D–1586

Sub. Code
34411

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2023.

First Semester

INORGANIC CHEMISTRY – I

(CBCS – 2018-19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. Differentiate between electronegativity and electron affinity.

2. What is the molecular shape of BF_3?

3. What is sigma bond and pi bond?

4. Explain the Kapustinski equation.

5. Write an account of acid-base concept in non-aqueous media.

6. Define Lewis acid base concept with example.

7. Explain Anderson structure.

8. What are chain silicates?

9. Give two examples of AB and AB_2 type of ionic crystals.

10. What is meant by Frenkel defect? Give example.

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Explain the formation of N_2 and O_2 molecules on the basis of molecular orbital theory and explain the differences in the reactivity of N_2 and O_2 based on MOT.

Or

(b) Explain the geometry containing lone pairs in central atom using VSEPR theory.

12. (a) Define lattice energy. Explain the Born – Haber cycle for lithium fluoride.

Or

(b) Explain the hardness and electrical conductivity of the ionic compounds with suitable examples.

13. (a) Explain the relative order of acid strength of boron halides.

Or

(b) Explain the principle of hard and soft acids and bases? Give one example for each type.

14. (a) Explain the isopoly and heteropoly acids with examples.

Or

(b) Write short notes on :

(i) Feldspar

(ii) Zeolites

(iii) Clay minerals.

15. (a) Classify the ionic structures with examples.

Or

(b) Explain Frenkel and Schottky defects in crystal structure.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Explain in detail about the types of hybridization with suitable example for each. (10)

17. Predict the shape of the following molecules by using the VSEPR theory (10)

(a) I_3^-

(b) CH_4

(c) CH_2O

(d) XeF_4

(e) SF_6

18. (a) Discuss the basis for classification of acids and bases as hard and soft. (6)

(b) How does the steric effect influence the basicity and acidity character of acids and bases? (4)

19. Discuss the classification and structural aspects of silicates with examples. (10)

20. Write short notes on :

(a) Structure of CdI_2 (3)

(b) Metal deficiency defect (2)

(c) Compare the structure of Diamond and Graphite. (5)

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D–1587

Sub. Code
34412

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2023.

First Semester

ORGANIC CHEMISTRY – I

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

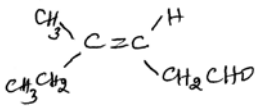
PART A — (10 × 2 = 20 marks)

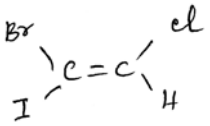
Answer ALL questions.

1. Why NMR spectrum need for aromaticity studies?

2. Write IUPAC nomenelature for Norborance.

3. Assign E or Z configuration to each of the following compounds.

(a) 

(b) 

4. Write stereochemistry of allenes.

5. What is specific rotation?

6. Distinguish between substitution and elimination reactions.

7. Write the reaction mechanism of vilsmeier Haak reaction.

8. Which is faster S_N1 or S_N2 reaction?

9. Why does the nucleophilic attack from the back side?

10. What is the order of decreasing reactivity toward electrophilic aromatic substitution for compounds: Toluene, benzene, nitrobenzene and phenol.

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) How does HMO theory explain the concept of aromaticity?

Or

(b) Describe the aromaticity of C_{60}.

12. (a) Distinguish between the following

(i) Enantiomers and diastereomers. (2½)

(ii) Absolute and relative configuration. (2½)

Or

(b) Discuss the generation and stability of carbocation.

13. (a) Write the reaction mechanism of von-Richter reaction.

Or

(b) Write the difference of S_N1 and S_N2 reactions.

14. (a) Discuss the Hammond postulate.

Or

(b) Write a reaction mechanism of Demzonev reaction.

15. (a) What is chiral? How to determine chirality?

Or

(b) Illustrate the reaction mechanism of the Aromatic Electrophilic substitution of the following

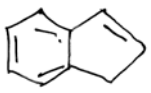
(i) diazonium coupling

(ii) vilsmier Haak reaction.

