

M.Sc. DEGREE EXAMINATION DECEMBER 2020.

## CHEMISTRY

FIRST YEAR

**Organic Chemistry-I**

Time : 3 hours

Maximum marks : 75

## PART-A (3X5=15)

Answers any THREE questions.

1. What is Pyrolytic elimination reaction explain with an examples reaction. (5)
2. Write short notes on Hammett and Taft equation. (5)
3. a). What are enantiomers and Diastereomers? Give one example each (4)  
b). Draw the structure of Trans decline (1)
4. a). What is synthon? (2)  
b). Write notes on Organo zinc compound (4)
5. What are aromatic, antiaromatic and nonaromatic compounds? Give one example each (5)

## PART- B (5X12=60)

Answer All the questios

- 6.a. How will you prepared the following compounds
- i). Benzoin from benzaldehyde. (4)
  - ii). Crotonic acid from acetaldehyde (4)
  - iii). Beta-hydroxy acid from acetone (4)
- Or
- b i) . Define the terms dehydration and dehydrohalogenation (4)
  - ii). Explain cope and chugaev elimation with examples (4)
  - iii) .What is addition reaction? Give an example of free radical addition reaction. (4)
7. a i). What is substitution reaction? . Discuss nucleophilic and Electrophilic Substitution reactions. (6)

ii). What is anchimeric Assistance ? How is sulphur, oxygen and aromatic involve in NGP. (6)

Or

b). Explain the following reaction

i). Chichibabin reaction (3)

ii). Sandmayer reaction (3)

iii) Ullmann reaction (3)

iv). Diazonium coupling reaction (3)

8.a. i). What are stereo selective and stereo specific reaction with examples (6)

ii). Discuss confirmations of disubstituted cyclohexane (6)

Or

b. i). What is atropisomerism? Explain atropisomerism of Biphenyl (5)

ii). Discuss the stereochemistry of decaline (5)

iii). what is geometrical isomerism? Given an example (2)

9. a. i) Explain the principal and protecting of carbonyl group (5)

ii) illustrate the disconnection approach application to 1,4-dicarbonyl compound and give this syntic routes. (5)

iii). Mention any two applications of Wilkonson's catalyst. (2)

Or

b. Explain the synthetic application of the following

i). CAN ii).. PDC (4)

iii). LiAlH<sub>4</sub> IV). NaBH<sub>4</sub>. (4)

v) Mn(OAc)<sub>3</sub> and vi). NBS (12) (4)

10.a.i). Define the term aromaticity? How is it Huckel rule? (6)

ii). Explain the aromaticity of azulene (6)

Or

b. i). Explain the aromaticity of fullerene (6)

ii). Define annulenes. Comment on aromatic nature of 10- annulene (6)

**M.Sc. DEGREE EXAMINATION – DECEMBER 2020.****First Year****Chemistry****INORGANIC CHEMISTRY –I**

Time: 3 Hours

Maximum Marks: 75

**PART- A (3 × 5 = 15 Marks)**Answer any **THREE** questions.

1. Discuss the important features and limitations of Valence bond theory.
2. Sketch the crystal field splitting in tetrahedral and square planar complexes.
3. Write a note on crown ethers.
4. Explain complementary and non complementary reactions.
5. What do you understand by the term lanthanide contraction?
6. What are its consequences?

**PART- B (5 × 12 = 60 Marks)**Answer **ALL** questions.

6. (a) i) What are the postulates of VSEPR theory.  
ii) How it is used to establish the shapes of molecules? Explain with any two examples.
- Or
- (b) i) Explain the Born Lande and Born-Meyer equation to calculate the lattice energy.  
ii) Illustrate the formation of NaCl molecule with the help of Born-Haber cycle.
7. (a) i) Write short notes on Orgel diagram.  
ii) Discuss Jahn-Teller distortion.

Or

- (b) i) Explain Ligand field theory. How is this applied to octahedral complexes?

ii) What is Nephelauxetic effect? Explain.

8. (a) i) Describe geometrical isomerism in octahedral complexes.

ii) What are the applications of ORD and CD? Explain.

