S. S. Jain Subodh PG College, Jaipur

Department of Chemistry

M Sc Sem III Assignment October 2025

Paper – I Photochemistry

Attempt four questions, one question from each unit. **MM:30**

Unit- I

Q.1 Write short notes on:

(a) Quantum Yield

(b) Jablonskii Diagram

Or

Q.2 Describe the rate constant and lifetimes of reactive energy states?

UNIT- II

Q.3 Discuss the photochemistry of cross conjugated and conjugated cyclohexadienone?

Or

Q.4 write a note on Paterno- buchi reaction and β-γ unsaturated ketones?

Unit- III

Q.5 Discuss the cis-trans isomerization of stilbene?

Or

Q.6 (a) Write a note on Di-π methane rearrangement?

(b) Discuss the mechanism of interconversion of ortho, meta, para xylene?

Unit-IV

Q.7 Write a short note on

(a) photochemistry of vision

(b) Singlet molecular oxygen reaction

Or

Q.8 (a) Discuss the photochemistry of photo fries reaction and barton reaction?

(b) Write explainatory note on photochemical formation of smog?

S. S. Jain Subodh PG College, Jaipur

Department of Chemistry

M Sc Sem III Assignment October 2025

Paper II: Bioorganic Chemistry

Attempt four questions, one from each unit **M. M. 15 marks**

Each question carries equal marks

Unit - I

Q.1 Give brief account on concept and identification of active site by the use of inhibitors.

Q.2 What do you understand by enzyme kinetics? Explain the significance and determination of

Michaelis – Menton constant (k_m).

Unit - II

Q.3 What is Chymotrypsin? Write regeneration of active site of chymotrypsin.

Q.4 Write Short notes on isomerization and rearrangement reactions of enzymes.

Unit - III

Q5. Discuss the structures of the following

i. FMN
ii. FAD
iii. NAD^+
iv. Pyridoxal Phosphate

Q6. Discuss about Crown ethers and Cyclodextrins.

Unit - IV

Q7 Discuss about the uses of enzymes in food and drink industry.

Q8 Write the techniques and methods of immobilization of Enzymes.

S. S. Jain Subodh PG College, Jaipur

Department of Chemistry

M Sc Sem III Assignment October 2025

Paper III: Environment Chemistry

Attempt four questions, one from each unit M. M. 15 marks

Each question carries equal marks.

Unit – I

Q.1 Discuss about biochemical effects of metals and factors responsible for heavy metal toxicity.

Q.2 Discuss classification of pesticides and also give biochemical effects of pestisides.

Unit – II

Q.3 Discuss the methods of re-mediation of soil.

Q.4 Write short notes on

i. Bhopal gas tragedy ii. Minimata disease.

Unit – III

Q.5 Give detailed account of classification of waste and solid waste disposal.

Q.6 Write in brief about disposal of medical and electronic waste.

Unit – IV

Q.7 Give detailed classification of energy resources.

Q.8 Consumption and conservation of Hydrogen World Energy Resources.

S.S. Jain Subodh P.G. College, Jaipur

Department of Chemistry

M.Sc. I Sem Chemistry

Assignment -2025

Paper I Inorganic Chemistry

Note: Attempt four questions, one question from each unit. M M : 30

UNIT-I

Q1. Determine the binary formation constants by pH metric and spectrophotometric methods?

Q2. Discuss the Walsh diagram of triatomic molecule taking suitable example.?

UNIT-II

Q 3 - Discuss limitations of CFT giving direct and indirect evidences

Q 4 - Draw molecular orbital diagrams for $[Co(NH_3)_6]^{+3}$ and $[Pt\ cl_4]^{-2}$

UNIT-III

Q5. Describe the calculation of Dq and β parameters in transition metal complexes with suitable examples.

Q6. Draw Tanabe Sugano diagrams for d^2 , d^4 and d^6 d^8 states in transition metal complexes.

UNIT-IV

Q7. Discuss charge transfer spectra and MOT diagram in detail.

Q8. Write short note on the following:

(a) Spin cross over

(b) ORD

(c) Anomalous magnetic moment

S.S. Jain Subodh P. G. College
Department of Chemistry
M.Sc. (Chemistry) I Sem
Assignment Oct 2025
Paper II - Organic Chemistry

Attempt four questions, one from each unit **M.M. 30 marks**

Each question carries equal marks

UNIT I

Q.1 (a) What is Taft Equation? Compare it with Hammett Equation . Discuss how does Hammett Equation helps in studying equilibria?

