

Seat No. \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**THE CHARUTAR VIDYA MANDAL UNIVERSITY**  
**M.Sc. (ORGANIC CHEMISTRY) – SEMESTER-3**  
**NOVEMBER 2021 EXAMINATION**

**Course Title: ORGANIC SPECTROSCOPY**

**Course Code: 101330301**

**Total Printed Pages : 03**

**Date: 16/11/2021**

**Time: 01:30 pm to 03.30 pm**

**Maximum Marks: 60**

**Instructions:**

- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

- Q. 1** Answer the following multiple choice questions. **(12)**
- (1) For H<sub>2</sub>O molecule, number of fundamental vibrations is \_\_\_\_\_.  
(a) 4                      (b) 5                      (c) 6                      (d) 3
  - (2) The shift of absorption toward higher wavelength due to substitution or solvent effect is called \_\_\_\_\_ effect.  
(a) hyperchromic      (b) hypochromic      (c) bathochromic      (d) hypsochromic
  - (3) In aldehyde the first overtone of C-H stretching observed at \_\_\_\_\_ cm<sup>-1</sup>.  
(a) 2620                      (b) 2830                      (c) 2780                      (d) 2920
  - (4) In <sup>1</sup>H-NMR the magnitude of the coupling constant depends upon \_\_\_\_\_.  
(a) dihedral angle      (b) instrument frequency      (c) Number of signal      (d) Peak area
  - (5) How many signals observed in 3-hydroxybutanoic acid for <sup>1</sup>H-NMR?  
(a) 4                      (b) 5                      (c) 6                      (d) 7
  - (6) Which of the following statements regarding NMR spectroscopy is wrong?  
(a) NMR signal towards the left of the spectral chart correspond to larger shifts.  
(b) Chemical shifts are larger when the frequencies of the radiation which includes the nuclear transitions are higher.  
(c) Chemical shift are larger when shielding effects are greater.  
(d) A hydrogen signal split into n+1 peaks by spin-spin coupling when the number of equivalent hydrogen atoms on adjacent atom(s) is n. And no other neighbouring atoms are involved.
  - (7) In HMQC spectrum, the connectivity between <sup>1</sup>H-<sup>13</sup>C observed is \_\_\_\_\_.  
(a) <sup>1</sup>J                      (b) <sup>2</sup>J                      (c) <sup>3</sup>J                      (d) both b & d
  - (8) In <sup>13</sup>C-NMR spectrum, chloroform-d (CDCl<sub>3</sub>) appeared at approximate value is \_\_\_\_\_.  
(a) 39.7 (triplet)      (b) 116.3(doublet)      (c) 77.0 (triplet)      (d) 29.6 (triplet)
  - (9) In pyrrolidine the C-2 and C-3 observed at \_\_\_\_\_ in <sup>13</sup>C-NMR.  
(a) 26 δ ppm and 47 δ ppm                      (b) 47 δ ppm and 27 δ ppm  
(c) 16 δ ppm and 29 δ ppm                      (d) 29 δ ppm and 16 δ ppm
  - (10) A hydrocarbon in its mass spectrum shows molecular ion peak M<sup>+</sup> and isotope peak M+1 with their intensity 100:4.4 therefore it will have \_\_\_\_\_.  
(a) 4 carbons                      (b) 8 carbons                      (c) 10 carbons                      (d) 6 carbons
  - (11) In mass spectrum of toluene, diffused peak observed at m/z =46.4 can be assigned as a \_\_\_\_\_.  
(a) M+1 peak      (b) Molecular ion peak      (c) Metastable ion peak      (d) M-45 peak

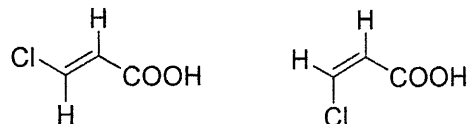
(12) A compound having one chlorine atom, will have two peaks in molecular ion region with the intensities \_\_\_\_.

- (a) almost 1:1      (b) 3:1      (c) 1:3      (d) 1:2

**Q.2**

Attempt **any eight** of the following. **(16)**

- (1) Write Lambert's Law and Beer's law.
- (2) Discuss the O-H stretching vibrations observed in the IR spectra of o-hydroxy acetophenone and p-hydroxy acetophenone.
- (3) Sketch the PMR spectrum for 1-nitropropane by taking appropriate  $\delta$  value for each signal and showing appropriate multiplicity.
- (4) In PMR, at room temperature cyclohexane gives one signal while at  $-70^\circ\text{C}$  it gives two signals. Explain.
- (5) How can you differentiate following geometrical isomer by PMR spectra?



