Total No. of Questions : 6] **[Total No. of Pages : 4**

P958

[4025]-201

M.Sc. (Sem. - II)

PHYSICAL CHEMISTRY

CH - 210 : Physical Chemistry - II

(2008 Pattern)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***All questions are compulsory.***
3) ***Figures to the right side indicate full marks.***
4) ***Use of logarithmic table/calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***

Physico-Chemical Constants

1.	Avogadro Number	N	=	$6.022 \times 10^{23} mol^{-1}$
2.	Boltzmann Constant	K	=	1.38×10^{-16} erg K^{-1} $molecule^{-1}$
			=	1.38×10^{-23} J K^{-1} $molecule^{-1}$
3.	Planck Constant	h	=	6.626×10^{-27} erg s
			=	6.626×10^{-34} JS
4.	Electronic Charge	e	=	4.803×10^{-10} esu
			=	1.602×10^{-19} C
5.	1 eV		=	23.06 k cal mol^{-1}
			=	1.602×10^{-12} erg
			=	1.602×10^{-19} J
			=	8065.5 cm^{-1}
6.	Gas Constant	R	=	8.314×10^{7} ergK^{-1} mol^{-1}
			=	8.314 J K^{-1} mol^{-1}
			=	1.987 cal K^{-1} mol^{-1}
7.	Faraday Constant	F	=	96487 C $equiv^{-1}$
8.	Speed of light	c	=	2.997×10^{10} cm s^{-1}
			=	2.997×10^{8} m s^{-1}
9.	I cal		=	4.184×10^{7} erg
			=	4.184 J
10.	I amu		=	1.673×10^{-27} kg
11.	Bohr magneton	β_e	=	-9.274×10^{-24} J T^{-1}
12.	Nuclear magneton	β_n	=	5.051×10^{-27} J T^{-1}
13.	Mass of an electron	m_e	=	9.11×10^{-31} kg

P.T.O.

SECTION - I

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

a) Describe the vibrational rotational spectrum of a linear molecule.

b) What is signal to noise ratio? How does F.T. give greater signal to noise ratio. Explain with suitable examples.

c) Discuss the normal nodes of vibrations of a molecule. Explain overtone and combination frequencies.

d) Depict the relative populations including degeneracy of the rotational energy levels of a diatomic molecule.

e) Explain in brief.

i) Principle moments of inertia and classification of molecules.

ii) Effect of rotational angular momentum on intensity of microwave spectra.

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

a) Discuss different processes by which an electronically excited molecule can lose energy.

b) Sketch and explain the polarizability ellipsoids for the H_2O molecule.

c) What is fortrat parabola? Obtain the expression for the band head in terms of B'and B".

d) Write a note on-applications of ESR spectroscopy.

e) Give the principle of NMR spectroscopy in brief.

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

a) The fundamental vibrational band of Cl_2 molecule is at 2940.8 cm^{-1}, where each chlorine atom has atomic weight 35.0. Determine the corresponding fundamental vibration band of Cl_2 molecule in which the atomic weights of Cl atoms are 35.0 and 37.0 in the Cl_2 molecule. What is separation of spectral lines due to isotopes?

b) For the HF molecule the rotational transition corresponding to $J = 4 \rightarrow J = 5$ Occurs at 204.62 cm^{-1} and $J = 5 \rightarrow J = 6$ occurs at 244.93 cm^{-1}. Calculate the value of the rotational and centrifugal distortion constants of the molecule.

c) The absorption spectrum of O_2 shows a vibrational-electronic structure which becomes a continuous at 175.05 nm. The ground electronic state dissociates into ground state while the excited state involved dissociates to $^3P_2$ and $^1D_2$ oxygen atoms. The term values for these states are 109837.3 and 109610.5 cm^{-1}. Calculate the dissociation energy D_o and D_e for O_2 ground state.

SECTION - II

Q4) Attempt any three of the following: **[15]**

a) Explain the term resolution time of a G.M. counter. Discuss the quenching mechanism.

b) What is a hydrated electron? Explain the different methods of obtaining the hydrated electron.

c) Discuss how the primary radiolytic products of water are formed. Describe briefly Samuel-Magee model.

d) Enlist the modes of interaction of gamma radiation with matter. Discuss the predominent mode of interaction with matter.

e) Define the separation factor. Explain the electromagnetic method for the separation of isotopes.

Q5) Attempt any three of the following: **[15]**

a) Discuss the fast breeder test reactor at Kalpakkam.

b) Explain in short, low level and high level nuclear waste management.

c) Discuss the radioanalytical method to determine the solubility and heat of solution of a sparingly soluble salt.

d) Discuss the use of tracers in the determination of friction and wear out of machine part.

e) Explain different applications of neutron activation analysis.

Q6) Attempt <u>any two</u> of the following: **[10]**

a) Half-life of ^{226}Ra is 1580 years. How many grams will be left undisintegrated from 1.0g of the isotope after 4740 years.

b) Calculate the mass absorption coefficient for/ MeV, γ - radiation of $NaIO_3$ [Given, absorption coefficient of O = 16.9 b/atom, Na = 2.32 b/atom, I = 12.03b/atom].

c) 0.1g Mn sample was irradiated in a neutron flux of 10^7 n cm^{-2} s^{-1} for 30 min. What will be its activity at the end of irradiation, if r = 100%, σ = 13.3b and $t_{½}$ of ^{56}Mn = 2.58 h.?

■■■

σ

Total No. of Questions : 6] **[Total No. of Pages : 5**

P960

[4025]-203

M.Sc. - I (Sem. - II)

ORGANIC CHEMISTRY

CH - 250 : Synthetic Organic Chemistry and Spectroscopy

(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 to be written in separate answer books.***

Q1) Explain <u>any four</u> of the following: **[16]**

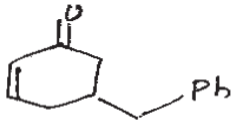
a) 2- Butyne on reduction with Na/liq. NH_3 gives trans- 2- butene. Explain with mechanism.

b) Explain the reactions of 'A' with

i) MeLi

ii) Me_2CuLi

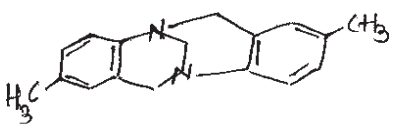
iii) Me Mg Pr



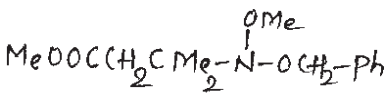
(A)

c) 1, 1- difluoro -1, 2 - dibromo -2,2- dichloro ethane shows only one sharp line in fluorine resonance at room temperature but five sharp lines are observed at-80°C. Explain.

d) Comment on the optical activity of compound 'B' and 'C'



(B)



(C)

e) Oximes derived from aldehyde are not usually good substrates for Beckmann's rearrangement.

P.T.O.

Q2) Attempt <u>any four</u> of the following: **[12]**

a) Write note on Wardsworth-Emmon's reaction.

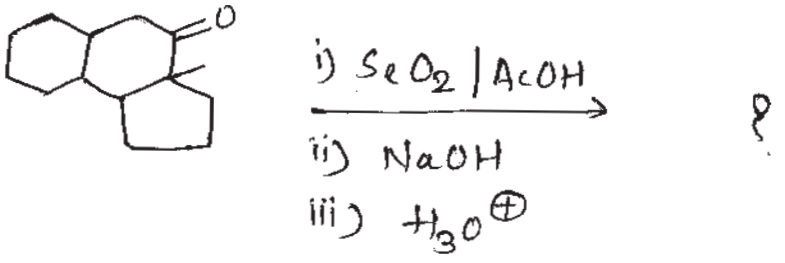
b) Discuss applications and importance of AIBN.

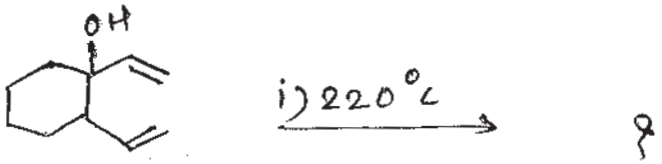
c) Explain the uses of peracid in epoxidation and lactonization.

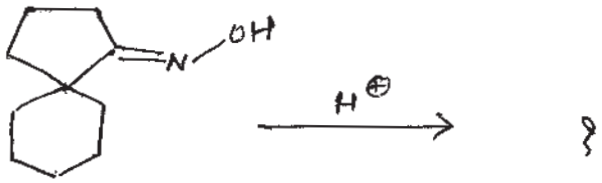
d) Explain generation and fate of nitrene.

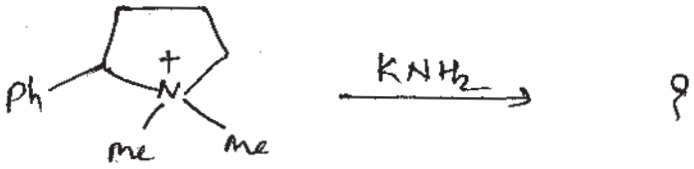
e) Write note on semipinacol rearrangement.

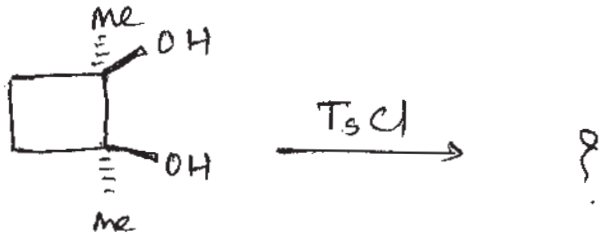
Q3) Predict the product and suggest the mechanism (any four): **[12]**

a) 

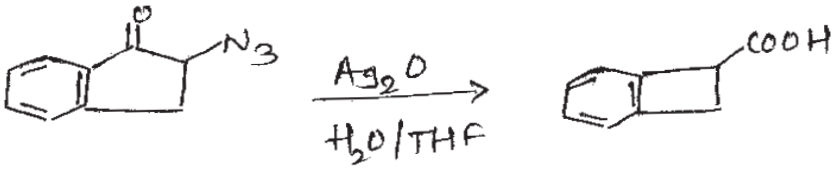
b) 

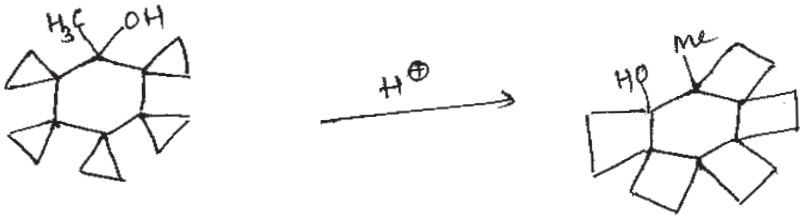
c) 

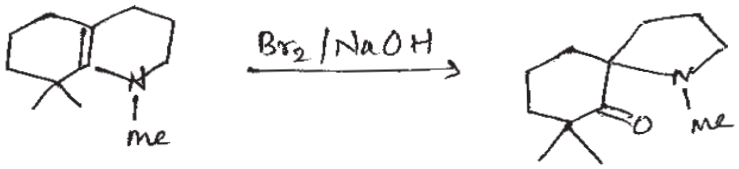
d) 

e) 

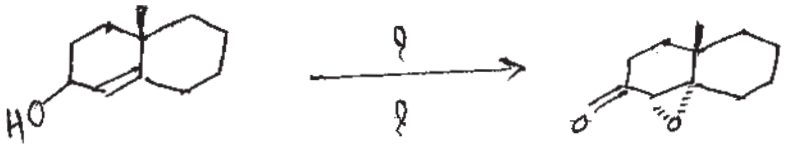
Q4) a) Suggest the mechanism for <u>any two</u> of the following: **[6]**

i) 

ii) 

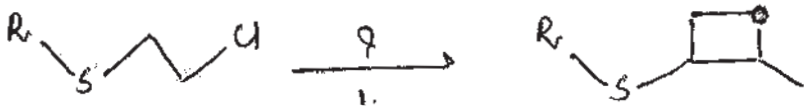
iii) 

b) Suggest the reagents in following conversions (any three) : **[6]**

i) 

ii) 

iii) 

iv) 

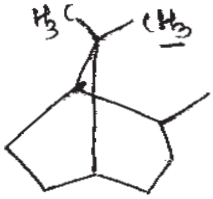
Q5) Attempt <u>any four</u> of the following: **[16]**

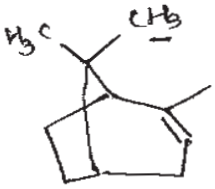
a) Compound 'D' and 'E' are isomers of each other having molecular formula $C_4H_8O_3$ Identify D and 'E'.

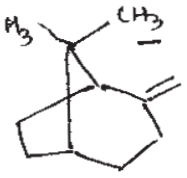
<u>Compound - D</u> - δ : 1.3 (3H, t); 3.6 (2H, quartet); 4.1 (2H, S) 11.1 (1H, br, singlet)

<u>Compound - E</u> - δ : 2.6 (2H, t); 3.4 (3H, S); 3.7 (2H, t) 11.3 (1H, br, S)

b) Discuss the δ values of highlighted protons in the following compounds.

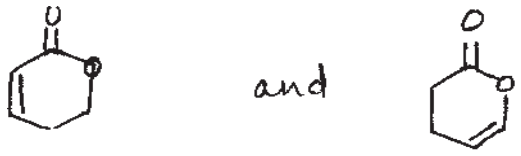


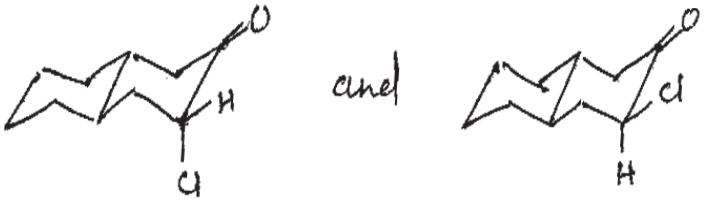




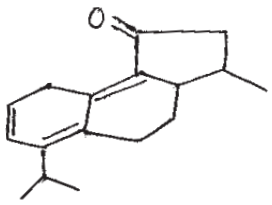
'δ' for highlighted proton	(I)	(II)	(III)
	1.01 ppm	0.85 ppm	0.72 ppm

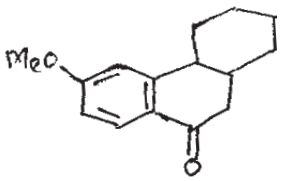
c) How will you distinguish following compounds. By IR spectroscope.

i) 

ii) 

d) Calculate the λ max for Following compounds.

i) 

ii) 

e) Write note on 'Coupling constant'.

Q6) Deduce the structure of <u>any three</u> of the following using spectral data and justify your answer. **[12]**

a) MF = $C_{10}H_{11}O_2Cl$

UV : λ max = 245, (E = 18000)

IR : 3000 - 2920, 1745, 1600, 1580, 820 cm^{-1}

PMR : δ 2.0 (3H, S)
2.8 (2H, t, J = 6 H_z)
4.1 (2H, t, J = 6 H_z)
7.1 (2H, d, J = 8 H_z)
7.3 (2H, d, J = 8 H_z)

b) MF : $C_5H_{10}O$

IR : 3500 - 2900, 1610, 990, 910 cm^{-1}

PMR : δ 1.20 (6H, S)
3.40 (1H, S - broad)
4.80 (1H, dd, J = 1.2 H_z)
5.10 (1H, dd, J = 16 and 1.2 H_z)
5.85 (1H, dd, J = 16 and 10 H_z)

c) MF = $C_5H_4O_2$

IR : 2700, 1670 cm^{-1}

PMR : δ 6.03 (1H, dd, J = 5H_z and 2H_z)
7.28 (1H, d, J = 5H_z)
7.72 (1H, d, J = 2H_z)
9.07 (1H, S)

d) MF = $C_4H_7BrO_2$

UV : Transparent above 210 nm

IR : 3300 - 2700, 1720 cm^{-1}

PMR : δ 1.08 (3H, t, J = 7H_z)
2.07 (2H, m)
4.23 (1H, t, 7H_z)
10.97 (1H, S, Exchangable with D_2O)

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Total No. of Questions : 6] **[Total No. of Pages :2**

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M.Sc. (Sem. - I)

BIOCHEMISTRY

BCH - 172 : Microbiology and Cell Biochemistry of Eukaryotes

(2010 Pattern)

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

Instructions to the candidates :

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

SECTION - I

(Microbiology)

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

a) What is phenol coefficient method? Explain it with suitable example.

b) How will you use filtration technique for control of microorganisms?

c) Discuss the methods of preservation of bacterial culture.

d) Discuss structure of bacterial membrane.

e) What are the contributions of Louis pasteur and Edward Jenner?

Q2) Explain the following: (any three) **[15]**

a) Fluoroscence microscopy and its applications.

b) Flagellar structure and arrangement.

c) Types of media used for bacterial growth.

d) Methods of isolation of bacterial culture.

e) Moist heat sterilization.

Q3) Write notes on: (any two) **[10]**

a) Cultivation of anaerobic bacteria.

b) Replication of bacterial viruses.

c) Alcohol production.

P.T.O.

SECTION - II

(Cell Biochemistry of Eukaryotes)

Q4) Attempt any three of the following: **[15]**

a) What is Cell cycle? Describe different phases of cell cycle.

b) What do you understand by the term 'sub-cellular fractionation'? Describe various types of gradients used during centrifugation.

c) Explain in detail ultrastructure of mitochondrian and give its metabolic functions.

d) Give the structural and functional aspects of xylem and phloem.

Q5) Attempt any three of the following. **[15]**

a) Explain in detail fertilization event for human germ cell.

b) Describe in detail the events that occur during cell differentiation.

c) What are marker enzymes? State the examples and their specific staining methods.

d) Describe cell aggregation in sponges.

Q6) Write notes on any two of the following. **[10]**

a) Cell adhesion

b) Prophase I of meiosis

c) Lysosomes

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Total No. of Questions : 6] **[Total No. of Pages :2**

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M.Sc. (Sem. - I)

BIOCHEMISTRY

BCH - 172 : Cell Biochemistry

(2008 Pattern)

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

Instructions to the candidates :

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

SECTION - I

(Microbiology)

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

a) What are the usual magnifications obtained with light microscopy? What determines its useful limit?

b) Discuss in detail peptidoglycan synthesis.

c) Why oxygen is toxic to anaerobic bacteria? Add a note on cultivation of anaerobic bacteria.

d) Enlist different methods of isolation of pure culture. Explain any one in detail.

e) How UV light is useful in control of growth of bacteria?

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

a) Applications of different physical agents in control of microorganisms.

b) Microbiological assay of antibiotics.

c) Exotoxins

d) Contributions of microbiologists towards Vaccine development.

e) Difference between procaryotic & eukaryotic cells.

Q3) Write notes on any two. **[10]**

a) Isolation of bacterial mutants.

b) Industrial production of Vinegar.

c) Define sterilization, antimicrobial agents, sanitizer, disinfectant, bactericide.

P.T.O.

SECTION - II

(Cell Biochemistry / Cell Biology)

Q4) Attempt any three of the following. **[15]**

a) Describe salient features of a typical eukaryotic cell structure.

b) What is the role of marker enzymes in subcellular fractionation? Explain assays for any two marker enzymes.

c) Describe ultrastructure and function of endoplasmic reticulum and golgi Complex.

d) Give an account on types of stem cells and their physiological role.

Q5) Attempt any three of the following. **[15]**

a) Explain communication process between different cells of plants.

b) Compare and contrast mitotic and meiotic cell division.

c) Give a brief account on cell cycle and its regulation.

d) Describe structural features of a typical fungal cell.

Q6) Write short notes (any two) **[10]**

a) Fibronectin.

b) Spermatogenesis.

c) Functional maturation of tissues.

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Total No. of Questions : 6] **[Total No. of Pages :6**

P 959 **[4025] - 202**

M.Sc. - I (Sem. - II)

INORGANIC CHEMISTRY

CH - 230 : Inorganic Chemistry - II

(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) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logtables and calcucator is allowed.***
6) ***Given Atomic number. Ti = 22, Co = 27.***

SECTION - I

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

a) Prepare a table of Microstates and obtain R.S. term symbols for the ground state of oxygen atom.

b) Explain the following:

i) The molar absorptivity ($\in$) for $[CoBr]^{2-}$ is 500 lit $mol^{-1}cm^{-1}$ and that for $[Mn(H_2O)_6]^{2+}$ is 0.02 lit $mol^{-1}cm^{-1}$.

ii) The electronic spectral bands of Lanthanides and their complexes are almost same.

c) ^5D R.S. term is allowded for d^4 configuration of M_n^{3+} free ion. Find out how it looses, its degeneracy when $[M_n(H_2O)_6]^{3+}$ complex ion is formed.

d) Calculate degeneracy for the following term/configurations/ states.

i) $^3T_{ig}$ ii) ^6I iii) $P^3.F^2$ iv) $2.^3B_{ig}$ v) $(t_{2g})^5(e_g)^3$

e) Assign the R.S. term for the following values of L and S write possible values of J.

i) L = 4 and S = $3/2$

ii) L = 6 and S =2

Q2) Attempt any <u>three</u> of the following: **[15]**

a) Explain the possible allowed transitions in $[CO(H_2O)_6]^{2+}$ complex ion and correlate them in terms of crystal field spliting parameter, D_q and Racah parameter B.

b) Arrange the following transitions in octahedral complex according increasing intensity. Justify your answer.

i) $A_{2g} \rightarrow T_{2g}$

ii) $A_{1g} \rightarrow T_2u$

iii) $A_2u \rightarrow T_{2g}$

c) Explain in which of the following Complexes orbital contribution to the magnetic moment is quenched. Justify your answer.

i) Cs $[T_i (SO_4)_2]$ μ eff = 1.84 B.M.

ii) Cs_2 $[CO\ Cl_4]$ μ eff = 4.71 B.M.

d) Write note on:

Nephelauxetic effect and nephelauxetic series.

e) Arrange the following R-S terms increasing order of energy and justify your answer.

i) $^4D\ ^4I\ ^2F\ ^2H\ ^2S$

ii) $^3F\ ^1G\ ^3P\ ^1D\ ^1S$

Q3) Answer the following. **[10]**

a) Construct correlation diagram for d^8 Tetra hedral system. Given:

i) R. S. terms for d^8 configuration.

$^3F,\ ^1D,\ ^3P,\ ^1G,\ ^1S$

ii) The mulliken symbols for R. S. terms.

$^3F \longrightarrow {}^3T_1 + {}^3T_2 + {}^3A_2$

$^1D \longrightarrow {}^1T_2 + {}^1E$

$^3P \longrightarrow {}^3T_1$

$^1G \longrightarrow {}^1T_1 + {}^1T_2 + {}^1E + {}^1A_1$

$^1S \longrightarrow {}^1A_1$

OR

For complex $[CoCl_4]^{2-}$ μeff = 4.87 B.M. The ϑ_1 transition is observed at 2940 $cm^{-1.}$ Calculate the Spin orbit coupling constant for Co^{2+} ion in the complex.

b) The complex $[Ni\ (dma)_6]^{2+}$. Shows three absorption bands at 7576cm^{-1}, 12738 cm^{-1} and 23809 cm^{-1}. Calculate the crystal field spliting parameter D_9 and nephelauxetic parameter B and β. Commet on nature of M-L Bond. B_o = 1030 cm^{-1}.

SECTION - II

Q4) Answer any three of the following. **[15]**

a) Give an account of metal complexes and concept of spontaneous self assembly.

b) Explain the phenomenon of receptor mediated endocytosis with suitable example.

c) Discuss the voltage-gated channels for sodium transport.

d) "Metalloproteins and metalloenzymes possess different metals in various geometris." Explain the above statement with suitable examples.

e) Describe the uptake of chromium through chromate ion.

Q5) Write notes on any three of the following. **[15]**

a) Dioxygen transport.

b) Transferrin.

c) Metals in medicine.

d) Michaelis-Menten model.

e) Calcium binding calmodulin.

Q6) Draw structures of any five. **[10]**

a) Hemoglobin

b) Flavin

c) 4 Fe - 4 S

d) $[(Py)_2\ Pt\ (en)]^{+2}$

e) Vit B_{12}

f) Uracil.

DIRECT PRODUCTS

1. Groups of the form $G \times i$ or $G \times \sigma_h$:
   The g, u or $'$, $''$ additions to the IR symbols in these groups satisfy
   $g \times g = u \times u = g$, $g \times u = u$, $'x' = ''x'' = ', 'x'' = ''$.

2. Products of the form $A \times A$, $B \times B$, $A \times B$:
   For all groups :
   Letter symbols : $A \times A = A$, $B \times B = A$, $A \times B = B$.
   Subscripts : $1 \times 1 = 1$, $2 \times 2 = 1$, $1 \times 2 = 2$
   except for the B representations of D_2 and D_{2h} where
   $B \times B = B$ and $1 \times 2 = 3$, $2 \times 3 = 1$, $3 \times 1 = 2$.

3. Products of the form : $A \times E$, $B \times E$:
   (a) For all groups : $A \times E_k = E_k$ irrespective of the suffix on A.
   (b) For all groups except D_{6d}, D_{4d}, S_8 :
   $B \times E_1 = E_2$, $B \times E_2 = E_1$
   irrespective of the suffix on B. (If the group has only one E representative put $E_1 = E_2 = E$.)
   (c) For D_{6d} :
   $B \times E_1 = E_5$, $B \times E_2 = E_4$, $B \times E_3 = E_3$, $B \times E_4 = E_2$, $B \times E_5 = E_1$
   irrespective of the suffix on B.
   (d) For D_{4d}, S_8 :
   $B \times E_1 = E_3$, $B \times E_2 = E_2$, $B \times E_3 = E_1$
   irrespective of the suffix on B.

4. Products of the form $E \times E$:
   (For groups which have A, B or E symbols without suffixes put $A_1 = A_2 = A$, etc. in the equations below)
   (a) For O_h, O, T_d, D_{6h}, D_6, C_{6v}, C_{6h}, C_6, S_6, D_{3d}, D_{3h}, D_3, C_{3v}, C_{3h}, C_3 :
   $E_1 \times E_1 = E_2 \times E_2 = A_1 + A_2 + E_2$; $E_1 \times E_2 = B_1 + B_2 + E_1$.
   (b) For D_{4h}, D_4, C_{4v}, C_{4h}, C_4, S_4, D_{2d} :
   $E \times E = A_1 + A_2 + B_1 + B_2$.
   (c) For D_{6d} :
   $E_1 \times E_1 = E_5 \times E_5 = A_1 + A_2 + E_2$,
   $E_2 \times E_2 = E_4 \times E_4 = A_1 + A_2 + E_4$,
   $E_3 \times E_3 = A_1 + A_2 + B_1 + B_2$.
   $E_1 \times E_2 = E_4 \times E_5 = E_1 + E_3$, $E_1 \times E_3 = E_3 \times E_5 = E_2 + E_4$,
   $E_1 \times E_4 = E_2 \times E_5 = E_3 + E_5$, $E_2 \times E_3 = E_3 \times E_4 = E_1 + E_5$,
   $E_1 \times E_5 = B_1 + B_2 + E_4$, $E_2 \times E_4 = B_1 + B_2 + E_2$.

(*d*) D_{3d}, D_{3h}, D_3, C_{3v}, C_{3h}, C_3 :

$E_1 \times E_1 = A_1 + A_2 + E_2$, $E_2 \times E_2 = A_1 + A_2 + E_1$,

$E_1 \times E_2 = E_1 + E_2$.

(*e*) For D_{4d}, S_4,

$E_1 \times E_1 = E_2 \times E_2 = A_1 + A_2 + E_2$,

$E_2 \times E_2 = A_1 + A_2 + B_1 + B_2$

$E_1 \times E_2 = E_2 \times E_3 = E_1 + E_2$, $E_1 \times E_3 = B_1 + B_2 + E_2$.

5. Products involving the T (or F) representations of O_h, O and T_d :

$A_1 \times T_1 = T_1$, $A_1 \times T_2 = T_2$, $A_2 \times T_1 = T_2$, $A_2 \times T_2 = T_1$,

$E \times T_1 = E \times T_2 = T_1 + T_2$,

$T_1 \times T_2 = T_2 \times T_2 = A_1 + E + T_1 + T_2$,

$T_1 \times T_2 = A_2 + E + T_1 + T_2$.

6. The complete results for O are :

O	A_1	A_2	E	T_1	T_2
A_1	A_1	A_2	E	T_1	T_2
A_2	A_2	A_1	E	T_2	T_1
E	E	E	A_1+A_2+E	T_1+T_2	T_1+T_2
T_1	T_1	T_2	T_1+T_2	$A_1+E+T_1+T_2$	$A_2+E+T_1+T_2$
T_2	T_2	T_1	T_1+T_2	$A_2+E+T_1+T_2$	$A_1+E+T_1+T_2$

CORRELATION TABLE FOR GROUP O_h

O_h	O	T_d	D_{4h}	D_{2d}	C_{4v}	C_{3v}	D_{3d}	D_3	C_{2h}
A_{1g}	A_1	A_1	A_{1g}	A_1	A_1	A_1	A_{1g}	A_1	A_g
A_{2g}	A_2	A_2	B_{1g}	B_1	B_1	A_2	A_{2g}	A_2	B_g
E_g	E	E	$A_{1g}+B_{1g}$	A_1+B_1	A_1+B_1	A_1+A_2	E_g	E	A_g+B_g
T_{1g}	T_1	T_1	$A_{2g}+E_g$	A_2+E	A_2+E	$A_2+B_1+B_2$	$A_{1g}+E_g$	A_2+E	A_g+2B_g
T_{2g}	T_2	T_2	$B_{2g}+E_g$	B_2+E	B_2+E	$A_1+B_1+B_2$	$A_{1g}+E_g$	A_1+E	$2A_g+B_g$
A_{1u}	A_1	A_2	A_{1u}	B_1	A_2	A_2	A_{1u}	A_1	A_u
A_{2u}	A_2	A_1	B_{1u}	A_1	B_2	A_1	A_{2u}	A_2	B_u
E_u	E	E	$A_{1u}+B_{1u}$	A_1+B_1	A_2+B_2	A_1+A_2	E_u	E	A_u+B_u
T_{1u}	T_1	T_2	$A_{2u}+E_u$	B_2+E	A_1+E	$A_2+B_1+B_2$	$A_{2u}+E_u$	A_2+E	A_u+2B_u
T_{2u}	T_2	T_1	$B_{2u}+E_u$	A_2+E	B_1+E	$A_2+B_1+B_2$	$A_{1u}+E_u$	A_1+E	$2A_u+B_u$

Character Table for (O) rotational group

O	E	$6C_4$	$3C_2(=C_4^2)$	$8C_3$	$6C_2$		
A_1	1	1	1	1	1		$x^2+y^2+z^2$
A_2	1	−1	1	1	−1		
E	2	0	2	−1	0		$(2z^2-x^2-y^2$ $x^2-y^2)$
T_1	3	1	−1	0	−1	$(R_x, R_y, R_z);(x, y, z)$	
T_2	3	−1	−1	0	1		(xy, xz, yz)

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Total No. of Questions : 6] **[Total No. of Pages :2**

P 961 **[4025] - 204**

M.Sc. (Sem. - II)

BIOCHEMISTRY

BCH - 270 : Bioenergetics and Metabolism

(2008 and 2010 Pattern) (Old and New)

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

Instructions to the candidates :

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

SECTION - I

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

a) What is the fate of pyruvate in anerobic condition?

b) In which tissues is the pentose phosphate pathway active? Give the significance of the products generated by this pathway.

c) List out the irreversible reactions in glycolysis. How are they bypassed in gluconeogenesis?

d) How many ATPs are generated during the complete oxidation of glucose to CO_2 and H_2O? Show the energetics chart.

e) Write note on regulation of Glycogen metabolism.

f) Give an account of glycogen storage diseases.

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

a) Elaborate on the steps involved in CO_2 fixation to Carbohydrate in plants.

b) Explain the role of glycogenin in glycogen synthesis.

c) Outline the sequence of reactions that lead to the formation of Vitamin C in some animals.

d) Discuss the regulation of glycolysis and gluconeogenesis.

P.T.O.

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

a) Differentiate between cyclic and non-cyclic photophosphorylation.

b) Discuss the role of electron carriers in mitochondrial respiration.

c) Outline the steps involved in oxidation of acetylcoA to CO_2 and show its regulation.

SECTION - II

Q4) Answer any five of the following. **[15]**

a) Write note on the end products obtained due to Catabolism of odd number Carbon atom fatty acids.

b) What are polyamines? How are they synthesised?

c) Give the significance of transamination and oxidative deamination in amino acid metabolism.

d) How are porphyrins formed from succinylcoA and glycine.

e) Write note on salvage pathways for purine and Pyrimidine biosynthesis and give its significance.

f) Define Ketogenesis. Write note on acetylcoA as a Precursor in Ketogenesis.

Q5) Answer any three of the following. **[15]**

a) Explain the complete oxidation of palmitic acid and show how many molecules of ATP are generated during the oxidation.

b) Discuss the catabolism of purines to Uric acid.

c) Outline the reactions of Urea cycle.

d) Describe the overview of amino acid biosynthesis from precursors that are intermediates of glycolysis. TCA and pentose phosphate pathway.

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

a) Outline the biosynthesis of IMP from PRPP. that leads to synthesis of purine nucleotides like AMP and GMP.

b) Describe the biochemical lesion, clinical manifestation diagnosis and treatment of phenyl Ketonuria and Alkaptonuria.

c) Elaborate on the steps and enzymes involved in biosynthesis of triglycerides.

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Total No. of Questions : 4] **[Total No. of Pages :2**

P 962

[4025] - 205

M.Sc. (Sem. - II)

BIOCHEMISTRY

BCH - 271 : Techniques for Characterization of Biomolecules

(2010 Pattern) (New)

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

Instructions to the candidates :

1) ***All questions are compulsory.***
2) ***Figures on the right hand side indicate full marks.***

Q1) Attempt any four of the following: **[20]**

a) How standard sedimentation coefficient is measured?

b) Define and give applications of partial specific volume. How it is determined by pycnometer?

c) Viscosity is an intrinsic property of the molecules. Explain this statement with example and mathematical expression.

d) Give the constructions and functioning of scintillation counter.

e) How sensitivity of autoradiography is increased?

Q2) Attempt any four of the following: **[20]**

a) Which gases are used as quenching agents in Geiger-Muller counter? What is their significance.

b) Why it is necessary to form a density gradient in zonal sedimentations.

c) Describe the use of x-ray diffraction technique in biochemistry.

d) Write a note on immunosensor.

e) Explain the principle and application of potentiometric biosensor.

Q3) Attempt any two of the following: **[20]**

a) Describe briefly the theory of NMR spectrometry. What information can be obtained from NMR absorption peaks?

b) Give principle and application of LCMS.

c) Distinguish between ORD and CD.

P.T.O.

Q4) Write short notes (any four). **[20]**

a) ESR

b) Methods of immobilization

c) Application of ORD

d) Zonal centrifugation

e) Autoradiography

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Total No. of Questions : 6] **[Total No. of Pages :2**

P 962

[4025] - 205

M.Sc. (Sem. - II)

BIOCHEMISTRY

BCH - 271 : Biophysical Techniques

(2008 Pattern) (Old)

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

Instructions to the candidates :

1) ***All questions are compulsory.***
2) ***Figures to the right hand side indicate full marks.***

SECTION - I

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

a) Give the principle of lyophilization process.

b) "Thin-layer chromatography is superior to other types of chromatographic methods". Explain this statement.

c) Write a note on moving boundary electrophoresis.

d) What is covalent chromatography? Give its application.

e) Describe the advantages and disadvantages of starch gel electrophoresis.

f) Give the principle of gel filteration chromatography.

g) How does HPLC give rapid separation and high resolution?

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

a) Write short note on membrane filters and their applications in research and industry.

b) Describe the effect of pH and relative orientation of neighboring chromophores on adsorption properties of a chromophore.

c) The octapeptide AVGWRVKS was digested with the enzyme trypsin. Would ion-exchange or gel filteration chromatography be appropriate for separating the product? Explain.

d) Why are 'salting out' procedures often used as an initial purification step following the production of a crude extract by centrifugation.

e) How does pulse field electrophoresis separate DNA fragments?

P.T.O.

Q3) Attempt any <u>two</u> of the following: **[10]**

a) Explain how gel filteration is applicable for determination of molecular weight.

b) Describe the method and applications of ligand immobilization for affinity chromatography.

c) How is Southern blotting used for transfer and hybridization of DNA?

SECTION - II

Q4) Answer any <u>five</u> of the following: **[15]**

a) How did Meselson and stall used density gradient centrifugation to prove concept of semiconservative DNA replication

b) Enumerate the applications of radioactivity in biochemistry.

c) What is quenching? List out the factors that are involved in quenching.

d) What are the factors that affect sedimentation velocity?

e) Define partial specific volume. How can it be measured?

f) Write note on types of radiations and their features.

Q5) Answer any <u>three</u> of the following: **[15]**

a) Discuss the principle, technique and uses of Autoradiography.

b) Differentiate between preparative and analytical ultracentrifuges.

c) Explain the working of Ostwald's Viscometer in measuring viscosity of various liquids.

d) Discuss the working principle of liquid scintillation counters.

Q6) Answer <u>any two</u> of the following: **[10]**

a) Write note on molecular weight determination by sedimentation.

b) What are gamma counters. Give their uses.

c) Write the applications of airfuge.

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P953

[4025]-102
M.Sc. (Sem. - I)
INORGANIC CHEMISTRY
CH - 130 : Inorganic Chemistry - I
(2008 Pattern) (New) (Part - I)

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) ***Neat and labelled diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

SECTION - I

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

a) Sketch and describe all the symmetry operations in SF_6 molecule and classify it into appropriate point group.

b) Assign any two of the following molecules into appropriate point group. Justify it.

i) IF_7

ii) $B_3N_3H_6$

iii) P_4

c) Using great orthogonality theorem derive the character table for C_2V point group.

d) Prove that in C_2h point group, each element froms a separate class.

e) What are the conditions of a mathematical group. Explain them with the help of $POCl_3$ molecule.

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

a) Using matrix multiplication method, find

i) $C_2^{(y)} \times \sigma^{xy} = ?$

ii) $i \times \sigma^{xz} = ?$

b) For $[BrF_4]^-$ complex ion, find the reducible representation for which sigma bonds form the basis and find out which orbitals from Br^{+3} ion will be offered for sigma bonding. Given character table for D_4h point group.

