

Total No. of Questions :6]

SEAT No. :

P1519

[Total No. of Pages :5

[5225] - 31

M.Sc.-II

DRUG CHEMISTRY

CH - 361: Chemistry of Heterocycles and Biologically

Active Compounds

(2008 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

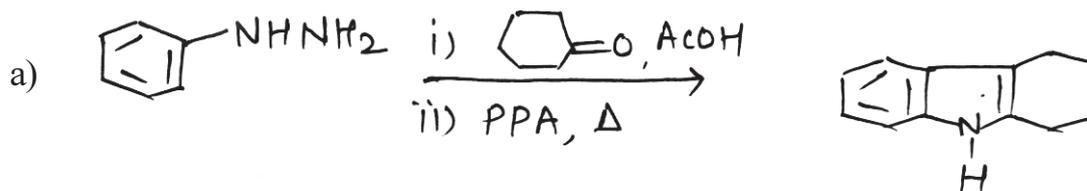
- 1) All questions are compulsory.
- 2) Figures to the right indicates full marks.
- 3) Answer to the two sections should be written in separate answer books.

SECTION - I

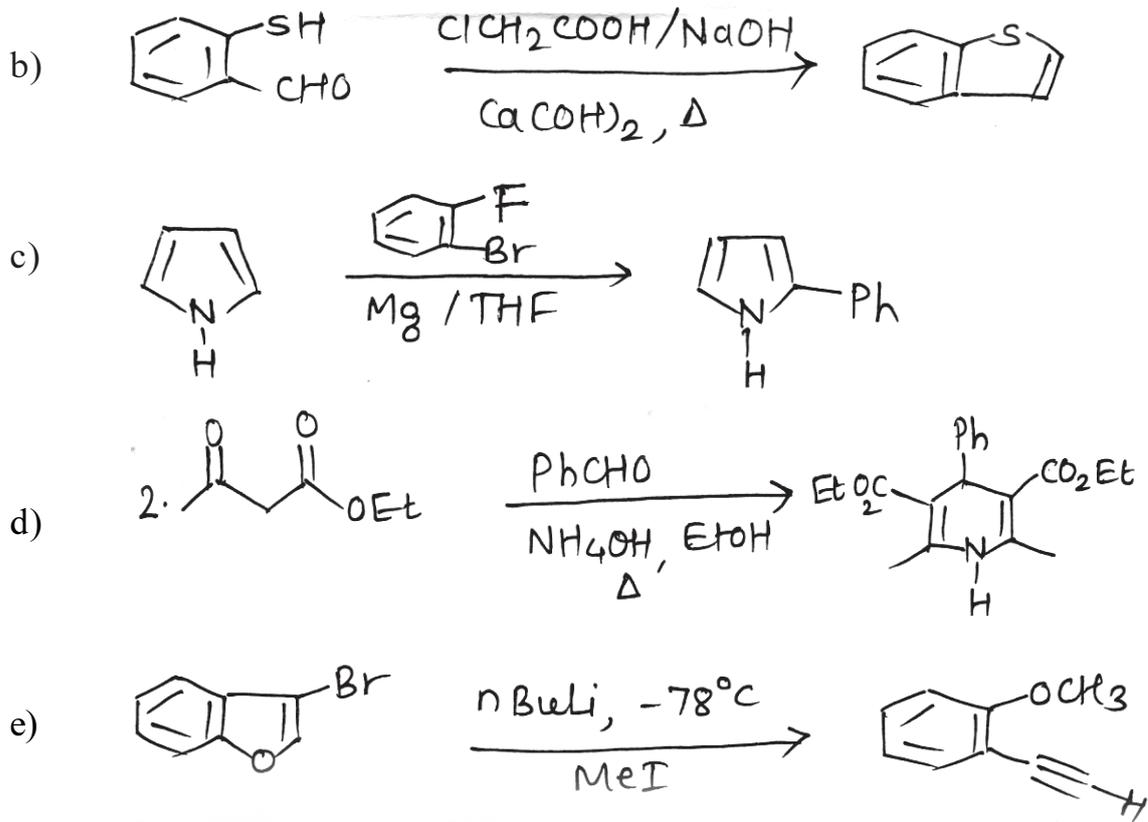
Q1) Explain any four of the following. [12]

- a) 3-formyl indole do not undergo benzoin condensation.
- b) Pyrimidine undergoes electrophilic substitution reaction mainly at C₅ – Position
- c) Imidazole is stronger base than pyridine.
- d) Pyrazole have higher boiling point than isoxazole.
- e) Furan undergoes cycloaddition reaction, where as pyrrole undergo substitution reaction.

Q2) Suggest the suitable mechanism for any four of the following [12]



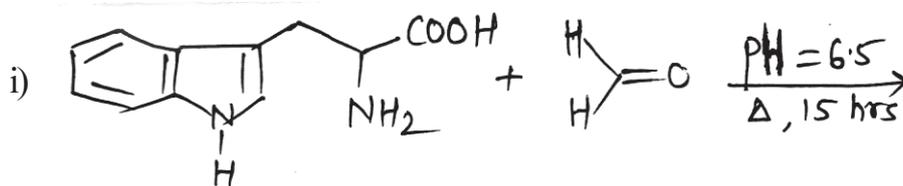
P.T.O.

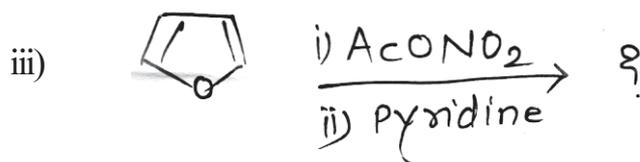


Q3) a) write short notes on any three of the following. [12]

- i) Hantzsch pyridine synthesis.
- ii) Feist - Benary synthesis of furan.
- iii) Medlung indole synthesis.
- iv) Gabriel thiazole synthesis.

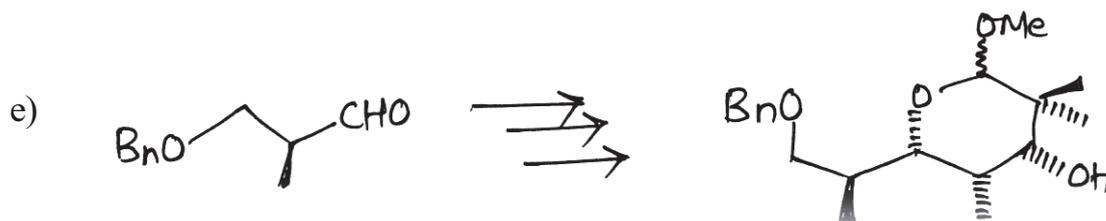
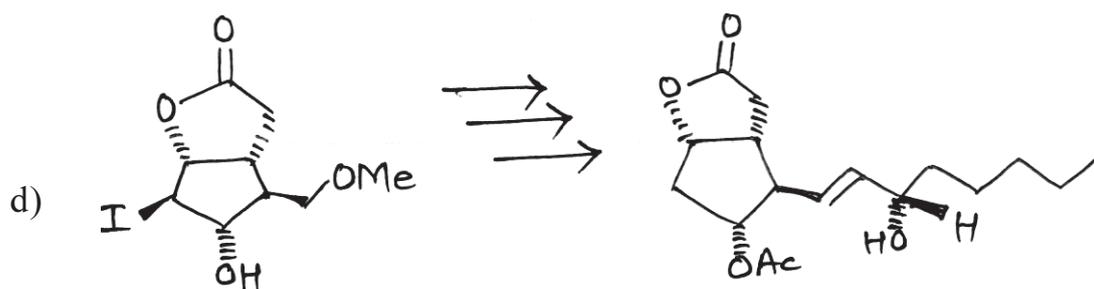
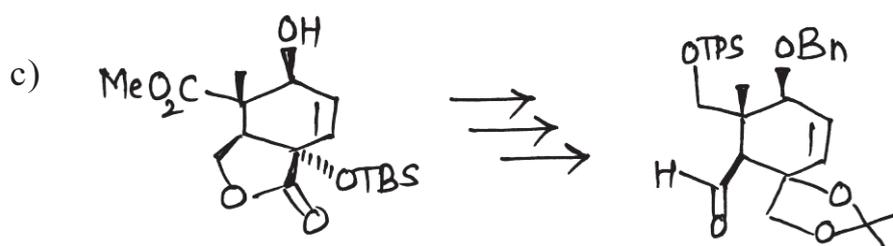
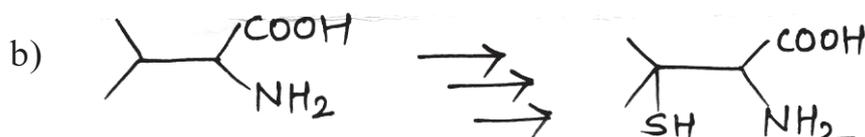
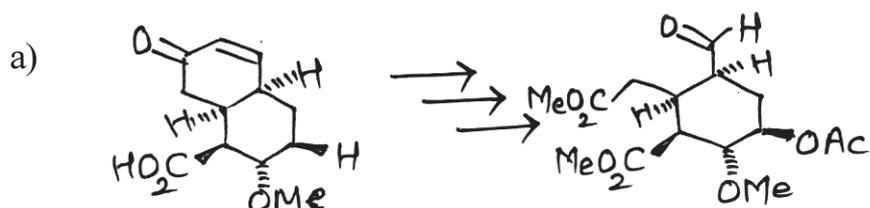
b) Predict the products with suitable mechanism (any two) [4]



