S–3188	Sub. Code
	23MCH1C1

M.Sc. DEGREE EXAMINATION, APRIL 2026

First Semester

Chemistry

ORGANIC REACTION MECHANISM — I

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is meant by isotope effect?

2. State Hammond's postulate.

3. What are annulenes?

4. Mention any one example for diazonium coupling reaction.

5. Sketch the orbital picture of benzyne ion.

6. Write an example for bucherer reaction.

7. Define axis of symmetry. Give one example.

8. State Cram's Rule.

9. Distinguish between conformation and configuration.

10. State Curtin Hammett principle.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Interpret the kinetic and thermodynamic stability with reference to sulfonation of naphthalene.

Or

(b) Taking suitable examples, explain the role of isotopic labeling and cross-over experiments.

12. (a) Chlorobenzene is far less reactive than aniline in electrophilic substitution through chlorine and nitrogen have almost same electronegativity – Explain.

Or

(b) Explain the Friedel-Crafis arylation reaction with mechanisms.

13. (a) Explain why 1- bromotriptycene is inert to both nucleophilic (SN1 and SN2) substitution reactions.

Or

(b) (i) Explain with the suitable example of the nucleophilic substitution at an allylic carbon.

(ii) What is Von Richter reaction?

14. (a) Differentiate between stereo-selective and stereospecific synthesis with suitable examples.

Or

(b) Explain the optical isomerism with asymmetric and dissymmetric molecules with carbon chiral centers.

15. (a) (i) Discuss the optical activity due to helicity. (3)

(ii) What is meant by a "plain curve"? (2)

Or

(b) What is Axial α-haloketone rule? Explain with suitable example.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Outline the role of Taft equation detail. (5)

(b) Give a brief account of the significance of the substituent and reaction constants in the Hammett equation. (5)

17. Explain SE1 and SE2 mechanisms.

18. (a) (i) Discuss the effect of substrate on SN1 reactions. (3)

(ii) Explain the Sommelet – Hauser rearrangement with mechanism. (5)

(b) Write a note on Swain Scott relationship. (2)

19. Outline the conditions under which allenes and spiranes show optical activity by taking suitable examples each.

20. Sketch the different conformations of decalins. Comment on their stability and reactivity.

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S–3189

Sub. Code
23MCH1C2

M.Sc. DEGREE EXAMINATION, APRIL 2026

First Semester

Chemistry

STRUCTURE AND BONDING IN INORGANIC COMPOUNDS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. How VB theory account for the paramagnetic nature of $[NiCl_4]^{2-}$?

2. Predict the geometry and bond angles of H_2O, OF_2 and OCl_2.

3. Calculate the radius ratio and geometry of CaF_2 and LiI.

4. Analyse the point group for CH_4 and NH_3 molecules.

5. What is the general sequence for growth of crystals?

6. Mention any two uses and importance of rock salt.

7. Write Bragg's equation. Mention its significance.

8. Sketch the consequences of systematic absence of reflections.

9. List the importance of band gap.

10. What are phosphors?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the isomorphic replacement of silicates in detail.

Or

(b) Write a note on heteropoly anions.

12. (a) Derive Kapustinski equation.

Or

(b) Understanding the voids in crystal lattices is essential-Why?

13. (a) Draw a flow chart to show different crystal growth methods. Explain the importance of sot-gel method.

Or

(b) Compare and contrast the structures of rutile and anatase with diagram.

14. (a) In an X-ray diffraction experiment, peak with at half maxima is 0.6° and its corresponding Bragg angle is 24°. Calculate the crystalline size using Scherrer equation. Given that the wavelength used in X-ray diffraction experiment is 1.54 Å.

Or

(b) Explain the instrumentation of *Powder X-ray diffraction*. Give Laue pattern.

15. (a) Distinguish the line and plane defects.

Or

(b) Write a note on n-type semiconductors.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Find the structure of following compounds using Wade's rule and Zintl ions.

    (a) $B_6H_6^{2-}$

    (b) $C_2B_4H_8$

    (c) $C_2B_7H_{13}$

    (d) Sb_7^{3-}

17. (a) Tabulate seven crystal systems with their parameters and Bravis lattices. Give examples.

    (b) The powder XRD photograph was obtained for a crystalline substance using radiation at wavelength 1.785. Reflections were collected at the following Bragg angle (degree) 18.5, 27.0, 33.7, 40.0, 45.9, 58.3, 65.4 and 74.6. Calculate the edge length of a cell material and what is the lattice type?