P.T.O.

D_4h	E	$2c_4$	c_2	$2c_2'$	$2c_2''$	i	$2s_4$	σh	$2\sigma v$	$2\sigma d$		
A_{1g}	1	1	1	1	1	1	1	1	1	1		x^2+y^2, z^2
A_{2g}	1	1	1	–1	–1	1	1	1	–1	–1	R_z	
B_{1g}	1	–1	1	1	–1	1	–1	1	1	–1		$(x^2 - y^2)$
B_{2g}	1	–1	1	–1	1	1	–1	1	–1	1		xy
E_g	2	0	–2	0	0	2	0	–2	0	0	(R_x, R_y)	x_2, y_2
A_{1u}	1	1	1	1	1	–1	–1	–1	–1	–1		
A_{2u}	1	1	1	–1	–1	–1	–1	–1	1	1	Z	
B_{1u}	1	–1	1	1	–1	–1	1	–1	–1	1		
B_{2u}	1	–1	1	–1	1	–1	1	–1	1	–1		
E_u	2	0	–2	0	0	–2	0	2	0	0	x, y	

c) Write out the characters of the representation of the following direct product and determine the set of irreducible representations which comprise them for the point group D_4h Direct product $E_g \times B_2u$
(Character table for D_4h point group question no zb)

d) Identify the point group and develop stereographic projection for the molecules. Justify the answer.
   i) Planar B_2Cl_4
   ii) $SOCl_2$

e) Find out the normalized SALC using projection operator of E_u irreducible representation which operates on σ_1 of the $[ptCl_4]^{-2}$ complexion.

D_4h	E	$2c_4$	c_2	$2c_2'$	$2c_2''$	i	$2s_4$	σh	$2\sigma v$	$2\sigma d$
E_u	2	0	–2	0	0	–2	0	2	0	0

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

a) What are miller indices? Explain them with the help of suitable example. Draw (2 2 2) and (0 1 0) plane in simple cubic system.

b) On the basis of symmetry what is the correct criterion for the molecule to be optically active? Predict the optical activity for the following molecules. Justify your answer.
   i) 1, 3, 5, 7 tetramethylcyclooctatetrocene.
   ii) C (Cl) (H) (Br) (F)

c) By schematic representation give the product of the following symmetry operation in NF_3.
   i) $C_3 \times \sigma^1 v$
   ii) $\sigma^2 v \times \sigma^3 v$

SECTION - II

Q4) Attempt any <u>three</u> of the following : **[15]**

a) Give an account of hydrides of boron.

b) 'The noble gases are monoatomic and are extensively used in different fields'. Support this statement with suitable examples.

c) Give an account of oxides of Nitrogen.

d) What are interhalogen compounds? Write the important reactions of inter halogen compounds.

e) Explain the separation of alkali metals by using crown ethers.

Q5) Write short notes (any three) **[15]**

a) Fullarenes

b) Saline hydride

c) Phosphorous nitrogen compounds.

d) Sulfur halides with different oxidation states of sulfur.

e) Electron rich compounds.

Q6) a) Draw the structures of the following (any five) : **[5]**

i) $B_3N_3H_6$

ii) $Al_2(ph)_2(Et)_4$

iii) $[SiO_6O_{18}]^{12-}$

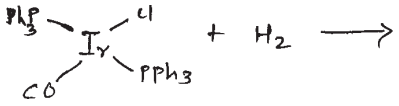
iv) N_2O_5

v) XeO_2F_2

vi) $S_4N_4F_4$

b) Complete the following reactions (any five) **[5]**

i) $COCl_2 + RNH_2 \rightarrow$

ii) 

iii) $Ga(CH_3)_3 + ROH \rightarrow$

iv) $Na + C_{10}H_8 \xrightarrow{THF}$

v) $PCl_5 + n\ NH_4Cl \rightarrow\ +\ 4\ nHCl$

vi) $BeCl_2 + 2NaC_5H_5 \rightarrow\ +\ 2NaCl$

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Total No. of Questions : 6] **[Total No. of Pages : 4**

P954

[4025]-103
M.Sc. - I (Sem. - I)
ORGANIC CHEMISTRY
CH-150 : Organic Reaction Mechanism & Stereo Chemistry
(2008 Pattern)

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

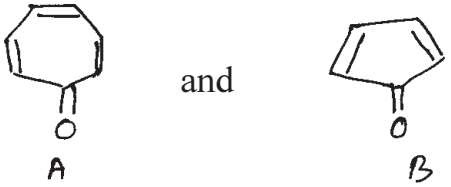
Instructions to the candidates:

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) Attempt any four of the following : **[16]**

a) Compound A is more stable than B. Explain



b) Why phenanthrene on reaction with Br_2 gives 9, 10 - dibromophenanthrene?

c) Acetolysis of both 4 - methoxy - 1-pentyl brosylate and 5-methoxy -2-pentyl brosylate gives the same product. Explain.

d) Reaction of 1-chloro -2-methyl propane with benzene in presence of $AlCl_3$ gives t - butyl benzene. Explain.

e) Explain, elimination of HBr from meso -1, 2-dibromo - 1, 2 - diphenyl ethane gives cis - 2 - bromostilbene while dL pairs gives trans product.

Q2) Write short notes on any three of the following : **[12]**

a) EDA - complexes.

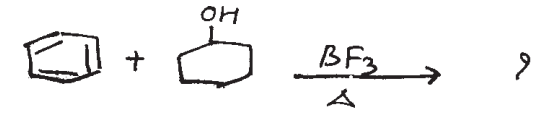
b) Benzyne intermediate.

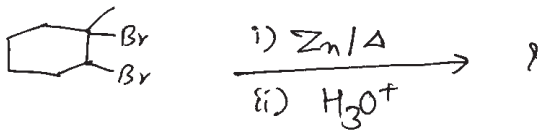
c) Proton sponges.

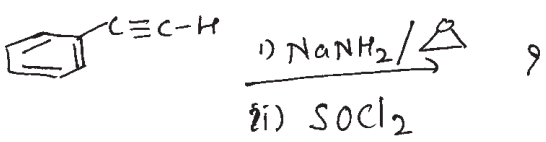
d) Prochiral relationship.

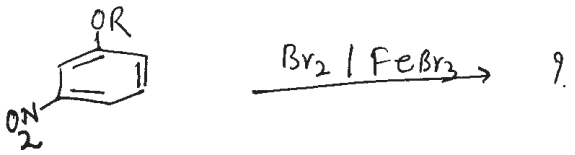
P.T.O.

Q3) Predict the products with mechanism (any three) **[12]**

a) 

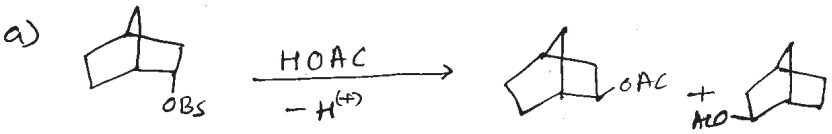
b) 

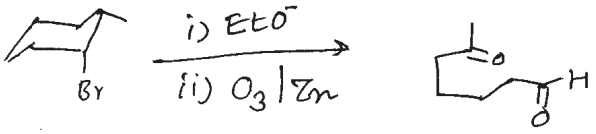
c) 

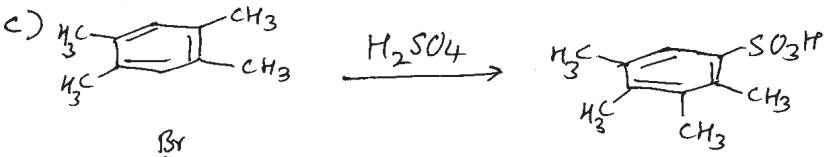
d) 

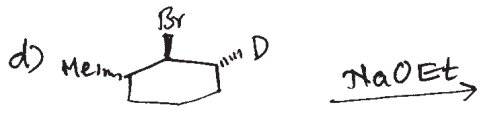
SECTION - II

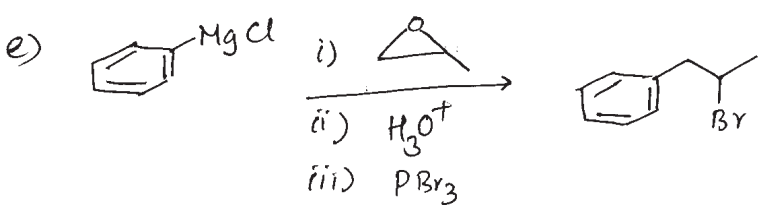
Q4) Suggest mechanism for <u>any four</u> of the following : **[12]**

a) 

b) 

c) 

d) 

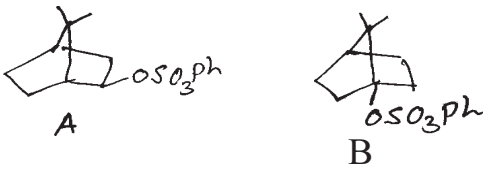
e) 

Q5) Attempt <u>any four</u> of the following : **[12]**

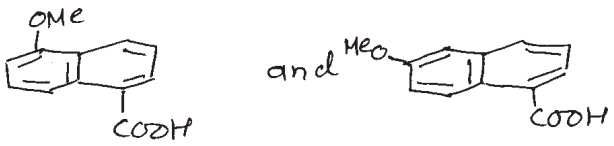
a) The proportion of gauche conformation of ethylene glycol is more than expected. Explain.

b) PKa value of 4-nitrotoulene is lower than 3-nitrotoulene. Explain.

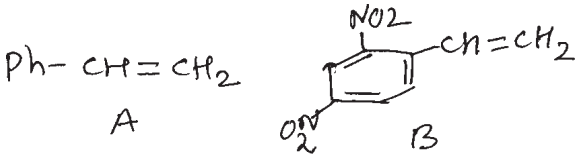
c) Compound A undergoes solvolysis reaction but B does not. Explain.



d) Predict which acid in following pair is stronger. Justify your choice.

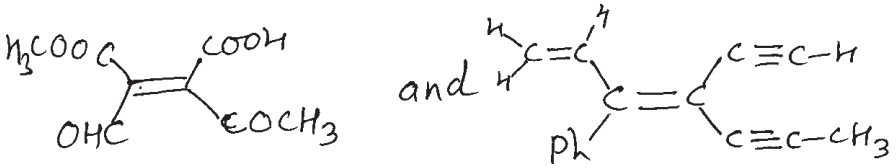


e) Compound A on reaction with HBr only gives Markonikoff's addition product where as B gives anti - Markonikoff's addition product. Explain.

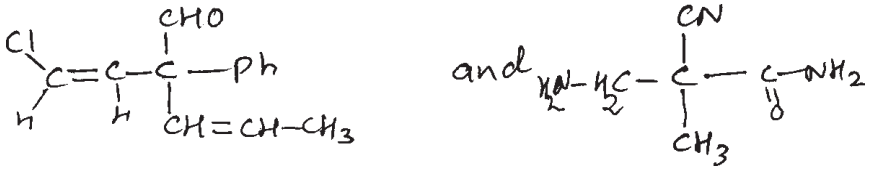


Q6) Attempt any eight of the following : **[16]**

a) Assign E/Z configuration to the following



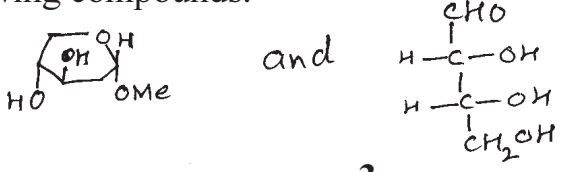
b) Assign R/S configuration to the chiral center in the following.



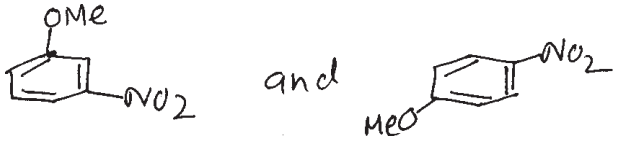
c) Acetamide is neutral but pthalamide is acidic. Explain.

d) Which of the following is optically active ? Justify.

e) Identify chiral carbon atoms and find total no. of stereoisomers in the following compounds.



f) Draw the resonance structures for following.



g) Arrange the following compounds in increasing order of basicity.

h) Cyclo - octatetraene is non aromatic. Explain.

i) Pyridine is more basic than pyrrole. Explain.

♦♦♦♦

Total No. of Questions : 6] **[Total No. of Pages : 2**

P955

[4025]-104
M.Sc. (Sem. - I)
BIOCHEMISTRY
BCH - 170 : Biomolecules
(2008 & 2010 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) Answer the following (any five) **[15]**

a) List out derived sugars and give their significance.

b) What are amphipathic lipids? How do they behave in water.

c) Name the coenzyme forms of Riboflavin and Niacin, give their metabolic significance.

d) Write note on properties of water.

e) Give biological significance of phospholipids.

f) Differentiate between storage and structural polysaccharides.

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

a) Classify lipids with suitable examples.

b) Write structures of

i) α - D Glucose.

ii) Milk sugar.

iii) Cane sugar

iv) A Saturated fatty acid.

v) A steroid

c) Discuss formation of biologically important macromolecules from their monomeric subunit.

d) Elaborate on source function and deficiency of Vitamin A & Vitamin C.

P.T.O.

Q3) Answer the following (any two) **[10]**

a) Classify lipoprotein and give their biochemical significance.

b) Give reactions of glucose with oxidising and reducing agents.

c) Write note on mutarotation.

SECTION - II

Q4) Answer the following (any five) **[15]**

a) Comment on physical properties of amino acids.

b) Discuss various interactions which stabilises tertiary structure of proteins.

c) Discuss classification of amino acids on the basis of dietary requirement.

d) Give short account on structure of hemoglobin.

e) Comment on secondary structure of proteins.

f) Define isoelectric pH of amino acids. What will be the charge on amino acids Alanine aspartic acid and Lysine at pH 5.0.

Q5) Answer any three of the following **[15]**

a) Give short account on biologically important peptides.

b) Comment on titration curve of alanine.

c) Discuss reactions of amino acids with nihydrin and give its significance.

d) Classify proteins based on functions.

Q6) Write notes on (any two) **[10]**

a) Ramchandran plot.

b) Super secondary structures.

c) Solid phase synthesis.

♦♦♦♦

Total No. of Questions : 6] **[Total No. of Pages : 2**

P956

[4025]-105
M.Sc. (Sem. - I)
BIOCHEMISTRY
BCH-171 : Enzymology and Biophysical Techniques - I
(2008 & 2010 Pattern)

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

Instructions to the candidates:

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

SECTION - I

(Enzymology)

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

a) What do you understand from the term isoenzymes? Explain with suitable example.

b) What do you understand from the term homogenization? Explain different techniques.

c) Discuss in detail enzyme specificity.

d) Derive Michaelis - Menten equation.

e) Explain proximity and orientation effect on catalysis.

Q2) Explain the following : (any three) **[15]**

a) Site directed mutagenesis.

b) Affinity chromatography.

c) Control of enzyme activity by covalent charges.

d) KNF model of allosteric enzymes.

Q3) Write notes on : (any two) **[10]**

a) Enzyme turnover.

b) Enzymes diagnosed in Liver disease.

c) Competitive inhibition.

P.T.O.

SECTION - II

(Biophysical Techniques)

Q4) Attempt any five of the following. **[15]**

a) What physical characteristics of a biomolecules influence its rate of movement in an electrophoresis matrix.

b) Write short notes on hydrophobic chromatography.

c) "Ion exchange materials may be classified in terms of acidic or basic strength of the functional groups attached to the polymer matrix". Explain this statement.

d) Differentiate thin layer chromatography and thin layer gel (filtration) chromatography.

e) How does pulse field electrophoresis separate DNA fragments?

f) Describe any one application of nitrocellulose filters in binding assay.

Q5) Answer any three of the following **[15]**

a) What are the applications of purified enzymes? How purity of an enzyme is judged?

b) Describe the effect of pH and the relative orientation of neighboring chromophores on absorption properties of a chromophore.

c) Illustrate a gas chromatography instrument; describe the principal components.

d) Explain the principle and application of isoelectric focusing.

Q6) Attempt any two of the following **[10]**

a) How does electrophoresis separate proteins based on molecular weight?

b) Write a note on affinity chromatography.

c) Explain in brief the theory of electrophoresis. Give the types and explain disc PAGE.

♦♦♦♦

Total No. of Questions : 4] **[Total No. of Pages : 2**

P990

[4025]-405
M.Sc. - II (Sem. - IV)
INORGANIC CHEMISTRY
CH - 430 : Inorganic Solids and Heterogeneous Catalysis
(New) (2008 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Neat diagrams should be drawn wherever necessary.***

Q1) Answer the following (any four) :

a) With the help of potential energy diagram explain the adsorption of H_2 on Ni surface.

b) What do you understand by peroxy-acids? Explain their structures and acidic properties with the help of appropriate examples.

c) Discuss the bonding in Sulphur-Nitrogen (SN) compounds.

d) Draw the structures of <u>any four</u> of the following :

i) $[C_oM_oO_{24}]^{9-}$

ii) $[Rh_{13}(CO)_{25}H]^{4-}$

iii) $[Pt_{15}(CO)_{30}]$

iv) $(PNCl_2)_6$

v) $Ir_4(CO)_{12}$

e) Explain the working of a catalytic converter.

Q2) Answer the following (any four) :

a) Discuss the effects of pH and SiO_2 : Al_2O_3 moleratio on the zeolite synthesis.

b) What are phosphazenes? Give an account of their synthesis and draw their structures.

c) What are molecular sieves? Give their classification and important applications.

d) Give an account of the surface characterization methods used for the characterization of supported metal catalysts.

e) Explain the basic principles involved in heterogeneous catalysis.

P.T.O.

Q3) Answer the following : (any four)

a) Discuss the different aspects of synthesing metal nanoparticals by the chemical reduction of metal salts.

b) Comment on the effect of size, polarizability and stability of the product in the formation of polyoxoanions.

c) Explain with suitable examples the role of nanomaterials catalysts in organic synthesis.

d) "Pyrolysis has a considerable effect on the nuclearity of poly nuclear metal carbonyls". Justify the statement with the help of suitable examples.

e) Explain the catalytic hydrogenation of Alkenes. Which is the best suited metal as a catalyst for this reaction?

Q4) a) Write notes on (any three) :

i) MFI and MEL type zeolites.

ii) Fischer - Tropsch synthesis.

iii) Silicones.

iv) Supported transition metal catalysts.

b) Complete the following equations :

i) $SiO_2 + [SiO_3]^{-} \longrightarrow ?$

ii) $B_3N_3H_6 \xrightarrow{\Delta} ?$

iii) $B_{10}H_{14} + Et_3NBH_3 \longrightarrow ?$

iv) $S_4N_4 + Ag_2S \longrightarrow ?$

♦♦♦♦

Total No. of Questions : 4] **[Total No. of Pages : 2**

P991

[4025]-406
M.Sc. - II (Sem. - IV)
INORGANIC CHEMISTRY
CH - 431 : Material Science
(New) (2008 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to right indicate full marks.***
4) ***Use of logarithmic tables and calculator is allowed.***

Q1) Attempt any FOUR of the following : **[20]**

a) What is nanotechnology? Name the various methods for synthesis of nanomaterials? Write any two applications of nano materials.

b) Explain in brief types of semiconductors.

c) Explain the mechanism of thermal decomposition reaction of Type - I with suitable example.

d) State and explain Fick's law of diffusion.

e) Explain Bardeen - Cooper - Schrieffer theory of super conductivity.

f) What is reinforced concrete? How it is made?

Q2) Attempt any FOUR of the following : **[20]**

a) Explain the low thermocouple operate on the basis of Peitter & Seebeck effect.

b) Derive the expression for Curie Law.

c) Explain different applications of Biomaterials.

d) Calculate energy gap in Si given that it is transparent to radiation of wavelength greater than 11000A°.

e) Mobility of electron & holes in a sample of instrinsic Ge at room temperature are 3600 cm^3/V sec and 1700 cm^3/V sec respectively. If $\overline{es}$ & hole densities are equal to $2.5 \times 10^3/cm^3$. Calculate the conductivity.

f) Calculate the net magnetic moment per iron atom in crystal structure of Fe. Following data may be used.

i) Fe has FCC structure with lattice parameter = 2.87A°.

ii) 1 B.M. = 9.273×10^{-24} A/m^2.

iii) Saturation magnetisation is 1700 kA/m^2.

iv) Electronic structure of free iron atom is $3d^6 \Delta s^2$.

P.T.O.

Q3) Attempt any FOUR of the following : **[20]**

a) Explain the working mechanism of n-p rectifier.

b) Explain the mechanism of fluorescence and phosphorescence with the help of energy level diagram.

c) Explain the cement making process with flow diagram.

d) Explain Meissner effect. What are type - I & Type - II super conductors?

e) What are molecular magnets? Draw structure of first organic ferromagnet?

f) What are different types of magnetism? Explain with suitable examples.

Q4) Write short notes on any Four : **[20]**

a) Photo conductivity.

b) Schottky & Frenkel defect.

c) Czochariskis method for obtaining single crystal of Ge.

d) Biosolids.

e) Oil - well cement.

f) Sol - gel process.

♦♦♦♦

Total No. of Questions : 9] **[Total No. of Pages : 3**

P992

[4025]-407
M.Sc. - II (Sem. - IV)
INORGANIC CHEMISTRY
CH 445 : Inorganic Applications in Industry, Biotechnology and Environmental Chemistry
(2008 Pattern) (New)

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

Instructions to the candidates:

1) ***Attempt any two sections from the following.***
2) ***Both sections should be written in the same answer book.***
3) ***All questions are compulsory.***
4) ***Figures to the right indicates full marks.***
5) ***Neat diagrams must be necessary wherever necessary.***
6) ***Use of logarithmic table / calculator is allowed.***

SECTION - A
Applications of Inorganic Materials

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

a) Explain how such complexes such as prussian blue and ferrocene modify the behaviour of electrodes in electroplating.

b) Give two examples and draw structures of –
   i) Metallized dyes,
   ii) Addition reagent,
   iii) Medially metallized azodyes.

c) What are farmazans? How are they classified as ligand. Give atleast two examples of each type and draw the structure of metal complexes they form.

d) What are the general properties of pigments? Explain any one of them.

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

a) Explain two methods of electroplating of tin.

b) Mention the basic materials and chemical composition of portland cement. Describe various types of portland cement.

c) Calculate the modulus of elasticity for a composite material consisting of fiber by volume of continuous E-glass fiber and 40% epoxy resin for the matrix which stressed under isostress conditions. The modulus of elasticity of the E-glass is 10.5×10^6 psi and that of the epoxy resin is 0.45×10^6psi.

d) Draw a cross section of typical tree. Explain various layers with functions.

P.T.O.

Q3) Write notes on (any two) **[10]**

a) Blue pigment

b) Micro structure of soft timber.

c) Carbon - fiber - reinforced epoxy resin.

SECTION - B

Environmental Chemistry

Q4) Attempt any three of the following. **[15]**

a) Discuss some of the advantages of physical - chemical treatment of sewage as opposed to biological waste.

b) List the trace element pollutant in natural waters with sources, effects and significance.

c) What are the best options for energy sources for 21^{st} century? Explain in short.

d) Draw a schematic diagram of a molten carbonate Fuel cell (MCFC). What reaction is occurring at the cathode and anode. Show the overall reaction. Describe the molten electrolyte used in this fuel cell.

Q5) Attempt any three of the following. **[15]**

a) What is a powerball? Draw a schematic diagram of plant for producing powerball. How is hydrogen gas liberated from a powerball. How is the powerball manufactured?

b) What does tertiary treatment in a sewage treatment plant remove from the waste stream?

c) Name the instrumental method for determination of metals such as Hg, Cd, As, & Pb. Explain cold - vapour Atomic Absorption [CVAA] method for the determination of Hg from polluted water.

d) What are oxygen - consuming waste? Name typical sources. Describe how to do a BOD test on a water sample.

Q6) Write notes on (any Two) **[10]**

a) Reverse Osmosis.

b) Energy from Biomass.

c) Electrodialysis.

SECTION - C
Biotechnology

Q7) Attempt any three **[15]**

a) How do microbes help in the production of preteen?

b) Outline the main stages of Beer - making.

c) Compare the food production by agriculture and by using microbes.

d) Describe an experiment to show the effect of temperature on the action of renin on milk.

Q8) Attempt any three **[15]**

a) Differentiate between the respiration with and without oxygen with respect to alcohol production.

b) Outline the different stages in purification of drinking water.

c) Give an overview of chemical reactions involved in the production of biohydrogea.

d) What are the applications of monoclonal anti bodies?

Q9) Write notes on any two **[10]**

a) Solid state fermentation.

b) Tissue culture.

c) Microbes and oil recovery.

♦♦♦♦

Total No. of Questions : 4] **[Total No. of Pages : 1**

P1000

[4025]-415
M.Sc. (Sem. - IV)
BIOCHEMISTRY
BCH - 472: Genetic Engineering (New)
(2008 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right hand side indicate full marks.***

Q1) Answer the following (any two): **[20]**

a) How will you ascertain the developmental stage specific gene expression using microarray/micro chips technique.

b) Explain the importance of various protein gradients that are formed after fertilization.

c) What is genomic library? How it is prepared? Give the significance of genomic library.

Q2) Answer the following (any two): **[20]**

a) What is cosmid? Give its applications in genetic engineering.

b) Explain detailed procedure for cloning of an insulin gene in E.Coli.

c) Describe various methods for selection of recombinant DNA clones.

Q3) Answer the following (any two): **[20]**

a) Explain in detail southern blotting technique and gives its applications.

b) How will you characterize the recombinant gene by S1 mapping.

c) Give the applications of genetic engineering in medicine and agriculture.

Q4) Write short notes (any four): **[20]**

a) PCR.

b) Restriction mapping.

c) Transgenic plants.

d) Metagenomics.

e) M13.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P1001

[4025]-417

M.Sc. (Sem. - IV)

BIOCHEMISTRY

Fermentation, Enzyme Technology and Food Technology

(Old & New) (2004 & 2008 Pattern)

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

Instructions to the candidates:

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

SECTION - I

(Fermentation & Enzyme Technology)

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

a) Explain in detail about antifoams.

b) Describe in detail the biological treatment of effluents.

c) Write short note on : Sterilization of media.

d) How precursors will affect the fermentation process.

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

a) Methods of immobilization of enzymes.

b) Steps involved in recovery of products.

c) Batch culture.

d) Development of inoculum for Baker's yeast.

Q3) Write short notes on (any two): **[10]**

a) Methods of maintenance and preservation of culture.

b) Role of agitation and aeration in fermentation.

c) Oxygen requirement for industrial fermentation.

P.T.O.

SECTION - II

(Food Technology)

Q4) Attempt any three of the following: **[15]**

a) Describe the method of dehydration exploited in food industry.

b) Describe the process of starch production.

c) 'Monitoring of food quality is essential' - why?

d) Describe the role of various food preservatives and give their significance.

Q5) Attempt any three of the following: **[15]**

a) Write an account on enzyme detoxification of food.

b) What are genetically modified foods? Add a note on its merits and demerits?

c) Why Brown bread is better preferred than white bread? Explain.

d) Explain in detail the process of preparation of clear and cloudy juice.

Q6) Write short notes on (any two): **[10]**

a) Food spoilage.

b) Sweetners.

c) SCP.

Total No. of Questions : 6] **[Total No. of Pages : 3**

P952

[4025]-101
M.Sc. (Sem. - I)
PHYSICAL CHEMISTRY
CH - 110 : Physical Chemistry - I
(2008 Pattern)

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

Instructions to the candidates:

1) ***Answers to the TWO sections should be written in SEPARATE answer books.***
2) ***ALL questions are COMPULSORY.***
3) ***Figures to the RIGHT SIDE indicate FULL marks.***
4) ***Use of logarithmic table/calculator is ALLOWED.***
5) ***Neat diagrams must be drawn WHEREVER necessary.***

Physico-Chemical Constants

1.	Avogadro Number	N	$= 6.022 \times 10^{23} mol^{-1}$
2.	Boltzmann Constant	k	$= 1.38 \times 10^{-16}$ erg K^{-1} $molecule^{-1}$ $= 1.38 \times 10^{-23}$ J K^{-1} $molecule^{-1}$
3.	Planck Constant	h	$= 6.626 \times 10^{-27}$ erg s $= 6.626 \times 10^{-34}$ J s
4.	Electronic Charge	e	$= 4.803 \times 10^{-10}$ esu $= 1.602 \times 10^{-19}$ C
5.	1 eV		$= 23.06$ k cal mol^{-1} $= 1.602 \times 10^{-12}$ erg $= 1.602 \times 10^{-19}$ J $= 8065.5$ cm^{-1}
6.	Gas Constant	R	$= 8.314 \times 10^{7}$ $ergK^{-1}$ mol^{-1} $= 8.314$ J K^{-1} mol^{-1} $= 1.987$ cal K^{-1} mol^{-1}
7.	Faraday Constant	F	$= 96487$ C $equiv^{-1}$
8.	Speed of light	c	$= 2.997 \times 10^{10}$ cm s^{-1} $= 2.997 \times 10^{8}$ m s^{-1}
9.	1 cal		$= 4.184 \times 10^{7}$ erg $= 4.184$ J
10.	1 amu		$= 1.673 \times 10^{-27}$ kg
11.	Bohr magneton	β_e	$= -9.274 \times 10^{-24}$ J T^{-1}
12.	Nuclear Magneton	β_n	$= 5.051 \times 10^{-27}$ J T^{-1}
13.	Mass of an electron	m_e	$= 9.11 \times 10^{-31}$ kg

P.T.O.

SECTION - I

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

a) State Heisenberg's uncertainty principle. Explain the experimental evidence for the same.

b) Derive the expression for particle in a one dimensional box.

c) What is clausius inequality? Derive this inequality.

d) Derive clausius - clapeyron equation. Give it's applications.

e) Define partial molal quantities. Explain the graphical method to determine it.

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

a) Discuss dual nature of matter. Derive expression for de Broglie wavelength.

b) Define chemical potential. Derive the expression for the change in free energy of mixing of an ideal gases.

c) Explain what are colligative properties. How is osmotic pressure measured?

d) Derive Gibb's Duhen equation.

e) Explain the principle of steam distillation. Give it's applications.

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

a) The work function for metalic sodium is 2.0 eV. Calculate the kinetic energy and speed of electron ejected by light of

i) 650 nm. &

ii) 195 nm.

b) 1.06 g of a substance was dissolved in 90.0 g of water and the solution boiled at 100. 0238°C. Certain amount of same substance was dissolved in 68g of benzene raised the boiling point of benzene by 0.056°C. Calculate the amount of substance in benzene. (Given ebullioscopic constant of water and benzene are 2.527 and 0.51 for 1000 g).

c) What is uncertainty in momentum if an electron is to be located when uncertainty in position is 150 picometer. Hence calculate the uncertainty in velocity of electron.

SECTION - II

Q4) Attempt any three of the following : **[15]**

a) Describe, the Lindemann theory of unimolecular reaction.

b) Write equations for first order and second order reaction. Obtain the units of the rate constants for the first and second order rate constants.

c) How does the rate of a reaction depend upon temperature? Explain the term activation energy. What does the factor exp (–Ea/RT) represent?

d) State and explain in short 'steady state principle' How does it explain the third order reaction between NO(g) and O_2 (g)? Explain the decrease in the rate of the above reaction with decrease in the temperature.

e) Write a short note on Lineweaver and Eadie plots.

Q5) Attempt any three of the following. **[15]**

a) Derive a relation between rate constant of an ionic reaction and the ionic strength of the solution.

b) Derive the Eyring's equation for reaction rate.

c) What is partition function? Obtain an expression for the internal energy of a molecule in terms of partition function.

d) Discuss Fermi - Dirac statistics.

e) Explain stirling approximation and thermodynamic probability. Using them, obtain the condition for the probability to be maximum.

Q6) Solve any two of the following **[10]**

a) A first order reaction has $k = 1.5 \times 10^{-6} s^{-1}$ at 25°C. If the reaction is allowed to run 10hrs, what percentage of the initial concentration would have changed in the product? What is the half life of this reaction?

b) Estimate the steric factor p for the reaction.

$$H_2 + C_2H_4 \rightarrow C_2H_6 \text{ at } 628° \text{ K}$$

(Given : $A = 1.24 \times 10^{-6} M^{-1}S^{-1}$, $\sigma = 0.46$ nm^2, $\mu = 3.12 \times 10^{-27}$kg)

c) Calculate the partition function for translational motion of N_2 molecule free to move along one dimension of a one litre cubic container at 25°C (At. wt. N = 14].

♦♦♦♦

Total No. of Questions : 5] **[Total No. of Pages : 3**

P989

[4025]-404
M.Sc. (Sem. - IV)
PHYSICAL CHEMISTRY
CH - 415 : Special Topics in Nuclear Radiation Chemistry
(2008 Pattern) (New)

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

Instructions to the candidates:

1) ***Answers to the TWO sections should be written in SEPARATE answer books.***
2) ***ALL questions are COMPULSORY.***
3) ***Figures to the RIGHT SIDE indicate FULL marks.***
4) ***Use of logarithmic table/calculator is ALLOWED.***
5) ***Neat diagrams must be drawn WHEREVER necessary.***

Physico-Chemical Constants

1.	Avogadro Number	N	$= 6.022 \times 10^{23} mol^{-1}$
2.	Boltzmann Constant	k	$= 1.38 \times 10^{-16}$ erg K^{-1} $molecule^{-1}$ $= 1.38 \times 10^{-23}$ J K^{-1} $molecule^{-1}$
3.	Planck Constant	h	$= 6.626 \times 10^{-27}$ erg s $= 6.626 \times 10^{-34}$ J s
4.	Electronic Charge	e	$= 4.803 \times 10^{-10}$ esu $= 1.602 \times 10^{-19}$ C
5.	1 eV		$= 23.06$ k cal mol^{-1} $= 1.602 \times 10^{-12}$ erg $= 1.602 \times 10^{-19}$ J $= 8065.5$ cm^{-1}
6.	Gas Constant	R	$= 8.314 \times 10^{7}$ ergK^{-1} mol^{-1} $= 8.314$ J K^{-1} mol^{-1} $= 1.987$ cal K^{-1} mol^{-1}
7.	Faraday Constant	F	$= 96487$ C $equiv^{-1}$
8.	Speed of light	c	$= 2.997 \times 10^{10}$ cm s^{-1} $= 2.997 \times 10^{8}$ m s^{-1}
9.	1 cal		$= 4.184 \times 10^{7}$ erg $= 4.184$ J
10.	1 amu		$= 1.673 \times 10^{-27}$ kg
11.	Bohr magneton	β_e	$= -9.274 \times 10^{-24}$ J T^{-1}
12.	Nuclear Magneton	β_n	$= 5.051 \times 10^{-27}$ J T^{-1}
13.	Mass of an electron	m_e	$= 9.11 \times 10^{-31}$ kg

SECTION - I

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

a) Explain the working of technitium generator.

b) What are the advantages of food irradiation over conventional methods of food preservation?

c) Give an account of solid Radioactive waste management.

d) What are the precautions to be taken care of while handling the radioactivity.

e) What do you mean by in-vivo and in - vitro diagnosis? Explain any one of them with suitable example.

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

a) Explain the terms : Fall, Find, cosmochemistry, stellar nucleosynthesis.

b) Discuss the solar neutrino problem.

c) Describe the method of separation of uranium.

d) Write a note on premordial nucleosynthesis.

e) Discuss the underlying principle of seperation of isotopes.

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

a) $^{99}M_0$ with an activity of 24,000 cpm is loaded on alumina column. Find out the activity of $^{99m}T_C$ when extracted after 8 hours with an efficiency of 70%. Given t½ of $^{99}M_0$ = 66.6h and $^{99m}T_C$ = 6.01h.

b) Find out dose due to 200 $^{m}C_i$ Co – 60 at a distance of 3 meters. Given : gamma energy of Co – 60 is 2.5 Mev.

c) Find out the thickness of lead needed to reduce the activity from 2000 cpm to 4,275 cpm. Given $e\mu$ = 0.211 b, Z of pb = 82 and A of pb = 207. density of lead = 11.35 $gmcm^{-3}$

SECTION - II

Q4) Attempt any four of the following. **[20]**

a) Describe a typical radiometric titration curve obtained in a precipitation reaction where in substance and reagent both are labelled. Write the experimental procedure for the titration.

b) Write radiolysis mechanisms for organic compound, RH2

c) Explain the radiolysis of aromatic hydrocarbons.

d) What care should be taken during the preparation of a radioactive nuclide for tracer applications?

e) Give an account of the chemical problems of purification and isolation of radioactive species.

f) Explain how alpha emitters and soft radiation emitters are prepared.

Q5) Attempt any four of the following **[20]**

a) Show how kinetic equations can be applied to conductometric & colour imetric methods to measure concentration.

b) Write a note on non-homogeneous kinetics.

c) Define a chain reaction. Discuss its two types.

d) Explain a neutralization radiometric titration with a neat labelled diagram.

e) Draw an experimental set - up for a beta - scattering radiometric titrations. State its advantages and limitations.

f) 10 cc of zinc ions labelled with $^{65}Z_n$ were titrated with 0.005 M dithiozone. Addition of 1 cc of the titrant followed by extraction of complex in an organic solvent showed a decrease in activity from 4900 counts for 3 min to 2350 counts for 2min. Calculate the concentration of zinc ions in terms of molarity.

