S–1000

Sub. Code
23MCH1C1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Chemistry

ORGANIC REACTION MECHANISM – I

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. State Hammond postulates.
2. State any two thermodynamic requirements of a chemical reaction.
3. Give an example for non-aromatic and anti-aromatic compounds.
4. Write the reaction for Friedel-Craft acylation.
5. What is S_Ni reaction? Give an example.
6. Explain ambident nucleophile with a suitable example.
7. What is mutarotation?
8. Explain the term 'Enantiotopic and diasterotopic atoms'. Give an example for each.
9. What is ORD? Write its application.
10. Give an example for intramolecular rearrangement reaction.

Part B (5 × 5 = 25)

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

11. (a) How do you determine the reaction mechanism by the following methods?

    (i) Isotopic labelling

    (ii) Detection of intermediates

    Or

    (b) (i) Discuss the thermodynamics and kinetic requirements of a chemical reaction.

    (ii) Write Taft equation and its significances.

12. (a) Discuss the mechanism of the following reactions.

    (i) Fridel-Craft alkylation and

    (ii) Bromination reaction

    Or

    (b) What is S_N2 reaction? Write its mechanism with a suitable example.

13. (a) Write the mechanism for S_NAr reaction. Explain with a suitable example.

    Or

    (b) Give a suitable mechanism for the nucleophilic substitution at an allylic and vinylic carbon.

14. (a) State and explain Cram's rule.

    Or

    (b) How does optical isomerism arise in allenes and spiranes?

15. (a) Account for the conformation and reactivity in mono and disubstituted cyclohexane.

Or

(b) State and explain Curtin-Hammett principle.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Write a note on 'Linear free energy relationship' and 'partial rate factor'.

17. (a) Discuss the orientation and reactivity of o-Cresol.

(a) Write the following reaction with a suitable example.

(i) Nitration

(ii) Diazonium Coupling.

18. (a) Write the mechanism for Rosenmund reduction and Smiles rearrangement.

(b) Explain Swain-Scott relationship.

19. (a) Explain the following terms with a relevant example.

(i) proR

(ii) proS

(iii) si-phase and

(iv) re-phase.

(b) Discuss the configuration of ansa and cyclophanic compounds.

20. (a) What is cotton effect? Write its applications.

(b) Account for the conformation and reactivity in decalin compound.

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S–1001	Sub. Code
	23MCH1C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

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. Deduce the geometry of $[Ni(CO)_4]$ according to VB theory.

2. Predict the structures of $PF_3(CH_3)_2$ and $PF_2(CH_3)_3$.

3. Calculate the radius ratio and geometry of ZnS and NaCl.

4. Analyse the point group for H_2O and C_6H_6 molecules.

5. What are the conditions for the successive growth of crystals?

6. Write the point group and geometry of rutile.

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

8. Sketch the working principle of TEM.

9. Correlate the phenomenon of superconductivity with the band structure.

10. Define laser.

Part B (5 × 5 = 25)

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

11. (a) Discuss the structural and bonding features of B-N and P-N compounds.

Or

(b) Write the steps involved in preparation of silicone rubber.

12. (a) What is lattice energy? Derive Born-Lande equation. What is the importance of Madelung constant?

Or

(b) If a solid "A^+B^-" has a structure similar to NaCl. Consider the radius of anion as 250 pm. Find the ideal radius of the cation in the structure. Is it possible to fit a cation C^+ of radius 180 pm in the tetrahedral site of the structure "A^+B^-"?

13. (a) Sketch and explain the structural features of rock salt.

Or

(b) Draw and explain the structural features of nickel arsenide.

14. (a) X-rays of wavelength 1.5418 Å are diffracted by (III) planes in a crystal at an angle of 30° in the first order. Calculate lattice constant (a) of cubic Unit cell.

Or

(b) Compare TEM with optical microscope.

15. (a) "NaCl exhibits *Schottky defect* whereas AgBr not". Substantiate.

Or

(b) Discuss the *Band theory* of solids with examples.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Explain the isomorphous replacement in silicates in detail.

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

(b) Metal excess defects resulting in *n*-type semi conductors and color centers – Substantiate.

18. Draw and explain the structural features of normal and inverse spinel types.

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

20. (a) Explain the linear defects and its effects due to dislocations.

