Preface

The idea of the book entitled **"Organic Chemistry: SET PYQ's"** was born because of the lack of any comprehensive book covering previous year questions with detailed explanation for all states SET examination.

This book covers all PYQ's with topic wise sorted question and solution:

1. Nomenclature,
2. General organic chemistry,
3. Stereochemistry,
4. Reaction Mechanism,
5. Name reaction,
6. Reagent,
7. Pericyclic reactions,
8. Photochemistry,
9. Spectroscopy,
10. Heterocyclic chemistry,
11. Natural Products.

The ultimate purpose of this book is to equip the reader with brainstorming challenges and solution for organic chemistry and applied aspect examinations. It contains predigested information on the entire academic subject of organic chemistry for good understanding, assimilation, self-evaluation, and reproducibility. Although we have made every effort to make the book error free, we are under no illusion. We welcome comments, criticism and suggestions from the readers to evolve the contents.

Acknowledgement

First of all I would like to thank our entire students at Institute for advanced Studies (IFAS), who have helped us to learn and practice both the art and science of chemistry. We would like to thank Er. Radheshyam Choudhary, Founding CEO, IfAS Edutech Pvt. Ltd. for being a continuous source of inspiration through his positive strokes.

We also want to thank Dr. Kailash Choudhary, Director at IFAS Publications, for his valuable support and critical suggestion for completion of the work.

Our special thanks Mr. Rajiv Abhyankar to motivating us.

We would not forget to thank all the IfAS team where we were able to further continue our teaching, training, and especially learning the many facets of the process of building these creative questions in books.

This book is a team effort, and producing it would be impossible without outstanding people of IFAS publication. It was pleasure to work with many others dedicated and creative people of IFAS during the production of this book. Special thanks for Vikendra Metha who crafted our ideas to wonderful design of cover page and Kuldeep Singh Rathore for formatting and type setting.

And finally, our humble greetings to all who put their significant efforts and are unmentioned.

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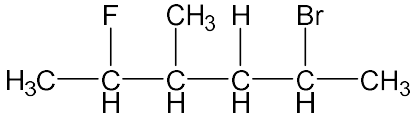
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CHAPTER-1 NOMENCLATURE

MH-SET

(2020)

1. The correct IUPAC name of the following compound is:



(1) 2-fluoro-5-bromo-3-methylhexane

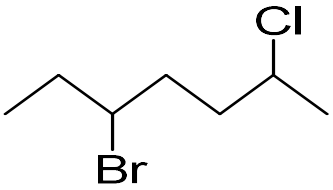
(2) 5-bromo-2-fluoro-3-methylhexane

(3) 2-bromo-5-fluoro-4-methylhexane

(4) 5-fluoro-2-bromo-5-methylhexane

(2018)

2. The correct IUPAC nomenclature of the following compound is



(1) 5-Bromo-2-chloroheptane

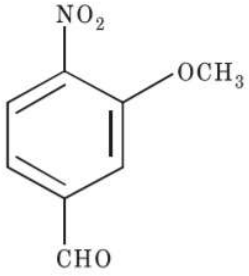
(2) 2-chloro-5-bromoheptane

(3) 3-Bromo-6-chloroheptane

(4) 6-chloro-3-bromoheptane

(2018)

3. The correct IUPAC nomenclature of the following compound is:



(1) 2-Nitro-5-carbaldehydo anisole

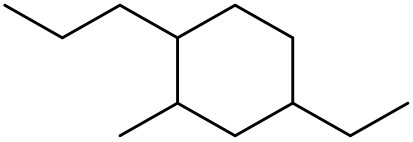
(2) 2-Methoxy-4-carbaldehydo nitrobenzene

(3) 4-Nitro-5-methoxy benzaldehyde

(4) 3-Methoxy-4-nitro benzaldehyde

(2017)

4. The correct IUPAC nomenclature of the following compound is:



(1) 4-Ethyl-2-methyl-1-propylcyclohexane

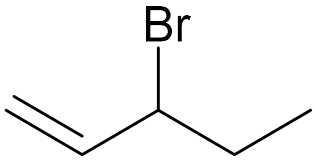
(2) 1-Ethyl-3-methyl-4-propylcyclohexane

(3) 5-Ethyl-1-methyl-2-propylcyclohexane

(4) 3-Ethyl-1-methyl-6-propylcyclohexane

(2017)

5. The correct IUPAC nomenclature of the following compound is



(1) 3-Bromopent-4-ene

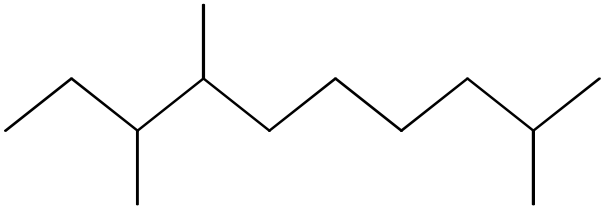
(2) 3-Bromopent-1-ene

(3) 1-Bromo-1-ethylprop-2-ene

(4) Ethyl vinyl bromomethane

(2016)

6. The correct IUPAC nomenclature of the following compound is:



(1) 3, 4, 9-trimethy1 decane

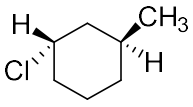
(2) 2, 7, 8-trimethydecane

(3) isotetradecane

(4) 7-methy1-2-(1-methy1propy1) octane

(2015)

7. The correct IUPAC name of the following compound is



(1) (1R, 3R)-1-chloro-3-methylcyclohexane

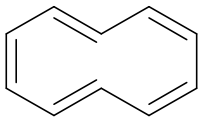
(2) (1R, 3S)-1-chloro-3-methylcyclohexane

(3) (1S, 3S)-1-chloro-3-methylcyclohexane

(4) (1S, 3R)-1-chloro-3-methylcyclohexane

(2015)

8. The correct IUPAC nomenclature for the following compound is:



(1) 10-[5]-annulene (2) 10-[10]-annulene
(3) 10-[18]-annulene (4) 10-[20]-annulene

(2015)

9. The correct IUPAC nomenclature for the following compound is:



(1) (E) Pent-2-en-4-yne (2) (E) Pent-1-yne-3-ene
(3) (E) Pent-4-yne-2-ene (4) (E) Pent-3-en-1-yne

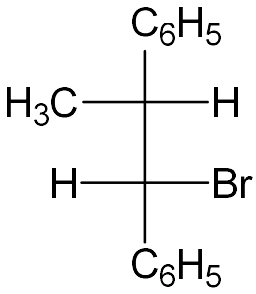
(2015)

10. The chemical abbreviation of DDT is one of the following:

(1) p^- dichlorodipheny1 trichloroethane
(2) p^- dichlorodipheny1 tetrachloroethane
(3) p^- dichlorodipheny1 trichloropropane
(4) p^- dichlorodipheny1 Tetrachlorobutane

(2013)

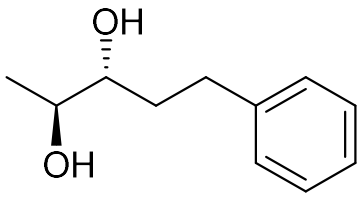
11. The IUPAC name of the following compound is:



(1) Threo-2-bromo-1, 2-diphenylpropane
(2) Erythro-1-bromo-1,2-diphenylpropane
(3) Threo-1-bromo-1, 2-diphenylpropane
(4) Erythro-2-bromo-1,2-diphenylpropane

(2013)

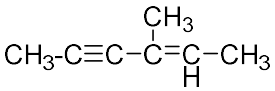
12. The *correct* IUPAC nomenclature of the following compound is :



(1) (2S, 3R)—5—Phenylpentane-2, 3-diol
(2) (3S, 4R)—1—Phenylpentane-3, 4-diol
(3) (2R, 3S)—5—Phenylpentane-2, 3-diol
(4) (3R, 4S)—1—Phenylpentane-3, 4-diol

(2021)

13. The correct IUPAC name of the following compound is:

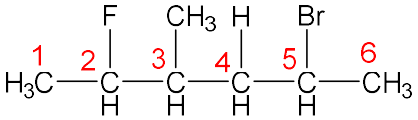


(1) 4-Methyl-4-hexen-2-yne
(2) 4-Methyl-2-hexen-4-yne
(3) 3-Methyl-4-hexen-2-yne
(4) 3-methylhex-2-en-4-yne

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
2	2	4	1	2	2	3	2	4	1
11	**12**	**13**							
3	1	4							

:: MH-SET: Solutions ::

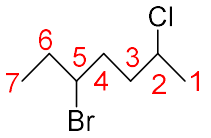
1. Solution:



Numbering give from this side where attachment of substituent should be nearest (CH_3 at 3) and naming of substituent gives alphabetically

Correct Answer is 5-bromo-2-fluoro-3-methylhexane

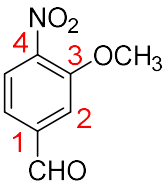
2. Solution:



Numbering give from this side where attachment of substituent should be nearest and priority of substituent through alphabetically

Correct Answer is 5-Bromo-2-chloroheptane

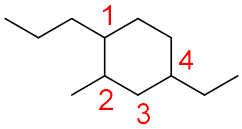
3. Solution:



In this example 1st numbering goes to aldehyde and then goes to nearest substituent and naming of substituent through alphabetically

Correct Answer is 3-Methoxy-4-nitro benzaldehyde

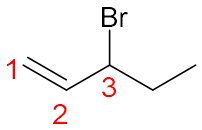
4. **Solution:**



Numbering has been given from that side where substituent are near and numbering of substituent through alphabetically

