

**M.Sc (Chemistry) Second Semester  
First Paper  
Inorganic chemistry  
Assignment-2024**

**Answer any two questions:**

**M.M: 30**

**Unit-I**

- Q.1 What are symmetry elements and symmetry operations? Discuss all symmetry elements with suitable examples. 15
- Q.2 a) Explain great orthogonality theorem and its importance.  
b) Derive character table for  $C_{2v}$ -point group. 7.5+ 7.5

**Unit-II**

- Q.3 What are inert and labile complexes. Discuss  $S_N^1$  and  $S_N^2$  mechanisms of nucleophilic substitution reactions in octahedral complexes. 15
- Q.4 Explain inner sphere and outer sphere mechanisms of one electron transfer reactions 15

**Unit-III**

- Q.5 Discuss in detail structure and bonding in the following Metallic Carbonyls 7.5+7.5  
(a)  $Ni(CO)_4$   
(b)  $Mn_2(CO)_{10}$
- Q.6 (a) Classify Nitrosyl compounds on the basis of its structure and nature of bonding.  
(b) Discuss the methods of preparation for obtaining Metal Nitrosyls. 7.5+7.5

**Unit-IV**

- Q.7 Write a detailed note on the magnetic properties of solids. How is magnetic susceptibility related to the number of unpaired electrons? 15
- Q.8 Discuss the following  
(a) Thermodynamics of Schottky and Frenkel defect formation.  
(b) New superconductors. 7.5+7.5

**M.Sc (Chemistry) Second Semester  
Second Paper  
Organic chemistry  
Assignment-2024**

**Answer any two questions:**

**M.M: 30**

**UNIT I**

1. (i) Give the detailed account of homotopic, enantiotopic and diastereotopic atoms, groups and faces with suitable examples.  
10+5
- (ii) Explain the existence of chirality in allene
2. Write short notes on the following:- 3\*5
- (i) Cram's Rule
- (ii) Effect of conformation on reactivity
- (iii) Asymmetric synthesis
- (iv) Racemic mixture resolution
- (v) Chirality due to helical shape

**UNIT II**

3. Explain the following 4+4+4+3
- (i) Heck reaction
- (ii) Negishi Coupling
- (iii) Phase transfer catalysis
- (iv) Schmidt rearrangement
4. Briefly explain the synthetic applications of the following: 4+4+4+3
- (i) Crown ethers
- (ii) Peterson's Synthesis
- (iii) Suzuki coupling
- (iv) Tributyl tin hydride

**UNIT III**

5. Write note on- 5+5+5
- (i) Pinacol pinacolone rearrangement
- (ii) Favorskii rearrangement
- (iii) Curtius rearrangement

6. What is molecular rearrangement, explain various type of it? Discuss Baeyer Villiger oxidation and Wittig rearrangement. 15

#### UNIT IV

7. i) Classify the pericyclic reactions with proper example. 5+5+5  
ii) Describe the Frontier Molecular Orbital Theory.  
iii) Explain the photo chemical conversion of 3,4- dimethyl cyclobutene into 2,4- hexadiene and vice versa
8. Explain the following: 4+4+4+3  
i) Thermal cyclization of butadienes  
ii) Ene-reaction  
iii) 3,3- and 5,5- sigmatropic rearrangement  
iv) Claisen and Cope Rearrangement

**M.Sc (Chemistry) Second Semester  
Third Paper  
Physical chemistry  
Assignment-2024**

**Answer any two questions:**

**M.M: 30**

**Unit-I**

- Q.1 What do you understand by chemical potential? How is it affected by temperature and pressure? 15
- Q.2 Explain fugacity. Derive Gibbs Duehem Margules equation. 15

**Unit –II**

- Q.3 Discuss Bose Einstein statistics 15
- Q.4 Write short notes on 7.5x2
- (a) Sterling theorem
- (b) Lagrange law of multiplier

