Total No. of Questions :6]

SEAT No. :

P1114

[Total No. of Pages : 3

[5430]-11
M.Sc. - I
CH - 110 : PHYSICAL CHEMISTRY - I
(2008 Pattern) (Semester - I) (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	=	6.022×10^{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) Sketch the plots for (i) the wave function (ψ) verses displacement co-ordinate (ii) ψ^2 verses displacement co-ordinate for the first four energy levels for a particle in a cubic box. Comment on the nature of these plots.

b) Derive the expression for workdone in the adiabatic expansion of one mole of an ideal gas.

c) State the third law of thermodyanamics. Hence explain the determination of absolute entropy of a gas.

d) Explain the term osmotic pressure. Derive an expression for the osmotic pressure of the solution using the concept of chemical potential.

e) State Raoult's and Henry's laws. Explain its applications.

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

a) Deduce the Gibbs-Duhem equation. Explain how it defines the non independance of the intensive variables.

b) What is meant by ultraviolet catastrophe? How was it overcome by plank's hypothesis?

c) Sketch and explain the phase diagram for water system.

d) Derive Gibbs-Helmholtz equation. What is temperature coefficent of a reaction.

e) Derive Clausius-Clapeyron equation and give its significance.

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

a) At 25°c the density of 50% by mass of ethanol-water mixture is 914 kg/m^3. Find the Partial molar volume of ethanol.

[Partial Molar volume of water=17.4 cm^3 $mole^{-1}$]

b) What is the degeneracy of the level for which the total energy

i) $14h^2/8ma^2$

ii) $17h^2/8ma^2$

c) Calculate the change in entropy when 21 gm of nitrogen are mixed with 22 gm of Co_2 and 24 gm of oxygen at 25°c.

[Given Atomic weight : N=14, O =16, C =12]

SECTION - II

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

a) Derive the expression for second order rate constant considering equal reactant concentration.

b) Write a note on partition function for traslation.

c) What is meant by diffusion controlled reactions? Derive the expression for diffusion controlled rate constant.

d) Describe enzyme kinetics using michaelis-Menton mechanism.

e) Derive Eyring equation using activated complex theory.

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

a) Describe Fermi - Dirac statistics.

b) Derive the expression for the total partition function.

c) Give an example of a consecutive reaction. Apply steady state approximation to obtain rate constant of such reaction.

d) Write a note on collision theory of reaction rates.

e) What is the effect of ionic strength on the reaction rates?

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

a) Certain first order solution phase reaction is 5% complete in 30 minuts. Calculate the time ratio fer its 99% to 50% completion.

b) Calculate the energy of activation for a first order reaction whose half life periods are 950 and 1150 seconds at 35°C and 30°C respectively.

c) Calculate the rotational partition function of H_2 molecules at 273 k if its rotational constant at this temperature is 25.527 cm^{-1}.

☼☼☼☼

Total No. of Questions : 6]

SEAT No. :

P1115

[Total No. of Pages : 3

[5430]-12
M.Sc. - I
INORGANIC CHEMISTRY - I
CH-130 : Molecular Symmetry and Chemistry of P-Block Elements
(2008 Pattern) (Semester - 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) ***Figures to the right indicates full marks.***
4) ***Use of calculators is allowed.***

SECTION - I

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

a) Classify the following molecules into appropriate point group.

i) H_2O_2 ii) Cis-platin

b) What is similarity transformation? Using similarity transformation find at conjugate symmetry elements of H_2O molecule having E, C_2^z, σ_v^{xz}, σ_v^{yz}.

c) Label the following irreducible representations with appropriate Mulliken symbols. Justify your answer :

C_2h	E	C_2^z	σ_h^{xy}	i
...	1	1	1	1
...	1	1	–1	–1
...	1	–1	1	–1
...	1	–1	–1	+1

d) Using matrix multiplication method find the products for :

i) $i \times \sigma_h^{xz}$ ii) $C_2^z \times \sigma_h^{xy}$

e) What are symmetry elements and symmetry operations? Explain all possible axes of symmetry in $[CoF_6]^{3-}$.

P.T.O.

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

a) Sketch and describe all symmetry operations of $[Ni(CN)_4]^{2-}$.

b) Derive the character table for D_3 point group.

c) Find the reducible representation for $[Ni(CN)_4]^{2-}$ ion for which σ-bond forms a basis and find out the orbitals offered by central ion for σ-bonding. Given-character table.

d) Using matrices predict the products for NH_3 molecule

i) $6V_2 \times \sigma V_3$ ii) $C_3 \times \sigma V_3$,

find whether is an abelian or non abelian group.

e) Define plane of symmetry. Explain different types using examples.

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

a) Give the conditions for mathematical group and illustrate using examples.

b) Define and explain :

i) Unit cell ii) Screw axis

iii) Glide plane

c) What the point groups for linear molecules? Explain using suitable examples.

d) Define and explain :

i) Centre of inversion ii) Improper axis of rotation.

SECTION - II

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

a) Explain in detail preparation, properties and uses of Grignard reagent.

b) Give an account of catenated and cydic Arsanes with suitable examples.

c) Give the classification of hydrides.

d) What are interhalogen compounds? Give their important reactions.

e) Give synthesis and structures of xenon fluorides.

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

a) Write note on phosphazenes and phosphanitrilic compounds.

b) Write note on zeolites.

c) Write note on clatharate compounds of inert gases.

d) What are inorganic benzenes? Draw the structures and explain their reactivity.

e) Give characteristic reactions of dihydrogen.

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

i) P_4O_{10} ii) B_4H_{10}

iii) IF_7 iv) N_2O_5

v) ClF_3

b) Complete the following reactions : **[5]**

i) $BeCl_2 + 2RMgX + C_2H_5OC_2H_5 \rightarrow ?$

ii) $PhLi +$  $\rightarrow ?$

iii) $2NaBH_4 + I_2 \rightarrow ?$

iv) $4NH_3 + 5O_2 \underset{100^oC}{\overset{Pt}{\rightleftharpoons}} ?$

v) $3BCl_3 + 3NH_4Cl \rightarrow ?$

Given Character Table :

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_1, 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	

Total No. of Questions : 6]

SEAT No. :

P1116

[Total No. of Pages : 4

[5430]-13
M.Sc. -I
ORGANIC CHEMISTRY
CH-150 : Organic Reaction Machanism and Stereo Chemistry
(2008 Pattern) (Semster-I)

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

Instructions to the candidates:

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

SECTION-I

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

a) Picric acid is stronger acid than phenol.

b) menthyl chloride on treatment with sodium ethoxide gives only one product whereas Neo-menthly chloride gives two different products.

c) Et-S-CH_2-CH_2-Cl undergoes hydrolysis 10^4 times faster than Et-O-CH_2-CH_2.Cl under similar conditions.

d) Nitration of acetanilide gives p-nitroacetanilide as a major product where as nitration of aniline gives m-nitroaniline.

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

Q2) Write a short note on any three of the following. **[12]**

a) Inclusion compounds

b) Prochiral relationship

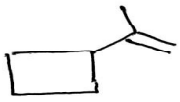
c) Hoffmann and saytzeffls elimination

d) IPSO Substitution.

Q3) Predict the products with mechanism for any three of the following: **[12]**

a) 

$\xrightarrow[\text{furan}]{Mg}$?

b)  $\xrightarrow{HBr}$?

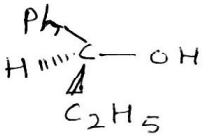
c)  $\xrightarrow{H_2SO_4}$?

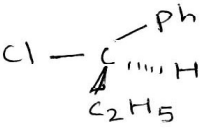
d) 

$\xrightarrow{AcOH}$?.

SECTION-II

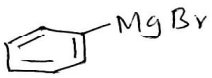
Q4) Suggest the machanism for any four of the following: **[12]**

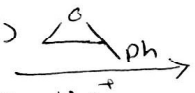
a) 

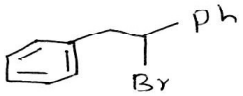
$\xrightarrow[\text{Pyridine}]{SOCl_2}$ 

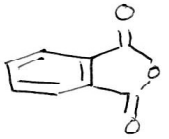
b) 

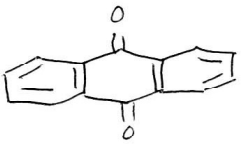
$\xrightarrow[\Delta]{H_2SO_4}$ 

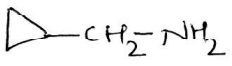
c) 

i) 

ii) H_3O^+
iii) PBr_3


d) 

i) $AlCl_3$, Benzene
ii) con. H_2SO_4


e) 

$\xrightarrow{HNO_2}$ 

Q5) Attempt any four of the following. **[12]**

a) Cylopentadiene on-reaction with strong base form it's anion but benzene doesnot. Explain.

b) Why cyclo-octatetraene is non aromatic compound?

c) Predict which of the following compound is more acidic? Justify your answer.

d) Why chair and boat interconversion is easier in cyclohexane than t.butyl cyclohexane?

e) What are the effect of nature of substrate on rate of SN^1 and SN^2 reactions?

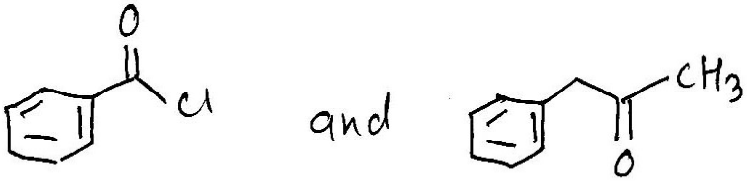
Q6) Attempt any eight of the following. **[16]**

a) Assign E/Z configuration of the following.

b) Assign RIS configuration of the following.

c) Why pyrrole is stronger acid than pyrrolidine?

d) Assign Si/Re face's of the following.

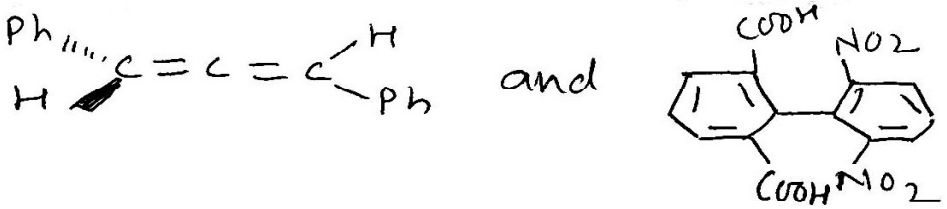


e) Draw the resonance structures for the following.

f) Identify aromatic, antiaromatic and nonaromatic compound of the following.

g) Write a short note on tautomerism.

h) Comment on Optical activity of the following.



i) Dimethyl amine is more basic than trimethyl amine in aqueous medium. Explain.

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Total No. of Questions :6]

SEAT No. :

P1117

[Total No. of Pages : 3

[5430]-21
M.Sc. I
CHEMISTRY
CH - 210 : Physical Chemistry - II
(2008 Pattern) (Semester - II) (Old)

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

Instructions to the candidates:

1) ***Answers to the TWO sections should be written in SEPARATE answer books.***
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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 three of the following: **[15]**

a) Explain the factors affecting intensity of spectral lines.

b) Discuss the breakdown of Born-Oppenhiemer approximation.

c) Explain Raman Scattering on the basis of molecular polarizability.

d) Write a note on Pre-dissociation.

e) Give the classification of molecules on the basis of moment of inertia with suitable examples.

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

a) Give the principle of photo electron spectroscopy and discuss the UPES spectrum of carbon monoxide.

b) What is the criteria for a vibration on a molecule to be Raman active? Discuss Raman activity of CO_2 molecule.

c) Discuss the influence of rotation on the spectra of polyatomic linear molecules showing perpendicular vibrations.

d) What do you mean by non-rigid rotator? write the energy expression in cm^{-1} for the same and using equations of 'B' and 'D'. Show that $D=4B^3/\bar{w}^2$ compare the spectra of rigid and non rigid rotor.

e) What is Stark effect? Discuss its applications.

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

a) The spectrum of HCl shows a fundamental absorption at 2886 cm^{-1} and first overtone at 5668 cm^{-1}. Evaluate equilibrium vibrational frequency, the anharmonicity, zero point energy and force canstant.

b) The average spacing between successive rotational lines CO molecule is 3.6862cm^{-1}. Determine the trasitions which given the most intense spectral line at 308 K.

c) The first stokesline in the rotational Raman spectrum of $^{14}N^{15}N$ is observed at 11.5416 cm^{-1}. Calculate its 'B' value and bondlength. Comment on the intensity of spectrum.

SECTION - II

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

a) How does the gamma rays interact with matter? Give an account of Photo-electric effect.

b) What is 'G' value? Explain radiolysis of Fricke solution.

c) Describe the application of radioisotopes in determining surface area of the precipitate.

d) Distinguish between secular and transient equilibria.

e) Explain the principle of a breeder reactor.

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

a) Describe isotope dilution and reverse isotope dilution analysis.

b) Explain the terms

i) tracks ii) Spurs

iii) δ-tracks and iv) Stopping power

c) How is ^{14}C obtained naturally and artificially?

d) Write a note on nuclear waste management.

e) Describe the working of a G.M. counter.

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

a) The half life period of a radio-isotope is 3.8 days. How much of it will remain after 28 days if 5 g of it is present initially?

b) A 0.1 g of a catalyst sample containing 65% Cu was irradiated for 24 h in a neutron flux of 10^9 $ncm^{-2}s^{-1}$. Calculate the activity due to ^{64}Cu after a cooling period of 6 hrs.

[Given : At. weight of Cu=63, $t_{1/2}$ of ^{64}Cu=12.7hrs, σ_{cu} = 4.5 b and isotopic abandance = 69.2%]

c) Determine linear absorption coefficient of ethanol using following data.

[eμ=0.211 b/e^-, ρ= 0.713 g. cm^{-3}, Z of C=6, H=1, 0=8 and A of C=12, H=1 and O=16]

Total No. of Questions : 6]

SEAT No. :

P1118

[Total No. of Pages : 4

[5430]-22
M.Sc.-I
CHEMISTRY
CH-230 : Inorganic Chemistry-II
(2008 Pattern) (Semester-II)

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) ***Use of log tables and calculators is allowed.***
4) ***Figures to the right indicate full marks.***
5) ***Draw neat diagrams wherever necessary.***

SECTION-I

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

a) What is selection rule? Give the selection rules for d-d transitions using suitable examples.

b) Calculate the total degeneracy of the following:

i) t_{2g}^{4} ii) ^{4}F iii) $^{4}A_{2g}$ iv) $s^{1}d^{1}$ v) e_{g}^{2}

c) Give the splitting of ^{3}F term in weak cubic field using character table for pure rotational point group 'O'.

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

e) The colour intensity of tetrahedral complexes is 100 times greater than octahedral complexes. Explain.

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

a) Give the full spectroscopic symbol for G.S. term for the following ions:

i) Ti^{3+} ii) Mn^{2+} iii) Zn^{2+} iv) Eu^{2+} v) Tb^{4+}

b) Write a note on paramagnetism using suitable examples.

c) Identify which of the following complexes show orbital contribution to magnetic moment. Justify.

i) $[Fe(H_2O)_6]^{3+}$ ii) $[Co(OH)_6]^{3-}$

d) Predict the electronic transitions in $[CrCl_6]^{3-}$ using orgel diagram.

e) Write a note on inter-electron repulsion parameters.

P.T.O.

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

a) Write a note on 'Nephelauxetic effect'.

b) The μ_{eff} of $[CuC1_6]^{4-}$ is 2.05 B.M. Calculate crystal field splitting parameter if λ is – 830 $cm^{-1.}$

c) Explain Bethe's descending symmetry method to assign the spin multiplicities for e_g^2 configuration in strong octahedral ligand field.

SECTION-II

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

a) Describe chelate effect and Irving-Williams series with respect to complexes.

b) Discuss the structure and function of haemoglobin.

c) Explain the acetylcholine receptor and it's working.

d) What are the kinetic aspects of bioinorganic chemistry? Discuss the types of electron transfer reactions.

e) What are possible pathways of absorption of metal ions by cells.

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

a) Mercury detoxification

b) Concept of model complexes

c) Calmodulin

d) Metal junctions in metalloproteins.

e) Receptor mediated endocytosis.

Q6) Draw structures of : (any five) **[10]**

a) Adenin

b) 3Fe-4S

c) Cytosine

d) Corrin

e) Mo-binding cofactor

f) EF hand protein

Direct Product

1. **Group of the form G ×p i or G × σh**

   The g, u, or ',' additions to the IR symbol in this group satisfy

   $g \times g = u \times u = g$, $g \times u = u$,

2. **Product of the form A x A, B x B, A x B**

   For all groups:

   Letter Symbol: $A \times A = A$, $B \times B = A$, $A \times B = B$

   Subscript: $1 \times 1 = 1$, $2 \times 2 = 1$, $1 \times 2 = 2$

   Except for the B representations of D_2 and D_2 where

   $B \times B = B$, and $1 \times 2 = 3$, $2 \times 3 = 1$, $3 \times 1 = 2$

3. **Products of the forms: a x E, B x E:**

   (a) For all groups $A \times E_k = E_k$ irrespective of the suffix on A.

   (b) For all groups except D_4h, 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 B representative put $E_1=E_2=E$)

   (c) For D_4h:

   $B \times E_1 = E_3$, $E \times E_2 = E_3$, $B \times E_3 = E_3$, $B \times E_2 = E_2$, $B \times E_3 = E_1$

   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 x E:**

   (For groups which have A, B, or E symbols without suffixes put $A_1 = A_2 = A$, etc in the equation below)

   (a) For Oh, O, T_3, D_6h, D_2, C_6v, C_6h, C_6, S_6, D_2d, D_2h, D_3, C_2, C_3h, C_3:

   $E_1 \times E_1 = E_2 \times E_2 = A_1 + A_2 + B_2$; $B_1 \times E_2 = B_1 + B_2 + E_1$

   (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:

   $E_1 \times E_1 = E_3 \times E_3 = A_1 + A_2 + Eg$

   $E_2 \times E_2 = E_4 \times E_4 = A_1 + A_2 + Eg$

   $E_3 \times E_3 = A_1 + A_1 + B_1 + B_2$

   $E_1 + E_2 = E_4 + E_3 = E_1 + E_3$, $E_1 \times E_3 = E_3 \times E_1 = E_2 + E_1$,

   $E_1 + E_4 = E_2 + E_3 = E_3 + E_3$, $E_2 \times E_3 = E_3 \times E_4 = E_1 + E_3$,

   $E_1 + E_3 = B_4 + B_2 + E4$, $E_2 \times E_4 = B_1 + B_2 + E_2$,

   (d) D_5d, D_2h, 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_8

   $E_1 \times E_1 = E_3 \times E_3 = A_1 + A_2 + E_2$

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

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

5. **Product involving the T (or F) representation of Oh, O, Td:**

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

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

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

6. **To Complete result 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	$T_1 + T_2$	$A_2 + E + T_1 + T_2$	$A_1 + E + T_1 + T_2$

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)

Correlation table for group Oh

Oh	O	Td	D_4h	D_2d	C_{4v}	C_2v	D_3d	D_3	C_2h
A_1g	A_1	A_1	A_1g	A_1	A_1	A_1	A_1g	A_1	Ag
A_2g	A_2	A_2	B_1g	B_1	B_1	A_2	A_2g	A_2	Bg
Eg	E	E	A_1g+B_1g	A_1+B_1	A_1+B_1	A_1+A_2	Eg	E	Ag+ Bg
T_1g	T_1	T_1	A_2g+E_g	A_2+E	A_2+E	$A_2+B_1+B_2$	A_2g+Eg	A_2+E	Ag+ 2Bg
T_2g	T_2	T_2	B_2g+Eg	B_2+E	B_2+E	$A_1+B_1+B_2$	A_1g+Eg	A_1+E	2Ag+Bg
A_1u	A_1	A_1	A_1u	B_1	A_2	A_2	A_1u	A_1	Au
A_2u	A_2	A_1	B_1u	A_1	B_2	A_1	A_2u	A_2	Bu
Eu	E	E	A_1u+B_1u	A_1+B_1	A_2+B_2	A_1+A_2	Eu	E	Au+ Bu
T_1u	T_1	T_2	A_2u+Eu	B_2+E	A_1+E	$A_1+B_1+B_2$	A_2u+Eu	A_1+E	Au+ 2Bu
T_2u	T_2	T_1	B_2u+Eu	A_2+E	B_1+E	$A_2+B_1+B_2$	A_1u+Eu	A_1+E	2Au+Bu

✓ ✓ ✓

Total No. of Questions : 6]

SEAT No. :

P1119

[Total No. of Pages : 4

[5430]-23
M.Sc.-I
ORGANIC CHEMISTRY
CH-250 : Synthetic Organic Chemistry and Spectroscopy
(2008 Pattern) (Semester - II)

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

Instructions to the candidates:

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

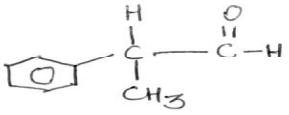
SECTION - I

Q1) Explain any four of the following: **[16]**

a) C is-3-hydroxy cyclohexane carboxylic acid undergo lactonization on heating white the trans isomer doesn't.

b) Oxime of ethylmethyl ketone gives two products on treatment with H_2SO_4 white oxime of acetone gives only one product.

c) N–methyl phthalimide doesn't undergo Hoffmann rearrangement to form N-methyl anthranilic acid.

d) The reduction of  with $NaBH_4$ proceeds without recemisation.

e) Write the mechanism to convert alkene to alkane using Wilkinson's catalyst.

