Year - April 2024

MSC - Organic Chemistry

(SEM - I)

No. of pages - 18

M.Sc Organic Chemistry - NEP - 2020

TIME: 2 HOURS **MAX. MARKS: 50**

NB:

1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of logarithmic table/non-programmable calculator is allowed.**
4) **At. Wts: H=1, C=12,N=14,O=16,Na=23,Al=27,S=32, Cl=35.5, K=39, Ca=40,Ag=108 , Ba=137, Pb=207,Mg= 24.3,F=19,Cu= 63.5, Cr = 52, Sn=118.7 Fe = 55.8**

Q.1 Answer **any two** of the following: 10

A. Define the terms:

a) Measurement b) Technique c) Protocol d) Analyte e) Matrix

B. What is Kaizen? Explain the six steps involved.

C. Discuss quantitative method of analysis with respect to calibration curve method.

D. Write note on basic safety in laboratory.

Q.2 Answer **any two** of the following: 10

A. Calculate the pH of a 0.1 M NH_4OH solution. Given $K_b = 1x10^{-5}$.

B. How much volume of a 1000 ppm K^+ solution, using KCl, is required to prepare 100 cm^3 of 0.02 M KCl solution.

C. 16.98 g of $AgNO_3$ is treated with 6.5 g of NaCl, producing AgCl. Calculate the amount of AgCl produced, in grams. Which is the limiting reagent?

D. Determine the mole fraction of both the substances, when 45 g of acetone is mixed with 55 g of methanol.

Q.3 Answer **any two** of the following: 10

A. Describe the use of Nernst Glower and the Globar in IR spectroscopy.

B. Write short note on Near and Far region of IR spectra.

C. In what way the Fourier Transform (FT) instruments differ from the optical instruments?

D. Describe the effect exerted by the pH and solvents on the λ_{max} values in the absorption spectroscopic technique.

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Q.4 Answer **any two** of the following. 10

A. With the help of schematic diagram, discuss any one Differential Scanning Calorimetry (DSC) instrument.

B. Discuss the applications of DSC for:

a) Drug analysis

b) Safety screening

C. Discuss the factors affecting DSC curves.

D. Describe the role of multilayered films in automated analysis.

Q.5 Answer **any five** of the following: 10

A. Define the figures of merit of Analytical methods:

a) Robustness b) LOD

B. What is significance of government standards like HALLMARK and ISI.

C. Solid $PbSO_4$ is dissolved in water at 25°C. Its solubility is 1.25×10^{-4} mol/dm^3. Calculate the solubility product (K_{sp}) of the compound.

D. Assign oxidation number to each element in $Cr(OH)_4^-$

E. Draw a schematic of optical arrangement of a dual wavelength spectrophotometer.

F. Describe any one method of sample preparation in recording IR spectra.

G. Draw the schematic DSC thermogram, show the glass transition, exothermic and endothermic peaks.

H. Enlist any four objectives of automation.

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MSc - chem - sem I

[Time: 2:30 Hours] [Marks:60]

Please check whether you have got the right question paper.

N.B.: 1. **All questions are compulsory.**
2. **Figure to the right indicates full marks.**
3. **Use of non – programmable scientific calculator is allowed.**

Useful constants

$c = 2.998 \times 10^{8}$ m.s^{-1} | $e = 1.602 \times 10^{-19}$ C
$R = 8.314$ J.K^{-1}mol^{-1} | $k = 1.3811 \times 10\text{-}23$ J.K^{-1}
$= 2.0$ cal.K^{-1} mol^{-1}
$h = 6.626 \times 10^{-34}$ Js | $1J = 6.24 \times 10^{18}$ eV
$m_e = 9.110 \times 10^{-31}$ kg | $1eV = 8.06 \times 10^{3}$ cm^{-1}
$NA = 6.022 \times 10^{23}$ mol^{-1} | 1 amu $= 1.66 \times 10^{-27}$ kg
Atomic mass of H = 1, C = 12, N = 14, O = 16, S = 32, Cl = 35.5

1. A) Attempt ***any two*** of the following:
   i) Write the expression for phase changes in the following phase transition a)melting b) Vaporization c)Sublimation d) allotropic transformation 4
   ii) In Joule –Thomson's experiment prove that enthalpy of the system remains constant. 4
   iii) Explain the concept of residual entropy with suitable example. 4
   iv) Derive the following Maxwell's relation [dV/dT] P = - [dS/dP] T 4

