Total No. of Questions : 4]

SEAT No. :

P683

[Total No. of Pages : 2

[4327] - 302

M.Sc. DRUG CHEMISTRY (Semester - III)

CH-363 : Advanced Analytical Methods

(2008 Pattern)

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 suparate answer books.***
3)

SECTION - I

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

a) How bacteria are characterized and classified ?

b) What are natural sources of carbon used for large scale production of antibiotics ?

c) Describe different parts of a typical industrial scale fermenter.

d) Explain diffusion assays for antibiotic.

e) Discuss need for treatment of an effluent from drug manufacturing industry.

Q2) Attempt any three of the following : **[15]**

a) Explain classification of immunity, giving suitable examples for each class.

b) With the help of diagram, explain structure of IgG molecule.

c) Describe the function of different type of cells involved in immune mechanism.

d) What are monoclonal antibodies ? Explain its production.

e) Explain ELISA technique.

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

a) What is the difference between a lead compound and a drug ? Discuss in brief the most fruitful approaches applied in lead discovery identification.

P.T.O.

b) How do drugs exhibit their effect ? Explain. What is meant by potency & efficacy of a drug ?

c) Explain the following terms.

i) Pharmacoepia

ii) Bioisosterism

iii) First pass effect

iv) Ec_{50}

SECTION - II

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

a) What is bioavailability of a drug ? What are the factors that affect the bioavailability of an oral drug ? Explain in brief.

b) Discuss in brief how acute & subacute toxicological tests are conducted on a NCE. Explain them in brief.

c) Explain in brief i) Benefits of invitro testing over invivo testing ii) Pharmaco ynamics of drug action.

d) Explain in brief with examples why there are so many dosage forms of drugs & the various routes of drug administration.

Q5) Answer any two of the following : **[14]**

a) Explain the following in brief with regards to a patent i) Invention ii) Discovery iii) Patentable invertion iv) Infringement v) PCT vi) Preamble vii) Prior art

b) What are the observations done in phase I clinical trials ? why are these done on healthy human volunters ? How do the out come of these studies help in planning of phase II ? Discuss

c) Discuss in brief the functions of the following in a pharmaceutical industry i) R & D ii) Process development iii) QA

Q6) Answer any two of the following **[8]**

a) Discuss in brief Phase I & Phase II metabolism.

b) Role of FDA & Institutional review board in clinical trials

c) Strategies in lead modification & development.

■■■

Total No. of Questions : 6]

SEAT No. :

P685

[Total No. of Pages : 4

[4327] - 304

M.Sc. (Semester - III)

DRUG CHEMISTRY

CH-364 : Stereo Chemical Principles and Applications

(2008 Pattern)

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 the separate answer books.***

SECTION - I

Q1) Answer any four of the following. **[16]**

a) Cis- 4-hydroxy cyclohexane carboxylic acid lactonise while trans isomer does not.

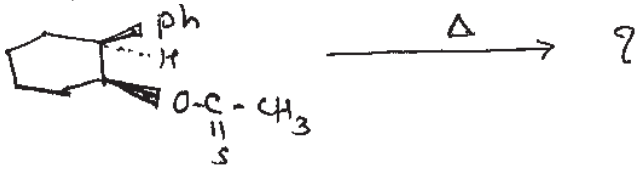
b) Trans -4 - t-butyl cyclohexanol is more strongly adsorbed on alumina than cis isomer. Explain .

c) The β-isomer of hexa chloro cyclohexane reacts very slowly with base than any of its isomers. Explain .

d) Explain why chair-boat interconversion is more focile in cyclohexane.

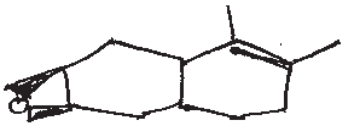
e) Half number of enantiomers are observed in case of bridge ring systems.

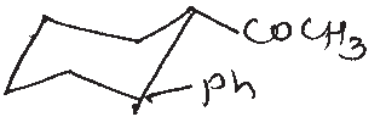
Q2) Predict the product and explain mechanism, stereo chemical principles involves (any four) **[12]**

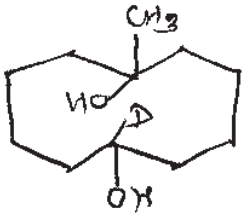
a) 

b) 

P.T.O.

c)  HBr → ?

d)  Br_2 →

e)  $H^{\oplus}$ → ?

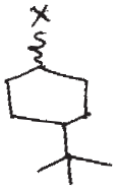
Q3) Solve any three of the following : **[12]**

a) Draw cis - anti- trans & cis - anti-cis isomers of perhydrophenanthracene and compare their stability. Also comment on their optical activities.

b) Write short note on 'Von Auwer's skita rule.

c) Relative rates of saponification of

I are $\frac{K_{trans}}{K_{cis}} = 20$, where for II, $\frac{K_{trans}}{K_{cis}} = 2.5$



I ; X = COOEt

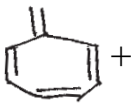
II ; X = OCO-

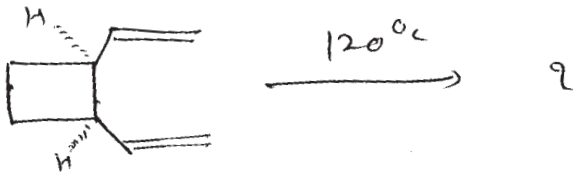
d) Explain with examples 'trans annular interactions'.

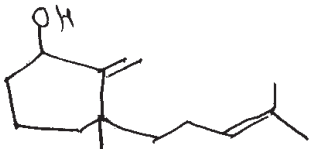
SECTION - II

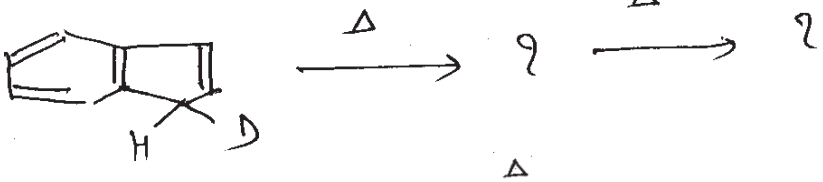
Q4) a) Draw correlation diagram of CON rotatory ring opening of 1,3 - cyclohexadiene to 1,3,5-hexatriene and predict if the reaction is thermally or photo chemically allowed process. **[4]**

b) Predict the product/s in any four of the following and justify your answer. **[8]**

i)  + → ?

