

D-5084

Sub. Code

34411

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION, DEC 2020.

First Semester

INORGANIC CHEMISTRY – I

(CBCS 2018–19 Academic Year onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define unit cell.
2. Why hydrogen forms diatomic molecule while helium remains mono atomic?
3. What are different kinds of Lewis acid?
4. Why is the aqueous solution of HF weakest acid?
5. What are isopoly acids?
6. What is the structure of the SiO_4 unit found in silicates?
7. Draw BCC structure.
8. What is metal excess defect?
9. What are the characteristics of hard acids?
10. What is bond order? Give the relationship with bond energy.

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) O₂ is paramagnetic but N₂ is diamagnetic. Explain.

Or

- (b) Discuss the formation of bonding molecular orbital in heteronuclear diatomic molecules.

12. (a) Explain HSAB concept with examples.

Or

- (b) Distinguish between Bronsted and Lewis acids and bases.

13. (a) How are isopoly acids classified? Explain the structure of polytungstate.

Or

- (b) Discuss the different structures of silicates.

14. (a) Distinguish between semiconductors and insulators.

Or

- (b) What is the cause of Frenkel defect? Derive an expression for the number of Frenkel defects.

15. (a) Explain the shapes of molecules by using VSEPR theory.

Or

- (b) Write notes on types of solids with suitable examples.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. (a) Explain the molecular orbital picture of NO. (5)
(b) What are different types of overlapping? (5)
17. Discuss the factors affecting relative strengths of acids and bases.
18. How are silicates classified? Give structure for each type.
19. Explain the structures of rock salt, zinc blende and CsCl.
20. (a) Explain structure of rutile. (5)
(b) Derive Born-Meyer equation for the lattice energy of an ionic compound. (5)
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D-5085

Sub. Code

34412

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION, DEC 2020.

First Semester

ORGANIC CHEMISTRY – I

(CBCS 2018–19 Academic Year onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What are the steps to name aromatic hydrocarbons?
2. What is mesomeric effect?
3. Give reason why pyridine is aromatic.
4. Which orbital are the lone pair electrons on the nitrogen atom of pyrrol?
5. What is chirality?
6. Write a note on diastereoisomer.
7. What is helical chirality?
8. What is the mechanism for S_{Ei} reaction?
9. What is Von – Richter reaction?
10. What is nucleophilic and nucleofuge?

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Comment on the aromaticity of the following

- (i) [6] annulene
- (ii) [16] annulene
- (iii) [10] annulene
- (iv) [8] annulene
- (v) [18] annulene

Or

(b) What are carbocations? How would you account for their stability.

12. (a) Describe the isomerism exhibited by maleic and fumaric acid.

Or

(b) Define geometrical isomerism. How is dipole moment measurement useful in studying the configuration of geometrical isomers?

13. (a) Write the mechanism of Wagner – Meerwein rearrangement.

Or

(b) Describe microscopic reversibility principle.

14. (a) Write the reaction mechanism of Friedel craft alkylation.

Or

(b) Write the reaction mechanism for S_N1 and S_N2 reactions.

15. (a) Explain saytzeff rule with example.

Or

(b) Describe R and S nomenclature using CIP rule.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. (a) Explain the relative stability of 1°, 2° and 3° carbonions. (5)

(b) Describe the Huckle rule for aromaticity. (5)

17. Explain stereochemistry of ansa and spirane. (5+5)

18. Write the mechanism for wolff and stern rearrangement.

19. Explain the reaction mechanism of nitration and sulphonation.

20. (a) Describe configuration and conformational stereoisomer. (5)

(b) Write note on importance of electron delocalisation and resonance in aromaticity. (5)

D-5086

Sub. Code

34413

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION, DEC 2020.

First Semester

PHYSICAL CHEMISTRY – I

(CBCS 2018–19 Academic Year onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What are the four process of Carnot cycle?
2. What is the significance of Zeroth law of thermodynamics?
3. What is Fugacity its difference with pressure?
4. Define ionic activity coefficient.
5. What is the difference between EMF and potential difference?
6. What are different types of electrodes?
7. Define Heisenberg uncertainty principle?
8. What is the one dimensional wave equation?
9. What is the activated complex theory?
10. What is meant by isotopic effect?