♦♦♦♦

P989

[4025]-404

M.Sc. (Sem. - IV)

PHYSICAL CHEMISTRY

CH - 416 : Special Topics in Physical Chemistry

(2004 Pattern) (Old)

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

Instructions to the candidates:

1) ***Answers to the TWO sections should be written in SEPARATE answer books.***
2) ***ALL questions are COMPULSORY.***
3) ***Figures to the RIGHT SIDE indicate FULL marks.***
4) ***Use of logarithmic table/calculator is ALLOWED.***
5) ***Neat diagrams must be drawn WHEREVER necessary.***

Physico-Chemical Constants

1.	Avogadro Number	N	$= 6.022 \times 10^{23} mol^{-1}$
2.	Boltzmann Constant	k	$= 1.38 \times 10^{-16}$ erg K^{-1} $molecule^{-1}$ $= 1.38 \times 10^{-23}$ J K^{-1} $molecule^{-1}$
3.	Planck Constant	h	$= 6.626 \times 10^{-27}$ erg s $= 6.626 \times 10^{-34}$ J s
4.	Electronic Charge	e	$= 4.803 \times 10^{-10}$ esu $= 1.602 \times 10^{-19}$ C
5.	1 eV		$= 23.06$ k cal mol^{-1} $= 1.602 \times 10^{-12}$ erg $= 1.602 \times 10^{-19}$ J $= 8065.5$ cm^{-1}
6.	Gas Constant	R	$= 8.314 \times 10^{7}$ ergK^{-1} mol^{-1} $= 8.314$ J K^{-1} mol^{-1} $= 1.987$ cal K^{-1} mol^{-1}
7.	Faraday Constant	F	$= 96487$ C $equiv^{-1}$
8.	Speed of light	c	$= 2.997 \times 10^{10}$ cm s^{-1} $= 2.997 \times 10^{8}$ m s^{-1}
9.	1 cal		$= 4.184 \times 10^{7}$ erg $= 4.184$ J
10.	1 amu		$= 1.673 \times 10^{-27}$ kg
11.	Bohr magneton	β_e	$= -9.274 \times 10^{-24}$ J T^{-1}
12.	Nuclear Magneton	β_n	$= 5.051 \times 10^{-27}$ J T^{-1}
13.	Mass of an electron	m_e	$= 9.11 \times 10^{-31}$ kg

SECTION - I

Q1) Attempt any four of the following : **[20]**

a) Explain catalytic cycle for acetal hydrolysis in aqueous acid solution.

b) Write mass balance on sodium and arsenate in 0.03 M NaH_2ASO_4 and charge balance for $C_8H_6O_2$.

c) Write a note on chemiresistors.

d) Draw a logarithmic concentration diagram for 0.1M H_2CO_3 [$PKa_1 = 6.35$, $PKa_2 = 10.25$]

e) Derive the expression for saturation kinetics of an enzyme - catalyzed reaction.

f) Explain the dependence of the observed rate constant for oximation of acetone on pH at 298 K.

Q2) Attempt any four of the following : **[20]**

a) Derive the rate equation

$$r = \frac{K_2 C_R (C_E)t}{C_R + K - \frac{1}{K_1}}$$

b) Define the terms :

i) Catalyst.

ii) Activity.

iii) Selectivity.

iv) Poison and

v) Hammet acidity function.

c) Setup the mass belance on sodium and oxalate in 0.4M $Na_2C_2O_4$ and acetate in 0.2M CH_3COOH.

d) Find the concentration of H_2CO_3, HCO_3^- and CO_3^{2-} The pH of 0.1M solution of salt of carbonic acid is 5.2. [Given : $Ka_1 = 4.45 \times 10^{-7}$, $Ka_2 = 5.65 \times 10^{-11}$].

e) Calculate pH and Concentration of all ionic species for 0.2MCH_3COONA. [Given : $K_a = 1.85 \times 10^{-5}$].

f) Discuss classification of sensors on the basis of

i) The materials used and

ii) The principle of conversion.

SECTION - II

Q3) Attempt any four of the following **[20]**

a) What is elastic nonlinearity? How is it applied to prepare smart materials?

b) Describe the phase diagram of the water system.

c) Write a note on the scanning tunneling microscope.

d) Discuss the effect of added salt on a phase diagram of two components partially miscible.

e) Derive the phase rule.

f) Write a note on advanced composits.

Q4) Attempt any four of the following **[20]**

a) Describe chemical methods of preparing nanoparticals.

b) Write a note on pachinco machine.

c) Define actuators. Describe four types of actuators used in smart materials.

d) Describe abnormal physical and chemical properties of nanoparticals.

e) What is the significance of eutectic point?

f) Can a smart material function like the human brain? Discuss.

♦♦♦♦

Total No. of Questions : 6] **[Total No. of Pages : 2**

P999

[4025]-414

M.Sc. (Sem. - IV)

BIO-CHEMISTRY

BCH - 470 : Bio-chemical Endocrinology and Tissue Culture

(Old & New) (2004 & 2008 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Draw neat diagram wherever necessary.***
3) ***Figures to the right hand side indicate full marks.***
4) ***Answers to the two sections should be written on separate answer books.***

SECTION - I

(Biochemical Endocrinology)

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

a) How are thyroid hormones transported in the blood?

b) Write a note on parathyroid hormone.

c) Explain why it is thought that prolactin and G.H. have discrete effects, even though they are very similar in structure.

d) Explain the effect of renin-angiotensin system on synthesis of adrenal steroid hormone.

e) What are gastroindestinal hormone? Write the mode of action of any one.

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

a) What role do G-proteins play in secondary messenger formation?

b) How secretion of insulin is regulated?

c) Steroid hormone receptors are targets for drugs. Justify with suitable example.

d) Write a note on "hormonal interrelationship" Explain with physiological response of target cells.

P.T.O.

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

a) Discuss the role of calcium on release of Catecholamines.

b) Describe the biological importance of growth factors (any two).

c) What is Zn-finger? Explain its structure.

SECTION - II

(Tissue Culture)

Q4) Answer any three of the following: **[15]**

a) What are the requirements of PTC laboratory?

b) Differentiate between organ culture and cell culture.

c) What is the mode of action of cellulose and pectinase on plant cells.

d) Explain the methods of animal cell preservation.

e) Describe the advantages and disadvantages of serum in media.

Q5) Attempt any three of the following: **[15]**

a) Discuss the growth pattern of cells in suspension culture. How did you determine stationary phase from growth pattern in suspension culture.

b) Explain in detail characterization of cell lines.

c) Describe different ways of organ culture.

d) "Pure lines can be generated in tissue culture" How? Give its importance.

Q6) Attempt any two: **[10]**

a) What are Somaclonal Variation? Describe methods used for selection of it.

b) What is Somatic hybridization? Describe different methods used for production of somatic hybrid.

c) Explain various ways of organ culture.

Total No. of Questions : 6] **[Total No. of Pages : 4**

P1002

[4027] - 301
M.Sc. (Sem. - III)
DRUG CHEMISTRY
CH - 361 : Chemistry of Heterocycles & Biologically Active Compounds
(2008 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to 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) Treatment of thiophene with maleic an hydride gives low yield of addition product, while furan gives adduct with high yield.

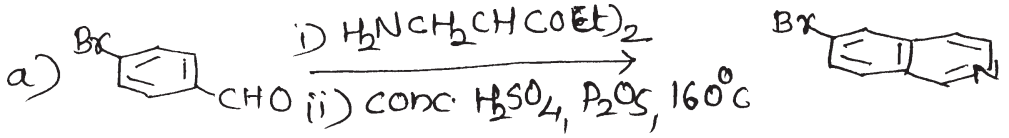
b) 4-chloropyridine is synthesized via pyridine-N-oxide from pyridine and not by direct chlorination of pyridine.

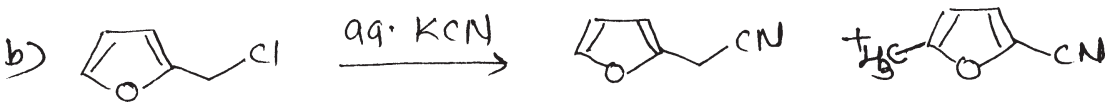
c) Indole on reaction with chloroform and KOH in ethanol gives 3-chloroquinoline as one of the products.

d) N-alkylation of purines under neutral condition occurs at five member ring nitrogen.

e) Oxazole is less basic than imidazole.

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

a) 

b) 

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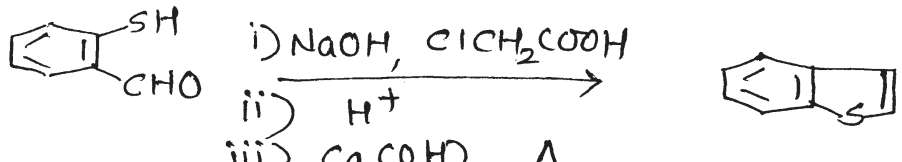
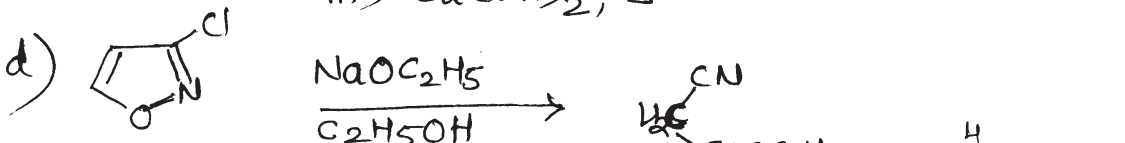
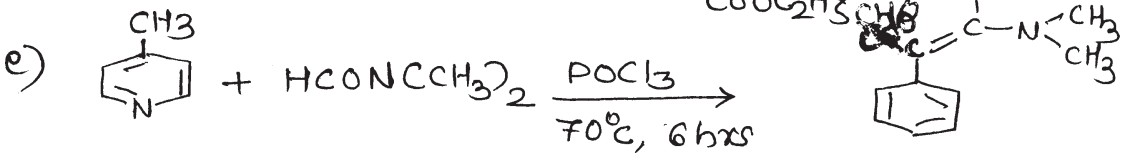
c) 

d) 

e) 

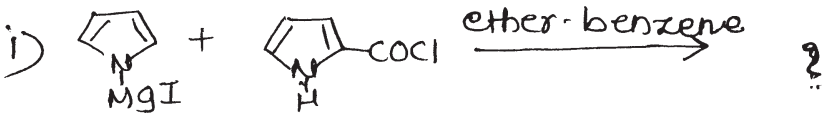
Q3) a) Write short notes on any two of the following : **[7]**

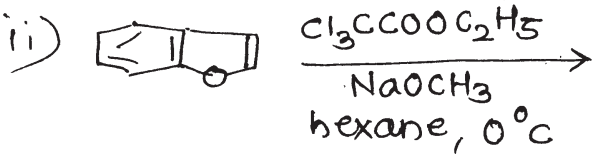
i) Fischer-Indole synthesis.

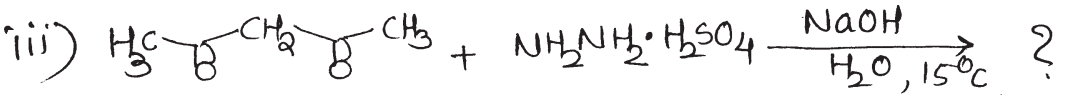
ii) Hantzsch synthesis.

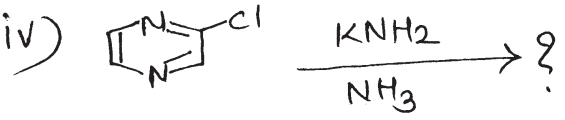
iii) Bischler Napieralski synthesis.

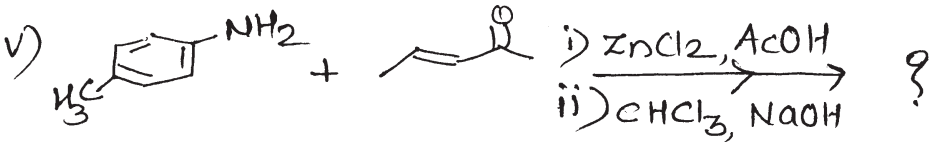
b) Predict the products with mechanism (any three) : **[9]**

i) 

ii) 

iii) 

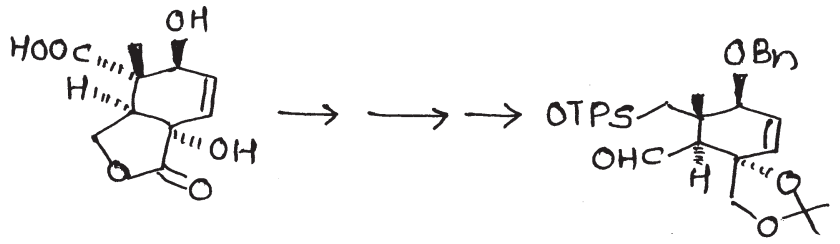
iv) 

v) 

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]**

a)



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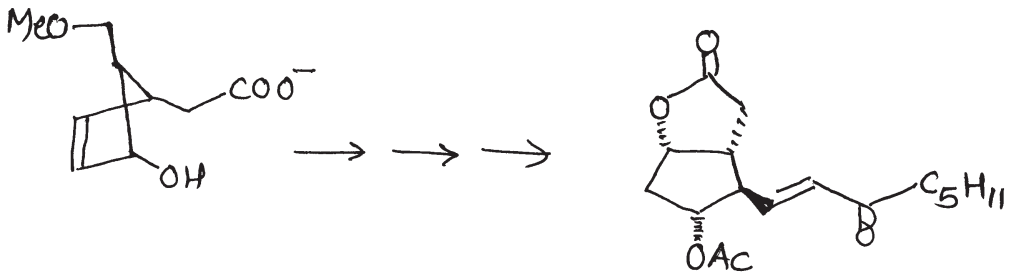

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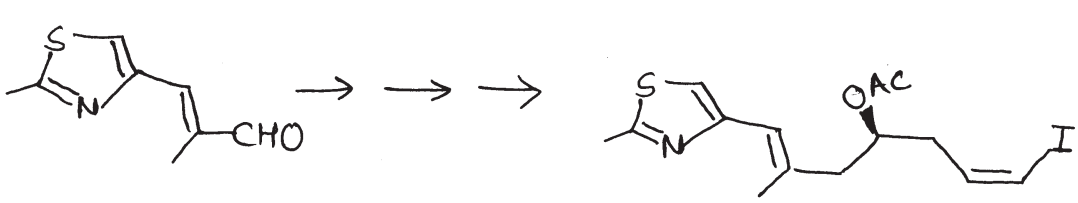

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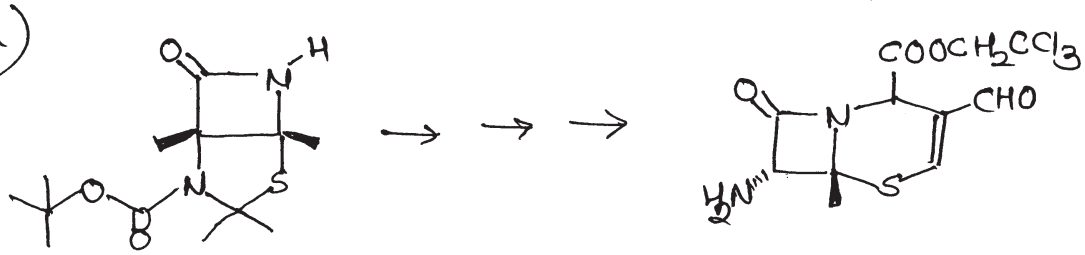

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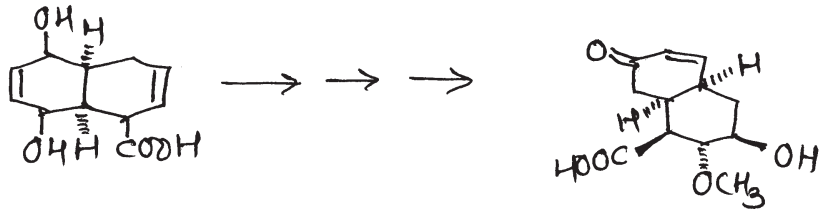
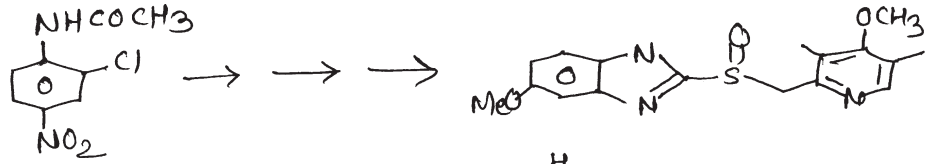


Q5) Discuss the synthesis of the following drugs, comment on the reagents used and mechanism involved (any four) : **[16]**

a)



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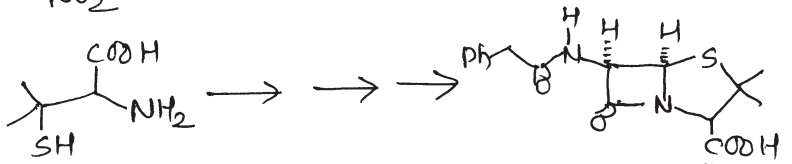

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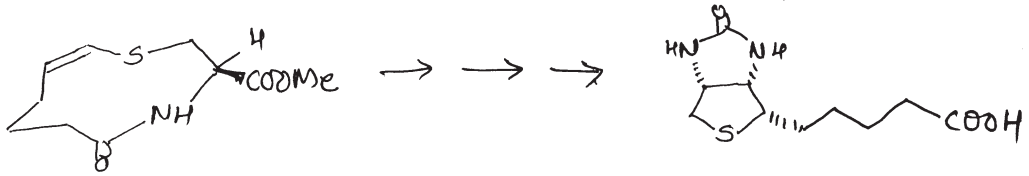
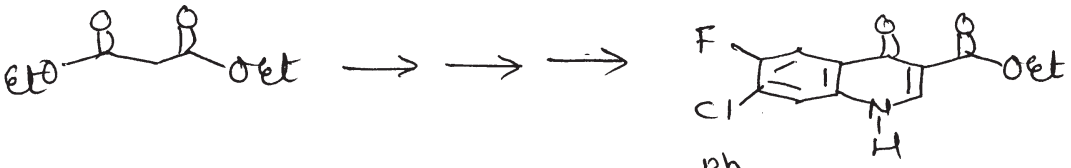
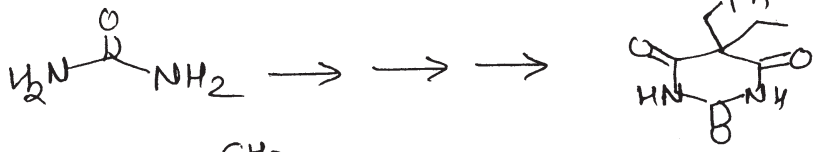
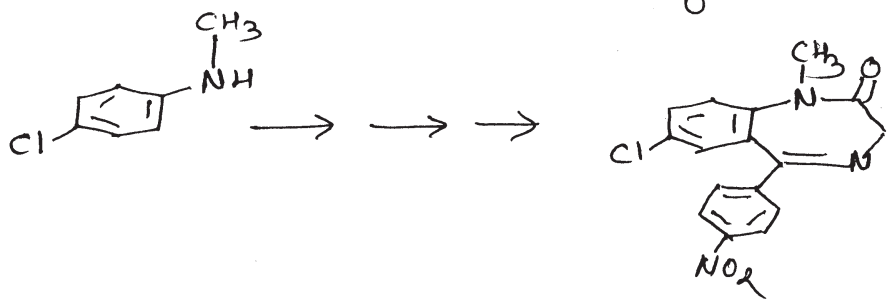
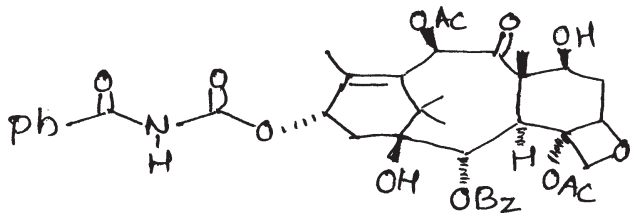


d) 

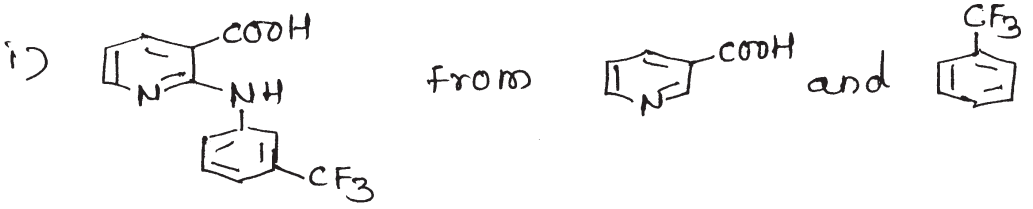
e) 

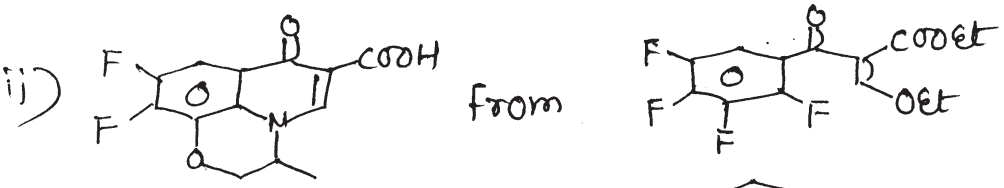
f) 

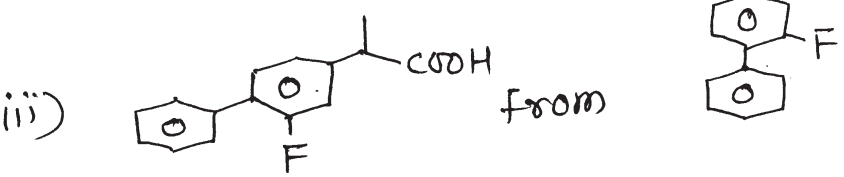
Q6) a) Give a reterosynthetic analysis of **[4]**



b) The following molecules can be prepared from the starting compounds shown via multiple steps. Suggest the reactions and reagents to achieve this. Explain the steps (any two) : **[5]**

i) 

ii) 

iii) 

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Total No. of Questions : 6] **[Total No. of Pages : 5**

P1003

[4027] - 302
M.Sc. (Sem. - 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]**

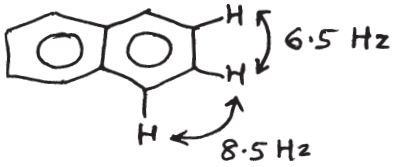
a) Axial-equitorial coupling constant is smaller than axial - axial coupling in cyclohexane in PMR.

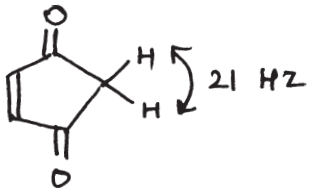
b) ^{13}C-^{13}C coupling in not seen in CMR spectrum.

c) M^+ intensity decreases in the order cyclic > acyclic > branched.

d) MALDI is used for biomolecules and high mol. wt compounds.

e) The coupling constants for the following compounds are as shown below.





Q2) Answer any four of the following : **[16]**

a) Deduce the possible structure and assign the signals to various carbon atoms. Justify your answer

M.F. : $C_6H_8O_2$

CMR : 17.1, 21.1, 68.8, 120.3, 165.6, 190.4

DEPT 90 : 165.6, 190.4 up

17.1, 21.1, 68.8, 120.3 no peak

DEPT 135 : 165.6, 190.4 up

17.1, 21.1, 68.8 down

P.T.O.

b) A nitronaphthalene derivative $C_{11}H_9NO_4$ show the following PMR data

3.8 (s, 24 mm) 5.4 (s, exch. 8mm) 6.8(s, 8mm) 7.1(s, 8mm)

7.6 - 7.9 (m, 16 mm) 8.1 (dd, 1.9 & 7Hz, 8mm)

NOE expt.

i) irradiation at δ 3.8 gives 21% enhancement at 7.1δ.

ii) irradiation at δ 7.1 gives 7% enhancement at δ 3.8.

Deduce the nature of the functional group and substitution pattern.

c) Deduce the structure

M.F : $C_9H_{16}O_4$

IR : 1750, 1735 cm^{-1}

CMR : 10(q) 12(q, str) 20(t) 48(d) 58(t, str) 158(s)

PMR : 0.9 (t, 7Hz, 3H) 1.9(q, 7Hz, 2H) 3.2(t, 7Hz, 1H) 1.3(t, 6.5Hz, 6H) 4.3(q, 6.5Hz, 4H)

d) Assign the structure from the given spectral data

M.F. : $C_3H_6Cl_2$

PMR : 1.6(d, 6Hz, 18mm) 3.52(dd, 7 & 9 Hz, 6mm) 3.78(dd, 4 & 9 Hz, 6 mm) 4.1(ddq, 4, 6 & 7Hz, 6mm)

Explain why the non equivalance is observed.

e) Deduce the structure

M.F. : $C_6H_{10}O$

IR : 3360, 2200 cm^{-1}

PMR : 1.0(d, 6Hz, 9mm) 1.02(d, 6Hz, 9mm) 1.82(eight lines, 6Hz, 3mm) 2.47(d, 2Hz, 3mm) 2.82(s, exch., 3mm) 4.18(dd, 2 & 6 Hz, 3mm).

CMR : 22(q) 22.1(q) 35.7(d) 50(d) 65(d) 82(s).

Q3) Write short note on <u>any three</u> of the following : **[12]**

a) Time of flight analyzer.

b) Factor affecting the geminal coupling.

c) Spin-spin coupling mechanism.

d) Distortionless Enhancement by Polarization Transfer.

SECTION - II

Q4) a) Write the genesis of the ions <u>any three</u> : **[9]**

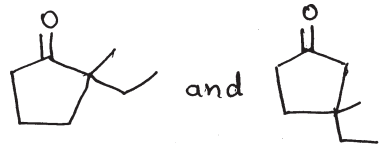
i) Ethyl isopropyl thioether 104, 89, 61, 47

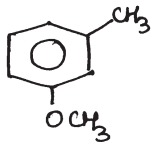
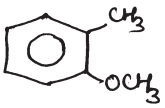
ii) 3-Methyl hexan-3-amine 100, 86, 72

iii) 1-Phenyl-2-propanone 134, 119, 91, 43

iv) Methyl-5-dimethylamino-pentanoate 159, 128, 74, 59, 58.

b) Differentiate the following pairs by mass spectrometry. **[3]**

i)  and

ii)  and 

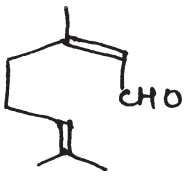
Q5) a) Answer <u>any two</u> of the following : **[8]**

i) Draw the schematic diagram of HPLC and explain the factors important in resolution.

ii) Explain i) Chiral column ii) Theoretical plates

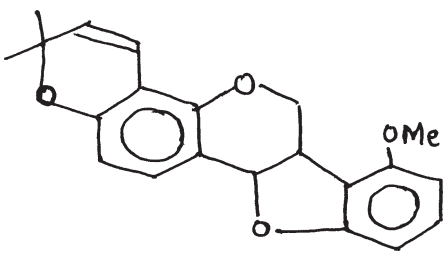
iii) Discuss the theory & instrumentation of GLC.

b) Assign the signals to various carbon atoms. Justify your answer. **[3]**



189(d) 133(s) 128(d) 162(s) 123(d)
32.5(t) 27.2(t) 25.3(q) 24.4(q) 17.4(q)

c) Assign the signals to different protons in compound shown below, on the basis of the decoupling and NOE experiment. **[5]**
Justify your answer.

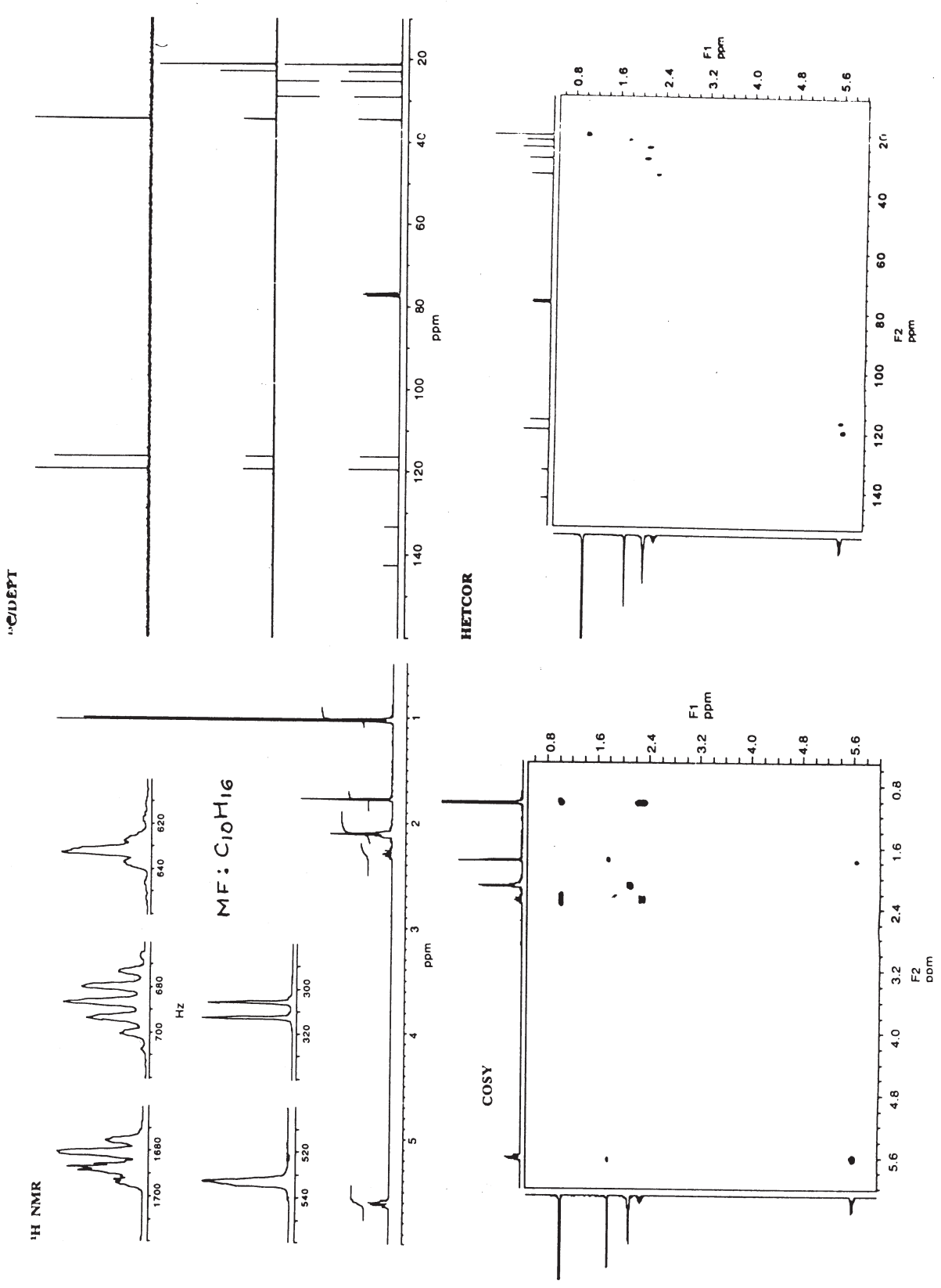


1.42(s, 6H) 3.69(m, 1H) 3.76(m, 1H)
3.85 (s, 3H) 4.33(m, 1H) 5.45(d, 7Hz, 1H)
5.56(d, 10Hz, 1H) 6.45(dd, 8 & 2Hz, 1H)
6.50(dd, 8 & 2Hz, 1H) 6.53(d, 9Hz, 1H)
6.67(d, 10Hz, 1H) 7.05(d, 9Hz, 1H)
7.12(t, 8Hz, 1H)

NOE/spin decoupling Expt.

Irradiation at	Change at
i) 3.69 δ	5.45(d) → (s)
	3.76(m) → d(13 Hz)
	4.33(m) → d(13 Hz)
ii) 3.85 δ	17% enhancement at 3.69 δ

Q6) A compound exhibits the following spectral properties (attached sheet). Suggest the structure of the compound and explain the spectral data. **[12]**


^{13}C/DEPT
ppm
HETCOR
F1 ppm
F2 ppm
^{1}H NMR
MF: C10H16
Hz
ppm
COSY
F1 ppm
F2 ppm

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1004

[4027] - 303
M.Sc. (Sem. - 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) ***Answers to the two sections to be written in separate answer books.***
3) ***Figures to the right indicate maximum marks.***

SECTION - I

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

a) Enlist the techniques used for isolation of industrially important micro-organisms. Explain any one technique in detail.

b) Explain different methods of strain improvement.

c) Briefly describe the steps for processing fermentation liquor.

d) Describe assay techniques for antibiotic activity using liquid media.

e) Define and explain in short-BOD and COD.

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

a) Describe the steps in activation of immune response.

b) Giving suitable examples, explain classification of immunity.

c) Describe agglutination methods used to visualize antigen-antibody complexes.

d) Describe the structure of lgG molecule with the help of a diagram.

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

a) Give a brief account of the various sources of drugs. How are the active constituents isolated from a plant source.

b) How do drugs act? Explain with proper examples.

c) Explain

i) First pass effect. ii) Competative Inhibitor.

iii) Efficacy. iv) MIC.

v) Pharmacophore.

P.T.O.

SECTION - II

Q4) Answer any two of the following : **[14]**

a) Explain the following :

i) Patent ii) Infringment of a patent

iii) Provisional specifications iv) Patentable inventions

v) IPR.

b) Give a brief account of pharmacokinetics of drug. Explain the factors that dictate ADME. How absorption of drugs is improved.

c) Explain in brief the various phases of clinical trials. Discuss the objectives & abservation made in phase II & Phase III. & their significance.

Q5) Answer any three of the following : **[18]**

a) Explain the following :

i) LD_{50}. ii) AMES test.

iii) Reproductivity tests. iv) Teratogenicity.

v) Hepatotoxic. vi) Nephrotoxicity.

b) Explain in brief the strategies involved in lead discovery with proper examples. What is the need for lead development.

c) Discuss the role of the following in a pharma Industry.

i) PD ii) R&D

iii) QC iv) Safety & Hygeine

d) What properties of a drug are responsible for its dosage forms. Why are sene drugs taken by IV only? What will be the best dosage form for skin Infection & Eye infection.

Q6) Discuss in brief any two of the following : **[8]**

a) You are entitled to a project involved in discovery of novel AIDS drug. Discuss in brief how will you lead the program towards successful discovery of a drug for AIDS.

b) Give in brief the strategies adopted towards lead development with illustrations.

c) Explain in brief how are Bioassays performed on an NCE. Discuss the benefits & shortcomings of invivo & invitro methods.

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Total No. of Questions : 6] **[Total No. of Pages : 5**

P1005

[4027] - 304

M.Sc. (Sem. - III)

DRUG CHEMISTRY

CH - 364 : Stereo Chemical Principles & Applications

(2008 Pattern)

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

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***Figures to 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]**

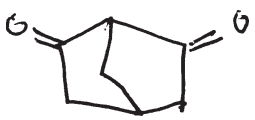
a) Van Anuwer's skita rule does not apply to explain the boiling points of alkyl cyclohexanols.

b) Saphonifaction of esters of cyclohexanol occurs faster than cyclohexane carboxylic ester.

c) In IR spectrum of α-halocyclohexanone, the c = 0 streching frequency is higher by 20 cm^{-1}, if α-halogen is equatorial.

d) Camphor on LAH reduction mainly give isoborneol.

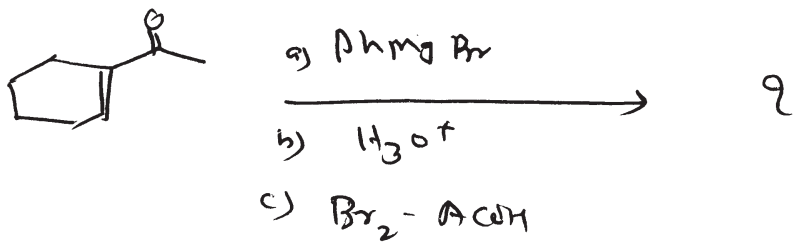
e) Compound I do not show acidic property.

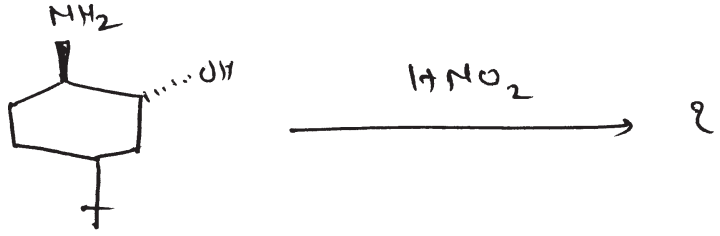


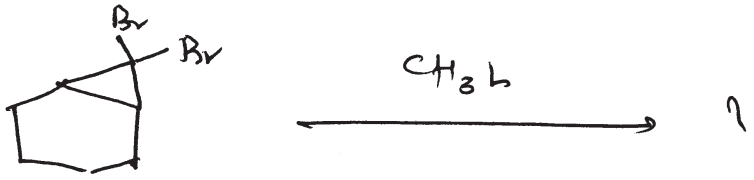
I

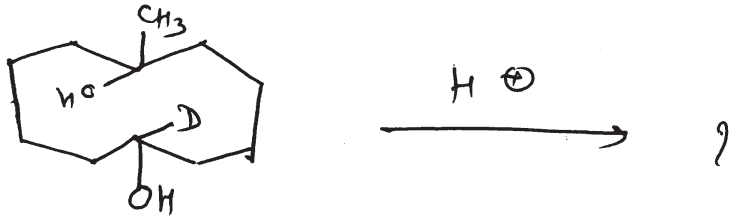
Q2) Predict the product/s. Explain the mechanism & stereochemical principles involved (any four) : **[12]**

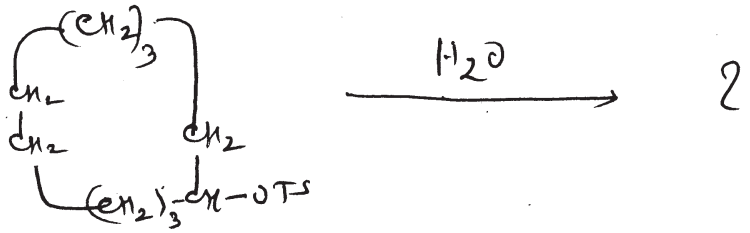
P.T.O.

a) 

b) 

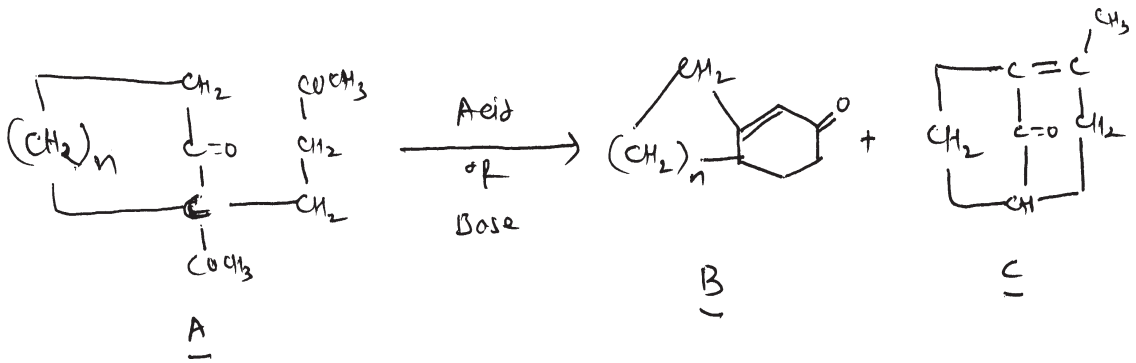
c) 

d) 

e) 

Q3) Answer the following : **[4]**

a) Compound A with acid or base furnish either fused ring B or bridge ring system C or both depending upon the ring size. Explain.