1. B) Attempt ***any one*** of the following:
   i) A piece of alloy weighing 2kg at 500 °C is placed in 4 kg of water at 300 K. If the heat capacity of water is 4.184 JK^{-1}g^{-1} and heat of alloy is 22 JK^{-1}g^{-1}. Calculate the entropy change. 4
   ii) The van der Waal's constant a and b for hydrogen in liter atmosphere units are 0.246 Nm^{4}mol^{-2} and 0.0267 m^{3}mol^{-1}. Calculate the inversion temperature of hydrogen. 4

2. A) Attempt ***any two*** of the following:
   i) Starting with equation 4

$$\frac{\partial^2\psi(x,t)}{\partial x^2} = \frac{1}{c^2}\frac{\partial^2\psi(x,t)}{\partial t^2}$$

   Set up the time independent Schrodinger wave equation.
   ii) What is meant by normalization of wave function? Normalize the following wave function. $\psi = A \sin\frac{n\pi x}{L}$ in the limit zero to L. 4
   iii) Prove that Eigen values of Hermitian operator are real. 4
   iv) What do you mean by degeneracy of energy levels? Determine degree of generacy of energy level, $\frac{21h^2}{8ma^2}$ of a particle in cubical box? 4

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2. B Attempt ***any one*** of the following:

i) An electron is confined in a one-dimensional box of length 1Å. Calculate its ground state energy in electron (eV). Is quantization of energy levels observable? 4

ii) Show that function f(x) = cos5x, $3e^{-5x}$ is an eigen function of operator $\hat{A} = \frac{d^2}{dx^2}$ 4

3. A) Attempt ***any two*** of the following:

i) For the thermal decomposition of acetaldehyde, 4
Sow that $\frac{d}{dt}[CH_4] = k[CH_3CHO]^{3/2}$

ii) Explain in brief the Rice-Ramsperger Kassel-Marcus (RRKM) theory. 4

iii) Explain the mechanism of the decomposition of ozone. 4

iv) H_2 react with Br_2 to give HBr according to reaction $H_2 + Br_2 \longrightarrow 2HBr$. 4
Using the chain reaction mechanism, obtain the rate equation for the above thermal reaction.

3. B) Attempt ***any one*** of the following:

i) Calculate k_f and k_b and K for the given reaction $A \rightleftharpoons B$. Given that initial concentration of A is 0.15 M, concentration of B at time t is 0.056 M and equilibrium concentration of B is 0.064 M. 4

ii) The rate of formation of C in the reaction $2A + B \rightleftharpoons 2C + 3D$ is 1 mol^{-1} s^{-1}. State the reaction rate and the rates of formation or consumption of A, B, C and D. 4

4. A) Attempt ***any two*** of the following:

i) State Debye-Huckel-Onsager equation and explain the terms involved. Also discuss its validity for non-aqueous solutions. 4

ii) Explain Debye-Falkenhagen effect and Wien effect for the conductance of strong electrolytes. 4

iii) Explain construction and working of solid oxide fuel cell with the help of well labelled diagram. 4

iv) Write a note on the electrochemical enzyme – catalysed oxidation of Styrene. 4

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4 B) Attempt ***any one*** of the following:

i) Calculate the mean ionic activity coefficient of NaCl in aqueous solution containing 50 cm^3 of 0.04m NaCl and 50 cm^3 of 0.02m $MgSO_4$ at 298K. (Given: A = 0.509 at 298 K) 4

ii) Calculate the resting membrane potential for the following: 4

Ion Species	Intracellular concentration in mM	Extracellular concentration in mM
Na^+	0.004	4.5
Cl^-	200	15

(Given that $\frac{2.303RT}{F}$ at 298K = 61)

5. Attempt ***any five*** of the following

a) Explain the terms i) partial molal volume ii) partial molal enthalpy 3

b) Obtain the relation $\Delta G = NRT\sum xi \ lnXi$ 3

c) Explain Linear Momentum Operator. 3

d) Write a note on Heisenberg's uncertainty principle. 3

e) Describe the kinetics of free radical chain polymerization. 3

f) Write a note on Lindeman – Hinshelwood theory. 3

g) Explain Relaxation Effect for the conductance of strong electrolytes. 3

h) What is fuel cell? Write any two applications of Phosphoric acid fuel cell. 3

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MSc - Sem I - chemistry

TIME: 2 ½ HOURS **MAX.MARKS:60**

NB:

1) **All questions are compulsory.**
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4) **At. Wts: H=1, C=12,N=14,O=16,Na=23,Al=27,S=32, Cl=35.5, K=39, Ca=40, Ag=108 , Ba=137, Pb=207,Mg= 24.3,F=19,Cu= 63.5, Cr = 52, Sn=118.7 , Ag = 108 , Mn = 55**

Q 1 A Attempt **any two** of the following:

a. What are determinate errors? How to minimize determinate errors? 4

b. Describe the calibration curve method for quantitative analysis of unknown sample. 4

c. What are OECD principles of Good Laboratory Practices? 4

d. What is six sigma approach for total quality management? Explain. 4

Q 1 B Attempt **any one** of the following:

a. Write note on cost and benefits of introducing quality system. 4

b. Explain the figure of merits in analytical determination. 4

Q 2 A Attempt **any two** of the following:

a. i. Solid AgCl is dissolved in water at 25°C. Its solubility is 1.43 x 10^{-3}g /dm^3. Calculate the solubility product (K_{sp}) of the compound. 4

ii. Calculate the amount of succinic acid required to prepare 250 cm^3 of a 0.1 N solution of succinic acid in water.

b. 100 g of Na_2CO_3 reacts with 100 g of HCl. Which is the limiting reagent. Calculate the amount of NaCl formed, in moles and in grams. 4

c. A buffer solution was prepared by mixing 0.05 mole of Formic acid with 0.06 mole of sodium formate in distilled water to make 1 dm^3 solution. Calculate the pH of the solution. Given Ka for formic acid is 1.8 x 10^{-4}. 4

d. Determine the mole fraction of both the substances, when 45 g of acetone is mixed with 55 g of methanol. 4

Q 2 B Attempt **any one** of the following:

a. Calculate the weight of compound required to prepare 500 cm^3 of a 50 ppm K^+ solution using 4

(i) KCl (ii) KNO_3

b. 25 cm^3 of a solution of $Ba(OH)_2$ required 45.8 cm^3 of 0.25 M HCl for complete neutralization. 4

i. Write the equation of the reaction.

ii. What is the molarity of the $Ba(OH)_2$ solution.

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Q3 A Attempt **any two** of the following:

a. With the help of schematic diagram, discuss the instrumentation of the dispersive IR spectrophotometer. 4

b. Discuss the fiber optics used in optical instruments. 4

c. Derive Beer Lambert's law and state its limitations. 4

d. Explain: 4

i. Optical arrangement of a dual wavelength spectrophotometer.

ii. Photoconducting transducers used in IR spectrometer.

Q 3 B Attempt **any one** of the following:

a. Simultaneous determination of two elements P and Q spectrophotometrically at two different wavelengths gave the following results: 4

[Given: b= 1cm]

Elements	Concentration (mol dm^{-3})	Absorbance	
		447nm	650nm
P	**2.8×10^{-3}**	**0.666**	**0.180**
Q	**7.2×10^{-3}**	**0.130**	**0.874**
P + Q	-------	**0.440**	**0.412**

Calculate the molar concentration of A and B.

b. Discuss the different techniques for preparation of solid samples for IR absorption measurements. 4

Q 4 A Attempt **any two** of the following:

a. Explain the application of DSC in the study of specific heat, liquid crystals and percentage crystallinity. 4

b. Discuss the instrumentation of power compensated DSC. 4

c. What is an automatic titrator? Write the advantages of using automatic titrator. 4

d. Describe the application of flow injection analysis for the colorimetric estimation of chloride. 4

Q 4 B Attempt **any one** of the following:

a. Discuss the factors affecting the DSC curves. 4

b. What are thermal methods? Discuss the principle of heat-flux DSC. 4

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Q5 Attempt **any four** of the following

a. Discuss the types of quality standards for quality systems in laboratories. 3

b. Define: 1. Determination 2. Protocol 3. Analysis 3

c. Determine oxidation number of Cl in 3
(i)$Ca(ClO_2)_2$ (ii) $KClO_3$ (iii) Cl_2

d. Calculate the amount of $K_2Cr_2O_7$ that is required to prepare $1dm^3$ of a 3
100 ppm solution with respect to Cr^{+6}. How much volume of this solution will be required to prepare 5 dm^3 of a 100 ppb solution?

e. What is diffuse reflectance spectroscopy? Explain the diffuse reflectance 3
spectrum.

f. What are the major advantages of an FTIR spectrometer compared with 3
a dispersive instrument?

g. Differentiate between TGA and DTA. 3

h. Describe what quantity is measured and how the measurement is 3
performed for each of the following techniques: TGA, DTA and DSC.