Correct Answer is 4-Ethyl-2-methyl-1-propylcyclohexane

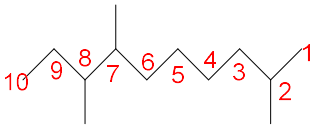
5. **Solution:**



1st priority goes to alkene functional group and numbering gives through alphabetically

Correct Answer is 3-Bromopent-1-ene

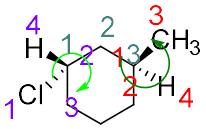
6. **Solution:**



First select long chain then numbering give from nearest substituent and numbering give alphabetically

Correct Answer is 2, 7, 8-trimethydecane

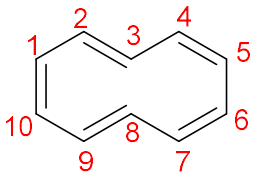
7. **Solution:**



1st number goes to halogenated carbon. And according to CIP rule 1st priority goes to highest atomic number atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane)

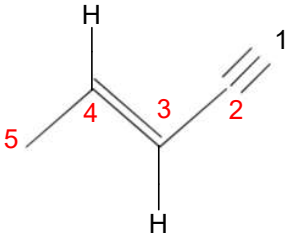
Correct Answer is (1S, 3S)-1-chloro-3-methylcyclohexane

8. **Solution:**



10 carbo and 10 electron so correct answer is 10-[10]-annulene

9. **Solution:**

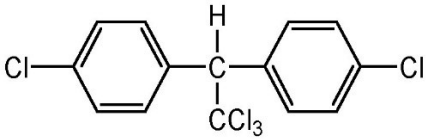


If two same group are opposite side then we can say trans(E) and numbering has been given to alkene first

Correct Answer is (E) Pent-3-en-1-yne

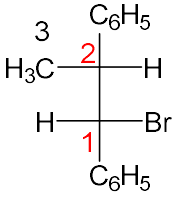
10. **Solution:**

DDT means



p^- Dichlorodipheny1 trichloroethane with IUPAC name 4,4'-(2,2,2-trichloroethane-1,1-diyl)bis(chlorobenzene)

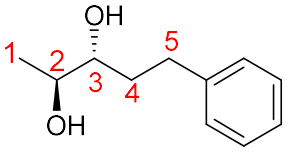
11. **Solution:**



1st no. goes to halogenated carbon and If the same atom are opposite side then we called threo isomer

Correct Answer is Threo-1-bromo-1, 2-diphenylpropane

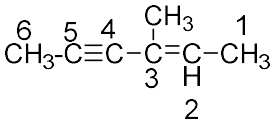
12. **Solution:**



Numbering has been given from nearest substituent side and R,S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane)

Correct Answer is (2S, 3R)—5—Phenylpentane-2, 3-diol

13. Solution: **(2016)**



Priority of alkene is more than alkyne.

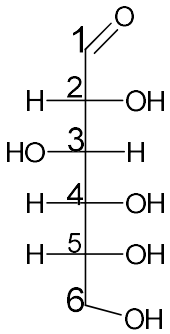
3-methylhex-2-en-4-yne

Correct Answer is D

Kerala-SET

(2019)

1. Using the following Fischer projection formula of D(+) glucose the R and S designations of the chiral centres can be assigned as

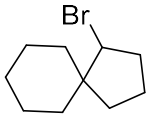


(1) 2R, 3S, 4R, 5R (2) 2S, 3R, 4S, 5R

(3) 2R, 3R, 4S, 5S (4) 2S, 3S, 4R, 5S

(2018)

2. Give the IUPAC name of the following compound.



(1) 1-bromospiro [5, 4] decane

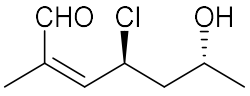
(2) 1-bromospiro [4, 5]decane

(3) 2-bromospiro [4, 5]decane

(4) 2-bromospiro [5, 4]decane

(2017)

3. The IUPAC name of the following compound is



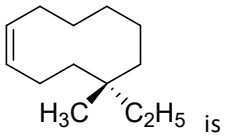
(1) (2Z, 4R,6R)- 4-Chloro-6-hydroxy-2-metthylhept-2-enal

(2) (2E, 4S,6R)- 4-Chloro-6-hydroxy-2-metthylhept-2-enal

(3) (2E, 4R,6S)- 4-Chloro-6-hydroxy-2-metthylhept-2-enal

(4) (2Z, 4S,6R)- 4-Chloro-6-hydroxy-2-metthylhept-2-enal

4. The IUPAC name of the compound



is

(1) (1E, 5R) 5-ethyl-5-methylclodec-1-ene

(2) (1Z, 5S) 5-ethyl-5-methylclodec-1-ene

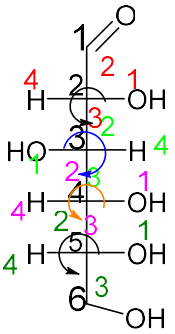
(3) (1E, 5S) 5-ethyl-5-methylclodec-1-ene

(4) (4E, 1S) 1-ethyl-1-methylcyclodec-4-ene

Answer Key			
1	**2**	**3**	**4**
1	2	4	2

:: Solution ::

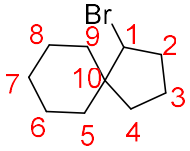
1. Solution:



In fisher projection all horizontal atom are in above the plane and R,S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane)

Correct Answer Is 2R, 3S, 4R, 5R

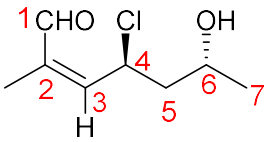
2. Solution:



Number starting from those carbon where substituent attached.In spiro compounds have one atom common to both rings. In spiro compound numbering starting from less membered ring to more membered ring

Correct Answer is 1-bromo spiro [4, 5] decane

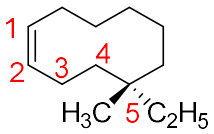
3. Solution:



1st priority goes to aldehyde, if two priority group on same side means Z isomer and R,S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane)

Correct Answer is (2Z, 4S, 6R)- 4-Chloro-6-hydroxy-2-metthylhept-2-enal

4. Solution:



1st no. goes to alkene and numbering has been given from that side where nearest substituent will come and R,S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane)

Correct Answer is (1Z, 5S) 5-ethyl-5-methylclodec-1-ene

K-SET

(2020)

1. The IUPAC name of camphor is

(1) 6-oxo-1, 2, 2-Trimethylbicyclo[2,2,1] heptane

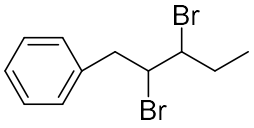
(2) 1, 7, 7-Trimethylbicyclo[2,2,1] heptane-2-one

(3) 1, 5, 5-Trimethylbicyclo[2,2,1] heptane-2-one

(4) 1, 7, 7-Trimethylbicyclo[2,1,2] heptane-2-one

(2020)

2. The IUPAC name of the following compound is:



(1) 2,3-Dibromo pentyl benzene

(2) 5-phenyl-3,4-dibromopentane

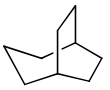
(3) 2,3-Dibromo-1-phenylpentane

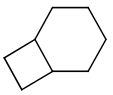
(4) 1-phenyl-2,3-dibromopentane

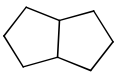
(2020)

3. Identify the correct structure of bicyclo [2,2,2] octane

(A) 

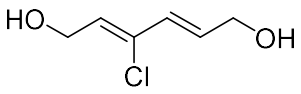
(B) 

(C) 

(D) 

(2018)

4. The IUPAC name of the following compound is



(1) 2E,4E–3–chlorohex– 2, 4 – diene – 1, 6 – diol

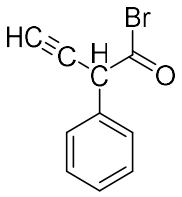
(2) 2Z,4E–3–chlorohex– 2, 4 – diene – 1, 6 – diol

(3) 2Z,4Z–4–chlorohex– 2, 4 – diene – 1, 6 – diol

(4) 2E,4Z–4–chlorohex– 2, 4 – diene – 1, 6 – diol

(2017)

5. The IUPAC name of the following compound is:-



(1) 2-(4-Pyridyl) but - 3ynoyl bromide

(2) 1-(4-Pyridyl) but-1-yn-4-oyl bromide

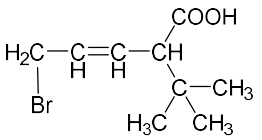
(3) 2-(4-Pyridyl) but-2-oyl bromide

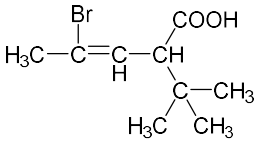
(4) 3-(4-Pyridyl) but-3-oyl bromide

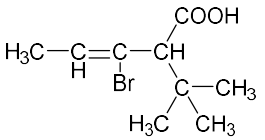
(2017)

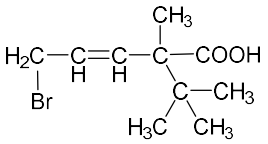
6. Choose the correct structure for the following Nomenclature.