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) How do you prove the first law of thermodynamics?

Or

- (b) What are chemical potential and its significance?

12. (a) Derive the Debye Huckel limiting law.

Or

- (b) What are electrochemical cell and its types?

13. (a) What are the application of conductivity measurement?

Or

- (b) What are Eigen function and Eigen value?

14. (a) What is black body radiation? Give some examples of black body radiation.

Or

- (b) Describe the quantum chemistry of one and three dimensional boxes.

15. (a) Define potential energy surface and write an application of potential energy surface.

Or

- (b) Define (i) consecutive reaction (ii) branched reaction and (iii) explosive reaction.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Derive Carnot's theorem with explanation and its applications.
17. (a) What is meant by EMF? Write the applications of EMF.
(b) Derive the Butler – Volmer equation.
18. Write short notes on postulates of quantum mechanics and Schrödinger wave equation.
19. (a) What are the applications of potential energy surface?
(b) Write principle of microscopic reversibility.
20. Describe the Lindeman Hinshelwood mechanism for unimolecular reactions.

D-5090

Sub. Code

34431

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION, DEC 2020.

Third Semester

ADVANCED INORGANIC CHEMISTRY

(CBCS 2018–19 Academic Year onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What do you mean by stability constant? And chelate effect.
2. What are macro cyclic ligands? How is it synthesised?
3. Define the term spinels? How is it classified?
4. State and explain Wade's rule.
5. What are organometallic compounds? Give any four examples.
6. How is ferrocene prepared? List out its properties.
7. Define metal carbonyl complexes. Give any two examples.
8. Illustrate the structure of myoglobin and hemoglobin.
9. What are sodium ion pump?
10. What do you mean by fluxional molecules? Give any two examples.

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

11. (a) How can you determine stability constant by pH metric and spectrophotometric methods?

Or

- (b) Explain trans effect and template effect with examples.

12. (a) What are metal clusters? How are they classified? Explain in detail.

Or

- (b) Describe the structure and bonding in polyhedral boranes and carboranes

13. (a) Discuss the synthesis and structure of metal alkyls and aryls with suitable examples.

Or

- (b) What are metallocenes? Give its structure compare metallocenes with Ferrocene.

14. (a) What are Iron-Sulphur proteins? Draw the active site structure of Rubredoxin and Ferredoxin.

Or

- (b) Write a short note on metal poisons and chelating agents in medicine.

15. (a) Explain hydrogenation and hydroformylation reactions with examples.

Or

- (b) What are metal nitrosyls and metal carbonyl clusters? Explain their preparation and properties.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Discuss the mechanism of (a) acid hydrolysis and anation reactions in octahedral complexes (b) substitution reactions in square planar complexes.
17. Explain the energy level diagrams of Orgel and Tanabe – Sugano diagram.
18. Write a short note on : (3+4+3)
- (a) Olefin and acetylene complexes
 - (b) Metal carbonyl hydrides and halides
 - (c) Isolobal analogy.
19. (a) What is the basis of Ziegler – Natta polymerization? What is the role of $\text{Al}(\text{C}_2\text{H}_5)_3$ in the catalytic system? (6)
- (b) Write a note on vitamin B_{12} and copper containing oxidases. (4)
20. (a) Give an introduction of metal ions in biology. (5)
- (b) Give an account of biological nitrogen fixation. (5)
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D-5091

Sub. Code

34432

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION, DEC 2020.

Third Semester

ADVANCED ORGANIC CHEMISTRY

(CBCS 2018–19 Academic Year onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What is Prevost reaction?
2. Write down any four oxidizing and reducing agents used in organic synthesis.
3. List out the important strategies of retro synthesis.
4. What do you know about functional group protection?
5. How is Flavone synthesized?
6. Give the structure of Maltose, Starch and cellulose.
7. What do you mean by DNA replication and RNA transcription?
8. How is zingiberene synthesised?
9. What are vitamins? Give examples.
10. Give the structure of progesterone.

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Describe about Sharpless asymmetric dihydroxylation and epoxidation reactions.

Or

- (b) What is meant by catalytic hydrogenation reaction? How is it categorized? Explain with suitable example.

12. (a) What is DIBAL-H and trialkyl silanes? Explain its synthetic uses in organic chemistry.

