

D-6914

Sub. Code

34411

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

First Semester

INORGANIC CHEMISTRY — I

(CBCS 2018-19 Academic Year onwards)

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What is meant by dsp² hybridisation? Give one example.
2. O₂ is paramagnetic in character. Why?
3. What are sigma and Pi-bonds?
4. Write down the limitations of Bronsted concept of acids and bases.
5. What is meant by Lewis acid and Lewis base? Give suitable examples.
6. What are isopoly acids? Give two examples.
7. What are ortho and meta silicates?
8. What is feldspar?

9. Write down the differences between conductors and insulators.
10. What is meant by Frenkel defect?

SECTION B — (5 × 5 = 25 marks)

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

11. (a) Discuss the hybridisation and shape of NH_3 and H_2O molecules.

Or

- (b) Discuss the concept of multicentre bonding with suitable example.
12. (a) Give the MO energy level diagram of F_2 molecule. Calculate its bond order and find out its magnetic property based on MO approach.

Or

- (b) How is the lattice energy determined by Born-Haber cycle?
13. (a) Write a note on the relative order of acid strength of boron halides.

Or

- (b) What is buffer solution? How is it classified? Explain them with suitable examples.
14. (a) Discuss briefly the structure of three dimensional silicates with suitable examples.

Or

- (b) What are zeolites? Explain briefly their structure.

15. (a) What is meant by radius ratio rule? Discuss briefly its influence on structures.

Or

- (b) Discuss briefly the crystal structure of CsCl.

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

Answer any THREE questions.

16. Based on VSEPR theory, discuss the geometry of XeF_2 , XeF_4 and XeF_6 .
17. Derive the Born-Landé equation for the lattice energy of an ionic compound.
18. State HSAB principle and explain with suitable examples. Write down its applications and limitations.
19. Explain briefly the structure of the following heteropoly anions:
- (a) 12 – tungstophosphate anion
- (b) 6 – molybdotellurate anion. (5+5)
20. (a) Discuss briefly the band theory of solids.
- (b) Describe briefly the crystal structure of ZnS. (5+5)

D-6915

Sub. Code

34412

DISTANCE EDUCATION
M.Sc. (Chemistry) DEGREE EXAMINATION.
MAY 2021 EXAMINATION
&
MAY 2020 ARREAR EXAMINATION
First Semester
ORGANIC CHEMISTRY – I
(CBCS 2018–19 Academic Year onwards)

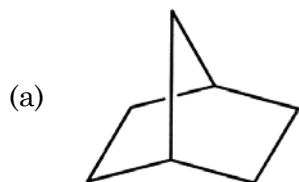
Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

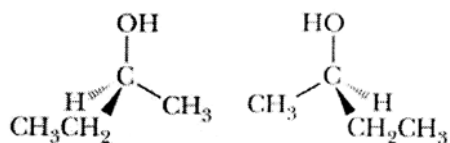
Answer ALL questions.

1. Predict the name of the following bicyclic compounds:



2. What are enantiomers?

3. Designate the R/S configuration for of the following organic compounds:



4. What is meant by primary kinetic isotopic effects?
5. Which carbocation is more stable? Why?
6. What is ortho para ratio?
7. Which type of alkyl halides undergo S_N¹ and S_N² mechanism?
8. What is homoaromaticity? Give example.
9. State the principle of microscopic reversibility.
10. What is meant by inductive effect?

PART B — (5 × 5 = 25 marks)

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

11. (a) Explain the term aromaticity with examples.

Or

- (b) Discuss the aromatic character of annulene.

12. (a) Differentiate conformation and configuration.

Or

- (b) Explain the optical activity of tartaric acid.

13. (a) State Hammond postulate and explain it.

Or

(b) Sketch the mechanism of pinacol-pinacolone rearrangement.

14. (a) Sketch the mechanism of SN^1 reaction.

Or

(b) Sketch the mechanism of nitration of benzene.

15. (a) Sketch the mechanism of Wagner -Meerwin rearrangement.