5-bromo-2-(tert-butyl)pent-3-enoic acid

A) 

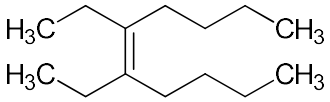
B) 

C) 

D) 

(2015)

7. The IUPAC name of:-



(1) 5, 6-diethyldeca -5-ene

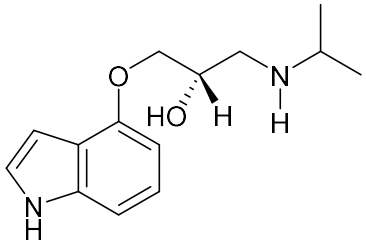
(2) 3,4-dibutyl hex - 3 - ene

(3) 3-butyl - 4 - ethyl- oct-3-ene

(4) 6-butyl-5-ethyl- oct-5-ene

(2015)

8. The IUPAC name of the compound having following structure is:-



(1)(S)-1-((1H-indol-4-yl)oxy)-3-(isopropylamino)propan-2-ol

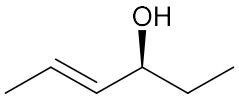
(2) R-1-((1H - indol-4-yl) oxy) -3 - (isopropyl - amino) - propan-2-ol

(3) S-3-((1H – indol-4-yl) oxy)-1-(isopropyl- amino) – propan-2-ol

(4) R-3-((1H-indol-4-yl)oxy)-1-(isopropyl – amino) – propan-2-ol

(2014)

9. IUPAC name of the following compound is:-



(1) (E, 4S) – Hept – 5 – en – 4 – ol

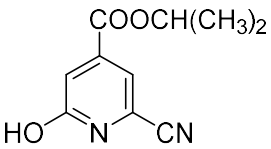
(2) (E, 4S)-hex-4-en-3-ol

(3) (E, 4R) – Hept – 5 – en – 4 – ol

(4) (E, 4R) – Hept – 2 – en – 4 – ol

(2014)

10. The IUPAC name of the compound is



(1) Isopropyl 2-cyano-6- hydroxypyridine-4-carboxylate

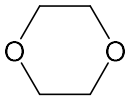
(2) Isopropyl 6-cyano-2- hydroxypyridine-4-carboxylate

(3) Isopropyl 3-cyano-5-hydroxypyridine carboxylate

(4) Isopropyl-3-hydroxy-5- cyanopyridine carboxylate

(2013)

11. The IUPAC name of the following compound is:-



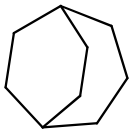
(1) Dioxane

(2) 1,4-Dioxane

(3) Diethylene-1, 4-dioxane

(4) 1,4-dioxacyclohexane

12. The IUPAC name of the following molecule is:-



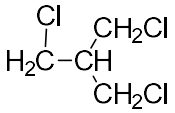
(1) Bicyclo [2.2.2] octane

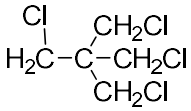
(2) Bicyclo [2.2.3] octane

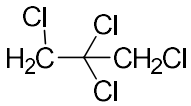
(3) Bicyclo [3.2.1) heptane

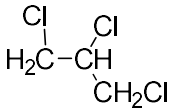
(4) Bicyclo [3.22] nonane

13. The structure of the compound 1,3-dichloro-2, 2-bis (chloromethyl) propane

A) 

B) 

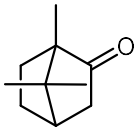
C) 

D) 

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
B	A	A	B	A	A	A	A	B	A
11	**12**	**13**							
B	D	B							

Solution

1. **Solution:**

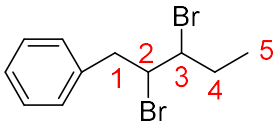


Numbering starting from near to ketone where substituent attach

Correct Answer is

1,7,7-Trimethylbicyclo[2,2,1]heptane-2-one

2. **Solution:**

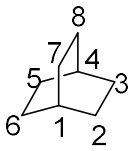


Numbering starting from those carbon where benzene group attached

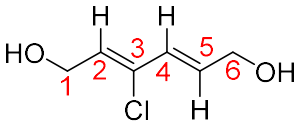
Correct Answer is 2, 3-Dibromo pentyl benzene

3. **Solution:**

Structure of bicyclo [2, 2, 2] octane is



4. **Solution:**

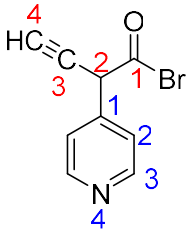


Numbering starting from those carbon where chlorine should near and for E, Z nomenclature if same priority group on same side, then we can say Z isomer and if same priority group on opposite side, then we can say E isomer and priority of the atom given on the basis of atomic number

Correct Answer is

2Z,4E-3-chlorohex- 2, 4 - diene - 1, 6 - diol

5. **Solution:**



1st number goes to carbonyl carbon

Correct Answer is

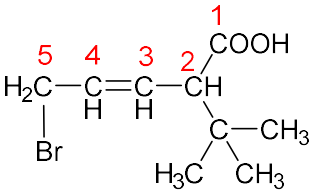
2-(4-Pyridyl) but - 3ynoyl bromide

6. **Solution:**

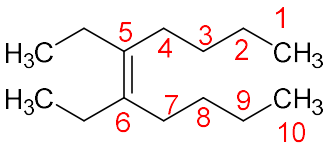
Correct structure for the following Nomenclature

5-bromo-2-(tert-butyl)pent-3-enoic acid

So, **Correct Answer** is



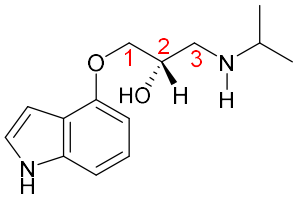
7. **Solution:**



1st select the long carbon chain then give numbering accordingly

Correct Answer is 5, 6-diethyldeca -5-ene

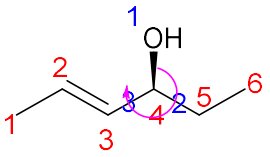
8. **Solution:**



1st number goes to those carbon where oxygen attach compare to nitrogen and R,S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane)

Correct Answer is (S)-1-((1H-indol-4-yl)oxy)-3-(isopropylamino)propan-2-ol

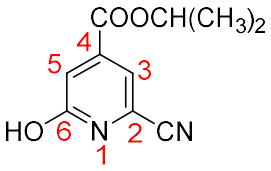
9. **Solution:**



1st number goes to those carbon where alkene attached and R,S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane)and for E,Z nomenclature if same priority group on opposite side then E isomer

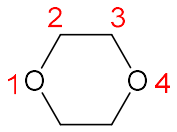
Correct Answer is (E, 4S)-hex-4-en-3-ol

10. Solution:



Correct Answer is Isopropyl 2-cyano-6-hydroxypyridine-4-carboxylate

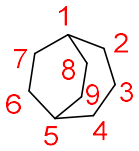
11. Solution:



1st number goes to oxygen

Correct Answer is 1, 4-Dioxane

12. Solution:

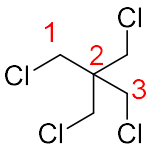


1st number goes to tertiary carbon and in bicyclic compound number starting from more membered ring to less numbered ring

Correct Answer is Bicyclo [3.2.2] nonane

13. Solution:

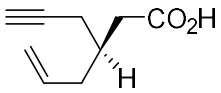
Structure of the compound 1, 3-dichloro-2, 2-bis (chloromethyl) propane is



Tel-SET

(2018)

1. The IUPAC name of the following compound is



(1) (R)-3-(prop-2-enyl) hex-5-ynoic acid

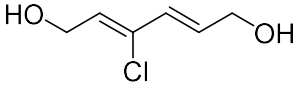
(2) (R)-3-(prop-2-enyl) hex-5-enoic acid

(3) (S)-3-(prop-2-ynyl) hex-5-enoic acid

(4) (S)-3-(prop-2-enyl) hex-5-ynoic acid

(2018)

2. The IUPAC nomenclature of the following compound is



(1) (2E, 4E)-3-chlorohexa-2, 4-diene-1, 6-diol

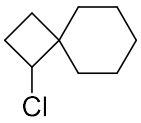
(2) (2Z, 4E)-3-chlorohexa-2, 4-diene-1, 6-diol

(3) (2Z, 4Z)-3-chlorohexa-2, 4-diene-1, 6-diol

(4) (2E, 4Z)-3-chlorohexa-2, 4-diene-1, 6-diol

(2017)

3. The correct name of the following compound is:



(1) 1-chloro spiro- [3, 5] – nonane

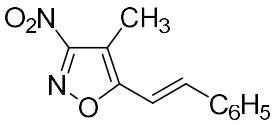
(2) 3-chloro spiro- [5, 3] – nonane

(3) 6-chloro spiro- [5, 3] – nonane

(4) 4-chloro spiro- [5, 3] – nonane

(2017)

4. The correct nomenclature of the following compound is:



(1) 3-Nitro-4-Methyl-5-Styryl oxazole

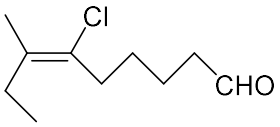
(2) 4-methyl-3-nitro-5-styrylisoxazole

(3) 3-Nitro-4-Methyl-5-Styryl pyrazole

(4) 4-Styryl-2-Nitro-3-Methyl isoxazole

(2014)

5. The correct name of the following compound is



(1) 6-Chloro-7-methylnonanol

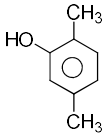
(2) 6-chloro-7-methylnon-6-enal

(3) 6-Chloro-7-methylnonenol

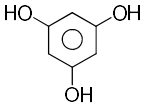
(4) 6-Chloro-7-methylnonanal

(2014)

