F–1335

Sub. Code
7MCH2C1

M.Sc. DEGREE EXAMINATION, APRIL 2024

Second Semester

Chemistry

ORGANIC CHEMISTRY – II

(CBCS – 2017 onwards)

Time : Three Hours Maximum : 75 Marks

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

Answer **all** questions.

1. Which conformation of 1,2,-dimethyloyelohexane is more stable and why?

2. What happens with more than one substitution on cyclohexane ring? Give example.

3. Peaks in UV spectrum are broad. Why?

4. Explain the principles of mass spectroscopy.

5. What is meant by chemically equivalent protons? Give example.

6. How will you differentiate o–, m– and p-xylenes on the basis of proton decoupled 13_C NMR spectra.

7. What are the characteristics of good oxidising agent?

8. What is Birth reduction? Give an example.

9. How cholesterol double bond position identified?

10. Prove androsterone molecule is tetracyclic.

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

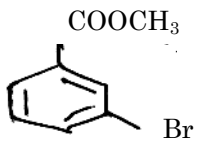
Answer **all** questions choosing either (a) or (b).

11. (a) Give a brief note on Ellel-Ro equation.

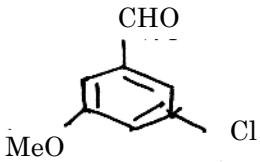
Or

(b) How will you correlate the conformation of acyclic and cyclic system based on their chemical properties?

12. (a) (i) Predict the value of λ_{max} for the following compounds. (2)



(I)



(II)

(ii) Explain metastable and isotopic ions. (3)

Or

(b) Discuss the factors influencing group frequencies in IR chemical shift of protons.

13. (a) Discuss the influence of stereochemical factors on chemical shift of protons.

Or

(b) Write an account on coupling constant and CIDNP.

14. (a) (i) Explain the role of 1,3-dithane in organic synthesis. (3)

(ii) Write the advantages of phase transfer catalysts. (2)

Or

(b) Discuss Meerwein-Pondorf-Verley reduction.

15. (a) Establish the position and configuration of angular methyl group in cholesterol.

Or

(b) How progesterone is synthesized starting from ergosterol.

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

Answer any **three** questions.

16. (a) Explain the stereoelectronic and steric factors in acyclic derivatives.

(b) Explain the conformation of ethane. (5+5)

17. (a) Describe the absorption spectra of conjugated dienes.

(b) Write short note on Mc Lafferety rearrangement.(5+5)

18. (a) Explain spin-spin decoupling. (3)

(b) How many ^{13}C peaks should be seen in brood-band decoupled spectrum of benzene molecule. Assign the multiplicity expected for each signal in the off-resonance decoupled spectrum. (4)

(c) Explain shift reagents. (3)

19. Discuss the applications of LDA and DDQ in organic synthesis.

20. Outline the total synthesis of cholesterol.

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F–1337

Sub. Code
7MCH2C3

M.Sc. DEGREE EXAMINATION, APRIL 2024

Second Semester

Chemistry

PHYSICAL CHEMISTRY – II

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. How will you distinguish between order and molecularity of reactions?

2. What is steady state approximations?

3. Which of the following molecules show rotational spectra and why?

   HCl, Co, H_2 and O_2

4. What is Fermi resonance?

5. How do you explain Stokes' lines and anti-Stokes' lines in Raman spectra?

6. State Koopman's theorem.

7. How will you distinguish between NMR and ESR spectroscopy?

8. Define the term chemical shift.

9. What is meat by symmetry elements and symmetry operations?

10. Write the point group of the following molecules

(a) H_2O_2 (b) Trans CHCl = CHCl

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

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

11. (a) Explain the decomposition of N_2O_5.

Or

(b) Write a note on Hinshelwood's theory.

12. (a) Discuss the isotopic effect in rotational spectrum.

Or

(b) The fundamental vibrational frequency of HCl is 2,890 cm^{-1} calculate the force constant of this molecule. The atomic masses are $1_H = 1.673 \times 10^{-27}$ kg; $^{35}Cl = 58.06 \times 10^{-27}$ kg.

13. (a) Write the classical theory of Raman scattering.

Or

(b) Draw and explain the Fortrat parabola diagram.

14. (a) What is Decoupling? Explain with suitable example.

Or

(b) Draw and explain the ESR spectrum of the following molecules

(i) Hydrogenation

(ii) Methyl radical. (3+2)

15. (a) Deduce the symmetry elements present in the following molecules and identity their point group

(i) H_2O (ii) BF_3

Or

(b) Determine the symmetry of normal modes of ammonia molecule.

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

Answer any **three** questions.

16. Describe the Absolute reaction rate theory.

17. Derive an expression for rotational spectrum of rigid diatomic molecules.

18. (a) Write a note on Laser Raman spectrum.