18. Compare and contrast the structures of zinc blende and wurtzite by giving the diagram.

19. Elaborate the principle, instrumentation, sampling methods and applications of TEM.

20. (a) Explain the *Non-stoichiometry point defects* in solids.

    (b) What are the instruments used to study the defects in solids? Explain any one of it.

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S–3192

Sub. Code
23MCH1E3

M.Sc. DEGREE EXAMINATION, APRIL 2026

First Semester

Chemistry

Elective – ELECTRO CHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define "ionic activity" and write its mathematical relation.

2. How dilution affects the molar conductance of strong electrolytes?

3. What is an electrical double layer?

4. Define "zeta potential".

5. Write two examples for standard electrodes.

6. Define "over potential".

7. Mention the importance of Pourbaix diagram.

8. Define electrode polarization and depolarization.

9. Narrate shortly "Pulse cyclic voltammetry".

10. What are fuel cells?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Discuss the Arrhenius theory of electrolysis and give its merits and demerits.

Or

(b) Derive Debye Huckle limiting law at appreciable concentration.

12. (a) Demonstrate the thermodynamic treatment of Lippmann equation.

Or

(b) Briefly narrate (i) Electro-osmosis (ii) Electrophoresis,

13. (a) Discuss the model of three electrodes system.

Or

(b) Derive Nernst equation and mention its applications.

14. (a) Describe the determination of transfer coefficients and significance.

Or

(b) Illustrate the evolution of oxygen and hydrogen at different pH.

15. (a) Explain cyclic voltammetry and its applications.

Or

(b) Describe the Sodium-ion and Lithium-ion batteries.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Elaborate Debye Buckle Onsager treatment of strong electrolytes, verifications and limitations.

17. Discuss (a) Helmholtz-Perrin Model (b) Guoy-Chapman Model.

18. Explain Tafel equations and Tafel Plots.

19. Deduce Butler-Volmer equation for multi-step reaction,

20. Explain the principle and applications of polarography.

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S–3193

Sub. Code
23MCH1E4

M.Sc. DEGREE EXAMINATION, APRIL 2026

First Semester

Chemistry

Elective – MOLECULAR SPECTROSCOPY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Why in Raman spectra the stoke's lines are far more intense than the antistokes lines?

2. What is Raman shift?

3. Why the breakdowns in the Born-Oppenheimer approximation occur?

4. Write the selection rule of Infrared spectroscopy.

5. Define the term population inversion.

6. Why the binding energies generally increase as the oxidative state becomes more positive?

7. What is the internal standard used in NMR? Give reasons for using the same.

8. Give any two advantages of 2D NMR over 1D NMR.

9. How a molecular ion is a powerful tool for structure determination in mass spectrometry?

10. Define the term of 'isomer shift' in Mossbauer spectroscopy.

Part B $(5 \times 5 = 25)$

Answer **all** questions choosing either (a) or (b).

11. (a) Explain application of mutual exclusion principle in Raman spectroscopy.

Or

(b) Brief about the effect of isotopic substitution in rotational spectroscopy.

12. (a) Differentiate overtone and combination frequency.

Or

(b) Write notes on vibrational spectroscopy of a diatomic molecule behaving like simple harmonic oscillator.

13. (a) Describe the electronic spectra of diatomic molecule with the help of Frank-Condon principle.

Or

(b) Show diagrammatically $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ transitions and their selection rule in the electronic spectra.

14. (a) What are the factors which influences the chemical shift in NMR spectroscopy.

Or

(b) Discuss the characteristic features of line shape and line width of ESR spectra.

15. (a) Explain the principle and advantages of Electrospray ionization technique in mass spectrometry.

Or

(b) State and explain the principle of Mossbauer spectroscopy.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Write a short note on pure rotational Raman spectra of linear and asymmetric top molecule.

(b) Recall the factors which determine the intensity of rotational spectral lines. (5 + 5)

17. Give comprehensive notes on the followings. (5 + 5)

(a) Dissociation spectra

(b) Predissociaton spectra

18. (a) Give an account on the basic principle of X-ray photoelectron spectroscopy.

(b) Write a short note on the properties of LASER. (5 + 5)

19. (a) Brief about Nuclear Overhauser Effect.

