Deccan Education Society's

FERGUSSON COLLEGE (Autonomous) Pune-4

10 DEC 2022

M.Sc. II (Semester: III)
Subject: Analytical Chemistry
Paper Title: Advanced Analytical Techniques
Paper Code: CHA5301
2019 Pattern (4 Credits)

[Time: 3 Hours] **[Max. Marks : 50]**

Instructions to the candidates:

1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) Answer the following questions (Any Five). **10 M**

a) Define the term Half wave potential.

b) Draw a neat and labeled diagram for ampherometric titration set up.

c) Enlist the sources of errors in TG analysis.

d) Enlist the types of pneumatic nebulizer?

e) Define saturation voltage? What is the value of saturation voltage used in phototube?

f) Explain Ionization suppressor.

Q2) Answer the following questions (Any Three) **9 M**

a) What are the advantages of a rotating platinum microelectrode over a dropping mercury electrode?

b) Differentiate between heat flux and heat flow type DSC.

c) Explain construction and working of hydride generation method.

d) Why line sources are required for atomic spectroscopic techniques?

Q3) Answer the following questions (Any Three) **9 M**

a) A TG curve of 12 mg of naturally occurring hydrated copper oxalate losses 3.5% of its weight at 250 ^{0}C by dehydration. Calculate number of water molecule.
[Given: At. Wt. Cu=63.55, C=12, H=1, O=16]

b) A blood sample is analyzed for potassium by emission spectrometry in which two 0.500 mL aliquots were taken and each added in to 5.00 mL portions of water. To one portion is added 10.0 μL of 0.0500M KCl solution. The net emission signals in arbitrary units are 32.1 and 58.6. Calculate the concentration of potassium.

c) Draw and explain cyclic voltamogram of ferrocene in acetonitrile.

d) What are the properties of ideal AAS detector?

Q4) Answer the following questions (Any Three) **9M**

a) Explain the principle and working of DTA.

b) Discuss how thermometric titration is different from volumetric titration.

c) Draw and explain the types of electrodes used in Arc-AES technique.

d) Explain construction and working of ruby laser.

Q5) Answer the following questions (Any Two) **8 M**

a) Enlist the factors affecting DSC curve. Explain any two factors with suitable example.

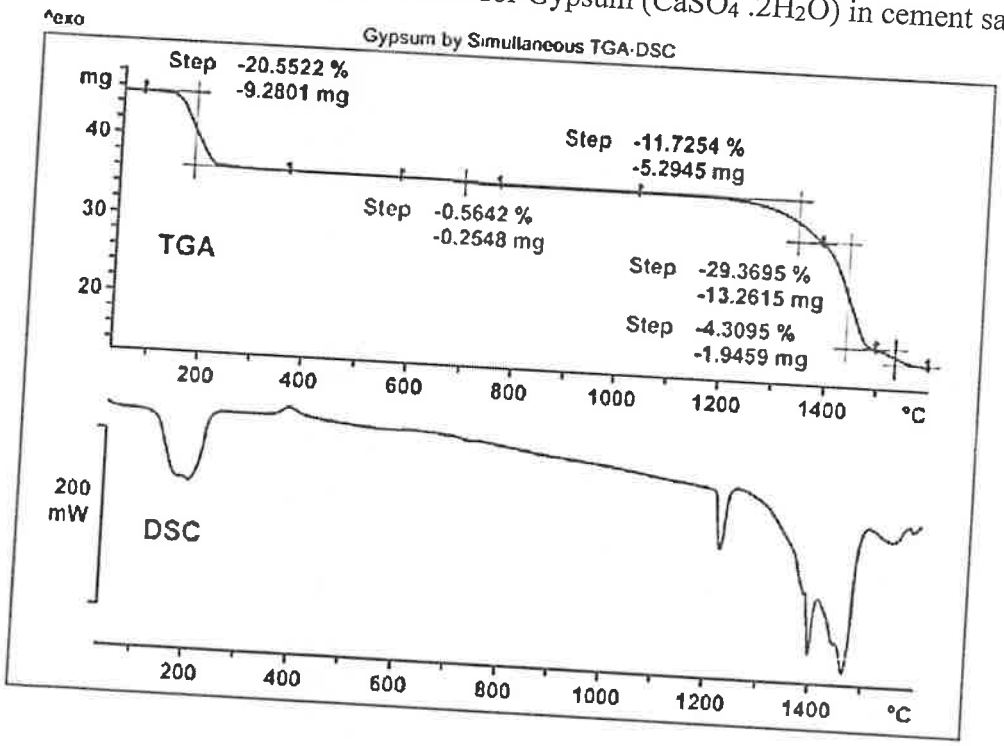
b) Write a note on spectral interferences in atomic spectroscopic analysis.

c) Describe the construction and working of electro thermal atomizer.

Q6) Answer the following questions (Any One) **5 M**

a) Describe construction and working of ICP-MS instrument.

b) Interpret the given TG-DSC curve for Gypsum ($CaSO_4 .2H_2O$) in cement sample.



12 DEC 2022

Deccan Education Society's

FERGUSSON COLLEGE (Autonomous) Pune-4

M.Sc. II (Semester: III)

Subject: Analytical

Paper Title: Extraction Techniques and Metallurgy

Paper Code: CHA5302

2019 Pattern (4 Credits)

[Time: 3 Hours] **[Max. Marks : 50]**

Instructions to the candidates:

1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) Answer the following questions (Any Five) **10 M**

a) Give formula to calculate fraction of compound extracted. What are the conditions for 'K_d' and 'V' to achieve 99% extraction efficiency?

b) Draw and label the diagram of atmospheric MAE system.

c) Name two sources of iron with their chemical formula.

d) State the importance of soil analysis.

e) Enlist two non ferrous alloys with their major elements.

f) List the different forms in which nitrogen is present in soil along with their chemical formula.

Q2) Answer the following questions (Any Three) **9 M**

a) Explain the principle of microwave heating. How it is better than conventional heating?

b) Draw a neat labeled diagram for Hoope's process. State the reactions occurring during the process.

c) Discuss the froth floatation method used for concentration of ore.

d) Explain the procedure to determine lead from solder alloy.

Q3) Answer the following questions (Any Three) **9 M**

a) Explain solvent strength for normal and reverse phase SPE process.

b) Write down the reactions taking place in blast furnace.

c) A sample of hematite ore is analyzed for iron content by gravimetric method. If 345 mg of ore yields 0.180 g of Fe_2O_3. Calculate the percentage of iron in the ore sample. (At. wt. Fe = 55.85, O = 16.00)

d) How much sample particle size used in SFE and why?

Q4) Answer the following questions (Any Three) **9M**

a) Describe the single drop micro extraction process.

b) What are the major components of illmenite ore? Outline the procedure for quantitative analysis of iron from illmenite.

c) Explain the process involved in refining of Aluminum.

d) State the importance of lime buffer capacity.

Q5) Answer the following questions (Any Two) **8 M**

a) Write a note on types of sorbent used in SPE.

b) What are the different forms in which carbon is present in soil? Discuss the process for determination of carbonate from soil.

c) Name different methods used for concentration of bauxite ore. Explain any one method.

Q6) Answer the following questions (Any One) **5 M**

a) Why CO_2 is more suitable for SFE? Describe construction and working of SFE.

b) Which are the macronutrients present in soil. Give the procedure which would help in estimating nitrogen quantitatively from soil samples.

Deccan Education Society's
Fergusson College (Autonomous), Pune-4

M.Sc. (Semester I)
Subject: Chemistry
(CHO/CHA4103) Advanced Organic Chemistry and Spectroscopy
(2019 pattern)

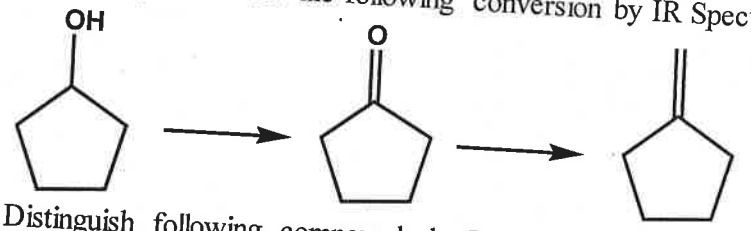
[Time: 3 Hours] **[Max. Marks : 50]**

Instructions to the candidates:

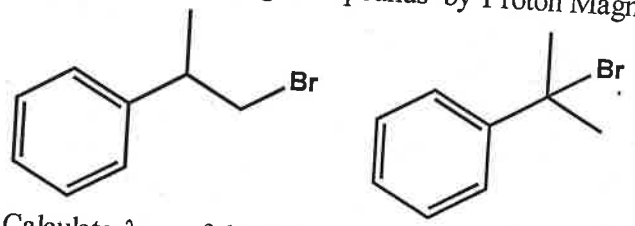
1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

1) **Answer the following questions (Any Five).** **10 M**

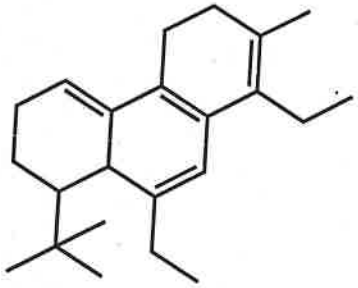
a) How will you monitor the following conversion by IR Spectroscopy?



