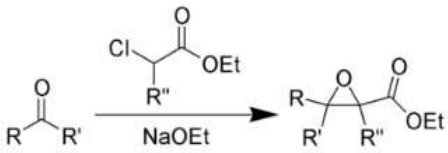
Duration: 2.5 hours **Max. Marks: 60**

N.B. i) All questions are compulsory.
ii) Figures to the right indicate full marks.

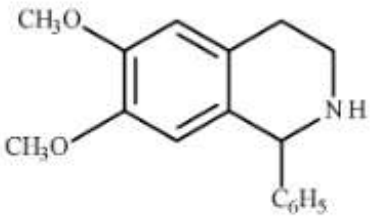
1. A. Attempt **any two** of the following: **8**

i)



a. What is the name of this reaction?
b. Write the mechanism of the reaction.

ii) The following compound is synthesised by the Pictet-Spengler reaction.



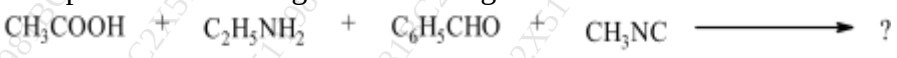
What are the components of this reaction? Explain the mechanism of this reaction.

iii) Primary or secondary alcohols on treatment with carboxylic acid in the presence of diethyl azodicarboxylate and triphenylphosphine are converted to esters. Write one example of this reaction, its name and the mechanism.

iv) What are the characteristics of a click reaction? Give an example of the Huisgen 1,3-dipolar reaction.

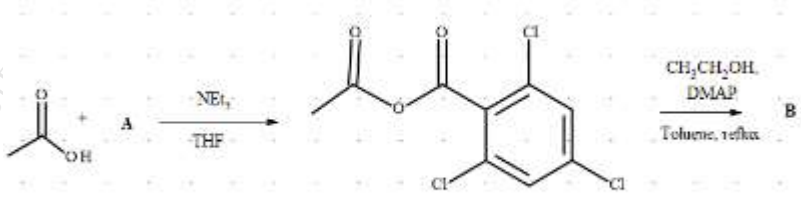
B Attempt **any one** of the following: **4**

i) Complete the following reaction and give the name.



Write the mechanism of the reaction.

ii) Complete the following reaction and give the name.



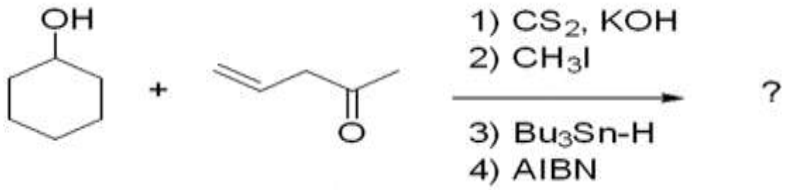
Write the mechanism of the reaction.

X51Y981BC2X51Y981BC2X51Y981BC2X51Y981BC2

2. A Attempt **any two** of the following: **8**

i)

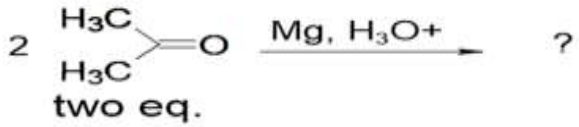
Predict the product and suggest the mechanism.



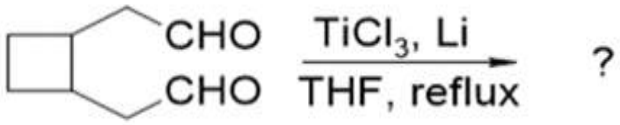
ii) Explain persistent radical with its stability and radical initiator with suitable examples.

iii)

Predict the product, name and suggest the mechanism



iv Predict the product, name the reaction and suggest the mechanism.

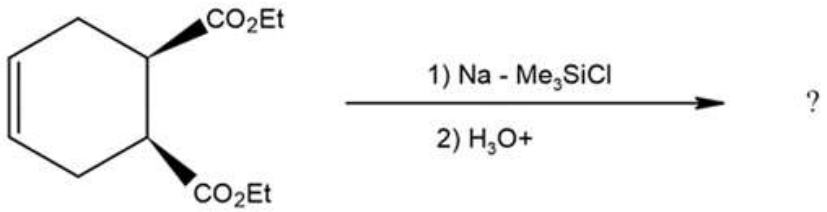


B Attempt **any one** of the following: **4**

i) Discuss with example, intramolecular C-C bond formation using thiol donors.

ii)

Give the product and mechanism of the following reaction.



