S.S. Jain Subodh P.G. College, Jaipur(Autonomous)

Assignment- March 2025

M.Sc Semester-II Chemistry

Paper- I

Inorganic Chemistry

Attempt four questions (One from each Unit): MM:30

UNIT-I

Q.1. What is representation? Explain representation of group by matrices. Explain character of representation. (7.5)

Q.2. Derive character table for C_{3V} point group. (7.5)

UNIT-II

Q-3. Explain nucleophilic substitution reaction in octahedral complexes with special reference of dissociative and associative mechanism. (7.5)

Q-4 Explain inner sphere mechanism of one electron transfer reaction in detail. (7.5)

UNIT-III

Q-5. How vibrational spectra of Metal Carbonyls are used for the determination of their structure? (7.5)

Q-6. Discuss classification of Metal Nitrosyls on the basis of their Structure and bonding. (7.5)

Unit-IV

Q.7. Describe organic super conductors. State consequences of metal deficiency defects? (7.5)

Q.8. Write short notes on organic charge transfer complex. Discuss magnetic properties of inorganic materials. (2.5+5)

S.S. Jain Subodh P.G. College, Jaipur(Autonomous)

Assignment- March 2025

M.Sc Semester-II Chemistry

Paper- II

Organic Chemistry

Attempt four questions (One from each Unit): MM:30

UNIT I

Q 1. (a) Give the detailed account of enantiotopic and diastereotopic atoms, groups and faces with suitable examples.

(b) Explain the existence of chirality in allenes.

(c) Describe briefly the resolution of racemic mixture? (2.5x3)

Q 2. Write short notes on the following

(i) Asymmetric synthesis

(ii) Conformational analysis of decalins

(iii) Cram's Rule and Prelog's rule (2.5x3)

UNIT-II

Q.3 Write Notes on (4+3.5)

(i) Phase Transfer Catalyst

(ii) Wilkinson;s catalyst and it's applications

Q.4 Write Explainatory note on: (2.5x3)

(i) Peterson Synthesis

(ii) Suzuki coupling

(iii) Heck reaction

UNIT-III

Q 5. Discuss following reaction:

(i) Wagner-Meerwin rearrangement.

(ii) Demjanov rearrangement

(iii) Neber (2.5x3)

Q 6. Discuss following reaction:

(i) Wolf rearrangement

(ii) Shapiro reaction

(iii) Lossen rearrangement (2.5x3)

UNIT IV

Q 7. (a) Classify the pericyclic reactions with proper example.

(b) Explain about:

(i) Claisen Rearrangement

(ii) 1, 3- dipolar cycloaddition reactions. (2.5x3)

Q 8. (a) Draw the π-MO diagram of 1,3-butadiene and 1,3,5-hexatriene.

(b) Discuss selection rule for [4+2]-cycloaddition reaction using FMO method.

(c) 1,3-sigmatropic rearrangement (2.5x3)

S.S. Jain Subodh P.G. College, Jaipur(Autonomous)

Assignment- March 2025

M.Sc Semester-II Chemistry

Paper- III

Physical Chemistry

Attempt four questions (One from each Unit): MM:30

Unit-I

Q1 . Write notes on

a. Chemical potential and its applications

b. Effect of temperature and pressure on chemical potential (7.5)

Q2. Dicuss fugacity and methods of determining it. How is it affected by temperature ? (7.5)

Unit-II

Q 3. Discuss Maxwell Boltzmann characteristics and how does it differ from Fermi -Dirac Statistics? (7.5)

Q4 . Discuss partition function and the various types of partition functions. (7.5)

Unit-III

Q.5 . Write notes on

a. Solubilization

b. Reverse micelles (7.5)

Q.6 Derive BET theorem. (7.5)

Unit-IV

Q.7 .Discuss the kinetics of solid state reactions. (7.5)

Q.8. Write notes on

a. osmometry

b. viscometry

c. Braggs Law (7.5)

S.S. Jain Subodh P.G. College, Jaipur(Autonomous)

Assignment- March 2025

M.Sc Semester-II Chemistry

Paper- IV

Spectroscopy-II

Attempt four questions (One from each Unit): MM:30

Unit-I

1. (i) Discuss electronic spectroscopy of conjugated dienes.

