S–6407

Sub. Code
23MCH1C1

M.Sc. DEGREE EXAMINATION, APRIL 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. How can the Hammond Postulate be used to predict the relative reactivity of different substrates in a reaction with the same mechanism?

2. What is the difference between isolating and detecting an intermediate?

3. Mention the three main criteria for a molecule to be considered aromatic.

4. Identify the most common type of carbon electrophile used in Friedel-Crafts acylation reactions.

5. What are the two general requirements for a successful aromatic nueleophilic substitution reaction?

6. Write note on Rosenmund reaction.

7. Define the term chirality.

8. Differentiate between chiral shift reagents and chiral solvating agents.

9. State axial haloketone rule.

10. Draw the preferred conformation of methylcyclohexane and why.

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

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

11. (a) Discuss with examples: Trapping reactions of benzyne.

Or

(b) Briefly explain the concept of a σ (sigma) constant and its role in LFERs.

12. (a) Arrange benzene, pyridine, furon, pyrrole and thiophene in the decreasing order of their aromaticity. Explain it.

Or

(b) Write the synthetic applications of diazotization of reactions.

13. (a) Discuss the aliphatic nucleophilic substitution reactions at an allylic carbon.

Or

(b) Comment on :

(i) Bucherer reaction and

(ii) Von Richter reaction

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

Or

(b) Describe briefly about stereochemistry of biphenyl derivatives.

15. (a) Explain how neighbouring group participation (NGP) can affect the stereochemical outcome of a nucleophilic substitution reaction. Briefly discuss two examples.

Or

(b) Explain the concept of ORD curves and how they are used to determine the chirality of a molecule.

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

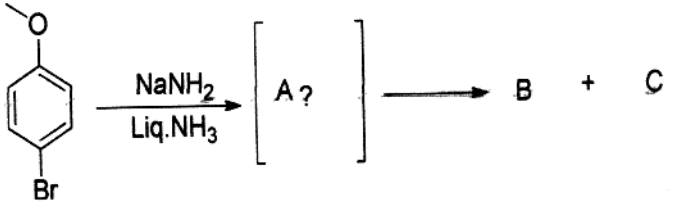
Answer any **three** questions.

16. Explain the principles behind Hammett and Taft equations and discuss their applications in determining reaction mechanisms.

17. (a) Discuss the reactivity and orientation in disubstituted phenol and nitrobenzene.

(b) Write note on aliphatic electrophilic substitution reaction of SEi. (7+3)

18. (a) Find out the product. Give its suitable mechanism.



(b) Write in detail the evidence of SNi reaction mechanism. (6+4)

19. (a) Describe two types of stereoisomerism possible in disubstituted allenes and provide an example for each.

(b) Define the terms stereoselective and stereospecific reactions. Give its one example. (5+5)

20. (a) Discuss the conformation analysis of disubstituted cyclohexane (1,2-1,3 and 1,4-dimethyl) (7)

(b) Illustrate Bredt's rule. (3)

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S–6408

Sub. Code
23MCH1C2

M.Sc. DEGREE EXAMINATION, APRIL 2025

First Semester

Chemistry

STRUCTURE AND BONDING IN INORGANIC COMPOUNDS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** the questions.

1. State Bent's rule.
2. What is Mno rule? Give an example.
3. Calculate the number of unit cells in 8.1 g of aluminium if it crystallizes in a face centered cubic structure?
4. What is radius ratio?
5. Why is $Fe3O_4$ inverse spinel?
6. Write the principle of crystallization.
7. What is Bragg's law used for?
8. Give the difference between optical and electron microscopy.
9. Define Hall Effect.
10. What is meant by metal excess effect?

Part B (5 × 5 = 25)

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

11. (a) Discuss the structure of boranes on the basis of Wade's rules.

Or

(b) List out the applications of Pauling's rule of electrovalence.

12. (a) Give a brief account of hexagonal close packed (hcp) structures of crystals.

Or

(b) Write a note on : Kapustinski equation.

13. (a) Describe the crystal structure of zinc blende.

Or

(b) Discuss the crystal growth methods with an example.

14. (a) What is systematic absence of reflections? Explain it with an example.

Or

(b) Explain the applications of SEM.

15. (a) Write a note on : Lasers.

Or

(b) Describe the types of semiconductors and mention its functions.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain the structure and application of ortho, meta and pyro silicates.

17. State the fundamental of point group and space group for lattices.

18. Discuss the structural aspects for fluorite and anti fluorite.

19. Explain the interpretation of XRD technique.

20. Write a note on :

    (a) Schottky defects

    (b) Frenkel defects. (5 + 5)

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S–6409

Sub. Code
23MCH1E1

M.Sc. DEGREE EXAMINATION, APRIL 2025

First Semester

Chemistry

Elective — PHARMACEUTICAL CHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define angle of rotation.

2. What is Pseudo plastic flow?

3. State surface activity.

4. Short note on body scanning.

5. How to drug product development?

6. What are the common terms in drugs?

7. Define steric parameters.

8. Give to two developments of QSAR.

9. What is extrapolation?

10. Short note on computer memory.

Part B (5 × 5 = 25)

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

11. (a) Explain the physical properties of drug molecule.

Or

(b) Discuss the importance and determination of polychromic light.

