Roll No. _____

PGIIIS-N-1524 B-18

M.Sc. III Semester (CBCS) Degree Examination
ORGANIC CHEMISTRY
Chemistry (IV) / Essential of Organic Chemistry
Paper - OET 3.2
(New)

**Time : 3 Hours**   **Maximum Marks : 80**

Instructions to Candidates:

    1)   *Answer all questions.*

    2)   *All questins carry equal marks.*

1.   Answer any **eight** of the following.   (8×2=16)

    a)   Define the terms bond length and bond angle.

    b)   What are epimers? Give examples.

    c)   What is of hybridization?

    d)   What do you mean by homotopic groups and faces? Give examples for each.

    e)   Write the classification of organic reactions.

    f)   What is Dieckmann reaction?

    g)   Why furan is less aromatic than pyrrole and thiophene?

   h)   Predict the product with suitable mechanism for the following.

$$R-\overset{\overset{\displaystyle O}{\|}}{C}-OR^1 \xrightarrow{\overset{\ominus}{\underset{OH}{18}}} \text{?}$$
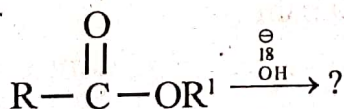
    i)   Formulate a method for the synthesis of quinoline.

    j)   Define the terms bond polarity and dipole moment with suitable examples.

2.   a)   Write an account on R/S nomenclature of chiral compounds.

    b)   Write briefly on Fischer, Newman and Sawhorse projection formulae and their interconversion.

    c)   Explain briefly on enantiomers and Diastereomers. How they differ from each other?

                    OR

    c)   Discuss briefly on elements of symmetry and chirality.   (5+5+6=16)

3. **a)** Illustrate bond angle, bond energies and geometry of sp^3, sp^2 and sp hybridized orbitals with examples.

b) Based on Huckel molecular orbital theory state whether the following compounds are aromatic/antiaromatic/nonaromatic.
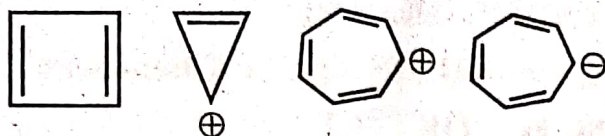
c) Write an account on aromaticity of non-benzenoid compounds?
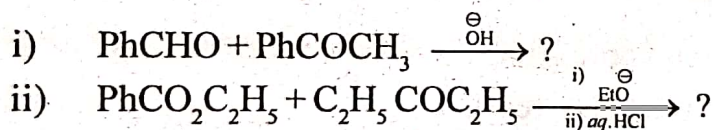
OR

c) What are annulenes and heteroannulenes? Discuss their chemistry.   (5+5+6=16)

4. **a)** How the study of intermediates is useful in determining the mechanism of reaction?

b) What is Aldol condensation? Discuss the applications with mechanism.

c) Discuss the product proportion in a reaction and its applications in determining the reaction mechanism.

OR

c) Formulate the products with suitable mechanism in the following reactions.

(5+5+6=16)

i) $PhCHO + PhCOCH_3 \xrightarrow{\ominus \text{OH}} ?$

ii) $PhCO_2C_2H_5 + C_2H_5COC_2H_5 \xrightarrow[\text{ii) } aq.\text{HCl}]{\text{i) } \ominus \text{EtO}} ?$

5. **a)** Outline the synthesis of thiophene and explain any two electrophilic substitution reactions.

b) Outline Fischer Indole synthesis with mechanism.

c) Write an account of etherification and hydrolytic reaction with suitable example.

OR

c) Enumerate the organic functional group inter-conversion involving reduction and elimination.   (5+5+6=16)

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PGIIIS-O-1516 B-18
M.Sc. III Semester (CBCS) Degree Examination
CHEMISTRY
Physical Chemistry - III
Paper - HCT 3.2 (Old Syllabus)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

Answer all questions.

1. Answer any **EIGHT** of the following: (8×2=16)

    a) What are Fermions?

    b) What are Bosons?

    c) Define Heat Capacity.

    d) Define Hamiltonian operator.

    e) Differentiate between pi and sigma molecular orbitals.

    f) Define secular equation.

    g) What are the conditions of rigid rotor.

    h) Define an orbital.

    i) How does one differentiate between perfect and imperfect crystal.

    j) What is meant by microscopic reversibility.

