D–3196

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION,
DECEMBER 2019.

First Semester

INORGANIC CHEMISTRY – I

(CBSC 2018–19 Academic year onwards)

Time : Three hours   Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Which of the following elements is having the highest electronegativity? Why?

   (Oxygen, Fluorine, Nitrogen, Sodium, Magnesium)

2. Write down the Kapustinski equation. What is its importance?

3. What is meant by bond order? Calculate the bond order of hydrogen molecule.

4. What are levelling and differentiating solvents?

5. Arrange the following in the order of increasing acidity:

   $HClo . HClo_2 . HClo_3 , Hcl_4$
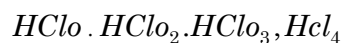
6. What is meant by buffer solution? Give one example.

7. What are heteropolyacids?

8. What are zeolites?

9. Give two examples for ionic crystals.

10. Differentiate between n-type and p-type semiconductors.

SECTION B — (5 × 5 = 25 marks)

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

11. (a) What are the postulates of VSEPR theory? Based on this theory explain the structure and bonding in XeF_4 molecules.

Or

(b) Discuss the concept of hybridisation. Explain briefly the hybridisation and shape of NH_3 molecule.

12. (a) Discuss the Lewis concept of acids and bases with suitable examples.

Or

(b) Write down the Bronsted concept of acids and bases with suitable examples. Mention its advantages and limitations.

13. (a) What is HSAB principle? Discuss its applications and limitations.

Or

(b) Explain briefly the structure of pyrosilicates and sheet silicates with neat diagram.

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14. (a) State and explain Schottky and Frenkel defects.

Or

(b) Draw the crystal structure of Nacl and explain briefly.

15. (a) Define the following and discuss their variation across a period and along a group.

(i) Ionization potential

(ii) Electron affinity $(2\frac{1}{2}+2\frac{1}{2})$

Or

(b) Discuss the structure and bonding of XeO_3.

SECTION C — $(3 \times 10 = 30$ marks)

Answer any THREE questions

16. Draw the MO energy level diagram of O_2 and *HCl* molecules. Discuss them in details.

17. (a) What are ionic compounds? Write and explain any four properties of ionic compounds. (5)

(b) What is Born-Haber cycle? Explain its significance with one suitable example. (5)

18. Describe briefly the structure of the following silicates with suitable examples.

(a) Ortho and Meta silicates

(b) Chain silicates

(c) Three dimensional silicates (3+3+4)

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19. Discuss briefly the crystal structures of graphite and diamond with neat diagrams and explain their conducting properties.

20. Give the crystal structure of the following and explain them.

    (a) Fluorite

    (b) Rutile

    (c) CdI_2 (4+3+3)

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	34412

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION,
DECEMBER 2019.

First Semester

ORGANIC CHEMISTRY – I

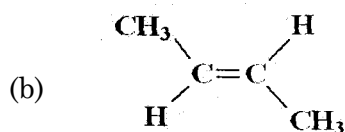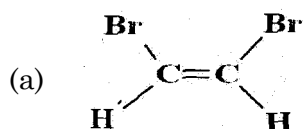(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours　　　　　　　　Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Arrange the following substituted acetic acid in increasing order of acidity.

   $ClCH_2COOH$, $Cl_2CHCOOH$, Cl_3CCOOH, CH_3COOH.

2. Define Antiaromaticity with example.

3. Designate the cis/trans configuration for the following organic compounds.

   (a)

   (b)

4. What is called secondary kinetic isotopic effect?

5. Arrange the following carbocation in the increasing order of stability Benzyl, Tertiary, Secondary, Primary.

6. List out the ring activating and deactivating functional groups.

7. Draw the structure of (a) bicyclo[2.2.1]heptane (b) bicyclo[2.2.2]octane.

8. Write the various isomers of tartaric acid.

9. What are the uses of Hammond postulate?

10. Write any two differences between classical and non-classical carbocations.

PART B — (5 × 5 = 25 marks)

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

11. (a) Write the differences between aromaticity and non-aromaticity.

Or

(b) Explain the stability of the organic compounds based upon hyperconjugation.

12. (a) Explain the optical activity of allenes.

Or

(b) Discuss the dipole moment character present in azulene ring system.

13. (a) Explain how cross over experiments is useful in determining the organic reaction mechanism.

Or

(b) Sketch the mechanism of Baeyer-Villiger rearrangement.

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14. (a) Sketch the mechanism of S_N2 reaction and explain its stereochemistry.

Or

(b) Sketch the mechanism of Friedel-Craft acylation of benzene.

15. (a) Sketch the mechanism of bromination of benzene.

Or

(b) Explain the formation and stabilityof carbocations.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Discuss the aromaticity of cyclopentadienyl anion.