(b) Discuss the role of shift reagent in simplification of complex spectra. (5 + 5)

20. Give an account on the following in EPR spectroscopy.

(a) Zero field splitting

(b) Kramer's degeneracy

(c) hyperfine splitting (2.5 + 2.5 + 5)

S–3194

Sub. Code
23MCH2C1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Chemistry

ORGANIC REACTION MECHANISM – II

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is E1 reaction? Explain with an example.
2. Differentiate between a short-lived and a long-lived free radical.
3. What is a hydride transfer? Give an example.
4. What is Bouveault-Blanc reduction?
5. Write about the Wagner-Meerwein rearrangement.
6. Write the name of the rearrangements which is involved rearrangement to electron deficient nitrogen.
7. What is the difference between an electrophilic addition and a nucleophilic addition reaction?
8. What is a free radical addition reaction? Explain with an example.
9. What is the role of Sodium cyano borohydride in organic reactions?
10. How is LDA used in organic synthesis?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain syn and anti elimination in E2 elimination reactions with examples.

Or

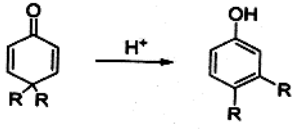
(b) Discuss the role of Saytzeff and Hofmann rules in the orientation of double bonds.

12. (a) Discuss about the mechanism of oxidation reactions with SeO_2 and OsO_4.

Or

(b) Compare the Corey-Kim oxidation with Swern oxidation.

13. (a) Identify the following reaction and explain it with suitable mechanism.



Or

(b) Describe the mechanism of Wolf rearrangement and provide specific examples to illustrate its applications.

14. (a) Describe the following Mechanism of

(i) Mannich reaction

(ii) Hydrolysis of an ester

Or

(b) Explain the mechanism of addition of organozinc and organolithium reagents to carbonyl compounds.

15. (a) Examplify the role of following reagents in the synthetic organic chemistry.

(i) Meta-Chloroperbenzoic acid

(ii) Diazomethane and Zn-Cu.

Or

(b) Describe the mechanism and synthetic applications of Negishi reaction.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Elaborate the methods of detection and stability of free radicals.

17. (a) Explain the mechanism of the hydroboration reaction on a cyclic alkene.

(b) Describe Rosenmund reduction reaction. (5 + 5)

18. Discuss the mechanism, applications,and stereochemistry of the Pinacol-Pinacolone rearrangement.

19. (a) Discuss the detailed mechanism of Wittig reaction with stereochemical outcome

(b) Explain the mechanism of the Stobbe reaction.

20. Discuss about the catalytic activity of the following reagents

(a) DMAP (4-Dimethyl aminopyridine)

(b) DBU (Diazobicyclo (5.4.0) undec-7-ene)

(c) DIAD and DEAD (Di-isopropyl azodicarbo oxylate and Diethylazodio carboxylate).

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S–3195

Sub. Code
23MCH2C2

M.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Chemistry

PHYSICAL CHEMISTRY – I

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define chemical potential

2. What is the relation between activity and activity coefficient?

3. Define ensemble.

4. State Equipartition principle.

5. Write the equation for heat transfer.

6. How do you relate the flux and force by an equation?

7. Define temperature coefficient in reaction kinetics.

8. Write a short note on homogeneous catalysis.

9. List out the types of complex reactions.

10. Write any two methods to study the kinetics of fast reactions.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Arrive Gibbs-Duhem Equation.

Or

(b) Using EMF method, how to determine activity coefficient.

12. (a) Derive the expression for Maxwell-Boltzmann statistics.

Or

(b) Explain Einstein theory of heat capacity of solids.

13. (a) Derive an expression for entropy production due to heat flow.

Or

(b) Arrive an expression for entropy production due in chemical reaction.

14. (a) Derive Arrhenius equation for temperature effect in kinetics.

Or

(b) Explain Primary salt effect and secondary salt effect.

15. (a) Explain the kinetics of a reversible first order reaction.

Or

(b) Describe Flash Photolysis method.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Determine the fugacity by graphical and equation of state methods.

17. Deduce an expression for the molecular rotational partition function of an ideal diatomic gas.

18. Derive the Onsager reciprocal relations from the principle of reversibility.

19. Explain ARRT postulates, rate equation derivation and its applications.

20. Discuss in detail the kinetics of anionic and cationic polymerization.

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S–3196

Sub. Code
23MCH2E2

M.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Chemistry

Elective – GREEN CHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is the need of green chemistry?

2. Mention any two chemical accidents and mention the safety measures to prevent them.

3. Dimethyl carbonate is considered as a green reagent. Explain.

4. Mention any two criteria to choose the starting materials for green chemical synthesis.

5. What is environmental pollution? Give an example for an environmental pollutant.

6. What is green catalyst? Give an example.

7. What is crown ether? Draw the structure of [12]-Crown-4.

8. What is the role of crown ethers in esterification reaction?

9. What is the purpose of using microwave in green chemical synthesis?

10. What is sonochemistry?

Part B (5 × 5 = 25)

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

11. (a) Write the goals limitations of green chemistry.

