stable than the less substituted double bond product in path-i

5. Choose the **CORRECT** statement regarding the given scheme

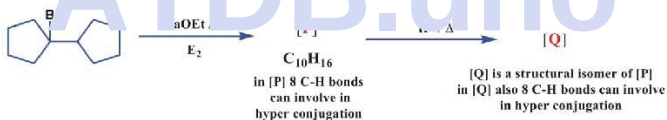


- A) [Q] & [R] can be chain isomers
 B) [Q] & [R] can be positional isomers
 C) [R] & [S] can be a positional isomers
 D) [Q] & [S] can be a chain isomers

6. Choose the **CORRECT** statement about the given scheme (consider major organic product in every step)



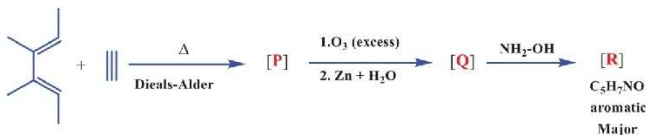
- A) Compound [R] is having chiral centre with *s* configuration
 B) [R] is having Ester and amine functional groups
 C) [P] on treatment with HNO_2 followed by heat gives compound [X] which gives positive fehilings test
 D) [Q] can resp

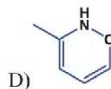
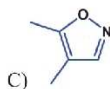
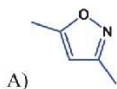


7.

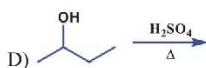
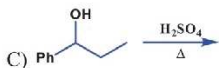
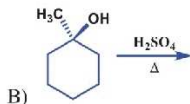
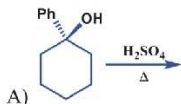
- A) [Q] cannot exhibit geometrical isomerism
 B) Three transition states are formed during the conversion of [P] to [Q]
 C) [Q] on reaction with Bayers reagent gives two stereo isomers
 D) Reductive ozonolysis of [Q] gives symmetrical diketone

8. Identify [R] (major) in the given sequence



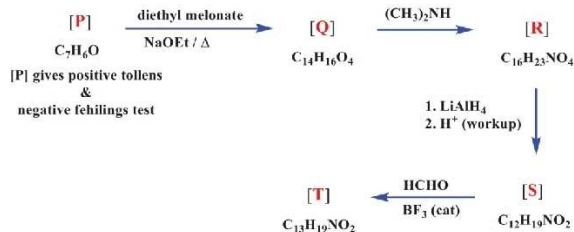


9. In the given elimination reactions which can be taken as example(s) of regioselective but not stereo selective.

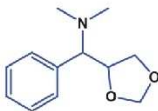


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10. Choose the **CORRECT** statement regarding given scheme and consider major organic product in each and every step



- A) [R] can show optical isomerism
 B) conversion of [Q] to [R] is a conjugate addition
 C) Degree of unsaturation in [Q] is 7



D)

[T]

SECTION- II (NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

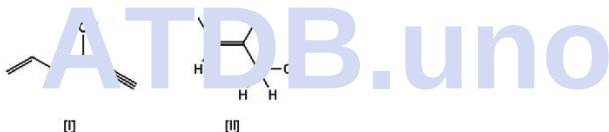
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

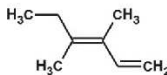
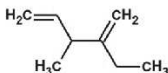
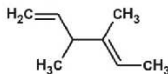
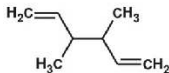
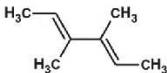
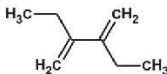
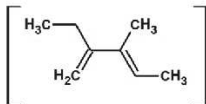
Zero Marks: 0 in all other cases.

11. Consider the given two molecules

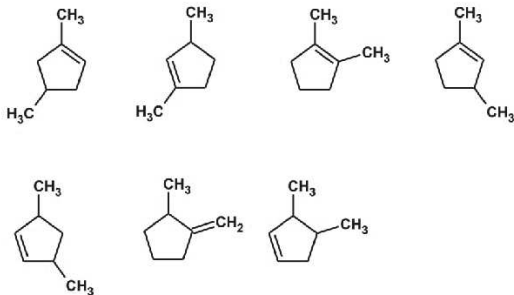


If [X] is the position of -OH group in [I] and [Y] is the position of -Cl group in [II] then what is the value of [X] + [Y] (Take all the positions as per IUPAC rules)

12. How many of the following are chain isomers of



13. Number of meso isomers possible with molecular formula $C_6H_{12}Cl_2$
14. How many out of the given structures give 5-Keto-2-methyl hexanal upon ozonolysis?



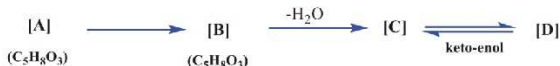
ATDB.uno SECTION III
(COMPREHENSION TYPE)

This section contains Paragraphs Questions. Based on each paragraph, there are 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Paragraph For Questions 15 & 16

The compound **[A]** ($C_5H_8O_3$) is called levulinic acid gives effervescence with aq. $NaHCO_3$ and gives orange colour compound with 2,4-dinitrophenylhydrazene and does not provide silver mirror with Tollens reagent, which undergoes the following sequence of reactions. Under acidic conditions **[A]** converts into the compound **[B]**, which neither give effervescences with aq. $NaHCO_3$ nor orange colour with 2,4-dinitrophenylhydrazene. The compound **[B]** on the loss of water molecule yield compound **[C]**, which on keto-enol tautomerism furnish an aromatic compound **[D]**.



15. Number of sp^2 carbon atoms present in the compound [D] is
 A) 2 B) 3 C) 4 D) 5
16. The position of carbonyl carbon in the reactant [A] is
 A) 2 B) 3 C) 4 D) 5

ANSWERS

1	2	3	4	5	6	7	8	9	10
C	A	AC	CD	ACD	AC	AD	C	B	ABC
11	12	13	14	15	16	17	18	19	20
4	5	5	2	C	C				

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PAPER-4

SECTION - I (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

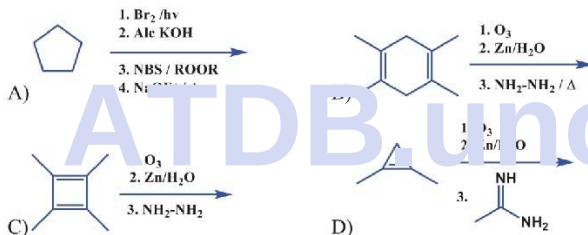
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks: +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

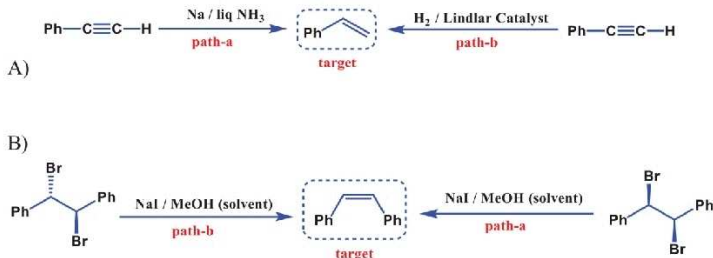
Zero Marks: 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks: -2 In all other cases.

1. Which among the following can yield the aromatic compound?



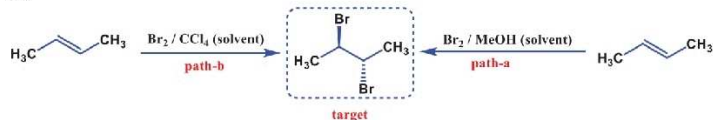
2. Which among the following **path b** is better than **path a** to achieve target molecule as a major product (Ph = phenyl group)





C)

D)

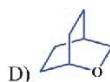
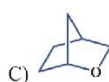
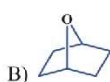
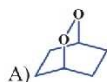


3. Consider the organic products obtained in the given reactions and choose the **INCORRECT** statement(s)

Consider each reaction gives 100% yield



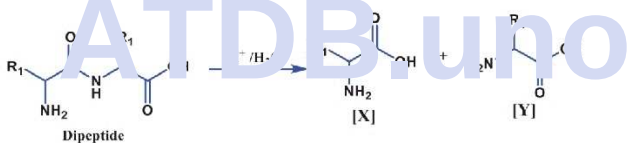
- A) In reaction-1 given alkene is *cis*, water addition is *syn* addition so product formed is *meso*
- B) Two fractions obtained (consider only organic compounds) when we distilled out the product mixture of the reaction-1
- C) Diastereomeric mixture formed in the reaction-2
- D) Two fractions obtained (consider only organic compounds) when we distilled out the product mixture of the reaction-2
4. Compound B has molecular formula $C_6H_{10}O$ and does not possess any π bonds. When treated with *con* HBr, *cis*-1,4-dibromocyclohexane is produced. Identify the structure of compound B.



5. Analyze the following data and choose the **CORRECT** option(s)

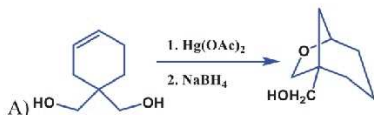
Compound [X]	Compound [Y]
M.F: C_4H_6O (acyclic compound)	M.F: C_4H_6O (acyclic compound)
Gives positive tollens test	Gives positive tollens test
Gives positive bromine water test	Gives positive bromine water test
Can show tautomerism	Cannot show tautomerism

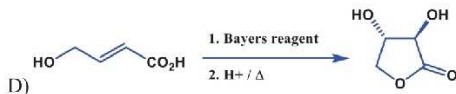
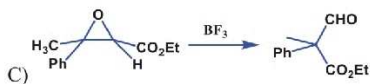
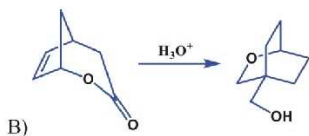
- A) [X] & [Y] are positional isomers
 B) [Y] is an aldol condensation product of acetaldehyde
 C) [X] on treatment with D_3O^+ number of replaceable hydrogens with Deuterium is 4
 D) [X] & [Y] are chain isomers
6. Analyze the following data of the following hydrolyzed products choose the correct options



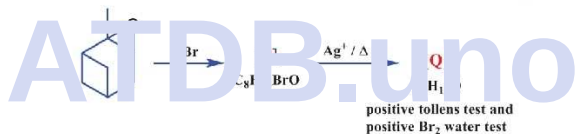
If the dipeptide first treat with HNO_2 and then hydrolysis is carried out we got lactic acid and [Y]. [Y] on heating gives 2,5-diketopiperazine.

- A) $R_1 = H$ & $R_2 = CH_3$ B) $R_1 = CH_3$ & $R_2 = CH_3$
 C) $R_1 = CH_3$ & $R_2 = H$ D) $R_1 = H$ & $R_2 = H$
7. Among the following how many of them are correctly matched with its major product

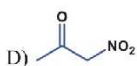
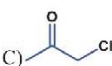
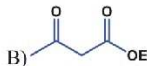
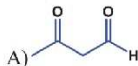




8. Choose the **CORRECT** option(s) among the following regarding given scheme



- A) During the formation of [P] 3° carbocation rearranges to 2° carbocation
 B) [P] is having five chiral centres
 C) [Q] can show geometrical isomerism
 D) [Q] on reductive ozonolysis gives y which can show optical isomerism
9. How many of the following are more acidic than **acetyl acetone**?



SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

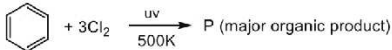
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

10. Number of -Cl atoms present in the Major organic product obtained in given reaction is?

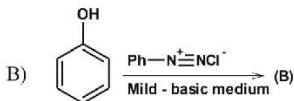
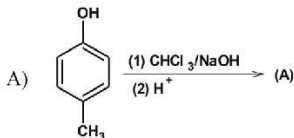


11. The rate law for the substitution reaction of optically pure 2-bromobutane with NaOH in 75% ethanol & 25% water at 30°C is, $R = 3.6 \times 10^{-5} [2\text{-bromobutane}] [\text{OH}^-] + 7.0 \times 10^{-6} [2\text{-bromobutane}]$. Assuming that $\text{S}_\text{N}1$ & $\text{S}_\text{N}2$ reactions take place with 100% racemisation and 100% inversion respectively, find the ratio of percentage of inverted to racemic product in 0.5M NaOH?

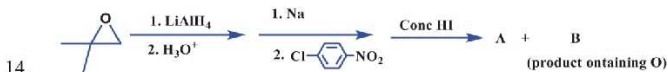


Find the dipole moment of product [P]

13.



Double bond equivalent of A + B =



In the above reaction, the ratio of C to O in the molecular formula of B is ____.

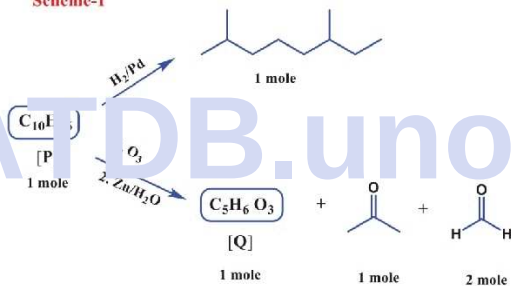
SECTION - III (COMPREHENSION TYPE)

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

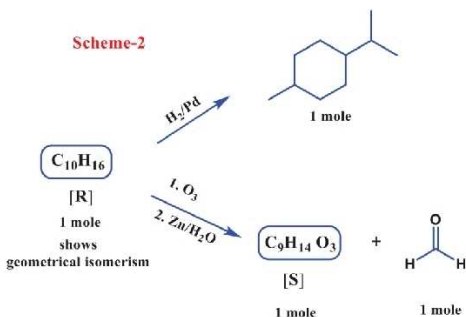
Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Paragraph For Questions 15 & 16

Scheme-1



Scheme-2



15. Choose the **CORRECT** statement(s) regarding Scheme-1
- A) **[P]** can show geometrical isomerism
 - B) **[Q]** can respond to the tollens reagent
 - C) **[Q]** contains two ketones and one aldehyde group
 - D) Number of carbon atoms in principal chain of **[Q]** is 5 (as per IUPAC)
16. Choose the **CORRECT** statement(s) regarding Scheme-2
- A) **[R]** in scheme-2 is structural isomer of **[Q]** in scheme-1
 - B) **[R]** can show both geometrical as well as optical isomerism
 - C) **[S]** can show optical isomerism
 - D) **[S]** can respond to the iodoform test

ANSWERS

1	2	3	4	5	6	7	8	9	10
ABD	AC	BCD	E	CD	C	AC	A	A	C
11	12	13	14	15	16	17	18	19	20
6.14	0	14	2	BD	ABCD				

PAPER-5

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

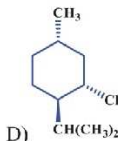
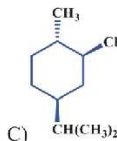
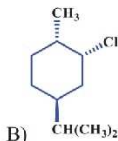
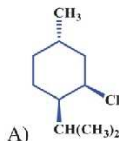
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

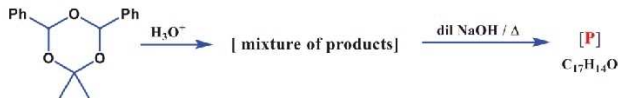
Zero Marks : 0 If none of the options is chosen [i.e. the question is unanswered].

Negative Marks: -2 In all other cases.

1. In the following reaction reactant(s) [Q] is/are

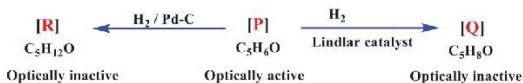


2. Choose the **CORRECT** statement(s)

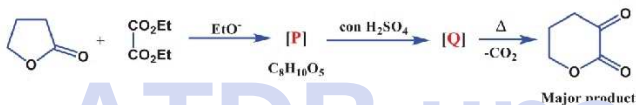


- A) In mixture one of the products shows positive iodoform test
 B) In mixture one of the products shows positive tollens & negative fehilings test
 C) [P] on reaction with hydroxyl amine gives oxime that can have 4 stereo isomers
 D) Number of double bonds in [P] is 10

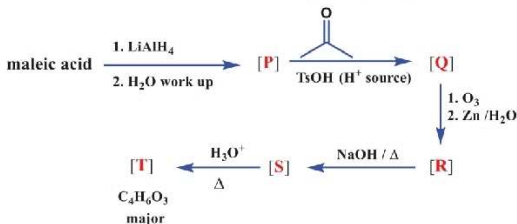
3. Choose the **CORRECT** statements regarding the given scheme



- A) [R] can be oxidized (with PCC) in to optically active carbonyl compound
 B) Oxidized (with PCC) product of [Q] can show tautomerism
 C) [P] contains triple bond which contains at 4th position (as per IUPAC)
 D) [Q] can give white turbidity immediately with Lucas reagent
4. Choose the **CORRECT** options regarding the given scheme?

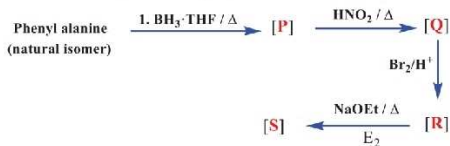


- A) Formation of [P] is an example of condensation reaction
 B) [P] can respond to 2,4-Dinit test
 C) Conversion of [P] to [Q] is an example of isomerization
 D) [P] is an example of beta keto ester
5. Choose the **CORRECT** option(s) regarding the given scheme



- A) [T] can show optical isomerism
 B) [T] contains three functional groups
 C) [T] can decolourise the KMnO₄ colour
 D) [T] up on reaction with NH₂OH (excess) gives four diastereomers

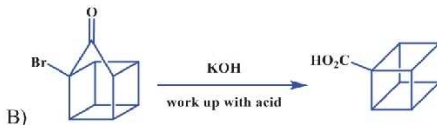
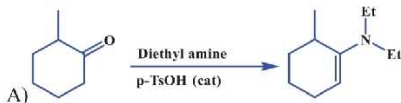
6. Choose the **CORRECT** options for the given reaction scheme

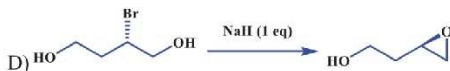
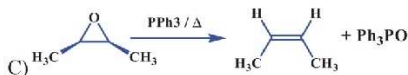


- A) [R] & [S] can show stereo isomerism
 B) [S] can show tautomerism
 C) [S] also can be prepared by crossed aldol condensation between benzaldehyde and acetaldehyde
 D) [S] is more reactive than [Q] towards nucleophilic addition reaction
7. Choose the **CORRECT** statement for given scheme



- A) [Q] is less reactive than cyclopentanone towards CH_3MgBr
 B) [Q] on reaction with CH_3MgBr followed by work up gives 3° alcohol
 C) [Q] on prolonged heating with D_3O^+ three hydrogens from [Q] exchanged with deuterium
 D) [Q] can show geometrical isomerism
8. How many of the following reactions are correctly matched with its major organic product





SECTION- II
(NUMERICAL VALUE)

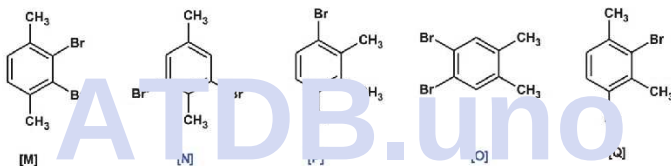
The answer to each question is a **NUMERICAL VALUE**

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

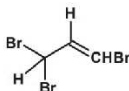
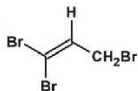
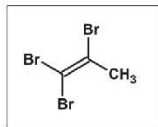


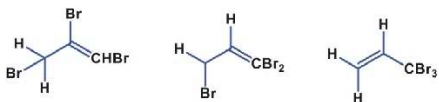
Find the sum of position number of (according to IUPAC rules) for both Bromine atoms in given all compounds

(Note: In [M], Position of (Br-) atoms = 1 & 2

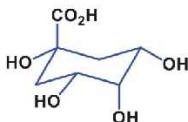
In [N], Position of (Br-) atoms = 3, 4, sum will be = 10) for [M] & [N]

10. In the given Position isomers of molecular formula $C_3H_3Br_3$, count the isomers in which position (locant) of double bond as per the **IUPAC** is changed with respect to given structure





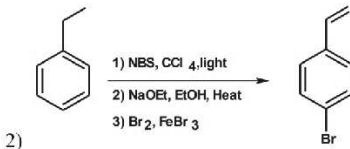
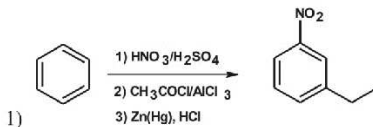
11. The optical rotation of the given compound is?

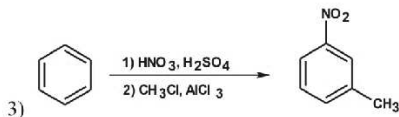


12. Pseudoephedrin, a natural alkaloid used as nasal decongestant. When we treat the pseudoephedrin with Hoffman elimination condition gives **[H]** ($C_9H_{10}O$). However H does not decolorize Br_2 water and does not form an oxime derivative. Number of stereoisomers (including D and L) possible for **[H]** is?



13. How many of the following synthesis will fail to give following as final product



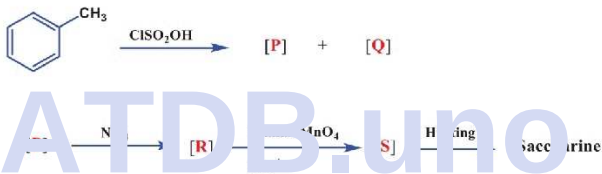


SECTION - III
(COMPREHENSION TYPE)

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Paragraph For Questions 14& 15



14. Choose the **INCORRECT** statement
- [P] & [Q] obtained by from toluene by electrophilic substitution reaction
 - Since $-\text{Cl}$ is better leaving group than $-\text{OH}$; SO_3H will get substituted on benzene ring in first step
 - [P] and [Q] are positional isomers
 - SO_2Cl will get substituted in first step
15. Choose the **CORRECT** Option
- [P] is the ortho isomer
 - [Q] is the ortho isomer
 - Number of oxygen atoms in [S] is 3
 - Number of sp^2 atoms in saccharine is 7

SECTION- IV
(MATRIX MATCH)

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

FOUR options are given representing matching of elements from **LIST-I** and **LIST-II**.

For each question, choose the option corresponding to the correct matching.

Full Marks : +1 if **ONLY** the option corresponding to the correct match(es) is(are) chosen.

Zero Marks : 0 if none of the options is chosen (i.e. the question is unanswered).

Negative Marks : -1 in all other cases.

16. Match the final organic product of given reaction in column-I with appropriate percentage of in column-II
(data C = 12.00 amu, N = 14.00 amu, H = 1.00 amu)

	Column-I		Column-II (% of elements)
A)	$\text{Ph}-\text{CH}_2-\text{C}(=\text{O})\text{OH} \xrightarrow[3. \text{NH}_4\text{Cl}]{1. \text{NH}_3/\Delta, 2. \text{LiAlH}_4}$	P)	% of N is 11.56
B)	$\text{Ph}-\text{CH}_2-\text{C}(=\text{O})\text{OH} \xrightarrow[2. \text{NaOH}/\Delta]{1. \text{NH}_3/\Delta}$	Q)	% of C is 79.3
C)	$\text{Ph}-\text{CH}_2-\text{Br} \xrightarrow[2. \text{H}_2]{1. \text{Al}, \text{O}_2}$	R)	% of is 6.7
D)	$\text{Ph}-\text{CH}_2-\text{Br} \xrightarrow[2. \text{H}_2/\text{Ni}]{1. \text{AgCN}}$	S)	% of C is 78.46
		T)	% of H is 8.47

ANSWERS

1	2	3	4	5	6	7	8	9	10
CD	ABC	CD	ABD	BCD	AC	AB	ABD	21	0
11	12	13	14	15	16				
0	4	3	B	A	A-PQ B-RST C-RSR D-PQ				

PAPER-6**SECTION - I****(ONE OR MORE THAN ONE)**

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

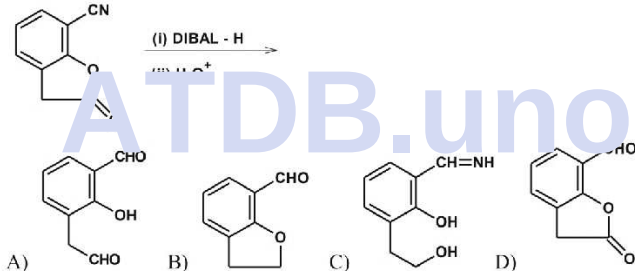
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

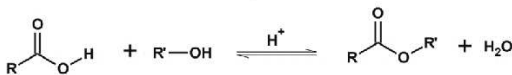
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks: -2 In all other cases.

1. The main product of the following reaction is



2. A carboxylic acid ester is prepared commonly by reacting a carboxylic acid with excess of an alcohol in the presence of a small quantity of a strong acid such as conc. H₂SO₄ as a catalyst. The reaction is reversible and generally the equilibrium constant for the esterification is close to 1. As it is reversible reaction, different method are used to increase the yield of ester. It is established that the mechanism of esterification under such conditions involves initial protonation of the acid followed by the attack of the alcohol as a nucleophile.

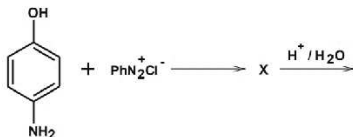


The **CORRECT** statement(s) is/are

- A) When esterification is carried out using molar ratio of acid and alcohol as 1 : 10, the yield of the ester with respect to the acid should be close to 90%.

- B) The function of conc. H_2SO_4 is also to increase the free energy change of the reaction and thereby increasing the equilibrium constant.
- C) When an ester is heated with acidified water the protonation will be more favourable at the acyl oxygen atom than at the alkoxy oxygen atom.
- D) When butyl hexanoate is heated with a large excess of methanol in the presence of a small quantity of conc. H_2SO_4 , methyl hexanoate is the major product.

3.



Possible final product(s) is /are

A) Phenol

B) Aniline

C) P-amino phenol

D)



4. **CORRECT** statement(s) among the following is/are

- A) The pK_a of $-\text{COOH}$ group in an α -amino acid is lower than the pK_a of acetic acid.
- B) Proline is an example of aromatic heterocyclic ring containing amino acids
- C) The pentaacetate of glucose does not react with hydroxylamine
- D) α -D-(+)-Glucopyranose and β -D-(+)-Glucopyranose differ in their configuration at C_2 position.

5. Which of the following polymer does not have a vinyl monomer unit(s) ?

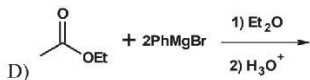
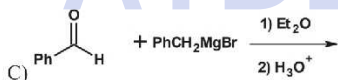
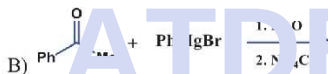
A) Acrylonitrile (PAN)

B) Polystyrene

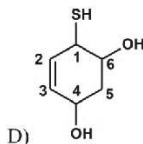
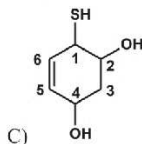
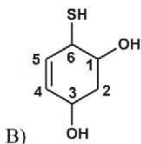
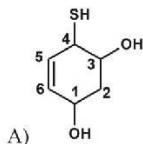
C) Nylon

D) PVC

6. Biodegradable polymer which can be produced from glycine and aminocaproic acid is:
- A) PHBV
B) Buta-N
C) Nylon 6, 6
D) Nylon 2- nylon 6
7. The **CORRECT** order of resonance stabilization for RCOCl (acid chloride), RCOOMe (ester), RCONH_2 (amide) is?
- A) Acid Chloride > Amide > Ester
B) Ester > Amide > Acid Chloride
C) Amide > Ester > Acid Chloride
D) Acid Chloride > Ester > Amide
8. Which reaction will not provide a synthesis of 1,1-diphenylethanol?



9. Select the structure with correct numbering for **IUPAC** name of compound



SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

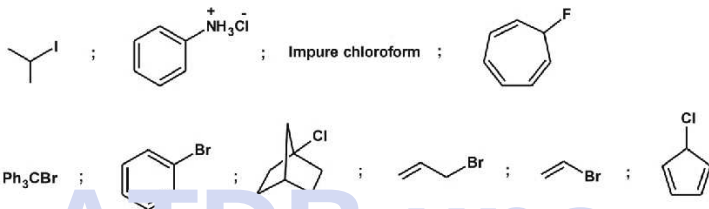
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

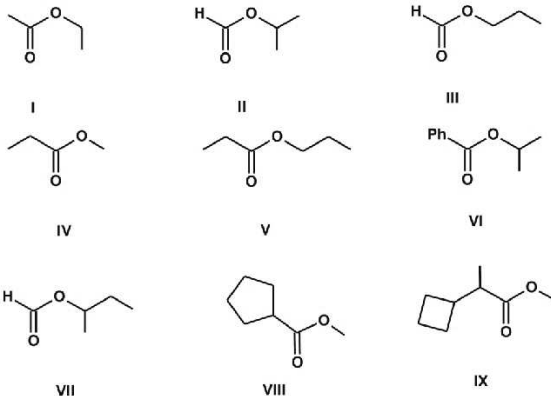
Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

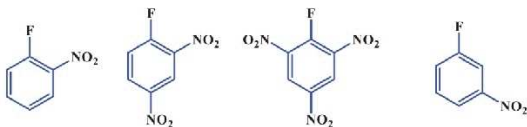
10. How many of the following will give precipitate with $\text{AgNO}_3(\text{aq})$?



11. An organic compound reacts with excess MeMgBr followed by H_2O to give two organic product of which one reacts with NaOI to give yellow precipitate and OTHER DOES NOT. How many of the following compounds can satisfy this condition?



12. How many of the following are more reactive than p-nitro fluorobenzene with NaOH?



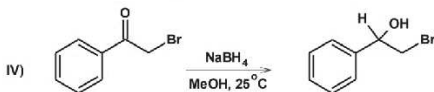
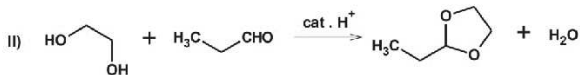
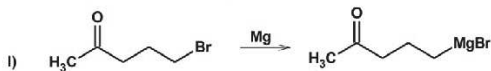
13. Consider the following reaction:



How many of the following set of R & R' fail to yield an ether as major product?

	R	R'
a)	Me(Ph)CH-	Ph-
b)	PhCH ₂ -	PhCH ₂ -
c)	MeCH=CH-	Me(Ph)C=CH-
d)	Ph-	n-C ₆ H ₁₃ -
e)	Me ₃ C-	Ph-C-
f)	Me ₃ CCH ₂ -	Me ₂ CH-
g)	Et-	Ph ₂ (Me)C-CH ₂ -

14. How many of the following reactions are **CORRECT**?



SECTION – III (COMPREHENSION TYPE)

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Choose the appropriate reagent sequence from the given reagents pool to complete the synthetic conversation given in the question number 15 and 16

Make sure to use strictly all the boxes given on the arrow, not more not less

Note: you can simply mention the numerical values corresponding to the reagents in the boxes **P, Q, R, S**, and also in each stage consider major product.

1. NaBH_4

5. HBr, ROOR, hv

9. $\text{NBS, H}_2\text{O}$

13. O_3

2. Br_2, hv

6. $\text{H}_2\text{O}_2, \text{NaOH}$

10. $\text{Hg}(\text{OAc})_2, \text{MeOH}$

14. CH_3COOH

3. $\text{BH}_3 \cdot \text{THF}$

7. $\text{EtONa/EtOH, } \Delta$

11. $\text{Conc. H}_2\text{SO}_4, \Delta$

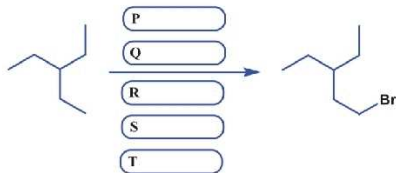
15. $\text{H}^+ / \text{H}_2\text{O}$

4. Zn, PCl_5

8. $\text{H}_2\text{C}=\text{H}_2\text{SCl, H}_2\text{SO}_4$

12. $\text{rt-EtOH, } \Delta, \text{ CuCl}_2, \Delta$

15. What is the value of $[\text{P} + \text{Q} + \text{R} - \text{S} + \text{T}]$



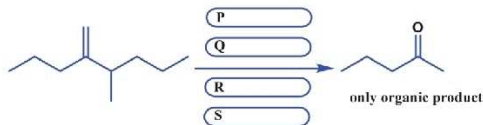
A) 5

B) 7

C) 14

D) 10

16. What is the value of $[\text{P} + \text{Q} - \text{R} - \text{S}]$



A) 35

B) 36

C) 9

D) 10

ANSWERS

1	2	3	4	5	6	7	8	9	10
A	ACD	ABCD	AC	C	D	C	BC	B	5
11	12	13	14	15	16				
3	3	5	3	B	C				

ATDB.uno

PAPER-7

SECTION- I (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

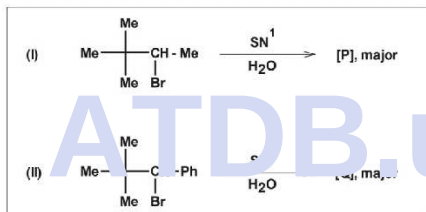
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

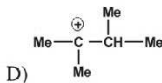
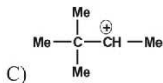
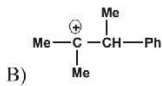
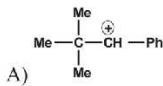
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks: -2 In all other cases.

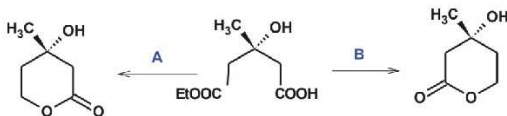
1.

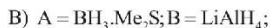


Identify the **INCORRECT** intermediate carbocation which does **NOT** form during the reaction I & II?

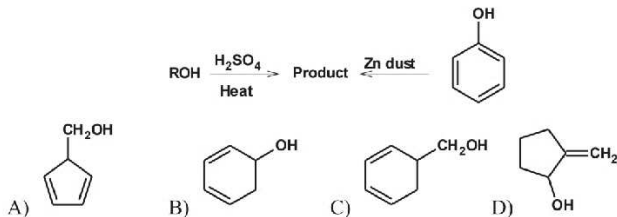


2. Identify appropriate reagent **A** and **B** in the following reactions.

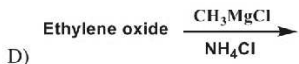
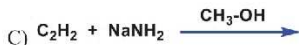




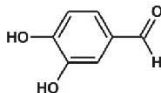
3. The possible structure of the alcohol is



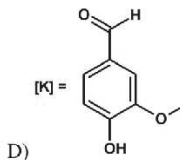
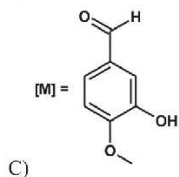
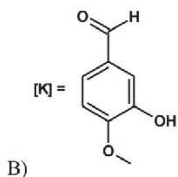
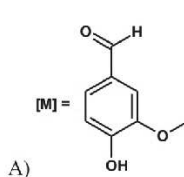
4. Which among the following new C-C bond formed in the product is/are?



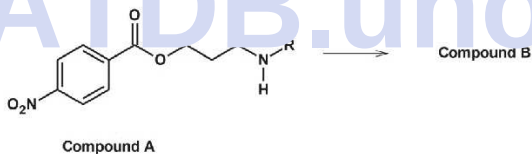
5. Protocatechualdehyde with dimethyl sulphate in the presence of NaOH gives **K** along with **L** and **M**. In this reaction product ratios can be controlled by the reaction conditions. With excess of NaOH and excess of dimethyl sulphate, product **L** formed exclusively. When one equivalent of NaOH and one equivalent of dimethyl sulphate were used, **K** was formed in 87% yield. The same reaction when carried out with excess of NaOH and only one equivalent of dimethyl sulphate **M** was formed in 96% yield.



Identify the correct options

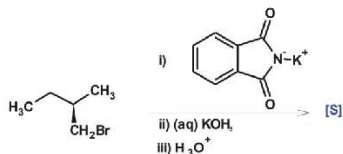


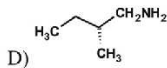
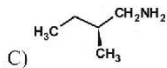
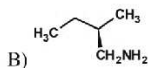
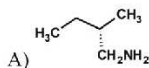
6. When the following compound is allowed to stand in pentane, converted into a constitutional isomer. Which of the following is/are correct about the constitutional isomers **A** and **B** ?



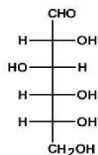
- A) **(A) & (B)** are functional isomers
 B) Both give same products on hydrolysis
 C) Hydrolysed products can be separated by aqueous. HCl/Ether in separating funnel
 D) Hydrolysed products can be separated by aqueous. NaOH/Ether in separating funnel

7. The product **[S]** in the following reaction can be represented as :



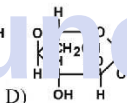
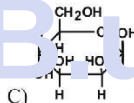
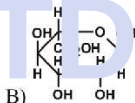
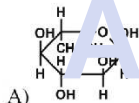


8. The Fischer presentation of D-glucose is given below.

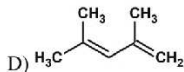
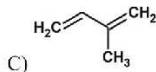
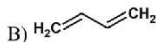
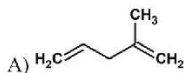
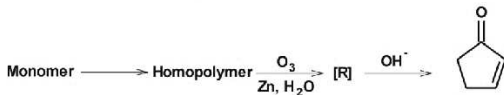


D - glucose

The correct structure(s) of β -L-glucopyranose is (are)



9. Identify the monomer in this sequence.



SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

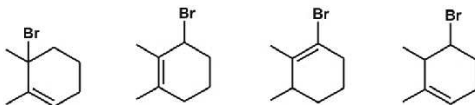
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

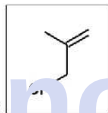
Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

10. What is the sum of position number assigned to Bromine atoms while numbering the parent chain in given structures?

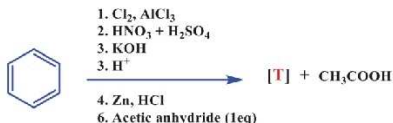


11. Identify the position isomers for the given molecule ()



12. A solution is prepared by dissolving 60.0gm of (+)-2-butanol in 200ml solution and another solution by dissolving 50.0gm of (-)-2-butanol in 500ml solution. 50ml each of these solutions are mixed into a polarimeter tube of length 500mm. What will be the observed rotation for the solution if specific rotation of 2-butanol is 13.5° . (in degrees)
13. Consider all possible isomeric ketones including stereoisomers of MW = 100, All these isomers are independently reacted with CH_3MgBr (NOTE: stereoisomers are also reacted separately and also consider no racemization of alpha carbon of the carbonyl group during the reaction). The total number of ketones that give a racemic product is/are

14.