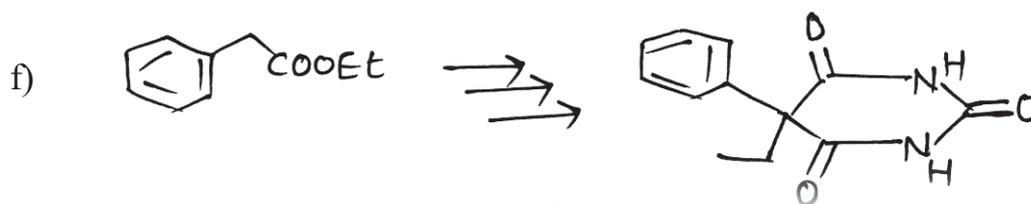
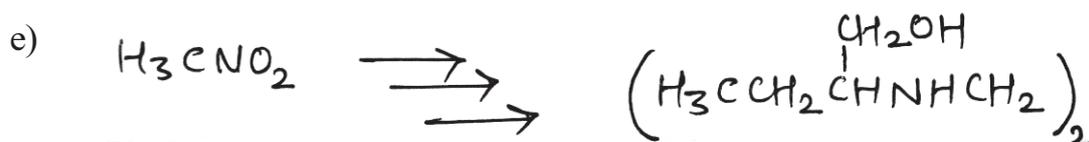
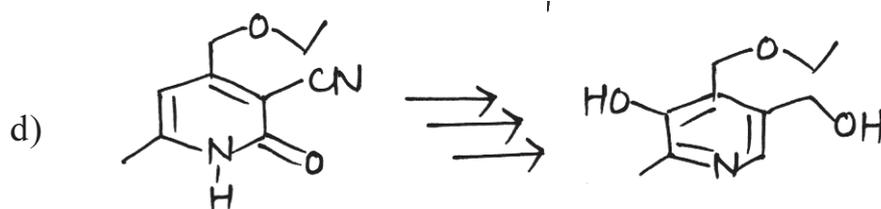
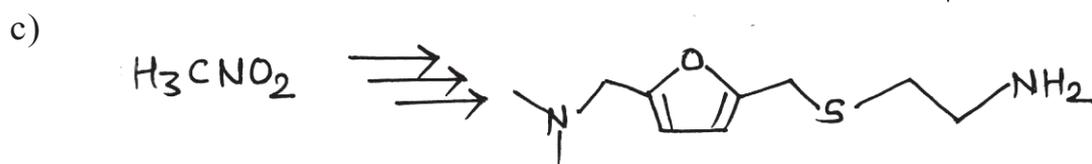
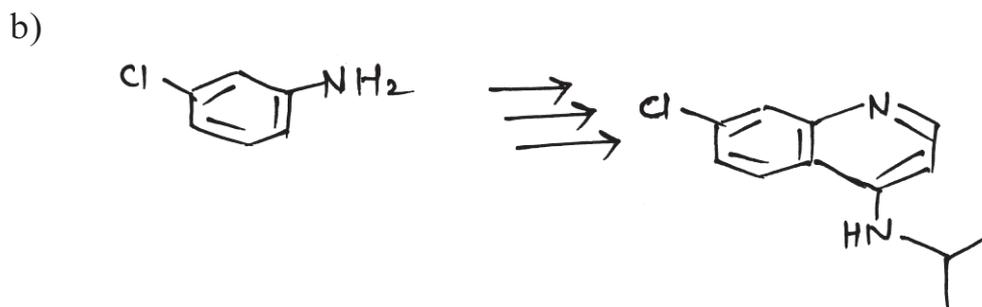
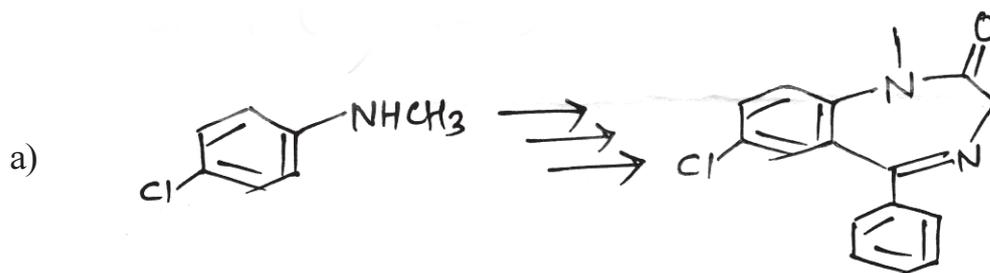


SECTION - II

Q4) Discuss the steps involved in the synthesis of the following molecules. Explain the stereochemistry and mechanism involved in all steps (any three). [15]



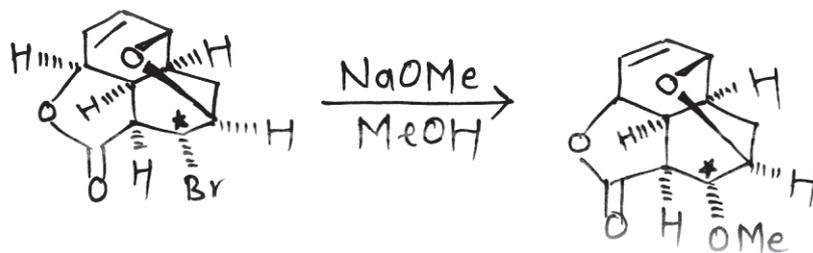
Q5) Discuss the steps involved in the synthesis of the following drugs, comment on the reagents used and mechanism involved (any four) [16]



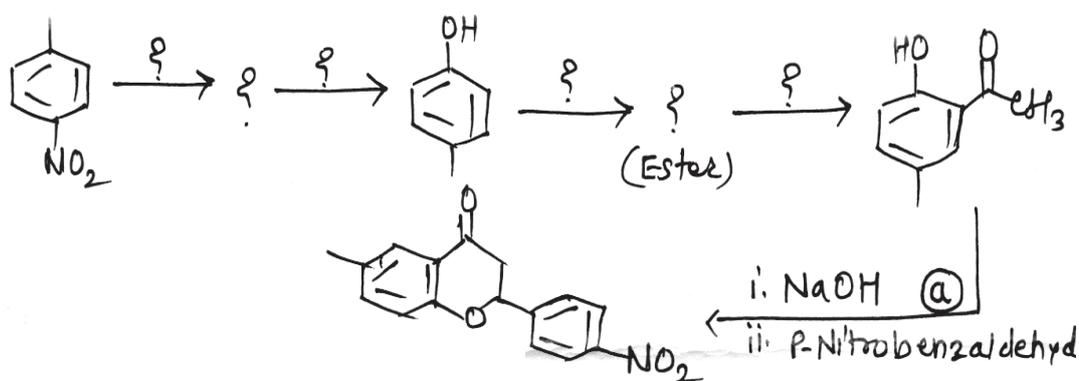
Q6) Answer any two of the following.

[9]

- a) Explain the mechanism in the following and also stereochemistry at labelled position.



- b) Put the missing reagents/ intermediates in the sequence given below & explain mechanism for step - @



- c) Explain olefin metathesis approach and macroaldolisation approach for epithiolone synthesis.



Total No. of Questions :6]

SEAT No. :

P1520

[5225]-32

[Total No. of Pages : 6

M.Sc.

DRUG CHEMISTRY

**CH - 362 : Advanced Analytical Methods
(2008 Pattern) (Semester - III)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

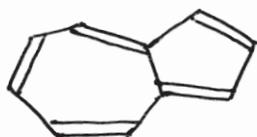
- 1) *All questions are compulsory*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right side indicate full marks.*

SECTION-I

Q1) Explain any four of the following.

[12]

- a) ¹H NMR of the following compound recorded in TFA.