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Msc ~~sem~~ - Nep 2020 organic chemistry

[Time: 2hr] [Marks:50]

Please check whether you have got the right question paper.

N.B. 1. All questions are compulsory.
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3. Use of non – programmable scientific calculator is allowed.

Useful constants

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$R = 8.314$ J.K^{-1}mol^{-1} $= 2.0$ cal.K^{-1} mol^{-1}
$h = 6.626 \times 10^{-34}$ Js
$m_e = 9.110 \times 10^{-31}$ kg
$N_A = 6.022 \times 10^{23}$ mol^{-1}
$e = 1.602 \times 10^{-19}$ C
$k = 1.3811 \times 10\text{-}23$ J.K^{-1}
$1\text{J} = 6.24 \times 10^{18}$ eV
$1\text{eV} = 8.06 \times 10^{3}$ cm^{-1}
1 amu $= 1.66 \times 10^{-27}$ kg
Atomic mass of H = 1, C = 12, N = 14, O = 16, S = 32, Cl = 35.5

1. A) Attempt ***any two*** of the following:
   i) What are secondary data sources? What are their advantages and disadvantages? 05
   ii) Describe the term citation? What is the purpose and significance of citation? 05
   iii) What is the world wide web? Give some important Internet Resources for chemistry available on the internet. 05
   iv) What is the impact factor of the journal? How it is calculated? What is the significance of the impact factor? 05

2. A) Attempt ***any two*** of the following:
   i) What is the scientific method? Explain the steps involved in scientific method. 05
   ii) How dependency of one variable on other is decided by regression analysis? 05
   iii) The replicate analysis of a sample of Nickel ore gave the following results: 05
   Amount of Ni (%): 20.24, 20.26, 20.25, 20.30 20.28, 20.32. Calculate confidence interval at 95% and 99% probability level using range (Given: Cn = 0.40 at 95% and 0.63 at 99%)
   iv) What is NON-Parametric and Parametric test? Give its advantage and disadvantages 05

3. A) Attempt ***any two*** of the following:
   i) What is research? Explain the steps involved in scientific research. 05
   ii) Why publishing a scientific work is essential? Explain the qualities of good research manuscript. 05
   iii) Explain the common ethics needs to be followed while writing scientific articles. 05
   iv) Give the general guidelines for reporting a practical and project work. 05

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4 A) Attempt ***any two*** of the following:

i) In a chemical industry, what control measures are required to keep you, your employees and your workplace safe? 05

ii) Explain the various acceptable and non-acceptable discharges to the Sanitary Sewer. 05

iii) Discuss the incineration method for the treatment of hazardous waste. 05

iv) What are the ways to reduce, reuse and recycle the chemical waste. How do these actions impact our environment, wildlife and well-being? 05

5 A) Attempt ***any five*** of the following:

i) What is a Scholarly journal? Give the names of any two scholarly journals. 02

ii) Describe the term consortium. Give any one example. 02

iii) Explain when are Zero's significant in measurement. 02

iv) What metric units are commonly used to measure temperature and energy? 02

v) How to avoid authorship abuse in scientific writing? 02

vi) State the general rules for writing conclusion. 02

vii) What are cryogens? What precautions are required while handling of cryogens? 02

viii) What actions must be taken in the event of chemical spills? 02

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MSC - chem - sem I

[Time: 2 ½ Hours] [Marks: 60]

Please check whether you have the right question paper

N.B.: 1. All the questions are compulsory.