Find the number of lone pair of electron in product [T].

15. Total number of products (including both structural and stereoisomers) formed by monochlorination of the following compound is...



SECTION- III
(MATRIX MATCH)

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.**FOUR** options are given representing matching of elements from **LIST-I** and **LIST-II**.

For each question, choose the option which is correct matching.

Full Marks : If ONLY the option corresponding to the correct match(es) is/are chosen.**Zero Marks** : If one or more of the options chosen for the question is/are incorrect.**Negative Marks** : If all the options are chosen for the question.

16. Match the appropriate reagents from column-II for the given conversion in column-I

	Column-I		Column-II
A)		P)	$\text{KOH in EtOH} / \Delta$
B)		Q)	$\text{Ag}^+ / \text{H}_2\text{O}$
C)		R)	$(\text{CH}_3)_3\text{COK} / (\text{CH}_3)_3\text{COH}$
D)		S)	Aq KOH

		T)	1. EtOK/EtOH 2. i) BH ₃ ·THF ii) H ₂ O ₂ /OH ⁻
--	--	----	--

ANSWERS

1	2	3	4	5	6	7	8	9	10
B	C	AB	AD	AB	ABCD	BD	D	C	15
11	12	13	14	15	16				
0	6.75	2	5	10	A-Q B-R C-ST D-P				

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PAPER-8

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks: -2 In all other cases.

1. Match the resonance energies 67, 88 and 121 kJ/mol for the following compound



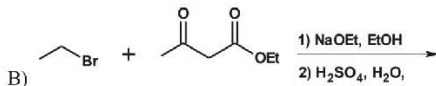
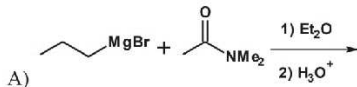
A) I-67, I-121, III-88

B) I-121, II-88, III-67

C) I-67, II-88, III-121

D) I-121, II-88, III-67

2. Which reaction is not appropriate for the synthesis of pentan-2-one?



3. Identify which test are positive (+) or negative (-) for β -D-glucopyranose?

(Note: Here Positive means -respond to test)

Negative means-Not respond to test)

- 1) 2, 4 - DNP 2) $\text{NH}_2\text{OH} / \text{H}^+$ 3) Tollen's test 4) NaHSO_3

A)

1	2	3	4
+	+	+	-

B)

1	2	3	4
+	+	-	-

C)

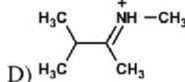
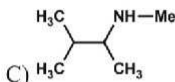
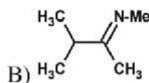
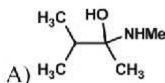
1	2	3	4
-	+	+	-

D)

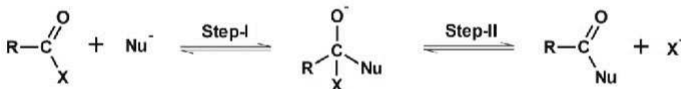
1	2	3	4
-	-	-	-

4. Consider the following sequence of reaction

3-Methyl butane-2-one $\xrightarrow[\text{Heat}]{\text{MeNH}_2}$ (X) $\xrightarrow[\text{(ii) H}_2\text{O}]{\text{(i) LiAlH}_4}$ (Y) The final product (Y) is



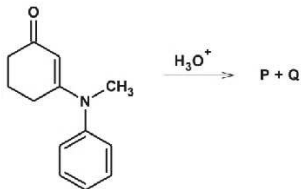
- 5.



Some statements about nucleophilic acyl substitution of carboxylic acid derivatives given below. Correct statement among the following is/are

- A) For base catalyzed hydrolysis of ester, step-I is slow step
 B) For base catalyzed hydrolysis of acid chloride, step-I is slow step
 C) For base catalyzed hydrolysis of amide, step-II is slow step

6.

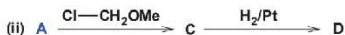


Choose the **CORRECT** statement regarding the product mixture

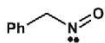
- A) One of the product gives positive DNP test
 B) Both products gives the positive tollens test
 C) One of the product gives iodoform test
 D) number of SP^2 carbon atoms in both P and Q together is 8
7. An alkyl halide (X) on reaction with ethanolic sodium hydroxide forms an alkene(Y) which on further reaction with HBr gives the same alkyl halide. The alkene(Y) on reaction with HBr /peroxide followed by reaction with $\text{Hg}^{2+}/\text{ac}^-$ followed by reaction with HCN produces an aldehyde (Z) here consider the reaction between MgX and HCN is nucleophilic addition not the acid base reaction. Among the following Z can be



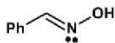
8. Which is /are true for following reactions?



- A) A is a homocyclic compound
 B) D on treating with 1 equivalent conc. HI, produces a primary alkyl halide predominantly
 C) C does not decolorizes Br_2 - water
 D) A is organometallic compound
9. The **CORRECT** statement(s) about the following species is (are)



(I)



(II)



(III)

- A) **I** is more stable than **II** and **III**
B) **II** and **III** are more stable than **I**
C) **II** and **III** are diastereomers
D) **III** is a tautomer of **I**

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SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

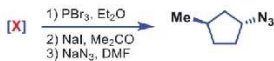
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

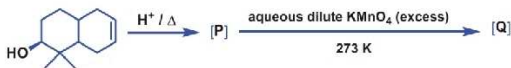
10. Consider the given reaction sequence



How many of the following are suitable as a [X]



11. How many isomeric aryl diazonium chlorides of xylene can be reduced to meta-xylene by treatment with H_3PO_2 , heat?
12. In pyrrole the electron density is maximum on **X** or **Y** carbons respectively. The sum of **X** and **Y** is equal to
13. Consider the given reaction sequence



Number of secondary hydroxyl group(s) presents in [Q] is

SECTION – III
(COMPREHENSION TYPE)

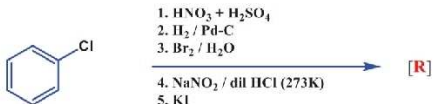
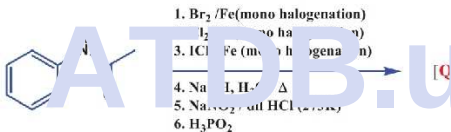
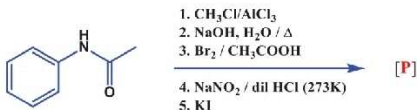
This section contains Paragraphs Questions. Based on each paragraph, there are 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Paragraph For Questions 14 TO 16

Study the below three schemes and answer the given three questions

Note consider major organic product in each case and move forward



14. Choose the **CORRECT** options regarding [P]
- A) Sum of the positions of the substituents (as per IUPAC) in [P] is 11 if toluene is taken as a parent chain
- B) [P] is having plane of symmetry (except molecular plane) in which five atoms are going through plane
- C) Sum of the positions of the substituents (as per IUPAC) in [P] is 12 if benzene is taken as a parent chain
- D) All
15. Choose the **INCORRECT** options
- A) Reaction of [P] with hot KMnO_4 followed by decarboxylation with sodalime gives [Q]
- B) Reaction of [P] with hot KMnO_4 followed by decarboxylation with sodalime gives [R]
- C) Reaction of [P] with hot KMnO_4 followed by decarboxylation with sodalime gives positional isomer of [Q]
- D) All
16. Choose the correct option among the following
- A) Position of the iodide in [Q] and [R] is same (as per IUPAC)
- B) Position of the $-\text{Cl}$ in [Q] and [R] is same (as per IUPAC)
- C) [R] is having plane of symmetry in which plane is going through four atoms (except molecular plane)
- D) All

ANSWERS

1	2	3	4	5	6	7	8	9	10
C	D	C	C	ABCD	ACD	BC	ABD	BCD	4
11	12	13	14	15	16				
3	7	2	B	D	C				

PAPER-9

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

Zero Marks : 0 If none of the options is chosen [i.e. the question is unanswered].

Negative Marks: -2 In all other cases.

1. The rate constants for the bromination of several disubstituted stilbenes are given in the table. Find the correct relation between rate constants for different **X** and **Y**?



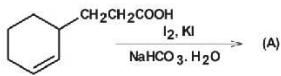
X	Y	k ($\times 10^3 \text{ min}^{-1} \text{ mol}^{-1}$)
OMe	Me	K_1
OMe	Cl	K_2
OMe	OMe	K_3
OMe	NO_2	K_4

A) $K_1 > K_3 > K_4$

B) $K_1 > K_2 > K_4$

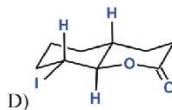
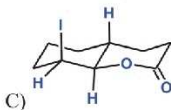
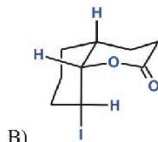
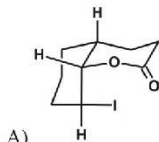
C) $K_3 > K_2 > K_4$

D) $K_3 > K_1 > K_2$

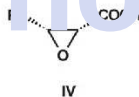
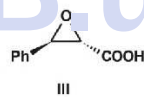
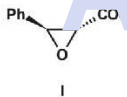


2.

The prominent product(s) in the reaction is(are)



3. Identify relationship



A) (I, II) are diastereomers

B) (II, IV) are enantiomers

C) (I, III) are enantiomers

D) (III, IV) are homomers

4. The maximum number of constitutional isomers of a compound having molecular formula $C_3H_2Cl_2$

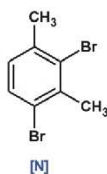
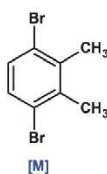
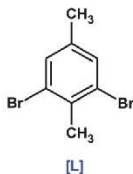
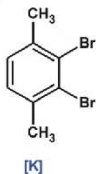
A) 7

B) 5

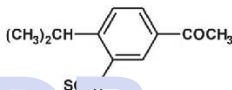
C) 3

D) 0

5. In how many of the following structures, both bromine located at the identical position according to IUPAC numbering

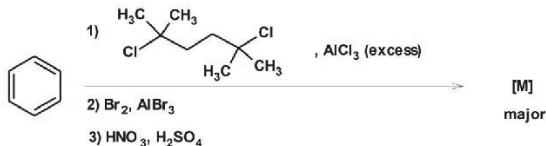


- A) K and L B) L and M C) M and N D) L and N
6. The best sequence of reactions for preparation of the following compound from benzene is

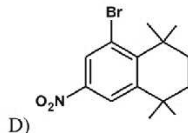
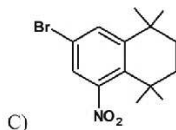
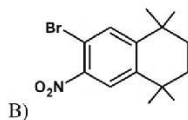
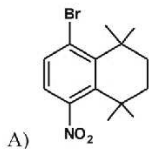


- A) (i) $\text{CH}_3\text{COCl} / \text{anhyd. AlCl}_3$ (ii) $\text{Oleum} / \text{H}_2\text{SO}_4$ (iii) $(\text{CH}_3)_2\text{CH}-\text{Cl} / \text{anhyd. AlCl}_3$
- B) (i) $(\text{CH}_3)_2\text{CH}-\text{Cl} / \text{anhyd. AlCl}_3$ (ii) $\text{CH}_3\text{COCl} / \text{anhyd. AlCl}_3$ (iii) Oleum
- C) (i) Oleum (ii) $\text{CH}_3\text{COCl} / \text{anhyd. AlCl}_3$ (iii) $(\text{CH}_3)_2\text{CH}-\text{Cl} / \text{anhyd. AlCl}_3$
- D) (i) $(\text{CH}_3)_2\text{CH}-\text{Cl} / \text{anhyd. AlCl}_3$ (ii) Oleum (iii) $\text{CH}_3\text{COCl} / \text{anhyd. AlCl}_3$

7.



The product [M] is :

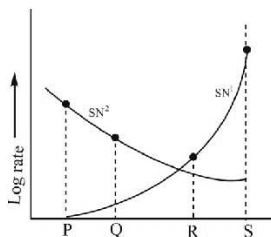


8. An interesting sequence is obtained by the reaction of dilute, aqueous ethanolic sodium hydroxide with series of halides as:



(I) (II) (III) (IV)

Measurements of their rates of hydrolysis with dilute, aqueous ethanolic NaOH solution gives a plot,

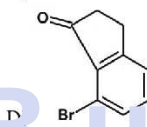
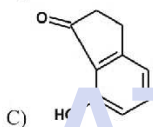
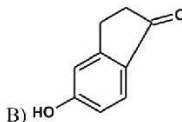
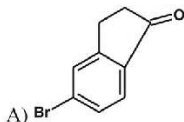
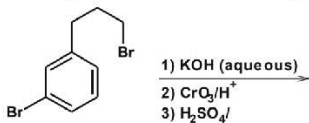


The **CORRECT** statement(s) on the basis of given graph is/are

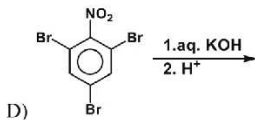
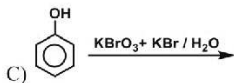
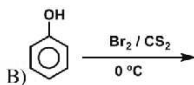
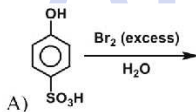
- A) for hydrolysis of Me_2CHBr , rate of $\text{S}_{\text{N}}1 > \text{rate of } \text{S}_{\text{N}}2$
 B) for hydrolysis of Me_2CHBr , rate of $\text{S}_{\text{N}}2 > \text{rate of } \text{S}_{\text{N}}1$
 C) CH_3Br and Me_3CBr are undergoing ready hydrolysis, whereas the two intermediate members being more resistant comparatively
 D) P, Q, R and S respectively are



9. The major product of the following reaction is



10. Which among the given reactions can give the following compound as a major product?



SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -30, 30.27, -127.30) designated to enter the answer.

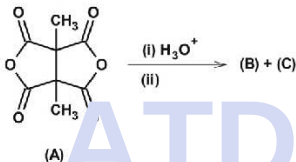
Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

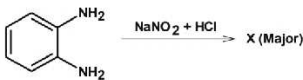
11. 2.8g sample of 60% pure urotropine is completely hydrolysed in acidified water. Assuming only 40% of water is utilized for hydrolysis, find the weight of water to be taken in this hydrolysis process? (in 'g')

12.



1.1 mole of (A) was reacted according to above reaction. 'C' is the gas produced which turns lime water milky. The amount of C formed in gram is x. The value of $x/14$ is (Given At. Wt. of C, O, H are 12, 16, 1 gm respectively)

13.



, Degree of unsaturation of X is

14. How many aldonic acids are obtained upon nitric acid oxidation of D- and L-aldopentoses
15. Melamine formaldehyde is a condensation polymer of melamine and formaldehyde. The number of nitrogen atoms in one molecules of melamine is X. X is...

SECTION- III
(MATRIX MATCH WITH NUMERICAL)

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

FOUR options are given representing matching of elements from **LIST-I** and **LIST-II**.

For each question, choose the option corresponding to the correct matching.

For each question, choose the option corresponding to the correct matching.

Full Marks : +1 If **ONLY** the option corresponding to the correct match(es) is(are) chosen.

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks : -1 in all other cases.

16. For the given molecular formula in column-I draw all possible structures; and match the appropriate chemical tests given in the column-II (Note: if at least one structure from column-I satisfying the test in column-II mark that one as a **CORRECT**)

	Column-I		Column-II
A)	C_3H_6O (C=O group is present)	P)	Can give tollens test
B)	CO_2H_2	Q)	Can give fehilings test
C)	C_6H_6O (contains benzene ring)	R)	Can give iodoform test
D)	C_6H_5O (contains benzene ring)	S)	Can give 2,4-DNP test
		T)	Can give neutral $FeCl_3$ test

ANSWERS

1	2	3	4	5	6	7	8	9	10
BCD	B	ABC	A	D	B	B	ACD	A	AC
11	12	13	14	15	16				
3.24	6.91	6	4	6	A-PQRS B-PQ C-PS D-PQRST				

PAPER-10

SECTION- I (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks: +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

Zero Marks: 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks: -2 In all other cases.

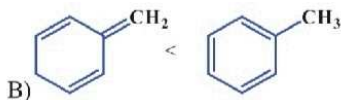
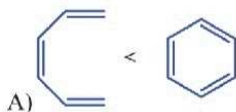
ATDB.uno



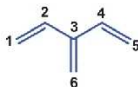
Which is/are **CORRECTLY** matched with **R** and **R'** to have acetone as the sole organic product.

- A) R is H- R' is —C=CH_2
|
 CH_3
- C) R' is $\text{—H}_2\text{C—HC=CH}_2$ D) R' is CH_3

2. Which order among the following is/are **CORRECT** for the resonance energy?



3. Identify the **INCORRECT** relation regarding to the bond length of the following molecule



$$a = C_1 - C_2$$

$$b = C_2 - C_3$$

$$c = C_3 - C_4$$

(where a, b and c represents bond lengths)

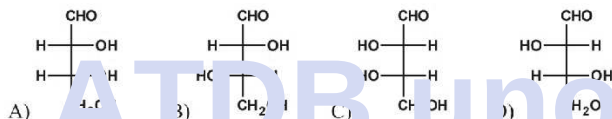
A) $b > c > a$

B) $c > b > a$

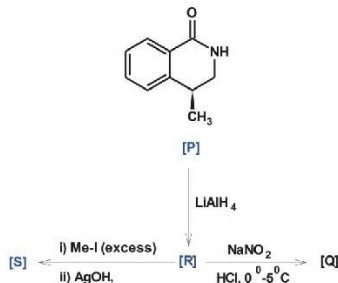
C) $b > a > c$

D) $c > a > b$

4. An optically active aldotetrose which retains its optical activity with aqueous Br_2 but loses it with conc. HNO_3 has the following structure:

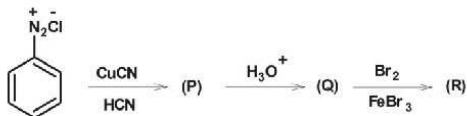


5. With reference to the scheme given below, which of the following statement(s) is/are **INCORRECT** about compounds **P, Q, R** and **S**?



- A) **[P]** release ammonia when boiled with concentrate NaOH solution
- B) **[Q]** is a yellow oily liquid and is chiral
- C) **[S]** shows geometrical isomerism
- D) **[S]** on reaction with $\text{NaNO}_2 / \text{HCl}$ gives a compound which two chiral centres.

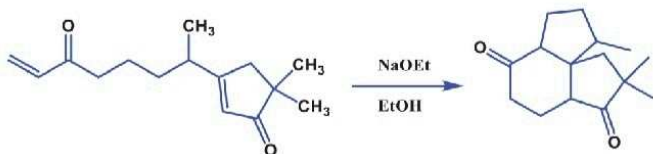
6. In the following reaction sequence :



Find the 'True' statement :

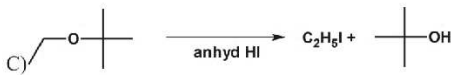
- A) [R] is more acidic than [Q]
 B) [R] is more reactive towards electrophilic aromatic substitution than [Q]
 C) [Q] is more reactive towards electrophilic substitution than benzene
 D) [R] on reaction with sodium carbonate forms a compound which can undergo phenol formation with a NaOH treatment under normal condition of pressure and temperature

7. Identify **CORRECT** statement(s) about the following reaction?



- A) It involves successive intramolecular aldol and conjugate nucleophilic addition reactions
 B) It involves two successive intramolecular Aldol reactions
 C) It involves conjugate nucleophilic addition and acid base reaction
 D) It involves successive nucleophilic addition and aldol reactions
8. Which of the following is/are correct reaction(s)? (consider dominant products)





SECTION- II (NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

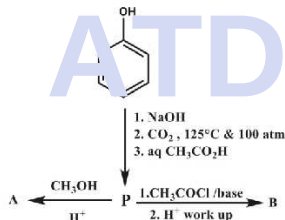
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 if **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

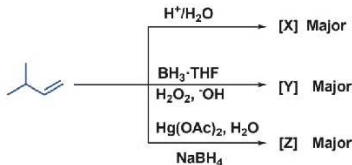
9.



In the above reaction, M_A , M_B and M_P are the molecular weights of **A**, **B** and **P** respectively.

What the value is of $\left(\frac{M_A - M_B}{M_P - M_A} \right)$ is ____.

10.



How many of the following statements are correct with respect above scheme of reactions?

I) 'Z' is primary alcohol

II) 'Y' forms immediately turbidity with Lucas reagent

III) 'X' is 2° alcohol

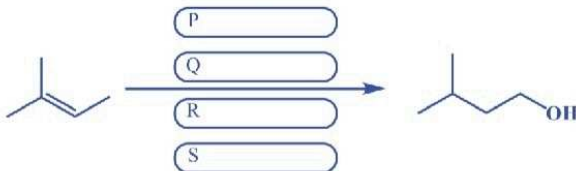
IV) Both 'Y' and 'Z' are 2° alcohol

V) All (X, Y & Z) change the orange colour of acidified potassium dichromate to green under normal conditions.

11. Number of sp^2 carbons in BENZYNE is 'p' and number sp -carbons in Benzyne is 'q' then the value of (p-q) is ____
12. Isomeric alkenes of molecular formula C_5H_{10} each react with $Br_2/CHCl_3$, and given "n" number of bromo products. Out of "n" products, find the number of achiral isomers.
13. Choose the appropriate reagent sequence from the given reagents pool to complete the synthetic conversation. **Make sure to use strictly four reagents, not more not less.**

Note: you can simply mention the numerical values corresponding to the reagents in the boxes **P, Q, R, S** respectively and also consider major organic product in each step.

What is the value of [P + Q + R - S]



1. HBr

5. $EtONa/EtOH/\Delta$

9. H_2O_2, OH^-

2. H^+/H_2O

6. $HBr / ROOR / \Delta$

10. $t-BuOK/\Delta$

3. $Hg(OAc)_2/H_2O$

7. $con H_2SO_4 / \Delta$

SECTION – III
(COMPREHENSION TYPE)

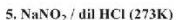
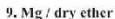
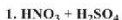
This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

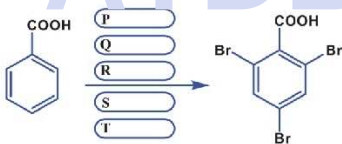
Choose the appropriate reagent sequence from the given reagents pool to complete the synthetic conversation given in the questions.

Make sure to use strictly all the boxes given on the arrow, not more not less

Note: you can simply mention the numerical values corresponding to the reagents in the boxes **P, Q, R, S,** and also in each stage consider major product.



14. What is the value of $[\text{P} + \text{Q} + \text{R} - \text{T}]$



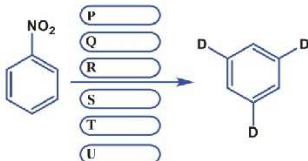
A) 12

B) 5

C) 7

D) 10

15. What is the value of $[\text{P} + \text{Q} + \text{R} + \text{S} - \text{T} - \text{U}]$



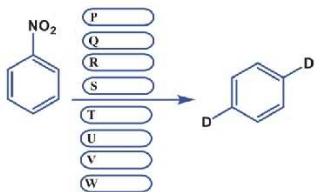
A) 6

B) 8

C) 10

D) 12

16. What is the value of $[P + Q + R + S + T + U + V + W]$



A) 1

B) 9

C) 4

D) 6

ANSWERS

1	2	3	4	5	6	7	8	9	10
B	ABCD	BCD	AC	ACD	A	C	BC	2	0
11	12	13	14	15	16				
6	0	11	C	B	0				

PAPER-11

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

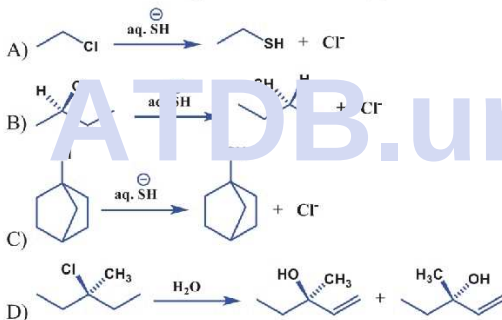
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

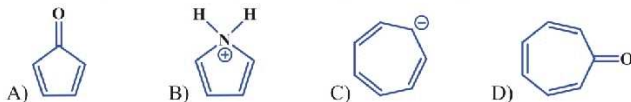
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks: -2 In all other cases.

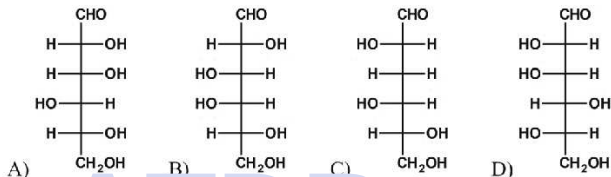
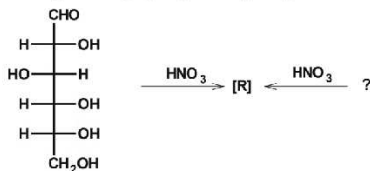
1. Which of the following is/are S_N^2 reaction(s) ?



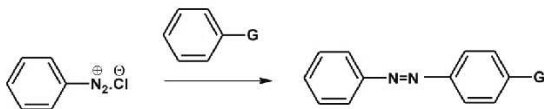
2. Identify the anti-aromatic species among the following?



3. In the following scheme, which of the following monosaccharides will not give the same product **[R]** as given by D-glucose?



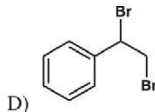
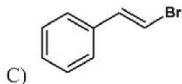
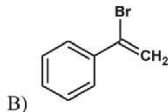
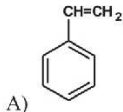
4.



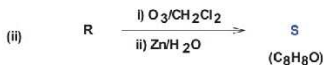
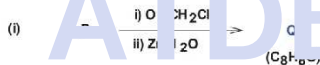
Choose the **CORRECT** statement(s)

- A) If G is (OH) group, slightly acidic medium is required to favour the reaction
 B) If G is ($-\ddot{\text{N}}\text{Me}_2$) group, slightly alkaline medium is required to favour the reaction
 C) If G is (-OH) group, slightly alkaline medium is required to favour the reaction
 D) If (G) is ($-\ddot{\text{N}}\text{Me}_2$) group, slightly acidic medium is required to favour the reaction

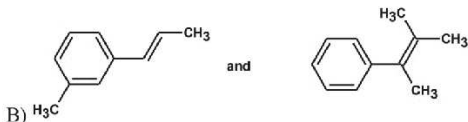
5. Identify [X]

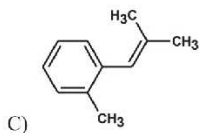


6. Compounds **P** and **R** upon ozonolysis produce **Q** and **S**, respectively. The molecular formula of **Q** and **S** is $\text{C}_8\text{H}_8\text{O}$. **Q** undergoes Cannizzaro reaction but not haloform reaction, whereas **S** undergoes haloform reaction but not Cannizzaro reaction.

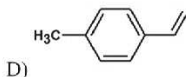
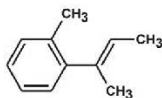


The option(s) with suitable combination of **P** and **R**, respectively, is(are)

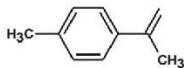




and



and

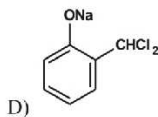
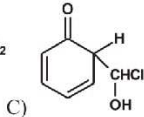
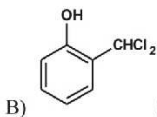
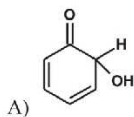


7. Which of the following statement(s) is/are **CORRECT** for the given reaction (consider the predominant pathway)

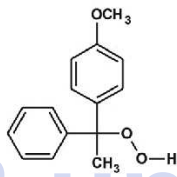
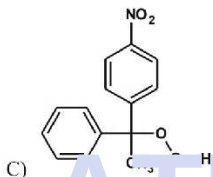
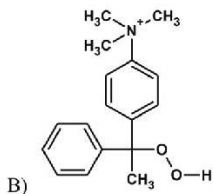
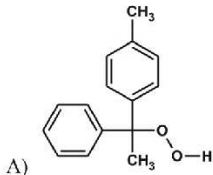


$\Delta H = 36.3$

- A) Cleavage of bond between methyl carbon and oxygen takes place in the reaction
 B) Methyl alcohol and vinyl chloride form final products
 C) Reaction follows electrophilic addition on alkene
 D) One of the products from product mixture gives precipitate NaI in acetone
8. When phenol is reacted with CHCl_3 and NaOH followed by acidification, salicylaldehyde is obtained. Which of the following species is (are) not involved in the above mentioned reaction as intermediate(s)?



9. Which compound(s) gives unsubstituted phenol as major product along with suitable ketone when treated with dilute sulphuric acid?



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SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

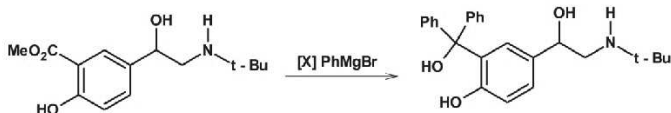
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

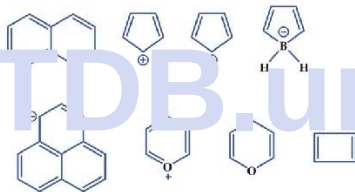
Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

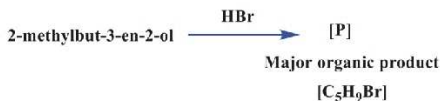
10. At least [X] equivalents of PhMgBr is/are required in following reaction



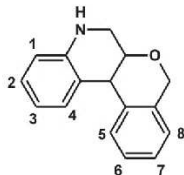
11. Among the following the total number of aromatic species is?



12. Position of the Br (as per IUPAC system) in major organic product P



13. From which position does NO₂⁺ replace a H⁺ from the following compound predominantly?



SECTION – III
(COMPREHENSION TYPE)

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Answer Q,14, Q15 and Q,16 by appropriately matching the information given in the three columns of the following table.

Column-1 (Polymer)	Column-2 (Monomer)	Column-3 Characterstics of monomers
(I) Polystyrene	(i) Caprolactum	(P) Resonance
(II) Poly Vinyl Chloride	(ii) $\text{PhCH}=\text{CH}_2$	(Q) 1, 4 addition of HBr (mainly) at 40°C
(III) Natural rubber	(iii) $\text{CH}_2=\text{CHCl}$	(R) 1, 2 addition of HBr at room temp. mainly and as per traditional Markonikoff's rule)
(IV) Nylon-6	(iv) $\text{CH}_2=\text{C}(\text{CH}_3)-\text{CH}=\text{CH}_2$	(S) $\text{CO}_2(\text{g})$ evolution with KMnO_4/H^+ .

14. Which of the following combination is **CORRECT**?
A) (III)(ii)(R) B) (II)(i)(P) C) (IV)(i)(P) D) (I) (iii)(S)
15. Which of the following combination is **INCORRECT**?
A) (I)(ii)(P) B) (I)(ii)(R) C) (III)(iv)(P) D) (II) (iv)(R)
16. Which of the following combination is **CORRECT**?
A) (II)(ii)(P) B) (II)(iii)(R) C) (III)(iii)(P) D) (IV) (ii)(P)

ANSWERS

1	2	3	4	5	6	7	8	9	10
AB	A	ABC	BC	C	AB	ACD	ABC	BC	5
11	12	13	14	15	16				
4	1	3	C	D	B				

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PAPER-12

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

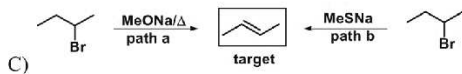
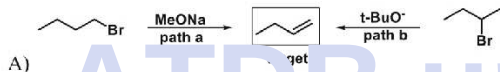
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks: +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

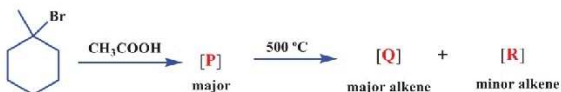
Zero Marks: 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks: -2 In all other cases.

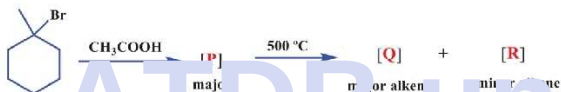
1. Which among the following **path b** is better than **path a** to achieve target molecule



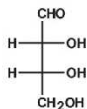
2. Choose the **CORRECT** option(s) regarding given scheme



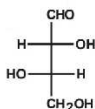
- A) Formation of [P] involves bimolecular substitution mechanism
 B) [P] can be obtained by addition of acetic acid to [R]
 C) [P] can be obtained by addition of acetic acid to [P]
 D) Formation of [P] to [Q] is an anti-elimination reaction
3. Choose the **CORRECT** options regarding [Q] and [R]



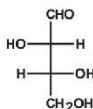
- A) Addition of Br_2 to [R] gives product [S] which contains two chiral centers
 B) Addition of Br_2 to [Q] gives product [T] which contains two chiral centers
 C) [R] up on treatment with NBS/ROOR gives 3 monobrominated products
 D) [R] up on treatment with NBS/ROOR gives 6 monobrominated products
4. For the aldotetroses I-IV, the combination of **TRUE** statements, among P-S, is:



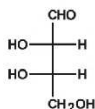
I



II



III



IV

P = I and II are diastereomers and II and III are enantiomers.
 Q = I and IV are mesomers and are optically inactive.

R = I and III can be interconverted by a base catalysed isomerisation.
 S = I and IV are HIO_4 cleavable.

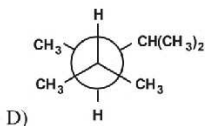
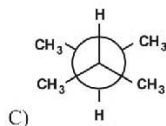
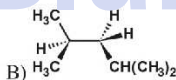
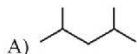
- A) Q, R, S B) P, R, S C) P, Q, R D) P, Q, S

5. Choose the **CORRECT** option(s) for given reaction scheme

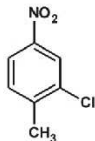


- A) Position of double bond in **[P]** is 2
 B) Position of double bond in **[P]** is 1
 C) Above reaction can be taken as an example of stereoselective
 D) Above reaction can be taken as an example of regioselective

6. Which compound is different from the other?



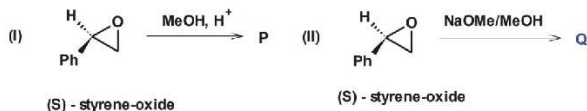
7. Which of the following is/are **CORRECT IUPAC** name of given compound



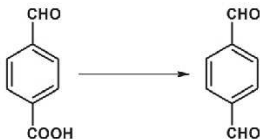
- A) 2-chloro-1-methyl-4-nitrobenzene

- B) 4-methyl-5-chloronitrobenzene
- C) 2-chloro-4-nitrotoluene
- D) 2-methyl-5-nitrochlorobenzene

8. For the reactions shown below, identify the **CORRECT** statement with regard to the products formed.

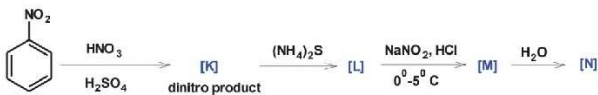


- A) **P** and **Q** are identical, both are optically active.
 - B) **P** and **Q** are positional isomers, **P** is racemic and **Q** is optically active.
 - C) **P** and **Q** are positional isomers, **P** is optically active and **Q** is racemic.
 - D) **P** and **Q** are positional isomers, both are optically inactive.
9. Identify the set of reagent/reaction condition for the following transformation



- A) Conc. HI/red P
- B) (i) PCl_5 , (ii) H_2 / Ni
- C) (i) $\text{HOCH}_2\text{CH}_2\text{OH}$ / dry HCl (ii) SOCl_2 (iii) H_2 / Pd – BaSO_4 (iv) H_3O^+
- D) (i) PCl_5 , (ii) NaBH_4 / EtOH

10.



How many maximum atoms are in one plane in any possible conformation

A) 15

B) 14

C) 13

D) 12

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SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

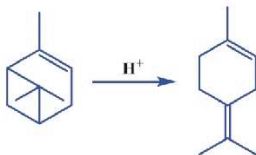
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

11. If [Y] is the number of transition state in the given conversion, what is the value of [Y]?



12. The total number of chiral isomers possible with molecular formula $C_5H_{12}O$ is?
13. Calculate the cyclic constitutional isomers of $C_4H_6Cl_2$
14. How many isomers (containing alkyne) of the fifth member of the alkyne can be converted in to corresponding alkene using Na in $liqNH_3$
15. How many alkenes give 2-methylbutan-2-ol as a major product upon reaction with dil H_2SO_4 ?

SECTION- III
(MATRIX MATCH WITH NUMERICAL)

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

FOUR options are given representing matching of elements from **LIST-I** and **LIST-II**.

For each question, choose the option corresponding to the correct matching.

For each question, choose the option corresponding to the correct matching.

Full Marks : +3 If **ONLY** the option corresponding to the correct matching is chosen.

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks : -1 in all other cases.

16. Match the column

	List-I (Compound)		List-II (IUPAC names)
P)		1)	1-Bromo-4-chloro cyclohexene
Q)			1-Bromo-4-chloro cyclohexene
R)		3)	3-Bromo-6-chloro cyclohexene
S)		4)	4-Bromo-1-chloro cyclohexene

Note: Correctly match **P, Q, R, S** with 1, 2, 3 & 4 and give your answer in integer values

If

P	Q	R	S
4	1	2	3

then your answer is [4123]

ANSWERS

1	2	3	4	5	6	7	8	9	10
AB	BC	BC	B	BD	C	AC	B	C	A
11	12	13	14	15	16				
3	8	9	3	3	1342				

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PAPER-13

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

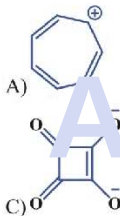
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks: +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

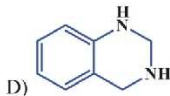
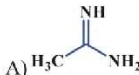
Zero Marks: 0 If none of the options is chosen [i.e. the question is unanswered].

Negative Marks: -2 In all other cases.

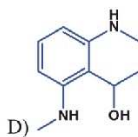
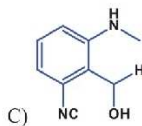
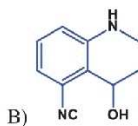
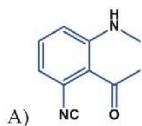
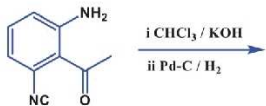
1. Which among the following molecule(s) having unique C-C bond length?