- (6) What are difficulties observed in production of  $^{13}\text{C}$  spectra?
- (7) Sketch the expected DEPT 90 spectrum for 1,4-diisopropylbenzene taking approximately  $\delta$  value for each signal.
- (8) How will you detect metastable ion peak in the mass spectrum? Calculate the position of ion peak for an ion with unit mass 60 produces a fragment ion of mass 42 units.
- (9) What is nitrogen rule? Using the guideline indicate whether the following formula are correct or incorrect?  
(a)  $\text{C}_5\text{H}_5\text{N}$     (b)  $\text{C}_{15}\text{H}_{10}\text{NBr}$

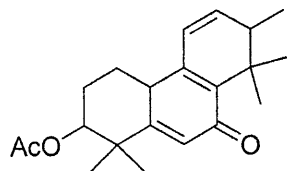
(10) Explain electron impact method for production of mass spectra.

**Q.3**

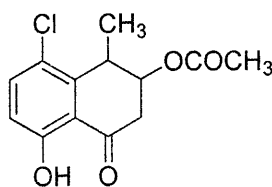
(A) Explain the Fermi resonance in Infrared spectra. **(08)**

(B) Do the  $\lambda_{\text{max}}$  for the following compounds.

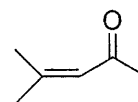
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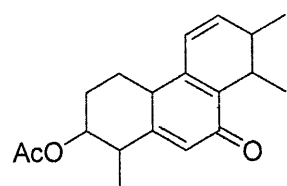
**OR**

**Q.3**

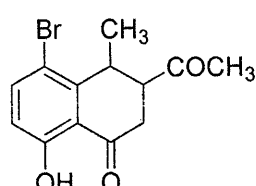
(A) Discuss in detail the characteristics infrared absorptions in esters. **(08)**

(B) Do the  $\lambda_{\text{max}}$  for the following compounds.

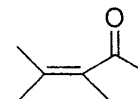
1.



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3.



**Q.4**

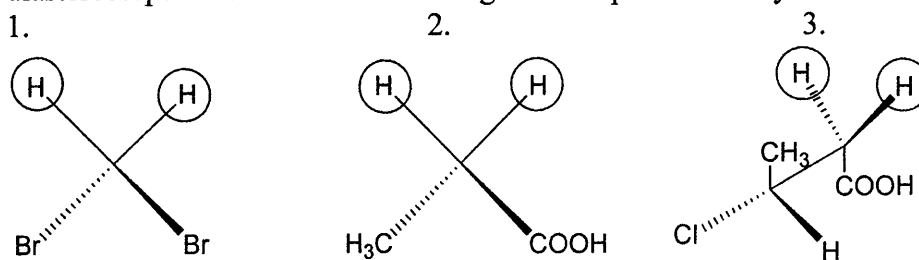
(A) What is Nuclear Overhauser Effect? Discuss use of NOE experiment to distinguish isovanillin and vanillin. **(08)**

(B) List the method used for simplification of  $^1\text{H-NMR}$  spectra. Discuss the use of increasing field strength and spin coupling in detail.

(C) Define Coupling Constant

OR

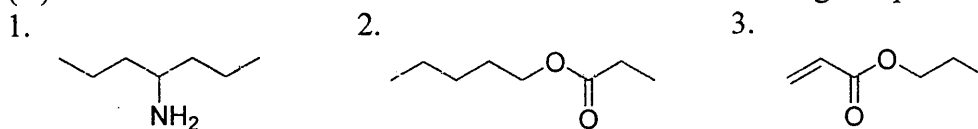
Q. 4 (A) Indicate whether the circled protons are homotopic, Enantiotopic or diastereotopic in each of the following. Give explanation of your answer. (08)



(B) Sketch the expected  $^1\text{H-NMR}$  spectrum for styrene by taking approximate  $\delta$  value for each signal and show that styryl group is in AMX system with three coupling constants.

(C) Why TMS use as a reference material in  $^1\text{H-NMR}$ ?