3. A Attempt **any two** of the following: **8**

i) Give the synthesis of 2-hexene using a Witting reaction. Explain the mechanism involved.

ii) What are S-yields? How are they prepared? Give two applications of S-yield in organic synthesis.

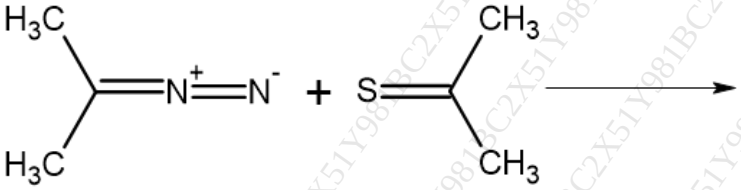
iii) What is Steven's rearrangement? Illustrate with the mechanism and one application.

iv) Explain the generation of carbanions in nitro compounds and phosphonates and give one application of each in C-C bond formation.

X51Y981BC2X51Y981BC2X51Y981BC2X51Y981BC2

B Attempt **any one** of the following: **4**

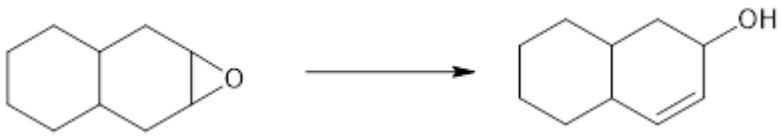
i) Complete the following reaction, and give its name and mechanism.



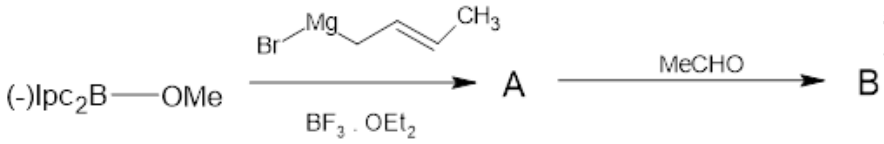
ii) Explain with mechanism, formation of enamine by condensation of secondary amine and aldehyde.

4. A Attempt **any two** of the following: **8**

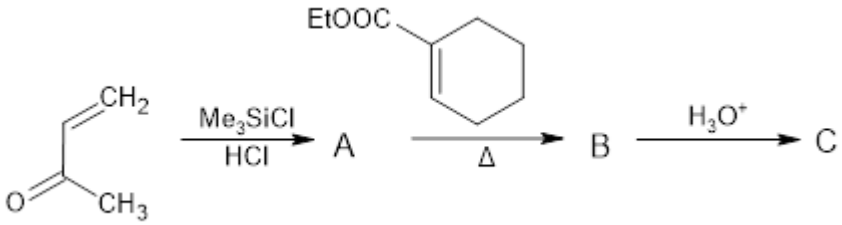
i) Give the following conversion via selenoxide.



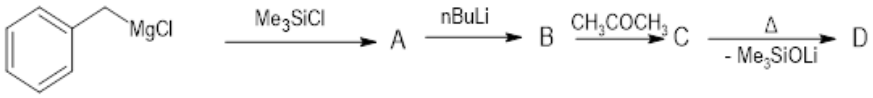
ii) Complete the following reaction with correct stereochemistry and predict the mechanism.



iii) Complete the following reaction and identify A, B and C.

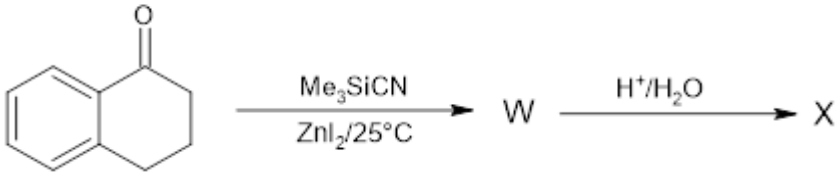


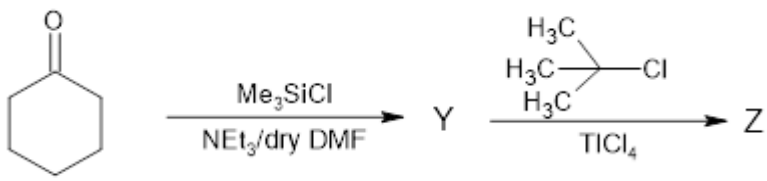
iv) Complete the following reaction by identifying A, B, C, and D.