Or

(b) Define atom economy. Calculate atom economy for the following reaction.

$CH_3–CH=CH_2 + H_2 \rightarrow CH_3–CH_2–CH_3$.

12. (a) What are ionic liquids? Write its preparation.

Or

(b) Discuss the green synthesis of adipic acid.

13. (a) What is polymeric super acid catalyst? Write its applications.

Or

(b) Discuss the role of acid catalysts in green catalysis.

14. (a) How does hydrogen peroxide is used as an oxidation reagent in green synthesis?

Or

(b) List out any five synthetic applications of phase transfer catalyst.

15. (a) Discuss the principle and instrumentation of ultra-soniccator.

Or

(b) Explain cavitation theory.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. State and illustrate the twelve basic principles of green chemistry.

17. What is super critical CO_2? Write its preparation, advantages and limitations.

18. Discuss the role of following in green chemistry.

(a) Polystyrene aluminium chloride

(b) Oxidation catalyst

19. Explain the role of crown ethers in the following reactions

(a) Elimination and

(b) displacement reaction.

20. Write the principle. instrumentation and applications of microwave reactions.

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S–3197

Sub. Code
23MCH2E3

M.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Chemistry

Elective – BIO INORGANIC CHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Write a note on essential trace elements?

2. What is a meant by coenzymes?

3. Define Oxygen carriers.

4. Draw the structure of myoglobin.

5. Which pigments protects nitrogenase from oxygen?

6. What is meant by nitrogen fixation?

7. Define Diagnostic agents.

8. Write the toxicity of Zn and Sb.

9. Give the equation of Michelis-Menton catalyst.

10. What is meant by catalysis?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Discuss the applications of Ceruloplasmin enzyme.

Or

(b) Describe the Calcium signaling proteins.

12. (a) Explain the role of heme group in hemoglobin.

Or

(b) Describe the oxygenation Bohr effect.

13. (a) Discuss the transition metal complexes of dinitrogen.

Or

(b) Illustrate the different types of photo systems.

14. (a) Describe the critical magnetic field.

Or

(b) Discuss the significance of therapeutic compounds.

15. (a) Explain the enzyme catalysis with mechanism.

Or

(b) Describe the effect of temperature on enzyme reactions.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the concept of the storage of metal ions.

17. Describe briefly about the Cytochrome P-450.

18. Elucidate the metal clusters in nitrogenase.

19. Explain the action and mechanism of Chelation therapy.

20. Describe the nomenclature of enzymes.

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S–3198

Sub. Code
23MCH2S1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Chemistry

PREPARATION OF CONSUMER PRODUCTS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions

1. Why is it called consumer?

2. What are the types of consumer products?

3. What is the primary ingredient used in making Gulkand?

4. What is the primary ingredient used in making candles?

5. Name one common surfactant used in the production of detergents.

6. What is the main abrasive agent typically found in toothpaste?

7. Which ingredient is commonly used as a base in the preparation of toothpowder?

8. What is the primary purpose of shampoo in a hair care routine?

9. Name one common conditioning agent found in hair conditioners.

10. What is the role of fragrance in perfumes used in hair care products?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Discuss the importance of packaging and presentation for consumer products.

Or

(b) What factors might influence consumers' sensitivity to changes in price for a particular consumer product?

12. (a) Explain the differences between making jam and jelly.

Or

(b) Describe the basic steps involved in making cottage cheese.

13. (a) Explain the basic steps involved in the production of soap and detergent.

Or

(b) Write a short note on functions and applications of disinfectants.

14. (a) Explain the process of extracting essential oils from spices and flowers.

Or

(b) Explain the formulation and function of shampoo, conditioner, and perfume in hair care.

15. (a) Explain the functions and benefits of powders and creams in skincare.

Or

(b) Explain the concept of herbal makeup preparations.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Describe in detail the four main types of consumer products.

17. Compare and contrast the preparation methods of Gulkand and cottage cheese.

18. Discuss the production processes of soap, detergent, toothpaste, and disinfectants in small-scale manufacturing.

19. Explain the ingredients present in the followings :

(a) Face creams

(b) Body lotions.

20. Discuss the significance of lipsticks and lip balm in skincare and makeup routines.

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S–3199

Sub. Code
23MCH3C1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

Chemistry

ORGANIC SYNTHESIS AND PHOTOCHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

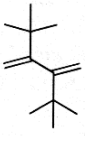
1. What do you mean by target molecule?