12. (a) Write a note on degree of ionization.

Or

(b) Give account on properties of various types of radiopharmaceuticals.

13. (a) Explain the drug regulation and control.

Or

(b) Discuss the routes of administration of drugs products.

14. (a) Describe the molecular modification of lead compounds.

Or

(b) Explain the biological properties of simple functional groups.

15. (a) Write a note on :

(i) CPU

(ii) I/O devices.

Or

(b) Explain the software components.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain the dielectric constant explanation and determination.

17. Discuss the physic chemical properties and drug action.

18. Write a note on following :

    (a) Drug delivery system

    (b) Drug dosage and development.

19. Explain the following :

    (a) lipophilicity

    (b) Chelation parameters.

20. Describe the C+ language to handle various numerical methods in chemistry.

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S–6410

Sub. Code
23MCH1E2

M.Sc. DEGREE EXAMINATION, APRIL 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** questions.

1. Define nanoparticles.

2. How do you synthesis nano materials for fabricate nano structures?

3. What do you mean by solvothermal method?

4. Give the types of CVD with an example.

5. What are the mechanical properties of nanomaterials?

6. Write thermal properties of nanoparticles.

7. How do you calculate the Hall voltage?

8. Why GaAs is used in semiconductor?

9. What are the core-shell nanoparticles?

10. What are ceramic based nanocomposites?

Part B (5 × 5 = 25)

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

11. (a) Discuss the features of nanostructures.

Or

(b) List out the applications of nanomaterials and technologies.

12. (a) Describe the synthesis of nanoparticle using physical and chemical methods.

Or

(b) Write a note on: Microwave assisted synthesis.

13. (a) How does adhesion affect friction? Explain it.

Or

(b) Discuss any one technique to study the mechanical properties of nanomaterials.

14. (a) Discuss the interpretation of charge carrier density.

Or

(b) Explain the construction and working of photovoltaic cell.

15. (a) Write a note on: Ceramic and polymer.

Or

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

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Discuss about the tools of the nanoscience.

17. Write a brief account on inert gas condensation method for synthesis of nanoparticles.

18. Describe the thermal properties of nano materials and nanoparticles.

19. Discuss the variation of Fermi level with temperature in an n-type semiconductor.

20. Explain the principle, instrumentation and applications of TEM technique.

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S–6411

Sub. Code
23MCH1E3

M.Sc. DEGREE EXAMINATION, APRIL 2025.

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 ideal behavior.

2. What is ion-ion interaction?

3. Short note on poly electrodes.

4. State streaming potentials.

5. Write a short note on behavior of electrodes.

6. What is transfer coefficient?

7. Define rate determining step.

8. Short note on multi electron system.

9. What is alkaline fuel cell?

10. Define cyclic voltammetry.

Part B (5 × 5 = 25)

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

11. (a) Derive the Debye-Huckel limiting law.

Or

(b) Write a note on ion association and triple ion formations.

12. (a) Discuss the electrocapillary phenomena.

Or

(b) Describe the electrophoresis method.

13. (a) Explain the significance of exchange current density.

Or

(b) Give an account on low and high field approximations.

14. (a) Explain the stoichiometric number.

Or

(b) Brief note on chemical and electro chemical overvoltage.

15. (a) Discuss the mechanism of charge storage.

Or

(b) Explain the phosphoric acid fuel cells.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Describe the Debye Huckel theory of strong electrolytes.

17. Explain zeta potential and potential at zero charge.

18. Discuss the polarizable and non-polarizable.

19. Explain the Butler-Volmer equation for a multi-step reaction.

20. Discuss the energy production system of fuel cells.

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S–6412

Sub. Code
23MCH1E4

M.Sc. DEGREE EXAMINATION, APRIL 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. State two factors that influence the intensity of a rotational spectral line.

2. Why cant homonuclear diatomic molecules show puce rotational spectra in the microwave region?

3. Define hot band in vibrational spectroscopy.

4. Why do symmetric top molecules have two distinct moments of inertia?

5. Distinguish between absorption and emission spectroscopy in the context of electronic transitions.

6. What is population inversion?

7. Comment on COSY and NOESY in 2D NMR.

8. How many ESR lines observed in isopropyl and naphthalene radical?

9. What is the main difference between chemical ionization and electron impact (EI) ionization in mass spectrometry?

10. Write the fundamental principle behind Mossbauer spectroscopy?

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

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

11. (a) Explain the rule of mutual exclusion principle.

Or

(b) Briefly describe two consequences of considering non-rigid rotations in the analysis of a molecule's rotational spectrum.

12. (a) How can hot bands be used to study the vibrational states of molecules?

Or

(b) Explain the theory behind vibrational spectroscopy for a diatomic molecule.

13. (a) Write down the Laporte and Spin selection rules for electronic transition.

Or

(b) Explain the basic principles of photoelectron spectroscopy.

14. (a) Comment on the following terms in NMR technique:

(i) Nuclear Over Hauser Effect

(ii) Vicinal and Geminal Coupling

Or

(b) Discuss the ESR spectrum of bis – (salicylaldimine copper (II) complex.

15. (a) What will be the structure of organic compound which gives the peak at m/z 99, 71, 57, 43, 41 and 29?

Or

(b) Write short notes on isomer shift and quadrupole splitting.