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

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S–1002

Sub. Code
23MCH1E1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Chemistry

Elective – PHARMACEUTICAL CHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is the role of surfactant in pharmaceuticals?

2. Define Dilatent flow.

3. Write the significance of the dilution factor in isotopic Dilution?

4. Explain basis of the scintillation counters.

5. Write a note on Bioavailability of drug.

6. What are drug dosage forms?

7. Classify the occupancy theory in development of drugs.

8. What are the important steric parameters in drug analysis?

9. Depict the need of computers for chemistry.

10. Delineate the Data smoothing tool.

Part B (5 × 5 = 25)

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

11. (a) Discuss the Plastic flow and Pseudo plastic flow with examples.

Or

(b) Compare and contrast the Newtonian and non-Newtonian system.

12. (a) Explain the degree of ionization in pharamaceutical chemistry.

Or

(b) Describe the advantage and limitations of pharmaceutical chemistry.

13. (a) Confer the drugs development process in detail with examples.

Or

(b) Describe the terms drug regulation and its importance.

14. (a) Exemplify the drug receptor interactions in quantitative analysis.

Or

(b) Elucidate the significance of chelating parameters and indicator variables in drugs developments.

15. (a) Explain the organization of computer applications in drug delivery system.

Or

(b) Describe the interpolation and extrapolation in computers.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Elucidate the concept of optical activity and specific rotation of drugs.

17. Explain briefly about the radiopharmaceuticals drugs.

18. Exemplify the pharmacopoeias formularies and routes of administration of drugs products.

19. Illustrate the lipophilicity and electronic parameters in drug development.

20. Describe about the numerical methods differentiation, integrations and least square fit.

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S–1003	Sub. Code 23MCH1E2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Chemistry

Elective – NANO MATERIALS AND NANO TECHNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is 3D nanomaterial and give an example?
2. Exemplify the role of size in nanomaterials.
3. How is microwave applied to synthesis nanoparticles?
4. Write notes on Laser ablation.
5. Illustrate the properties of silica nanoparticles.
6. Write down the synthesis silver nanoparticles.
7. Classify the following semiconductor materials.
   (a) GaAs and
   (b) GaP.
8. Write a brief notes on rectifiers.
9. Exemplify the nano thin film.
10. Define the nano composites.

Part B (5 × 5 = 25)

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

11. (a) How do you analyses the unique properties of nanomaterial?

Or

(b) Explain the Bottom - Up synthesis method of nanomaterials with suitable examples.

12. (a) Give salient features of chemical vapour deposition (CVD) technique.

Or

(b) Illustrate about the synthesis of nanomaterial by hydrothermal method.

13. (a) Explain the thermal properties of nano materials.

Or

(b) How are the metal oxides nanoparticles prepared and discuss their properties?

14. (a) What is Hall effect? Give their significances.

Or

(b) Explicate in detail about *p*-and *n*-type semiconductors.

15. (a) Classify the types of nanocomposites.

Or

(b) Explain the types and synthesis of core shell nanoparticles.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Classify and discuss the nanomaterials according to their dimension.

17. Discuss to bonding and structure of the nanomaterials.

18. Explain theories relevant to mechanical properties of nanomaterials.

19. Discuss the following properties of nanomaterials.

    (a) Electrical

    (b) Conductivity

    (c) Magnetic.

20. Enumerate the principle, instrumentation and application of TEM analysis.

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S–1004

Sub. Code
23MCH1E3

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Chemistry

Elective – ELECTROCHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Write the relation between activity and activity coefficient.
2. Draw the graph of Debye Huckle Onsager equation for strong electrolytes.
3. List two evidences for electrical double layer.
4. What is sedimentation potential?
5. Explain briefly Standard Hydrogen Electrode.
6. Calculate ΔG° for the potential $E^\circ = 1.1$ V and the number electrons transferred is 2.
7. What is Evans Diagram?
8. Define Transfer Coefficient.
9. Narrate shortly the modes of transport of electro active Species.
10. Mention any two roles of supporting electrolytes in Polarography.

Part B (5 × 5 = 25)

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

11. (a) Discuss the Debye Huckle Bjerrum model.