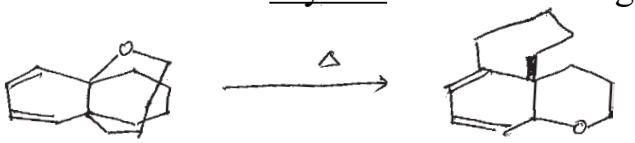
ii) 

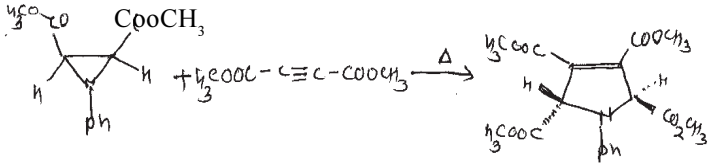
iii) 

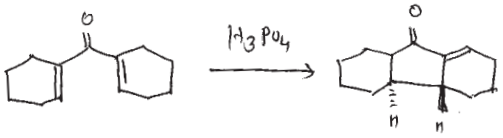
iv) 

v) $H_2C = CH.\ COOCH_3 + CH_2\ N_2 \xrightarrow{\Delta} ?$

c) Suggest mechanism for <u>any two</u> of the following : **[4]**

i) 

ii) 

iii) 

Q5) Answer the followings :

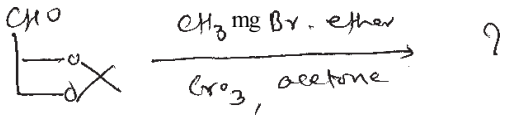
a) Give the conversion of manitol to R - epichlorohydrine. **[3]**

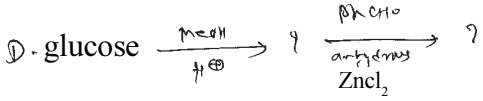
b) Write short note on (any one). **[3]**

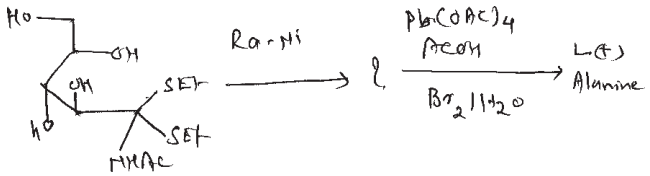
i) Anomeric effect.

ii) Ferrier rearrangement.

c) Suggest the product/s of the following reactions (Any two). **[6]**

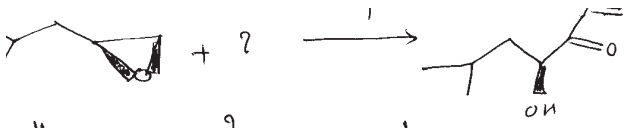
i) 

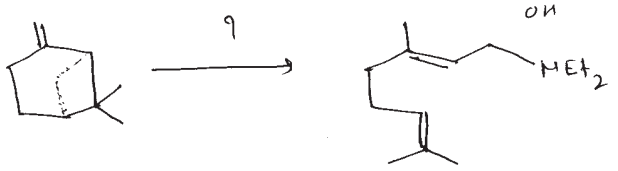
ii) 

iii) 

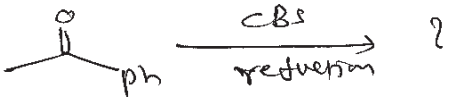
Q6) a) Explain with examples Cram's rule for addition to prochiral carbonyl compounds. Give the Felkin's modification to Cram's rule. **[4]**

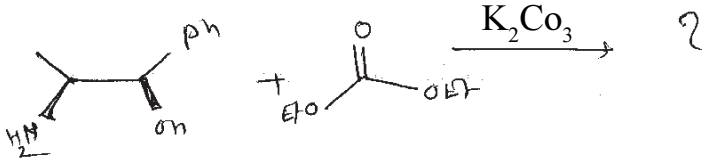
b) Suggest reagent & complete the reaction sequence & explain the mechanism (Any one). **[3]**

i) 

ii) 

c) Give the product in <u>any one</u> of the following reactions. **[3]**

i) 

ii) 

d) Explain the term Asymmetric synthesis with example. **[2]**

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Total No. of Questions : 6]

SEAT No. :

P686

[Total No. of Pages : 4

[4327] - 401

M.Sc. (Semester - IV)

DRUG CHEMISTRY

CH-461 : Synthetic Methods in Organic Chemistry

(2008 Pattern)

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) Enamines gives better yields with allylic or benzylic halides than methyl halide.

ii) Olefin metathesis is an excellent way to make difficult ring sizes.

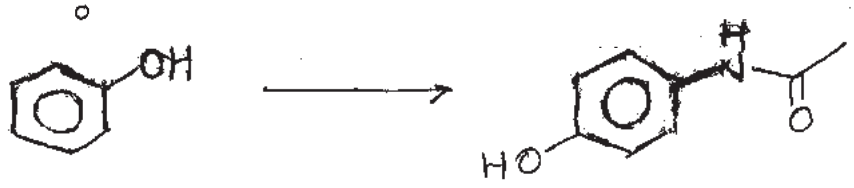
iii) Reaction involving Buli in THF are carried out at –78° C.

iv) Metallated enol ethers are excellent synthetic equivalent for acylanions.

b) Complete the following transformation and justify your answer. (Any two) **[6]**

i)

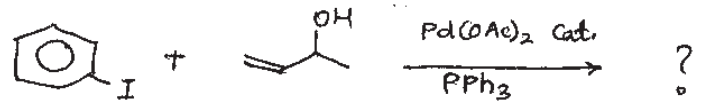
ii)