Or

- (b) Write down the basic principles and terminology of retrosynthetic analysis. Explain the one group C – C and two group C – C disconnections.

13. (a) Discuss about synthesis, structure and reactivity of indole.

Or

- (b) What are proteins? How are they classified? Give examples for each type.

14. (a) Discuss the structure of DNA and RNA.

Or

- (b) Explain about biosynthesis of alkaloids and terpenes.

15. (a) Give a short note on chemistry and physiological action of thiamin and pyridoxine.

Or

- (b) Elucidate the structure of cholesterol.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Describe the metal based and non-metal based oxidations of
- (a) Alcohols to carbonyl compounds
 - (b) Hydroboration – oxidation reaction
 - (c) Birch reduction
 - (d) Wilkinson reduction with suitable examples.
17. Discuss about (a) MPV reduction (b) Stereo and enantio selectivity reductions (c) Chemo and regioselective protection and deprotection reaction with suitable example.
18. (a) How is Anthocyanin synthesized? (4)
(b) What do you mean by Co enzyme? (2)
(c) Explain the primary structure of protein. (4)
19. Describe the synthesis and structure of morphine and camphor.
20. (a) Explain about elementary aspect of vitamin A, E, K and B₁₂. (6)
(b) How is progesterone synthesized? (4)

D-5092

Sub. Code

34433

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION, DEC 2020.

Third Semester

SPECTROSCOPY APPLICATIONS IN ORGANIC AND
INORGANIC CHEMISTRY

(CBCS 2018–19 Academic Year onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What is mean by overtone and combination bands?
2. What are the factors affecting intensity of absorption bands?
3. What are NMR shift reagents? Give any two examples.
4. What is mean by nuclear overhauser effect?
5. What is Me Lafferty rearrangement?
6. Define 'g' value.
7. Define cotton effect.
8. Write any two applications ORD.
9. Mention the basic principles of flame photometry.
10. State and explain octant rule.

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Write any four applications of UV-visible spectroscopy.

Or

- (b) Explain the principle and instrumentation of IR spectroscopy.

12. (a) Write any four applications of IR spectroscopy.

Or

- (b) Explain the principle and applications of ^1H NMR spectroscopy.

13. (a) Compare ESR and NMR spectroscopy.

Or

- (b) Describe the instrumentation of mass spectrometer with a neat diagram.

14. (a) Write down the principle of circular birefringence and circular dichroism.

Or

- (b) What are the principle and applications of DTA and TG?

15. (a) Explain the instrumentation and applications of flame photometry.

Or

- (b) Describe the principle and applications of nephelometry.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. (a) State and explain Hook's law. (2)
(b) State Woodward – Fieser rules to calculate λ_{\max} value for conjugated dienes and α, β - unsaturated carbonyl compounds. (8)
17. Define chemical shift. What are the factors affecting chemical shift?
18. Write the principle, instrumentation and any four applications of ESR spectroscopy.
19. (a) Define CD and ORD. (6)
(b) State and explain α -haloketone rule. (4)
20. (a) Write down the principle, instrumentation and applications of turbidimetry. (6)
(b) Write a short note on thermometric titrations. (4)
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D-6491

Sub. Code

34441

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, DECEMBER 2020.

Fourth Semester

Chemistry

ANALYTICAL CHEMISTRY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : 3 hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL the questions.

1. What is accuracy?
2. Define confidence limit.
3. Give the principle of coulometric analysis
4. What is polarography?
5. Define chromatography
6. Name the components of a HPLC.
7. What is electrophoresis?
8. What are the steps involved in fractional crystallization?
9. What is mean?
10. Define average deviation.

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

11. (a) Define error. How are they classified?

Or

- (b) What are the rules to determine the significant figure? Explain.

12. (a) Discuss the application of polarography in detail.

Or

- (b) What is the principle of chronopotentiometry? Explain the instrumentation of chronopotentiometry

13. (a) Write a note on paper chromatography.

Or

- (b) Discuss the application of HPLC.

14. (a) Explain the theory of gel-permeation chromatography.

Or

- (b) Write a note on solvent extraction method.

15. (a) Define electro dialysis. What are the controlling factors?

