Total No. of Questions : 6]

SEAT No. :

P2814

[Total No. of Pages : 4

[5025]-301

M.Sc. (Semester - III)

DRUG CHEMISTRY

CH-361 : Chemistry of Heterocycles and Drug Synthesis

(2013 Pattern)

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

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) Explain any four of the following : **[8]**

a) N-acetyl pyrrole undergoes cycloaddition reaction with acetylene dicarboxylate but pyrrole does not.

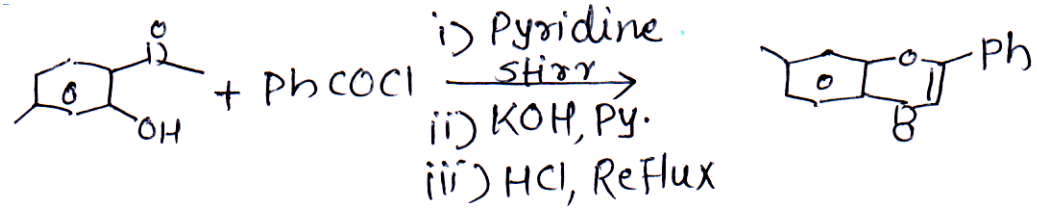
b) N-Alkylation of purines under neutral condition occurs at five member ring nitrogen.

c) 1, 3-Azoles undergo electrophilic substitution at C-5 while 1,2-azoles at C-4.

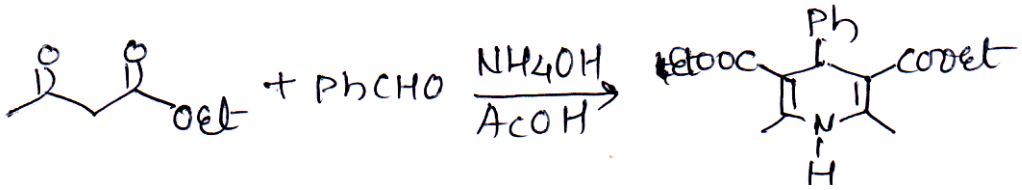
d) 4-Methyl imidazole is better represented as 4(5) methyl imidazole.

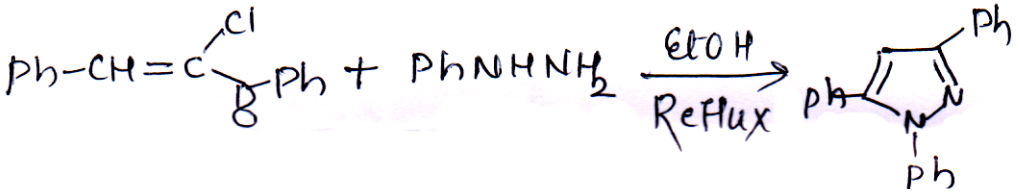
e) 1, 2, 5-Thiadiazole is more aromatic than thiophene while 1, 3, 4-thiadiazole is less aromatic.

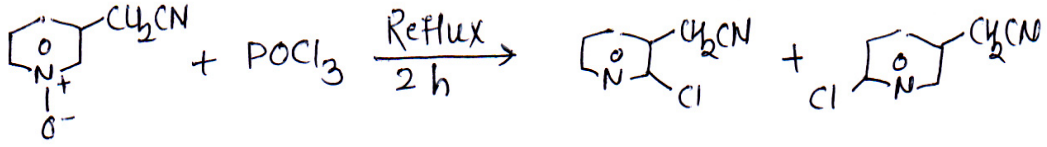
Q2) Suggest the suitable mechanism for any four of the following : **[8]**

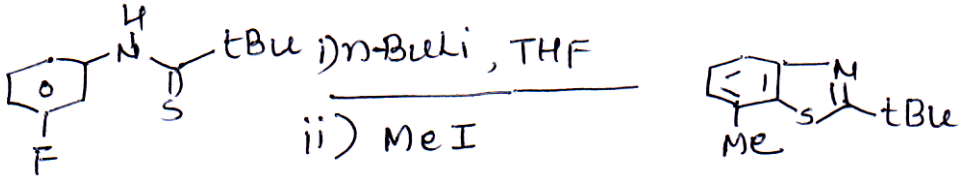
a) 

P.T.O.

b) 

c) 

d) 

e) 

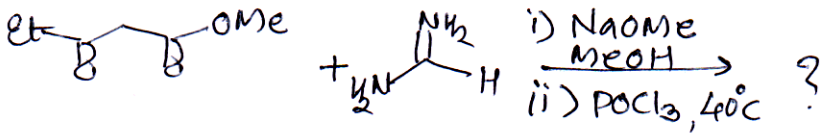
Q3) a) Write short notes on any two of the following : **[4]**

i) Pechamann Coumarin synthesis

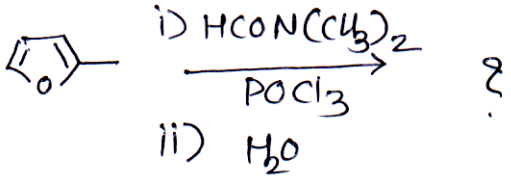
ii) Fischer Indole synthesis

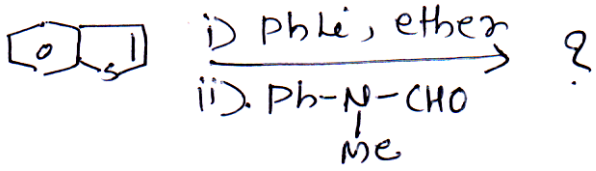
iii) Fiest -Benary furan synthesis

b) Predict the products for any two of the following : **[5]**

i) 

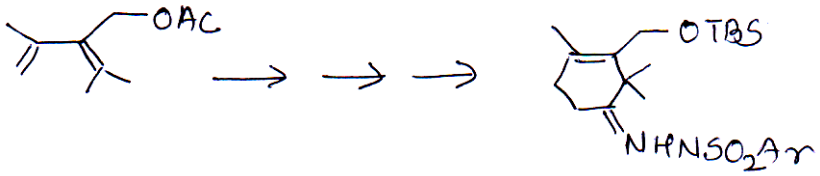
ii) 

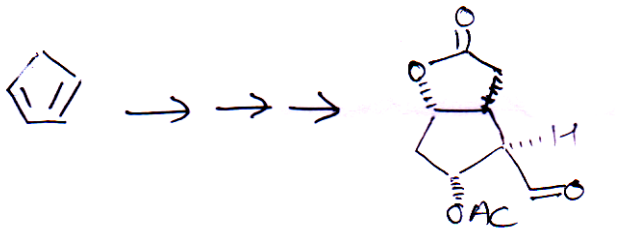
iii) 

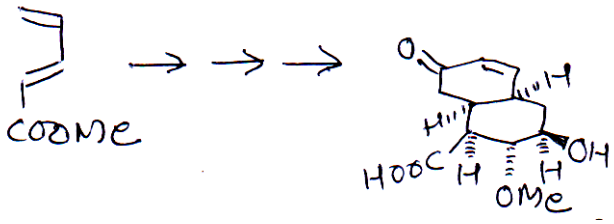
iv) 