(b) State and explain Franck-Condon principles. (5+5)

19. Explain the principle and applications of NQR spectroscopy.

20. Construct the character table for the C_2V point group.

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F–1338

Sub. Code
7MCH3C1

M.Sc. DEGREE EXAMINATION, APRIL 2024

Third Semester

Chemistry

ORGANIC CHEMISTRY – III

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** questions.

1. Mention the type of product for Wolff rearrangement involving cyclic systems.

2. Spiro compounds of enone rearranges to fused ring phenols. Mention the type of rearrangement and the conditions under which it takes place.

3. Explain singlet carbene with orbital diagram.

4. Give example of Shapiro reaction.

5. Mention important precursor used in biosynthesis of terpenoids.

6. Draw the structure of zinziberene.

7. Explain the Retrosynthetic analysis with suitable example.

8. Mention importance of convergent approach to total synthesis.

9. What do you mean by Photoreduction reaction?

10. Define conrotatory and disrotatory motions in thermal and photochemical reactions.

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

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

11. (a) Briefly explain with mechanism and suitable example for Di-pi methane rearrangement reaction.

Or

(b) Explain the mechanism of sommelet reaction.

12. (a) Describe Claisen condensation reaction of esters with suitable example and mechanism.

Or

(b) Briefly describe Sharpless asymmetric epoxidation reaction.

13. (a) How will you effect the following conversions :

(i) Camphor to Camphoric acid

(ii) α- Pinene to α-terpeniol.

Or

(b) Schematically illustrate the biosynthetic route of monoterpenes from mevalonic acid.

14. (a) Compare and Contrast Convergent and Divergent approach in Retrosynthetic analysis.

Or

(b) Briefly describe the role of starting material and molecular history in retrosynthetic analysis.

15. (a) Describe Jablonski diagram with a neat sketch.

Or

(b) Construct the correlation diagram for [2+2] cyclo addition and state the conditions under which addition occurs?

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

Answer any **three** questions.

16. Discuss the mechanisms of the following:

(a) Reaction involving sigmatropic rearrangement.

(b) Rearrangement involving migration from Carbon to Oxygen atom. (5+5)

17. Describe the following with suitable examples:

(a) Mechanism of addition of Grignard reagent to α,β-unsaturated carbonyl compounds.

(b) Mechanism of addition of carbenes to double bond. (5+5)

18. Briefly describe the synthesis of the following:

(a) Cadinene

(b) Abietic acid (5+5)

19. Device a documented synthetic scheme for 2,4-Dimethyl-2-hydroxypentanoic acid.

20. Briefly Discuss:

(a) Norrish type I and type II reaction.

(b) Paterno-Buchi reaction. (6+4)

F–1339

Sub. Code
7MCH3C2

M.Sc. DEGREE EXAMINATION, APRIL 2024.

Third Semester

Chemistry

INORGANIC CHEMISTRY – III

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Distinguish between forbidden transition and allowed transitions.

2. Define Recoil energy.

3. Tetrahedral complexes give more intense bands in ligand field spectra than octahedral complexes. Why?

4. Predict the ^{31}P-NMR of P_4S_3.

5. Mention the names and formulae of ores of selenium.

6. What is meant by synergic effect?

7. Write down the electronic configuration of Gd (Z = 64).

8. F-block elements are placed separately in modern periodic table. Why?

9. How is ferrocene prepared?

10. What is meant by Naked cluster? Give an example.

Part B (5 × 5 = 25)

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

11. (a) Describe the use of IR and Raman spectra in inter and intramolecular hydrogen bonding.

Or

(b) What is Mossbauer Effect? Discuss the principle of Mossbauer spectroscopy.

12. (a) Explain Contact shift and Pseudo Contact shift with suitable examples.

Or

(b) Explain the consequences of Jahn-Teller effect in electronic spectroscopy.

13. (a) Describe the isolation and purification of germanium.

Or

(b) Discuss the nature of bonding in metal carbonyl. How are $Cr(CO)_6$ and $Mn_2(CO)^{10}$ prepared?

14. (a) Explain the process of separation of Pu Uranium fuel.

Or

(b) Discuss the spectral and magnetic properties of lanthanides.

15. (a) Discuss the structure of 12-tungstophosphate ion.

Or

(b) What are Wade's rules? Apply Wade's rules explain the classification of carboranes.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. (a) Distinguish the following linkage isomers by IR spectroscopy.

    (i) M-CN and M-NC;

    (ii) M-NO and M-ON.

    (b) Explain the MB spectra of $Fe(CO)_5$ and $Fe_2(CO)_9$. (5+5)

17. (a) A tetrahedral complex of Co (II) exhibits two absorption bands in the visible range at 7140 cm^{-1} and a doublet peak (18180 and 19600 cm^{-1}). Determine its spectral parameters 10 Dq and β (Given 15 B_o = 15500 cm^{-1}).