B Attempt **any one** of the following: **4**

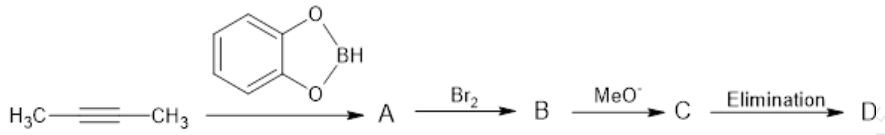
i) Complete the following reaction by identifying W, X, Y and Z.





X51Y981BC2X51Y981BC2X51Y981BC2X51Y981BC2

ii) Complete the following reaction and identify A, B, C and D.



5. Answer **any four** of the following: **12**

(a) Write equations to show the following reactions
Ritter reaction
Peterson olefination reaction
Strecker reaction

(b) What is a multi-component organic reaction between an aryl aldehyde, a β-keto ester and urea called? With a suitable example, explain the mechanism of this reaction.

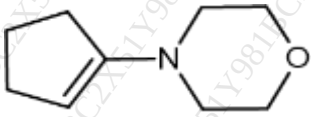
(c) Write the reagent and name the reaction.



(d) Write the reagent and byproduct and name of the following reaction.



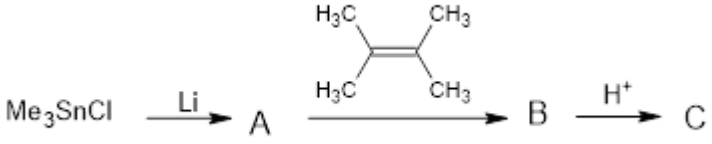
(e) What is the action of following reagents on



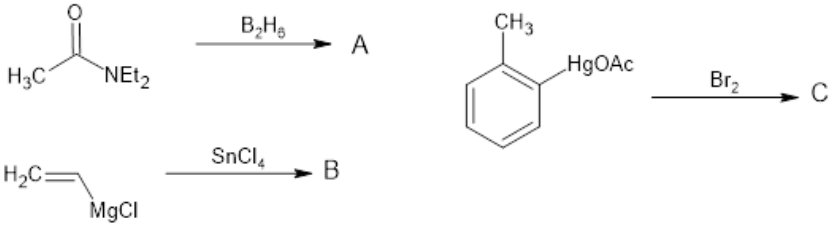
i) CH_3Br
ii) CH_3COCl
iii) $CH_2=CH-CH_2Cl$

(f) Write a brief note on Bestman Ohira reagent.

(g) Complete the following reaction by identifying A, B and C.



(h) Complete the following reactions by identifying A, B and C.



X51Y981BC2X51Y981BC2X51Y981BC2X51Y981BC2

Duration: 2 ½ Hours **Total Marks: 60**

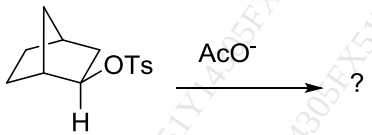
Instructions:

(1) All questions are compulsory.

(2) Figures to the right indicate full marks.

Q. 1 (a) Attempt any **two** of the following: **08**

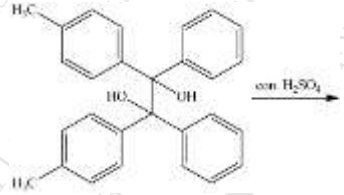
(i) Explain anchimeric assistance by σ-bond in the following reaction and predict the products.



(ii) Explain the methods of generation and structure of carbine.

(iii) Explain molecular orbital basis for the α-effect.

(iv) Predict the product formed in the following reaction and suggest a possible mechanism.



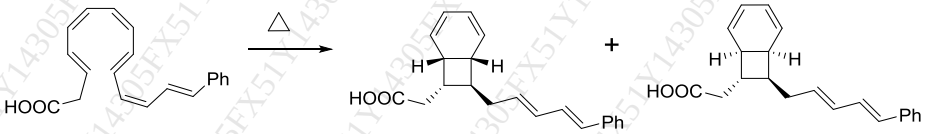
(b) Attempt any **one** of the following: **04**

(i) Discuss the role of FMO in reactions involving hard and soft nucleophiles and electrophiles.