	A	B
n = 4	65%	-
n = 5	32%	14%
n = 6	-	76%

b) Write short note on (any two) : **[8]**

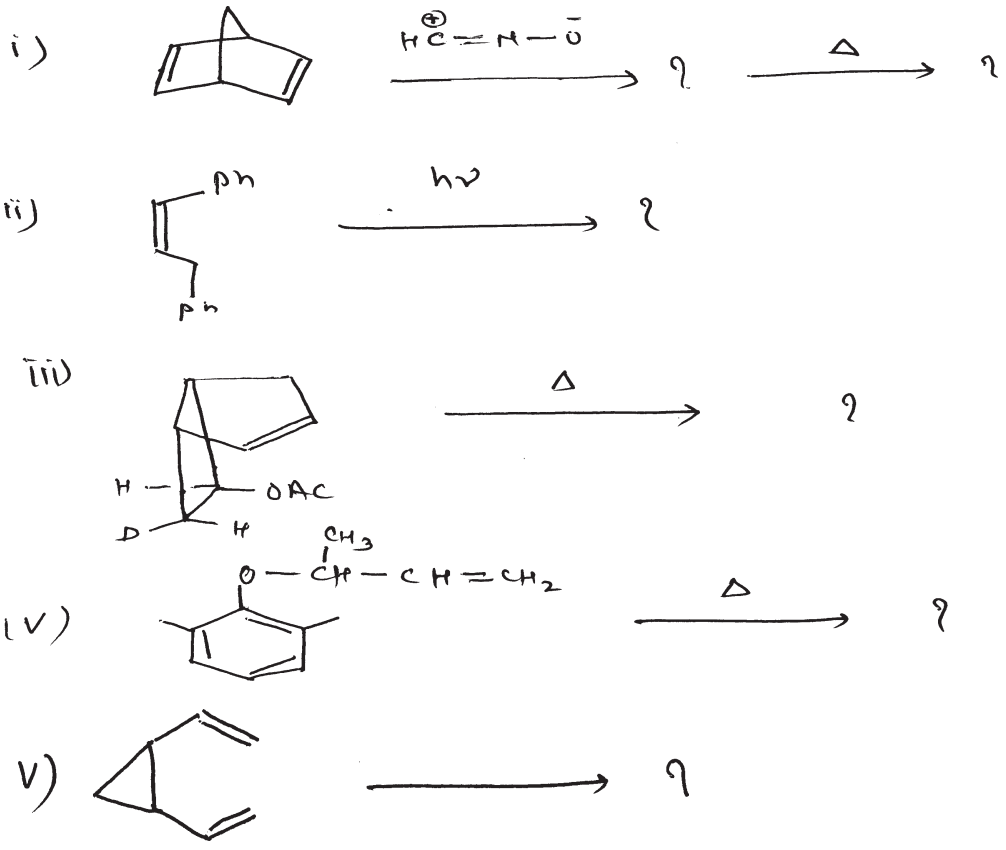
i) Limitations of Bredt's rule.

ii) I-strain.

iii) Transannular interactions.

SECTION - II

Q4) a) Predict the product/s & write the stereochemistry. Justify your answer (any four) **[12]**



b) Construct a correlation diagram for 1,3,5-hexatrione to 1, 3-cyclo hexadione & show on the basis of orbital symmetry thert. DIS rotatory cyclisation is thermally allowed process. **[4]**

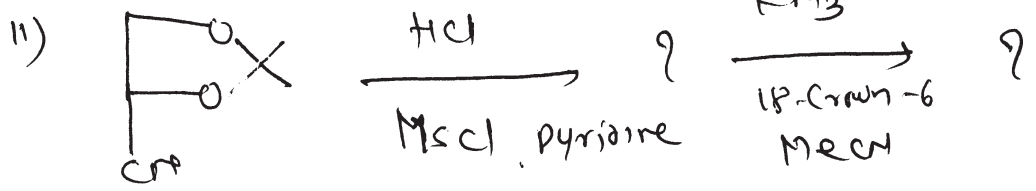
Q5) Answer the following questions :

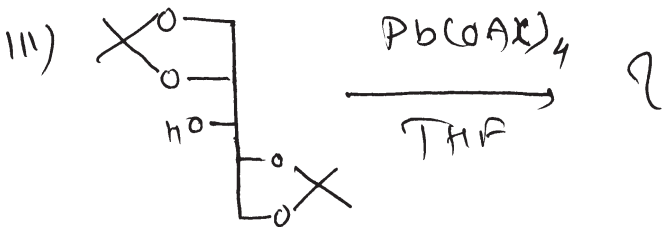
a) A hexose C on catalytic reduction gives two hexahydric alcohal D & E. Alcohal D can be obtained from D(+) Glucose. Identify C, D and E. **[3]**

b) Write $^{4}C_{1}$ and $^{1}C_{4}$ configuration in aldohexone. **[3]**

c) Predict the product/s in any two of the following : **[6]**

i) D(+) Glucose $\xrightarrow{MeOH/H^{\oplus}}$?

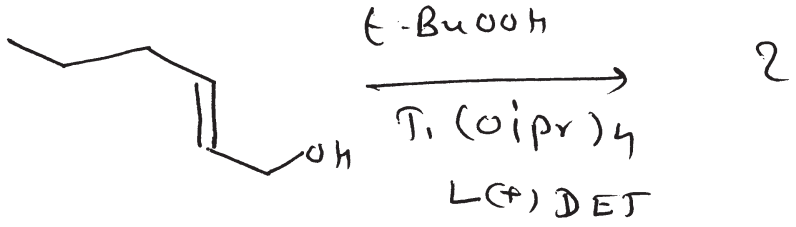
ii) 

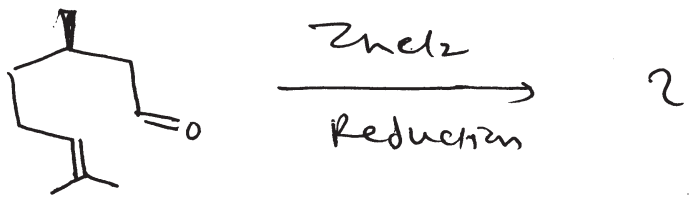
iii) 

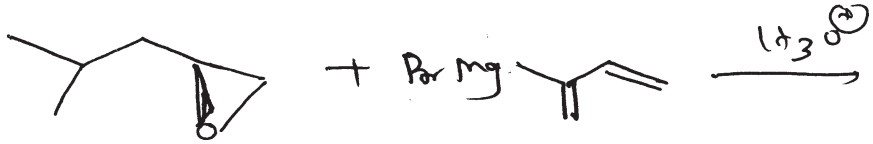
Q6) Answer any three of the following : **[12]**

a) Write short note on 'Chiral Auxillary'.

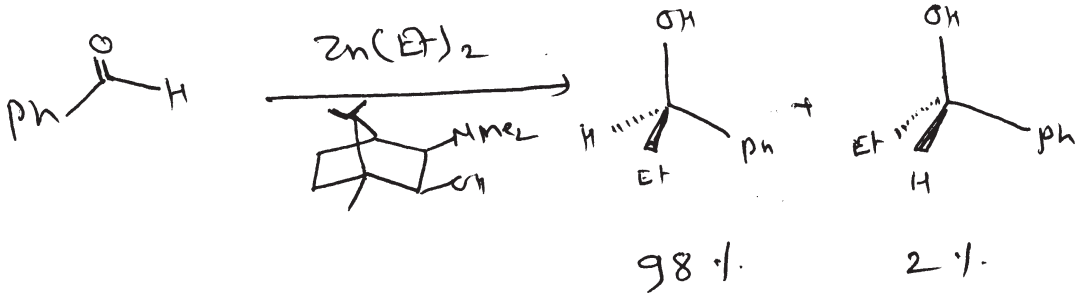
b) Predict the product & write correct stereochemistry (any two).

i) 

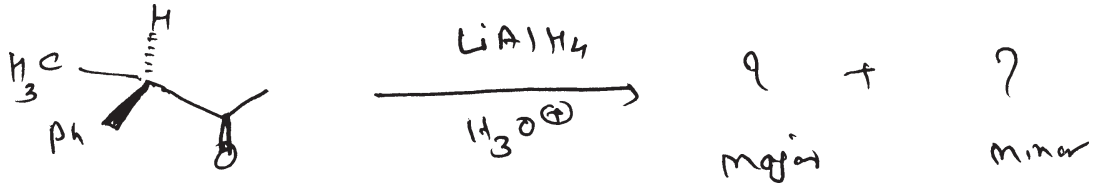
ii) 

iii) 

c) Explain the mechanism of following reaction and calculate enantiomeric excass in following reaction.



d) Using Felkin rule, explain the formation of major product in following reaction.



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Total No. of Questions : 6] **[Total No. of Pages : 5**

P1006

[4027] - 401
M.Sc. (Sem. - 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) FMOC has susceptibility inverse to that of BOC.

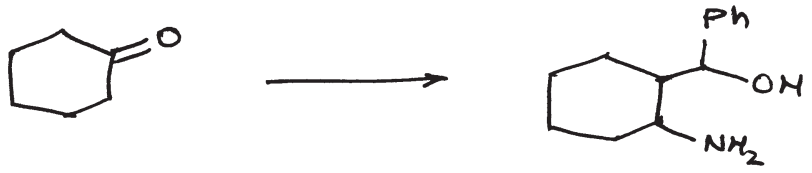
ii) Non terminal alkenes can be converted to terminal alkenes by use of hydroboration reaction.

iii) Oxo process is less successful with conjugated dienes.

iv) Ethyl ethylthiomethyl sulphoxide is used for synthesising 1, 4-dicarbonyl compounds.

b) Complete any two of the following conversions : **[6]**

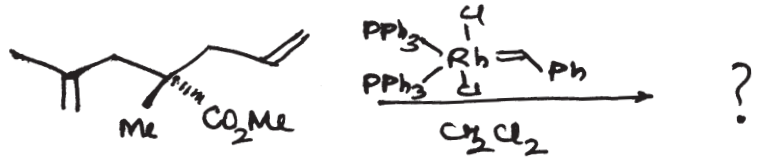
i) 

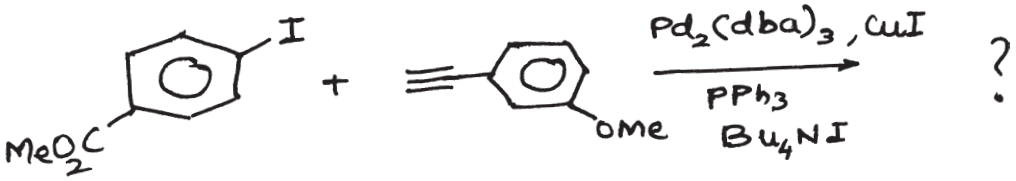
ii) 

iii) 

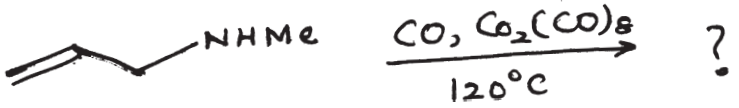
P.T.O.

Q2) a) Predict the product explaining the mechanism of transition metal complex (any three) : **[9]**

i) 

ii) 

iii) $HC\equiv CH + CO + CH_3OH \xrightarrow{Ni(CO)_4}$?

iv) 

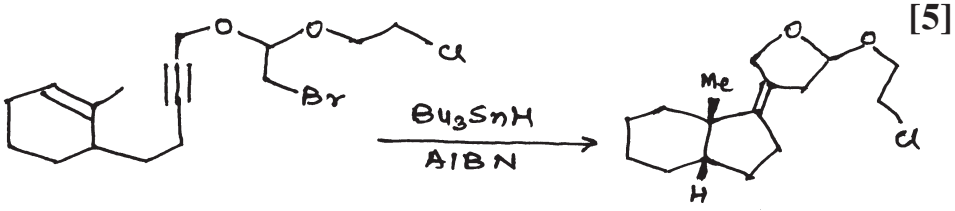
b) Discuss <u>any two</u> of the following : **[6]**

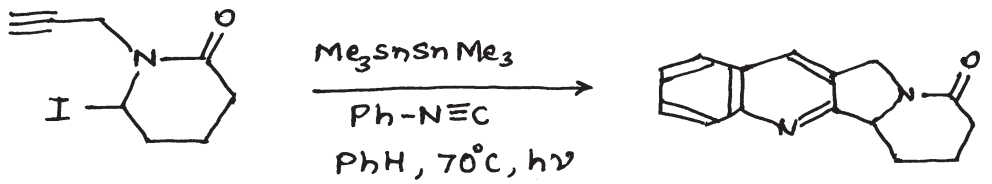
i) Use of $Co_2(CO)_8$ in Pausan Khand reaction.

ii) Use of chiral boranes to prepare optically active alcohols.

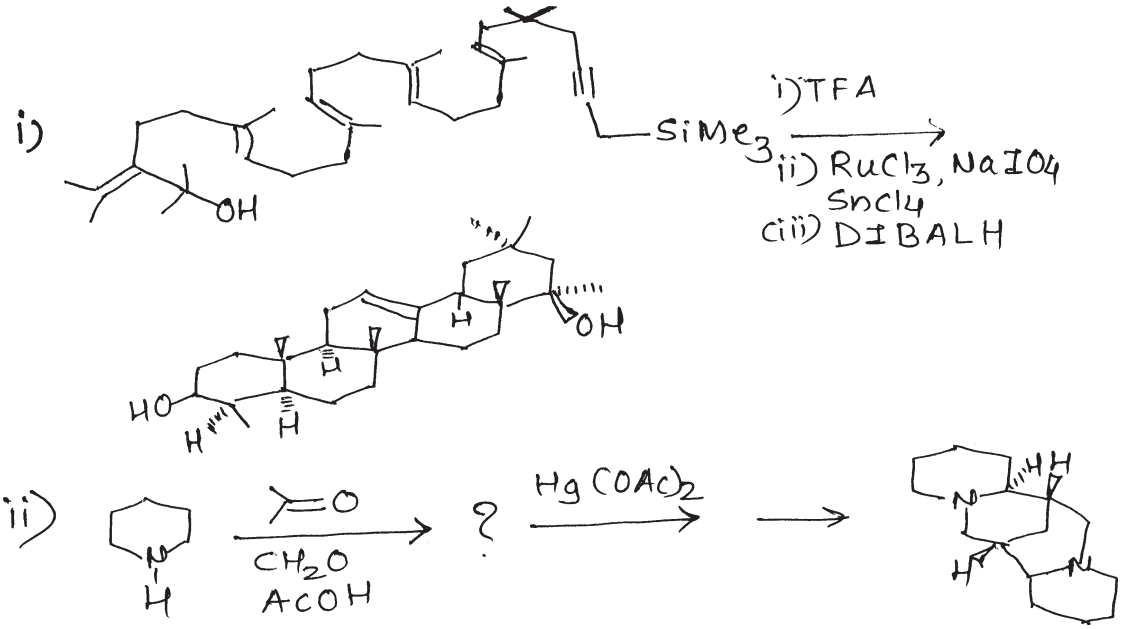
iii) Role of $Na_2Fe(CO)_4$ in organic synthesis.

Q3) a) Explain the steps involved in <u>any one</u> of the following domino reaction: **[5]**

i) 

ii) 

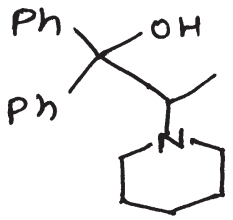
b) Explain the biomimetic approach to reterosynthesis to obtain <u>any one</u> of the following compounds. **[5]**



SECTION - II

Q4) Using retrosynthetic analysis, suggest a suitable method to synthesize <u>any three</u> of the following : **[12]**

a)



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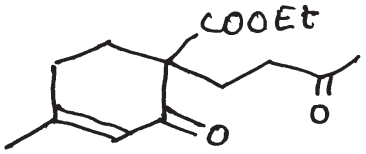
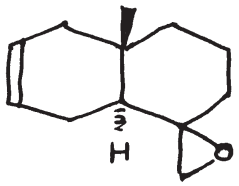


c)



d)

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

b) Employing umpolung, carry out the following transformations (any two): **[6]**

i) 

ii) 

iii) 

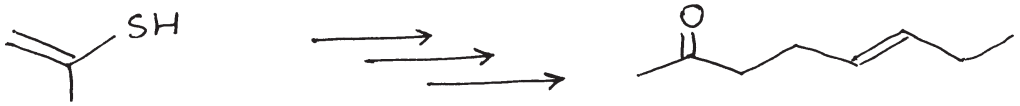
Q6) a) Give brief account of <u>any one</u> of the following : **[4]**

i) Use of microwave and ultrasonication in organic synthesis.

ii) Convergent synthesis vs linear synthesis.

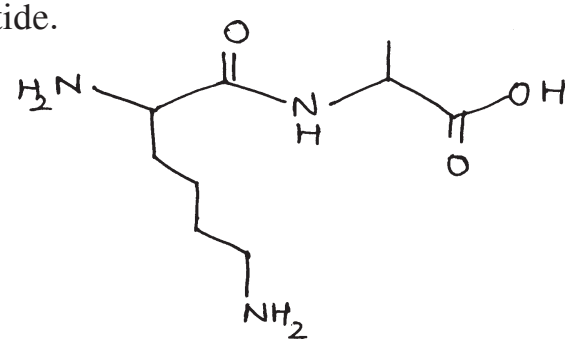
b) Answer <u>any four</u> of the following : **[12]**

i) Carry out the following conversion using the reagents given below. Arrange the reagents in proper order.

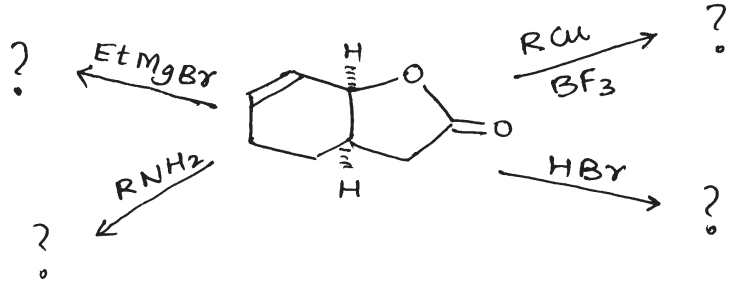


Reagents : C_2H_5I, S-Buli;  ;H_3O^+; Δ,200°C.

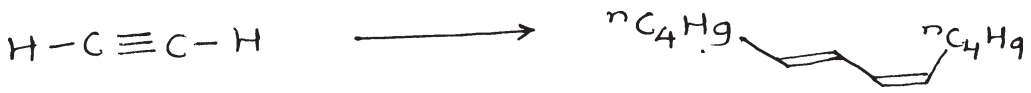
ii) Discuss the steps involved in the synthesis of the following peptide.



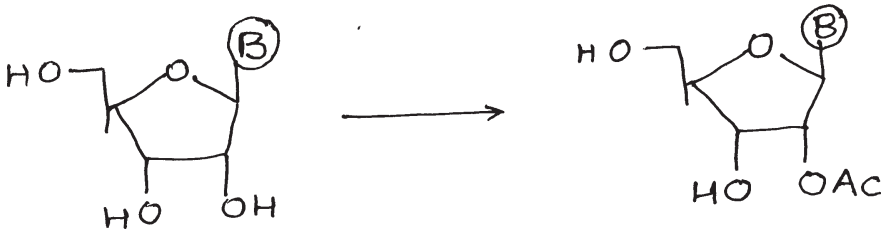
iii) Suggest the possible products.



iv) Carry out the following conversion using organo borane chemistry.



v) Carry out the following conversion.



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Total No. of Questions : 6] **[Total No. of Pages : 2**

P1007

[4027] - 402
M.Sc. - II (Sem. - IV)
DRUG CHEMISTRY
CH - 462 : Chemotherapy
(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) Answer any three of the following : **[15]**

a) What are the characteristics of an ideal antibiotic? Can penicillin be termed as an ideal drug? What are strategies adopted to convert it to an ideal antibiotic?

b) Give a brief commentary on the steps involved in protein synthesis. Discuss how Tetracyclines and Aminoglycosides act as Antibiotics.

c) Explain the phenomenon of drug resistance, discuss the molecular mechanisms involved. What are the strategies adopted to combat drug resistance?

d) Give a brief commentary on discovery and development of cephalosporins.

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

a) Describe in brief biosynthesis of purines or pyrimidines and the drugs used to inhibit these pathways utilized as anticancer drugs.

b) Discuss in brief the discovery and development of Quinolone antibiotics clearly explaining the benefits exhibited by the current fluoroquinolones. Discuss their mechanism of action.

c) Explain in brief depression & convulsions. What happens in these CNS disorders? How do drugs rectify these disorders; discuss with proper examples.

P.T.O.

Q3) Discuss in brief any three of the following : **[9]**

a) Analgesics.
b) Sedatives.
c) Drug Resistance.
d) Viral Life Cycle.

SECTION - II

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

a) How does the endocrine system maintain homeostasis? Explain the role of Estrogen, prolactin, somatostatin, and Aldosterone.
b) Explain the mechanism of Pain and Inflammation. Discuss how Aspirin, Morphine and Ibuprofen exhibit their effect.
c) Discuss the management of the following :
   i) Hypertension.
   ii) Congestive Heart Failure.
   iii) Myocardial Infarction.
d) Explain the life cycle of plasmodium. Discuss the various strategies to control and treat malaria.

Q5) Answer any two of the following : **[10]**

a) Explain in brief antimitotics and Intercalators used in cancer chemotherapy.
b) Describe in brief common GIT disorders. What are the common strategies adopted to treat them.
c) How do the following group of drugs affect CVS.
   i) Ionotropics.
   ii) Thrombolytics.
   iii) ACE-Inhibitors.

Q6) Discuss the mode of action and uses of the following drugs (any four): **[12]**

a) Glipizide.
b) Metformin.
c) Retonovir.
d) Rifampicin
e) Erythromycin.
f) Chlorambucil.

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P1008

[4027] - 403
M.Sc. (Sem. - IV)
DRUG CHEMISTRY
CH - 463 : Drug Design
(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 right indicate full marks.***

SECTION - I

Q1) Answer any two of the following : **[14]**

a) What are recombinant vaccines? How they differ from conventional vaccines?

b) What is protein engineering? Name at least two products produced by protein modification used as drug and their application.

c) Comment on any two :

i) Antisense technology.

ii) Transgenic plants in vaccine production.

iii) Animal pharming.

Q2) Answer any two : **[12]**

a) What is median and mode? State their use. Compute the same for the below given data

1.8, 2.3, 2.6, 1.6, 1.8, 2.5, 1.8, 2.9, 3.1, 2.7.

b) Probability that a certain type of seed of a crop germinates is 0.8. out of 6 such seeds sown. Find the probability that

i) all will germinate.

ii) only four will germinate.

iii) atleast one germinate

P.T.O.

c) Define correlation between 2 variables. State the 2 types. Find the same for the data given below.

Hight of sons	62	60	68	70	69	65	67	69	71	65
Hight of fathers in inches	60	59	67	68	63	63	65	66	70	65

Q3) Answer <u>any two</u> of the following : **[14]**

a) Discuss the functions of membrane bound receptor superfamilies and explain the steps involved in signal transduction pathways.

b) Draw a neat diagram of cell membrane and depict the role of membrane lipids and proteins.

c) Discuss the receptor theories of Drug Action and explain the important features of each theory.

SECTION - II

Q4) Answer <u>any three</u> of the following : **[21]**

a) What are the benifits of solid phase synthesis over routine synthesis. How is this utilized in constructing libraries for drug discovery and development. Explain with examples.

b) Discuss the development of Hansch analysis for correlating biological activities with neumerical descriptors. What is the need of s 't' & 'F' tests in this correlation.

c) Explain in brief the following :

i) Systematic search.

ii) Ab-initio methods.

iii) Molecular mechanics force field.

d) You are assigned a project to design novel anti HIV drugs. With the current level of knowledge how would you approach and arrive to your target. Justify and explain you approach.

Q5) Answer any two of the following : **[10]**

a) What is a prodrug? Explain in brief the chemistry and biology of prodrug design and its eventual benifits.

b) How is Free Wilson approach different from Hansch approach? Explain how it is used in drug development. Discuss the steps involved.

c) Give a brief account of :

i) DOCKING.

ii) Inside out & outside in methods.

Q6) Discuss in brief the following (any three) : **[9]**

a) COMFA and COMISIA.

b) Craigs plot and its application.

c) Conformational search methods.

d) Virtual screening.

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Total No. of Questions : 6] **[Total No. of Pages :2**

P963

[4025] - 206
M.Sc. (Sem. - II)
BIOCHEMISTRY
BCH - 273: Membrane Biochemistry and Genetics (New)/Nucleic acids(Old)
(2008 & 2010 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
Membrane Biochemistry

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

a) Fundamental properties of biological membranes.

b) Experimental proofs to prove lateral mobility of lipids and proteins.

c) Structure and role of gramicidin.

d) Gap junctions and physiological significance.

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

a) ABC transporters.

b) Mechanism for sodium-potassium ATPase pump.

c) Involvement of sodium channel in action potential development.

d) Phosphotransferase system.

Q3) Write short notes on any two : **[10]**

a) Chloride - bicarbonate exchanger.

b) Nuclear pore complex.

c) Aquaporin channels.

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SECTION - II
Genetics - New / Nucleic Acids - Old

Q4) Answer any three of the following: **[15]**

a) Explain how mapping of E. Coli chromosome is carried out? Give the significance of chromosome mapping.

b) What are plasmids? Give their applications.

c) What is genetic code? Give its characteristics.

d) What is transformation? Explain the mechanism of bacterial transformation.

Q5) Answer any three of the following: **[15]**

a) Explain mendel's principle of independent assortment.

b) Explain in detail the tetrad analysis in Neurospora crass and give its significance.

c) What is auxotroph? How will you select and isolate the bacterial auxotrophs?

d) Explain in short the use of viruses in genetic studies.

Q6) Write short notes on any two : **[10]**

a) Nearest neighbor analysis.

b) Fertility factor.

c) DNA denaturation and renaturation.

P964

[4025] - 301
M.Sc. (Sem. - III)
PHYSICAL CHEMISTRY
CH - 310 : Quantum Chemistry and Solid State Chemistry
(2008 Pattern)

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

Instructions to the candidates:

1) ***Answers to the TWO sections should be written in SEPARATE answer books.***
2) ***ALL questions are COMPULSORY.***
3) ***Figures to the RIGHT SIDE indicate full marks.***
4) ***Use of logarithmic table, calculator is ALLOWED.***
5) ***Neat diagrams must be drawn WHEREVER necessary.***

Physico - Chemical Constants

1)	Avogadro Number	N	$= 6.022 \times 10^{23}$ mol^{-1}
2)	Boltzmann Constant	k	$= 1.38 \times 10^{-16}$ erg K^{-1} molecule^{-1}
			$= 1.38 \times 10^{-23}$ J K^{-1} molecule^{-1}
3)	Planck Constant	h	$= 6.626 \times 10^{-27}$ erg s
			$= 6.626 \times 10^{-34}$ J s
4)	Electronic Charge	e	$= 4.803 \times 10^{-10}$ esu
			$= 1.602 \times 10^{-19}$ C
5)	1 eV		$= 23.06$ k cal mol^{-1}
			$= 1.602 \times 10^{-12}$ erg
			$= 1.602 \times 10^{-19}$ J
			$= 8065.5$ cm^{-1}
6)	Gas Constant	R	$= 8.314 \times 10^{7}$ ergK^{-1} mol^{-1}
			$= 8.314$ J K^{-1} mol^{-1}
			$= 1.987$ cal K^{-1} mol^{-1}
7)	Faraday Constant	F	$= 96487$ C equiv^{-1}
8)	Speed of light	c	$= 2.997 \times 10^{10}$ cm s^{-1}
			$= 2.997 \times 10^{8}$ m s^{-1}
9)	1 cal		$= 4.184 \times 10^{7}$ erg
			$= 4.184$ J
10)	1 amu		$= 1.673 \times 10^{-27}$ kg
11)	Bohr magneton	β_e	$= -9.274 \times 10^{-24}$ J T^{-1}
12)	Nuclear magneton	β_n	$= 5.051 \times 10^{-27}$ J T^{-1}
13)	Mass of an electron	m_e	$= 9.11 \times 10^{-31}$ kg

P.T.O.

SECTION - I

Q1) Attempt <u>any four</u> of the following. **[20]**

a) Show that

$[\hat{L}_y, \hat{L}_z] = i\hbar \hat{L}_x$ for a set of angular momentum operators $\hat{L}_x$, $\hat{L}_y$ and $\hat{L}_z$.

b) Show that 'a' is eigen value of $\hat{L}$, then 'a^n' is eigen value of $[\hat{L}]^n$.

c) Formulate the total energy operators for i) H_e and ii) H_2. State the terms involved in each of these.

d) Show that eigen functions of a hermitian operator corresponding to different eigen values are orthogonal.

e) Derive the expression for first order perturbation energy for non-degenerate systems in a generalized situation.

f) What is the heed of approximate methods in quantum chemistry? Compare perturbation method with variation method.

Q2) Attempt <u>any four</u> of the following. **[20]**

a) Obtain the secular determinants for cyclobutadiene and calculate the delocalization energy on the basis of Hiickel's approximation.

b) Comment, giving examples on the positive or negative nature of REPE value for a molecule.

c) State the Hiickel (4m + 2) rule and explain how it accounts for the stability of cyclooctatetraene dianion.

d) Apply the HMO theory to obtain the energy of the lowest three MO's of benzene molecule.

e) Set up secular determinant and write the secular equation for hapthalene.

f) Explain the basic Hiickel approximations. How are these justified?

SECTION - II

Q3) Attempt any three of the following: **[15]**

a) Show that Eo, the fermi energy lines midway between E_C and E_V for an intrinsic semi conductor.

b) Explain with suitable diagram the point contact transistor.

c) Write a note on : Taylor -Orowan dislocations.

d) Explain with a suitable diagram various types of point defects.

e) 'Fast growing faces are eliminated but slow growing persist in a crystal'. Explain.

Q4) Attempt any three of the following. **[15]**

a) Discuss the conditions for crystal growth from a moltan salt.

b) Write a note on : 'Ferro electricity in ionic crystal's.

c) Explain linear rate law used to explain the mechanism of gas-solid reaction.

d) Write and explain the mechanism for the reactions occuring at the

i) Interphases AgCl/NaCl and NaCl/NaI for the reaction between AgCl and NaI.

ii) Interphases Cu/CuCl and CuCl/AgCl for the reaction between Cu(s) and AgCl (s).

e) Explain the origin of colour centres in halide crystals.

Q5) Solve any two of the following. **[10]**

a) The average energy required to create a vacancy in a metal is 1eV. Calculate the ratio of the vacancies at 300 and 800 K.

b) Calculate the drift mobility of a charge carrier for a semiconductor having donor concentration of $10^{22}, m^{-3}$.

[Given : Conductivity = 100 mhos m^{-1}]

c) Estimate fermi energy in eV for a monovalent crystal having the number of free electron 9.8×10^{18} per cm^3 at 300 K.

Total No. of Questions : 6] **[Total No. of Pages :3**

P965

[4025] - 302
M.Sc. (Sem. - III)
PHYSICAL CHEMISTRY
CH - 311 : Nuclear and Radiation Chemistry (New)
(2008 Pattern)

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

Instructions to the candidates:

1) ***Answers to the TWO sections should be written in SEPARATE answer books.***
2) ***ALL questions are COMPULSORY.***
3) ***Figures to the RIGHT SIDE indicate FULL marks.***
4) ***Use of logarithmic table, calculator is ALLOWED.***
5) ***Neat diagrams must be drawn WHEREVER necessary.***

Physico - Chemical Constants

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3)	Planck Constant	h	$= 6.626 \times 10^{-27}$ erg s
			$= 6.626 \times 10^{-34}$ J s
4)	Electronic Charge	e	$= 4.803 \times 10^{-10}$ esu
			$= 1.602 \times 10^{-19}$ C
5)	1 eV		$= 23.06$ k cal mol^{-1}
			$= 1.602 \times 10^{-12}$ erg
			$= 1.602 \times 10^{-19}$ J
			$= 8065.5$ cm^{-1}
6)	Gas Constant	R	$= 8.314 \times 10^{7}$ ergK^{-1} mol^{-1}
			$= 8.314$ J K^{-1} mol^{-1}
			$= 1.987$ cal K^{-1} mol^{-1}
7)	Faraday Constant	F	$= 96487$ C equiv^{-1}
8)	Speed of light	c	$= 2.997 \times 10^{10}$ cm s^{-1}
			$= 2.997 \times 10^{8}$ m s^{-1}
9)	1 cal		$= 4.184 \times 10^{7}$ erg
			$= 4.184$ J
10)	1 amu		$= 1.673 \times 10^{-27}$ kg
11)	Bohr magneton	β_e	$= -9.274 \times 10^{-24}$ J T^{-1}
12)	Nuclear magneton	β_n	$= 5.051 \times 10^{-27}$ J T^{-1}
13)	Mass of an electron	m_e	$= 9.11 \times 10^{-31}$ kg

P.T.O.

SECTION - I

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

a) Describe the square-well potential? What are the other forms of nuclear potential.

b) Explain the functions of - Fuel, Moderator, Reflector, controll rods and coolent in nuclear reactor.

c) What are the prompt and delay neutrons in nuclear fission what is their origin.

d) Write a note on Van-de-Graff accelerator.

e) Discuss the thermonuclear reaction occuring on the stars.

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

a) Explain the applications of PIXE.

b) Discuss the experimental evidences for Bohr theory of compound nucleus.

c) Derive the Breit Wigner formula.

d) Describe how depth profile can be studied by using Rutherford back scattering technique.

e) What are merits and limitations of liquid drop model.

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

a) Calculate the binding energy of i) the last proton ii) last neutron in ^{28}Si. Given the atomic masses

$^{27}A1 = 28.9816$ amu mp = 1.0078

$^{27}Si = 26.9867$ amu mn = 1.0087

$^{28}Si = 27.9769$ amu

b) On the basis of semiemperical mass equation predict the stable nuclide of isobaric series A = 140.

c) Assuming symmetric fission of $^{250}_{100}Fm$ calculate

i) Fission barrier

ii) Fission energy released Given the atomic masses

$^{250}_{100}Fm = 250.0795$ amu $r_o = 1.5$ F

$^{125}Sn = 124.9077$ amu

SECTION - II

Q4) Attempt any three of the following. **[15]**

a) What are the effects of chernobyl accident?

b) Explain the working of surface-barrier detector.

c) Discuss the Samuel Magee model for radiolysis of water.

d) Write a note on somatic effect of radiation.

e) Give an account of Szilard-Chalmer's process.

Q5) Attempt any three of the following. **[15]**

a) Write a note on Ferrous sulphate dosimeter.

b) Enlist organic scintillators. Describe the properties and working of any one of them.

c) What is personal dosimetry? Describe the working of quartz fibre dosimeter.

d) Enlist various natural and manmade sources of radiations.

e) Explain ICPR recommendation for maximum permissible dose.

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

a) Find the recoil energy of an atom with mass number 200 in eV and k.cal/mole for 2 MeV photon emission.

b) The dose rate at 2 m from particular gamma source is 50 m rem/h. At what distance will it give a dose rate of 20 m rem/h.

c) Calculate approximate dose rate at a distance of 3 meters from a 180 mc_i Cobalt - 60 source. Cobalt-60 emits 2 gamma-rays per disintegration of energies 1.17 and 1.33 MeV.

Total No. of Questions : 6] **[Total No. of Pages :3**

P966

[4025] - 303
M.Sc. (Sem. - III)
PHYSICAL CHEMISTRY
CH - 312 : Advanced Instrumental Methods of Analysis
(2008 Pattern)

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

Instructions to the candidates:

1) ***Answers to the TWO sections should be written in SEPARATE answer books.***
2) ***ALL questions are COMPULSORY.***
3) ***Figures to the RIGHT SIDE indicate full marks.***
4) ***Use of logarithmic table, calculator is ALLOWED.***
5) ***Neat diagrams must be drawn WHEREVER necessary.***

Physico - Chemical Constants

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3)	Planck Constant	h	$= 6.626 \times 10^{-27}$ erg s
			$= 6.626 \times 10^{-34}$ J s
4)	Electronic Charge	e	$= 4.803 \times 10^{-10}$ esu
			$= 1.602 \times 10^{-19}$ C
5)	1 eV		$= 23.06$ k cal mol^{-1}
			$= 1.602 \times 10^{-12}$ erg
			$= 1.602 \times 10^{-19}$ J
			$= 8065.5$ cm^{-1}
6)	Gas Constant	R	$= 8.314 \times 10^{7}$ ergK^{-1} mol^{-1}
			$= 8.314$ J K^{-1} mol^{-1}
			$= 1.987$ cal K^{-1} mol^{-1}
7)	Faraday Constant	F	$= 96487$ C equiv^{-1}
8)	Speed of light	c	$= 2.997 \times 10^{10}$ cm s^{-1}
			$= 2.997 \times 10^{8}$ m s^{-1}
9)	1 cal		$= 4.184 \times 10^{7}$ erg
			$= 4.184$ J
10)	1 amu		$= 1.673 \times 10^{-27}$ kg
11)	Bohr magneton	β_e	$= -9.274 \times 10^{-24}$ J T^{-1}
12)	Nuclear magneton	β_n	$= 5.051 \times 10^{-27}$ J T^{-1}
13)	Mass of an electron	m_e	$= 9.11 \times 10^{-31}$ kg

P.T.O.