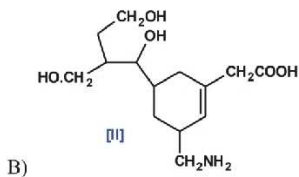
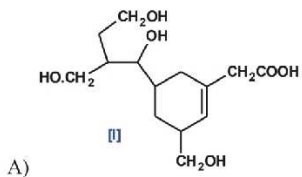
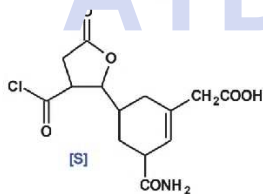
2. Which among the following molecule(s) having both localized and delocalized lone pair of electrons?

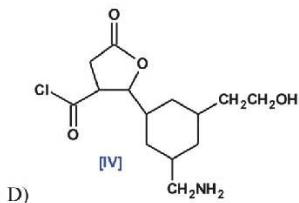
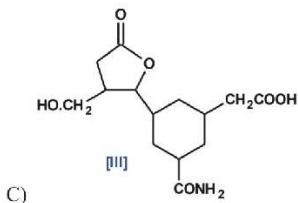


3. The major product obtained in the following reaction is :



4. Different reduced product of the given compound [S] are shown

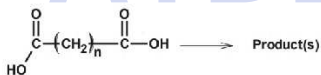




Pick the **CORRECT** statement(s) regarding reduction reaction using LiAlH_4 , NaBH_4 , BH_3 / THF and H_2 / Ni

- A) None of them can produce (I) from [S]
- B) [S] cannot be converted to (IV) by using LiAlH_4
- C) Ni / H_2 will produce (II) from [S]
- D) LiAlH_4 can produce (II) from [S]

5.



When $n=1$, organic product formed is P_1

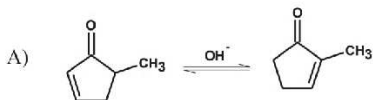
When $n=3$, organic product formed is P_2

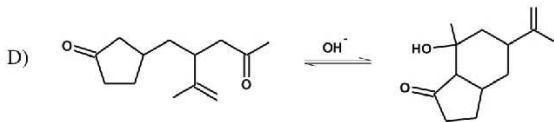
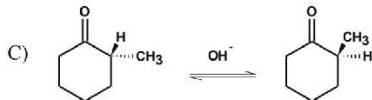
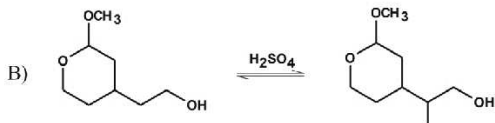
When $n=4$, organic product formed is P_3

CORRECT statement(s) is/are is

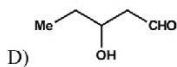
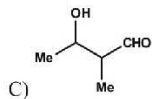
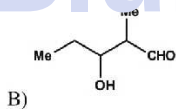
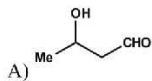
- A) P_1 gives Tollen's test
- B) P_2 is cyclic anhydride
- C) P_3 gives 2,4-DNP test
- D) P_3 gives Tollen's test

6. In which of the following reactions the reactant and product are in equilibrium?

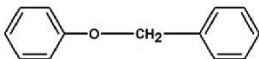




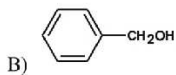
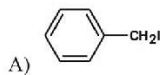
7. Which of the following are possible aldol products in the given reaction?

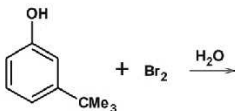
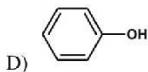
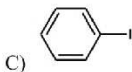


8. The ether



when treated with HI produces:





9. In the following reaction,

A) Product is 2, 4, 6-tribromo-3-tert butyl phenol.

B) Product is 2, 4-dibromo-5-tert butyl phenol.

C) The reactant on reaction with $\text{CHCl}_3 + \text{KOH}$ gives 2-hydroxy-4-tert butyl benzaldehyde.

D) The reactant on oxidation with KMnO_4 gives 3-hydroxy benzoic acid

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SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

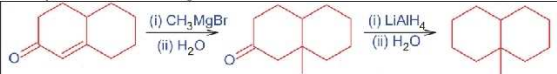
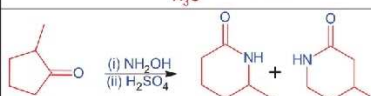
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

10. How many of the following reaction schemes contain one or more flaws?

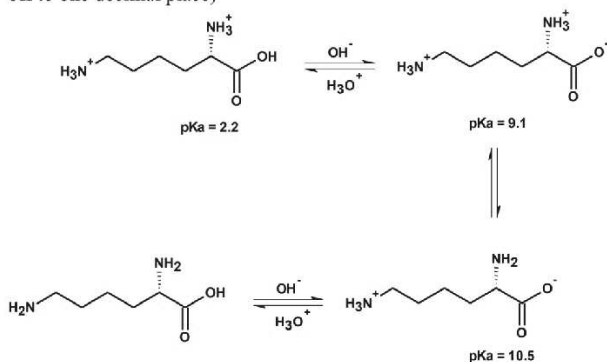
1.	
2.	$\text{C}_6\text{H}_5\text{CH}=\text{CHCH}_2\text{OH} \xrightarrow[\text{H}_3\text{O}^+]{\text{CrO}_3} \text{C}_6\text{H}_5\text{CH}=\text{CHCHO} \xrightarrow[\text{H}_3\text{O}^+]{\text{H}^+, \text{CH}_3\text{OH}} \text{C}_6\text{H}_5\text{CH}=\text{CHCH}(\text{OCH}_3)_2$
3.	
4.	
5.	
6.	

11. Identify the longest C-N bond length in the given molecule

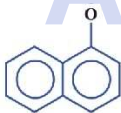


12. **A** is monomer of Natural rubber, on reaction with HBr (1 eq)/ CCl_4 at 298K it forms **B**. the number of hyper conjugation structures of **A** is **[X]** and of **B** is **[Y]**; the value of **[Y] – [X]** is:

13. Based on the information given below, the isoelectric point (PI) of lysine is (Round off to one decimal place)



14. Find the number of stereocenters where the negative charge present in secondary carbon for the given compound.



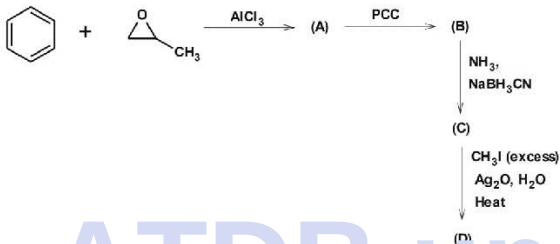
SECTION - III
(COMPREHENSION TYPE)

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

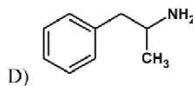
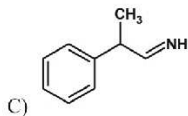
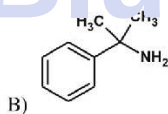
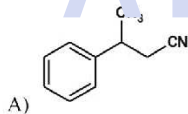
Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Paragraph For Questions 15 & 16

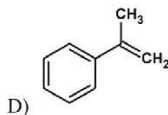
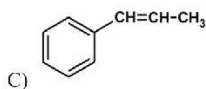
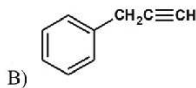
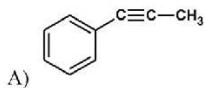
In the following sequence of reactions, **A**, **B**, **C** and **D** are different product:



15. Identify **(A)**



16. Identify **(D)**



ANSWERS

1	2	3	4	5	6	7	8	9	10
ABC	ACD	D	D	BC	ACD	CD	AD	AC	4
11	12	13	14	15	16				
5	5	9.8	6	D	C				

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PAPER-14

SECTION - I (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

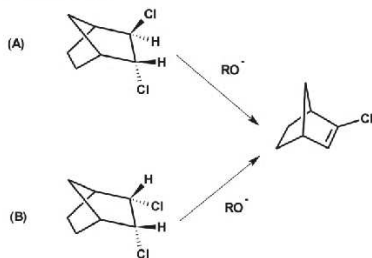
Negative Marks: -2 In all other cases.

1. Terpinen-4-ol is an active ingredient in tea tree oil has the following structure



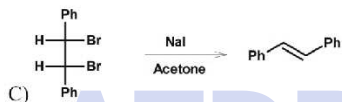
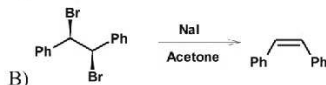
The correct observation for the terpinen-4-ol is/are

- A) It can rotate the plane of plane polarized light
B) It reacts with Bayer's reagent can form triol
C) On reaction with excess of NaBr and H_2SO_4 , it can form a dibromo compound
D) On ozonolysis (with O_3 ; $\text{Zn}/\text{H}_2\text{O}$) it gives a compound with molecular formula $\text{C}_{10}\text{H}_{18}\text{O}_3$
2. Observe the following scheme of reactions and identify the **CORRECT** statement(s)?

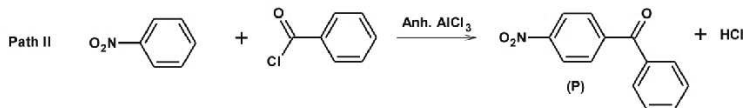
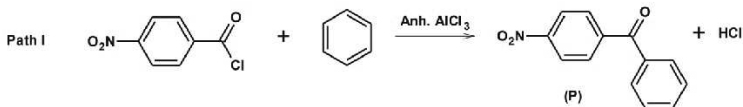


- A) (A) is more reactive than (B)
 B) (A) is less reactive than (B)
 C) A single isomer is formed in both reactions
 D) A pair of enantiomers is formed in reactions (A)

3. Identify the **CORRECTLY** matched reactant, reagent & product set(s)



4.

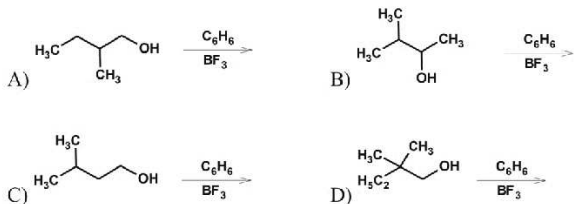


The **CORRECT** statement among the following about the above two paths of synthesizing the organic product P is:

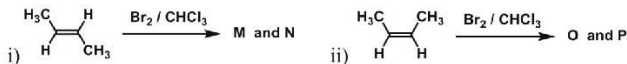
- A) Path I is better than Path II
 B) Path II is better than Path I
 C) Both the paths are equally good

D) Path I will give less yield of the product as compared to that obtained by path II

5. Which of the following give tert-pentylbenzene as the major product?

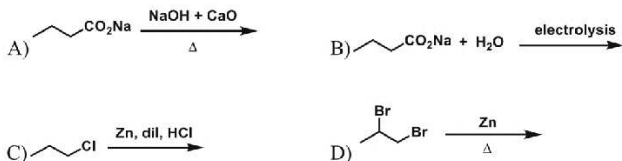


6. The **CORRECT** statement(s) for the following addition reactions is (are)

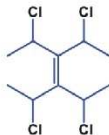


- A) **O** and **N** have identical melting, boiling and optical rotation values
- B) Optical rotation value of **P** and **Q** is same except sign
- C) Number stable conformers of **M** with zero dipole moment is 3
- D) Number stable conformers of **P** with zero dipole moment is 2

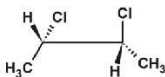
7. Which of the following reactions **cannot** produce propane as a major product?



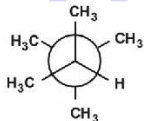
8. Total number of possible achiral stereoisomers for the given compound is



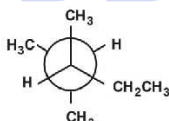
- A) 2 B) 4 C) 1 D) 3
9. Find the total number of stable conformers with non zero dipolemoment for given compound



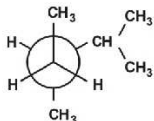
- A) Zero B) 2 C) 3 D) 1
10. Newman projections **P**, **Q**, **R** and **S** are shown below



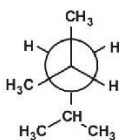
(P)



(Q)



(R)



(S)

Which one of the following options represents chain isomers?

- A) **P** and **Q** B) **Q** and **R** C) **R** and **S** D) **Q** and **S**

SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

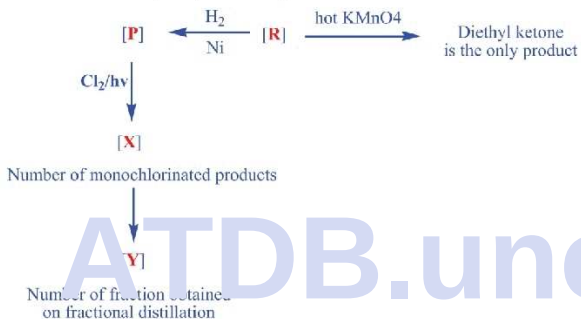
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

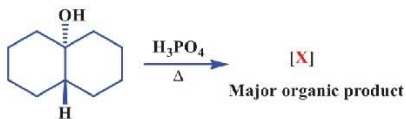
Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

11. Find the value of $|X-Y|$ from the given data

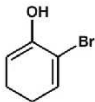


12. The number of hydrogens in $[X]$ can participate in hyper conjugation



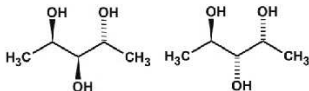
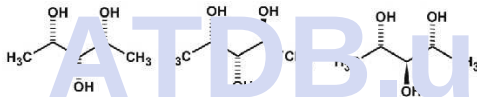
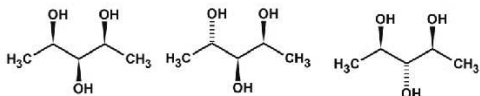
13. (R) -2- methyl-1-butanol has a specific rotation of $+13.5^\circ$. The specific rotation of 2-methyl-1-butanol containing 15% of the (S)-enantiomer is ____

14. According to IUPAC numbering, position of (-OH) & (-Br) in **M** and **N**



Find the sum of [**M+N**]

15. How many out of the given stereo isomers of pentane 2,3,4-triol show optical isomerism?



SECTION- III
(MATRIX MATCH WITH NUMERICAL)

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

For each question, choose the option corresponding to the correct matching.

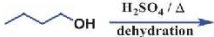
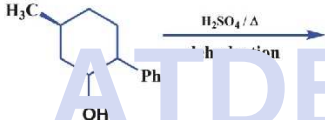
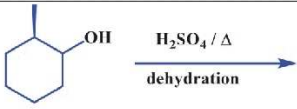
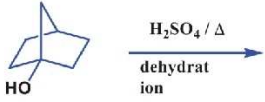
For each question, choose the option corresponding to the correct matching.

Full Marks : +3 If **ONLY** the option corresponding to the correct matching is chosen.

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks : -1 in all other cases.

16. Match the given reaction in column-I with appropriate statement(s) of column-II.

	Column-I		Column-II
A)		P)	One of the product shows optical isomerism
B)		Q)	Major product contains even number of α -hydrogens (Hydrogen which can involve in hyperconjugation)
C)		R)	One of the product shows geometrical isomerism
D)		S)	Reactant can turn acidified dichromate to green
		T)	Will not undergo dehydration

ANSWERS

1	2	3	4	5	6	7	8	9	10
ABCD	AD	ABCD	A	ABC	AB	BD	D	B	A
11	12	13	14	15	16				
3	8	9.45	7	8	A-QRS B-PQRS C-PS D-T				

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PAPER-15

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

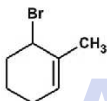
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks: +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

Zero Marks: 0 If none of the options is chosen (i.e. the question is unanswered).

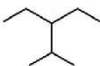
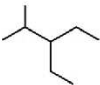
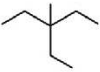
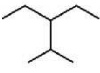
Negative Marks: -2 In all other cases.

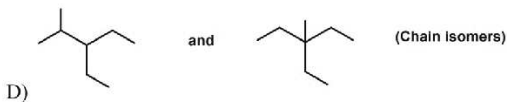
1. Provide the proper **IUPAC** name for alkene shown below



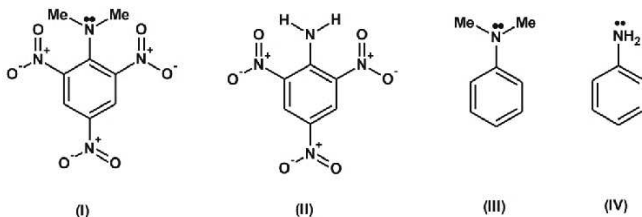
- A) 2-bromo-1-methylcyclohexene
B) 6-Bromo-1-methylcyclohexene
C) 1-bromo-2-methylcyclohex-2-ene
D) 3-Bromo-2-methylcyclohexene

2. Identify the **CORRECT** match in the given pairs __

- A)  and  (chain isomers)
- B)  and  (Position isomers)
- C)  and  (Position isomers)

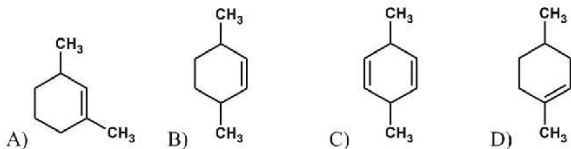


3. Consider the following four compounds I, II, III and IV:

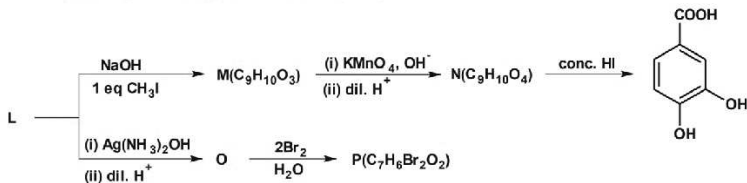


Choose the CORRECT statement(s):

- A) Anilinium salts of compound I are largely hydrolysed in aqueous solution.
 B) Compound II is insoluble in aqueous acids.
 C) Compound III readily undergoes hydrolysis to picric acid.
 D) Compound IV is more basic than compound I
4. Compound which cannot show geometrical isomerism is/are?



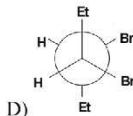
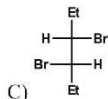
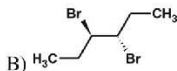
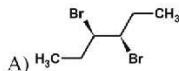
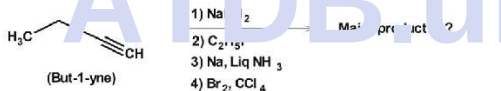
5. Vanillin (L) $C_8H_8O_3$ is isolated from vanilla beans. It gives an intense colour with $FeCl_3$ and a positive Tollens test. It is not steam-distilled and does not react with HCl . It goes through the following steps:



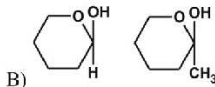
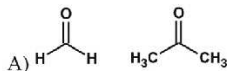
Among the following pair(s) which CAN be distinguished by aq. $NaHCO_3$ is

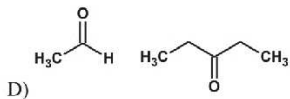
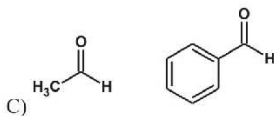
- A) M, N B) N, P C) L, O D) P, O

6.

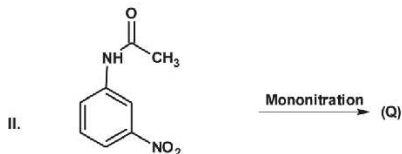
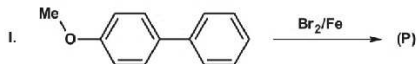


7. Among the following pair of compounds, identify the pairs which can be differentiated by Fehling's as well as Tollen's reagent?



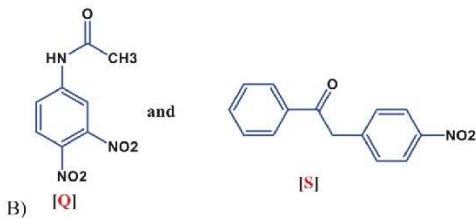
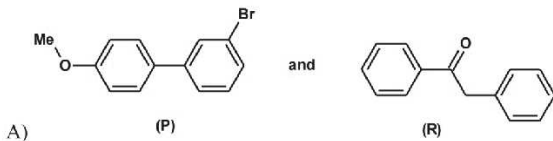


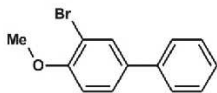
8.



Where (P), (Q), (R) and (S) are all major products of the respective reactions.

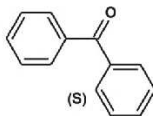
Choose the **CORRECT** choice(s) from the following:





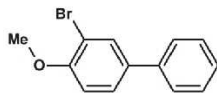
(P)

and



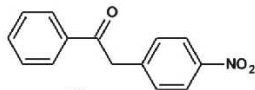
(S)

C)



(P)

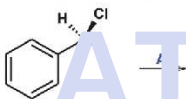
and



(S)

D)

9. Which of the following is a **CORRECT** statement about given reaction?



A) The product has only (S)-configuration when (A) is H_2O .

B) The product is  when (A) is aqueous NH_3 .

C) The product has only (R)-configuration when (A) is KCN in acetone.

D) The reaction proceeds with inversion of configuration only when (A) is H_2O .

SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

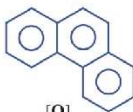
Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

10. If x is the number of resonance structures of [P] and y is the number of resonance structures of [Q] what the value of y-x is

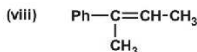
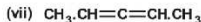
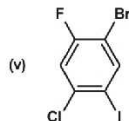
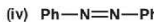
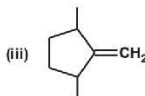
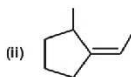
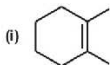


[P]

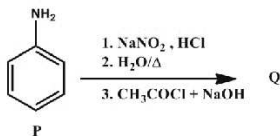


[Q]

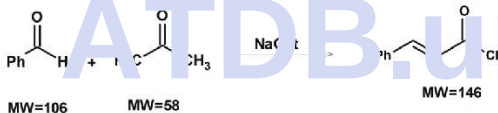
11. In the below compounds, number of compounds which show geometrical isomerism are **X** and number of compounds which exhibit optical isomerism are **Y**. The value of $\frac{Y}{X}$ is:



12. One mole of acidified $\text{K}_2\text{Cr}_2\text{O}_7$ oxidizes how many moles of butan-2-ol to butan-2-one
13. Consider the reaction sequence from **P** to **Q** shown below, the overall yield of the major product **Q** from **P** is 75%. What is the amount in grams of **Q** obtained from 4.65 ml of **P**? (Use density of **P** = 1 g ml^{-1})



14. 2.12 g of benzaldehyde was reacted with acetone to produce 1.46 g of the enone product as per the reaction shown below, the percentage yield of the reaction is:



(MW = molecular weight)

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONE OR MORE THAN ONE** option can be correct.

Paragraph For Questions 15 & 16

$$\begin{array}{ccccccc}
 \text{[T]} & \xrightarrow[\text{H}_2\text{O}]{\text{H}^+} & \text{C}_6\text{H}_{10}\text{O}_3 & \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) LiAlH}_4} & \text{C}_4\text{H}_8\text{O}_2 & + & \text{C}_2\text{H}_6\text{O}_2 \\
 & & \text{[P]} & & \text{(Q)} & & \text{(R)}
 \end{array}$$

15. Choose the **CORRECT** statement (s) regarding [P]
 A) [P] can give positive 2,4-DNP test
 B) [P] is an isomer of [T]
 C) [P] can give positive fehling test
 D) [P] can give positive iodoform test
16. Choose the **CORRECT** statement (s) regarding [Q]
 A) Number of stereoisomers possible for Q is 2
 B) [Q] can produce 4 stereoisomers on reaction with NH_2OH
 C) [Q] is a functional isomer of [T]
 D) [Q] can also obtained by aldol reaction of acetaldehyde with dil NaOH.

1	2	3	4	5	6	7	8	9	10
B	BC	ABD	A	ABCD	B	ABD	BD	BC	1
11	12	13	14	15	16				
0.8	3	5.1	50	ABD	ABD				

PAPER-16

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

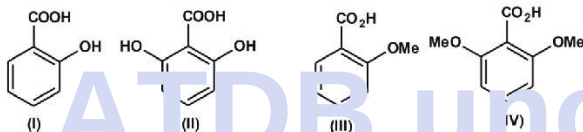
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks: +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

Zero Marks: 0 If none of the options is chosen (i.e. the question is unanswered).

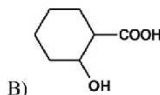
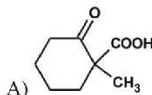
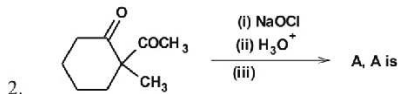
Negative Marks: -2 In all other cases.

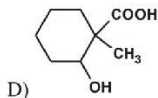
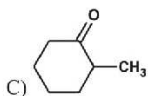
1. Consider the following four compounds I, II, III and IV:



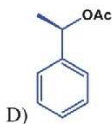
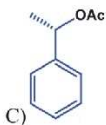
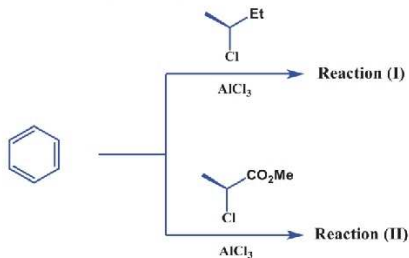
Choose the **CORRECT** statement(s):

- A) The order of acidity is $\text{II} > \text{IV} > \text{I} > \text{III}$.
B) The magnitude of pKa difference between I and II is more than that between III and IV.
C) Intra H-bonding is more in IV than in III.
D) Intra H-Bonding makes compound II most acidic among all.

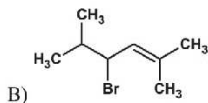
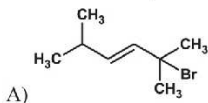
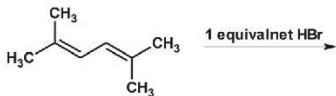


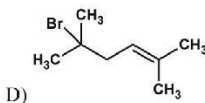
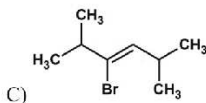


3. Identify the product(s) in the given reaction I and II-

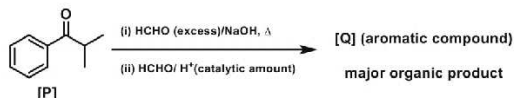


4. In the following reaction, the major product is

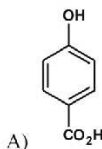
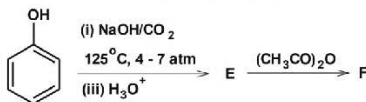




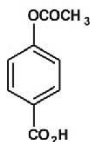
5. Choose the **CORRECT** statement (s) about the given conversion



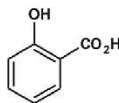
- A) Conversion of [P] to [Q] involves crossed cannizzaro reaction.
B) Conversion of [P] to [Q] involves crossed aldol reaction.
C) Compound [Q] has a chiral centre
D) Compound [Q] is a β-hydroxy aldehyde
6. In the following reactions, the major products E and F, respectively, are



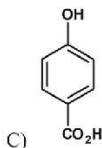
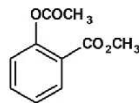
and



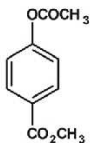
B)



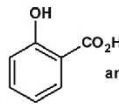
and



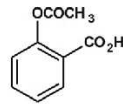
and



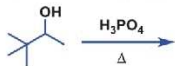
D)



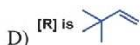
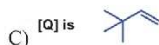
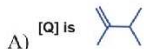
and



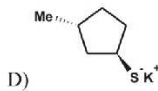
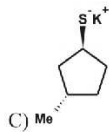
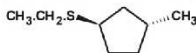
7. In the following reaction three products [P], [Q], [R] are obtained



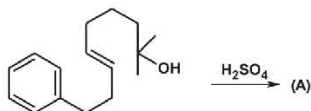
The approximate experimental yields of the three compounds were 64%, 33% and 3% respectively. Choose the **CORRECT** option(s) among the following



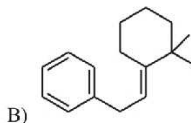
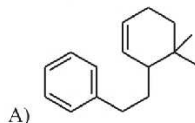
8. Give the structure of nucleophile that could be used to convert the iodoethane into



9.



Major product formed in the above reaction (A) is :



SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

11. The number of co-polymer(s) in the below list is/are X:

(Nylon-6, Buna-N, Dacron, Buna-S, Teflon, PHBV)

The number of carbohydrate(s) which show mutarotation in the below list is/are Y:

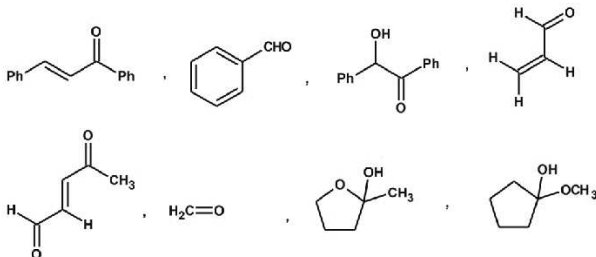
(α -D-(+)-glucopyranose, β -D-(+)-glucopyranose, lactose

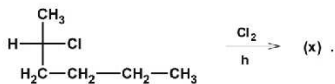
α -D-(-)-fructofuranose, β -D-(-)-fructofuranose, sucrose, maltose)

The value of (X-Y) is...

12. A pentapeptide on complete hydrolysis gives Glycine, Alanine and Valine. On partial hydrolysis, it never gives "Valine". If neither $-H_2N$ nor $-COOH$ present at chiral centre then how many possible structures of pentapeptide are possible?

13. Among the following the total number of compounds which can give positive Tollen's test?





14. **S-2-chloro hexane**

(x) = total number of achiral di-chloro product

15. If [X] is the number of isomeric alkynes with molecular formula C_6H_{10} that can produce methane with CH_3MgBr , then what is value of [X]?

ATDB.uno

SECTION- III (MATRIX MATCH)

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

FOUR options are given representing matching of elements from **LIST-I** and **LIST-II**.

For each question, choose the option corresponding to the correct matching.

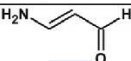
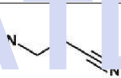
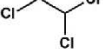
For each question, choose the option corresponding to the correct matching.

Full Marks : +3 If **ONLY** the option corresponding to the correct matching is chosen.

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks : -1 in all other cases.

16. Match the column

	Column-I		Column-II
A)	 	P)	Functional isomers
B)	 	Q)	Chain isomers
C)	 	R)	Position isomers
D)	 	S)	metamers

A) A-P; B-P; C-R; D-R

B) A-P; B-R; C-Q; D-R

C) A-P; B-Q; C-R; D-S

D) A-R; B-S; C-Q; D-P

ANSWERS

1	2	3	4	5	6	7	8	9	10
BD	C	AB	AC	ABC	D	AD	BD	C	A
11	12	13	14	15	16	17	18	19	20
-2	6	5	2	5	A				

PAPER-17

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks : +3 If all the four options are correct but **ONLY** three options are chosen.

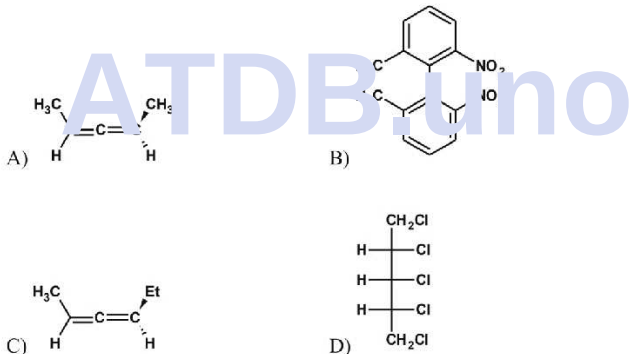
Partial Marks : +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

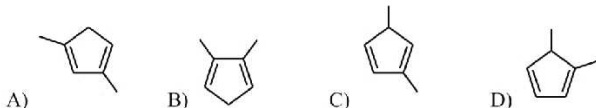
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks : -2 In all other cases.

1. Which of the following is/are achiral molecules



2. What is the structure for 2,5-dimethyl-1,3-cyclopentadiene?



3.



(I)



(II)



(III)

A) I, II, III are constitutional isomers of each other

B) I, II are chain isomers

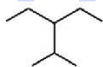
C) I, III are position isomers

D) II, III are chain isomers

4. Which of the following is/are **CORRECT**



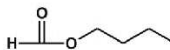
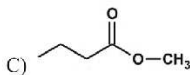
A) is approximately the plane of symmetry present in the molecule (consider chair conformation)



&



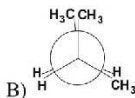
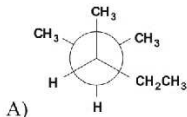
B) are chain isomers

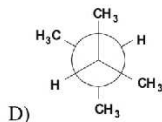
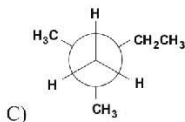


are metamers

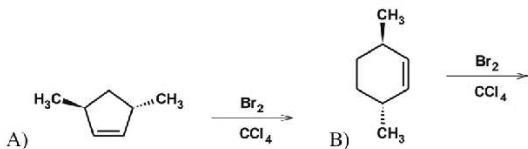
D) In Meso-tartaric acid, net dipole moment $\mu \neq 0$

5. Which of the following Newmann's projections represent conformations of 2,3-dimethyl butane ?

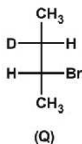
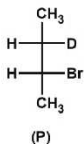




6. Which of the following reaction(s) will produce enantiomeric products?



7. When **P** and **Q** treated with $\text{C}_2\text{H}_5\text{OK}$ in $\text{C}_2\text{H}_5\text{OH}$

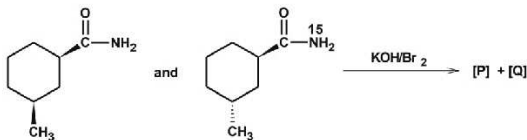


- A) **P** give cis-2-butene without loss of deuterium
 B) **P** give trans-2-butene with loss of deuterium
 C) **Q** give trans-2-butene without loss of deuterium
 D) **Q** give cis-2-butene with loss of deuterium

8. The **CORRECT** decreasing order for acid strength is

- A) $\text{FCH}_2\text{COOH} > \text{NCCH}_2\text{COOH} > \text{NO}_2\text{CH}_2\text{COOH} > \text{ClCH}_2\text{COOH}$
 B) $\text{CNCH}_2\text{COOH} > \text{O}_2\text{NCH}_2\text{COOH} > \text{FCH}_2\text{COOH} > \text{ClCH}_2\text{COOH}$
 C) $\text{NO}_2\text{CH}_2\text{COOH} > \text{NCCH}_2\text{COOH} > \text{FCH}_2\text{COOH} > \text{ClCH}_2\text{COOH}$
 D) $\text{NO}_2\text{CH}_2\text{COOH} > \text{FCH}_2\text{COOH} > \text{CNCH}_2\text{COOH} > \text{ClCH}_2\text{COOH}$

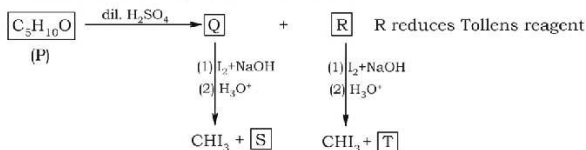
9.



[P] and [Q] are

-
-

10. On the bases of following information.



Which among the following is **CORRECT** statement :

- A) [Q] is also formed when propene is reacted with dil. H_2SO_4
 B) [Q] will also give coloured complex with neutral FeCl_3
 C) The product formed by dry distillation of calcium salt of [S] will give acetone.
 D) [T] will also give silver mirror with ammonical solution of AgNO_3 .

SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

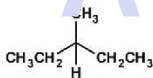
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

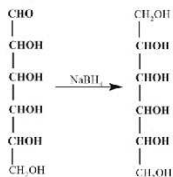
Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

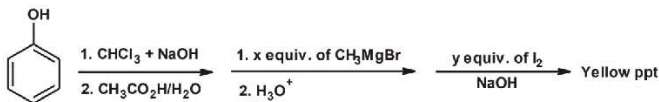
11. How many chloroethenes are possible for molecular formula $\text{C}_2\text{H}_{4-n}\text{Cl}_n$, (where 'n' can be an integer from 1 to 4) which can possess geometrical isomerism
12. The maximum number of achiral isomers that are possible on monochlorination of the following compound,



13. Compound X, $\text{C}_9\text{H}_{10}\text{O}$ is inert to Br_2/CCl_4 . Vigorous oxidation with hot alkaline permanganate yields benzoic acid. X gives precipitate with semi carbazide hydrochloride and with 2, 4-DNP. The number of isomeric X and the number of compounds among them which give +ve iodoform test, respectively are P and Q, then the value of $P+Q$ is?
14. Observe the following reaction and find out that how many number of reactant stereoisomers can be reduced to optically inactive meso product



15.



In the above reaction, the value of $(x+y)$ is ____.

(Do not consider iodination of aromatic ring)

SECTION- III
(MATRIX MATCH)

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

FOUR options are given representing matching of elements from **LIST-I** and **LIST-II**.

For each question, choose the option corresponding to the correct matching.

For each question, choose the option corresponding to the correct matching.

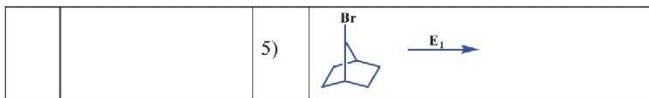
Full Marks : +3 If **ONLY** the option corresponding to the correct matching is chosen.

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks : -1 in all other cases.