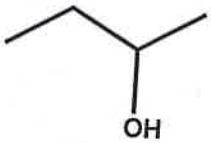
b) Distinguish following compounds by Proton Magnetic Spectroscopy.



c) Calculate λ_{max} of the following compound.

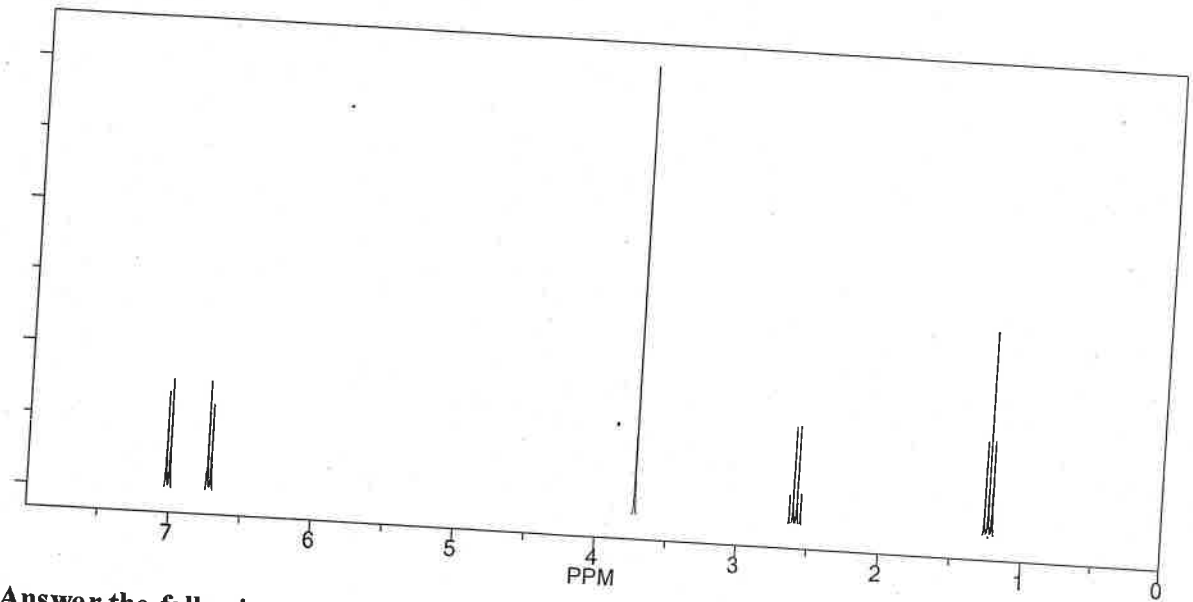


d) Explain generation of the ions (m/z = 59,45) in the given compound.



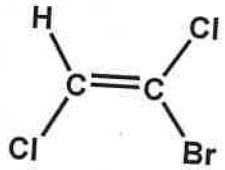
e) Explain $CDCl_3$ is used as a solvent in ^{13}C-NMR Spectroscopy.

f) Predict the structure of the organic molecule from the following ^{1}HNMR Spectra.
M.F : $C_9H_{12}O$

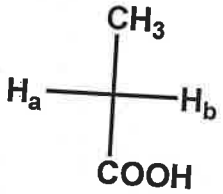


Q2) **Answer the following questions (Any Three)** **9 M**

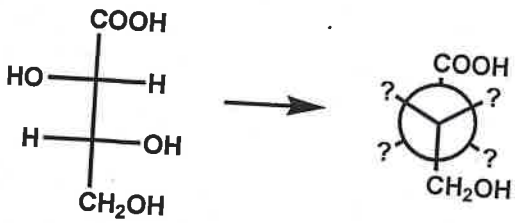
a) (i) Assign E/Z configuration to the following molecule.



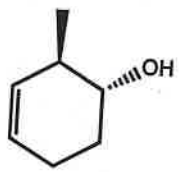
(ii) Assign Pro-R and Pro-S labels to Ha and Hb



b) (i) Convert Fischer projection to Newman Projection.

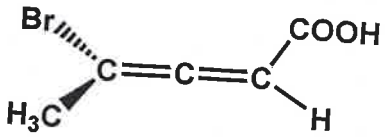


(ii) Give "R" or "S" label to the chiral center in the following molecule.



c) Assign correct configuration to the following molecules.

(i)



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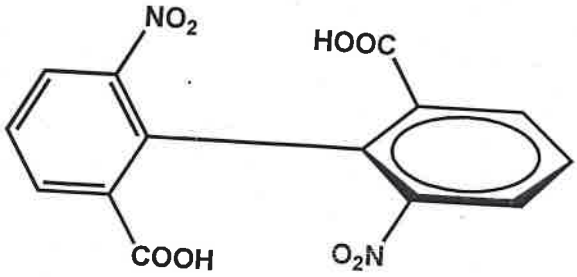

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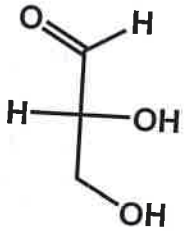
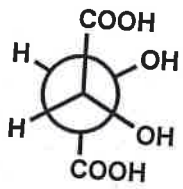
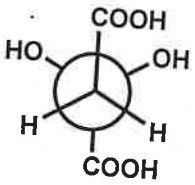


d) Give the stereochemical relationship between following molecules.



(I)



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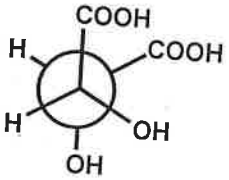

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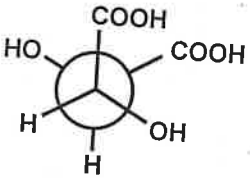
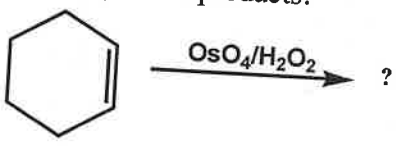


(IV)

Q3) **Answer the following questions (Any Three)** 9 M

a) Predict the product/products:

(i)



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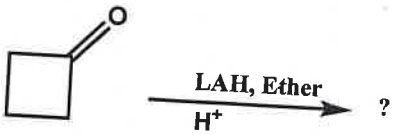

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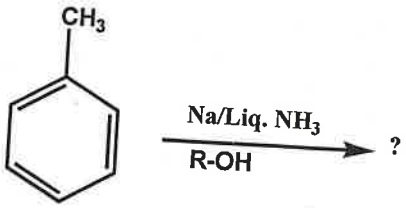


b) Write a note on "Swern Oxidation".

c) Write the mechanism of oxidation by metachloroperbenzoicacid (m-cpba) along with example.

d) Write a note on MPV reduction.

Q4) **Answer the following questions (Any Three)** 9M

a) An Organolithium reagent reacts with CO_2 to produce ketones, whereas Grignard reagent gives carboxylic acids. Explain with suitable examples.

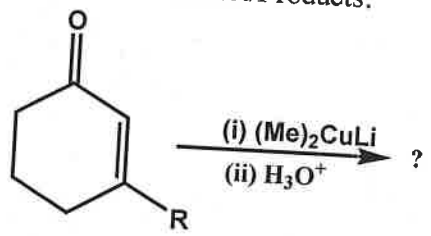
b) What happens when

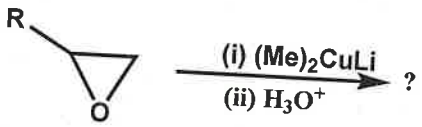
(i) Cinnamaldehyde is reduced in presence of (Ph_3P) RhCl catalyst.

(ii) Cyclohexene is treated with Diborane followed by reaction with acidic dichromate.

c) What is Simmons-smith reaction? Explain with suitable example.

d) Predict the Product/Products:





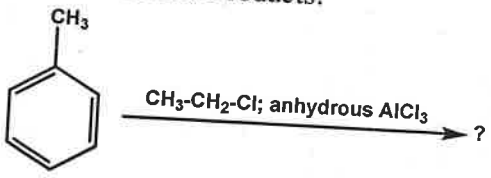
Q5) **Answer the following questions (Any Two)** 8 M

a) Comment on the stereochemistry of the S_Ni reaction in presence of base. Show the mechanism with the help of suitable example.

b) What is Wittig Reaction? Write one preparation method of Phosphorous ylide. What is Benzyne? Write one application of benzyne with suitable example.

c) Predict the Product/Products:

i.



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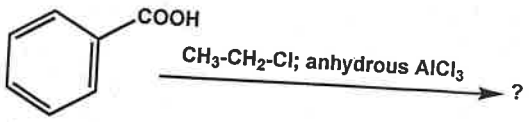

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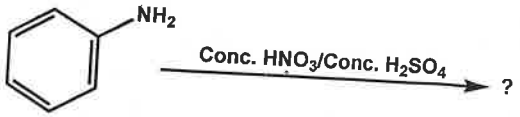
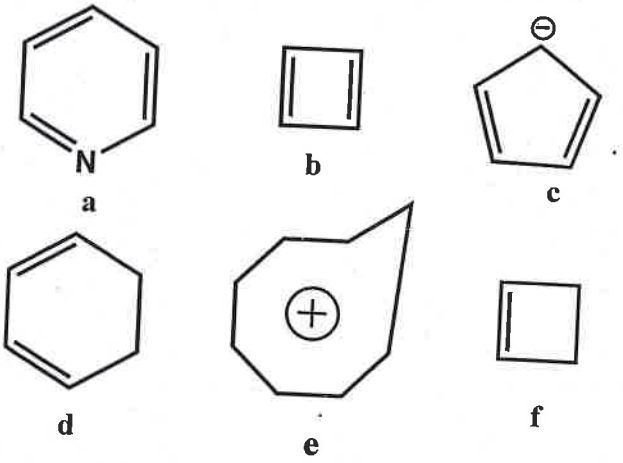


Q6) **Answer the following questions (Any One)** 5 M

a) What are Homoaromatic Compounds? Write two examples of it. Comment on the stability of Homoaromatic compounds in comparison with Antiaromatic compounds. Is Cyclopropanone a Homoaromatic compound?

b) Classify following compounds as Aromatic, Antiaromatic, Non-aromatic, Homoaromatic compounds.