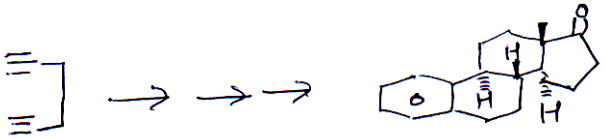
SECTION - II

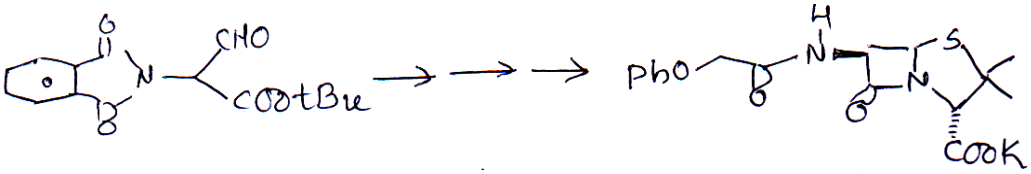
Q4) Discuss the steps involved in the following transformations. Comment on steps indicating mechanism and reagents used (any three) : **[12]**

a) 

b) 

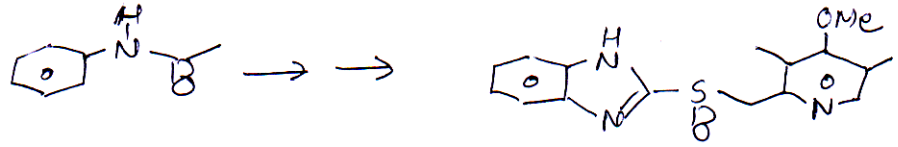
c) 

d) 

e) 

Q5) Discuss the steps involved in the synthesis of the following drug molecules from the precursors shown (any three) : **[9]**

a)



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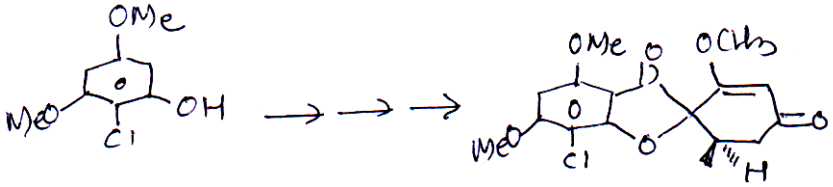

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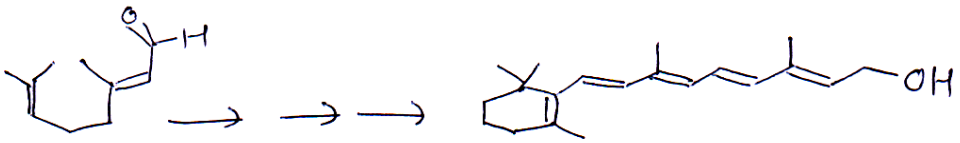
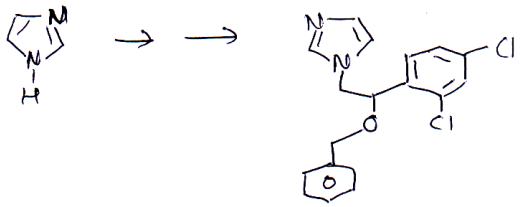
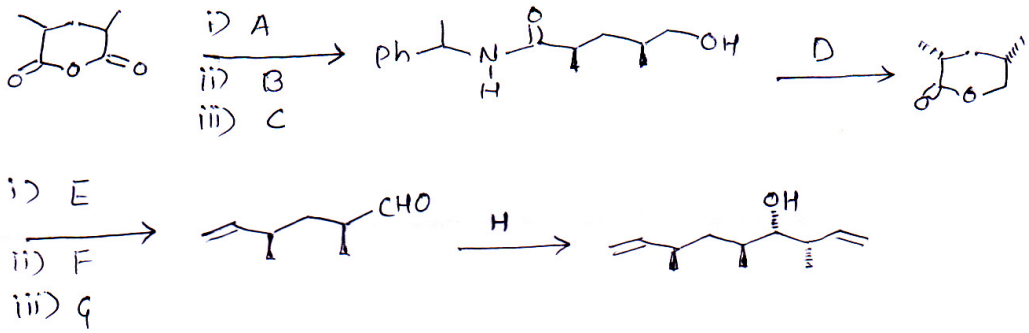


d)



Q6) Answer any one of the following : **[4]**

a) Indentify the missing reagents and explain the following transformation.



b) Explain the following reactions in brief :

i) Suzuki coupling

ii) Olefin metathesis

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Total No. of Questions : 6]

SEAT No. :

P2815

[Total No. of Pages : 5

[5025]-302

M.Sc. (Semester - III)

DRUG CHEMISTRY

CHD - 362 : Advanced Analytical Methods

(2013 Pattern)

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

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.***

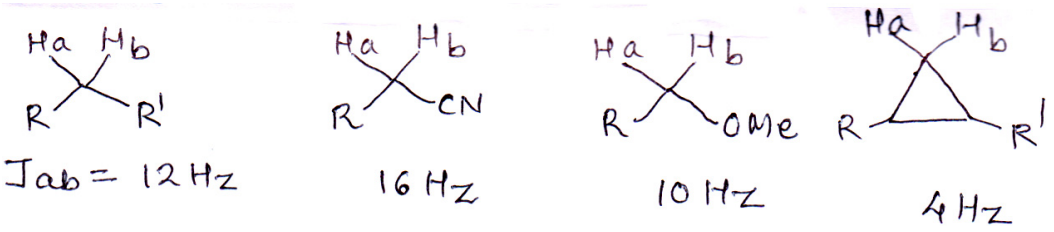
SECTION - I

Q1) Answer any four of the following : **[8]**

a) Explain the diamagnetic anisotropy effect observed in Acetylene, Benzene and Benzaldehyde.

b) Explain with proper illustrations how the spectra of AB spin system differs from AX system. How is the ratio of intensities calculated in an AB system.

c) Explain the coupling constants observed in the following molecules.



d) Molecular ion intensity decreases in the order cyclic > acyclic > branched compounds.

e) DEPT and off-resonance spectra aid the interpretation of CMR spectra.

P.T.O.

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

a) Deduce the structure using following spectral data.