(b) What is Curtin Hammett Principle? Explain it in brief.

Q.2Write brief notes on :

(a) Isotopic Labelling

(b) Identification of products and by products for determining reaction mechanism.

UNIT II

Q. 3 (a) What is SNAr substitution? Explain its mechanism and give evidence in support of its mechanism.

(b) Explain various factors affecting reactivitity of nucleophillic substitution reactions?

Q.4 Write short note on:

(i) Substitution at allylic and vinylic carbon atoms

(ii) Substitution at trigonal carbon atom.

UNIT III

Q. 5 (a) Explain the arenium ion mechanism and give evidence in support of its mechanism.

Q. 6 Write short notes on:

(i) o & p ratio

(ii) Wohl Ziegler bromination

UNIT IV

Q.7 Explain E1CB reaction and briefly discuss various factors affecting it.

Q8 Write short notes on:

1.Sharpless asymmetric epoxidation

2.Perkins reaction

S.S. Jain Subodh P.G. College, Jaipur

Department of Chemistry

M.Sc. I Sem Chemistry

Assignment -2025

Paper III Physical Chemistry

Note : Attempt any four questions **M M : 30**

UNIT-I

1. (a) Give the postulates of Quantum Mechanics.

(b) Discuss the solution of Schrodinger Equation for a particle in a three dimensional box.

2. Write notes on:

(a) SWE for simple harmonic oscillator

(b) Angular momentum

UNIT-II

3. Explain

(a) Huckel molecular orbital theory

(b) Linear Variation principle

4. Write short note on the following:

(a) Elementary concept of MO and VB theories.

(b) Application for Huckel Theory for cyclopropenyl radical.

UNIT-III

5. Explain different types of methods of determining rate laws.

6. Write short notes on:

a) Hinshelwood theories of Unimolecular reactions

(b) The Study of fast reaction by relaxation method.

UNIT-IV

7. Discuss the Debye- Huckel-Onsanger treatment and its extension.

8. Write short notes on:

a) Bockris Devanathan models (b) Ilkovic equation.

S. S. Jain Subodh PG College, Jaipur
Department of Chemistry
Assignment- Oct. 2025
M.Sc I Sem (Chemistry)
Paper – IV Spectroscopy

Attempt four questions, one question from each unit. M.M.30

Each question carries equal marks

Unit- I

Q.1 What is moment of inertia? derive the equation for moment of inertia for a rigid diatomic molecule? Explain the allowed rotational energy levels?

Or

Q.2 write short notes on

(a) Effect of isotopic substitution

(b) Non-Rigid Diatomic Rotor

Unit-II

Q.3 What do you understand by an hormonic oscillator? Derive general equation for vibrational energy of an hormonic oscillator?

Or

Q.4 (a) On the basis of quantum theory explain why stoke's lines are more intense than antistoke's lines?

(b) Discuss rotational raman Spectra?

Unit-III

Q.5 Discuss in detail the fine electronic spectra of Hydrogen and Lithium atom?

Or

Q.6 Explain basic principle of photoelectron spectroscopy and discuss spectra of simple molecule?

Unit-IV

Q.7 Explain the principle and application to transition metal complexes of electon spin resonance spectroscopy?

Or

Q.8 (a) Discuss the spectral parameters of Massbauer spectroscopy?

(b) How Massbauer spectroscopy is helpful in detection of oxidation state and in equivalent MB atom?

S. S. Jain Subodh PG College, Jaipur

Department of Chemistry

M Sc Sem I, Assignment October 2025

Paper V: Bioinorganic Chemistry

Attempt four questions, one from each unit **M. M. 15 marks**

Each question carries equal marks

UNIT-1

Q 1 a) Discuss role of Sodium, Potassium in biological system.–

b) Give classification of essential elements.

Q 2 a) Write about the role of Calcitonin.

b) Give structure of Calmodulin.

UNIT – II

Q 3 - What are Iron-sulphur proteins? Give their structure and functions.

Q 4 - a) Explain non-cyclic photo-phosphorylation.

b) Write about functions of Photosystem-II

UNIT- III

Q 5 - Explain the role of heme proteins in oxygen uptake and transport in biological systems.

Q 6 - Describe the structure and function of haemoglobin. Explain how its quaternary structure facilitates oxygen binding and release under physiological conditions.

