

D-5580

Sub. Code

34411

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, MAY 2022.

First Semester

Chemistry

INORGANIC CHEMISTRY – I

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Write the concept of hybridization.
2. Ionic radii of elements increase up to down in periodic table. Why?
3. What is the shapes of given polyatomic molecules?
 - (a) CO₂
 - (b) H₂O
4. Account the acid strength of oxy-acids?
5. Illustrate the structure of chain silicates, ortho silicates and meta silicates
6. Draw Schottky and Frenkel defects with examples.
7. Explain — Anderson structure

8. Differentiate Bronsted and Lewis acids
9. What are different types of solids examples
10. Why graphite differs from diamond.

PART B — (5 × 5 = 25 marks)

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

11. (a) Discuss about (i) Molecular orbitals, (ii) electronic configuration of homo nuclear and hetero nuclear diatomic molecules.

Or

- (b) Draw the MO energy level diagram of N₂ molecule. Discuss it in details.
12. (a) Give advantages and limitations of Bronsted concept.

Or

- (b) Discuss periodic trends in Bronsted acid and base.
13. (a) Discuss isopoly and heteropoly acids with example

Or

- (b) Illustrate the salient feature of Zeolites
14. (a) Write notes about band theory of solids

Or

- (b) How to calculate the packing voids and rule for radius ratio — Give its influence on structures with suitable example.

15. (a) Describe about Born-Haber cycle and its significance.

Or

- (b) Explain briefly the energy levels in homo-and hetero nuclear diatomic molecules for suitable example.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Explain the hybridization, geometry and shapes of the following molecules:
- (a) CH_4
 - (b) H_2O
 - (c) IF_7
 - (d) NH_3
17. Write notes about lattice energy and its calculations by Born-lande and Born-Meyer equations.
18. Discuss the principle, application and limitation of HSAB
19. What are the types of silicates? Give details for any five types of silicates with suitable example with structure.
20. (a) Write about HCP, FCC and BCC the types of solids.
(b) Discuss: Ionic structure for AX, AX₂, AX₃ types with suitable examples.
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D-5581

Sub. Code

34412

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2022.

First Semester

ORGANIC CHEMISTRY – I

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours

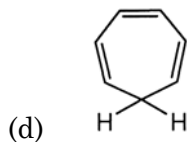
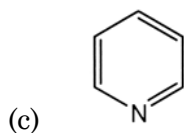
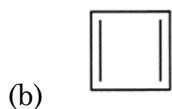
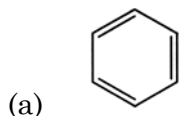
Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

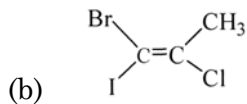
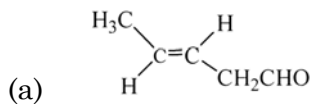
1. Draw the structure of (a) Bicyclo [4.1.0] heptane
(b) bicycle [4.4.0] decane.

2. Use the Huckel rule to indicate whether the following planar species are Aromatic or Non aromatic.



3. Differentiate between Enantiomers and diastereomers.

4. Assign E and Z nomenclature to the following compounds.



5. Explain with example the driving force behind Pinacol-Pinacolone rearrangement.
6. Arrange the following carbocation in increasing order of stability; Primary, Secondary, Tertiary and Methyl.
7. What is chirality? Give example.
8. What is Friedel-Crafts acylation? Explain with suitable example?
9. What kind of reaction between diazonium compound with a phenol?
10. Write Von-Richter reaction.

PART B — (5 × 5 = 25 marks)

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

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

Or

- (b) What is Huckel molecular orbital theory of aromaticity? Explain.

12. (a) Write short note on optical activity of biphenyls.

Or

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

13. (a) Sketch the mechanism of Favorskii rearrangement.

Or

- (b) Write a note on stereo chemistry of ansa compounds.

14. (a) Describe the Gattermann Koch formylation.

Or

(b) Discuss benzyne mechanism.

15. (a) Briefly discuss the S_E1 Mechanism.

Or

(b) Write a note on Erythro and Threo isomers.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Explain the term Aromatic, non—aromatic and antiaromatic.

17. Write short note on optical activity of allenes and spiranes.

18. Discuss the mechanism of Wagner-Meerwein and Beckmann rearrangement.

19. What are S_N1 and S_N2 reaction? Give mechanism of each type of reaction.

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. DEGREE EXAMINATION, MAY 2022.

