D–6526	Sub. Code
	34411

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION,
DECEMBER 2024.

First Semester

INORGANIC CHEMISTRY – I

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. Explain hybridization.
2. Give example for ionic character in a covalent bond.
3. Define intermolecular forces.
4. Explain why the molecule of CO_2 and methane have zero dipole moment.
5. Order the following species in the increasing Bronsted – lowry acid strength : $K(H_2O)_6^+, Fe(H_2O)_2^{2+}, Co(H_2O)_6^{3+}$ and explain your reasoning.
6. Define 'BCC'. Give one example.
7. Give two comparison between Bronsted and lewis acids.
8. Why does a buffer solution resist any change in p^H?
9. Draw structure of graphite.
10. Explain Schottky defects.

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) Draw the molecular diagram of CO_2 and NO_2^-. Explain the bond pair and magnetic property on the basis of MO diagram.

Or

(b) Explain the structure and hybridization, dipole moment of XeF_2.

12. (a) Explain the relative acids strength of (i) Oxy acids (ii) boron halides.

Or

(b) Details on the concept of 'Bronsted acid and bases'.

13. (a) Discuss about isopoly acids and heteropoly acids.

Or

(b) Write note on 'Zeolites'.

14. (a) Briefly describe the following (i) Born meyer equation (ii) properties of sigma and pi bonding.

Or

(b) Describe about 'band theory of solids'.

15. (a) Explain the structure of fluorite.

Or

(b) Explain the terms (i) semiconductors (ii) insulators.

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

Answer any THREE questions.

16. Describe in detail about structure and bonding in fluorine and oxygen compounds.

17. Explain the chemical periodicity of (a) ionic radii (b) electronegativity (c) ionization potential.

18. Discuss about principle, application and limitations of HSAB.

19. Explain the structure and properties of different types of silicates.

20. Explain the ionic structure of CsCl, cristobolite.

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D–6527

Sub. Code
34412

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION,
DECEMBER 2024.

First Semester

ORGANIC CHEMISTRY — I

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. What is the structure of cyclopropane?
2. Arrange the following acids in increasing order of acid strength and justify :

   $ClCH_2COOH$, CH_3COOH, C_6H_5COOH.
3. Write a short note on antiaromatic compounds.
4. Define chiral center.
5. Define the term axial chirality.
6. When does diastereomerism occur?
7. Discuss Hammond's postulate.
8. What do you understand by steric effect?
9. Write a short note on the SE1 reaction.
10. How will you convert bromonitrobenzene into bromobenzoic acid?

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) Write the structural formulae of the following compounds :

(i) 3-ethyl-2-methylhexene-1

(ii) 4-methylpent-2-ene

(iii) 2,2,3-trimethylhexane

(iv) 1-Bromo-2-chloropentane

(v) Pentane-2,4-dione.

Or

(b) Explain the significance of the term hybridization. How does it explain the tetracovalent nature of carbon and that methane has a bond angle of 109.5° rather than 90°?

12. (a) What are fullerenes? Describe its types.

Or

(b) Explain the E-Z system for designating isomeric alkenes with examples.

13. (a) Elaborate a note on spiranes and exo-cyclic alkyldenecycloalkanes.

Or

(b) Explain R and S nomenculature using CAHN-INGOLD-PRELOG RULES.

14. (a) Explain Pinacol-Pinacolone rearragngement.

Or

(b) Discuss the mechanism of the S_N2 reaction.

15. (a) Discuss about Vilsmeier-Haach reaction.

Or

(b) Explain in detail about the benzyne mechanism.

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

Answer any THREE questions.

16. Explain the following terms in connection with the structure of organic compounds :

(a) Electronegativity

(b) Conjugation

(c) Mesomerism

(d) Resonance

(e) Hyperconjugation.

17. (a) What is Huckel's rule of aromaticity? Explain.

(b) Give a detailed note on molecules with C.N.S. based chiral centers.

18. (a) Explain biphenyls and binaphthyls.

(b) Elaborate a note on spiranes and exo-cyclic alkyldenecycloalkanes.

19. (a) Discuss the mechanism of Beckman rearrangement.

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

20. (a) Write a detailed note on nitration, halogenation, sulphonation, mercuration, and hydrogenation in detail also mentioning its mechanism.

(b) Write a short note on nucleophiles.

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D–6528	Sub. Code
	34413

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION,
DECEMBER 2024.