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

a) Favorskii rearrangement.

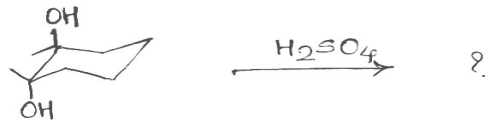
b) MPV reduction.

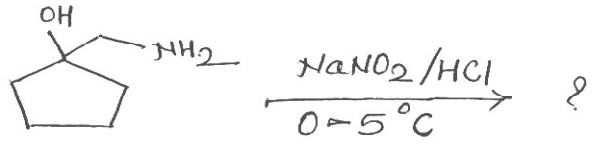
c) Addition of Diborane across asymmetrical alkene

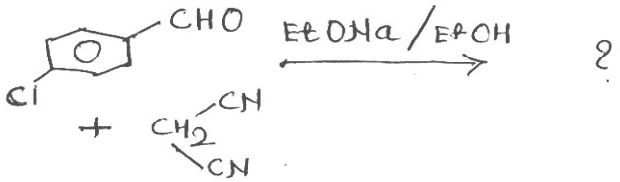
d) Use of Organo Lithium in Organic Synthesis.

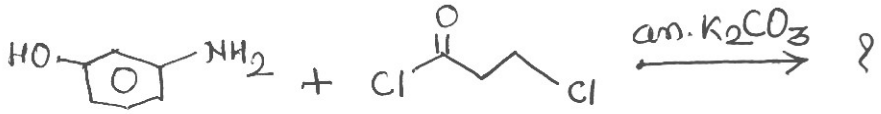
P.T.O.

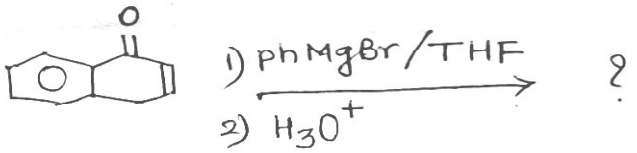
Q3) Predict the product and suggest the mechanism for <u>any four</u> of the follwoing: **[12]**

a) 

b) 

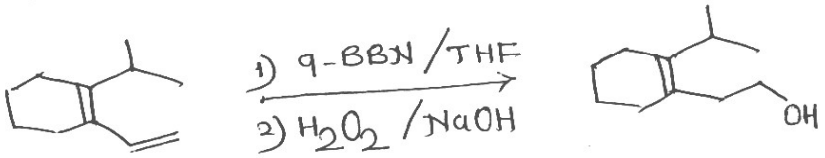
c) 

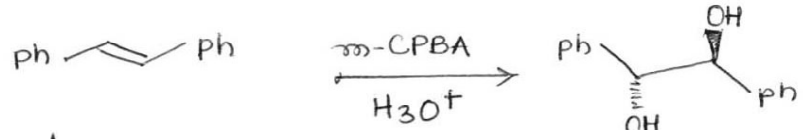
d) 

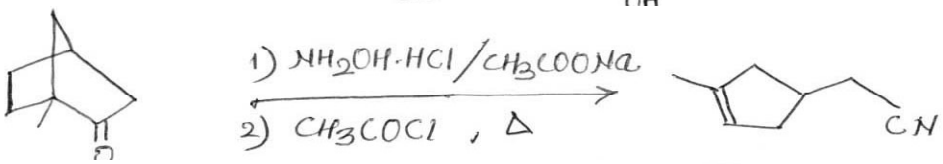
e) 

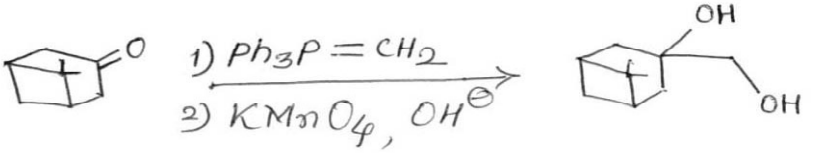
SECTION - II

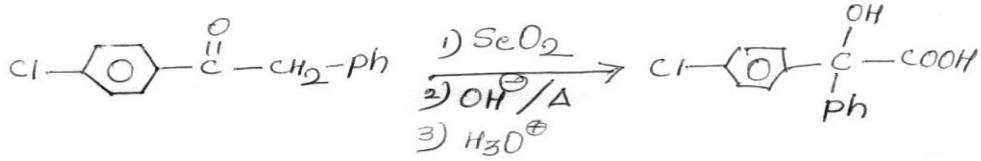
Q4) Suggest the mechanism for <u>any four</u> of the following: **[16]**

a) 

b) 

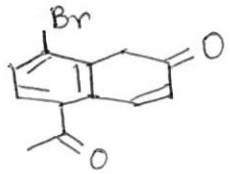
c) 

d) 

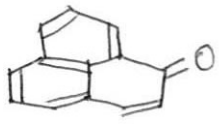
e) 

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

a) Calculate λ_{max} for the following compounds clearly show your calculations.

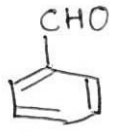


(A)

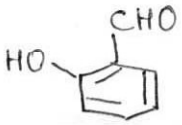


(B)

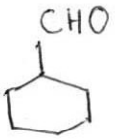
b) Arrange the following compounds according to the increasing carbonyl frequency Justify.



(i)



(ii)



(iii)

c) An organic compound with molecular formula C_3H_7NO gives absorption in the region 3417, 3236, 3030, 2899, 1667, 1634 and 1460 cm^{-1} give the probable structure.

d) Orthohydroxy acetophenone on methylation shows a blue shift while para hydroxy acetophenone on methylation shows a red shift explain.

e) Write note on "Coupling constant".

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

a) MF : $C_6H_{10}O_3$
IR : 1745, 1710 CM^{-1}
PMR : 1.27 δ (t, J = 7 Hz, 3H)
2.23 δ (S, 3H)
3.24 δ (S, 2H)
4.30 δ (q, J =7Hz, 2H)

b) MF : $C_5H_6O_2$
IR : 3300-3600 cm^{-1} (Broad)
PMR : 4.4 δ (S, 2H)
4.7 δ (bs, exchangable with D_2O, 1H)
6.24 δ (dq, 1H)
6.31 δ (dd, J = 1.9 & 3.2 Hz, 1H)]
736 δ (dd, J = 1.9 & 0.9 Hz, 1H)

c) MF : C_6H_7N

PMR : 2.5 δ (S, 3H)

7.08 δ (dd, J = 4.8 & 74 Hz, 1H)

7.14 δ (dd, J = 7.4 & 2.0 Hz, 1H)

7.56 δ (ddd, J = 7.4, 4.8 & 2.0 Hz, 1H)

8.49 δ (dd, J = 4.8 & 2 Hz, 1H)

d) MF : $C_5H_{10}O$

PMR : 2.4 δ (t, 2H)

9.8 δ (S, 1H)

0.92 δ (t, 3H)

1.45 δ (sextate, 2H)

1.61 δ (quintate, 2H)

☼☼☼☼

Total No. of Questions : 5]

SEAT No. :

P1120

[Total No. of Pages : 3

[5430]-31
M.Sc. - II
PHYSICAL CHEMISTRY
CH - 310 : Quantum Chemistry & Solid State Chemistry
(2008 Pattern) (Semester - III) (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	=	6.022×10^{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 four of the following: **[20]**

a) Show that hermitian operators have real eigen Values.

b) State the condition for wave function to be acceptable.

c) Construct the Hamiltonian operators for Li^{+} ion and Be^{+2} ion, explain the terms involved in it.

d) What are even and odd functions? Which of the following are odd and even functions? Justify your answer.

i) Cos$x$ ii) $2e^{x}$ iii) $3-3x$

e) Evaluate the commutator $[\hat{x}\ \hat{P}x]$, Where $\hat{P}x = \frac{\hbar}{i}\frac{\partial}{\partial x}$, x is the operator for position.

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

a) Deduce the secular equations for benzeme and hence sketch the HMO energy level diagram.

b) State HÜckels (4m+2) rule. Explain the mnemonic model used for monocyclic conjugated polyenes to deduce the separation of the Mo energy levels.

c) Sketch the orientations of L for l=1. Explain the significance of the magnitude and nature of the theta factor for l=0 and l=1.

d) The Π energy of hapthalene is $10\alpha+13.68\beta$. Estimate its delocalization energy and sketch the energy levels.

e) Explain HÜckels approximation method and apply it to set up the secular determinant for butadiene molecule.

SECTION - II

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

a) Define 'defect' and explain types of point defects.

b) Explain the formation of F and V colour centres in crystals.

c) Describe the various types of α–t plots of a single solid.

d) Explain the mechanism of diffusion in solids.

e) Write a note on: Burger Circuit.

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

a) Show that the fermi energy (E_o) lines midway between E_c and E_v for an intrinsic semiconductor.

b) Discuss briefly the occurance of elastic and plastic deformations in solids.

c) Explain 'Kirkendall effect with suitable diagram.

d) Discuss the thermal properties of a crystal.

e) Explain the mechanism of crystal growth from vapour phase.

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

a) If the average energy required to create a vacancy in a metal is 1 ev, calculate the ratio of vacancies in the metal at 200k and 700k.

b) The diffusion coefficient of Li in Ge at 500°c is 10^{-6} cm^2/s. What is the distance penetrated in one hour?

c) Calculate relaxation time.

(Given At Wt. of Cu = 63.5, density of Cu = 8.929 cm^{-3})

Total No. of Questions : 6]

SEAT No. :

P1121

[Total No. of Pages : 3

[5430]-32
M.Sc.
PHYSICAL CHEMISTRY
CH-311: Nuclear and Radiation Chemistry
(2008 Pattern) (Semester-III)

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}
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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}
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			=	8.314 J K^{-1} mol^{-1}
			=	1.987 cal K^{-1} mol^{-1}
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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) Discuss the principle & working of breeder reactor.

b) Explain the charge distribution on the fission fragments & deduce the expression for the atomic numbers of the primary fission fragments.

c) Write the sequence of filling of nuclear orbitals. What is the necessity of proposing spin-orbit coupling?

d) Write a note on critical size of a nuclear reactor.

e) Discuss the merits & demerits of shell model of nucleus.

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

a) Discuss with suitable examples various types of nuclear reactions.

b) Deduce the four factor formula for infinite medium.

c) Write a note on coolants & control material.

d) Draw & explain the experimental set up of PIXE technique.

e) Discuss how surface analysis can be done using Rutherford back scattering process.

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

a) Find out the geometric cross section for ^{197}Au & ^{75}As

Given $r_o = 1.4 \times 10^{-15}$ m.

b) Calculate the spin & parity of $^{136}_{55}Cs$ & $^{115}_{48}Cd$

c) Calculate the fission energy & the barrier energy for symmetric fission at $^{250}_{100}Fm$.

Given : The masses $^{250}Fm = 250.079500$amu

$^{125}Sn = 124.907700$ amu

$r_o = 1.4F$

SECTION-II

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

a) Distinguish between intrinsic and extrinsic semiconductor. What are the requirements of semi-conductor to be a good radiation detector?

b) Give an account of Szilard-Chalmer's reaction.

c) Explain the working of Tandem Van de Graaff generator.

d) How the external radiation hazards can be controlled.

e) Discuss the somatic effects of acute radiation exposure.

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

a) Explain the terms - G-value, retention, recoil energy and efficiency of detector.

b) Discuss the ICRP recommendation for maximum permissible dose.

c) Write the various reactions in radiolysis of cupric sulphate.

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

e) Enlist various natural and man-made sources of radiation.

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

a) Find out the thickness of lead required to reduce the activity from 15000 cpm to 5000 cpm.

Given : Linear mass absorption coefficient of Pb = $0.57 cm^{-1}$

b) Find out the dose due to 250mci Mn-56 source at a distance of 2 meters.

Given : Gamma energy = 847, 1811 & 2111 keV.

c) When chloroform is exposed to gamma radiation, what is the dose absorbed in 6 hours.

Given : $(\bar{Z}/A)$ of fricke solution is 0.553 and the dose absorbed by fricke solution at the same position is 4.06 Gy/min.

✓ ✓ ✓

Total No. of Questions :6]

SEAT No. :

P1122

[Total No. of Pages : 3

[5430]-33
M.Sc. - II
PHYSICAL CHEMISTRY
CH - 312 : Advanced Instrumental Methods of Analysis
(2008 Pattern) (Semester - III)

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
			=	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 absorptive edge? Describe a typical x-ray absorption spectrum of thin sample.

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

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

d) Draw and explain block diagram of the major components of an instrument used to measure photoluminescence.

e) Discuss the applications of NAA technique.

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

a) State different types of detectors used in mass spectrometer. Explain any one detector in brief.

b) Define the terms :

i) Matrix, ii) Cross-section of a reaction,

iii) Target iv) Flux and

v) Saturation activity

c) Derive the equation $\frac{M}{Z} = \frac{B^2 r^2}{2E}$

d) Describe briefly the phenomenon of chemiluminescence.

e) Discuss the choice of an optimum nuclear reaction in activation analysis.

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

a) 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 of 0.25 T and radius of curvature of the ion path through magnetic field is 12.5 cm?

b) The energy of ionization for argon atom is 9.6×10^{-18}J. The argon gas is irradiated by x-ray photons having wavelength 0.1 nm. How many ion-electron pairs will be formed by considering 50% efficiency of ionization?

c) Estimate the activity of ^{90}Y formed from 0.05 mg of ^{89}Y during the $^{89}Y(n,\gamma)^{90}Y$ reaction after an irradiation period of 72.0 h. The cross section of the reaction is 1.31 b, the half-life of ^{90}Y is 64.3 h and neutron flux is 2.0×10^7 ncm^{-2}s^{-1}. (Given : γ = 100%)

SECTION - II

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

a) Draw and describe a typical ICP source. State the detection limit of the technique.

b) Discuss the applications of DSC.

c) Give an account of the technique differential pulse voltammetry.

d) Discuss spectral splitting and chemical shift observed in ESCA technique.

e) Give the advantages of coulometric titrations.

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

a) What is cyclic voltammetry? Draw and explain a typical cyclic voltamogram.

b) Discuss the factors affecting TGA curve.

c) Write the applications of thermometric titrations.

d) Discuss in brief the essential components of ESCA apparatus.

e) State the principle of hydrodynamic voltammetry. Describe any one electrode used in this technique.

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

a) A constant current of 9.5 mA passed through chloride solution for 195s. Calculate the weight of chloride reacting with silver anode.

b) The work function of a spectrometer is 45 eV. The binding energy of the emitted electron is 1050 eV. If the kinetic energy of the electron is 1.8 eV. Find the wavelength of incident x-ray.

c) 10 g sample containing $CuSO_4.5H_2O$ was heated in TGA apparatus. When the monohydrate formation was complete at 200°C, the loss in mass was 1.2 mg. Find the percentage of $CuSO_4.5H_2O$ in sample.

[Given : Atomic weights of Cu = 63.55, S = 32, O = 16, H = 1]

Total No. of Questions : 5]

SEAT No. :

P1123

[Total No. of Pages : 3

[5430]-34
M.Sc. -II
PHYSICAL CHEMISTRY
CH-314 : Polymer Chemistry
(2008 Pattern) (Semester-III) (Old)

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

Instructions to the candidates:

1) ***Answer 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, table calculator are allowed.***
5) ***Neat diagram 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) Derive the co-polymer equation for free radicals copolymerisation.

b) Distinguish between textile and fabric properties of polymers.

c) Discuss the use of TGA and DTA techniques in the analysis of polymers.

d) Describe the principle and applications of membrane osmometry.

e) What are copolymers? What are advantages of copolymer over homo polymers?

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

a) What is glass trasition temperature? Give relation between T_g and T_m.

b) Discuss the presence of defects in crystalline polymer.

c) Write a note on vulcanization.

d) What is characterization of polymers? Why do we use the term average molecular weight for polymer?

e) Explain the terms : Fiber, denier, moisture content and moisture regain.

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

a) Calculate the relative viscosity at c=0.65 g/de of polymer with M=100000 which obeys Mark-Houwink equation, $K=1.2\times10^{-4}$ and $\alpha=0.72$ Huggin constant=0.33.

b) 430 gm vinyl acetate is copolymerized with 125gm vinyl chloride. Calculate the composition of the polymer formed if the monomer reactivity ratios are 0.23 and 1.68 respectively. (At.Wt. H=1, C=12, O=16, Cl=35.5)

c) Calculate $\overline{x}_n, \overline{x}_w$ and Wt. fraction of $\overline{x}_n$-mers when linear step polymerization is 96% complete.

SECTION-II

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

a) Explain use of NMR and ESR spectroscopy in analysis of polymers.

b) Write a note on : X-ray diffraction in the analysis of polymers.

c) Describe the effect of radiation exposure on polyethylene.

d) Distinguish between addition and condensation polymerisation processes.

e) How polymers are classified on the basis of applications and tacticity? Explain with Suitable examples.

f) Discuss the secondary bond forces in polymer.

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

a) What is molding? Discuss blow molding with neat diagram.

b) Describe end group analysis for determination of molecular weight of polymer.

c) Describe the sedimentation equilibrium method.

d) Derive the expression of instantaneous composition of polymer.

e) Write a note on : Block copolymerization.

f) Discuss the elastomers forming properties of polymers.

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

P1124

[Total No. of Pages : 3

[5430]-35
M.Sc.-II
PHYSICAL CHEMISTRY
CH-315 : Special Topics in Physical Chemistry
(2008 Pattern) (Semester-III)

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

Instructions to the candidates:

1) *Answer 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 are allowed.*
5) *Neat diagram 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}
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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}
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			=	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
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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) Explain the influence of hydrogen and water vapour on the properties of semiconductor ceramics.

b) Define the term adsorption isotherm. Draw different types of adsorption isotherms and explain isotherm of type IV

c) Write a note on chemiresistors.

d) Give classification of sensors according to their principle of conversion.

e) Define sensor. Draw and explain the block diagram of sensor system.

f) Explain the properties of conducting electrodes for operation of sensors.