17. Explain the effect of substrate, solvent and leaving group in S_N^{1} and S_N^{2} reactions.

18. How will you determine the mechanism of an organic reaction by kinetic isotopic methods?

19. Sketch the mechanism for Favorskii and Wagner-Meerwein rearrangement.

20. What is called neighbouring group participation? How does it influence the rate of reaction? Explain briefly.

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	34413

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION,
DECEMBER 2019.

First Semester

PHYSICAL CHEMISTRY – I

(CBCS 2018–19 Academic Year Onwards)

Time : Three hours   Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Write the mathematical formulation of first law of thermodynamics.

2. What is reaction isotherm?

3. Give the Debye-Huckel Onsagar equation.

4. What are electrochemical cells?

5. State Heisenberg's uncertainly principle.

6. Define photoelectric effect.

7. What is meant by the term "eigen value".

8. What is isotopic effect?

9.   Define third order reactions.

10.   What are the limitations of collision theory?

SECTION B — (5 × 5 = 25 marks)

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

11.   (a)   Write the criteria of spontaneity of chemical reaction.

Or

(b)   Derive Gibb's Duhem equation.

12.   (a)   Give the applications of EMF measurements.

Or

(b)   State and explain Debye-Huckel limiting law.

13.   (a)   Derive Nernst equation.

Or

(b)   Write a note on Carnot's cycle.

14.   (a)   Draw and explain the energy level diagram of a particle in 3-D box.

Or

(b)   Explain the character of wave particle dualism.

15.   (a)   Discuss the principle of microscopic reversibility.

Or

(b)   Explain Lindemann theory of unimolecular reaction.

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SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions

16. Explain the term fugacity? How is fugacity of a gas in determined.

17. Discuss different types of electrodes with examples.

18. Describe the postulates of quantum mechanics.

19. What are fast reactions? How are they studied by using NMR spectra?

20. (a) Write the statement of third law of thermodynamics. (3)

    (b) Write note on:

        (i) Potential energy surfaces (3)

        (ii) Steady state approximation (4)

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D–3199

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION,
DECEMBER 2019.

Second Semester

INORGANIC CHEMISTRY – II

(CBCS 2018 – 19 Academic Year Onwards)

Time : Three hours   Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1.   Write any two limitations of VBT.

2.   Calculate the CFSE for weak and strong octahedral fields for d^9 system.

3.   Give the IUPAC name for the following coordination compounds.

   (a) $K_2[PtCl_6]$

   (b) $[Co(NH_3)_5Cl]^{2+}$

4.   What are isobars? Give two examples.

5.   What is meant by half – life period?

6.   What is Q value?

7.   What is spallation reaction? Give one example.

8.   What is meant by isotopic dilution analysis?

9.   Write down the electronic configurations of Sm and Tb.

10.   What are the common oxidation states of lanthanides and actinides?

PART B — (5 × 5 = 25 marks)

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

11.   (a)   What are geometrical and optical isomerism? Discuss them in square planar complexes.

Or

(b)   What is meant by spectrochemical series? Explain.

12.   (a)   What are dia, para, ferri and antiferri magnetisms? Discuss them.

Or

(b)   What is 10Dq? Discuss the various factors affecting 10Dq.

13.   (a)   Discuss briefly the liquid drop model.

Or

(b)   Describe briefly the various factors which affect the nuclear stability.

14.   (a)   Distinguish between nuclear fission and nuclear fusion.

Or

(b)   Explain the principle and working of cyclotron.

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15. (a) What is meant by lanthanide contraction? Write down any three consequences of lanthanide contraction.

Or

(b) Describe the spectral and magnetic properties of lanthanides and actinides.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. (a) State and explain Jahn – Teller distortion .

(b) Discuss briefly the splitting of 'd' orbitals in octahedral and tetrahedral complexes. (5 + 5)

17. Compare the VBT and CFT.

18. Describe the principle working and applications of Geiger – Muller and Scintillation counters.

19. (a) Discuss briefly the principle and applications neutron activation analysis. (6)

(b) Write a note on nuclear cross – section. (4)

20. Explain briefly how the lanthanides are separated by

(a) Ion exchange method

(b) Solvent extraction method. (5 + 5)

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D–3200

Sub. Code
34422

DISTANCE EDUCATION

M.Sc DEGREE EXAMINATION, DECEMBER 2019.

Second Semester

Chemistry

ORGANIC CHEMISTRY-II

(CBCS 2018 – 2019 Academic year onwards)

Time : Three hours   Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions

1.   State Hofmann rule.

2.   State Markovnikov's rule with example.

3.   Which is the more stable isomer of butane-2,3-diol? Why?

4.   What are called enantiotopic ligands? Give examples.

5.   How are free radicals formed?

6.   What is meant by fluorescence?

7.   How will you prepare primary and secondary alcohols using Grignard reagent?

8.   What happens when olefin undergoes treatment with O_sO_4?

9.   Define chemoselectivity.

10. Write Paterno- Buchi reaction.

PART B — (5 ×5 = 25 marks)

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

11. (a) Sketch the mechanism for E_1 and E_2 reactions.