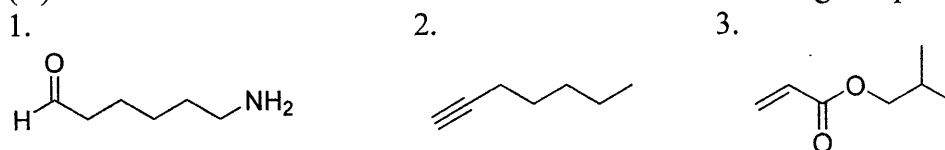
Q. 5 (A) Do the  $^{13}\text{C-NMR}$  chemical shift calculation for the following compounds. (08)



(B) By taking approximate  $\delta$  value for the signals, sketch the  $^1\text{H-}^1\text{H}$  COSY spectrum for 2-heptanal 2D NMR spectra.

OR

Q. 5 (A) Do the  $^{13}\text{C-NMR}$  chemical shift calculation for the following compounds. (08)



(B) Draw a structure of Limonene. Give the approximate  $^{13}\text{C-NMR}$   $\delta$  value of it, Using the  $^{13}\text{C-NMR}$  chemical shift value sketch the  $^{13}\text{C-NMR}$  DEPT-90 and DEPT-135 spectra for it.

Q. 6 (A) Do the mass fragmentation for the following compound. (08)

(1) Benzamide (2) 2-hexanone (3) 3-methyl pentanoic acid  
(B) Introduce metastable ion peak.

OR

Q. 6 (A) Explain mass fragmentation ether and aldehyde (08)

(B) Discuss McLafferty rearrangement in detail with suitable example.

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Seat No. \_\_\_\_\_

Enrollment No. \_\_\_\_\_

**THE CHARUTAR VIDYA MANDAL UNIVERSITY**  
**M.Sc. (Organic Chemistry) – SEMESTER 3**  
**WINTER 2021 EXAMINATION**

**Course Title: Disconnection Approach**

**Course Code: 101330302**

**Total Printed Pages : 04**

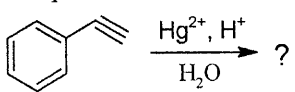
**Date: 17/11/2021**

**Time: 01.30 pm to 03.30 pm**

**Maximum Marks: 60**

**Instructions:**

- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

- Q. 1** Answer the following multiple choice questions. (12)
- (1) Which of the following reaction used for the preparation of  $\alpha,\beta$ -unsaturated carbonyl compounds?  
(a) Mannich Reaction (b) Wittig Reaction  
(c) Acyloin condensation (d) Strecker reaction
- (2) The reagent used for chloromethylation is \_\_\_\_\_.  
(a) AcOH/HCl (b) HCHO/HCl (c)  $\text{CHCl}_3/\text{HCl}$  (d) HCl/MeOH
- (3) Aldehyde when reacted with ethylene glycol under acidic condition yields \_\_\_\_\_ derivative.  
(a) ester (b) thiol (c) ketal (d) acetal
- (4) Reconnection concept only possible in \_\_\_\_\_.  
(a) 1,3-dicarbonyl compound (b) 1,4-dicarbonyl compound  
(c) 1,5-dicarbonyl compound (d) 1,6-dicarbonyl compound
- (5) In acidic media, nucleophile will prefer to attack on epoxide at \_\_\_\_\_.  
(a) more substituted side (b) less substituted side  
(c) oxygen atom (d) such reaction is not favourable
- (6) The product for following reaction is \_\_\_\_\_.  
  
(a) phenyl ethyl alcohol (b) propiophenone  
(c) acetophenone (d) phenyl acetaldehyde
- (7) The nature of hydrogen present in  $\text{CH}_3\text{-NO}_2$  is \_\_\_\_\_.  
(a) basic (b) acidic (c) neutral (d) amphoteric
- (8) 3-Methyl-pyazol-5-one is synthesized from \_\_\_\_\_.  
(a) Ethyl aceto acetate + Hydrazine (b) Ethyl aceto acetate +  $\text{NH}_2\text{OH}$   
(c) Ethyl acetate + Hydrazine (d) Ethyl acetate +  $\text{NH}_2\text{OH}$
- (9) Preparation of four membered ring using ketene involves \_\_\_\_\_.  
(a) 2+2 thermal cyclo addition (b) 2+2 photochemical cyclo addition  
(c) 4+2 thermal cyclo addition (d) 4+2 photochemical cyclo addition
- (10) Which of the following statement is incorrect for good characteristic of protecting group?  
(a) Easy to put in  
(b) Resist to the reagent which would the unprotected functional group

