

PG-722

MCHE-11

M.Sc. DEGREE EXAMINATION –
DECEMBER, 2019.

First Year

Chemistry

ORGANIC CHEMISTRY – I

Time : 3 hours

Maximum marks : 75

PART A — (3 × 5 = 15 marks)

Answer any THREE questions.

1. Explain the reactions of Grignard reagent with an aldehyde and a ketone.
2. What is non-classical carbocation? Differentiate classical and non-classical carbocations.
3. Discuss the chirality exhibited by allenes.
4. What are the applications of NBS and NaBH₄?
5. State and explain Huckel's rule of aromaticity.

PART B — (5 × 12 = 60 marks)

Answer ALL questions.

6. (a) Draw a mechanism of the following reactions:
- (i) Benzoin condensation
 - (ii) Knoevenagel Condensation.

Or

- (b) Illustrate electrophilic, nucleophilic and free radical addition reactions with suitable examples.
7. (a) Write the preparation and chemical reactions of diazonium salts.

Or

- (b) Explain about aromatic electrophilic substitution reactions.
8. (a) Explain Cahn-Ingold-Prelog (CIP) rules for determining priorities.

Or

- (b) Discuss about stereoselective and stereospecific synthesis.

9. (a) What are the applications of Jones reagent and PCC?

Or

- (b) Discuss the preparation, mechanism and applications of Wilkinson's catalyst.

10. (a) Describe about aromaticity in any THREE heterocyclic molecules.

Or

- (b) Explain about Electron occupancy in MO's and aromaticity.
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MCHE-12

M.Sc. DEGREE EXAMINATION —
DECEMBER, 2019.

First Year

Chemistry

INORGANIC CHEMISTRY – I

Time : 3 hours

Maximum marks : 75

PART A — (3 × 5 = 15 marks)

Answer any THREE questions.

1. Explain sigma, pi and delta bonds with examples.
2. What are normal and inverse spinels? Give examples.
3. What are crown ethers? Give two examples.
4. Distinguish between thermodynamic and kinetic stability.
5. Derive the term symbol for
 - (a) Pr^{3+} and
 - (b) Sm^{3+} .

PART B — (5 × 12 = 60 marks)

Answer ALL questions.

6. (a) Give the hybridization and shape of :

- (i) XeF_4
- (ii) XeO_3
- (iii) XeOF_4
- (iv) XeF_6
- (v) BrF_5
- (vi) ClF_3 .

Or

- (b) (i) What is lattice energy? Explain its determination by Born-Haber cycle.
- (ii) Write notes on multicenter bonding.

7. (a) (i) Explain crystal field splitting of d-orbitals in tetrahedral field with diagrams.

- (ii) Discuss the factors affecting crystal field splitting.

Or

- (b) (i) Explain MO energy level diagram for octahedral complexes.
- (ii) Write notes on :
- (1) Chelate effect
- (2) Nephelauxetic effect.
8. (a) (i) Explain electronic and steric factors affecting linkage isomerism.
- (ii) Explain the role of coordination compounds as a catalyst in asymmetric synthesis.

Or

- (b) (i) Write notes symbiosis.
- (ii) Explain the determination of absolute configuration of complexes by ORD and CD methods.
9. (a) Discuss S_N1 , S_N2 and S_N1B mechanisms in octahedral complexes.

Or

- (b) Write the characteristics of inner sphere and outer sphere mechanisms. Explain these mechanisms with suitable examples.

10. (a) (i) Write the electronic configuration, oxidation state and term symbol for lanthanides.
- (ii) Explain the factors that influence the formation of lanthanide complexes.

Or

- (b) (i) What is lanthanide contraction? Explain its consequences.
- (ii) Explain the general characteristics of actinides.
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MCHE-13

M.Sc. DEGREE EXAMINATION –
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First Year

Chemistry

PHYSICAL CHEMISTRY – I

Time : 3 hours

Maximum marks : 75

PART A — (3 × 5 = 15 marks)

Answer any THREE questions.

1. (a) Give the physical significance of fugacity. (2)
(b) How is the fugacity of the real gas determined? (3)
2. (a) State any five postulates of quantum mechanics. (3)
(b) State Born-Oppenheimer approximation. (2)
3. Explain primary and secondary salt effects with suitable examples. (5)

4. (a) Predict the number of degrees of freedom in each of the following systems. Suggest the variables that could correspond to these degrees of freedom.
- (i) Liquid water and water vapour in equilibrium
 - (ii) Liquid water and water vapour in equilibrium at a pressure of 1 atm. (2)
- (b) What is meant by eutectic point? Explain how it can be calculated? (3)
5. Derive Butler-Volmer equation. (5)

PART B — ($5 \times 12 = 60$ marks)

Answer ALL questions.