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

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

b) Discuss general and specific acid base catalysis

c) Write the charge balance for 0.1 N HCN and 0.01N NaCl

d) Write proton condition for $H_2C_2O_4$ and NaHS.

e) Draw a logarithmic concentration diagram for 0.1 M H_2CO_3

f) Calculate pH and concentration of all species for 0.1N CH_3 COONa (Given : $k_a = 1.8 \times 10^{-5}$)

SECTION-II

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

a) What do you mean by replicating nature? How is it applied to prepare smart materials?

b) What are intelligent gels? Explain.

c) State and explain the characteristics of a passively smart material

d) Discuss the applications of carbon nanotubes.

e) What are possible hazards in the use of nano-machines

f) Give an account of sushi sensor.

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

a) Explain the principle of preparation of tunable smart materials.

b) Write a note on rubber like ceramics.

c) Derive the phase rule. State its limitation.

d) Write a note on constant boiling liquids.

e) What is biomimitics? Explain with two examples.

f) Give an account of the applications of advanced composites.

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

P1125

[Total No. of Pages : 2

[5430]-36
M.Sc. - II
INORGANIC CHEMISTRY
CH-326 : Organometallic Compounds Of Transition Metals and Homogeneous Catalysis
(2008 Pattern) (Semester - III)

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

Instructions to the candidates:

1) ***All questions are compulsory and carry equal marks.***
2) ***figures to the right indicate full marks.***
3) ***At No. Mn=25, Fe=26, Ir=77.***

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

a) What is EAN rule? Do the following compounds obey the $18\bar{e}$ rule.

i) $IrBr_2(CH_3)$ (CO) pph_3.

ii) $[Mn\ (CO)_4\ No]^-$

iii) $Fe_2\ (CO)_9$.

iv) $(\eta^5–C_5H_5)\ (\eta^1 – C_5H_5)\ Fe(CO)_4$.

b) Explain giving appropriate examples the oxidative addition and reductive elimination reaction shown by OMC's.

c) How are metal carbonyls prepared? Discuss the properties of metal carbonyls.

d) Explain the typical reactions of $Mo\ (CO)_6$.

e) Discuss mechanism of hydroformation reaction of alkene with rhodium and cobalt catalysis.

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

a) Draw the structure

i) Dimeric $Re_2\ (Co)_{10}$

ii) $Co_2\ (Co)_8$ in a solution and solid state.

iii) $(\eta^5–C_5H_5)$ Ni (μ-ph e≡Cph) Ni $(\eta^5–C_5H_5)$

iv) $[Re_3\ H_2\ (CO)_{12}]^{-2}$

v) Mn $(\eta^3–C_3H_5)\ (CO)_4$

P.T.O.

b) Describe the molecular orbital representation of structure of Ferrocene.

c) Give the systematic classification of 6–bonded T.M. hydrocarbyls.

d) What is the difference between Fischer carbene and schrock carbenes?

e) Explain the following terms giving two examples each.

i) Insertion reaction

ii) Reductive elimination

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

a) What do you understand by hydrosilyation of alkenes? Which catalysts are useful in these reaction? Explain the catalytic cycle of hydrosilyation on alkenes.

b) Discuss briefly the possible mechanism for metathesis of propene.

c) Explain the role of organometallic compounds as protecting agent.

d) The complex K[pt (Cl_3) ($CH_3CH=CH_3$)] exhibits υC=C stretching at 1504 cm^{-1}, while free propene shows the band at 1652 cm^{-1}. Explain

e) Explain the role of alkyne molybdate in the epoxidation of propylene.

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

a) Industrial applications of Heck reaction.

b) Group V Omc's in medicine.

c) Tertiary phosphine complexes of transition metals.

d) Sandwich Compounds.

e) Organometallic compounds of *f* block elements.

Total No. of Questions : 4]

SEAT No. :

P1126

[Total No. of Pages : 2

[5430]-37
M.Sc.-II
INORGANIC CHEMISTRY
CH-330 : Coordination Chemistry Magnetism and Inorganic Reaction Mechanism
(2008 Pattern) (Semester-III)

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

Instructions to the candidates:

1) ***All questions are compulsory and carry equal marks.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Use of logarithmic table, and calculator are allowed.***

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

a) What are magnetically dilute and concentrated systems?

b) Discuss the factors that affect the crystal Field stabilization energy in transition metal complexes.

c) 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)

d) Explain the terms.

i) Spin Pairing.

ii) Paramagnetic material.

e) Write a note on 'High Spin-Low Spin' equilibria.

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

a) What are mixed valence compounds? How they are classified?

b) Explain why certain Ni (II) complexes shows anomalous magnetic moment.

c) Write a note as super exchange model for an antiferomagnetic interaction.

d) Explain why $Mn(Co)_5$ is paramagnetic while $Mn_2(Co)_{10}$ diamagnetic.

e) Explain the Solute-Solute interaction.

P.T.O.

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

a) Explain the main reaction types with suitable examples.

b) What is trans effect? Explain it with suitable examples.

c) Write a note on insertion reactions.

d) Explain the isomerism in $[Co(en)_2Cl_2]^+$.

e) Discuss the mechanism of electron transfer reaction, With reference to inner sphere reaction.

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

a) Write a note on Oxidative addition reactions.

b) Explain the mechanism of photographic process.

c) What is mixed-Order substitution reaction? Explain it with suitable examples.

d) Explain in brief about the base hydrolysis of cobalt (III) ammine complexes.

e) Complete the following chemical equations.

i) $BF_3 + F^- \rightarrow$ ☐

ii) $[Fe(CN)_6]^{4-} + [Fe(CN)_6]^{3-} \rightarrow$ ☐ + ☐

iii) $CH_3Mn(CO)_5 + PPh_3 \rightarrow$ ☐

iv) $(CH_3)_3B + N(CH_3)_3 \rightleftharpoons$ ☐

v) $Cr(CO)_6 + PY \rightarrow$ ☐ + ☐

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

P1127

[Total No. of Pages : 2

[5430]-38

M. Sc. - II

INORGANIC CHEMISTRY

CH - 331 : Structural Methods in Inorganic Chemistry

(2008 Pattern) (Semester - III)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Use of calculators is allowed.***

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

a) Explain the MÖssbauer spectra of $Fe_2(CO)_9$ metal cluster.

b) Explain the ESR-Spectra for. CH_3 radical.

c) Explain the ^{19}F–NMR spectra of HPF_2 molecule

Given :

i) $J_{^{19}F-^{1}H} > J_{^{19}F-^{31}P}$

ii) $J_{^{19}F-^{31}P} > J_{^{19}F-^{1}H}$

d) Explain the cyclic voltammogram of thyranine.

e) Explain the principle of NQR spectroscopy.

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

a) What is Auger effect? Explain the any four applications of auger spectroscopy.

b) What is TEM? Explain the working of TEM.

c) What is DSC? Explain the principle, instrumentation and working of DSC.

d) Explain the application of x-ray diffraction technique for determination of NaCl.

e) Write the difference between ^{1}H–NMR spectroscopy and ^{31}P–NMR spectroscopy.

P.T.O.

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

a) Explain the ^{31}P–NMR spectra for P_4S_3 molecule.

b) What is Weiss Indices? Compute the Miller indices for the faces having intercepts.

i) [200] ii) [001] iii) [212]

c) A TG plot of 2.89 mg of $MgSO_4.7H_2O$ shows single decomposition step at on set temperature 3.78K corresponding to formation of $MgSO_4H_2O$ the mass loss in the step was 0.59 mg. Determine percentage $MgSO_4.H_2O$ in the sample.

(Given : At. wt. Mg = 24.32, S = 32.06)

d) Explain the DTA curve for $CaC_2O_4.H_2O$ heated in air atmosphere.

e) Draw the energy level diagram and calculate NQR transition frequencies for a nucleus having I = 5/2 assuming $\eta \neq 0$.

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

a) Zero-Field splitting.

b) Application of TGA to gravimetric analysis.

c) Advanstages and disadvantages of SEM.

d) Factors affecting on width of Mössbauer spectra.

e) Principle and working of XPS.

Total No. of Questions : 4]

SEAT No. :

P1128

[Total No. of Pages : 2

[5430]-39
M.Sc. -II
INORGANIC CHEMISTRY
CH-332 : Bioinorganic Chemistry : Inorganic Elements in the Chemistry of Life
(2008 Pattern) (Semester - III)

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

Instructions to the candidates:

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

Q1) Answer the following. (Any Four) **[20]**

a) What is the difference between blue-and non-blue copper oxidases? Explain the active site structure and function of enzyme galactose oxidase.

b) Explain the S_4 cycle of Mn-tetramer present in water oxidation complex of photosystem II.

c) What are chemical nucleases? Write the mechanism of DNA cleavage by $[Fe(EDTA)]^{2-}$ complex.

d) With the help of structure, explain the unique structural features of Vit B_{12}.

e) Why gold compounds are effective in the treatment of rheumatoid arthiritis?

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

a) What is MRI? Explain the working of MRI-contrast agents with the help of suitable example.

b) Which metal is present at the active site of plastocyanin? What is the geometry around that metal? Which amino acids are bound to metal?

c) Explain in brief any two techniques used to study metal complex-DNA interactions?

d) Which reaction is catalysed by the enzyme carbonic anhydrase? Why this enzyme is important for oxygen release from hemoglobin? Which element is present at the active site of this enzyme?

e) What is the role of manganese in catalase enzyme?

P.T.O.

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

a) Which compounds amongst the following will show DNA intercalation? Explain.

i) $[Pt(en)Cl_2]$

ii) $[Ru(bpy)_2(dppz)]$

iii) [Pt(terpy)Cl]

iv) $[Ru(en)_2Cl_2]$

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

vi) $[Cu(phen)_2]^{+}$

b) Draw the active site structure of enzyme urease and explain its function.

c) Which element is present at the active site of enzyme xanthine oxidase? Write down the reaction catalysed by this enzyme and the source of oxygen in oxidation of the substrate.

d) What are the required properties of a compound/element to act as an MRI imaging agent?

e) Why $[Cu(Phen)_3]^{2+}$ favours minor groove binding?

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

a) Superoxide dismutase

b) $99M_{Tc}$ in radiopharmaceuticals

c) DNA foot ptinting agents

d) Anticancer drugs

e) Carboxy peptidase A

✓ ✓ ✓

Total No. of Questions : 6]

SEAT No. :

P3656

[Total No. of Pages : 3

[5430]-40

M.Sc. - II (Organic Chemistry)

CHO - 350 : ORGANIC REACTION MECHANISM

(2008 Pattern)

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

Instructions to the candidates:

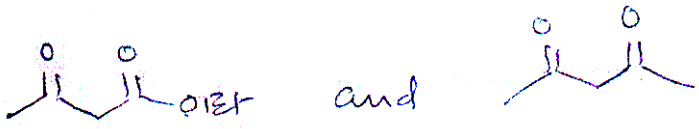
1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Answer to the two sections should be written in separate answer books.***

SECTION - I

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

a) Predict the sign of Hammett constants for P-CH_3, P-NO_2, M-CH_3 and P-Cl

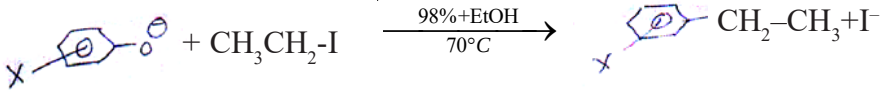
b) Which of the following prefers end form



c) Explain the neighbouring group participation by phenyl ring with a suitable example.

d) Give the significance of ρ and σ.

e) Predict the sign of the Hammett equation in the following :



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

a) Hofmann rearrangement.

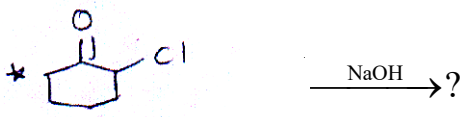
b) Claisen condensation.

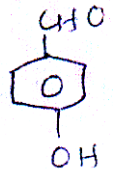
c) Role of FMN in biotransformations.

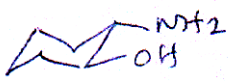
d) Benzoin condensation.

P.T.O.

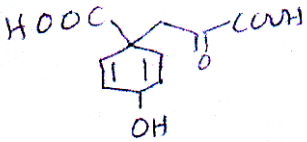
Q3) Predict the products with mechanism (any four) : **[16]**

a)  $\xrightarrow{NaOH}$?

b)  $\xrightarrow[O^{-}H]{H_2O_2}$?

c)  $\xrightarrow[0-5°C]{HNO_2}$?

d) $CH_3 - \overset{O}{\overset{\|}{C}} - N_3 \xrightarrow[2.H_2O]{1\ hv}$

e)  $\xrightarrow{NADH}$?

SECTION - II

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

a) Simmons - Smith reaction with a suitable example.

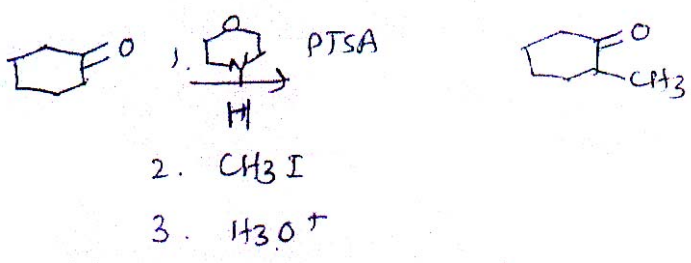
b) Neighbouring group participation by an oxygen atom.

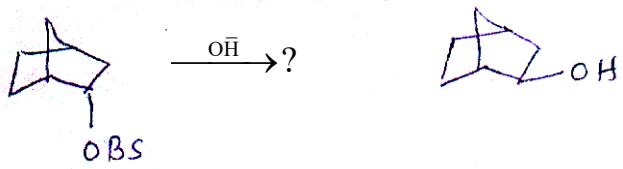
c) Role of NAD^{+} in the biotransformations.

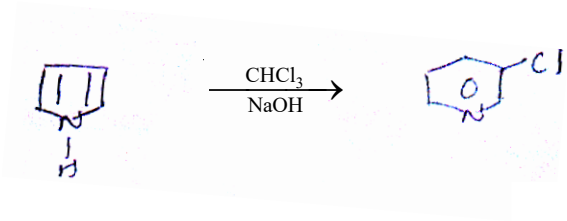
d) The lossen rearrangement with suitable example.

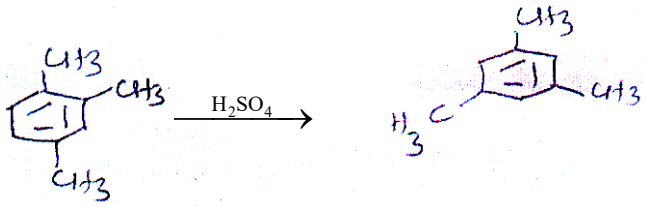
e) Benzilic acid rearrangement with an example.

5. Suggest the mechanism (any four) : **[16]**

a) 

b) 

c) 

d) 

e) $PhCHO + HCHO \xrightarrow{O\bar{H}} PhCH_2OH + HCOOH$

Q6) Answer <u>any four</u> of the following : **[12]**

a) Effect of resonance on carbanion stabilization.

b) Explain the beckmann rearrangement with an example.

c) Explain AAC-2 mechanism.

d) Explain Benzil - Benzilic Acid rearrangement.

e) Discuss Mannich reaction with an example.

Total No. of Questions : 6]

SEAT No. : ____

P1129

[Total No. of Pages : 7

[5430]-41
M.Sc.
ORGANIC CHEMISTRY
CH-351 : Spectroscopic Methods in Structure Determination
(2008 Pattern) (Semester-III)

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

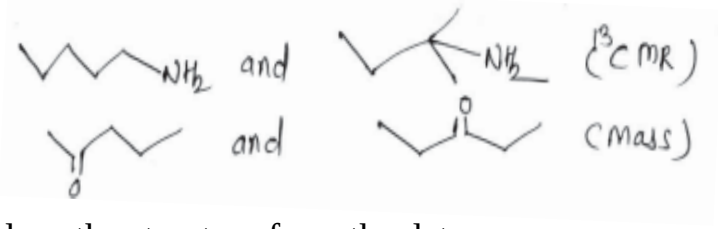
Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Spectroscopic data : IR, PMR, CMR is not provided.***

SECTION-I

Q1) Explain any-4 of the following. **[16]**

a) How will you distinguish between following pairs by indicated spectral method?

i) 

ii)

b) Deduce the structure from the data.

^{13}C MR : 12 (Q), 13(Q), 22(f), 127(s), 147(d), 174(s)

PMR : 1.17 (f) 7.5 Hz 3H

1.85 (d) 1.5 Hz 3H

2.2 (dQ) 7.5, 6.3Hz 2H

6.9 (fQ) 1.5, 6.3Hz 1H

12.7 (bs) 1H

c) Explain the concept of NOE.

d) What is vicinal coupling? Explain factors affecting it.

e) Ethyl acetoacetate shows nine signals in its ^{13}CMR. Explain.

P.T.O.

Q2) a) Explain any three of the following. **[9]**

i) Give strategies to improve M^+ intensity in MS.

ii) Deduce the structure from given data

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

CMR : 18, 41, 67, 116, 141

DEPT (I) 18, 41, 141 all up, 116 down

DEPT (II) 41, 141 up.

iii) M.F. : $C_6H_{10}O_2$

IR : 1720, 1620, 1150 cm^{-1}

^1H NMR : 1.3 (f) 7Hz 3mm

2.0 (d) 7Hz 3mm

4.2 (Q) 7Hz 2mm

5.8 (d) 16Hz 1mm

6.9 (dQ) 7,16Hz 1mm

iv) M.F. = $C_{10}H_{12}NO_2$

I.R. = 2250, 1600 cm^{-1}

PMR = 3.65 (s) 8mm

3.85 (s) 24mm

6.36 (f) 2Hz 4mm

6.45 (d) 2Hz 4mm

b) Assign the signals to different protons and justify your answer. **[3]**

1.31 (d) 7.1Hz, 18mm

3.14 (sept.) 7.1Hz, 3mm

3.79 (s), 6mm

6.09 (s), 3mm

7.03 (d), 8.5Hz, 3mm

7.18-7.32 (m), 14.8mm

7.61 (dd) 8.5, 2.1Hz, 3mm

7.83 (d) 2.1Hz, 3mm

Q3) Write short note on any three of the following. **[12]**

a) Fragmentation pattern of carbonyl compounds in MS.

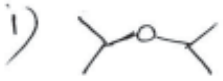
b) 2D Spectroscopic techniques in NMR.

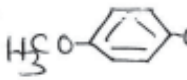
c) Lanthanide shift Reagents.

d) Rearrangements in Mass Spectroscopy.

SECTION-II

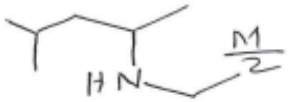
Q4) a) Explain the genesis of ions for any four of the following. **[8]**

i)  $\frac{m}{z}$: 102, 87, 59, 45.

ii)  $\frac{m}{z}$: 136, 135, 119, 107.

iii)  $\frac{m}{z}$: 98, 83.

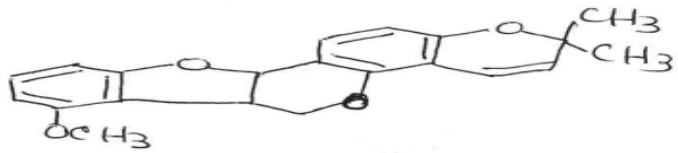
iv) $H_2C=CHCH_2CH_2Br$ $\frac{m}{z}$: 136, 134, 55.

v)  $\frac{M}{z}$: 129, 114, 72, 30.

b) Suggest the structure for the compound M based on the following data.