Or

(b) i) What is linkage isomerism? Explain the various factors affecting it.

ii) Write a note on symbiosis.

9. (a) Discuss inner and outer sphere mechanism of octahedral complexes.

Or

(b) i) Explain trans effect.

ii) Illustrate dissociative and associative mechanisms of octahedral complexes.

10. (a) Discuss the oxidation state, spectral and magnetic properties of lanthanides.

Or

(b) Explain the following properties of actinides

i) Oxidation state    ii) magnetic property    iii) spectral character

\*\*\*\*\*

M.Sc. DEGREE EXAMINATION DECEMBER 2020.

FIRST YEAR

Chemistry

**PHYSICAL CHEMISTRY –I**

Time: 3 Hours

Maximum Marks: 75

PART A — (3 × 5 = 15 Marks)

Answer any THREE questions.

1. Write a short note on Canonical ensemble and Grand canonical ensemble. (5)
2. Write down the salient features of acid base catalysed reactions. (5)
3. Discuss Homogeneous catalysis and Heterogeneous catalysis with examples. (5)
4. Write the symmetry elements present in  $c3u$  group with an example. (5)
5. Compare Fluorescence and Phosphorescence. (5)

PART B — (5 × 12 = 60 Marks)

Answer ALL questions.

6. (a) i) Define ensemble. (2)
- ii) Derive Boltzmann distribution function for classical particles (10)

Or

- (b) i) Write a note on Onsager reciprocal relationships. (4)
- ii) Deduce the expression for rotational partition function. (8)

7. (a) i) Write the kinetics of stepwise polymerization. (4)
- ii) Discuss Michaelis – Menten mechanism for enzyme catalysis. (8)

Or

- (b) i) Explain precisely Flash photolysis. (3)
- ii) Deduce Rice Herzfeld mechanism for  $H_2 - Br_2$  reaction. (9)

- 8.(a) i) Define the terms Sorption, absorption and adsorption. (3)  
ii) Derive BET adsorption isotherm for calculating the surface area. (9)

Or

- (b) i) Deduce Langmuir Hinselwood mechanism for heterogeneous catalysis reactions. (8)  
ii) List the metal and semiconductor catalysed reactions with examples. (4)
9. (a) i) Write a short note on Symmetry elements. (5)  
ii) Write the postulates of group theory. (7)

Or

- (b) i) Construct the character table for  $c_{2v}$  group using water molecule (4)  
ii) State orthogonality theorem and its proof (8)
- 10.(a) i) What is Frank Condon principle? (2)  
ii) Draw a neat Jablonsky diagram and discuss the various photo physical processes. (10)

Or

- (b) i) Define Quantum yield. (2)  
ii) Derive Stern – Volmer equation. (10)

**PG-C-808**

**MCHE - 14**

**M.Sc. DEGREE EXAMINATION – DECEMBER 2020**

**First Year**

**Chemistry**

**Analytical and Environmental Chemistry**

**Time: 3 hours**

**Maximum marks: 75**

**PART- A**

**(3 × 5 = 15 Marks)**

**Answer any THREE questions.**

1. a. How many peaks would be expected in the  $^1\text{H}$  NMR spectrum of vinylchloride? b. Define coupling constant. (5)
2. Write a note on finger print region with examples. (5)
3. Explain the term chromophores and auxochromes. (5)
4. Describe the classification and principles of chromatography. (5)
5. Write the principle and advantage of reverse osmosis of water purification. (5)

**PART- B**

**(5 × 12 = 60 Marks)**

**Answer ALL questions.**

6. a. i. What is chemical shift? ii. What are the factors influences the chemical shift? iii. Write a note on coupling constant. (2+6+4)

Or

- b. What are methods used for simplification of complex spectra? (12)
7. a. Describe principle, Instrumentation and source of IR spectroscopy (12)

Or

b. Explain the term Fermi resonance, fundamentals, overtone, combination and hot bands. (12)

8. a. i. Explain the Mac Lafferty rearrangement of mass spectroscopy. ii. What are the factors influences the position and intensity of absorption band of UV spectroscopy? (6+6)

