

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

## **MSc. II Sem Chemistry**

### **Assignment 2026**

#### **Biophysical Chemistry**

##### **Paper V**

**Max. Marks 15**

**Attempt One Question from Each Unit and each question carry equal marks**

#### **Unit I**

- Q 1. (i) Discuss role of ATP in biological system.  
(ii) Show that ATP hydrolysis shifts the equilibrium of coupled reactions by a factor of  $10^8$
- Q 2. (i) Explain sliding Filament theory of Muscular contraction.  
(ii) Define Enthalpy, Entropy and Gibbs free energy.

#### **Unit II**

- Q 3. What are Electrostatic Charges? Explain the role of electrostatic charges in molecular expansion.
- Q 4 Explain the various binding forces involved in biological systems.

#### **Unit III**

- Q 5. What are Autoanalyzers? explain their functioning in analysis.
- Q 6. Write short notes on (any two)
- (i) Nerve conduction
  - (ii) Fluid Mosaic model of cell membrane
  - (iii) Irreversible thermodynamic treatment of membrane transport

#### **Unit IV**

- Q.7. How will you determine the size of biopolymers? Explain.
- Q 8. Discuss the following methods to determine molecular weight of macromolecules
- (i) Sedimentation velocity method
  - (ii) Viscosity determination method

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

## **MSc. II Sem Chemistry**

### **Assignment 2026**

#### **Environmental Chemistry I**

##### **Paper VI**

**Max. Marks 15**

**Attempt One Question from Each Unit and each question carry equal marks**

##### **Unit I**

Q 1. Explain biogeochemical cycle of sulphur, nitrogen and carbon.

Q 2. Discuss the structure of various atmospheric layers. Explain radiation budget of the earth's atmosphere system.

##### **Unit II**

Q 3. Write a short note on photochemical smog. Discuss the formation and reaction of nitrate radicals.

Q 4. Explain the role of hydroxyl, hydroperoxyl and organic radicals in the oxidation of hydrocarbon and other organic compound.

##### **Unit III**

Q 5. Explain Green House effect and Global Warming.

Q 6. Write short notes on

i) Acid Rain and their damaging Effect

ii) Ozone Layer Depletion

##### **Unit IV**

Q.7. Explain the following

i) Sources of Water pollution

ii) Acid base chemistry of fresh water bodies

Q 8. Write short notes on

i) COD and BOD

ii) Purification of water



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

**M.Sc. II Sem Chemistry**

**Assignment 2026**

**Organic Chemistry**

**Paper II**

Attempt one question from each unit

**M.M.30**

**UNIT-I**

**1. Explain the following terms**

- (a) Enantiotopic and diastereotopic atoms**
- (b) Optical activity**

**Or**

- 2. (a) Comment on chirality of unsymmetrical sulphoxide**  
**(b) A brief note on asymmetric synthesis**

**UNIT II**

**Q 3. Give one method of preparation and important synthetic applications for the following:**

- (i) Merrifield's Resin**
- (ii) Crown Ethers**
- (iii) SeO<sub>2</sub>**
- (iv) Wilkinson's Catalyst**

**Or**

**Write Short notes on :**

- (i) Heck Reaction**
- (ii) Cryptands**
- (iii) Suzuki Coupling**
- (iv) Phase Transfer Catalyst**