(ii) What are Bathochromic Shift and Hypsochromic Shift? Discuss the causes for these shifts (7.5)

2. What is the Beer – Lambert Law? Express it mathematically and give the significance of each term (7.5)

Unit-II

3. (i) Describe the vibrational modes of Infrared Spectroscopy.

(ii) Write the effect of hydrogen bonding on IR Spectroscopy of any compound (7.5)

4. Write short note on :-

(i) Fermi resonance.
(ii) Overtone (7.5)

Unit-III

5. What are Shielding and Deshielding Effect ? Describe Anisotropy with example. (7.5)

6. Explain the following terms in detail with suitable examples.

(i)Two dimension spectroscopy – DEPT and NOESY.

(ii)Spin – Spin Coupling (7.5)

Unit-IV

7. Give a detailed explanation on the general fragmentation modes in mass spectrometry. (7.5)

8. (a) Predict the structure of the compound whose peaks in the mass spectrum have m/z values

86, 71, 58,43 (100%)

(b) What is nitrogen rule? Explain some important features of mass spectra of nitro compounds. (7.5)

S.S. Jain Subodh P.G. College, Jaipur(Autonomous)

Assignment- March 2025

M.Sc. Semester-II Chemistry

Paper- V

Biophysical Chemistry

Attempt four questions (One from each Unit): MM:15

Unit-I

Q1. Explain structure of ATP molecule.

Q2. Write short notes on:

i) Prove that ATP hydrolysis shifts the equilibrium of coupled reactions by factor of 10^8.

ii) ATP-ADP cycle in biological system.

Unit-II

Q 3.Describe in detail the various factors involved in Biopolymeric interactions.

Q 4. Write notes on:

i) Osmotic equilibrium

ii) Hydrogen ion titration curves

Unit-III

Q5. Explain Fluid Mosaic model of cell membrane.

Q6. Write short notes on:

i) Active transport of ions

ii) membrane lipids and proteins

Unit-IV

Q7. Write notes on:

i) Hydrodynamic method

ii) Electrophoresis and rational motions

Q8. Explain the sedimentation velocity method for determination of molecular weight of biopolymers.

S.S. Jain Subodh P.G. College, Jaipur(Autonomous)

Assignment- March 2025

M.Sc Semester-II Chemistry

Paper- VI

Environmental Chemistry-I

Attempt four questions (One from each Unit): MM:15

Unit-I

Q1. Write the segment of Environment. Explain various layers of atmosphere.

Q2. What do you mean by Biogeochemical cycles? Discuss the Biogeochemical cycles of carbon and Nitrogen

Unit -II

Q.3. a) How is Ozone formed in atmosphere? Discuss the mechanism.

b) Explain about Photochemical smog in detail.

Q.4 a) Discuss the mechanism of photo dissociation of NO_2 and the formation of hydroxyl radicals, hydroperoxyl radicals and hydrogen peroxide.

b) Write down the reaction of OH radicals with NO_2.

Unit -III

Q.5. What is Green House Effect and Global Warming? What are the consequences of global warming?

Q.6 Explain Acid Rain? Discuss about the adverse effect of acid rain

Unit -IV

Q.7. Discuss various water quality parameters and give methods for the determination of COD and BOD in water sample.

Q.8.Write short notes on:

a) sources of water pollution.

b) Acid-Base chemistry of fresh water and sea water

S.S. Jain Subodh P.G. College, Jaipur(Autonomous)

Assignment- March 2025

M.Sc Semester-IV Chemistry (Organic)

Paper- I

Green Chemistry

Attempt four questions(One from each Unit): **MM:30**

UNIT I

1. (a) What do you understand by the term environmentally benign chemical synthesis ?

   (b) Write important applications of Green Chemistry in day to day life?

   (c) Discuss the important factors to be considered for designing and production of safer chemicals?

   (2.5x3)

2. (a) What do you understand by Atom Economy? "All high yield reactions are not atom economic reactions". Explain this statement by taking suitable examples of organic reactions.

   (b) Write short notes on following principles of green chemistry:-

   (i) Prevention of waste/by-products

   (ii) Use of appropriate solvents (2.5x3)

UNIT II

3. (a) What are Green Reagents? Discuss the role of Dimethyl carbonate in methylation reaction with a suitable example.

   (b) What are Phase Transfer (Catalysts (PTC)? Discuss the advantages of PTC which are relevant to green synthesis.