Or

(b) Calculate the mean activity coefficient of 0.01 m of KCI using Debye Huckle limiting law.

12. (a) Demonstrate the Stern model of electrical double layer.

Or

(b) Narrate electrokinetic phenomena with examples.

13. (a) Explain anodic and cathodic currents and the conditions for the discharge of ions.

Or

(b) What is zeta potential and mention its applications and limitations?

14. (a) Describe the reduction of I^{3-} and Fe^{2+} system.

Or

(b) Explain the dissolution of Fe to Fe2^{+}.

15. (a) Explain the principle, applications of square wave polarography.

Or

(b) Describe the types of fuel cells.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Elaborate Arrhenius theory of strong electrolytes, merits and demerits.

17. Discuss in detail the Lipmann equation and Guoy Chapman model of electric double layer.

18. Deduce Butler-Volmer equation for current density and mention its significance.

19. Explain overvoltage, types and its method of determination.

20. Discuss the principle, instrumentation and applications of cyclic voltammetry.

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S–1005	Sub. Code 23MCH1E4

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Chemistry

Elective – MOLECULAR SPECTROSCOPY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Diatomic nitrogen molecule (N_2) is IR inactive but Raman active. Justify.

2. The rotational constant for H^{35} Cl are observed to be 10.5909 cm^{-1}. What are the values of B for H^{37} Cl and ^2D ^{35}Cl?

3. Give the selection rule of vibrational spectroscopy.

4. Define hot bands.

5. What is Franck Condon principle?

6. Give the principle of photoelectron spectroscopy.

7. What are the criteria for a molecule to absorb NMR radiation?

8. Why Tetramethylsilane (TMS) is used as internal standard in NMR spectroscopy?

9. Why water and alcohol are not suitable solvents in EPR studies?

10. Define Kramer's degeneracy.

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

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

11. (a) Explain Raman shift and pictorially represent stokes, antistokes and Rayleigh lines.

Or

(b) Describe the micro wave spectra of non rigid diatomic molecule.

12. (a) Give an account on the vibration of polyatomic molecules with an example.

Or

(b) Explain the anharmonicity on the vibration spectra of diatomic molecules.

13. (a) Give comprehensive notes on the followings :

(i) dissociation spectra

(ii) pre-dissociation spectra.

Or

(b) Write a short note on population inversion.

14. (a) Illustrate the factors influencing coupling constant and relative intensities in NMR.

Or

(b) Explain Nuclear Overhauser Effect with suitable examples.

15. (a) Explain the mossbauer spectra of high spin iron compounds with an example.

Or

(b) Discuss applications of EPR spectroscopy in analysis of any two organic molecules.

Part C $(3 \times 10 = 30)$

Answer any **three** questions.

16. (a) Discuss Vibrational-Rotational Raman spectra of gaseous diatomic molecule.

(b) Explain the application of mutual exclusion principle in Raman spectroscopy.

17. (a) Explain the followings :

(i) Overtone

(ii) Combination frequency.

(b) Describe the effect of isotopic substitution in vibrational spectra of simple molecules. (5+5)

18. (a) Describe the basic principle of X-ray photoelectron spectroscopy. (5+5)

(b) Give any five properties of LASER radiation.

19. (a) Give the mechanism of shielding and deshielding in NMR spectroscopy. (5+5)

(b) Enumerate any two methods to simplify the complex NMR spectrum.

20. Explain the principle of following ionization techniques of mass spectrometry.

(a) Electron ionization

(b) Chemical ionization. (5+5)

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S–1006	Sub. Code
	23MCH2C1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Second Semester

Chemistry

ORGANIC REACTION MECHANISM - II

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is E1 reaction? Give an example.

2. Arrange 1°, 2° and 3° radicals in the descending order of their stability. Give reason.

3. Write Swern oxidation reaction.

4. What is Rosenmund reduction?

5. Give the reaction of Wolff rearrangement.

6. Write the mechanism of Beckmann rearrangement.

7. What is Michael addition? Give an example.

8. Write the product of hydrolysis and ammonolysis of ester.

9. What is AIBN? Draw its structures.

10. What is Meisenheimer complex? Write its structure.

Part B (5 × 5 = 25)

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

11. (a) Discuss the effect of following factors on the rate of E2 reaction.