Or

(b) Discuss hyperconjugation and mesomeric effects with examples.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions

16. Discuss the aromaticity of azulene and tropylium cations.

17. Explain briefly the optical activity of biphenyls.

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

19. Sketch the mechanism for Beckmann rearrangement and benzyne mechanism.

20. Explain the neighbouring group participation of σ electrons.

D-6916

Sub. Code

34413

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

First Semester

Chemistry

PHYSICAL CHEMISTRY-I

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Give the statement of zeroth law of thermodynamics.
2. What is fugacity?
3. Define the term activity.
4. What is transport number?
5. Define calomal electrode.
6. What is photo electric effect.
7. Draw the energy level diagram of a particle in 1-D box.

8. What are fast reactions.
9. Define explosive reaction.
10. State Steady state approximation.

PART B — (5 × 5 = 25 marks)

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

11. (a) How will you determine mean activity co-efficient of electrolytes.

Or

- (b) Define and differentiate: Gibb's free energy and Helmholtz free energy.

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

Or

- (b) Derive Butler- Volmer equation.

13. (a) Explain the terms eigen value and eigen function.

Or

- (b) Discuss the character of wave particle dualism.

14. (a) Give the basic idea of kinetic isotopic effect.

Or

- (b) Write the application of flow techniques in the study fast reactions.

15. (a) State and explain Heisenberg's uncertainty principle.

Or

- (b) Write Debye Huckel theory of interionic attraction.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Draw Carnot's cycle. Explain the process involved in it.
17. What is over voltage? How is it determined?
18. Set up schrodinger wave equation for a particle in a three dimensional box-solve the equation to get the wave function.
19. Discuss the theory of absolute reaction rates. Compare this theory with collision theory.
20. Explain the following:
- (a) Nernst heat theorem (3)
 - (b) Quantum mechanical operators (3)
 - (c) Slater theory (4)

D-6917

Sub. Code

34421

DISTANCE EDUCATION
M.Sc. DEGREE EXAMINATION.
MAY 2021 EXAMINATION
&
MAY 2020 ARREAR EXAMINATION
Second Semester
Chemistry
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. What is spectrochemical series? Give its importance.
2. Mention any two limitations of valence bond theory.
3. What are ferro and antiferro magnetisms?
4. Which of the following complex has larger crystal field splitting?
(a) $[Co(CN)_6]^{3-}$ or $[Co(NH_3)_6]^{3+}$
(b) $[Co(H_2O)_6]^{2+}$ or $[Co(H_2O)_6]^{3+}$
5. What is meant by nuclear isomerism? Give one example.
6. What is meant by ^{14}C dating?

7. What is the importance of Geiger-Muller counter?
8. What are actinides?
9. $[CoF_6]^{3-}$ is paramagnetic but $[Co(NH_3)_6]^{3-}$ is diamagnetic. Why?
10. Give the electronic configuration of Gd^{3+} and Lu^{3+} .

PART B — (5 × 5 = 25 marks)

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

11. (a) What is optical isomerism? Discuss briefly the optical isomerism exhibited by the octahedral complexes.

Or

- (b) Discuss briefly the splitting of d-orbitals in tetrahedral complexes.

12. (a) What is meant by crystal field stabilization energy? Calculate its value in the d^5 low spin octahedral and d^5 high spin octahedral systems.

Or

- (b) Discuss the various factors which affect the $10Dq$.

13. (a) What is meant by Q value? Explain briefly the importance of this value.

Or

- (b) Discuss briefly the working of synchrotron. Write down its uses.

14. (a) Discuss briefly the principle of isotopic dilution analysis.

Or

- (b) What is radioactive decay? Discuss any one theory of radioactive decay process.
15. (a) Explain briefly the spectral and magnetic properties of lanthanides.