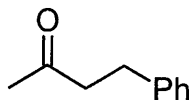
- (c) Resistant to as wide variety of other reagent  
 (d) Protecting group can't be easily removed
- (11) The rate of silylation of alcohols with TBSCl follows the trend \_\_\_\_\_.  
 (a)  $2^\circ \text{ROH} > 3^\circ \text{ROH} > 1^\circ \text{ROH}$   
 (b)  $1^\circ \text{ROH} > 2^\circ \text{ROH} > 3^\circ \text{ROH}$   
 (c)  $3^\circ \text{ROH} > 1^\circ \text{ROH} > 2^\circ \text{ROH}$   
 (d)  $3^\circ \text{ROH} > 2^\circ \text{ROH} > 1^\circ \text{ROH}$
- (12) The role of  $\text{B}_2\text{H}_6$  in the synthesis of Cephalosporin-C is to reduce \_\_\_\_\_.  
 (a) ester (b) lactum (c) aldehyde (d) amide

**Q. 2** Attempt **any eight** of the following. **(16)**

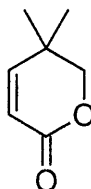
- (1) Define the following terms (a) Synthons (b) Retrosynthesis
- (2) Write the steps for disconnection and design of synthesis.
- (3) Give any two approaches for the disconnection of alcohols.
- (4) Illustrate the term illogical electrophile.
- (5) Give the mechanism for the preparation of acetone from propyne.
- (6) Give atleast two methods for the synthesis of 1,2-diols.
- (7) Explain the reaction mechanism of Darzens reaction.
- (8) Write down protection and deprotection of aldehyde and ketone.
- (9) Write the dimerization products of unsubstituted and disubstituted ketenes in the absence of nucleophile.
- (10) Write down the classical methods used for synthesis of esters.

**Q. 3** Answer the following. **(08)**

1. Explain the use of activation in organic synthesis. Using this approach plan the synthesis of the following molecule.



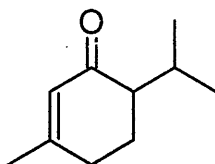
2. Do the disconnection and plan the synthesis for the following lactone derivative.



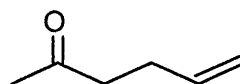
**OR**

**Q. 3** Do the disconnection and plan the synthesis for the following molecules. **(08)**

1.

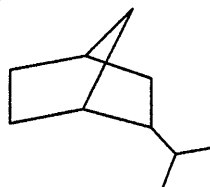


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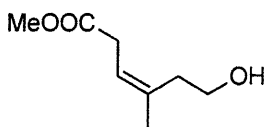
**Q. 4** Answer the following. **(08)**

1. Illustrate the term FGA, Using this approach plan the synthesis of the following molecule.



2. Give the general strategy for disconnection of 1,6-dicarbonyl compound and using this approach plan the synthesis of following

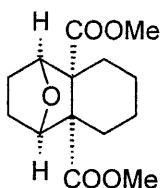
molecule.



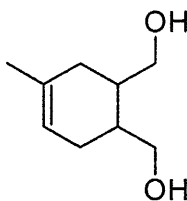
OR

**Q. 4** Do the disconnection and plan the synthesis for the following molecules. (08)

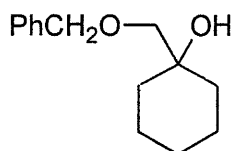
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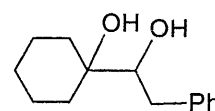
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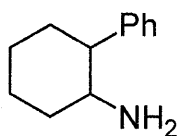


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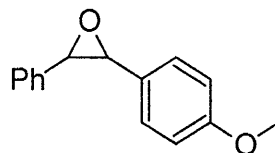


**Q. 5** Do the disconnection and plan the synthesis for the following molecules. (08)

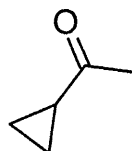
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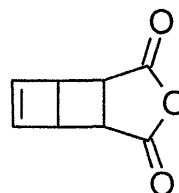
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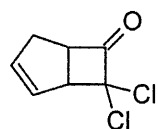
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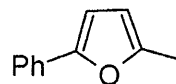
OR