    (i) Substrate

    (ii) Leaving group

    (iii) Solvent

    Or

    (b) Write the formation of radicals by thermal and photochemical reaction.

12. (a) Write the mechanism of oxidation reaction by using the following oxidizing agents.

    (i) SeO_2

    (ii) $Pb(OAc)_4$

    Or

    (b) What is Wolf-Kishner reduction? Give its reaction mechanism.

13. (a) Write the reaction mechanism of Favorski rearrangement.

    Or

    (b) Explain the mechanism of Wagner-Meerwin rearrangement.

14. (a) Discuss the mechanism of electrophilic addition reaction with a relevant example.

    Or

    (b) What is Stobbe reaction? Write its reaction mechanism.

15. (a) What is DEAD? Write its synthetic application with a suitable example.

Or

(b) What is the role of PCC in organic synthesis? Explain with a relevant example.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. (a) Explain E1CB reaction mechanism with a suitable example. (4)

(b) Discuss the radical reaction mechanism of the following reactions. (3 +3)

(i) Polymerisation

(ii) Halogenation

17. Discuss the synthetic application of the following reagents with a suitable reaction mechanism. (4+3+3)

(a) Mercuric acetate

(b) Osmium tetroxide

(c) Dimethyl sulphoxide

18. Give a detailed mechanism for the following rearrangement reaction. (3+3+4)

(a) Pinacol-Pinacolone rearrangement

(b) Curtius rearrangement

(c) Baeyer - Villiger oxidation

19. Write a detailed mechanism for the following reaction. (4+3+3)

(a) Mannich reaction

(b) Witting action

(c) Prins reaction

20. Sketch reaction mechanism of the following reactions. (5+5)

(a) Heck reaction

(b) Suzuki coupling

S–1007

Sub. Code
23MCH2C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Second Semester

Chemistry

PHYSICAL CHEMISTRY – I

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Section A (10 × 2 = 20)

Answer **all** questions.

1. Name any two partial molar properties with its expressions.

2. What is thermodynamic standard state?

3. List the variables used in canonical ensemble.

4. Define Molar heat capacity.

5. Write Ficks law.

6. What is chemical affinity in irreversible thermodynamics?

7. Write Arrhenius equation and its terms in kinetics.

8. List the factors determine the reaction rates in solutions.

9. Explain parallel reaction with an example.

10. Which step determines the rate of a multi-step complex reaction?

Section B (5 × 5 = 25)

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

11. (a) How does chemical potential vary with respect to T and P?

Or

(b) Briefly describe the methods to determine the activity coefficient.

12. (a) Compare Fermi-Dirac Statistics and Bose-Einstein statistics.

Or

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

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

Or

(b) Arrive an expression for entropy production due to matter flow.

14. (a) Explain Lindemann theory of unimolecular mechanism.

Or

(b) Compare Collision theory and Activated Complex theory.

15. (a) Explain the kinetics of a consecutive reaction.

Or

(b) Discuss free radical polymerization.

Section C (3 × 10 = 30)

Answer any **three** questions.

16. Deduce Duhem-Margules equation and mention its applications.

17. Deduce an expression for the translational partition function of an ideal gas.

18. Summarize the four electrokinetic effects SP, EO, EOP and SC.

19. Explain enzyme catalysis and derive Michaelis-Menton rate expression for enzyme catalysis.

20. Deduce an equation for the photochemical reaction between H_2 and Br_2.

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S–1009

Sub. Code
23MCH2E2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Second Semester

Chemistry

Elective – GREEN CHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define green chemistry. Write its need.

2. Calculate atom economy for the following reaction.

$$CH_3 - CH = CH_2 + H_2 \rightarrow CH_3 - CH_2 - CH_3$$

3. Write the properties of Sc CO_2.

4. What is ionic liquid? Write its Preparation.

5. What is green catalyst? Give any two examples.

6. Mention any four chemicals which pollute our environment.

7. Write the role of H_2O_2 in organic reaction.

8. What is acid catalyst? Give any two examples.

9. What the working principle of microwave?

10. What is ultrasound? How does it produce?

Part B (5 × 5 = 25)

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

11. (a) Mention the advantages and disadvantages of green chemistry.

Or

(b) Mention any five chemical laboratory accidents. How do you protect from this?