16. Match the column

	List-I (Compound)		List-II (IUPAC names)
P)	Hoffmen product	1)	
Q)	Zaitsev's product	2)	
R)	Anti-elimination	3)	
S)	Syn elimination	4)	



A) P-1, Q-2, 4, R-1, S-4,5

B) P-1, Q-2, 4, R-1, S-4

C) P-1, 4 Q-2, R-1, 3S-4

D) P-1, 4Q-2, 3R-1, 3S-4

ANSWERS

1	2	3	4	5	6	7	8	9	10
D	C	ABCD	ACD	D	CD	ABCD	C	CD	ACD
11	12	13	14	15	16	17	18	19	20
2	2	6	4	6	C				

ATDB.uno

PAPER-18

SECTION- I (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

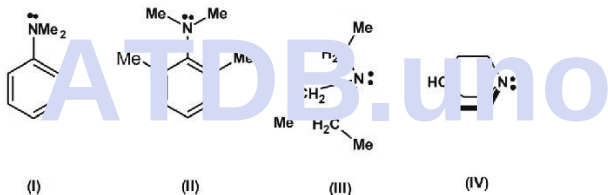
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks: +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

Zero Marks: 0 If none of the options is chosen (i.e. the question is unanswered).

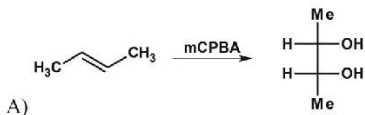
Negative Marks: -2 In all other cases.

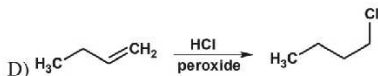
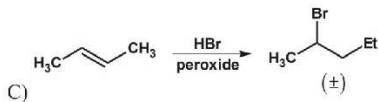
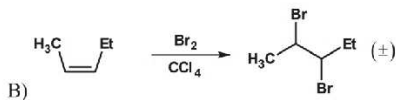
1. Consider the following four compounds I, II, III and IV.



Choose the **CORRECT** statement(s):

- A) The order of basicity is $\text{II} > \text{IV} > \text{III} > \text{I}$
- B) II does not couple with Ph N_2^+ .
- C) Complex formed by III and Me_3B dissociates extremely readily.
- D) The magnitude of pK_b difference between I and II is less than that between III and IV.
2. Identify how many of the following reactions are correctly matched with their major product.



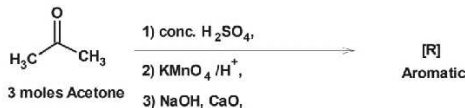


3. Choose the **CORRECT** option(s) about the product mixture

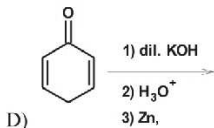
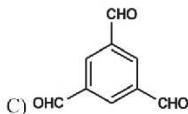
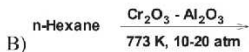
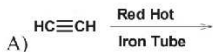


- A) In product mixture there is a diastereomeric pair
 B) Major alkene is having six C-H bonds which can involve in hyper conjugation
 C) all the alkenes in product mixture on hydrogenation give same alkene
 D) Bromination of major alkene in product mixture gives racemic mixture

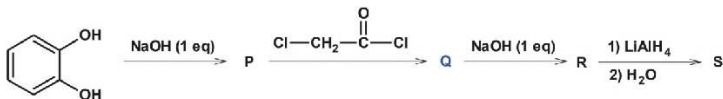
4.



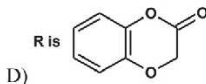
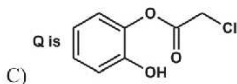
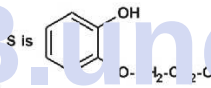
Out of the given reactions, which can give major product [R].



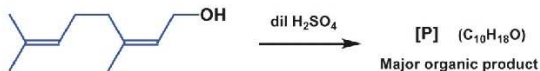
5.



Select the **CORRECT** statement:



6. Choose the **CORRECT** statement regarding major organic product obtained in the given reaction



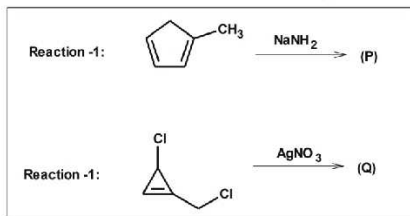
A) Tertiary alcoholic group present in [P]

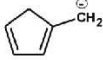
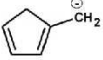
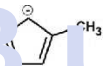
B) There is a one chiral centre present in [P]

C) [P] is an isomer of reactant.

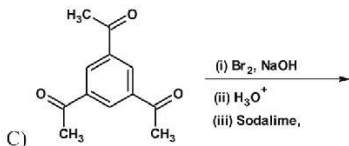
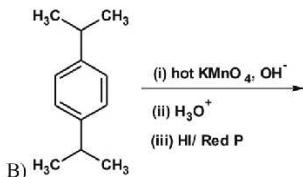
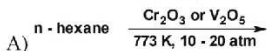
D) During this reaction mechanism hydroxyl group is the one which protonated first

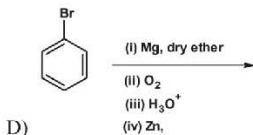
8. The products **P** and **Q** in the following reaction respectively are



- A) (**P**) , (**Q**)  B) (**P**) , (**Q**) 
- C) (**P**) , (**Q**)  D) (**P**) , (**Q**) 

9. The reactions leading to the formation of benzene is/are





SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

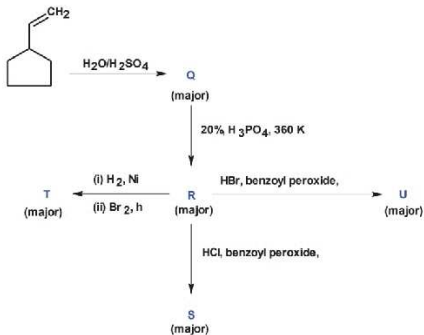
Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

5. Consider the given reaction, If **X** is the number of possible monobrominated products then what is $X/5$



10.



How many of the product(s) is/are correctly matched.



S



U



S



S

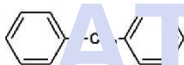


U



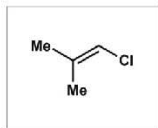
T

11. The molecular formula of diphenyl methane is

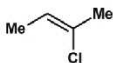
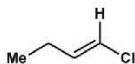


How many structural isomers are possible when one of the hydrogen is replaced by chlorine atom

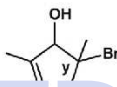
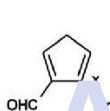
12. In the given isomers of compound (**K**)



The count of isomers out of the following in which Locant (Position) of chlorine atom is changed as per the **IUPAC** with reference to given structure **K**



13. Find the sum of position number (x + y + z + w) assigned to Bromine according to IUPAC rule



SECTION - III (THREE COLUMN MATCHING)

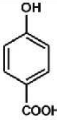
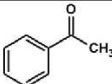
This section contains three questions for matching type. This section contains one table (having three columns and four rows; each question has a four options A, B, C & D ONLY ONE of these four options is correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Answer Q.14, Q.15 and Q.16 by appropriately matching the information given in the three columns of the following table.

Column 1, 2 and 3 contain starting material, reaction conditions and the molecular formula of the products respectively.

	Column-I		Column-II		Column-III
A)		1)	i) $\text{HNO}_3, \text{H}_2\text{SO}_4, 60^\circ$ ii) Na_2S iii) $\text{NaNO}_2, \text{HCl}, 0^\circ \text{C}$ iv) CuBr/	P)	C_6H_6

B)		2)	i) NaOI ii) acidic workup iii) NaOH, CaO, iv) CH ₃ Cl, AlCl ₃ (Anhyd) v) 2Cl ₂ , h vi) aq. KOH	Q)	C ₆ H ₆ NF
C)		3)	i) (NH ₄) ₂ S ii) NaNO ₂ , HCl, 0° - 5° C iii) HBF ₄ iv) Sn/HCl	R)	C ₇ H ₆ O
D)		4)	i) Br ₂ , H ₂ O ii) Zn-dust, iii) Mg (THF) iv) H ₂ O	S)	C ₆ H ₄ NO ₂ Br

14. Find the correct combination.

- A) B-2-R B) A-3-Q C) D-2-P D) C-4-P

15. Identify the incorrect combination:

- A) A-1-S B) B-3-Q C) D-2-R D) B-2-S

16. Column-I reactant [D], can be distinguished from its correct matched product [R] of column-III (formed by suitable set of reagents in column-II) by :

- A) Silver mirror test B) Neutral FeCl₃ test
C) Victor mayer test D) Lucas test

ANSWERS

1	2	3	4	5	6	7	8	9	10
BC	BC	ACD	ABD	BC	ABCD	C	ACD	1.8	3
11	12	13	14	15	16				
4	3	21	D	D	A				

PAPER-19

SECTION- I (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

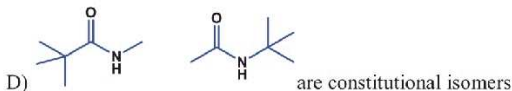
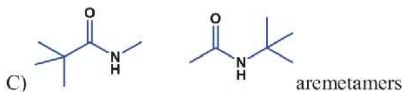
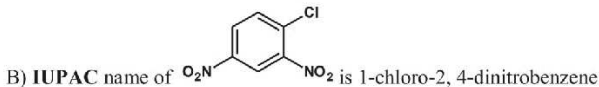
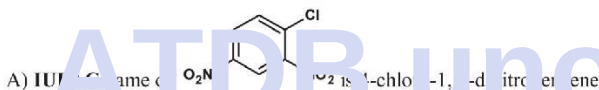
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

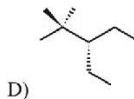
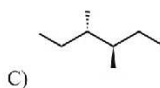
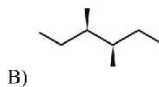
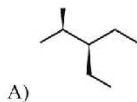
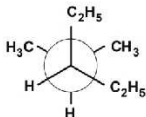
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks: -2 In all other cases.

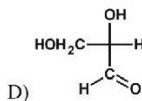
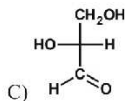
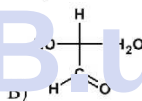
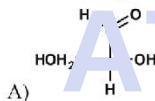
1. Choose the **CORRECT** options among the following?



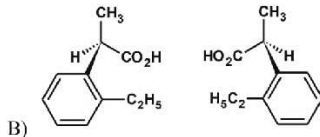
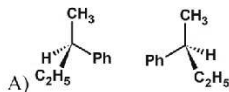
2. The Newman projection shown is the same as

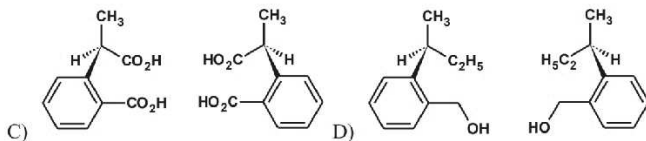


3. Which among the following compounds represents the D-glyceraldehyde

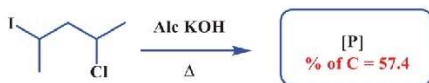


4. Which mixture can be converted in diastereomeric mixture by reaction with the following compound?

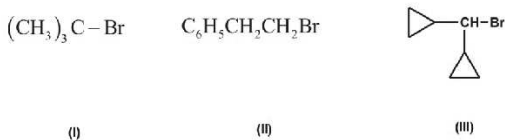




5. If [P] is the major organic product obtained in the given reaction, choose the correct statement about [P]

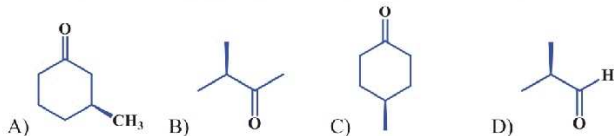


- A) [P] is a conjugated diene B) [P] is a cumulative diene
C) [P] is having C-Brine atom D) [P] is having C=C bond
6. Which of the following statements regarding the given compounds are true?

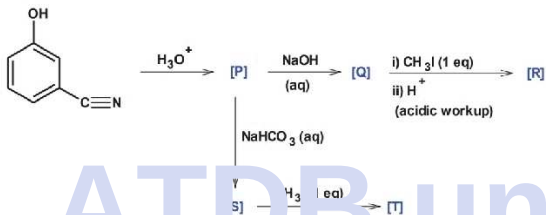


- A) Reactivity for S_N1 is III > II > I B) Reactivity for S_N1 is III > I > II
C) Reactivity for S_N2 is II > III > I D) Reactivity for S_N2 is II > I > III

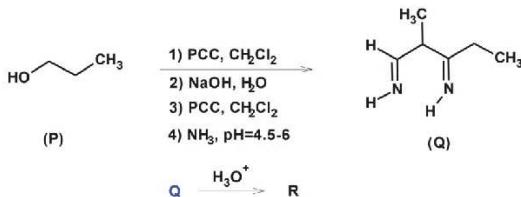
7. Which of the following gives pair of diastereomer on reaction with NaBD_4 ?



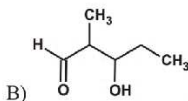
8. In the following reaction sequence, the correct statement(s) is/are



- A) **R** give violet color with neutral FeCl_3 .
- B) **R** can evolve CO_2 gas with NaHCO_3 .
- C) **R** and **T** are functional isomers
- D) **T** is more acidic than **R**
9. Choose the **CORRECT** statement(s)



- A) Formation of **[Q]** involve nucleophilic addition step



is intermediate product of reaction $[P \rightarrow Q]$

C) $[R]$ can give 2,4-DNP test.

D) stereoisomers possible for $[Q]$ are 8.

SECTION- II (NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

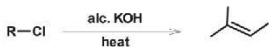
Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

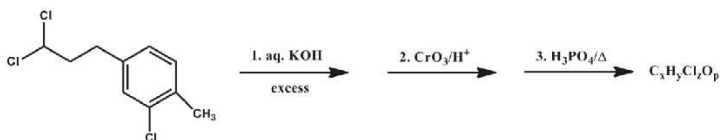
10. Find the degree of unsaturation of the major organic product



11. Find the number of alkyl chlorides which on reaction with alc. KOH, heat gives following compound as major product.

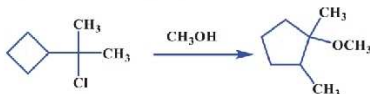


- 12.



In the above reaction, the value of $(x-y+z+p)$ is _____

13. Consider the mechanism following reaction



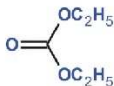
If X is the number of transition states formed in the above reaction, then what is X/3

14. The Claisen Condensation proceeds by carbon-carbon bond formation between an enolate donor and a carbonyl acceptor. For each of the following Claisen products select a donor and an acceptor compound from the list at the bottom (compounds 1 through 8). The sum of the numbers assigned to A, B, C, D, E is?

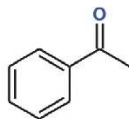
Claisen Product	Enolate donor	Carbonyl acceptor
		A
	B	
	C	
		D
		E



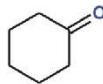
(1)



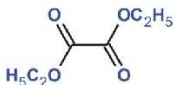
(2)



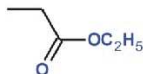
(3)



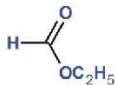
(4)



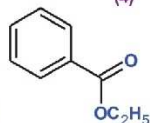
(5)



(6)



(7)



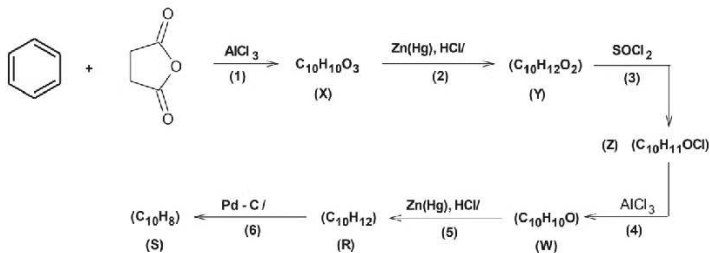
(8)

SECTION - III (COMPREHENSION TYPE)

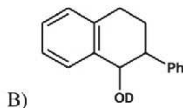
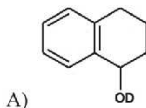
This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) from which **ONE** option can be correct.

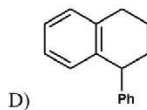
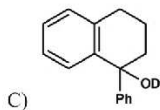
Marking scheme: +3 for correct answer, 0 for incorrect answer, -1 for attempted and 1 in 10 for wrong answers.

Paragraph for Question 15 & 16

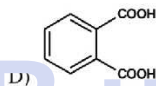
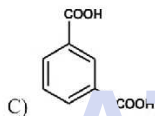
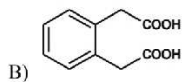
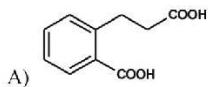


15. What product will be obtained if 'W' is treated with $\text{C}_6\text{H}_5\text{MgBr}$ followed by D_3O^+ ?





16. What product is obtained when R is heated with $\text{KMnO}_4 / \text{H}^+$?



ANSWERS

1	2	3	4	5	6	7	8	9	10
BCD	AD	C	BC	C	BC	AC	BC	ABCD	11
11	12	13	14	15	16	17	18	19	20
3	21	1.66	21	C	D				

PAPER-20

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

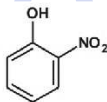
Partial Marks: +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

Zero Marks: 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks: -2 In all other cases.

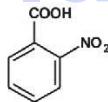
1. Which of the following compounds are soluble in NaHCO_3 ?

A) Picric acid



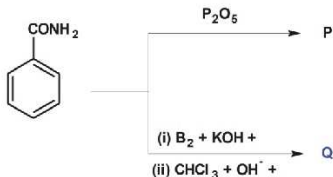
C)

D)



D)

- 2.



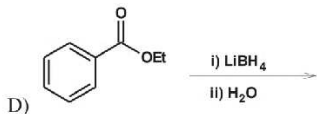
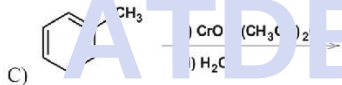
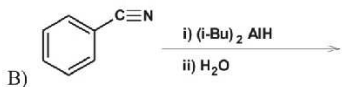
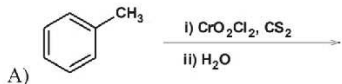
Which statement(s) is/are **CORRECT**

A) Reduced product of **P** and **Q** will be metamers to each other

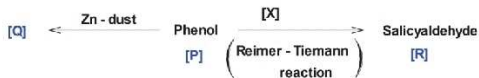
B) By dry distillation of hydrolysed products of **P** with $\text{Ca}(\text{OH})_2$, gives benzophenone

- C) One of the hydrolysis product of **Q**, reacts with $\text{NaNO}_2 + \text{HCl}$ followed by reaction with phenol in mild basic medium, gives orange red dye
- D) Electrophile involved in the formation of **Q** is dichlorocarbene

3. In which of the following reaction(s) benzaldehyde is obtained as a product?

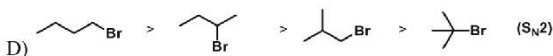
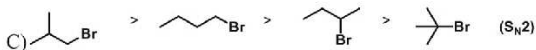
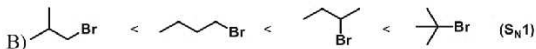


4. Choose the **CORRECT** statement(s) regarding following reaction sequence

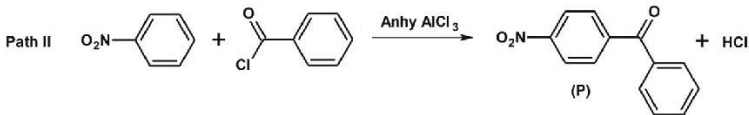
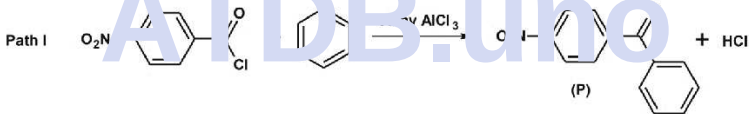


- A) **[P]** and **[Q]** can be distinguished by neutral FeCl_3 .
- B) Reagent mixture **[X]** can distinguish 1° and 2° amines
- C) Both **[P]** and **[R]** are soluble in (aq) NaOH .
- D) **[P]** is the monomer of Novolac and Dacron.

5. Which of the following is/are **CORRECT** regarding nucleophilic substitution reaction?



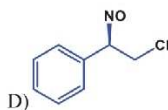
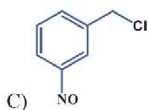
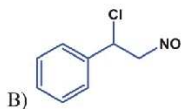
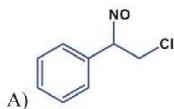
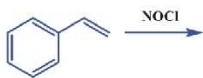
6.



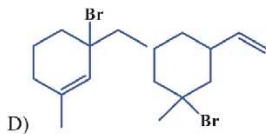
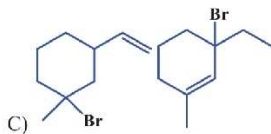
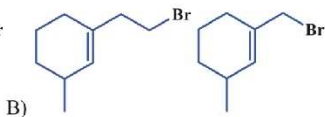
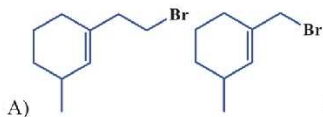
The **CORRECT** statement among the following about the above two paths of synthesizing the organic product P is :

- A) Path I is better than Path II
 B) Path II is better than Path I
 C) Both the paths are equally good
 D) Path I will give less yield of the product as compared to that obtained by path II.

7. The major organic product of the given reaction is



8. Major and minor organic products formed in the given reaction respectively



9. The following symmetry element(s) is/are present in the d as well as l form of the tartaric acid
- A) Centre of symmetry B) axis of symmetry (C_2)
- C) plane of symmetry D) alternating axis of symmetry
10. The specific rotation of optically pure (R)-2-bromo butane is -12.00° . A given sample of 2-bromobutane exhibited a specific rotation of -82.88° . The percentage of (S)-(+)-enantiomer present in the sample is
- A) 74% B) 27% C) 13% D) 37%

SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

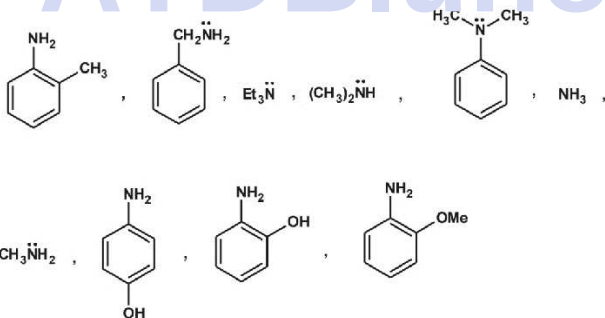
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

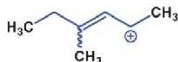
Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

11. Find the number of compounds which are more basic than $\text{Ph}-\text{NH}_2$

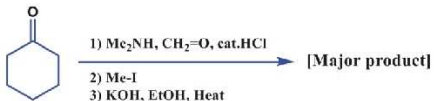


12. If the following carbocation is formed in a chemical reaction that finally bonds with bromide nucleophile, how many different bromide product(s) are formed?



(Note: geometry of double bond is NOT locked)

13. Find the Degree of unsaturation of product?



14. Total number of constitutional isomers (only position isomers) possible for trimethyl cyclohexane is

11. Find the LOCANT of Br in product as per the IUPAC nomenclature.



SECTION- III
(MATRIX MATCH WITH NUMERICAL)

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

FOUR options are given representing matching of elements from **LIST-I** and **LIST-II**.

For each question, choose the option corresponding to the correct matching.

Full Marks : +3 if **ONLY** the option corresponding to the correct match(es) is (are) chosen.

Zero Marks : 0 if none of the options is chosen (i.e. the question is unanswered).

Negative Marks : -1 in all other cases.

16. Match the conversion in Column-I with appropriate reagent(s) of column-II.

	Column-I		Column-II
A)	$\begin{array}{c} \text{H}_3\text{C} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{H} \end{array} \longrightarrow \begin{array}{c} \text{H}_3\text{C} \\ \\ \text{C}=\text{O} \\ \\ \text{HO} \end{array}$	P)	PCC (pyridinium chlorochromate)
B)	$\begin{array}{c} \text{H}_3\text{C} \\ \\ \text{H}-\text{C}-\text{H} \\ \\ \text{H} \end{array} \longrightarrow \begin{array}{c} \text{H}_3\text{C} \\ \\ \text{C}=\text{C} \\ \\ \text{H} \end{array}$	Q)	$\text{CrO}_3/\text{H}_2\text{SO}_4/3\text{K}$
C)	$\begin{array}{c} \text{H}_3\text{C} \\ \\ \text{H}-\text{C}-\text{OH} \\ \\ \text{H}_3\text{C} \end{array} \longrightarrow \begin{array}{c} \text{H}_3\text{C} \\ \\ \text{C}=\text{O} \\ \\ \text{H}_3\text{C} \end{array}$	R)	$\text{K}_2\text{Cr}_2\text{O}_7 + \text{dil H}_2\text{SO}_4 / 293 \text{ K}$
D)	$\begin{array}{c} \text{H}_3\text{C} \\ \\ \text{H}_3\text{C}-\text{C}-\text{OH} \\ \\ \text{H}_3\text{C} \end{array} \longrightarrow \begin{array}{c} \text{H}_3\text{C} \\ \\ \text{C}=\text{CH}_2 \\ \\ \text{H}_3\text{C} \end{array}$	S)	$\text{KMnO}_4/\text{H}^+ / 293 \text{ K}$
		T)	$\text{H}_3\text{PO}_4/358\text{K}$

ANSWERS

1	2	3	4	5	6	7	8	9	10
ABD	BCD	ABC	ABC	A	A	B	C	B	C
11	12	13	14	15	16				
8	8	3	6	2	A-RS B-PQ C-PQRS D-QT				

ATDB.uno

PAPER-21

SECTION- I (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

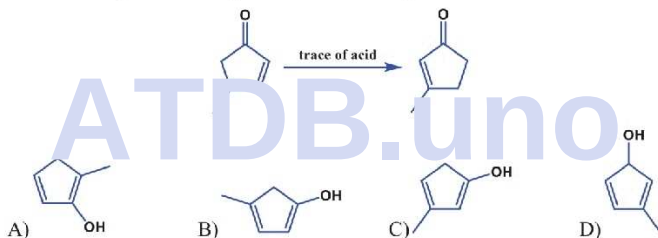
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks: +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

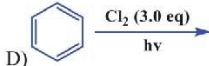
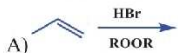
Zero Marks: 0 If none of the options is chosen [i.e. the question is unanswered].

Negative Marks: -2 In all other cases.

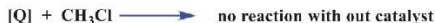
1. Which among the following is an intermediate(s) in the below isomerization reaction



2. Free radical addition reaction(s) is (are)



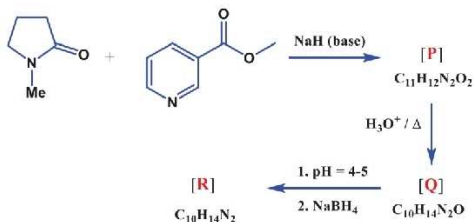
3. Analyze the following data and choose the **CORRECT** statement(s)



- A) Compound $[\text{P}]$ is aromatic

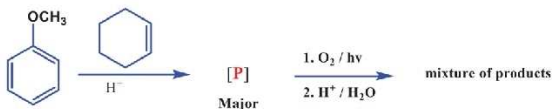
- B) All bond lengths in compound [Q] is identical
 C) Compound [Q] is less reactive than [P] towards electrophilic substitution reactions
 D) Compound [P] is more reactive than aniline towards electrophilic substitution reaction

4. Choose the **CORRECT** option(s) regarding the given scheme



- A) In first product [P] one of the nitrogen part of amide and other nitrogen is part of amide
 B) [Q] on reaction with HNO_2 gives pale yellow oily liquids
 C) [R] on reaction with KMnO_4 gives corresponding aromatic carboxylic acid which is more acidic than benzoic acid
 D) Maximum number of Me-I that is consumed by [R] is two

5. Choose the **CORRECT** statements regarding the given scheme



- A) The two major products in product mixture can be separated with dil NaHCO_3
 B) One of the products from the mixture shows neutral FeCl_3 test but not phthaline test
 C) One of the product from the product mixture shows 2,4-DNP test but not tollens test
 D) One of the products from the product mixture subjected to reimer-tiemann reaction gives positional isomer of vaniline

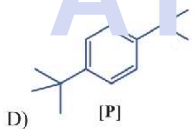
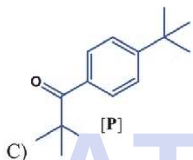
6.



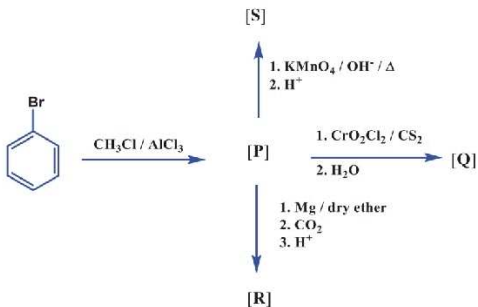
In the above scheme **[P]** is the disubstituted aromatic compound and major and **[Q]** & **[R]** are monosubstituted aromatic compounds which are formed as a minor and **[Q]** respond to 2,4-DNP whereas **[R]** do not. Choose the correct option(s)

A) **[R]** is more reactive than benzene towards nitration

B) **[R]** is more active than **[P]** & **[Q]** towards electrophilic substitution reaction

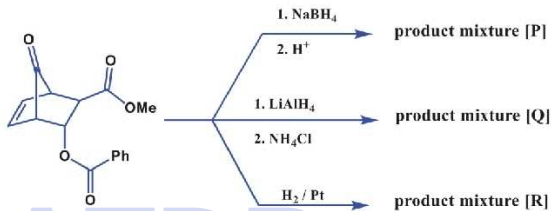


7.



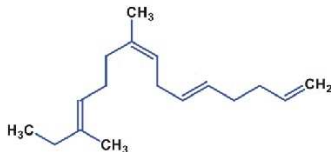
- A) [S] reacts faster with NaHCO_3 than [R]
 B) Mixture of [Q] and [R] can separate with dilNaOH
 C) [Q] on reaction with tollens reagent followed by acidification gives [S]
 D) [Q] on reaction with tollens reagent followed by acidification gives [R]

8. Choose the **CORRECT** option(s) regarding the given scheme



- A) Product mixture [P] contains two diastereomers
 B) Product mixture [R] contains two diastereomers
 C) One of the products from product mixture [Q] contains 1° , 2° and 3° alcoholic groups
 D) One of the products from product mixture [Q] on treatment with P.C.C gives aromatic aldehyde

9. Which type of overlapping is/are involved in the given compound?



- A) $\pi \rightarrow \pi^*$
 B) $\pi \rightarrow \sigma^*$
 C) $\sigma \rightarrow \text{p(empty)}$
 D) $\sigma \rightarrow \pi^*$

SECTION - II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

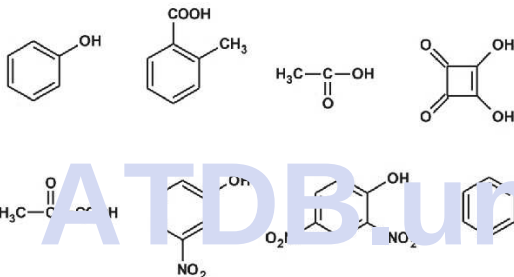
Full Marks:

+3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks:

0 in all other cases.

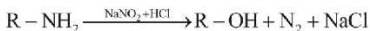
10. Find the number of compounds which evolve effervescence of CO_2 with aqueous NaHCO_3 ?

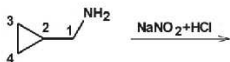


11. A hydrocarbon (X) contains 91.2% carbon and 8.8% hydrogen. The compound on chlorination using $\text{Cl}_2/h\nu$ and $\text{Cl}_2/\text{AlCl}_3$ gives three isomeric monochloro substituted products. What is the total number of atoms in (X) / 10
12. Consider the major organic product in each case, If **X** is the total number of C-H bonds which can involve in hyper conjugation in structures **C**, and then what is $\text{X}/6$



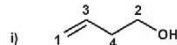
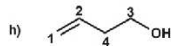
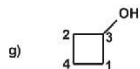
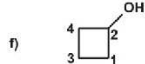
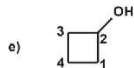
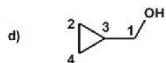
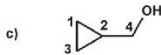
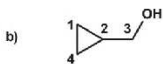
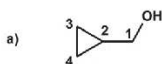
13. The reaction of chloromethane with hydroxide ion at 30°C has a ΔG° value of -21.7 kcal/mol. What is the $\text{K}_{\text{eq}} / 1015$ (K_{eq} equilibrium constant) for the reaction?
14. Aliphatic amines on diazotization gives alcohol via carbocation intermediate





(Carbons are labeled with numbers)

In the above reaction how many of the following products are possible

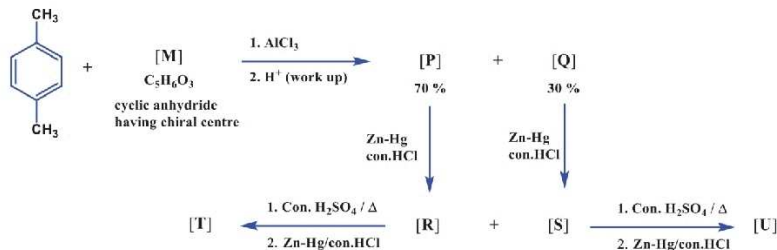


SECTION III COMPREHENSION TYPE

This section contains five questions. Based on each paragraph, there are four or five questions. Each question has four options (A), (B), (C) and (D) for answer, out of which ONE or MORE option(s) can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Paragraph For Questions 15 & 16



15. Choose the **CORRECT** option(s)

- A) [P] is having one alpha hydrogen adjacent to ketone
B) [Q] is having one alpha hydrogen adjacent to ketone

C) [P] & [Q] are positional isomers

D) [P] and [Q] both evolve CO_2 gas with NaHCO_3

16. Choose the **CORRECT** option(s)

A) [R] and [S] are structural isomers

B) [T] and [U] are same compounds

C) [M] on reaction with LiAlH_4 gives diol which don't have chiral carbon

D) Degree of unsaturation of [R] and [T] is same

ANSWERS

1	2	3	4	5	6	7	8	9	10
BC	AD	ACD	BCD	BCD	ABC	ABC	ABD	D	6
11	12	13	14	15	16				
1.5	1.6	4.8		BCD	ABD				

PAPER-22

SECTION - I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

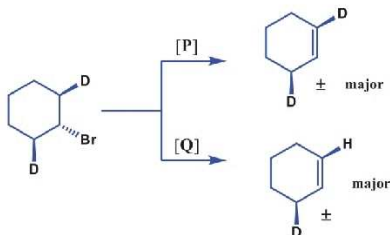
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks: -2 In all other cases.

1. Phenol on bromination gives 2,4,6-tribromophenol as a major product. Choose the **CORRECT** statement(s) about bromination of phenol in presence of Br_2 and acetate buffer.
- A) Since all active positions of phenol occupied by Br atoms fourth bromine atom will go to para position
- B) Since OH is ortho para directing group and all ortho and para positions are occupied by Br atom no further reaction takes place
- C) Fourth bromine atom goes to again para position
- D) The product formed is non-aromatic
2. Choose the **CORRECT** statement (s) for given reaction scheme

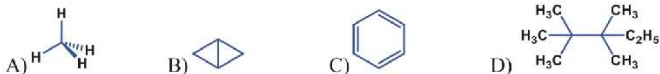


- A) [P] = MeOH / heat and follows E1 elimination
- B) [P] = MeONa / MeOH / heat and follows E2 mechanism
- C) [Q] = MeOH / heat and follows E1 elimination
- D) [Q] = MeONa / MeOH / heat and follows E2 mechanism

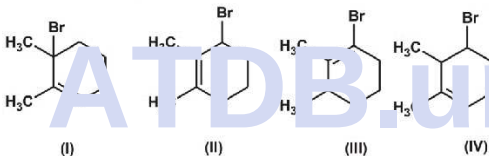
3. In which of the following S_N2 reaction(s) there is large increasing in rate takes place by increasing solvent polarity?



4. Which of the following product(s) is (are) prepared as major by using Na/Dry ether from many suitable single organic chloride or single organic dichloride?

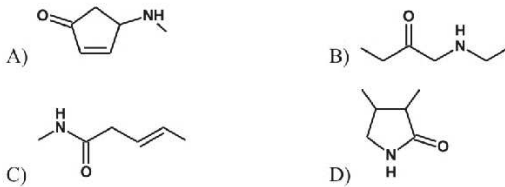
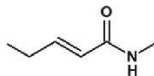


5. What is the sum of position assigned to bromine while numbering the parent chain in the below compounds

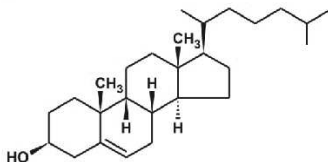


- A) 11 B) 13 C) 15 D) 12

6. Identify the constitutional isomers for molecule



7. Cholesterol (**A**) is the most abundant compound from steroids in animals. It is the precursor of all other steroids. It is an important component of the cell membrane.

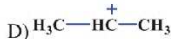
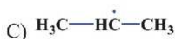
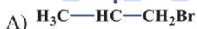


A

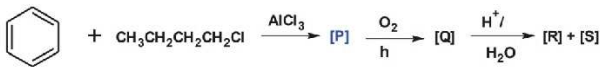
[Note: Thick solid wedge indicates a bond coming above the plane, while broken wedge indicates a bond below the plane]

The total number of stereoisomers possible for **A** is

- A) 32 B) 256 C) 128 D) 64
8. The intermediate during the addition of HCl to propene in the presence of **peroxide** is (consider a major organic product reaction path only)



9. Choose the **CORRECT** option(s) regarding following reaction sequence:



- A) Product (**R**) may be butanone
 B) Product (**S**) may be phenol
 C) Product (**Q**) is cumene hydroperoxide
 D) Product (**P**) is known as cumene

SECTION- II (NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

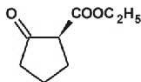
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

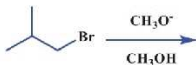
Zero Marks: 0 in all other cases.

10.

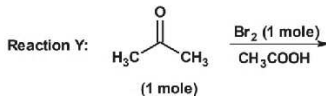
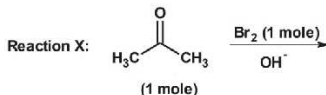


When the above molecule is reduced with excess LiAlH_4 followed by dilute acid work up, how many fractions can be obtained on fractional distillation of product mixture.