$\frac{M}{Z}$; M^+ 150(30), 108(100), 91(66), 90(46), 77(15), 43(72) **[4]**

Q5) a) Assign the chemical shifts and comment on the observed coupling constants in compound N. **[8]**

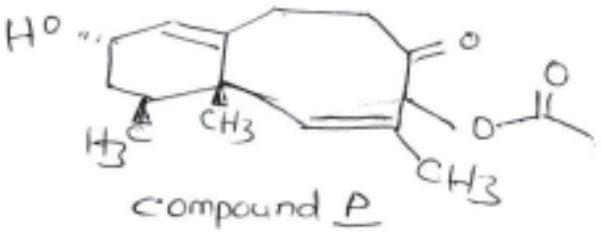


compound N

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

What changes you will observe when doublet at 5.56 δ and 6.53 δ are irradiated?

b) Assign the chemical shifts to various carbon atoms in compound P **[4]**



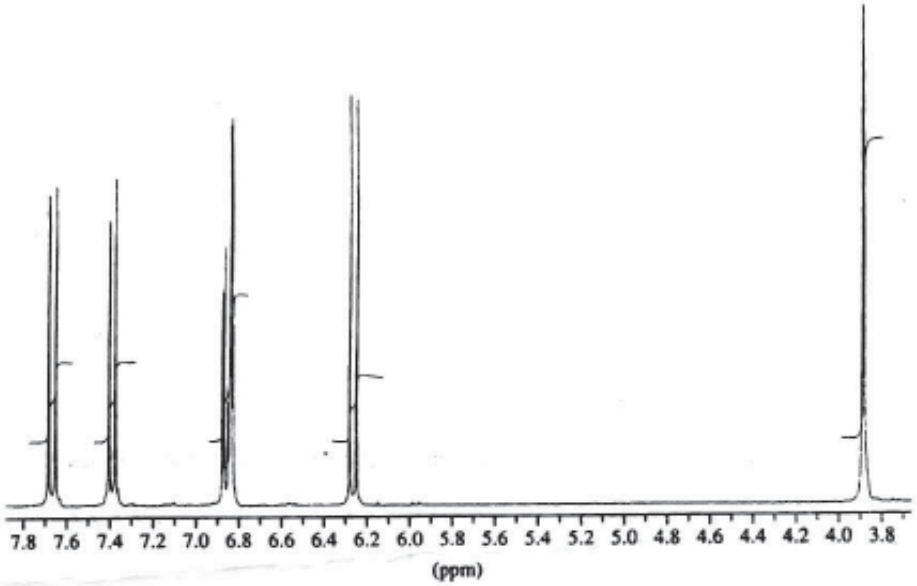
^{13}C NMR : δ : 190.8, 170.4, 149.5, 138.7,
127.1, 125.9, 76.2, 63.4,
44.2, 43.8, 35.8, 34.1,
28.3, 20.9, 20.5, 18.1,
16.6.

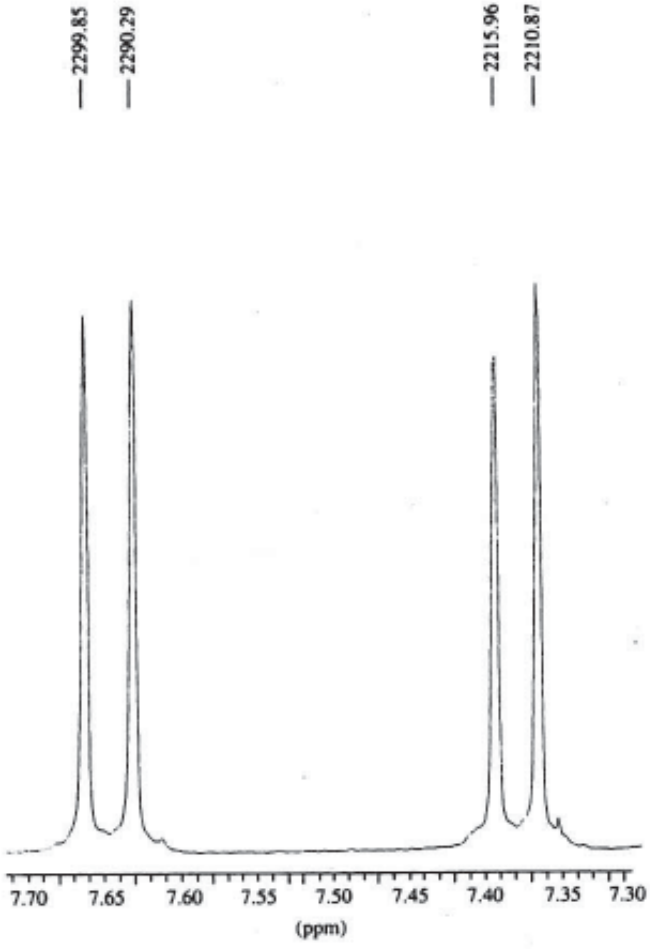
c) A basic compound with molecular formula $C_{10}H_8N_2$ shows the following signals in its ^{13}C NMR Spectrum. Assign structure for the compound. **[4]**

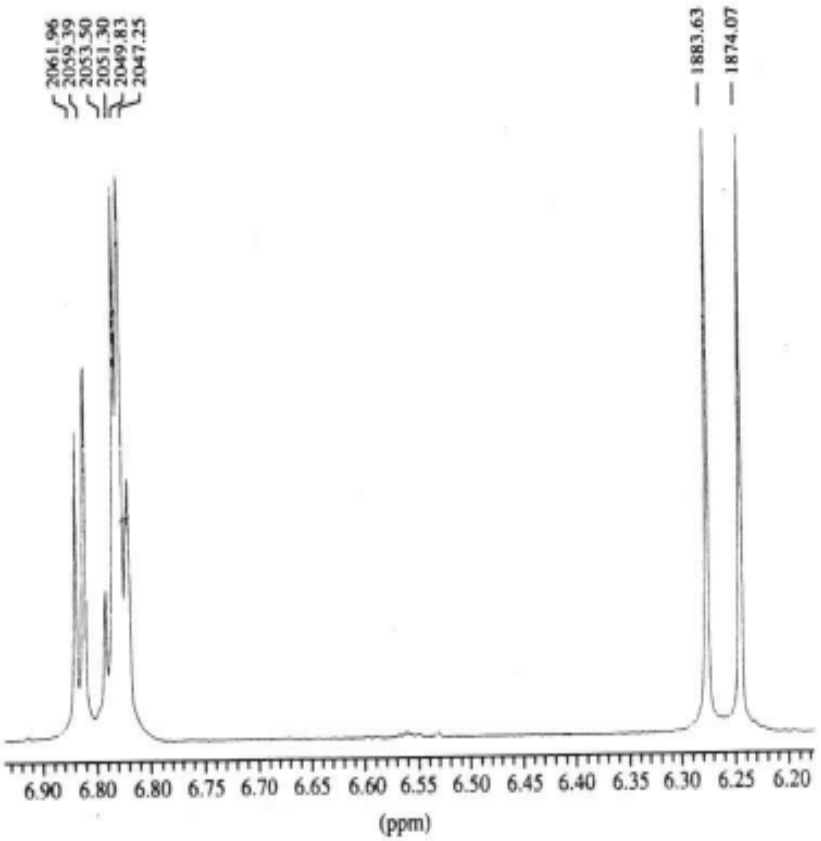
^{13}C NMR : δ :124.7 (d), 128.2(d),
141.6(d), 154.0(d),160.6(s)

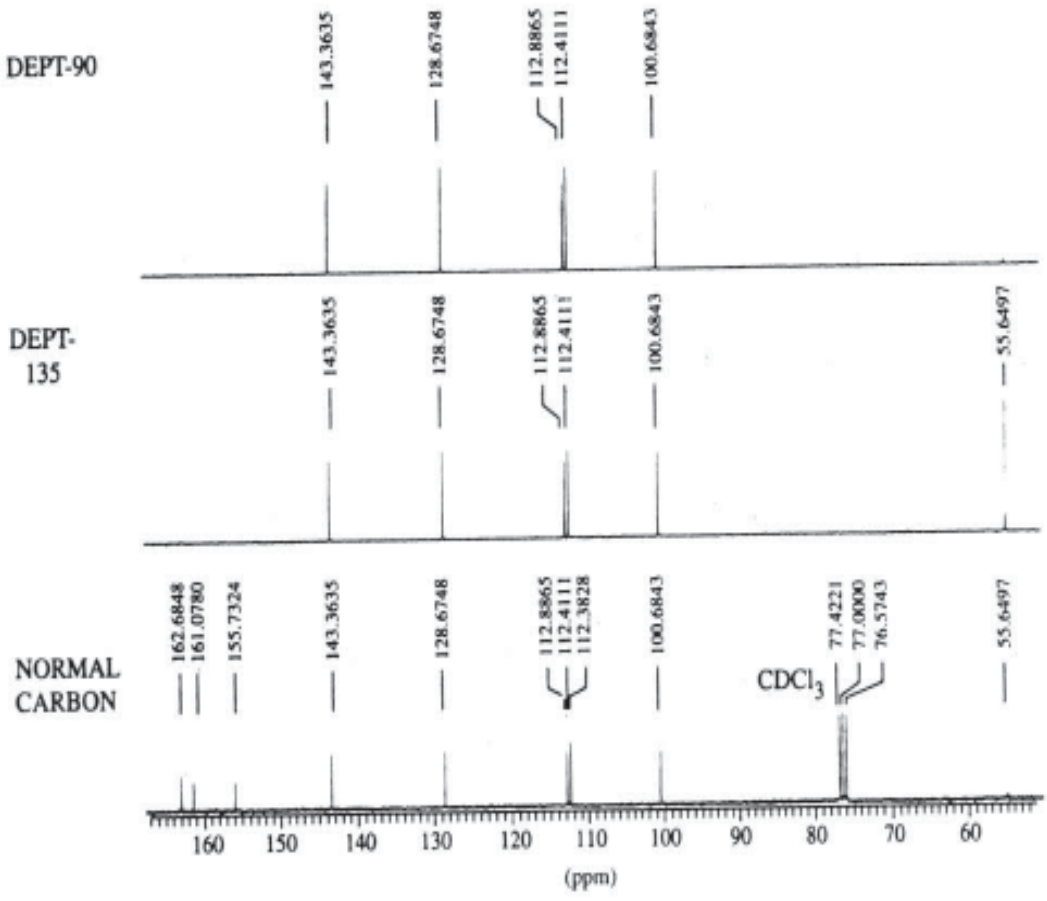
Q6) The Spetra of an unknown compound are shown on adjacent pages. Analyse the spectra and use to arrive at a correct structure of the unknown. Justify. **[12]**

Determine the structure for a compound with formula $C_{10}H_8O_3$. The infrared spectrum shows strong bands at 1720 and 1620 cm^{-1}. In addition, the infrared spectrum has bands at 1580, 1560, 1508, 1464, and 1125 cm^{-1}. The proton NMR spectrum, with expansions, along with the COSY and DEPT spectra are provided in this problem. Assign all of the protons and carbons for this compound.






2061.96
2059.39
2053.50
2051.30
2049.83
2047.25
1883.63
1874.07
6.90 6.80 6.80 6.75 6.70 6.65 6.60 6.55 6.50 6.45 6.40 6.35 6.30 6.25 6.20
(ppm)


DEPT-90
143.3635
128.6748
112.8865
112.4111
100.6843
DEPT-135
143.3635
128.6748
112.8865
112.4111
100.6843
55.6497
NORMAL CARBON
162.6848
161.0780
155.7324
143.3635
128.6748
112.8865
112.4111
112.3828
100.6843
77.4221
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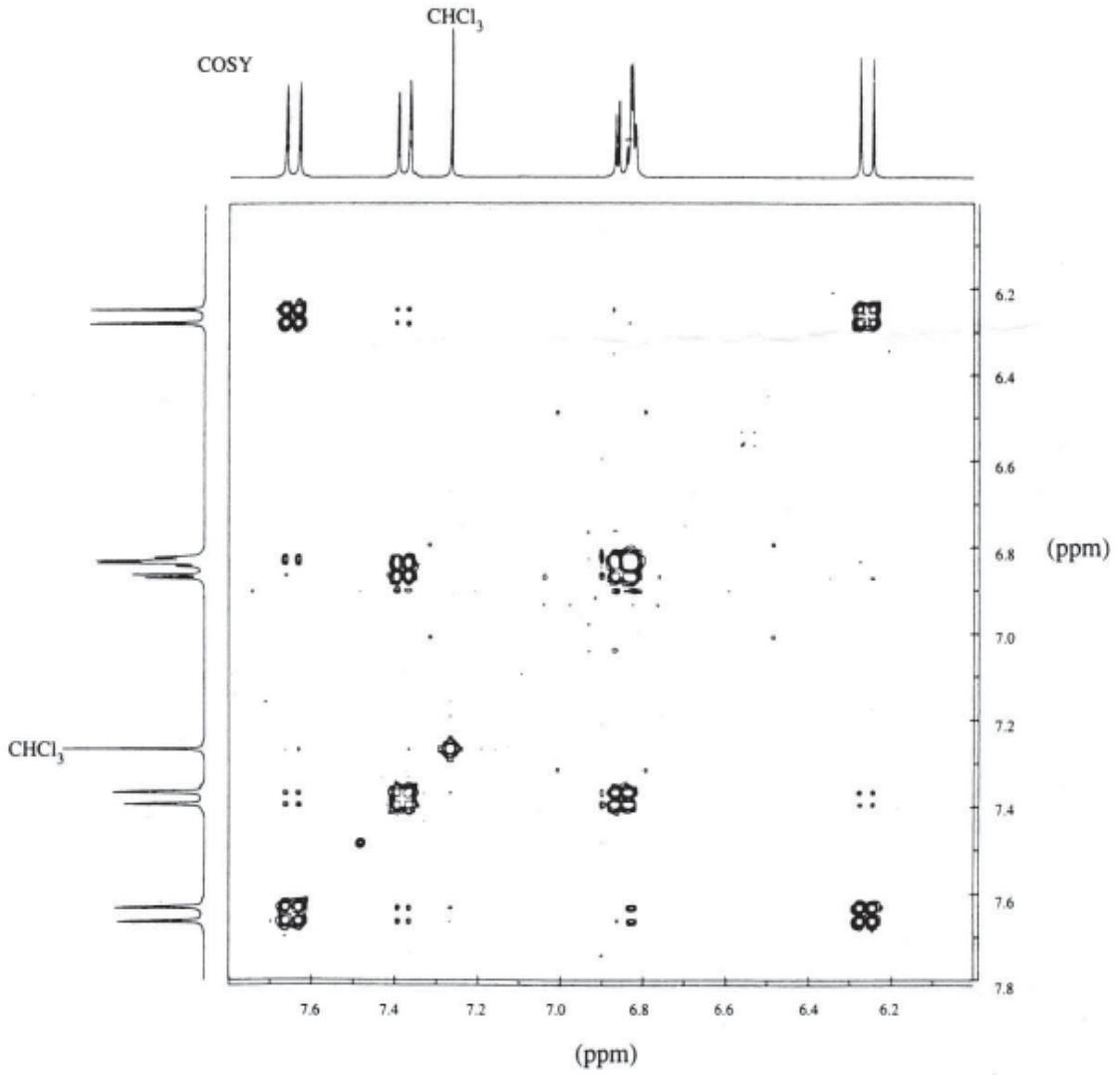
76.5743
CDCl3
55.6497
160 150 140 130 120 110 100 90 80 70 60
(ppm)


COSY
CHCl3
CHCl3
6.2
6.4
6.6
6.8
7.0
7.2
7.4
7.6
7.8
(ppm)
7.6
7.4
7.2
7.0
6.8
6.6
6.4
6.2
(ppm)

✓ ✓ ✓

Total No. of Questions : 6]

SEAT No. :

P1130

[Total No. of Pages : 4

[5430]-42

M. Sc.

ORGANIC CHEMISTRY

CH - 352 : Organic Stereochemistry

(2008 Pattern) (Semester - III)

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

Instructions to the candidates:

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

SECTION - I

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

a) Draw the most stable conformations for

i) Bicyclo [2.2.2] octane

ii) Trans –1, 3 - di tert-butyl cyclohexane. Justify your answer.

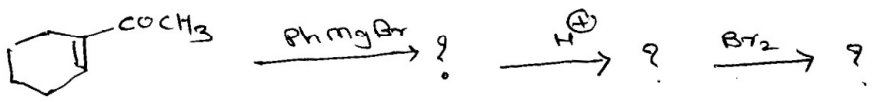
b) Draw the stable conformations of cis-syn-cis and cis-anti-cis per hydro-anthracenes. Calculate their energies and comment on their optical activities.

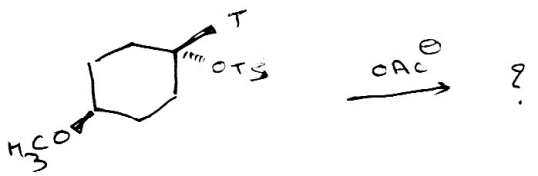
c) Give any four methods of formation of racemic modifications.

d) Why comphor does not exists in four isomeric forms inspite of having two chiral centers.

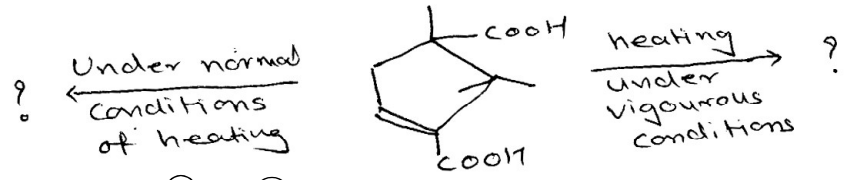
e) Write note on I-strain.

Q2) Predict the products in any four of the following and explain the stereo chemical principles involved. Justify. **[12]**

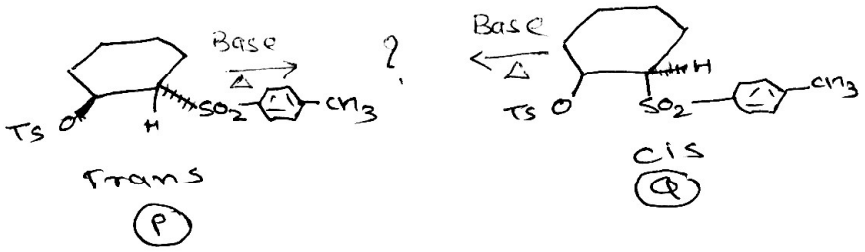
a) 

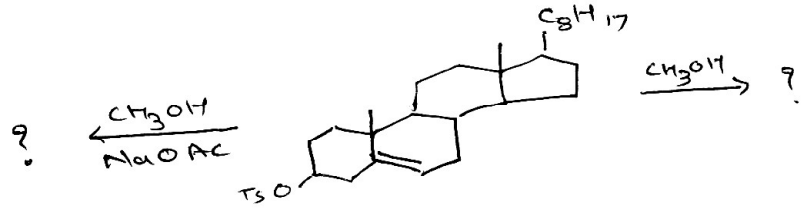
b) 

P.T.O.

c) 

d) Compound Ⓟ and Ⓠ forms the similar product after elemination reaction.



e) 

Q3) Attempt the following (any three) : **[12]**

a) Give conditions for good resolving agent.

b) Write note on determination of configuration of hydrindane.

c) Write short note on

i) Van Arkel rule

ii) Van Auwer & Skita rule

d) Non classical strains in mediurn sized rings.