03 JAN 2023

Deccan Education Society's
Fergusson College (Autonomous), Pune-4

M.Sc. (Semester I)
Subject: Chemistry
(CHO/CHA 4102) Fundamentals of Inorganic Chemistry
(2019 pattern)

Time: 3 Hrs **Max. Marks: 50**

Instructions to the candidates:

1. All questions are compulsory.
2. Neat diagrams must be drawn wherever necessary.
3. Figures to the right side indicate full marks.

Q1) **Answer the following questions (Any Five).** **Two Marks Each** **10 M**

a) Find the order of group and number of classes in $Ni(CO)_4$ molecule.

b) Predict the product of symmetry operations

i) $C_3 \times \sigma_v^1$.

ii) $\sigma_v^2 \times \sigma_v^3$.

c) Prove that $S_2 = i$ using matrices

d) Give spin-only magnetic moment and the spectroscopic ground state term symbol of chromium ion in $[Cr(H_2O)_6]^{3+}$.

e) Calculate degeneracy for the following term/configuration/states.

i) $2.^3B_{1g}$ ii) $p^3.f^2$

f) Write the following R-S terms in increasing order and justify.

^2F, ^3D, ^2P, ^3I, ^4S.

Q2) **Answer the following questions (Any Three)** **Three Marks Each** **9 M**

a) Give the matrices for σ_v^{xy} and C_2^z and find the product of them. Give the matrix representation for the improper axis of rotation.

b) When n is odd, $S_n^{2n} = E$, prove with suitable examples.

c) Prepare a microstate table for P^2 configuration and find out R-S term

d) Describe in brief the Orgel diagram for the F ground state term

Q3) **Answer the following questions (Any Three)** **Three Marks Each** **9 M**

a) For the Trans dichloroethylene molecule, E, C_2^z σh^{xy} i are the symmetry elements. Divide them into appropriate classes using similarity transformation

b) Explain all the symmetry elements present in $[Ni(CN)_4]^{2-}$ and assign the correct point group to it.

c) Identify from the following complex ions that show the same R.S term using Hund's rule.

i) $[CoF_6]^{3-}$

ii) $[FeF_6]^{4-}$

iii) $[NiCl_4]^{2-}$

d) Using the orthogonality theorem derive the character table the for NH_3 molecule and assign mulliken symbols to the irreducible representations.

Q4) **Answer the following questions (Any Three)** **Three Marks Each** **9M**

a) Determine the full spectroscopic term symbols for the following ions.

i) Ni^{2+} (Z = 28) ii) Sm^{3+} (Z = 62)

iii) Gd^{3+} (Z = 64) iv) Lu^{3+} (Z = 7l)

b) List all the possible symmetry elements for BF_3 molecule and show that they form a mathematical group.

c) Co^{2+} (Td) complex shows 23% increase in the magnetic moment compared to it's spin-only value. Calculate spin-orbit coupling constant (λ) for Co^{2+} ion, its crystal field splitting parameter 10Dq = $3600cm^{-1}$.

d) Give the splitting of ^6H R-S term in the weak cubic field using the character table for pure rotational point group and reduction formula.

Character table for T_d point group

	E	$8C_3$	$3C_2$	$6S_4$	$6\sigma_d$	linear, rotations	quadratic
A_1	1	1	1	1	1		
A_2	1	1	1	-1	-1		
E	2	-1	2	0	0		(z^2, x^2-y^2)
T_1	3	0	-1	1	-1	(R_x, R_y, R_z)	
T_2	3	0	-1	-1	1	(x, y, z)	(xy, xz, yz)

Character Table for O rotational point group

O	E	$8C_3$	$6C'_2$	$6C_4$	$3C_2=(C_4)^2$	linear functions, rotations	quadratic functions	cubic functions
A_1	+1	+1	+1	+1	+1	-	$x^2+y^2+z^2$	-
A_2	+1	+1	-1	-1	+1	-	-	xyz
E	+2	-1	0	0	+2	-	$(x^2-y^2, 2z^2-x^2-y^2)$	-
T_1	+3	0	-1	+1	-1	(x, y, z) (R_x, R_y, R_z)	-	(x^3, y^3, z^3) $[x(z^2+y^2), y(z^2+x^2), z(x^2+y^2)]$
T_2	+3	0	+1	-1	-1	-	(xy, xz, yz)	$[x(z^2-y^2), y(z^2-x^2), z(x^2-y^2)]$

Q5) **Answer the following questions (Any Two)** **Four Marks Each** **8 M**

a) Label the following irreducible representations with appropriate Mulliken symbols and justify

D_{3h}	E	$2C_3$	$3C_2$	σ_h	$2S_3$	$3\sigma v$
T1	1	1	1	1	1	1
T2	1	1	-1	1	1	-1
T3	2	-1	0	2	-1	0
T4	1	1	1	-1	-1	-1
T5	1	1	-1	-1	-1	1

b) What is meant by quenching of orbital magnetic moment by the ligand field? Explain with a suitable example.

c) What is the principle of NMR spectroscopy? Write its application in medical diagnosis.

Q6) **Answer the following questions (Any One)** **Five Marks Each** **5 M**

a) Find the reducible representation for CCl_4 considering σ-bond as basis and find out the orbitals offered by 'C' for sigma bonding.

Given character- Table for Td point group

b) For hexaquo Co(III)complex, three absorption bands are observed at $8100cm^{-1}$, $16000cm^{-1}$, and $19400cm^{-1}$. Calculate the crystal field splitting parameter, and nephelauxetic parameter, and comment on the nature of the M-L bond. $Bo=971cm^{-1}$

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Deccan Education Society's

FERGUSSON COLLEGE (Autonomous) Pune-4

Affiliated to Savitribai Phule Pune University

M.Sc. I (Semester: I)

Subject: Chemistry

Paper Title: Fundamentals of Physical Chemistry

Paper Code: CHA/CHO 4101

2019 Pattern (4 Credits)

[Time: 3 Hours] **[Max. Marks : 50]**

Instructions to the candidates:

1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Some useful constants:

1. Avogadro's number (N_A) : 6.022×10^{23} mol^{-1}
2. Planck's constant (h) : 6.626×10^{-34} Js
   : 6.626×10^{-27} erg s
3. Boltzmann constant (k) : 1.3806×10^{-23} J/K
   : 1.3806×10^{-16} erg / K
4. Speed of light (c) : 2.9979×10^{8} m/s
   : 2.9979×10^{10} cm/s
5. Mass of electron (m_e) : 9.1095×10^{-31} kg
   : 9.1095×10^{-28} g
6. Electron volt eV : 1.6021×10^{-19} J/molecule
7. 1 a.m.u. = 1.66×10^{-27} kg
8. 1 Å = 10^{-10} m

Q1) **Answer the following questions (Any Five).** **10 Marks**

a) A cricket ball weighing 100 g is to be located within 0.1 Å. What is the uncertainty in its velocity? Comment on your result.

b) The $t_{1/2}$ of a reaction is halved as the initial concentration of the reactant is doubled. What is the order of the reaction?

c) Explain pseudo uni-molecular reactions with examples.

d) A given mass of a gas at 0^0 C is compressed reversibly and adiabatically to a pressure 20 times the initial value. Calculate the final temperature of the gas if γ (gamma) for the gas is 1.42.

e) Write down the Einstein's photo-electric equation and explain every terms involved in it.

f) 5 moles of an ideal gas expand reversibly from a volume of 8 dm^3 to 80 dm^3 at a temperature of 27^0C. Calculate the change in entropy.

Q2) **Answer the following questions (Any Three)** **9 Marks**

a) The linear momentum of a particle is described by the wave function e^{ikx}. Does it obey Eigen value equation? If yes find out its Eigen value.

b) Derive an integrated rate expression for the following 2nd order reaction, $A + B \rightarrow$ Products.

c) Find the commutator of [x, H] where H is Hamiltonian operator.

d) Show that the ratio of $t_{1/2} / t_{3/4}$ for an n^{th} order reaction is a function of n alone.

Q3) **Answer the following questions (Any Three)** **9 Marks**

a) The activation energy of a non-catalyzed reaction at 37 °C is 83.68 $KJmol^{-1}$ and the activation energy of the same reaction catalyzed by an enzyme is 25.10 $KJmol^{-1}$. Calculate the ratio of the rate constants of the enzyme catalyzed and the non-catalyzed reaction.

b) What is Stirling's approximation? Calculate, ln N_A ! using it.

c) The rate constant for the 1st order reaction is given by:
ln K (sec^{-1}) = 14.34 – (1.25 × 10^4 K)/T. Calculate the E_a and pre exponential factor of the reaction.

d) Calculate the relative Boltzmann population of two energy levels at 25 °C if the energy levels are separated by 10 KJ/mol.