2. What are synthetic equivalents?

3. Write one example of one group C-X disconnection in carbonyl compounds.

4. What do you mean by reconnection?

5. Comment on the feasibility of Diels-Alder reactions with following dienes.

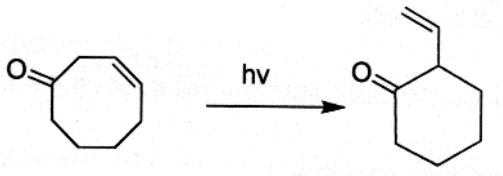
(a) 

(b) 

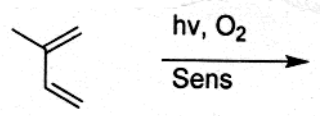
6. Correlate the symmetric of the molecule orbitals with Dis and Con rotation.

7. How does chemical quencher affect fluorescence?

8. Effect the following conversions:



9. Identify the product in the given reaction.



10. What do you mean by photon transfer reaction?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Explain the linear and converges synthesis.

Or

(b) Discuss the advantages of activating groups and bridging elements.

12. (a) Discuss Umpolung (reversal of polarity) of carbonyl compound by taking suitable examples.

Or

(b) "If the carbon framework of the target molecule (TM) is difficult to construct, one strategy is to construct a slightly different framework by conventional reaction and rearrange it to the TM". Justify the statement with suitable example.

13. (a) (i) Taking suitable examples, explain the selectivities in Diels-Alder reactions.

(ii) Unlike other pericyclic reactions, Diels-Alder reaction is susceptible to catalytic acitivity. Substantiate.

Or

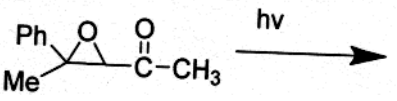
(b) Explain Nazarov cyclization under thermal and photochemical conditions.

14. (a) Illustrate Norrish type-II reactions with examples.

Or

(b) (i) Using Jablonski diagram explain fluorescence and bleaching. (2.5 + 2.5)

(ii) Convert the following into suitable product:



15. (a) Illustrate photo Fries rearrangement with examples.

Or

(b) Barton reaction is very important in natural product synthesis. Explain.

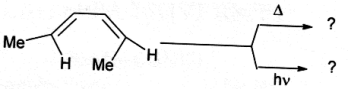
Part C (3 × 10 = 30)

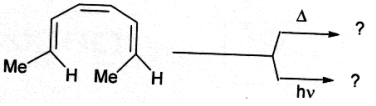
Answer any **three** questions.

16. What do you mean by order of events? Discuss importance of the order of events in organic synthesis by taking suitable examples.

17. Discuss in detail disconnection approach for aromatic heterocycles with special emphasis on five - and six - membered rings.

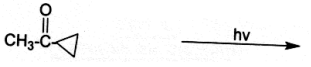
18. Electrocyclic reactions are stereospecific and complementary with respect to thermal photochemical conditions. Substantiate this statement using FMO approach taking following examples. (5+5)

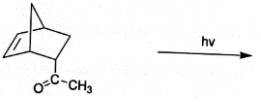
(a) 

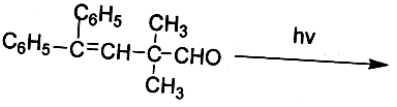
(b) 

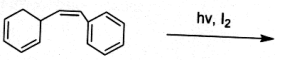
19. Illustrate Di-π methane rearrangement and Paterno-Buchi reaction. (5+5)

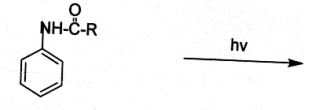
20. Suggest the mechanism for the following photochemical reactions. (2+2+2+2+2)

(a) 

(b) 

(c) 

(d) 

(e) 

S–3200

Sub. Code
23MCH3C2

M.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

Chemistry

COORDINATION CHEMISTRY – I

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is spectrochemical series? Why is it so called?

2. What are the spinels and antispinels.

3. What is the importance of nephelauxetic series.

4. State the term state for d ions.

5. Define step-wise stability constant.

6. Write about the determination of stability constant.

7. Why do square planar complexes prefer an associative mechanism.

8. What is the Kurnakov Test?

9. Define photo-substitution in coordination complexes and give one example.

10. What is the role of a “bridging ligand” in inner-sphere reactions?

Part B (5 × 5 = 25)

Answer **all** questions choosing, either (a) or (b).