    (b) Discuss the NMR spectra of fluxional molecules. (5+5)

18. (a) What is metallocene? Discuss the synthesis and bonding of any two metallocenes.

    (b) How is beryllium extracted for its ore? Mention any three uses. (5+5)

19. (a) How is UO_3 prepared? How does it react with HCl, NaOH and Li_2CO_3?

    (b) Differentiate between actinide and lanthanide series. (5+5)

20. (a) What is styx number? Calculate the styx number of B_5H_9.

    (b) What are polyacids? How are they classified? (6+4)

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F–1340

Sub. Code
7MCH3C3

M.Sc. DEGREE EXAMINATION, APRIL 2024

Third Semester

Chemistry

PHYSICAL CHEMISTRY – III

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Explain the term photosensitisation?

2. Write a short note on fluorescence.

3. What is commutator operator?

4. Explain Heisenberg uncertainty principle.

5. What is meant by the term degeneracy of the energy states?

6. What are eigen value and eigen functions?

7. What are hermite polynomials?

8. Predict the shape of 1s orbital with the help of its wave function.

9. Write a note on thermal conductivity of gases.

10. Define acid — base catalysis.

Part B (5 × 5 = 25)

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

11. (a) Discuss the mechanism of chemiluminescence.

Or

(b) Explain the mechanism of phosphorescence.

12. (a) Explain the significances of Hamiltonian operator.

Or

(b) Obtain the quantum mechanical operator for potential energy.

13. (a) Explain

(i) Orthogonal functions

(ii) Normalisation of wave functions with an example for each.

Or

(b) Derive time independent Schrodinger wave equation.

14. (a) Explain the shapes of various atomic orbitals with the help of wave functions.

Or

(b) Apply perturbation method to helium atom.

15. (a) Define mean free path. How is it related to collision diameter?

Or

(b) Explain temperature jump method for the determination of rate of fast reactions.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Discuss the kinetics for the photo chemical reaction of formation of hydrogen chloride from hydrogen and chloride.

17. (a) State the four postulates of quantum mechanics.

    (b) Describe an experiment to verify de Broglie's wave equation. (5+5)

18. Deduce the Schrodinger wave equation for particle in one dimensional box.

19. Using HMO calculations calculate the delocalisation energy for butadiene.

20. Derive an expression for the Maxwell distribution of molecular velocity.

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F–1341	Sub. Code
	7MCH3E1

M.Sc. DEGREE EXAMINATION, APRIL 2024.

Third Semester

Chemistry

Elective: PHARMACEUTICAL CHEMISTRY

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Explain bioisosterism with suitable examples.

2. Mention any two drugs prepared from animal source.

3. How are chloroquine classified?

4. In what pH range, erythromycin is highly active.

5. Give any two examples of CNS depressants.

6. Draw the structure of 6-mercaptopurine.

7. Define cordiovascular drug. Give one suitable example.

8. Mention the types of drugs that act on postganglionic sympathetic nerve endings.

9. Give any two therapeutic uses of captopril.

10. Mention the uses of paracetomol.

Part B (5 × 5 = 25)

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

11. (a) Explain the concept of lead compound and lead modification in drug design.

Or

(b) Write a note on structure activity relationship.

12. (a) Discuss the structure activity relationship of pencillin-G antibiotic.

Or

(b) What are anti-viral agents? Describe their medicinal importance.

13. (a) Describe the synthesis of chlorambucil.

Or

(b) Discuss the mode of action of hypnotics.

14. (a) Illustrate the synthesis of amyl nitrite.

Or

(b) Describe the synthesis of atenolol.

15. (a) Describe the synthesis and therapeutic uses of Nifedipine.

Or

(b) Write a note on volatile general anaesthetics.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Discuss the factors affecting bioactivity of drugs.

17. Discuss the synthesis of the following:
    (a) Pencillin – V
    (b) Chloramphenicol. (5 + 5)

18. Describe the synthesis of the following:
    (a) Mechloroethamine
    (b) Cyclophosphamide. (5 + 5)

19. Write short notes on:
    (a) Cardiovascular drugs
    (b) Local infective drugs. (5 + 5)

20. Write short notes on:
    (a) Intravenous anaesthetics
    (b) Local anaesthetics. (5 + 5)

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F–1342	Sub. Code
	7MCH4C1

M.Sc. DEGREE EXAMINATION, APRIL 2024.

Fourth Semester

Chemistry

INSTRUMENTAL METHODS OF ANALYSIS

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Define error. A thermometer shows room temperature 28.8º when the actual temperature is 35.5ºC. Calculate the percentage error in the reading.