SECTION - I

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

a) How x-rays are generated? Describe x-ray tube with neat labelled diagram.

b) What is Bremsstrahlung? Discuss the factors affecting short wavelength cut off and intensity of x-rays.

c) Describe gas-ionization detector used in x-ray absorption instrument.

d) With suitable energy level diagram explain the molecular transitions associated with absorption, resonant fluorescence, normal fluorescence and phosphorescence.

e) Distinguish between chemiluminescence (CL) and electrochemiluminescence (CECL). Briefly discuss the quantitative analysis by CL.

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

a) Describe electron-bombardment ionization source in mass spectrometer.

b) Discuss briefly chemical analysis by using mass spectrometry.

c) Why is comparator method preferred over absolute method in NAA?

d) Write the radioactivity production equation and explain the terms involved in it.

e) Explain the terms : i) matrix ii) cross section of reaction iii) target iv) flux.

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

a) Estimate the thickness of foil of the alloy having absorption coefficient 631.75 cm^2/g at 0.436 nm. If the detector recorded 10,848 counts per min of transmitted x-rays when foil was not in the path of x-rays and 1023 counts/min when foil was placed in the path. The density of alloy is 8.01 g/cm^3.

b) What accelerating voltage is required to direct a singly charged water molecule through exit slit of magnetic sector mass spectrometer if the magnet has field strength of 0.25 T and radius of curvature of the ion through the magnetic field is 12.5 cm?

c) Estimate the activity of ^{90}Y formed from 0.050 mg of ^{89}Y during the ^{89}Y $(n, \gamma)^{90}Y$ reaction after an irradiation period of 72.0 h. The cross section f or the reaction is 1.31 b, the half life of ^{90}Y is 64.3 h and neutron flux is 2.0×10^7 n/cm^2s.

SECTION - II

Q4) Attempt any three of the following. **[15]**

a) With neat diagram explain sample introduction in ICP spectrometer.

b) Discuss briefly quantitative analysis using ICP emission spectrometry.

c) With suitable example explain the advantage of taking derivative of thermogram. Draw and explain schematic diagram of TGA apparatus.

d) Write a note on power compensated DSC.

e) Discuss spectral splitting and chemical shift in ESCA.

Q5) Attempt any three of the following. **[15]**

a) What is cyclic voltametry? Draw and explain the typical cyclic voltamogram.

b) Explain the principle of ESCA.

c) Write short note on pulse voltametry.

d) Discuss current-voltage relationship is coulometric technique.

e) Give the applications of coulometry technique.

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

a) Constant current coulometry was used to assay a solution containing iron (II). To ensure 100% current efficiency, the assay was performed in 0.1m cerium (III) sulfate-sulfuric acid solution. At the end point of titration of 25 ml sample, a controlled current of 6.43 mA had flowed for 3 min 43s. Calculate the concentration of Fe^{2+} in the sample.

b) The work function of a spectrometer is 50 eV. The binding energy of the emitted electron is 1070 eV. If the kinetic energy of the electron is 1.77 eV, find wavelength of incident x-ray.

c) The thermal curve corresponding to a sample that contain Al (OH) $(HCOO)_2$ 0.5 H_2O shows stepwise weight loss at temperatures of 200, 260 and 350ºC in either air or nitrogen corresponding to decomposition to Al_2O_3. A 25 mg sample had total loss of 22.5% of the initial mass of the sample. Determine the percentage of Al (OH) $(HCOO)_2$ 0.5 H_2O in the sample

Given : atomic weights of Al = 26.98, C = 12.01
O = 15.99, H = 1.008

Total No. of Questions : 5] **[Total No. of Pages :3**

P967

[4025] - 304
M.Sc. (Sem. - III)
PHYSICAL CHEMISTRY
CH - 314 : Polymer Chemistry
(2008 Pattern)

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

Instructions to the candidates:

1) ***Answers to the TWO sections should be written in SEPARATE answer books.***
2) ***ALL questions are COMPULSORY.***
3) ***Figures to the RIGHT SIDE indicate FULL MARKS.***
4) ***Use of logarithmic tables, calculator is ALLOWED.***
5) ***Neat diagrams must be drawn WHEREVER necessary.***

Physico - Chemical Constants

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4)	Electronic Charge	e	$= 4.803 \times 10^{-10}$ esu
			$= 1.602 \times 10^{-19}$ C
5)	1 eV		$= 23.06$ k cal mol^{-1}
			$= 1.602 \times 10^{-12}$ erg
			$= 1.602 \times 10^{-19}$ J
			$= 8065.5$ cm^{-1}
6)	Gas Constant	R	$= 8.314 \times 10^{7}$ erg K^{-1} mol^{-1}
			$= 8.314$ J K^{-1} mol^{-1}
			$= 1.987$ cal K^{-1} mol^{-1}
7)	Faraday Constant	F	$= 96487$ C equiv^{-1}
8)	Speed of light	c	$= 2.997 \times 10^{10}$ cm s^{-1}
			$= 2.997 \times 10^{8}$ m s^{-1}
9)	1 cal		$= 4.184 \times 10^{7}$ erg
			$= 4.184$ J
10)	1 amu		$= 1.673 \times 10^{-27}$ kg
11)	Bohr magneton	β_e	$= -9.274 \times 10^{-24}$ J T^{-1}
12)	Nuclear magneton	β_n	$= 5.051 \times 10^{-27}$ J T^{-1}
13)	Mass of an electron	m_e	$= 9.11 \times 10^{-31}$ kg

P.T.O.

SECTION - I

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

a) Derive the rate equation for step polymerization in presence of catalyst.

b) Distinguish between condensation and addition polymerization.

c) Discuss the classification of polymers based on :

i) Atoms in the main chain.

ii) Behaviour towards heat and pressure.

d) What are copolymers? What are advantages of copolymer over homopolymers.

e) Discuss with suitable example the mechanism of cationic chain polymer.

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

a) Write a note on : Block and graft copolymer.

b) Discuss the effect of degree of crystallinity on hardness, modulus and permeability.

c) What is glass transition temperature? Give relationship between T_g and T_m.

d) 'It is almost impossible to obtain 100% crystalline polymer' Explain.

e) Explain how mechanical properties can be used in physical testing of polymers.

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

a) Calculate the viscosity at C = 0.40, H = 0.33, M = 120000, K = 1.2×10^{-4} and $\alpha = 0.72$.

b) Calculate $\overline{M}_n, \overline{M}_w$ and PI from the following distribution of polymer sample.

Fraction	0.05	0.20	0.40	0.20	0.15
Mole. Wt.	15000	30000	40000	50000	60000

c) A sample of polymer contains 0.5 mole fraction with molecular weight 100000 and 0.5 mole fraction with molecular weight 200000, calculate $\overline{M}_n$ and $\overline{M}_w$.

SECTION - II

Q4) Attempt any four of the following. **[20]**

a) Describe the use of DTA technique in the analysis of polymer.

b) Distinguish between textile and frabic properties of polymers.

c) Describe conduction mechanism for conducting polymers.

d) Explain how NMR and ESR spectroscopy useful in the analysis of polymer.

e) Describe the compression molding with neat diagram.

f) Describe the process of dyeing fibre.

Q5) Attempt any four of the following. **[20]**

a) Describe the principle of membrane osmometry.

b) What are different types of spinning techniques? Why melt spinning is preferred over the others?

c) Write a note on x-ray diffraction in analysis of polymer.

d) Explain with the help of molecular weight distribution curve the distribution molecular weight-in polymer sample. Show the various average on the curve.

e) Write a note on vulcanization.

f) Describe the experimental method by viscosity measurement to determine the molecular weight of polymer.

Total No. of Questions : 4] **[Total No. of Pages :3**

P968

[4025] - 305
M.Sc. (Sem. - III)
PHYSICAL CHEMISTRY
CH - 315 : Special Topics in Physical Chemistry
(2008 Pattern)

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

Instructions to the candidates:

1) ***Answers to the TWO sections should be written in SEPARATE answer books.***
2) ***ALL questions are COMPULSORY.***
3) ***Figures to the RIGHT SIDE indicate FULL marks.***
4) ***Use of logarithmic tables, calculator is ALLOWED.***
5) ***Neat diagrams must be drawn WHEREVER necessary.***

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4)	Electronic Charge	e	$= 4.803 \times 10^{-10}$ esu
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5)	1 eV		$= 23.06$ k cal mol^{-1}
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			$= 1.602 \times 10^{-19}$ J
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6)	Gas Constant	R	$= 8.314 \times 10^{7}$ ergK^{-1} mol^{-1}
			$= 8.314$ J K^{-1} mol^{-1}
			$= 1.987$ cal K^{-1} mol^{-1}
7)	Faraday Constant	F	$= 96487$ C equiv^{-1}
8)	Speed of light	c	$= 2.997 \times 10^{10}$ cm s^{-1}
			$= 2.997 \times 10^{8}$ m s^{-1}
9)	1 cal		$= 4.184 \times 10^{7}$ erg
			$= 4.184$ J
10)	l amu		$= 1.673 \times 10^{-27}$ kg
11)	Bohr magneton	β_e	$= -9.274 \times 10^{-24}$ J T^{-1}
12)	Nuclear magneton	β_n	$= 5.051 \times 10^{-27}$ J T^{-1}
13)	Mass of an electron	m_e	$= 9.11 \times 10^{-31}$ kg

P.T.O.

SECTION - I

Q1) Attempt <u>any four</u> of the following: **[20]**

a) What are the basic criteria for sensors.

b) Explain the influence of oxygen medium on the properties of surfaces and ceramic grain boundries in poroas substance.

c) Write a note on conductimetric sensors.

d) Write charge balance, mass balance and proton condition on thiosulphate in a 0.4 M $H_2S_2O_3$ solution.

e) Draw and explain the block diagram of sensor system.

f) Calculate the pH and concentration of all ionic species for 0.01M CH_3COONa [ka = 1.8×10^{-5} for acetic acid].

Q2) Attempt <u>any four</u> of the following: **[20]**

a) Define the terms - catalyst, activity, selectivity, poision and Hammet acidity function.

b) Explain the catalytic cycle for the acetal hydrolysis in dilute agueous acid solution.

c) Find the concentration of H_2CO_3, HCO_3^- and CO_2^{-2}
[Given pH = 5, $ka_1 = 4.1 \times 10^{-7}$, and $ka_2 = 5.6 \times 10^{-11}$]

d) Explain catalysis in gas phase with suitable example.

e) Write proton condition for H_2Se and NaHSe.

f) Discuss the mechanism of general acid-base catalysis.

SECTION - II

Q3) Attempt <u>any four</u> of the following: **[20]**

a) Discuss the characteristic of passively smart material.

b) What are the applications of carbon nanotube.

c) Describe the different forms of smart composite.

d) Write a note on Pachinko-machine.

e) Discuss briefly mechanical properties of nano-particle.

f) What are intelligent gels? Explain.

Q4) Attempt <u>any four</u> of the following: **[20]**

a) How are rubber like ceramics prepared? Discuss their applications.

b) Explain the principle of steam distillation.

c) Explain how the active smart materials can be used to add domestic comforts.

d) Write a note on fullerin.

e) Write a note on ‘azeotropic mixture’.

f) What are the applications of nanogels?

Total No. of Questions : 4] **[Total No. of Pages :3**

P968

[4025] - 305
M.Sc. (Sem. - III)
PHYSICAL CHEMISTRY
CH - 316 : Environmental Pollution (Old)
(2004 Pattern)

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

Instructions to the candidates:

1) ***Answers to the TWO sections should be written in SEPARATE answer books.***
2) ***ALL questions are COMPULSORY.***
3) ***Figures to the RIGHT SIDE indicate FULL marks.***
4) ***Use of logarithmic table, calculator is ALLOWED.***
5) ***Neat diagrams must be drawn WHEREVER necessary.***

Physico - Chemical Constants

1)	Avogadro Number	N	$= 6.022 \times 10^{23}$ mol^{-1}
2)	Boltzmann Constant	k	$= 1.38 \times 10^{-16}$ erg K^{-1} molecule^{-1}
			$= 1.38 \times 10^{-23}$ J K^{-1} molecule^{-1}
3)	Planck Constant	h	$= 6.626 \times 10^{-27}$ erg s
			$= 6.626 \times 10^{-34}$ J s
4)	Electronic Charge	e	$= 4.803 \times 10^{-10}$ esu
			$= 1.602 \times 10^{-19}$ C
5)	1 eV		$= 23.06$ k cal mol^{-1}
			$= 1.602 \times 10^{-12}$ erg
			$= 1.602 \times 10^{-19}$ J
			$= 8065.5$ cm^{-1}
6)	Gas Constant	R	$= 8.314 \times 10^{7}$ ergK^{-1} mol^{-1}
			$= 8.314$ J K^{-1} mol^{-1}
			$= 1.987$ cal K^{-1} mol^{-1}
7)	Faraday Constant	F	$= 96487$ C equiv^{-1}
8)	Speed of light	c	$= 2.997 \times 10^{10}$ cm s^{-1}
			$= 2.997 \times 10^{8}$ m s^{-1}
9)	1 cal		$= 4.184 \times 10^{7}$ erg
			$= 4.184$ J
10)	1 amu		$= 1.673 \times 10^{-27}$ kg
11)	Bohr magneton	β_e	$= -9.274 \times 10^{-24}$ J T^{-1}
12)	Nuclear magneton	β_n	$= 5.051 \times 10^{-27}$ J T^{-1}
13)	Mass of an electron	m_e	$= 9.11 \times 10^{-31}$ kg

P.T.O.

SECTION - I

Q1) Attempt any four of the following: **[20]**

a) Give the classification of air pollutants and discuss the sources of oxides of carbon.

b) Explain the sulphur cycle in the atmosphere.

c) Explain the biochemical effect of carbon monoxide.

d) Discuss with the help of labelled diagram hydrological cycle.

e) What are the ecological effect of air pollutants.

f) Write a note of atmospheric photochemistry.

Q2) Attempt any four of the following: **[20]**

a) What is acid rain? Explain the rain water composition.

b) Explain what do you mean by biological cycle.

c) With the reference of chloride and sulphate describe the chemical examination of water.

d) Write a brief note on modified detergents.

e) Discuss how environment get polluted by petroleum hydrocarbon.

f) Write a short note on cationic surfactants.

SECTION - II

Q3) Attempt any four of the following: **[20]**

a) What is the effect of CFC on ozone layer? Explain.

b) Write a note on photochemical smog.

c) Explain the biotic damage due to thermal pollution.

d) Explain 'ecological impact of organochlorine compounds'.

e) Describe the soil pollution by industrial waste.

f) Discuss the mechanism of polymer degradation by photo sensitiser additives.

Q4) Attempt <u>any four</u> of the following: **[20]**

a) What is hard and soft water? Explain the procedure for examination of hardness of water.

b) Write a short note on green house effect.

c) Discuss the various effects of noise pollution on human health.

d) Describe chemical examination of water with reference to mercury, lead and iron.

e) Write down the procedure for estimation of dissolved oxygen in water.

f) Write a short note on chemical toxicology.

P969

[4025] - 306

M.Sc. - II (Sem. - III)

INORGANIC CHEMISTRY

CH - 326: Organometallic Compounds of Transition Metals and Homogeneous Catalysis

(2008 Pattern) (New Course)

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

Instructions to the candidates:

1) ***All questions are compulsory and equal marks.***
2) ***Figures to the right indicates full marks.***
3) ***At NO : V = 23, Mn = 25, Fe = 26, Rh = 45, W = 74.***

Q1) Attempt any four of the following: **[20]**

a) State the EAN rule and evaluate 'n' value of the following complexes.

i) $(\eta^5.\ C_5H_5)\ V\ (CO)_n$;

ii) $Na_2Fe\ (CO)_n$;

iii) $Mn\ Br\ (CO)_n$;

iv) $(\eta^5 - C_5H_5)Rh\ (CO)_n$;

v) $(\eta^6 - C_6H_6)\ W\ (CO)_n$.

b) Give the formal oxidation state of the metal, delectron count, total valence electron (TVE) and the number of M-M bonds if any, for the following molecules.

i) $\mu.CO - [(\eta^4 - C_4H_4)\ Fe\ (CO)]_2$;

ii) $CpMn\ (CO)_3$;

iii) $(\mu - Br)_2 - [Mn\ (CO)_4]_2$;

iv) $[CpCo\ (CO)_2]\ (\mu - CO)$;

v) $Ru\ (PPh_3)_2\ Cl\ (NO)$;

c) Give the different methods for the preparation of metal - carbonyl compounds.

d) Explain the utility of OMC's in agriculture and horticulture.

e) What do you mean by hydrocyanation reaction? Which catalysts are used for this reaction. Explain with one example.

P.T.O.

Q2) Attempt any four of the following: **[20]**

a) Explain the typical reactions of $Fe(CO)_5$.

b) What do you understand by

i) Sand wich compounds?

ii) Bent metallocene. Describe the methods of synthesis of metallocene.

c) Discuss mechanism of hydroformylation reaction of alkene with rhodium and cobalt catalysis.

d) Give a brief account of the preparative methods and properties of metal-nitrosyl compounds.

e) Explain the catalytic role of alkyl molybdate (VI) compounds in epoxidation reaction.

Q3) Attempt any four of the following : **[20]**

a) Explain the ν (CO) band in the IR spectrum of $[Fe(CO)_4]^{-2}$ is at about 1790 cm^{-1}, whereas for Ni $(CO)_4$ it is about 2060 cm^{-1}.

b) Comment on the therapeutic properties of

i) Mercurochrome

ii) Salvarsan

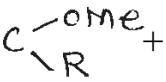
iii) Silatrane and

iv) Cisplatin

c) What do you mean by Heck reaction? Explain the steps involved in cyclopropanation reaction.

d) Complete the following reactions :

i) Mo $(CO)_6$ + cycloheptatriene $\longrightarrow$?

ii) $(CO)_5$ Cr =  + HN = Cph_2 $\longrightarrow$?

iii) $(pph_3)_2$ CO Cl_2 Os =  + 2 LiAr $\longrightarrow$?

iv) Mo $(\eta^6 - C_6H_6)_3$ + 6 PF_3 $\xrightarrow[600atm]{100^oC}$?

v) $(\eta^5 - C_5Me_5)_2$ UR_2 + 2CO $\xrightarrow[25^oC]{PhMe}$?

e) Draw the structures :

i) Mo $(CO)_3$ $(\eta^6 - C_7H_8)$

ii) OS_3 $(CO)_{12}$

iii) HRe_2Mn $(CO)_{14}$

iv) $[Co(H)$ (N_2) $(PPh_3)_2$

v) Fe_2 Ru $(CO)_{12}$.

Q4) Write short notes any Four : **[20]**

a) Fluxional behaviour of organometallics.

b) Environmental aspects of organometallics.

c) Monsanto acetic acid synthesis.

d) Applications of the suzuki cross-couplling reaction.

e) Tolman's catalytic cycle.

Total No. of Questions : 4] **[Total No. of Pages :2**

P970

[4025] - 307

M.Sc. - II (Sem. - III)

INORGANIC CHEMISTRY

CH - 330: Coordination Chemistry, Magnetism and Reaction Mechanism

(New Course) (2008 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory and carry equal marks.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of logarithmic tables and calculator is allowed.***

Q1) Answer any four of the following: **[20]**

a) Discuss the factors that affect the crystal field stabilization energy in transition metal complexes.

b) The extent of exchange interaction in the Cu_2O_2 ring system is greater than that in Cr_2O_2 ring system. Explain.

c) Explain why $Fe_2(CO)_g$ is diamagnetic?

d) Define the terms :
   i) Paramagnetic material.
   ii) Diamagnetic material.
   iii) Ferromagnetic material.
   iv) Ferrimagnetic material.
   v) Antiferromagnetic material.

e) Explain the experimental magnetic moment of the following ions.
   Ti^{3+} μ B. m. expt = 1.7 to 1.8 B. m.
   Co^{2+} μ B. m. expt = 4.1 to 5.2 B. m.
   Given : - atomic no. of Ti = 22 and that of Co = 27.

Q2) Answer any four of the following: **[20]**

a) Draw the structures of following molecules.
   i) Rh (acac) $(C_2H_4)_2$
   ii) cis – Pt $(NH_3)_2$ Cl_2
   iii) [Co $(en)_2$ (ox)] Cl
   iv) $Pd(NH_3)_2$ $(C_2H_3O_2)_2$
   v) mer – [Rh $(PR_3)_3$ Cl_3]

P.T.O.

b) Explain the terms
   i) Magnetic domain.
   ii) Spin Pairing.

c) Differentiate between magnetically dilute system and magnetically concentrated system.

d) Why are the complexes K_4 [$Mo(CN)_8$] and k_2 [Cl_5 Mo O Mo Cl_5] diamagnetic?

e) Discuss the various models to account for the anomalous magnetic behaviour of transition metal complexes.

Q3) Attempt <u>any four</u> of the following : **[20]**

a) What is conjugate base dissociation mechanism? Explain it with reference to octahedral Co(III) complexes.

b) What is mixed-order substitution reaction? Explain it with suitable examples.

c) Discuss the mechanism of electron transfer with reference to outer-sphere reactions.

d) Differentiate between SN^1 and SN^2 mechanisms.

e) Write a note on anation reaction.

Q4) Answer <u>any four</u> of the following: **[20]**

a) Discuss in brief recemization of tris-chelate complexes.

b) Write a note on reductive elimination reactions.

c) Give in a brief about two electron transfer reaction.

d) What is trans effect? Explain it with suitable examples.

e) Complete the following chemical equations.

i) $BF_3 + F^- \rightarrow$ ☐

ii) $(CH_3)_3B + N(CH_3)_3 \rightleftharpoons$ ☐

iii) $[Pt\ (NO_2)\ Cl_3]^{2-} + NH_3 \rightarrow$ ☐ + ☐

iv) $[pt\ Cl_4]^{2-} \xrightarrow{?}$ ☐ $\xrightarrow{?}$ ☐

v) $[Fe\ (CN)_6]^{4-} + [Fe\ (CN)_6]^{3-} \rightarrow$ ☐ + ☐

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Total No. of Questions : 4] **[Total No. of Pages :2**

P971

[4025] - 308

M.Sc. - II (Sem. - III)

INORGANIC CHEMISTRY

CH - 331: Structural Methods in Inorganic Chemistry

(2008 Pattern) (New Course)

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

Instructions to the candidates:

1) ***All questions are compulsory***
2) ***All questions carry equal marks.***

Q1) Answer any four of the following: **[20]**

a) Explain the mössbauer spectra for Iron in (+2) and (+3) oxidation state in low spin and high spin octahedral complexes.

b) With the help of an energy level diagram-explain the principle of ESR spectroscopy. Draw the structure of a compound used as a standard in ESR spectroscopy. State the selection rules for ESR transitions.

c) Draw the possible isomers of $[Cr(CO)_3(p(OCH_3)_3)_3]$ complex. How will you distinguish the isomers by using ^{31}p-NMR - spectroscopy.

d) Draw and explain the 19F - NMR spectra of BrF_5 molecule.

e) Draw a typical cyclic voltamogram and explain each term used in cyclic voltamogram.

Q2) Attempt any four of the following: **[20]**

a) Calculate NQR - transition frequencies for nucleus having Spin quantum no. I = 3/2 assuming i) $\eta = 0$ and ii) $\eta \neq 0$.
Draw energy level diagram for $I = 3/2$

b) Explain the Mössbauer spectra of $Fe_3(CO)_{12}$ cluster which gives three equally intense peaks. Draw the possible structures and explain which is correct and why.

c) Explain the Hyperfine and superfine lines observed in an ESR spectrum with suitable example.

d) Explain the ^{31}p-NMR spectra of HPF_2 molecule
Given : - i) $^{J31}p - ^{19}F > {}^{J31}p - {}^{1}H$
ii) $^{J31}p - ^{1}H > {}^{J31}p - {}^{19}F$

e) Explain how mechanism of oxidation of Thyronine can be determined from cyclic voltametry.

P.T.O.

Q3) Attempt <u>any four</u> of the following : **[20]**

a) Calculate the % of $MgCO_3$ and $CaCO_3$ in 40 mg. of limestone sample that exhibits thermogram showing weight of 30 mg. at 500ºC and 18 mg. at 900ºC.
[Given. At. wt. Ca = 40.08, Mg = 24.31, C = 12.01, O = 15.99]

b) What are the Miller indices? Compute the Miller indices for the faces having the intercepts as
   i) 111
   ii) 100
   iii) $\frac{1}{2}$, $\frac{1}{3}$, 1.

c) Explain the DTA curve for $CaC_2O_4.H_2O$ in presence of O_2 and CO_2 atomosphere.

d) Draw the schematic diagram of DSC-instrument and write note on the working of DSC instrument.

e) An oxide of potassium is formed by reaction $2\,KO_3 \xrightarrow{\Delta} 2KO_2 + O_2\,(g)$.
If 0.254 gm of sample was heated at 70ºC for 1 hrs;
weight was found to be 0.212 gm. Calculate the percentage of KO_3 in sample.
(Given : At. wt. K = 39, O = 16)

Q4) Attempt <u>any four</u> of the following: **[20]**

a) Explain the principle of Auger photoelectron spectroscopy.

b) Explain the effect of following on DTA curve
   i) Gaseous environment
   ii) Instrumental factor

c) Explain the application of SEM with respect to
   i) Topographic Imaging
   ii) Composition

d) Give the application of XPS in industry and limitations of XPS.

e) Write short note on isomer shift.

✪✡✪✡

Total No. of Questions : 4] **[Total No. of Pages : 2**

P972

[4025]-309
M.Sc. (Semester - III)
INORGANIC CHEMISTRY
CH - 332 : Bio-Inorganic Chemistry : Inorganic Elements in the Chemistry of life.
(Part - II) (2008 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***

Q1) Answer the following (any four) : **[20]**

a) Discuss the use of radioactivity in medicine.

b) What are the effects of platinum binding on the structure of DNA.

c) Explain the role of Manganese in photosynthesis.

d) Explain the process of characterizing Labile Iron pool in the brain.

e) Discuss the mechanism of bioalkylation reaction catalysed by cobalamin.

Q2) Attempt any four : **[20]**

a) Write an account of Bone scanning.

b) Write an account of Zinc enzymes.

c) Give an account of the techniques useful for studying metal-nucleic acid interactions.

d) Discuss the role of metals in medicine.

e) Discuss in detail the class I and class II formulations of technitium 99_m.

Q3) a) Attempt any five : **[10]**

i) Which kind of ionizing radiations are useful in radio pharmaceuticals?

ii) Identify the metals involved in electron transfer reactions.
Ni^{+2}, Zn^{2+}, Mo^{4+}, Ca^{+2}, Cu^{+2}, Mg^{+2}, Mn^{2+}, Al^{3+}, Na^{+}

iii) Give examples of radionuclides in clinical diagnosis.

P.T.O.

iv) Name the Nickel dependent enzymes and mention their functions.

v) Draw the active site structure of carboxypeptidase.

vi) What is radiolabelling? How is it used for antibiotics?

b) Match the metals with their appropriate functions. **[5]**

Copper	Control of pH in blood
Zinc	Cell division
Cobalt	Respiration
Iron	Photosynthesis
Manganese	Transport & storage of O_2

c) Draw the structures : **[5]**

$Ru(bipy)_3^{2+}$

Haemocyanin

Ethidium bromide

Blue proteins.

$[Cu(phen)_2]^+$

Q4) Write short notes on (any four) : **[20]**

a) Catalases.

b) Model compounds of Iron-sulphur proteins.

c) Zinc proteins.

d) Laccase reaction cycle.

e) Super Oxide Dismutase.

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P973

[4025]-310
M.Sc. - II (Sem. - III)
ORGANIC CHEMISTRY
CH - 350 : Organic Reaction Mechanism
(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) Attempt any four of the following : **[12]**

a) The meta $\overset{+}{N}Me_3$ group increases the acidity of benzoic acid but meta SO_3^- group decreases its acidity. Explain.

b) The base catalyzed hydrolysis of m-nitro ethyl benzoale is 63.5 times faster than unsubstituted ester. What will be the comparable rate for p-methoxy-ethyl benzoale under similar conditions?

$\sigma m - NO_2 = 0.71$; $\sigma p - OMe = -0.27$

c) Explain stork enamine synthesis.

d) Prove that Hammet equation is linear free energy relationship.

e) Explain Deamination of α-aminoacid proceeds with retention of configuration.

Q2) Write short note on any three of the following : **[12]**

a) Isotope labelling in determination of reaction mechanism.

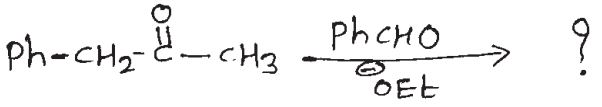
b) General methods for formation of carbanion.

c) BAC2 mechanism.

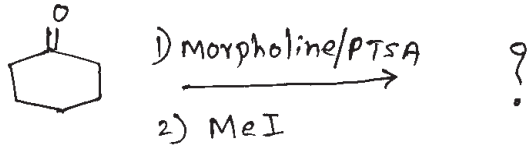
d) Transannular Rearrangement.

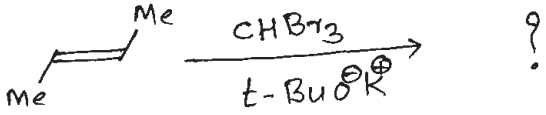
P.T.O.

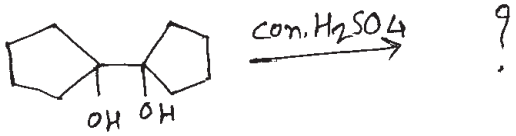
Q3) Predict the products with mechanism for <u>any four</u> of the following : **[16]**

a) 

b) 

c) 

d) 

e) 

SECTION - II

Q4) Explain <u>any four</u> of the following : **[12]**

a) Role of pyridoxal phosphate in nature.

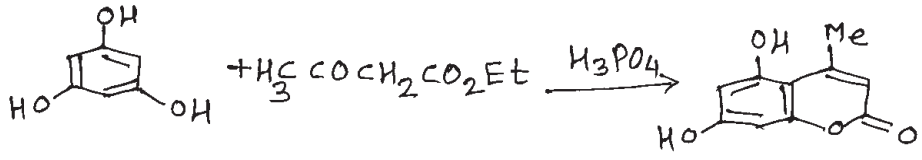
b) How identification of product suggest differences in mechanism.

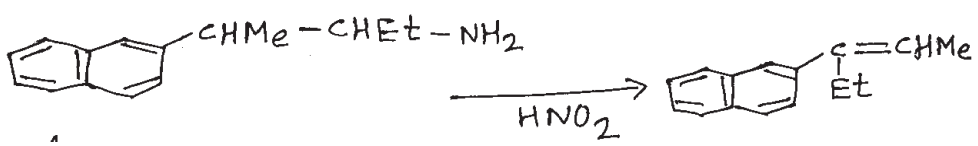
c) P-Me $C_6H_4CO_2Me$ is hydrolysed more rapidly than Ph CO_2Me in conc. H_2SO_4 but the reverse is true in dil. H_2SO_4.

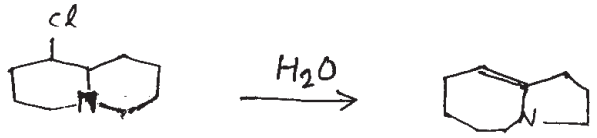
d) P-nitrobenzaldehyde does not undergo the benzoin condensation, where as 0-nitrobenzaldehyde undergoes the benzoin condensation.

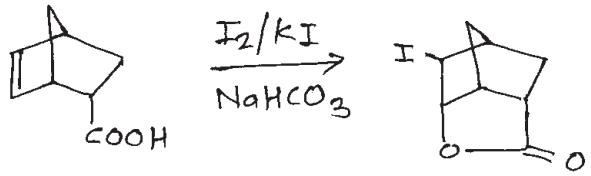
e) Anchimeric assistance to solvolysis of β-phenyl alkyl brosylates is enhanced by branching at Cβ but inhibited by branching at Cα.

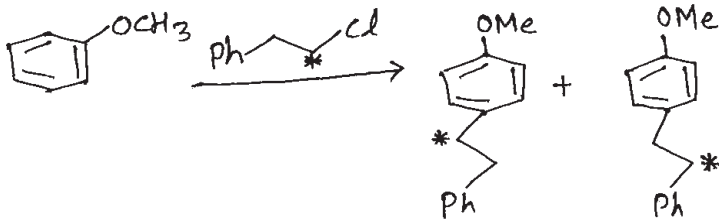
Q5) Suggest the mechanism for <u>any four</u> of the following : **[16]**

a) 

b) 

c) 

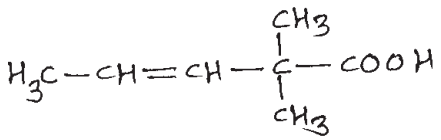
d) 

e) 

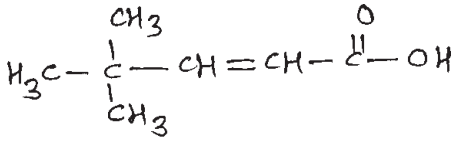
Q6) Answer <u>any four</u> of the following : **[12]**

a) Discuss the mechanism of reduction of pyruvic acid by NADH.

b) The acid <u>A</u> and not <u>B</u> undergoes thermal decarboxylation. Explain.



<u>A</u>



<u>B</u>

c) Michael reaction fails with α-phenyl cinnamic ester.

d) Tri(O-tolyl) methane is less acidic than tri (P-tolyl) methane.

e) Methyl ethyl Ketone when reacted with benzaldehyde in presence of base and acid separately it gives two different products.

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Total No. of Questions : 6] **[Total No. of Pages : 7**

P974

[4025]-311
M.Sc. - II (Sem. - III)
ORGANIC CHEMISTRY
CH - 351 : Spectroscopic Methods in Structure Determination
(2008 Pattern)

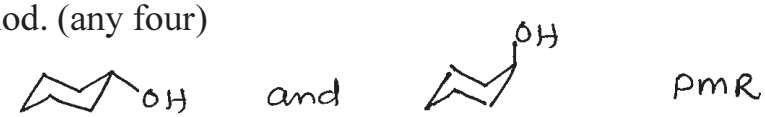
Time : 3 Hours] ***[Max. Marks : 80***

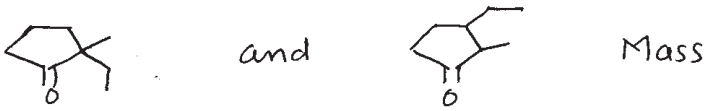
Instructions to the candidates:

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.***

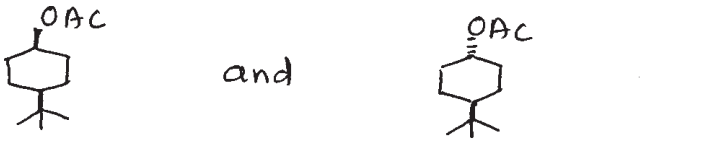
SECTION - I

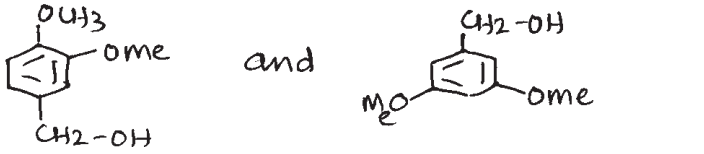
Q1) a) Distinguish between the following pairs by using the indicated spectral method. (any four) **[8]**

i) 

ii) 

iii) 

iv) 

v) 

b) Explain <u>any two</u> of the following : **[4]**

i) CD_3C1 shows seven lines of unequal intensity in CMR.
ii) Diethyl phthalate shows m/e at 149 in mass spectrometry.
iii) One of the chemical shifts of acetyl acetone appears at 15.1 as a singlet in PMR.

P.T.O.

Q2) Answer <u>any four</u> of the following : **[16]**

a) Deduce the structure.

M.F : $C_9H_9ClO_3$, After D_2O exchange.
PMR : 1.8 (d, J = 7Hz, 3H),
(δ) 4.78 (q, J = 7Hz, 1H), 6.78 (dt, J = 8, 2Hz, 1H),
6.9 (t, J = 2Hz, 1H), 6.97 (dt, J = 8, 2Hz, 1H),
7.2 (t, J = 8Hz, 1H)

b) Assign the structure to a compound from given spectral data.

IR : 1690, 1600 cm^{-1}
Mass (M/e) : 154/156 (M^+/M^++2 peaks in the ratio 3: 1), 139/141, 111/113.
PMR(δ) : 2.5 (S, 3H), 7.3 (d, J = 8Hz, 2H),
7.8 (d, J = 8Hz, 2H).
CMR : 26(q), 128 (d, strong), 129 (d, strong),
135 (s), 140 (s), 197 (s).
DEPT1 26, 128, 129 up 135, 140, 197 Absent
DEPT2 128, 129 up

c) Deduce the structure

M.F : $C_8H_{10}O_2$
CMR : 55 (q), 133.5 (s), 64 (t, mod.), 159 (s),
(δ) 114 (d, strong), 129 (d, strong)
PMR : 2.0(bs, exchangable, 1H), 3.8 (s, 3H),
(δ) 5.0 (S, 2H), 6.5 (d, J = 7Hz, 2H),
6.8 (d, J = 7Hz, 2H)
Mass : 138, 137, 107
(M/e)

d) Deduce the structure.

M.F : $C_{12}H_{17}NO$
IR : 3296, 1642 cm^{-1}
PMR : 7.23-7.42 (m, 5H), 5.74 (bs, exchangable, 1H),
(δ) 5.14 (q, J = 6.7 Hz, 1H), 2.15 (t, J = 7.1 Hz, 2H),
1.66 (m, 2H), 1.48 (d, J = 7.1 Hz, 3H),
0.93 (t, J = 7.1 Hz, 3H)
CMR : 172 (s), 143.3(s), 128.6(d), 127.3(d), 126.1(d),
(δ) 48.5(d), 38.8(t), 21.7(q), 19.1(t), 13.7(q)

e) Deduce the structure

M.F : $C_8H_9NO_3$
IR : 2500-3000 (b), 3300, 1600, 1510, 1200cm^{-1}
PMR : 3.8 (s, 3H), 6.84 (d, J = 8Hz, 1H), 7.22 (d, J = 8, 3Hz, 1H)
(δ) 7.26 (d, J = 3Hz, 1H),
5.0 (bs, 1H, exchangable), 11.2 (bs, 1H, exchangable).