UNIT -IV

Q 7 - Discuss the process of nitrification and explain the role of microorganisms involved in it.

Q 8 - Write an account on the role and significance of nitrogen in the biosphere.

S.S. Jain Subodh P.G. College

Department of Chemistry

M.Sc Chemistry, I Sem

Assignment October 2025

Paper VI , Introduction to Analytical Techniques and Nanochemistry

Attempt four questions, one from each unit :- **M.M. 15marks**

Each questions carries equal marks.

Unit 1

Q1. Explain Coulometric technique of Analysis.

Q2. Write a detail note on TGA.

Unit 2

Q3. Explain the process of Solvent Extraction.

Q4. What do you understand by Atomic Absorption Spectroscopy.

Unit 3

Q5. Define nanomaterials. Explain this properties and applications in detail.

Q6. Explain the following;

(a) Photoluminiscence
(b) Electroluminiscence

Unit 4

Q7. Explain the following :-

(a) TEM & SEM
(b) XRD

Q8. Explain solvothermal method for the synthesis of nanoparticles.

S. S. Jain Subodh PG College, Jaipur

Department of Chemistry
M Sc Sem III
Assignment October 2025
Paper IV: Organic Synthesis I

Attempt four questions, one from each unit M. M. 30 marks
Each question carries equal marks.

Unit – I

Write short notes on:
Q1. Explain in detail Robinson Annelation

Q2. Discuss Inter & Intramolecular Aldol Condensation in detail.

Unit – II

Q3. Write short notes on:
(a) Oxidation with Sulphur
(b) Oxidation with Selenium
(c) Oppenauer Oxidation

Q4. Write short notes on:
(a) Hydrohalogenation
(b) Symmetric Hydroboration
(c) Preparation of amines and sulphide via hydroboration

Unit – III

Q5.(a) Give the mechanistic details of reduction of the following: (any two)
(a) Reduction of epoxides
(b) Reduction of oxime groups
(c) Hydrogenolysis

Q 6. Discuss stereochemistry and applications of catalytic hydrogenation using Pd, Pt and Ni catalyst.

Unit – IV

Q7. Give synthesis and reactions of tropone.
Q8. Write short notes on :
(a) Aromaticity of annulenes
(b) Chemistry of Azulene

S. S. Jain Subodh PG (Autonomous)College
M.Sc. Semester III Assignment 2025
Paper V : Natural Products-I

Attempt any 4 questions. **M. M. 30 marks**

UNIT-I

Q.1 (a) How are the terpenes separated from essential oils?
(b) Give the synthesis of menthol.
(c) Describe the classification of terpenes by giving one example of each class with name
and structure. (5+5+5)

Q.2 Writes short notes on (7.5+7.5)
(a) Stereochemistry of citral
(b) Classification of terpenoids.

Unit-II

Q.3 (a)Give one synthesis of Abietic acid
(b) Discuss stereochemistry of Santonin. (8+7)

Q.4 Explain (5+5 +5)
(a) Oxidative degradation of terpenes
(b) Ozonolysis of zinziberene
(c) Position of angular methyl group in abietic acid.

Unit III

5. (i) Write short notes on :-
(a) Constitution of meriquinene
(b) EMDE and von Braun degradation method
(ii) Establish the structure of ephedrine. (10+5)

6. (a) Discuss the synthesis and stereochemistry of morphine.
(b) Explain the following:

(i) Presence of phenolic and alcoholic hydroxyl group in morphine
(ii) Presence of vinyl group in quinine
(iii) Presence of n- propyl group in coniine
(iv) Presence of di tertiary nitrogen in nicotine (5 + 10)

Unit IV

7. (a) Describe the constitution of myrcetin and elucidate its structure.
(b) Formulate the synthesis of quercetin and luteolin? (7.5 + 7.5)

8. (a) Discuss the structure of cyanidin - 7 – arabinoside and confirmed by synthesis.
(b) Write an account of chemistry of alizarin. (7.5 + 7.5)

S.S. Jain Subodh P.G. College, Jaipur

Department of Chemistry

M.Sc. III Sem Chemistry

Assignment -2025

Paper VI Heterocyclic Chemistry

Note: Attempt four questions, one question from each unit. **M M : 30**

Unit – I

Q1 Taking suitable examples to explain fused and bridged heterocycles. 7.5

Q2 Explain ring current effect as a criteria of aromaticity in heterocyclic compounds. 7.5

Unit – II

Q3 Write short note on :