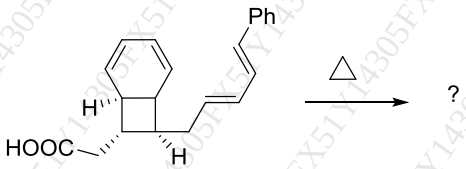
(ii) Draw the correct MO diagrams of 1,3,5-hexatriene & 1,3-cyclohexadiene molecules.

Q. 2 (a) Attempt any **two** of the following: **08**

(i) Give the mechanism for following ring closer reaction.



(ii) What is cycloaddition reaction? Predict the product and explain the stereochemistry in the following conversion.



(iii) Using correlation diagram, discuss [4 + 2] cycloaddition reaction.

(iv) Discuss oxy-cope and aza-cope reaction with suitable example.

(b) Attempt any **one** of the following: **04**

(i) Give the reaction for formation of Vitamin D from 7-dehydrocholesterol.

(ii) Explain periselectivity and regioselectivity in pericyclic reactions.

X51Y14305FX51Y14305FX51Y14305FX51Y14305F

Q. 3 (a) Attempt any **two** of the following: **08**

(i) Discuss the conformational features of cyclodecane ring system.

(ii) Explain the stereochemistry and stability of hydrindane.

(iii) Draw all the diastereomers of perhydroanthracene and comment on optical activity of each diastereomer.

(iv) Explain the reactivity and mechanism of E_2 elimination as shown by pair of epimers of menthyl chloride.

(b) Attempt any **one** of the following: **04**

(i) Discuss transannular reactions giving examples.

(ii) Discuss the mechanism and stereochemistry of bromination of cyclohexene.

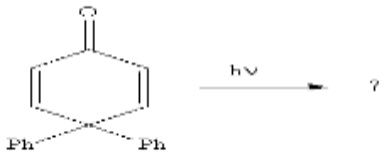
Q. 4 (a) Attempt any **two** of the following: **08**

(i) What are photochemical quenchers? Discuss the principle involved in photoquenching process.

(ii) Discuss the cleavage of a bond β to the carbonyl group in photochemical reactions of ketones with a suitable example.

(iii) Explain the mechanism of di-π methane rearrangement.

(iv) Give mechanism of the following reaction.



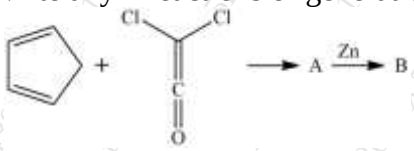
(b) Attempt any **one** of the following: **04**

(i) What is Paterno-Buchi reaction? Give its mechanism and stereochemical consequences.

(ii) What is photoreduction? Discuss the mechanism of photoreduction of benzophenone in the presence of isopropyl alcohol.

Q. 5 Attempt any **four** of the following: **12**

(a) Write any 2 reactions of generation of ketene. Predict product A and B.



(b) Explain any three features of pericyclic reactions

(c) What is Diels-Alder & Retro Diels-Alder reaction? Explain both with suitable example of each.

(d) Draw the π MO of allyl 2,4-pentadienyl system.

(e) Assign the point groups to the following molecules:
NH_3, staggered ethane and CH_4

(f) Explain Bredt's rule with two examples.

(g) Write a short note on Photo-Fries rearrangement reaction.

(h) Write a note on photo-oxygenation reactions.

X51Y14305FX51Y14305FX51Y14305FX51Y14305F

Duration: 2 Hours 30 minutes **Max Marks: 60**

N.B. i) All questions are compulsory.
ii) Figures to the right indicate full marks.

1. a. Attempt **any two** of the following: **8**
   i) Discuss the following physical and chemical parameters in drug distribution: (a) Solubility (b) Ionization.
   ii) Explain the use of functional groups in prodrugs with advantages.
   iii) Discuss the basic idea regarding combinatorial synthesis.
   iv) Discuss how penicillin was discovered without a lead compound
   b. Attempt **any one** of the following: **4**
   i) Discuss structure modification to increase potency and therapeutic index of a drug.
   ii) Explain factors affecting bioactivity of drugs.

2. a. Attempt **any two** of the following: **8**
   i) What are QSAR models? Explain, how Taft equation describes the steric effects of a substituent?
   ii) What is Hansch analysis? Give its merits and limitations.
   iii) What is computer aided drug design? Give its principle and advantages.
   iv) What are prodrugs? What are the objectives of prodrug design?
   b. Attempt **any one** of the following: **4**
   i) Give synthesis and one application of Zidovudine.
   ii) Give synthesis and one application of Diclofenac.