Q4) **Answer the following questions (Any Three)** **9Marks**

a) Define- Degeneracy. For a particle in 2-D square box of length l, its energy is given by $\frac{h^2}{ml^2}$, calculate the degeneracy of a particle in 2-D square box.

b) Derive an expression for the molecular rotational partition function of an ideal di-atomic gas.

c) What will be the probability of finding a free particle inside the left half of 1-D box.

d) Calculate the translational partition function for argon in a cubical box of side 1 cc at 25^0C.

Q5) **Answer the following questions (Any Two)** **8 Marks**

a) Derive an Eyring equation for the rate constant of a simple bi-molecular gaseous reactions.

b) Describe the Lindemann theory of uni-molecular reactions.

c) What are complex reactions? Explain different types of it.

Q6) **Answer the following questions (Any One)** **5 Marks**

a) (i) With Michalis- Menten equation for enzyme catalysed reaction, plot the following graphs, 1) Line- Weaver Burk and 2) Eadie – Hofstie plots. (3 Marks)

(ii) Derive an expression for normalized wave function for 1s orbital of H-atom. (2 Marks)

b) (i) Explain a) Maxwell-Boltzmann b) Bose- Einstein statistics in short. (2 Marks)

(ii) If A, B and C are Hermitian operators, find 1) AB + BA 2) AB – BA. Comment on the result. (3 Marks)

1/12/22 016

Deccan Education Society's

FERGUSSON COLLEGE (Autonomous) Pune-4

M.Sc.–II (Semester : IV)

Subject: Organic Chemistry

Paper Title: Chemistry of Natural Products and Chiron Approach

Paper Code:CHO5401

2019 Pattern (4 Credits)

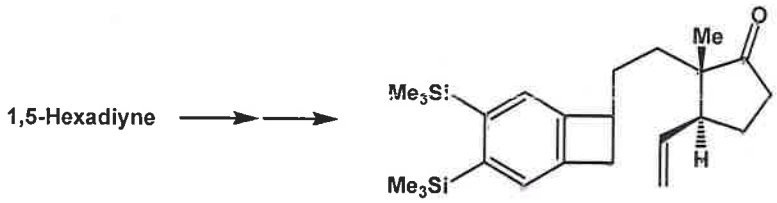
[Time: 3 Hours] **[Max. Marks : 50]**

Instructions to the candidates:

1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) Outline the steps involved in the following synthetic sequences. Indicate the reagents & discuss the mechanism and stereochemistry involved **(Any Five).** **20 M**

a)



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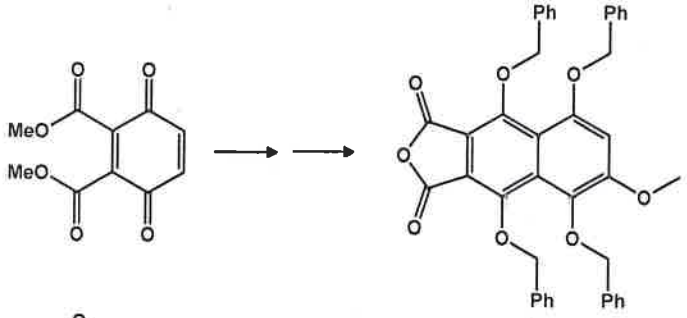

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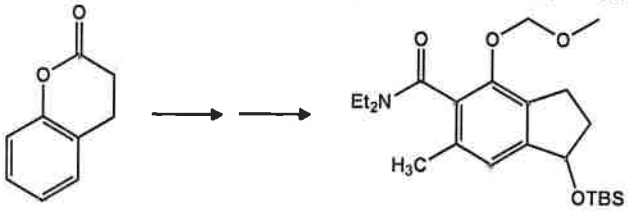

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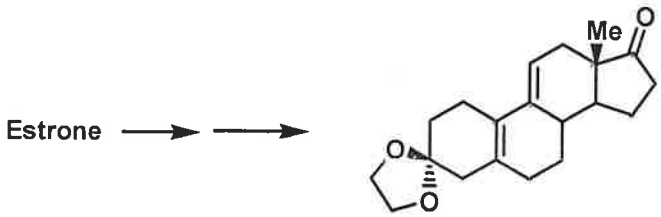
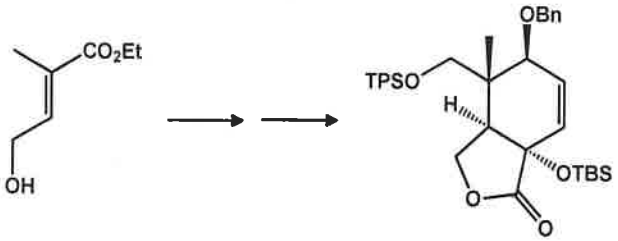


e) Juvabione synthesis by Pawson & Cheung

f)



Q2) **Suggest biogenetic scheme for the following (Any Two)** **4M**

a)

b) GPP ⟶ FPP

c) DMAPP ⟶ GPP

Q3) **Answer the following questions (Any Two)** **6M**

a) Give biogenetic pathway for synthesis of citrenellol using GPP

b) Suggest pathway for limolene using menthyl cation

c) Caryophyllyl cation from E,E- farnesyl cation

Q4) **Answer the following questions (Any Four)** **8M**

a) Explain the term Chiron.

b) Give reaction of D-Glucose with HNO_3 and Br_2-water.

c) Describe mutarotation.

d) Give retrosynthesis of (-) Shikimic acid

f) What are chiral drugs?Explain with suitable example.

Q5) **Answer the following questions (Any Two)** **6 M**

a) How will you convert D-aldopentose to D-aldohexose?

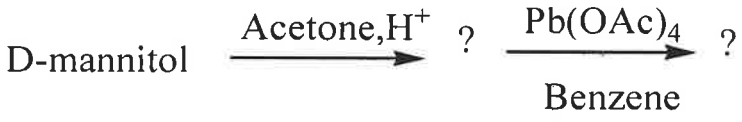
b) Describe Mitsunobu reaction with example.

c) Explain Ruff's degradation.

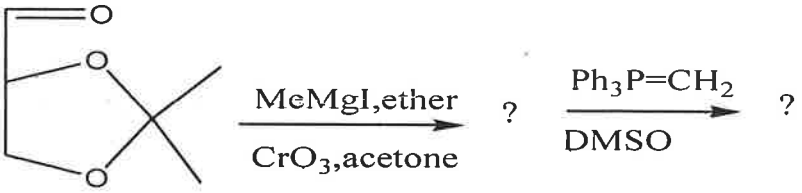
Q6) **Answer the following questions (Any Two)** **6 M**

a) Explain synthesis of Ephedrine.

b) Give mechanism



c) Suggest mechanism



02/12/2022
O/C
2:30 pm

Deccan Education Society's

FERGUSSON COLLEGE (Autonomous) Pune-4

M.Sc. II (Semester : IV)

Subject: Organic Chemistry

Paper Title: Advanced Synthetic Organic Chemistry

Paper Code:CHO5404

2019 Pattern (4 Credits)

[Time: 3 Hours] **[Max. Marks : 50]**

Instructions to the candidates:

1) **All questions are compulsory.**
2) **Neat diagrams must be drawn wherever necessary.**
3) **Figures to the right side indicate full marks.**

Q1) **Answer the following questions (Any two).** **[8M]**

a) Why transition metals are versatile catalysts in coupling reactions. Explain Suzuki coupling

b) Explain Hiyama coupling reaction with suitable examples.

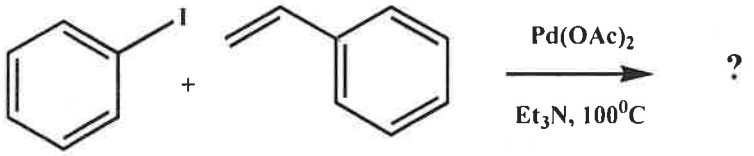
c) Discuss Sonogashira coupling reaction.

Q2) **Answer the following questions (Any Three)** **[9M]**

a) Explain Stille coupling with suitable examples.

b) Discuss Fukuyama coupling reaction giving suitable examples.

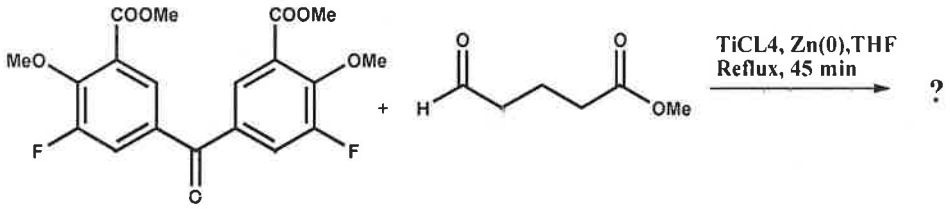
c) Comment on Heck reaction



d) Write short note on Negishi coupling reaction.