12. (a) (i) What is greener solvent? Give examples.

(ii) Mention any three examples for H_2O assisted organic synthesis.

Or

(b) Write the advantages and disadvantages Sc.CO_2.

13. (a) What is polymer supported catalyst? Mention its synthetic applications.

Or

(b) Explain the role of acid and basic catalyst in green catalysis.

14. (a) How does the following reactions are performed in Crown ether

(i) Esterification

(ii) Saponification.

Or

(b) What is phase transfer catalyst? Explain its role in green synthesis with a relevant example.

15. (a) Explain the instrumentation of microwave reactor.

Or

(b) Write any five applications of ultrasound in green synthesis.

Part C (3 × 10 = 30)

Answer any **three** questions.

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

17. Write any five synthetic applications of ionic liquid.

18. Explain the role of following in green catalysis.

(a) Polystyrene aluminium chloride

(b) Poly supported photosensitizers.

19. Write any five synthetic application of Crown ether.

20. (a) Explain the instrumentation of ultrasoniccator.

(b) Write the advantages of ultrasound assisted chemical reactions.

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S–1010

Sub. Code
23MCH2E3

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Second Semester

Chemistry

Elective – BIO-INORGANIC CHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What do you mean by active transport and passive transport?

2. Write the catalytic reaction of catalase and peroxidase with toxic H_2O_2.

3. Name four π-acid ligands that competitively replace O_2 from Hb.

4. How do you classify cytochromes? Give an example for each.

5. Give the reasons behind the chemical inertness of N_2?

6. What is the role of Mg(II) in chlorophyll?

7. Mention the important sources of Pb toxicity.

8. Why is nephrotoxicity occurring in heavy metal poisoning?

9. What is induced fit theory?

10. Mention the biological property of transferase.

Part B (5 × 5 = 25)

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

11. (a) Explain the importance of calcium and its signaling proteins.

Or

(b) Compare the probable difference in pockets present in carboxypeptidase and carbonic anhydrase.

12. (a) Contrast the active site structures of hemerythrin and hemocyanin.

Or

(b) Explain the biological role of cyt-p450.

13. (a) Comment on the thermodynamic and kinetic aspects of N_2–fixation.

Or

(b) Describe the structure of Chlorophyll.

14. (a) Explain the Mercury poisons symptoms, complications, causes, diagnosis and treatment.

Or

(b) Outline the similarities and differences in the biological actions of vandate and phosphate analogy.

15. (a) Write a note on the classification of enzymes.

Or

(b) Derive the Michelis - Menton equation. Explain the effect of pH and temperature on enzyme reactions.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Show the selective transport and storage of iron in biological system. Explain its importance.

17. Discuss the structure of active site, role of protein, diamagnetic behavior of the oxygenated complex, mechanism of oxygen transport and cooperativity in haemoglobin.

18. Outline the probable mechanistic pathways for nitrogenase activity in N_2-fixation.

19. How platinum compounds are utilized as chemotherapeutic agents? Explain with the mechanism.

20. Explain the free energy of activation and the effects of enzyme catalysis. Mention the factors contributing to the efficiency of enzyme.

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S–1012

Sub. Code
23MCH2S1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

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. What is the advantage of widespread availability of a product?

2. Name two products that do not require complicated information based advertisement.

3. Why consumers are brand loyal to speciality product?

4. When will the producers adopt mass promotion strategies?

5. How is total solid content of a jam measured?

6. Name different types of waxes for candle making.

7. Define saponification.

8. What are the preservatives used in shampoo?

9. Which are the major ingredients of a sunscreen lotion?

10. Why is make up done?

Part B (5 × 5 = 25)

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

11. (a) "A product is a solution to a problem or package of benefits" – Conclude in your point of view.

Or

(b) Name any five categories of shopping products.

12. (a) What do you meant by operating supplies in a factory? Give four examples.

Or

(b) Explain the preparation of squash and jelly.

13. (a) What is cottage cheese? How does it differ from other milk products?

Or

(b) How is soap manufactured and salted out?

14. (a) How are different types of jams prepared?

Or

(b) Tabulate the formulations of face powder.

15. (a) Differentiate a moisturizer from cream.