First Semester

Chemistry

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. Define the term entropy.
2. Differentiate Gibbs and Helmholtz free energy.
3. What is meant by transport number?
4. What is hydrogen over voltage ? How is it measured?
5. Show that the function $\psi = 8e^{4x}$ is an eigen function of the operator d/dx . what is the eigen value?
6. State and explain Photoelectric effect.
7. State the principle of microscopic reversibility.
8. What are parallel, consecutive and opposing reactions?

9. What are the limitations of collision theory?
10. State zeroth law of thermodynamics.

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) What are the needs for second law of thermodynamics? State the different forms of second law of thermodynamics.

Or

- (b) Derive Gibbs-Helmholtz equation and write its significance.

12. (a) Describe the applications of conductivity measurements.

Or

- (b) List out the different types of electrodes and explain each of them by providing an example.

13. (a) Discuss the important postulates of quantum mechanics.

Or

- (b) Show that the functions $\sin(\pi x/a)$ and $\cos(\pi x/a)$ are orthogonal over the interval $0 < x < a$.

14. (a) Give a comparative account of absolute reaction rate theory and collision theory.

Or

- (b) Discuss the kinetics of Lindemann theory of unimolecular reaction.

15. (a) Derive Nernst equation for electrode potential.

Or

(b) State the third law of thermodynamics and explain apparent exceptions to it.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions

16. What are activity and activity coefficient? How is mean ionic activity coefficient of an electrolyte determined?
17. Derive Butler-Volmer equation and discuss how is it reduced to Tafel equation.
18. Set up and solve Schrodinger equation for a particle in a three dimensional box.
19. What are fast reactions? How are they studied using continuous flow method?
20. Discuss Debye-Huckel theory of strong electrolyte and explain how is it validated and also provide the modification made in the equation.
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D-5583

Sub. Code

34421

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2022.

Second Semester

INORGANIC CHEMISTRY – II

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Give the systematic name of $K_4Fe(CN)_6$ and $Na_2[Ni(CN)_4]$.
2. Calculate the CFSE for low spin d^4 complex.
3. Point out limitations of VB theory.
4. Define half life period.
5. What are isobars?
6. List out any two characteristics of nuclear force.
7. What is meant by nuclear spallation?
8. Give a brief note on synchrotron.
9. Write the electronic configuration of californium and curium.
10. What is meant by actinide contraction?

PART B — (5 × 5 = 25 marks)

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

11. (a) Give the comparison of valence bond theory and crystal field theory.

Or

- (b) Show optical isomerism in coordination complexes with suitable examples.

12. (a) Describe the factors that affect nuclear stability.

Or

- (b) Give a detailed note on cyclotron.

13. (a) Explain the different types of artificial radioactivity.

Or

- (b) Illustrate neutron activation analysis.

14. (a) Outline the causes and consequences of Lanthanide Contraction.

Or

- (b) List out the uses of lanthanides and actinides.

15. (a) Determine the number of alpha and beta particles emitted, when ${}_{92}\text{U}^{238}$ changes into radioactive ${}_{82}\text{Pb}^{206}$.

Or

- (b) Write a note on; (i) Isobar (ii) Q value. (2+3)

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. (a) Calculate the crystal field stabilization energy in terms of Dq for $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{FeCl}_6]^{3-}$ ions. (5)
(b) Describe the MO theory of octahedral complexes. (5)
17. Express any two methods for the detection and measurement of radio activity.
18. Compare and contrast the salient features of Nuclear Fusion and Nuclear Fission
19. (a) Explain the magnetic properties of actinides. (5)
(b) Calculate the μ_{eff} for $\text{K}_4[\text{Fe}(\text{CN})_6]$ and $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$. (5)
20. How are Lanthanides separated by the following methods?
(a) Fractional crystallization
(b) Solvent extraction
(c) Selective oxidation and reduction. (3+4+3)
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D-5584

Sub. Code

34422

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, MAY 2022.

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. Define Chemoselectivity.
2. Write barton reaction.
3. How are free radical formed?
4. Tri ethyl ammine is a weaker base than diethyl amine why?
5. Show that Bredts rule is usefull in identiying the correct structure for α -pinene.
6. What is Darzen reaction.
7. Formulating the following:
Zingiberene+ Acetyleneicarboxylate \rightarrow ?
8. Addition of Grignard reagents.

9. Confirmational analysis of cyclic and acyclic systems.
10. Define photo sensitization.

PART B — (5 × 5 = 25 marks)

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

11. (a) Explain (1,3) dipolar addition reaction

Or

- (b) Diels's alder reaction

12. (a) Explain the conformation analysis of decalin.

Or

- (b) Write notes on di-pi methane rearrangement

13. (a) Mechanism of aldol condensation.

Or

- (b) Explain n-butane, cyclohexane and its derivatives.