SECTION - II

Q4) Answer the following (any three) : **[12]**

a) Give the experimental evidence to show that C_8 and C_3 groups in cinchonine are cis to each other.

b) Prove that lactone is transfused to the 10-membered ring in enhydrin.

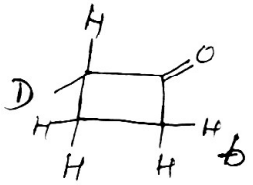
c) Prove that C_8–C_9 bond and C_3 Vinyl bond are on the same side in Cinchonine and quinidine.

d) Draw the structure of quinine and show all chiral centres in it.

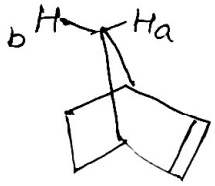
Q5) Attempt the following (any four) : **[12]**

a) Identify the following compounds as Re/Si faces.

b) In the following molecules A and B indicates whether the hydrogens marked H^a, H^b are homotopic, enantiotopic or diastereotopic.

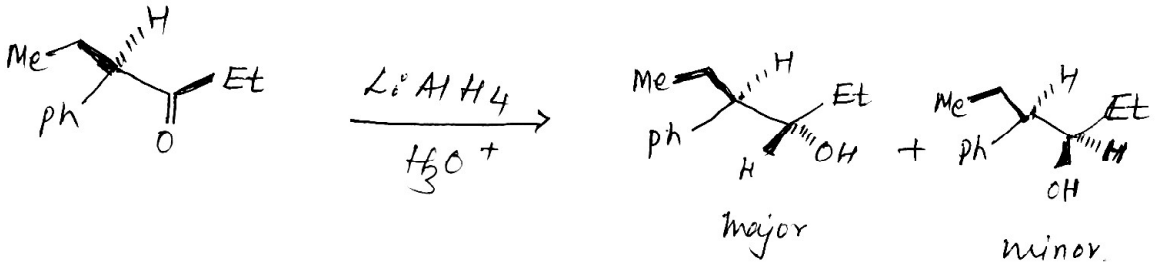


(A)



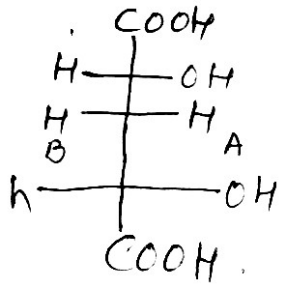
(B)

c) Using Felkin rule, explain the following transformation.

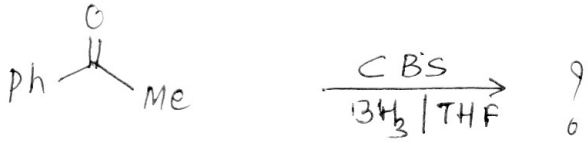


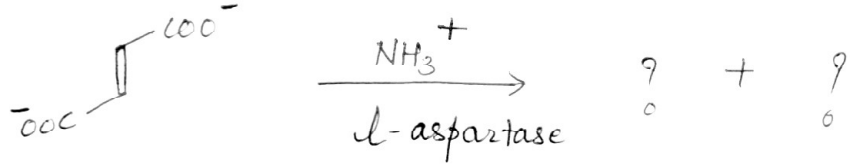
d) Explain the term enantiomeric excess with suitable examples.

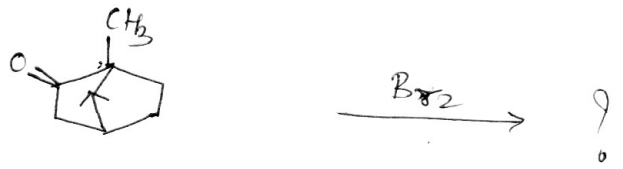
e) Identify pro 'R' and pro 'S' hydrogen atoms in the following compounds.

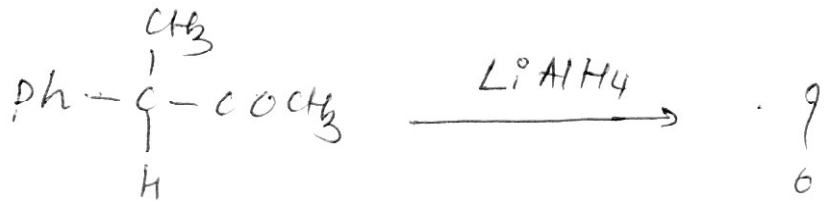


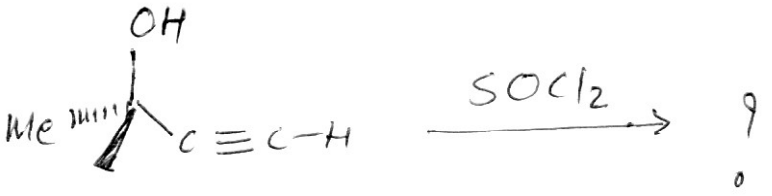
Q6) a) Predict the product/s and write stereo chemistry of the following reaction (any four) **[8]**

i) 

ii) 

iii) 

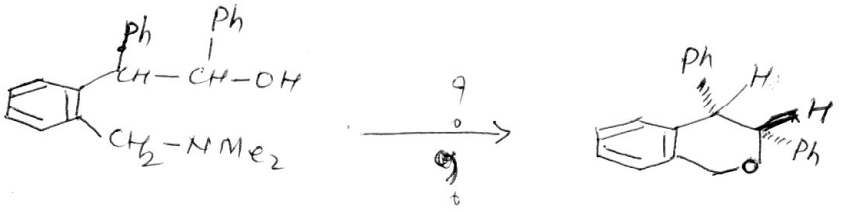
iv) 

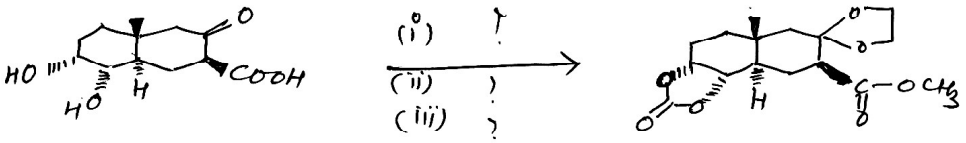
v) 

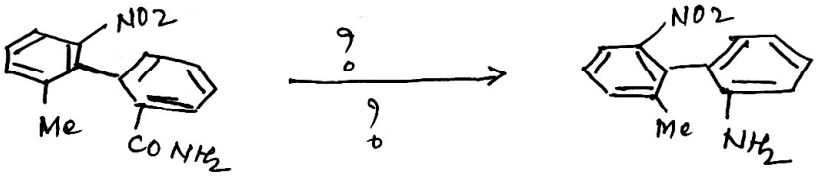
b) Solve the following :

Explain the concept of natural pool strategy, with suitable example. **[2]**

c) Give the reagents and write stereochemistry in following reaction (any two) **[6]**

i) 

ii) 

iii) 

Total No. of Questions : 6]

SEAT No. :

P1131

[Total No. of Pages : 4

[5430]-43
M.Sc.-II
ORGANIC CHEMISTRY
CH-353 : Free Radical, Photochemistry and Pericyclic Reaction and Their Applications
(2008 Pattern) (Semester - III)

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

Instructions to the candidates:

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

SECTION-I

Q1) a) Write short notes any two of the following. **[8]**

i) Jablonski Diagram.

ii) Norrish Type II reaction

iii) Decomposition of dit-butyl peroxide.

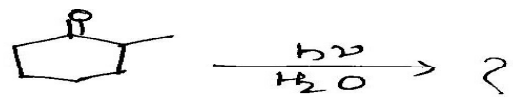
b) Explain any two of the following **[6]**

i) N-Bromosuccinimide (NBS) has been used extensively for alhylic and benzylic bromination.

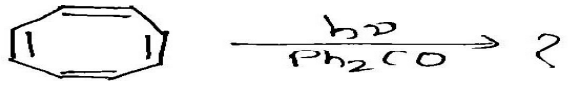
ii) Photochemical reduction of benzophenone in protic solvents gives benzpinacol whereas the photochemical reduction of O-methyl ace tophenone fails.

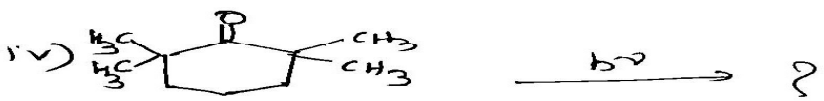
iii) Trans stilbene on photocyclization gives phenanthrene.

Q2) Predict the product/s indicating mechanism in any four of the following. **[12]**

i) 

ii) 

iii) 

iv) 

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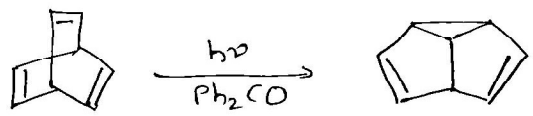
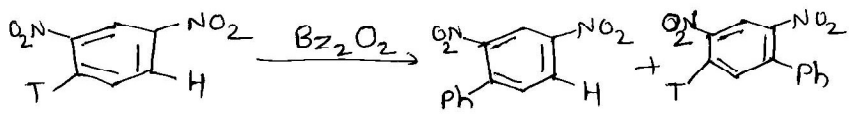
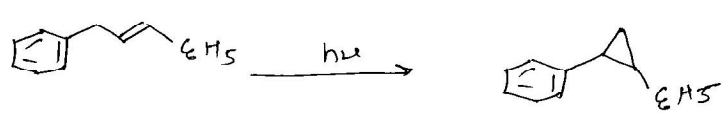
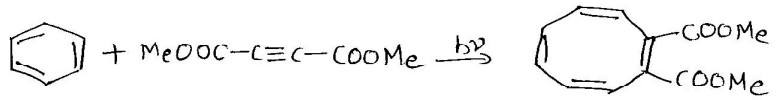
P.T.O.

Q3) a) Propose the suitable mechanism for any five of the following. **[10]**

i) 

ii) 

iii) 

iv) 

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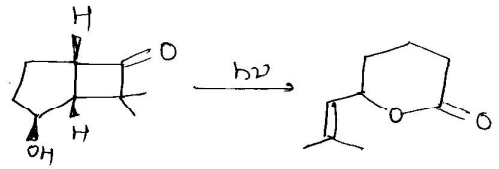
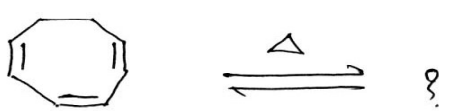
vi) 

b) Explain paterno Büchi reaction. Discuss its mechanism along with stereochemical consequences. **[4]**

SECTION-II

Q4) a) Explain with the help of F.M.O method of analysis, a suprafacial sigmatropic [1, 5] carbon shift with retention at the migrating centre is thermally or photochemically allowed. **[6]**

b) Predict the product in any four of the following. Explain their stereochemistry and mechanism. **[8]**

i) 

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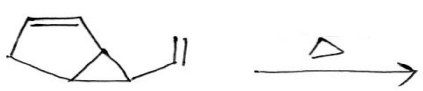

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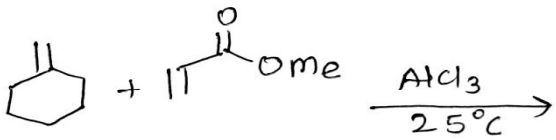
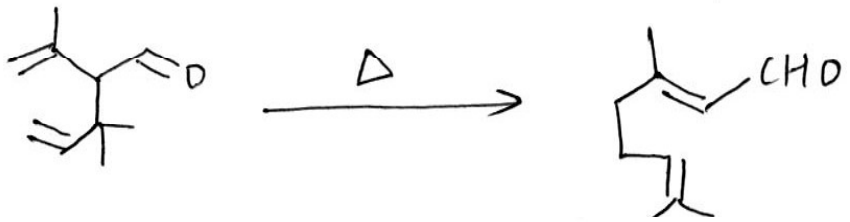


5)

Q5) a) With the help of co-relation diagram, show that the Diels-Alder reaction is thermally allowed process. **[4]**

b) Explain the mechanism - Any Four **[8]**

i)



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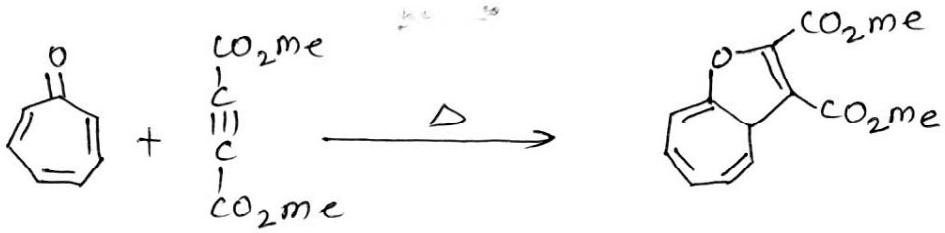

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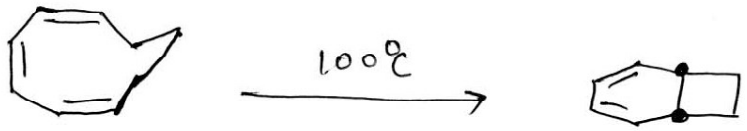

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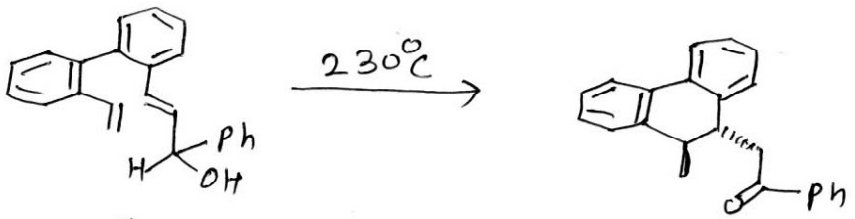

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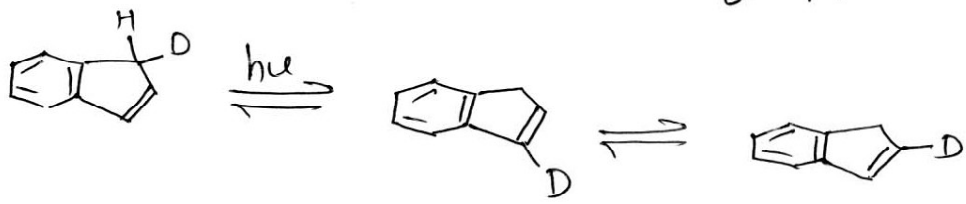


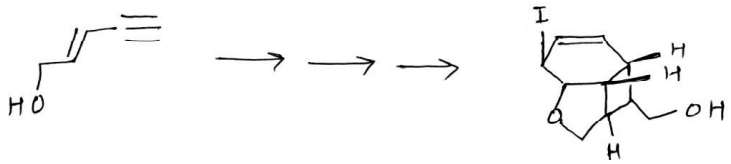
Q6) a) Explain the Black's hypothesis for the synthesis of Endiandric acid A-D **[6]**

b) Answer any two of the following. **[8]**

i) Complete the synthetic sequence indicating all intermediates and reagents required for the synthesis of Isocomene.

ii) Explain the synthesis of ladderane.

iii) Complete the following synthetic sequence indicating all intermediate and reagent required.



✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

P1132

[Total No. of Pages : 2

[5430]-44
M.Sc. - II
ANALYTICAL CHEMISTRY
CH-390 : Electroanalytical and Current Analytical Methods in Industries
(2008 Pattern) (Semester - III)

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, non programmable calculator is allowed.***
4) ***Answer to the two sections should be written in seperate answer book.***

SECTION - I

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

a) What are nanomaterials. Give its general applications.

b) Give a brief account of Hydrodynamic voltametry.

c) Sketch and explain the nature of amperogram for

i) Analyte is electroactive, reagent is not active

ii) Reagent is electroctive, analyte is not active

d) A diffusion coefficient for Zinc (II) ions is 9.1083×10^{-6} cm^2/s. the capillary characteristic were m= 1.42mg/s t= 3.475 calulate the diffusion current of 1.25 mm solution of Zinc (II) ions.

e) Constant current coulometry was used to assay a solution containing iron (II). The assay was performed in 0.1 M cerium sulphate-sulpuric acid solution. The overall reaction was $Ce^{4+} + Fe^{2+} \rightarrow Ce^{3+} + Fe^{3+}$

At the end point of titration of 25 ml sample a controlled current of 6.43 MA had flowed for 3 min 43 sec. Calculate the concetration of Fe^{2+} in sample.

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

a) Explain the technique pulse polarography. Hence explain the nature of pulse polarogram and voltage ramp used in it.

b) Describe the electrogravimetric method for estimation of copper from brass.

c) State the principle of stripping methods. Describe the importance of electrodeposition step in it

P.T.O.

d) Give the applications of polarography in qualitative and quantitative analysis.

e) A peak current of 22.5 μA was observed at scan rate of 0.20 V/s at the disk electrode on tringular wave voltammogram during forward scan. Calculate the peak current at a scan rate of 45.0 mv/s if species undergoes reversible electrochemical reaction.

SECTION - II

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

a) Give a briet account of direct isotope dilution analysis.

b) What is thermogravimetry? With neat labelled diagram explain the componets of modern thermobalance.

c) Explain the application of radiometric titration for estimation of ions in given mixture.

d) A ta curve was obtained fro 2.89 mg of sample containing $MgSO_4.7H_2O$. The monohydrate is formed due to complete loss in mass was 0.59 mg. Determine the percentage of heptahydrate in the sample.

Given (At.Wt H=1 O=16 Mg=24 S=32)

e) A 0.5ml of a sample solution containing 1 microcurie activity of tritium is injected into the blood stream of lab animal. After sufficient time 0.10ml of blood was withdrawn and found to have an activity of 125 dpm. Calculate the volume of blood in the body of lab animal.

Q4) Answer any four of the following: **[20]**

a) Explain the terms

i) Turbidance

ii) Turbidity coefficient

iii) Tyndal scattering

b) Discuss the principle and applications of chemically modified electrodes.

c) Explain the important applications of NAA.

d) Describe the effect of particle size of sample, heating rate and furance atmosphere on thermogram.

e) A thermal curve of 125.7 mg sample that contains a mixture of $CaC_2O_4.H_2O$ (mol.wt 146.129) and a thermally stable salt had a mass loss of 6.95 mg of an onset temperature of 140°C. corresponding to the vaporisation of water. Determine the w/w percentage of $CaC_2O_4.H_2O$ in given sample.

Total No. of Questions : 4]

SEAT No. :

P1133

[Total No. of Pages : 2

[5430]-45
M.Sc. -II
ANALYTICAL CHEMISTRY
CH-391 : Environmental and Analysis of Industrial Materials
(2008 Pattern) (Semester-III)

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

Instructions to the candidates:

1) ***Answer to the two sections should be written in separate answer books.***
2) ***All questions are compulsory and carry equal marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Use of logarithmic table, non-Programable calculator are allowed.***

SECTION-I

Q1) Attempt any Four of the following. **[20]**

a) Describe a method used for estimation of nitrogen from sample of urea.

b) Discuss the method to extract and estimate unsulphonated and unsulphated material from sample of detergent.

c) Explain the procedure for estimation of Zinc by using 8-hydroxy quinoline from deodorants and antiperspirants.

d) Enlist major constituents of glass? Outline the procedure for estimation of cobalt from glass sample.

e) A sample of 0.258gm of Nitrogen fertilizer was kjeldahlised and NH_3 evolved was absorbed in 50 ml of N/10 HCL, which requires 24.7ml of N/10 NaoH for neutralization. Determine percentage of Nitrogen.
[Given : At. Wt. N=14]

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

a) What are pigment? Discuss the analytical method for the estimation of chromium from pigment Sample.

b) What are the constitueuts of face powder? Explain the method of estimation of calcium from face powder.

c) What is meant by sampling? What are different steps involved in sampling of different material.

d) What are propellant and explosive? Explain adiabatic calorimeter method to measure heat of explosion.