Or

- (b) What is F-test? Discuss the various steps of F-test.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. (a) A student obtained the following results for the percentage of copper in a mineral as 22.64, 22.54, 22.61 and 22.53 grams. Calculate the standard deviation. (5)

- (b) Explain the correlation coefficient in detail. (5)

17. Discuss the instrumentation and working of cyclic voltammetry. What are the advantages over polarographic techniques?
 18. Explain the principle and instrumentation of gas chromatography.
 19. What is ion-exchange chromatography? Discuss the theory and application of ion-exchange chromatography?
 20. (a) Explain the theory of thin layer chromatography techniques. (5)
(b) Write a note on vacuum distillation method. (5)
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D-6492

Sub. Code

34442

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, DECEMBER 2020.

Fourth Semester

Chemistry

APPLIED CHEMISTRY

(CBCS 2018 – 19 Academic Year Onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What are hazardous wastes?
2. Define pollutants.
3. What is corrosion?
4. Define Galvanic series.
5. What is the principles of electro forming?
6. Define alloy. Give two examples.
7. What are nano materials?
8. What is pH?
9. Define thermal pollution.
10. What is liquid - metal corrosion?

PART B — (5 × 5 = 25 marks)

Answer ALL questions by choosing either 'a' or 'b'.

11. (a) What is green house effect? Give its importance.

Or

- (b) Explain the construction and working of lead storage cell.

12. (a) Discuss the mechanism of electro chemical corrosion. How does it occur?

Or

- (b) What is cathodic protection? Explain the control of corrosion by impressed current cathodic protection method.

13. (a) Explain the mechanism of metal deposition from solution of simple salt.

Or

- (b) Write a mechanism and applications of vapour deposition.

14. (a) Explain the various sources for list of journals in chemistry.

Or

- (b) How are nanoparticles prepared by sputtering techniques?

15. (a) Explain the biological methods of waste water treatment.

Or

- (b) What is electroplating? Discuss the surface preparation for electroplating.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. What are fuel cells? Explain the construction and working of fuel cells.
17. (a) Draw and explain the pourbaix diagram for Fe–H₂O system in detail. (5)
(b) Write a note on high temperature corrosion. (5)
18. What is the principles of composite coatings? Explain the mechanism and application of composite coatings.
19. (a) Discuss the calculation of crystallite size of nano – material by XRD techniques. (6)
(b) How will you determine the particle size of nano material by TEM? (4)
20. (a) Discuss the working and advantages of super capacitors. (5)
(b) Define Anodizing. Explain the types of anodizing bath.
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D-6493

Sub. Code

34443

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION,
DECEMBER 2020.

Fourth Semester

ADVANCED PHYSICAL CHEMISTRY

(CBCS 2018–19 Academic Year Onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define partition function.
2. Which of the following substance would probably not have zero entropy in the crystalline state near 0 K. O₂, OCS, CO, IBr?
3. Write Onsager reciprocal relationship.
4. What is zero point energy?
5. Define Coulomb integral.
6. Give the selection rule for IR spectra.
7. Write the matrix representation of E and S_n .
8. What are reducible representations?
9. What is salt effect?
10. State and explain Bronsted Bjerrum equation.

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Derive an expression for molecular translational partition function of an ideal gas.

Or

- (b) Explain Einstein theory of heat capacities.

12. (a) State and explain the steps followed in variation method.

Or

- (b) What is Slater determined? Give its significance?

13. (a) Set up Schrodinger wave equation for rigid rotator.

Or

- (b) Write various symmetry elements and point group of the following molecules.

(i) CO₂ (ii) HCHO (iii) HCN (iv) BF₃ (v) Trans N₂F₂.

14. (a) Detect the IR active fundamental vibration modes in H₂O molecule.

Or

- (b) State and explain Great Orthogonality theorem.

15. (a) Explain the factors affecting the reaction rates in solution.

Or

- (b) Discuss the effect of pH on enzyme catalysed reaction.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Derive the mathematical statement of Maxwell – Boltzmann distribution law.
 17. Discuss the Huckel Molecular orbital treatment of butadiene molecule.
 18. Construct the character table for C_{2v} point group.
 19. (a) With the help of group theory explain the electronic transition in C_2H_4 molecule. (6)
(b) Discuss the effect of solvent on ion-ion reaction. (4)
 20. Derive Michaelis – Menton equation. Give its significance on enzyme catalysis.
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