1. Anomeric effect 7.5

2.Torsional strain in small ring

Q4 Explain Conformation of small ring Heterocycles. 7.5

Unit – III

Q. 5 Write down the synthesis methods and orientation of nucleophilic ring opening reaction of Aziridine. 7.5

Q. 6 writes notes on- 7.5

a) acid hydrolysis and base hydrolysis reactions of oxaziridines

b) Synthesis of oxirane by oxygen and methylene insertion reaction

Unit IV

Q.7 Describe mechanism of following synthesis : - 7.5

(I) Fisher -Indole synthesis

(II) Reissert synthesis

Q8. Describe orientation of electrophilic substitution in benzo furan. 7.5

S. S. Jain Subodh PG (Autonomous) College, Jaipur

Department of Chemistry

M. Sc. Sem III Assignment Sept.2025

Paper IV: Advanced Electrochemistry - I

Attempt four questions one question from each unit **M. M. 30 marks**

Unit – I

Q.1 (a) Discuss the following in detail.

i. Potentiostat

ii. Galvanostat

iii. Electrolysis at controlled potential

Q.2 Discuss following fuel cells in detail.

i. Hydrocarbon Air Cell
ii. Phosphoric Fuel Cell
iii. Direct NaOH Fuel Cell

Unit – II

Q.3 What are energy storage system? Explain mechanism of charging and discharging of a battery. How the performance of a battery is measured?

Q.4 What are secondary batteries? Explain construction and working of Lead – Acid battery in detail.

Unit – III

Q.5 Discuss surface mechanism of the corrosion of metals.

Q.6 Write short note on-

i. Weight loss method
ii. Inhibition from corrosion by addition of substrates
iii. Pourbaix diagrams

Unit –IV

Q.7 Explain –

i. Bioelectrodes
ii. Electrocardiography
iii. Nernst -Plank equation

Q8 Differentiate between Simplistic theory and Modern theory.

S. S. Jain Subodh PG College, Jaipur

Department of Chemistry

M Sc Sem III Assignment Sept.2025

Paper V: Phase Rule and Surface Phenomenon

Attempt four questions one question from each unit **M. M. 30 marks**

Unit – I

Q.1 (a) What is meant by peritectic reaction? Draw and discuss the phase diagram of NaCl-H_2O system.

(b) Draw the phase diagram of lead-silver system and explain briefly its essential features.

Q.2 (a)Derive a distribution formula of Nernst distribution law when the solute gets associated with one of the solvents.

(b) Explain the theory of fractional distillation.

Unit – II

Q.3 Write short note on:

(a) Stern's theory of double layer

(b) Hardy-Schulze Rule

(c) Gold number

Q.4 (a) Discuss the classification of colloids.

(b) What are the applications of colloids? Discuss in detail.

Unit – III

Q.5 What do you understand by the term Adsorption? How does it differ from absorption? Distinguish between physical adsorption and chemisorption.

Q.6 What are Adsorption Isotherms? Give the main points of Langmuir theory of adsorption and also deduce Langmuir adsorption equation $\frac{x}{m} = \frac{KP_A}{1+KP_A}$

Unit – IV

Q.7 How do you distinguish between a liquid and a crystalline structure from their respective XRD patterns? What are the challenges in analyzing the data from a liquid, which is essentially an amorphous material, compared to a crystalline solid?

Q.8 Write short note on:

a) Trouton’s rule
b) Eyring theory of liquids
c) Specific heat of liquids

S. S. Jain Subodh PG College, Jaipur

M. Sc. Sem III Assignment October 2025
Physical Specialization

Paper- VI : Advanced Chemical Kinetics

Attempt any four questions **Max. Marks 30**

Unit I

Q 1. (a) What do you understand by induced reactions? Discuss their kinetics

(b) What is steady state approximation ?

Q 2. (a)Discuss Frank -Robinovich effect

(b) Write about parallel reactions.

Unit II

Q 3. Discuss reactions in which first step is rate determining step.

Q 4. . Discuss reactions in which all steps have comparable rate

Unit III

Q 5. Write a short notes on the following:-

(a) autocatalysis

(b) Auto-oxidation

(c) Anation reaction

Q 6. Discuss Rice-Herzfield mechanism

Unit IV

Q 7. Discuss Henry Taube s Classical reaction in detail .What is the difference between outer sphere and inner sphere reactions

Q 8. Discuss theory of absolute reaction rates as applicable to solutions.