Or

- (b) Discuss briefly how the lanthanides are separated by fractional crystallization.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. What is crystal field theory? How does it differ from the valence bond theory? Describe the bonding in $[Fe(H_2O)_6]^{3+}$ and $[Fe(CN)_6]^{3-}$ in terms of valence bond theory and crystal field theory.
17. Discuss briefly the sigma and pi metal-ligand bonding in transition metal complexes with reference to tetrahedral transition metal complexes.
18. (a) Explain briefly the shell model for nuclear structure. (5)
- (b) Discuss the basic principle of neutron activation analysis in detail. (5)
19. What are nuclear reactions? Explain briefly any three nuclear reactions with suitable examples.

20. (a) How are lanthanides separated by selective reduction and oxidation method? (5)
- (b) Discuss briefly the position of lanthanides and actinides in the periodic table. (5)
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D-6918

Sub. Code

34422

DISTANCE EDUCATION
M.Sc. DEGREE EXAMINATION.
MAY 2021 EXAMINATION
&
MAY 2020 ARREAR EXAMINATION
Second Semester
Chemistry
ORGANIC CHEMISTRY – II
(CBCS 2018–19 Academic Year onwards)

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Explain Bredt's rule with an example.
2. Complete the following reaction and give reason for your answer:
 $\text{CH}_2 = \text{CH} - \text{OMe} + \text{HBr} \rightarrow ?$
3. Draw all the possible conformers of 1, 2 -dichloroethane and 1, 1, 2, 2, -tetra bromoethane and also mention the stable conformer among them.
4. Why does cyanide ion behave as specific catalyst for benzoin condensation?
5. How would you generate nitrene?

6. Write a note on ullmann reacting.
7. Define Triplet excited state.
8. Explain Diels Alder reaction with suitable example.
9. What is sigmatropic rearrangement? Explain with an example.
10. What is curtius rearrangement?

SECTION B — (5 × 5 = 25 marks)

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

11. (a) Explain Saytzeff rule with suitable example.

Or

- (b) Addition of HBr to an unsymmetrical Olefin is a regiospecific reaction – Explain.

12. (a) What is hydroboration? Discuss the mechanism of hydroboration reaction.

Or

- (b) Write the mechanism for the following reaction.

- (i) Cannizzaro reaction
- (ii) Claisen ester-condensation

13. (a) Discuss the important chemical properties of carbene.

Or

- (b) Discuss briefly about the following reactions

- (i) Barton
- (ii) Pschorr

14. (a) What is Cyclo addition reaction? Explain cyclo addition reaction by FMO approach. (2+2)

Or

- (b) Write note on photochemical reaction of olefine.

15. (a) (i) Describe the structure of carbene.
(ii) Explain retrograde aldol condensation.

Or

- (b) Compare elimination and substitution reactions.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions

16. Discuss the effect of substrate, leaving group and reaction medium in E1 and E2 reactions.
17. (a) Give the synthetic importance of Michael addition.
(b) Give the synthetic importance of Lithium diethylcuprate.
18. Explain the stability of free radical.
19. (a) Explain Norrish type-II reaction with suitable example.
(b) Write a note on sensitization and Quenching.
20. How would you generate free radicals? And also list out identification test for free radical.

D-6919

Sub. Code

34423

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

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 the questions.

1. What is adsorption? Define the terms adsorbent and adsorbate.
2. What is adsorption isotherm?
3. What are surfactants? Give example.
4. Define fluorescence.
5. What is hydrated electron?
6. Explain chemiluminescence.
7. Define the term polymerization.
8. What are the initiators that are used in free radical polymerization?

9. Write any two major differences between a molecular solution and suspension.
10. Define photovoltaic effect.

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Derive the Langmuir adsorption isotherm. What are the limitations of it?

Or

- (b) Differentiate chemisorption and physisorption.

12. (a) Derive Gibbs adsorption isotherm.

Or

- (b) Define quantum yield. How can it be experimentally determined?

13. (a) Briefly discuss the flash photolysis.

Or

- (b) Discuss the radiolysis of water.

14. (a) Explain the classification of polymers with examples.

Or

- (b) Discuss the mechanism of anionic polymerization.

15. (a) Explain the electrokinetic properties of colloids.