**Q. 5** Do the disconnection and plan the synthesis for the following molecules. (08)

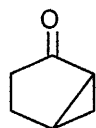
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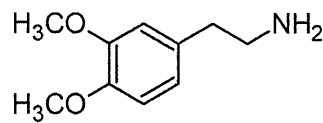
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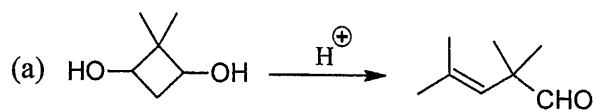


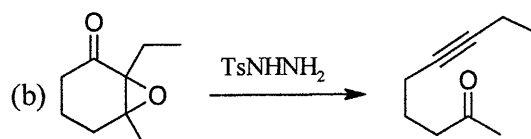
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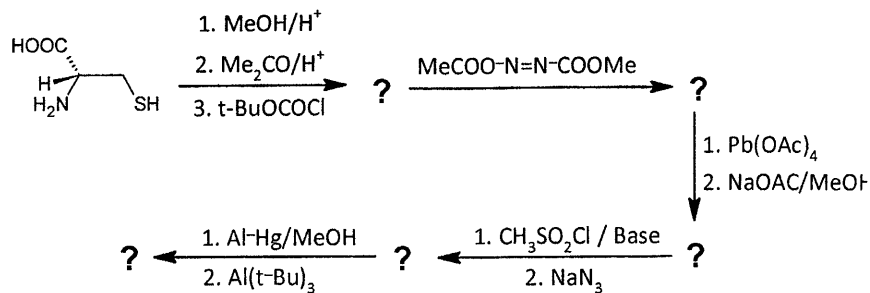
**Q. 6** Answer the following. (08)

1. Comments on the following reactions on the basis of pull-push chemistry with detailed reaction mechanism.





2. Complete the following synthetic steps.



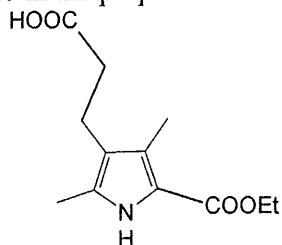
OR

Q. 6

Answer the followings.

(08)

1. Give the synthesis of following pyrrole derivative used as intermediate in the preparation of mesoporphyrin IX.



2. Write down the three different methods for protection and deprotection of alcohols and amines.

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Seat No. \_\_\_\_\_

Enrollment No. \_\_\_\_\_

**THE CHARUTAR VIDYA MANDAL UNIVERSITY**  
**M.Sc. (Organic Chemistry) – SEMESTER 3**  
**WINTER 2021 EXAMINATION**

**Course Title: Heterocyclic Chemistry**

**Course Code: 101330303**

**Total Printed Pages : 03**

**Date: 18/11/2021**

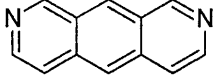
**Time: 01.30 pm to 03.30 pm**

**Maximum Marks: 60**

**Instructions:**

- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

**Q. 1** Answer the following multiple choice questions. **(12)**

- (1) Which of the following method is *NOT* used for the synthesis of indole?  
(a) Fischer synthesis (b) Reissert synthesis  
(c) Modelung synthesis (d) Skraup synthesis
- (2) Identify the correct name for following heterocyclic compound.
- 
- (a) Pyrido[3,4-g]isoquinoline (b) Pyrido[4,3-g]isoquinoline  
(c) Pyrido[3,4-g]quinoline (d) Pyrido[4,3-g]quinoline
- (3) Which of the following product is obtained upon reduction of benzo[b]furan in presence of Pd-C?  
(a) 2,3-dihydrobenzo[b]furan (b) 2-ethylphenol  
(c) 2,3,4,5 tetrahydro benzo[b]furan (d) octahydro benzo[b]furan
- (4) Electrophilic aromatic substitution reactions in quinoline and isoquinoline mainly occurs at position- \_\_\_\_\_.  
(a) 5 and 8 (b) 4 and 6 (c) 6 and 7 (d) 2 and 3
- (5) Nitration of quinazoline mainly occurs at position- \_\_\_\_\_.  
(a) 1 (b) 4 (c) 5 (d) 6
- (6) 2,4-Dichloroquinazoline upon reacting with NH<sub>3</sub>/MeOH/18hrs gives \_\_\_\_\_.  
(a) 4-amino-2-chloroquinazoline (b) 2-amino-4-chloroquinazoline  
(c) 2,4-diamino quinazoline (d) 8-amino-2,4-dichloroquinazoline
- (7) Diethyl malonate reacts with urea in presence of base to give \_\_\_\_\_.  
(a) barbituric acid (b) uracil (c) melamine (d) cyanuric acid
- (8) Which of the following statement is correct for nucleophilic substitution reaction at various positions of pyridine?  
(a) Postion-4 is more preferred over postion-2  
(b) Postion-2 is more preferred over postion-4  
(c) postion-3 is more preferred over postion-2  
(d) postion-2 is more preferred over postion-3
- (9) 2,4,6-Trimethyl pyridine is commonly known as \_\_\_\_\_.  
(a) picoline (b) lutidine (c) collidine (d) nicotine
- (10) Electrophilic substitution reaction on  $\alpha$ -pyrone proceeds at \_\_\_\_\_.  
(a) ortho & para positions with respect to carbonyl group