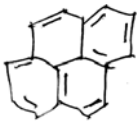
PART C — (3 × 10 = 30 marks)

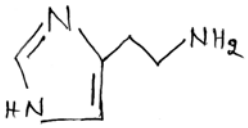
Answer any THREE questions.

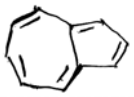
16. Indicate and explain aromatic, antiaromatic and non-aromatic nature in the following compounds.

(a) 

(b) 

(c) 

(d) 

(e) 

17. Explain the conformational features of binaphthyls and biphenyls.

18. Explain the importance of non-kinetic method for determining organic reaction mechanism.

19. Give the reaction mechanism for the following rearrangement. (2½ × 4 = 10)

(a) Semi-pinacol

(b) Bayer-villiger

(c) Beckmann

(d) Pinacol-pinacolone.

20. (a) Differentiate elimination and substitution reaction. (2)

(b) Give an account of Neighbouring group participation. (5)

(c) Write racemic modification. (3)

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D–1588

Sub. Code
34413

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2023.

First Semester

PHYSICAL CHEMISTRY – I

(CBCS – 2018-19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

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

Answer ALL questions.

1. Is the entropy of mixing positive or negative?
2. Why are the laws of thermodynamics important?
3. What is the zeroth law of the thermodynamic system, and write an example?
4. Define the conductivity and its application.
5. How do you define electrode kinetics?
6. What is meant by wave-particle dualism?
7. Are vectors used in quantum mechanics? And explain with an example.
8. What is ψ in the Schrodinger equation?
9. Which interatomic distance gives us the minimum value of interatomic potential?
10. What is the formula for a steady-state approximation?

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) Derive the properties of Helmholtz Free Energy equations and their isothermal change in work function.

Or

(b) Derive the Gibbs-Helmholtz Equation with applications.

12. (a) Write the applications of Chemical Potential.

Or

(b) Draw and explain the Silver/Silver Chloride Reference Electrode.

13. (a) Write notes on the Electron Transfer and Energy Levels diagram.

Or

(b) What is the Compton Effect, and draw the picture of the Scattering of X-rays?

14. (a) Write any two Operators from the mathematical preparation for quantum chemistry.

Or

(b) Explain Schrodinger's equation with the help of Polar coordinates.

15. (a) Write notes on the Reaction Coordinates.

Or

(b) Draw and briefly explain the Explosion Limits from the kinetics of complex reactions.

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

Answer any THREE questions.

16. (a) Derive the Maxwell Relations.

    (b) Write the measurement of ΔH and ΔS from EMF data.

17. Derive the Debye-Hückel-Onsagar equation.

18. Derive the Butler-Volmer equation and their approximation.

19. Discuss in detail the applications of conductivity measurements.

20. Discuss the terms :

    (a) Orthogonality of Wave Function and

    (b) Normalization of the Wave Function.

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D–1589	Sub. Code
	34421

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2023.

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. Name the following co-ordination compounds:
   (a) $Na[PtCl_3(NH_3)]$
   (b) trans — $[Co(en)_2ClH_2O](NO_3)_2$

2. What are the defects of CFT?

3. List out the short coming of VBT.

4. Write the increasing order of spectrochemical series.

5. Explain meson field theory.

6. Define 'Threshold energy'.

7. Give notes on 'Half- life period'.

8. Any two biological applications of C-14 dating method.

9. Sketch and label 'cyclotron'.

10. Give example of spallation reaction.

PART B — (5 × 5 = 25 marks)

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

11. (a) Write down on geometrical and optical isomerism for octahedral complexes.

Or

(b) Describe the theorem of John-Teller distortion for complexes with examples.

12. (a) Differentiate on VBT and CFT.

Or

(b) Discuss the properties of nucleus.