Or

(b) Write a short note on :

(i) Pain balm

(ii) Lip balm.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Classify different types of consumer products and explain the characteristics of each type.

17. How do you prepare : (a) gulkand and (b) disinfectants?

18. Explain the preparation of candles step by step.

19. Elaborate the process of extraction oils from spices.

20. Discuss the preparation of various types of shampoos.

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S–1013

Sub. Code
23MCH3C1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025.

Third Semester

Chemistry

ORGANIC SYNTHESIS AND PHOTOCHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

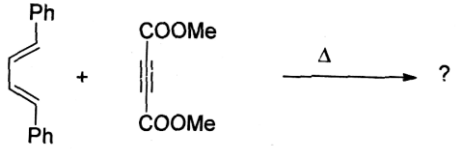
1. Define Synthon.

2. What do you mean reagent?

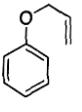
3. List one disconnection approach for synthesis of amine.

4. Show two applications of using protective groups.

5. Give the stereochemistry of the products in the given reaction.

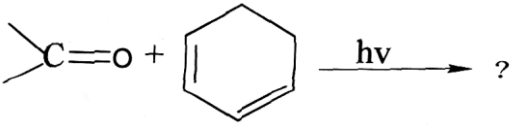


6. Predict the product and give mechanism for the following substrate undergoing pericyclic reaction.

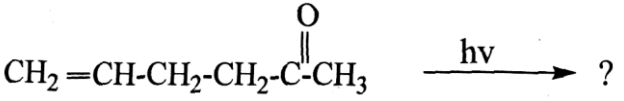


7. What are the requirements of an ideal sensitizer?

8. Predict the product in the following reaction :



9. Identify the outcome of the following reaction :



10. Define photoisomerization.

Part B (5 × 5 = 25)

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

11. (a) Compare linear and convergent synthesis.

Or

(b) Establish the use of protective groups.

12. (a) Discuss one group C-C disconnection by taking suitable examples.

Or

(b) Discuss two group C-X disconnection in 1, 5 - difunctionalized compounds with any two examples.

13. (a) Cope and Claisen reactions are sigmatropic rearrangements. Substantiate and give mechanism.

Or

(b) Predict the thermal / photochemical feasibility of the following pericyclic reaction and substantiate the stereochemistry.

14. (a) Using Jablonski diagram explain the possible transition with suitable examples.

Or

(b) Discuss the importance of Stern-Volmer equation in photochemical reactions.

15. (a) Write notes on :

(i) Aza-Di-π methane rearrangement and

(ii) Barton reaction. (2.5 + 2.5)

Or

(b) Explain the photochemistry of vision.

Part C (3 × 10 = 30)

Answer any **three** questions.

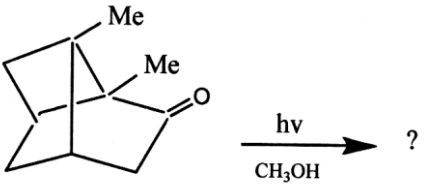
16. Discuss any two examples for advanced strategy in disconnection approach.

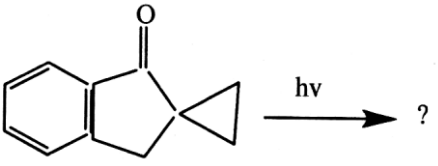
17. Explain two group C-X disconnections in 1,2- and 1,4-difunctionalized compounds by taking suitable examples.

18. Arrive at Woodward-Hoffmann rules for (2 + 2) and (4 + 2) cycloaddition reactions under thermal and photochemical conditions using correlation diagram with appropriate examples.

19. Differentiate Norrish type-I from Norrish type-II reactions. Explain the factors affecting them and bring out the evidences in support of their mechanisms.

20. Predict the products of the reactions and propose the mechanisms. (5 + 5)

(a) 

(b) 

S–1014

Sub. Code
23MCH3C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025.

Third Semester

Chemistry

COORDINATION CHEMISTRY — I

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What are π and σ bonds in tetrahedral complexes?