First Semester

PHYSICAL CHEMISTRY — I

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. What is the law of degradation of energy?

2. Write the term of the fugacity and activity.

3. What is meant by the electrode potential?

4. Write the significance of the EMF significance.

5. Describe the block-body radiations.

6. Write the definition for the transport number.

7. How do you write the degeneracy?

8. Define the simple collision theory.

9. Write the definition of potential energy surfaces.

10. How to write the mechanism of fast reactions?

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) Derive the Nernst heat theorem with the help of thermodynamic law.

Or

(b) What is the Gibb's – Helmholtz energies derive in detail?

12. (a) What is the electrochemical cell, and what is the type of the cell?

Or

(b) Derive the Debye Huckel Onsagar equation.

13. (a) Drawn in detail Heisenberg's uncertainty principle.

Or

(b) Discuss the Eigen value and Eigen functions.

14. (a) Write the application of the one-dimensional box.

Or

(b) Write detailed notes on the wave-particle dualism.

15. (a) Write notes on the ARRT theory.

Or

(b) Derive and explain the steady state approximations.

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

Answer any THREE questions.

16. Derive and draw detailed derivation on Duhem margules equation.

17. Determine the electrode kinetics and over voltage.

18. Derive the postulates of quantum mechanics.

19. Derive the Schrodinger equation of the three-dimensional box importance.

20. How do you derive the complex reaction by the NMR methods?

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D–6529	Sub. Code
	34421

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION,
DECEMBER 2024.

Second Semester

INORGANIC CHEMISTRY – II

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. Mention any two limitations of valance bond theory.

2. Give example for strong field and weak filed splitting ligands.

3. Illustrate optical isomerism in octahedral complex.

4. Give example for ferro and antiferro magnetic substance.

5. Define half life period.

6. State Q value.

7. Write any two uses of charged particle accelerator.

8. List out the properties of nucleus.

9. What are actinoids? Why are they so called?

10. Give the electronic configuration of Gd^{3+}.

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) Describe the John-Teller distortion theorem with examples.

Or

(b) What is meant by crystal field stabilization energy? Calculate its value in the d^7 low spin and high spin octahedral systems.

12. (a) Discuss the various factors affecting the nuclear stability.

Or

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

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

Or

(b) Draw and explain how does Geiger – Muller counter works.

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

Or

(b) Explain the principle and working process of cyclotron.

15. (a) Explain briefly about the spectral and magnetic properties of lanthanides.

Or

(b) Explain the causes of lanthanide contraction.

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

Answer any THREE questions.

16. Discuss briefly the sigma and pi metal-ligand bonding in transition metal complexes with reference to tetrahedral transition metal complexes.

17. (a) Discus briefly the splitting of 'd' orbitals in octahedral and tetrahedral complexes.

(b) Calculate the μ eff for $K_4[Fe(CN)_6]$ and $[Co(H_2O)_6]^{3+}$.

18. Discuss briefly the applications of nuclear chemistry by neutron activation and isotopic diluation analysis.

19. Write notes on the following (a) nuclear cross section (b) laws of radioactivity (c) nuclear isomer.

20. Describe briefly about the extraction and separation techniques of lanthanides.

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D–6530

Sub. Code
34422

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION,
DECEMBER 2024.

Second Semester

ORGANIC CHEMISTRY – II

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. What are trans elimination reactions?

2. State the Hofmann rule.

3. What are hydride transfer reactions?

4. How diastereotopic H atoms are identified using ^{1}H NMR spectra?

5. Draw the structure of singlet carbenes.

6. Write the ways by which nitrenes are generated.

7. What are electrocyclic reactions?

8. Define the term phosphorescence.

9. State the importance of Barton's reaction.

10. What are sigmatropic rearrangement?

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) Discuss the mechanism of E_2 elimination reaction.

Or

(b) Explain the nucleophilic addition reaction with a suitable example.

12. (a) Discuss the importance of reformatsky reaction.

Or

(b) Explain about homotopic ligands and faces.

13. (a) Discuss the steps involved in Hoffmann rearrangement.

Or

(b) Explain about Hunsdiecker reaction.

14. (a) Write in detail about Beckmann rearrangement.

Or

(b) Explain di-π methane rearrangement.

15. (a) Discuss the importance of cyclo addition reaction.

Or

(b) Discuss the mechanism of Pschorr reaction.