4.4 (bs, 2H) 7.8 (bd, 1H)
8.1 (bd, 1H) 9.0 (m, 5H)

- b) 2- Nitrobutane shows a non-equivalence of methylene protons.
- c) n- propylbenzene shows a peak at m/e 92 in Ms whereas isopropyl benzene does not show this peak.
- d) DMSO-d₆ shows a septet of 1:3:6:7:6:3:1 intensity in ¹³C NMR.
- e) COSY spectrum is used for chemical shift assignment of protons.

Q2) Answer any four of the following:

[16]

- a) An AB system gives four peak pattern $\nu_1=300\text{Hz}$ $\nu_2=290\text{ Hz}$ $\nu_3=289\text{Hz}$ and $\nu_4=279\text{Hz}$ find the positions of the uncoupled peaks A & B in Hertz.

P.T.O.

b) Deduce the structure

M.F. : $C_6H_{12}O$

IR : 1715 cm^{-1}

CMR : 12(q) 16(q) 26(q) 28(t) 49(d) 213(s)

PMR : 0.78 (t, 7Hz, 3H) 0.98(d, 7Hz, 3H)

1.3(ddq, 12, 6, 7 Hz, 1H) 1.58 (ddq, 12, 5, 7 Hz, 1H)

2.03(s, 3H) 2.34 (ddq, 5, 6, 7 Hz, 1H)

c) 1, 4 - butanediol on oxidation and work-up gave product with mol. formula $C_4H_6O_2$ shows following spectral data. Deduce its structure.

IR : 1780 cm^{-1}

PMR : 1.2 (m, 2H) 2.5(m, 2H) 4.0(m, 2H)

d) Predict the possible structure

M.F. : $C_9H_{10}O_3$

CMR : 56, 56.1, 109.4, 110.7, 126.5, 130.3, 149.8, 154.8, 190.7

DEPT 135 : 56, 56.1, 109.4, 110.7, 126.5, 190.7 up 130.3, 149.8, 154.8
absent

DEPT 90 : 109.4, 110.7, 126.5, 190.7 up

e) Deduce the structure

M.F. : $C_8H_{13}NO_3$

IR : $1690, 1725\text{ cm}^{-1}$

PMR : 4.25 (q, 6.7Hz, 2H) 3.8 (t, 7Hz, 4H) 2.45(t, 7Hz, 4H)
1.3 (t, 6.7Hz, 3H)

CMR : 207(s) 155(s) 62(t) 43(t) 41(t) 15(q)

Mass (m/e) : 171 (M^- , 15) 142(25) 56(68) 42(100)

Q3) Write short notes on any three.

[12]

- DEPT
- Shift reagents
- Factors affecting chemical shift of carbon in CMR
- Mechanism of spin-spin coupling

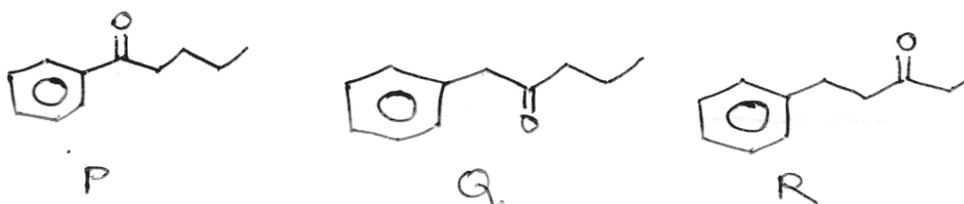
SECTION-II

Q4) A) Write the genesis of the ions (Any three)

[9]



B) Mass spectral data for one of the three structures A, B, C is given below. Identify the structure consistent with the data.

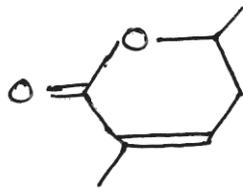


Mass : 119(7), 91(60), 77(30), 71(10), 43(65) & 134(70)

[3]

Q5) A) Assign the signals to the protons in the structure using decoupling experiments given below. Justify your answer.

[4]

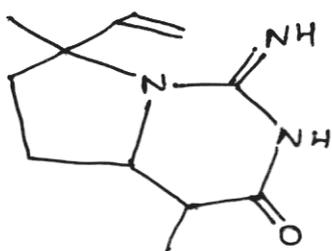


5.89 (ddq, 7, 5 & 2 Hz, 1H)
 4.53 (ddq, 7, 6 & 4 Hz, 1H)
 2.45 (ddd, 14, 7 & 4 Hz, 1H)
 2.40 (ddd, 14, 6 & 5 Hz, 1H)
 2.1 (d, 2Hz, 3H)
 1.41 (d, 7Hz, 3H)

Decoupling expt:

- a) Irradiation at 4.53 changes 1.41(d) → (s)
 changes 2.4 (ddd) → (dd) 14 & 5Hz
 changes 2.45 (ddd) → (dd) 14 & 7Hz
- b) Irradiation at 5.89 changes 2.1 (d) → (s)
 changes 2.4 (ddd) → (dd) 14 & 6Hz
 changes 2.45 (ddd) → (dd) 14 & 4Hz
- c) Irradiation at 1.41 enhances the signal at 2.45 δ by 7%

B) Assign the chemical shifts to various carbon atoms [4]



11.5, 20.6, 29.9, 40.7
 42.3, 63.1, 65.1, 116.1
 142.5, 158.5, 179.8

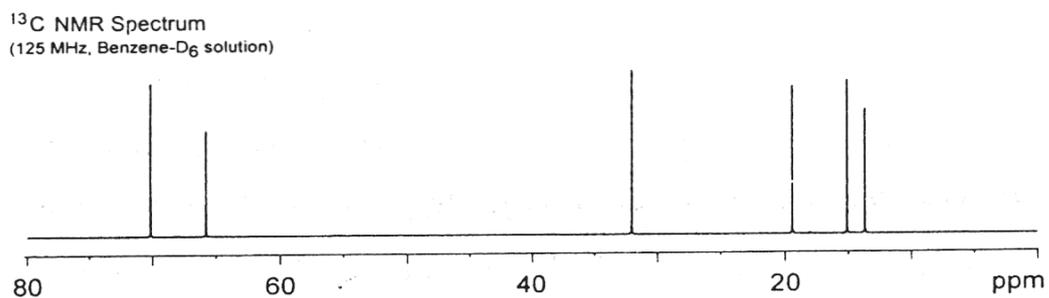
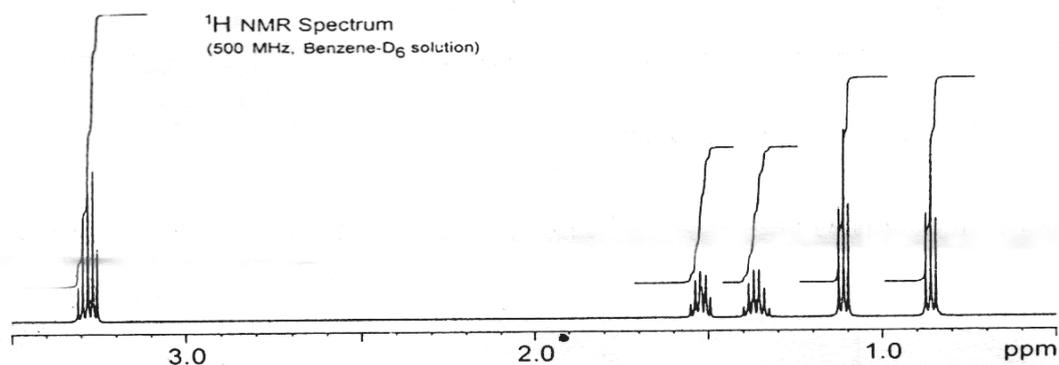
C) Answer any two. [8]