Or

b. Describe the theory of uv-visible spectroscopy and their deviations. (12)

9. a. Draw a neat diagram, principle and application of cyclic voltammetry. (12)

Or

b. Explain principle, type and applications of thin layer chromatography (12)

10.a. Explain the formation, theory and control of acid rain. (12)

Or

b. i. Write the steps involved in the purification of sewage water.

ii. Write a note on effects of fluorocarbons in ozone layer depletion. (6+6)

\*\*\*\*\*

**PG-C-809**

**MCHE-15**

**M.Sc. DEGREE EXAMINATION – DECEMBER 2020**

**First Year**

**Chemistry**

**Chemistry of Bio-Molecules and Green Chemistry**

Time: 3 hours

Maximum marks: 75

PART A - (3 × 5 = 15 marks)

Answer any THREE questions.

1. (a) What is a protecting group? (2)
- (b) Discuss about the amine protecting groups. (3)
2. (a) Define the term mutarotation. (2)
- (b) Write a short note on the structure of glucose. (3)
3. Write a note on lead arsenate and Paris green pesticides. (5)
4. Illustrate the biosynthesis of morphine. (5)
5. Discuss about the concept of atom economy. (5)

PART B — (5 × 12 = 60 marks)

Answer ALL questions.

6. (a) (i) Write a note on the Watson- Crick DNA model. (6)
- (ii) Elaborate on the secondary structures of proteins. (6)
- Or
- (b) (i) Discuss in detail about the Dansyl Chloride method for N-terminal peptide analysis and carboxy peptidase method for C-terminal analysis of peptides. (10)
- (ii) Point out the significance of proteins' isoelectric point. (2)
7. (a) (i) Give the comparison of vitamins and hormones. (5)
- (ii) Illustrate about the biosynthesis of PEG1. (7)
- Or
- (b) (i) Discuss in detail about the monosaccharides. (7)
- (ii) Write a note on the classification of proteins based on its structure. (5)

8. (a) (i) Elaborate on the role of various elements involved in plants growth. (8)  
(ii) Give the synthesis and uses of Urea. (4)

Or

- (b) (i) Discuss the applications of penicillin, chloromycetin, and streptomycin. (6)  
(ii) Give an account on DDT and Gammexane. (6)

9. (a) (i) Sketch the various steps involved in the synthesis of Cholesterol. (8)  
(ii) Outline the classification of terpenoids with example. (4)

Or

- (b) (i) Draw the biosynthesis of santonin. (8)  
(ii) Discuss the synthesis of nicotine. (4)

- (a) (i) Discuss about ionic liquids and its uses in organic synthesis (6)  
(ii) List out the advantages of green chemistry approach in organic synthesis. (6)

Or

- (b) (i) Write a note on microwave assisted green synthetic method. (4)  
(ii) Describe the consequences of chemistry to wildlife. (8)
-

**M.Sc. DEGREE EXAMINATION – DECEMBER - 2020****CHEMISTRY****First Year****POLYMER CHEMISTRY**

Time: 3 Hours

Maximum Marks: 75

**PART A**

(3 × 5 = 15 Marks)

Answer any THREE questions

1. Differentiate Thermosetting and Thermoplastic polymers. (5)
2. Explain the coordination polymerisation with Ziegler-Natta catalysts. (5)
3. Define the following terms  
i) Crystalline melting point ii) Glass transition temperature. (2+3)
4. Explain the concept of number average molecular weight. (5)
5. Write down the structure and applications of cellulose derivatives. (5)

**PART B (5 × 12 = 60 Marks)**

Answer ALL questions

- 6 (a) i) How polymers are classified on the basis of structure? (4)  
ii) What is step growth polymerization? Explain the steps involved in this process. (8)  
Or  
(b) Explain the bulk and solution polymerisation techniques with suitable examples. (12)
- 7 (a) i) Write a short note on Tacticity. (4)  
ii) Discuss the tacticity in 1,1- and 1,2-disubstituted ethylenes. (8)  
Or  
(b) i) Describe the stereochemistry of 1,4-polymerization of 1-mono and 1,4-di substituted 1,3-butadiene. (8)  
ii) Explain the stereoisomerism of cellulose and amylose. (4)