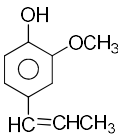
6. Match the following:

I) 

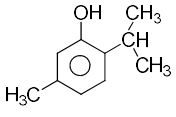
1.Phloroglucinol

II) 

2.PXylenol

III) 

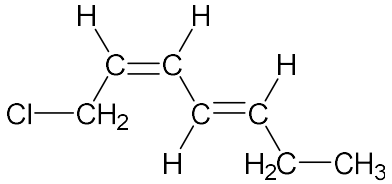
3.Thymol

IV) 

4.Isoeugenol

	I	II	III	IV
(1)	1	3	2	4
(2)	2	1	4	3
(3)	3	4	2	1
(4)	1	4	3	2

7. Give the IUPAC name for the given structure



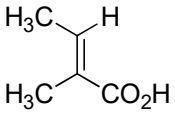
(1) 1– Chloro – 2Z,4Z – heptadiene

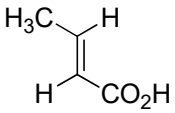
(2) 1– Chloro – 2Z,4E – 2,4 – heptadiene

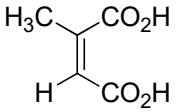
(3) 7– Chloro – 2Z,4E – heptadiene

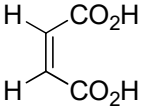
(4) 1– Chloro – 2E,4Z – 2,4 – heptadiene

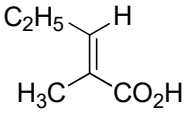
8. Match the following:

I)Maleic acid 1. 

II)Citraconic acid 2. 

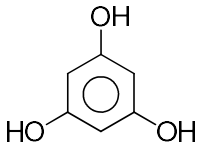
III)Crotonic acid 3. 

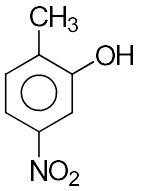
IV)Tiglic acid 4. 

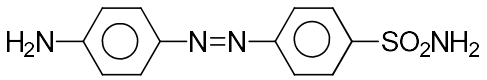
5. 

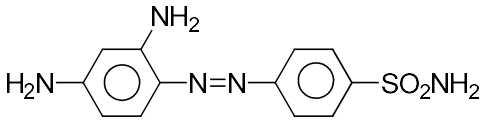
	I	II	III	IV
(1)	1	4	2	3
(2)	4	3	2	1
(3)	3	1	5	2
(4)	2	3	1	5

9. Identify prontosil from the following

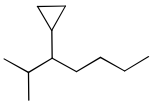
A) 

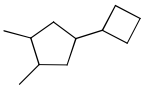
B) 

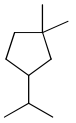
C) 

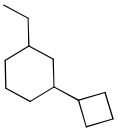
D) 

10. Match the following:

I)  1. 1,1-Dimethyl-3- isopropyl cyclopentane

II)  2. 1-Cyclobutyl-3- ethylcyclo-hexane

III)  . 3. 1,1,2,3- Tetramethylcyclobutane

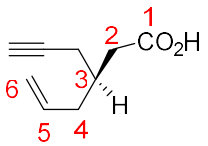
IV)  4. 3-cyclopropyl-2- methyl-heptane

	I	II	III	IV
(1)	1	3	2	4
(2)	4	1	2	3
(3)	5	2	3	4
(4)	4	5	1	2

Answer Key									
1	2	3	4	5	6	7	8	9	10
3	2	1	2	2	2	2	2	4	4

:: Solution ::

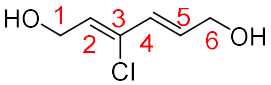
1. **Solution:**



1st number goes to carboxylic acid and R,S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane)

Correct Answer is (S)-3-(prop-2-ynyl) hex-5-enoic acid

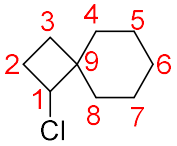
2. **Solution:**



1st number goes to that carbon where nearest substituent will come and E, Z nomenclature if same priority group on same side, then we can say Z isomer and if same priority group on opposite side, then we can say E isomer and priority of the atom given on the basis of atomic number

Correct Answer is (2Z, 4E)-3-chlorohexa-2, 4-diene-1, 6-diol

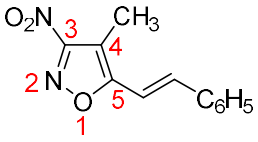
3. **Solution:**



1st number goes to these carbon where chlorine attached and in spiro compound numbering start from less membered ring to more membered ring

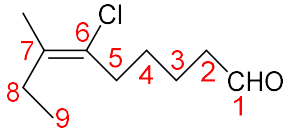
Correct Answer is 1-chloro spiro- [3, 5] – nonane

4. **Solution:**



Correct Answer is 4-methyl-3-nitro-5-styrylisoxazole

5. **Solution:**



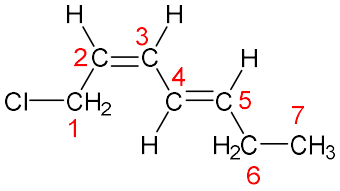
1st number goes to aldehyde and naming of substituent according to alphabetically order

Correct Answer is 6-chloro-7-methylnon-6-enal

6. **Solution:**

Correct Answer is (B) 2 1 4 3

7. **Solution:**



1st number goes to those carbon where substituent attached and for E,Z nomenclature if same priority group on same side, then we can say Z isomer and if same priority group on opposite side, then we can say E isomer and priority of the atom given on the basis of atomic number

Correct Answer is 1– Chloro – 2Z,4E – 2,4 – heptadiene

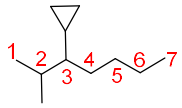
8. **Solution:**

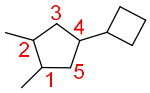
Correct Answer is (B) 4 3 2 1

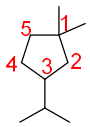
9. **Solution:**

Correct Answer is D

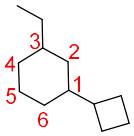
10. **Solution:**

I)  1. 1,1-Dimethyl-3- isopropyl cyclopentane

II)  2. 1-Cyclobutyl-3- ethylcyclo-hexane

III)  . 3. 1,1,2,3- Tetramethylcyclobutane

4. 3-cyclopropyl-2- methyl-heptane

IV) 

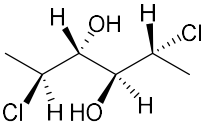
5) 4-cyclobutyl-1,2-dimethylcyclopentane

Correct Answer is (D) 4 5 1 2

WB-SET

(2020)

1. The IUPAC name of the following compound is



(1) (2S, 3R, 4S, 5R)–2, 5–dichlorohexane – 3, 4-diol

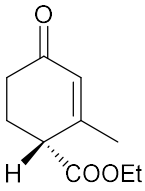
(2) (2S, 3S, 4S, 5R)–2, 5–dichlorohexane – 3, 4-diol

(3) (2R, 3S, 4R, 5S)-2,5-dichlorohexane-3,4-diol

(4) (2S, 3R, 4R, 5S)–2, 5–dichlorohexane – 3, 4-diol

(2018)

2. The IUPAC name of the following compound is



(1) ethyl (S)-2- methyl-4- oxocyclohex-2-enecarboxylate

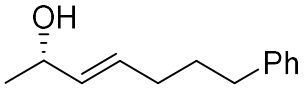
(2) ethyl (R) -2- methyl-4- oxocyclohex-2-enecarboxylate

(3) (R) -4- ethoxycarbonyl-3- methylcyclohex-2-enone

(4) (S)-4- ethoxycarbonyl-3-methylcyclohex-2-enone

(2017)

3. The IUPAC name for the compound given below is:



(1) (2R,3Z) – 7 – phenylhept – 3 en – 2 – o1

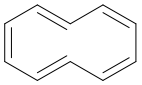
(2) (2S,3Z) – 7 – phenylhept – 3 en – 2 – o1

(3) (2R,3E) – 7 – phenylhept – 3 en – 2 – o1

(4) (2S,3E) – 7 – phenylhept – 3 en – 2 – o1

(2015)

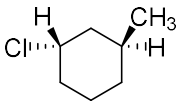
4. The correct IUPAC nomenclature for the following compound is



(1) 10 – [5] – annulene (2) 10 – [10] - annulene

(3) 10 – [18] – annulene (4) 10 – [20] – annulene

5. The correct IUPAC name of the following compound is



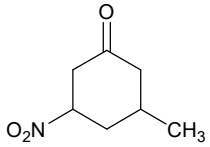
(1) (1R, 3R)-1-chloro-3-methylecyclohexane

(2) (1R, 3S)-1-chloro-3-methylecyclohexane

(3) (1S, 3R)-1-chloro-3-methylecyclohexane

(4) (1S, 3S)-1-chloro-3-methylecyclohexane.