14. (a) Explain photo oxidation and photo reduction reaction.

Or

- (b) Photochemical reaction of olefins.

15. (a) Account for the products formed when $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$ is subjected to dehydration.

Or

- (b) Narrate the stereo chemistry of electrophilic and free radical addition of HBr to alkanes.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Sketch the mechanism for Hoffmann and Gomberg rearrangements.
 17. (a) Explain Frontier molecular orbital theory.
(b) Knoevenagel reaction and Benzoin condensation.
 18. Explain perturbation theory.
 19. Explain
 - (a) Curtius reaction;
 - (b) Beckmann rearrangement
 - (c) Pschorr and Hunsdiecker reaction.
 20. Explain photochemical reaction of olefins.
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D-5585

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34423

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, MAY 2022.

Second Semester

Chemistry

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. What are adsorbents?
2. What are detergents?
3. What is photo sensitization?
4. Define phosphorescence.
5. What are polymers?
6. Identify the functionality of ethylene and amino acids.
7. Define degree of polymerization.
8. What is Tyndall effect?
9. What is primary salt effect?
10. What are acid — base catalysts?

PART B — (5 × 5 = 25 marks)

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

11. (a) Explain the theory of contact angle study.

Or

- (b) Write the differences between physisorption and chemisorption.

12. (a) Discuss the working principle of uranyl oxalate actinometer.

Or

- (b) Write a note on flash photolysis.

13. (a) Write the characteristic features of stepwise polymers.

Or

- (b) Write a note on emulsion polymerization.

14. (a) Explain the viscometric method of determining molecular mass of a polymer.

Or

- (b) Write the differences between addition and condensation polymerization.

15. (a) Write a note on conducting polymers.

Or

- (b) Explain how the charge on the colloid is determined by electrophoretic method.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Discuss in detail about B.E.T adsorption isotherm.
 17. Explain the mechanism of radiolysis of water.
 18. Discuss the mechanism of free radical and cationic polymerization.
 19. Discuss the principle of solar water splitting
 20. Write a note on
 - (a) Formation of micelles using surfactants (5 Marks)
 - (b) Hydrogen — Chlorine reaction (5 Marks)
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D-5586

Sub. Code

34431

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, MAY 2022.

Third Semester

Chemistry

ADVANCED INORGANIC CHEMISTRY

(CBCS 2018 – 2019 Academic year onwards)

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Explain chelate effect.
2. What are labile complexes? Give an example.
3. Define the term trans effect.
4. What are cages? Give an example.
5. Illustrate Styx notation.
6. What is fluxional molecule?
7. What is Ziegler–Natta catalyst?
8. How is ferrocene prepared?
9. Draw the structure of Vitamin B₁₂.
10. What is HIPIP?

SECTION B — (5 × 5 = 25 marks)

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

11. (a) Illustrate tunneling mechanism of electron transfer reactions.

Or

- (b) How are cis and trans $[Pt(NH_3)_2Cl_2]$ synthesized using trans effect?

12. (a) What are spinels? How are they classified? Give examples.

Or

- (b) Explain the structure and bonding in boranes.

13. (a) Give the mechanism involved in the Zeigler-Natta polymerisation of propylene.

Or

- (b) Explain hydrogenation of alkene using Wilkinson catalyst.

14. (a) With a schematic diagram explain how nitrogenase enzyme converts nitrogen from air into ammonia.

Or

- (b) Explain the structure and functions of cytochrome.

15. (a) Explicate outer sphere electron transfer reaction with suitable example.

Or

- (b) Deduce the term symbols for Cr^{3+} and Ni^{2+} .

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Discuss the determination of stability constant of coordination complexes using spectrophotometric method.
17. Give a detailed note on metal cluster.
18. Write a note on :
- (a) Hydroformylation
 - (b) Metal carbonyls. (5+5)
19. Enumerate the structure and applications of enzymes and coenzymes.
20. (a) Outline the Tanabe-Sugano diagram for $[Ni(H_2O)_6]^{2+}$. (6)
- (b) Explain the structure and biological activities of chlorophyll. (4)
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D-5587

Sub. Code

34432

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, MAY 2022.

Third Semester

Chemistry

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. What is Woodward method of hydroxylation?
2. What is Birch reduction? Give example.
3. Write any two applications of O_sO_4 .
4. Define the terms synthetic equivalent of the synthon.
5. What are called blocking groups in organic synthesis?
6. Give any one method of preparation of imidazole.
7. What are nucleic acids? Give examples.
8. Draw the structure of starch.
9. How will you establish the position of hydroxyl group in cholesterol?
10. Sketch the structure of riboflavin.