### UNIT III

**Q 4. Explain Molecular rearrangement reactions. Also write note on-**

**I. Pinacol- Pinacolone Rearrangement**

**II. Wittig Reaction**

**Or**

**Discuss following reactions with their importance in synthetic applications-**

**I. Baeyer Villiger oxidation**

**II. Arndt Eistert Reaction**

**III. Damjanov Rearrangement**

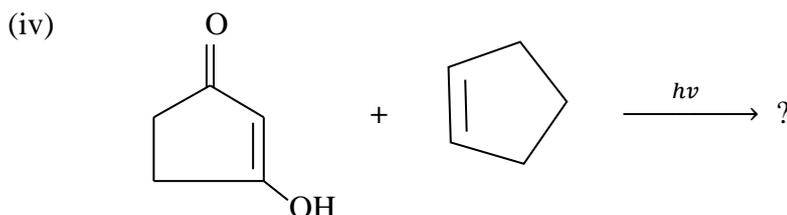
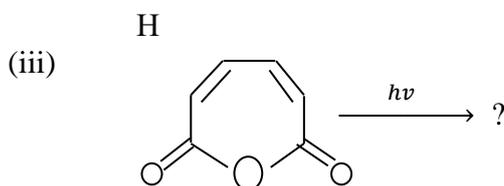
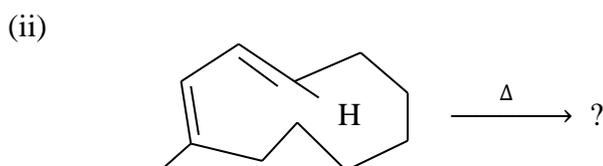
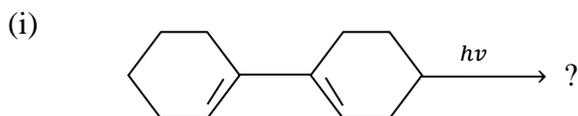
### UNIT- IV

**7. (a) What are Electrocyclic Reactions? Discuss disrotatory interconversion of cyclobutene  $\rightarrow$  butadiene system with the help of correlation diagram.**

**(b) Discuss in brief 1,3 sigmatropic Reaction.**

**Or**

**8. (a) Complete the following reactions:**



**Write a note on Fluxional Tautomerism.**



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**MSc.II Sem Chemistry**

**Assignment 2026**

**SPECTROSCOPY -II**

**Paper IV**

**Attempt one question from each unit .Each question carry equal marks. M.M.30**

**UNIT I**

Q1 (i) Discuss U.V Spectroscopy Of Conjugated Dienes

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

Q2 What is the Beer – Lambert Law? Express it mathematically and give the significance of each term

**UNIT II**

Q3. (i) Describe the principle of Infrared Spectroscopy.

(ii) Write the effect of hydrogen bonding on IR Spectroscopy .

Q4 Write short note on :-

(i) Fermi resonance.

(ii) Overtone

**UNIT III**

Q5 What are Shielding and Deshielding Effect ?Describe Anisotropy with example.

Q6. Explain the following terms in detail with suitable examples.

(i) Two-dimension spectroscopy – DEPT and NOESY.

(ii) Spin – Spin Coupling

## UNIT IV

Q.7 (i) Give a detailed explanation on general fragmentation modes in mass spectrometry.

(ii) Discuss metastable peak with suitable example.

Q.8 (i) Predict the structure of the compound whose peaks in the mass spectrum have  $m/z$  values : 86,71,58,43(100%).

(ii) What is Nitrogen rule? Explain some important features of mass spectra of Nitro compound.

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

## MSc. II Sem Chemistry

### Assignment 2026

#### Paper- I

#### Inorganic Chemistry

M.M 30

1. What are the symmetry operations in point group  $C_{2v}$ . Identify a molecule that belongs to the group by examining the effect of sequential application of various symmetry operations in the group. Construct the group multiplication table.  
[4+3+8]
2. (a) What are sub-groups in the point group  $D_{3d}$ ? Write their order also.  
(b) Mention the sub-groups of  $S_4$  and  $D_{2d}$ .  
(c) Name various symmetry elements and point groups present in the following molecules:  
(1)  $NH_3$       (2)  $H_2O_2$       (3) Benzene      (4)  $SF_4Cl$       [6+5+4]
3. Discuss in detail the kinetics of acid hydrolysis and base hydrolyses reactions with suitable examples [7+8]
4. What is the difference between outer sphere and inner sphere reaction mechanism? Give mechanism in detail [7<sup>1/2</sup>+7<sup>1/2</sup>]
5. (a) What are metallic carbonyls? Give their general methods of preparation and properties  
(b) Discuss structure and bonding of  $Cr(CO)_6$  in detail. [8 + 7]
6. (a) Classify Nitrosyl compounds on the basis of its structure and nature of bonding.  
(b) Discuss the preparative methods for obtaining metal nitrosyl. [9+6]
7. Describe super conductors. State consequences of metal deficiency defects.  
[8+7]

8. Explain Schottky and Frenkel defects with suitable examples and discuss the thermodynamics of Schottky and Frenkel defect formation. [8+7]

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

**MSc. II Sem**

**Assignment 2026**

**Physical Chemistry**

**Paper III**

**Max. Marks 30**

**Attempt One Question from Each Unit and each question carries equal marks**

## **Unit I**

Q 1. What do you understand by chemical potential. Discuss Duhem -Margules equation.