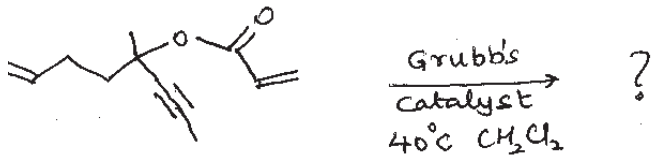


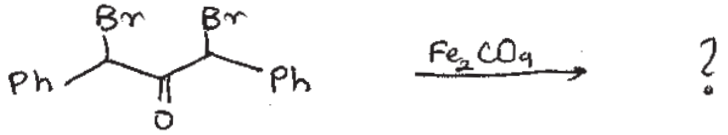
iii)

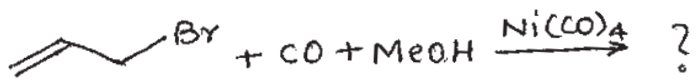
P.T.O.

Q2) a) Predict the product in <u>any three</u> of the following explaining the role of transition metal complex. **[9]**

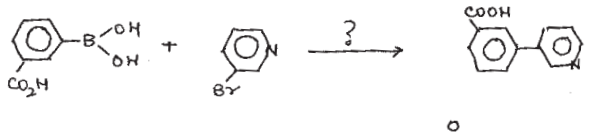
i) 

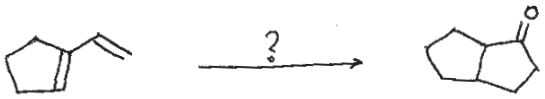
ii) 

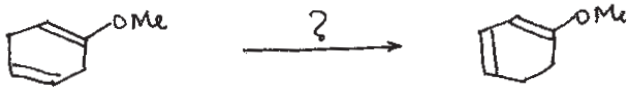
iii) 

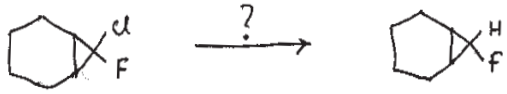
iv) 

b) Suggest the reagents to accomplish the following conversions. (Any three) **[6]**

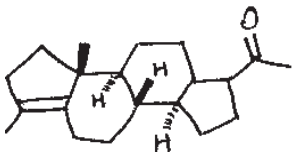
i) 

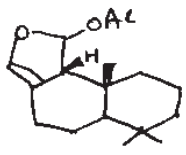
ii) 

iii) 

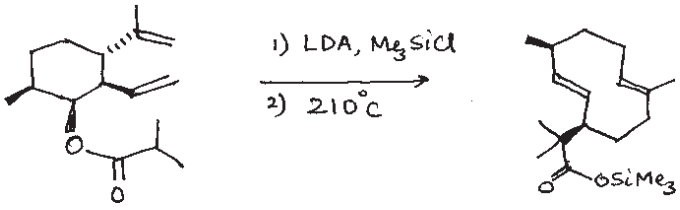
iv) 

Q3) a) Explain the biomimetic approach to the reterosynthesis. Explain how this method is used to obtain <u>any one</u> of the following. **[5]**

i) 

ii) 

b) Explain how Domino reactions is better than stepwise synthesis. Explain the following transformation **[5]**



SECTION - II

Q4) a) Give brief account of any one of the following : **[4]**

i) Use of sulphur compounds in umpolung reactions.

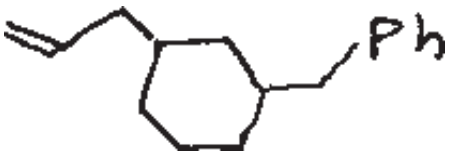
ii) Advantage of Green chemistry in organic synthesis with one example.

b) Answer any four of the following : **[12]**

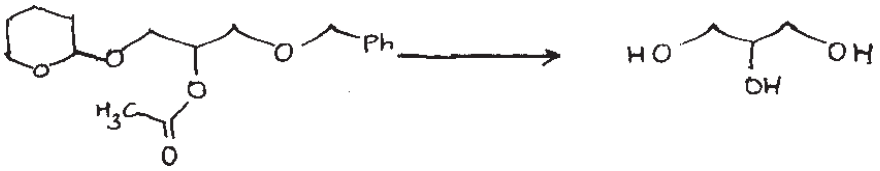
i) Complete the conversion using the reagents given (Arrange the reagents in proper order)

NaOMe ; $(Sia)_2BH$; $C_4H_9-C\equiv CH$; AcOH, Δ

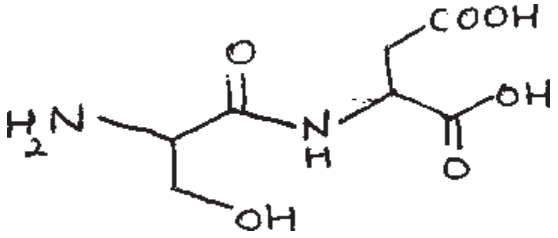
ii) Synthesize the following compound by enamine approach



iii) Suggest the reagents to achieve the following transformation.

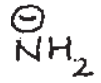


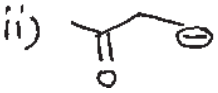
iv) Discuss the steps involved in the synthesis of the dipeptide given below.

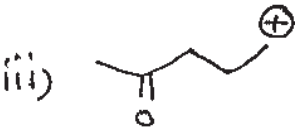


v) Discuss the oxo process in organic synthesis.