Or

- (b) What are conducting polymers? Give their applications.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Derive the Freundlich adsorption isotherm. What are the assumptions made by him?
17. (a) Discuss the behavior of Langmuir adsorption isotherm at very low and very high pressures.
(b) What are dendrimers? Give their applications. (5 + 5)
18. Explain the following:
(a) Photochemical decomposition of carbonyl compounds.
(b) Photosensitization. (6 + 4)
19. Discuss the principles of various polymerization techniques.
20. Write short notes on:
(a) Artificial photosynthesis and
(b) Fire retardants. (6 + 4)
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D-6920

Sub. Code

34431

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Third Semester

ADVANCED INORGANIC CHEMISTRY

(CBCS 2018-2019 Academic Year onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What is anation reaction? Give an example.
2. What is meant by template effect?
3. What are cage compounds? Give one example.
4. What happens when ferrocene reacts with CH_3CoCl in presence of Lewis acid?
5. What are carboranes? Give one example.
6. Give any one preparation of metal nitrosyls.
7. What is meant by reductive elimination?
8. Name any two examples for copper containing enzymes.

9. What is meant by fixation of nitrogen?
10. Give the importance of sodium ion pump.

PART B — (5 × 5 = 25 marks)

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

11. (a) How is stability constant determined by pH metric method?

Or

- (b) Discuss briefly the mechanism of inner sphere process.

12. (a) Discuss the significance of trans effect with suitable example.

Or

- (b) Discuss briefly the steps involved to find out the structure of boranes using Wade's rule.

13. (a) Draw the Orgel diagram for the complex $[\text{Co}(\text{NH}_3)_6]^{2+}$ and explain briefly.

Or

- (b) Discuss briefly the structure of $[\text{Re}_2\text{Cl}_8]^{2-}$ cluster.

14. (a) Discuss briefly the bonding in olefins.

Or

- (b) What are fluxional molecules? Explain with suitable example.

15. (a) Discuss the structure and functions of ferridoxins.

Or

- (b) Explain any five chelating agents used in medicine with their functions.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. What is meant by base hydrolysis? Discuss the mechanism involved in base hydrolysis reaction and give the evidences for $SN1CB$ mechanism.
17. (a) What are the selection rules for the electronic spectra of co-ordination compounds? Explain them. (5)
- (b) What are spinels? Explain the structure of normal and inverse spinels. (5)
18. What are metal carbonyls? How are they synthesized? Discuss the structure of metal carbonyls in details.
19. (a) Explain briefly the Zeigler-Natta polymerization with mechanism. (6)
- (b) What is meant by hydroformylation? Explain with suitable example and the mechanism. (4)
20. Discuss briefly the structure and function of hemoglobin with the mechanism.
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D-6921

Sub. Code

34432

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Third Semester

ADVANCED ORGANIC CHEMISTRY

(CBCS 2018-19 Academic Year onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Write the advantages of Wilkinson catalyst.
2. What is Fermi's salt?
3. Define Birch reduction.
4. What is Adam's catalyst?
5. What are synthetic equivalents?
6. Define the term protecting group.
7. What are proteins?
8. Define co-enzyme.
9. Write the chemical name and structure of Vitamins A and K.
10. Draw the structure of cholesterol and Zingiberene.

PART B — (5 × 5 = 25 marks)

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

11. (a) What is Prevost reaction? Write Woodward modification of Prevost reaction.

Or

- (b) Write the mechanism of Bayer Villiger Oxidation.

12. (a) With a suitable example, discuss chemoselective reaction.

Or

- (b) Discuss the mechanism of Wacker's process.

13. (a) Give an account of selective protection of NH₂ group in peptide synthesis.

Or

- (b) Explain the structure of oxazole.

14. (a) Discuss the end group analysis of protein.

Or

- (b) Draw and explain the structure of starch molecule.

15. (a) Write the Bio-synthesis of terpenes.

Or

- (b) Give the synthesis of progesterone.

PART C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Write the synthetic applications of the following reagents.

(a) LiBH₄

(b) DIBAL – H.