11. (a) Explain the method of finding out crystal field splitting value for an octahedral complex with an example.

Or

(b) Give the sequence of energy level of d orbitals in square planar crystal field.

12. (a) Discuss the role of Racah parameters in understanding the electronic structure of transition metal complexes.

Or

(b) Illustrate the selection rules for electronic transition spectra.

13. (a) Explain the factors affecting stability of complexes.

Or

(b) Describe the concept of chelate effect and its impact on complex stability.

14. (a) Brief account on acid hydrolysis and base hydolysis of octahedral complexes.

Or

(b) Classify the metal ions based on rate of water replacement of reaction.

15. (a) Describe the photo-isomerisaation reactions of coordination complexes.

Or

(b) Discuss the mechanism involved in electron transfer reactions in octahedral complexes. Give suitable examples.

Part C **(3 × 10 = 30)**

Answer any **three** questions.

16. Explain the consequences of Jahn-Teller distortions in coordination complexes.

17. Describe briefly about Sugano-Tanabe energy level diagram.

18. Discuss the different methods of determining stability constants of complexes.

19. Explain the theories of trans effect and their applications.

20. Derive and explain the Marcus-Hush theory.

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S–3201

Sub. Code
23MCH3E1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

Chemistry

Elective — PHARMACOGNOSY AND PHYTOCHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Mention any two drugs obtained from plant tissue culture.

2. Write a note on ash value.

3. How does the choice of solvent impact the extraction process?

4. Compare the efficiency of maceration and Soxhlet extraction?

5. Define isoprene rule. Give its importance.

6. Portray the structure of geraniol and its importance.

7. Write the structure and uses of reserpine.

8. What is the therapeutic use of the alkaloid atropine?

9. Identify any two drugs obtained from marine plants and give its uses.

10. Which part of the senna plant is commonly used for its glycoside content?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Describe the WHO guidelines for the sampling and evaluation of crude drugs.

Or

(b) Discuss the historical development of pharmacognosy and its role in modern medicine.

12. (a) Explain the percolation technique of extraction. Detail the procedure and compare it to maceration and decoction.

Or

(b) Describe the steam distillation technique.

13. (a) Discuss various techniques used for the isolation and separation of terpenoids.

Or

(b) Give the preparation of menthol. Explain its properties and its various applications.

14. (a) Describe the preliminary qualitative tests used to detect the presence of alkaloids.

Or

(b) Describe the chemical properties and structure of morphine.

15. (a) Explain the isolation and synthesis of quercetin.

Or

(b) Discuss the basic ring systems found in plant glycosides.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Discuss the general chemical tests and extraction techniques used in phytochemical investigations.

17. Depict the microwave-assisted extraction. Explain how microwaves are used to enhance the extraction process.

18. Describe the structure of taraxasterol and write its general properties and its therapeutic uses.

19. Discuss the chemical properties and structure of papaverine.

20. Discuss the cytotoxic compounds and anti-inflammatory agents obtained from marine sources.

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S–3202	Sub. Code
	23MCH3E2

M.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

Chemistry

Elective — BIOMOLECULES AND HETEROCYCLIC COMPOUNDS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Define lipids.

2. Draw D-glucose by Fischer Projection and Haworth representation.

3. What are Prostaglandins?

4. Show two color reactions of sterols.

5. What is Zwitterion?

6. What do you mean by dialysis?

7. List out any two physiological roles of fatty acids.

8. What is omega oxidation?

9. How will you synthesize 5-nitroisoquinoline?

10. What are the preferable positions for electrophilic substitution in quinoline?

Part B (5 × 5 = 25)

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

11. (a) Write a short note on starch.

Or

(b) Establish the structure of cellulose.

12. (a) Discuss the position of Double bond in cholesterol.

Or

(b) Elucidate the nature of Ring A, B and D of cholesterol.

13. (a) Discuss the solid phase synthesis of oligonucleotide.

Or

(b) Explain the process involved in separation of proteins.

14. (a) Illustrate the following concepts and their functions

(i) Amino acid pool;

(ii) Protein turnover.

Or

(b) Discuss the steps involved m beta oxidation.

15. (a) Discuss Skraup and Bischler-Napieralski reactions using a proper mechanism.

Or

(b) Explain the mechanism involved in Reissert and Madelung reaction.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Discuss the conformation of maltose using Haworth synthesis.