Q3) **Answer the following questions (Any Three)** **[9M]**

a) Predict the product for the following reaction



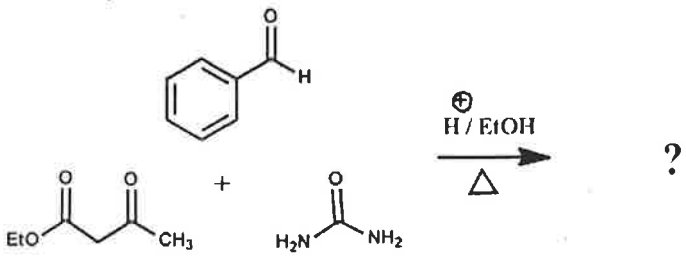
b) Explain Julia-Lythoge reaction with suitable examples.

c) Discuss Tebbe-Petasis reaction

d) Define Wittig reaction and discuss stereo control in Wittig reaction

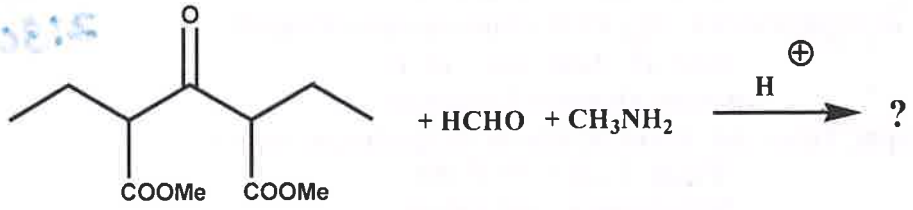
Q4) **Answer the following questions (Any Three)** **[6M]**

a) Predict the product for the following reaction



b) Explain Ugi reaction with suitable examples.

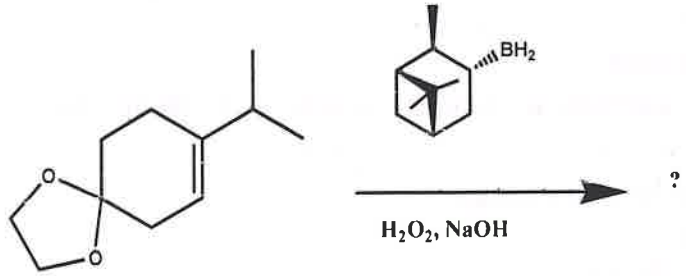
c) Predict the product for the following reaction



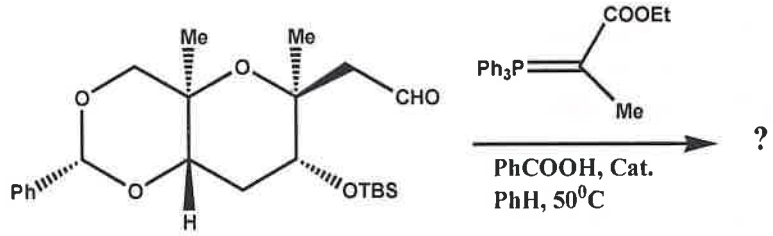
d) Explain Passerini reaction with suitable examples

Q5) **Answer the following (Any Three)** **[9M]**

a) Predict the product for the following reaction



b) Predict the product for the following reaction.



c) Explain synthetic applications of Catecholborane.

d) Give synthetic applications of 9-BBN

Q6) **Answer the following (Any Three)** **[9M]**

a) Explain mechanism of Eschenmoser fragmentation reaction with suitable examples.

b) What is click reaction? Explain 1,3 dipolar addition reaction

c) Explain Bergman cyclization mechanism.

d) Discuss Baylis-Hillman reaction with suitable example.

17-12-22 d/c

2:30

Deccan Education Society's
FERGUSSON COLLEGE (Autonomous) Pune-4
M.Sc.–II (Semester: III)
Subject: Organic Chemistry

Paper Title: Chemistry Heterocycles and Medicinal Chemistry

Paper Code: CHO5303

2019 Pattern (4 Credits)

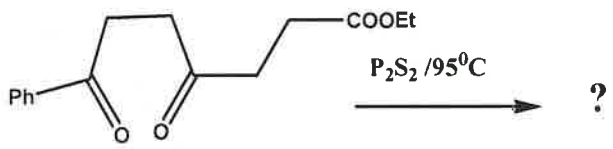
Time: 3 Hours **Marks: 50**

Instructions to the Candidates:

1) **All questions are compulsory**
2) **Neat diagrams must be drawn wherever necessary**
3) **Figures to the right indicate full marks**

Q.1Predict the product/s (Any three) **[6]**

a)



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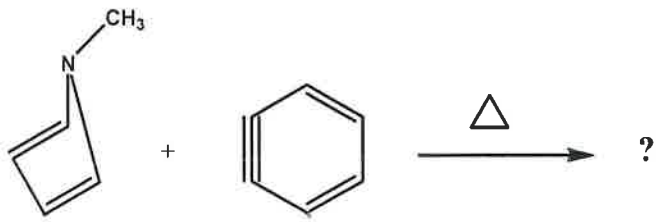

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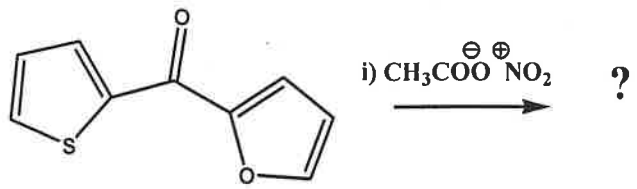

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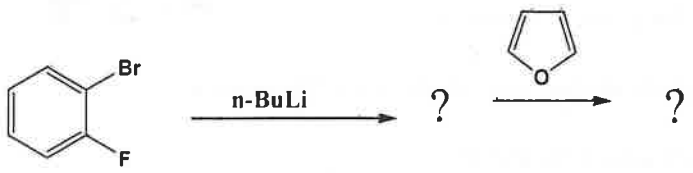


Q.2 Answer the following (Any three) [9]

a) Explain synthesis of benzofuran form coumarin

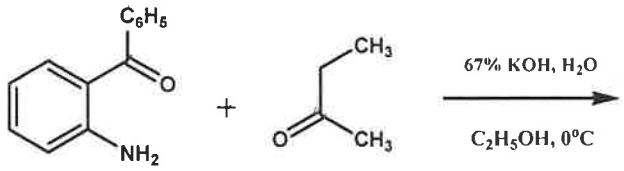
b) Discuss Pictet Spengler Synthesis of isoquinoline

c) Piloty-Robinson synthesis of pyrrole

d) Write short note on heterocycles in natural products

Q. 3 Predict the product/s (Any three) [9]

a)



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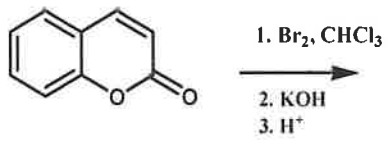

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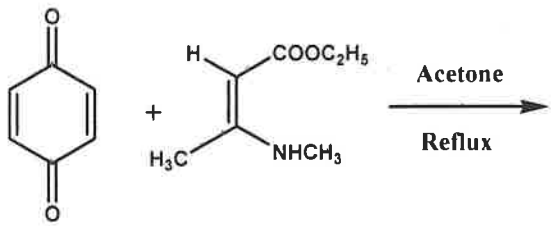

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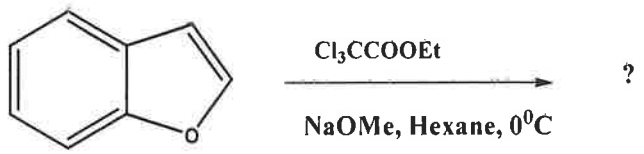


Q.4 Answer the following (Any four) **[8]**

a) Comment of non competitive inhibition of enzyme.

b) Explain Rule of five and its importance

c) Explain role of combinatorial synthesis in drug synthesis

d) Explain carbohydrate as target with reference to anticancer agents

e) Discuss carrier proteins.

Q.5Solve the following (Any three) **[9]**

a) Write short note on alkylating agent acting on nucleic acid target.

b) Explain Phase I metabolism

c) Comment on placental barrier

d) Explain various ways of drug excretion form the body.

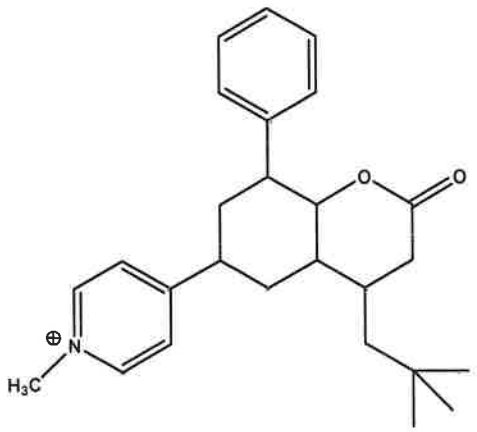
Q.6Answer the following (Any three) **[9]**

a) Explain any threemethods drug administration.

b) Define and explain concept of pharmacophore.

c) Write short note on SAR of chloramphenicol drug.

d) Explain possible interactions the following drug molecule can show in active site of enzyme.



17-12-22

Deccan Education Society's

FERGUSSON COLLEGE (Autonomous) Pune-4

2:30

M.Sc. II (Semester: III)
Subject: Analytical Chemistry
Paper Title: Pharmaceutical Chemistry
Paper Code: CHA5303
2019 Pattern (4 Credits)

[Time: 3 Hours] **[Max. Marks : 50]**

Instructions to the candidates:

1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) Answer the following questions (Any Five) **10 M**

a) Give the full form for i) CDER ii) CVM

b) Give advantages of liquid dosage form.

c) Explain the term drug potency.

d) Define shelf life.

e) Give acceptance criteria for specificity test.

f) Define retention time and void time.