M.F. $C_9H_{16}O_2$

I R - 1740 cm^{-1}

PMR - 0.9 (t, 7.6 Hz, 3H) ; 1.3 (m, 4H);

1.65 (m, 2H) ; 2.32 (t, 6.7 Hz, 2H);

4.58 (d, 7.8 Hz, 2H) ; 5.21 (d, 10.4 Hz, 1H);

5.32 (d, 15.9 Hz, 1H) ; 5.92 (ddt, 7.8, 10.4 & 15.9 Hz,1H)

CMR - 13.9 (9); 22.3 (t) ; 24.7 (t); 31.3 (t);

34.2 (t); 64.9 (t) ; 118 (t); 132 (d); 174(S)

b) Deduce the structure. Justify your answer

M.F. - $C_5H_{10}O$

CMR - 18, 41, 67, 116 and 141

DEPT 1 - 18, 41, 141 all up 67 & 116 down

DEPT 2 - 41 and 141 up

c) Deduce the structure

M.F. - $C_7H_{12}O$

PMR - 1.08 (S, 6H); 2.21 (d, 7Hz, 2H); 5.08(d, 11.8 Hz,1H)

5.11(d, 15.5 Hz, 1H); 5.75 (ddt, 11.8, 15.5 & 7.2 Hz, 1H) 9.49 (S, 1H)

CMR - 21(9); 41(t); 45 (s); 118(t); 133(d); 206(d)

d) Deduce the structure using following spectral data.

M.F. $C_8H_{16}O_2$

PMR - 0.8 (t, 3H); 0.85 (t,3H); 1.2 (sextet, 2H); 1.4(quintet, 2H); 1.55 (sextet, 2H); 2.15 (t,2H); 4.0(t, 2H)

HETCOR - 13:: 0.85 ; 15::0.8; 19::1.55; 20::1.20

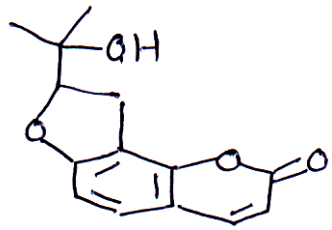
31::1.4; 36::2.15; 64::4.0

COSY - 0.8::1.20; 0.85:: 1.55; 1.20:: 0.8 & 1.4;

1.55:: 2.15 & 0.85; 2.15:: 1.55; 4.0:: 1.4

(:: - correlates with).

Q3) Assign the signals to the protons of the compound shown below. Justify your choice. Explain the decoupling experiment. **[5]**



1.2 (S, 9mm); 1.3 (S, 9mm);

2.0 (S, 3mm, ex.); 3.3 (d, 7 Hz, 6mm);

4.82 (t, 7Hz, 3mm); 6.25 (d,10 Hz, 3mm)

6.77 (d, 8Hz, 3mm); 7.23 (d, 8Hz, 3mm)

7.72 (10 Hz, 3mm)

Decoupling Experiment

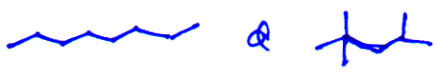
Irradiated	Observed
3.3	4.82 t – S
6.25	7.72 d – S

SECTION - II

Q4) Answer any five of the following : **[10]**

a) An ester with µf $C_9H_{10}O_2$ shows the following ion in its M.S. Deduce its structure MS: 150; 108; 91, 90,77,43

b) Differentiate the following pairs by MS

i) 

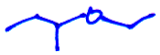
ii) 

c) Explain i) Isotope peaks ii) Metastable Ion

d) Discuss the working of Ionisation chamber in M.S.

e) What are the factors that affect the M^+ intensity? How can it be increased?

f) Give the genesis of Ions of  162, 134,119, 91, 77, 71,43

g) Explain the mechanism of ions formed from  102, 87, 73, 59, 57, 45,31

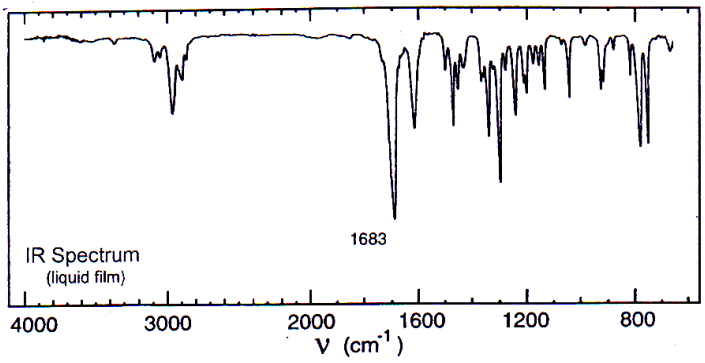
Q5) Discuss any two of the followig in brief : **[6]**

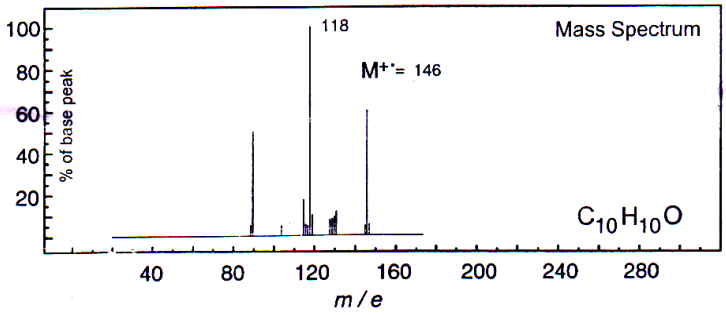
a) Factors affecting vicinal coupling

b) NOE

c) COSY

Q6) You are provided with spectras of a compound on the next page. Analyse the spectras & arrive at a structure consistent with the data. Justify your structure.**[9]**