SECTION B — (5 × 5 = 25 marks)

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

11. (a) Illustrate sharpless asymmetric epoxidation with suitable examples.

Or

- (b) Explain the Baeyer villiger oxidation of acetone and cyclohexanone.

12. (a) Explain the synthesis and reactions of oxazole.

Or

- (b) Outline the steps involved in Fischer–indole synthesis.

13. (a) What are proteins? How are they classified?

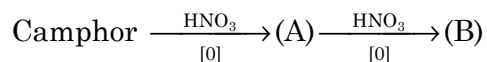
Or

- (b) Bring out the differences between RNA and DNA.

14. (a) Give the synthesis of zingiberene.

Or

- (b) Complete the following reaction; predict the product 'A' and 'B'



15. (a) Hydroxylation of cis-2-butene using $\text{I}_2/\text{CH}_3\text{COOAg}/\text{H}_2\text{O}$ gives cis-hydroxylated product but in dry $\text{I}_2/\text{CH}_3\text{COOAg}$, it gives trans hydroxylated product. Explain with a suitable mechanism.

Or

- (b) Explain chemo and regio selective protection and deprotection in organic synthesis.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Give an account of,
- (a) Homogeneous hydrogenation using Wilkinson catalyst
 - (b) Reduction using Lithium aluminium hydride
 - (c) Oxidation of alcohols by oxides of Cr. (5+3+2)
17. (a) Illustrate the protection and deprotection in organic synthesis. (6)
- (b) Do a retro synthetic analysis on 2-methylcyclopentanone. (4)
18. Write a note on :
- (a) Replication of DNA
 - (b) N-terminal amino acid analysis. (5+5)
19. Outline the synthesis of progesterone.
20. (a) Write a note on secondary structure of proteins. (4)
- (b) Outline the synthesis of α -pinene. (6)
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D-5588

Sub. Code

34433

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION, MAY 2022.

Third Semester

SPECTROSCOPY APPLICATIONS IN ORGANIC AND
INORGANIC CHEMISTRY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Predict the λ_{\max} of the compound $\text{CH}_3\text{COCH}=\text{C}(\text{CH}_3)\text{-CH}=\text{CH}_2$.
2. What are overtones?
3. State Hook's law.
4. ^{13}C is NMR active while ^{12}C is not. Explain.
5. Give any two shift reagents.
6. What is McLafferty rearrangement?
7. Sketch the expected PMR spectra of $\text{CH}_2\text{Br-CH}_2\text{Br}$ taking TMS as the standard reference.
8. Define the term circular birefringence.
9. Illustrate the principle of thermogravimetry.
10. Point out any two applications of flame photometry.

PART B — (5 × 5 = 25 marks)

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

11. (a) Describe the types of electronic excitation in organic molecules.

Or

- (b) Write a note on charge transfer complexes.

12. (a) Write note on the importance of NOE phenomenon in ^1H NMR spectroscopy.

Or

- (b) Illustrate spin-spin coupling with suitable examples.

13. (a) State and explain octant rule.

Or

- (b) Explain the following in mass spectroscopy:

(i) Nitrogen rule

(ii) Metastable ion. (3+2)

14. (a) Write a note on thermometric titration.

Or

- (b) Sketch and explain the DTA curve for the decomposition of calcium oxalate monohydrate.

15. (a) Give a brief account on Fermi resonance.

Or

- (b) Bring out the differences between first order and non first order NMR spectra.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. What are characteristic absorption frequencies of various functional groups? Illustrate the effect of conjugation and bond angle on absorption frequencies.
 17. Define the term chemical shift. Describe the factors affecting the chemical shift value.
 18. (a) Illustrate the types of cotton effect curves. (5)
(b) Give a comparative account on ESR and NMR. (5)
 19. Describe the principle and instrumentation of nephelometry.
 20. (a) Explain the principle of ^{13}C spectroscopy. (5)
(b) What is DSC? Enumerate the principle of DSC. (5)
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D-5589

Sub. Code

34441

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, MAY 2022.

Fourth Semester

Chemistry

ANALYTICAL CHEMISTRY

(CBCS 2018 – 19 Academic Year Onwards)

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What is regression analysis?
2. How many significant figures are there in the following?
 - (a) 4.050×10^{-2}
 - (b) 0.00149
3. Why is dropping mercury electrode used in polarography?
4. Define the term decomposition potential.
5. State the principle of coulometric method.
6. Write the advantages of TLC.
7. Mention any two applications of GC.

8. Point out the different types of detectors used in HPLC.
9. What are anion exchange resins? Give examples.
10. What is electro dialysis?