17. In detail explain the structure of androgens and estrogens.

18. Discuss metabolism of amino acid in detail.

19. Explain the process involved in urea cycle.

20. How will you synthesize the following products :

    (i) 3-nitroindole

    (ii) Indole-3-carbaldehyde

    (iii) 2-Amino quinoline

    (iv) Phthalic acid from isoquinoline

    (v) 1-aminoisoquinoline

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S–3203

Sub. Code
23MCH3S1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

Chemistry

INDUSTRIAL CHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Define cottage industry.

2. Write a short note on licenses.

3. Define industry.

4. What are adulterants?

5. What is dyeing?

6. How to detect the presence of adulterants in turmeric powder?

7. What is isolation?

8. Draw the structure of lactose.

9. Give the uses of citric acid

10. What is caffeine? Five its structure.

Part B (5 × 5 = 25)

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

11. (a) Explain the scope of small scale industries.

Or

(b) Describe the registration process of industries.

12. (a) Discuss about the testing of water samples using testing kit.

Or

(b) Illustrate the tie and dye method.

13. (a) Explain the isolation of casein from milk.

Or

(b) Outline the isolation of caffine from tea.

14. (a) Discuss the isolation of citric acid from lemon.

Or

(b) Write a note on village industry.

15. (a) Describe the location of industries.

Or

(b) Discuss about batik dyes printing.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Elucidate the steps to be taken before constructing or establishing a factory.

17. Describe the detection of adulterant in food items by simple techniques.

18. Demonstrate the isolation of lactose from milk.

19. Discuss about the determination of soil organic carbon using Walkley-Black chromic acid wet oxidation method.

20. Explicate the dyeing of cotton fabrics with natural and synthetic dyes.

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S–3204

Sub. Code
23MCH4C1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Chemistry

COORDINATION CHEMISTRY — II

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Write a note on 18-electron rule.

2. Write a short note on fluxional isomerism.

3. What is β-eliminations?

4. Explain the effect of coordination on the stretching frequency of aqua complex.

5. Give any two applications of ^{19}F NMR spectroscopy in structural identification of inorganic complexes.

6. Define quadrupolar nuclei effect.

7. What is Secondary hyperfine splitting?

8. Define Mossbauer effect.

9. Write a brief note on origin of fine structures.

10. Write a note on vertical transistions.

Part B (5 × 5 = 25)

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

11. (a) Write a note on high nuclearity carbonyl clusters.

Or

(b) Discuss the π-acceptor nature of carbonyl group.

12. (a) Elucidate the hydrogenation of olefins using Wilkinson's catalyst.

Or

(b) Describe the oxidation of olefins Wacker's process.

13. (a) Discuss the effect of coordination on the stretching frequency of sulphato and sulphito complex.

Or

(b) Demonstrate the fluxional molecules effect in NMR spectroscopy.

14. (a) Illustrate the quadrupole splitting and magnetic interactions.

Or

(b) Explain the ESR spectra of Cu(II) complex.

15. (a) Describe the PES of O_2 molecule.

Or

(b) Explain the principles of CD and ORD techniques.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Elucidate the MO approach to bonding in metallocenes.

17. Describe the cyclo-oligomerisation of acetylenes using Reppe's catalyst.

18. List out the applications of ^{1}H, ^{15}N and ^{31}P NMR spectroscopy in structural identification of inorganic complexes.

19. Elucidate the applications of ESR to coordination compounds with more than one unpaired electrons.

20. Explain the applications and limitations of Koopman's theorem.

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S–3205

Sub. Code
23MCH4C2

M.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Chemistry

PHYSICAL CHEMISTRY – II

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Arrive de Broglie relation for wave particle duality.

2. State the orthonormal and orthogonal condition.

3. Write the expression for rotational constant B.

4. Explain force constant using Hooke's law

5. List out two reasons for need of the approximation methods?

6. State Paulis Exclusion principle.

7. List the symmetry elements in SF_6 molecule.

8. Explain improper rotation symmetry.

9. How many normal modes are possible for CO_2 molecule?

10. What is HMO method?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Demonstrate Photoelectric effect

Or

(b) Explain the properties of acceptable wavefunctions in quantum mechanics.

12. (a) Derive Schrodinger wave equation for particle in 3D box.

Or

(b) Explain rigid rotor and its selection rules.

13. (a) Apply Variation method to particle in 1D box.

Or

(b) Describe Hartree Self-Consistent field method

14. (a) Explain the symmetry elements present in T_d and D_{nh} point groups.

Or

(b) Discuss the Great Orthogonality Theorem and its applications.

15. (a) Apply LCAO method for H_2^+ molecule.

Or

(b) Explain electronic spectra of ethylene using group theory.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Discuss in detail Black Body radiation.