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

Answer any THREE questions.

16. (a) Discuss the stereochemistry of addition reaction. (7)

(b) Write a note on E_1cB reaction. (3)

17. Discuss about the various conformers of cyclohexane with a neat sketch.

18. (a) Discuss the mechanism of Aldol condensation. (5)

(b) Explain about the Ullmann reaction. (5)

19. (a) Write a note on photo sensitization process. (5)

(b) Explain the mechanism of free radical polymerization process. (5)

20. Explain in detail about Paterno-Buchi reaction.

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D–6531

Sub. Code
34423

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION,
DECEMBER 2024.

Second Semester

PHYSICAL CHEMISTRY – II

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. Define the term adsorption of gas on a solid surface.

2. What is the Langmuir-Riedal mechanism?

3. What is meant by natural polymer and give an example?

4. What is meant by internal conversion?

5. What is mean by actinomer?

6. What is mean by photosynthesis?

7. Define the term colloids.

8. What is called polymer electrolyte?

9. Define emulsion polymerrisation.

10. Explain the photovoltaic cell.

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) Explain the surface area determination.

Or

(b) Explain the term micelles? Explain the uses of micelles.

12. (a) Write about the detailed mechanism of fluorescence.

Or

(b) What is called phosphorescence? Explain the process with example.

13. (a) Write about the decomposition of carbonyl compounds.

Or

(b) Write down the radiolysis of water.

14. (a) Explain the addition polymerization process.

Or

(b) Explain the molar mass of polymer and how will you measure it.

15. (a) Write about the classification of colloids.

Or

(b) Write about the principles of solar water splitting.

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

Answer any THREE questions.

16. Write about the mechanism of uni and bimolecular surface relations. (10)

17. Explain :

    (a) Micelles and detergents. (5)

    (b) Gibbs adsorption isotherm. (5)

18. Write about the stepwise polymerization and its significance. (10)

19. Write about the mechanism of solution polymerisation. (10)

20. (a) Explain the atom radical polymerisation with example. (5)

    (b) Explain the artificial photosynthesis. (5)

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D–6532	Sub. Code
	34431

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION,
DECEMBER 2024.

Third Semester

ADVANCED INORGANIC CHEMISTRY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. What is trans effect?

2. Mention four important properties of inert complexes.

3. Write about outer sphere electron transfer.

4. Write the ground state term for d^2 ions.

5. Draw perovskite structure.

6. Give two method of preparation of metal nitosyl compounds.

7. Write down Ziegler-Natta polymerization reaction.

8. What are fluxional molecules? Give examples.

9. Draw the structure of vitamin B_{12}.

10. What are the functions of Chlorophyll?

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) Explain the spectrophotometric methods of determining stability constants.

Or

(b) Compare salient features of inner sphere and outer sphere complexes.

12. (a) Describe the term of (i) Wade's rule (ii) 'STYX' notation (iii) Isolobal analogy.

Or

(b) Write notes on 'normal and inverse types of spinels'.

13. (a) Dewar-Chatt approach to bonding in olefin. Explain.

Or

(b) Describe about preparation and properties of ferrocene.

14. (a) Illustrate two set of orgel diagram and explain.

Or

(b) What is Wilkinson catalyst? Discuss its use in hydrogenation of olefin by catalytic cycle.

15. (a) Explain structure and the functions of carboxypeptidase – A.

Or

(b) Discuss about in-vitro nitrogen fixation.

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

Answer any THREE questions.

16. Describe briefly about ligand displacement reactions in Octahedral complexes.

17. Write notes on the following (a) trinuclear clusters with examples (b) band intensity and band widths of electronic spectra.

18. Discuss about synthesis and structures of metal alkyls and aryls complexes.

19. Describe about synthesis structure and reactions of metal carbonyls.

20. Illustrate sodium ion pump mechanism.

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D–6533	Sub. Code
	34432

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION,
DECEMBER 2024.

Third Semester

ADVANCED ORGANIC CHEMISTRY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. Give any one example of metal and nonmetal-based oxidation reaction.

2. What is Wilkinson catalyst? Write any one use.

3. What is functional group transposition? Write any two examples.

4. Give two uses of $LiAlH_4$.

5. What are chiral boranes? Give two uses.

6. Write down the structure of atropine and camphor. How many chiral carbons are present in each compound?

7. List out the classifications of proteins.

8. What do you mean by RNA replication?

9. What are the sources of vitamin A, K and B12?

10. Write any one synthetic method of α – pinene.

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) Explain the reaction and mechanism of Prevost reaction and discuss about the Woodward modification on it.