2. Define spectrochemical series.

3. Write a note on Nephelauxetic effect.

4. Define the Racha parameter.

5. What is stability constant in thermodynamic aspects?

6. What is spin orbital coupling magnetic moment?

7. Show reaction of base hydrolysis of the complexes.

8. Define labile complexes with suitable examples.

9. Write a reaction of photoredox reaction.

10. What is bridging ligands? Give suitable examples.

Part B (5 × 5 = 25)

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

11. (a) Discuss structure and bonding of spinels.

Or

(b) Write a brief note on factors influencing magnitude of crystal field splitting of d-orbitals

12. (a) Explain the orgel diagram of $[Cu(H_2O)_6]^{2+}$ complex.

Or

(b) The electronic spectra of $[Ni(H_2O)_6]^{2+}$ complex shows greenish blue colour. This complex shows absorption bands at 8700 cm^{-1} 14500 cm^{-1} and 25300 cm^{-1}. Then calculate 10 Dq value.

13. (a) Discuss brief review of outer sphere mechanism in coordination complexes.

Or

(b) What is chelate? Write applications of Chelates ligands?

14. (a) Explain the SN_2 mechanism of the coordination complexes.

Or

(b) Define Kurnakov test. How to distinguish cis and trans isomers square planar complexes.

15. (a) Explain the Marcus-Hush theory with examples.

Or

(b) Write the reaction mechanism of photo substation reaction and its types.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. (a) What is CFSE? Calculate the CFSE energy of low spin and high spin d^5, d^6, d^7 complexes?

(b) Explain the Molecular orbital theory with suitable example for octahedral complex.

17. Demonstrate the orgel diagram of $[V(H_2O)_6]^{2+}$ complex.

18. Determine the stability of the complexes by Bjerrum's half method and continuous variation method.

19. Define Trans effect. Write the applications of Trans effect for the synthesis of cis-trans isomers of Pt complexes.

20. Illustrate the mechanism of inner sphere electron transfer reaction in octahedral complexes.

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S–1015

Sub. Code
23MCH3E1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025.

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. What is the first step in the pharmacognostic study of a crude drug?

2. Define pharmacognosy.

3. Describe the structure and composition of camphor oil.

4. Describe the decoction technique of extration.

5. Write any two examples for volatile oils.

6. Give the structure and uses of amyrine.

7. What is the main pharmacological action of papaverine?

8. What reagent is used in Dragendorff's test?

9. Which reagent is used in Bornträger's test for glycosides?

10. What is digoxin? Mention its use.

Part B

$(5 \times 5 = 25)$

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

11. (a) Explain the steps involved in the pharmacognostic study of a crude drug.

Or

(b) Describe the Shikimic acid pathway and the acetate pathway.

12. (a) Discuss supercritical fluid extraction, focusing on the use of supercritical gases like CO_2.

Or

(b) Discuss the maceration method of extraction. Explain the steps involved and its advantages and disadvantages.

13. (a) Describe the composition of geranium oil. Discuss its properties and its uses in aromatherapy and cosmetics.

Or

(b) Explain the isoprene rule and its significance in the structure and function of terpenoids.

14. (a) Outline the chemical properties and structure of reserpine.

Or

(b) Discuss the occurrence and distribution of alkaloids in the plant kingdom.

15. (a) Illustrate the qualitative analytical methods used to identify plant glycosides.

Or

(b) Describe various types of marine toxins and their sources.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Describe the acetate pathway and its significance in the formation of secondary metabolites in plants.

17. Outline the Soxhlet method of extraction. Explain how it differs from other extraction techniques.

18. Outline the structure of menthol. Explain its properties and discuss its applications in medicine and industry.

19. Discuss the pharmaceutical importance of alkaloids. Provide examples of well-known alkaloids and their therapeutic uses.

20. Elucidate the pharmacological activities of senna glycosides. Explain their mechanism of action and therapeutic uses, particularly in the treatment of constipation.

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S–1016

Sub. Code
23MCH3E2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025.

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. How are lipids classified?

2. What product is obtained on acid hydrolysis of amylase?

3. What are steroids?

4. Draw the structure of progesterone.

5. What are amino acids?

6. What do you mean by urea cycle?

7. What are fatty acids?

8. Define glycolysis.

9. Point out the heterocyclic compound corresponding to benzo [b] pyridine nomenclature.

10. List out any two applications of isoquinoline.

Part B (5 × 5 = 25)

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

11. (a) Discuss the presence of α-glycosidic linkage in maltose.