Q2) Answer the following questions (Any Three) **9 M**

a) Differentiate between tablet and capsule.

b) What is sterilization? Explain any one type sterilization.

c) Explain any two unofficial tests for evaluation of solid dosage form.

d) Describe isocratic and gradient elution in HPLC.

Q3) Answer the following questions (Any Three) **9 M**

a) 0.32 g of paracetamol ($C_8H_9NO_2$) was dissolved in 30 mL 2N H_2SO_4. This solution was titrated with 0.1N ceric ammonium sulphate using ferroin sulphate as an indicator. This gave a burette reading 8.1 mL. Calculate the percentage of paracetamol.
[Given: At. Wt. C=12, H=1, N=14, O=16]

b) Aspirin has a rate of drug elimination of 15 mL min^{-1}. Calculate the elimination rate for aspirin when the plasma drug concentration, is 2 μg/mL.

c) The average initial weight of 6 tablets was 705.67 mg. The friability test was carried out at 50 rpm and the final average weight obtained was 699.32 mg. Calculate the percent friability.

d) A chromatographic separation of the compound gave peak signal = 0.041 unit, retention time (t_R) = 608 sec, peak with at base (W_b) = 98 sec and dead time (t_m) is 16.7 sec. Calculate the capacity factor and number of theoretical plates.

Q4) Answer the following questions (Any Three) **9M**

a) State the advantages and disadvantages of Karl Fischer titration.

b) Explain in brief ADME process.

c) What is loss on drying? Discuss the method to determine loss of drying of pharmaceutical product.

d) What is meant by band broadening? How higher K' cause peak broadening?

Q5) Answer the following questions (Any Two) **8 M**

a) Write a note on different drug release pattern.

b) Give dissolution test for tablet.

c) What is meant by Method validation? Why method validation is necessary?

Q6) Answer the following questions (Any One) **5 M**

a) Explain identification test and assay for sodium benzoate.

b) Explain Van-Demeter equation and effect of different parameters on chromatographic analysis.

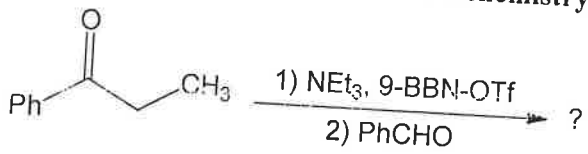
03/12/202
2:30 pm

Deccan Education Society's
Fergusson College (Autonomous), Pune-4
M.Sc. II (Semester: IV)
Subject: Organic Chemistry
(CHO5407) Designing Organic Synthesis & Asymmetric Synthesis
2019 Pattern (4 Credits)

[Time: 3 Hours] **[Max. Marks : 50]**

Instructions to the candidates:
1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) **Predict the product with correct stereochemistry (Any Five).** **10 Marks**

a)


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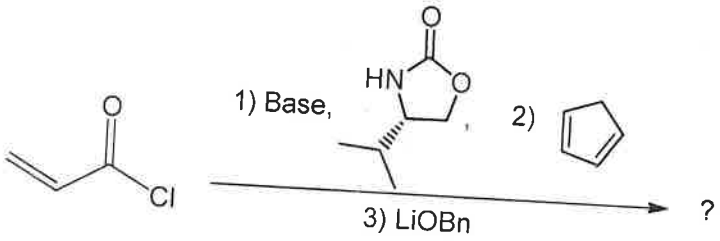

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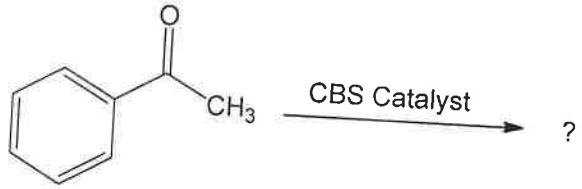

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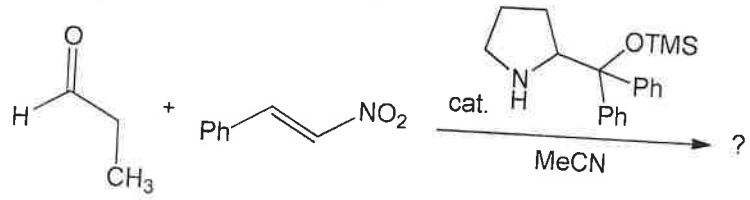
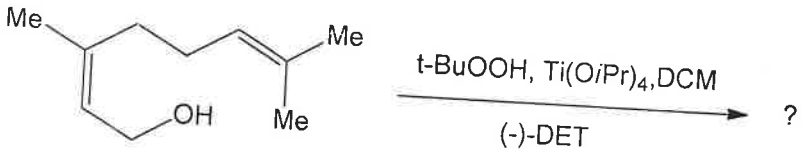


e)


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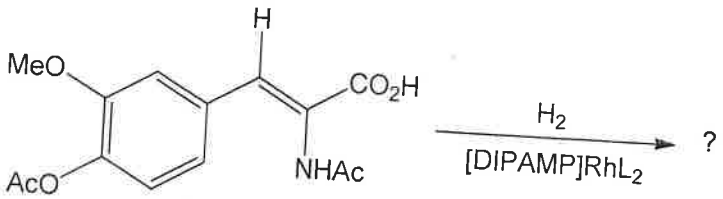
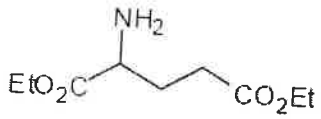


Q2) Using the retrosynthetic analysis, suggest the suitable method to synthesize following molecules: **(Any Three)** **9 Marks**

a)



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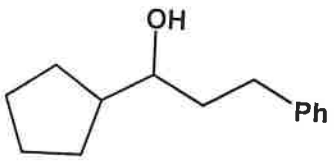
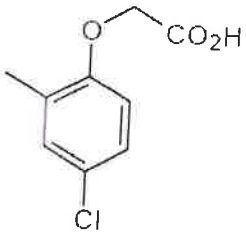


c)

d)

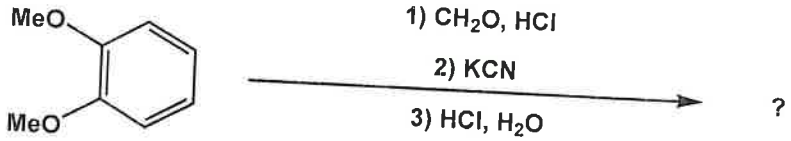


Q3) **Answer the following questions (Any Three)** **9 Marks**

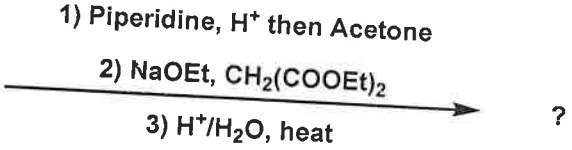
a) Write a note on Felkin-Anh model.
b) Explain Re and Si faces
c) Explain Chiral reagents.
d) Write a note on Asymmetric Mannich reaction.

Q4) **Predict the correct product in following (Any Three)** **9 Marks**

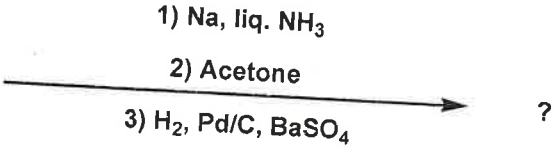
a)



b) MeCHO



c) HC≡CH



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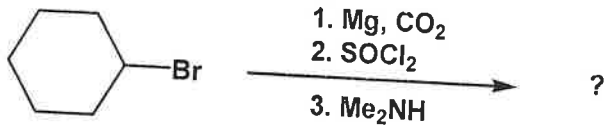
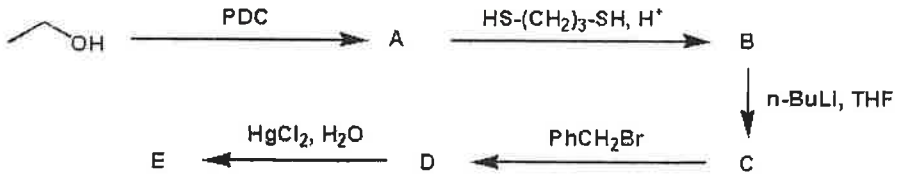


Q5) **Answer the following questions (Any Two)** **8 Marks**

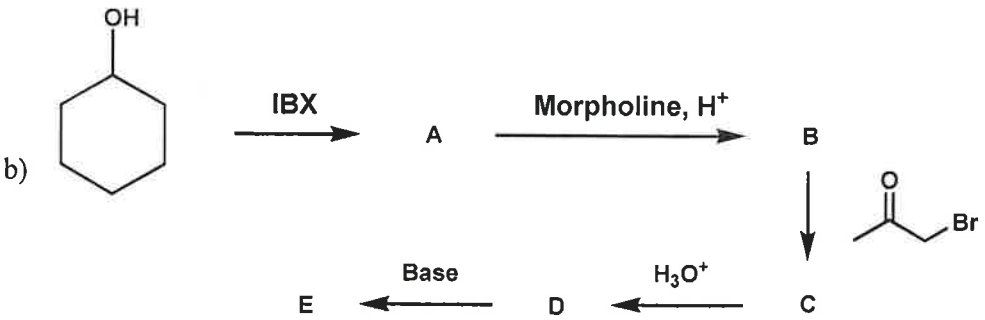
a) Outline the protection and deprotection methods for MEM and THP protecting group for alcohols.
b) Write a note on order of stability of silyl protecting groups.
c) Outline the protection and deprotection methods for Boc and acetyl protecting group for amines.