SECTION B — (5 × 5 = 25 marks)

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

11. (a) Explain (i) Systematic error (ii) Relative error.
(2.5+2.5)

Or

- (b) Write briefly about correlation coefficient.

12. (a) Discuss briefly the polarography technique.

Or

- (b) Explain the principle involved in acid-base type potentiometric titration.

13. (a) Give an account of ion-selective electrodes.

Or

- (b) Discuss the instrumentation of chronopotentiometry.

14. (a) Discuss the principle and instrumentation of GC.

Or

- (b) Describe the principle and working of paper chromatography.

15. (a) Write short note on solvent extraction.

Or

- (b) Write briefly about vacuum distillation.

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

Answer any THREE questions

16. (a) How is standard deviation calculated for a set of data? Explain its importance.
(b) Write the rules to determine significant figures. (6+4)
17. Describe the principle and instrumentation of cyclic voltammetry.
18. Discuss the principle and applications of GC-MS.
19. Describe the principle and instrumentation of HPLC.
20. Explain the following:
(a) Ion-exchange chromatography
(b) Electrophoresis (6+4)
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Sub. Code

34442

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, MAY 2022.

Fourth Semester

Chemistry

APPLIED CHEMISTRY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What is mean by radioactive pollution?
2. What is mean by a supercapacitor?
3. What are general forms of corrosion?
4. Give the account of current efficiency of a bath.
5. What is mean by composite coating?
6. Define electroless plating.
7. Define electrochemical energy conversion.
8. What are microscopic methods of nanomaterial characterization?
9. Explain the online course NPTEL.
10. What is mean by chemistry database?

SECTION B — (5 × 5 = 25 marks)

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

11. (a) What is called land pollution and explain their ill effects.

Or

- (b) Write about the secondary methods of wastewater treatment.

12. (a) Give an account of electrochemical method of corrosion rate measurement.

Or

- (b) Write about the mechanism of corrosion inhibitors.

13. (a) Give an account of surface preparation for electroplating.

Or

- (b) Write about the cladding and vapour deposition.

14. (a) Give an account of composite coating and their principles.

Or

- (b) Write about the colouring of anodizing aluminium.

15. (a) Write about the CVD method of nanomaterial preparation.

Or

- (b) Write about the AFM and SEM methods of nanomaterial characterization.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Write about the principles of electrochemical energy conversion with examples.
 17. Write about the hazardous materials and their ill effects.
 18. Write about the general classification of corrosion control methods.
 19. Write about the alloy plating of Brass and Brush plating.
 20. (a) Explain the vacuum evaporation method for nanomaterial preparation. (5)
(b) Explain the XPS methods of nanomaterial characterization. (5)
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D-5591

Sub. Code

34443

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION, MAY 2022.

Fourth Semester

Chemistry

ADVANCED PHYSICAL CHEMISTRY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define partition function of a molecule.
2. Calculate the translational partition function of CH₄ at 25°C in a volume of one liter.
3. Mention the Hamiltonian operator and the zero point energy of simple harmonic oscillator.
4. State Pauli Exclusion Principle.
5. Write the Schrodinger wave function of rigid rotor.
6. What are bosons?
7. What is meant by irreducible representation?
8. Assign the point group for benzene and allene.
9. Write Taft equation.
10. What is Lineweaver- Burke equation?

PART B — (5 × 5 = 25 marks)

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

11. (a) Construct the character table for C_{3v} point group

Or

- (b) Deduce the symmetry selection rule for electronic transition in ethylene molecule.

12. (a) Briefly explain negative absolute temperature.

Or

- (b) Arrive an expressions for equilibrium constant in terms of partition functions.

13. (a) Discuss the application of perturbation method to solve helium atom problem.

Or

- (b) Solve the Schrodinger wave equation for energy and wave function in one dimensional simple harmonic oscillator.

14. (a) Explain the effect of solvent on the reaction between ion and ion.

Or

- (b) Illustrate Zucker-Hammett hypothesis in acid-base catalysis.

15. (a) Define: Group. Illustrate the rules for forming a group.

Or

- (b) Discuss the following:

(i) Micro canonical ensembles

(ii) Macro canonical ensembles

(3+2)

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Derive an expression for Bose—Einstein statistics.
 17. Confer the application of HMO method for solving different energy levels present in butadiene system
 18. Write a note on;
 - (a) Great orthogonality theorem.
 - (b) Matrix representation of symmetry operation. (5+5)
 19. What is meant by enzyme catalysis? Derive Michaelis-Menton equation.
 20. (a) Discuss the solution of Schrodinger wave equation for hydrogen atom. (6)
(b) Give a brief account on effect of substituent's on reaction rate. (4)
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