17. Derive the wave equation and solution for simple harmonic oscillator (SHO) and mention the selection rules for SHO.

18. Explain the Hamiltonian, radial and angular wavefunctions for H atom.

19. Construct character table for C_{2h} and D_{2h} point groups.

20. Apply HMO method to Benzene and ethylene.

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S–3206

Sub. Code
23MCH4E1

M.Sc DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Chemistry

Elective – CHEMISTRY OF NATURAL PRODUCTS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. How do you isolate alkaloids from their source?

2. Draw the structure of Nicotine and Atropine.

3. What is carotenoids? Give an example.

4. Outline the classification of terpenoids.

5. Distinguish between flavones and flavonoids.

6. Write any two biological importances of flavones.

7. How do you isolate purines from its source?

8. Write any two physiological activity of Cholesterol.

9. How do you purify natural dyes?

10. Write the occurrence of natural dye.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Discuss the structural elucidations of Cocaine.

Or

(b) How do you elucidate the structure of Piperine by chemical method?

12. (a) Discuss the structure determination of Abietic acid.

Or

(b) State and explain isoprene rule.

13. (a) What is cyanidine chloride? Give its structure determination.

Or

(b) What is anthocyanine? Give its structure and any three general method of synthesis.

14. (a) Write the structure and synthesis Uric acid.

Or

(b) What is Diel's hydrocarbon? Discuss its stereochemistry.

15. (a) Discuss the colour and constitution of natural dye.

Or

(b) Write the synthesis of Alizarin.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. (a) Write the classification of alkaloids.

    (b) Write the chemical method of structure determination of Coniine.

17. Draw the structure of Vitamin A. Write its function and synthesis.

18. Discuss the structure elucidation and importance of flavonoids.

19. (a) Write the classification and spectral properties of steroids,

    (b) Give any four colour reactions of sterols.

20. Explain the structural elucidation and synthesis of Indigoitin.

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S–3207

Sub. Code
23MCH4E2

M.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Chemistry

Elective – POLYMER CHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define the term Tg.

2. Calculate the average molar mass (Mn) of Polymers with examples.

3. What is meant by degree of polymerization?

4. Write a note on Stero regular polymers.

5. Define thermal degradation.

6. Classify the polymerization techniques.

7. Write the two applications of polyamides.

8. Draw the structure of Buna-N polymer.

9. Define Film casting.

10. Differ the injection and compression moulding.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the term Cohesive energy.

Or

(b) Discuss the chemical tests in characterization of polymers.

12. (a) Depict the free radical Polymerization

Or

(b) Illustrate the Ziegler-Natta polymerization.

13. (a) Explain the Interfacial polymerization.

Or

(b) Describe the photostablizers.

14. (a) Elucidate the preparation and properties of polypyrrole.

Or

(b) Difference between Buna-N and Buna-S polymers.

15. (a) Exemplify the calendaring and die casting of polymers.

Or

(b) Describe the thermofoaming process in polymers with examples.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the primary and secondary bond forces in polymers.

17. Describe briefly about the mechanism and kinetics of polymers.

18. Exemplify the solid and gas phase polymerization.

19. Explain the elastomers polymers with examples.

20. Describe the polymerization catalysis process.

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S– 3208

Sub. Code
23MCH4S1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Chemistry

CHEMISTRY FOR ADVANCED RESEARCH STUDIES

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define research problem.
2. What are the main steps involved in research process?
3. How do you conduct basic literature review?
4. Why is it important to document references while writing a research paper?
5. Name the examples of plagiarism software.
6. Why is honesty important in reporting experimental data?
7. Define foot notes in research work writing.
8. How can chemical research benefit to the society and environment?
9. What types of costs are expected for characterization of samples?
10. Write a note on biological testing.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Discuss the fundamental principles in scientific research.

Or

(b) Classify the types of research with examples.

12. (a) Depict the key strategies and tools for conducting an effective literature review.

Or

(b) Illustrate the importance of documentation techniques.

13. (a) Explain the research ethics to carry the fundamental research.

Or

(b) Describe the uses of plagiarism check software.

14. (a) Elucidate the term Dissertation and thesis.

Or

(b) How to write the review article in basic research.

15. (a) Describe the various research funding agencies.

Or

(b) How to write and submit research proposal to research grant.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the patent oriented research and how to file the patent.

17. Describe briefly about the uses of e-resources and library books for literature review.

18. Exemplify the CPSSBA guidelines to use of animal samples in research.

19. Explain the uses of reference managing software in research paper writing.

20. Describe the cost incurred on raw materials.

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