**Unit-III**

- Q. 5 Write short note on followings 7.5x2
- (a) Kelvin Equation
- (b) Surface active agents
- Q. 6 What do you mean by critical micellar concentration (CMC)? Give factors affecting the CMC of surfactants. 15

**Unit-IV**

- Q. 7 Define number and mass average molecular masses. Explain light scattering method for the determination of molecular mass of macro molecule. 15
- Q. 8 Write short note on 5x3
- (a) Sedimentation
- (b) Osmometry
- (c) Viscometry

**M.Sc (Chemistry) Second Semester  
Fourth Paper  
Spectroscopy-II  
Assignment-2024**

**Answer any two questions:**

**M.M: 30**

**Unit-I**

1. "A conjugated diene absorbs at a higher wavelength with higher value of extinction coefficient as compared to a diene in which double bonds are isolated." Comment on this statement with examples giving the chemistry involved. (15)
2. (a) Discuss the UV spectra of  $\alpha$ ,  $\beta$  unsaturated carbonyl compounds. (8+7)
- (b) Write a note on bathochromic shift and hypsochromic shift.

**Unit-II**

3. Write Short notes on: (5x3)
  - (a) Finger print region
  - (b) Fermi Resonance
  - (c) Vibration Modes
4. (a) Mention the selection rules for IR Spectroscopy. (8+7)
- (b) Discuss the important band in IR spectra of Carboxylic acids.

**Unit-III**

5. Define chemical shift. Discuss with example how inductive effect, anisotropic effect influence the chemical shift. (15)
6. Write notes on: (8+7)
  - (a) Nuclear overhauser effect
  - (b) Deuterium exchange reactions

**Unit- IV**

7. (a) How can one do distinction between primary, secondary and tertiary alcohols on the basis of mass spectroscopy? (8+7)
- (b) Describe factors influencing fragmentation pattern in mass spectrometry.
8. (a) Write detailed description of McLafferty rearrangement.
- (b) Name four techniques for ion- production in mass spectroscopy of compounds. Explain any two. (8+7)

**M.Sc (Chemistry) Second Semester  
Fifth Paper  
Biophysical Chemistry  
Assignment-2024**

**Answer any two questions:**

**M.M: 15**

**Unit-I**

Q1. Explain Structure of ATP and its hydrolysis. ( 7.5)

Q2. Write notes on: ( 3.5+ 4)

- a) Muscular contraction: sliding filament theory
- b) Relation in Standard free energy change and equilibrium constant in biochemical reactions .

**Unit -II**

Q.3. What are biopolymer interactions and describe the force involved in biopolymer interactions. ( 7.5)

Q.4. Explain the multiple equilibria and various types of binding processes in biological systems. ( 7.5)

**Unit -III**

Q.5. Explain ion transport through cell membrane. ( 7.5)

Q.6. Write notes on ( 3.5+ 4)

- a) Radioisotopes
- b) Autoanalyzer

**Unit -IV**

Q.7. Explain different methods to determine size of biopolymers. ( 7.5)

Q.8. Give detailed description of hydrodynamic method for the determination of molecular weight of biopolymers. ( 7.5)

**M.Sc (Chemistry) Second Semester  
Sixth Paper  
Environmental Chemistry  
Assignment-2024**

**Answer any two questions:**

**M.M: 15**

**Unit-I**

Q1. Draw temperature – altitude profile of atmosphere and explain the reasons for the nature of temperature variations in different regions. Discuss the heat budget of atmosphere.

( 7.5)

Q2. What are Biogeochemical cycles ? Discuss the Biogeochemical cycles of Nitrogen and Sulphur.

( 7.5)

**Unit -II**

Q.3. a) Discuss the mechanism of formation of Ozone.

b) Explain about Photochemical smog in detail

(3.5+4)

Q.4 a) Discuss the mechanism of photo dissociation of  $\text{NO}_2$  and the formation of hydroxyl radicals, hydroperoxyl radicals and hydrogen peroxide.

b) Write down the reaction of OH radicals with  $\text{NO}_2$ .