6. The IUPAC name of the following compound is



(1) 3-methyl-5-nitrocyclohexan-1-one

(2) 5-methyl-3-nitrocyclohexanone

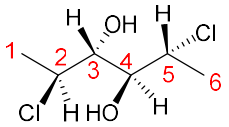
(3) 3-methyl-5-nitro-1-oxocyclohexane

(4) 5-methyl-3-nitro-1-oxocyclohexane

Answer Key					
1	2	3	4	5	6
3	2	4	2	4	1

:: Solution ::

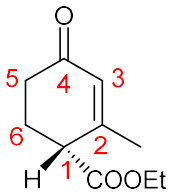
1. Solutions:



R, S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane)

Correct Answer is (2R, 3S, 4R, 5S)-2,5-dichlorohexane-3,4-diol

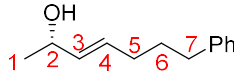
2. Solutions:



R, S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane) and numbering start from near to substituent

Correct Answer is ethyl (R) -2- methyl-4- oxocyclohex-2- enecarboxylate

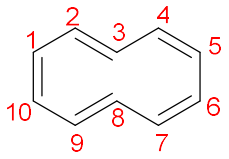
3. Solutions:



Numbering starting from these carbon where substituent should near and R,S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane) and for E,Z nomenclature if same priority group on opposite side then we can say E isomer

Correct Answer is (2S,3E) – 7 – pheny1hept–3en–2– ol

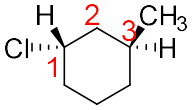
4. Solutions:



10 carbo and 10 electron

Correct Answer is 10 - [10]-annulene

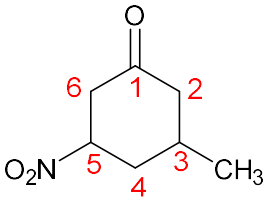
5. Solutions:



R, S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane)

Correct Answer is (1S, 3S)-1-chloro-3-methylecyclohexane

6. Solutions:



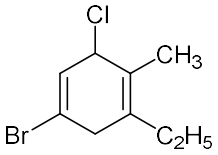
1st number goes to carbonyl group

Correct Answer is 3-methyl-5-nitrocyclohexan-1-one

AP-SET

(2019)

1. IUPAC name of



(1) 5-Bromo-3-chloro-1-ethly-2-methylcyclohex-1,4-diene

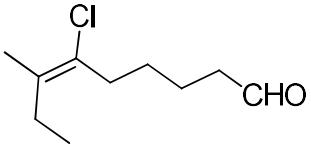
(2) 4-Bromo-6-chloro-2-ethyl-1-methylcyclohex-1-ene

(3) 1-Bromo-5-chloro-3-ethyl-4-methylcyclohex-3-ene

(4) 5-Bromo-4-chloro-3-ethyl-2-methylcyclohex-2-ene

(2014)

2. The correct name of the following compound is



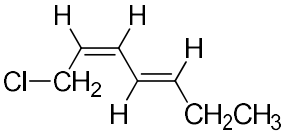
(1) 6-Chloro-7-methylnonanol

(2) 6-chloro-7-methylnon-6-enal

(3) 6-Chloro-7-methylnonenol

(4) 6-Chloro-7-methylnonanal

3. Give the IUPAC name for the given structure



(1) 1– Chloro – 2Z,4Z – heptadiene

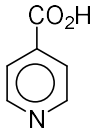
(2) 1– Chloro – 2Z,4E – 2,4 – heptadiene

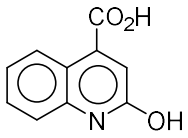
(3) 7– Chloro – 2Z,4E – heptadiene

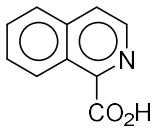
(4) 1– Chloro – 2E,4Z – 2,4 – heptadiene

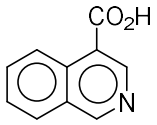
(2013)

4. Identify cinchoninic acid from the following structures

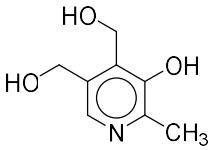
A) 

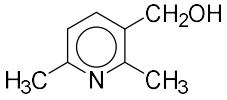
B) 

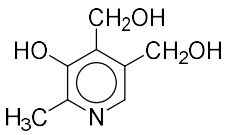
C) 

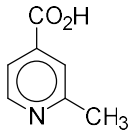
D) 

5. Identify pyridoxin from the following structures

A) 

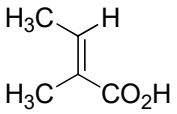
B) 

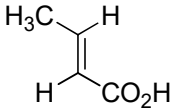
C) 

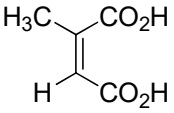
D) 

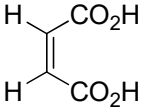
(2012)

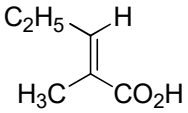
6. Match the following: (Nomenclature)

I)Maleic acid 1. 

II)Citraconic acid 2. 

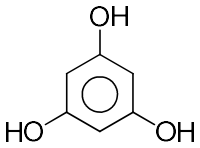
III)Crotonic acid 3. 

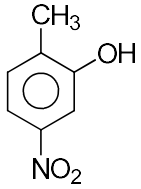
IV)Tiglic acid 4. 

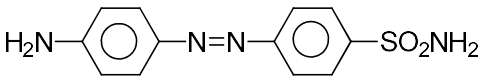
5. 

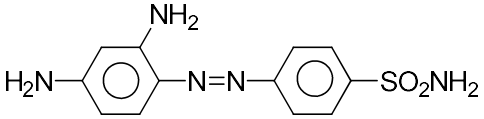
	I	II	III	IV
(1)	1	4	2	3
(2)	4	3	2	1
(3)	3	1	5	2
(4)	2	3	1	5

7. Identify prontosil from the following (Nomenclature)

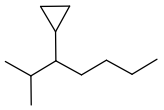
A) 

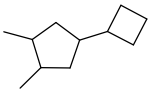
B) 

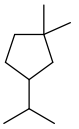
C) 

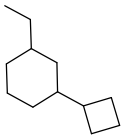
D) 

8. Match the following: (Nomenclature)

I)  1. 1,1-Dimethyl-3- isopropyl cyclopentane

II)  2. 1-Cyclobutyl-3- ethylcyclo-hexane

III)  3. 4-cyclobutyl-1,2-dimethylcyclopentane

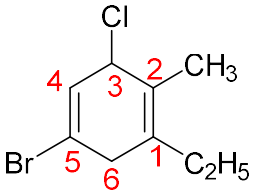
IV)  4. 3-cyclopropyl-2- methyl-heptane

	I	II	III	IV
(1)	1	3	2	4
(2)	4	1	2	3
(3)	5	2	3	4
(4)	4	3	1	2

Answer Key							
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	2	2	2	3	2	4	4

:: Solutions ::

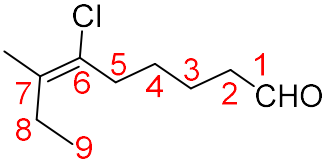
1. Solution:



1st number gives to those carbon where ethyl and alkene attached

Correct Answer is 5-Bromo-3-chloro-1-ethly-2-methylcyclohex-1,4-diene

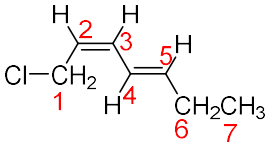
2. Solution:



1st priority goes to aldehyde

Correct Answer Is 6-Chloro-7-methylnonenal

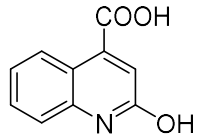
3. Solution:



1st number goes to those carbon where substituent attached and for E,Z nomenclature if same priority group on same side, then we can say Z isomer and if same priority group on opposite side, then we can say E isomer and priority of the atom given on the basis of atomic number

Correct Answer is 1– Chloro – 2Z, 4E – 2,4 – heptadiene

4. Solution:



cinchoninic acid

Correct Answer is 1

5. Solution:

Correct Answer is **Ans C**

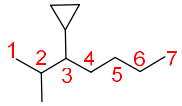
6. Solution:

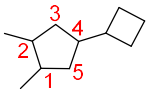
Correct Answer is (B) 4 3 2 1

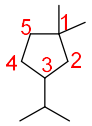
7. Solution:

Correct Answer is **Ans D**

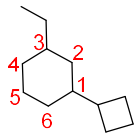
8. Solution:

I)  1. 1,1-Dimethyl-3- isopropyl cyclopentane

II)  2. 1-Cyclobutyl-3- ethylcyclo-hexane

III)  3. 1,1,2,3- Tetramethylcyclobutane

4. 3-cyclopropyl-2- methyl-heptane

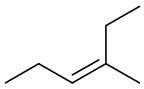
IV)  5) 4-cyclobutyl-1,2-dimethylcyclopentane

Correct Answer is (D) 4 5 1 2

GJ-SET

(2019)

1. The correct IUPAC name of the following compound is:



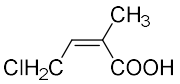
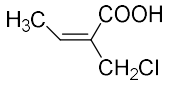
(1) 4-Ethylpent-3-ene (2) 2-Ethylpent-2-ene

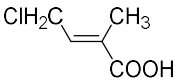
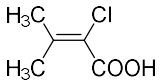
(3) 3-Methylhex-3-ene (4) 4-Methylhex-3-ene

(2019)

2. The structure of the following compound is:

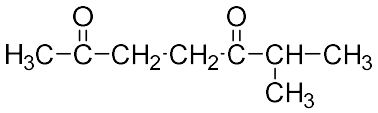
(z)-2-(chloromethyl) but-2-enoic acid

(A)  (B) 

(C)  (D) 

(2018)

3. The IUPAC name of the following compound is:



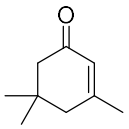
(1) 6-Methylheptane-2, 5-dione

(2) 2-Methylheptane-3, 6-dione

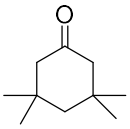
(3) 6-Methyl-2, 5-dioxoheplatne

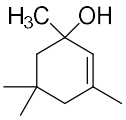
(4) 2-Methyl-3, 6-dioxoheptane

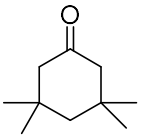
4. Predict the products in the following reactions:

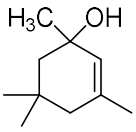
 $\xrightarrow[2.\ H_3O^+]{1.\ CH_3MgBr/CuBr}$ Compound I

$H_2C{=}CH{-}C{\equiv}N \xrightarrow[2.\ H_3O^+]{1.\ CH_3MgBr}$ Compound II

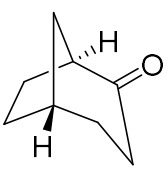
(A)  and $H_3C{-}CH_2{\cdot}CH_2{\cdot}COCH_3$

(B)  and $H_3C{-}CH_2{\cdot}CH_2{\cdot}C{\equiv}N$

(C)  and $CH_3{\cdot}CH_2{\cdot}\overset{O}{\overset{\|}{C}}{-}CH_3$

(D)  and $CH_3{\cdot}CH_2{\cdot}\overset{O}{\overset{\|}{C}}{-}CH_3$

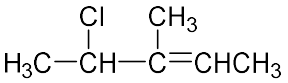
5. Propose correct IUPAC name for the following compound:



(1) 1S, 5S-Bicyclo [3.2.1] octa-2-one
(2) 1S, 5R-Bicyclo [3.2.1] octa-2-one
(3) 1R, 5S-Bicyclo [3.2.1] octa-5-one
(4) 1S, 5S-Bicyclo [3.2.1] octa-5-one

(2017)

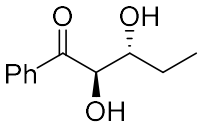
6. Which is the correct IUPAC name of the following compound?



(1) 2-chloro-3-methylpent-3-ene
(2) 4-chloro-3-methylpent-2-ene
(3) 3-methyl-4-chloropent-2-ene
(4) 3-methyl-2 chloropent -3-ene

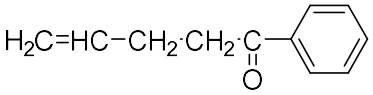
(2016)

7. The IUPAC name of the following molecule is:



(1) (2S, 3R)-1-Phenyl-pentan-1-one
(2) (2R,3R)-2,3-dihydroxy-1-phenylpentan-1-one
(3) (2S, 3S)-1-Phenyl-pentan-1-one
(4) (2R, 3R)-1-Phenyl-pentan-1-one

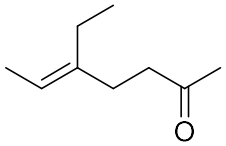
8. The IUPAC name of the following molecule is ……



(1) Phenylbutenylketone
(2) 5-phenyl-5-oxo-1-pentene
(3) 1-phenylpenta-4-en-1-one
(4) 1-phenyl-2-oxo-4-pentene

(2014)

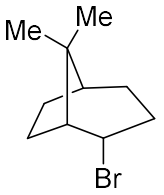
9. The IUPAC name of the following compound is:



(1) (Z)-3-Ethylhept-2-en-6-one
(2) (E)-3-Ethylhept-2-en-6-one
(3) (Z)-5-Ethylhept-5-en-2-one
(4) (E)-5-Ethylhept-5-en-2-one

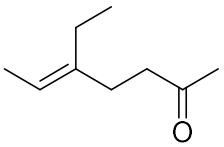
10. The IUPAC name of $Li[AlH_4]$ is:
(1) Lithium tetrahydridoaluminate (III)
(2) Lithium tetrahydridoaluminium (III)
(3) Lithium tetrahydridoaluminium
(4) Lithium tetrahydroaluminate (III)

11. The IUPAC name of the following molecule is:



(1) 2-bromo-6, 6-dimethylbicyclo [3.2.1] octane
(2) 1, 1-dimethyl-3-bromobicyclo [1.2.3] octane
(3) 2-bromo-8, 8-dimethylbicyclo [3.2.1] octane
(4) 5-bromo-8, 8-dimethylbicyclo [3.2.1] octane

12. The IUPAC name of the following compound is:

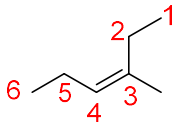


(1) (Z)-3-Ethylhept-2-en-6-one
(2) (E)-3-Ethylhept-2-en-6-one
(3) (Z)-5-Ethylhept-5-en-2-one
(4) (E)-5-Ethylhept-5-en-2-one

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
3	2	1	1	1	2	2	3	4	1
11	**12**								
3	4								

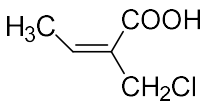
:: Solution ::

1. Solution:



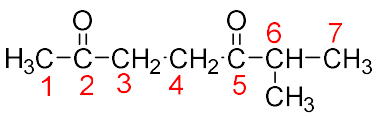
Numbering starting from those carbon where methyl and double bond should near
Correct Answer is 3-Methylhex-3-ene

2. Solution:



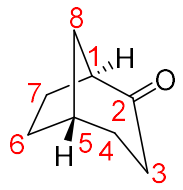
Correct Answer is B

3. Solution:



Number starting from near to carbonyl carbon
Correct Answer is 6-Methylheptane-2, 5-dione

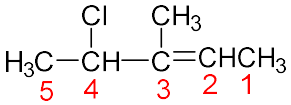
5. Solution:



Number starting from near to carbonyl carbon. R, S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane) numbering start from near to functional group

Correct Answer is 1S, 5S-Bicyclo [3.2.1] octa-2-one

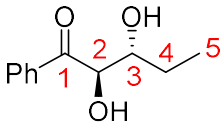
6. Solution:



Numbering starting from near to alkene carbon

Correct Answer is 4-chloro-3-methylpent-2-ene

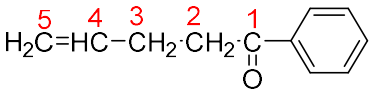
7. Solution:



Numbering starting from carbonyl carbon. If the same atom are opposite side then we called threo isomer.

Correct Answer is threo-1-phenyl-2, 3-dihydroxypentanone

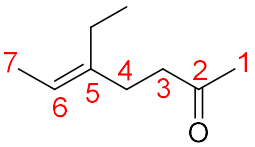
8. Solution:



Numbering starting from carbonyl carbon

Correct Answer is 1-phenylpenta-4-en-1-one

9. Solution:



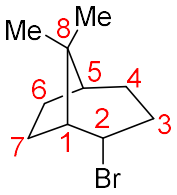
Numbering starting from near to carbonyl carbon

Correct Answer is (E)-5-Ethylhept-5-en-2-one

10. Solution:

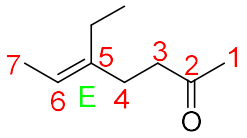
Correct Answer is Lithium tetrahydridoaluminate (III)

11. Solution:



Correct Answer is 2-bromo-8, 8-dimethylbicyclo [3.2.1] octane

12. Solution:

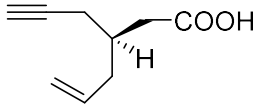


(E)-5-Ethylhept-5-en-2-one

HP-SET

(2018)

1. The IUPAC name of the following compound is:



(1) (R)-3-(prop-2-enyl)hex-5-ynoic acid

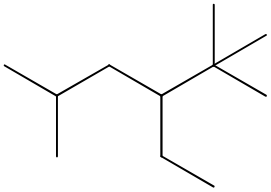
(2) (S)-3-(prop-2-enyl)hex-5-ynoic acid

(3) (R)-3-(prop-2-enyl)hex-5-enoic acid

(4) (S)-3-(prop-2-yn-1-yl)hex-5-enoic acid

(2017)

2. IUPAC name of the following compound is:-



(1) 3-Ethyl-2, 2, 5-trimethyl hexane

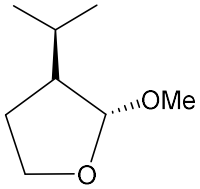
(2) 3-tert-butyl-5-methyl hexane

(3) 4-Ethyl-2, 5, 5-trimethyl hexane

(4) 2, 2, 5-trimethyl-4-Ethyl hexane

(2014)

3. IUPAC name of the following compound is:-



(1) (3R)-isopropyl-(2S)-methoxy-tetrahedrofuran

(2) (2R,3R)-3-isopropyl-2-methoxytetrahydrofuran

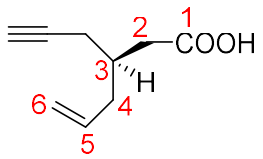
(3) (3R)-isopropyl-(2R)-methoxy-tetrahedrofuran

(4) (3S)-isopropyl-(2S)-methoxy-tetrahedrofuran

Answer Key		
1	**2**	**3**
4	1	2

:: Solutions ::

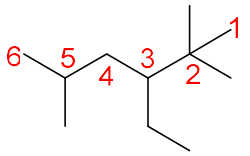
1. Solution:



1st number goes to carboxylic acid group and R, S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane)

Correct Answer is (S)-3-(prop-2-yn-1-yl)hex-5-enoic acid

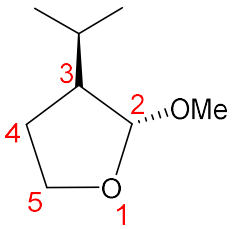
2. Solution:



1st select the long chain and numbering start from that side where substituent should near