3. a. Attempt **any two** of the following: **8**
   i) What is biosynthesis? Discuss the biosynthesis of DMAPP from acetyl-CoA.
   ii) Explain in brief the terms primary and secondary plant metabolites.
   iii) Explain the mechanism involved in production of PGF_{2a}.
   iv) Write the shikimic acid pathway for the biosynthesis of benzoic acid and its derivatives.

   b. Attempt **any one** of the following: **4**
   i) Discuss the biosynthetic pathway for L-tryptophan.
   ii) Explain the biosynthetic conversion of chorismic acid to L-Tyrosine and phenylalanine.

X51Y157B4FX51Y157B4FX51Y157B4FX51Y157B4F

4	a.		Attempt **any two** of the following:	**8**
		i)	What is the polymer supported reagent? Give any two advantages of polymer supported reagents.	
		ii)	Give the examples of any two green acid catalyst. Write down any two green acid catalyzed reactions.	
		iii)	Write down the any one reaction in which water is employed as a green solvent. Give any two advantages of water as a green solvent.	
		iv)	Write Note on DES. Give any one reaction in which DES is employed as a green solvent.	
	b.		Attempt **any one** of the following:	**4**
		i)	Why microwave assisted reactions takes less time for completion? Give any one example of microwave assisted reaction.	
		ii)	Write note on Solid Phase Synthesis. Give any one application of Solid phase synthesis in organic reactions.	
5			Attempt **any four** of the following:	**12**
		a)	Define the terms: Drug potency and drug receptor	
		b)	Explain therapeutic index of a drug.	
		c)	Explain drug design via enzyme inhibition using examples.	
		d)	Give synthesis of Flucanazole.	
		e)	Explain the Shikimate pathway in biosynthesis of flavonoids.	
		f)	Give the steps involved in the biosynthesis of citronellol from DMAPP.	
		g)	Define nano material. Write down any two advantages of Nano catalysts.	
		h)	Write down the structure and chemical name of Aliquat 336. Give any one application of Aliquat 336 in organic synthesis.	

X51Y157B4FX51Y157B4FX51Y157B4FX51Y157B4F

Time: 2 ½ hours **Total Marks: 60**

N.B. (1) All questions are **compulsory.**

(2) **Figures** to the **right** indicate **full** marks.

Q.1 A Attempt any two of the following: **8**

a Explain structural features and applications of inositol and heparin.

b Give structural features and biological importance of carotenoids and quinones.

c Give synthesis of β-carotene.

d Write a short note on deoxy sugars and branched sugars.

Q.1 B Attempt any one of the following: **4**

a Give the synthesis of ubiquinone from 3,4,5-trimethoxy acetophenone.

b Write a short note on sex pheromones and trail pheromones.

Q.2 A Answer any two of the following: **8**

a Discuss the synthetic strategy for the synthesis of Longifolene.

b Write the Structure of Gibberellic acid. Give the synthesis of Triacontanol.

c Explain the insect growth regulator. Discuss the structure features of gibberellic acid.

d How is decalinedione prepared from resorcinol? Draw the configuration of the two enantiomers of Griseofulvin.

Q.2 B Answer any one of the following: **4**

a Write the structure of reserpine. Write the biological importance of prostaglandins.

b Draw the structure of 4-demethoxydaunomycin. How is phloroglucinol converted to 4,6-dimethyl benzofuranone?

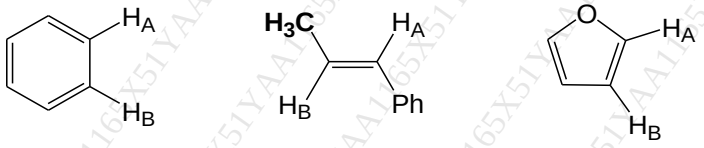
Q.3 A Answer any two of the following: **8**

a Give one example each for compounds which exhibit the following spin systems according to Pople's nomenclature:

i) AB ii) AX iii) AMX iv) A_3X_2

X51YAA1165X51YAA1165X51YAA1165X51YAA1165

b Arrange the following compounds in decreasing order of coupling constant. Justify your answer.



c Calculate ^{13}C NMR chemical shifts for all the aromatic carbons using incremental shifts of all the aromatic carbon atoms from the table given below for the following compounds:

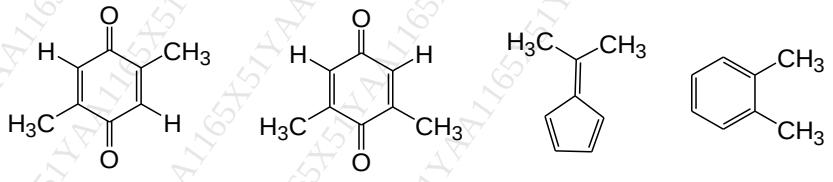
(I) *p*-bromoaniline (II) *m*-chlorophenol

Substituents	Increments in ppm			
	Ipso	*Ortho*	*Meta*	*Para*
-Cl	+6.4	+0.2	+1.0	-2.0
-NH_2	+19.2	-12.4	+1.3	-9.5
-OH	+26.6	-12.7	+1.6	-7.3
-Br	-5.4	+3.4	+2.2	-1.0

d Explain the first order and second order spin system with suitable examples.

Q.3 B Answer any one of the following: **4**

a Predict the number of signals for following compounds in ^{1}H and ^{13}C NMR. Justify your answer.



i ii iii iv

b Deduce the structure of an organic compound from the following data:

Molecular formula: $C_8H_{14}O_3$,

IR (cm-1): 2900, 1820 and 1755 cm^{-1};

^{1}H NMR: δ: 1.0 (t), 1.7 (m) and 2.5 (t);

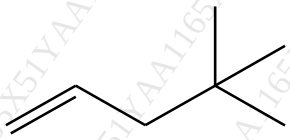
^{13}C NMR (δ): 12, 18 (DEPT –ve signals), 38 and 180;

Mass: 158 (M+), 71 (base peak), 70 and 55.

X51YAA1165X51YAA1165X51YAA1165X51YAA1165

Q.4 A Answer any two of the following: **8**

a The following chemical shifts were obtained in the ^{13}C NMR spectrum of the compound.



δ(ppm): 28, 29, 49, 118, 133.

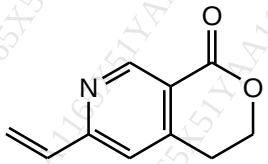
Match the chemical shifts with the appropriate carbons and draw its proton decoupled ^{13}C NMR, DEPT-45, DEPT-90, DEPT-135 spectra.

b Discuss the significance of 2D NMR spectroscopic techniques over one dimensional.

c What is Nuclear Overhauser Effect proton NMR? What significance does it have? Explain with suitable example.

d Assign the ^{13}C NMR chemical shifts to the given structure. Justify your assignments.

24 (t), 66.12(t), 120.26(t), 120.82(s), 129.44(d), 130.72(s), 144.66(s), 150.20 (d), 150.88(d), 163.46 (s).



Q.4 B Answer any one of the following: **4**

a What is HETCOR spectroscopy? With suitable example explain its significance in structure determination of organic compounds.

b Predict the probable ^{1}H NMR and ^{13}C NMR signals for 1-propanol. Using predicted signals draw a sketch of ^{1}H-^{1}H COSY spectrum and assign correlations.

Q.5 Answer any four of the following **12**

a Give the synthesis of Grandisol.

b Prove the following :

i. Presence of secondary amine group in coniine

ii. Presence of piperidine nucleus in coniine

X51YAA1165X51YAA1165X51YAA1165X51YAA1165

c What are lipids? Give its classification with suitable example.

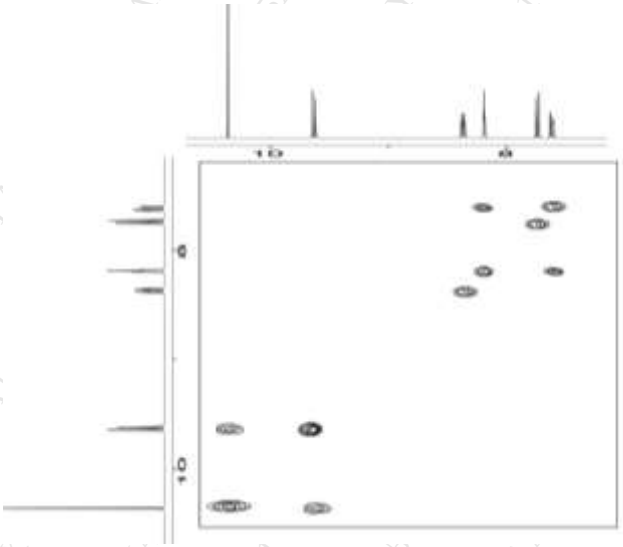
d Draw the structure of Texol. Give the applications of JH_2 and JH_3