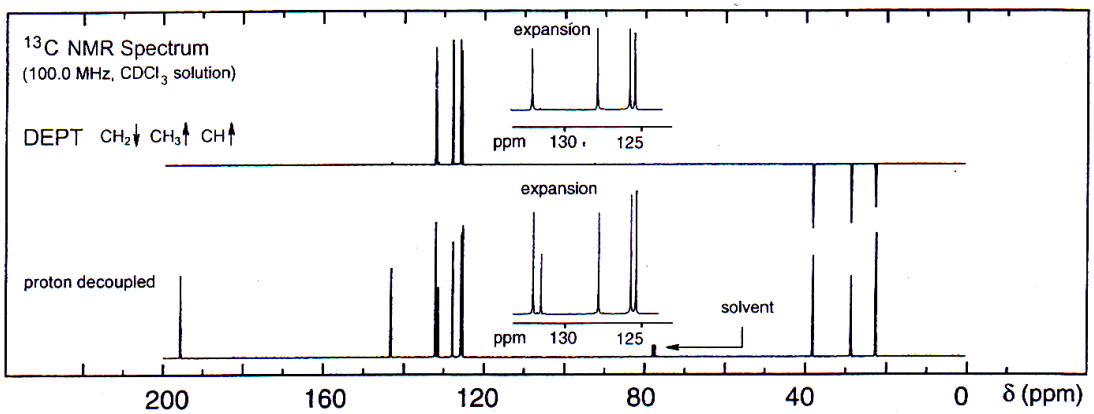


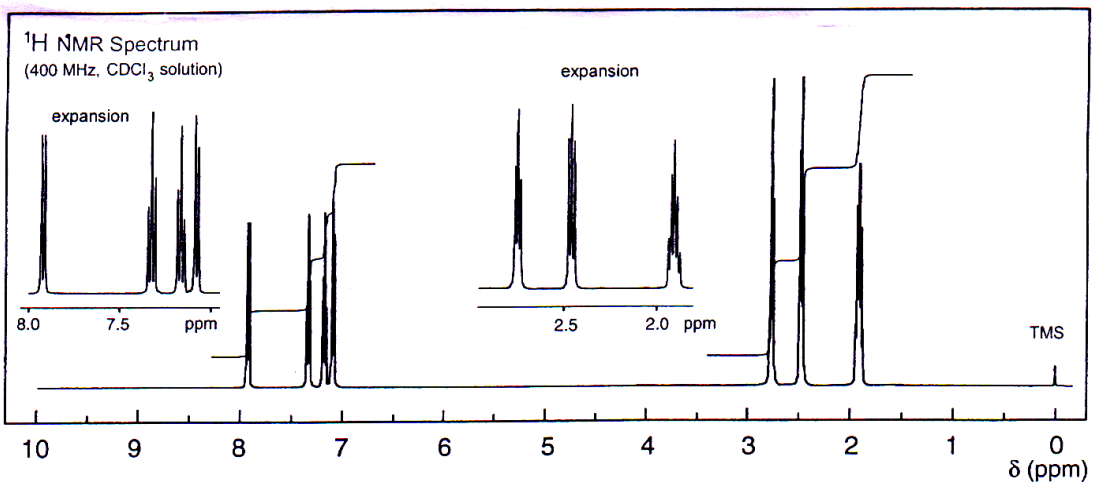
UV Spectrum

λ_{max} 249 nm ($\log_{10}\varepsilon$ 4.1)

λ_{max} 292 nm ($\log_{10}\varepsilon$ 3.3)

solvent : ethanol





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Total No. of Questions : 6]

SEAT No. :

P2816

[Total No. of Pages : 3

[5025]-303

M.Sc. (Semester - III)

DRUG CHEMISTRY

CHD-363 : Microbiology, Immunology & Drug Discovery and Development

(2013 Pattern) (Credit System)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate maximum marks.***
3) ***Draw neat, labelled diagrams wherever necessary.***
4) ***Answers to the two sections to be written in separate answer books.***

SECTION - I

Q1) Attempt any three of the following : **[12]**

a) Explain the morphological characters of bacteria.

b) Describe principles of primary screening methods for microorganisms to be used in industrial production of biomolecules.

c) Using a graphical representation of bacterial growth, explain it's growth kinetics.

d) Discuss use of different 'C' and 'N' sources incorporated in nutrient media.

e) What are downstream processes in drug industry. Explain with the help of a flowchart.

Q2) Attempt any two of the following : **[8]**

a) Describe the differences between innate immunity and adoptive immunity.

b) Explain the mechanism and symptoms of type-I hypersensitivity.

c) List immunodeficiency disorders. Explain any one disorder in detail.

d) Explain agglutination reactions to visualize antigen-antibody complexes in vitro.

P.T.O.

Q3) Explain <u>any five</u> of the following terms : **[5]**

a) Enzymes as drug targets

b) Transgenic animals.

c) Preclinical trials

d) Bioequivalence

e) Lipinski's Rule

f) Therapeutic window

SECTION - II

Q4) Answer <u>any three</u> of the following : **[12]**

a) Comment in brief on the planning and execution of clinical trials. What are the objectives of phase-I & IV.

b) What are the factors that dictate the routes of drug administration. Explain with example.

c) What are the objectives of toxicological studies? Explain in brief how are chronic toxicity studies done?

d) What is the need of lead modification? How is it performed? Explain SAR in brief.

e) Give a brief account of strategies adopted for lead discovery.

Q5) Answer <u>any two</u> of the following : **[8]**

a) Explain the following with respect to a patent.

i) Prior art

ii) Patentable invention

iii) PCT

iv) Claims

b) Explain with respect to pharma industry.

i) Saftey

ii) Quality Management

iii) Economization of a manufacturing process

c) Define bioassay. How is bioassay of a NCE performed? Explain in brief.

Q6) Answer <u>any two</u> of the following : **[5]**

a) Xenobiotic biotransformations.

b) Modern drug discovery tools

c) Drug targets

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Total No. of Questions : 6]

SEAT No. :

P2817

[Total No. of Pages : 5

[5025]-304

M.Sc. (Semester - III)

DRUG CHEMISTRY

CHD - 364 : Stereochemistry, Asymmetric Synthesis & Pericyclic Reactions

(2013 Pattern)

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

Instructions to the candidates:

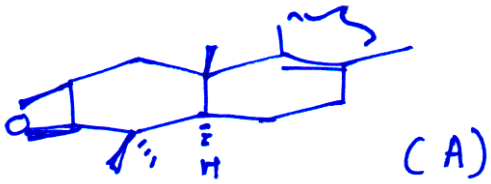
1) ***All questions are compulsory.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***

SECTION - I

Q1) Answer any four of the following : **[8]**

a) Chair-boat interconversion of cyclohexanone is more facile than chair-boat interconversion of cyclohexane.

b) 2, 3 β-epoxy lanost 8-ene (A) undergoes diequatorial ring opening with HBr whereas the α-epoxide gives normal diaxial ring opening with HBr.



(A)

c) Draw the stereostructures for cis-anti-trans & cis-anti-cis isomers of perhydrophenanthrene and compare their stabilities. Comment on their optical activity.

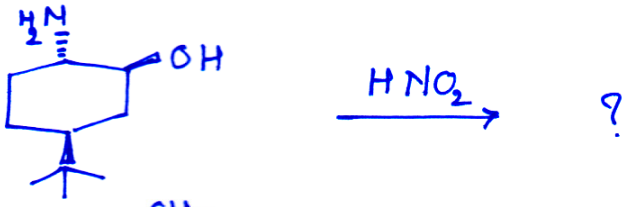
d) Menthyl chloride on treatment with sodium ethoxide gives 2- Menthene at a very slow rate.

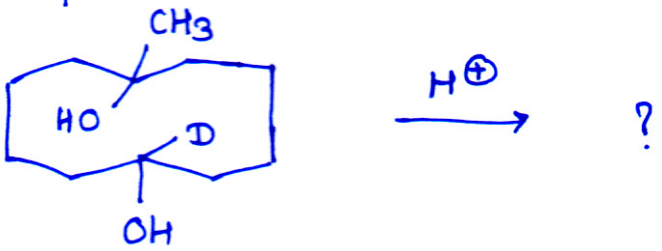
e) Compound (B) do not show acidic property.