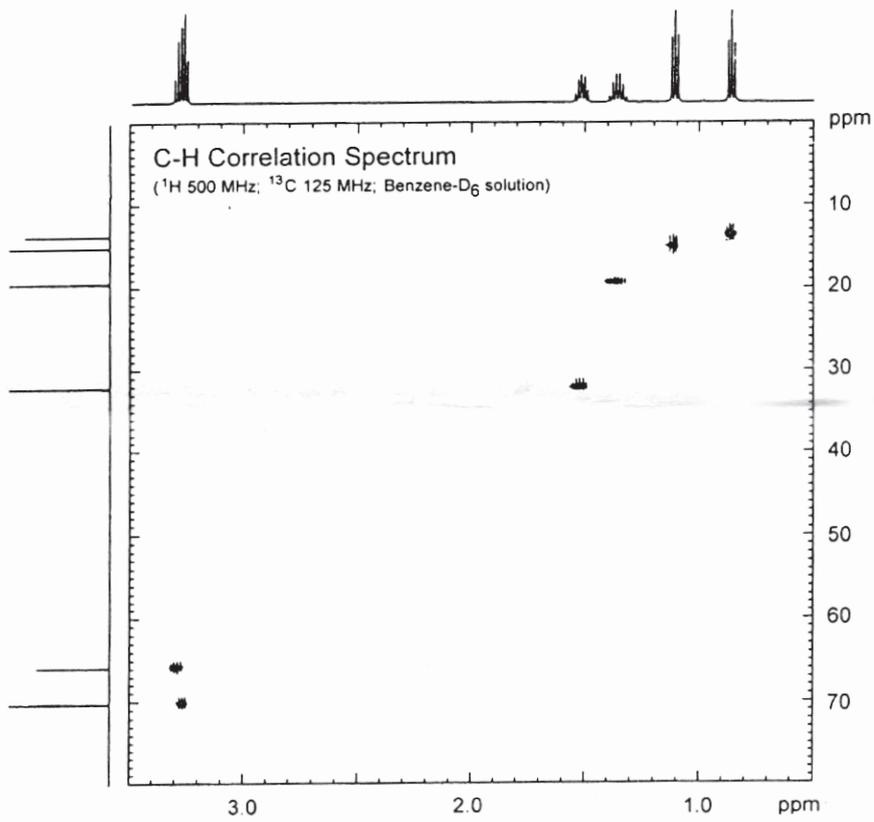
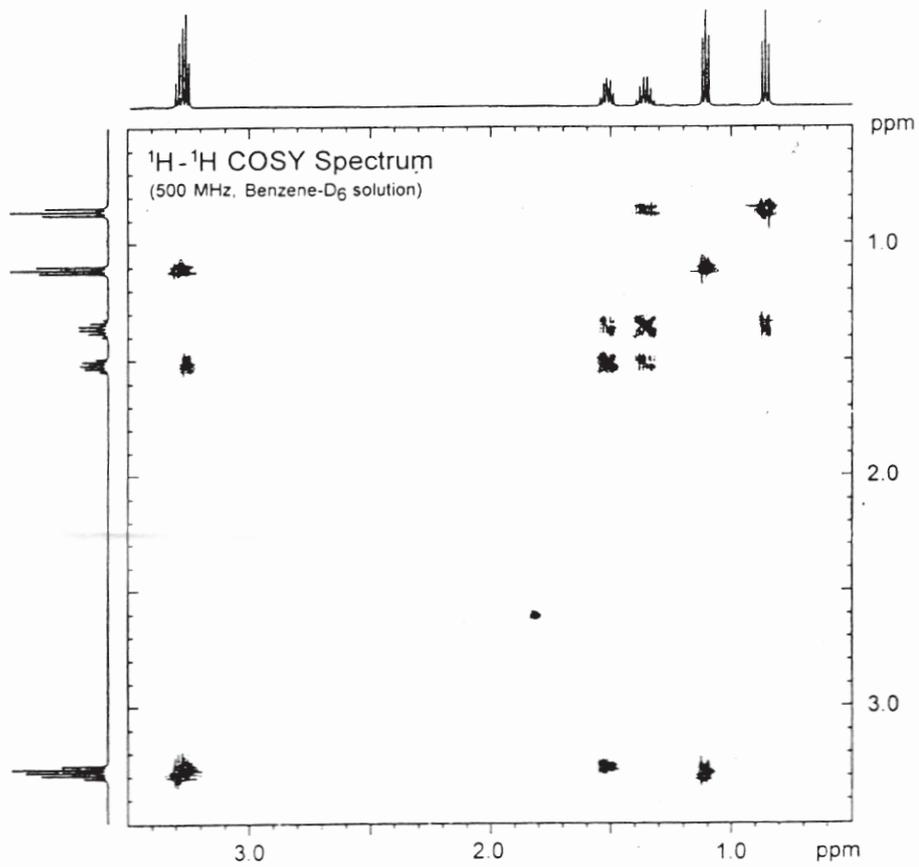
- a) Draw schematic diagram of HPLC and explain the importance of chiral columns.

- b) Explain
- i) Theoretical plates
 - ii) Reverse phase chromatography.
- c) Explain various detectors used in mass spectrometry.

Q6) A compound shows spectral information provided on next page. Deduce the structure and justify your answer. **[12]**

M.F. : $C_6H_{14}O$





Total No. of Questions : 6]

SEAT No. :

P1521

[5225]-33

[Total No. of Pages : 2

M.Sc.

DRUG CHEMISTRY

**CH-363 : Drug Development
(Immunology & Microbiology)
(2008 Pattern) (Semester-III)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Answers to the two section to be written in separate answer books.*
- 3) Figures to right indicate maximum marks.*

SECTION-I

Q1) Answer any three of the following. [15]

- a) State the various phases of typical bacterial growth curve and describe each of the phase in brief.
- b) Diagrammatically represent 'A typical stirred tank Fermentor'(With lables)
- c) Enlist the methods used for antimicrobial assays. Describe any one in brief.
- d) Short note on : Classification of microbes.
- e) Describe the microbial methods for effluent treatment.

Q2) Answer any three of the following. [15]

- a) Describe the types of Adaptive immunity.
- b) What is Hypersensitivity. Enlist it's types and describe any one in brief.
- c) Describe the barriers of Innate Immunity.
- d) What are Immunosuppresants and Immunomodulators. Give examples of each.
- e) Describe the Radioimmunoassay or ELISA technique.

P.T.O.

Q3) Answer any two of the following. **[10]**

- a) Make a comment on History of drugs with examples.
- b) Write a short note on 'Ayurveda-System of Medicines'.
- c) Give a commentary on how combinatorial chemistry, HTS and computers have aided the process of drug discovery.

SECTION-II

Q4) Answer any three of the following. **[18]**

- a) Give all the parameters used to study toxicological evaluation of new drugs.
- b) What is Bioassays? Explain need of Bioassays. Give in detail the type of Bioassays.
- c) Discuss the following in brief
 - i) Pharmacophore identification
 - ii) Chronic toxicity
- d) What is a patent? Give its basic and formal requirements of patents.

Q5) Answer any two of the following. **[12]**

- a) Explain all the phases involved in clinical trials.
- b) What is Lead? Discuss the different strategies used in Lead discovery.
- c) Explain the different types of dosage forms used in the formulation of drug dosage forms.

Q6) Answer any two of the following. **[10]**

- a) Discuss the following
 - i) FDA
 - ii) Pharmacopoeia
- b) Write a short note on 'scale up process'.
- c) Give a brief account on 'Industrial hygiene and safety'.



Total No. of Questions : 6]

SEAT No. :

P1522

[Total No. of Pages : 5

[5225] - 34

M.Sc.

DRUG CHEMISTRY

CH-364 : Stereochemical Principles & Applications

(2008 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks :80

Instructions to the candidates:

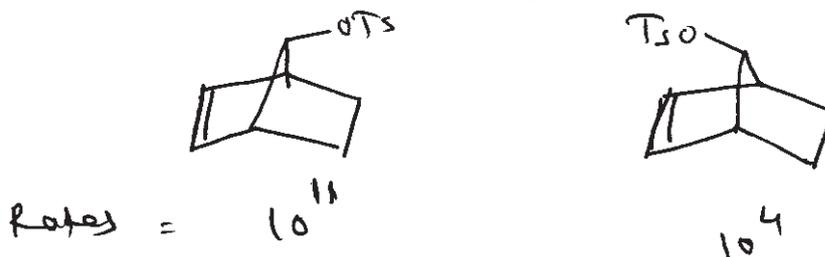
- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Answers to the two sections should be written in separate answer books.*

SECTION - I

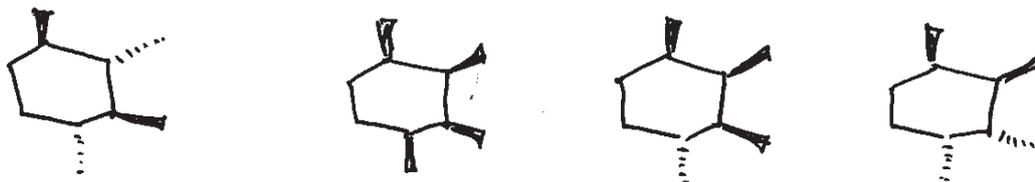
Q1) Answer any four of the following :

[16]

- a) Neomenthyl chloride undergoes base catalyzed dehydration 200 times faster than menthyl chloride. Explain.
- b) The rate of acetolysis of the following compounds are as follows. Explain.