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

Answer any **three** questions.

16. (a) Describe the formation of Stokes and Anti-Stokes lines in a Raman spectrum. (7)

(b) How does the spacing between adjacent lines within an O-branch differ from the spacing between lines in an S-branch? Briefly explain the reason for this difference. (3)

17. (a) What is a harmonic oscillator? Derive the equation of motion for a harmonic oscillator and solve it to find the general solution. (7)

(b) What is an anharmonic oscillator? Explain the difference between harmonic and anharmonic oscillators. (3)

18. Discuss how the Franck-Condon Principle affects the intensity distribution observed in electronic absorption spectra of molecules.

19. Define the term "chemical shift". Explain four main factors that influence the chemical shift values of protons in an NMR spectrum.

20. Explain the applications of Mossbauer spectra of Fe and Sn compounds.

S–6413

Sub. Code
23MCH2C1

M.Sc. DEGREE EXAMINATION, APRIL 2025

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 EICB reaction? Give an example.

2. State Hoffmann rule of elimination. Give an example.

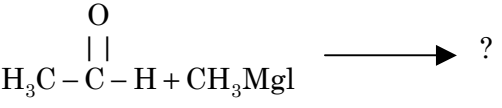
3. What is the role of OsO_4 in organic synthesis?

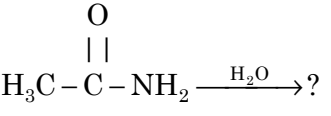
4. Write the reaction of Clemmenson reduction.

5. What is Benzilic acid rearrangement?

6. What is Photo Fries rearrangement?

7. Complete the following reactions :

(a) 

(b) 

8. What is enolate ion? Write its formation.

9. Draw the structure of the following reagents.

   (a) TEMPO

   (b) DMAP

10. Write Baylis-Hillman reaction.

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

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

11. (a) Explain syn and anti elimination reaction with relevant examples.

Or

   (b) Give radical reaction mechanism for aromatic substitution reactions.

12. (a) Write a detailed mechanism for the following reaction.

   (i) Oxidative decarboxylation

   (ii) Allylic oxidation

Or

   (b) Explain the mechanism of homogeneous hydrogenation reaction with a relevant example.

13. (a) Give a mechanism for Wagner-Meerwin rearrangement.

Or

   (b) Write a mechanism for Cope and Oxy cope rearrangement.

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

Or

(b) How does the following reagent react with Acetone?

(i) Grignard reagent

(ii) Organo zinc

15. (a) What is DBU? Write its role in organic synthesis.

Or

(b) Discuss the synthetic application of PDC.

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

Answer any **three** questions.

16. (a) Write a reaction mechanism for E1 reaction with a suitable example.

(b) State and explain Saytzeff rule.

(c) Write the reaction mechanism for pyrolitic elimination with a suitable example.

17. Write a reaction mechanism for (5+5)

(a) Rosenmund reduction

(b) MPV reduction

18. Write the reaction mechanism for (5+5)

(a) Lossen rearrangement and

(b) Benzidine rearrangement

19. Write a detailed mechanism for the following reaction.

(5+5)

(a) Free radical addition reaction

(b) Wittig reaction

20. Discuss the role of following reagents in organic synthesis. (4+3+3)

(a) NBS

(b) $NaIO_4$

(c) $TiCl_3$

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S–6414

Sub. Code
23MCH2C2

M.Sc. DEGREE EXAMINATION, APRIL 2025

Second Semester

Chemistry

PHYSICAL CHEMISTRY — I

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A ($10 \times 2 = 20$)

Answer **all** questions.

1. Give the differences between classical and statistical thermodynamics.
2. What are the physical significances of chemical potential?
3. Define ensemble.
4. What is law of equipartition of energy?
5. What do you understand by conjugate pair of fluxes and forces?
6. Define the term 'entropy production' in irreversible thermodynamics.
7. How does the temperature affect the rate of a reaction?
8. Write the significances of Michelis-Menton constant.
9. Give reason why conventional techniques lead difficulties for kinetically fast reactions.
10. What are the differences between free radical and ionic polymerization?

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

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

11. (a) Describe one method to determine fugacity of a gas.

Or

(b) Explain the concept of activity and activity coefficient.

12. (a) Prove that Helmholtz free energy $(A) = -nRT \ln Q$.

Or

(b) Compare Bose-Einstein and Fermi-Dirac statistics.

13. (a) Write notes on conservation of energy.

Or

(b) Briefly discuss the electrokinetic effects.

14. (a) Derive Lindeman unimolecular mechanism for $A \rightarrow$ Products.

Or

(b) What are the factors governing the rate of enzyme catalysis?

15. (a) Brief about Rice-Herzfeld mechanism.

Or

(b) Derive photokinetics of the H_2 and Br_2 reaction.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. (a) Derive Gibbs-Duhem equation. (5 + 5)

    (b) How does the chemical potential vary with temperature and pressure?

17. Derive Maxwell's-Boltzmann distribution statistics.

18. (a) Discuss the Onsagar theory, its validity and its verification. (5 + 5)

    (b) Illustrate the Onsager reciprocal relationship.

19. (a) Brief about Collision theory. (5 + 5)

    (b) Discuss in detail activated complex theory (ACT) and it significances.