Or

(b) Explain Bredt's rule with example.

12. (a) Sketch the mechanism for aldol condensation reaction.

Or

(b) Discuss the conformation analysis of decalin.

13. (a) Sketch the mechanism for Pschorr and Ullmann rearrangements.

Or

(b) Explain the stability of free radicals.

14. (a) Define Norrish type-I reactions with example.

Or

(b) Discuss the various types of sigmatropic rearrangement.

15. (a) Sketch the mechanism for Perkin reaction.

Or

(b) Narrate the difference between elimination and substitution.

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PART C — (3 ×10 = 30 marks)

Answer any THREE questions

16. Explain the effect of substrate and leaving group in E_1 and E_2 elimination reactions.

17. (a) Explain the conformation analysis of monosubsituted cyclohexane.

    (b) Write the mechanism for hydroboration reaction.

18. Sketch the mechanism for Hoffmann and Gomberg rearrangements.

19. Predict and explain whether the transformation of cyclobutene to butadiene by CON rotation is allowed thermally or photochemically.

20. Sketch the mechanism for Wolff rearrangement and Benzoin condensation reactions.

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D–3200

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, DECEMBER 2019.

Second Semester

Chemistry

PHYSICAL CHEMISTRY — II

(CBCS 2018–2019 Academic Year onwards)

Time : Three hours   Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define adsorption.

2. What are detergents?

3. What are micelles?

4. What is phosphorescence?

5. Define photosensitizer.

6. What are initiators?

7. What is suspension polymerization?

8. Define solar cell.

9. What are dentrimers?

10. Give the size range of colloidal particles.

SECTION B — (5 × 5 = 25 marks)

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

11. (a) Write the differences between physiorption and chemisorption.

Or

(b) How is surface area of an adsorbent is determined?

12. (a) Explain the radiolysis of water.

Or

(b) What is hydrated electron? Give its reactions.

13. (a) What are polymers? Give their types.

Or

(b) What is functionality of monomers? Give its significance.

14. (a) Give the classification of colloids.

Or

(b) What are conducting polymers? Give an example. Explain the properties of conducting polymers.

15. (a) Discuss the stability of colloids.

Or

(b) Explain Langmuir-Riedal mechanism of surface reactions.

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SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Derive Langmuir adsorption isotherm.

17. Give the principle and working of flash photolysis technique.

18. Discuss the kinetics and mechanism of anionic polymerisation.

19. Explain the following :

    (a)   Thermally stable and bio-degradable polymers.   (5)

    (b)   Polymer electrolyte.   (5)

20. What is quantum yield of a photo chemical reaction? How it is determined?

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D–3202

Sub. Code
34431

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, DECEMBER 2019.

Third Semester

Chemistry

ADVANCED INORGANIC CHEMISTRY

(CBCS 2018–19 Academic year onwards)

Time : Three hours   Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL the questions.

1. Distinguish between trans effect and trans influence.

2. Explain anation reaction with an example.

3. State and explain wades rule.

4. What are cage compounds?

5. Write the hydroformylation using cobalt salt with example.

6. What are alkyne complexes? Give its bonding in complexes.

7. Listout the poisonous metals.

8. Define the term nitrogen fixation.

9. What are the advantages of Tanabe-sugano diagram?

10. What is trans effect? What are its applications?

PART B — (5 × 5 = 25 marks)

Answer ALL the questions.

11. (a) What are stepwise and overall stability constants? Explain the polarographic and p^H metric methods of determination of stability constant of a metal complex.

Or

(b) What are electron transfer reactions? Explain in detail about innersphere and outersphere reactions with mechanism.

12. (a) What are boranes and carboranes? Explain its bonding and structures briefly.

Or

(b) What are the selection rules for electronic transitions? Evaluate all the terms for d^2 configuration.

13. (a) Explain the Dewar–chatt approach to bonding in olefins.

Or

(b) Give an account of structural and bonding aspects of metal carbonyls.

14. (a) Describe the structure and biological functions of hemoglobin.

Or

(b) Write a short note on Na^+–K^+ pump and carboxy peptidase.

2   **D–3202**

15. (a) What do you mean by isolobal analogy? Explain with examples, how it act as a bridge between Inorganic and Organic chemistry.