(4+3.5)

**Unit -III**

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

( 7.5)

Q.6 What do you understand about Acid Rain? Discuss about the acid rain precursors and their aqueous and gas phase atmospheric oxidations.

( 7.5)

**Unit -IV**

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

( 7.5)

Q.8. Write short notes on

a) Sources and toxic effects of fluoride and nitrate in water.

( 4)

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

(3.5)

**M.Sc. (Chemistry) Fourth Semester  
(Organic Chemistry special)  
First Paper  
Green Chemistry  
Assignment-2024**

**Answer any two questions:**

**M.M: 30**

**Unit-I**

1. Write Short Notes on
  - (a) Atom Economy
  - (b) Role of Green Chemistry in daily life
  - (c) Designing a green synthesis using principles of Green chemistry (5x3)
  
2. What do you mean by sustainable chemistry? Explain the need of environment economic chemistry and its achievements using various principles. (15)

**Unit-II**

3. (a) Write a brief account on acid and basic catalysts? (8+7)  
(b) Discuss microbial oxidation with example under biocatalyst.
  
4. (a) How dimethylcarbonate is more advantageous over conventional methylation reagents. Also write uses of dimethylcarbonate? (8+7)  
(b) Write the green synthetic route of coumarins and flavanones under PTC conditions.

**Unit-III**

5. Discuss the following microwave assisted reactions in organic solvents by taking suitable examples:
  - (a) Decarboxylation (5x3)
  - (b) Esterification reactions
  - (c) Diels- Alder reaction
  
6. (a) What do you mean by sonochemistry? How is ultrasound generated and utilized in carrying out chemical reactions? (5x3)  
  
(b) Describe the following ultrasound assisted synthesis by taking suitable examples
  - (i) Substitution reactions
  - (ii) Oxidation

**Unit-IV**

7. (a) How will you synthesize pharmaceutical compounds by using ionic liquids as green solvents? (8+7)  
(b) Discuss the role of Fluorous solvents in green chemistry?
  
8. Write short notes on: (5x3)
  - (a) synthesis of sebacic acid
  - (b) benzoin condensation
  - (c) Claisen rearrangement



**M.Sc. (Chemistry) Fourth Semester  
(Organic Chemistry special)  
Second Paper  
Organic synthesis-II  
Assignment-2024**

**Answer any two question: -**

**MM: 30**

**Unit-I**

- Q.1. Write all the guidelines for the order of events in organic synthesis. 15
- Q.2. Write short note on 7.5+7.5
- i) Chemoselectivity
  - ii) Protection and deprotection of alcohol

**Unit-II**

- Q.3 With suitable examples show how two groups disconnection helps in synthetic strategies using 7.5+7.5
- i) Robinson annelation
  - ii) Michael addition
- Q.4. a) Give an example of organic synthesis 1,3 diX disconnection approach. 7.5+7.5
- b) Write explanatory note on use of alkynes and aliphatic nitro compounds in organic synthesis.

**Unit-III**

- Q.5. Describe use of insertion reactions in synthesis of three membered ring. 15
- Q.6. a) Write short note on use of photochemical reactions in the synthesis of four membered compounds.
- b) Give an account of the use of Ketenes in the synthesis of ring compounds with the help of suitable examples. 7.5+7.5

**Unit-IV**

- Q.7. How does enolate help in organic synthesis using  $a^2$  and  $d^2$  synthones. 15
- Q.8. Give suitable examples for use of following in synthesis of six membered ring. 7.5+7.5
- a) Use of 1,6-dicarbonyl compound
  - b) Use of Diels- Alder reaction

**M.Sc. (Chemistry) Fourth Semester  
(Organic Chemistry special)  
Third Paper  
Medicinal Chemistry & Natural Product-II  
Assignment-2024**

**Answer any two questions:-**

**MM: 30**

**Unit-I**

- Q.1 (a) How will you obtain chlorine from Chlorophyll-a. 8+7  
(b) Explain synthesis of Chlorophyll-a
- Q. 2 (a) How will you confirm that four pyrrole rings are linked together in haemin. 8+7  
(b) Explain the Chemical changes that occur when haemin is treated with HI in acetic medium.