Correct Answer is 3-Ethyl-2, 2, 5-trimethyl hexane

3. Solution:



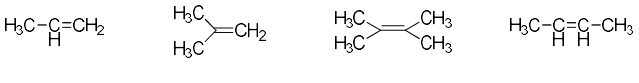
R, S nomenclature according to CIP rule 1st priority goes to highest atomic no. atom and then accordingly then for clockwise direction gives R (for that lowest priority group should be below the plane) and for anticlockwise direction give S (for that lowest priority group should be below the plane) and numbering start from oxygen

Correct Answer is (2R, 3R)-3-isopropyl-2-methoxytetrahydrofuran

MH-SET

(2020)

1. The correct order of stability of the following alkenes is:

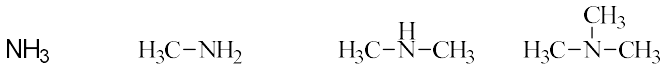


I II III IV

(1) IV < II < III < I
(2) III < IV < II < I
(3) IV < III < I < II
(4) I < II < IV < III

(2020)

2. The correct order of basicity of the following compounds is:

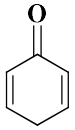
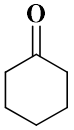
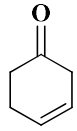
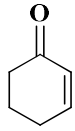


I II III IV

(1) III < II < IV < I
(2) IV < III < II < I
(3) I < IV < II < III
(4) II < IV < III < I

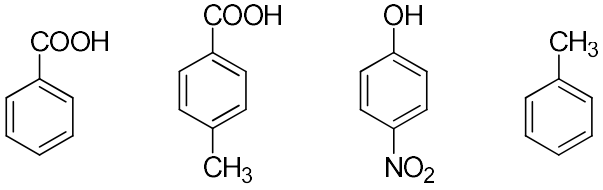
(2020)

3. Which of the following compounds undergo fastest tautomerization?

A) 
B) 
C) 
D) 

(2019)

4. The correct order of acidity of the following molecules is

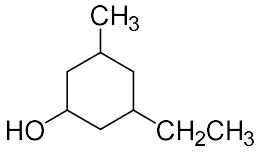


I II III IV

(1) (IV) < (III) < (II) < (I)
(2) (III) < (IV) < (II) < (I)
(3) (IV) < (II) < (I) < (III)
(4) (IV) < (I) < (III) < (II)

(2019)

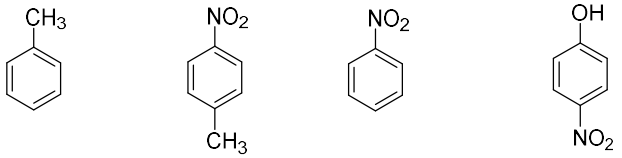
5. The correct IUPAC name of the following compound is



(1) 3-ethyl-5-hydroxy-1-methyl cyclohexane
(2) 5-ethyl-3-methyl cyclohexanol
(3) 1-ethyl-3-methyl-5-hydroxy-cyclohexane
(4) 3-ethyl-5-methyl cyclohexanol

(2019)

6. The correct order of dipole moment for the following compounds is

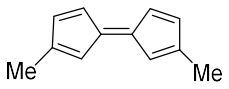
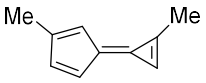
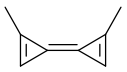
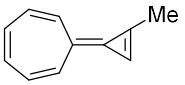


(I) (II) (III) (IV)

(1) (III) < (I) < (IV) < (II)
(2) (III) < (II) < (I) < (IV)
(3) (I) < (IV) < (III) < (II)
(4) (I) < (II) < (III) < (IV)

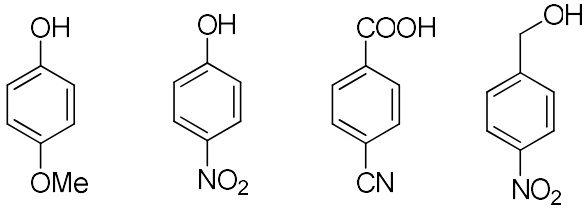
(2018)

7. Amongst the following the rate of cis-trans isomerisation is expected to be highest in:

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

(2018)

8. The correct order of acidity for the following compounds is:

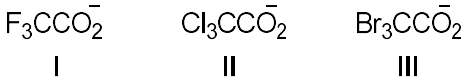


I II III IV

(1) III > I > II > IV
(2) II > III > I > IV
(3) IV > II > I > III
(4) III > II > I > IV

(2017)

9. The correct order of basicity of the following species is:



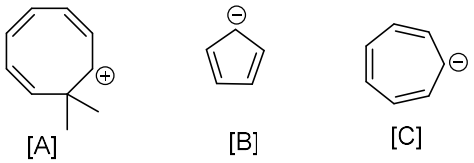
I II III

(1) I > III > II (2) II > I > III

(3) III > II > I (4) III > I > II

(2016)

10.



[A] [B] [C]

Among the three ions [A], [B], [C], given:

(1) A is aromatic, B is homoaromatic and C is antiaromatic

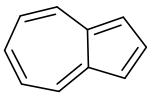
(2) A is homoaromatic, B is aromatic and C is antiaromatic

(3) A is aromatic, B is antiaromatic and C is homoaromatic

(4) A is homoaromatic, B is antiaromatic and C is aromatic

(2016)

11.



[X]

The most correct statement about compound [X] is:

(1) It is aromatic

(2) It is aromatic and has high dipole moment than expected

(3) It is aromatic bit has no dipole moment

(4) It is antiaromatic

(2016)

12. The carbonyl compounds exhibits electrophilic functionality because they have:

(1) A Low Energy LUMO σ^* orbital

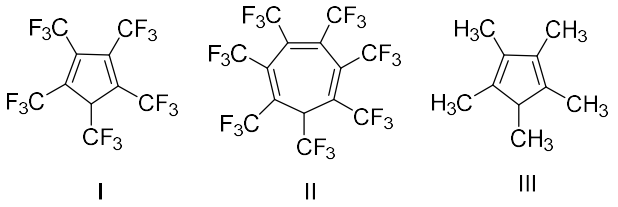
(2) A Low Energy HOMO π^* orbital

(3) A Low Energy LUMO π^* orbital

(4) A Low Energy HOMO σ^* orbital

(2015)

13. The correct order of acidity of the following compounds is



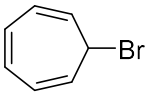
I II III

(1) II > III > I (2) I > III > II

(3) I > II > III (4) III > I > II

(2015)

14. Cycloheptatrienyl bromide has structure:



This compound is to:

(1) behave like covalent compound and dissolves in non-polar solvents

(2) behave like ionic compound and dissolves in polar solvents like water

(3) behave like coordination compounds

(4) behave like ionic compound but dissolves in non-polar solvent

(2015)

15. Which of the following statements is not correct for Benzene?

(1) It is a (4n + 2) = 6π-electron Annulene

(2) It doesn't represent by a real cyclic structure

(3) It doesn't show resonance phenomenon

(4) It is entirely different than Annulene skeleton

(2015)

16. The organic reaction occurs when the HOMO of nucleophile overlaps with the LUMO of electrophile to form:

(1) A new σ-bond

(2) A new π-bond

(3) A new coordinate covalent bond

(4) A new lone pair/non-bonding electron pair

(2013)

17. Which of the following compounds is not aromatic in nature?

(1) Cyclopentadienyl anion (2) Pyrrole

(3) Fullerene C_{60} (4) Azulene

(2013)

18. Which of the following is not a criteria for

(1) Presence of (4n + 2) delocalizable electrons

(2) Diamagnetic character

(3) Strong shielding-de-shielding pattern as a result of induced ring current

(4) Paramagnetic character

(2021)

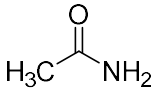
19. The correct order of polarity of the following functional group is:



I

CH_3-OH

II



III

$CH_3-CH_2-C\equiv N$

IV

(1) I<II <III <IV

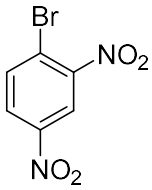
(2) I<IV <III < II

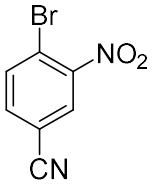
(3) IV< III<I < II

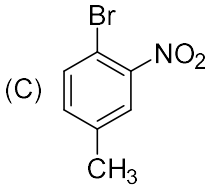
(4) III<IV <II < I

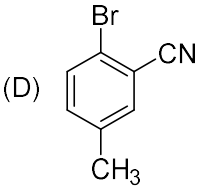
(2021)

20. Which of the following reacts fastest with NaOMe?

(A) 

(B) 

(C) 

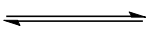
(D) 

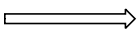
(2021)

21. Which one among the following arrows is the correct representation of resonance?

(A) 

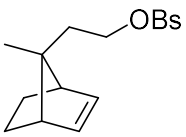
(B)

(C) 

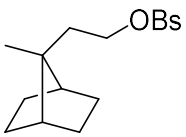
(D) 

(2021)

22. Compound A at 25^0C undergoes acetolysis 140000 times faster than compound B. Select the reason for this behavior:



A



B

(1) Anchimeric assistance

(2) Inductive Effect

(3) Field effect

(4) Resonance effect

Answer Key									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
4	3	1	1	4	3	2	4	3	2
11	**12**	**13**	**14**	**5**	**16**	**17**	**18**	**19**	**20**
2	3	2	2	3	1	3	4	2	1
21	**22**								
2	1								

:: Solutions ::

1. Solution: (4)

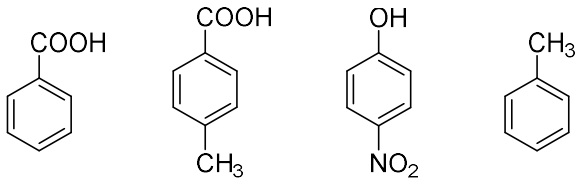
More substituted double bond is more stable.