20. (a) Explain the kinetics of parallel reaction with an example. (5 + 5)

    (b) Write a notes on the rate kinetics of reversible reaction.

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S–6415

Sub. Code
23MCH2E1

M.Sc. DEGREE EXAMINATION, APRIL 2025

Second Semester

Chemistry

Elective — MEDICINAL CHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is the primary function of a receptor in medicinal chemistry?

2. Define Drug Agonist.

3. What is the primary purpose of antibiotics?

4. What type of enzyme do beta-lactam antibiotics inhibit?

5. What is oestriol's role during pregnancy?

6. What is the most potent form of estrogen in the human body?

7. Define hypertension.

8. Write the mechanism of action of ACE inhibitors?

9. Depict the two main types of diabetes.

10. How does sulfonyl urea stimulate insulin secretion?

Part B

$(5 \times 5 = 25)$

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

11. (a) Give details about the importance of receptor-ligand interactions in the development of new pharmaceuticals.

Or

(b) Analyze the challenges and strategies involved in identifying and validating new drug targets.

12. (a) Provide an overview of the major classes of antibiotics, including examples of drugs within each class.

Or

(b) Evaluate the role of bacterial enzymes in the development of antibiotic resistance.

13. (a) Explain the mechanism of action of sildenafil, its clinical applications in the treatment of erectile dysfunction.

Or

(b) Give an account of the Pharmacological properties of prednisolone its clinical uses.

14. (a) Elaborate the therapeutic importance of diuretics in the treatment of hypertension and heart failure, highlighting their different classes.

Or

(b) Discuss the challenges in diagnosing and treating secondary hypertension.

15. (a) Describe the biochemical and cellular mechanisms underlying the inflammatory response.

Or

(b) Confer the role of key mediators such as prostaglandins, cytokines and leukotrienes in the inflammation process.

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

Answer any **three** questions.

16. Examine the mechanisms underlying drug resistance and its impact on the efficacy of pharmacotherapy.

17. Describe the primary targets of antibiotic action within bacterial cells and explain how these targets are exploited to achieve selective toxicity.

18. Compare and contrast oestrone with other estrogens, focusing on its physiological functions clinical applications, and potential side effects.

19. Provide a detailed classification of antihypertensive agents, discussing the mechanism of action, therapeutic uses, and potential side effects of each class.

20. Analyze the Pharmacological properties classification, and mechanism of action of diclofenac.

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S–6416

Sub. Code
23MCH2E2

M.Sc. DEGREE EXAMINATION, APRIL 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. Write any two goals of green chemistry.

2. List out the limitations of green chemistry.

3. What are ionic liquids? Give an example.

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

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

6. Write any two advantages of polymer supported catalysts.

7. What saponification? Write its chemical reaction.

8. What is crown ether? Draw the structure of [18]-Crown-6.

9. What is microwave? Write its role in chemical synthesis.

10. What is sonochemistry?

Part B (5 × 5 = 25)

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

11. (a) Discuss the accidents generally happened in chemical laboratory. How do you prevent them?

Or

(b) Mention any five advantages of green chemistry.

12. (a) Write the preparation (any one) and synthetic applications (any four) of ionic liquids.

Or

(b) Suggest a greener method for the synthesis of adipic acid.

13. (a) Discuss the role of oxidation catalyst anti basic catalyst in green synthesis.

Or

(b) Explain the causes and control methods of environmental pollution.

14. (a) Write the preparation (any five) of crown ether.

Or

(b) List out any five synthetic applications of crown ether.

15. (a) Discuss the principle and instrumentation of microwave reactor.

Or

(b) Explain cavitation theory.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Mention any ten international green chemistry organization and their role towards the development of green chemistry.

17. What is super critical CO_2? Mention its advantages and disadvantages.

18. Discuss the role of following in green chemistry :

    (a) Polystyrene aluminium chloride

    (b) Polymeric super acid catalyst.

19. What is phase transfer catalyst? Discuss its applications in organic synthesis.

20. (a) Explain the instrumentation of ultrasoniccator.

    (b) Give any five examples for ultra sound assisted organic synthesis.

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S–6417

Sub. Code
23MCH2E3

M.Sc. DEGREE EXAMINATION, APRIL 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. Give the distribution patterns of the ions like Na+, K+, Ca^{2+} and Mg^{2+} in the cellular fluid.

2. Name the potential inhibitors towards carbonic anhydrase (CA). How do they inhibit the function of CA?

3. What is the role of protein in O_2 carriers?

4. Name the sites of action of different Fe-S proteins.

5. What is the requirement of ATP-hydrolysis in N2-fixation?

6. What is Hill reaction? Write it's significance?

7. Mention the possible reasons for heavy metal toxicity.

8. What is minamata disease? Write the antidote used in this disease?

9. Why enzymes are specific?

10. What are the three kinds of cofactor present in enzymes?

Part B (5 × 5 = 25)

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

11. (a) Examine the biological role of ion pump and its electrogenic activity.

Or

(b) Write the structural importance and biological role of coenzyme B_{12}.

12. (a) Write the adverse effects on binding of CO and CN to Hb.

Or

(b) Compare the Fe-S bonding features of rubredoxin and ferredoxin.

13. (a) Illustrate the components are involved in the nitrogen fixation process biological system.