P.T.O.

e) 0.250 gm sample of borosilicate glass was fused with sodium carbonate. The product was converted into boric acid by suitable process. After adding sufficient amount of manitol, whole solution was titrated with 0.05N NaOH Solution Using para-nitrophenol as an indicator. The fitration reading was 15.8ml. Calculate percentage of B_2O_3 in the Sample.

[Given : At. Wts. B = 11, O=16]

SECTION-II

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

a) Mention aluminium based alloys. Explain the method of estimation of aluminium.

b) Out line analytical procedure for estimation of Ti from Ilmenite ore.

c) What are safety rules and methods in industries.

d) 0.380gm sample of steel was disintegrated by acid tratment. the solution was diluted to 100ml. 50ml of aligeot further used and iron was removed as $Fe(OH)_3$. The amount of $PbCrO_4$. was found to be 0.187 gm. Calculate perecentage of chromium in the sample
[Given ; At wts. Pb=207, Cr=51.99, O=16]

e) How No_x is generated? Explain its hazardous effect on material How it controlled?

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

a) Explain the method of determination of hexavalent chromium from waste water.

b) Write note on anerobic decomposition.

c) Give an account of estimation of dissolved oxygen (Do).

d) Describe any two method used for disposed of sludge.

e) 0.240gm Cupronickel alloy was dissolved by acid treatment and solution was diluted to 100ml. In Todometric determination of Cu, 10ml diluted solution required 9.5ml of 0.025N $Na_2 S_2 O_3$ for complete reaction. In gravimetric estimation of Ni as Ni-DMG 25ml diluted solution was gave 0.120 gm Ni (DMG) ppt. after removal of Cu.Calculate percentage of Cu and Ni from alloy.
[Given : At. Wts. Cu=63.5, Ni=58.6, Ni (DMG)=288.6]

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

P1134

[Total No. of Pages : 2

[5430]-46
M. Sc. - II
ANALYTICAL CHEMISTRY
CH - 392 : Advanced Analytical Techniques
(2008 Pattern) (Semester - III)

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 calculator is allowed.***
5) ***Use of graph paper is allowed.***

SECTION - I

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

a) State the Kirchhoff's law. Give its significance in relation with conservation of mass and energy.

b) Draw the circuit symbols of the following and give any one application of each :

i) Amplifiers ii) Photo resistors

iii) Light emitting diodes iv) Transistors

v) Photodiodes

c) Explain the role of microprocessor control in X-ray spectrometer.

d) Write short note on flow injection analyzer.

e) Calculate binary equivalent of 201 and decimal equivalent of 11011001.

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

a) Write short note on centrifugal force analyzer.

b) Draw a block diagram of digital computer and explain the function of each component.

c) State and explain the principle and working of current and voltage measuring devices with one typical example.

d) A metallic cube of length 6 cm is to be copper plated, if the cube is immersed in a copper electrolyte. The current is adjusted to 7.00A and passed for 40min. What will be thickness of deposited copper?
[Given At. Wt. of Cu = 63.54g, density of Cu = 8.96 g/ml. 1F = 96487 Coulomb]

e) Which value of resistor should be connected parallel with 70Ω resistor to reduce to 20Ω.

P.T.O.

SECTION - II

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

a) Compare the ICPS and Direct Current plasma emission spectroscopic techniques of analysis with respect to principle and method of analysis.

b) State and explain super critical fluid chromatography and mention its merits and demerits.

c) Write a note on Atomic fluorescence spectroscopy.

d) Describe the principle of single immuno diffusion and double immunodiffusion techniques of analysis. Mention their important applications.

e) Magnesium in blood serum is determined by AAS. A 5.00 ml serum sample was diluted to 100 ml and its absorbance was found to be 0.175. A standard containing 3×10^{-5}M of Mg^{2+} gave the absorbance of 0.250. Calculate the magnesium concentration in milligram percent in sample of blood.

[Given : Atomic mass of Mg = 24.0 g/mol]

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

a) Give a comparative account of Atomic mass spectrometry and molecular mass spectrometry.

b) Mention the elements required in micronutrients for the growth of crop. Describe any one suitable method for the determination of molybdenum from soil sample.

c) Explain clinical application of radioimmuno-assay of Esterogen.

d) Write a note on Resonance ionization spectroscopy.

e) A well water sample is analysed flame photometrically for sodium at 590nm. The emission signal is 10.8 unit an emission scale. A series of standard solution give the following result. Determine sodium level in ppm in well water sample.

Standard Sodium in ppm	Emission Reading
0.4	0.64
2.0	2.80
4.0	5.70
6.0	8.42
8.0	11.28

Total No. of Questions : 4]

SEAT No. :

P1135

[Total No. of Pages : 2

[5430]-47
M.Sc.-II
ANALYTICAL CHEMISTRY
CH-380 : Pharmaceutical Analysis (Optional)
(2008 Pattern) (Semester - III)

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

Instructions to the candidates:

1) ***Answer 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 calculators is allowed.***

SECTION-I

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

a) What are manufacturing hazard? Explain in brief cross contamination.

b) How stability study of drug is used to determine the self-life of drug?

c) Explain the limit test for lead and arsenic.

d) Outline the procedure for photometric determination of haemoglobin.

e) Explain biological assay of tetanous antitoxin.

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

a) Explain determination of ABO group of blood sample.

b) Describe the disintegration test for tablets.

c) Discuss the principle and assay of steroids.

d) Write a note on "Determination of thiomersal."

e) 0.28g adrenaline ($C_gH_{13}O_3N$) sample was dissolved in 30ml glacial acetic acid and solution was titrated with 0.1N acetous perchloric acid using crystal violet indicator. The titration reading was 15.0 ml. Determine the percentage of adrenaline in the given sample.

P.T.O.

SECTION-II

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

a) Differentiate between ointments and creams.

b) What are the capsules? Explain different methods of preperation of hard and soft capsules.

c) Discuss in detail clinical study in the development of new drug.

d) Give the procedure for determination of ash in ginger. Mention the application of ash value for vegetable drug.

e) 0.42g Ibuprofen sample [$C_{13}H_{11}O_2$] was dissolved in 100 ml alcohol which was previously neutralized using phenolphthalein. It was then titrated with 0.1N NaOH and required 19.8 ml of NaOH. Calculate the percentage of Ibuprofen in given sample. (Given : C=12, H=1, O=16).

Q4) Attempt any Four of the following: **[20]**

a) What is sterlization? Explain dry heat sterlization in detail.

b) What is pyrogen? Explain preliminary (sham test) for pyrogen.

c) Explain the role of FDA in pharmaceutical industry.

d) Give an account of mouthwashes and ophthalmic preperations.

e) 0.13g of Ferrous gluconate ($C_{12}H_2O_{14}Fe$) was dissolved in a mixture of 75ml of water and 25ml dilute sulphuric acid. The solution was titrated with 0.01N ammonium ceric sulphate using O-phenanthroline-ferrous sulphate as an indicator. The burette reding was 28.1ml. Determine the perecntage of ferrous glaconate in the sample.

Give : (C=12 H=1 O=16 Fe=56)

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

P1136

[Total No. of Pages : 2

[5430]-48
M.Sc.-II
ANALYTICAL CHEMISTRY
CH-381 : Medicinal Chemistry
(2008 Pattern) (Semester - III) (Optional)

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

Instructions to the candidates:

1) ***Answer 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.***

SECTION-I

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

a) What are novel drug delivery systems? Explain with suitable examples.

b) Write a short note on biological assays.

c) Give a brief account of new procedures followed in drug design.

d) Define the term : Inductive effect, Hormones, isosterism, bio-isosteris, depressant.

e) Explain drug receptor interaction.

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

a) Explain the classification of drugs with suitable examples.

b) Define and explain : pro drug, Ed_{50}, Drug absorption, Sedatives.

c) Write a short note on hansch analysis.

d) Give the synthesis of chloramphenicol

e) Explain the role of alkylating agents in cancer therapy.

P.T.O.

SECTION-II

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

a) Discuss the mode of action of hypnotics and anti-anxiety drugs.

b) Discuss the stereochemical aspects of psychotropic drugs.

c) What are neoplastic agents? Explain the mode of action of mitotic inhibitors.

d) Give the synthesis of

i) PenicillinG

ii) Phenytoin

e) Write a short note on cardiovascular diseases.

Q4) Attempt any Four of the following: **[20]**

a) What is antifective drug? Discuss with suitable examples.

b) Write a short note on drug development and serendipity.

c) Define and explain the term.

i) Sedatives

ii) Neuro transmitters.

d) Give a brief account of neurochemistry of mental diseases.

e) Give the role of hormones and natural products in chemotherapy.

✓ ✓ ✓

Total No. of Questions :6]

SEAT No. :

P1137

[Total No. of Pages : 3

[5430]-51

M.Sc.

PHYSICAL CHEMISTRY

CH - 410 : Molecular Structure and Spectroscopy

(2008 Pattern) (Semester - IV) (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	=	6.022×10^{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) Define chemical shift in nmr. Explain the factors affecting it.

b) Explain the advantages of FT nmr.

c) Write a note on : Use of nmr in medical diagnostics.

d) Discuss the applications of nqr with suitable examples.

e) Explain the instrumentation involved in high resolution nmr spectroscopy.

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

a) Explain the nature of the esr spectrum of the naphthalene anion.

b) What is g value? Explain the factors affecting it.

c) What is the principle of PAS? How it is useful in the study of gases and condensed systems?

d) Define and explain the following terms related to esr spectroscopy.

i) Spin Hamiltonian and

ii) Spin densities

e) Describe the instrumentation used in esr spectroscopy and explain the working of a klystron.

Q3) Solve any two 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_2OH and CH_3-O-CH_3

ii) $CH_3CH_3CH_2OH$ and $(CH_3)_2$ CHOH

iii) $CH_3-\overset{O}{\overset{\|}{C}}-CH_3$ and $CH_3-CH_2-\overset{O}{\overset{\|}{C}}H$

b) Calculate the precessional frequency of a proton in a field of 1.5 T. The g-factor for proton is 5.585.

c) Differentiate among the following compounds from the ^{19}F spectra at high field.

i) $CH_3–CH_2F$

ii) $CH_2F–CH_2F$

iii) $CH_3–CF_3$

SECTION - II

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

a) How are X-rays produced and detected? What is the principle of X-ray diffraction?

b) State the phase problem and outline the techniques used to overcome it.

c) Describe the electron diffraction experiment and indicate how the Wierl equation is used to deduce molecular geometry.

d) Discuss the advantages and disadvantages of XRD method.

e) Explain the principle of neutron diffraction. Describe the components of a neutron spectrometer with the help of a diagram.

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

a) Define the terms magnetic susceptibility and explain paramagnetism and diamagnetism.

b) Explain the working of the Guoy balance with the help of a schematic diagram.

c) Derive Van-Vleck's general equation for magnetic susceptibility.

d) What are the limitations of electron diffraction technique?

e) What is spin only magnetic moment? Find these for a metal complex with four unpaired electrons.

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

a) Calculate the spin only moment for a metal complex with 3 unpaired electrons.

b) Calculate the magnetic susceptibility of molecules having 2 and 5 unpaired electrons at 27°c.

c) A beam of X-rays having 154.1 pm wavelength is passed into the surface of a silver crystal. The beam is reflected at 22.2°. Deduce the interplanar spacing in the silver crystal.

Total No. of Questions : 6]

SEAT No. :

P1138

[Total No. of Pages : 4

[5430]-52
M.Sc.
PHYSICAL CHEMISTRY
CH-411 : Surface Chemistry and Electrochemistry
(2008 Pattern) (Old) (Semester - IV)

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

Instructions to the candidates:

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

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

a) Discuss the adsorption behaviour at liquid surfaces. Give necessary equations.

b) What is wetting phenomenon? Explain its mechanism.

c) Derive the equation for differential energy of adsorption at constant temperature and volume.

d) Describe the volumetric method for measurement adsorption.

e) Give the critical comparison of various multilayer models of adsorption.

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

a) Describe any two methods of determination of surface area of solids.

b) What are porous solids? How is the pore size determined by mercury porosimeter method?

c) What is hysteresis of adsorption ? Give Zsigmondy's theory to explain hysteresis.

d) Define the terms,

i) Turnover number

ii) Catalyst selectivity

iii) Functionality

iv) Sites and

v) Negative catalyst.

e) What are zeolites? How these act as molecular sieves?

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

a) The adsorption of butane vapour on 1.85g of catalyst was studied at 0°C. The data when fitted in BET equation, yielded a linear plot with the slope of 38.95×10^{-3} ml^{-1} and intercept of 1.85×10^{-3} m^{-1}. The area occupied per molecule of butane is 44.6 $Å^2$. Determine the specific surface area of the catalyst.

b) The mass 'X' of a solute adsorbed per gram of solid adsorbent is given by Freundlich adsorption isotherm as $X=K.C^n$ where 'K' and 'n' are 0.160 and 0.431 respectively, calculate the amount of acetic acid that 1Kg of charcoal would adsorb from 0.837 M vinegar solution.

c) The following table gives the number of millilitres (θ) of nitrogen adsorbed per gram of active carbon at 0°C at a series of pressures:

P/Pa	524	1731	3058	4534	7497
θ/cm^3g^{-1}	0.987	3.04	5.08	7.04	10.31

Plot the data according to langmuir isotherm and determine the constants, K and θ_m.

SECTION-II

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

a) Describe the structure of water when ion is present in it.

b) Explain the term ionic strength. How does it affect

i) Thickness of ionic atmosphere

ii) Mean activity coefficient.

c) Explain the terms

i) Galvani potential

ii) Outer potential

iii) Surface potential

iv) Electrochemical potential.

d) Discuss the Stern theory of electrical double layer.

e) Explain how the Debye-Huckel law of activity coefficient can be extended for apprecible concentration.

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

a) Derive Tatel equation from Butler-Volmer equation.

b) Discuss the general mechanism of passivation of metals.

c) Describe with neat diagram of H_2-O_2 fuel cell.

d) Explain the terms -

i) Faradic efficiency,

ii) Voltage efficinecy

iii) Maximum efficiency

iv) Over all efficiency.

e) Explain the principles involved in the methods of preventing corrosion.

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

a) Calculate the thickness of ionic atmosphere at 25°C in 0.01M solution of KBr. The dielectric constant of water is 78.5.

b) If the Tafel constants 'a' and 'b' have values 0.64 and 0.123 respectively for reduction of hydrogen ion. Calculate the transfer coefficient 'α' and exchange current density i_0 at 298K.

c) The following reaction may be made to operate in fuel cell at 300K.

$$CH_4 + 2O_2 \rightleftharpoons CO_2 + 2H_2O(l)$$

$$\Delta H_{300} = -890.4\,KJmol^{-1},\ \Delta G_{300} = -818.0\,KJ\,mol^{-1}$$

Calculate

i) Number of electrons transferred in overall cell reaction.

ii) Reversible emf of the cell at 300K.

iii) Maximum efficiency of the cell.

✓ ✓ ✓

Total No. of Questions : 4]

SEAT No. :

P1139

[Total No. of Pages : 3

[5430]-53
M.Sc. - II
PHYSICAL CHEMISTRY
CH - 414 : Biophysical Chemistry and Related Techniques
(2008 Pattern) (Semester - IV) (Old) (Optional)

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

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 four of the following: **[20]**

a) Explain blood buffering mechanism.

b) Distinguish between chaperones and chaperonins.

c) State applications of Donnan membrane equilibrium.

d) What are flickering clusters?

e) Write a note on Phosphoanhydride bond in ATP.

f) Compare reverse osmosis with osmosis.

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

a) Discuss the significance of directionality in H bond.

b) Explain the use of Henderson - Hassalbalch equation to determine buffer concentrations. What is buffer capacity?

c) Derive the relation $l = \frac{\overline{R} \times (3\pi)^{\frac{1}{2}}}{\sqrt{8N}}$.

d) Calculate R_{rms} for a polymer with 250 monomer units and total length 4000Å.

e) Compare animal and plant cell structures.

f) Discuss the role of nucleic acids in cell biology.

SECTION - II

Q3) Answer any four of the following: **[20]**

a) Explain the structure of a cell membrane with the help of unit membrane model.

. b) Define the terms :

i) axolemma ii) synapse

iii) action potential iv) impulse and

v) all and none law

c) What is enzyme inhibition? Explain briefly reversible inhibition.

d) What is a nerve? State it types giving examples.

e) Discuss briefly the methods used to determine the size of biopolymers.

f) Write a note on Helix-cell transition.

Q4) Answer any four of the following: **[20]**

a) Discuss the viscosity method to determine the molecular weight of a biopolymer.

b) Describe the instrumentation for measuring optical rotatory dispersion (ORD).

c) Discuss the factors affecting enzyme activity.

d) Explain the light scattering method for determination of molecular weight of biopolymers.

e) Discuss the applications of circular dichroism.

f) State the principle of X-ray diffraction how is it used to determine the molecular weight of an asymmetric macromolecule?

Total No. of Questions :5]

SEAT No. :

P1140

[Total No. of Pages : 3

[5430]-54
M.Sc. - II
PHYSICAL CHEMISTRY
CH - 415 : Special Topics in Nuclear Radiation Chemistry
(2008 Pattern) (Semester - IV) (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 tables/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}
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5.	1 eV		=	23.06 k cal mol^{-1}
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			=	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
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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) Answer any three of the following: **[15]**

a) Describe the method of preparation of ^{99m}Tc.

b) Give an account of solid radioactive waste management.

c) Write a short note on radiation therapy.

d) Explain how time, distance and shielding parameters help to reduce the external radiation hazards.

e) Describe the method of separation for boron isotopes.

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

a) Write a note on r and p-processes.

b) Explain the C–N–O bicycle.

c) Draw and explain cosmic, abundance curve.

d) Discuss the solar neutrino problem.

e) Write down the properties of quark confinement era GUT era and inflation era.

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

a) Find out the thickness of lead required to reduce gamma activity from 15000 cpm to 3000 cpm. Given $e^{\mu} = 0.211$ b, Z of Pb = 82, A of Pb = 207, density of lead = 11.35 g/cm^3.

b) Find the dose due to 150 mci Mn-56 at a distance of 2.5 m. Given Mn-56 emits 3 gamma rays of energy 847, 1111, and 2111 keV.

c) Find out the activity of ^{99m}Tc which was extracted after loading ^{99}Mo in generator (Given Initial activity of ^{99}Mo=28000 cpm, time of decay = 16h, % extraction = 80, $t_{1/2}$ of ^{99}Mo = 66h and of ^{99m}Tc = 6h.)

SECTION - II

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

a) Write a note on carriers.

b) Give the reactions in the radiolysis of methanol.

c) Define redical scavenging. Give examples.

d) Discuss types of chain reactions.

e) How are alpha emitters prepared.

f) Explain the principle of radiometric titrations.

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

a) How are radioactive nuclides for tracer use, prepared?

b) Explain the use of kinetic equations for optical methods.

c) Discuss how counters are chosen for activity measurement.

d) How is beam energy determined?

e) Explain the influence of radiations on alcohol.

f) Write a note on radiolysis of water.