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

i) 

ii) 

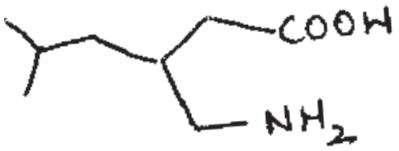
iii) 

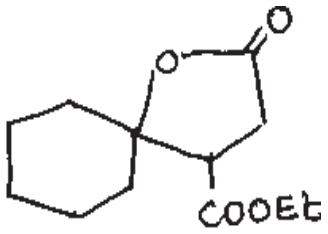
b) Discuss the synthetic utility of <u>any two</u> of the following reagents. **[6]**

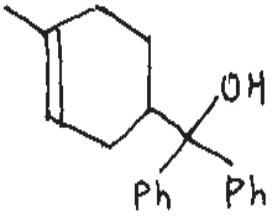
i) $P(OEt)_3$ ii) $(Ph_3P)_3$ RhCl

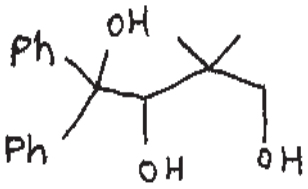
iii) Na_2 Fe $(CO)_4$

Q6) Using retrosynthetic analysis, suggest a suitable method to synthesise <u>any three</u> of the following : **[12]**

i) 

ii) 

iii) 

iv) 

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Total No. of Questions : 6] **SEAT No. :**

P682 **[Total No. of Pages : 4**

[4327]-301

M.Sc. (Semester - III)

DRUG CHEMISTRY

CH-361: Chemistry of Heterocycles and Biologically Active Compounds

(2008 Pattern)

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) Explain any Four of the following : **[12]**

a) Pyrrole reacts with electrophiles at all positions but prefers 2 and 5 positions while indole prefers the 3-position.

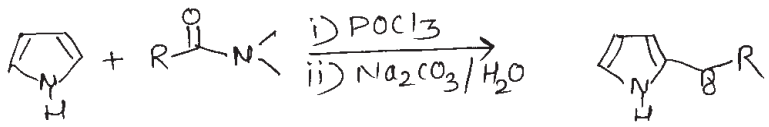
b) Pyridine N-oxides are reactive towards both electrophilic and nucleophilic substitutions.

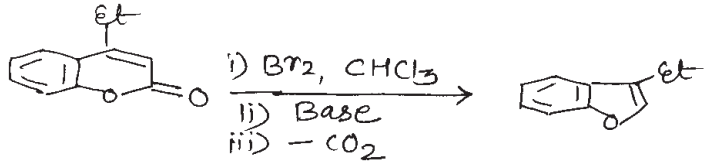
c) Cowmarin is easily attacked by electrophilic as well as nucleophilic reagent.

d) Sulphonation of quinoline using conc. H_2SO_4 at 200°C occurs in homocyclic ring; however sulphonation of benzopyrrole occurs in heterocyclic ring.

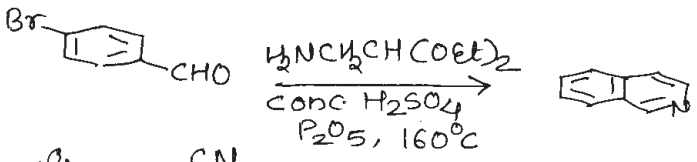
e) Biological importance of purines and pyrimidines.

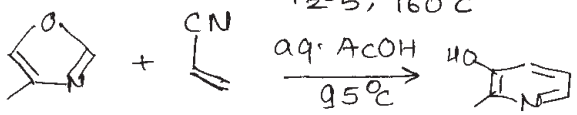
Q2) Suggest the suitable mechanism for any four of the following conversions. **[12]**

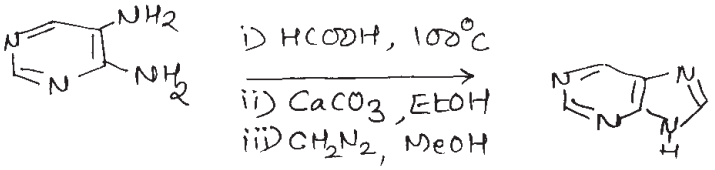
a) 

b) 

P.T.O.

c) 

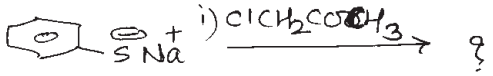
d) 

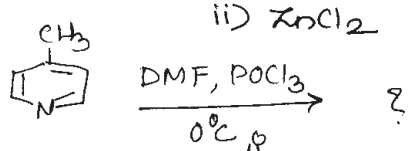
e) 

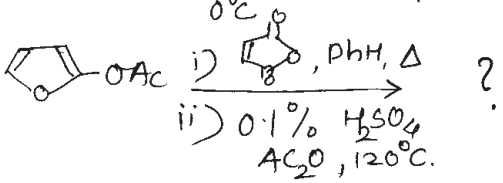
Q3) a) Write short notes on any three of the following : **[9]**

i) Paal-Knorr synthesis of Furan.
ii) Hantzsch pyridine synthesis.
iii) Gabriel synthesis of thiazole derivatives.
iv) Reissert synthesis.

b) Predict the products with mechanism (any two) : **[7]**

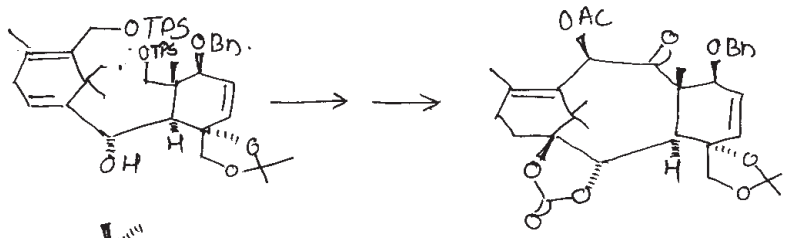
i) 

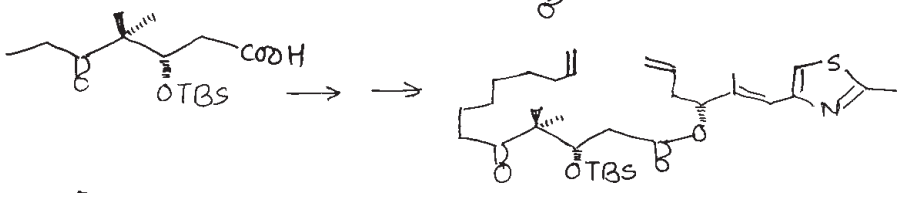
ii) 