17. Give the mechanism of the following process :
- (a) Acyloin formation
 - (b) Pinacol formation.
18. (a) Discuss one group C-X disconnections with suitable examples.
- (b) What is regio-selectivity? Discuss with an example.
19. Describe the structure of DNA and RNA.
20. Give a detailed study of structural elucidation of Atropine.
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D-6922

Sub. Code

34433

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Third Semester

Chemistry

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. State Beer-Lambert's law.
2. Define Hook's law.
3. What is overtone? Explain.
4. What are shift reagents?
5. Define chemical shift.
6. What are the advantages of tetramethyl silane as internal standard in NMR spectroscopy?

7. How will you characterise a primary amine by means of a mass spectrum?
8. Define isotropic and anisotropic 'g' value.
9. Write the principle of differential thermal analysis.
10. Give any two applications of turbidimetric analysis.

PART B — (5 × 5 = 25 marks)

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

11. (a) What are the factors affecting position and intensity of absorption bands in UV-visible spectroscopy? Explain.

Or

- (b) Discuss the applications of IR spectra in the study of hydrogen bonding.
12. (a) Write and explain the principle of double resonance techniques with an example.

Or

- (b) Explain the instrumentation of ^{13}C NMR spectroscopy.
13. (a) Give any two applications of ESR spectra in the structural analysis of inorganic compounds.

Or

- (b) In the mass spectrum of toluene, strong peaks are formed at $m/e = 91$ and $m/e = 65$. Also a broad peak appears at $m/e = 46.4$. Justify the origin of these signals.

14. (a) State and explain octant rule with an example.

Or

(b) Give a comparative study of ORD and CD curves.

15. (a) Write the principle and applications of thermometric titrations.

Or

(b) Give the principle of turbidimetry and nephelometry.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Describe the applications of UV-visible spectroscopy in qualitative and quantitative analysis.

17. Define the following terms :

(a) Bathochromic shift

(b) Combination bands

(c) Spin-spin coupling

(d) Parent ion

(e) Metastable ion.

18. Explain the applications of proton NMR spectroscopy.

19. (a) Discuss the presentation of ESR spectrum. (5)

(b) Give the applications of thermogravimetric analysis. (5)

20. Write the principle and applications of flame photometry.

D-7341

Sub. Code

34441

DISTANCE EDUCATION

M.Sc. DEGREE EXAMINATION

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Fourth Semester

Chemistry

ANALYTICAL CHEMISTRY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define Error.
2. What is t-test?
3. What is meant by controlled potential coulometry?
4. What is the basic principle of polarography?
5. Define the terms, median and standard deviation.
6. Give the principle of paper chromatography.
7. What are the steps involved in the fractional crystallization?

8. Define Sublimation.
9. What is the principle of electrogravimetry?
10. Define electrophoresis.

PART B — (5 × 5 = 25 marks)

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

11. (a) What is Quotients test? How does rejection of a result based on it?

Or

- (b) What is confidence limit? How is it determined? Give any one significance?

12. (a) Write a note on Ion-selective electrodes.

Or

- (b) Discuss the advantage of dropping mercury electrode.

13. (a) Explain the theory of thin layer chromatography.

Or

- (b) Discuss the application of gas chromatography.

14. (a) Give the application ion-exchange chromatography.

Or

- (b) Write a note on vaccum distillation method.

15. (a) Discuss the application of Di-electrophoresis.

Or

- (b) What is correlation co-efficient? Explain it.

PART C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. (a) How many significant figures are there in each of the following? (5)
- (i) 500
 - (ii) 6.023×10^{23}
 - (iii) 0.4050
 - (iv) 50.025
 - (v) 1.625
- (b) How do you derive the calibration graph using least squares? Explain. (5)
17. Discuss the principle, instrumentation and application of cyclic voltammetry.
18. Explain the principle, instrumentation and applications of GC-MS.
19. (a) What is electro dialysis? Give its applications. (5)
- (b) Write a note on solvent extraction method. (5)
20. What is the principle of HPLC? Discuss the instrumentation of HPLC in detail.
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D-7342

Sub. Code

34442

DISTANCE EDUCATION
M.Sc.(Chemistry) DEGREE EXAMINATION
MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Fourth Semester

APPLIED CHEMISTRY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL the questions.