6. Define the following terms
- (a) entropy
 - (b) reversible process
 - (c) irreversible process
 - (d) free energies.
- Or
7. Define Chemical Potential. Derive Gibbs-Duhem equation. How does chemical potential vary with temperature and pressure? (12)

8. (a) Write short notes on the followings
- (i) Black-body radiation (8)
 - (ii) Photoelectric effect.
- (b) Write the significance of eigen values and eigen function. (4)

Or

9. (a) Solve the Schrodinger wave equation for a particle in a one-dimensional box and find the expression of the energy. (9)
- (b) State the principle of perturbation theory. (3)
10. (a) Write a short note on potential energy surfaces. (4)
- (b) Discuss Lindemann's theory of unimolecular reactions. (8)

Or

11. (a) Explain primary and secondary kinetic isotope effects with suitable examples. (6)
- (b) Discuss transition state theory of chemical reactions rates. (6)

12. (a) Illustrate the application of phase rule to the three component system with suitable example. (8)
- (b) Explain partially miscible binary systems with suitable examples. (4)

Or

13. (a) Write different types of phase transitions. Illustrate the phase behaviour of liquid-solid with suitable example. (7)
- (b) Derive the Phase rule and explain the terms in phase rule. (5)
14. (a) Using the Debye-Huckel limiting law, calculate the value of mean activity coefficient in a
- (i) 7.2×10^{-3} M solution of NaBr
- (ii) 7.5×10^{-3} M solution of SrCl_2 . (4)
- (b) Discuss the Stern model of electrical double layer. Mention the conditions at which it approaches Gouy-Chapmann and Helmholtz-Perrin models. (8)

Or

15. (a) Derive Debye-Huckel limiting law. How is the law verified? (8)
- (b) Write a short note on over potentials. (4)

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ANALYTICAL AND ENVIRONMENTAL
CHEMISTRY -1

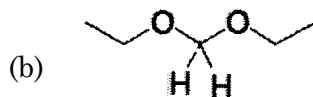
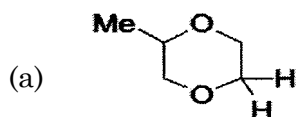
Time : 3 hours

Maximum marks : 75

PART A — (3 × 5 = 15 marks)

Answer any THREE questions.

1. Indicate if the labeled Groups are Homotopic, Enantiotopic, or Diastereotopic, and if they must appear at the same chemical shift



2. What are overtones and combination bands? Explain.
3. Explain the effect of solvent on $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ transitions in UV spectroscopy.
4. What is chromatography? Explain its classification.
5. What are inorganic and organic pollutants? Give an examples.

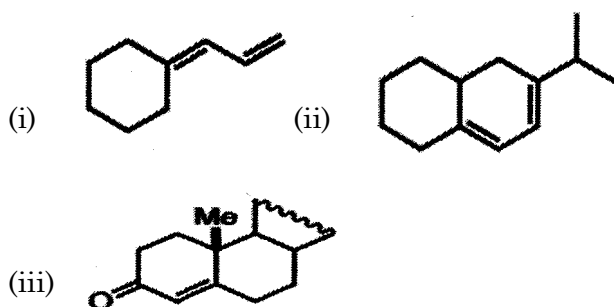
PART B — (5 × 12 = 60 marks)

Answer ALL questions.

6. (a) Propose structures for compounds that fit the following ^1H NMR data:
 - (i) Formula: $\text{C}_8\text{H}_9\text{Br}$: Doublet, δ 2.0 (3H); Quartet, δ 5.15 (1H); Multiplet, δ 7.35 (5H)
 - (ii) Formula: $\text{C}_4\text{H}_9\text{Cl}$: Doublet, δ 1.04 (6H); Multiplet, δ 1.95 (1H); Doublet, δ 3.35 (2H)
 - (iii) Formula: $\text{C}_4\text{H}_9\text{Br}$: 1H, sextet (δ 4.1); 3H, d (δ 1.7); 2H, q (δ 1.9) and 3H, t (δ 1.1)

Or

- (b) What is chemical shift? Explain the factors affecting chemical shift.
7. (a) (i) Write notes on instrumentation in IR spectroscopy.
- (ii) Calculate exactly the force constant of the $^1\text{H}^{35}\text{Cl}$ bond if the molecule absorbs at 3343.8 nm.
- [$c = 3 \times 10^8 \text{ ms}^{-1}$, proton mass = $1.673 \times 10^{-27} \text{ kg}$].
- Or
- (b) Give the absorption frequencies for nitrate ions, sulphate ions, chlorate ions, ammonia and water molecules. How these absorption frequencies changes upon coordination?
8. (a) (i) Explain the general rules of fragmentations in mass spectrometry
- (ii) Explain McLafferty rearrangement with an example.
- Or
- (b) Using Woodward-Fieser's rule, calculate λ_{max} for following compounds:



9. (a) Write notes on
- (i) Alpha halo ketone rule
 - (ii) Octant rule.
- Or
- (b) (i) Explain the principle and applications of TLC.
- (ii) What are advantages of TLC over other chromatographic techniques?
10. (a) Discuss on Radioactive pollutions and its prevention methods.