Q 2. What do you understand by ionic strength. Discuss the Debye-Huckel theory of Ionic Coefficients.

## **Unit II**

Q 3. Discuss Bose-Einstein statistics. How are they different from Fermi-Dirac Statistics.

Q 4. Discuss partition function. Discuss translational and vibrational partition function.

## **Unit III**

Q.5 Write short notes on

i. Capillary action

ii. Surface films on liquids.

Q 6 . Write notes on

i. micelle formation

ii. Thermodynamics of micellization .

## **Unit IV**

Q.7. Explain the types of crystal structure and Braggs Law.

Q.8. Write notes on light scattering methods and mass average molecular mass.

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

Assignment March 2026

M.Sc IV Semester (Organic Chemistry)

Paper- I Green Chemistry

**Attempt four questions, one question from each unit.**

**M.M.30**

**UNIT-I**

1. (a) Why Green Chemistry is needed for sustainable development?  
(b) Discuss any four principles of Green Chemistry taking suitable examples.
- Or
2. (a) How will you synthesize following organic compounds using green route?  
(i) Paracetamol                      (ii) Citral  
(b) Write short notes on the following:-  
(i) Atom efficient synthesis  
(ii) Energy efficient synthesis  
(iii) Green Chemistry in day to day life.

**UNIT- II**

3. (a) How are polymer supported chromic acids considered as green reagents? Give an example of polymer supported chromic acid.  
(b) Give any two chemical applications of the following :-  
(i) Polymer supported per acid,  
(ii) DMC  
(c) Give advantages of using PTCs in organic synthesis (any six)

**OR**

- (a) How does PTC work during catalyzing a chemical reaction? Give suitable examples of following PTC catalyzed reactions (one each)  
(i) Darzen's reaction      (ii) Wittig reaction      (iii) Oxidation using H<sub>2</sub>O<sub>2</sub>

- (b) What are Biocatalysts? Why are they considered as green catalysts? Give one example of biocatalyst catalyzed reaction.

### UNIT- III

5. Describe the following Ultrasound assisted synthesis by taking suitable examples

- a) Oxidation
- b) Reduction
- c) Addition

Or

6. Discuss the following Microwave assisted reactions in organic solvents:

- a) Decarboxylation
- b) Fries rearrangement
- c) Esterification reactions

### UNIT- IV

7. a) Write short note on supercritical CO<sub>2</sub> in Green chemistry.

b) What are ionic liquids? Explain the advantages and specific role of ionic liquids in

- i) Diels-Alder reaction
- ii) Heck reaction

Or

8. Discuss the specific role of aqueous phase media in the following reactions:

- a) Michael reaction
- b) Knoevenagel reaction
- c) Reduction of carbon-carbon multiple bonds

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

Assignment March 2026

M.Sc IV Semester (Organic Chemistry)

Paper II- Organic Synthesis

Attempt four questions, one question from each unit.

M.M.30

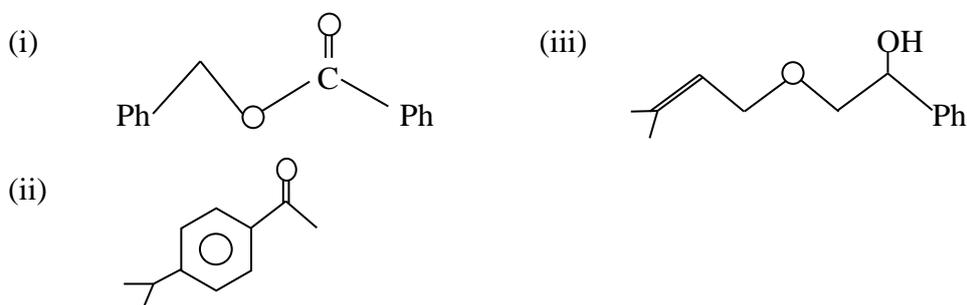
### UNIT-I

1. Explain the following terms with suitable examples

- Synthetic Equivalent
- Retroanalysis or Disconnection Approach
- Functional Group Interconversion (FGI)
- Chemo Selectivity

Or

2. (a) Give the disconnection and synthesis of the following compounds.