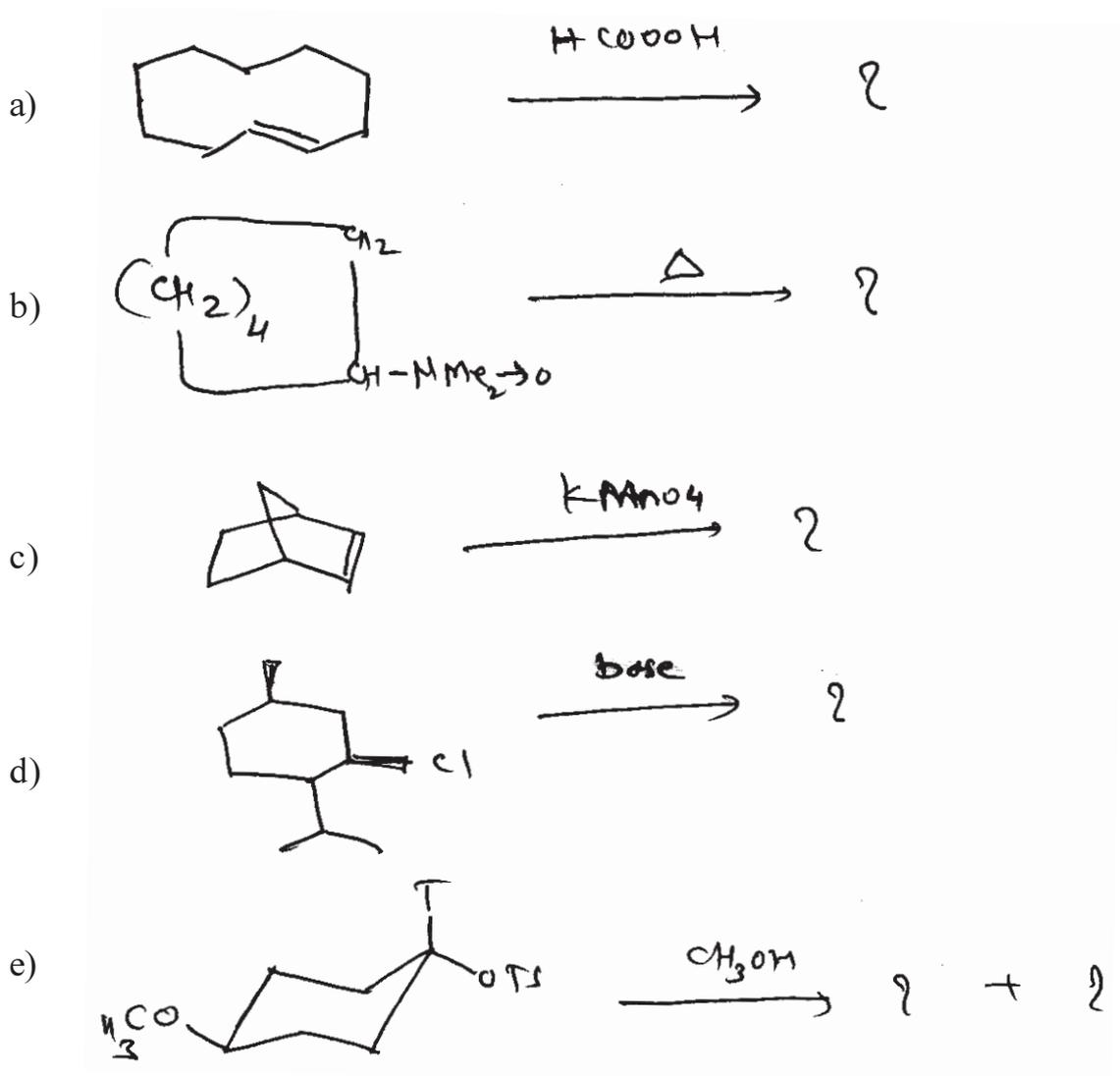
- c) Chair-boat interconversion is more facile in cyclohexanone than in cyclohexene. Explain.
- d) Give the preferred conformations of the four tetramethyl cyclohexanes given below. Estimate the enthalpy of these, based on this indicate the stability of these compounds. Explain your answer clearly.



- e) Reaction of cyclohexene with peracid followed by hydrolysis gives trans 1, 2-diol, whereas similar reaction of trans cyclodecene give trans 1, 6-diol.

P.T.O.

Q2) Predict the product/s in any four of the following and explain the stereochemistry involved. [12]



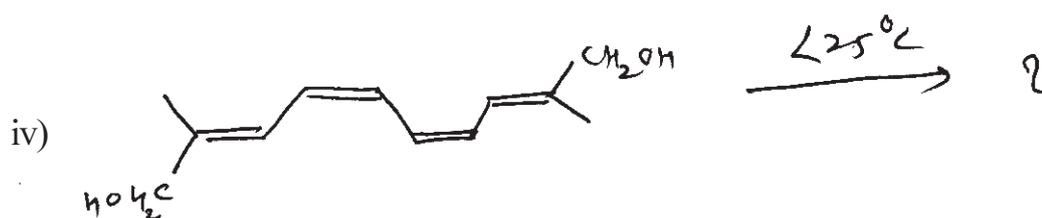
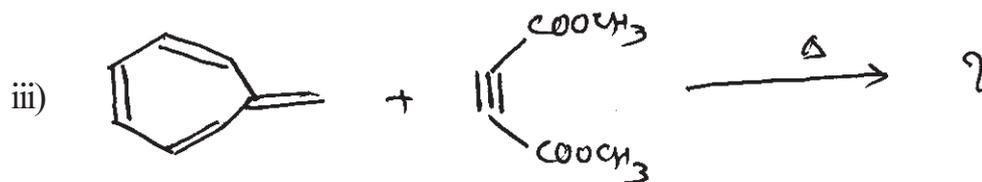
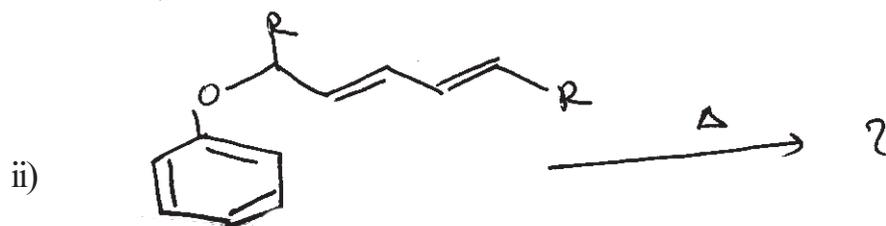
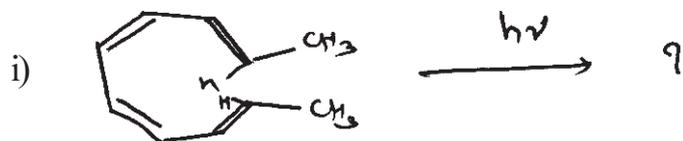
Q3) Write short note on any three : [12]

- Alder rule.
- Trans annular interactions.
- Isomers of perhydroanthracene & their stability.
- Conformational rule.

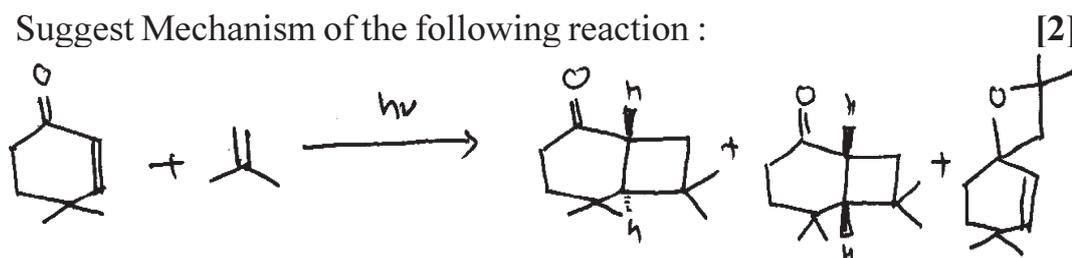
SECTION - II

Q4) a) Explain with the help of Mobius and Huckel aromatic transition state approach the [1, 3] shift is thermally or photochemically allowed process. [4]