Or

- (b) How to handle and store the following chemicals in lab?
- (i) Carcinogenic
 - (ii) Poisonous
 - (iii) Easily vaporizable
 - (iv) Inflammable.
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MCHE-15

M.Sc. DEGREE EXAMINATION —
DECEMBER, 2019.

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) How are proteins classified? Give an example for each. (3)
- (b) What is meant by denaturation of proteins? (2)
2. Give an account on glycolysis of carbohydrates. (5)
3. What are pesticides? How are they classified? Give the advantages and disadvantages of using pesticides. (5)

4. Write the synthesis of quinine. (5)
5. Explain the concept of atom economy in a green synthesis with suitable examples. (5)

PART B — (5 × 12 = 60 marks)

Answer ALL questions.

6. (a) Discuss the primary and secondary structures of proteins. (6)
- (b) What are enzymes? Mention their sources. Explain the mechanism of enzyme action. (6)

Or

7. (a) Discuss the synthesis of nucleic acid with suitable examples. (8)
- (b) Compare and contrast between DNA and RNA. (4)
8. (a) Write the structure of Vitamin A₁ and Vitamin E. (3)
- (b) Discuss the preparation, properties and structural aspects of monosaccharide with suitable example. (9)

Or

9. (a) Discuss the classification of carbohydrates with suitable examples. (5)
- (b) Differentiate between vitamins and hormones. (4)
- (c) How will you distinguish between sucrose and maltose. (3)
10. (a) (i) Explain the theories of origin of petroleum. (ii) What are important properties of petroleum? (8)
- (b) Define Antibiotics and Analgesics. Give examples for each. (4)

Or

11. (a) Write the applications of Pencillin and Chloromycetins. (3)
- (b) Explain the ill effects of widespread use of inorganic fertilizers. (3)
- (c) Write a short note on the following (i) DDT (ii) Role of various elements in plants growth. (6)
12. (a) How will you synthesis cholesterol starting from cholestenol. (8)
- (b) Draw the structure of progesterone and discuss its stereochemistry. (4)

Or

13. (a) Explain the general methods of structural elucidation of carotenes with suitable examples. (10)
- (b) Define Alkaloids. Give an example. (2)
14. (a) Enumerate the twelve principles of green chemistry (6)
- (b) Discuss the green catalysts with suitable examples. (3)
- (c) Explain the effects of ultrasound in green synthesis with suitable examples. (3)
- Or
15. (a) Explain the green chemical synthesis of paracetamol. (4)
- (b) Discuss the toxicity to humans and toxicity to wildlife. (4)
- (c) Explain the function and mechanism of a phase transfer catalyst in a reaction. (4)
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MCHE-16

M.Sc. DEGREE EXAMINATION –
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First Year

Chemistry

POLYMER CHEMISTRY

Time : 3 hours

Maximum marks : 75

PART A — (3 × 5 = 15 marks)

Answer any THREE questions.

1. How the polymers are classified on the basis of their origin?
2. Discuss about Stereoregular Polymers.
3. Give a brief account on the relationship between T_m and T_g .
4. How can be measured the viscosity of a polymer solution using Ostwald method?
5. Classify: Biopolymer. Mention its uses.

PART B — (5 × 12 = 60 marks)

Answer ALL questions.

6. (a) Explain any three types of polymerization.

Or

- (b) What are the advantages and disadvantages of Emulsion, Mass and solution polymerization methods?

7. (a) What is Coordination polymerization? Explain the mechanism of Ziegler-Natta Catalyst.

Or

- (b) Explain the isomerism in Mono/Di-substituted Ethylene Polymers.

8. (a) Definition Glass Transition Temperature (T_g). What are the factors that affect glass transition temperature?

Or

- (b) Write an essay about the morphology and order in crystalline polymers.

9. (a) What is Weight Average Molecular Weight (M_w)? Write any TWO methods to calculate the M_w .

Or

- (b) Discuss in detail about NMR and TGA in polymer analysis.

10. (a) Draw a note on
- (i) Polymer Blend
 - (ii) Electroluminescent Polymers.

Or

- (b) Illustrate the manufacture (Any ONE method), structure, properties and uses of silicones.