(b) Write a short note on protection of

- Amines
- Discuss the importance of protecting groups on organic synthesis.

### UNIT- II

3. (a) Explain the term Stereospecificity, Stereoselectivity and regioselectivity of Diels – Alder reaction by taking suitable examples.

(a) Write a note on Retroanalysis of Robinson Annulation.

Or

4. (a) Discuss the synthesis of Ketones, aldehyde and alcohols using one group C-C disconnections. Provide mechanisms and retrosynthetic analysis.

- (b) Discuss the synthetic utility of Michael addition and aldol condensation in the context of two group disconnections.

### **Unit III**

- Q5 Describe the use of insertion and cyclization reactions in synthesis of 3&4 membered rings. (15)
- Q6. Give an account of the use of ketenes in the ring synthesis with suitable examples. (15)

### **Unit IV**

- Q7 Give suitable examples for use of 1,4 and 1,6 di-carbonyl compounds in synthesis of Five membered rings. (15)
- Q8 Write short notes on following:
- (a) Diels alder reaction
  - (b) Reduction of aromatic compounds

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

**MSc. IV Sem**

**Assignment 2026**

**Medicinal Chemistry and Natural products II**

**Paper III**

**Max. Marks 30**

**Attempt One Question from Each Unit and each question carry equal marks**

## **Unit-I**

Q.1 Define Prostaglandins. Discuss their nomenclature, classification and clinical significance

Q. 2 (a) How will you confirm that four pyrrole rings are linked together in haemin.

(b) Explain the Chemical changes that occur when haemin is treated with Sn/HCl.

## **UNIT II**

Q3. What are vitamins? Explain their importance in vital activities.

Discuss structure of Vitamin C with suitable reactions?

Or

Q4. Write detailed note on following:

(I) Pyrethroids

(i) Rotenones

## **Unit-III**

Q.5 Establish the structure of progesterone and androsterone.

or

Q. 6 Explain position of angular methyl group, double bond and side chain in cholesterol.

## **UNIT IV**

Q 4. What are Antimalarials? Discuss structure, synthesis and uses of

(i) Aminoquinolines

(ii) Pyrimidines.

Or

Write note on following:

(i) Diphenhydramine hydrochloride

(ii) Methadone

(iii) Melphalan

(iv) Antiviral agents

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

**MSc.IV Sem Chemistry(Organic special)**

**Assignment 2026**

**Heterocyclic Chemistry -II**

**Paper IV**

**Attempt One Question from Each Unit and each question carry equal marks**

**M.M.30**

**UNIT I**

1. What are Meso-ionic heterocycles? How these are classified? Explain. Describe reactions of following meso-ionic heterocycles:

- (i) 1,3-Diazolium -4-olates
- (ii) 1,3-Oxazolium -5-olates

2. Describe method of synthesis and chemical reactivity of Tetrazole.

**Unit II**

3. Predict the reaction products with suitable mechanism when: -

- i) 4-pyrone reacts with Bromine.
- ii) 4-pyrone reacts with Grignard Reagent.
- iii) Pyrilium salt reacts with Secondary Amines.
- iv) Resorcinol reacts with  $\beta\beta$ -diketone

4. Explain following with examples:

- (i) Electrophilic Addition in pyrimidines
- (ii) 1,3,5-Triazines undergo cyclo- addition reactions
- (iii) Nucleophilic Substitution In Diazine.

**Unit III**

5. (a) Explain method of synthesis and chemical reactivity of Azepine.

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

6. Describe antiaromaticity in azepines, oxepines and thiepinines. How will you synthesis-

- a) 1-H-azepine From Nitrobenzene
- b) Oxepines from Cyclohexadiene.

c)Thiepines from cis-hexatriene

#### **Unit IV**

7. Describe Smiles rearrangement in detail with its significance and limitations for the synthesis of phenothiazines.

8. Describe the following synthesis with their mechanistic steps:

a) Friedlander Synthesis

b) Bisler Napieralski Synthesis

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

**MSc. IV Sem (Physical Specialization )**

**Assignment 2026**

**Advance Electrochemistry-II**

**Paper IV**

**Max. Marks 30**

**Attempt One Question from Each Unit and each question carry equal marks**

## **Unit I**

Q 1. Explain structure of double layer at the semiconductor solution interface and effect of light at semiconductor -solution interface.