Or

(b) What is the requirement of ATP hydrolysis in N_2-fixation?

14. (a) Write a note on Lead poisoning? Give its remedial measures.

Or

(b) Write a note on the MRI imaging and contrasting compounds.

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

Or

(b) What are the points to remember to give nomenclature of enzymes? Illustrate with an example.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Recall the role of copper and iron enzymes in the eradication of ROS.

17. How are cytochromes classified? Discuss the catalytic cycle of cytochrome p-450 and poisoning effect of heavy metals on this enzyme.

18. Draw the electron transport chain in photosynthesis of electrode potentials of the different couples involved. Why is it called Z-Scheme?

19. Discuss the application of vanadium compounds in the treatment of Diabetes and cancer.

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

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S–6419	Sub. Code
	23MCH2S1

M.Sc. DEGREE EXAMINATION, APRIL 2025.

Second Semester

Chemistry

PREPARATION OF CONSUMER PRODUCTS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Why is promotion of a product required?

2. What is the purpose and concept of marketing?

3. Name two criteria for successful market segmentation.

4. Why are shopping products bought less frequently?

5. What are the characteristics of a perfect jelly?

6. Why is leaching carried out during jam preparation?

7. How is medicated tooth paste prepared?

8. Name two binders employed in compact powder.

9. Write the advantages of cleansing cream.

10. What are the specific actions of moisturizers on skin?

Part B (5 × 5 = 25)

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

11. (a) Analyse the importance of understanding the types of consumer products.

Or

(b) Name various factors for product issues.

12. (a) How is business products classified?

Or

(b) Elaborate the marketing strategy of unsought products.

13. (a) List out the major raw materials and their role in a cleaning powder.

Or

(b) Explain the preparation of tooth paste and tooth powder.

14. (a) Elaborate the preparation of pain balm and different types of oils added to it.

Or

(b) Name any two each primary and secondary cells.

15. (a) Write a note on all purpose shaving creams.

Or

(b) How do you prepare a natural lipstick? Explain.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain role of intermediaries in marketing strategy.

17. How do you prepare
    (a) candle and
    (b) detergents?

18. Elaborate the extraction of oil from flowers.

19. Discuss the advantages and disadvantages of creams and sunscreen.

20. Examine the herbal make up preparations step by step.

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S–6420

Sub. Code
23MCH3C1

M.Sc. DEGREE EXAMINATION, APRIL 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. Write the synthetic equivalents for the following synthons.

   (a) MeS^- (b) $^-CH_2CHO$

   (c)  (d) 

2. What is protection and deprotection of the functional group?

3. What is the role of bridging elements in the synthesis of organic compounds?

4. What is regiospecific and stereospecific reactions?

5. Explain the following terms with examples.

   (a) Dis rotation

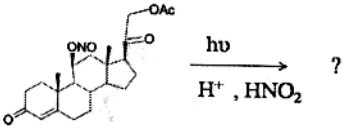
   (b) Con rotation

6. What is [1,3] sigmatropic rearrangement? And give an example.

7. What are the types of electronic transitions occur in organic photochemical reactions?

8. What is photo reduction? Give an example.

9. Predict the product obtained in the following reaction.



10. What is photo cycloaddition reaction? Give one example.

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

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

11. (a) (i) What is relay approach? How is it work in the organic synthesis.

(ii) What is Disconnection in organis synthesis? Give an example for best disconnection.

Or

(b) Compare linear, convergent and divergent synthesis.

12. (a) Discuss various types of alcohols protecting groups applied in synthesis.

Or

(b) Illustrate about Disconnection and Functional group inter conversion with suitable examples.

13. (a) Write a note on con rotatory and Dis rotatory motion in ring opening and closing reactions using suitable examples.

Or

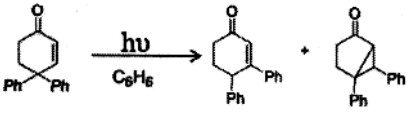
(b) Explain the relation between Diels-Alder reaction and 1,3-dipolar addition reaction.

14. (a) Discuss the mechanism of Norrish Type – II reaction with suitable example.

Or

(b) Write a note on Stern-Volmer equation.

15. (a) Propose a suitable mechanism for the following transformation.



Or

(b) Discuss about the photochemistry of aromatic compounds.

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

Answer any **three** questions.

16. Explain the general guidelines applied for disconnection approach with examples.

17. Discuss about the protecting and deprotecting groups for aldehydes and ketones.

18. Construct a correlation diagram for [4+2] cycloaddition reaction and explain whether it is thermally or photochemically allowed.

19. Discuss about the following terms by the use of Jablonski diagram.

    (a) Energy cascade

    (b) Vibrational cascade

    (c) Internal conversion

    (d) Intersystem croosing

    (e) Fluorescence

    (f) Phosphorescence.

20. Describe the mechanism of photochemical reaction of 4, 4-diphenylyl cyclohexa 2,5-dienone to 3,4-diphenyl phenols.

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S–6421

Sub. Code
23MCH3C2

M.Sc. DEGREE EXAMINATION, APRIL 2025

Third Semester

Chemistry

COORDINATION CHEMISTRY — I

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 2 = 20)$

Answer **all** questions.