- 8 (a) i) Write a note on crystal structures of polymers. (5)  
ii) Explain in detail about various factors influence the crystalline melting point  $T_m$ . (7)

Or

- (b) Discuss how the following factors affect the glass transition temperature  $T_g$ .  
i) Molecular weight ii) Diluents iii) Chemical structure iv) Crosslinking (3+3+3+3)

- 9 (a) How will you determine the molecular weight of polymers using end group and ultra centrifugation methods? (12)

Or

- (b) Discuss how spectroscopic and thermal methods used in the analysis of polymers. (12)

- 10 (a) i) Illustrate the characteristic and uses of polyethylene and polyvinyl chloride. (8)  
ii) Write a short note on fire retarding polymers. (4)

Or

- (b) i) What are biopolymers? Explain its classification and advantages. (8)  
ii) What is electroluminescent polymer? Give any two examples. (4)

\*\*\*\*\*



PART B — (5 × 12 = 60 marks)

Answer ALL questions.

6. (a) Discuss the following Rearrangement with mechanism
- (i). Wagner-Meerwin Rearrangement (4)
  - ii). Fries Rearrangement (4)
  - iii). Schmidt Rearrangement (4)

Or

- (b) (i) Explain Frontier orbital method for cycloaddition of 1,3-butadiene. (6)
- (ii) What do you understand by the term Antrafacial and Suprafacial addition? (6)

7. (a) (i) How will you prepared Benzothiophene (4)
- (ii) Write notes on Paal-Knorr cyclization (4)
- (iii) Explain Pictet-Spengler synthesis (4)

Or

- (b) (i) How will you prepared Pyridine using Hantzsch synthesis (6)
- ii) Explain any two preparation of Thiophene (2)
- iii) How is Furan converted into: a). 2-Nitrofuran  
b). 2-Aryl furan c). Furan-2-sulphonic acid and  
d). 2-Acetylfuran (4)

8. (a) i). Explain the synthesis of Androsterone from Cholesterol (6)

ii) Discuss the synthesis of epibatidine (6)

Or

(b). i). Explain Biosynthesis of camphor (6)

ii). Explain Biosynthesis of Nicotine (6)

9 (a) (i) Write short notes on Norrish reactions (6)

(ii) Explain photodimerization and photosensitization of Butadiene (6)

Or

(b) (i) How will you convert benzophenone into benzopinacol by photochemical method. (6)

ii). Describe the photochemical reactions of carbonyl compounds and olefins. (6)

10. (a) (i) Write short notes on chemical shift and spin-spin coupling (6)

(ii) How does Carbon-13 NMR Work? (3)

iii) How many proton signals would you expect in the NMR spectra of the following compounds a). Ethyl chloride b) acetaldehyde and c). ethyl chloride (3)

Or

- (b) (i) Explain various factor influencing positions and intensity of absorption bands (6)
- (ii) How would be IR spectra of the following pairs of compounds differ a) Acetone and Ethanol  
b). Cyclohexanone and 2-Cyclohexanone (4)
- iii) How will you distinguish Cis and Trans Stilbene by UV spectroscopy. (2)
-

**M.Sc. DEGREE EXAMINATION – DECEMBER 2020.****SECOND YEAR****CHEMISTRY****INORGANIC CHEMISTRY - II****Time : 3 Hours****Maximum Marks : 75****PART-A****(3 × 5 = 15 Marks)**Answer any **THREE** questions.