Q 2. Discuss the various Electrochemical instrumentation methods.

## **Unit II**

Q 3. Discuss the following methods of determining kinetic parameters for quasi-reversible and reversible waves:

(a) Koutecky's method

(b) Meits Israel method

Q 4. What is Electrocatalysis? Explain electrochemical catalysis with special reference to purostates, porphyrin oxides of rare earths.

## **Unit III**

Q 5. Write short notes on

(a) Controlled potential coulometry

(b) Electroorganic synthesis and its importance

Q 6. What is stripping analysis? Explain Cathodic and anodic mode of stripping analysis.

## **Unit IV**

Q.7. Explain the following

(a) Electro growth of metals on electrode nucleation

(b) Variety of shapes formed in electrodeposition

Q 8. Discuss about Electrochemical sensors based on carbon nanotubes and their applications.

**M.Sc. Fourth Semester Assignment March, 2026**

(Faculty of Science)

Chemistry

First Paper

**Nanochemistry and Nanomaterials**

Paper Code- MCHE 411

**Maximum Marks-30**

**Attempt four questions each from one unit**

**Unit-I**

- Q. 1 (a) What is meant by Quantum confinement of a NP-explain.
- (b) Discuss the classification of nanomaterial's on the basis of dimensions.
- (c) Emissions and absorption of wavelengths of NPs are size and shape dependant-explain this with CdSe NP as example.

**OR**

- (a) Explain in detail how melting point and chemical reactivity of nonomaterial's depend on the size of NMs.
- (b) Explain in detail why band gap of nonmaterial's increases with size reduction.
- (c) Explain degree of confinement and degree of freedom with suitable examples.

**Unit-II**

- Q. 2 (a) Explain PVD method.
- (b) What is CVD method?
- (c) Explain microemulsion method.

**OR**

- (a) Briefly explain what is Sol-Gel method.
- (b) Explain Ball-milling for nano synthesis.
- (c) Explain in detail nucleation growth.

**Unit-III**

Q. 3 Brief account on Synthesis and mechanism of formation of Carbon Nanotubes.

OR

Discuss on synthetic strategies and growth control of nanowires.

**Unit-IV**

Q. 4 Explain the role and mechanism of nanomaterials for CO<sub>2</sub> capture.

OR

What are nanocatalyst? Write down their applications.

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

**MSc. IV Sem (Physical Specialization)**

**Assignment 2026**

**Polymer Chemistry**

**Paper II**

**Max. Marks 30**

**Attempt One Question from Each Unit and each question carry equal marks**

## **Unit I**

Q 1. Give definition and classification of polymers.

Q 2. Define polymer, monomer and degree of polymerization. Discuss the mechanism and kinetics of anionic polymerization.

## **Unit II**

Q 3. Compare step growth and chain growth polymerization on the basis of mechanism, molecular weight development and kinetics.

Q 4. Discuss click chemistry in polymer synthesis and its applications.

## **Unit III**

Q.5 Discuss Flory-Huggins Theory of Polymer Solutions in detail.

Q 6 .Discuss crystallinity in polymers and glass transition temperature.

## **Unit IV**

Q.7.What do you understand by electroluminescent polymers and fire-retarding polymers?

Q.8.Discuss X-Ray diffraction study of polymers.

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

**MSc. IV Sem (Physical Specialization)**

**Assignment 2026**

**Chemistry of Materials**

**Paper III**

**Max. Marks 30**

**Attempt One Question from Each Unit and each question carries equal marks**

## **Unit I**

- Q 1. What are thermotropic and lyotropic liquid crystals. Discuss their applications.
- Q 2. What do you understand by smectic A and smectic C phases. Discuss the optical properties of liquid crystals.

## **Unit II**

- Q 3. What are perovskites and defect perovskites. What are the various kinds of defects in defect perovskites.
- Q 4. Discuss the applications of high  $T_c$  cuprates.

## **Unit III**

- Q.5 Discuss the preparation of Langmuir-Blodgett films and their applications.
- Q 6 . Write notes on molecular beam epitaxy and magnetron sputtering.

## **Unit IV**

- Q.7.What do you understand by composites. Discuss the types of composites.
- Q.8. Write notes on ceramics and refractories.