13. (a) Draw and explain how does Geiger - muller counter works.

Or

(b) Write notes on nuclear fission and fusion reaction.

14. (a) Write notes on Lanthanides separation using the following

(i) Ion exchange technique

(ii) Thermal decomposition.

Or

(b) Uses of lanthanide and actinide and their compounds.

15. (a) Explain the causes of lanthanide contraction.

Or

(b) Discuss detail about alpha, beta and gamma ray properties.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. What are inner sphere and outer sphere complexes? Explain them with suitable mechanisms.

17. Describe ferro, ferri and anti-ferromagnetism of the complexes.

18. Explain the MOT of Tetrahedral and square planar complexes.

19. Write short notes on (a) Neutron activation analysis and (b) Isotopic dilution analysis.

20. Discuss the following, (a) Spectral and Magnetic properties of lanthanide and actinides (b) Oxidation state of lanthanide and actinides.

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D-1590

Sub. Code
34422

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2023

Second Semester

ORGANIC CHEMISTRY — II

(CBCS 2018-19 Academic Year onwards)

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL the questions.

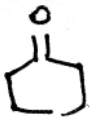
1. State and explain Bredt's rule.

2. Differentiate regioselectivity and chemoselectivity.

3. Explain Markownikoff's rule.

4. Identify the products of the following reactions :

   (a) $2\,C_6H_5CHO \xrightarrow{CN^-} ?$

   (b)  $+ (C_6H_5)_3\,P = CH_2 \rightarrow ?$

5. What are carbenes? How are they generated?

6. What are free radicals? What are their types? Which type is more stable?

7. Define Intersystem crossing (ISC).

8. Illustrate (2 + 2) cycloaddition reaction.

9. State and explain Hofmann's rule.

10. What are topicity ligands? Give two examples.

SECTION B — (5 × 5 = 25 marks)

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

11. (a) (i) State and explain Saytzeff rule.

(ii) Write an account on elimination versus substitution. $(2\frac{1}{2} + 2\frac{1}{2})$

Or

(b) Discuss the effect of substrate and leaving group in elimination reaction.

12. (a) Discuss the mechanism of Mannich reaction.

Or

(b) Explain the mechanism of Reformatsky reaction.

13. (a) What are nitrenes? How are they generated? Explain any one reaction of nitrenes?

Or

(b) Explain the mechanism of free radical substitution reaction.

14. (a) Explain Paterno-Buchi reactions.

Or

(b) Applying Frontier molecular orbital method (FMO) to Diels-Alder reaction.

15. (a) Explain the mechanism Dieckmann condensation.

Or

(b) Discuss the mechanism of Curtius rearrangement.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Discuss the mechanism of the following :

(a) E_1 reaction

(b) E_2 reaction

(c) E_1CB reaction (3 + 3 + 4)

17. Explain the mechanism of the following

(a) Dieckmann condensation

(b) Claisen ester condensation (5 + 5)

18. Explain the following :

(a) Wolff rearrangement

(b) Beckmann rearrangement (5 + 5)

19. Explain Norrish type I and type II reactions.

20. Write notes on the following :

(a) Photo sensitization

(b) Enantiotropic and diasterotopic ligands.

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D–1591	Sub. Code
	34423

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2023.

Second Semester

PHYSICAL CHEMISTRY — II

(CBCS 2018-2019 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

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

2. What is the Langmuir-Riedal mechanism?

3. What is mean by surfactant and give an example

4. What is mean by internal conversion?

5. What is mean by actinomer?

6. What is mean by photosynthesis?

7. Define the term colloids.

8. What is called thermally stable polymers?

9. Define emulsion polymerrisation.

10. Explain the photovoltaic cell.

PART B — (5 × 5 = 25 marks)

Answer ALL questions by 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 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 suspension polymerization.