**Unit- II**

- Q. 3. Discuss structure elucidation of Vitamin K? 15
- Q.4. Write a detailed note on Rotenoids? 15

**Unit-III**

- Q. 5 Explain the followings. 5x3  
(a) Size of the ring A ,B,C and D in Cholestrol  
(b) Position of alcoholic hydroxyl and methyl group in Cholestrol.  
(c) How will you establish position of the two angular methyl groups in cholesterol
- Q. 6 Write a note on steroids and Diel's hydrocarbon. Draw the basic structure of steroid with Numbering 15

**Unit- IV**

- Q.7. Explain various types of antimalarials used for treatment of different stages of plasmodium? 15
- Q.8. Write a note on: 15  
a) Antineoplastic agents  
b) Gene therapy

**M.Sc (Chemistry) Fourth Semester  
(Organic Chemistry special)  
Fourth Paper  
Heterocyclic Chemistry-II  
Assignment-2024**

**Answer any two questions:-**

**MM: 30**

**Unit-I**

1. (i) Classify the Meso - ionic heterocycles with suitable examples. (15)  
(ii) Describe the synthesis of 1,3-oxathiolium-5-olates.
2. What are Meso-ionic heterocycles? How these are classified? Describe synthesis and cyclo addition reactions of following meso - ionic heterocycles (15)
  - (i) 1,3-oxazolium-5-olates (Munchnones )
  - (ii). 1,2,3-oxadiazolium -5-olates (Sydnones)

**Unit-II**

3. How are Pyrilium salts synthesized? Explain their reactivity towards nucleophiles. Give the reactions of pyrilium salts with (15)
  - (i). NaOH
  - (ii). NaCN
  - (iii) Amines
  - (iv)  $\text{CH}_3\text{NO}_2$ -base
4. Predict the reaction products with suitable mechanism when:- (15)
  - (i) 4-pyrone reacts with  $\text{NH}_3$
  - (ii) 4-pyrone reacts with phenyl hydrazine
  - (iii) Pyrilium salt reacts with  $\text{CH}_3\text{NO}_2$
  - (iv) Resorcinol reacts with  $\beta$ -diketone

**Unit-III**

5. (i) Explain antiaromaticity in Azepines ,Oxepines and thiepins. (15)  
(ii) How are IH-azepines and oxepines synthesized by involving Diels- Alder reaction?  
(iii) Describe thermal and photochemical reactions of IH azepines.
6. Explain the following chemical reactions of Azepins. (15)
  - (a) Ring Contraction Reaction
  - (b) Reaction with oxidizing and reducing agents

#### Unit-IV

7. Give mechanism of following synthesis: (15)
- (a) Skraup Synthesis
  - (b) Pomeranz-Fritsch Synthesis
  - (c) Pictet Spengler Synthesis
8. Write a short note on the following: (15)
- (a) Smiles Rearrangement in Phenothiazines
  - (b) Antimicrobial activity of Phenothiazine heterocycles

**M.Sc. (Chemistry) Fourth Semester  
Physical Chemistry Specialization  
First Paper  
Nanochemistry and Nanocatalysis  
Assignment-2024**

**Answer any two questions:**

**M.M: 30**

**Unit-I**

(15 marks)

- Q. 1 (a) What is meant by Quantum confinement of a NP-explain.  
(b) Discuss the density of states in nanomaterials of 0D,1D,2D and electron motion in them.  
(c) Write in detail what is an electrostatic double layer and zeta potential.  
(d) Emissions and absorption of wavelengths of NPs are size and shape dependent-explain this with CdSe NP as example.

(15 marks)

- Q. 2 (a) Explain in detail how melting point and optical properties of nanomaterials depend on the size of NPs.  
(b) Write in detail the special magnetic properties of nanomaterials with special reference to Superparamagnetism.  
(c) Explain in detail why band gap of nanomaterials increases with size reduction.  
(d) Explain in detail the tunneling effect.