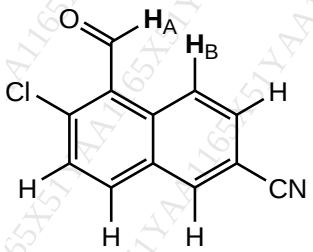
e Explain the principle and significance of double resonance technique in NMR spectroscopy.

f A compound with MF $C_6H_4N_2O_4$ shows IR at 1530, 1360 and 1600 cm^{-1}. PMR at 8.2 (s, 4H). ^{13}C NMR at 145 and 132 and DEPT-135 at 132 (up). Deduce the structure.

g Write a note on coupling constants.

h Assign the diagonal and off diagonal to protons H_A and H_B in a given NOESY spectrum and justify your answer.





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Duration: 2 Hours 30 minutes **Max Marks: 60**

N.B. i) All questions are compulsory.
ii) Figures to the right indicate full marks.

1. a. Attempt **any two** of the following: **8**
   i) Discuss the following physical and chemical parameters in drug distribution: (a) Solubility (b) Ionization.
   ii) Explain the use of functional groups in prodrugs with advantages.
   iii) Discuss the basic idea regarding combinatorial synthesis.
   iv) Discuss how penicillin was discovered without a lead compound
   b. Attempt **any one** of the following: **4**
   i) Discuss structure modification to increase potency and therapeutic index of a drug.
   ii) Explain factors affecting bioactivity of drugs.

2. a. Attempt **any two** of the following: **8**
   i) What are QSAR models? Explain, how Taft equation describes the steric effects of a substituent?
   ii) What is Hansch analysis? Give its merits and limitations.
   iii) What is computer aided drug design? Give its principle and advantages.
   iv) What are prodrugs? What are the objectives of prodrug design?
   b. Attempt **any one** of the following: **4**
   i) Give synthesis and one application of Zidovudine.
   ii) Give synthesis and one application of Diclofenac.

3. a. Attempt **any two** of the following: **8**
   i) What is biosynthesis? Discuss the biosynthesis of DMAPP from acetyl-CoA.
   ii) Explain in brief the terms primary and secondary plant metabolites.
   iii) Explain the mechanism involved in production of PGF_{2a}.
   iv) Write the shikimic acid pathway for the biosynthesis of benzoic acid and its derivatives.

   b. Attempt **any one** of the following: **4**
   i) Discuss the biosynthetic pathway for L-tryptophan.
   ii) Explain the biosynthetic conversion of chorismic acid to L-Tyrosine and phenylalanine.

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4	a.		Attempt **any two** of the following:	**8**
		i)	What is the polymer supported reagent? Give any two advantages of polymer supported reagents.	
		ii)	Give the examples of any two green acid catalyst. Write down any two green acid catalyzed reactions.	
		iii)	Write down the any one reaction in which water is employed as a green solvent. Give any two advantages of water as a green solvent.	
		iv)	Write Note on DES. Give any one reaction in which DES is employed as a green solvent.	
	b.		Attempt **any one** of the following:	**4**
		i)	Why microwave assisted reactions takes less time for completion? Give any one example of microwave assisted reaction.	
		ii)	Write note on Solid Phase Synthesis. Give any one application of Solid phase synthesis in organic reactions.	
5			Attempt **any four** of the following:	**12**
		a)	Define the terms: Drug potency and drug receptor	
		b)	Explain therapeutic index of a drug.	
		c)	Explain drug design via enzyme inhibition using examples.	
		d)	Give synthesis of Flucanazole.	
		e)	Explain the Shikimate pathway in biosynthesis of flavonoids.	
		f)	Give the steps involved in the biosynthesis of citronellol from DMAPP.	
		g)	Define nano material. Write down any two advantages of Nano catalysts.	
		h)	Write down the structure and chemical name of Aliquat 336. Give any one application of Aliquat 336 in organic synthesis.	

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Duration: 2 Hours 30 minutes **Max Marks: 60**

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   iv) Write the shikimic acid pathway for the biosynthesis of benzoic acid and its derivatives.

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