2. Figures to the right indicate full marks.

Q.1) (A) **Answer any two of the following:**

a How do the following techniques help in determining the mechanism of the reaction? 4
i)Product analysis
ii)Trapping of intermediates

b Compare giving reasons the acidity of the following: 4
i) Trifluoroacetic acid and acetic acid.
ii) ortho and para -hydroxybenzoic acid.

c Give examples and explain the following: 4
i) Primary kinetic isotopic effect
ii) Secondary kinetic isotopic effect.

d Using potential energy diagram explain kinetic and thermodynamic control of organic reaction. 4

(B) Answer **any one** of the following;

a Explain the difference between general and specific acid catalysis with suitable examples. 4

b Compare the basicity of pyridine, pyrrole, and aniline. 4

Q.2) (A) Answer **any two** questions out of the following

a What are the factors, which affect SN^1 vs. SN^2 mechanism? Discuss any twoin detail. 4

b Give the mechanism of BAc^2 mechanism of ester hydrolysis? Why is it called saponification? 4

c Draw the Frost-Musulin diagram of cyclooctatetraene and show the distribution of electrons in MO s. Comment on its aromaticity. 4

d Explain the mechanism of SN reactions involving neighbouring group participation by aryl rings.

(B) Answer **any one** question out of the following

a Give one example of each of the following nucleophilic substitution reactions: 4
i) **SN1'** ii) **SNCA**

b Explain the aromaticity of: 4
i)Furan ii) Azulene

Q.3) (A) **Answer any two of the following:**

a Discuss the stereochemistry of biphenyls. Give one example with its configurational descriptor. 4

b Explain the enantiomerism in the following with suitable examples. 4
1) Quaternary phosphonium compounds
2) Silanes

c Define pseudoasymmetric centre. Draw structure of two isomeric structures containing pseudoasymmetric centre. Assign configurational descriptors to them. 4

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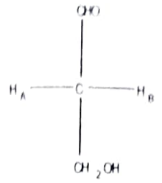
d Using substitution addition criterion, identify relationship between H_A and H_B Write stereochemical descriptor to H_A and H_B 4



(B) Answer **any one** of the following;

a Explain erythro-threo and *syn-anti* system of nomenclature with suitable examples. 4

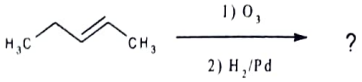
b Explain the following terms with one example each 4

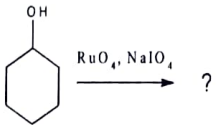
1) Enantiotopic ligand

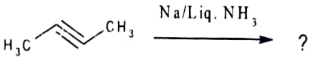
2) Homotopic ligand 4

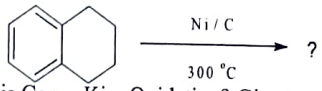
Q.4) (A) Answer any two of the following:

a Predict the product in the following reactions 4

1) 

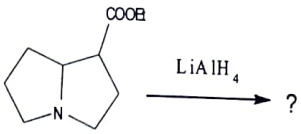
2) 

3) 

4 

b What is Corey-Kim Oxidation? Give two applications. 4

c Complete the following reaction and give its mechanism. 4



d What is Jones reagent? Give two applications. 4

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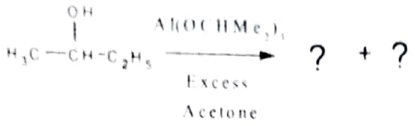
(B) Answer **any one** of the following:

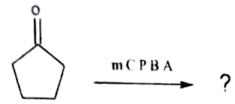
a Complete the following reaction, name it and give its mechanism 4



4

b Complete the following reactions and name them.

1)



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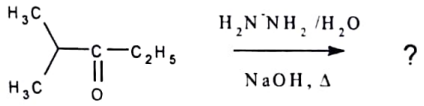


Q.5) Answer **any four** of the following;

a Explain Curtin-Hammett Principle 3

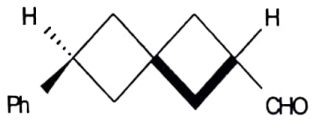
b Explain the principle of microscopic reversibility. 3

c Give any two evidences in support of the **SN^2** mechanism. 3

d Explain the structure and aromaticity of Ferrocene. 3

e Write the configurational descriptor to the following molecules 3

1)



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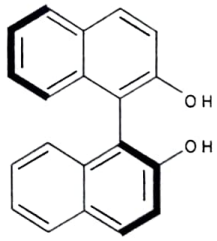

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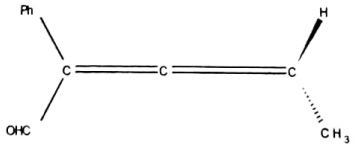

f Explain the optical activity of 'Ansa' compounds. 3

g What is Etard oxidation? Give two applications. 3

h Give Synthetic application of DMSO reagent. 3

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[Time: 2 Hours] [Total Marks: 50]

Please check whether you have the right question paper.