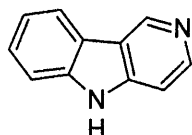
- (b) meta position with respect to carbonyl group  
 (c) ortho & para positions with respect to oxygen atom  
 (d) Electrophilic substitution reaction on  $\alpha$ -pyrone is not possible  
 (11) Coumarin in the presence of excess  $AlCl_3$ , bromination reaction proceeds at

- (a) 3<sup>rd</sup> position (b) 4<sup>th</sup> position (c) 5<sup>th</sup> position (d) 6<sup>th</sup> position  
 (12) The reaction of benzopyrylium chloride with  $HNO_3$  gives \_\_\_\_\_  
 (a) 4,6-dinitro salicylic acid (b) 3,6-dinitro salicylic acid  
 (c) 5-dinitro salicylic acid (d) salicylic acid

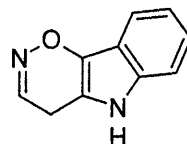
**Q. 2** Attempt **any eight** of the following. **(16)**

- (1) Write the complete name of following heterocyclic compounds.

(a)



(b)



- (2) "Electrophilic substitution reaction of indole favours at position-3" justify the statement.  
 (3) How benzo[b]furan-2-sulphonic acid can be synthesized from 2-bromo benzo[b]furan?  
 (4) Explain the ISAY synthesis.  
 (5) Write Bischler Napieralski synthesis of isoquinoline.  
 (6) Give the synthesis of cinnoline for methyl anthranilate  
 (7) Arrange basicity of 1,2-diazine, 1,3-diazine, 1,4-diazine in increasing order and explain it.  
 (8) Give the products for the reaction of coumarin with (a)  $Ni/H_2$  (b)  $LiAlH_4$ .  
 (9) Justify the statement "boiling point of imidazole and pyrazole are much higher than anticipated"  
 (10) Justify the statement "imidazole is much stronger base than pyrrole"

**Q. 3** Answer the following. **(08)**

- Write the synthesis of Ondansetron & Tryptamine.
- Give at least two methods for the synthesis of benzo[b]furan and discuss their oxidation and reduction reactions.

**OR**

**Q. 3** Answer the following. **(08)**

- Write the ring expansion reactions of indole derivatives and alkylation reaction of indole.
- Discuss the electrophilic substitution reactions of substituted indoles.

**Q. 4** Write atleast two methods for the synthesis of quinoline with their mechanism and write the electrophilic substitution reactions of substituted quinoline and isoquinoline. **(08)**

**OR**

**Q. 4** Write at least two methods for synthesis of each phthalazine and quinoxaline derivatives. Give the products for the reaction of quinoxaline with (a)  $RMgX$ , (b)  $HCN$  (c)  $LiAlH_4$  **(08)**

**Q. 5** Answer the following. **(08)**

- Write one synthesis each of each pyridazine, pyrimidine, pyrazine and discuss the bromination reaction of pyrimidine.
- Discuss the electrophilic substitution reactions of substituted pyridine-N-oxide.

**OR**

- Q. 5** Answer the following. (08)
1. Write the ring transformation reaction of pyrimidine and nucleophilic displacement reactions of halopyrimidine derivatives.
  2. Discuss the electrophilic substitution reactions of substituted pyridine.

- Q. 6** Answer the following. (08)
1. "2-benzopyrylium salt can be converted to isoquinoline however 1-benzopyrylium salt can't be converted to quinoline by the reaction with ammonia" justify the statement.
  2. Write the synthesis of  $\alpha$ -pyrone from malic acid and write the mechanism for the reaction of  $\gamma$ -pyrone with  $\text{NH}_3$  and  $\text{Ph-NH-NH}_2$  respectively.