11. If X is molecular weight of the major organic product obtained in the given reaction then what is $(X/7) \times 12 + 10 \times \text{amu} + (1.0078 \times 10^{-3} \times 7) \times \text{amu} = 5.9 \times 10^4 \text{amu}$
 $\text{Br} = 78.9183 \text{amu}$

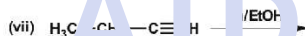
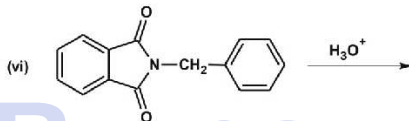
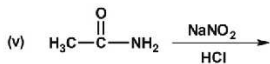
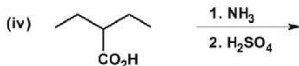
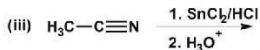
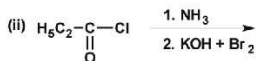
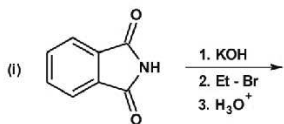


12.

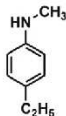
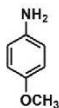


Number of moles of unreacted acetone left after the reaction **X** and reaction **Y** are 'a' & 'b' respectively. The value of (a + b) is ____

13. How many reactions will give 1° amine as final product?



14. How many of the following compounds are **more basic than aniline**?

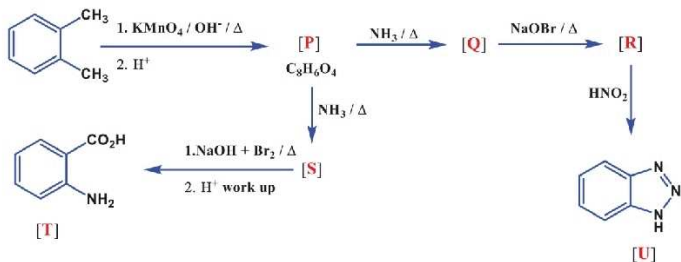


SECTION – III
(COMPREHENSION TYPE)

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

Paragraph For Questions 15 & 16



15. Choose the **CORRECT** option(s) among the following is/are
- Compound [S] is more acidic than [Q]
 - Compound [Q] is more acidic than [S]
 - Conversion of [P] to [Q] required more temperature than conversion of [P] to [S]
 - Conversion of [P] to [S] required more temperature than conversion of [P] to [Q]
16. Choose the **CORRECT** option(s) among the following is/are
- Compound [Q] is phthalamide
 - Compound [S] is phthalamide
 - Compound [T] is more acidic than [P]
 - Compound [T] is more acidic than corresponding p-amino benzoic acid due to ortho effect

ANSWERS

1	2	3	4	5	6	7	8	9	10
CD	AD	B	BC	C	CD	B	D	AB	2
11	12	13	14	15	16				
8.015	0.66	3	4	AD	A				

PAPER-23

SECTION - I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

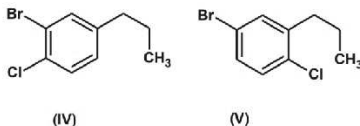
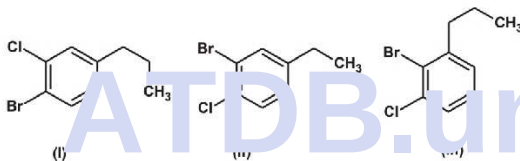
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

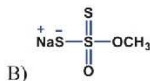
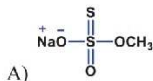
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

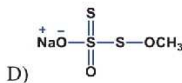
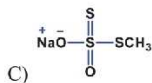
Negative Marks: -2 In all other cases.

1. Which of the following compounds corresponds to 2-bromo-1-chloro-4-propyl benzene?

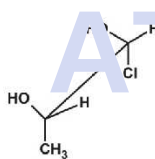


- A) II and V B) II and IV C) IV only D) I and IV only
2. Two isomeric S_{N}^2 products when Sodium thiosulphate is allowed to react with one equivalent of $\text{CH}_3\text{-I}$ in CH_3OH , in fact only one of the two possible products is formed. Which one is formed-?

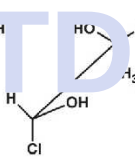




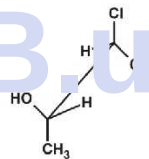
3. When neopentyl alcohol is treated with H_2SO_4 , a mixture of two alkenes (85: 15) is formed. Which statement(s) is/are correct about these alkenes?
- A) Both give same major products on treatment with HBr in dark.
 B) Both give different major products on treatment with HBr in presence of peroxide.
 C) The alkene which is formed in 85% concentration has higher heat of hydrogenation than other alkene.
 D) Both alkenes, on ozonolysis give same product.
4. Which of the given statement(s) about **N**, **O**, **P** & **Q** with respect to **M** is/are **CORRECT**.



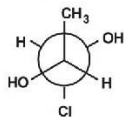
(M)



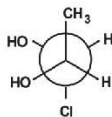
(N)



(O)



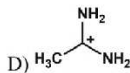
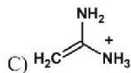
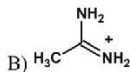
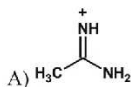
(P)



(Q)

- A) **M** and **N** are non-mirror image stereoisomers.
 B) **M** and **O** are identical.
 C) **M** and **P** are enantiomers
 D) **M** and **Q** are identical

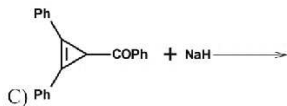
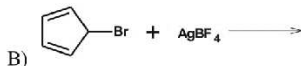
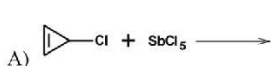
5. Which of the following is a defective resonance contributor of the acetamidinium ion?



6. An alkylbromide [X] produces single alkene[Y] when it reacts with sodium ethoxide and ethanol. [Y] upon hydrogenation produces 2-methylbutane. Choose the **CORRECT** statement(s) among the following

- A) [X] is a tertiary alkyl bromide
 B) [X] is a primary alkyl bromide
 C) [X] may or may not show stereoisomerism
 D) [Y] does not exhibit geometrical isomerism

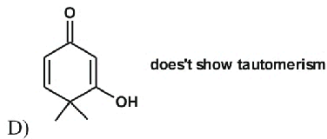
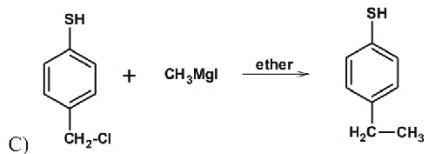
7. The reaction(s) that result(s) in the formation of aromatic species is/are



8. Choose the **INCORRECT** option(s):

- A) Picric acid & Benzoic acid can be distinguished by NaHCO_3





ATDB.uno

SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

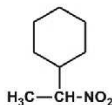
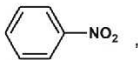
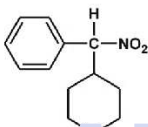
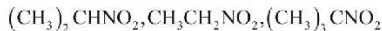
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

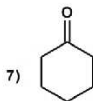
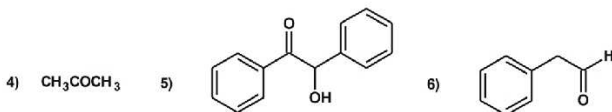
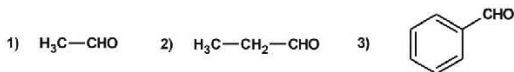
Zero Marks: 0 in all other cases.

9. The below compounds are treated with HNO_2 followed by addition of NaOH .



X is the number of compounds that give product **Y**. **Y** is the number of compounds that give product **X**. The value of (X/Y) is

10. The number of compounds give positive Fehling test



11. How many of them are **more acidic than** 



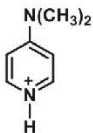
i



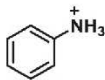
ii



iii

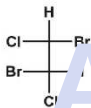


iv



v

12. Total number of stable conformer of having non-zero dipole moment are



13. Consider the following reaction,



Degree of unsaturation of intermediate is?

SECTION - III
(COMPREHENSION TYPE)

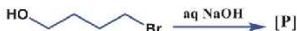
This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

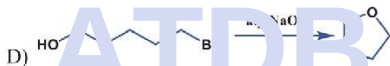
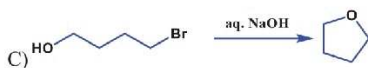
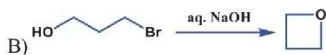
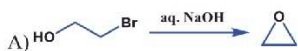
Paragraph For Questions 14 to 16

Cyclic ethers can be formed by intramolecular S_N2 reactions of halogen substituted alcohols like bromo alcohols. Proton transfer from alcohol to a base like sodium hydroxide gives a bromoalkoxide. If the solution is dilute, the alkoxide acts as a nucleophile, and an intramolecular reaction displaces a bromide ion. In more concentrated solutions, an intermolecular reaction occurs to give a bromoalkoxy ether. The intramolecular reaction is preferred at low concentrations because the reaction is first order and the competing intermolecular reaction is second order. The rate of cyclization of bromoalkoxide is a function of number of atoms forming the ring follows the order $5 > 6 > 3 > 4$. This order is attributed predominantly to favourable entropy of activation overcoming the unfavourable enthalpy of activation for the formation of smaller rings.

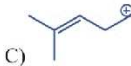
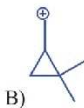
14. The major product **[P]** in the following reaction is



15. Slowest reaction among the following is



16. The intermediates involved in the following reactions is/are



ANSWERS

1	2	3	4	5	6	7	8	9	10
C	C	AB	ABC	C	BC	AD	CD	0.33	4
11	12	13	14	15	16				
0	2	7	A	A	AB				

PAPER-24

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

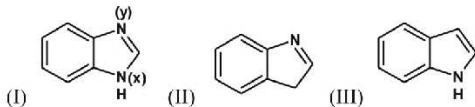
Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks: +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

Zero Marks: 0 If one of the options chosen is incorrect. No option is unmarked.

Negative Marks: -1 If one or more other options are chosen.

1. **CORRECT** statement(s) regarding given compounds is/are –



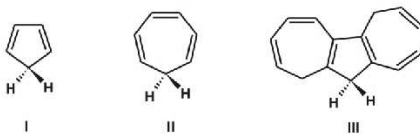
A) Basic strength order is $I > II > III$

B) In compound (I) y is more basic than (x)

C) In compounds (I) two lone pair, in compound II & III one lone pair are delocalized.

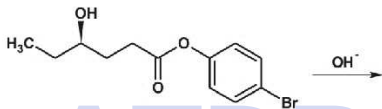
D) In compounds (I) & (III) one lone pair is delocalised.

2. The increasing order of the acidity of the hydrogen marked in bold italics among the following is:



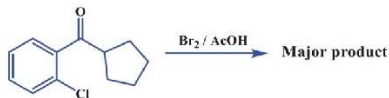
- A) I is more acidic than III B) III is more acidic than II
C) I is more acidic than II D) Conjugate base of II is aromatic

3.

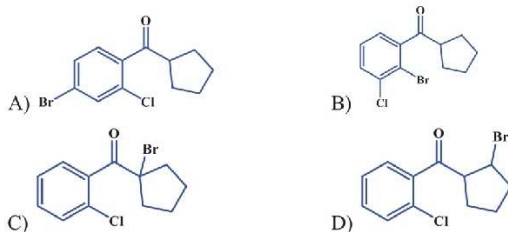


Which of the statements regarding the product formed in the above reaction is **CORRECT**?

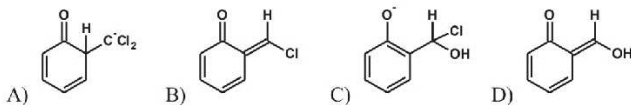
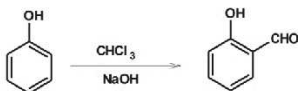
- A) If Br is replaced with NO_2 rate of reaction increases
B) Inversion of configuration takes place.
C) Nucleophilic acyl substitution takes place.
D) Configuration at chiral carbon does not change



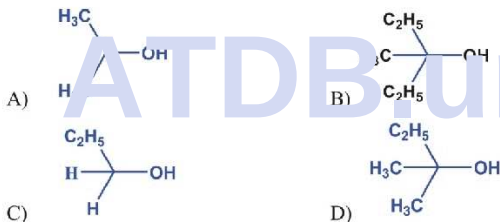
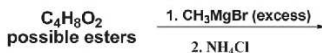
4.



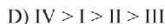
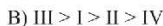
5. Which of the following intermediate product(s) is (are) formed during given Reimer-Tiemann reaction?



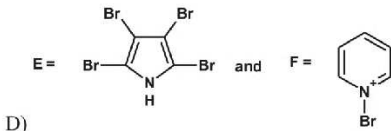
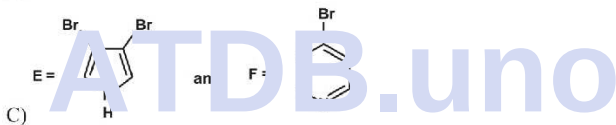
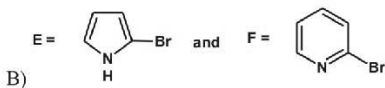
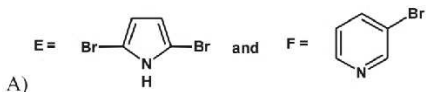
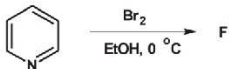
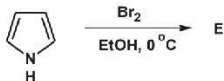
6. Possible products in the given reaction



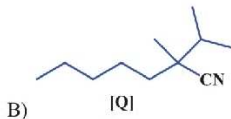
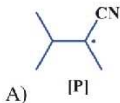
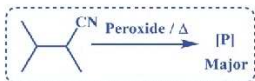
7. The rate of solvolysis of I - IV follows

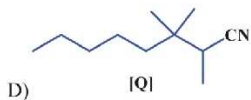
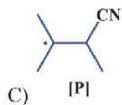


8. The major products E and F formed in the following reactions are

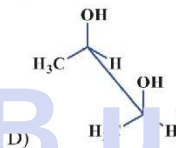
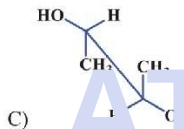
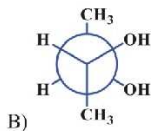
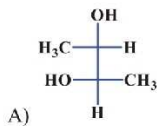


9. Choose the **CORRECT** options regarding [P] and [Q] of the given reaction





10. Product [Q] in the given reaction is/are



SECTION- II
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

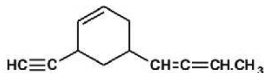
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

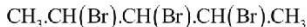
Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

11. Total number of geometrical isomers of given structure

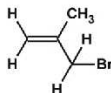
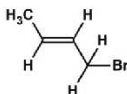
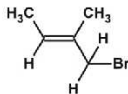
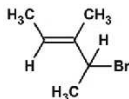
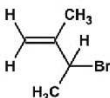
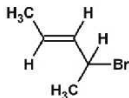


12. Find the number of stereoisomers of following

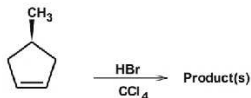


13. If number of Cl atoms in Lindane is **X**, number of Cl atoms in DDT is **Y**, then what is X/Y

14. Among the given structures, identify those containing bromine at 'tertiary' position according to **IUPAC** system.



15. Find the total number of possible product(s) in the following reaction



SECTION- III
(MATRIX MATCH)

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

FOUR options are given representing matching of elements from **LIST-I** and **LIST-II**.

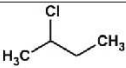
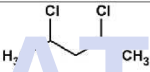
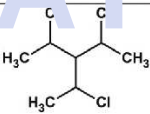
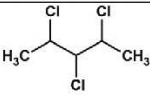
For each question, choose the option corresponding to the correct matching.

Full Marks : +3 If **ONLY** the option corresponding to the correct match(es) is(are) chosen.

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks : -1 in all other cases.

16. Match the columns

	Column-I (Compounds)		Column-II (Total number of stereoisomers)
A)		P)	8
B)		Q)	4
C)		R)	
D)		S)	2

ANSWERS

1	2	3	4	5	6	7	8	9	10
ABD	BC	ACD	C	ABCD	ACD	C	D	ABD	B
11	12	13	14	15	16				
2	4	1.2	2	4	A-S B-R C-Q D-Q				

PAPER-25

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

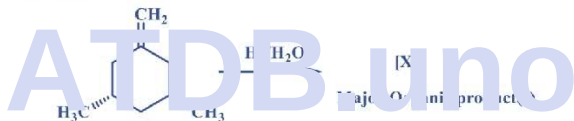
Partial Marks: +2 if three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

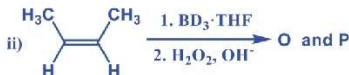
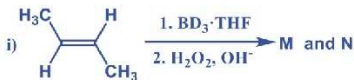
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

Negative Marks: -2 In all other cases.

1. Choose the **CORRECT** statement(s) regarding major organic product obtained in the given reaction

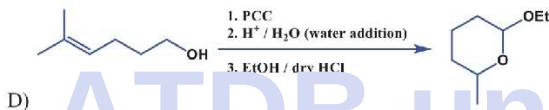
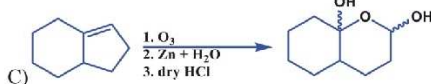
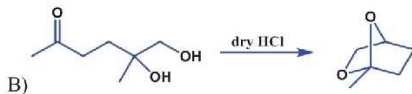
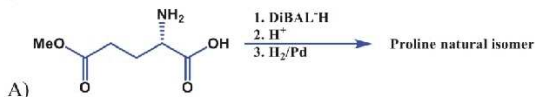


- A) Product is a mixture of diastereomers
B) Product mixture is optically inactive
C) Single optically active product is formed
D) Carbocation rearrangement will takes place in given reaction
2. The **CORRECT** statement(s) for the following addition reactions is (are)

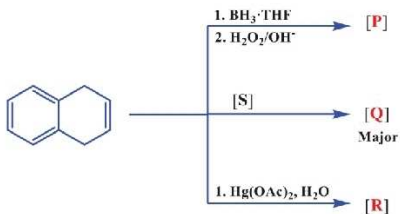


- A) **[O]** and **[P]** are identical molecules
B) **[M]** and **[N]** are enantiomers

6. Which among the following is/are appropriately matched with its major organic product.

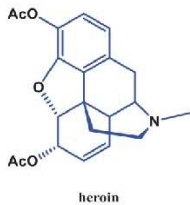
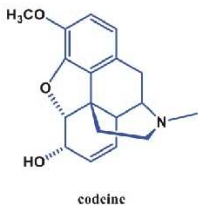


7. Choose the **CORRECT** option(s) for below given scheme



- A) [P] is the mixture of two constitutional isomers in unequal amount
 B) [R] is a mixture of two compounds
 C) [P] and [R] are same compounds
 D) If [S] is H^+/H_2O then [Q] will be the positional isomer to either [P] or [R]

8. Observe the below three compounds and choose the correct statements about their interconversions



- A) Morphine on treatment with 2 moles of NaH and one mole of methyl iodide gives codeine
- B) Morphine on treatment one equivalent of methyl iodide gives codeine
- C) Morphine on treatment one equivalent of NaOH and one equivalent of Methyl iodide gives codeine
- D) Morphine on treatment with excess acetic anhydride gives heroin

(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

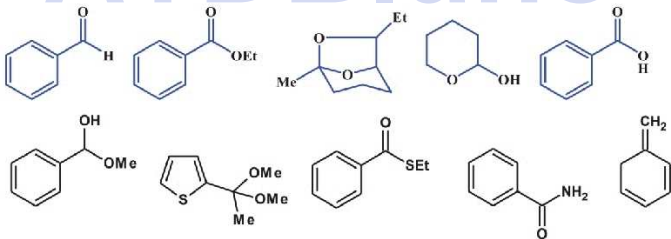
Zero Marks: 0 in all other cases.

9. How many of the following can be used to differentiate between

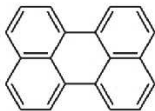


- A) NaOI B) Neutral FeCl_3 C) $\text{Br}_2 / \text{H}_2\text{O}$
D) libermannitroso test E) Na F) NaHCO_3
G) CAN (Ceric Ammonium Nitrate)

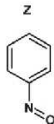
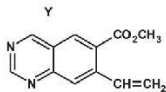
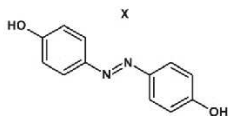
10. The total number of compound(s) (below) that form acetyl chloride on derivatization under acidic conditions is _____.



11. How many resonating structure are possible for given compound



12. Which statements about the three compounds **X**, **Y** and **Z** are correct?



1. **X** and **Y** are isomers.
2. **X** and **Z** have the same empirical formula.
3. The M.F of **Y** is exactly twice that of **Z**.

(Note: Write your answer in three digit.

i.e., if answer is option 1, then 001

if answer is option 1 & 2 both, then 012

if answer is option 1, 2 & 3 all, then 123)

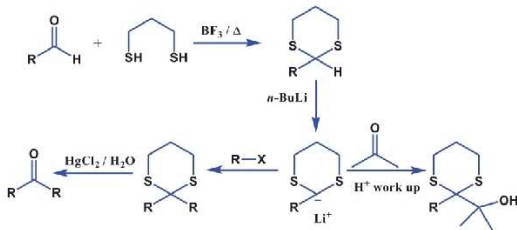
SECTION III COMPREHENSION TYPE

This section contains paragraph Questions. Based on each paragraph, there are four or five multiple choice questions (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +3 for correct answer, 0 if not attempted and -1 in all other cases.

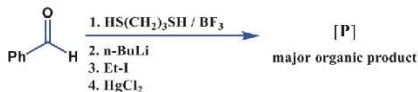
Paragraph For Questions 13to 16

Aldehyde protons are non-acidic. However, if the aldehyde is converted to a 1,3-dithiane (the sulfur analog of an acetal), the proton can then be quantitatively removed by NaNH_2 or organolithium bases. The resultant anion readily undergoes $\text{S}_\text{N}2$ or carbonyl addition reactions, subsequent reaction with HgCl_2 gives unmasked carbonyl group as shown below

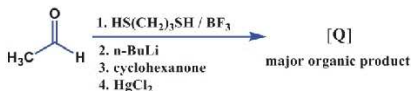


Understand the above passage and answer the below four questions

13. Choose the **CORRECT** option about [P]

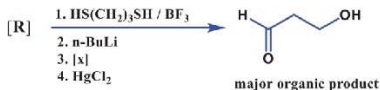


- A) [P] is acetophenone
 B) [P] can show iodoform test
 C) [P] is a propiophenone
 D) [P] third step is nucleophilic addition reaction
14. Choose the correct option about [Q]

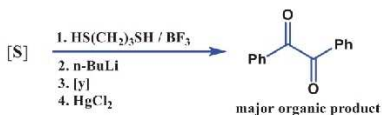


- A) [Q] is a beta-hydroxy ketone
 B) [Q] can be oxidized by P.C.
 C) in formation of [Q] one of the step is nucleophilic addition reaction
 D) All

15. Choose the **CORRECT** options regarding [R] and [x]



- A) [R] and [x] both are formaldehyde
 B) [R] is formaldehyde and [x] is acetaldehyde
 C) [R] is acetaldehyde and [x] is ethylene oxide
 D) [R] is formaldehyde and [x] is ethylene oxide
16. Choose the **CORRECT** options regarding [S] and [y]



- A) [S] is benzaldehyde and [y] is benzyl bromide
 B) [S] is benzaldehyde and [y] is bromo benzene
 C) both [S] and [t] are benzaldehyde
 D) [S] is benzaldehyde and [y] is benzoyl chloride

ANSWERS

1	2	3	4	5	6	7	8	9	10
C	B	D	AC	D	AC	BCD	CD	5	5
11	12	13	14	15	16				
9	12	C	C	D	D				

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PAPER-26

SECTION- I

(ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks : +4 If only (all) the correct option(s) is (are) chosen.

Partial Marks: +3 If all the four options are correct but **ONLY** three options are chosen.

Partial Marks: +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

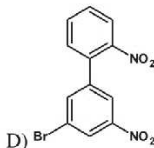
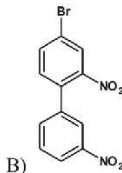
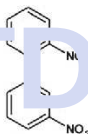
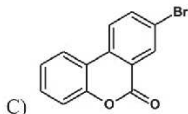
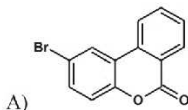
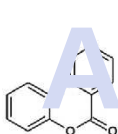
Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered).

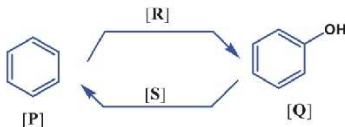
Negative Marks: -2 In all other cases.

1. Find the structure of the major product of bromination of the following compounds

using $\frac{\text{Br}_2}{\text{FeBr}_3}$

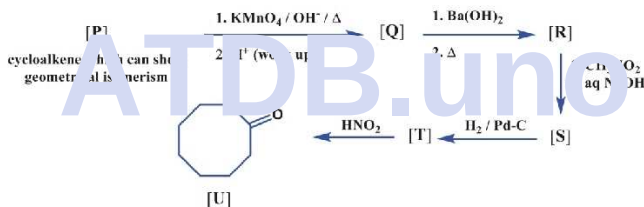


2. Choose the **CORRECT** option(s) for the given reaction scheme



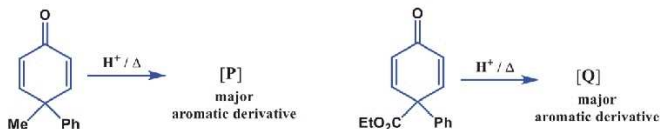
- A) [Q] on reaction with D_3O^+ gives product [T] which contains 5 deuterium atoms
 B) Condition of [R] is a Zn dust / Δ
 C) Condition of [S] is a Zn dust / Δ
 D) Condition of [R] is Fe^{+3} / H_2O_2

3. Choose the **CORRECT** option(s) about the below reaction scheme



- A) [R] and [U] both respond to same type of chemical tests
 B) During the formation of [U] from [T] seven membered ring is rearranged to eight membered ring
 C) [U] on reaction with i. $NaBH_4$, ii) PBr_3 , iii) alc. KOH gives [P]
 D) Number of carbon atoms are same in [Q] as well as [T]

4. Choose the **CORRECT** statement(s) about the given reaction scheme



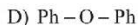
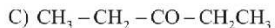
- A) Position of Ph group in [P] is 3

B) [P] and [Q] both respond to phthalein test

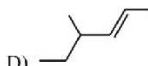
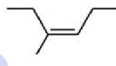
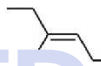
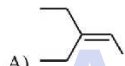
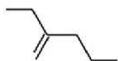
C) Position of Ph group in [Q] is 3

D) Position of Ph group in [Q] is 4

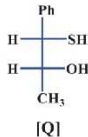
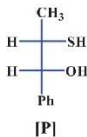
5. In the given structures which can **NOT** show metamerism



6. How many of the given structure(s), is/are chain isomers of



7.



[P] and [Q]

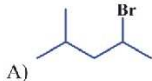
A) Enantiomers

B) Diastereomers

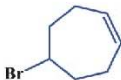
C) Configurational isomers

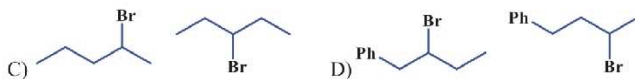
D) Constitutional isomers

8. Which among the given pairs second one is more reactive than first one in E_2 reaction with $\text{CH}_3\text{ONa}/\text{CH}_3\text{OH}$



B)

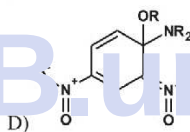
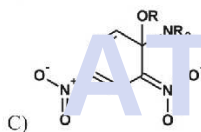
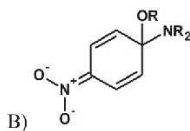
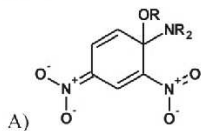




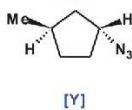
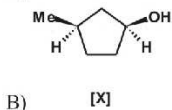
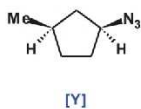
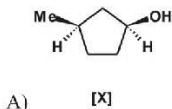
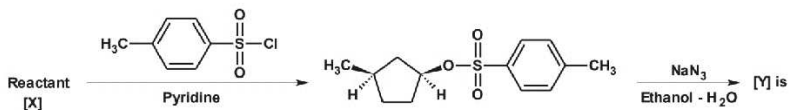
9. The intermediate in the addition-elimination mechanism

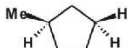


(I) is

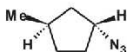


10.

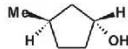




C) [X]



[Y]



D) [X]



[Y]

SECTION- II (NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

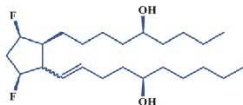
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

Full Marks: +3 If **ONLY** the correct numerical value is entered as answer.

Zero Marks: 0 in all other cases.

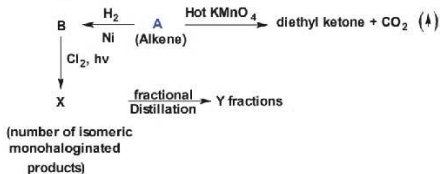
11. How many structural isomers can be formed by C_5H_{12} are possible having parent chain length of 5 Carbon.
12. For the given compound [X], the total number of optical active stereoisomers are