2. a) Differentiate between gamma and mu space.   (5)

    b) Differentiate between the different types of ensembles.   (5)

    c) Give an account of translation partition function.   (6)

    OR

    c) Give an account of Einstein's heat capacity of solids.   (6)

3. a) Differentiate between Fermi-Dirac and Bose-Einstein statistics.   (5)

    b) How is separation of different partition functions made? Represent the vibration partition function, giving its significance.   (5)

    c) Write the significance of Hartlee-Self Consistence field for multi electron system.(6)

    OR

    c) Give an account for simple Huckel theory for conjugated systems.   (6)

4.   a)   Based on band theory, discuss the various types of semiconductors.   (5)

      b)   Represent a typical thermogram (TGA and DTA traces) and identify the various chemical and physical changes taking place in solids.   (5)

      c)   Write a short note on photoconduction in solids.   (6)

<center>OR</center>

      c)   Write a short note optical reflectance in solids.   (6)

5.   a)   Discuss on Onsagar's reciprocity relationship.   (5)

      b)   Discuss the determination of CMC employing surface tension techniques.   (5)

      c)   Derive an expression for partial molar properties.   (6)

<center>OR</center>

      c)   Give an account of microscopic reversibility.   (6)

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PGIIIS-O-1515 B-18

M.Sc III Semester (CBCS) Degree Examination
CHEMISTRY(2016-17)
(Physical Chemistry-III)
Paper - HCT-3.2(Old)

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:

1) All Questions carry **equal** marks

2) All Questions are **Compulsory**

1.   Answer any **eight** of the following   (8×2=16)

   a)   Explain

       i)   Ensemble and

       ii)   Thermodynamic system

   b)   Define Partition function

   c)   Calculate the rms velocity for H_2 molecule at 0^0C

   d)   Write the Hamiltonian for a Schrodinger wave equation for time independent wave function

   e)   Write the complete mathematical expression for H_2 molecule according to variation theory and name the terms

   f)   Write the expression for simple conjugated system as per Huckel theory and name the terms in it.

   g)   Give the differences between schottky and Frenkel defects

   h)   What is Fermi energy? How it is represented in n-type semiconductor?

   i)   Define stationary state

   j)   Define a Colloid

2.   a)   Derive the classical Maxwell- Boltzmann distribution law for mixtures of gases (5)

   b)   Derive the expression for rotation partition function. Calculate the rotation partition function for Iodine monochloride molecule at 300K

       (moment of Inertia=$2.45 \times 10^{-40} gcm^2$)   (5)

c) i) Write a note on separation of partition function

ii) Calculate the value of 4! using strilings approximation and also without strilings approximation. Find the result and comment on the result (6)

OR

c) i) Give an account of Ortho-Para hydrogen system

ii) Express energy, heat capacity and entropy in terms of partition functions (6)

3. a) Give an account of schrondinger wave equations to Harmonic Oscillator and derive the expression for energy (5)

b) Distinguish between bonding and antibonding molecular orbitals. What is correlation diagram? Explain (5)

c) Write a note on Harttee self consistent Theory (6)

OR

c) Distinguish between coulombic and exchange integrals. Give the comparison between molecular orbital and valence bond theories (6)

4. a) Explain the different thermal methods used in the study of Solid State reactions (5)

b) Explain with suitable examples the different types of magnetic behavior in solids (5)

c) Write a note on optical properties in solids (6)

OR

c) Explain with a neat sketch the position of Fermi energy levels in the different types of Semi conductors. (6)

5. a) Distinguish between partial and excess for thermodynamic functions. (5)

b) Outline the Onsagaer's theory of microscopic reversibility (5)

c) Account for the electro kinetic effect on the laws of irreversible thermodynamics (6)

OR

c) What are colloids? Discuss any one method to determine critical micellar concentration. (6)

PGIIIS-N-1514 B-18

M.Sc. III Semester (CBCS) Degree Examination
CHEMISTRY
Physical Chemistry - III
Paper - HCT 3.2 (New)

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:

    1)   All questions are compulsory.

    2)   All questions carry equal marks.

1.   Answer any **EIGHT** of the following Questions: (8×2=16)

    a)   Show that $Ln N! = NLnN-N$.

    b)   Differentiate between the heat capacities of ortho-and para-hydrogen systems.

    c)   Write the Sucker - Tetrode equation and explain the terms involved in it.

    d)   Write the molecular orbital energy level diagram for N_2 molecule.

    e)   Define secular equation and write its significance.

    f)   Define Hamiltonian as an energy operator in quantum mechanics.

    g)   Differentiate between soft and hard magnetic materials giving suitable examples.

    h)   Write the structure of spinel compounds

    i)   What are partial molar quantities? Give examples.

    j)   What is meant by critical micillar concentration (CMC)?