   (c) Write a brief note on Darzen's reaction using green catalyst? (2.5x3)

4. (a) What are biocatalyst and biocatalytic conversions. Discuss any four advantages of biocatalytic conversions in context of Green Chemistry.

   (b). Write short note on (any two)

   (i) Oxidation Catalysts

   (ii) Microbial oxidation and reduction.

(iii) Polymer supported catalysts (2.5x3)

Unit-III

5. (a) Discuss microwave assisted fries rearrangement method for the preparation of phenolic ketones.

   (b) Describe the term 'Sonochemistry'. How does Acoustic cavitation work in sonication. What are the chemical applicability of Sonochemistry. (2.5+5)

6. How does microwaves affect the chemical reactivity? Describe the following microwave assisted reactions taking suitable examples: (2.5x3)

   (i) Decarboxylation

   (ii) Diel's Alder reaction

   (iii) Alkylation of reactive methylene group

Unit-IV

7. What are binary ionic liquids? Explain the role of ionic liquids in Heck reaction and epoxidation reaction. (7.5)

8. What are advantages of aqueous phase reactions? Explain the specific role of aqueous media in the following reactions: (2.5x3)

   (a) Benzoin condensation

   (b) Michael reaction

   (c) Oxidation of nitro compounds

S.S. Jain Subodh P.G. College, Jaipur(Autonomous)

Assignment- March 2025

M.Sc Semester-IV Chemistry (Organic)

Paper- II

Organic Synthesis-II

Attempt four questions(One from each Unit): **MM:30**

UNIT I

Q.1 (a) Define the following terms:

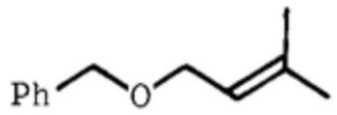
(i) Target molecule
(ii) Retrosynthetic analysis
(iii) Synthons
(iv) Synthetic equivalents

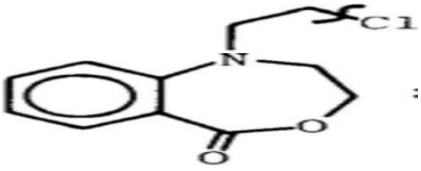
(b) Give two methods for protecting- OH group of an alcohol by ether formation. Also give the methods for deprotection of each.

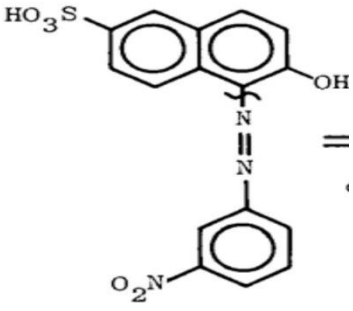
(c) Define chemoselectivity using suitable examples depicting retrosynthetic analysis?(7.5)

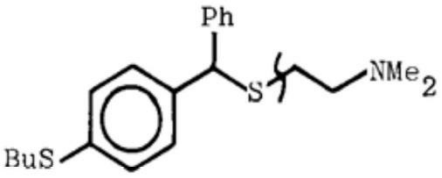
Q.2. (a) How is amine synthesis executed in the organic synthesis? (7.5)

(b) Propose retrosynthetic analysis and synthesis of the following compounds:-









UNIT II

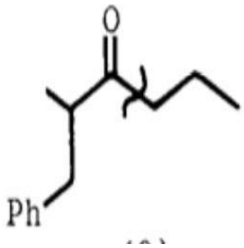
3. With the help of suitable examples, explain.

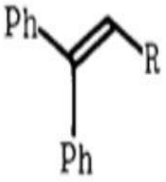
   (a) Synthesis of carbonyl compounds by 1, 2 c-c disconnection.

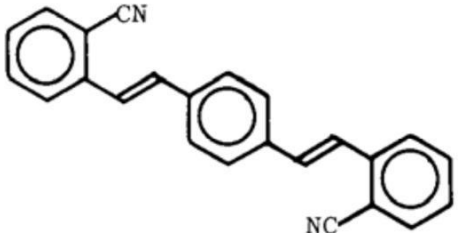
   (b) Stereospecificity and Stereoselectivity in Diel's Alder reactions.