1. What is spectrochemical series?

2. What is π and σ bonding in octahedral complexes?

3. Define Nephelauxetic series.

4. Write a note on Racha parameter.

5. What is spin orbital coupling?

6. Write a spin only magnetic moment of the complexes having three unpaired electron.

7. Define labile complexes with suitable examples.

8. Write a base hydrolysis in octahedral complexes.

9. Write photo redox reaction with examples.

10. What are electron transfer reaction and its types?

Part B (5 × 5 = 25)

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

11. (a) Define CFSE. Calculate CFSE of $[Co(HN_3)_6]^{2+}$ and $[Cr(H_2O)_6]^{2+}$

Or

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

12. (a) Discuss the detail about orgel diagram of d^6 configuration.

Or

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

13. (a) Give the brief review about inner sphere mechanism.

Or

(b) What is chelate? Write any two application of chelate with example?

14. (a) Illustrate the SNCB mechanism.

Or

(b) Write with explanatory note on substitution reaction in square planar complexes.

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

Or

(b) Write a note on photo substitution reaction and photo isomerization reaction.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain the Jahn-Teller distortion of the $[Cu(H_2O)_6]^{2+}$ complex.

17. Draw the orgel diagram of $[Ti(H_2O)_6]^{3+}$.

18. Write a brief note on step wise stability constant and over all stability constant.

19. What is Trans effect? Application of Trans effect to synthesis Cis-Trans isomers of Pt complexes.

20. Demonstrate Outer sphere electron transfer reactions in octahedral complexes with suitable examples.

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S–6422

Sub. Code
23MCH3E1

M.Sc. DEGREE EXAMINATION, APRIL 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 purpose of maceration in phytochemical extraction?

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

3. Compare the efficiency of maceration and Soxhiet extraction?

4. Describe the structure of menthol.

5. Portray the structure of citral and its importance.

6. In which plant families alkaloids are most commonly found?

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

8. What is the main pharmacological action of papaverine?

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

10. Which reagent is used in Borntrager's test for glycosides?

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

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

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

Or

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

12. (a) Describe the steam distillation technique.

Or

(b) Illustrate supercritical fluid extraction, focusing on the use of supercritical gases like CO_2.

13. (a) Elaborate the composition of camphor oil. Explain its properties and various applications in traditional and modern medicine.

Or

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

14. (a) Give an account of the chemical properties and structure of morphine.

Or

(b) Outline the chemical properties and structure of reserpine.

15. (a) Explain the basic ring systems found in plant glycosides.

Or

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

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

Answer any **three** questions.

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

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

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

19. Discuss the chemical properties and structure of papaverine.

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–6423

Sub. Code
23MCH3E2

M.Sc. DEGREE EXAMINATION, APRIL 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** questions.

1. Draw the ring structure of fructose and ribose.

2. Write the hydrolysis reaction of sucrose.

3. Write any two colour reactions of steroids.

4. What is diel's hydrocarbon? Write its structure.

5. Outline the mechanism of urea cycle.

6. What is dialysis?

7. Explain the process involved in carbohydrate metabolism.

8. What is Kerb's cycle?

9. Draw the structure of any two benzofused five membered ring.

10. Write the oxidation reaction of Quinoline.

Part B (5 × 5 = 25)

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

11. (a) Write any five chemical properties of fructose.

Or

(b) Discuss the structure and properties of cellulose.

12. (a) What are steroids? Write its classification and biological importance.

Or

(b) How do you effect the biosynthesis of cholesterol from squalene?

13. (a) Write any two methods of purification of proteins.

Or

(b) What is nucleoside? Write any two methods for the synthesis of nucleosides.

14. (a) What are fatty acids? Write its biosynthesis.

Or

(b) Describe glyoxilate cycle.

15. (a) Write the preparation and chemical properties of isoindole.

Or

(b) Explain the preparation and chemical properties of benzothiophene.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Discuss the structure and chemical properties of

    (a) Glycogen and

    (b) Maltose

17. (a) Discuss the physiological activity of cholesterol.

    (b) Write the functions of adrenocortical hormones.

18. (a) How do you convert nucleoside to nucleotide?

    (b) Explain the solid phase synthesis of oligonucleotides.

19. Write a note on the following.

    (a) Lipid metabolism and

    (b) Protein metabolism

20. Write the preparation and chemical properties

    (a) Isoquinoline and

    (b) Indole

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S–6424	Sub. Code 23MCH3S1

M.Sc. DEGREE EXAMINATION, APRIL 2025.

Third Semester

Chemistry

INDUSTRIAL CHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is the purpose of using a water testing kit?

2. Difference between natural and synthetic dyes.

3. Describe the tie and dye technique in fabric dyeing.

4. Which method is used to isolate caffeine from tea?

5. Give the significance of soil analysis in agriculture.

6. What are consumer products?

7. Why are hands-on experiences important in industrial chemistry education?

8. What factors should be considered when developing a small-scale industry?

9. Name two advantages of small-scale industries.

10. What is a village industry? Write the one advantage of village industries in rural development.

Part B (5 × 5 = 25)

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

11. (a) Describe the characteristics of cottage industries and their contribution to local economies.

Or

(b) Examine the various factors that influence the location of industries, including access to raw materials, labour, transportation and market proximity.

12. (a) Outline the essential steps to be taken before constructing or establishing a factory.