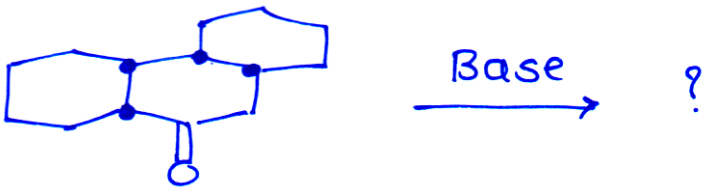
(B)

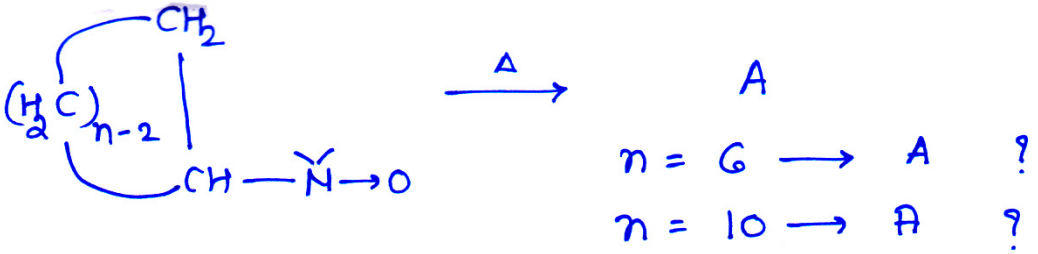
P.T.O.

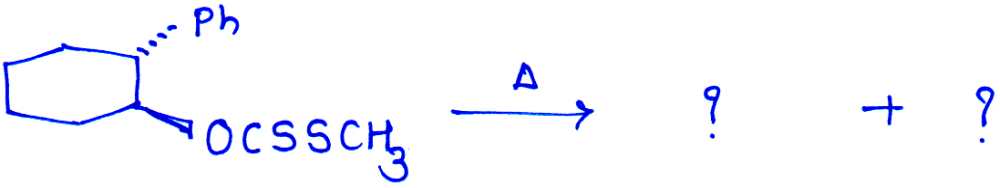
Q2) Predict the product/s. Explain the mechanism & stereochemical principles involved. (Any four) : **[8]**

a) 

b) 

c) 

d) 

e) 

Q3) a) Write short notes (any three) : **[6]**

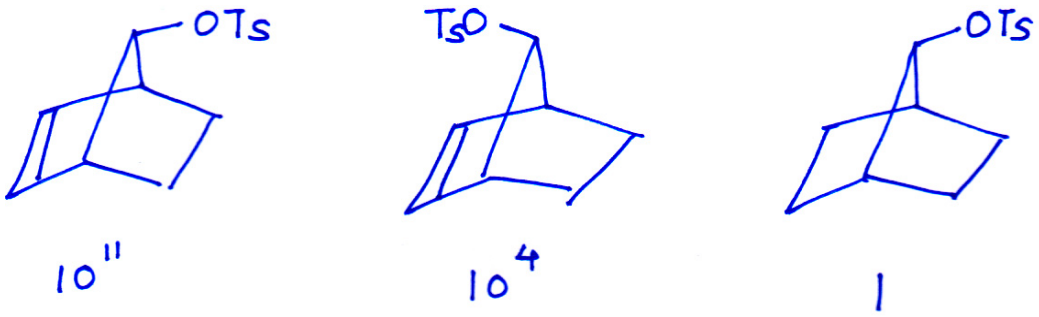
i) Limitations of Bredt's rule.

ii) I - Strain

iii) Von Auwers - Skita Rule & its limitations.

iv) Explain the use of $Pb(OAC)_4$ to determine the stereochemistry of cycloalkane 1, 2 diol.

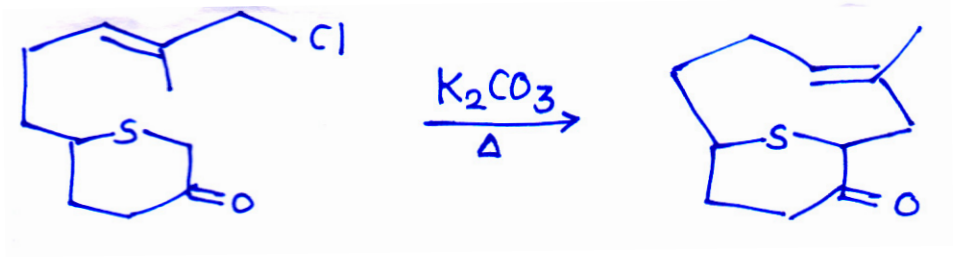
b) Relative rate of acetolysis for the following compounds are mentioned below. Explain with products. **[3]**



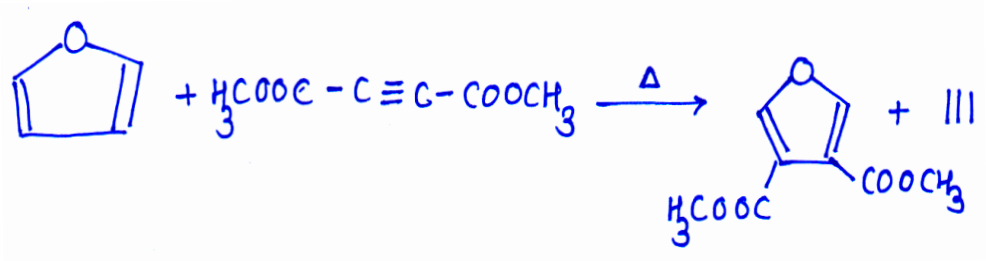
SECTION - II

Q4) a) Suggest the mechanism & comment on stereochemistry of products. (any two) : **[4]**

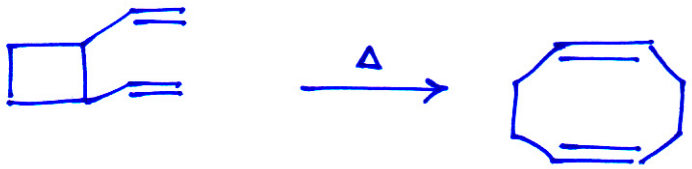
i)



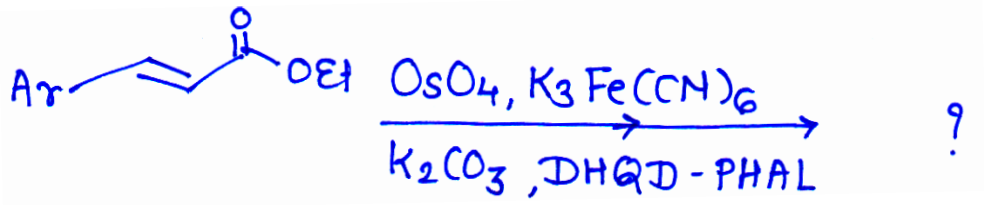
ii)