Or

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

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

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

17. (a) Explain

(i) Surface excess (3)

(ii) Contact angle (3)

(b) Explain the quantum yield and its calculation method. (4)

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

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

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

(b) Explain the hydrogen evolution reaction. (5)

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D–1592

Sub. Code
34431

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2023

Third Semester

ADVANCED INORGANIC Chemistry

(CBCS 2018-19 Academic Year onwards)

Time : Three hours Maximum : 75 marks

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

Answer ALL questions.

1. Define the term stability constant.

2. Give one example for electron transfer reaction.

3. Write the term about 'Template Effect'.

4. Write any two selection rule for electronic transition in complexes.

5. Explain inverse spinels with example.

6. Give any two preparation methods of ferrocene

7. Write about 'itai-itai' diseases

8. Draw the structure of carboxy peptidase-A

9. What are non-heme iron proteins

10. What is meant by nitrogen fixation?

SECTION B — (5 × 5 = 25 marks)

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

11. (a) Write about substitution reactions in square planar complexes.

Or

(b) Determine the stability constant by spectrophotometric methods.

12. (a) Write notes on two set of Orgel energy level diagrams.

Or

(b) Discuss structure and bonding in polyhedral carboranes.

13. (a) Explain: Synthesis and structure of Olefin and acetylene complexes.

Or

(b) Write short notes on 'Metal-carbonyl complexes'.

14. (a) Discuss structure and functions of Hemoglobin.

Or

(b) Comment on fluxional molecules with suitable examples.

15. (a) Explain the reactivity, magnetic property and stability of ferrocene.

Or

(b) Write notes on

(i) Isomerisation and racemisation;

(ii) Isolobal anology

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

Answer any THREE questions

16. Explain the following

    (a) Chelate effect;

    (b) perovskite structure

    (c) Dewar-Chatt model

17. Draw Tanabe — sugano d^2 energy level diagram.

18. Describe about metal clusters.

19. Write notes on the following reaction mechanism with examples

    (a) Hydrogenation;

    (b) Ziegler-Natta polymerisation

20. Illustrate about 'Sodium ion pump'.

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D–1593

Sub. Code
34432

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2023

Third Semester

ADVANCED ORGANIC CHEMISTRY

(CBCS 2018-19 Academic Year onwards)

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Write any one method of converting ketones into esters.
2. State the significance of sodium borohydride
3. What is disconnection?
4. Draw the structure of benzopyrylium cation.
5. What are oligosaccharides?
6. What is C - terminal residue?
7. Write any two characters of enzymes.
8. What are nucleotides?
9. State the sources of vitamin A.
10. What are alkaloids?

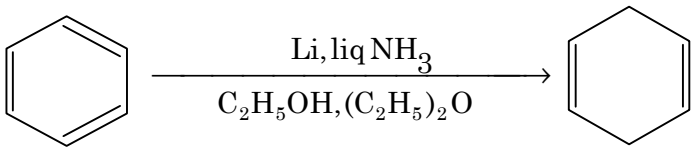
SECTION B — (5 × 5 = 25 marks)

Answer ALL questions, Choosing either (a) or (b)

11. (a) Discuss the role of PCC in the oxidation of alcohols.

Or

(b) Explain how the following conversion is made.



12. (a) Discuss about the masking of triple bonds.

Or

(b) Explain the significance of functional group-based strategies in retro synthesis.

13. (a) Discuss the conformation of cellobiose.

Or

(b) Explain the mechanism of co-enzymatic action.

14. (a) Explain the purpose of transcription.

Or

(b) Write note on biosynthesis of alkaloids.

15. (a) Explain the physiological function of ascorbic acid.

Or

(b) Discuss the position of double bond in the structure of cholesterol.

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

Answer any THREE questions

16. (a) Discuss the mechanism of Baeyer-Villiger oxidation reaction. (7)

(b) Write a short note on CBS reduction. (3)

17. Discuss in detail about one group and two group C-X disconnection. (10)

18. Explain in detail about Watson and Crick DNA Model. (10)

19. Explain the structure of zingiberene

20. Write note on biosynthesis of cholesterol. (10)

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D–1594

Sub. Code
34433

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2023.