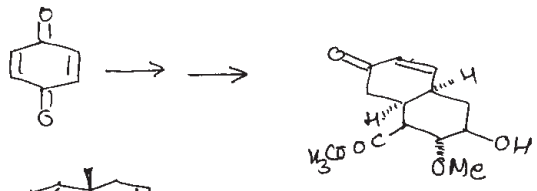
iii) 

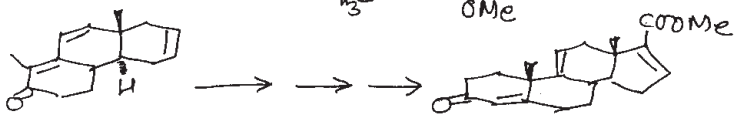
SECTION - II

Q4) Discuss the steps involved in the synthesis of following naturally occurring drug molecules or intermediates. Explain the mechanism (any three) : **[15]**

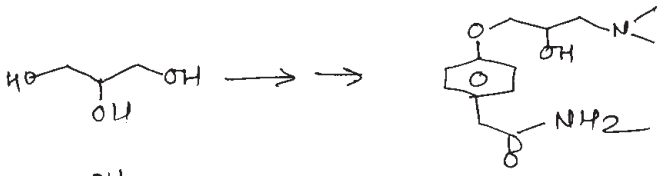
a) 

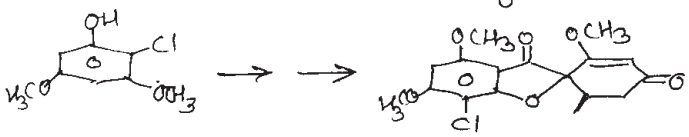
b) 

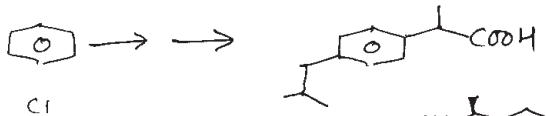
c) 

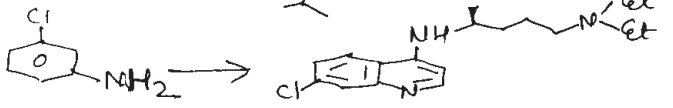
d) 

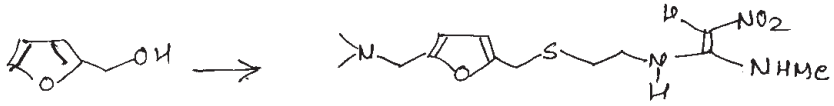
Q5) Discuss the steps involved in the synthesis of the following drug molecules from the precursors shown (any four) : **[16]**

a) 

b) 

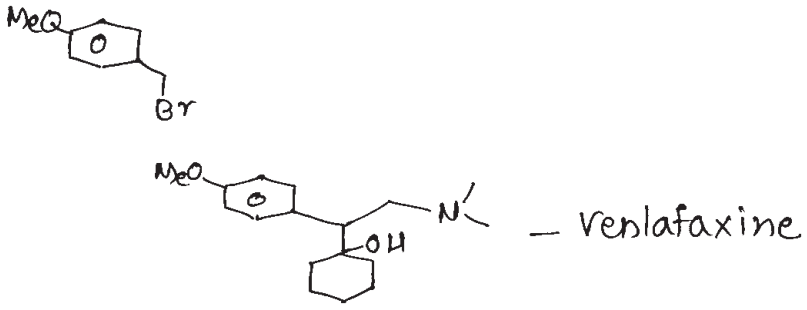
c) 

d) 

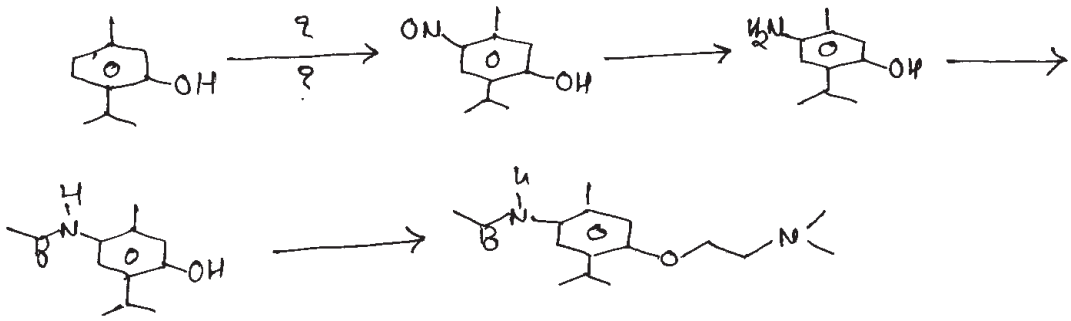
e) 

Q6) Answer any three of the following : **[9]**

a) Do a reterosynthetic analysis of Venlafaxine. Give a synthetic pathway for its synthesis starting with



b) Identify the missing reagents and explain the following transformation.



c) Explain the use of Suzuki coupling in synthesis of epothiolone.

d) Explain the role of various protecting groups in taxol synthesis.

Total No. of Questions : 6]

SEAT No. : ____

P683

[Total No. of Pages : 7

[4327] - 302
M.Sc. (Semester - III)
DRUG CHEMISTRY
CH - 362 : Advanced Analytical Methods
(2008 Pattern)

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) Methyl hydrogens on acetonitrile are more sheilded than those in methyl chloride even though the electronegativity of cyano group is greater than that of chlorine atom.

b) DEPT is better than off resonance technique in ^{13}C NMR.

c) Straight chain hydrocarbons show intense molecular ion peak than corresponding branched hydrocarbon.

d) For equal number of nuclii - ^{13}C NMR peaks are much weaker than ^{1}H NMR peaks.

e) Account for the observed J values.