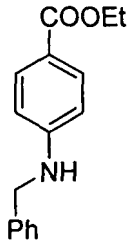
Or

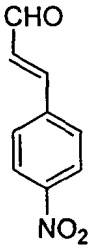
(b) Discuss the reaction and mechanism of Meerwein Pondorff verley reduction reaction.

12. (a) Discuss the methods of protecting and deprotecting carbonyl functional group.

Or

(b) Outline the possible retrosynthetic pathway for the following compounds :

(i) 

(ii) 

13. (a) How ill you synthesize flavone and anthocyanin? Give one reactivity for each.

Or

(b) Explain the utility of Os and Ru in oxidation processes.

14. (a) Explain the retrosynthetic pathway of Robinson annulation.

Or

(b) Explain with suitable examples of configuration and conformations of disaccharide and polysaccharides.

15. (a) What are vitamins? Discuss the chemistry and physiological functions of thiamine and pyridoxine.

Or

(b) Explain the synthesis and structure of morphine.

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

Answer any THREE questions.

16. (a) Write down the mechanism of the following reactions : (3+3)

(i) Pinacol formation

(ii) Wacker oxidation.

(b) With examples list out the synthetic utilities of the following reagents. (2+2)

(i) Sharpless asymmetric catalyst

(ii) $LiBH_4$.

17. Explain the synthesis, and reactivity of flavone and indole.

18. (a) Write a note on the solid phase peptide synthesis. (5)

(b) Elaborate the structural features of DNA and RNA. (5)

19. (a) Illustrate the structural elucidation of progesterone. (5)

(b) Discuss the structure and synthesis of camphor. (5)

20. Explain the structure and structural elucidation of cholesterol. (10)

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D–6534

Sub. Code
34433

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION,
DECEMBER 2024.

Third Semester

SPECTROSCOPY-APPLICATIONS IN ORGANIC AND INORGANIC CHEMISTRY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. State Beer-Lamber's law.

2. Define Hook's law.

3. Give example for charge transfer complexes.

4. What is the application of ^{1}H NMR?

5. Predict ESR spectral line with intensity for methyl radical?

6. What is meta stable ion peak?

7. What is the octant rule?

8. Differentiate between turbidometry and nephelometry?

9. What is the principle of flame photometry?

10. What are the difference between DTA and DSC?

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) What is the basic principle and instrumentation used of IR spectroscopy?

Or

(b) Explain about the principle and instrumentation of UV-Visible spectroscopy.

12. (a) List the type of physical change that can yield exothermic and endothermic peaks DTA and DSA.

Or

(b) Discuss the factors affecting of thermogravimetric analysis.

13. (a) Explain the factors that affect the magnitude of vicinal and geminal coupling constants?

Or

(b) Discuss the factors that affect the chemical shift of hydrogen and C-13 nuclei.

14. (a) Write notes on (i) Isotope peaks in mass spectrometry (ii) mass fragmentation of aliphatic and aromatic nitro compounds.

Or

(b) Write short note on principle and application of ESR spectroscopy.

15. (a) Write a brief note on DSC.

Or

(b) Explain about the principle and application of turbidimetry.

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

Answer any THREE questions.

16. Explain briefly about the qualitative and quantitative application of UV-visible spectroscopy.

17. Describe the following (a) shift reagent (b) deuterium exchange reaction (c) double resonance.

18. Explain briefly about the principle and application of ORD and CD.

19. Write a brief note on mass spectroscopy.

20. Explain the following (a) nephelometry (b) theory of ^{13}C NMR.

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D–6535	Sub. Code
	34441

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION,
DECEMBER 2024.

Fourth Semester

ANALYTICAL CHEMISTRY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. What is error?
2. Distinguish between precision and accuracy.
3. How to reject data base on Q-test?
4. Give important of ion selective electrodes.
5. Define RF values.
6. Write two advantages of dropping mercury electrode.
7. List any two difference between normal and reversed phase liquid chromatography.
8. How will you purify methanol solvent?
9. Write the principle involved in ion exchange chromatography.
10. How will you purify the chemicals using solvent extraction?

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) Explain the following terms with examples : (i) standard deviation (ii) rules to determine significant figures.