— This type of bond indicate that the configuration at the sepcific carbon and the geometry of the double bond is fixed.

~~~~~ This type of bond indicate that the configuration at the sepcific carbon and the geometry of the double bond is NOT fixed.

13. Identify the value of (X-Y)





**Marking scheme:** +3 for correct answer, 0 if not attempted and -1 in all other cases.

14. Which of the following is **CORRECT** matching resulting into desired product as indicated?
- A) IV, (i)&(S)                      B) (III), (ii) & (R)  
C) (I), (iii) & (R)                  D) (II), (i) & (S)
15. In which of the following sequence of reaction the diradical is formed as intermediate.
- A) (II), (iv) & (R)                  B) (III) (iv) & (R)  
C) (I), (iii) & (P)                  D) (IV), (i) & (S)
16. Which of the following is **INCORRECT** matching for the desired product in column 3?
- A) (I),(iii) & (P)                    B) (II), (iv) & (R)  
C)(IV),(i) & (S)                     D) (III), (iv) & (R)

### ANSWERS

|           |          |             |           |           |            |          |            |           |          |
|-----------|----------|-------------|-----------|-----------|------------|----------|------------|-----------|----------|
| 1         | 2        | 3           | 4         | 5         | 6          | 7        | 8          | 9         | 10       |
| <b>AB</b> | <b>C</b> | <b>ABCD</b> | <b>AD</b> | <b>AD</b> | <b>BCD</b> | <b>D</b> | <b>ABC</b> | <b>AC</b> | <b>B</b> |
| 11        | 12       | 13          | 14        | 15        | 16         |          |            |           |          |
| <b>5</b>  | <b>4</b> | <b>3</b>    | <b>A</b>  | <b>C</b>  | <b>D</b>   |          |            |           |          |

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**SECTION- I**

**(ONE OR MORE THAN ONE)**

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks :** +4 If only (all) the correct option(s) is (are) chosen.

**Partial Marks:** +3 If all the four options are correct but **ONLY** three options are chosen.

**Partial Marks:** +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

**Partial Marks :** +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

**Zero Marks :** 0 If none of the options is chosen (i.e. the question is unanswered).

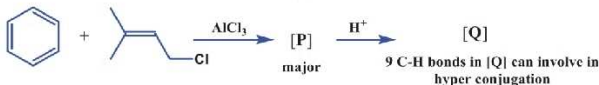
**Negative Marks:** -2 In all other cases.

1. Choose the **CORRECT** statement(s) for given reaction scheme



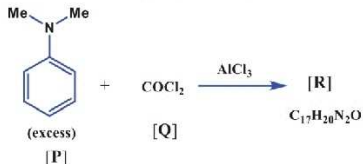
- A) If [Q] is an acid, [R] is a derivative of carboxylic acid  
 B) [R] is a class of tranquilizers  
 C) [R] is more acidic than [P]  
 D) There will be a three C=O groups in [R]

2. Choose the **CORRECT** statement(s) about the given reaction scheme

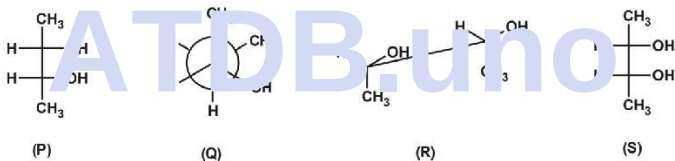


- A) [P] upon reaction with hot  $\text{KMnO}_4$  followed by acidification gives benzoic acid  
 B) Hydrogenation of [Q] gives optically inactive reaction mixture  
 C) [P] and [Q] are position isomers  
 D) In [P] six C-H bonds which can involve in hyper conjugation

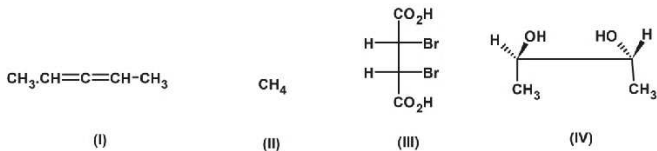
3. Choose the **CORRECT** statement(s) about [R]



- A) [R] is less basic than [P]  
 B) [R] is more reactive than benzophenone towards nucleophilic addition reaction  
 C) Instead of [P] if we use excess aniline product will be urea derivative  
 D) [Q] can be obtained by treating chloroform with air in presence of light
4. In the given structures P, Q, R and S the structure(s) is/are showing optical isomerism



- A) P                      B) Q                      C) R                      D) S
5. The compound(s) having  $C_2$ -axis of symmetry is/are



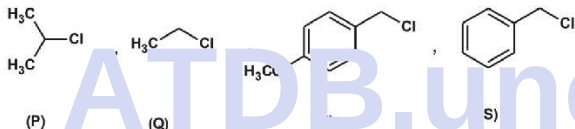
- A) I, II, III                      B) III, IV                      C) I, II, IV                      D) II, III, IV

6. The product **P** in the reaction:



- A) CC(C)c1ccccc1      B) O=Cc1ccc(OC)cc1      C) OC(=O)c1ccc(OC)cc1      D) CC(=O)c1ccc(O)cc1

7. Increasing order of reactivity of the following compounds for  $S_N1$  substitution is



- A)  $Q < R < S < P$       B)  $Q < R < P < S$   
 C)  $Q < P < S < R$       D)  $P < Q < S < R$

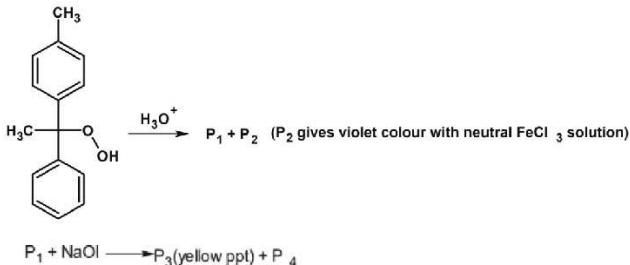
- 8.



Which of the following reagents can bring the above transformation in good yield?

- A) NaBH4 /  $H^+$       B) LiAlH4 /  $H^+$       C) H2; Pd/C      D) CH3MgBr /  $H^+$

9. **CORRECT** statement for the below sequence is/are



**CORRECT** statement for the above sequence is

- A) P<sub>3</sub> On reaction with Ag gives acetylene  
 B) P<sub>4</sub> On reaction with sodalime gives toluene  
 C) P<sub>4</sub> On reaction with sodalime gives benzene  
 D) P<sub>1</sub> On reaction with 2, 4-DNPH gives coloured compound

**SECTION- II**  
**(NUMERICAL VALUE)**

The answer to each question is a **NUMERICAL VALUE**

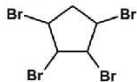
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

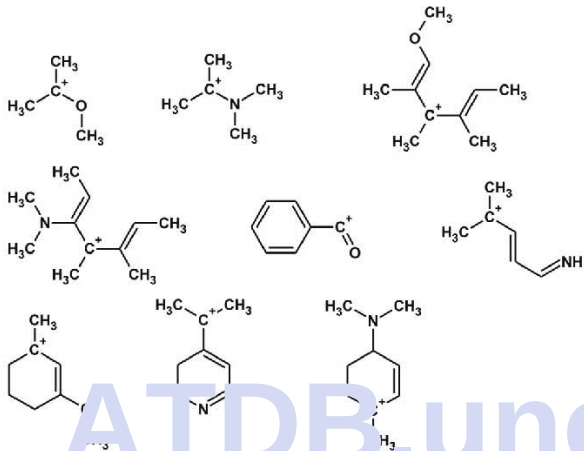
**Full Marks:** +3 If **ONLY** the correct numerical value is entered as answer.

**Zero Marks:** 0 in all other cases.

10. Find the number of geometrical isomers of



11. How many of the following ion(s) has/have at least one canonical structure in which all atoms (except hydrogen) has their octet complete?



12. Total number of benzenoid isomer of molecular formula  $C_6H_3Cl_3$  possible is

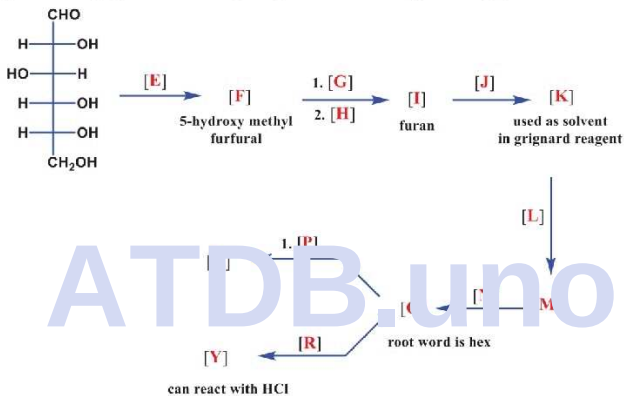
**SECTION – III**  
**(COMPREHENSION TYPE)**

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme:** +3 for correct answer, 0 if not attempted and -1 in all other cases.

**Paragraph For Questions 13 TO 16**

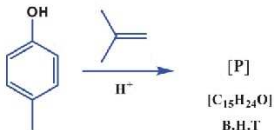
The two monomers [X] and [Y] for the synthesis of nylon 6,6 can be prepared from glucose supply the necessary reagents and identify missing products



13. Choose the **CORRECT** option
- A) [E] can be con  $\text{H}_2\text{SO}_4$  and the reaction is dehydration  
 B) Oxygen atom in [I] is more basic than [K]  
 C) [G] is PCC and [H] is sodalime heat  
 D) [F] can give fehilings test
14. Choose the **CORRECT** option
- A) [J] can be  $\text{H}_2$  / Pd-BaSO<sub>4</sub>& quinolone  
 B) [L] can be con HBr  
 C) [N] can bc AgCN  
 D) All



15. Choose the **CORRECT** option
- A) [P] is  $\text{SnCl}_2 + \text{dil HCl}$
- B) [R] can be  $\text{NaBH}_4$
- C) condition [J] can be used instead of [R]
- D) All
16. **CORRECT** option(s) regarding [P] is/are



- A) [P] can react with  $\text{dilNaOH}$
- B) [P] can respond to neutral  $\text{FeCl}_3$  test
- C) Number of different types of protons in [P] is 5
- D) Alkylation takes place on oxygen

### ANSWERS

|             |           |            |             |          |          |          |            |            |          |
|-------------|-----------|------------|-------------|----------|----------|----------|------------|------------|----------|
| 1           | 2         | 3          | 4           | 5        | 6        | 7        | 8          | 9          | 10       |
| <b>ABCD</b> | <b>BC</b> | <b>ACD</b> | <b>ABCD</b> | <b>C</b> | <b>D</b> | <b>C</b> | <b>ABC</b> | <b>ACD</b> | <b>6</b> |
| 11          | 12        | 13         | 14          | 15       | 16       |          |            |            |          |
| <b>5</b>    | <b>3</b>  | <b>A</b>   | <b>B</b>    | <b>C</b> | <b>A</b> |          |            |            |          |

# PAPER-28

## SECTION- I

### (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks:** +4 If only (all) the correct option(s) is (are) chosen.

**Partial Marks:** +3 if all the four options are correct but **ONLY** three options are chosen.

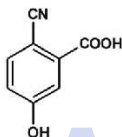
**Partial Marks:** +2 if three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

**Partial Marks:** +1 if two or more options are correct but **ONLY** one option is chosen and it is a correct option.

**Zero Marks:** 0 if none of the options is chosen (i.e. the question is unanswered).

**Negative Marks:** -2 in all other cases.

1.

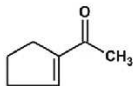


Correct IUPAC name is

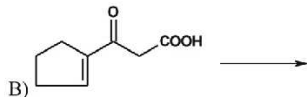
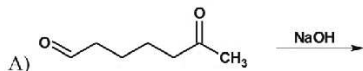
- A) 2-cyano-4-hydroxy benzene carboxylic acid  
B) 2-carboxy-4-hydroxy benzene carbonitrile  
C) 3-carboxy-4-cyano phenol  
D) 3-hydroxy-6-cyano benzene carboxylic acid

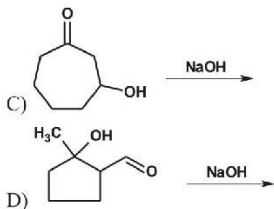
2.

Which of the following reaction(s) can produce



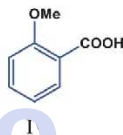
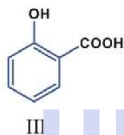
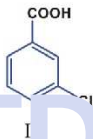
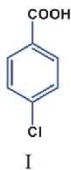
as one of the product?





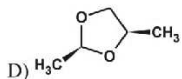
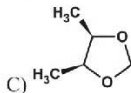
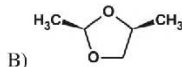
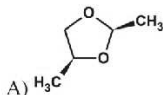
Isomers.

3. With respect to the compounds I-IV, Choose the **CORRECT** statements :



- A) +M effect of  $-\text{Cl}$  in case I, may cause the I to be weaker than II.  
 B)  $-\text{I}$  effect of  $-\text{Cl}$  in case I, may however, cause the I to be stronger than II  
 C) Intramolecular H-bonding operate in the undissociated acid III but not in (IV).  
 D) compound (I) become most acidic among, when it has  $-\text{Cl}$  at ortho instead of para position.

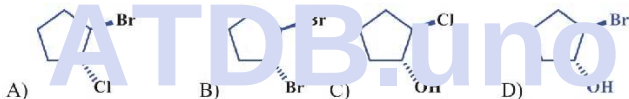
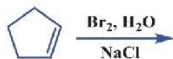
4. For the given structures, find the optically active structures:



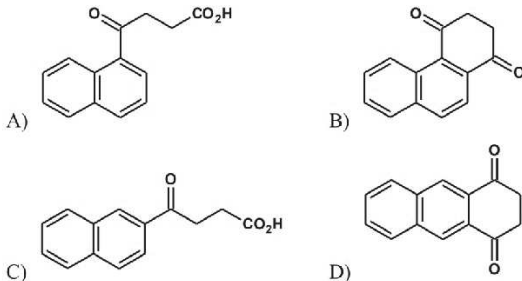
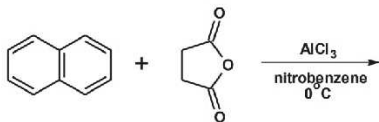
5. Choose the **CORRECT** statement(s) about the following two alkenes is/are



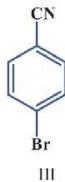
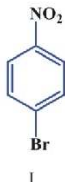
- A) Alkene [K] is more stable than alkene [L]  
 B) Hydrogenation of achiral alkene [K] will give chiral product  
 C) Hydrogenation of achiral alkene [L] will gives chiral product  
 D) The two alkenes [K] and [L] are structural isomers
6. The product(s) that can be formed in the given reaction is/are



7. Which is the most probable main product of the following reaction?



8. Select the **CORRECT** statement(s) regarding the given molecules?



- A) The rate difference between III and IV is more compare to I and II with NaOH  
 B) The rate difference between III and IV is less compare to I and II with NaOH  
 C) I and III react with same rate with NaOH  
 D) Resonance effect is more in I than II
9. Which among the following has/have lower boiling point than butan-1-ol  
 A) pentan-1-ol B) hexan-1-ol C) propan-1-ol D) ethanol

SECTION II  
(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

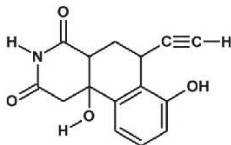
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks:** +3 If **ONLY** the correct numerical value is entered as answer.

**Zero Marks:** 0 in all other cases.

10. What is the net negative charge on the major product of the given species when it is treated with excess NaOH?



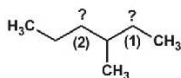
11. Construct-3-Ethyl-2,4,5-trimethylheptane by dragging the groups [M] and [N] to the question marks (?) 1 and 2.



[M]



[N]



Which question mark (1 or 2) position will be occupied by [M]

12. How many constitutional isomeric esters are possible with molecular formula  $C_4H_8O_2$ ?
13. How many of the following can show optical isomerism?

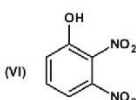
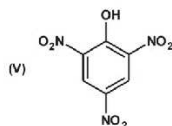
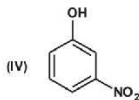
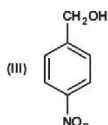
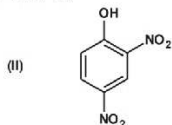
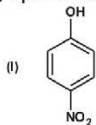


### SECTION - III (COMPREHENSION TYPE)

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme:** +3 for correct answer, 0 if not attempted and -1 in all other cases.

#### Paragraph For Questions 14& 15



14. The **CORRECT** order  $K_a$  value is:

- A) I > II > III      B) II > III > IV      C) IV > VI > V      D) V > VI > IV

15. Which of the following gives effervescence with  $\text{NaHCO}_3$ ?

- A) IV      B) III      C) V      D) All

**SECTION- IV**

**(MATRIX MATCH WITH NUMERICAL)**

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

**FOUR** options are given representing matching of elements from **LIST-I** and **LIST-II**.

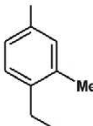
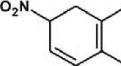
For each question, choose the option corresponding to the correct matching.

**Full Marks** : +3 If **ONLY** the option corresponding to the correct matching is chosen.

**Zero Marks** : 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks** : -1 in all other cases.

16. Match the column

|    | List-I<br>(Compound)                                                                |    | List-II<br>(Sum of position of substituent's) |
|----|-------------------------------------------------------------------------------------|----|-----------------------------------------------|
| P) |    | 1) | 7                                             |
| Q) |    | 2) | 10                                            |
| R) |   | 3) | 12                                            |
| S) |  | 4) | 8                                             |

Note: Correctly match P, Q, R, S with 1, 2, 3 & 4 and give your answer in integer values

If

|   |   |   |   |
|---|---|---|---|
| P | Q | R | S |
| 4 | 1 | 2 | 3 |

Then your answer is [4123]

### ANSWERS

|          |             |            |            |           |             |          |           |            |          |
|----------|-------------|------------|------------|-----------|-------------|----------|-----------|------------|----------|
| 1        | 2           | 3          | 4          | 5         | 6           | 7        | 8         | 9          | 10       |
| <b>A</b> | <b>ABCD</b> | <b>ACD</b> | <b>ABD</b> | <b>AD</b> | <b>ABD</b>  | <b>A</b> | <b>BD</b> | <b>BCD</b> | <b>2</b> |
| 11       | 12          | 13         | 14         | 15        | 16          |          |           |            |          |
| <b>2</b> | <b>4</b>    | <b>3</b>   | <b>D</b>   | <b>C</b>  | <b>2314</b> |          |           |            |          |

ATDB.uno



# PAPER-29

## SECTION - I (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks:** +4 If only (all) the correct option(s) is (are) chosen.

**Partial Marks:** +3 If all the four options are correct but **ONLY** three options are chosen.

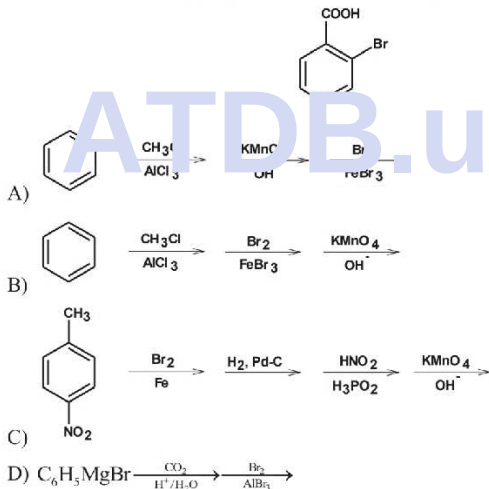
**Partial Marks:** +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

**Partial Marks:** +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

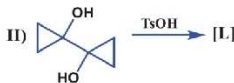
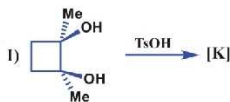
**Zero Marks:** 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks:** -2 In all other cases.

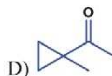
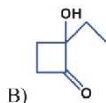
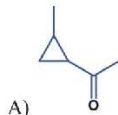
1. Which of the following sequence of reactions can give as major product?



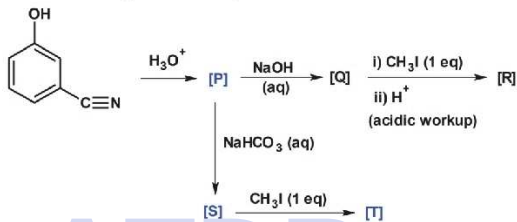
2. Consider the following two compounds-



Choose the **CORRECT** statement(s)



3. In the following reaction sequence, the **CORRECT** statement(s) is/are



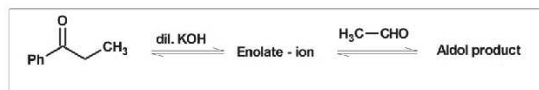
A) **R** gives violet color with neutral  $\text{FeCl}_3$

B) **R** can evolve  $\text{CO}_2$  gas with  $\text{Na}_2\text{CO}_3$

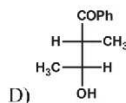
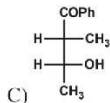
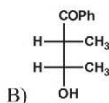
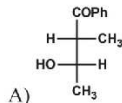
C) **R** and **T** are functional isomers

D) **T** is more acidic than **R**

4.



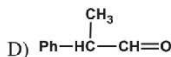
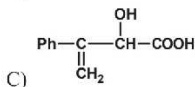
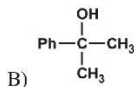
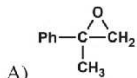
Identify the Aldol product(s) is/are



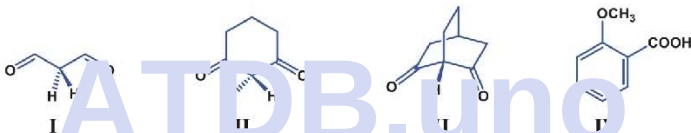


5.

The predominant product is



6. Consider the following four compounds,



A) Compounds I, II, III and IV are readily soluble in NaOH (aq).

B) Compounds I, II and III are not soluble in water.

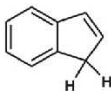
C) Compounds I and II only give a red color with  $\text{FeCl}_3$

D) Compounds I and II only give sweet smell colorless liquid with (aq) Bleaching powder.

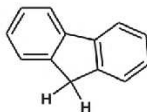
7. The **CORRECT** order of acidity of the following compounds



(x)



(y)



(z)

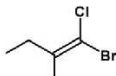
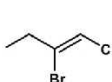
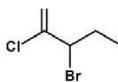
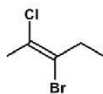
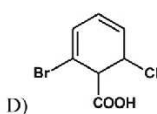
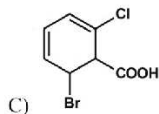
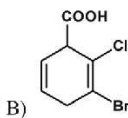
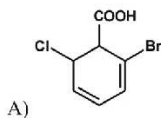
A)  $x > y > z$

B)  $z > y > x$

C)  $x > z > y$

D)  $z > y > x$

8. What is **CORRECT** structure of "6-bromo-2-chlorocyclohexa-2,4-dienecarboxylic acid"



9.

- A) I, II are position isomers. B) I, III are chain isomers.  
C) III, IV are position isomers. D) I, IV are chain isomers.

### SECTION- II (NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

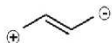
**Full Marks:** +3 If **ONLY** the correct numerical value is entered as answer.

**Zero Marks:** 0 in all other cases.

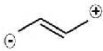
10. Which structure(s) is NOT the correct canonical structure(s) of others? (just write the number)



(I)



(II)



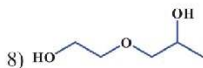
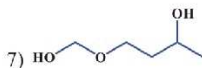
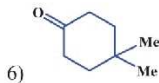
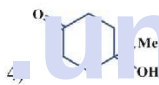
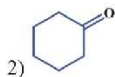
(III)



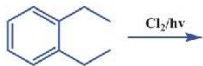
(IV)

11. Each of these compounds is a hemiacetal and therefore formed from an alcohol and a carbonyl compound. In each case select the carbonyl and alcohol compound from the list at the bottom. The sum of the numbers assigned to A, B, C and D?

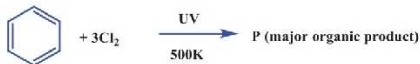
|   | Hemiacetals | Carbonyls | Alcohols |
|---|-------------|-----------|----------|
| 1 |             | A         |          |
| 2 |             |           | B        |
| 3 |             | C         |          |
| 4 |             |           | D        |



12. If X is the number of dichloro derivatives of the given reaction, then what is X/6



13. If X is the total number of stereo isomers of the PY is the number of optically active stereo isomers of product P Then what is X/Y



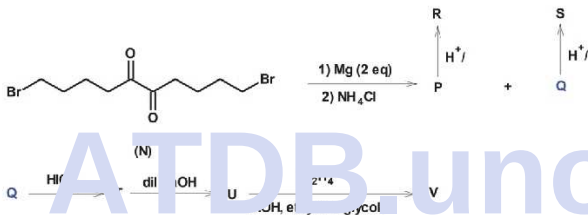
**SECTION – III**  
**(COMPREHENSION TYPE)**

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

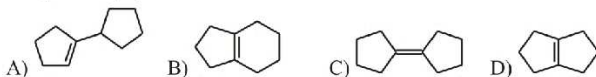
**Marking scheme:** +3 for correct answer, 0 if not attempted and -1 in all other cases.

**Paragraph For Questions 14& 15**

The reaction of compound **N** with  $\text{Mg}(2\text{eq})$  in  $(\text{C}_2\text{H}_5)_2\text{O}$  followed by addition of  $\text{NH}_4\text{Cl}$  gives **P** and **Q**. **P** and **Q** are constitutional isomers. The compound **P** and **Q** possess same molecular formula. The compound **Q** on treatment with  $\text{HIO}_4$  gives **T**. The reaction of **T** with  $\text{dil NaOH} / \Delta$  produces **U** which on reduction by  $\text{NH}_2 - \text{NH}_2 / \text{KOH}$ , Ethylene glycol gives **V**.



14. Relation between **[R]** and **[S]** is  
 A) Enantiomer    B) Diastereomer    C) Identical    D) Structural isomers
15. The product **[V]** is



**SECTION- IV**  
**(MATRIX MATCH)**

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

**FOUR** options are given representing matching of elements from **LIST-I** and **LIST-II**.

For each question, choose the option corresponding to the correct matching.

For each question, choose the option corresponding to the correct matching.

**Full Marks** : +3 if **ONLY** the option corresponding to the correct matching is chosen.

**Zero Marks** : 0 if none of the options is chosen (i.e. the question is unanswered).

**Negative Marks** : -1 in all other cases.

16. Match each of the following transformation to the correct reaction properties.

| Column-I |  | Column-II |  |
|----------|--|-----------|--|
| P)       |  | 1)        |  |
| Q)       |  | 2)        |  |
| R)       |  | 3)        |  |
| S)       |  | 4)        |  |

A) P-4, Q-2, R-1, S-3

B) P-1, Q-2, R-3, S-4

C) P-1,4, Q-2, R-none, S-3

D) P-4, Q-2, R-3, S-1

**ANSWERS**

|           |             |              |             |          |            |          |          |           |          |
|-----------|-------------|--------------|-------------|----------|------------|----------|----------|-----------|----------|
| 1         | 2           | 3            | 4           | 5        | 6          | 7        | 8        | 9         | 10       |
| <b>BC</b> | <b>BD</b>   | <b>BC</b>    | <b>ABCD</b> | <b>D</b> | <b>BCD</b> | <b>A</b> | <b>C</b> | <b>AD</b> | <b>4</b> |
| 11        | 12          | 13           | 14          | 15       | 16         |          |          |           |          |
| <b>9</b>  | <b>1.66</b> | <b>1.125</b> | <b>C</b>    | <b>C</b> | <b>A</b>   |          |          |           |          |

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# PAPER-30

## SECTION- I

### (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks :** +4 If only (all) the correct option(s) is (are) chosen.

**Partial Marks:** +3 If all the four options are correct but **ONLY** three options are chosen.

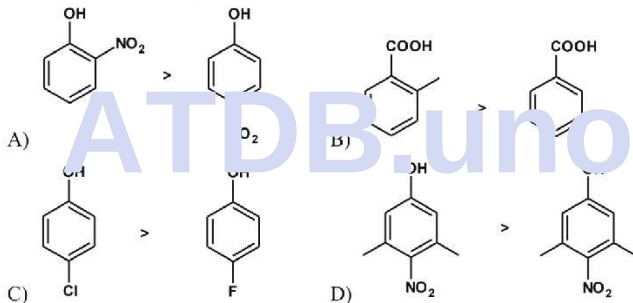
**Partial Marks:** +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

**Partial Marks :** +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

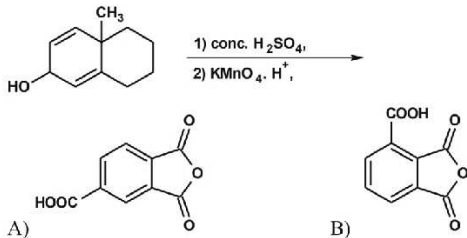
**Zero Marks :** 0 If none of the options is chosen (i.e. the question is unanswered).

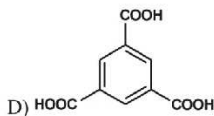
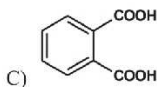
**Negative Marks:** -2 In all other cases.

1. Which of the following are **CORRECT** order of acidic strength

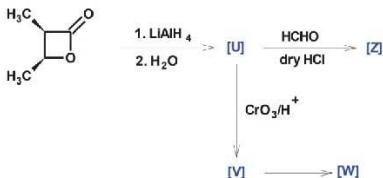


2. The final major product obtained in the following reaction is \_\_





3.



Identify the **CORRECT** statement(s)

A) [U] is optically inactive

B) [V] gives effervescent reaction with  $\text{NaHCO}_3$

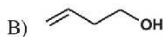
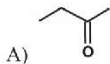
C) Molecular formula of [Z] is  $\text{C}_6\text{H}_{12}\text{O}_2$

D) [W] give iodoform test

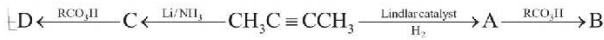
4. Two unknown compounds (A) & (B), both having molecular formula  $\text{C}_4\text{H}_8\text{O}$ , give following results with four chemical tests.

| Compound | $\text{Br}_2$ in $\text{CCl}_4$ | Na metal    | Chromic acid<br>[ $\text{CrO}_3, \text{H}_2\text{O} + \text{acetone}$ ] | Lucas reagent |
|----------|---------------------------------|-------------|-------------------------------------------------------------------------|---------------|
| (A)      | Decolourises                    | Bubbles     | Orange to green                                                         | No turbidity  |
| (B)      | No reaction                     | No reaction | No reaction                                                             | No turbidity  |

Compound (A) will be

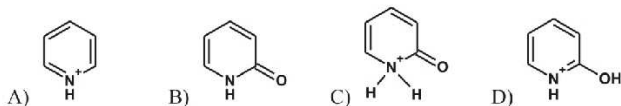


5. Identify **A**, **B**, **C** and **D** in the following

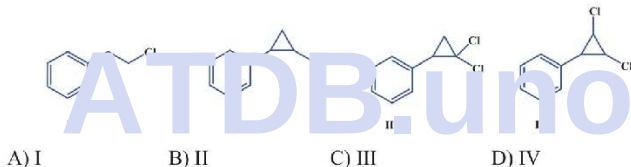


- A) **D** is Cis      B) **D** is trans      C) **B** is Cis      D) **B** is trans

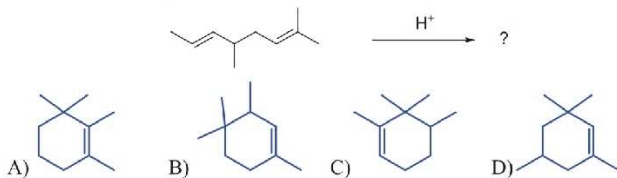
6. Which of (a)-(d) is not aromatic?



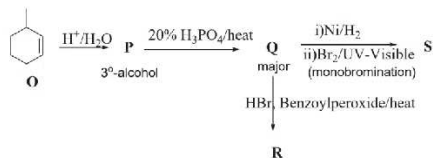
7. The product formed when styrene in  $\text{CHCl}_3$  is mixed with *aq.* NaOH and tetrabutyl ammonium chloride, is (Where  $\text{Bu}_4\text{N}^+\text{Cl}^-$  acts as phase transfer catalyst)



8. Predict the major product of the following reaction

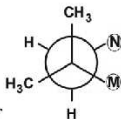


- 9.



Choose the **CORRECT** statements for the above reaction scheme.

- A) The products **R** and **S** are identical
- B) The compounds **O** and **Q** are positional isomers
- C) When the compound **R** is treated with *tert*-butoxide, **O** is formed as major product
- D) The compound **R** is 3°-halide



10. If \_\_\_\_\_ is structural isomer of n-pentane then possible values of M and N are

- A)  $\text{CH}_3$ , H
- B) H,  $\text{CH}_3$
- C)  $\text{CH}_3$ , Et
- D) Et, H

## SECTION - II

### NUMERICAL VALUE

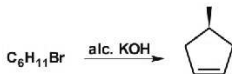
The answer to each question is a NUMERICAL VALUE (integer, decimal fraction, truncated/truncated off to the second decimal place; e.g. 6.25, 7.00, 30.27, 30.273, 127.3). Designated space to enter the answer.

Answer to each question will be evaluated according to the following marking scheme.

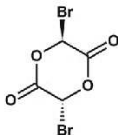
**Full Marks:** +3 If **ONLY** the correct numerical value is entered as answer.

**Zero Marks:** 0 in all other cases.

11. Find the total number of cyclic halide of molecular formula  $\text{C}_6\text{H}_7\text{Br}$ , which on heating with ethanolic KOH give product **[R]** by  $\text{E}_2$  reaction: (Anti-elimination)



12. Number of pair of enantiomers possible for bromochlorocyclopentane of x. Number of pair of enantiomers possible for chlorofluorocyclobutane of y. then find out the value of  $x + y$ .
13. The optical rotation of the given compound is

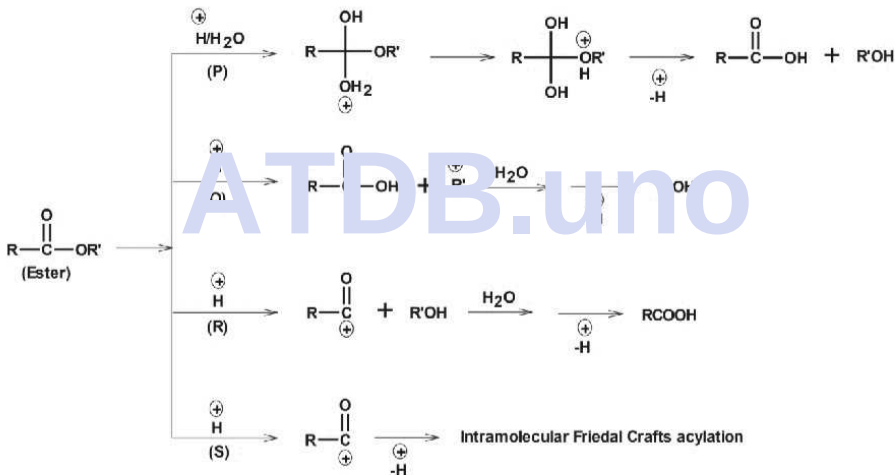


**SECTION – III**  
**(COMPREHENSION TYPE)**

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme:** +3 for correct answer, 0 if not attempted and -1 in all other cases.

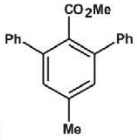
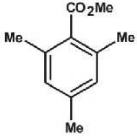
**Paragraph For Questions 14& 15**

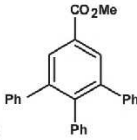
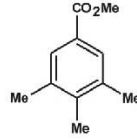


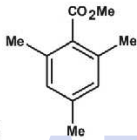
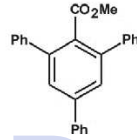
14. Identify the suitable reactant(s) for pathway [P] and [Q]:

- A)  $\text{CH}_3\text{CO}_2\text{C}_2\text{H}_5$  [P],  $\text{Me}_3\text{C}.\text{CO}_2\text{CH}_3$  [Q]  
 B)  $\text{CH}_3\text{CO}_2.\text{CMc}_3$  [P],  $\text{CH}_3\text{CO}_2.\text{C}_2\text{H}_5$  [Q]  
 C)  $\text{CH}_3\text{CO}_2.\text{C}_2\text{H}_5$  [P],  $\text{CH}_3\text{CO}_2.\text{CMc}_3$  [Q]  
 D)  $\text{Me}_3\text{C}.\text{CO}_2\text{CH}_3$  [P],  $\text{CH}_3\text{CO}_2.\text{CMc}_3$  [Q]

15. Identify the suitable reactant(s) for pathway [R] and [S]:

B)  [R] ,  [S]

C)  [R] ,  [S]

D)  [R] ,  [S]

SECTION - IV  
(MATCHING TYPE)

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

**FOUR** options are given representing matching of elements from **LIST-I** and **LIST-II**.

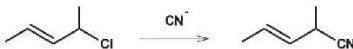
For each question, choose the option corresponding to the correct matching.

**Full Marks** : +3 If **ONLY** the option corresponding to the correct matching is chosen.

**Zero Marks** : 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks** : -1 in all other cases.

16. Match the entries on the left with most appropriate choice given on the right. Select the correct answer using the codes given below.

| Column I (reaction ) |                                                                                     | Column II (product) |                 |
|----------------------|-------------------------------------------------------------------------------------|---------------------|-----------------|
| P)                   | Dehalogenation of meso-2, 3-dibromobutane                                           | 1)                  | SN <sup>2</sup> |
| Q)                   | Dehalogenation of threo-2, 3-dibromobutane                                          | 2)                  | Cis-2-butene    |
| R)                   | Hydrolysis of 2-bromo-3-methylbutane                                                | 3)                  | SN <sup>1</sup> |
| S)                   |  | 4)                  | Trans-2-butene  |

A) P-2, Q-4, R-1, S-3

B) P-2, Q-4, R-3, S-1

C) P-4, Q-3, R-2, S-1

D) P-4, Q-2, R-3, S-1

### ANSWERS

|           |          |            |          |           |          |          |          |           |           |
|-----------|----------|------------|----------|-----------|----------|----------|----------|-----------|-----------|
| 1         | 2        | 3          | 4        | 5         | 6        | 7        | 8        | 9         | 10        |
| <b>BC</b> | <b>B</b> | <b>BCD</b> | <b>B</b> | <b>BC</b> | <b>C</b> | <b>C</b> | <b>B</b> | <b>BC</b> | <b>AB</b> |
| 11        | 12       | 13         | 14       | 15        | 16       |          |          |           |           |
| <b>4</b>  | <b>6</b> | <b>0</b>   | <b>C</b> | <b>D</b>  | <b>D</b> |          |          |           |           |

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# PAPER-31

## SECTION- I (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks:** +4 If only (all) the correct option(s) is (are) chosen.

**Partial Marks:** +3 If all the four options are correct but **ONLY** three options are chosen.

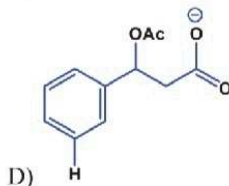
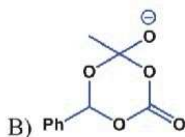
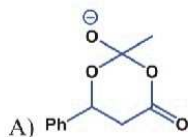
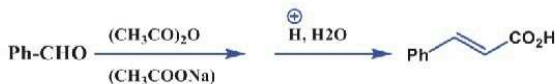
**Partial Marks:** +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

**Partial Marks:** +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

**Zero Marks:** 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks:** -2 In all other cases.

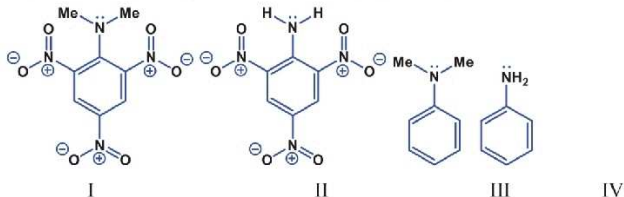
1. Consider the following reaction named **PERKIN** Reaction. Choose the correct intermediate (S) –



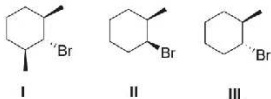
2. The compound(s) having all atoms in a "PLANE" in all conformation is/are
- A) But-1-ene                      B) But-1-ene-3-yne



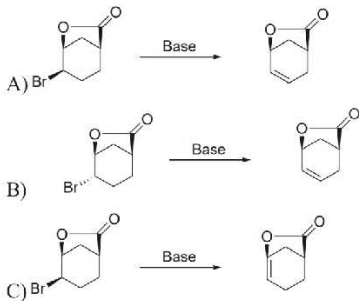
3. Consider the following four compounds I, II, III and IV

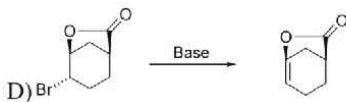


- A) The difference in magnitude of  $\text{PK}_b$  of III and IV is smaller than I and II.
- B) Mesomeric shift of unshared  $e^-$  pair on  $\text{NMe}_2$  to the oxygen atoms of the  $\text{NO}_2$  group is inhibited.
- C) The base weakening influence of three nitro groups is conformed essentially to their inductive effects
- D) The order of basicity is  $\text{III} > \text{I} > \text{II} > \text{IV}$ .
4. **INCORRECT** order regarding ease of  $\alpha$ -dehydrohalogenation in the presence of strong base of the following substrates is

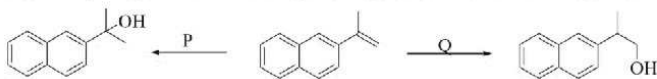


- A)  $\text{I} > \text{II} > \text{III}$       B)  $\text{III} > \text{II} > \text{I}$       C)  $\text{II} > \text{I} > \text{III}$       D)  $\text{II} > \text{III} > \text{I}$
5. Identify the **CORRECT** reactions among the following





6. Fill the missing reagents, from the options given, for the following reaction schemes



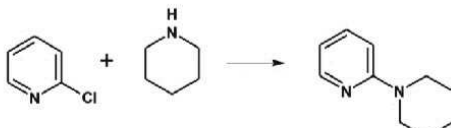
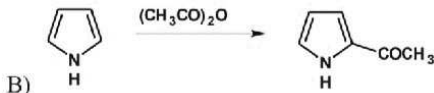
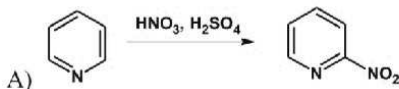
Scheme:1



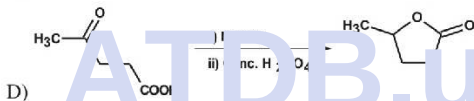
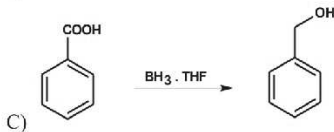
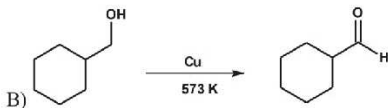
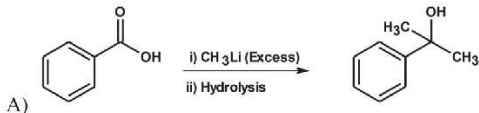
Scheme:2

- A) P =  $\text{H}^+/\text{H}_2\text{O}$ ; Q =  $\text{Hg}(\text{OAc})_2\text{-H}_2\text{O}/\text{NaBH}_4$   
 B) R =  $\text{OsO}_4/\text{NaHSO}_3$ ; S = m-CPBA/  $\text{H}^+/\text{H}_2\text{O}$   
 C) P =  $\text{Hg}(\text{OAc})_2\text{-H}_2\text{O}/\text{NaBH}_4$ ; Q =  $\text{B}_2\text{H}_6/\text{H}_2\text{O}_2\text{-OH}^-$   
 D) P =  $\text{H}^+/\text{H}_2\text{O}$ ; Q =  $\text{B}_2\text{H}_6/\text{H}_2\text{O}_2\text{-OH}^-$

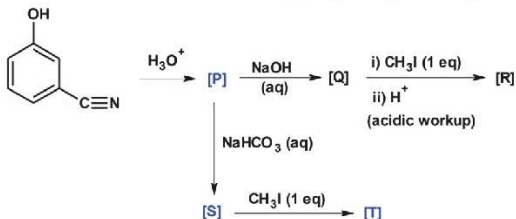
7. Which of the following equations shows an unlikely result?



8. Which of the following reaction(s) is (are) **CORRECT**?



9. Choose the **CORRECT** statement(s) regarding following reaction sequence

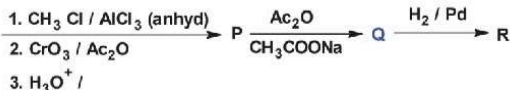


A) [P] and [R] can be distinguished by Fehlings solution.