1. Explain with suitable examples of polymer bound catalyst. (5)
2. Write a note on hyperfine splitting in ESR spectroscopy. (5)
3. Write a note on disposal of radioactive wastes. (5)
4. Illustrate the process of isomerization and racemization. (5)
5. Define the following terms: (5)
  - i) FCC
  - ii) HCP
  - iii) BCC

**PART-B****(5 × 12 = 60 Marks)**Answer **ALL** questions.

6. (a) (i) Write a note on Oxo process and Wacker process. (8)
    - ii) Discuss the applications of structure of nitrosyls. (4)
- Or
- (b) (i) Explain with suitable mechanism of Wilkinson's and Reppe's catalyst. (6)
    - ii) Describe the structure and bonding of metallocenes. (6)

7. (a) (i) Elaborate the principle involved in PES. (6)

(ii) What are shift reagents? Discuss the  $^{31}\text{P}$  NMR spectra of  $\text{PCl}_3$  and  $\text{PF}_3$ . (6)

Or

(b) (i) Explain the Mossbauer spectra of Fe and Sn compounds. (8)

(ii) Explain the following terms: i) g-factor ii) Chemical shift (4)

8. (a) (i) Discuss the shell model of nucleus. (4)

(ii) Show that nuclear fission and fusion reactions as energy sources. (8)

Or

(b) (i) Write a brief account on i) Stellar energy ii) Nuclear cross-section (4)

(ii) Discuss briefly the applications of radioisotopes in industrial and medicinal fields. (8)

9. (a) (i) Write the mechanism of acid and base hydrolysis reactions. (7)

(ii) Discuss the  $\pi$  - bonding theory of trans effect. (5)

Or

(b) (i) Explain the stereochemistry of substitution reactions in octahedral complexes. (7)

(ii) Discuss the conjugate base mechanism. (5)

10. (a) (i) Explain the term: Symbiosis (4)

(ii) Explain the structure of Graphite and Diamond. (8)

Or

(b) (i) Explain how liquid  $\text{NH}_3$  and liquid  $\text{SO}_2$  behaves as solvents with suitable chemical reactions. (8)

(ii) Outline the structure of Zinc blende. (4)

\*\*\*\*\*

**M.Sc. DEGREE EXAMINATION – DECEMBER 2020.****FIRST YEAR****CHEMISTRY****PHYSICAL CHEMISTRY - I****Time : 3 hours****Maximum marks : 75****PART -A****(3 × 5 = 15 Marks)****Answer any THREE questions.**

1. Write a short note on the characteristics of Maxwell Boltzmann statistics, Bose Einstein statistics and Fermi Dirac Statistics. (5)
2. Write down the kinetics of branched chain reactions. (5)
3. Differentiate Chemisorption and physisorption. (5)
4. Discuss Improper rotation with an example. (5)
5. Compare Fluorescence and Phosphorescence. (5)

**PART-B****(5 × 12 = 60 Marks)****Answer ALL questions.**

6. (a) (i) State Equipartition theorem. (2)  
(ii) Derive Bose-Einstein distribution function. (10)  

Or

(b) (i) Write a note on Onsager reciprocal relationships. (4)  
(ii) Deduce the expression for translational partition function. (8)
7. (a) (i) Write precisely the kinetics of condensation polymerization. (4)  
(ii) Deduce Michealis - Menton mechanism for enzyme catalysis. (8)

Or

- (b) (i) Explain stopped flow method. (5)
- (ii) Deduce Rice Herzfeld mechanism for  $H_2 - Br_2$  reaction. (7)
8. (a) (i) Define the terms Sorption, absorption and adsorption. (4)
- (ii) Derive Langmuir adsorption isotherm for calculating the surface area. (8)

Or

- (b) (i) Deduce Langmuir Hinshelwood mechanism for heterogeneous catalysis reactions. (8)
- (ii) Write the mechanism of acid catalyzed reaction. (4)
9. (a) (i) Using matrix representation explain any two symmetry operations. (5)
- (ii) Write the postulates of group theory. (7)

Or

- (b) (i) Construct the character table for  $c_{2v}$  group using water molecule. (5)
- (ii) State the great orthogonality theorem and its proof. (7)
10. (a) (i) What is Frank Condon principle? (2)
- (ii) Explain Photoreduction. (2)
- (iii) Draw a neat Jablonsky diagram and discuss the various photo physical processes. (8)

Or

- (b) (i) Define quantum yield. (2)
- (ii) Explain Green House effect. (2)
- (iii) Derive Stern-Volmer equation. (8)