Q3) Write notes on <u>any three</u> of the following : **[12]**

a) Offresonance spectroscopy.

b) AMX spin system.

c) Anisotropic shielding & deshielding in PMR.

d) Isotopic peaks in Mass spectrum.

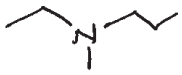
SECTION - II

Q4) a) Explain the genesis of the ions (any four) : **[12]**

i) 1-bromohexane — 166, 164, 135, 107

ii) Phcoph — 105, 77, 55

iii) $CH_3CH_2CH_2CH_O$ — 72, 71, 44

iv)  — 101, 86, 44

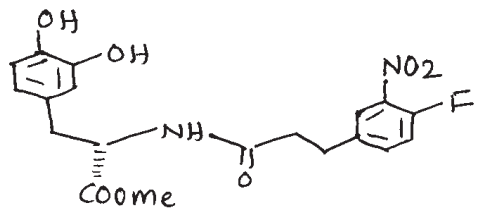
v)  — 74, 58, 31

b) Suggest the structure for the compound based on the following data and explain the genesis of the ions. **[4]**

M.F $C_9H_{10}O_2$

Mass (m/e) = 150, 108 (100%), 91, 77, 73.

Q5) a) Assign the chemical shifts and comment on the observed coupling constants and spin decoupling experiment. **[8]**

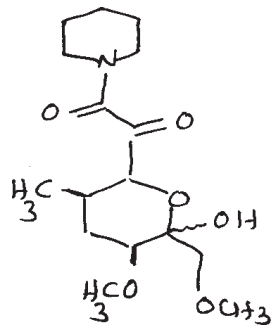


2.5 (t, J = 7.3Hz, 2H),
2.74 (dd, J = 13.9, 8.8Hz 1H),
2.89 (t, J = 7.3Hz, 2H),
2.93 (dd, J = 13.9, 5.5Hz, 1H),
3.64 (s, 3H),
4.56 (dd, J = 8.8, 5.5 Hz, 1H),
6.43 (dd, J = 8, 2Hz, 1H),
6.58 (d, J = 2Hz, 1H),
6.64 (d, J = 8Hz, 1H),
7.24 (dd, J = 11, 8.6 Hz, 1H),
7.42 (ddd, J = 8.6, 7.2, 2Hz, 1H),
7.87 (dd, J = 7.2, 2Hz, 1H)

Spin decoupling Experiment :-

	Irradiation at	Change at
i)	7.42	7.24 dd $\rightarrow$ d,J = 11Hz 7.87 dd $\rightarrow$ d,J = 7.2Hz
ii)	4.56	2.74 dd $\rightarrow$ d, J = 13.9Hz 2.93 dd $\rightarrow$ d, J = 13.9Hz

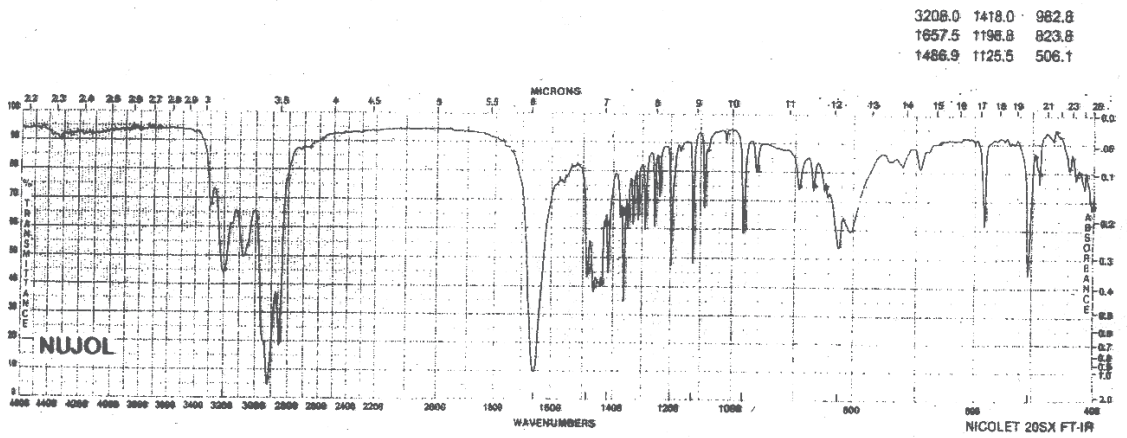
b) Assign the chemical shifts to various carbon atoms. **[4]**



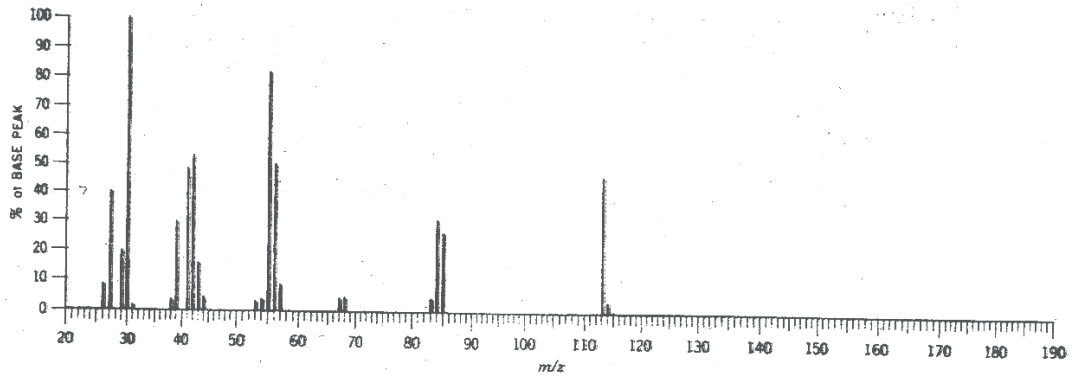
195(s), 170.4(s),
98(s), 74.5(d), 56.3(q)
52.4(q), 51.5(d), 39.1(t),
34.2(d), 31.7(t), 26.5(t),
24.4(t), 21.2(t), 15.5(q)

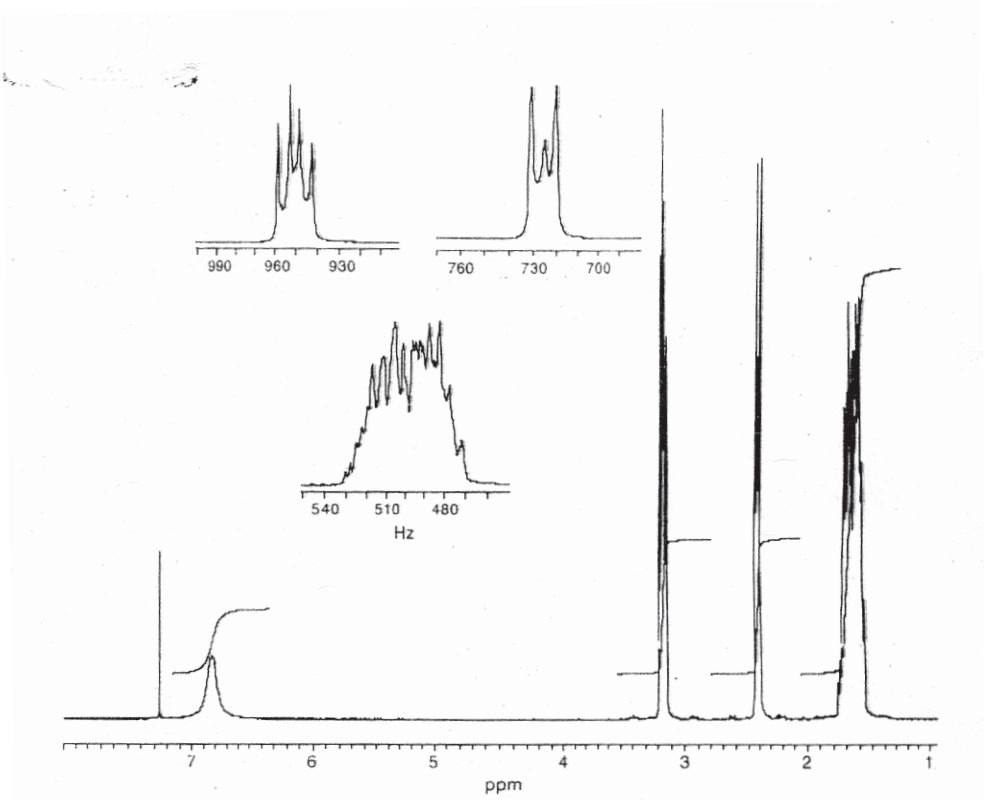
Q6) You are provided with the spectra of a compound. Analyse these spectra and arrive at a structure consistent with the data. Justify your structure. **[12]**

INFRARED



MASS




990
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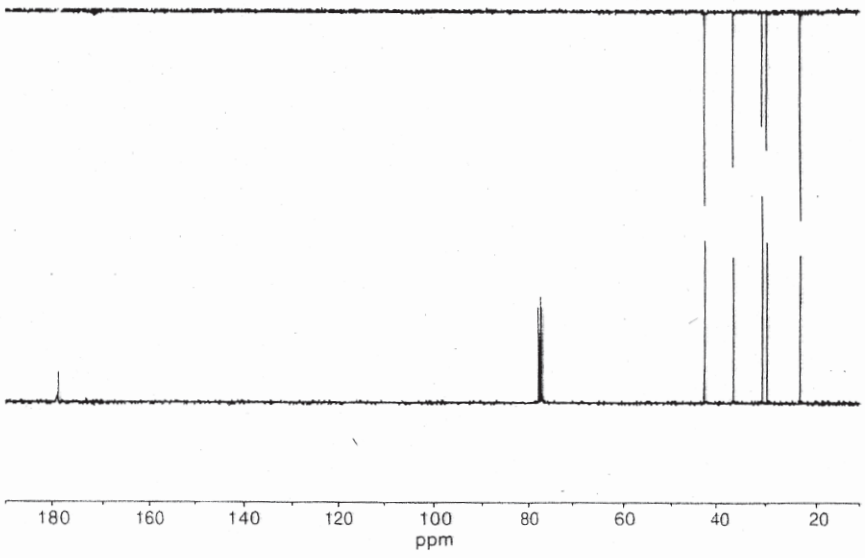
930
760
730
700
540
510
480
Hz
7
6
5
4
3
2
1
ppm

^{13}C/DEPT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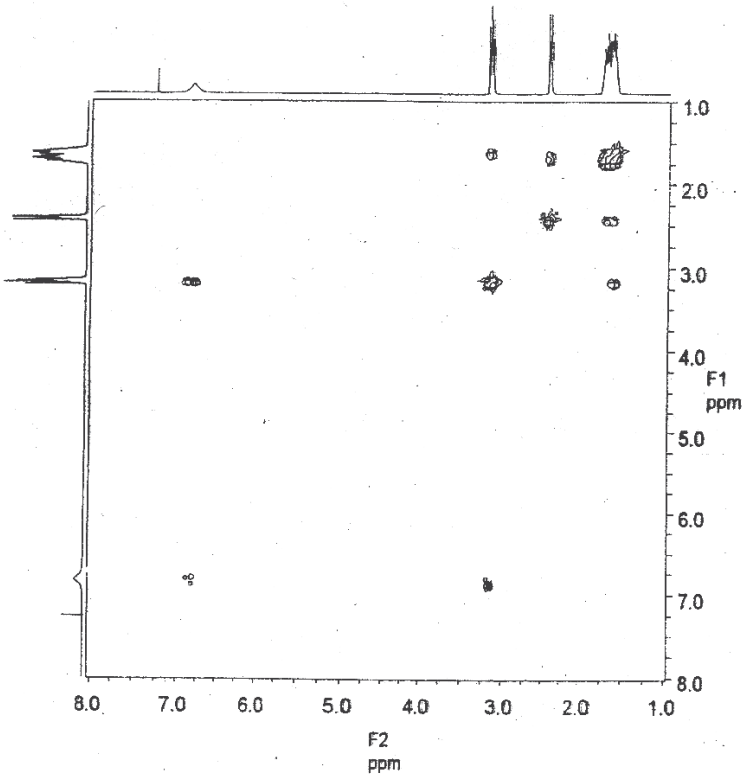
160
140
120
100
80
60
40
20
ppm

COSY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ppm
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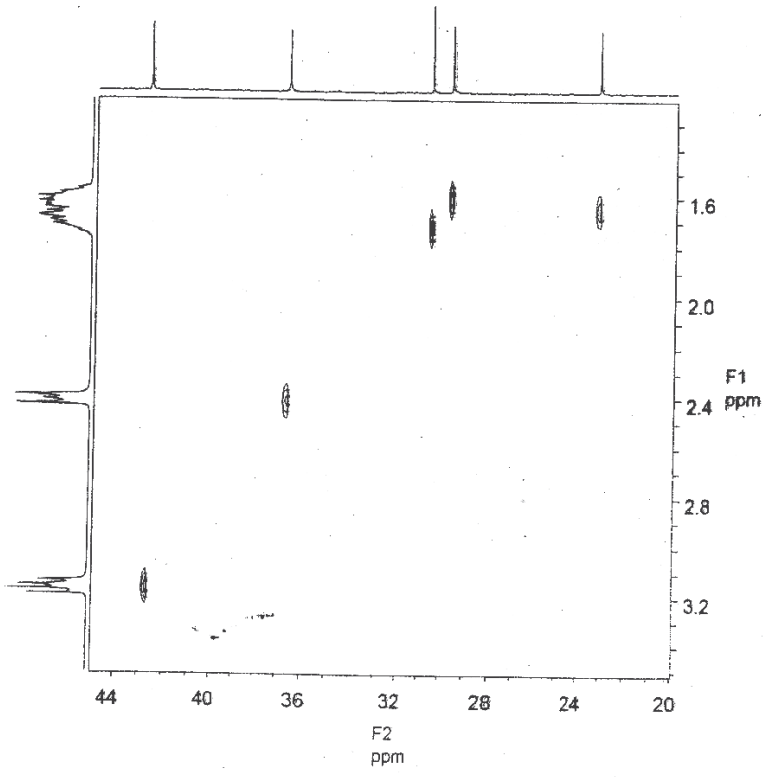
HETCOR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2.8
3.2
44
40
36
32
28
24
20
F2
ppm

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Total No. of Questions : 6] **[Total No. of Pages : 4**

P975

[4025]-312
M.Sc. - II (Sem. III)
ORGANIC CHEMISTRY
CH - 352 : Organic Stereochemistry
(2008 Pattern) (New)

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) Reduction of Camphor with Lithium aluminium hydride gives mainly isoborneol. Explain with stereostructures.

b) Cis 1,2 dibromocyclohexane undergoes bronine elimination with pottasium iodide in methanol at a rate of 11 times slower than trans isomer.

c) Draw the stereostructures of the most stable and the least stable conformations of perhydroanthracene. (Give the nomenclature of these isomers).

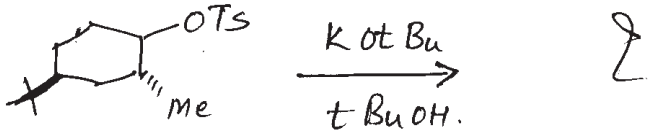
d) Von-Auwers-Skitn rule cannot be applied to alkyl cyclohexanols.

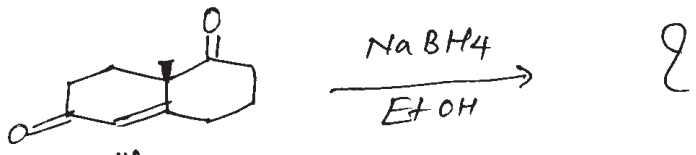
e) Explain the following observation

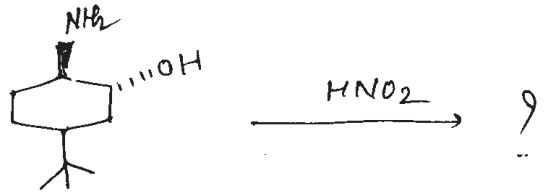
i) $\text{Cholestan} - 3\beta - 7\alpha\text{-diol} \xrightarrow[\text{Ethylchloroformate}]{\text{excess}} 3.\text{monocathylate}$

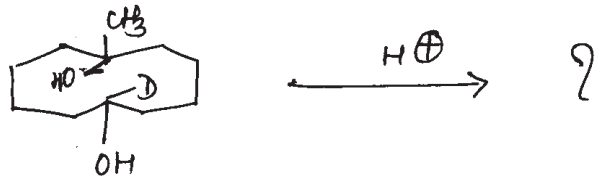
ii) $\text{Cholestan} - 3\beta - 7\beta.\text{diol} \xrightarrow[\text{Ethylchloroformate}]{\text{excess}} 3,7\text{dicathylate.}$

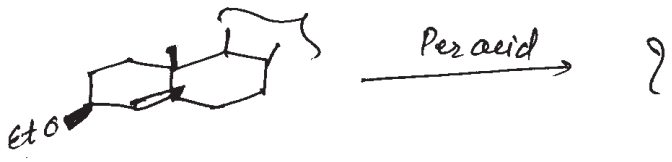
Q2) Predict the product/s in any four of the following and explain stereochemical principles involved. Justify. **[12]**

a) 

b) 

c) 

d) 

e) 

Q3) Answer <u>any three</u> of the following : **[12]**

a) Estimation of the relative stabilities of Cis and trans-deealin.

b) Write short note on -2-alkylketone effect.

c) Explain the Steric approach control and product development control with suitable examples.

d) Discuss the use of Chiral solvating reagents.

SECTION - II

Q4) Answer the following (Any three) : **[12]**

a) Give the relative configuration of C_5 and C_6 in codeine.

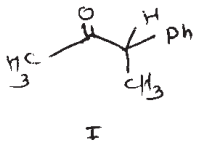
b) Prove that Cinchonine and Cinchodine have different configuration at C_8.

c) Give the evidence to prove that C_3-Vinyl and C_8-C_9 bond are on the same side.

d) How ^{1}HNMR is useful to illustrate obsolute stereochemistry of lacton fusion in Enhydrin.

Q5) Answer <u>any three</u> of the following (Any three) : **[12]**

a) i) Identify the following compounds as Re /s; faces; Pro-R/Pro-S



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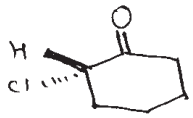
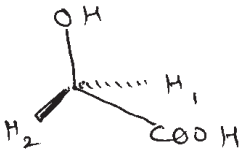


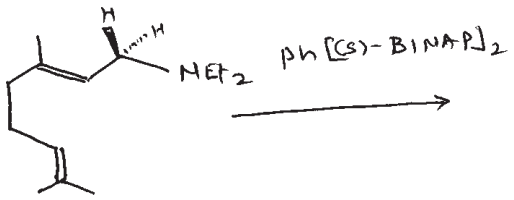
ii) Assign Pro-R/Pro-S configuration to H_1 and H_2 in following compound.



b) Explain the terms with example.

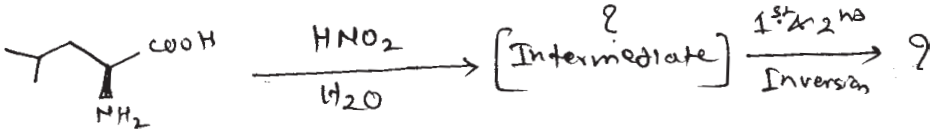
i) Optical purity
ii) Homo topic ligands
iii) Diastereo topic ligands

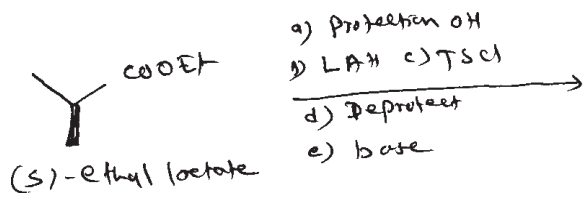
c) Give the major and minor products in the following reactions and calculate the ee

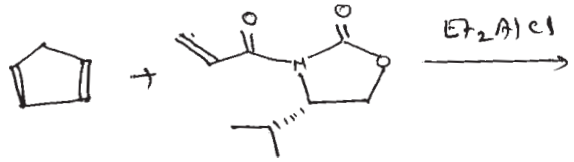


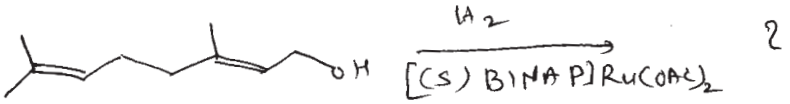
d) Explain, how Felkin Ahn Model differs form Gram's model.

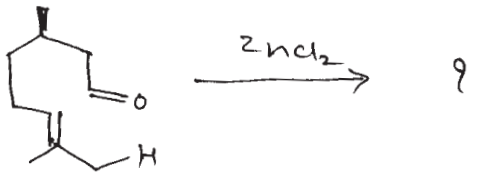
Q6) a) Predict the product/s and write stereochemistry of the following reaction (Any Four) : **[8]**

i) 

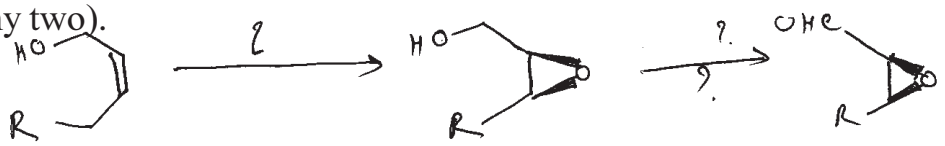
ii) 

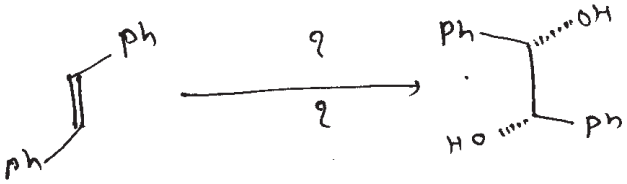
iii) 

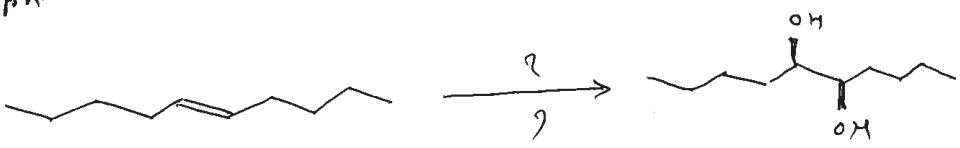
iv) 

v) 

b) Suggest reagent & explain stereochemistry of the following reactions (Any two). **[8]**

i) 

ii) 

iii) 

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Total No. of Questions : 6] **[Total No. of Pages : 3**

P976

[4025]-313
M.Sc. - II (Sem. - III)
ORGANIC CHEMISTRY
CH - 353 : Free Radicals, Photochemistry and Pericyclic reactions and their 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 separate answer books.***

SECTION - I

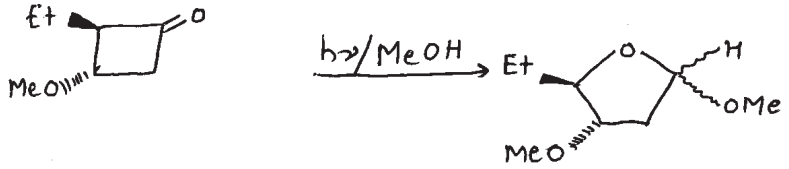
Q1) a) Write short notes on <u>any two</u> of the following : **[8]**

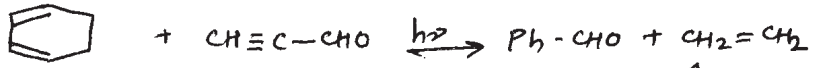
i) Diradicals.
ii) Photosensitiser.
iii) Lumiketone rearrangement.

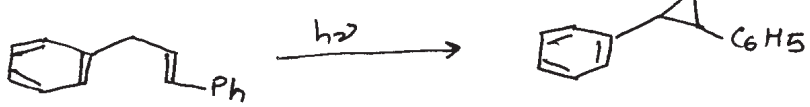
b) Explain <u>any two</u> of the following : **[6]**

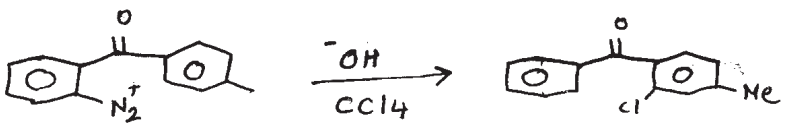
i) Gas phase irradiation of 2-pentanone gives three products.
ii) O-xylene on irradiation gives mixture of o, m & P-xylenes.
iii) When 2, 4-dinitro tritiobenzene is arylated with benzoyl peroxide, two products are formed in equal quantities.

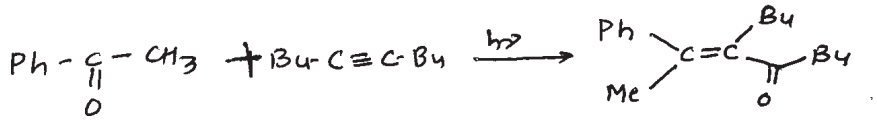
Q2) Suggest suitable mechanism for <u>any four</u> of the following : **[12]**

a) 

b) 

c) 

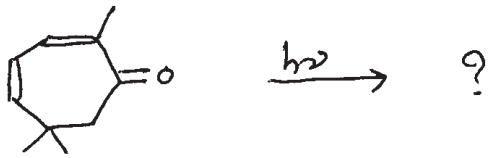
d) 

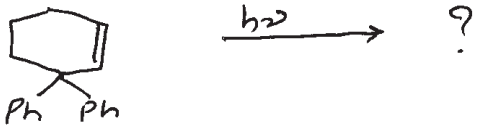
e) 

P.T.O.

Q3) a) What is importance of photosensitiser in photochemistry, which type of compounds can behave as photosensitisers. **[4]**

b) Predict the product/s indicating mechanism in any five of the following : **[10]**

i) 

ii) 

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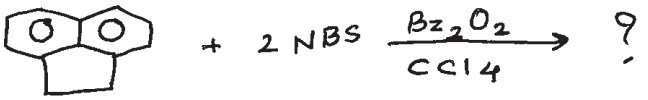
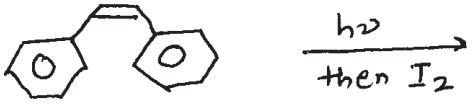
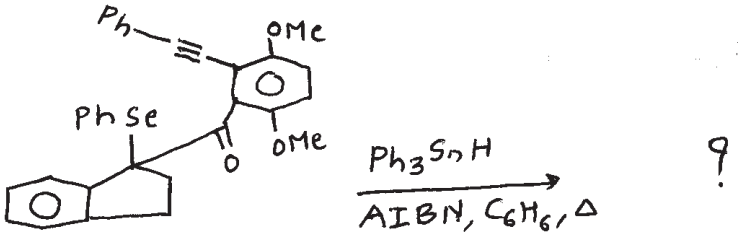
iv) 

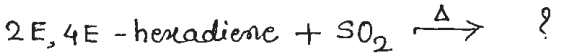
v) 

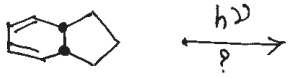
vi) 

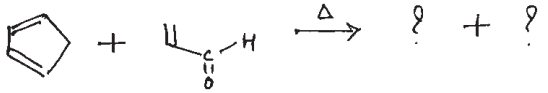
SECTION - II

Q4) a) With the help of FMO, predict whether (2+2) cycloaddition reaction of two ethylenes will be thermally or photochemically allowed. **[6]**

b) Predict the products in any four of the following. Explain their stereochemistry and mechanism. **[8]**

i) 

ii) 

iii) 

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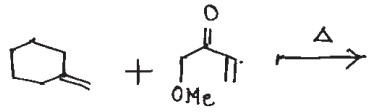
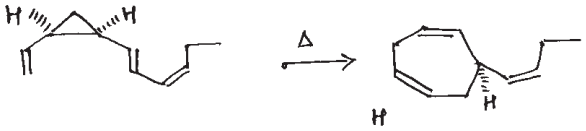
v) 

Q5) a) Draw corelation diagram for disrotatory ring opening of 1,3-cyclohexadiene to give 1, 3, 5-hexatriene. Justify whether the reaction is thermally or photochemically allowed. **[4]**

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

i) 

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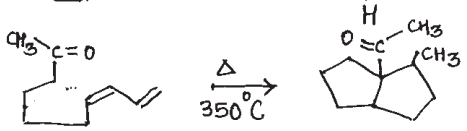
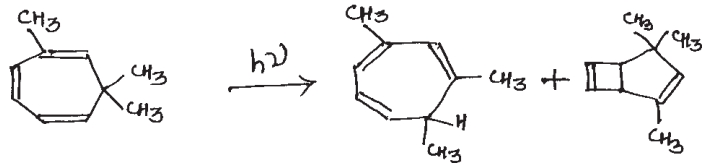
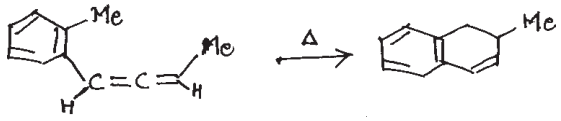
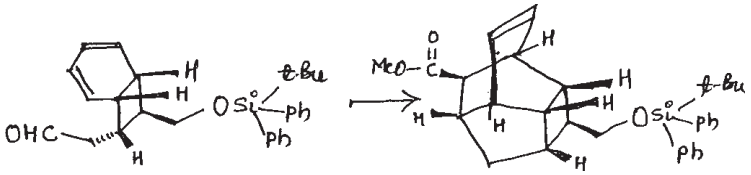
iii) 

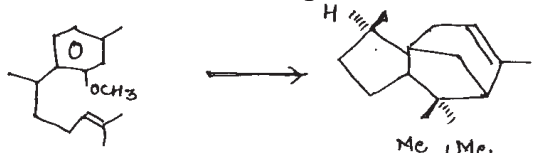
iv) 

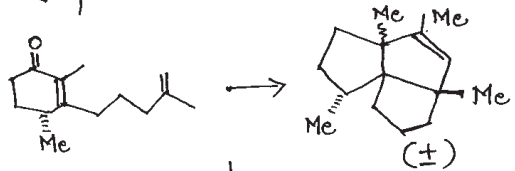
v) 

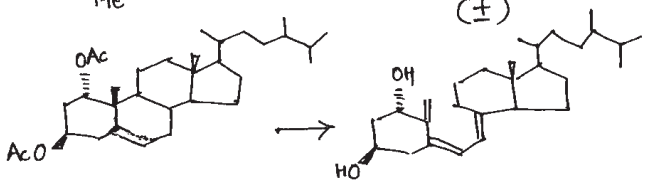
Q6) a) Outline the synthesis indicating reagents required and intrermediate involved. **[6]**



b) Complete any two synthetic sequences mentioning reagents and intermediates formed in steps. **[8]**

i) 

ii) 

iii) 

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Total No. of Questions : 4] **[Total No. of Pages : 3**

P977

[4025]-314
M.Sc. - II (Sem. - III)
ANALYTICAL CHEMISTRY
CH - 390 : Electro Analytical and Current Analytical Methods in Industries
(2008 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Answers to the two sections should be written in separate books.***

SECTION - I

Q1) Attempt any four of the following : **[20]**

a) Give the Ilkovic equation and Koutecky equation. Explain the terms involved in each equation.

b) Define diffusion current. Discuss the factors affecting on diffusion current.

c) Explain with schematic diagram the principle of differential polarography. Give its advantages.

d) Calculate the diffusion current for the reduction of 0.002 M Pb(II). The diffusion coefficient for Pb(II) is 1.01×10^{-5} cm^2/s and the mercury characteristics are m = 1.90 mg/s and drop time is 3.47 s/drop.

e) The concentration of AS(III) in water can be determined by differential pulse polarography in 1MHCl. The initial potential is set to – 0.1V verses SCE, and is scanned toward more negative potentials at a rate of 5 mV/s. Reduction of AS(III) to AS(0) occurs at a potential of approximately -0.44V versus the SCE. The peak currents, corrected for the residual current, for a set of standard solutions are shown in the following table.

[AS(III)] (M)	ip (mA)
1.00×10^{-6}	0.298
3.00×10^{-6}	0.947
6.00×10^{-6}	1.830
9.00×10^{-6}	2.720

P.T.O.

What is the concentration of AS(III) in a sample of water if the peak current under the same conditions is 1.37 mA?

Q2) Attempt <u>any four</u> of the following : **[20]**

a) Give classification of voltammetric technique and explain cathodic stripping voltametry.

b) What are the applications of coulometric titrations?

c) Write a note on biamperometry and rotating microelectrode.

d) A 0.3619 g sample of tetrachloropicolinic acid, $C_6HNO_2Cl_4$, is dissolved in distilled water, transferred to a 1000 ml volumetric flask, and diluted to volume. A exhaustive controlled potential electrolysis of a 10.00 ml portion of this solution at a spongy silver cathode requires 5.374 C of charge. What is the value of *n* for this reduction reaction?

e) Calculate the time required to convert 1.25 g of Pu^{4+} from solution to Pu^{3+} on electrode by applying 5μA current.
[Given: atomic weight of Pu = 241]

SECTION - II

Q3) Attempt <u>any four</u> of the following : **[20]**

a) Discuss the neutron activation analysis technique. Give its advantages.

b) Discuss the principle of isotope dilution analysis with reference to determination of trace amount of penicillin in a fermentation broth.

c) Write a critical note on radiometric titrations.

d) What is the activity for a 10.0 mg sample of pigment from a painting containing 1.50% chromium after a 24.0h irradiation in a flux of 1×10^{14} neutrons $cm^{-2}s^{-1}$?

Chromium-51 has a half life of 27.8 days; chromium-50, the target isotope, has a natural abundance of 4.31% and thermal neutron cross section of 17b.

e) A 0.6 cm^3 solution containing 7.5 μCi/cm^3 of ^{59}Fe was injected into the blood stream of a horse. After equilibriation, 1 cm^3 of blood was withdrawn and it gave 13239 counts in 3 min. Calculate the blood volume in the body of horse. [Given : $\in$ = 10%, 1Ci = 3.7×10^{10} dps].

Q4) Attempt <u>any four</u> of the following : **[20]**

a) Explain the following terms.

i) Turbidance.
ii) Turbidity coefficient.
iii) Tyndal scattering.

b) What is meant by thermal analysis? Discuss difference between DTA and DSC.

c) What are thermometric titrations? Explain the applications of thermometric titrations.

d) Explain the principle and applications of spectro-electrochemistry.

e) TGA of Gypsum showed mass loss of about 21% of original sample mass for complete dehydration of the Gypsum at about 170ºC. Determine the number of water molecules present in Gypsum.
[At. wt. of Ca = 40, S = 32, O = 16 and H = 1].

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Total No. of Questions : 4] **[Total No. of Pages : 3**

P978

[4025]-315
M.Sc. - II (Sem. - III)
ANALYTICAL CHEMISTRY
CH - 391 : Environmental and Analysis of Industrial Materials
(2008 Pattern) (New Course)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***All questions are compulsory and carry equal marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic tables, non-programmable calculators is allowed.***

SECTION - I

Q1) Attempt any four of the following : **[20]**

a) Explain the term compound fertilizers? Explain the Na-tetraphenyl borate method used for determination of potassium from mixed fertilizers.

b) Explain in details the method for determination of CaO in the sample of cobalt glass.

c) Give the suitable analytical method for determination of sulphate from cosmetics.

d) Explain the term explosive. How is heat of explosion measured by adiabatic calorimeter?

e) 10 ml of 0.01 M $ZnSO_4$ solution required 9.5 ml of EDTA solution for complete reaction. 0.260 gm of sample containing magnesium was dissolved in 100 ml of acid. An aliquot of 10 ml of same solution required 12 ml EDTA solution. Calculate percentage of magnesium in the sample. [Given : At. wts. Mg = 24.31]

Q2) Attempt any four of the following : **[20]**

a) What is meant by active ingredient of detergent? How is it determined?

b) Describe importance of pigment volume concentration in surface coating industries.

c) What are cosmetics? Give the procedure for estimation of calcium from cosmetics.

P.T.O.

d) A sample of detergent weighing 8.550 g was dissolved in water and solution was diluted to 1000 ml in a volumetric flask, 10 ml of an aliquot of this solution required 12 ml of 0.005 N CETAB solution for complete reaction. Calculate percentage of combined SO_3 present in the sample.
[Given : At. wts. O = 16, S = 32]

e) 0.145 g of nitrogen fertilizer was dissolved in acid and made strongly alkaline with NaOH. The solution was heated and liberated ammonia was absorbed in exactly 50 ml of 0.050 N H_2SO_4. The unused H_2SO_4 was back titrated with 0.05 N NaOH and burette reading was 22 ml. Calculate the percentage of nitrogen in the sample.
[Given: At. wts. N = 14]

SECTION - II

Q3) Attempt <u>any four</u> of the following : **[20]**

a) Enlist the constituents of ilmenite ore. Describe in brief the estimation of Iron from ilmenite ore.

b) Describe the method of determination of nickel from cupronickel alloy.

c) Outline the analytical procedure for the determination of <u>any one</u> of the following :

i) Chromium from steel.
ii) Iron from bauxite ore.

d) 0.205 gm cupronickel alloy was dissolved by acid treatment and the solution was diluted to 100 ml. In iodometric determination of Cu, 10 ml diluted solution required 9.5 ml of 0.025 N $Na_2S_2O_3$ for complete reaction. In gravimetric estimation of Ni as Ni-DMG 25 ml diluted solution gave 0.120 gm of Ni-DMG ppt. after removal of Cu. Calculate percentage of Cu and Ni from alloy.
[Given : At. wt Cu = 63.5, Ni = 58.6, Mol.wt of NiDMG = 288.6]

e) From the following data calculate chemical oxygen demand (COD) for the sample of waste water. 200 ml of sample was refluxed with 25 ml 0.25 N $K_2Cr_2O_7$ solution and 25 ml cone. H_2SO_4 solution. The solution was titrated with ferrous ammonium sulphate solution. The burette reading was 12 ml. A 25 ml of the same $K_2Cr_2O_7$ solution required 22.4 ml of ferrous ammonium sulphate solution.