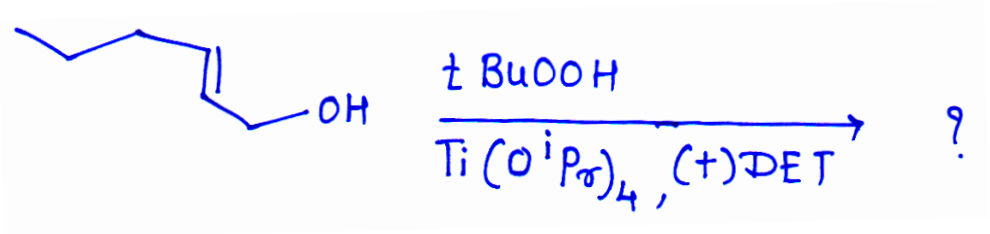


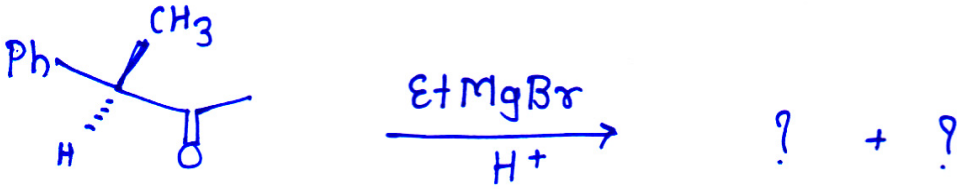
iii)

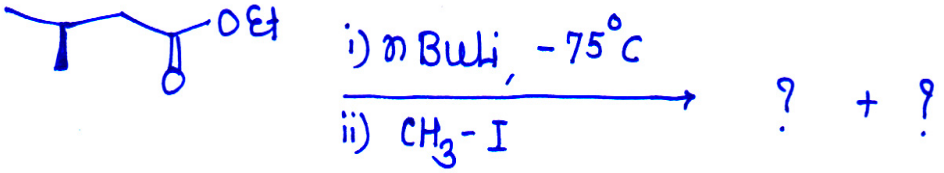


b) Predict the product/s in any three & justify. Indicate correct stereochemistry. **[6]**

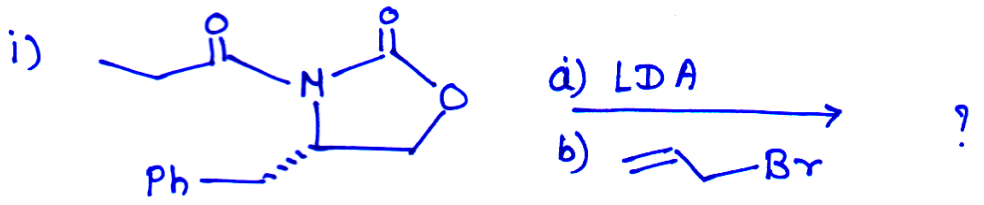
i) 

ii) 

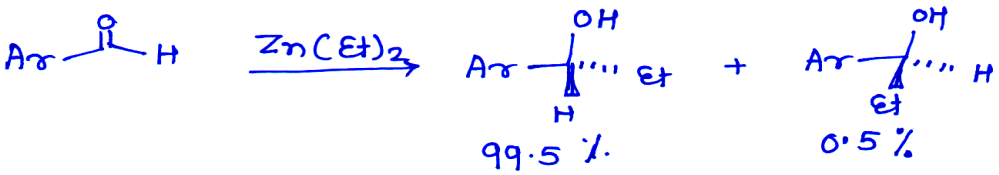
iii) 

iv) 

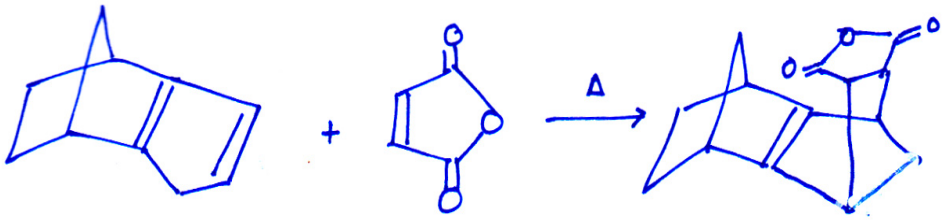
Q5) Answer <u>any two</u> of the following : **[10]**

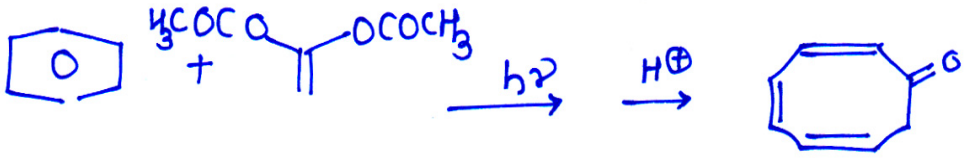
a) i) 

ii) Explain the term enantiomeric & distereomeric excess of following reaction.

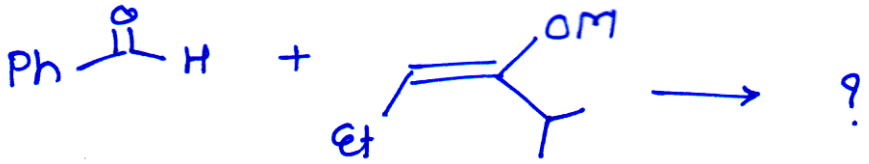


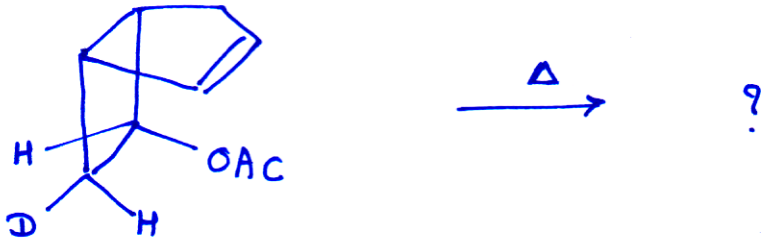
b) Suggest the suitable mechanism.

i) 

ii) 

c) Predict the product/s

i) 

ii) 

Q6) Construct correlation diagram for disrotatory conversion of 1,3 butadiene to cyclobutene. Check whether it is allowed thermally or photochemically. **[5]**

Total No. of Questions : 6]

SEAT No. :

P2818

[Total No. of Pages : 5

[5025]-401

M.Sc. - II (Semester - IV)

DRUG CHEMISTRY

CHD-461 : Advanced Organic Synthesis, Principles & Strategies

(2013 Pattern)

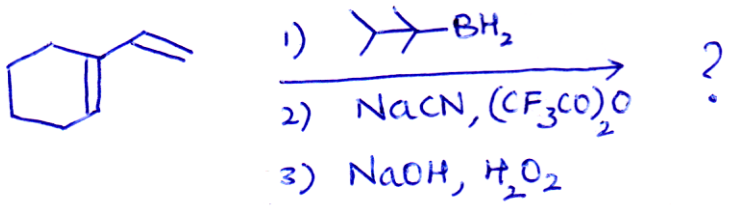
Time : 3 Hours] *[Max. Marks : 50*

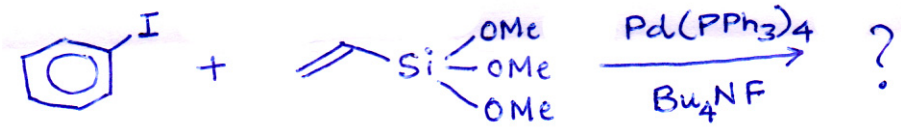
Instructions to the candidates:

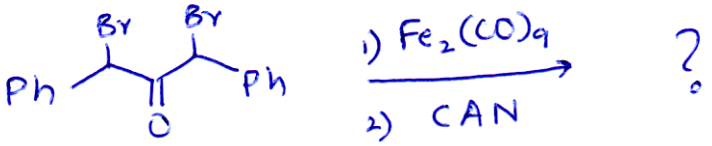
1) *All questions are compulsory.*
2) *Answers to the two sections should be written in separate answer books.*
3) *Figures to the right indicate full marks.*

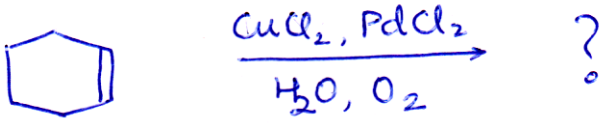
SECTION - I

Q1) Predict the product and suggest the mechanism for any three of the following: **[9]**

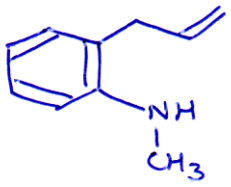
a) 

b) 

c) 

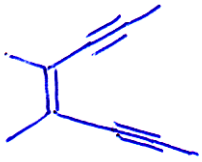
d) 

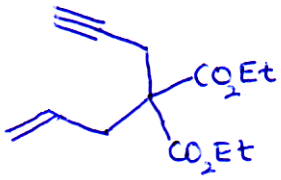
P.T.O.

e) 

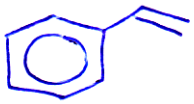
$PdCl_2(PPh_3)_2$, quinone → ?

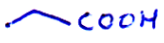
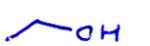
Q2) Predict the product for <u>any four</u> of the following : **[8]**

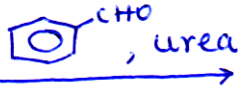
a)  → (Δ; 200°C) → ?

b) 

$Co_2(CO)_8$, CO, 3 atm → ?

c) 
1) Catachol borane, 100°C
2) Me_3SiCHN_2, THF
3) NaOH, H_2O_2
4) Bu_4NF, THF → ?

d) $P(OC_2H_5)_3 + Br_2 +$  → ? → 1)  2)  → ?

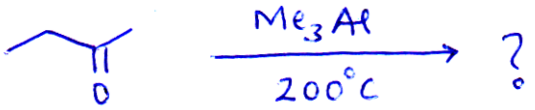
e) $CH_3\text{-}CO_2Et$ → ($^{\ominus}OEt$, EtOH) → ? →  ($Cu(OTf)_2$) → ?

Q3) Answer <u>any four</u> of the following : **[8]**

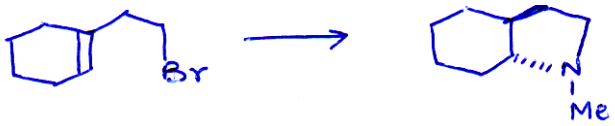
a) Write note on chiral organoborane reagents.

b) Ruthenium catalyzed azide cycloaddition gives 1, 5-disubstituted 1, 2, 3-triazole. Explain.

c) Predict the product in the following reaction



d) Carryout the following conversion using organoborane chemistry



e) Write note on OXO process

SECTION - II

Q4) a) Answer <u>any two</u> : **[4]**

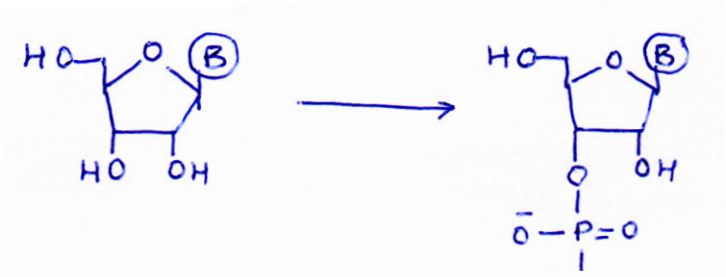
i) 1, 2 and 1, 4-dicarbonyl compounds can be synthesized using umpolung strategy. Explain.

ii) α-alkylation of aldehydes can be carried out by examine approach. Explain.

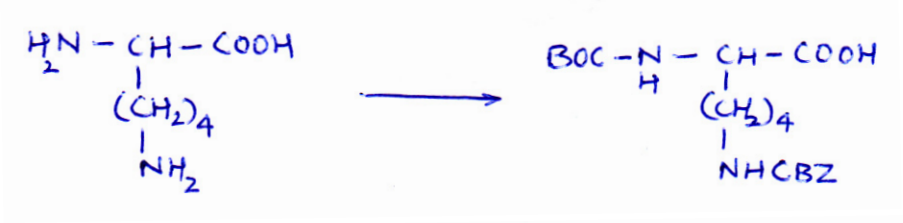
iii) Discuss any four principles of Green Chemistry.

b) Complete the following transformation (any two) : **[4]**

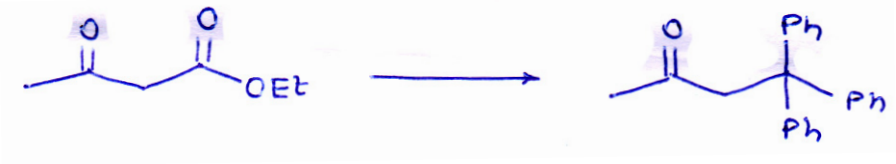
i)



ii)

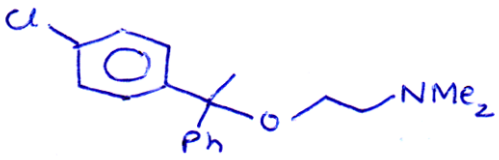


iii)

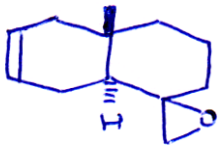


Q5) Using retrosynthetic analysis, suggest suitable method to synthesize <u>any three</u> of the following : **[9]**

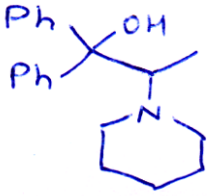
a)



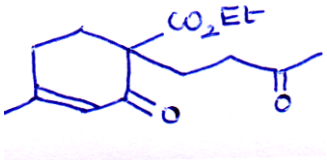
b)



c)

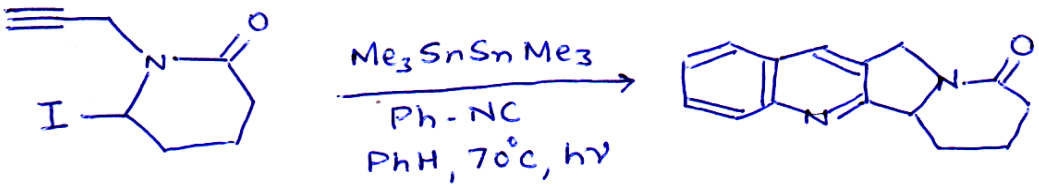


d)

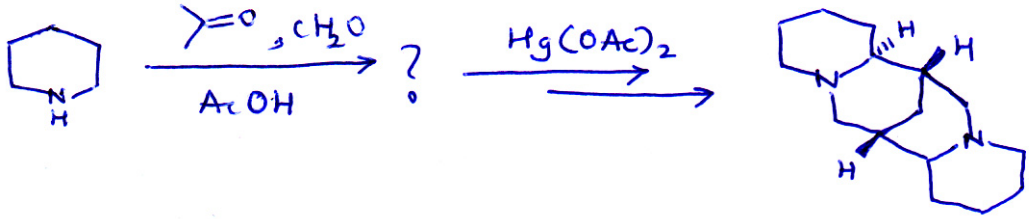


Q6) Answer <u>any four</u> of the following : **[8]**

a) Explain the steps involved in the following domino reaction.