NB: 1. All the questions are compulsory.

2. Figures to the right indicate full marks.

Q.1 **Answer any two of the following:**

a Explain primary and secondary kinetic isotopic effect using suitable examples. 5

b Arrange the following in increasing order of acidity and explain Phenol, o-nitrophenol, m- nitrophenol and p- nitrophenol 5

c Write a note on Curtin Hammett principle. 5

d Nitration of naphthalene gives two different products at different temperature. Explain. 5

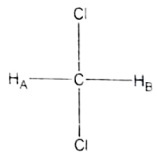
Q.2 **Answer any two of the following:**

a Draw four stereoisomers of 2,3,4-trihydroxy glutaric acid. Label pseudo asymmetric centre present in the stereoisomers and assign configurational descriptors to the pseudoasymmetric centre. 5

b Explain the enantiomerism in the following with suitable examples. 5
1)Quaternary phosphonium compounds 2)Silanes

c i.Explain with suitable substitution addition criteria to identify enantiotopic ligand. 3

ii.Identify the relationship between H_A and H_B in the following compound. 2



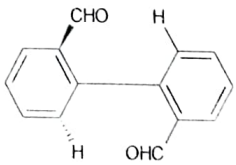
d i) Write the structure of pair of enantiomeric allenes with their configurational descriptors. 2

ii) Write the configurational descriptor to the following molecules 3

1)



2)



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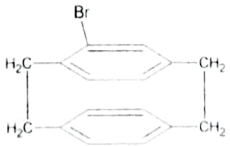

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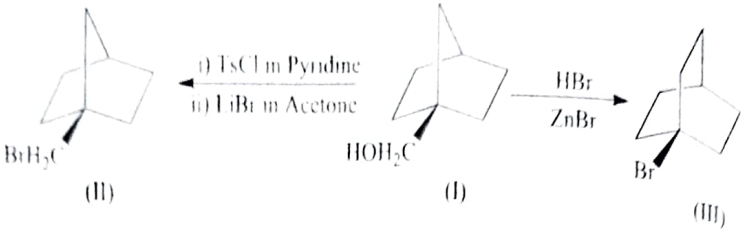
Q.3 **Answer any two of the following:**

a Compound I reacts as shown below. Explain following transformation 5



b Explain addition-elimination reaction in 4-chloro nitrobenzene with mechanism. 5

c Write a short note on aromaticity of annulenes. 5

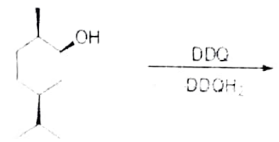
d Explain base catalysed hydrolysis of ester through B_{AC}^2 mechanism. 5

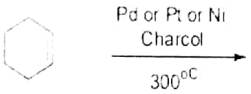
Q.4 **Answer any two of the following:**

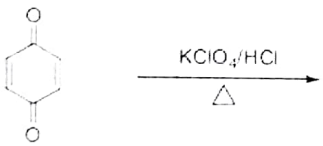
a What is Baeyer Villiger oxidation? Give its mechanism 5

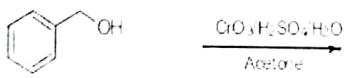
b Explain Birch Reduction for aromatic compounds and alkynes. 5

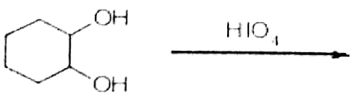
c Predict the product in the following reactions: 5

I 

II 

III 

IV 

V 

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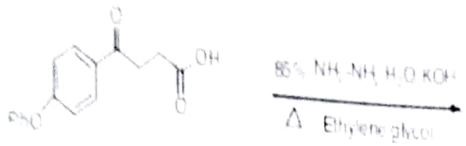
d Complete the following reactions and name first two reactions.

i)



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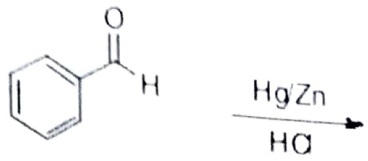
ii)