2.   a)   What are partitation functions? Give an account on the separation of the partitation function.   (5)

    b)   Derive the expression for vibrational partition function.   (5)

    c)   Derive the expression for Maxwell-Boltzmann classical statistics.   (6)

<div align="center">OR</div>

    c)   Write a note on heat capacities of ortho-, para- hydrogen system.   (6)

3. a) Give the comparison between the valence bond and molecular theory and write the different wave integrals obtained in each case for hydrogen molecule. (5)

b) Based on the use of trail wave function explain the variation principle. (5)

c) Write the molecular orbital energy level diagram for oxygen molecule and explain the features observed in the diagram. (6)

OR

c) Discuss the application of Huckel theory to aromatic system taking benzene as an example. (6)

4. a) Discuss the CVD method to grow the single crystal. (5)

b) Employ band theory of solids to explain the following - metals, semiconductors and insulators. With a diagram show the position of Fermi energy level in intrinsic and extrinsic semiconductors. (5)

c) Write a note on optical behavior of solids. (6)

OR

c) Write a note on photoconduction in solids. (6)

5. a) Discuss the surface tension method to determine Critical Micellar Concentration of surface active molecules. (5)

b) Discuss the different types of fluxes and forces. (5)

c) Illustrate the Onsagar's reciprocity relationships. (6)

OR

c) Derive the expression for Gibb's-Duhmen equation. (6)

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PGIIIS-O-1519AB-18

M.Sc. III Semester Degree Examination

CHEMISTRY

(Inorganic Chemistry - III)

Paper - SCT 3.2

(Old)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

1. *Answer all the questions*
2. *All questions carry **equal** marks.*

1. Answer any **Eight** questions

(8×2=16)

a) Write the principle for the estimation of ozone by coulometric methods.

b) What are gravitational settlers?

c) Distinguish between methyl orange acidity and phenolphthalein acidity of waste waters.

d) Write the basic reactions of involved in the estimation of D.O. in water sample.

e) Write the principle of the electrodialysis for the treatment of waste water

f) What are the micronutrients and macronutrients which are involved in chemistry of life.

g) Give three examples each for essential and trace metals.

h) What is quantum yield? Mention its significance

i) What is meant by artificial radioactivity? Give example.

j) Write the advantages and disadvantages of nuclear reactor

2. a) Discuss steps involved in sampling of particulate matter and gaseous pollutants. (5)

    b) Discuss the principle underlying the panel emission controlled by gravitational settling chamber and centrifugal collectors. (5)

    c) Discuss the methods of determining the following air pollutants. (6)

        i) NO_x by Chemiluminescence method and

        ii) CO by amperometric method

(OR)

Write a brief note on :

    i)   Wet scrubbers and

    ii) Catalytic converters

3. a) Discuss the sludge treatment and disposal of waste water. (5)

    b) Distinguish between BOD and COD. Describe a titrimetric method for the COD determination. (5)

    c) Write the public health significance of cadmium and lead. Describe a method for the analysis of lead in water sample. (6)

(OR)

    c) Describe the Ion exchange and electrodialysis techniques used for the waste water treatment.

4. a) With suitable examples discuss the metal complexes as a sensitizers. (5)

    b) Outline the mechanism of Fe-uptake and Fe-release by transferrin. (5)

    c) Describe the possible mechanism involved in photo oxidation and photo reduction reactions. (6)

(OR)

What is rubredoxin (Rb)? Discuss its structural features and function in biological system.

5. a) Discuss the parent daughter decay growth relationship with reference to parent shorter - lived than daughter. (5)

    b) Write the difference between nuclear fission and nuclear fusion reactions. Nuclear fission is a source of energy. Justify. (5)

    c) Discuss about the principles involved in the storage and disposal of nuclear waste management. (6)

(OR)

Discuss the principle and working of GM Counter and scintillation counter. Explain its uses.

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Roll No. _____

PGIIIS-O-1521 B-18
M.Sc. III Semester (CBCS) Degree Examination
ORGANIC CHEMISTRY
Natural Products
Paper - SCT 3.2 (Old)

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:
  1)   Answer all questions.
  2)   All questions carry equal marks.