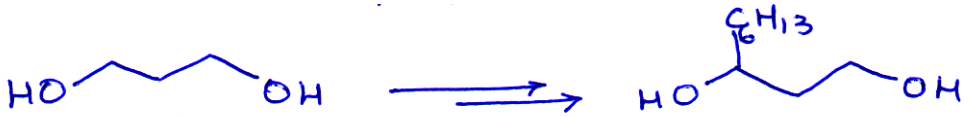


b) Explain the biomimetic approach to retrosynthesis to obtain the following compound.



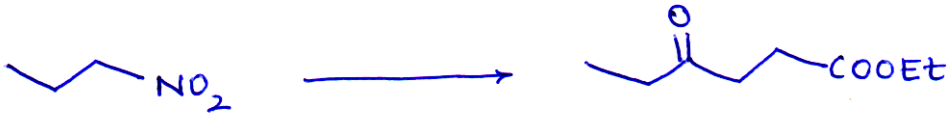
c) Discuss the use of ionic liquids in organic synthesis.

d) Carryout the transformation using reagents given below in proper sequence



DHP,$H^{\oplus}$;$C_6H_{13}MgBr$; MeOH, $H^{\oplus}$; PCC, NaOAc, $H_3O^{\oplus}$

e) Carryout the following transformation



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Total No. of Questions : 6]

SEAT No. :

P2819

[Total No. of Pages : 3

[5025]-402

M.Sc. (Semester - IV)

DRUG CHEMISTRY

CHD-462 : Advanced Medicinal Chemistry

(2013 Pattern)

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

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 : **[9]**

a) Discuss the steps in protein biosynthesis. Explain in brief how streptomycin, chloramphenicol, erythromycin and tetracycline exert their therapeutic activity.

b) What are the functions of cell wall and cell membrane of bacteria? How do β-lactam antibiotics and polyene antibiotics affect their function? Explain.

c) Discuss in brief the development of I, II and III generation cephalosporins, clearly explain the benefits achieved in each generation.

d) Explain viral life cycle and discuss how AZT, Cytarabine, Acyclovir and Indinavir exhibit their activity.

Q2) Answer any two of the following : **[10]**

a) Give a brief overview of cancer, discuss the differences in normal and cancer cells. Explain how chemotherapy helps in controlling cancerous growth. Discuss the mechanism of action of alkylating agents.

P.T.O.

b) Discuss nerve conduction? How is this phenomenon is affected in convulsions? Explain the therapeutic strategies applied to rectify nerve conduction in convulsion with suitable examples.

c) Discuss the following in brief (any two)

i) Quinolone antibiotics

ii) Azole antifungals

iii) Sedatives

Q3) Discuss in brief <u>any three</u> of the following : **[6]**

a) Enzyme inhibitors as drug molecules

b) MAO inhibitors

c) Bacterial drug resistance

d) Analgesics

SECTION - II

Q4) Answer <u>any three</u> of the following : **[9]**

a) Explain the life cycle of plasmodium. Discuss the various strategies to control and treat malaria.

b) Discuss in brief following common GIT disorders. What are common strategies to treat them. (any two)

i) Hyperacidity

ii) Nausea and vomitting

iii) Constipation

c) Explain in brief diabetes, its symptoms and management of NIDDM and IDDM.

d) What are mycobacterial infections. Discuss in brief tuberculosis, symptoms and treatment.

Q5) Answer <u>any two</u> of the following : **[10]**

a) Discuss in brief the organization and functioning of the Endocrine system. Explain the negative feedback mechanism with example. How do hormones bring their effect? Explain with suitable example.

b) Explain how the following groups of drugs help in management of CVS disorders. (any three)

i) Diuretics

ii) Vasodilators

iii) β-Blockers

iv) Thrombolytics

c) Discuss the following in brief (any three)

i) Inflammation

ii) Congestive heart failure

iii) Angina

iv) Stroke

Q6) Discuss the mode of action and uses of the following. (any three) **[6]**

a) 5-Fluorouracil

b) Vinblastin

c) Roxithromycin

d) Methotrexate

e) Gentamicin

Total No. of Questions : 6]

SEAT No. :

P2820

[Total No. of Pages : 3

[5025]-403

M.Sc. (Semester - IV)

DRUG CHEMISTRY

CHD - 463 : Principles and Applications in Drug Design

(2013 Pattern)

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

Instructions to the candidates:

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

SECTION - I

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

a) Define terms :

i) Metabolomics

ii) Monoclonal antibodies

iii) Plasmid

b) Give advantages of DNA vaccines over conventional vaccines.

c) Describe steps in development of transgenic animals.

d) Explain applications of restriction enzymes in genetic engineering.

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

a) Explain in brief membrane bound receptors & the steps involved in signal transduction.

b) Discuss the receptor theories of drug action.

c) Give a brief overview of solid phase synthesis & its application in combinatorial synthesis.

d) Discuss the benefits of prodrugs with proper examples.

P.T.O.

Q3) Explain <u>any four</u> of the following : **[4]**

a) Voltage gated ion channels

b) GPCR

c) High thorough put screening

d) Non covalent interactions

e) Pharmacogenomics

SECTION - II

Q4) Answer <u>any three</u> of the following : **[12]**

a) How are the following physicochemical parameters calculated or determined experimentally (i) π (ii) σ (iii) E_s

b) Explain in brief Hansch analysis. How is it performed on a congeneric series, Discuss.

c) Explain in brief

i) Quantum Mechanics

ii) Force field

iii) Quantum dynamics

d) Histamine is responsible for binding to histamine receptor & trigger acid secretion. Explain how this feature resulted in design of Ranitidine.

Q5) Answer <u>any three</u> of the following : **[9]**

a) Explain the tapliss stepwise approach used to select the proper substituent in drug development.

b) How is computer aided drug design used when the structure of the target is known.

c) Explain the concept of conformational search. What is the

i) Systematic search

ii) Monte Carlo simulation

d) Discuss the steps involved in 3D QSAR as carried out in COMFA or COMSIA.

Q6) Answer <u>any four</u> of the following : **[4]**

a) Bioinformatics

b) Virtual screening

c) Metabolomics

d) Craigs plat

e) 3D pharmacophore