Or

(b) Explain how these legal requirements ensure compliance and promote the legitimacy of industrial operations.

13. (a) Discuss simple techniques for detecting adulterants in common food items such as coffee, tea and milk.

Or

(b) Give briefly about the techniques such as tie and dye and batik and analyze their cultural significance and application in the textile industry.

14. (a) Describe common parameters assessed during water quality testing and their implications for public health.

Or

(b) List out the methods for determining soil organic carbon content, including the Walkley-Black chromic acid wet oxidation method.

15. (a) Discuss the importance of understanding consumer products for both producers and consumers, including aspects of safety, quality, and sustainability.

Or

(b) Illustrate the advantages and challenges faced by cottage industries in modern economies.

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

Answer any **three** questions.

16. Explain the concept of village industries, providing examples of typical products.

17. List out the factors impact the overall success of an industrial venture.

18. Discuss the significance of feasibility studies, market research, and site selection in the planning process for industrial development.

19. Examine the various extraction methods for natural products (any two methods).

20. Elucidate the resources of Consumer Products and their Relevance to Industrial applications.

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S–6425

Sub. Code
23MCH4C1

M.Sc. DEGREE EXAMINATION, APRIL 2025.

Fourth Semester

Chemistry

COORDINATION CHEMISTRY – II

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define the 16 electron rule.

2. List out the classification of organometallic compounds based on M-C bond.

3. Discuss α-elimination with an example.

4. Outline the water shift gas reaction.

5. Summarize the effect of coordination on the stretching frequency of aqua complexes.

6. What are fluxional molecules?

7. Explain Doppler shift in Mossbauer spectra.

8. Define Kramer's doublets in ESR spectra.

9. What are vertical transitions in PES?

10. Give the principle of CD.

Part B (5 × 5 = 25)

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

11. (a) Explain the MO approach of M-CO bonding.

Or

(b) Discuss the bonding nature of metal-allyl complexes.

12. (a) Elucidate the migratory insertion reaction and metathesis reaction with suitable example. (3 + 2)

Or

(b) Describe the cyclooligomerisation of acetylenes using Reppe' s catalyst.

13. (a) Discuss the IR spectroscopy of carbonyl complexes.

Or

(b) Explain the quadrupolar nuclei effect in NMR in spectroscopy.

14. (a) Outline the applications of ESR to coordination compounds with one unpaired electron.

Or

(b) Sum up the applications of Mossbauer's spectra of any two Fe compounds.

15. (a) Elucidate the PES of N_2 molecule.

Or

(b) Discuss about the PES of CO molecule.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Explain the structures based on polyhedral skeleton electron pair theory (Wade's rule).

17. (a) Describe the hydrogenation of olefins using Wilkinson catalyst.

    (b) Explain the oxidation of olefins using Wacker's process. (5 + 5)

18. List out the applications of ^{1}H, ^{15}N ^{19}F and ^{31}P NMR in spectroscopy in structural identification of inorganic complexes. (3 + 2 + 2 + 3)

19. Elucidate the ESR spectra of Mn(II) and Ni(II) complexes. (5 + 5)

20. Explicate the PES of H_2O and CH_4 molecules. (5 + 5)

S–6426

Sub. Code
23MCH4C2

M.Sc. DEGREE EXAMINATION, APRIL 2025.

Fourth Semester

Chemistry

PHYSICAL CHEMISTRY – II

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A ($10 \times 2 = 20$)

Answer **all** questions.

1. What is black body radiation?

2. Differentiate Eigen function and Eigen values.

3. Define Zero Point Energy.

4. What is simple Harmonic Oscillator?

5. Write down radial and angular wave function of a hydrogen atom.

6. What is Pauli's exclusion principle? Give example

7. Compare symmetry element and symmetry operation.

8. What is direct product representation? Give an example

9. What is linear variation function?

10. What is meant by Linear Combination of Atomic Orbital (LCAO)?

Part B (5 × 5 = 25)

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

11. (a) Construct the postulates of Quantum mechanics.

Or

(b) Explain the following

(i) wave and particle duality

(ii) Heisenberg uncertainity principle.

12. (a) Derive an expression for the energy of a rigid rotor using the Schrodinger wave equation.

Or

(b) Calculate the energies of an electron (eV) constrained to move in a one-dimensional box of width 1Å. (Given $h = 6.626 \times 10^{-34}$ Js ; $m = 9.109 \times 10^{-31}$ kg ; $1\,eV = 1.602 \times 10^{-19}$ J) .

13. (a) Brief about Hatrefock self consistent field method.

Or

(b) Using variation method solve the Schrodinger wave equation for the ground state energy of helium atom.

14. (a) Construct character table for C_{2v} point group.

Or

(b) Examine reducible and irreducible representation.

15. (a) Discuss Heitler London treatment to hydrogen molecule.

Or

(b) Apply Huckel's Molecular Orbital theory to ethylene system to calculate delocalization energy.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Derive Schrodinger time independent wave equation.

17. Discuss the solution of Schrodinger wave equation for a particle in a three-dimensional box.

18. (a) Illustrate the application of perturbation method to helium atom

    (b) Explain Slater determinants with suitable examples. (5 +5)

19. State and explain the great orthogonality theorem.

20. Analyze the application of group theory to electronic transitions in ethylene.

S–6427

Sub. Code
23MCH4E1

M.Sc. DEGREE EXAMINATION, APRIL 2025.