Q4) Attempt <u>any four</u> of the following : **[20]**

a) Explain analytical method for estimation of arsenic from waste water.

b) Give an account of estimation of dissolved oxygen (D.O).

c) How NO_X is generated? Explain its hazardous effect on material. How is it controlled?

d) Write note on (<u>any one</u>) :

i) Electrostatic precipitator.

ii) Catalytic converter.

e) Describe in brief any two methods used for disposal of sludge.

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Total No. of Questions : 4] **[Total No. of Pages : 3**

P979

[4025]-316
M.Sc. - II (Sem. - III)
ANALYTICAL CHEMISTRY
CH - 392 : Advanced Analytical Techniques
(2008 Pattern)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***All questions are compulsory and carry equal marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non-programmable calculator/logarithmic table is allowed.***
5) ***Use of graph paper is allowed.***

SECTION - I

Q1) Attempt any four of the following : **[20]**

a) State and explain Kirchhoff's laws. State their significance in relation with the conservation of mass and energy.

b) What is Zener diode? Describe it's current voltage characteristics. Give it's important applications.

c) Explain the terms :

i) Resistors.
ii) Inductors.
iii) Capacitors.
iv) Conductors.
v) Transformers.

d) Calculate the resistance of 0.04 μf capacitor at a frequency 6 kHz and 4 mHz.

e) Three capacitors of 7μf, 12μf and 21μf are connected in parallel. Find the equivalence capacitance.

Q2) Attempt any four of the following : **[20]**

a) Write a brief note on prospects of IC technology.

b) Explain the working of digital computer with neat block diagram.

c) Write a note on continuous flow analyzer.

d) Explain the role of microprocessor control in potentiometry.

P.T.O.

e) A 15Ω resistance and 0.5 Hz inductance coil is connected to 230 V. Also 50 cycle per sec. supply is applied. Find out

i) Impedance.

ii) Current.

SECTION - II

Q3) Attempt any four of the following : **[20]**

a) Explain how mercury is analysed by the cold vapour method in AAS. Why is the toxicity of mercury difficult to deal with?

b) Compare the techniques of Atomic mass spectrometry and molecular mass spectrometry.

c) Describe the principle, sources, cell, monochromators and detectors used in transition tunable laser.

d) A well water sample is analysed by flame photometry for sodium at 589.5 nm. The emission signal is 4.5 unit on emission scale. A series of standard solution gives the following results.

Standard Sodium in ppm	Emission reading
0.2	0.42
1.0	1.50
5.0	6.60

Determine the sodium level in ppm in well water sample.

e) The AAS method was used to determine the concentration of Strontium in sample. Determine the amount of Strontium from the following data.

Solution	Flask A	Flask B	Flask C	Flask D	Flask E
Sample/ml	20	20	20	20	20
Std. Sr 5×10^{-3} mg/ml	-	1	2	3	4
Water (ml)	5	4	3	2	1
Absorbance(A)	0.311	0.470	0.630	0.788	0.949

Q4) Attempt any four of the following : **[20]**

a) State and explain the principle of supercritical fluid chromatography. Mention it's advantages and limitations.

b) Mention the elements required as important micronutrients for the healthy growth of crops. Describe any one suitable method for the determination of Boron from the soil sample.

c) Explain the principle of single immuno-diffusion and double immunodiffusion technique of analysis. Mention their important applications.

d) A serum sample was analysed for potassium by FES using standard addition technique. Evaluate the concentration of Potassium in the sample solution A from the following data.

	Solution A	Solution B
Water	5 ml	5 ml
Sample	0.5 ml	0.5 ml
KCl solution (0.05 millimoles/ml)	-	10 µl
FES signal	32.1	58.6

e) A 17 ppm solution of lead gives atomic absorption signal of 9% absorption. What is atomic absorption sensitivity?

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Total No. of Questions : 4] **[Total No. of Pages : 2**

P980

[4025]-317
M.Sc. - II (Sem. III)
ANALYTICAL CHEMISTRY
CH - 380 : Pharmaceutical Analysis
(2008 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory and carry equal marks.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Use of logarithmic table/non-programmable calculator is allowed.***

SECTION - I

Q1) Attempt any four of the following : **[20]**

a) Explain in detail particulate and microbial contamination in pharmaceutical products.

b) How shelf life of drug is estimated?

c) Give biological assay of titanus antitoxin.

d) Describe in detail limit test for Arsenic.

e) 1.12 g sodium benzoate sample was dissolved in 20 ml distilled water and 20 ml ethanol. The solution was titrated with 0.5 m hydrochloric acid solution using bromophenol blue indicator. At the end point, the burette reading recorded was 13.5 ml. Determine the percentage of sodium benzoate in the sample.

Q2) Answer any four of the following : **[20]**

a) What is Karl-Fischer reagent? How is it standardized using water-methanol reagent?

b) What is ash value? How acid insoluble ash in rhubarb sample is determined?

c) Write in brief the procedure for determination of thiomersal.

d) Explain tube-assay method for microbial assay of antibiotics.

P.T.O.

e) 0.92 g of ascorbic acid ($C_6H_8O_6$) sample was dissolved in 25 ml distilled water and diluted to 100 ml. 10.0 ml of diluted sample solution was titrated with 0.1 N iodine solution using starch as an indicator. The titration reading was 9.8 ml. Calculate the percentage of ascorbic acid in the given sample.

SECTION - II

Q3) Attempt any four of the following : **[20]**

a) Describe in detail dissolution test for capsules.

b) What are aerosols? Mention their different categories according to their applications.

c) Give an account of ointments and creams.

d) What are tablets? Explain different types of tablets.

e) From 100 ml given saline water sample, 10 ml sample was pipetted out and titrated against 0.1 N silver nitrate solution using potassium chromate as an indicator. The titration reading was 9.2 ml. Determine the amount of sodium chloride in the given sample.

Q4) Answer any four of the following : **[20]**

a) Explain the role of diluents in tablet preparation.

b) What are opthalmic preparations? Mention precautions to be taken at the time of preparation, storage and applications.

c) Define sterilization and give membrane sterilization process for pharmaceutical products.

d) Explain the role of FDA in new drug development.

e) An accurately weighed (0.11 g) of phenobarbitone ($C_{12}H_{12}N_2O_3$) sample was dissolved in 30 ml dimethyl formamide. The solution was then titrated against 0.1 N lithiam methoxide solution using quinaldine red indicator. The burette reading was 8.5 ml. Determine the percentage of phenobarbitone in the sample.

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Total No. of Questions : 4] **[Total No. of Pages : 2**

P981

[4025]-319
M.Sc. (Sem. - III)
BIOCHEMISTRY
BCH - 370 : Molecular Biology
(New) (2008 & 2010 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right hand side indicate full marks.***
3) ***Draw neat labelled diagrams wherever necessary.***

Q1) Answer any four of the following : **[20]**

a) Which segments of DNA constitute gene? Discuss the role of each segment.

b) How diptheria toxin functions as inhibitor of protein biosynthesis.

c) Justify the statement, "all eukaryotic mRNAs are not polyadenylated".

d) What do you understand by the term degradosome? Explain its role.

e) What is origin locus? Give its characteristics.

Q2) Answer any two of the following : **[20]**

a) Explain in detail the stages of molecular assembly of DNA polymerase holoenzyme before the initiation of DNA synthesis.

b) Enlist the different functional ribosomal active sites and state their functions.

c) Explain in detail how amino acid is activated so as to participate in protein biosynthesis.

Q3) Explain the important role played by following proteins : **[20]**

a) Sigma factor and nusA.

b) eRF.

c) IF_2

d) Lex A.

e) Dna A.

P.T.O.

Q4) Write short notes on (any four) : **[20]**

a) Protein targeting to lysosomes.

b) Mechanism of splicing.

c) Proteasome.

d) Nucleosome.

e) Inhibitors of protein biosynthesis.

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P982

[4025]-320
M.Sc. (Sem. - III)
BIOCHEMISTRY
BCH - 371 : Medical Biochemistry and Immunology
(2008 & 2010 Pattern) (New)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures on the right side indicate full marks.***
3) ***Answers for each sections must be written in separate answer sheets.***

SECTION - I

(Medical Biochemistry)

Q1) Answer any three of the following : **[3 × 5 = 15]**

a) Discuss the significance of cerebrospinal fluid examination in various disorders.

b) Describe critically the interpretations of diagnosis of the following enzymes in serum.

i) Lactate dehydrogenase.
ii) Creatine kinase.
iii) Aspartate transaminase.

c) Elaborate on the physiological role of hydrolytic enzymes of lysosomes.

d) Enumerate the steps involved in formation and lysis of blood clot.

Q2) Answer any three of the following : **[3 × 5 = 15]**

a) What are hemoglobinopathies? Discuss the molecular basis of any one type.

b) Explain the mechanism of antibiotics that affect transcription.

c) Discuss the etiology and development of cancer.

d) Describe the concept of programmed cell death.

Q3) Answer any two of the following : **[2 × 5 = 10]**

a) Arteriosclerosis.

b) Alzheimer's disease.

c) Analgesics.

P.T.O.

SECTION - II

(Immunology - New)

Q4) Answer any three of the following : **[3 × 5 = 15]**

a) Where do T cells and B cells mature in the body? How are they responsible for desired immune response of the host system?

b) Elaborate on the cascade of proteolytic reactions that occur during compliment activation.

c) What are monoclonal antibodies? How are they developed?

d) Differentiate between competitive ELISA and indirect ELISA techniques.

Q5) Answer any three of the following : **[3 × 5 = 15]**

a) List out the different isotypes of Immunoglobulius in humans. Explain the structural feature of any one.

b) Explain the different types of Immunodiffusion techniques and give their significance.

c) What are interferons? Explain their role in prevention of viral proliferation.

d) Discuss the features of immunodeficiency diseases with suitable example.

Q6) Answer any two of the following : **[2 × 5 = 10]**

a) Western blotting.

b) Graft rejection.

c) Blood group substances.

Total No. of Questions : 4] **[Total No. of Pages : 2**

P983

[4025]-321
M.Sc. (Sem. - III)
BIOCHEMISTRY
BCH - 372 : Neurochemistry
(New) (2010 Pattern)

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

Instructions to the candidates:

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

Q1) Answer any four of the following : **[20]**

a) Describe sensory areas and association areas of the brain.

b) What is diencephalon? Explain any one component in brief.

c) Write a note on cytology of neuron.

d) What do you mean by membrane potential?

e) How chemical messengers operate at molecular level?

Q2) Attempt any two of the following : **[20]**

a) Describe the organization of the nervous system.

b) Which neurotransmitters are excitatory and which are inhibitory? How do they exert their effects?

c) Describe the ions, channels and integral protein pumps that contribute to generation of a resting membrane potential.

Q3) Answer any two of the following : **[20]**

a) Describe the ultra structure, function and ion selectivity of acetylcholine receptor.

b) What is acetylcholine? Explain the steps involved in transmission of nerve impulses.

c) The nerve gases that were developed for chemical warefare generally inhibit acetylcholinesterase. Why does inhibition of acetylcholinesterase produce death.

P.T.O.

Q4) Write short notes on <u>any four</u> : **[20]**

a) Cerebrospinal fluid.

b) Short term memory.

c) Glutamate receptor.

d) Synaptic plasticity.

e) Biochemistry of taste.

Total No. of Questions : 6] **[Total No. of Pages : 2**

P983

[4025]-321
M.Sc. (Sem. - III)
BIOCHEMISTRY
BCH - 372 : Signal Transduction Pathways (New)
Membrane Biochemistry and Specialized Tissues (Old)
(2004 & 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.***
4) ***Candidates of old course should attempt membrane Biochemistry as section-I and section-I (Signal Transduction Pathways) of new course as section-II (Specialized Tissues) of old course.***

SECTION - I

Q1) Answer any two of the following : **[10]**

a) Explain overall structure of rhodopsin, its functional regions and its orientation in disc membrane.

b) Explain the role of Ca^{++} in muscle contraction.

c) Explain the physiology of gustation.

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

a) Explain the mechanism of nerve impulse transmission.

b) Describe electron microscopic structure of presynaptic terminals.

c) Explain sliding filament theory in brief.

d) Explain action potential and resting membrane potential.

Q3) Write short notes on any three : **[15]**

a) Microscopic structure of retina.

b) Biochemistry of hearing.

c) Neurotransmitters.

d) Cell motility.

P.T.O.

SECTION - II

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

a) Describe in detail carbohydrate and amino acid metabolism in the brain.

b) Explain in detail the turnover and regulation of neuropeptides in brain.

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

Q5) a) Write short note on sensory modalities and perception.

b) Write short note on chemical composition of brain.

c) Describe different types of receptors and their properties.

d) Write an account on neural plasticity learning.

Write short notes on any three : **[15]**

Q6) a) Sensory perception.

b) Peripheral nervous system.

c) EEG patterns.

d) Mechanism of action of acetylcholine.

SECTION - I

(Membrane Biochemistry)

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

a) Explain in detail fluid mosaic model of membrane structure.

b) Describe molecular mechanism of valinomycin.

c) Write short note on ATP/ADP exchanger.

d) Explain the role of cerebrospinal fluid in detail.

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

a) How is the transport of solute across the membrane checked?

b) Explain the mechanism of protein targeting.

c) Describe in detail the chemiosmotic hypothesis of mitchell.

d) Write short note on transport of any three drugs in bacterial cell.

Q3) Write short notes on any two : **[10]**

a) Gap junctions.

b) Bacterial toxins.

c) Flip-Flop.

Total No. of Questions : 4] **[Total No. of Pages : 2**

P984

[4025]-322
M.Sc. (Sem. - III)
BIOCHEMISTRY
BCH - 373 : Biochemical Toxicology
(New) (2008 & 2010 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right hand side indicate full marks.***
3) ***Draw neat labelled diagrams wherever necessary.***

Q1) Answer any four of the following : **[20]**

a) What do you understand the terms acute and chronic toxicity? How are they evaluated?

b) Distinguish between :

i) Local toxicity and systemic toxicity.
ii) Paisonous animals and venomous animals.

c) Explain the relation between dose and response.

d) How toxicants are classified?

e) Discuss the idiosyncratic reactions.

f) Explain with suitable examples the receptor antagonism and chemical antagonisms.

Q2) Attempt any four of the following : **[20]**

a) What are the components of oxidative type of air pollution? How are they generated?

b) What are the toxic effects of O_3 and peroxyactylnitrate?

c) Discuss the factors enfluencing metal toxicity.

d) Explain the biochemical reactions involved in benzene biotransformation.

e) How mutagenic potential of chemical agent is evaluated?

f) How animals develop tolerance against toxicats?

P.T.O.

Q3) Answer any four of the following : **[20]**

a) What are the toxic effects of nickel?

b) Give the composition of snake venom.

c) What are the general and specific toxicities of solvents and vapors.

d) Give the mechanism of biotransformation catalyzed by sulfotransferase.

e) What are the occupational applications of toxicology?

f) What is the fate of lead in human body?

Q4) Give the pathogenesis and clinical manifestations of any five of the following : **[20]**

a) Farmer's lung.

b) Urticaria and phototoxicity caused by plants.

c) Hypotension and shock due to snake venom.

d) Aplastic anemia and leukemia due to benzene.

e) Perivascular disease due to arsenic.

f) Cardiovascular disorders by plant toxins.

g) Hematopaietic effects of lead.

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P984

[4025]-322
M.Sc. (Sem. - III)
BIOCHEMISTRY
BCH - 373 : Recent Trends in Biochemistry and Toxicology
(2004 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

(Recent Trends in Biochemistry)

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

a) Describe β pleated structure of proteins and its stabilisation.

b) Discuss role of heat shock proteins in protein folding.

c) Give an account on principle and applications of NMR spectroscopy.

d) Describe instrumentation in ESR spectroscopy.

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

a) Principle of ORD and its measurement.

b) Principle and design of spectrofluorimeter.

c) Explain advantage of coupling GC with MS.

d) Describe biosensor for blood glucose estimation.

Q3) Write short notes on any two : **[10]**

a) MALDI-TOF and its significance.

b) Transducer and its role in biosensor designing.

c) Patent specifications.

P.T.O.

SECTION - II

(Toxicology)

Q4) Answer any five of the following : **[15]**

a) Define the toxic agent. What are the different ways to classify toxic agents?

b) How acute and chronic toxicity is evaluated?

c) Explain the biochemical reactions involved in parathion biotransformation.

d) Distinguish between :

i) Immediate and delayed toxicity.

ii) Reversible and irreversible toxicity.

e) Explain the mechanism of oxidative type of biotransformation catalyzed by cytochrome P - 450.

f) Give the mechanism of toxic effects caused by methanol and chloroform.

g) Give the occupational applications of toxicology.

Q5) Give the pathogenesis and clinical manifestations of any three : **[15]**

a) Personality disorder by murcuary vapors.

b) Farmer's lung and asbestosis.

c) Renal dysfunction due to lead.

d) Liver necrosis and liver cirrhosis.

e) Hypersensitivity due to metals.

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

a) What is the fate of arsenio in the body?

b) Explain the toxio effects caused by carbomate insecticides.

c) Which toxics are ceneted by amphibians? What are their toxic effects?

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Total No. of Questions : 6] **[Total No. of Pages : 2**

P985

[4025] - 324

M.Sc. (Sem. III)

BIOCHEMISTRY

BCH - 375 : Nutrition and Clinical Nutrition

(2004 & 2008 Pattern)

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

Instructions to the candidates:

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

SECTION - I

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

a) Explain the methods of determining protein quality.

b) Describe various factors that affect protein metabolism.

c) Write a short note on food toxins.

d) What is BMR? Explain the factors affecting it.

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

a) Explain the classification of dietary lipids and their sources.

b) Describe in detail conditional nutritional disorders of diabetes.

c) Describe in detail the deficiency disorders of vitamin A and ascorbic acid and give thier biochemical basis of causation.

d) Explain in detail the physiological functions of lipids.

Q3) Write short notes on (any two) : **[10]**

a) Disorders due to B-complex group of vitamins deficiency.

b) Allergy.

c) Anaemia.

P.T.O.

SECTION - II

Q4) Answer the following (any three) : **[15]**

a) What do you understand by the term neutral transquilizers? Give the physiological action and adverse effects and precautions of phenothiazone and resersine.

b) Write an account on malnutrition and infection.

c) Describe acidic and alkaline foods.

d) Explain the effects of fermentation and irradiation on food quality.

Q5) Answer the following (any three) : **[15]**

a) What are dietary fibers? Explain their chemistry and give their beneficial and harmful effects.

b) Describe in detail the digestion and absorption of proteins.

c) Explain the effects of cooking on proteins, fats, carbohydrates and vitamins.

d) Explain in detail infant nutrition.

Q6) Write short notes on (any two) : **[10]**

a) Adverse effects of alcohol and tobacco.

b) Cholesterol metabolism.

c) Inborn errors of metabolism.

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Total No. of Questions : 6] **[Total No. of Pages : 4**

P986

[4025] - 401
M.Sc. (Sem. - IV)
PHYSICAL CHEMISTRY
CH - 410 : Molecular Structure and Spectroscopy (New)
(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) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of logarithmic tables/calculator is allowed.***

Physico - Chemical Constants

1.	Avogadro Number	N	=	6.022×10^{23} mol^{-1}
2.	Boltzmann Constant	k	=	1.38×10^{-16} erg K^{-1} molecule^{-1}
			=	1.38×10^{-23} J K^{-1} molecule^{-1}
3.	Planck Constant	h	=	6.626×10^{-27} erg s
			=	6.626×10^{-34} J s
4.	Electronic Charge	e	=	4.803×10^{-10} esu
			=	1.602×10^{-19} C
5.	1 eV		=	23.06 k cal mol^{-1}
			=	1.602×10^{-12} erg
			=	1.602×10^{-19} J
			=	8065.5 cm^{-1}
6.	Gas Constant	R	=	8.314×10^{7} erg K^{-1} mol^{-1}
			=	8.314 J K^{-1} mol^{-1}
			=	1.987 cal K^{-1} mol^{-1}
7.	Faraday Constant	F	=	96487 C equiv^{-1}
8.	Speed of light	c	=	2.997×10^{10} cm s^{-1}
			=	2.997×10^{8} m s^{-1}
9.	1 cal		=	4.184×10^{7} erg
			=	4.184 J
10.	1 amu		=	1.673×10^{-27} kg
11.	Bohr magneton	β_e	=	-9.274×10^{-24} J T^{-1}
12.	Nuclear magneton	β_n	=	5.051×10^{-27} J T^{-1}
13.	Mass of an electron	m_e	=	9.11×10^{-31} kg

P.T.O.

SECTION - I

Q1) Attempt <u>any three</u> of the following : **[15]**

a) Explain the nature of ABX and A_3 type of nmr spectra and deduce the situations when ABX spectrum is reduced to A_3.

b) Define chemical shift in nmr. Explain the factors affecting it.

c) Write a note on : FT nmr.

d) What is the experimental set up used in the nuclear magnetic resonance spectroscopy? Explain with a suitable diagram.

e) Discuss the applications of nqr with suitable examples.

Q2) Attempt <u>any three</u> of the following : **[15]**

a) Explain the terms zero field splitting, Kramer's degeneracy and hyperfine coupling constant involved in esr spectroscopy.

b) Describe the instrumentation used in esr spectroscopy and explain the working of a Klystron.

c) What is the principle of photoacoustic spectroscopy? How it is useful in the study of gases and condensed systems?

d) What is g-value? Explain the factors affecting g-values.

e) Define and explain the following terms related to esr spectroscopy.

i) Spin Hamiltonian.

ii) Spin densities.

Q3) Solve <u>any two</u> of the following : **[10]**

a) Predict the number of signals with relative intensities in the low resolution nmr spectra of the following isomers.

i) $CH_3CH_2CH_2OH$ and $(CH_3)_2CHOH$

ii) CH_3CH_2OH and $CH_3 - O - CH_3$

iii)  and

b) Calculate the Frequency required to excite a proton from $m_1 = 1/2$ to $m_1 = -\frac{1}{2}$

[Given : $g_N = 5.585$, Magnetic field applied = 1.8T].

c) Predict the nature of esr spectra of $^{14}NH_3$ and $^{15}NH_3$.

Given : ^{14}N, I = 1, A = 20G (for ^{14}N–H)

^{15}N, I = ½, A = 6G (for ^{15}N–H)

^{1}H, I = ½.

SECTION - II

Q4) Attempt any three of the following : **[15]**

a) Discuss an XRD method for investigating the internal structure of crystals.

b) Draw a neat labelled diagram of an x-ray powder camera. When does it satisfy the condition 1° equal to 1 mm?

c) Write an equation for the structure factor 'F_{hkl}' for j atoms in a unit cell and the electron density distribution within a crystal and explain the terms involved therein.

d) Explain how electron diffraction technique is more advantageous than x-ray diffraction.

e) Draw and explain with a neat labelled diagram of the experimental arrangement for the study of diffraction of gases.

Q5) Attempt any three of the following : **[15]**

a) Give the differences between x-ray diffraction and neutron diffraction techniques.

b) Discuss the applications of neutron diffraction technique.

c) Derive the equation to calculate the susceptibility of a liquid sample relative to a liquid reference.

d) Discuss the advantages and disadvantages of non-uniform field method.

e) Describe the Gouy method to determine χ_g.

Q6) Attempt <u>any two</u> of the following : **[10]**

a) Calculate the mass and volume paramagnetic susceptibilities of a complex salt with three unpaired electrons at 27°C.

Given : Molar mass = 127 gms, density = 1.72 gm cm^{-3}.

b) Calculate the molar diamagnetic susceptibility of ethylene diamine.

Given : χ_A of C = -6.00×10^{-6} cgs/g.atom,

χ_A of H = -2.93×10^{-6} cgs/g.atom and

χ_A of N(open chain) = -5.57×10^{-6} cgs/g.atom.

c) X-rays of wavelength 1.539 Å are used to calculate the spacing of (211) planes in aluminium. The Bragg angle for first order reflection is 22.4°. What is the size and volume of the aluminium crystal?

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Total No. of Questions : 6] **[Total No. of Pages : 4**

P987

[4025] - 402
M.Sc. (Sem. - IV)
PHYSICAL CHEMISTRY
CH - 411 : Surface and Electro Chemistry (New)
(2008 Pattern)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***All questions are compulsory.***
3) ***Figures to the right indicate full marks.***
4) ***Use of logarithmic table/calculator is allowed.***
5) ***Neat diagrams must be drawn wherever necessary.***

Physico - Chemical Constants

1.	Avogadro Number	N	=	6.022×10^{23} mol^{-1}
2.	Boltzmann Constant	k	=	1.38×10^{-16} erg K^{-1} molecule^{-1}
			=	1.38×10^{-23} J K^{-1} molecule^{-1}
3.	Planck Constant	h	=	6.626×10^{-27} erg s
			=	6.626×10^{-34} J s
4.	Electronic Charge	e	=	4.803×10^{-10} esu
			=	1.602×10^{-19} C
5.	1 eV		=	23.06 k cal mol^{-1}
			=	1.602×10^{-12} erg
			=	1.602×10^{-19} J
			=	8065.5 cm^{-1}
6.	Gas Constant	R	=	8.314×10^{7} erg K^{-1} mol^{-1}
			=	8.314 J K^{-1} mol^{-1}
			=	1.987 cal K^{-1} mol^{-1}
7.	Faraday Constant	F	=	96487 C equiv^{-1}
8.	Speed of light	c	=	2.997×10^{10} cm s^{-1}
			=	2.997×10^{8} m s^{-1}
9.	1 cal		=	4.184×10^{7} erg
			=	4.184 J
10.	1 amu		=	1.673×10^{-27} kg
11.	Bohr magneton	β_e	=	-9.274×10^{-24} J T^{-1}
12.	Nuclear magneton	β_n	=	5.051×10^{-27} J T^{-1}
13.	Mass of an electron	m_e	=	9.11×10^{-31} kg

P.T.O.

SECTION - I

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

a) What is Gibbs monolayer? Show that in dilute solutions the monolayer obeys the equation of state of a two-dimensional ideal gas.

b) What is detergency? Explain the role of micelle in detergent action.

c) Starting with chemical potential, derive the equation for isosteric heat of adsorption.

d) Discuss briefly the localized bond approach for chemical adsorption.

e) Write B.E.T. equation. Explain the terms involved in it. State its limitations.

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

a) How is the surface area of a solid determined by Harkins-Java equation?

b) Discuss the capillary condensation theory to explain the phenomenon of hysteresis.

c) Explain heterogeneous catalysis with the help of geometrical theory.

d) State at least three catalysts with the reactions for heterogeneous catalysis. What is the method for naming catalysts?

e) Explain how zeolites are used as molecular sieves.

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

a) The following table gives the volume of nitrogen (reduced to 0°C and 1 bar) adsorbed per gram of active carbon at 0°C at a series of pressures.

P/Pa	524	1731	3058	4534	7497
V/cm^3g^{-1}	0.987	3.04	5.08	7.04	10.31

Plot the data according to the Langmuir isotherm and determine the constants.

b) An insoluble compound X spreads on water to give a gaseous type film at low concentrations. When 10^{-7}g of X is added to 200 cm^2 surface, the surface tension at 25°C is lowered by 0.20 dyne cm^{-1}. Calculate the molecular weight of X.

c) At 21°C, surface tensions of aqueous solutions of $C_6H_5CH_2CH_2COOH$ vs solute molality are

m/(mmol/kg)	11.66	15.66	19.99	27.40	40.8
r/(dyne/cm)	61.3	59.2	56.1	52.5	47.2

Find Γ for a solution with 20 m mol of solute per kilogram of water.

SECTION - II

Q4) Attempt any three of the following : **[15]**

a) Describe Eley and Evans thought experiment to study the various aspects of the ion-dipole interactions.

b) Discuss the postulates of Debye-Huckel theory. Write the expression for activity coefficient. When the ion is considered as a point charge, explain the terms involved in it.

c) Derive the Einstein relation between the absolute mobility and diffusion coefficient.

d) What is exchange current density? How is the concept understood using Butler-Volmer equation?

e) Derive the total equation from the Butler-Volmer equation.

Q5) Attempt any three of the following : **[15]**

a) What is electrical double layer? How is it formed at electrode - electrolyte interface? Describe Helmholtz model for it.

b) Explain the terms :

i) Galvani potential. ii) Outer potential.

iii) Surface potential. iv) Electrochemical potential.

c) What are electron sink and electron source area? Describe the local cell theory of corrosion.

d) What are fuel cells? Describe any one fuel cell.

e) Give mechanisms of the following electrochemical conversions

i) benzene to aniline

ii) phenol to benzene

Q6) Solve any two of the following : **[10]**

a) Calculate the value of thickness of ionic atmosphere at 300 K in 0.01 molar of NaBr solution (given : dielectric constant of water = 78.54).

b) If the total constants a and b have values 1.54 V and 0.119 V respectively for the reduction of hydrogen ion at lead cathod, calculate the transfer coefficient (α) and the exchange current density at 300 K.

c) The following reaction may be made to operate in fuel cell at 298 K.

$CH_4 + 2O_2 \rightarrow CO_2(g) + 2H_2O(l)$

$\Delta H_{300} = -890.4$ kJ mol^{-1}, $\Delta G_{300} = -818.0$ $kJmol^{-1}$

Calculate

i) The number of electrons transfered over all in cell reaction.

ii) The reversible emf of the cell at 300 K.

iii) Maximum efficiency of the cell.

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Total No. of Questions : 4] **[Total No. of Pages : 3**

P988

[4025] - 403
M.Sc. (Sem. - IV)
PHYSICAL CHEMISTRY
CH - 414 : Biophysical Chemistry and Related Techniques
(New) (2008 Pattarn)

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

Instructions to the candidates:

1) ***Answers to the TWO sections should be written in SEPARATE answer books.***
2) ***ALL questions are COMPULSORY.***
3) ***Figures to the RIGHT SIDE indicate FULL marks.***
4) ***Use of logarithmic table/calculator is ALLOWED.***
5) ***Neat diagrams must be drawn WHEREVER necessary.***

Physico - Chemical Constants

1.	Avogadro Number	N	=	6.022×10^{23} mol^{-1}
2.	Boltzmann Constant	k	=	1.38×10^{-16} erg K^{-1} molecule^{-1}
			=	1.38×10^{-23} J K^{-1} molecule^{-1}
3.	Planck Constant	h	=	6.626×10^{-27} erg s
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			=	1.602×10^{-19} C
5.	1 eV		=	23.06 k cal mol^{-1}
			=	1.602×10^{-12} erg
			=	1.602×10^{-19} J
			=	8065.5 cm^{-1}
6.	Gas Constant	R	=	8.314×10^{7} erg K^{-1} mol^{-1}
			=	8.314 J K^{-1} mol^{-1}
			=	1.987 cal K^{-1} mol^{-1}
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			=	2.997×10^{8} m s^{-1}
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12.	Nuclear magneton	β_n	=	5.051×10^{-27} J T^{-1}
13.	Mass of an electron	m_e	=	9.11×10^{-31} kg

P.T.O.

SECTION - I

Q1) Attempt any four of the following : **[20]**

a) Compare RNA and DNA.

b) Compare animal cell and plant cell.

c) Write a note on reverse osmosis and Donnan membrane equilibrium.

d) Deduce Hender sons equation.

e) Prove that $R_{mp} = \sqrt{\frac{2N}{3}} \times l$.

f) Explain the factors affecting enzyme activity.

Q2) Attempt any four of the following : **[20]**

a) Distinguish between primary, secondary and tertiary proteins.

b) Discuss hydrophobic interactions. What are amphipathic groups?

c) Explain the term membrane potential.

d) Write a note on applications of dialysis.

e) How is muscle contraction controlled by Ca^{++} concentration involving tropomin-tropomyosin complex?

f) Explain the importance of phospho anhydride bonds in energy metabolism by the ATP molecule.

SECTION - II

Q3) Attempt any four of the following : **[20]**

a) Using the unit membrane model, explain the structure of the cell membrane.

b) Enlist five important functions of a cell membrane.

c) Define the terms :

i) axolemma. ii) synapse.

iii) action potential. iv) all and none law and

v) impulse.

d) Discuss briefly the factors affecting enzyme activity.

e) What is enzyme inhibition? Explain competitive inhibition.

f) Briefly discuss the methods for determining the shapes and sizes of biopolymer particles.

Q4) Attempt <u>any four</u> of the following : **[20]**

a) Describe the viscosity method to determine the molecular weight of biopolymers.

b) How is the molecular weight of a protein determined by gel electrophoresis?

c) Write a note on rotational diffusion of molecules.

d) Discuss the theory of optical rotary dispersion.

e) Differentiate between micelles and bilayers with respect to their structure and function.

f) Explain membrane equilibrium with the help of one example.

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Total No. of Questions : 6] **[Total No. of Pages : 4**

P993

[4025] - 408
M.Sc. (Sem. - IV)
ORGANIC CHEMISTRY
CH - 450 : Chemistry of Natural Products
(New Course) (2008 Pattern)

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

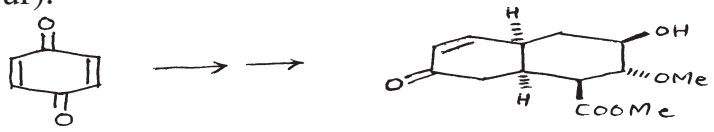
Instructions to the candidates:

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.***

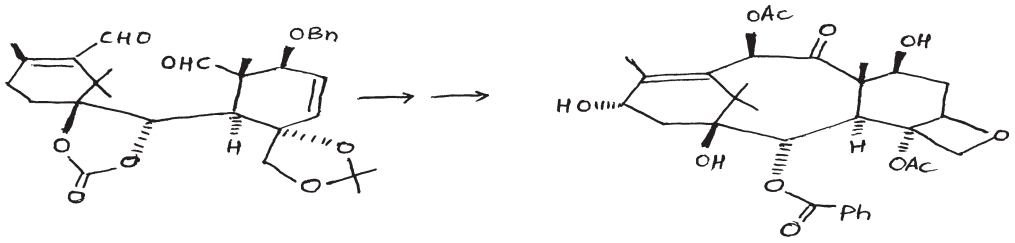
SECTION - I

Q1) Outline the steps involved in the following synthetic sequences. Indicate the reagents used and discuss the mechanism and stereochemistry involved (any four). **[16]**

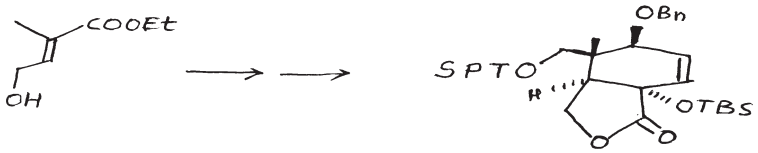
a)



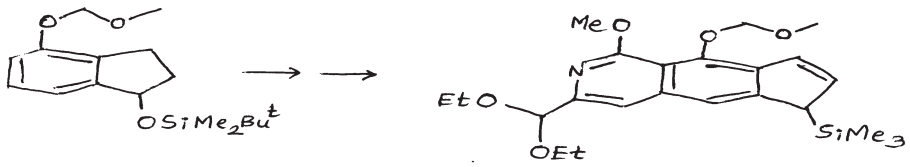
b)



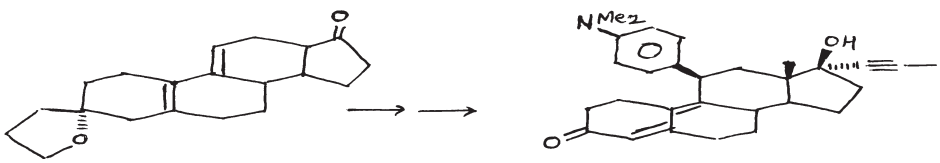
c)



d)



e)



P.T.O.