$^3J_{bc} = 9$ Hz
$^3J_{ac} = 6$ Hz
$^2J_{ab} = 6$ Hz

$^3J_{bc} = 4$ Hz
$^3J_{ac} = 2$ Hz
$^2J_{ab} = 6$ Hz

P.T.O.

Q2) Deduce the structure from the given spectral data (any four) : **[16]**

a) M. F. : $C_9 H_8O_3$

CMR : 115.4, 115.9, 125.4, 130.0, 144.2, 159.9, 168.1

DEPT 135 : 115.4, 115.9, 130.0, 144.2 up

125.4, 159.9, 168.1 absent

DEPT 90 : 115.4, 115.9, 130.0, 144.2 up

b) M. F. : $C_8 H_{12}O$

CMR : 23.5(t) 25.6(t)* 40.1(t)* 68.7(s)

72.8(d) 88.4(s) *Equally strong

Mass : 124(m^+), 123, 109, 95, 81, 68, 53, 39.

c) Two isomeric compounds with mol. formula $C_{10} H_{12}O$ shows the following spectral data.

IR : 1715, 1600-1450 cm^{-1}

A : 'HNMR - 1.0(t,3H) 2.45(q, 2H) 3.7(s, 3H) 7.25(m.4H)

B : 'HNMR - 2.1 (s, 3H) 2.75(t, 2H) 2.85(t, 2H) 7.20(m, 5H)

d) M. F. : $C_7 H_7O_3N$

UV : 265 nm $\in$ = 15000

IR : 3600, 1600, 1530, 1495, 1360 cm^{-1}

'HNMR : 2.9(s, 1H exch.) 5.0(s, 2H) 7.6(m, 3H)

8.15 (d d, 2 & 7Hz, 1H).

e) 

The product in the above reaction show following spectral data. Deduce its structure.

IR : 1745 cm^{-1}

'HNMR : 1.2(s, 9H) 3.67(s, 3H)

Q3) Write short notes on <u>any three</u> **[12]**

a) NOE

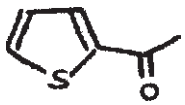
b) Desorption Ionization techniques in mass spectrometry.

c) Factors affecting geminal coupling.

d) Pulse NMR technique.

SECTION - II

Q4) A) Write the genesis of the ions (any three) : **[9]**

a)  126, 111, 83, 39

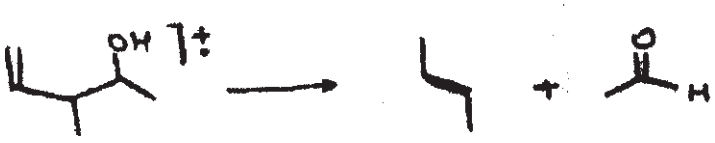
b) Triethylamine 101, 86, 58, 30

c) 2 - Methylhexanal 113, 85, 58, 29

d) O-Xylene 106, 91, 65, 39

B) Answer the following (any one) **[3]**

a) Assign the charge to one or the other of the product using Stevenson's rule. Justify your choice.



IE: 9ev IE: 10.2ev

b) How could mass fragmentation be used to follow the progress in the dehydration of 1 -methyl cyclohexan - 1- ol?

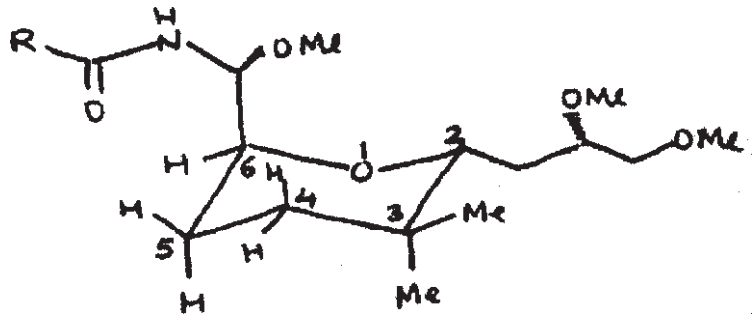
Q5) A) Answer <u>any two</u> of the following : **[8]**

a) Draw schematic diagram of GCMS and explain the factors responsible in resolution

b) Explain various detectors used in HPLC.

c) Explain i) reverse phase column ii) chiral column.

B) Assign the signals to various protons and Justify your answer. **[8]**



Note : Signals for only numbered protons are given.

1.85 (ddd, J = 5, 10, 12 Hz, 1H)

2.10 (ddd, J = 3, 4, 12 Hz, 1H)

3.75 (dd, J = 4 & 10 Hz, 1H)

3.85 (ddd, J = 3, 5 & 8 Hz, 1H)

4.00 (dd, J = 3 & 7 Hz, 1H)

Decoupling Expt :

i) Irradiation at 2.1 δ — Changes 1.85 (ddd) → dd (5 & 10 Hz)

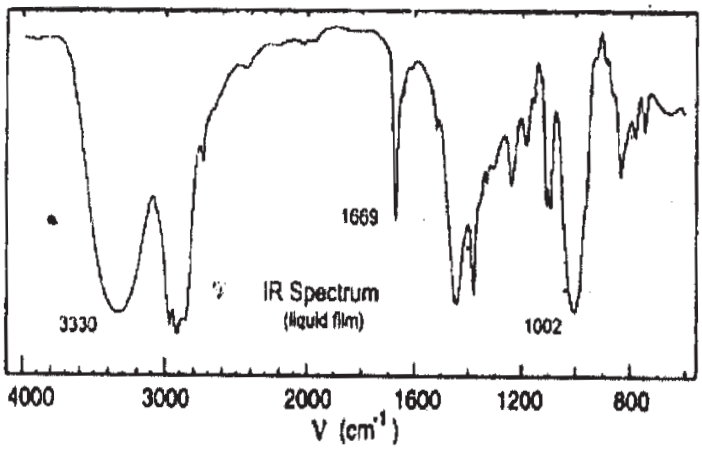
Changes 3.85 (ddd) → dd (5 & 8 Hz)