Third Semester

SPECTROSCOPY – APPLICATIONS IN ORGANIC AND INORGANIC CHEMISTRY

(CBCS 2018-19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

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

Answer ALL questions.

1. Define the term auxochrome.

2. Give an example of UV-spectra of a diene.

3. What is Hook's law?

4. Explain the stretching vibrations in H_2O molecule.

5. How many NMR signals will be observed for

   (a) CH_3-O-CH_3

   (b) CH_3-CH_2-OH

6. What is the NMR standard and why it is used?

7. Define the Nitrogen rule.

8. What is Cotton effect?

9. Give any two applications of flame photometry.

10. Explain the principles of thermogravimetry.

SECTION B — ($5 \times 5 = 25$ marks)

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

11. (a) What are called charge transfer complex and explain with example?

Or

(b) What are called overtone? Explain with example.

12. (a) Discuss the application of IR spectroscopy in organic compounds.

Or

(b) What are called shift reagents? Explain their importance.

13. (a) What is mean by nuclear over hauser effect? Explain.

Or

(b) Write down the difference between NMR and ESR.

14. (a) Explain Mclafferty rearrangement with example.

Or

(b) Draw and explain the instrumentation part of Mass spectroscopy.

15. (a) Write the principle and applications of flame photometry.

Or

(b) Write about the principles and applications of turbidimetry.

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

Answer any THREE questions.

16. Write about the factors affecting position and intensity of absorption of UV-visible spectrum? Explain the solvent effects. (10)

17. Explain :

(a) Combination bands (3)

(b) Fermi resonance. (3)

(c) What are the factors affecting chemical shift value Explain. (4)

18. Write about the application of ESR spectroscopy in organic and inorganic compound analysis. (10)

19. Write about the application of ORD and CD curves. (10)

20. (a) Explain the principles of differential scanning calorimetry. (5)

(b) Explain the principles of Nephelometry (5)

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D–1595

Sub. Code
34441

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2023.

Fourth Semester

ANALYTICAL CHEMISTRY

(CBCS – 2018-19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. What types of errors are generally involved in analytical work?

2. What is mean by the term confidence limit?

3. What are ion selective electrodes? Give suitable examples.

4. Write the principle of cyclic voltametry.

5. Write any two advantages of chronopotentiometry over Polarography.

6. Define the term "Chromatography". How is it categorised?

7. Give the principle of GC – MS.

8. List out any two applications of HPLC.

9. What do you mean by electrophoresis? Mention its applications.

10. Point out any four methods used for the purification of chemicals.

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) What is mean by significant figures? Explain the general rules to determine significant figures and calculation involving significant figures.

Or

(b) Explain the following terms :

(i) Mean, Median average deviation and standard deviation

(ii) Regression analysis and correlation coefficient.

12. (a) Discuss the general principle, techniques and applications of Electrogravimetry.

Or

(b) What are the advantages of dropping Mercury electrodes? Give its applications.

13. (a) Draw and explain the instrumentation of Chronopotentiometry.

Or

(b) Explain the instrumentation, interpretation and applications of GC – MS.

14. (a) Discuss about injection system, column and detector in Gas chromatography.

Or

(b) Write down the theory and applications of ion-exchange chromatography.

15. (a) Explain the types of equipment employed for electrophoresis.

Or

(b) What do you mean by solvent extraction and sublimation? Explain with suitable examples.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. (a) Differentiate between Precision and Accuracy. (3)

(b) Discuss about various types of Errors. (7)

17. (a) Give the principle of coulometric analysis and AC polarography. (8)

(b) List out any two applications of polarography. (2)

18. Give a brief account on classification of chromatography.

19. Write the principle, types and Instrumentation of HPLC.

20. Explain the principles of

(a) Electrodialysis (4)

(b) Gel permeation chromatography and (3)

(c) Vacuum distillation. (3)

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D–1596

Sub. Code
34442

DISTANCE EDUCATION

M.Sc.(Chemistry) DEGREE EXAMINATION, MAY 2023.