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Total No. of Questions : 4]

SEAT No. : [ ]

P1141

[Total No. of Pages : 2

[5430]-55
M.Sc. - II
INORGANIC CHEMISTRY
CH-430 : Inorganic Solids and Heterogeneous Catalysis
(2008 Pattern) (Semester - IV)

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 the right indicate full marks.***

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

a) Find out the frame work $e^{\ominus}$ in given cluster compound $[Ni_6(CO)_{12}]^{2-}$ & predict it's structure.

b) What are Silicones? Give general methods of preparation and mention their uses.

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

d) Explain hydrogenation of olefins with potential energy curve.

e) Discuss the construction, working, merits and demerits of stirred tank reactor.

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

a) What do you mean by adsorption differentiate between physisorption and chemisorption?

b) How will you characterise zeolite material?

c) Explain the importance of nanomaterials as a catalyst.

d) Silicon form a number of polyoxoanions but not carbon, why? Draw the structure of the Polyoxoanions of Silicon.

e) What is meant by supported metal catalyst? Describe the role of support in supported metal catalyst.

P.T.O.

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

a) Giving suitable example differentiate between linear and cyclic inorganic polymers.

b) Give different methods of synthesis of zeolite. Explain any one in detail.

c) Explain Volcano diagram for decomposition of methanoic acid to methanoate.

d) Explain the term polysilanes, silicones, silicone rubber and feldspar.

e) What are clays? How pillered and intercalated clays are prepared? Discuss their catalytic application.

Q4) Write a note on (Any four): **[20]**

a) ALPO and SAPO

b) MCM-41 as a catalyst

c) Phase transfer catalysis

d) SN compounds

e) Heteropolyanions of Mo and W.

Total No. of Questions : 4]

SEAT No. :

P1142

[Total No. of Pages : 2

[5430]-56
M.Sc.-II
INORGANIC CHEMISTRY
CH-431 : Materials Science
(2008 Pattern) (Semester-IV)

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 the right indicate full marks.***
4) ***Use of logarithmic table and, calculator is allowed.***

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

a) State and explain Fick's law's of Diffusion.

b) Explain Hard and Soft magnet.

c) What is Reinforced concrete? Explain the process for formation of concrete.

d) Define coherence length. Explain the synthesis of super conducting materials.

e) Explain the clinical uses of Biomaterials.

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

a) What are ceramics materials? Explain the process formation of cement.

b) What are nanoparticles?Explain the size dependent properties of nanoparticles.

c) What is the difference between normal and inverse spinel? Give the application of magnetic materials.

d) What are main types of synthetic fibers used to produce fiber reinforced plastic composite materials?

e) Explain the mechanism of Fluorescences and phosphorances with the help of energy level diagram.

P.T.O.

Q3) Solve any four of the following. **[20]**

a) Saturation Magnetisation of F.C.C. Iron is 1800KA/m^2. Calculate the net magnetic moment per Iron atom in crystal. Given lattice parameter of FCC Iron is 2.87Å.

b) Calculate the energy gap in 'Si' given that it is transparent to radiation of wavelength greater than 13000Å.

c) Mobility of electrons and holes in sample intrinsic Germanium at room temperature are 4000 & 2000 cm^3/Vsec respectively. If electron and hole densities are equal to $2.5 \times 10^3/cm^3$. Calculate conductivity.

d) In an n-type semiconductor the fermilevel lies 0.3eV below the conduction band at room temperature. If the temperature is increased at 530°K. Find the position of Fermilevel. [Room temp = 300°K]

e) In 'S' the energy gap is 0.8 eV. What is the wavelength at which start absorption of Light?

Q4) Write a short note on any four of the following. **[20]**

a) n-p-n Transistors.

b) Pyroelectric Materials

c) Sol-gel process

d) Type-I and Type-II Semiconductors

e) Kirkendall effect.

✓ ✓ ✓

Total No. of Questions : 9]

SEAT No. :

P1143

[Total No. of Pages : 3

[5430]-57
M.Sc. - II
INORGANIC CHEMISTRY
CH-445 : Inorganic Applications in Industry, Biotechnology and Environmental Chemistry
(2008 Pattern) (Semester-IV) (Paper-II)

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

Instructions to the candidates:

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

SECTION-I
Applications of Inorganic Materials

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

a) What is meant by the term Pigment? Explain the following properties of inorganic pigment.

i) Colour ii) Hiding power

iii) Ease of wetting iv) Chemical resistance

b) Which type of isomerism are seen in chromium and cobalt complexes of tridentate AZO compounds? Explain any one type of isomerism.

c) Explain the methods for electroplating of precious metals.

d) Explain the microstructure of soft and hard wood.

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

a) What is the difference between a pigment and dye? Explain the use of chromium in dyeing of wool using azo dyes? Give the structure of the compound involved.

b) What are redox centers to PVP electrode coating? Explain the effect of increasing the positive potential of the platinum electrode on electro deposition.

c) A piece of wood containing moisture weigh 174.3 gm. and after over drying a constant weight is 156.3 gm. What is its percentage moisture content? Justify your answer on the quality of wood.

d) Explain two methods of electroplating of tin.

P.T.O.

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

a) Explain the production and properites of glass fibers.

b) Write a note on - Luminous and Fluorescent pigments.

c) How do complexes such as prussian blue and ferrocene modify the behaviour of electrodes during electroplating.

SECTION-II

Environmental Chemistry

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

a) Describe how nitrogen can be removed from the waste water by biological treatment.

b) Draw a schematic diagram that shows all the components of an AAS. How is an aqueous sample introduced into AAS? The metal ion analyte has a positive charge, how does it become a neutral atom.

c) Compare aerobic treatment process with an anaerobic treatment process.

d) What are maximum contaminant level (MCL) of the safe drinking water Act?

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

a) Will geothermal energy ever be a major source of energy world wide? Explain.

b) List the five provision of the clean water act (CWA). Which of these are considered the most important?

c) What is powerball? Draw a schematic diagram of plant for producing powerball. How is the H_2 gas liberated from a powerball. How is the powerball manufactured.

d) Determine P^E for waste water that contains 5.0×10^{-7} M.Cd^{+2}. Does this waste water favours oxidation or reduction ($PE° = -6.81$)

Q6) Write note on any two. **[10]**

a) Energy from biomass

b) Electrodialysis

c) Biorefractory organic pollutant

SECTION-III

Biotechnology

Q7) Answer any three. **[15]**

a) What is Germ theory of diseases?

b) Explain the use of microbes in oil refinery.

c) Explain the effect of P^H concentration and temperature on making of curd.

d) Which principles of Genetics are used in biotechnology?

Q8) Attempt the following any three. **[15]**

a) Describe the steps involved in the synthesis of insuling from clone DNA segment.

b) Write an account on production of lactic acid.

c) How can fungi be used for production of food?

d) Name the different process used in water treatment and explain the deep shaft process in detail.

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

a) Solid state fermentations

b) Microbes and soil recovery

c) Stages in Genetic engineering.

Total No. of Questions : 6]

SEAT No. : ____

P1144

[Total No. of Pages : 3

[5430]-58
M.Sc. - II
ORGANIC CHEMISTRY
CH-450 : Chemistry of Natural Products
(2008 Pattern) (Semester - IV)

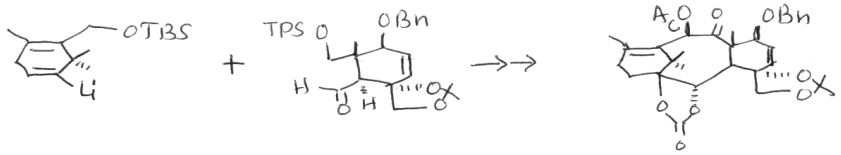
Time : 3 Hours] ***[Max. Marks : 80***

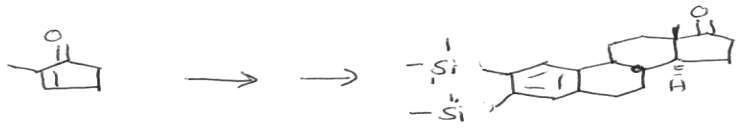
Instructions to the candidates:

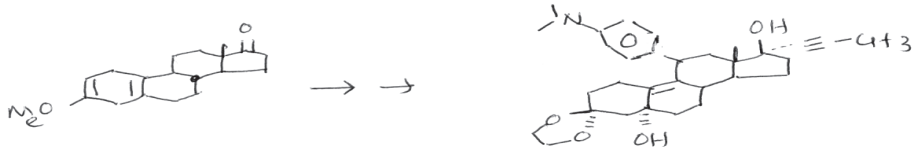
1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Answers to the two sections should be written in separate answer books.***

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) 

b) 

e) 

Q2) Answer the following (Any three) **[12]**

a) Describe evidences to establish presence of C-5 methyl group in Hardwickiic Acid.

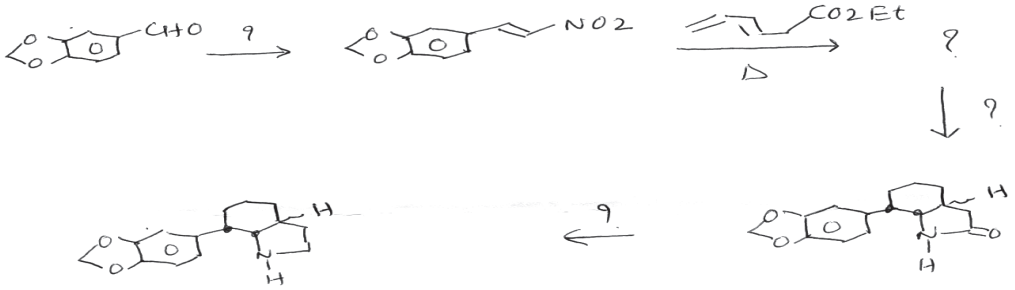
b) Explain the experiment to prove that camptothecin contains pyridone and Ar-CH_2-NCO groups.

P.T.O.

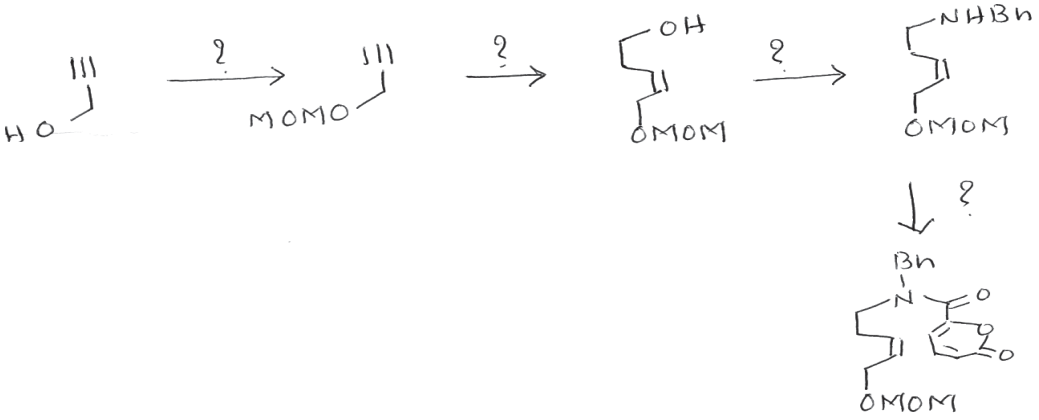
c) Give evidences to show that podophyllotoxin contains Y - lactone ring and free alcoholic OH group.

d) Give the evidences to establish the presence of monosubstituted furan ring in Hardwickiic Acid.

Q3) a) Place the appropriate missing reagents / intermediates in the following conversion and explain each step. **[6]**



b) Complete the following synthesis. **[6]**

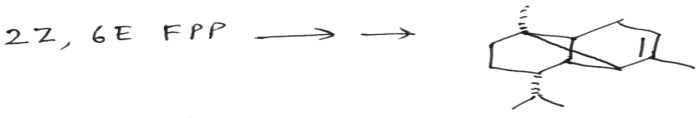


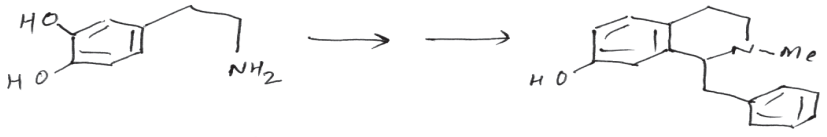
SECTION - II

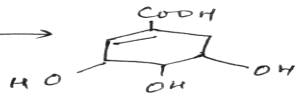
Q4) a) Write an account of Wagner Meerwein Rearrangement in biosynthesis of steroids. **[4]**

b) Suggest biogenetic scheme for any three of the following: **[12]**

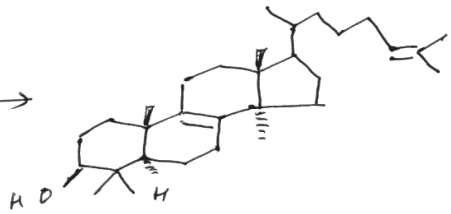
i) 

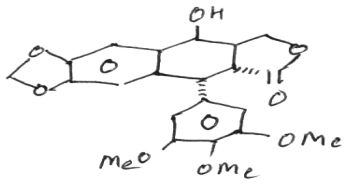
ii) 

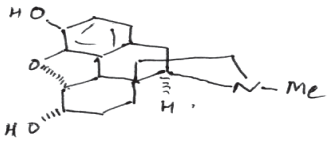
iii) 

iv) Erythrose - 4 - Phosphate 

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

a) Squalene monoepoxide ⟶ ⟶ 

b) Coniferyl alcohol ⟶ ⟶ 

c) Tyrosine [2–^{14}C] ⟶ ⟶ 

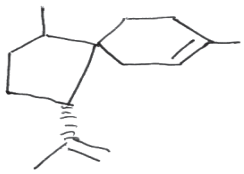
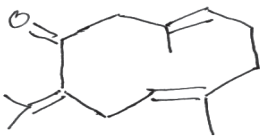
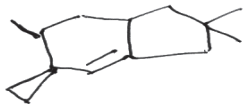
Indicate the position of label in each step

Q6) a) Complete the following biogentic transformation **[6]**

ornithine [2–^{14}C] ⟶ ⟶ 

Indicate the position of label in each step.

b) Suggest the biogenesis of the following compounds starting from FPP. **[6]**

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Total No. of Questions : 6]

SEAT No. :

P1145

[Total No. of Pages : 3

[5430]-59
M.Sc.-II
ORGANIC CHEMISTRY
CH-451 : Synthetic Methods in Organic Chemistry
(2008 Pattern) (Semester-IV)

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

Instructions to the candidates:

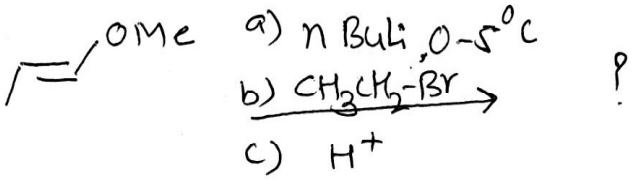
1) ***All questions are compulsory.***
2) ***Answers to the two sections should be written in separate answer books.***
3) ***Figures to the right indicate full marks.***

SECTION-I

Q1) Answer any four of the following. **[12]**

a) Explain the role of $CuCl_2$ in Wacker process.

b) What is Umpolung of reactivity? Predict the product and suggest the mechanism of the following.



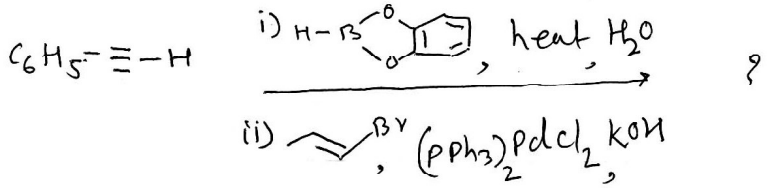
c) Use of Grubb's catalyst in large ring formation.

d) Urethane protection is preferred over acyl protection of amino group during peptide synthesis. Explain.

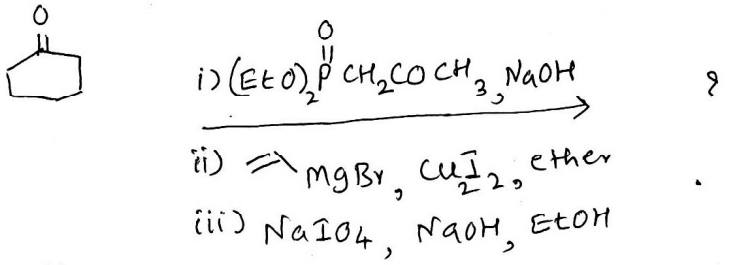
e) Use of diisopino camphenyl borane in organic synthesis.

Q2) Predict the product/s with mechanism in any four of the following. **[16]**

a)



b)



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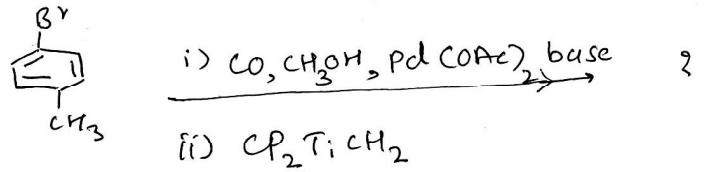
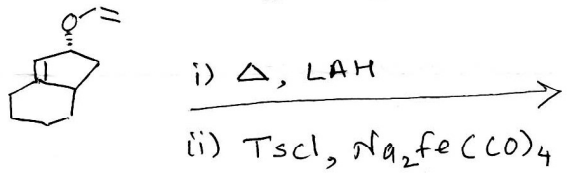
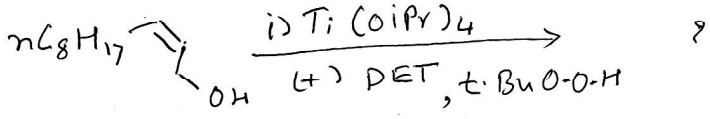
c) 

d) 

e) 

Q3) Write short notes on any four of the following. **[12]**

a) Collman's reagent in organic synthesis
b) Linear and convergent synthesis
c) Application of super hydride and selectrides in organic reaction.
d) Oxo process
e) $Ni(CO)_4$ in reductive coupling.

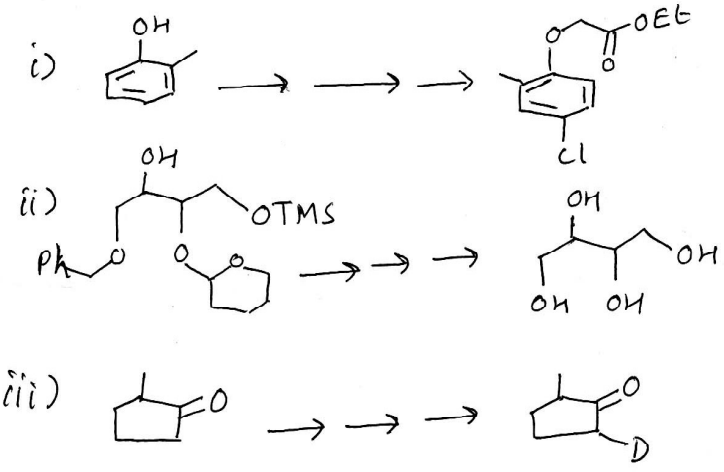
SECTION-II

Q4) Explain Any four of the following. **[12]**

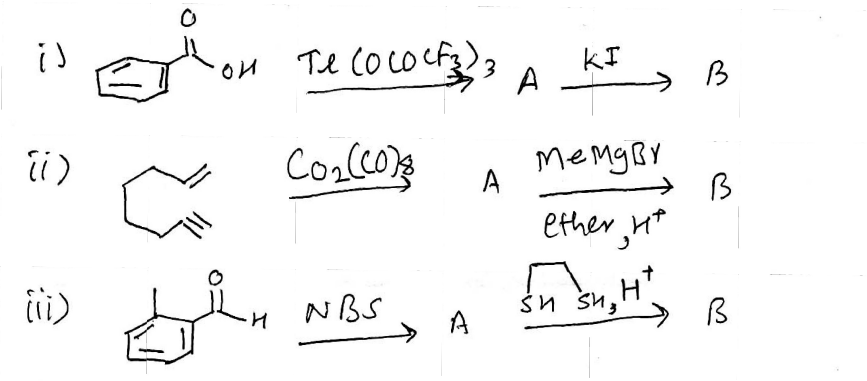
a) Use of EDCI and Bu_3 Sn H in organic synthesis.
b) Solid phase peptide synthesis.
c) Use of Mannich reaction in preparation of exomethylene Ketones.
d) How thexyl borane is used in synthesis of cycloketones?
e) Syn and anti products in organostannane addition reaction.