1.   Answer any EIGHT of the following: (8×2=16)
   a)   Write the ring structures of glucose and fructose.
   b)   What are deoxy sugar%. Give an example.
   c)   What is Barbier-Wieland degradation? Explain with an example.
   d)   Write the structures of 18-nor-cholestane.
   e)   Write the chemical evidence for the presence of reactive methylene group in camphor.
   f)   What is Herzig -Meyer's method. Mention its importance.
   g)   What is biogenesis? What are the prerequisite elements for biosynthesis?
   h)   Give the biosynthetic pathway of phospholipids.
   i)   Explain Blanc's rule with an example.
   j)   Give the structural differences between starch and glycogen.

2.   a)   How is the size of the ring determined in sucrose?
      b)   Discuss Edman's method of determining the sequence of amino acids in a polypeptide chain.
      c)   Describe the industrial applications of starch and cellulose.
                              OR
      c)   Discuss the secondary structure of proteins.   (5+5+6=16)

3.   a)   Discuss the general method of isolation of steroids.
      b)   Explain the photochemistry of ergosterol.
      c)   Write a note on diosgenin and its utility in hormone synthesis.
                              OR
      c)   How are the position of angular methyl groups in cholesterol determined? (5+5+6=16)

4.   a)   Outline the synthesis of α-santonin.

      b)   Write a note on narcotic alkaloids.

      c)   Elucidate the structure of camphor.

OR

      c)   Explain the steps involved in the synthesis of papaverine.   **(5+5+6=16)**

5.   a)   Explain the difference between anabolism and catabolism.

      b)   Discuss the biogenesis of monoterpenes.

      c)   Explain the photosynthetic pathway of glucose in plants.

OR

      c)   Discuss the biosynthetic pathway of cholesterol from acetyl CoA.   **(5+5+6=16)**

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PGIIIS-O-1515 B-18

M.Sc. III Semester (CBCS) Degree Examination

ORGANIC CHEMISTRY

Reaction Mechanism

Paper - HCT 3.1

(Old)

Time : 3 Hours   Maximum Marks : 80

Instructions to Candidates:

     1)   Answer all questions.

     2)   All questions carry equal marks.

1.   Answer any **eight** of the following.   (8×2=16)

    a)   What are carbenes? Give an example.

    b)   Give an example of Stork-Enamine reaction.

    c)   Illustrate with an example the nucleophilic substitution reaction at allylic carbon.

    d)   Mention an example of neighboring group participation by cyclopropane ring.

    e)   Explain the addition of sulphur nucleophile to a carbonyl compound.

    f)   What is Saytzeff elimination? Give an example.

    g)   Explain intramolecular elimination reaction with an example.

    h)   What is push-pull reaction? Give an example.

    i)   What is trans-annular rearrangement?

    j)   Suggest the products in the following reaction.
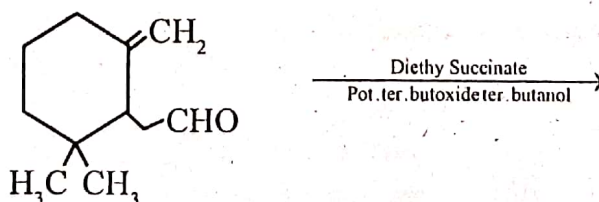
2.   a)   Write the synthesis and utility of sulphur ylides.

    b)   How arynes are generated? Discuss their applications.

    c)   Outline the methods of generation and reactions of nitrenes.

OR

    c)   Account for the structure, stability and reactivity of free radicals.   (5+5+6=16)

3. a) Give the evidence for formation of tetrahedral intermediate during nucleophilic substitution at trigonal carbon atom.
    b) Discuss the reactions of neighboring group participation involving aryl groups.
    c) Explain the mechanism involved in neighboring participation having alkyl halide & phenonium ion.

OR

    c) Write a note on neighboring group participation in addition and elimination reactions.

                                                                (5+5+6=16)

4. a) Write a note Elimination v/s Substitution.
    b) Discuss the stereochemistry of nucleophilic addition on carbonyl compounds highlighting Cram's rule.
    c) Discuss the following reactions.
        i)   Cope reaction
        ii) Barton reaction

                                OR

    c) Account for the following.   (5+5+6=16)
        i)   Addition to conjugated polyenes
        ii) Chugaev reaction

5. a) Explain the mechanism of Aldol condensation.
    b) Discuss the synthetic applications of Schimdt reaction.
    c) Describe the uses of McMurry reaction in organic synthesis.