Or

(b) Explain about isomerisation and Ziegler–Natta polymerization.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. (a) What is meant by chelate effect and template effect? Explain in detail. (5)

(b) Explain ligand displacement reactions with suitable examples. (5)

17. (a) What are Orgel diagrams? How are they different from Tanabe–sugano diagrams? (5)

(b) What are metal clusters? How are they classified? Explain in detail. (5)

18. (a) Give the preparation and electrophilic substitution reactions of Ferrocene. Write the orbital representation of the structure of Ferrocene. (5)

(b) Explain the oxidation addition, reductive elimination and hydrogenation in organometallic compounds. (5)

19. (a) What are fluxional molecule? Explain in detail.

(b) Discuss about Rubridoxin and $Fe_4 S_4$ Ferredoxin.

20. (a) Bringout the important structural features of the active sites of metal centres of Vitamin B_{12}. (4)

(b) Give an introduction of metal ions in biology. (6)

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3   **D–3202**

D–3203	Sub. Code
	34432

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION,
DECEMBER 2019.

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 the questions

1. Write down the sharpless asymmetric epoxidation reaction.

2. What is mean by Baeyer villiger oxidation reation?

3. Write any four reducing agents used in organic synthesis.

4. What do you mean by retrosyntheic analysis?

5. Give the structure of flavone and oxazole.

6. What are carbohydrates? How are they classified? Give suitable examples.

7. Define end group analysis.

8. Write down the biosynthesis of Terpenes.

9. List out the Physiological action of Riboflavin and vitamin B₁₂.

10. How is progesterone synthesised?

PART B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Describe the metal based and non-metal based oxidations of alcohols to carbonyls and alkenes to epoxides.

Or

(b) Explain the sharpless asymmetric dihydroxylation and pinacol formation reaction

12. (a) Discuss about Meerwein – pondroff – verely reduction and Luche reduction.

Or

(b) Explain the basic principles and terminology of retro synthesis.

13. (a) Describe the synthesis, structure and reactivity of Indole.

Or

(b) Give a brief account on Configuration and conformation of maltose.

14. (a) What are nucleic acids? How are they classifier? Explain the structure of DNA and RNA.

Or

(b) How is morphine synthesised? Give its structure.

15. (a) Write a short note on vitamins.

Or

(b) Elucidate the structure of progesterone.

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PART C — (3 × 10 = 30 marks)

Answer any THREE questions

16. (a) Explain the homogeneous and heterogeneous catalytic drogenation reactions with suitable example. (6)

    (b) What is Wacker oxidation and Prevast reaction? (4)

17. (a) Write a short note on L-Selectride and Luche reaction. (5)

    (b) Explain one group C-C and two group C-C disconnections. (5)

18. (a) Explain the protection and deprotection of hydroxy, carboxyl, carbonyl and carbon carbon multiple bond's with suitable examples. (4)

    (b) Discuss the structure and reactivity of Indole (6)

19. What are natural products? Give examples. Explain the structure of camphor and atropine.

20. Elucidate the structure of Cholesterol.

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D–3203

D–3204	Sub. Code 34433

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, DECEMBER 2019.

Third Semester

Chemistry

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 the questions.

1. State and explain Hook's law.

2. What do you mean by solvent effects?

3. Define the term chemical shift.

4. Write down the deuterium exchange reactions.

5. State and explain nitrogen rule.

6. Write any two applications of ^{13}C NMR spectroscopy.

7. Define ORD and CD.

8. What are the characteristics of DTA curves?

9. Give the principles of Nephelometry.

10. What do you know about thermometric titrations?

PART B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Write the basic principles of Uv-visible spectroscopy. What are the factors affecting position and intensity of absorption bands?

Or

(b) Discuss about stretching and bending vibrations with suitable examples.

12. (a) Write any five applications of IR-spectroscopy.

Or

(b) What do you mean by spin coupling and shift reagents?

13. (a) Discuss the principle and instrumentation of ^{13}C NMR spectroscopy.

Or

(b) What do you understand by parent ion, metastable ion, isotopic ions in mass spectroscopy?

14. (a) What is mean by cotton effect? Mention the applications of cotten effect curves.

Or

(b) Write down the principle, instrumentation and any two applications of TGA.

15. (a) Describe the instrumentation of flame photometry.

Or

(b) Explain the principle and instrumentation of Turbidimetry.

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D–3204

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. (a) State and explain Woodward - Fieser rules. (5)

    (b) List out any three applications of Uv-visible spectroscopy. (5)

17. (a) Define NOE. What are factors affecting chemical shift? (6)

    (b) Mention any four applications of IR Spectroscopy. (4)

18. (a) Compare ESR and NMR spectroscopy. (5)

    (b) Give the general rule of fragmentation. (5)

19. Illustrate the principle and applications of DTA and DSC.

20. (a) State and explain α-haloketone rule and octant-rule. (4)

    (b) List out the applications of Flamephotometry and Nephelometry. (6)

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