**OR**

- Q. 6** Answer the following. (08)
1. Write the synthesis of 2,4,6-trimethyl pyrilium salt. Write mechanism for the reaction of 2,4,6-trimethylpyrilium salt with  $\text{NH}_2\text{NH}_2$ ,  $\text{NH}_2\text{OH}$  and  $\text{NaCN}$  respectively.
  2. Write two general methods for synthesis of each coumarin and flavone. Give the product for the reaction of coumarin with  $\text{NaOH}$ .

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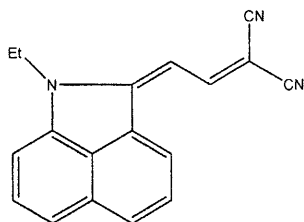
**THE CHARUTAR VIDYA MANDAL UNIVERSITY**  
**ORGANIC CHEMISTRY – SEMESTER 1**  
**WINTER 2021 EXAMINATION**

**Course Title: Selected Topics in Organic Chemistry****Course Code: 101330309****Total Printed Pages : 03****Date: 19/11/2021****Time: 1:30 pm to 3:30pm****Maximum Marks: 60****Instructions:**

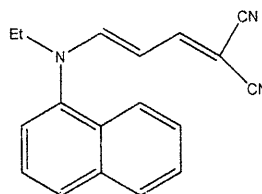
- Attempt all questions.
- Numbers to the right indicate full marks for each question.
- Make suitable assumptions wherever necessary.

**Q. 1** Answer the following multiple-choice questions. **(12)**

- (1) Which of the following is used as a photographic sensitizer?  
 (a) Kryptocyanine (b) Oxonols  
 (c) Phthalocyanine (d) Polymethine
- (2) Which of the following approach cannot be adopted for optimizing the bathochromic shift of a donor-acceptor chromophore?  
 (a) Increase the length of conjugated bridge  
 (b) Increasing the molecular weight of chromophore  
 (c) Increase the effective electron accepting strength of acceptor residue  
 (d) Increasing the effective electron donating strength of donor residue
- (3) Select odd one.  
 (a) Sulphur Dye (b) Xanthene Dye (c) Vat Dye (d) Solvent Dye
- (4)



[A]



[B]

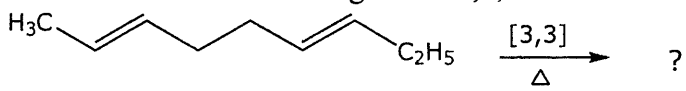
- Which of the above molecule has higher  $\lambda_{\max}$  value?  
 (a) A (b) B (c) cannot predict (d) same  $\lambda_{\max}$  value of both [A] & [B]
- (5) Which of the following is not allowed transition?  
 (a)  $\pi \longrightarrow \sigma^*$  (b)  $\sigma \longrightarrow \sigma^*$  (c)  $n \longrightarrow \sigma^*$  (d)  $\pi \longrightarrow \pi^*$
- (6) Which of the following is not promising application of NIR Dyes?  
 (a) As a cell marker (b) In spectrophotometric analysis  
 (c) For textile printing (d) In the photovoltaic cell
- (7) Cycloaddition reaction of Bicyclo [2.2.1]-2,5-heptadiene is \_\_\_\_\_ allowed.  
 (a) [2+2], hv (b) [4+2], hv (c) [2+2],  $\Delta$  (d) [4+2],  $\Delta$
- (8) For Sigma tropic alkyl shift which of the following is/are correct?  
 1. The allowed process includes supra facial [1,5] shift with retention