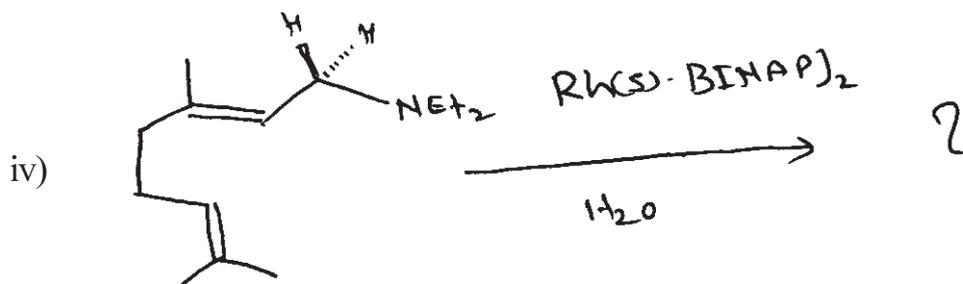
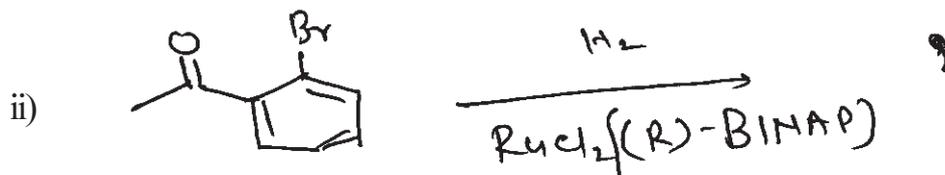
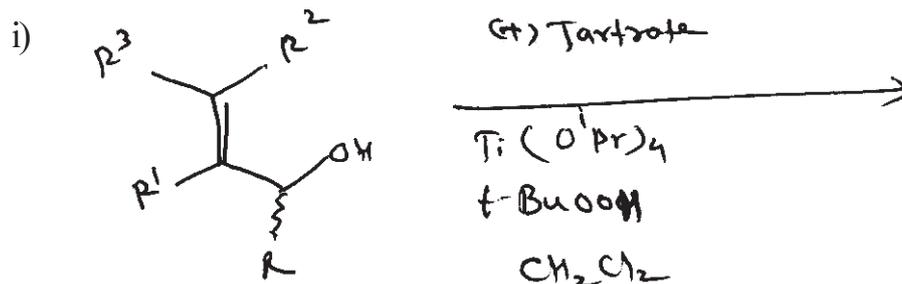
b) Predict the product/s in any three of the following : [6]



c) Suggest Mechanism of the following reaction :

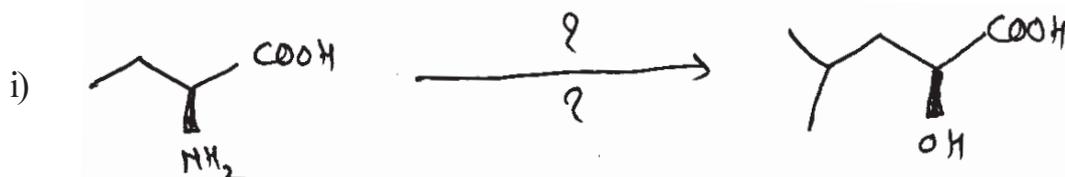


Q5) a) Predict the product/s & write the correct stereochemistry & justify your answer. (Any three) [6]



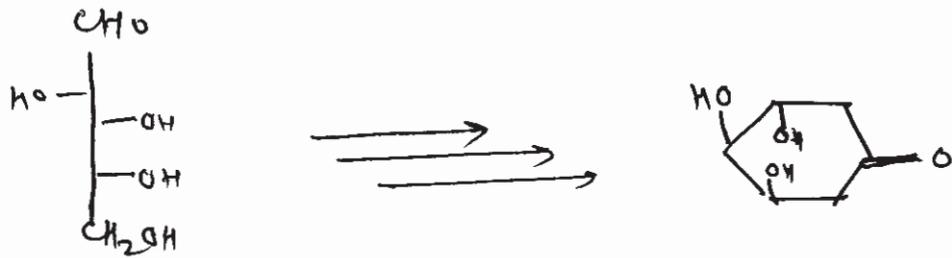
b) Write short note on "Chiral Pool". [3]

c) Suggest suitable reagent for the following conversion (any two): [5]



Q6) a) Solve the following (any two): [6]

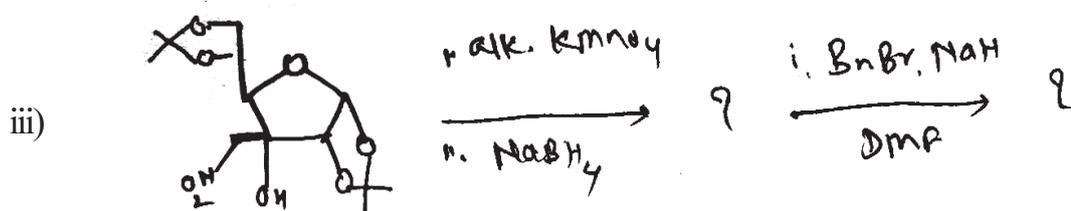
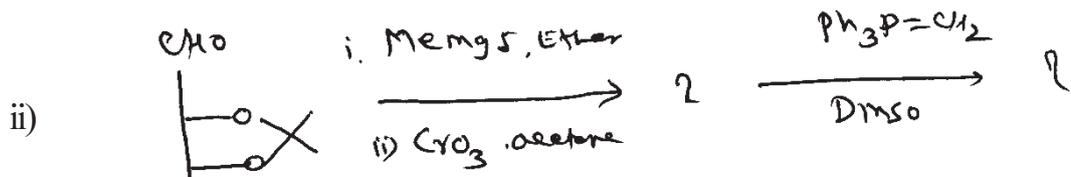
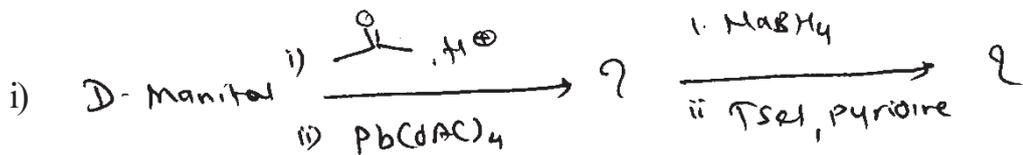
i) Complete the following reaction sequence.



ii) Write pyranose structure of D(+) - Glucose.

iii) Write short note on 'Anomeric effect'.

b) Predict the product/s and write mechanism (any three): [6]



c) What is optical purity? How it is calculated? Illustrate with suitable example. [2]



Total No. of Questions : 6]

SEAT No. :

P1523

[5225]-41

[Total No. of Pages : 5

M.Sc.

DRUG CHEMISTRY

CH - 461 : Synthetic Methods in Organic Chemistry

(2008 Pattern) (Old) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

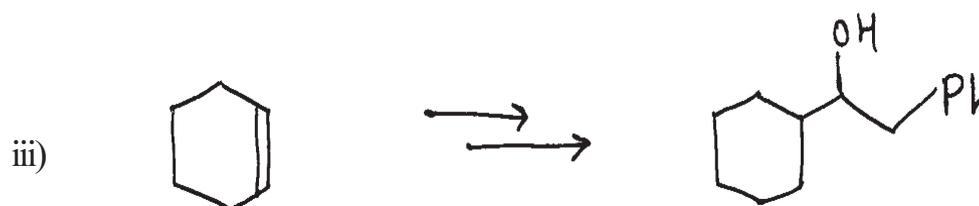
- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*