Q5) How will you carry out the following transformation (any two) **[6]**

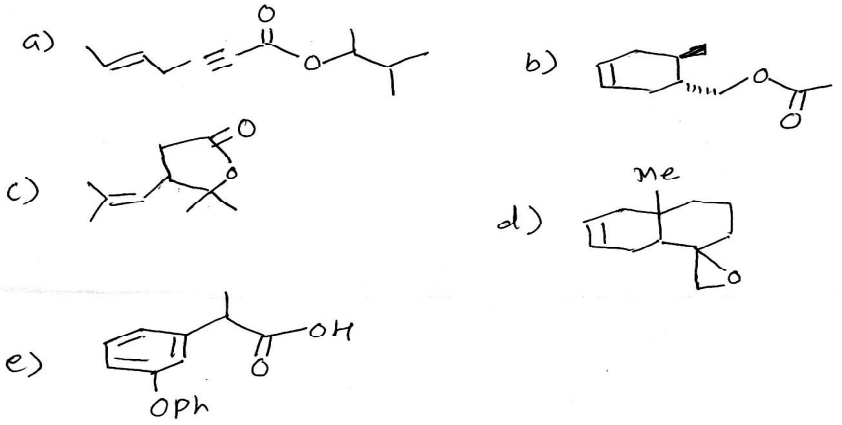
a)



b) Identify (A) and (B) in the following reaction sequence (Any two) **[6]**



Q6) Using retrosynthetic analysis suggest convenient route for the synthesis of any four of the following: **[16]**



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Total No. of Questions : 6]

SEAT No. :

P1146

[Total No. of Pages : 4

[5430]-60
M.Sc. - II
ORGANIC CHEMISTRY
CHO-452 : Heterocyclic Chemistry, Chiron Approach and Medicinal Chemistry
(2008 Pattern) (Semester - IV)

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) Reactivity of pyrrole is much greater than pyridine and pyrimidine towards electrophilic substitution reaction.

ii) Oxazole is less basic than imidazole.

iii) Benzyne on reaction with furan gives α-Napthol.

iv) Pyridine–N–oxide readily undergoes electrophilic substitution at the 4-position.

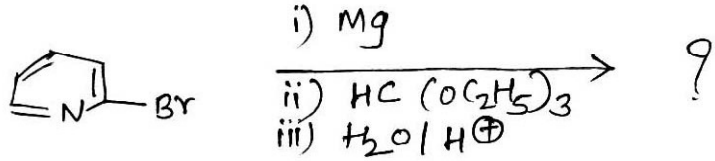
b) i) Give applications of supramolecular chemistry in medicine, data storage and processing. **[3]**

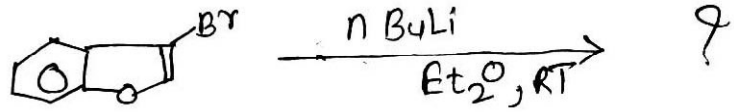
ii) Write the reactions of indole with **[3]**

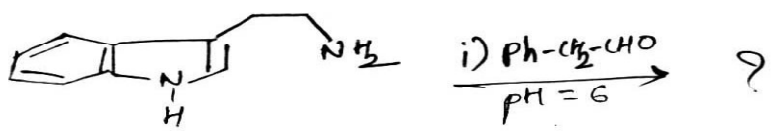
1) Dmf, $POCl_3$ and H_2O

2) $CHCl_3$, KOH, $C_2H_5O_4$

Q2) a) Predict the products in any five of the following: **[10]**

i) 

ii) 

iii) 

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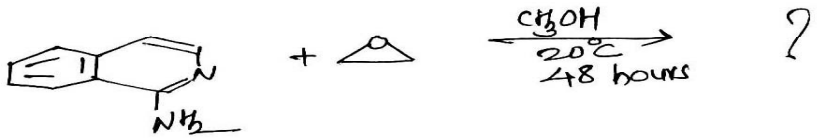
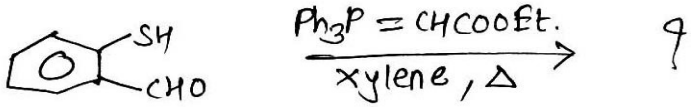
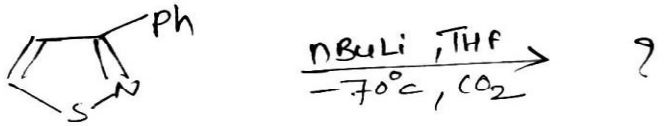
iv) 

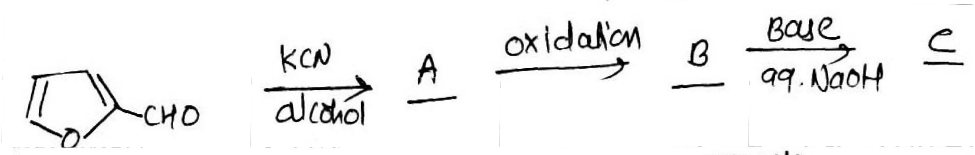
v) 

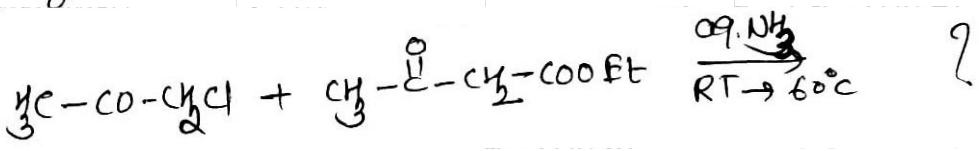
vi) 

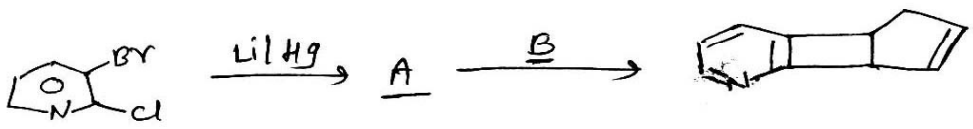
b) Write notes on (Any three) **[6]**

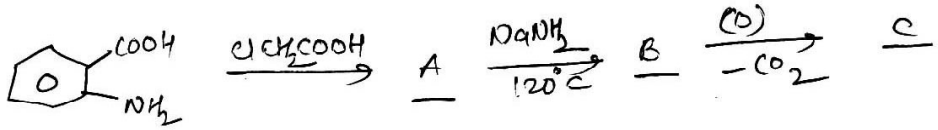
i) Hantzsch pyrrole synthesis
ii) Skraup Quinoline synthesis
iii) Bischler Napierlaski synthesis
iv) Use of thiourea in thiazole synthesis

Q3) a) Complete the following reaction sequence (Any three) **[6]**

i) 

ii) 

iii) 

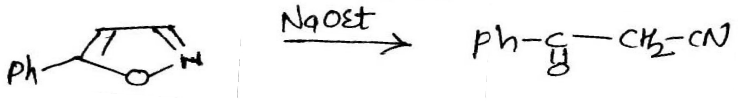
iv) 

b) i) Give the reactions of following reagents with thiophene **[3]**

1) H–CHO, $CHCl_3$, O°C
2) I_2, aq.HNO_3, 90°C
3) HNO_3, AC_2O, ACOH, O°C

ii) Suggest the mechanism for Any one of the following **[3]**

1) 

2) 

SECTION - II

Q4) Answer any three of the following: **[12]**

a) Write short note on

i) Anomeric effect

ii) Mutarotation

b) Write the reactions of D-glucose with

i) HNO_3 ii) Br_2-water

iii) HCN iv) excess of NH_2OH

c) Draw $^1C_4$ and $^4C_1$ conformations for D-(+) - Glucose and L-Mannose

d) How will you convert D-aldopentose into D-aldotetrose?

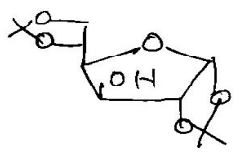
Q5) a) Write the restrosynthetic analysis for (–) –Shikimic acid. **[2]**

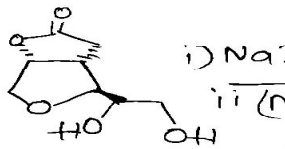
b) Explain the terms chiron and chiron Pool strategy. **[2]**

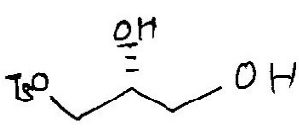
c) Predict the product/s in any four of the following reactions. **[8]**

i) D-Glucose $\xrightarrow{MeOH/H_3O^+}$? $\xrightarrow[\text{anhydrous } ZnCl_2]{PhCHO}$?

ii) D-Galactose $\xrightarrow{RSH/H_3O^+}$? $\xrightarrow[1 \text{ equivalent}]{TsCl/Pyridine}$?

iii)  $\xrightarrow[CH_2Cl_2]{PCC}$? $\xrightarrow{Ph_3P=CHCOOEt}$?

iv)  $\xrightarrow[ii\ (MeO)_2P(O)CH_2COC_6H_{11}\ iii\ ZnBH_4, NaH]{i\ NaIO_4}$? $\xrightarrow[TsOH]{\text{Dihydro pyran}}$?

v)  $\xrightarrow[CCl_4]{Ph_3P,}$? $\xrightarrow[Na]{\text{Ethylene glycol}}$?

Q6) Answer any four of the following: **[16]**

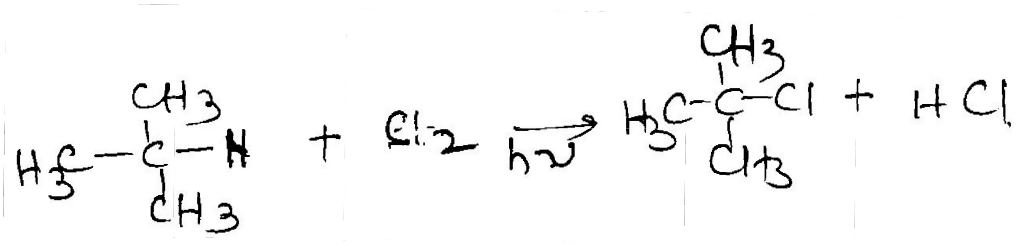
a) Explain Pharmacokinetics of drug action with suitable examples.

b) What are the different forces involved in drug-receptor interactions?

c) Discuss the role of computers in drug design.

d) Describe any four principles involved in green chemistry.

e) Calculate % atom economy for the following reaction.



Total No. of Questions : 4]

SEAT No. :

P1147

[Total No. of Pages : 2

[5430]-61

M.Sc. - II

ANALYTICAL CHEMISTRY

CH-481 : Bioanalytical and Forensic Science

(2008 Pattern) (Semester-IV)

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

Instructions to the candidates:

1) ***Answer 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) What is sterilization? How it is carried out?

b) Define rancidity. Explain analytical procedure for estimation of SAP value.

c) Write a note on organic food preservatives.

d) How is HMF estimated in honey?

e) 0.267 gm baking powder sample required 44.5ml of 0.05 M oxalic acid in CO_2 estimation. If blank titration reading is 50 ml. Calculate percentage of total CO_2 in sample. (Given : Mol. wt: of CO_2=44)

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

a) How amylase is estimated?

b) Discuss the chemistry of vitamin-C with respect to structure, biological functions and sources.

c) Write a note on micronutrients.

d) Discuss the method for estimation of phosphate.

e) Calculate HMF content of sample of jam if absorbance of unit path length was 0.190.

P.T.O.

SECTION-II

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

a) Explain the technique for extraction of caffeine from biological sample.

b) How cocaine is isolated from urine sample? Give detail procedure for adsorption and elution.

c) Explain the principle and procedure for determination of barbiturates by procedure-B.

d) How heroin is isolated from sample?

e) Urine sample was analysed for amphetamine content using gas chromatographic method which gives following observations.

i) Internal standard content in $CHCl_3$=3.68 μg/ml.

ii) Peak height for amphetamine = 16.68min.

iii) Peak height for amphetamine in standard reference solution = 8.56 min.

iv) Peak height for standard in specimen = 5.56 min.

v) Peak height for internal standard reference solution = 2.58 min.

vi) Volume correction factor (R) = 1.18 ml.

Calculate the concentration of urine sample in amphetamine.

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

a) Define the terms

i) Cannabis.

ii) Psychotropic Substances.

iii) Manufactured drug.

iv) Opium derivatives.

b) Explain the rules related to manufacture of manufactured drugs.

c) Outline the procedure for warehousing of alcoholic preparations.

d) Give the requirements of bonded laboratory.

e) Write a note on offences and penalties in the Psychotropic substance Acts.

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Total No. of Questions : 4]

SEAT No. :

P1148

[Total No. of Pages : 2

[5430]-62
M.Sc.-II
ANALYTICAL CHEMISTRY
CH-490 : Analytical Spectroscopy
(2008 Pattern) (Semester - IV)

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

Instructions to the candidates:

1) ***Answer 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) With a neat diagrm, describe the construction and working of double beam spectrophotometer.

b) What are monochromators? Explain with suitable diagram the working of prism.

c) Explain the phenomenon

i) ESCA satellite peaks,

ii) ESCA chemical shifts.

d) Calculate the molar extinction coeffcient of 1.70×10^{-4}m solution, which shows 70% transmittance in a 0.8 cm cell.

e) Calculate the mass absorptive coefficient of an alloy which consists of 80% Fe, 15% Ni and 5% Cu. The mass absorptive coefficient for pure elements are 510, 605 and 650 cm^2/gm respectively for Fe, Ni, and Cu.

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

a) Explain the theory behind chemical analysis by x-ray absorption.

b) What is electro-chemiluminescence? Explain 'S' route and 'J' route mechanisms in electro chemiluminescence.

c) Enlist the diffraction methods of crystal analysis. Describe Bragg's method for crystal analysis. How the reflection for different order are noted by this technique.

P.T.O.

d) Explain the gas phase chemiluminescence phenomenon with suitable example.

e) The 1s electron of sodium with B.E at 1072 eV. Estimate the work function of spectrometer, if incident radiation is the K_α of magnesium. The K.E. of measured electron is 176.7 eV. (Given : K_α (Mg)=1.89 Å, C=3×10^{10} cm/s, 1Å=10^{-8}cm h=6.626×10^{-34} J.S).

SECTION-II

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

a) Define the chemical shift. Explain the ways to express the chemical shift.

b) What is meant by relaxation? Explain spin-spin and spin-lattice relaxation.

c) Give the classification of coupling interaction.

d) Calculate energy and frequency of radiation that is required to excite a ^{13}C from the lower to upper energetic level if the applied field has a magnetic flux density of 10,000 G. [Given : μ = 0.70216, m_I=½, β = 5.0505×10^{-31}J/G, I=½]

e) Determine the ratio of the number of hydrogen nuclei in the upper energetic level to the lower energetic level at 25°C in magnetic field with flux density of 14,092G. [Given μ = 2.7972, I=½ β = 5.0505×10^{-31} J/G K=1.381×10^{-23} J/K]

Q4) Answer any four of the following: **[20]**

a) Discuss ESR Spectrum of benzene radical.

b) Explain the term
   i) ELDOR
   ii) ENDOR

c) Write note on quantitative analysis in ESR.

d) Explain in different ways in which inductive effect affects shielding constant.

e) If a resonance was observed for an unpaired electron at a magnetic flux density of 0.26T and frequency of 9500 MHz. Calculate 'g' factor for unpaired electron.
(Given : h = 6.626×10^{-34} J.S, Be=9.286×10^{-24} J/T)

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Total No. of Questions : 4]

SEAT No. :

P1149

[Total No. of Pages : 2

[5430]-63

M.Sc. - II

ANALYTICAL CHEMISTRY

CH-491 : Polymer Technology

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

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

Instructions to the candidates:

1) ***All questions are compulsory and carry equal marks.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***

SECTION-I

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

a) Explain the salient features of bulk polymerization.

b) Discuss the effect of radiation on polyethylene.

c) Discuss the kinetics of anionic polymerization.

d) Give the method of preparation and uses of

i) Polyester ii) Teflon

e) Distinguish between thermoplastic and thermosetting polymers.

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

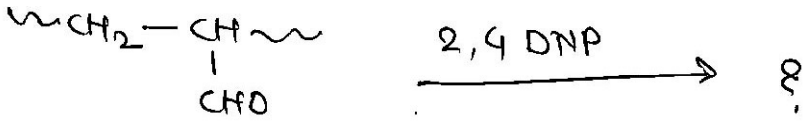
a) Write a short note on cross linking reactions.

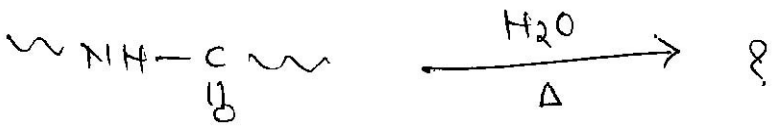
b) Explain with examples how polymers can be classified on the basis of their behaviour towards heat.

c) Discuss the copolymerization with suitable examples.

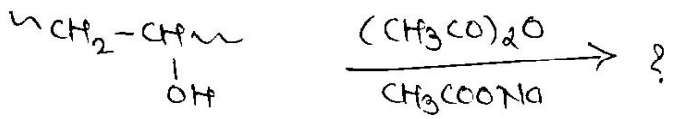
d) Explain interfacial condensation phenomenon with suitable example.

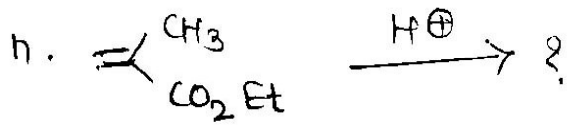
e) Complete the following reactions

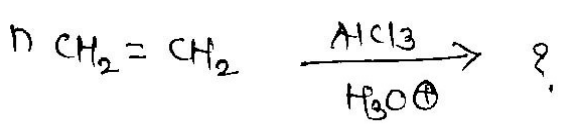
i) 

ii) 

P.T.O.

iii) 

iv) 

v) 

SECTION-II

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

a) Explain the role of thermal methods in structure elucidation of polymeric material.

b) Explain mechanical properties of polymers with respect to tensile-stress-strain curves and fatigue test.

c) Explain the terms: Colour, Transmittance, Glass, Haze, Transparency.

d) Give the types of fibres. Explain wet spinning method.

e) What is the percentage conversion of a monomer $HO-(CH_2)_{14}-COOH$ to a polymer of average molecular weight 24000. (Given : Monomer mol.wt. 240)

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

a) Describe the experimental method of viscosity measurement to determine the molecular weight of the polymer.

b) Describe the characterization of polymer by differential scanning colorimetry.

c) Write a short note on sol-gel and the aqueous chemistry of metal oxides.

d) Explain sulphur and non-sulphur vulcanization process.

e) Equal number of molecules with M_1=10,000 and M_2=1,00,000 are mixed, calculate $\overline{M}_n$ and $\overline{M}_w$ (Given : $n_1 = n_2 = 10$)