Or

(b) Discuss the rules in determining the significant figures.

12. (a) Explain about the principle, instrumentation of chronopotentiometry.

Or

(b) Write short note on coulometric analysis.

13. (a) Describe in details about the principle instrumentation of HPLC.

Or

(b) Write short note on gas chromatography.

14. (a) Illustrate about the purification techniques with example using vacuum distillation.

Or

(b) Write a note on electro dialysis.

15. (a) Write a short note on principle and instrumentation of Cyclic voltametry.

Or

(b) Discuss about gel permission chromatography.

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

Answer any THREE questions.

16. Explain the following with suitable examples (a) systematic and random errors (b) absolute and relative errors.

17. Discuss in detail about principles, instrumentation and application of polarography.

18. Describe about principle, instrumentation, interpretation and application of GC-MS.

19. Illustrate with suitable example about electrophoresis and di-electrophoresis.

20. Discuss the following (a) F-test and T-test (b) Paper chromatography.

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D–6536

Sub. Code
34442

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION,
DECEMBER 2024.

Fourth Semester

APPLIED CHEMISTRY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. Explain green house effect.

2. What is the difference between primary and secondary batteries?

3. List any two importance of corrosion studies.

4. What is meant by passivity?

5. Write the importance of pretreatment in electroplating processes.

6. Define cladding and vapour deposition.

7. Write short note son precipitation method.

8. Explain the principle of chemical vapour deposition.

9. Write a brief account on standard deviation and correlation coefficient.

10. What is internet? Who provide the internet service?

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) Discuss the formation of acid rain. How it can be controlled?

Or

(b) Briefly explain about waste water treatment methods.

12. (a) What are the different types of corrosion? Describe the electrochemical methods of corrosion rate measurement.

Or

(b) Write a brief account on EMF and Galvanic series.

13. (a) Explain the mechanism of electrodeposition in simple salts and complex salts.

Or

(b) Write short notes on :

(i) Electroforming

(ii) Electroless plating.

14. (a) Explain the role of SEM and TEM in ascertaining the nano characteristics of materials.

Or

(b) Write the physical methods for synthesising nanomaterials.

15. (a) How to calculate bond energy using Born-Lande equation?

Or

(b) Describe the special terms used in internet with details.

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

Answer any THREE questions.

16. Write short notes on :

    (a) Batteries

    (b) Fuel cell

    (c) Supercapacitors.

17. Draw and explain the pourbaix diagram with one example. State the application and limitations of this diagram.

18. (a) Explain the principle and applications of brush plating.

    (b) What is anodizing? Explain the principle and colouring of anodizing aluminium.

19. Give an account of spray pyrolysis and electrochemical deposition of nanoparticles.

20. Explain the online courses of NPTEL, Swayam and MOOC.

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D–6537	Sub. Code
	34443

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION,
DECEMBER 2024.

Fourth Semester

ADVANCED PHYSICAL CHEMISTRY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL the questions.

1. Define the term entropy.

2. What is the third law of thermodynamics?

3. Define heat capacity of a solid.

4. What is meant by Pauli's exclusion principle?

5. Define Fermi-Dirac distribution law.

6. Give an example for molecule with $C2_V$ point group.

7. What is the point group of C_2H_4?

8. Define bronsted acid with example.

9. What is mean by edie equation?

10. Explain the zucker hammett hypothesis.

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) Explain the negative absolute temperature.

Or

(b) What are called partial functions? Explain them.

12. (a) Write the Einstein model of heat capacity of solids.

Or

(b) What is called elementary treatment? Explain with example.

13. (a) What is mean by Slater determinant? Explain its importance.

Or

(b) Write down the perturbation method to helium.

14. (a) Explain the rules for forming a group.

Or

(b) Explain the systematic assignment of point group for molecule with example.

15. (a) Write about the factors influence the reaction rates in solution.

Or

(b) Write about the primary salt effect.

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

Answer any THREE questions.

16. Write about the one dimensional harmonic oscillator in detail. (10)

17. Explain :

    (a) Onsager reciprocall relations. (5)

    (b) Fermi-Dirac distribution law. (5)

18. Write about the HOMO method and its application to butadiene. (10)

19. Write about the application of group theory to IR and Raman spectra. (10)

20. (a) Explain the Acid-Base catalysis. (5)

    (b) Explain the Michaelis-Menton equation of enzymatic catalysis. (5)

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