SECTION - I

Q1) a) Explain any three of the following: **[9]**

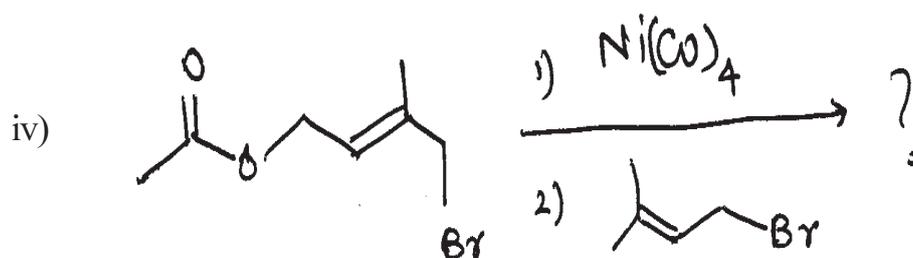
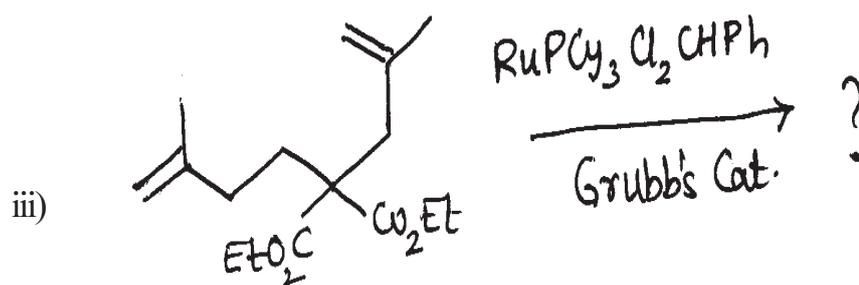
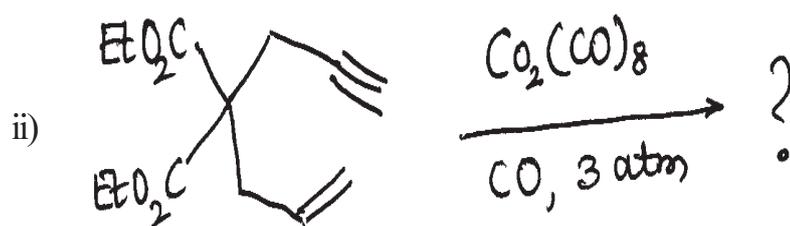
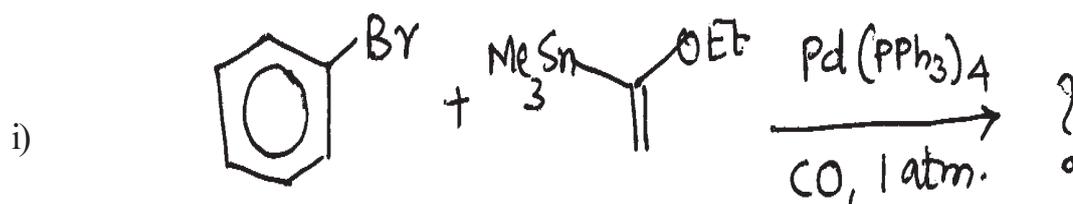
- i) CBZ (Benzyloxy carbonyl) group is preferred over acetylation for amino group protection in peptide synthesis.
- ii) THP protection is stable under alkaline conditions but can be removed under acidic conditions.
- iii) α - Pinene derived organoboranes can be used to prepare optically active alcohols.
- iv) Synthesis of macrocyclic rings can be achieved using organo nickel compounds.
- v) Role of palladium complex in the Heck reaction cycle.

b) Complete any two of the following transformations. Justify your answer. **[6]**



P.T.O.

Q2) a) Predict the product, explain the mechanism of the reaction. (Any Three): [9]



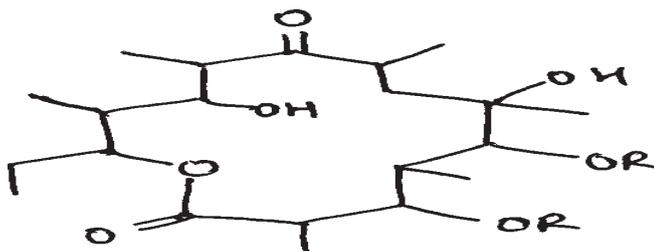
b) Discuss any two of the following. [6]

- Use of acetylene in organic synthesis.
- Enamines are preferred for monoalkylation at the α -position of aldehydes.
- Role of $\text{Na}_2\text{Fe}(\text{CO})_4$ in organic synthesis.

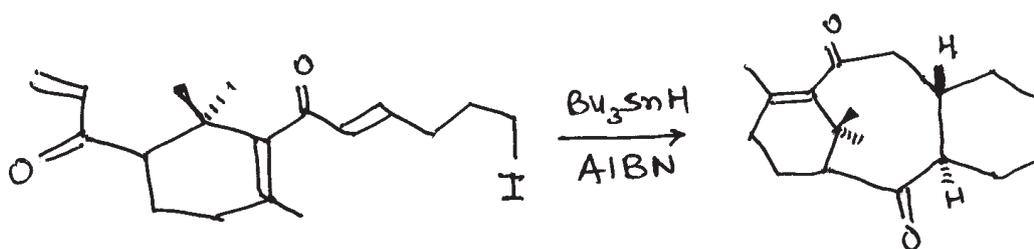
Q3) Answer any two of the following:

[10]

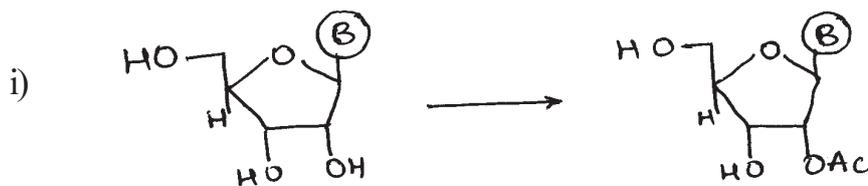
a) Explain the biomimetic approach to retrosynthesis of the following.



b) Explain how Domino (Tandem) reaction are useful than stepwise reaction. Write the steps involved in the following reaction.

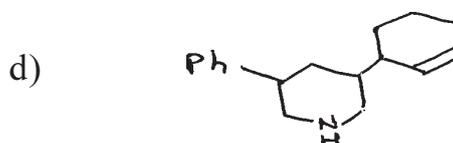
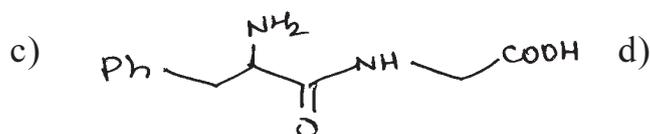
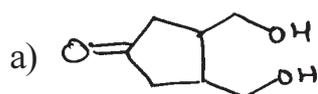


c) Carry out the following conversion (any two).

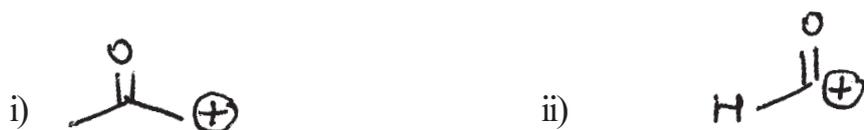


SECTION - II

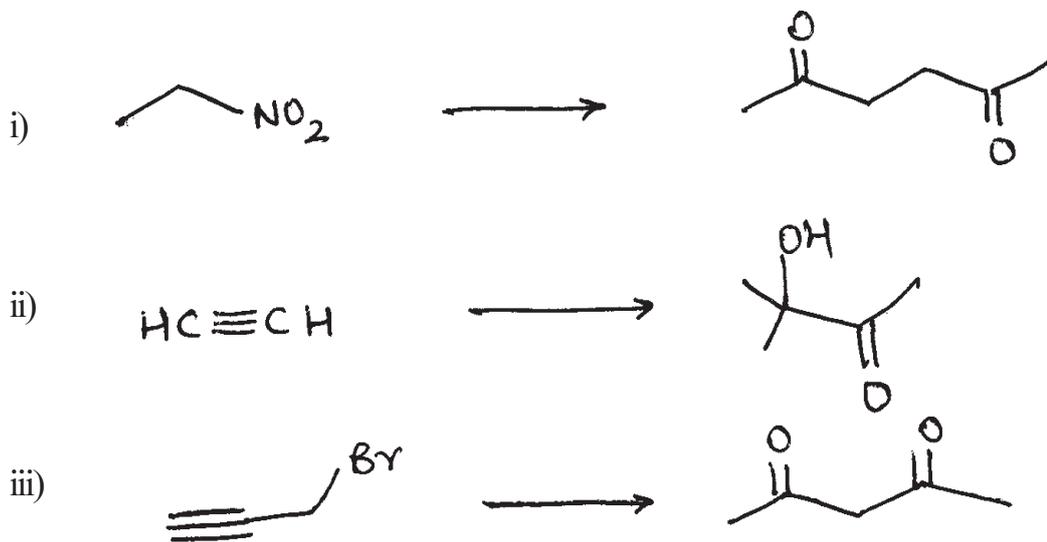
Q4) Using retrosynthetic analysis, Suggest a suitable method to synthesize any three of the following. [12]



Q5) a) Give one reaction with reagent, for each synthon given below. [6]



b) Employing umpolung carry out the following transformation (any two). [6]



Q6) a) Write a brief account on any one. [4]

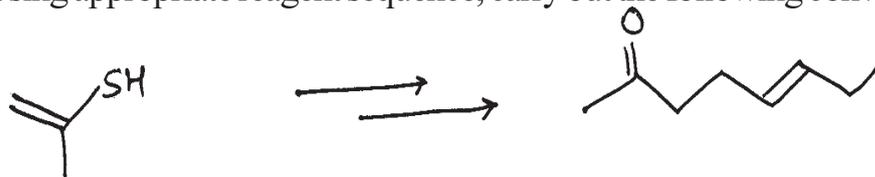
- i) Ionic liquids in Organic Synthesis.
- ii) Principles of Green Chemistry.

b) Answer any four of the following. [12]

i) How the following Compound can be prepared by enamine approach

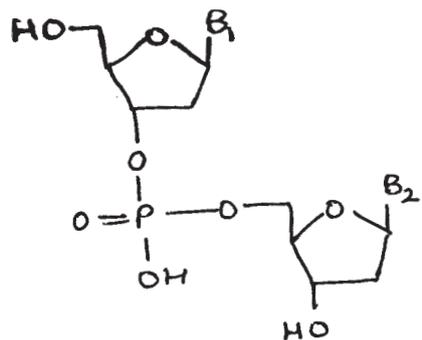


ii) Using appropriate reagent sequence, carry out the following conversion.