Or

(b) In detail explain the synthesis of cellobiose.

12. (a) Explain the biosynthesis of cholesterol.

Or

(b) Write a short note on :

(i) Applications of steroids and

(ii) Stereochemistry of steroids.

13. (a) Explain five ways by which amino acids are deaminated.

Or

(b) Discuss the electrophoresis and gel filtration methods involved in purification of proteins.

14. (a) Explain the process involved in Krebs cycle.

Or

(b) Explain the α-oxidation of phytanic acid with a clear flow diagram.

15. (a) Discuss Pomeranz-Fritsch and Fischer Indole synthesis using a suitable mechanism.

Or

(b) Explain the mechanism involved in Dobner Miller and Friedlanders reaction.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Illustrate the configuration and conformation of sucrose and cellulose.

17. Explain the structure and functions of adrenaline and thyroxin.

18. Discuss the structure of DNA using Watson and Crick model.

19. In detail explain the process involved in conversion of fat to carbohydrates.

20. How will you synthesize the following products:

    (a) 3-bromoindole

    (b) Quinoline-8-sulphonic acid

    (c) Nicotinic acid from quinoline

    (d) 3-phenylazoindole

    (e) 3-chloroquinoline from indole.

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S–1017

Sub. Code
23MCH3S1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025.

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 village industry.

2. Define small-scale industry.

3. Mention some common adulterants presence in pepper.

4. Give the simple technique used for detecting adulterant present in chilli powder.

5. Write a short note on soil organic carbon.

6. What is license?

7. Give the structure of citric acid.

8. Write a note on lactose.

9. What is caffeine? Write the structure of it.

10. What are adulterants? Give examples.

Part B (5 × 5 = 25)

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

11. (a) Discuss about the steps to be taken before constructing a factory.

Or

(b) Describe the industries that can be started or developed.

12. (a) Describe the detection of adulterant in any 3 food items by simple techniques.

Or

(b) Illustrate the dyeing of cotton fabrics with natural and synthetic dyes.

13. (a) Outline the isolation of lactose from milk.

Or

(b) Summarize the isolation of caffeine from tea.

14. (a) Discuss about the determination of soil organic carbon using Walkley-Black chromic acid wet oxidation method

Or

(b) Write a note on cottage industry.

15. (a) Describe the location of industry.

Or

(b) Discuss about the isolation of citric acid from lemon.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Elucidate the steps needs to be taken for licenses and registration of an industry.

17. Describe the tie and dye and batik methods of dyes printing.

18. Demonstrate the scope of small-scale industries.

19. Discuss about the isolation of casein from milk.

20. Explicate the testing of water samples using test kit.

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S–1019

Sub. Code
23MCH4C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Fourth Semester

Chemistry

PHYSICAL CHEMISTRY — II

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. State Heisenberg's Uncertainty Principle.

2. Write Schrodinger Time-independent and Time-dependent equations.

3. How many degeneracies is possible for the values of n (2, 1, 1) for a particle in 3D box?

4. Define "Anharmonicity".

5. What is Kohn theorem?

6. List out two examples for hydrogen-like species.

7. List the symmetry elements in CH_4 molecule.

8. What is an Abelian group?

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

10. Write a short note on" LCAO" theory.

Part B (5 × 5 = 25)

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

11. (a) Discuss the postulates of quantum mechanics.

Or

(b) Explain the properties of Hermitian operators with an example.

12. (a) Arrive Schrodinger wave equation for particle-in-1D box.

Or

(b) Explain Simple Harmonic oscillator.

13. (a) Elaborate variation method and trial wave function.

Or

(b) Describe Slater determinants.

14. (a) Compare symmetry elements and symmetry operations.

Or

(b) Examine reducible and irreducible representation.

15. (a) Compare VBT and MOT.

Or

(b) Apply HMO method to cyclopropenyl molecule.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Derive Schrodinger wave equation and write the significance of ψ and ψ^2.

17. Derive the wave equation and solution for rigid rotor and mention the importance of rotation constant.

18. Apply first order correction perturbation method to He atom.

19. Construct character table for C_{2v} and C_{3v} point groups.

20. Apply HMO method to butadiene and cyclobutadiene.