   (c) Disconnection of enones. (7.5)

4. Write the retrosynthetic analysis and synthesis of the following compounds: (7.5)







UNIT III

5. What are the various strategies employed for the synthesis of four membered rings. (7.5)

6. Explain the use of following reactions in formation three membered ring (7.5)

   (i) Insertion Reaction

   (ii) Cyclisation Reaction

Unit-IV

7. With the help of suitable examples explain the use of the following six membered aliphatic ring (7.5)

   (i) Diel's Alder reaction

   (ii) Birch Reduction

8. With the help of suitable examples explain the use of the following five membered aliphatic ring (7.5)

   (i) 1,4 dicarbonyl compound

   (ii) Sigmatropic rearrangement

S.S. Jain Subodh P.G. College, Jaipur(Autonomous)

Assignment- March 2025

M.Sc Semester-IV Chemistry (Organic)

Paper- III

Medicinal Chemistry and Natural Products-II

Attempt four questions(One from each Unit): MM:30

Unit-I

Q.1 (a) Write the Structure of Chlorophyll-a and Chlorophyll-b. How can they identify in laboratory.

(b) Synthesis of Chlorophyll-a (7.5)

Q. 2 (a) Explain the structure of Hemoglobin and give its synthesis.

(b) Explain the Chemical changes that occur when haemin is treated with HI in acetic medium. (7.5)

UNIT-II

Q3. Elucidate the structure of vitamin K and E. (7.5)

Q4. Give introduction, isolation, stereochemistry and synthesis of rotenones. (7.5)

Unit-III

Q5. Explain the followings.

(a) Size of the ring A , C and D in Cholesterol

(b) Position of methyl group in Cholesterol.

(c) How will you establish position of the two angular methyl groups in cholesterol? (7.5)

Q6. Write a note on Diel's hydrocarbon. Draw the basic structure of steroid with numbering. (7.5)

UNIT-IV

Q7. Give synthesis and uses of antihistamine. (7.5)

Q8. Write short notes on:

a) Antimalarial- aminoquinolines pyridines

b) Anticancer agents- Chlorambucil melphalan (7.5)

S.S. Jain Subodh P.G. College, Jaipur(Autonomous)

Assignment- March 2025

M.Sc Semester-IV Chemistry (Organic)

Heterocyclic Chemistry-II

Paper- IV

Attempt four questions(One from each Unit): MM:30

UNIT-I

Q1. What are Meso-ionic heterocycles? How these are classified? Describe synthesis and cycloaddition reactions of following meso-ionic heterocycles:

(i) 1,3-oxazolium-5-olates (Munchnones)

(ii). 1,2,3-oxadiazolium -5-olates (Sydnones) (7.5)

Q2. Describe method of synthesis and chemical reactivity of Trizole? (7.5)

UNIT-II

Q3. Predict the reaction products with suitable mechanism when:- (7.5)

i) 4-pyrone reacts with NH_3

I ii) 4-pyrone reacts with phenyl hydrazine

iii) Pyrilium salt reacts with CH_3NO_2.

Q4. Write short notes:

(i) Chemical reactivity of pyrimidines
(ii) Chemical reactivity of triazine (7.5)

UNIT-III

Q5. (i) Explain antiaromaticity in Azepines, Oxepines and Thiepins. (7.5)

(ii) How are IH-azepines and oxepines synthesized by involving Diels- Alder reaction?

Q6. (a) Describe methods of preparation and chemical reactivity of oxepines. (7.5)

(b) Describe thermal and photochemical reactions of 1H-azepine.

UNIT-IV

Q7. Describe Smiles rearrangement in detail with its significance and limitations for the synthesis of phenothiazines.
(7.5)

Q8. Give mechanism of following synthesis: (7.5)

(a) Skraup Synthesis

(b) Pomeranz-Fritsch Synthesis

S.S. Jain Subodh P.G. College, Jaipur (Autonomous)

Assignment- March 2025

M.Sc Semester-IV Chemistry (Physical)

Paper- I

Nanochemistry and Nanomaterials

Unit-I

Attempt four questions(One from each Unit): M M: 30

Q. 1 (a) What is meant by quantum size effect and degree of confinement of a NMs. Explain with examples.

(b) Discuss the classification of nanomaterials on basis of dimension

(c) Emissions and absorption of wavelengths of NPs are size and shape dependent-explain this with CdSe NP as example.

(d) Write difference between nanomaterials and bulk materials (2x3+1.5)

Q. 2. (a) Explain in detail how melting point and chemical reactivity of nanomaterials depend on the size of NPs.

(b) Write in detail the wettability of nanomaterials.