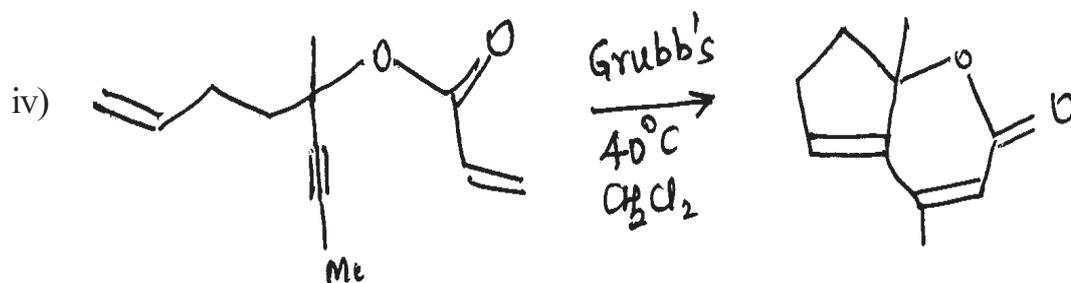


Reagents: $\text{S-BuLi}, \text{C}_2\text{H}_5\text{I}; \Delta, 200^\circ\text{C}; \text{CH}_2=\text{CHCH}_2\text{Br}; \text{H}_3\text{O}^+$

- iii) Discuss the steps involved in the synthesis of the following dinucleotide.

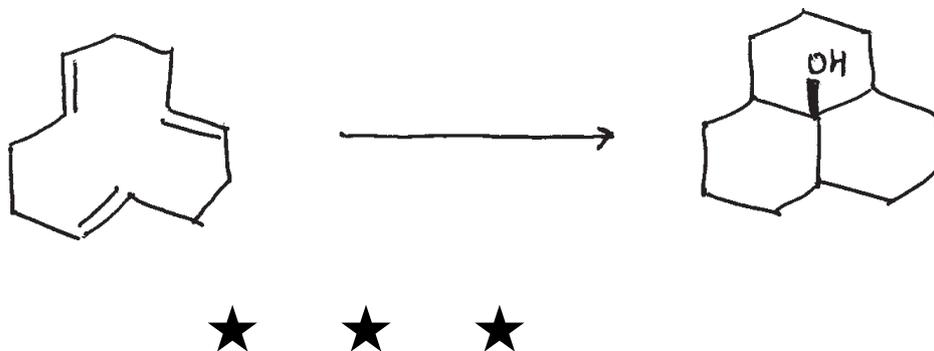


B_1 & B_2 are purine bases



Write the mechanism for the formation of the product in the above reaction.

- v) Carry out the following conversion using organo borane chemistry.



Total No. of Questions : 6]

SEAT No. :

P1524

[5225]-42

[Total No. of Pages : 3

M.Sc.

DRUG CHEMISTRY

**CH- 462 : Chemotherapy
(2008 Pattern) (Semester - IV)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections should be written in separate answer books.*
- 3) *Figures to the right indicate full marks.*

SECTION-I

Q1) Answer any three of the following. **[15]**

- a) What are antibiotics? How are they classified? What makes them selectively toxic.
- b) Give a brief account of discovery of penicillins. Discuss semisynthetic penicillins with their structural features.
- c) Give a brief account of the strategies employed in the development of cephalosporins. Explain how these strategies helped to achieve the improved drugs.
- d) Discuss the following in brief.
 - i) Sulphonamides
 - ii) Macrolide antibiotics.

Q2) Answer any two of the following. **[16]**

- a) Discuss in brief following classes of anticancer agents.
 - i) Alkylating agents
 - ii) Antimetabolites
 - iii) Antibiotics
- b) Draw a neat diagram of nerve cell. Discuss the phenomenon of nerve conduction. How this process is affected in convulsions? Discuss the therapeutic approaches to control convulsions.
- c) Explain viral life cycle. Discuss at least two classes of drugs affecting the viral life cycle.

P.T.O.

Q3) Discuss in brief (any three).

[9]

- a) Fluroquinolones
- b) Drug Resistance.
- c) MAO inhibitors
- d) Aminoglycosides

SECTION-II

Q4) Answer any three of the following.

[18]

- a) Discuss the organization and functioning of endocrine system. Explain the feedback mechanisms of hormone release. What is the function of pituitary gland.
- b) Describe the working of cardio vascular system. How do the following group of drugs exhibit their effect on CVS.
 - i) Cardiac glycosides
 - ii) β blockers
- c) Explain in brief prostaglandin biosynthesis. What are their physiological functions. How do anti-inflammatory agents exhibit their effects.
- d) Discuss following GIT disorders and their treatment.
 - i) Diarrhoea
 - ii) Ulcers
 - iii) Emesis

Q5) Answer any two of the following.

[10]

- a) Discuss in brief IDDM and NIDDM. Explain the management of NIDDM using oral hypoglycemic agents.
- b) Discuss in brief the symptoms and treatment of following mycobacterial diseases.
 - i) Leprosy
 - ii) Tuberculosis.
- c) Discuss in brief any two of the following.
 - i) Hypnotics
 - ii) Opioid Analgesics
 - iii) Proton pump inhibitors.

Q6) Give the mode of action and uses of following drugs (any four).

[12]

- a) Flucytosine
- b) Vancomycin
- c) Glyceryl trinitrate
- d) Mefloquin
- e) Artemisinin
- f) Captopril



Total No. of Questions :6]

SEAT No. :

[Total No. of Pages : 3

P1525

[5225]-43

M.Sc.

DRUG CHEMISTRY

CH - 463 : Drug Design

(2008 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Answers to the two sections to be written in separate answer books.*
- 3) *Figures to the right indicate maximum marks.*

SECTION-I

Q1) a) Explain the terms in brief: **[4]**

- i) Monoclonal antibodies
- ii) Vectors
- iii) Pharmacogenomics
- iv) Plasmid

b) Attempt any two of the following: **[10]**

- i) Explain the principle of antisense therapy.
- ii) Describe applications of recombinant DNA technology.
- iii) Give the steps in hybridoma preparation.

Q2) Answer any two of the following: **[12]**

- a) Explain the concept of standard deviation as a measure of variation in a data. Also compute the same for the data given below of weight in gms of experimental twice.

152, 184, 164, 149, 150, 148, 170

P.T.O.

- b) What is probability of an event? The probability that a particular seed of crop germinates is 0.9. If 7 such seeds are sown, find the probability that
- exactly 5 will germinate
 - less than 2 will germinate
- c) Compute Karl Pearsons coefficient of correlation between
- X: Production (in Quintals) & Y: price of wheat in Rs. for 5 reigons of state
- X: 1450 1575 1890 2005 1984
- Y: 1880 1850 1900 1750 1800

Q3) Answer any two of the following: **[14]**

- Discuss in brief the development of combinatorial chemistry as a modern tool for drug discovery. Explain the various ways the libraries are synthesised.
- Explain with proper examples how prodrugs have enabled the following
 - Improved oral absorption
 - Improved target selectivity
 - Reduced toxic effect
 - Improved taste
- What are the fractions of the cell membrane? Draw a schematic diagram & explain how these are performed?

SECTION - II

Q4) Answer any three of the following: **[18]**

- Explain QSAR? What are the physicochemical parameters normally correlated with biological activity? What is the significance of statistical terms like s,r,t test? Explain.

- b) Explain in brief how molecular mechanics is used in calculating the energy of a system.
- c) Discuss
 - i) Molecular Electrostatic potentials
 - ii) Quantum mechanics
 - iii) Monte Carlo search
- d) Explain
 - i) Hansch Analysis
 - ii) Free Wilson Analysis

Q5) Answer any two of the following: **[12]**

- a) Discuss in brief docking method & virtual screening.
- b) Explain Topliss decision tree & batch Analysis.
- c) Discuss structure based drug design.

Q6) Discuss any two of the following. **[10]**

- a) G - Protein Coupled Receptors
- b) 3D QSAR
- c) Bioinformation & Drug designing
- d) Conformational Analysis.