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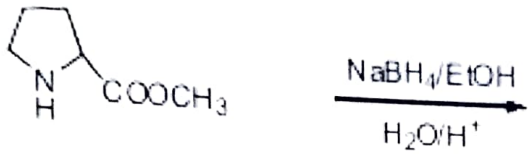
iii)



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Q.5 Answer **any FIVE** of the following;

a How the product analysis technique is used to determine reaction mechanism? 2

b Compare the basicity of piperidine and pyridine. 2

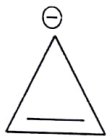
c Explain with suitable example simple or proper axis of symmetry 2

d Explain *syn-anti* system of nomenclature with suitable examples. 2

e Why Furan is Aromatic? 2

f Identify whether following compounds are aromatic, antiaromatic or non-aromatic. 2

(i) 

(ii) 

g Complete the following reactions. 2

i)



ii)



h Explain Clemmensen reduction with suitable example 2

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Paper / Subject Code: 94629 / Chemistry: Inorganic Chemistry (Rev)

MSc - Chem - Sem I

(17)

[Time: 2 ½ Hours] [Marks: 60]

Please check whether you have got the right question paper.

N.B: 1. All questions are compulsory.
2. Figures to the right indicate full marks.

1. a) Attempt **ANY TWO** of the following
i) Draw molecular orbital diagram for SF_6 molecule. Show the distribution of electron Explain its bond order and magnetic property. 4
ii) Using the concept of hybridization, obtain wave functions for sp hybrid orbitals. 4
iii) What is resonance energy? Draw all possible resonating structures for CO molecule. Calculate the formal charges on all the atoms in the molecule. 4
iv) Discuss any two methods of detection of hydrogen bonding in the molecules. 4

b) Attempt **ANY ONE** of the following
i) Discuss the geometry of PCl_5 and BrF_3 molecules on the basis of hybridisation. 4
ii) Construct a labelled molecular orbital diagram for the divanadium molecule. Calculate the bond order and explain it's magnetic property. 4

2. a) Attempt **ANY TWO** of the following
i) Construct the group multiplication table for C_3v point group. 4
ii) Define subgroup. Give its characteristics. Give the subgroups for C_2v point group. 4
iii) On the basis of Symmetry Adapted Linear Combination (SALC), draw the molecular orbital diagram for methane molecule. 4
iv) Explain Abelian and non-Abelian point group with the help of suitable example of each. 4

b) Attempt **ANY ONE** of the following
i) Explain the optical activity in molecules on the basis of group theory. 4
ii) What are irreducible representations? State their characteristics. 4

3. a) Attempt **ANY TWO** of the following
i) Explain the electrical conductivity of solids on the basis of Band Theory. 4
ii) Discuss structural details of solid nickel arsenide. Mention coordination number of ions in it. 4
iii) Describe sol-gel method for the preparation of inorganic solids. 4
iv) Define nanomaterials. Explain Langmuir- Blodgett method for preparation of nanomaterials. 4

b) Attempt **ANY ONE** of the following
i) Schematically represent the origin of first Brillouin zone in K space in inorganic solid. 4
ii) Discuss the microwave method for preparation of nanomaterials. 4

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4. a) Attempt **ANY TWO** of the following

i) Draw the orgel diagram for complex $[Cr(H_2O)_6]^{+3}$. Assign the electronic transitions. 4

ii) With respect to complex formation, explain the following evidences; 4

1. pH metric study 2. Magnetic measurements

iii) Give the expression for thermodynamic equilibrium constant. 4

iv) Explain how absorption spectra of the complex help in detection of complex formation. 4

b) Attempt **ANY ONE** of the following

i) Give the significance of Tanabe-Sugano diagram. 4

ii) Derive the expression for stepwise formation constant in complexes. 4

5. Attempt **ANY FOUR** of the following

a) What are the limitations of valence bond theory? 3

b) HF has a smaller heat of vaporization than water. Explain. 3

c) Explain the symmetry restriction on the dipole moment in molecule. 3

d) Derive the matrix representation for reflection operation on the basis of group theory. 3

e) Give an account of ceramic method for preparation of inorganic solids. 3

f) Discuss the co- precipitation method for preparation of nanomaterials. 3

g) Justify, '^{31}P NMR for the complex trans $[PtClBr(PR_3)_2]$ shows single peak & cis $[PtClBr(PR_3)_2]$ shows 2 peaks'. 3

h) Discuss the potentiometric method for determination of formation constant of complexes. 3

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