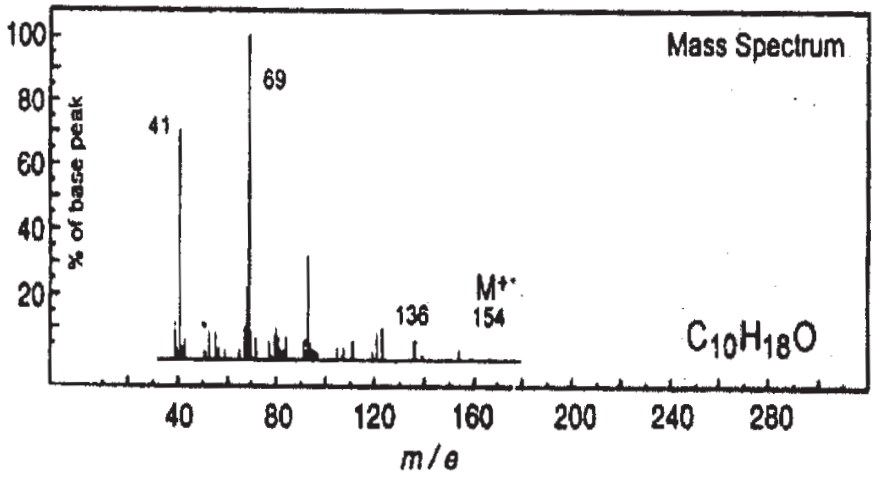
Changes 3.75 (dd) → d (10 Hz)

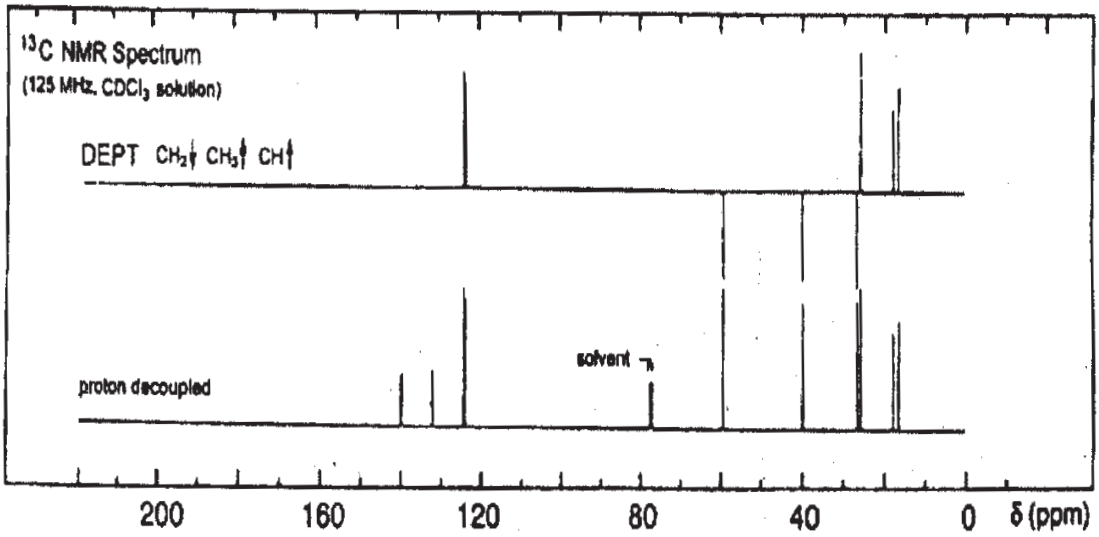
ii) Irradiation at 3.85 δ — Changes 2.10 (ddd) → dd (4 & 12 Hz)

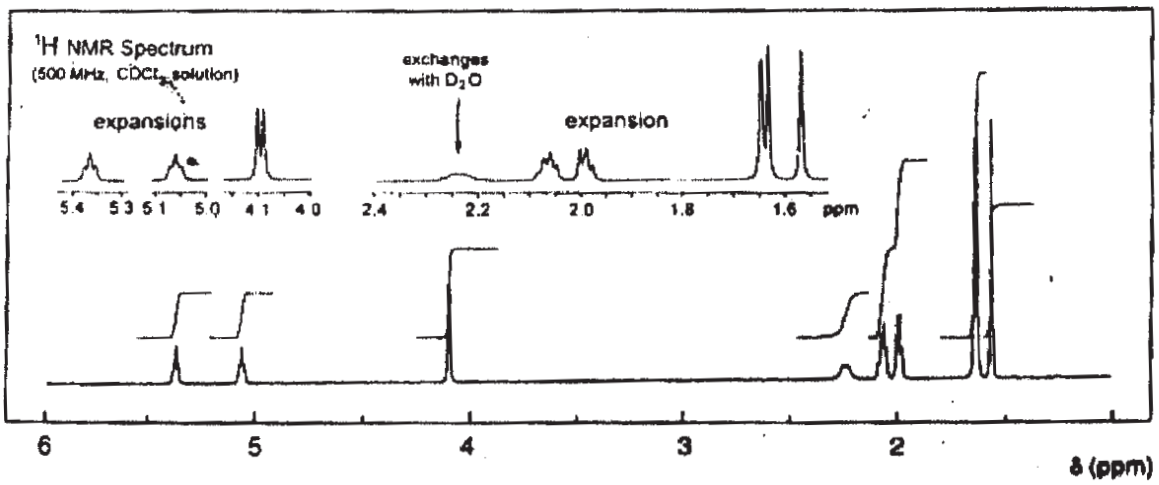
Changes 1.85 (ddd) → dd (10 & 12 Hz)