Q2) Answer <u>any three</u> of the following : **[12]**

a) Give the evidence to show the presence of pyrroloquinoline ring in hydroxy camptothecein.

b) Give evidences to establish the presence of a substituted furan ring and an α, β-unsaturated carboxyl group in Hardwickiic acid.

c) Give evidences to establish the relative stereochemistry of the four possible isomers of deoxy podophyllotoxin.

d) Using spectral methods explain the presence of

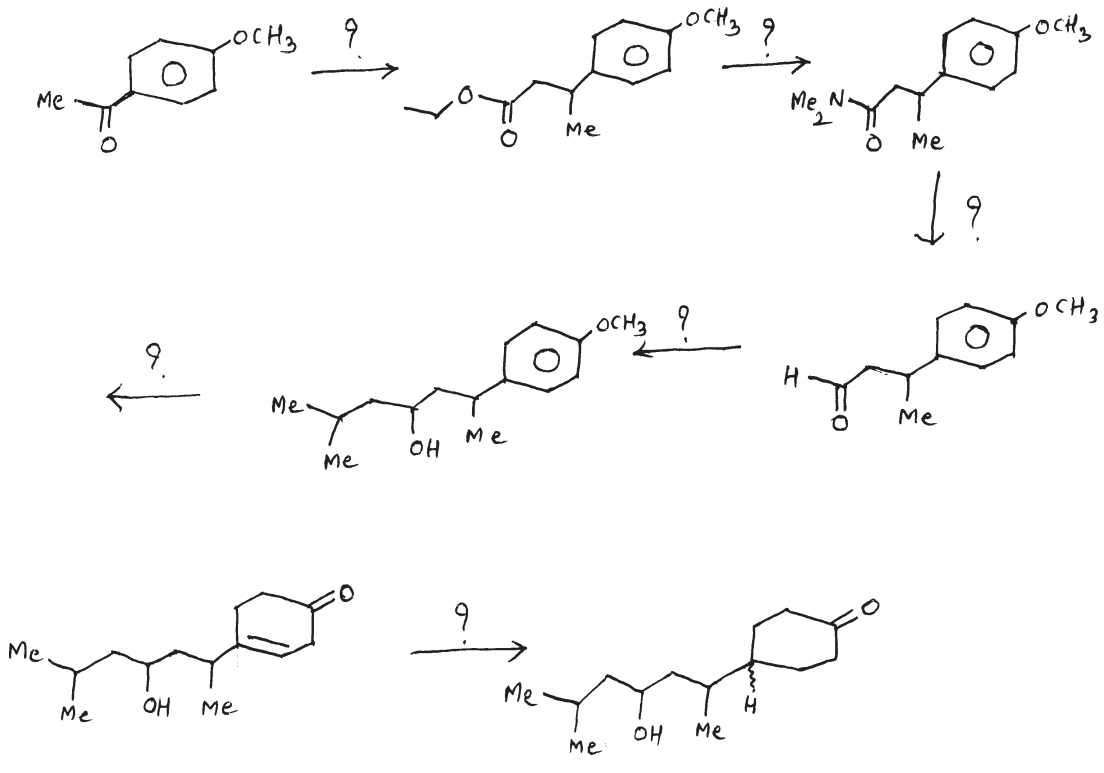
i) quinoline ring conjugated to pyridone ring.

ii) lactone ring and

iii) Ar CH_2–N(|)–CO– group in

Camtothecin

Q3) a) Following is the partial synthesis of a natural product by morietal. Place the reagents at the appropriate positions and explain the steps. **[6]**

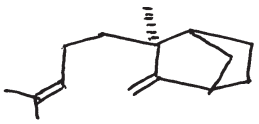


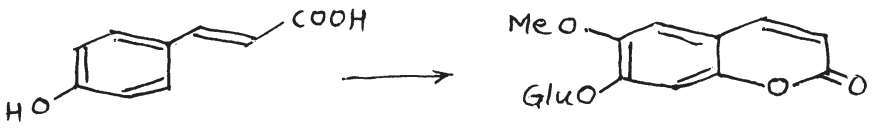
b) Discuss the retrosynthetic analysis of strychnine. Explain the strategic reactions involved in the synthesis of strychnine. **[6]**

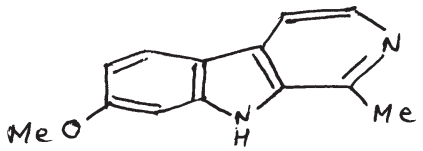
SECTION - II

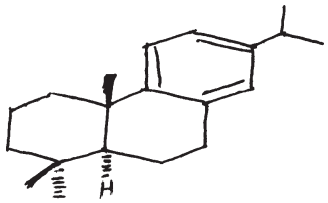
Q4) a) Explain the importance of phenolic oxidative coupling in biosynthesis of natural products with two examples. **[4]**

b) Suggest biogenetic scheme for <u>any three</u> of the following : **[12]**

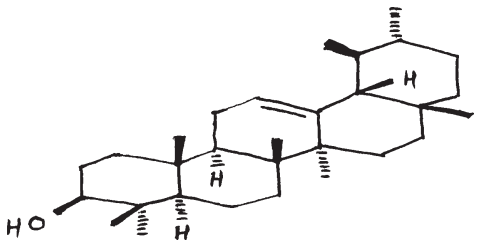
i) 2Z, 6E – FPP ⟶ 

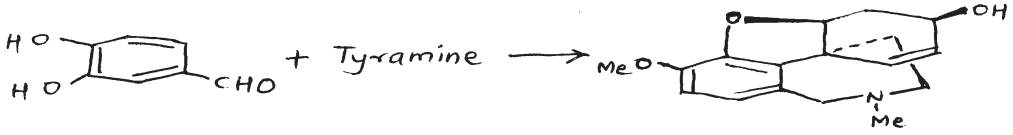
ii) 

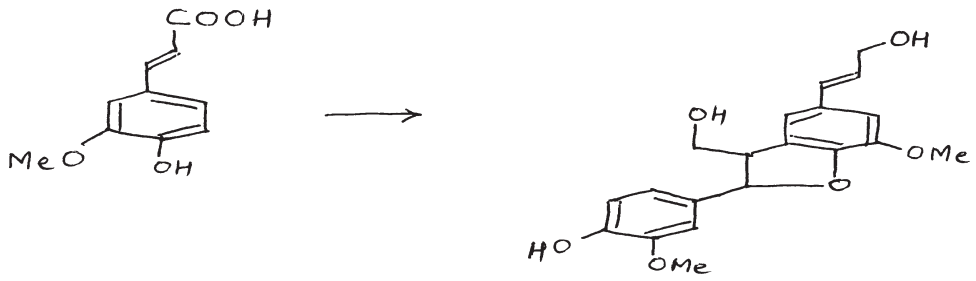
iii) Tryptophan ⟶ 

iv) Geranylgeranylpyrophosphate ⟶ 

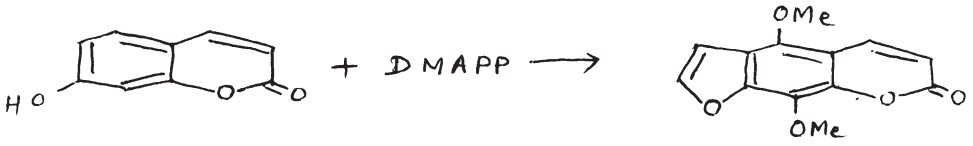
Q5) Write the steps involved in <u>any two</u> of the following biogenetic conversions. **[12]**

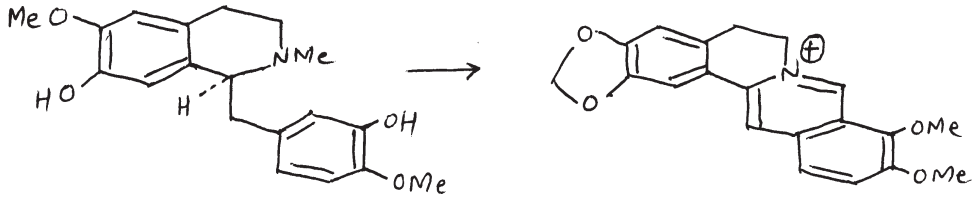
a) Squalene monoepoxide ⟶ 

b) 

c) 

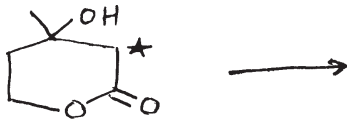
Q6) a) Write all steps in <u>any one</u> of the following biogenetic conversions. **[5]**

i) 

ii) 

b) Explain what is NIH shift with one example. **[2]**

c) Write all steps in the following biosynthetic sequence. **[5]**



Squalene

Indicate the position of label in each step and in the final product.

❖ ❖ ❖ ❖

Total No. of Questions : 6] **[Total No. of Pages : 5**

P994

[4025]-409
M.Sc. (Sem. - IV)
ORGANIC CHEMISTRY
CH - 451 : Synthetics Methods in Organic Chemistry
(2008 Pattern) (New Course)

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

Instructions to the candidates:

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

SECTION - I

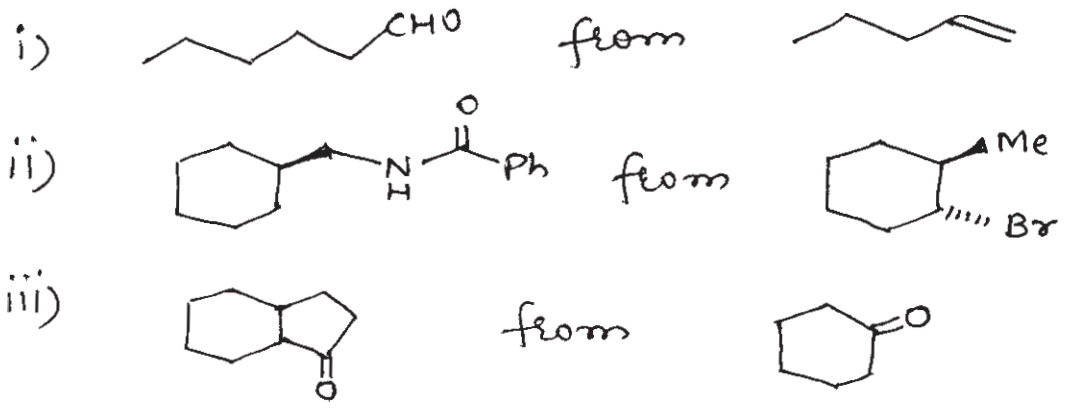
Q1) a) Explain any two of the following : **[6]**

i) Mannich reaction provides stable equivalents of exo-methylene ketones.

ii) Dilongifolyl borane can be used to prepare optically active alcohols.

iii) Oxo process gives good yield with unconjugated or simple olefins but is less successful with conjugated dienes.

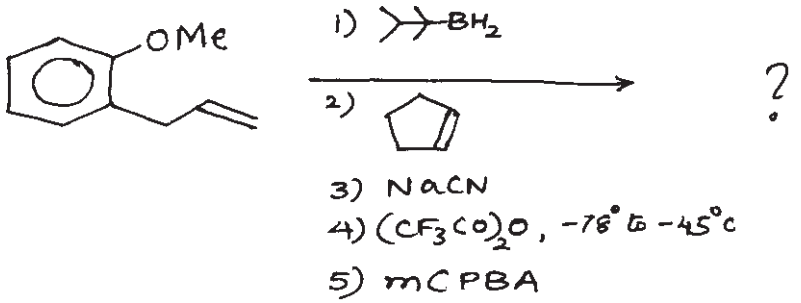
b) Provide a suitable synthesis using organo borane as a key step. Write all the reagents and intermediate products (any two) : **[6]**



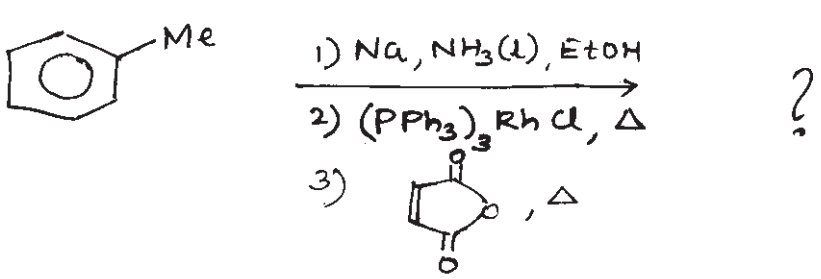
P.T.O.

Q2) a) Predict the products in any four of the following : **[12]**

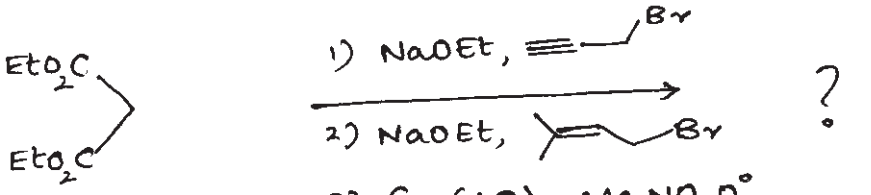
i)



ii)



iii)



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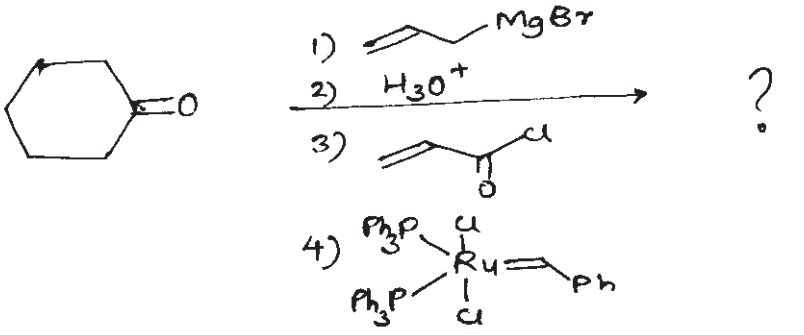
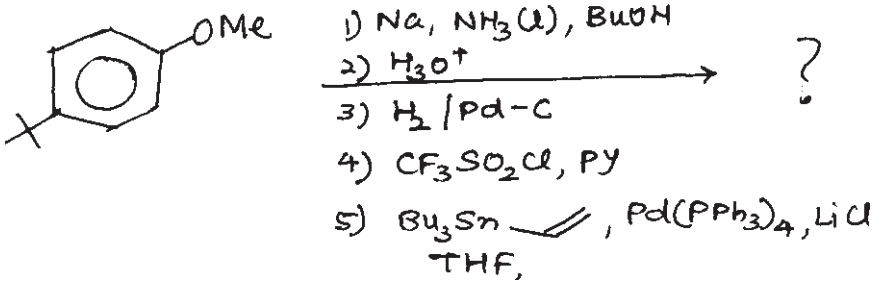


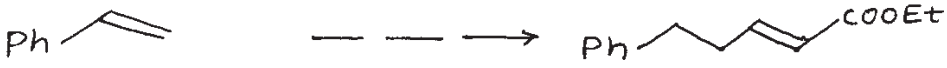
V)



b) Complete <u>any two</u> of the following transformations : **[4]**

i) 

ii) 

iii) 

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

i) Role of organoruthenium compounds in organic synthesis.
ii) Organo silicons in carbon-carbon double bond formation.
iii) Noyori annulation reaction.
iv) Role of organo allanes in organic synthesis.

b) Discuss various carbon-carbon bond formation reactions using organo palladium compounds.

OR

Discuss the role of $Ni(CO)_4$ in macrocyclic ring formation. **[3]**

SECTION - II

Q4) a) Answer <u>any two</u> of the following : **[6]**

i) Ketene dithioacetals could be used to prepare reagents having umpolung reactivity explain.
ii) Discuss the methods for 1, 2 and 1, 3 diol protection in nucleotide synthesis.
iii) Discuss the role of nitroalkanes in organic synthesis.

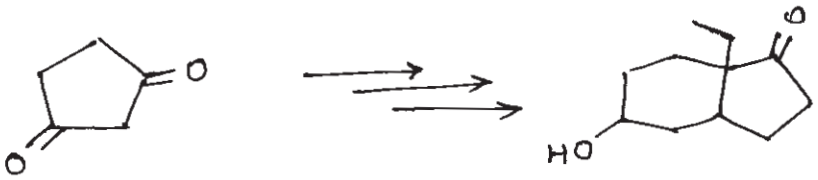
b) Explain the use of <u>any two</u> reagents : **[6]**

i) Tetrakis (triphenylphosphine) palladium (o).
ii) Tertiary butyl dimethyl silyl chloride.
iii) Collman's Reagent.

Q5) a) How will you carry out the following transformation (any two) : **[6]**

i)

ii)



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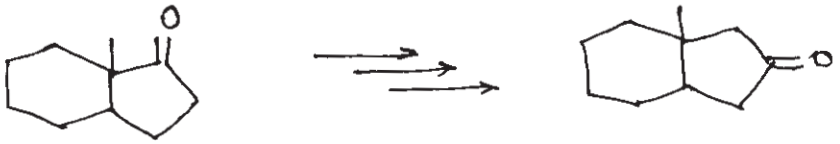


b) Complete the following using the reagents given below. Arrange the reagents in proper order. (any two) : **[6]**

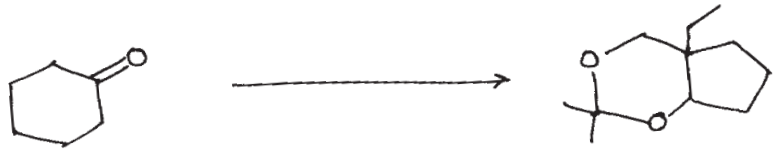
i)

Reagents : $(PPh_3)_3RhCl, H_2$; K_2CO_3 ; $TiCl_3, H_2O$; DIBAL ; CH_3NO_2, NaOH

ii)

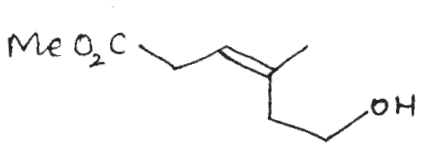
Reagents : LAH ; MeOH, H^+ ; ≡Li ; PPh_3, NBS ; DHP, TsOH ; NaH, Ph⌒Br ; HBr

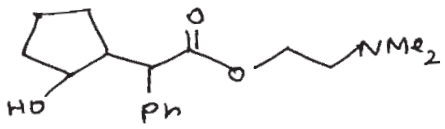
iii)

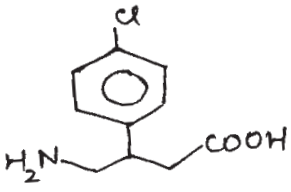


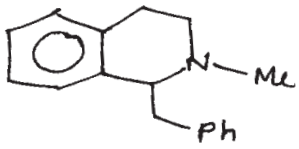
Reagents : LAH ;  , H^+ ; EtOH, H^+ ; $KMnO_4, H^+$; NaOEt, ⌒Br ; NaOEt

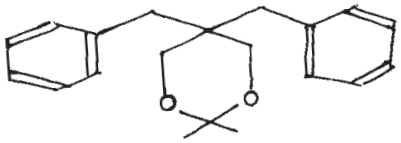
Q6) Using retrosynthetic analysis, suggest a suitable method to synthesize <u>any four</u> of the following. **[16]**

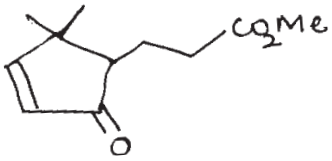
i) 

ii) 

iii) 

iv) 

v) 

vi) 

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Total No. of Questions : 6] **[Total No. of Pages : 5**

P995

[4025]-410

M.Sc. (Sem. - IV)

ORGANIC CHEMISTRY

CH - 452 : Heterocyclic Chemistry Chiron Approach and Medicinal Chemistry

(2008 Pattern) (New Course)

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) a) Explain the following (any three) : **[6]**

i) Pyridine on reaction with sodamide give 2-amino pyridine while piperidine on same reaction does not give 2-amino piperidine.

ii) Imidazole and pyrazole has boiling points 256º and 187º at 760mm respectively they are much higher than anticipated.

iii) Reactivity of pyrrole is much higher than pyridine, pyrimidine in electrophilic substitution reaction.

iv) Salicylaldehyde is a good starting material for benzofuran synthesis.

b) Attempt any two of the following : **[6]**

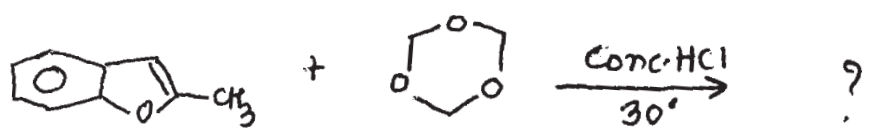
i) Benzyne on reaction with furan gives α-Napthol.

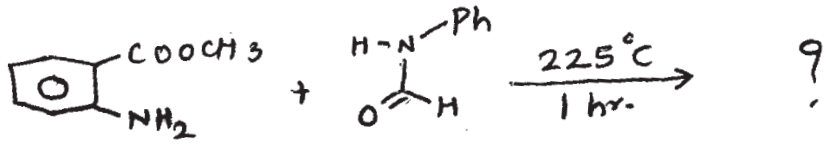
ii) Pictet spengler synthesis is of some importance in alkaloid field.

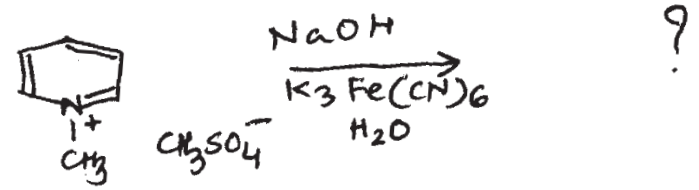
iii) Imidazole undergoes electrophilic substitution exclusively at 4 (5) - substitution.

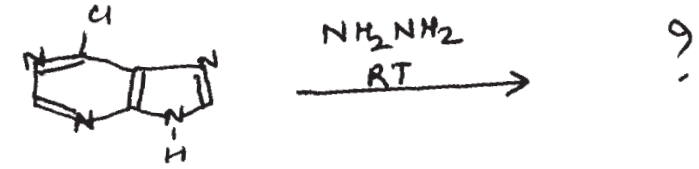
P.T.O.

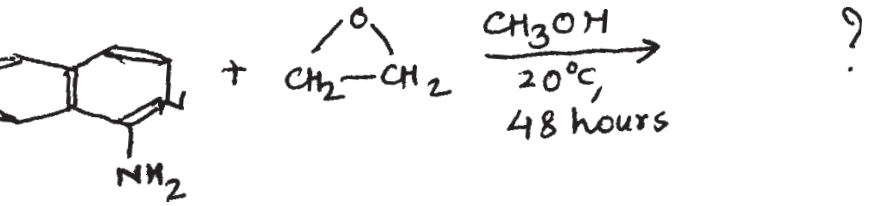
Q2) a) Predict the product/s in <u>any four</u> of the following : **[8]**

i) 

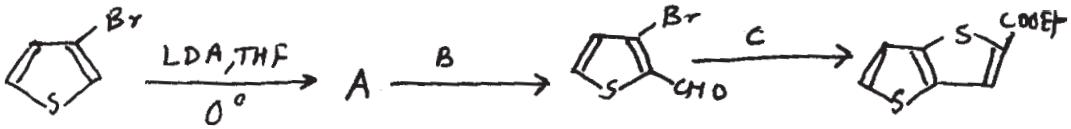
ii) 

iii) 

iv) 

v) 

b) Identify A, B, C in the following conversion. **[3]**

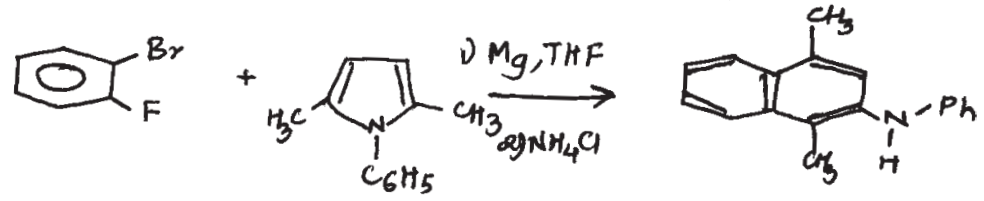


c) Give the reactions of the following reagents with Quinoline. **[3]**

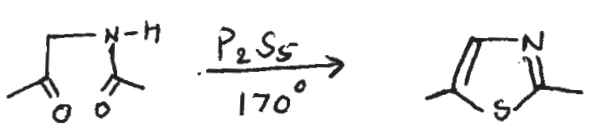
i) $NaNH_2$, DMA, Δ
ii) HNO_3, H_2SO_4 D', 30 min
iii) C_6H_5COCl; KCN, H_2O
iv) CH_3I; $C_6H_5M_gBr$

Q3) a) Suggest suitable mechanism for any two of the following : **[6]**

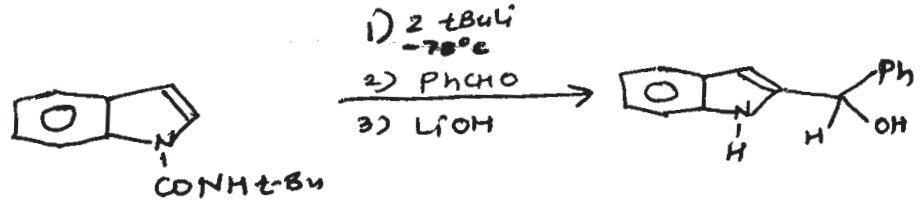
i)



ii)

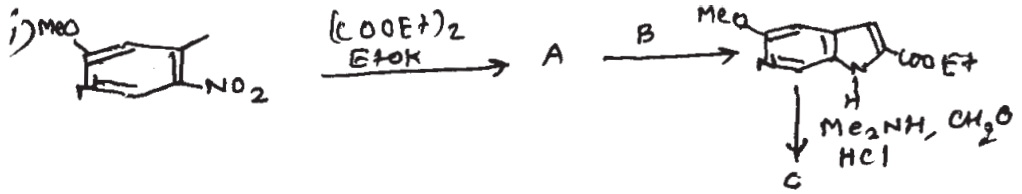


iii)

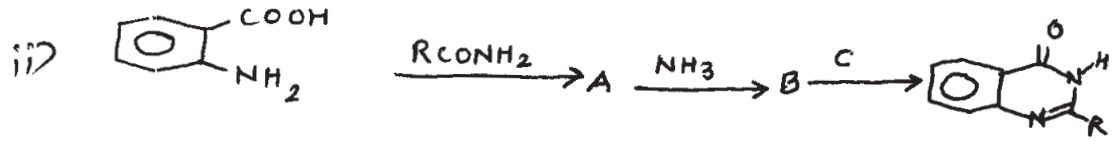


b) Complete the following reaction sequence (any two). **[4]**

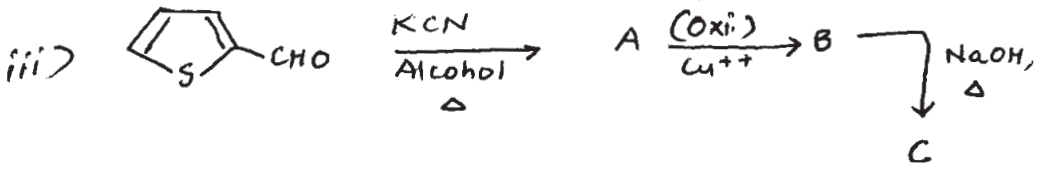
i)



ii)



iii)



c) Write notes on (any two) : **[4]**

i) Fschitschibabin reaction.
ii) Hantzsch pyrrole synthesis.
iii) Principles involved in supramolecular chemistry.

SECTION - II

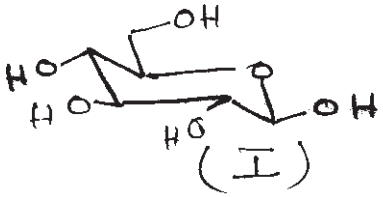
Q4) Answer <u>any four</u> of the following : **[16]**

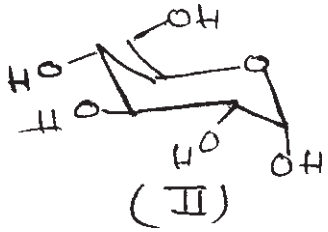
a) Write the following reaction sequence.

b) Write the structural formula for

i) α – D – (–) - fructopyranose.
ii) β – D – (–) - fructofuranose.

c) Explain the stability of I and II with the help of various hypothesis.





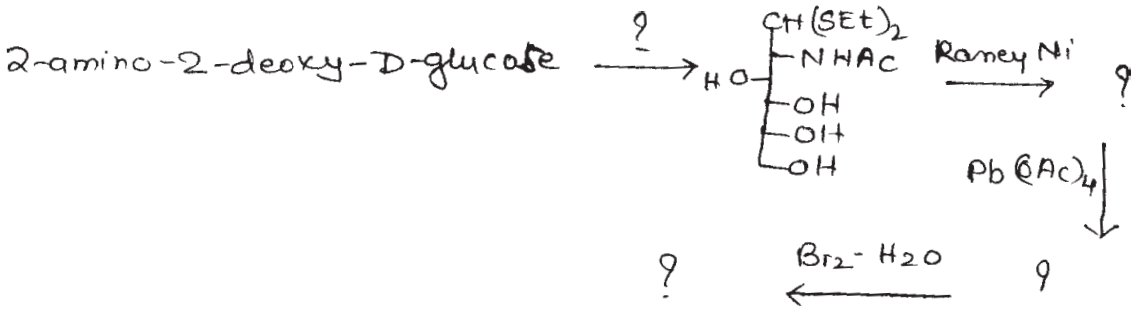
d) Give $^4C_1$ and $^1C_4$ conformations of D – (+) – Glucose and explain their stability.

e) Two isomeric compounds A and B with molecular formula $C_6H_{12}O_6$ give following reactions.

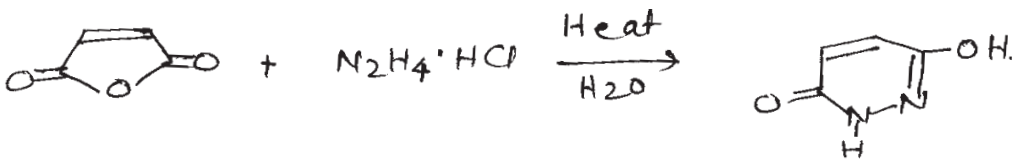
i) A & B → (+)ve Tollen's reagent test.
ii) A & B → same osazone.
iii) A & B → penta acetate with AC_2O/ACOH.
iv) A $\xrightarrow{(O)}$ optically inactive dicarboxylic acid.
B $\xrightarrow{(O)}$ optically active dicarboxylic acid.

Q5) a) Give the retrosynthesis of (–) shikimic acid. How will you prove the presence of α, β - unsaturated acid in it by physical and chemical methods. **[4]**

b) Complete the following sequence of reactions. Rewrite the sequence. **[4]**

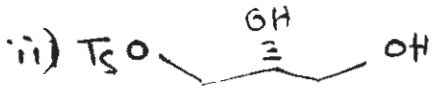


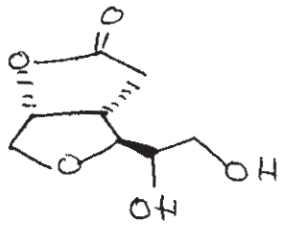
c) Explain the concept of atom economy for the following reaction. **[4]**



Q6) a) Predict the product in any four of the following write the mechanism in each step. **[8]**

i) D-mannitol $\xrightarrow{\text{O, } H^+}$? $\xrightarrow[\text{Benzene}]{Pb(OAc)_4}$?

ii)  $\xrightarrow[2)\ HOCH_2CH_2OH,\ Na]{1)\ Ph_3P,\ CCl_4}$?

iii)  $\xrightarrow[2)\ (MeO)_2P(O)COC_5H_{11}\ \text{followed by}\ ZnBH_4]{1)\ NaIO_4}$?

iv) D-(+)-Glucose $\xrightarrow[2)\ PhCHO,\ \text{anhyd. } ZnCl_2]{1)\ MeOH/H^+}$?

v)  $\xrightarrow[NaIO_4]{OsO_4}$?

b) Discuss the factors affecting the action of drug at active site. Explain specific effects of structure affecting drug action at active site. **[4]**

Total No. of Questions : 4] **[Total No. of Pages : 2**

P996

[4025]-411
M.Sc. - II (Sem. - IV)
ANALYTICAL CHEMISTRY
CH - 481 : Bioanalytical and Forensic Science
(2008 Pattern)

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

Instructions to the candidates:

1) ***Answers to the two sections should be written in separate answer books.***
2) ***All questions are compulsory and carry equal marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic table/non-programmable calculator is allowed.***

SECTION - I

Q1) Attempt any four of the following : **[20]**

a) Explain the term UHT. What is pasteurization? How is it verified?

b) Describe the method for the estimation of tannin from tea sample.

c) Outline a method for estimation of benzoic acid from food sample.

d) Write note on 'sweetening tablet'.

e) 0.3gm oil sample was treated with Wij's solution. After 30 minutes, it was treated with 10% KI solution and liberated iodine was titrated with 0.1M sodium thiosulphate. It gave burette reading 8.6 ml. If blank titration reading was 25ml. Calculate iodine value of oil. (Given : Atomic wt. of I = 126.9).

Q2) Attempt any four of the following : **[20]**

a) Discuss the chemistry of Vitamin-C with respect to structure, bio chemical functions and method of estimation.

b) Give the principle and analytical procedure for determination of phosphatase.

c) Explain the method for estimation of creatinine in urine sample.

d) Define the terms Iodometry and Iodimetry. Outline the analytical procedure for the estimation of iodine from iodized salt.

e) The chicory content was estimated in sample of coffee. The percentage of water extract obtained from sample was 43.2%. If the average value for % of water extract in chicory is 72.3% and pure coffee is 26.8%. Calculate the percentage of chicory in sample of coffee.

P.T.O.

SECTION - II

Q3) Attempt any four of the following : **[20]**

a) State the principle and explain the technique for extraction of caffeine from biological sample.

b) Explain the principle and procedure for determination of barbiturates by procedure B.

c) Outline type B procedure for isolation and determination of stimulants.

d) State the principle and detail procedure for determination of heroin.

e) Blood sample was analyzed for metamphetamine content using gas chromatographic method. It gave following observations :

i) Internal standard concentration = 1.89μg.
ii) Peak height for metamphetamine = 9.11
iii) Peak height for metamphetamine in internal standard reference solution = 4.40
iv) Peak height for internal standard in specimen = 2.82
v) Peak height for internal std. in reference solution = 1.42
vi) Volume correction factor = 0.57

Calculate concentration of metamphetamine in given blood sample.

Q4) Attempt any four of the following : **[20]**

a) Define the terms :

i) Canabis (Hemp),
ii) Manufacture,
iii) Opium derivative.
iv) Dutiable goods.

b) Explain the provision made in narcotic and psycotropic drug rules related to manufacture of manufactured drugs.

c) Give the rules related to building arrangements in non bonded laboratory.

d) State the rules related to export of medicinal and toilet preparations containg alcohol.

e) Explain the rules for "manufacture and storage of medicinal and toilet preparations".

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Total No. of Questions : 4] **[Total No. of Pages : 3**

P997

[4025]-412
M.Sc. - II (Sem. - IV)
ANALYTICAL CHEMISTRY
CH - 490 : Analytical Spectroscopy
(Old & New Course) (2008 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory and carry equal marks.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of logarithmic table/non-programmable calculator is allowed.***

SECTION - I

Q1) Attempt any four of the following : **[20]**

a) Name the detectors used in IR spectro-photometer and explain the principle on which they are based. With the help of a schematic diagram explain the working of a thermal detector.

b) Enlist the x-ray diffraction methods of crystal analysis. Discuss the powder method for crystal analysis and mention it's advantages and limitations over Bragg's method.

c) Explain the following phenomenon :

i) ESCA satellite peaks.
ii) ESCA chemical shifts.

d) A powdered silicon sample was exposed to Cu K_α x-rays in a powder camera. The radius of the camera was 57.3mm. The distance on the exposed film between the two opposite arcs of the most-intense diffracted cone of radiation was 32.73mm. Determine the spacing in silicon.

e) The mass absorptive coefficient of an alloy was found to be $51 cm^2/g$, which consists of 39 percent nickel and 61 percent copper at wavelength corresponding to K_α radiation of copper. The mass absorptive coefficient at that wavelength is $49.3 cm^2/g$ for nickel. Calculate the mass absorptive coefficient for copper.

P.T.O.

Q2) Attempt any four of the following : **[20]**

a) Give the energy level diagram of an insulator. Explain the terms Fermi level and work function.

b) What is fluorescence? Explain it's role in qualitative and quantitative analysis.

c) What are monochromators? Explain with special reference to prisms and gratings.

d) With a neat diagram explain electrostatic field analyser in electron spectroscopy.

e) X-ray diffraction technique is an analytical tool. Explain with suitable example.

SECTION - II

Q3) Attempt any four of the following : **[20]**

a) Give the classical approach to explain the NMR phenomenon.

b) What are the different methods to measure the relative intensities of coupling lines? Explain any one method in detail.

c) Name two types of scanning microscopes. How do they differ? List their advantages and disadvantages.

d) Explain general applications of ESR spectroscopy.

e) Calculate the energy of radiation that is required to excite a proton from the lower to the higher energy level if the applied field has a magnetic flux density of 14000G.

[Given μ for proton = 2.7927 magneton $\beta = 5.05 \times 10^{-31}$ J/G]

Q4) Answer any four of the following : **[20]**

a) What is meant by relaxation? Give an account of different relaxation methods in NMR technique.

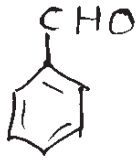
b) Distinguish between proton magnetic resonance spectra and non-protonic resonance spectra.

c) With a suitable schematic diagram explain the working of an ESCA spectrometer.

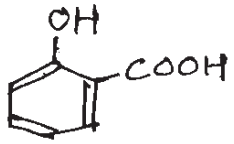
d) Explain the following terms of an EPR spectrum :

i) Position.
ii) Intensity.
iii) Band-width.

e) Predict the nature of NMR spectra of the following compounds :

i) 

ii) $CH_3 - CH_2 - OH$

iii) 

iv) 

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Total No. of Questions : 4] **[Total No. of Pages : 2**

P998

[4025]-413
M.Sc. - II (Sem. - IV)
ANALYTICAL CHEMISTRY
CH - 491 : Polymer Technology
(2008 Pattern)

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

Instructions to the candidates:

1) ***All questions are compulsory and carry equal marks.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Draw diagrams wherever necessary.***

SECTION - I

Q1) Attempt any four of the following : **[20]**

a) Give the salient features of suspension polymerisation.

b) Discuss the mechanism of cationic polymeridation.

c) Describe the kinetics of free-radical chain polymerisation.

d) Explain isotactic, syndiotactic and atactic polymers with suitable examples.

e) The intrinsic viscosity of myosin is 227cm^3/g. Calculate the approximate concentration of myosin in water which would have a relative viscosity of 1.57.

Q2) Answer any four of the following : **[20]**

a) What is meant by oxidative degradation? Give an account of oxidative degradation of saturated polymers.

b) Explain the following :

i) Aromatic polyesters are rigid whereas rubber is flexible.
ii) Polycarbonate is used for making armour shields.

c) Give the method of preparation and uses of the following polymers :

i) Polyvinyl chloride.
ii) Nylon - 66.

d) Equal mass of polymer molecules with molecular weights 20,000 and 80,000 respectively are mixed together. Calculate the number-average $(\overline{Mx})$ and weight-average $(\overline{Mw})$ molecular weight.

e) Write a note on Vulcanization.

P.T.O.

SECTION - II

Q3) Attempt <u>any four</u> of the following : **[20]**

a) Describe in detail an ebulliometric method used for determination of number-average molecular weight $(\overline{Mx})$ of polymer sample.

b) Give a full account of mechanical properties of polymers.

c) Explain the terms :

i) Flammability.
ii) Transparency.
iii) Resistivity.
iv) Gloss.
v) Vapour permeability.

d) Describe the characterization of polymers by x-ray diffraction technique.

e) 12 moles of acrylamine ($r_1 = 1.38$) are mixed with 8 moles of acrylic acid ($r_2 = 0.36$). Find the composition of polymer formed instantaneously.

Q4) Answer <u>any four</u> of the following : **[20]**

a) Explain the term-sol-gel. Give brief account of aqueous chemistry of metal oxide.

b) What is meant by fibre-spinning? Describe in detail the wet spinning process.

c) Define the term polymer processing. Write an account of injection moulding.

d) Explain the terms :

i) Denier.
ii) Crimp.
iii) Comfort.
iv) Crease resistance.
v) Wear resistance.

e) 0.846g CTPB sample was dissolved in a mixture of ethanol and xylene solution and was titrated with 0.295 N alcoholic potassium hydroxide solution. The surette reading was 5.1 ml. Calculate number-average $(\overline{Mx})$ and weight-average $(\overline{Mw})$ molecular weight of the polymer.Given functionality of polymer is 2.