(c) Explain in detail why band gap of nanomaterials increases with size reduction.

(d) Explain in detail the point defect. (2x3+1.5)

Unit-II

Q. 3 (a) Explain PVD method.

(b) What is CVD method?

(c) Explain microemulsion method.

(d) Explain high energy ball milling method. (2x3+1.5)

Q.4 (a) Briefly explain what is Sol-Gel method.

(b) Explain Ball-milling for nano synthesis.

(c) Explain supersaturation with respect to nanoparticles.

(d) Explain in detail nucleation growth. (2x3+1.5)

Unit-III

Q. 5 Brief account on Synthesis and mechanism of formation of Carbon Nanotubes. (7.5)

Q.6 Discuss on synthetic strategies and growth control of nanowires. (7.5)

Unit-IV

Q. 7 Explain the role and mechanism of nanomaterials for CO_2 capture. (7.5)

Q.8 What are nanocatalyst? Write down their applications. (7.5)

S.S. Jain Subodh P.G. College, Jaipur(Autonomous)

Assignment- March 2025

M.Sc Semester-IV Chemistry (Physical)

Paper- II

Polymer Chemistry

Attempt four questions(One from each Unit): Max. Marks 30

Q.1. a) Discuss classification of polymer in detail. 7.5

b) Derive the copolymer equation? Discuss the copolymers formed when reactivity ratios are (i) unity and (ii) zero .

Q.2 a) Discuss intermolecular forces in polymers in detail. 7.5

b)Explain the radical polymerization process along with its mechanism and example.

Unit-II

Q.3. a) What is ring opening polymerization? Discuss its mechanism with the help of an example.

b) Discuss thermodynamics aspects of polymerization. 7.5

Q.4 a) Explain Click chemistry. 7.5

b) Explain Nitroxide Mediated Polymerization.

Unit-III

Q. 5. Explain Flory-Huggins Theory of polymer solution. 7.5

Q.6 Write Short note on 7.5

a) Molecular weight of polymers.

b) Crystallinity in polymers.

c) Glass transition temperature.

Unit-IV

Q. 7. Write short note on 7.5

a) Liquid crystalline polymer

b) Inorganic polymer

Q.8 a) Explain spectroscopic methods of chemical analysis of polymer. 7.5

b) Explain biomedical polymer.

S.S. Jain Subodh P.G. College, Jaipur(Autonomous)

Assignment- March 2025

M.Sc Semester-IV Chemistry (Physical)

Paper- III

Chemistry of Materials

Attempt four questions(One from each Unit): **M.M. 30**

Unit-I

Q1 . Write notes on

a. Optical properties of liquid crystals

b. Thermotropic liquid crystals (7.5)

Q2. Discuss the various types of liquid crystals. (7.5)

Unit-II

Q 3.What are defect perovskites? Discuss defects in perovskites and their uses. (7.5)

Q4 . What are high temperature superconductors? Discuss the applications of superconductors. (7.5)

Unit-III

Q.5 . What are Langmuir-Blodgett films? Write in detail. (7.5)

Q.6.Write a detailed note on photolithography. (7.5)

Unit-IV

Q.7 What are refractories? Discuss their properties and applications. (7.5)

Q 8. Explain composites and their types. (7.5)

S.S. Jain Subodh P.G. College, Jaipur(Autonomous)

Assignment- March 2025

M.Sc Semester-IV Chemistry (Physical)

Paper- IV

Advance Electrochemistry

Attempt four questions(One from each Unit): M.M. 30

Unit-I

Q.1 Write short notes on the following 7.5

(a) Hydrodynamic techniques

(b) Scanning probe techniques

Q.2 Explain structure of double layer at semiconductor solution interface. 7.5

Unit-II

Q.3 What is irreversible electrode process/ Explain irreversible information from irreversible waves. 7.5

Q.4 Explain Koutechy's method to determine kinetic parameters for quasi-reversible and irreversible waves. 7.5

Unit-III

Q.5. Explain electro-organic synthesis and its applications. 7.5

Q.6. Explain stripping analysis for anodic and cathodic mode and its application. 7.5

Unit-IV

Q.7. write short note on: 7.5

(a) Electrochemical sensors for Nitric Oxide

(b) Electrochemical sensors based on carbon nanotubes

Q.8. Explain electro growth of metals on electrode. 7.5