2. Solution: (3)

3. Solution: (1)

In compounds first undergo fastest tautomerization because after tautomerization it becomes aromatic.

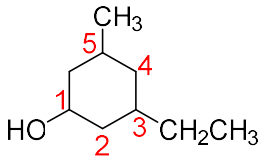
4. Solution: (1)



I II III IV

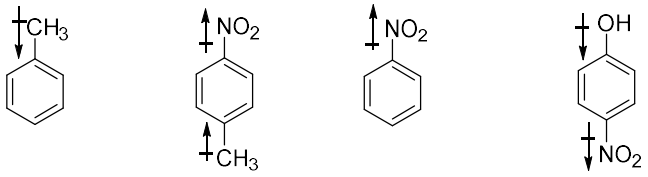
Because first one is more acidic; second compound is less acidic than first because +I effect of methyl group destabilise the carboxylate anion then third one and fourth.

5. Solution: (4)



Correct Answer is 3-ethyl-5-methyl cyclohexanol

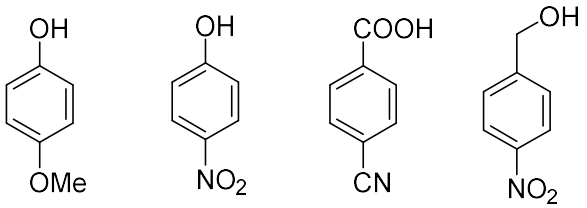
6. Solution: (3)



Because the more dipole moment presents in second compound compared to fourth compound because in compound four OH group have +M and -I effect but in compound second methyl group have only +I effect.

7. Solution: (2)

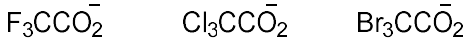
8. Solution: (4)



I II III IV

Because, third one is more acidic because acid group present then second because -I effect of NO_2 group stabilise the negative charge then first and four respectively.

9. Solution: (3)



I II III

Third one Is more basic because less electronegative Bromine atom and first one is less basic because more electronegative Fluorine atom withdraw electron density itself.

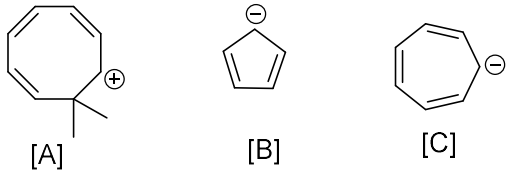
10. Solution: (2)

Rule for Aromaticity:-

If compound obey: - 4n+2πe, Planar, Cyclic & cyclic Conjugation then this compound are aromatic.

If compound obey: - 4n πe, Planar, Cyclic & cyclic Conjugation then this compound are Anti-aromatic.

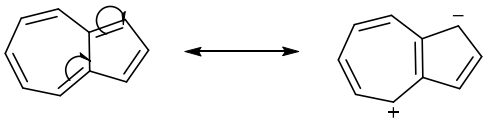
If compound doesn't have (Planar, Cyclic, Conjugation) one of these three then this compound are non-aromatic.



[A] [B] [C]

Correct Answer is A is homoaromatic, B is aromatic and C is antiaromatic. A is homoaromatic because it contains one SP^3 carbon and B is aromatic because it follows 4n+2π electron rule it is planar, conjugated and cyclic and C is antiaromatic because it follows 4n π electron.

11. Solution: (2)

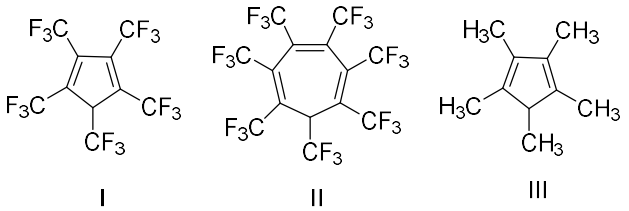


Correct Answer is It is aromatic and has high dipole moment than expected

12. Solution: (1)

Correct Answer is A Low Energy LUMO π^* orbital because carbonyl carbon has SP^2 hybridized. Hence, they have low energy Lowest Unoccupied molecular Orbital (LUMO) π*.

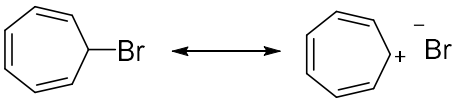
13. Solution: (2)



I II III

Correct Answer is I > III > II I compound has more acidic proton because CF_3 group have -I effect and after removing proton it becomes aromatic II compound is less acidic because after removing proton it becomes Non-aromatic and III compound is more acidic than second because after removing proton it becomes aromatic compounds.

14. Solution: (2)



Correct Answer is behaved like ionic compound and dissolves in polar solvents like water. It is behaved like ionic compound because after ionisation it becomes aromatic and ionised compound are dissolve in polar solvent.

15. Solution: (3)

Correct Answer is It doesn't show resonance phenomenon

Benzene ring has resonating structure. Hence it always shows resonance phenomenon.

16. Solution: (1)

When HOMO of nucleophile (electron rich moiety) and LUMO of electrophile (electron deficient moity) overlapped then formation of σ bong.

Correct Answer is A new σ-bond

17. Solution: (3)

Cyclopentadienyl anion, Pyrrole, and Azulene are aromatic compounds because they follow 4n+2π electron rule and they are planar, cyclin and they have conjugation.

Correct Answer is Fullerene C_{60}

18. Solution: (4)

Aromatic compound is: -

Obey 4n+2 e rule.

Aromatic compound has diamagnetic character and anti-compound have paramagnetic character.

Aromatic compound shows strong induced ring current.

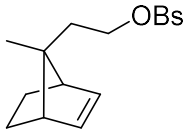
19. Solution: (2)

20. Solution: (1)

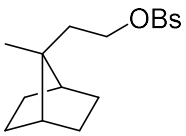
21. Solution: (2)

22. Solution: (1)

The interaction of an electron pair (either lone pair or PI bond) with an adjacent reaction center reaction is called as neighboring group participation also termed as Anchimeric assistance.



A



B

In Compound A pi-bond bond present hence Anchimeric assistance(neighboring group participation presence while in Compound B no Anchimeric assistance(neighboring group participation).

Hence Rate of acetolysis (solvolysis) of Compound A is faster than compound B.

Kerla-SET

(2019)

1. Which of the following statement is true?

(1) An aromatic compound is less stable than an analogous cyclic compound

(2) An antiaromatic compound is less stable than an analogous cyclic compound

(3) An antiaromatic compound is more stable than an analogous aromatic compound

(4) An antiaromatic compound must be a planar cyclic compound with an interrupted ring of p-orbital bearing atoms and the π cloud must contain an odd number ofpairs of π eletrons.

(2018)

2. Which among the following is aromatic?

(1) Cyclopropene (2) Cyclopropenyl cation

(3) Cyclopropenyl anion (4) Cyclopropane

(2018)

3. Which is more acidic?

a)  b)  c)  d) 

(2018)

4. Which one of the following shows highest dipole moment?

(1) 1,3-dchlorobenzene

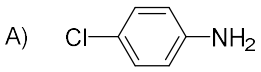
(2) 1,3,5-trichlorobenzene

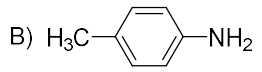
(3) 1,4-dichlorobenzene

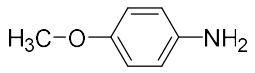
(4) 1,2-dichlorobenzene

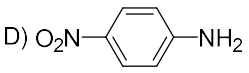
(2018)

5. Which is the weakest base among the following?

A) 

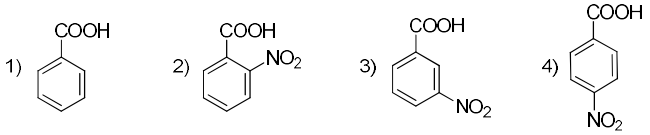
B) 

C) 

D) 

(2017)

6. Arrange the following in the increasing order of acidity.



(1) (i) < (ii) < (iv) < (iii) (2) (i) < (iv) < (iii) < (ii)

(3) (i) < (iii) < (iv) < (ii) (4) (iii) < (ii) < (iv) < (i)

(2017)

7. Which of the following statements is wrong?

(1) Benzene, and [6] annulene is aromatic

(2) Cyclobutadiene, and [4] annulene is antiaromatic

(3) Cyclooctatetraene, and [8] annulene is nonaromatic

(4) Cyclodecapentaene, and [10] annulene is aromatic

(2017)

8. The increasing order of stability of the following free radicals is

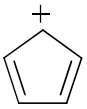
i) CH_3 ii) CF_3iii) CH_2F iv) CHF_2

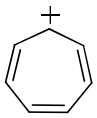
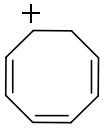
(1) i< iii < iv < ii (2) i< ii < iii < iv

(3) i< iii < ii < iv (4) ii <i< iii < iv

(2017)

9. Which among the following ion is homo aromatic?

A)  B) 

C)  D) 

10. The hapticity of cyclopentadienyl is/are

(1) 1 (2) 3

(3) 5 (4) 1, 3 and 5