Fourth Semester

APPLIED CHEMISTRY

(CBCS – 2018-19 Academic Year Onwards)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. What are hazardous materials?
2. Define anaerobic oxidation process.
3. Define crevice corrosion.
4. How the usage of pure metals controls corrosion?
5. State the need for electroplating an article
6. Write two limitations of electroless plating.
7. What are nano materials?
8. What is vacuum evaporation process?
9. Write a program to calculate the pH of a solution.
10. State the mode of information obtained from ACS website.

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Discuss about the functioning of alkaline batteries.

Or

(b) Write a note on radioactive pollution.

12. (a) Explain the process of hot dipping.

Or

(b) Discuss about the basics of bio corrosion.

13. (a) Discuss about any two types of anodizing bath.

Or

(b) Explain the procedure for alkali cleaning process.

14. (a) Discuss the basics of XRD analysis.

Or

(b) Explain about the sol-gel method for nano particle preparation.

15. (a) Write a program to calculate the standard deviation for a given data set of your choice.

Or

(b) Write a general note on MOOC's platform.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. (a) Discuss the working of H_2 and O_2 fuel cell. (7)

(b) Give a brief account on ozone layer depletion. (3)

17. Explain in detail about the mechanism of wet corrosion process. (10)

18. (a) Explain how the throwing power of a bath solution is determined. (6)

(b) Give a brief account on laser cladding. (4)

19. Write a note on :

(a) Solvothermal synthesis (5)

(b) Pulsed lase ablation method. (5)

20. List out the various information obtained from journal sites. (10)

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D–1597	Sub. Code
	34443

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2023.

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 questions.

1. Calculate the number of ways in which five identical bosons can be distributed in four state.

2. What are the draw backs of Einstein model of heat capacity of solids? How are they corrected in Debye's model?

3. State Onsager-reciprocal relationship.

4. Write the schrodinger equation for a diatomic molecule assumed as a rigid rotor and explain the terms in it.

5. What are symmetric and antisymmetric wave functions?

6. State Pauli's exclusion principle.

7. What is the need for approximation is quantum mechanics?

8. What are symmetric elements and symmetrics operation?

9. Identify the point group for the following

   (a) Biphenyl

   (b) P-dichlorobenzene.

10. State Bronsted catalytic law.

SECTION B — (5 × 5 = 25 marks)

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

11. (a) Derive the expression for translational partition function.

Or

   (b) Apply Fermi Dirac distribution law of photon gas and discuss its results.

12. (a) Set up and solve schrodinger wave equation for a diatomic molecule assuming as are dimensional harmonic oscillator.

Or

   (b) Apply HMO method to butadiene and explain its result.

13. (a) Construct the character table for H_2O molecule and explain the same.

Or

   (b) Discuss the electronic spectra of HCHO on the light of group theory.

14. (a) Discuss the effect of dielectri constant of solvent on reaction rate in solution.

Or

(b) Discuss the effect of pH and temperature as enzyme catalysed reactions.

15. (a) Explain Debyis model of heat capacity of solids.

Or

(b) Write the rules for forming a group.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. (a) Discuss the Bose- Einstein statistics and compare the same with Maxwell Boltzman.

(b) Derive an expression for rotational partition function. (5+5)

17. State the important postulates of variation principle and apply the same to hydrogen atom.

18. Apply group theory to find out the IR and Raman active vibrations of H_2O molecule.

19. (a) Discuss the influence of ionic strength on reaction in solution.

(b) Write an account on Bronsted–Bjerrum equation. (5+5)

20. Derive Michaleis-Menton equation and discuss the methods to verify it.

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