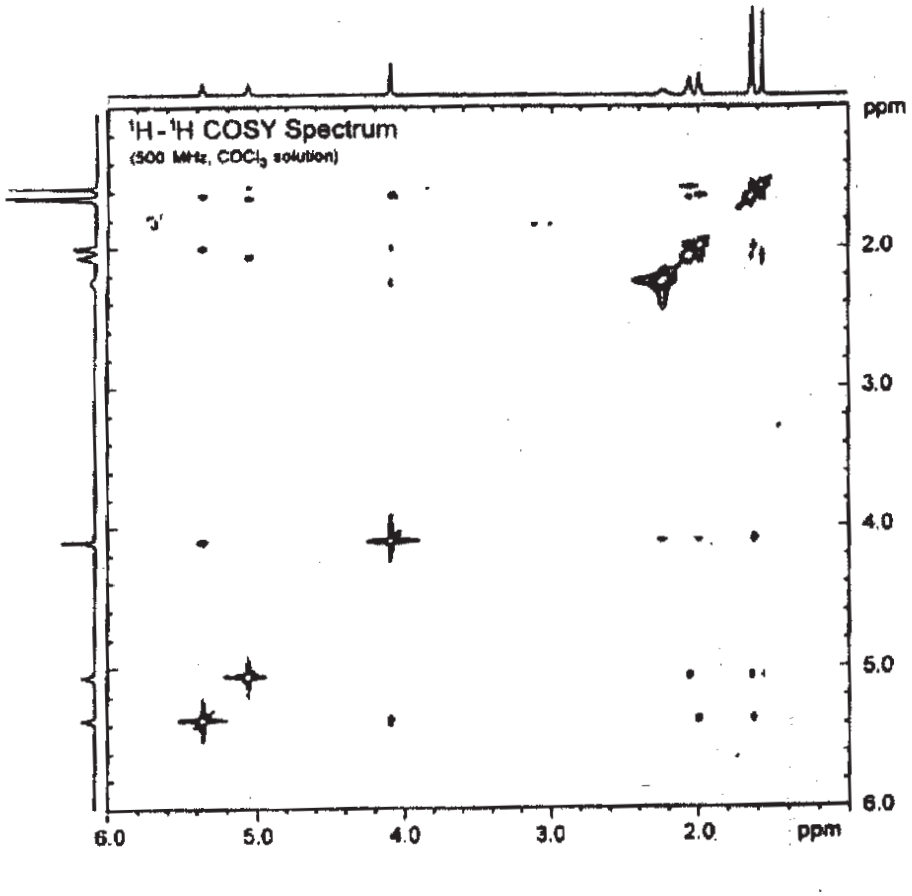
Q6) A compound exhibits following spectral properties shown on the attached sheet. Suggest the structure for the compound and explain the observed spectral data. **[12]**


1669
IR Spectrum
(liquid film)
3330
1002
4000
3000
2000
1600
1200
800
ν (cm⁻¹)


Mass Spectrum
100
80
60
40
20
% of base peak
69
41
M+·
154
136
C10H18O
40
80
120
160
200
240
280
m/e


13C NMR Spectrum
(125 MHz, CDCl3 solution)
DEPT CH2↓ CH3↑ CH↑
solvent
proton decoupled
200
160
120
80
40
0
δ (ppm)


^{1}H NMR Spectrum
(500 MHz, CDCl$_3$ solution)
expansions
exchanges with D$_2$O
expansion
5.4 5.3 5.1 5.0 4.1 4.0
2.4 2.2 2.0 1.8 1.6 ppm
6 5 4 3 2
δ (ppm)


^{1}H-^{1}H COSY Spectrum
(500 MHz, CDCl$_3$ solution)
ppm
2.0
3.0
4.0
5.0
6.0
6.0 5.0 4.0 3.0 2.0 ppm

⌘⌘⌘

Total No. of Questions : 6]

SEAT No. :

P684

[Total No. of Pages : 2

[4327]-303
M.Sc. (Semester - III)
DRUG CHEMISTRY
CH-363: Drug Development
(2008 Pattern)

Time :3 Hours] *[Max. Marks :80*

Instructions to the candidates :

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

SECTION - I

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

a) How bacteria are characterized and classified?

b) What are natural sources of carbon used for large scale production of antibiotics?

c) Describe different parts of a typical industrial scale fermenter.

d) Explain diffusion assays for antibiotic.

e) Discuss need for treatment of an effluent from drug manufacturing industry.

Q2) Attempt any three of the following : **[15]**

a) Explain classification of immunity, giving suitable examples for each class.

b) With the help of diagram, explain structure of IgG molecule.

c) Describe the function of different type of cells involved in immune mechanism.

d) What are monoclonal antibodies? Explain it's production.

e) Explain ELISA technique.

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

a) What is the difference between a lead compound and a drug? Discuss in brief the most fruitful approaches applied in lead discovery/identification.

b) How do drugs exhibit their effect? Explain. What is meant by potency & efficacy of a drug?

P.T.O.

c) Explain the following terms :
   i) Pharmacoepia.
   ii) Bioisosterism.
   iii) First pass effect
   iv) EC_{50}.

SECTION - II

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

a) What is bioavailability of a drug? What are the factors that affect the bioavailability of an oral drug? Explain in brief.

b) Discuss in brief how acute & subacute toxicological tests are conducted on a NCE. Explain them in brief.

c) Explain in brief :
   i) Benefits of invitro testing over invivo testing.
   ii) Pharmaco dynamics of drug action.

d) Explain in brief with examples why there are so many dosage forms of drugs & the various routes of drug administration.

Q5) Answer any two of the following : **[14]**

a) Explain the following in brief with regards to a patent :
   i) Invention.
   ii) Discovery
   iii) Patentable Invention.
   iv) Infringement
   v) PCT
   vi) Preamble
   vii) Prior art

b) What are the observations done in Phase I clinical trials? Why are these done on healthy human volunteers? How do the outcome of these studies help in planning of phase II? Discuss.

c) Discuss in brief the functions of the following in a pharmaceutical industry
   i) R & D.
   ii) Process development.
   iii) QA.

Q6) Answer any two of the following : **[8]**

a) Discuss in brief Phase I & Phase II metabolism.

b) Role of FDA & Institutional review board in clinical trials.

c) Strategies in lead modification & development.