B) [R] is more acidic than [P].

C) Both [P] and [R] are soluble in (aq) NaOH.

D) [P] is the monomer of Novolac and Dacron.



10.

Which of the following option(s) is/are **CORRECT** ?

- A) Q gives Tollen's test but not iodoform test.
- B) Q is more reactive towards electrophilic aromatic substitution than benzene
- C) R has degree of unsaturation 4
- D) P does not give positive Fehling test.

**SECTION - II**  
(NUMERICAL VALUE)

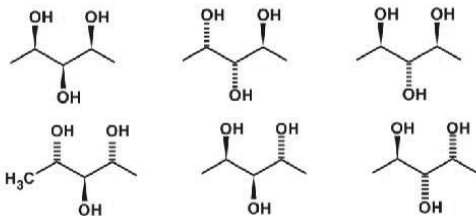
The answer to each question is a NUMERICAL VALUE (Not in Words). For each question, enter the correct numerical value in the box provided, rounded off to the second decimal place; e.g. 6.25, 7.00, -0.33, -30, 30.27, -127.30 designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks:** +3 If **ONLY** the correct numerical value is entered as answer.

**Zero Marks:** 0 in all other cases.

11. How many of the given isomers of the molecular formula  $\text{C}_5\text{H}_{12}\text{O}_3$  show  $0^\circ$  optical rotation



12. How many isomeric chiral alkanes are possible of lowest molecular mass following the formula  $\text{C}_n\text{H}_{2n+2}$ ?

13. Find total canonical structures of

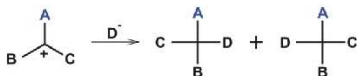
**SECTION - III**  
**(COMPREHENSION TYPE)**

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

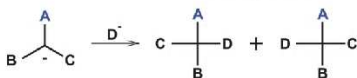
**Marking scheme:** +3 for correct answer, 0 if not attempted and -1 in all other cases.

**Paragraph for Questions 14 to 16**

Answer Q.14, Q.15 and Q.16 by appropriately matching the information given below.



racemic mixture



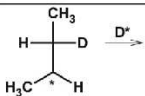
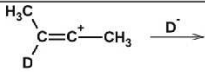
racemic mixture



racemic mixture

Do not consider rearrangements if possible for given intermediate in column-I. consider the given information and solve the given problems.

|      | Column-I                                                                                                                                           |      | Column-II<br>(Regarding<br>reactant)   |     | Column-III                     |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------------------------------|-----|--------------------------------|
| (I)  | $\begin{array}{c} \text{CH}_3 \\   \\ \text{H} - \text{C} - \text{D} \\   \\ \text{H}_3\text{C}^+ - \text{H} \end{array} \xrightarrow{\text{D}^-}$ | (i)  | Can be stabilized by inductive effect  | (P) | Racemic mixture will be formed |
| (II) | $\begin{array}{c} \text{CH}_3 \\   \\ \text{H} - \text{C} - \text{D} \\   \\ \text{H}_3\text{C}^- - \text{H} \end{array} \xrightarrow{\text{D}^+}$ | (ii) | Can be stabilized by hyper conjugation | (Q) | Meso is one of the product     |

|       |                                                                                   |       |                                  |     |                                        |
|-------|-----------------------------------------------------------------------------------|-------|----------------------------------|-----|----------------------------------------|
| (III) |   | (iii) | Destabilized by inductive effect | (R) | Diastereomeric mixture will be formed  |
| (IV)  |  | (iv)  | Sp hybridized carbon atom        | (S) | One of the product is optically active |

14. Which of the following option is **CORRECT**?

- A) I-iii-Q      B) II-ii-P      C) III-iii-P      D) IV-iv-R

15. Which of the following option is **INCORRECT**?

- A) I-i-s      B) II-iii-Q      C) III-ii-R      D) IV-iii-R

16. Which of the following option is **CORRECT**?

- A) I-iv-      B) II- -R      C) II-ii-S      D) IV-i-C

### ANSWERS

|            |           |            |            |          |            |           |            |            |          |
|------------|-----------|------------|------------|----------|------------|-----------|------------|------------|----------|
| 1          | 2         | 3          | 4          | 5        | 6          | 7         | 8          | 9          | 10       |
| <b>ACD</b> | <b>BD</b> | <b>ABC</b> | <b>ABC</b> | <b>B</b> | <b>BCD</b> | <b>AC</b> | <b>BCD</b> | <b>ABC</b> | <b>D</b> |
| 11         | 12        | 13         | 14         | 15       | 16         |           |            |            |          |
| <b>3</b>   | <b>4</b>  | <b>7</b>   | <b>D</b>   | <b>D</b> | <b>C</b>   |           |            |            |          |

# PAPER-33

## SECTION - I

### (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks:** +4 If only (all) the correct option(s) is (are) chosen.

**Partial Marks:** +3 If all the four options are correct but **ONLY** three options are chosen.

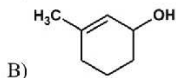
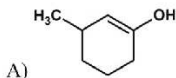
**Partial Marks:** +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

**Partial Marks:** +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

**Zero Marks:** 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks:** -2 In all other cases.

1. Which of the following is/are 3-methylcyclohex-3-enol?



C)

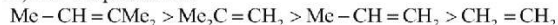
D)

2. On increasing temperature, dipole moment of 1,2-dichloro ethane is

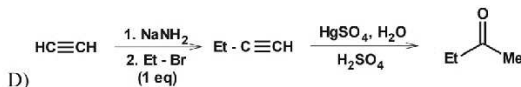
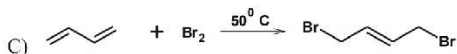
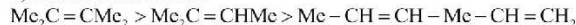
A) Increases      B) decreases      C) remains constant      D) None

3. Which of the following is/are **CORRECT** statement(s)?

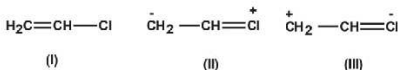
A) rate of epoxidation:



B) Rate of bromination :

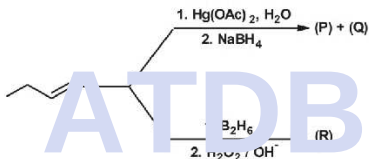


4. Compounds which are more reactive than benzene towards nitration are  
 A) Toulene      B) Pyridine      C) Pyrrole      D) Nitrosobenzene
5. Arrange the contributing resonance structures of vinyl chloride,  $\text{CH}_2 = \text{CH} - \text{Cl}$  in order of decreasing stability \_\_\_\_



- A) I > II > III      B) I > III > II      C) II > III > I      D) III > II > I

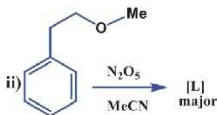
6.



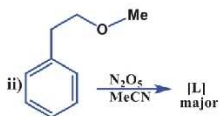
The **CORRECT** option regarding above reaction is/are

(Given: (P), (Q) & (R) are organic products)

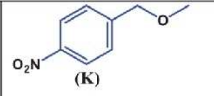
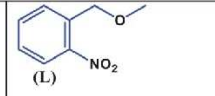
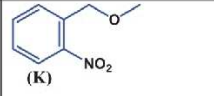
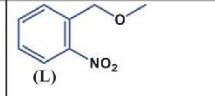
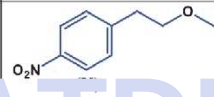
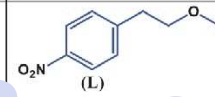
- A)  $\text{H}_2\text{O} > (\text{R}) > (\text{P})$  (Acidic strength)
- B)  $(\text{P}) > (\text{R})$  (Rate of dehydration)
- C) All (P), (Q) and (R) give same major product with Lucas Reagent.
- D) All (P), (Q) & (R) react with Lucas reagent at the same rate.
7. Consider the following reaction-







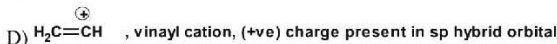
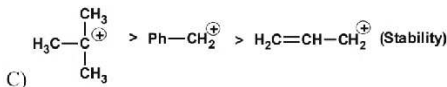
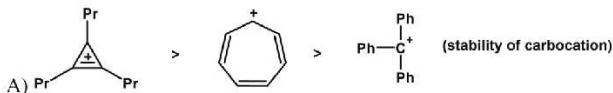
Identify K & L -

|    |                                                                                          |                                                                                          |
|----|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| A) | <br>(K) | <br>(L) |
| B) | <br>(K) | <br>(L) |
| C) | <br>(K) | <br>(L) |

8. Which of the following statements are true about the major product (X) in the reaction?



- A) X is a cyclic amide  
 B) X has a chiral carbon  
 C) X is a primary amine  
 D) X give foul smell after reaction with  $\text{CHCl}_3$  and NaOH.
9. Which of the following statements is /are **CORRECT**



## SECTION- II (NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**;

e.g. 6.25, 7.00, -0.30, 30.22, 127.30) as the answer.

Answer to each question will be evaluated according to the following marking scheme.

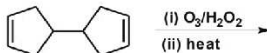
**Full Marks:** +5 ONLY a correct numerical value is entered as answer.

**Zero Marks:** 0 if all other cases.

10. How many statement(s) is/are **CORRECT** for methane ( $\text{CH}_4$ ) ?

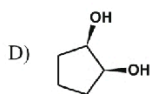
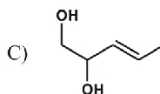
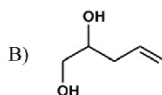
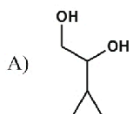
- i) It posses  $C_2$  axis of symmetry
- ii) It posses plane of symmetry
- iii) It posses centre of symmetry
- iv) It posses  $S_4$  alternate axis of symmetry

11. Number of moles of  $\text{CO}_2$  evolved during following reaction are



12. For a given molecule X is the number of stereo isomers Y is the optically inactive isomers then what is  $X/Y = ?$





ATDB.uno

**SECTION- IV**  
**(MATRIX MATCH)**

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

**FOUR** options are given representing matching of elements from **LIST-I** and **LIST-II**.

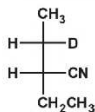
For each question, choose the option corresponding to the correct matching.

**Full Marks** : +3 If **ONLY** the option corresponding to the correct matching is chosen.

**Zero Marks** : 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks** : -1 in all other cases.

15. The Fischer projection of structure (**K**) is shown below.



[K]

Structure [K] and its structural isomers are listed as P, Q, R and S in column-I. choose the correct relationship of P, Q, R and S with [K] with column-II.

|    | Column-I |    | Column-II         |
|----|----------|----|-------------------|
| P) |          | 1) | Functional Isomer |
| Q) |          | 2) | Chain isomer      |
| R) |          | 3) | Identical         |

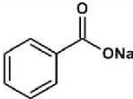
A) P-3; Q-2; R-1

B) P-2; Q-1; R-3

C) P-2; Q-3; R-1

D) P-3; Q-1; R-2

16. Match the following.

|    | Column-I<br>(Reaction conditions)                                                                                                                                                                                                                                                            |    | Column-II<br>(One of the possible product)                                        |
|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|-----------------------------------------------------------------------------------|
| A) |  $\xrightarrow[3) \text{ NaOI}]{1) \text{ H}_2\text{SO}_4, \text{ isomerisation)}$<br>$\xrightarrow[3) \text{ NaOI}]{2) \text{ O}_3, \text{ Zn}}$                                                           | P) | $\text{CHI}_3$                                                                    |
| B) |  $\xrightarrow[3) \text{ Ag}(\text{NH}_3)_2^+, \text{ OH}^-]{1) \text{ H}_2\text{SO}_4, \text{ isomerisation)}$<br>$\xrightarrow[3) \text{ Ag}(\text{NH}_3)_2^+, \text{ OH}^-]{2) \text{ O}_3, \text{ Zn}}$ | Q) |  |
| C) |  $\xrightarrow[3) \text{ NaOH, CaO}]{1) \text{ O}_3, \text{ Zn}}$<br>$\xrightarrow[3) \text{ NaOH, CaO}]{2) \text{ NaOI}}$                                                                                  | R) |  |
| D) |  $\xrightarrow[3) \text{ NaOI}]{1) \text{ H}_2\text{SO}_4, \text{ isomerisation)}$<br>$\xrightarrow[3) \text{ NaOI}]{2) \text{ O}_3, \text{ Zn}}$                                                           | S) | $\text{C}_6\text{H}_5\text{COONa}$                                                |

A) A-Q; B-S; C-R; D-P

B) A-P; B-R; C-S; D-Q

C) A-R; B-P; C-Q; D-S

D) A-P; B-R; C-Q; D-S

### ANSWERS

|          |            |             |           |          |           |          |            |            |          |
|----------|------------|-------------|-----------|----------|-----------|----------|------------|------------|----------|
| 1        | 2          | 3           | 4         | 5        | 6         | 7        | 8          | 9          | 10       |
| <b>C</b> | <b>A</b>   | <b>ABCD</b> | <b>AC</b> | <b>A</b> | <b>AB</b> | <b>D</b> | <b>BCD</b> | <b>ABC</b> | <b>3</b> |
| 11       | 12         | 13          | 14        | 15       | 16        | 17       | 18         | 19         | 20       |
| <b>2</b> | <b>1.5</b> | <b>C</b>    | <b>D</b>  | <b>A</b> | <b>A</b>  |          |            |            |          |

# PAPER-34

## SECTION- I

### (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks:** +4 If only (all) the correct option(s) is (are) chosen.

**Partial Marks:** +3 If all the four options are correct but **ONLY** three options are chosen.

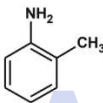
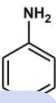
**Partial Marks:** +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

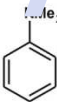
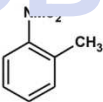
**Partial Marks:** +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

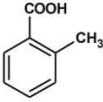
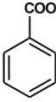
**Zero Marks:** 0 If none of the options is chosen (i.e. the question is unanswered).

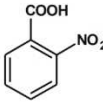
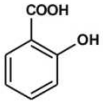
**Negative Marks:** -2 In all other cases.

1. Choose the **INCORRECT** options

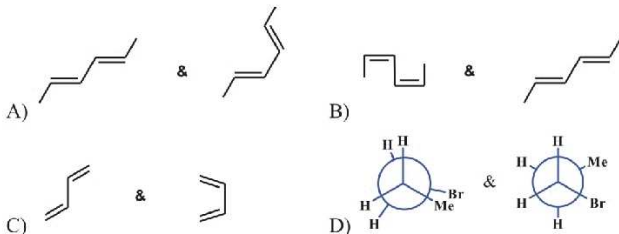
A)  is more basic than 

B)  is more basic than 

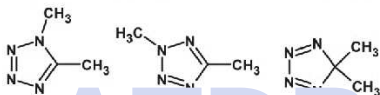
C)  is more acidic than 

D)  is more acidic than 

2. Which of the following is not a **CORRECT** conformer pair?

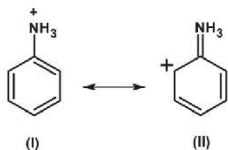


3. The **CORRECT** statement of the following structures is



- A) 1, 2, and 3 are resonance structures  
 B) 1 and 2 are resonance structures, whereas 3 is an isomer of 1 and 2  
 C) 1 and 3 are resonance structures, whereas 2 is an isomer of 1 and 3  
 D) 1, 2, and 3 are constitutional isomers

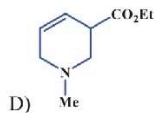
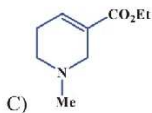
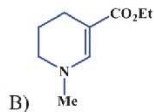
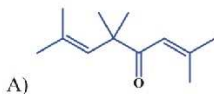
4. Choose the **CORRECT** statement from the ones given below for two anilines in



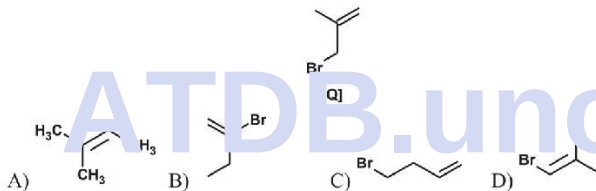
- A) II is NOT an acceptable canonical structure because carbonium ion is less stable than ammonium ion.  
 B) II is NOT an acceptable canonical structure because it is non-aromatic  
 C) II is NOT an acceptable canonical structure because the nitrogen has 10 valence electrons.  
 D) II is an acceptable canonical structure.



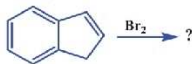
5. How many of three molecules are conjugated?



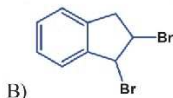
6. Which of the chain isomer of molecule [Q] is capable to show geometrical isomerism?



7. How would you expect the Hydrocarbon below to react with Bromine,  $\text{Br}_2$  ?



- A) Aromatic ring typically react by substitution



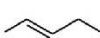
- C) Alkene reacts by Electrophilic addition



8. Find the **CORRECT** order of heat of combustion of isomeric pentenes



(P)



(Q)



(R)



(S)



(T)



(U)

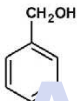
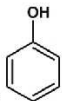
A)  $U > P > R$

B)  $Q > S > T$

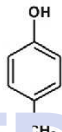
C)  $R > Q > S$

D)  $Q > R > S$

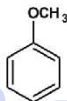
9. What is the next homologue of



A)



B)



C)



D)

(NUMERICAL VALUE)

The answer to each question is a **NUMERICAL VALUE**

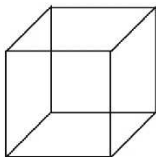
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

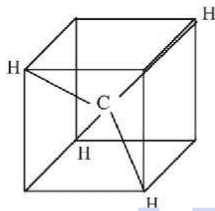
**Full Marks:** +3 If **ONLY** the correct numerical value is entered as answer.

**Zero Marks:** 0 in all other cases.

10. Calculate the total plane of symmetry in a cube, \_\_\_\_\_



11. An alkene  $C_nH_{2n}$  is converted by a reduction procedure to  $C_nH_{2n+2}$ . The % change in the molecular weight = 3.57. What is the value of  $n$ .
12. Consider the  $CH_4$  molecule in a cube as given below



Now calculate the total plan of symmetry possible in methane molecule.

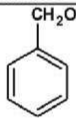
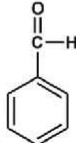
### SECTION - III (COMPREHENSION TYPE)

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme:** +3 for correct answer, 0 if not attempted and -1 in all other cases.

#### Paragraph for Questions 13 to 15

Answer Q, 13, Q, 14 and Q,15 by appropriately matching the information given in The three columns of the following table.

|      | Column-1                                                                                                                                                       | Column-2                                                                                 | Column-3                                                        |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-----------------------------------------------------------------|
| (I)  | <br>(i) $H_3C-CH_2-CH_2-Cl$ / Anhyd. $AlCl_3$<br>(ii) $O_2/h$<br>(iii) $H^+$ | (i)   | (P) Gives ppt. when treated with $Br_2 / H_2O$                  |
| (II) | <br>(i) $BuLi$<br>(ii) $H-\overset{O}{\parallel}C-H/H^+$<br>(iii) PCC        | (ii)  | (Q) Less reactive with nitrating mixture as compared to benzene |

|       |                                                                                                                                                                                                                       |       |                                                                                   |     |                                                       |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----------------------------------------------------------------------------------|-----|-------------------------------------------------------|
| (III) | <br>(i) $\text{BuLi}$<br>$\xrightarrow{\text{H}-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}/\text{H}^+}$<br>(iii) $\text{PCl}_5$ | (iii) |   | (R) | Gives turbidity with $\text{AgNO}_3$                  |
| (IV)  | <br>(i) $\text{CH}_3\text{Cl}/\text{AlCl}_3$<br>$\xrightarrow{\text{Cl}_2, \text{h}}$ (monochlorination)<br>(iii) $\text{NaOH}$      | (iv)  |  | (S) | Gives turbidity with conc. $\text{HCl}/\text{ZnCl}_2$ |

Assuming hydrogen of benzene ring is acidic enough to react with Butyllithium, answer the following questions:

13. Which of the following combination is **CORRECT** for I?  
 A) (I) (ii) (R)      B) (I) (iii) (P)      C) (I) (ii) (P)      D) (I) (iii) (Q)
14. Which of the following combination is **CORRECT**?  
 A) (II) (ii) (Q)      B) (II) (iii) (X)      C) (III) (ii) (P)      D) (I) (ii) (Q)
15. Which of the following combination is **CORRECT** for VI?  
 A) (IV) (i) (S)      B) (IV) (iv) (R)      C) (IV) (i) (R)      D) (IV) (ii) (Q)

**SECTION- IV**  
**(MATRIX MATCH WITH NUMERICAL)**

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

**FOUR** options are given representing matching of elements from **LIST-I** and **LIST-II**.

For each question, choose the option corresponding to the correct matching.

**Full Marks** : +3 If **ONLY** the option corresponding to the correct matching is chosen.

**Zero Marks** : 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks** : -1 in all other cases.

16. Match the column

|    | List-I<br>(Compound) |    | List-II<br>(IUPAC names)               |
|----|----------------------|----|----------------------------------------|
| P) |                      | 1) | IUPAC name is 2-chloro cyclobutenol    |
| Q) |                      | 2) | IUPAC name is 3-chloro cyclobutenol    |
| R) |                      | 3) | IUPAC name is 4-chloro cyclobut-2-enol |
| S) |                      | 4) | IUPAC name is 1-chloro cyclobut-2-enol |

Note: Correctly match **P, Q, R, S** with 1, 2, 3 & 4 and give your answer in integer values

If

|   |   |   |   |
|---|---|---|---|
| P | Q | R | S |
| 4 | 1 | 2 | 3 |

Then your answer is [4123]

**ANSWERS**

|           |            |          |          |             |             |           |            |          |          |
|-----------|------------|----------|----------|-------------|-------------|-----------|------------|----------|----------|
| 1         | 2          | 3        | 4        | 5           | 6           | 7         | 8          | 9        | 10       |
| <b>AB</b> | <b>ACD</b> | <b>D</b> | <b>C</b> | <b>ABCD</b> | <b>A</b>    | <b>BC</b> | <b>ABC</b> | <b>B</b> | <b>9</b> |
| 11        | 12         | 13       | 14       | 15          | 16          |           |            |          |          |
| <b>4</b>  | <b>6</b>   | <b>B</b> | <b>A</b> | <b>A</b>    | <b>1234</b> |           |            |          |          |

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**SECTION - I****(ONE OR MORE THAN ONE)**

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks:** +4 If only (all) the correct option(s) is (are) chosen.

**Partial Marks:** +3 If all the four options are correct but **ONLY** three options are chosen.

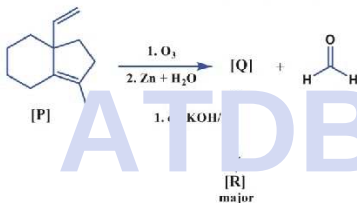
**Partial Marks:** +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

**Partial Marks:** +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

**Zero Marks:** 0 If none of the options is chosen (i.e. the question is unanswered).

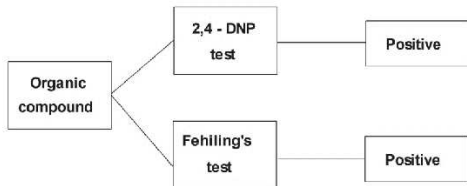
**Negative Marks:** -2 In all other cases.

1. Choose the **CORRECT** option(s) regarding the given reaction scheme



- A) Compound [R] can respond to positive 2,4-DNP test as well as positive tollen's test  
 B) Compound [R] can respond to positive 2,4-DNP test and negative tollen's test  
 C) Degree of unsaturation in [R] is same as [P]  
 D) [Q] and [R] can show Iodoform test

2.

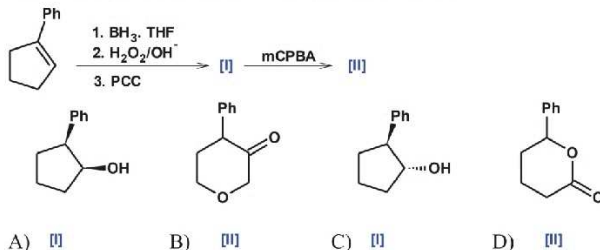


How many among the following compounds will given the above result?

- i. cyclohexanone    ii. acetone    iii. propionaldehyde

- iv. acetophenone    v. acetaldehyde    vi. Benzophenone    vii. Benzaldehyde  
 A) 2                      B) 3                      C) 4                      D) 5

3. The product(s) formed in the following reaction is/are:

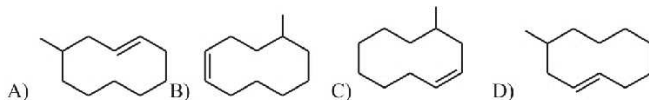


4. Consider major path in each stage



'P' is

- A) [P] can be 3,3-dimethyl-1-pentyne  
 B) [P] can be 3,3-dimethyl-1-butyne  
 C) [P] 2-hexyne  
 D) [P] 3-methyl-1-butyne
5. In the given four structures, identify the non-stereo isomeric structure



6. Choose the **CORRECT** option(s) regarding the given reaction below





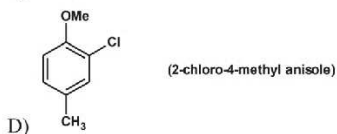
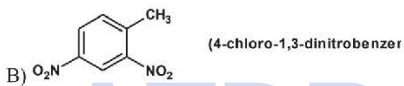
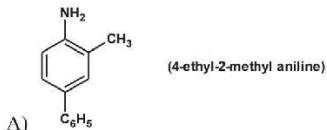
A) compound [Q] can show tautomerism

B) [P] and [Q] both can show tollen's test

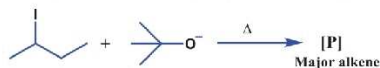
C) [Q] upon treatment  $D_3O^+$  gives [R] which contains 4 deuterium atoms

D) [Q] up on treatment with  $CH_3MgBr$  followed by heat with conc.  $H_2SO_4$  gives aromatic compounds

7. Which of the following is/are "NOT" correctly matched?



8. Choose the **CORRECT** option(s) among the following about [P]



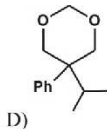
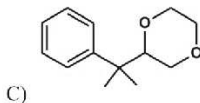
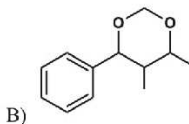
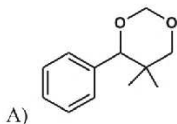
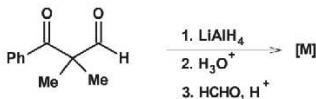
A) In [P] is a two  $C-H$  bonds which can involve in hyper conjugation

B) [P] cannot show stereo isomerism

C) [P] upon hydrogenation gives mainly n-butane

D) Mono chlorination of [P] gives 3

9. Identify the product [M]:



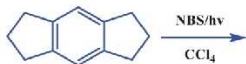
The answer to each question is a NUMERICAL VALUE. For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the second decimal place; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

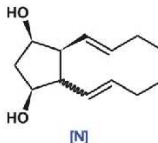
**Full Marks:** +3 If ONLY the correct numerical value is entered as answer.

**Zero Marks:** 0 in all other cases.

10. If X is the total number of mono bromo derivatives of the given reaction then what is 10X/8



11. For given compound [N], the total number of geometrical isomer are



► Indicates that configuration at specific carbon and the geometry of double bond is fixed.

◄◄ Indicates that configuration at specific carbon & the geometry of double bond is NOT fixed.

12. If [X] is the total number of hydrogens present in 5-sec-butyl-4-isopropyldecane, What is the value of [X] / 4?

**SECTION - III**  
**(COMPREHENSION TYPE)**

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme:** +3 for correct answer, 0 if not attempted and -1 in all other cases.

**Paragraph For Questions 13& 14**

Chlorination in presence of sunlight ( $h\nu$ ) is known as a photochlorination. It is free radical substitution. For the given reaction



13. Total possible monochloro products obtained in given reaction is  
A) 12                      B) 8                      C) 16                      D) 6
14. Total number of fractions obtained on frictional distillation of monochloro products is  
A) 4                      B) 7                      C) 9                      D) 10

**SECTION- III**  
**(MATRIX MATCH)**

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

**FOUR** options are given representing matching of elements from **LIST-I** and **LIST-II**.

For each question, choose the option corresponding to the correct matching.

**Full Marks** : +3 If **ONLY** the option corresponding to the correct matching is chosen.

**Zero Marks** : 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks** : -1 in all other cases.

15. Match the following List-I with List-II

| Acids |                                                                                              | pKa Values |                               |
|-------|----------------------------------------------------------------------------------------------|------------|-------------------------------|
| P)    | Neutralisation equivalent(E.Wt) is 59, on heating it gives another carboxylic acid of NE 74. | 1)         | Maleic acid                   |
| Q)    | NE is 59, stable to heat, forms anhydride easily                                             | 2)         | Fumaric acid                  |
| R)    | NE is 58, stable to heat, forms anhydride easily                                             | 3)         | $\alpha$ -methyl malonic acid |
| S)    | NE is 58, stable to heat, its pKa <sub>2</sub> is less than that of its diastereomer.        | 4)         | Succinic acid                 |

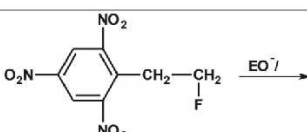
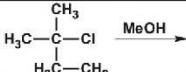
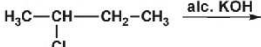
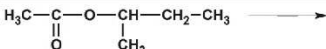
A) P-3, Q-4, R-2, S-1

B) P-4, Q-3, R-1, S-2

C) P-3, Q-4, R-1, S-2

D) P-4, Q-2, R-3, S-1

16. Match the following

|    | List-I<br>(Reaction)                                                                |    | List-II<br>(Most appropriate mechanism expected) |
|----|-------------------------------------------------------------------------------------|----|--------------------------------------------------|
| P) |    | 1) | E <sub>2</sub> mechanism                         |
| Q) |    | 2) | Hoffman product is formed as major product       |
| R) |   | 3) | E <sub>1</sub> CB mechanism                      |
| S) |  | 4) | E <sub>1</sub> mechanism                         |
|    |                                                                                     | 5) | It is single step reaction                       |

A) P-1,5;Q-1,5;R-2,3;S-2

B) P-3;Q-4;R-3;S-2

C) P-3;Q-4;R-1,5;S-2,5

D) P-1,5;Q-1,2;R-1,5;S-2

**ANSWERS**

|          |          |          |           |          |          |          |           |          |            |
|----------|----------|----------|-----------|----------|----------|----------|-----------|----------|------------|
| 1        | 2        | 3        | 4         | 5        | 6        | 7        | 8         | 9        | 10         |
| <b>B</b> | <b>A</b> | <b>D</b> | <b>BC</b> | <b>B</b> | <b>A</b> | <b>B</b> | <b>CD</b> | <b>A</b> | <b>2.5</b> |
| 11       | 12       | 13       | 14        | 15       | 16       |          |           |          |            |
| <b>4</b> | <b>9</b> | <b>C</b> | <b>D</b>  | <b>C</b> | <b>C</b> |          |           |          |            |

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## PAPER-36

### SECTION- I (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks:** +4 If only (all) the correct option(s) is (are) chosen.

**Partial Marks:** +3 If all the four options are correct but **ONLY** three options are chosen.

**Partial Marks:** +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

**Partial Marks:** +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

**Zero Marks:** 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks:** -2 In all other cases.

- Which name of given alcohols is/are ambiguous?  
A) Sec-butyl alcohol and Butan-2-ol  
B) Isobutyl alcohol and 2-methylpropanol  
C) Sec-pentyl alcohol and pentan-2-ol  
D) Neo-pentyl alcohol and 2,2-dimethylpropanol
- What are the elements of symmetry present in the following molecules and which of them is chiral?



A



B

- A) A has a 2-fold rotation axis and B has a plane of symmetry; A is chiral  
B) A has a plane of symmetry and B has a centre of inversion; B is chiral  
C) A has a plane of symmetry and B has a 2-fold rotation axis; A is chiral  
D) A has a plane of symmetry and B has a 2-fold rotation axis; B is chiral
- Identify the **INCORRECT** statements from the following  
A) All chiral centers are stereogenic  
B) All stereogenic centres are chiral

C) Gauche butane interactions are present in more preferred conformation of trans-1,2-dimethylcyclohexane

D) No gauche butane interactions are present in more preferred conformation of trans-1,2-dimethylcyclohexane

4. Bi acetyl (butane -2,3-dione) is unstable at room temperature, on long standing undergoes dimerization. On the right hand side partial structure of dimerized product is given, choose the correct options for complete the given partial structure (two methyl groups and one keto group is missing in the product side)



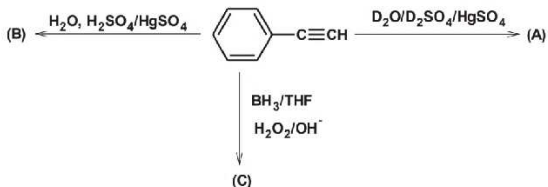
A) Two Methyl groups are present at 1<sup>st</sup> and 3<sup>rd</sup> positions

B) One Keto group should be there at 3<sup>rd</sup> position

C) Two methyl groups should be there at 3<sup>rd</sup> and 4<sup>th</sup> positions

D) Keto group should be there at 2<sup>nd</sup> position

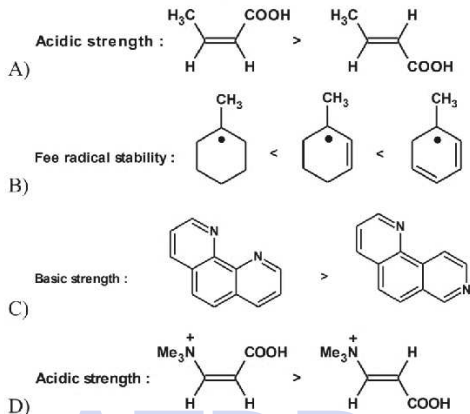
5.



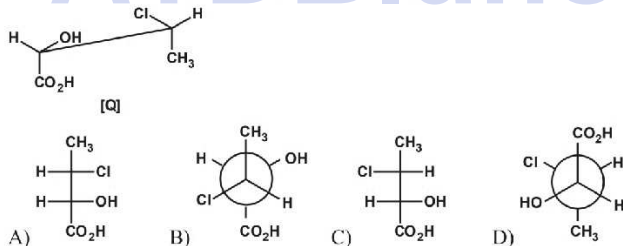
Which statement is/are **CORRECT**?

- A) Product **B** on reaction with aq. Bleaching powder give sweet smelling colourless liquid.
- B) Product **C** do not give fehling test.
- C) Product **(A), (B)** and **(C)** all give aldol (or ketol) condensation.
- D) Product **A** give 2, 4 DNP test.

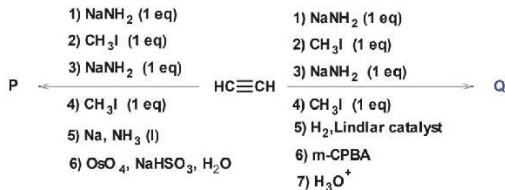
6. Which of the following is **CORRECT**?



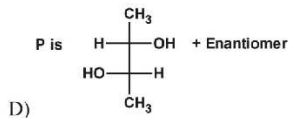
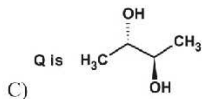
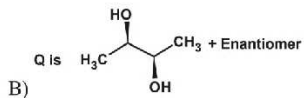
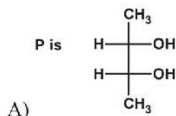
7. The **CORRECT** projection of given structure [Q] is/are



8.



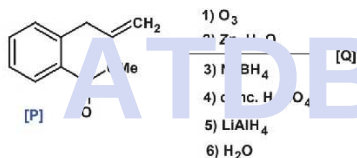




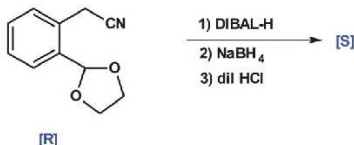
9. Scheme 1 and 2 includes starting materials, reagents of selected chemical reactions and conversion of **P** to **Q** and **R** to **S** respectively.

Scheme-3 describes the synthesis of **S** from **Q**.

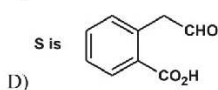
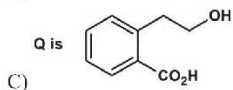
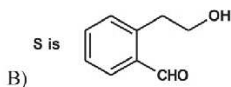
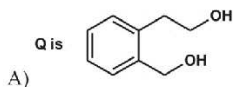
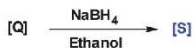
**Scheme-1:**



**Scheme-2:**



**Scheme-3:**



**SECTION- II**  
**(NUMERICAL VALUE)**

The answer to each question is a **NUMERICAL VALUE**

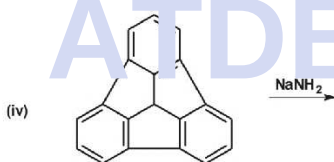
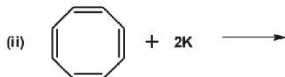
For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

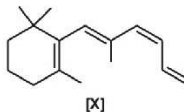
**Full Marks:** +3 If **ONLY** the correct numerical value is entered as answer.

**Zero Marks:** 0 in all other cases.

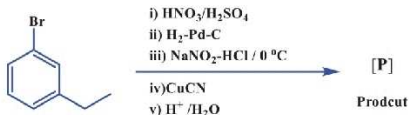
10. In the below reactions X number of reactions give aromatic species Whereas Y number of reactions give gaseous product. The value of (X/Y) is ....