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. What is the role of alkaloids in neurotransmission?

2. Write the oxidation reaction used for in the structure determination of nicotine?

3. Definition of Carotenoids.

4. Mention the function of vitamin A in the human body?

5. Indicate the role of flavan-3, 4-diols in the biosynthesis of anthocyanines?

6. Differentiate flavones and other types of flavonoids.

7. What is the structure of uric acid?

8. Write the IUPAC rule for naming steroids?

9. What are the two main classes of natural dyes?

10. Give the characteristic colour of indigo dye?

Part B (5 × 5 = 25)

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

11. (a) Describe the different types of plants that are known to produce alkaloids.

Or

(b) Depict the general methods used for the structural elucidation of alkaloids.

12. (a) Illustrate the monoterpenes, sesquiterpenes and diterpenes and how do they differ in terms of their chemical structure and biological functions?

Or

(b) Explain the chemical methods used to determine the structure of terpenoids, including oxidation, reduction, and hydrolysis reactions?

13. (a) Give briefly about the significance of cyanidine chloride in the food industry, including its use as a natural food coloring and its potential health benefits.

Or

(b) Outline the biological importance of flavones, including their antioxidant and anti- inflammatory properties.

14. (a) Discuss the significance of cholesterol in human health, including its role in membrane structure and cholesterol metabolism.

Or

(b) Describe the colour reactions of sterols, including the use of Liebermann-Burchard and Salkowski reactions.

15. (a) Explain the concept of colour constitution in natural dyes, including the role of chromophores.

Or

(b) Elucidate the physical and chemical properties of natural dyes, including their solubility, melting point, and UV-Vis absorption spectra.

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

Answer any **three** questions.

16. Discuss the importance of alkaloids in medicine, highlighting their therapeutic applications.

17. Illustrate the significance of terpenoids in natural products chemistry, including their occurrence, classification, and biological functions.

18. How does quercetin differ from other flavonoids in terms of its chemical structure and biological functions?

19. Describe the methods used to isolate purines from natural sources, including extraction, chromatography, and crystallization?

20. Outline the synthesis of alizarin dye from anthraquinone, including the use of oxidation, reduction, and condensation reactions.

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S–6428

Sub. Code
23MCH4E2

M.Sc. DEGREE EXAMINATION, APRIL 2025.

Fourth Semester

Chemistry

Elective : POLYMER CHEMISTRY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is cohesive energy?

2. Write a short note on thermal methods in molecular weight determination.

3. Define stereo regular polymers.

4. What do you mean by reaction kinetics?

5. What is emulsion?

6. Give any two applications of photostabilizers.

7. Write the preparation method of poiy Vinyl Chloride.

8. Write a note on conducting polymers.

9. Define the role of plasticizers in polymer processing.

10. What are fire retardants and colourants?

Part B (5 × 5 = 25)

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

11. (a) Explain the determination of molecular mass of polymers using number average molecular mass (M_n) of polymers method.

Or

(b) Discuss about the primary and secondary bond forces in polymers.

12. (a) Describe the Ziegler-Natta polymerization.

Or

(b) Illustrate the chain growth polymerization.

13. (a) Explain the interfacial and gas phase polymerization.

Or

(b) Elucidate the solid and gas phase polymerization.

14. (a) Write a note on preparation of polystyrene and its application.

Or

(b) Express the preparation of Buna-N and its application.

15. (a) Describe the compression moulding polymer processing.

Or

(b) Discuss about film casting polymer processing.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Elucidate the molecular weight determination of high polymers by physical methods.

17. (a) Describe the step growth polymerization.

    (b) Explain the degree of polymerization. (5+5)

18. Demonstrate the types of polymer degradation.

19. Give the preparation of Neoprene, Poly Sulphure Nitriles and Polyurethanes. (3+4+3)

20. Explicate the polymerization catalysis and auto-exhaust catalysis.

S–6429

Sub. Code
23MCH4S1

M.Sc. DEGREE EXAMINATION, APRIL 2025.

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. Give any two objectives of research.

2. Write a short note on research problem.

3. Illuminate the use of thesis in literature survey.

4. Give the use of books in literature survey

5. What is plagiarism?

6. Define research ethics.

7. What is impact factor?

8. Write a note on indexing.

9. Give a brief account on cost analysis.

10. What is research project?

Part B (5 × 5 = 25)

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

11. (a) Classify the types of research.

Or

(b) Describe research synopsis.

12. (a) List out the use of chemical abstract and patent database in literature survey.

Or

(b) Illustrate the importance of documentation techniques in literature survey.

13. (a) Explain the responsibility and accountability of researchers.

Or

(b) Outline the use of plagiarism detection software.

14. (a) Write a note on short communication.

Or

(b) Elucidate results and discussion in research report.

15. (a) Describe the instrumentation and biological testing in project cost management.

Or

(b) Discuss about writing a research project.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Elucidate the steps involved in research proposal.

17. Describe the uses of online resources such as scientific engines and online servers in literature survey and documentation.

18. Demonstrate the ethical consideration during animal experimentation including CPSSEA guidelines.

19. Discuss about technical writing and reporting of review article.

20. Explicate the various funding agencies and their function in India.

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