Q6) **Answer the following questions (Any One)** **5 Marks**

a)



b)



12 DEC 2022

O/C

Deccan Education Society's

FERGUSSON COLLEGE (Autonomous) Pune-4

M.Sc.–II (Semester : III)

Subject: Organic Chemistry

Paper Title: Structure Determination by Analytical Methods

Paper Code: CHO5302

2019 Pattern (4 Credits)

[Time: 3 Hours] **[Max. Marks : 50]**

Instructions to the candidates:

1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

Q1) **Answer the following questions (Any Five).** **10 M**

a) Identify the amide which gives a strong peak at m/z 44.

b) How will you verify that a particular signal is arising from the protons of –OH,-NH or -SH?

c) NMR can be used as a tool to distinguish primary, secondary and tertiary alcohols. How?

d) Identify different types of hydrogens. a)$CH_3CH=CH_2$ b)CH_3COOCH_3

e) Explain Nitrogen rule.

f) $(CD)_3SO$ shows five lines in CMR at 40.1 ppm. Explain.

Q2) **Answer the following questions (Any Three)** **9 M**

a) Describe spin systems in PMR and explain AMX spin system.

b) Discuss principles and applications of NOE.

c) Use of Karplus equation in determination of vicinal coupling constant.

d) Explain application of COSY in NMR interpretation.

Q3) **Answer the following questions (Any Three)** **9 M**

a) A compound **$C_4H_7BrO_2$** shows IR: 3200-2900cm^{-1}(broad), 1680cm^{-1}, NMR: 1.08 δ (t,9mm), 2.07 δ (quintet,6mm), 4.25 δ (t,3mm), 10.9 δ (s,3mm,exchangeable proton). Predict the structure.

b) Deduce the structure. Molecular formula **$C_{11}H_{14}O_3$** UV: 225 nm, IR: 3200-2800(broad), 2710,1710,1610,1510,850 cm^{-1}, NMR: 1.95 δ (quintet, J=8 Hz,12mm), 2.22 δ (t, J=6Hz,12mm), 2.63 δ (t, J=6Hz,12mm), 3.78 δ (s,18mm), 6.75 δ (d, J=8Hz,12mm),7.05 δ (d, J=8Hz,12mm), 14.1 δ (s,6mm)

c) A compound **$C_4H_8O_2$** shows the following spectral data- IR bands at 1742,1200 cm^{-1}, PMR: 3.66 δ (s,3H),2.32 δ (q,2H),1.1 δ (t,3H). Suggest a structure.

d) The IR spectrum of a compound **$C_5H_8O_2$** shows bands at 3100, 1760, 1200 cm^{-1}. The PMR spectrum shows peaks at 1.8 δ (s, 3H), 1.9 δ (s, 3H), 4.3 δ (m, 2H). Give a Structure.

Q4) **Answer the following questions (Any Three)** **9M**

a) Propose the structure from the given data for **C_3H_7I**. CMR – 9.2(t), 15(q), 27(t)

b) Predict the structure for the Molecular formula: **C_3H_9NO** from the given data. CMR – 36(q), 54(t), 60(t)

c) Describe spin decoupling technique.

d) Explain DEPT experiment.

Q5) **Answer the following questions (Any Two)** **8 M**

a) Write note on McLafferty rearrangement.

b) Explain chemical ionization in MS.

c) Explain the genesis of the following.

a) Ph-CO-NH_2 : 121,77 b) Cyclohexanol – 99,82

Q6) **Answer the following questions (Any One)** **5 M**

a) Deduce the structure from the given data and justify your answer.

M.F. - **C_8H_7OCl**

IR – 1690, 1600 cm-1

PMR – 2.5 δ (s, 3H), 7.3 δ (d, 4H,J=8 Hz), 7.8 δ (d,2H,J=8 Hz)

CMR - 26(q), 128 (d, strong), 123 (d, strong), 135(s), 140 (s), 197 (s)

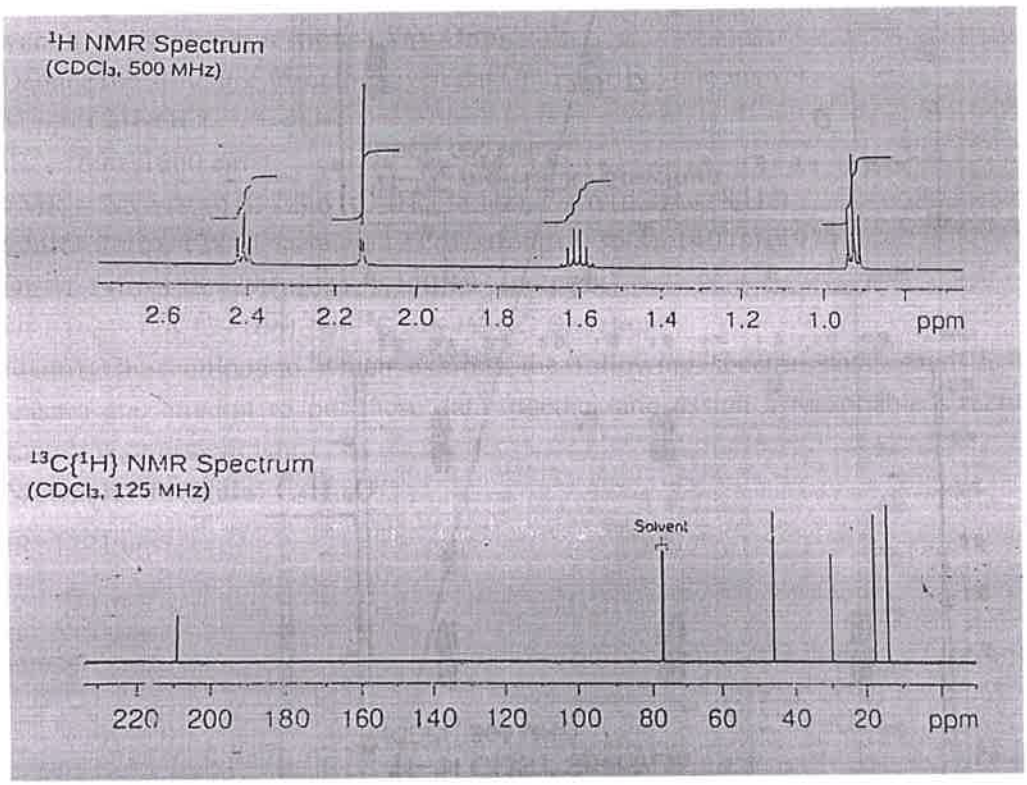
DEPT 1- 26,128,129 (up), 135,140,197 (no peak)

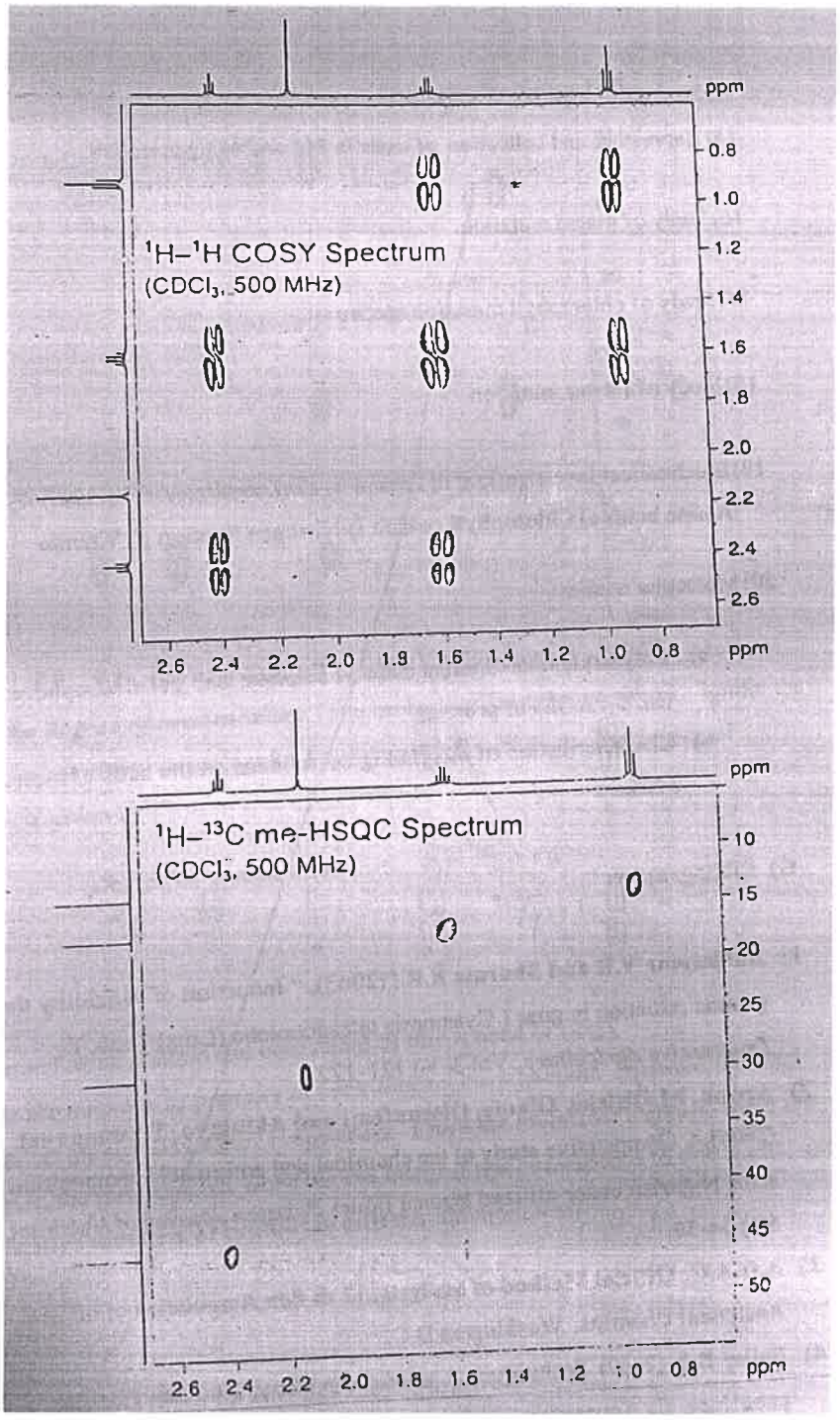
DEPT 2 – 128,129 (up)