                                OR

    c) Discuss the applications of the following reactions.   (5+5+6=16)
        i)   Fries rearrangement
        ii) Knoevanagel condensation

PGIIIS-O-1514 B-18

M.Sc. III Semester (CBCS) Degree Examination
CHEMISTRY/ORGANIC CHEMISTRY
Organic Chemistry - III /Spectroscopy
(Common to Chemistry and Organic Chemistry)
Paper - HCT 3.1 (Old)

**Time : 3 Hours**   **Maximum Marks : 80**

Instructions to Candidates:

    1)   ***Answer all Questions.***

    2)   ***All questions carry equal marks.***

1.   Answer any **EIGHT** of the following: (8×2=16)

    a)   With the help of neat diagram indicate the allowed electronic transitions in organic molecules.

    b)   Give the mathematical expression of Hooke's law.

    c)   How the CW-^{1}H NMR is differentiated from FT-NMR?

    d)   Name the solvent and internal standards to record the NMR of organic molecules.

    e)   Illustrate how carbocations are identified by CMR?

    f)   What are cross peaks in 1H-1H COSY? Give their significance.

    g)   Define Stevenson rule. Highlight its importance in EIMS fragmentation.

    h)   What are metastable ions? How are they formed?

    i)   In terms of percentage transmission how the fundamental bands differ from overtones?

    j)   Illustrate chemical and magnetic equivalence.

2.   a)   Enumerate *Woodward-Fieser* rule for α,β-unsaturated carbonyl compounds with the help of any two examples.

    b)   Write a note on complementarity of IR and Raman.

    c)   i)   What are model compounds? How are they used in UV spectroscopy?

        ii)   Predict the λ_{max} of the following compounds:
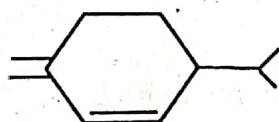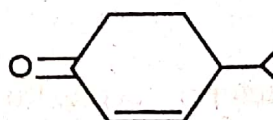
                            OR

    c)   What are Fermi resonance bands? How are the useful to distinguish aldehydes from ketones.   (5+5+6=16)
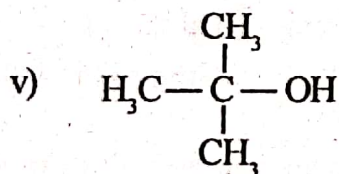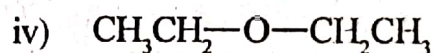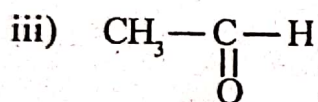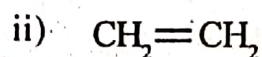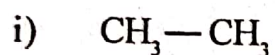
3. a) Account for the anisotropic effect of benzene.

   b) State and explain first order splitting in PMR.

   c) Write notes on :

      i) Karplus equation curve and its importance

      ii) CIDNP technique

   OR

   c) i) NOE and its applications

      ii) Lantahanide shift reagents   (5+5+6=16)

4. a) How the following are identified using CMR?

      i) $CH_3—CH_3$ ii) $CH_2=CH_2$

      iii) $CH_3—\overset{\overset{\displaystyle O}{\|}}{C}—H$ iv) $CH_3CH_2—O—CH_2CH_3$

      v) $H_3C—\overset{\overset{\displaystyle CH_3}{|}}{\underset{\underset{\displaystyle CH_3}{|}}{C}}—OH$

   b) Discuss the importance of DEPT.

   c) Write notes on :

      i) Broad band decoupling

      ii) Off resonance techniques

   OR

   c) Discuss the factors affecting the coupling constants in PMR.   (5+5+6=16)

5. **a)** Deduce the structure of the compound having molecular formula C_8H_8NOBr with the help of the following spectral data & assign the values:

UV-V is λ_{max} 252 nm

IR (cm^{-1}) 3294, 3054, 1670, 1455, 1311 & 606

^{1}H-NMR (δ, ppm) : 10.03 (s, 1H), 7.64-7039 (m, 4H) 2.05 (s, 3H)

^{13}C-NMR (δ, ppm) : 168.4, 137.5, 132.0, 122.3, 117.9, 23.9

EIMS : 213, 211 [M+], 173, 171, 92, 53 and 43 [base peak]

b) Discuss the instrumentation of EIMS.

c) What is McLafferty rearrangement? Discuss with suitable examples.

OR

c) Write notes on :   (5+5+6=16)

    i)   Nitrogen rule

    ii)   Odd & even electron rule

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