1. What are the causes of radioactive pollution?
2. Mention the uses of super capacitor.
3. State Pilling-Bedworth rule.
4. How do corrosion inhibitors work?
5. Write the differences between electroplating and electroforming.
6. Provide the chemicals used in aluminium anodizing.
7. Write a brief note on combustion method.
8. What is meant by spray pyrolysis deposition?

9. List out any two databases used in chemistry field.
10. What is the use of NPTEL?

SECTION B — (5 × 5 = 25 marks)

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

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

Or

- (b) Discuss the working and electrochemical reactions of lead-acid battery.

12. (a) Describe the pitting corrosion with suitable example.

Or

- (b) How corrosion is controlled by impressed current cathodic protection method?

13. (a) Discuss the measurement of throwing power and current efficiency of electroplating bath.

Or

- (b) Give a brief account on cladding.

14. (a) List out the importances of nanoscience and technology.

Or

- (b) Give a brief account on MOOC.

15. (a) Give the various sources for list of journals.

Or

- (b) Explain the calculation of pH using a suitable computer programming.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Write a short note on:
- (a) Acid rain
 - (b) Ozone layer depletion
 - (c) Greenhouse effect (3+3+4)
17. (a) What is EMF series? Mention its significance.
(b) Write briefly about corrosion control by proper designing. (5+5)
18. Discuss the principle, advantages and limitations of electroless plating.
19. How nanomaterials synthesized by following methods?
- (a) Micro emulsion
 - (b) Sputtering
 - (c) CVD (3+3+4)
20. Explain the characterization of nanomaterials using the following techniques:
- (a) Laser Raman spectra
 - (b) TEM (5+5)
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D-7343

Sub. Code

34443

DISTANCE EDUCATION

M.Sc. (Chemistry) DEGREE EXAMINATION.

MAY 2021 EXAMINATION

&

MAY 2020 ARREAR EXAMINATION

Fourth Semester

ADVANCED PHYSICAL CHEMISTRY

(CBCS 2018 – 2019 Academic Year Onwards)

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL the questions.

1. State Onsager reciprocal relationship.
2. What are photon gases?
3. What are fermions?
4. Write down the Schrodinger wave equation of rigid rotor.
5. What is the need for approximation method?
6. Define order of a group.
7. Give the matrix representation for C_2 and C_3 axis.
8. Explain mirror plane of symmetry.

9. What is acidity function?
10. What is enzyme catalysis?

SECTION B — (5 × 5 = 25 marks)

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

11. (a) Explain about the salient features of Debye theory of heat capacities of solids.

Or

- (b) Calculate the rotational partition function of hydroxyl radical at 300 K. Given that, the bond length of O-H is 0.971 Å

12. (a) Discuss the application of variation method to solve hydrogen atom problem.

Or

- (b) Solve the Schrodinger wave equation for energy and wave function of a particle in simple harmonic oscillator.

13. (a) Construct the character table for C_{2v} point group using the postulates of great orthogonality theorem.

Or

- (b) Deduce the electronic transition in HCHO molecule using direct product method.

14. (a) List out the factors affecting reaction rates in solution.

Or

- (b) Write short notes on negative absolute temperature.

15. (a) Derive an expression for equilibrium constant in terms of partition functions.

Or

- (b) Bring out the differences between reducible and irreducible representation.

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

Answer any THREE questions.

16. Deduce the expressions for internal energy and entropy in terms of partition functions.
17. List out the symmetry elements present in the following molecules and assign their point group. (a) H_2O (b) NH_3 (c) CO_2 (d) Benzene (e) Allene.
18. Write a note on: (a) Pauli's Exclusion principle (b) Slater determinant (4+6)
19. Explain the following: (a) Primary and secondary salt effect (b) Taft equation (c) Edie equation (4+3+3)
20. (a) Give a brief account on SCF method. (4)
- (b) Illustrate the effect of pH and temperature on the rate of enzyme catalyzed reactions. (6)
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