**Unit-II**

(15 marks)

- Q. 3 Explain the following:  
(a) PVD method.  
(b) CVD method  
(c) Microemulsion method.  
(d) High energy ball milling method.

(15 marks)

- Q. 4 Explain the following:  
(a) Sol-Gel method.  
(b) Lithography

(c) Supersaturation with respect to nanoparticles.

(d) Nucleation growth.

### **Unit-III**

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

(15 marks)

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

(15 marks)

### **Unit-IV**

Q. 7 (a) Explain the role and mechanism of nanomaterials for CO<sub>2</sub> capture.

(b) What are nano catalyst? Write down their applications.

(15 marks)

Q.8 Explain the role of size and shape of nano catalyst on their reactivity.

(15 marks)

**M.Sc. (Chemistry) Fourth Semester  
Physical Chemistry Specialization  
Second Paper  
Polymer Chemistry  
Assignment-2024**

**Answer any two questions:**

**M.M: 30**

**Unit-I**

- Q.1. a) Discuss classification of polymer in detail. 7+8  
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+8  
b) Explain the radical polymerization process along with its mechanism and example.

**Unit-II**

- Q.3. a) What is coordination polymerization? Discuss its mechanism with the help of an example.  
b) Discuss thermodynamics aspects of polymerization. 7+8
- Q.4 a) Explain Click chemistry. 5+5+5  
b) Discuss Reversible addition Fragmentation chain transfer polymerization.  
c) Explain Nitroxide Mediated Polymerization.

**Unit-III**

- Q. 5. Explain Flory-Huggins theory of polymer solution. 15
- Q.6 Write Short note on 5+5+5  
a) Nature of macromolecule in solution.  
b) Crystallinity in polymers.  
c) Glass transition temperature.

**Unit-IV**

- Q. 7. Write short note on 7+8  
a) Liquid crystalline polymer  
b) Fire-retarding polymer
- Q.8 a) Explain spectroscopic methods of chemical analysis of polymer. 7+8  
b) Explain X-ray diffraction study of polymer.

**M.Sc. (Chemistry) Fourth Semester  
Physical Chemistry Specialization  
Third Paper  
Chemistry of material  
Assignment-2024**

**Answer any two questions:**

**M.M: 30**

**Unit-I**

Q 1. Discuss the optical properties of liquid crystals. 15

Q 2. What do you understand by thermotropic liquid crystals? 15

**Unit-II**

Q 3. Discuss high T<sub>c</sub> superconductivity in cooperates. 15

Q 4. What do you understand by perovskites and defect perovskites? Discuss their applications in detail. 15

**Unit-III**

Q 5. What do you understand by photolithography? 15

Q 6. Write notes on 15  
i) Ceramics  
ii) Refractories

**Unit-IV**

Q 7. Discuss the preparation techniques of thin films. 15

Q 8. What do you understand by composites? Discuss their types. 15



**M.Sc. (Chemistry) Fourth Semester  
Physical Chemistry Specialization  
Fourth Paper  
Advanced electrochemistry—II  
Assignment-2024**

**Answer any two questions:**

**M.M: 30**

**Unit-I**

Q.1 What is quantization of charge at electrode solution interface? Explain electron tunneling in detail. (15)

Q.2 Give a detailed account about scanning probe techniques. (15)

**Unit-II**

Q.3. What are multistep electrode reactions? Derive Butler – Volmer equation for multistep electrode reactions. (15)

Q.4 What are quasi reversible & irreversible waves? Explain Koutecky's method to determine kinetic parameters for quasi reversible & irreversible waves. (15)

**Unit-III**

Q. 5. Describe controlled current coulometry, its instrumental setup and its applications. (15)

Q .6. Write down basic principle and steps involved in cathodic stripping voltammetry. (15)

**Unit-IV**

Q .7 What is electro crystallization ? How electrodeposition takes place, explain with examples. (15)

Q. 8. Describe about various types of electro chemical sensors and their significance . (15)