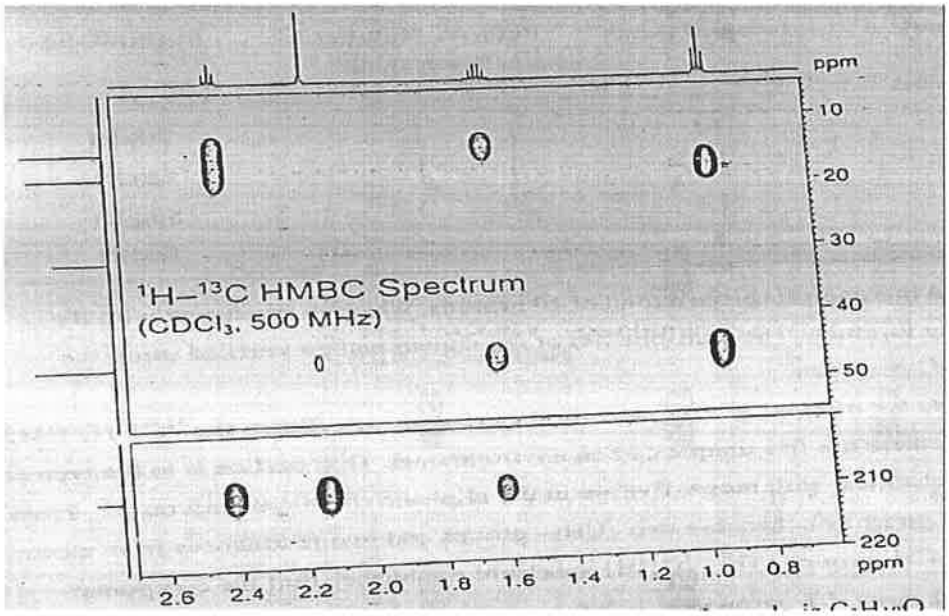
b) Identify the compound which exhibits the following spectral data. Analyze the spectra and attempt to put these data together and assign a reasonable structure. Justify your assignment.

Molecular formula: $C_5H_{10}O$

IR: 1721 cm^{-1}




^{1}H–^{1}H COSY Spectrum
(CDCl$_3$, 500 MHz)
ppm
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.6 2.4 2.2 2.0 1.8 1.6 1.4 1.2 1.0 0.8 ppm
^{1}H–^{13}C me-HSQC Spectrum
(CDCl$_3$, 500 MHz)
ppm
10
15
20
25
30
35
40
45
50
2.6 2.4 2.2 2.0 1.8 1.6 1.4 1.2 1.0 0.8 ppm


^{1}H–^{13}C HMBC Spectrum
($CDCl_3$, 500 MHz)
ppm
10
20
30
40
50
210
220
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
ppm

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FERGUSSON COLLEGE (Autonomous) Pune-4

M.Sc. II (Semester: III)

Subject: Organic Chemistry

Paper Title: Stereochemistry of Organic Molecules

Paper Code: CHO5301

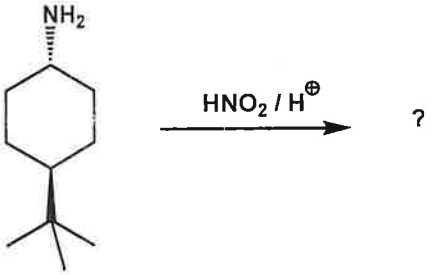
2019 Pattern (4 Credits)

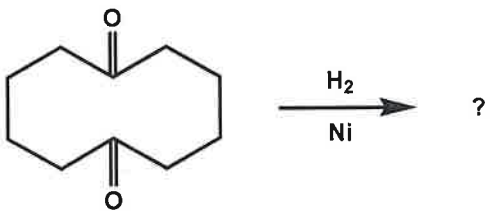
[Time: 3 Hours] **[Max. Marks : 50]**

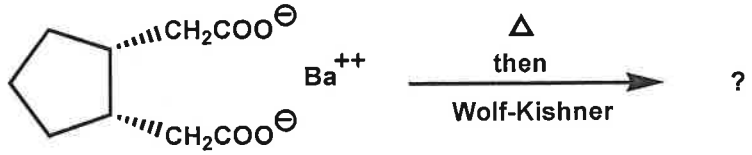
Instructions to the candidates:

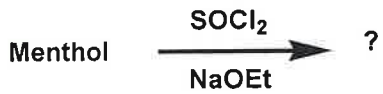
1) All questions are compulsory.
2) Neat diagrams must be drawn wherever necessary.
3) Figures to the right side indicate full marks.

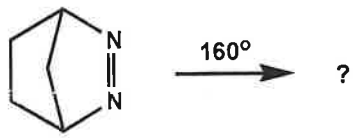
Q1) **Predict the product with correct stereochemistry (Any Five).** **10 Marks**

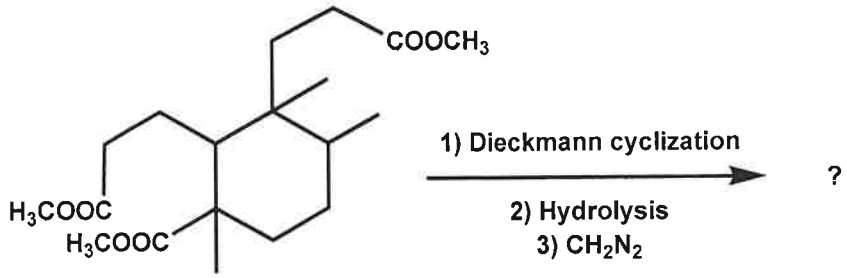
a) 

b) 

c) 

d) 

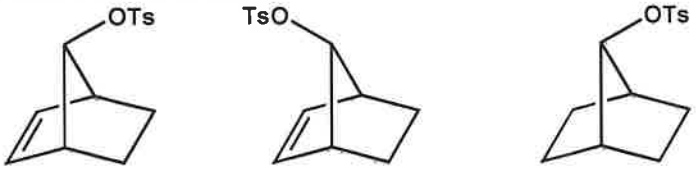
e) 

f) 

Q2) **Answer the following questions (Any Three)** **9 Marks**

a) The *cis*-4-hydroxycyclohexanecarboxylic acid lactonize, while the *trans*-isomers does not. Explain.

b) Explain, relative rate of acetolysis of the following compounds which is mentioned below the structures.



10^{11} 10^{4} 1

c) Explain, why *trans*-1,3-*di*-*t*-butylcyclohexane do exist in the boat conformation and *cis*-1,3-*di*-*t*-butylcyclohexane exist in the chair conformation?

d) Explain van Arkel rule.

Q3) **Answer the following questions (Any Three)** **9 Marks**

a) Write a note on the stereochemistry of cyclopentane.

b) The *trans*-9-methyl decalin is more stable than its *cis* isomer by 3.35 kJ/mol. Explain.

c) Explain Wagner-Meerwein Rearrangement.

d) Explain $A^{1,3}$ strain with suitable example.

Q4) **Answer the following questions (Any Three)** **9 Marks**

a) Explain how the locations of C5 and C9 methyls in Hardwickiic acid have been determined.

b) Determine the presence of lactone in Camptothecin.

c) Draw the correct stereostructure of Enhydrin and highlight all stereocenters.

d) Determine the relative configuration of C-3 and C-4 in quinine.

Q5) **Answer the following questions (Any Two)** **8 Marks**

a) Write a note on resolution of enantiomers by formation of diastereomers.

b) Write a note on Baldwin's rule.

c) Draw stable conformations of cyclooctane.

Q6) **Answer the following questions (Any One)** **5 Marks**

a) Draw all stereoisomers of perhydrophenanthrene and comment on their thermodynamic stability.

b) Determine the relative configuration of C-13 and C-14 of morphine and its derivatives.