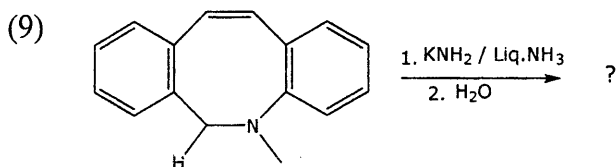
2. The allowed process includes supra facial [1,3] shift with inversion  
 3. The allowed process includes supra facial [1,3] shift with retention  
 4. The allowed process includes supra facial [1,5] shift with inversion  
 (a) Only (1) (b) Only (4) (c) Both (1) & (2) (d) Both (3) & (4)
- (9) [2+2] chelotropic cycloaddition of alkene is stereospecific with \_\_\_\_\_.  
 1. singlet carbene 2. triplet carbene  
 3. thermal condition 4. photochemical condition  
 (a) (1&3) (b) (2 & 4) (c) (1 & 4) (d) (2 & 3)
- (10) \_\_\_\_\_ is the analogs reaction of Diel's -Alder reaction.  
 (a) [3,3] Sigmatropic (b) 1,3- Dipolar cycloaddition  
 (c) [2+2] Ketene addition (d) All of them
- (11) Thermally induced [4n+2] cycloadditon reaction is \_\_\_\_\_.  
 (a) symmetry allowed in supra-supra mode  
 (b) symmetry allowed in supra-antara mode  
 (c) symmetry forbidden in supra-supra mode  
 (d) symmetry forbidden in antara-supra mode
- (12) Allyl phenyl ether undergoes [3,3] sigma tropic rearrangement is known as \_\_\_\_\_ rearrangement.  
 (a) Claisen (b) Cope (c) Sommelet-Hauser (d) Benzidine

**Q.2**

Attempt **any eight** of the following.

(16)

- (1) Define the terms chromophore and auxochrome. Give their types and suitable examples.
- (2) Give the synthesis of Amido Yellow E.
- (3) Explain in short about medicinal application of colourants.
- (4) Write the postulates of Valance Bond Theory.
- (5) Draw molecular orbital diagram of 1,3,5-hexatriene.
- (6) 
- (7) Explain [1,3], [1,5] and [1,7] sigma tropic rearrangement with suitable examples.
- (8) Compare photo-lithiography and ink jet printing.



- (10) List out different tests performed on pigmented materials and explain any two from them.

**Q. 3**

Answer the following.

(08)

- (i) What is dye? Explain the classification of dye based on its chemical composition.  
 (ii) Discuss photographic dyes.

**OR**

**Q.3**

Discuss cyanine type chromophore in detail.

(08)

**Q. 4**

Answer the following.

(08)

- I. What are Fluorescent Bighting Agents? Explain its method of working and detail classification.  
 II. Write a note on Modern High-Grade Pigments.

**OR**

Q. 4 Give the applications and synthesis of following. (08)  
a. Tetrabromo Indigo      b. Tartrazine yellow      c. Direct Deep Black

Q. 5 Answer the following. (08)

I. Explain Nazarov reaction with its silicon modification giving suitable reaction mechanism.

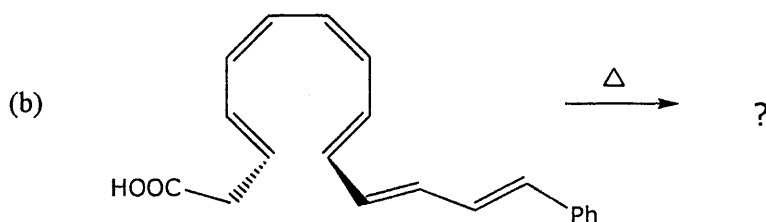
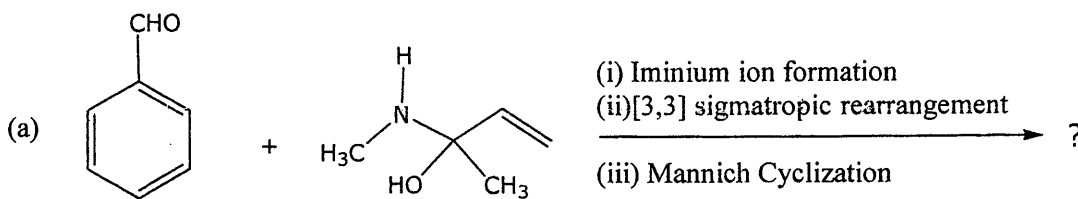
II. Explain the reason for the formation of major product formed during reaction of cyclopentadiene and maleic anhydride at 00C temperature.

OR

Q. 5 Answer the following. (08)

I. Explain electrocyclic ring opening reaction of 1,3,5-Hexatriene using FMO approach.

II. Complete the following reactions with reasonable mechanism.



Q. 6 Answer the following. (08)

I. Discuss the correlation diagram of [4+2] cyclo-addition reaction.

II. Write a note on ene-transfer reaction.

OR

Q. 6 Answer the following the following. (08)

I. Write a note on Chelotropic reaction.

II. Explain [2+2] cycloaddition reaction using Huckel - Mobius approach.

ALL THE BEST