11. For the given compound [X] the total number of geometrical isomers is?



Sum of the positions of "Br" atom in reactant and final product [P] (consider IUPAC numbering and major product in each step) of the following reaction scheme

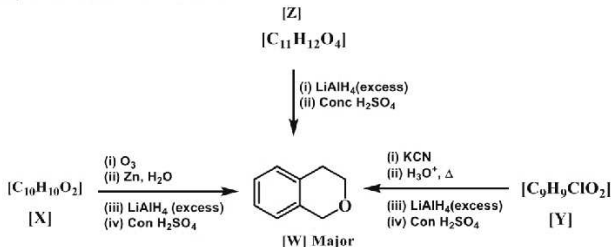


**SECTION - III**  
**(COMPREHENSION TYPE)**

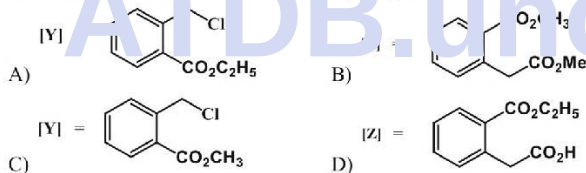
This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONE OR MORE THAN ONE** option can be correct.

**Marking scheme:** +3 for correct answer, 0 if not attempted and -1 in all other cases.

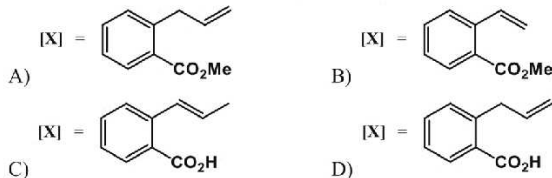
**Paragraph For Questions 13& 14**



13. Choose the **CORRECT** option(s) among the given?



14. Choose the **CORRECT** option regarding [X]



**SECTION- IV**  
**(MATRIX MATCH WITH NUMERICAL)**

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

**FOUR** options are given representing matching of elements from **LIST-I** and **LIST-II**.

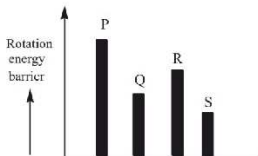
For each question, choose the option corresponding to the correct matching.

**Full Marks** : +3 If **ONLY** the option corresponding to the correct matching is chosen.

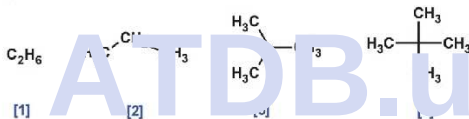
**Zero Marks** : 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks** : -1 in all other cases.

15.



Rotation energy barriers of four homologues are given. Those homologues are from given set I, II, III, IV

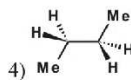
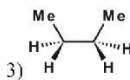
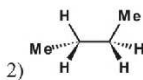
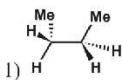
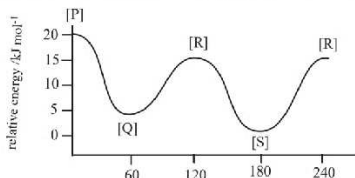


Note: If correct match of P,Q,R,S with 1,2,3,4 is like

| P | Q | R | S |
|---|---|---|---|
| 4 | 3 | 2 | 1 |

Submit your answer as 4321.

16. In the given potential energy diagram of butane along  $\text{C}_2 - \text{C}_3$  bond. Place the correct former out of P, Q, R and S at its perfect position 1, 2, 3 (or) 4.



Note: If correct match of **P,Q,R,S** with 1,2,3,4 is like

| P | Q | R | S |
|---|---|---|---|
| 1 | 2 | 3 | 4 |

Submit your answer as 1 2 3 4.

### ANSWERS

|          |          |            |           |             |             |           |           |           |             |
|----------|----------|------------|-----------|-------------|-------------|-----------|-----------|-----------|-------------|
| 1        | 2        | 3          | 4         | 5           | 6           | 7         | 8         | 9         | 10          |
| <b>C</b> | <b>D</b> | <b>BD</b>  | <b>CD</b> | <b>ACD</b>  | <b>ABD</b>  | <b>CD</b> | <b>BD</b> | <b>AB</b> | <b>1.50</b> |
| 11       | 12       | 13         | 14        | 15          | 16          |           |           |           |             |
| <b>4</b> | <b>5</b> | <b>BCD</b> | <b>D</b>  | <b>4231</b> | <b>3124</b> |           |           |           |             |

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# PAPER-37

## SECTION- I (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks :** +4 If only (all) the correct option(s) is (are) chosen.

**Partial Marks:** +3 If all the four options are correct but **ONLY** three options are chosen.

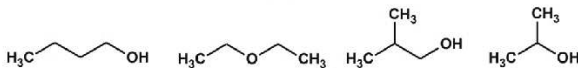
**Partial Marks:** +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

**Partial Marks :** +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

**Zero Marks :** 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks:** -2 In all other cases.

1. The **CORRECT** order of boiling points of compounds I-IV is



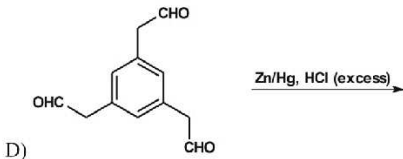
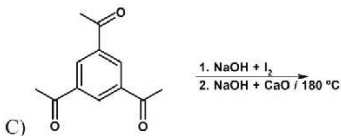
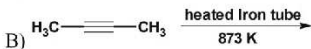
A) II > I > III > IV

B) I > III > I > IV

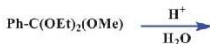
C) I > III > IV > II

D) I > IV > III > II

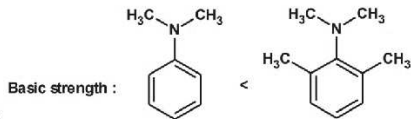
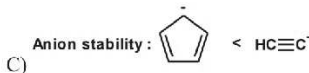
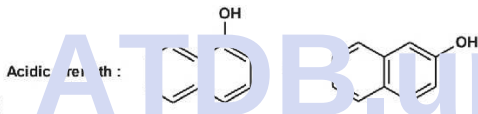
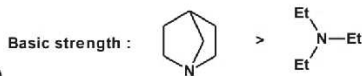
2. The reaction(s) leading to the formation of 1, 3,5-trimethylbenzene is (are)



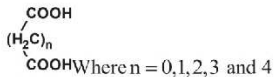
3. **CORRECT** statements regarding the following reaction is/are (assume complete hydrolysis)



- A) Benzoic acid is one of the product  
 B) Two moles of ethyl alcohol are formed  
 C) Three moles of alcohol are formed  
 D) Three moles of  $\text{H}_2\text{O}$  are consumed.
4. Select the **CORRECT** option against mentioned property



5. Which of the following is/are **CORRECT** about given dicarboxylic acids.

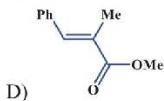
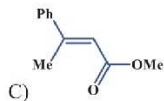
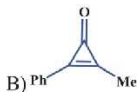
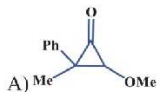
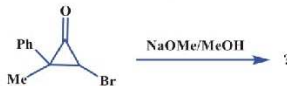


- A)  $\text{pK}_{\text{a}1}$  for all the dicarboxylic acids is smaller than the  $\text{pK}_{\text{a}}$  for mono carboxylic acids with the same number of carbon atoms  
 B) The difference between  $\text{pK}_{\text{a}1}$  and  $\text{pK}_{\text{a}2}$  for dicarboxylic acids decreases as 'n' increases.

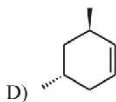
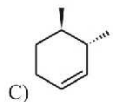
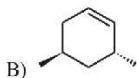
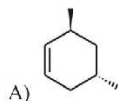
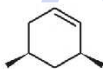
C)  $pK_{a1}$  For all the dicarboxylic acids is higher than the  $pK_{a2}$

D)  $K_{a1}$  for all dicarboxylic acid is higher than the  $K_{a2}$

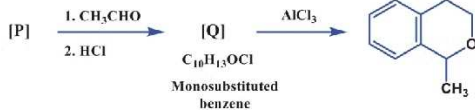
6. The major product formed in the following reaction is?



7. The stereoisomer of given structure is



8. Choose the **CORRECT** option(s) about the given reaction scheme





- A) Compound [P] can be obtained by Reaction of PhMgBr with acetaldehyde followed by acidic workup
- B) Formation of [Q] from [P] involves addition of alcohol to aldehyde
- C) Compound [P] can be obtained by reaction of PhMgBr with ethylene oxide followed by acidic workup
- D) [Q] is an example of hemiacetal

**SECTION- II**  
**(NUMERICAL VALUE)**

The answer to each question is a **NUMERICAL VALUE**

For each question, enter the correct numerical value (in decimal notation, truncated/rounded off to the **second decimal place**; e.g. 6.25, 7.00, -0.33, -.30, 30.27, -127.30) designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme:

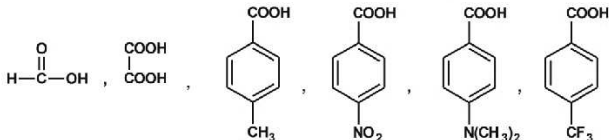
**Full Marks:** +3 If **ONLY** the correct numerical value is entered as answer.

**Zero Marks:** 0 in all other cases.

9. X is the number of below compounds which are more basic than aniline?  
O-toluidine, o-anisidine, m-anisidine, p-anisidine, p-chloroaniline, m-toluidine,



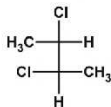
Y is the number of below compounds which are more acidic than benzoic acid



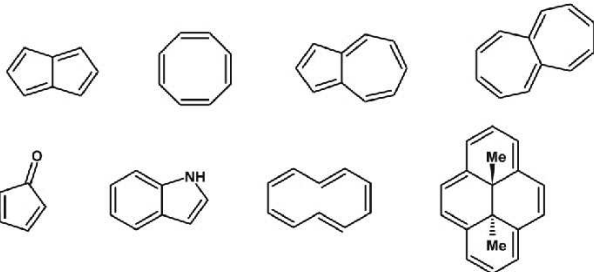
Picric acid, 2,4-dinitro phenol

The value of (X/Y) is...

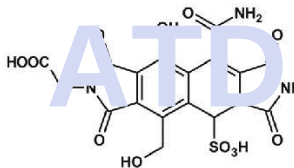
10. Find the number of stable conformers with non-zero dipole moment of given structure:



11. Among the following, the number of molecules that are aromatic is \_\_\_\_.



12. Number of moles of water formed when 1 mole of below molecule react with NaOH is



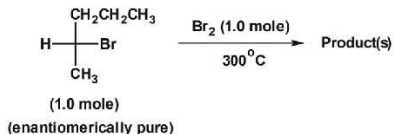
**SECTION - III**  
**(COMPREHENSION TYPE)**

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme:** +3 for correct answer, 0 if not attempted and -1 in all other cases.

**Paragraph For Questions 13 & 14**

In the following monobromination reaction:



13. The number of possible achiral products is

A) 7                                      B) 1                                      C) 3                                      D) 2



**ANSWERS**

|          |          |            |            |            |          |          |           |             |          |
|----------|----------|------------|------------|------------|----------|----------|-----------|-------------|----------|
| 1        | 2        | 3          | 4          | 5          | 6        | 7        | 8         | 9           | 10       |
| <b>C</b> | <b>A</b> | <b>ABC</b> | <b>ABD</b> | <b>ABD</b> | <b>C</b> | <b>C</b> | <b>BC</b> | <b>0.67</b> | <b>2</b> |
| 11       | 12       | 13         | 14         | 15         | 16       |          |           |             |          |
| <b>3</b> | <b>4</b> | <b>D</b>   | <b>B</b>   | <b>C</b>   | <b>D</b> |          |           |             |          |

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# PAPER-38

## SECTION - I

### (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks :** +4 If only (all) the correct option(s) is (are) chosen.

**Partial Marks:** +3 If all the four options are correct but **ONLY** three options are chosen.

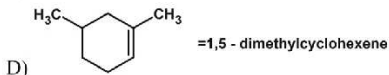
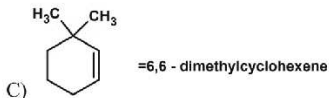
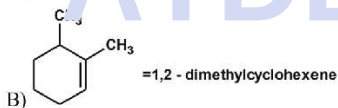
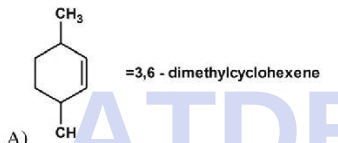
**Partial Marks:** +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

**Partial Marks :** +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

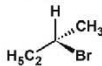
**Zero Marks :** 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks:** -2 In all other cases.

1. Which of the following name will NOT be **CORRECT**?



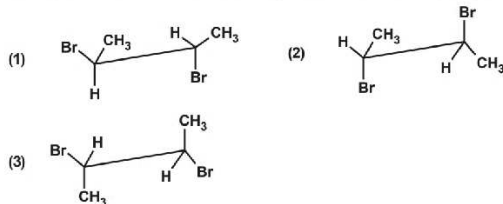
2. Which of the following structure(s) is enantiomeric with the molecule (A) given below:



[A]



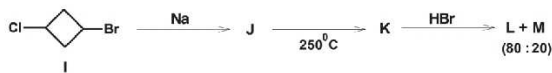
3. Consider the following configuration of 2, 3-dibromobutane.

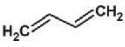
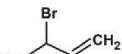
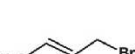


Which one of the following is correct answer?

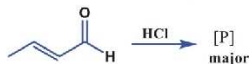
- A) Conformation (1) is the meso-form while (2) and (3) are an enantiomeric pair.  
 B) Conformation (2) is the meso-form while (1) and (3) are an enantiomeric pair.  
 C) Conformation (1) is the meso-form while (1) and (3) are an enantiomeric pair.  
 D) Conformation (1) and (2) are identical and (3) is the meso-form.

4. Compound **I** reacts with metallic sodium in dry  $\text{Et}_2\text{O}$  to form compound **J**, which on heating forms **K** ( $\text{C}_4\text{H}_6$ ). 1 mole of hydrogen bromide reacts with **K** to give **L** ( $\text{C}_4\text{H}_7\text{Br}$ ) and **M** ( $\text{C}_4\text{H}_7\text{Br}$ ) in ratio 80 : 20 respectively.



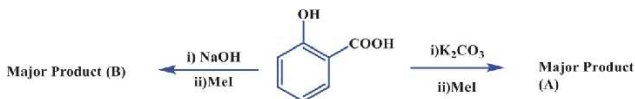
- A) **J** is 
 B) **K** is 
- C) **L** is 
 D) **M** is 

5. Choose the **CORRECT** option about the major organic product [**P**]



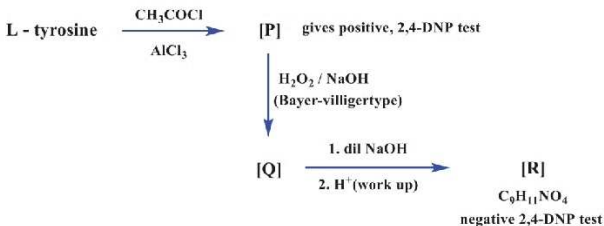
- A) Formation of **[P]** involves carbocation intermediate  
 B)  $-COOH$  Group is  $-I$  group, so  $H^+$  added to the  $\alpha$ -carbon and forms more stable carbocation  
 C) **[P]** is  $\beta$ -chloropropanoic acid  
 D) All

6. Identify the correct statements regarding to the major products of the following reaction

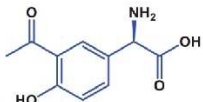


- A) Compound **B** on reaction with  $MeMgBr$  consumes three moles  
 B) Compound **A** gives purple colour with neutral  $FeCl_3$   
 C) Compound **B** is soluble in aq.  $NaOH$  solution  
 D) Compound **A** on reaction with  $MeMgBr$  consumes three moles

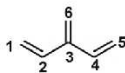
7. Choose the CORRECT option(s) regarding given reaction scheme



- A) **[R]** is more acidic than acetic acid



- B) **[P]** is  $HO$   
 C) Degree of unsaturation in **[Q]** is 6  
 D) can react with 3 moles of acetyl chlorides and forms corresponding tri-acetyl derivative



3-Methylene-1, 4-pentadiene

(I)



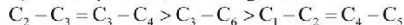
1,3-Butadiene

(II)

8.

**CORRECT** statements about the above two compounds is/are

A) In Compound-I, bond length order is



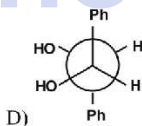
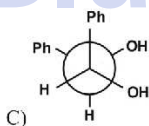
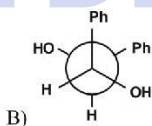
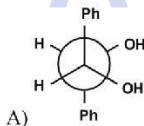
B) In Compound-I,  $C_1 - C_2$  bond possess more and  $C_3 - C_6$  bond possess less double bond character than the double bonds in 1, 3-butadiene

C) In Compound-I,  $C_1 - C_2$  bond is double bond in three of the five contributing canonical forms while the  $C_3 - C_6$  bond is double bond in only one canonical form.

D) Cross conjugated  $C=C$  unit has a slightly longer bond length than the non-cross conjugated  $C=C$ .

9.

Which one of the following Newman projection formula correctly represents a Meso structure?



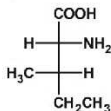
### SECTION - III (COMPREHENSION TYPE)

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme:** +3 for correct answer, 0 if not attempted and -1 in all other cases.

#### Paragraph For Questions 10 & 11

The Fischer projection of given amino **isoleucine** is shown below.



Given amino acid, isoleucine and its isomers are listed as **P, Q, R** and **S** in List.

Choose the correct relationship of **P, Q, R** and **S** with given amino acid from List-II.



|    | List-I |    | List-II      |
|----|--------|----|--------------|
| P) |        | 1) | Diastereomer |
| Q) |        | 2) | Identical    |
| R) |        | 3) | Enantiomer   |
| S) |        |    |              |

10. The "incorrect" combination is

- A) P-2      B) Q-3      C) R-1      D) S-2

11. The "correct" combination is

- A) P-3      B) Q-2      C) R-1      D) S-3

### Paragraph for Questions 12& 13

Answer Q.12 and Q.13 by appropriately matching the information given below.

|    | Column – I |    | Column – II       |
|----|------------|----|-------------------|
| 1) |            | P) | Rearrangement     |
| 2) |            | Q) | E <sub>1</sub>    |
| 3) |            | R) | E <sub>2</sub>    |
| 4) |            | S) | E <sub>1</sub> CB |

12. Identify the correct match  
 A) 1 - Q                      B) 3 - S                      C) 2 - P                      D) 4 - S
13. Identify the incorrect match  
 A) 1 - R                      B) 2 - Q                      C) 3 - S                      D) 4 - R

**Paragraph for Questions 14& 15**

The two major contributors of conformers of 1,2-dichloroethane are anti and gauche. At 32°C in gas phase, the measured dipole moment of 1,2-dichloroethane is 1.12 D. The dipole moment of a mixture of **X** and **Y** is given by the relationship

$$\mu^2 = N_X \mu_X^2 + N_Y \mu_Y^2$$

Here, N = mole fraction of each kind of molecule. From bond moment measurement, it has been estimated that gauche conformer of 1,2-dichloroethane should have a dipole moment of about 3.2 D.

14. What percent of conformers of 1,2-dichloroethane is anti at 32°C  
 A) 12%                      B) 36%                      C) 60%                      D) 82%
15. What happens if temperature is increased to 52°C?  
 A) Percentage of gauche conformers decreases and that of anti-conformers increases  
 B) Percentage of both gauche and anti-conformers increases  
 C) No change in percentage of anti and gauche conformers occur  
 D) Percentage of both anti and gauche conformers decreases

**SECTION- III**  
**(MATRIX MATCH WITH NUMERICAL)**

Each question has **TWO (02)** matching lists: **LIST-I** and **LIST-II**.

**FOUR** options are given representing matching of elements from **LIST-I** and **LIST-II**.

For each question, choose the option corresponding to the correct matching.

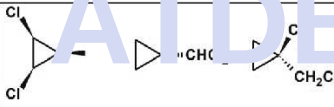
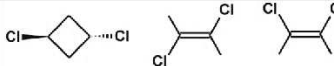
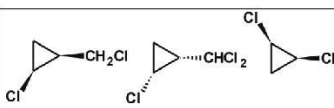
For each question, choose the option corresponding to the correct matching.

**Full Marks** : +3 If **ONLY** the option corresponding to the correct matching is chosen.

**Zero Marks** : 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks** : -1 in all other cases.

16. Among the compounds of molecular formula  $C_4H_6Cl_2$ , identify the best alternative given in the Column-II, for each Box containing solution of 3 compounds given in Column-I.

|    | Compound                                                                          |    | Total number of stereoisomers            |
|----|-----------------------------------------------------------------------------------|----|------------------------------------------|
| A) |  | 1) | All are constitutional isomers           |
| B) |  | 2) | All are meso compounds                   |
| C) |  | 3) | All have 2-Fold axis of symmetry element |
| D) |  | 4) | Overall solution is optically active     |

Correctly match ABCD with 1, 2, 3 & 4 and give your answer in integer values

If

|   |   |   |   |
|---|---|---|---|
| A | B | C | D |
| 4 | 1 | 2 | 3 |

Then your answer is [4123]

**ANSWERS**

|           |          |          |           |          |             |            |             |          |          |
|-----------|----------|----------|-----------|----------|-------------|------------|-------------|----------|----------|
| 1         | 2        | 3        | 4         | 5        | 6           | 7          | 8           | 9        | 10       |
| <b>BC</b> | <b>A</b> | <b>C</b> | <b>AB</b> | <b>C</b> | <b>BCD</b>  | <b>ACD</b> | <b>ABCD</b> | <b>C</b> | <b>D</b> |
| 11        | 12       | 13       | 14        | 15       | 16          |            |             |          |          |
| <b>C</b>  | <b>B</b> | <b>D</b> | <b>D</b>  | <b>D</b> | <b>4231</b> |            |             |          |          |

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# PAPER-39

## SECTION - I

### (ONE OR MORE THAN ONE)

Each question has **FOUR** options for correct answer(s). **ONE OR MORE THAN ONE** of these four option(s) is (are) correct option(s).

For each question, choose the correct option(s) to answer the question.

Answer to each question will be evaluated according to the following marking scheme:

**Full Marks :** +4 If only (all) the correct option(s) is (are) chosen.

**Partial Marks:** +3 If all the four options are correct but **ONLY** three options are chosen.

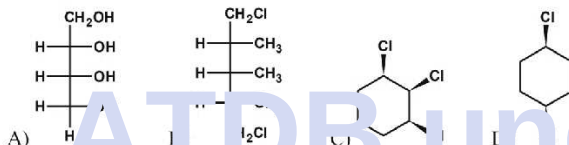
**Partial Marks:** +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct options.

**Partial Marks :** +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.

**Zero Marks :** 0 If none of the options is chosen (i.e. the question is unanswered).

**Negative Marks:** -2 In all other cases.

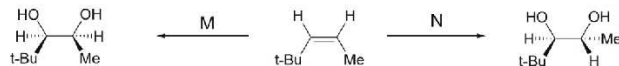
1. Identify the mesocompound(s)



2. How much (in gm) of the R enantiomer is present in 10g of a mixture which has an enantiomeric excess of 20% S isomer?

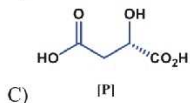
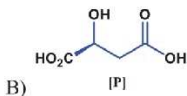
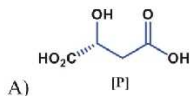
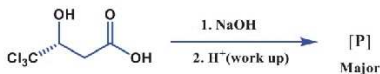
A) 2 gm                      B) 4 gm                      C) 6 gm                      D) 8 gm

3. Identify the missing reagents in the following reaction scheme.



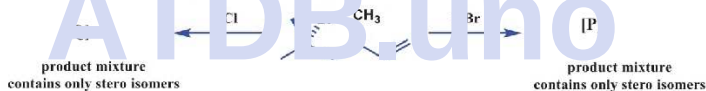
- A)  $M = \text{alk. KMnO}_4, 0^\circ\text{C}; N = m\text{-CPBA} / \text{H}_3\text{O}^+$   
 B)  $M = \text{OsO}_4 / \text{aq NaHSO}_3; N = \text{alk. KMnO}_4, 0^\circ\text{C}$   
 C)  $M = m\text{-CPBA} / \text{H}_3\text{O}^+, N = \text{OsO}_4 / \text{aq NaHSO}_3$   
 D)  $M = m\text{-CPBA} / \text{H}_3\text{O}^+, N = m\text{-CPBA} / \text{H}_3\text{O}^+$

4. Choose the **CORRECT** option(s) about [P]

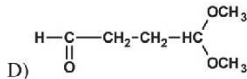
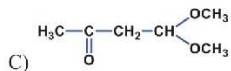
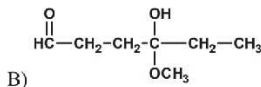
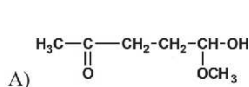


D) [P] also known as malic acid

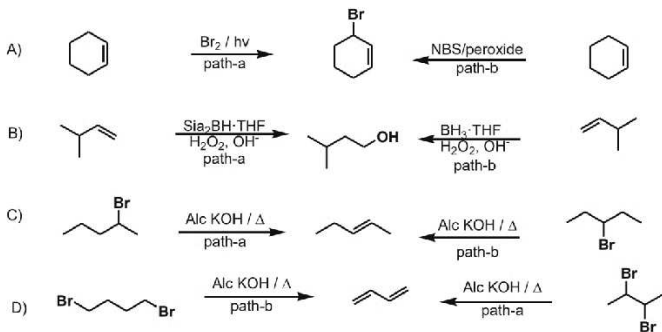
5. Choose **CORRECT** option(s) for the given reaction scheme



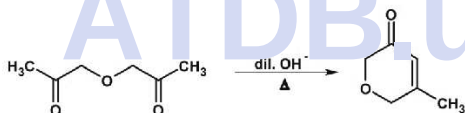
- A) Product mixture [P] contains four stereoisomers and two fractions  
 B) Product mixture [P] contains three stereoisomers and two fractions  
 C) Product mixture [Q] contains three stereoisomers and two fractions  
 D) Product mixture [Q] contains four stereoisomers and two fractions
6. Compound A ( $\text{C}_6\text{H}_{12}\text{O}_3$ ) when treated with  $\text{I}_2$  &  $\text{NaOH}$  gives yellow precipitate. When A is treated with Tollen's reagent no reaction occurs. When A is treated with  $\text{H}_3\text{O}^+$  & then treated with Tollen's reagent gives silver mirror compound A can be.



7. Which among the following path a is better than path b to achieve the target molecule?



8.



Which of the following is/are involved in the mechanism of above conversion?

- A) Tautomerism  
B) Nucleophilic addition  
C) E<sub>1</sub>CB  
D) Dehydration

**SECTION - II**  
**(COMPREHENSION TYPE)**

This section contains Paragraphs Questions. Based on each paragraph, there are 2 or 3 questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

**Marking scheme:** +3 for correct answer, 0 if not attempted and -1 in all other cases.

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

| Column I |  | Column II |                                |
|----------|--|-----------|--------------------------------|
| (I)      |  | (P)       | Diastereomers                  |
| (II)     |  | (Q)       | Recemic mixture                |
| (III)    |  | (R)       | Meso compound                  |
| (IV)     |  | (S)       | CO <sub>2</sub> gas is evolved |

9. The correct combination in the following is

- A) I, P, S                      B) I, Q, S                      C) II, Q, R                      D) II, P, R

10. The **incorrect** combination in the following is

- A) I, P, S                      B) II, P, R                      C) III, S                      D) IV, P, R



**Paragraph For Questions 11 & 12**

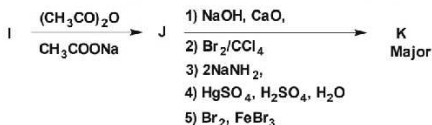
Among conformers, the barrier to rotation originate mainly from torsional strain when atoms or groups eclipse one another. Following are the costs of energy required to cross the rotational barrier for the indicated pair of groups eclipsing

| Groups eclipsing                  | Energy cost (kJ/mol) |
|-----------------------------------|----------------------|
| H – H                             | 4.00                 |
| CH <sub>3</sub> – H               | 6.00                 |
| CH <sub>3</sub> – CH <sub>3</sub> | 11.00                |

11. What is the energy barrier to rotation in neopentane?  
A) 12 kJ/mol      B) 16 kJ/mol      C) 18 kJ/mol      D) 23 kJ/mol
12. What is the energy barrier to rotation in 2-methyl propane?  
A) 10 kJ/mol      B) 12 kJ/mol      C) 14 kJ/mol      D) 16 kJ/mol

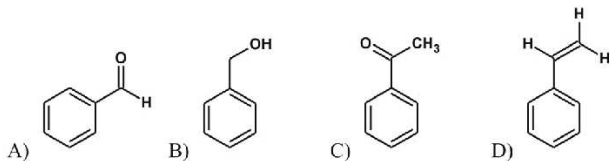
**Paragraph For Questions 13 & 14**

In the following reaction sequence, the compound [J] is an intermediate product.

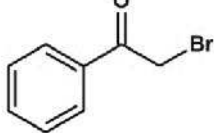


J(C<sub>9</sub>H<sub>8</sub>O<sub>2</sub>) Gives effervescence on treatment with NaHCO<sub>3</sub> and a positive Baeyer's test

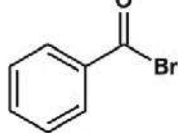
13. The compound [I] is



C)



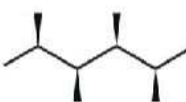
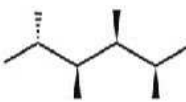
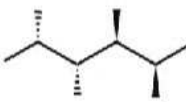
D)



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| Column-I                                                                                                                                                                                                                                                             |    | Column-II                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------------------------------------------------------------------------|
| $\begin{array}{c} \text{H}_2\text{C}=\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_3 \\   \\ \text{Et} \end{array} \xrightarrow[\text{(ii) NaBH}_4/\text{OH}^-]{\text{(i) Hg(OAc)}_2/\text{H}_2\text{O}}$                                                               | P) | Product is a racemic mixture of carboxylic acids                               |
| $\begin{array}{c} \text{H}_2\text{C}=\text{C}-\text{HC} \\   \quad \diagup \quad \diagdown \\ \text{Et} \quad \text{CH}_3 \quad \text{CH}_3 \end{array} \xrightarrow[\text{(iii) KMnO}_4]{\text{(i) B}_2\text{H}_6 \text{ (THF), (ii) H}_2\text{O}_2 + \text{OH}^-}$ | Q) | Resolvable alcohol is formed as product                                        |
| $\begin{array}{c} \text{H}_2\text{C}=\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_3 \\   \\ \text{Et} \end{array} \xrightarrow[\text{Ozonolysis}]{\text{Reductive}}$                                                                                                   | R) | One of the products obtained by oxidation of 3-Hexanol with $\text{KMnO}_4$ is |
| $\begin{array}{c} \text{H}_2\text{C}=\text{C}-\text{HC} \\   \quad \diagup \quad \diagdown \\ \text{Et} \quad \text{CH}_3 \quad \text{CH}_3 \end{array} \xrightarrow[\text{Ozonolysis}]{\text{Reductive}}$                                                           | S) | Product is also obtained by oxidation of 2-Pentanol with $\text{KMnO}_4$       |

Match the following

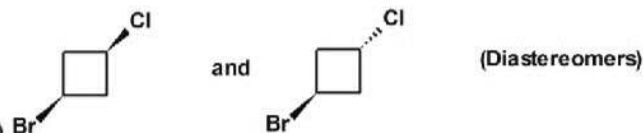
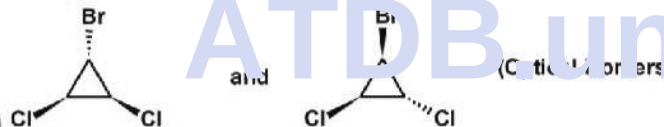
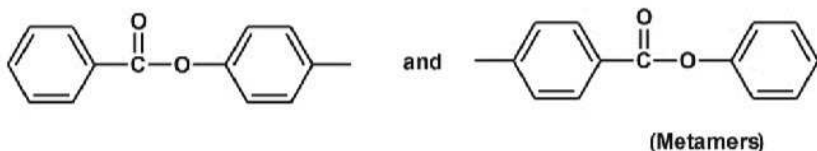
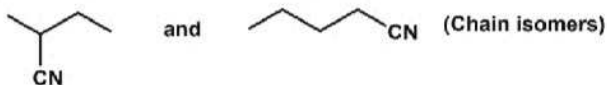
|    | Column-I                                                                           |    | Column-II              |
|----|------------------------------------------------------------------------------------|----|------------------------|
| P) |    | P) | Is identical to (B)    |
| Q) |  | Q) | Is diastereomer of (C) |
| R) |  | R) | Is diastereomer of (D) |

|          |          |            |                                                      |                                                        |          |             |          |
|----------|----------|------------|------------------------------------------------------|--------------------------------------------------------|----------|-------------|----------|
| 2        | 3        | 4          | 5                                                    | 6                                                      | 7        | 8           | 9        |
| <b>B</b> | <b>A</b> | <b>BCD</b> | <b>BD</b>                                            | <b>C</b>                                               | <b>B</b> | <b>ABCD</b> | <b>A</b> |
| 12       | 13       | 14         | 15                                                   | 16                                                     |          |             |          |
| <b>D</b> | <b>A</b> | <b>C</b>   | <b>A-Q</b><br><b>B-P</b><br><b>C-R</b><br><b>D-S</b> | <b>A-PQ</b><br><b>B-Q</b><br><b>C-R</b><br><b>D-QS</b> |          |             |          |

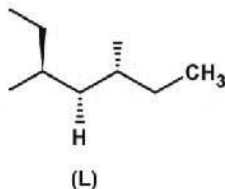
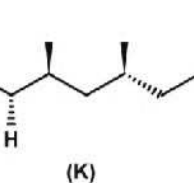
ATDB.uno

- ptions.  
 +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option.  
 0 If none of the options is chosen (i.e. the question is unanswered).  
 marks: -2 In all other cases.

Which of the following is/are correctly matched?



Identify the correct relationship in the given structures **K** & **L**.



A) Geometrical isomers

B) chain isomers

A) **O** and **P** are identical molecules

B) (**M** and **O**) and (**N** and **P**) are two pairs of diastereomers

C) (**M** and **O**) and (**N** and **P**) are two pairs of enantiomers

D) Bromination proceeds through trans-addition in both the reactions

What is the major product if HBr (in excess) is added to  $\text{H}_2\text{C}=\text{CH}-\text{CH}_3$

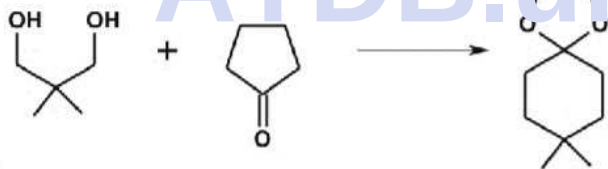
A)  $\text{CH}_3-\text{CH}(\text{Br})-\text{CH}_2-\text{Br}$

B)  $\text{H}_2\text{C}=\text{CH}-\text{CH}_2-\text{Br}$

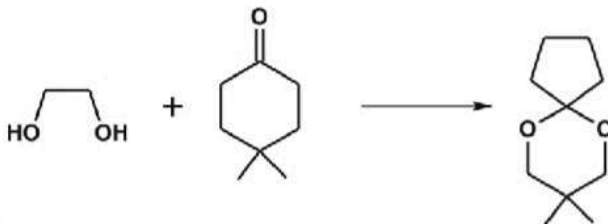
C)  $\text{CH}_3-\text{CH}(\text{Br})-\text{CH}_2-\text{OH}$

D)  $\text{CH}_3-\text{CH}(\text{OH})-\text{CH}_2-\text{OH}$

Which of the following set & reactant(s) is correctly matched with product below?

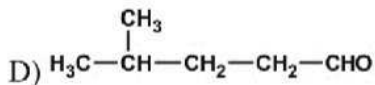
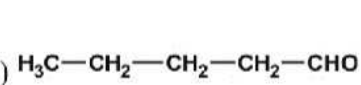
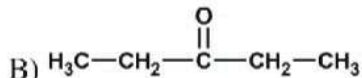
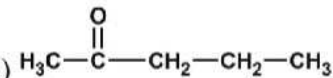


A)

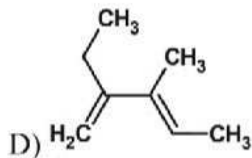
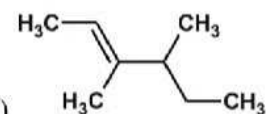
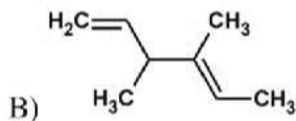
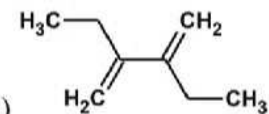
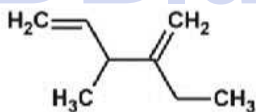


B)

An organic compound A  $C_5H_{10}O$  reacts with phenylhydrazine, and does not reduce Fehling's solution, but gives iodoform test. Compound A should not be:

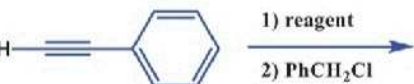


Which of the following isomers of the given compound can show geometrical isomerism?



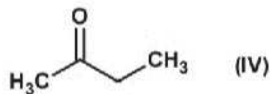
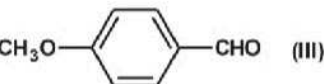
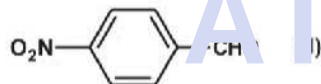


Synthetic steps for the disconnection shown:



- A) BuLi, THF      B) EtMgBr, Et<sub>2</sub>O      C) NaOEt, EtOH      D) NaNH<sub>2</sub>, NH<sub>3</sub>

Arrange the following carbonyl compounds in decreasing order of their reactivity towards nucleophilic addition reaction.



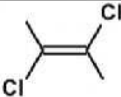
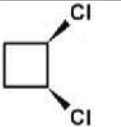
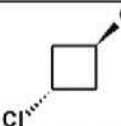
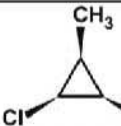
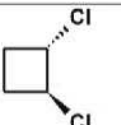
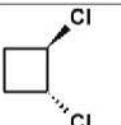
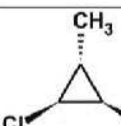
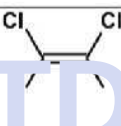
A) II > III > I > IV

B) I > II > III > IV

C) II > I > III > IV

D) I > II > IV > III



| Column-I                                                                         | Column-II                                                                              | Column-III                |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|---------------------------|
|   | i)     | P) Diastereomers          |
|  | ii)   | Q) Enantiomers            |
|  | iii)  | R) Geometrical isomers    |
|  | iv)   | S) Constitutional isomers |

Choose the **CORRECT** option among the following

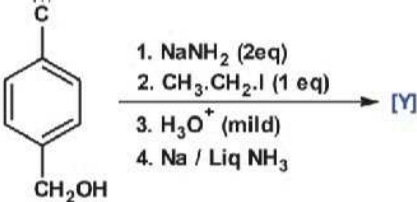
- A) (IV) (i) (S)      B) (II) (iii) (R)      C) (II) (iii) (Q)      D) All

Choose the **INCORRECT** option among the following is

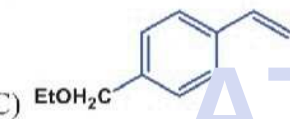
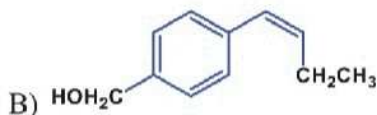
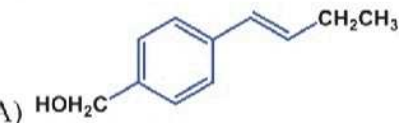
- A) (IV) (i) (S)      B) (II) (iii) (Q)      C) (I) (iv) (R)      D) (II) (i) (S)

Choose the **CORRECT** option among the following

- A) (IV) (iv) (S)      B) (IV) (ii) (Q)      C) (I) (iv) (S)      D) (III) (i) (Q)



[Y] is \_\_\_\_\_



D) Both B & C

The correct statement regarding [X] is

- A) It gives positive Tollen's test and is a functional isomer of [Y]  
 B) It gives negative Tollen's test and is a geometrical isomer of [Y]  
 C) It gives a positive iodoform test and is a functional isomer of [Y]  
 D) It gives negative iodoform test and a functional isomer of [Y]

**Graph for Question Nos. 15 to 16:**

Two isomeric hexanes [P] and [Q] data was given below analyze the data and answer the given questions

| [P] | [Q] |
|-----|-----|
|-----|-----|

Choose the **CORRECT** option(s) about [P] and [Q]

A) [P] and [Q] are positional isomer

B) [P] and [Q] are diastereomer

C) [P] and [Q] are chain isomer

D) [P] and [Q] are constitutional isomer

Choose the **CORRECT** option(s) about [P] and [Q]

A) Number of fractions obtained on mono chlorination of [P] and [Q] is same

B) Number of Enantiomeric pairs obtained on mono chlorination of [P] and [Q] is same

C) Number of fractions obtained on mono chlorination of [P] and [Q] is not same

D) Number of mono chlorination products of [P] and [Q] is same

**ANSWERS**

|          |           |          |           |            |          |          |          |
|----------|-----------|----------|-----------|------------|----------|----------|----------|
| 2        | 3         | 4        | 5         | 6          | 7        | 8        | 9        |
| <b>D</b> | <b>BD</b> | <b>A</b> | <b>CD</b> | <b>BCD</b> | <b>D</b> | <b>C</b> | <b>D</b> |
| 12       | 13        | 14       | 15        | 16         |          |          |          |
| <b>A</b> | <b>B</b>  | <b>D</b> | <b>AD</b> | <b>AD</b>  |          |          |          |