2. Define mean and median.

3. What are participating agents?

4. How is purity of precipitates determined?

5. Which electroanalytics technique is used for measurement of potential? Mention its principle.

6. Distinguish between over voltage and over potential.

7. Draw a thermomorgam of calcium acetate monohydrate.

8. Distinguish between DTA and DSC.

9. Write down the principle of fluorimetry.

10. Define Beer's and Lambert's law.

Part B (5 × 5 = 25)

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

11. (a) Write a note on student's "t" test to compare the precision of two methods.

Or

(b) Define accuracy and precision. How are precision expressed for a set a data?

12. (a) Discuss the applications of gravimetric methods.

Or

(b) Describe the techniques of precipitation from homogeneous solution.

13. (a) Discuss theory of electrogravimetric analysis.

Or

(b) Illustrate the principle and working of stripping voltammetry.

14. (a) Explain the TG and DTA of calcium carbonate monohydrate in air and nitrogen atmosphere.

Or

(b) Discuss the any five applications of DTA.

15. (a) Discuss the instrumentation of AAS.

Or

(b) Distinguish between Flourimetry and turbidimetry techniques.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. What do you mean by correlation coefficient? What is the principle of least square method applied to have the linear regression expression? Obtain the values of slope and intercept using least square straight line fitting.

Pressure (atm)	2	4	6	8	10
Temperature	107	117	125	163	186

17. Define co-precipitation? How does it differ from post-precipitation? Mention the applications of gravimetric methods.

18. Discuss the principle and applications of :

    (a) stripping voltammetry and

    (b) amperometry. (5 + 5)

19. (a) Describe the theory of DSC.

    (b) Explain the thermal behaviour of copper sulphate and calcium oxalate monohydrate using TG and DTA. (5 + 5)

20. (a) How will you determine copper in the presence of iron using colorimetric analysis?

    (b) Explain the principle and applications of Turbidimetry. (5 + 5)

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F–1343

Sub. Code
7MCH4E1

M.Sc. DEGREE EXAMINATION, APRIL 2024.

Fourth Semester

Chemistry

Elective - NANO CHEMISTRY

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** the questions.

1. What is morphology of a nanoparticle?

2. Write different modes of classification of Nanomaterials.

3. Which carbon is used in nanotechnology?

4. Give the full form and explanation for the following, (a) MWCNT (b) SWCNT

5. What are carbon clusters?

6. Give any two examples of Inorganic nanomaterials

7. Explain the principle of XRD analysis of NPs.

8. Write Debye-Scherrer formula for size determination of NPs.

9. Explain the advantages of nanosensing

10. What is protein nano array?

Part B (5 × 5 = 25)

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

11. (a) Explain hydro thermal synthesis of nanoparticles.

Or

(b) Write a note on sonochemical synthesis.

12. (a) Explain the structure and properties of carbon nano tubes.

Or

(b) Discuss the preparation and structure of fullerenes.

13. (a) Explain the discovery of C_{60}.

Or

(b) Write a note on organic nanomaterials.

14. (a) Describe the instrumentation of TEM techniques.

Or

(b) How is XRD useful in the characterization of nano materials?

15. (a) What are DNA nanoparticle devices? Explain.

Or

(b) Discuss the applications of DNA based sensors.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. Discuss the principle involved with suitable diagrams in the following techniques:

    (a) hydrodynamic Cavitation

    (b) solvethermal synthesis (5+5)

17. (a) What are Polymer NPs? How are they prepared?

    (b) Explain the applications of carbon nanotubes (5+5)

18. (a) What are larger and smaller fullerenes?

    (b) Write a note on Inorganic nanomaterials (5+5)

19. Explain with a neat diagram TEM setup and its use in analyzing nanostructures. Compare and contrast SEM and TEM.

20. Discuss the following:

    (a) molecular diodes

    (b) nano transistors (5+5)

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F–1345

Sub. Code
7MCH4E3

M.Sc. DEGREE EXAMINATION, APRIL 2024

Fourth Semester

Chemistry

Elective – GREEN CHEMISTRY

(CBCS – 2017 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer ALL questions

1. What do you understand by the term sustainability?

2. What is cleaner production?

3. Define the term atom economy.

4. Give any two green chemistry awards and their motive.

5. Define heavy metals.

6. Give any one method for removal of arsenic from water.

7. What is ionic liquids?

8. Explain how does the choice of catalyst impacts green synthesis.

9. Give any two advantages of phase transfer catalysts.

10. What is enzymatic hydrolysis?

Part B (5 × 5 = 25)

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

11. (a) Discuss the need for the green chemistry.

Or

(b) Write short notes on .

(i) Green products

(ii) Recycling of waste

12. (a) Write a note on inception of green chemistry.

Or

(b) Explain the role of international organisations in promoting green chemistry.

13. (a) Write any two methods for removal of cadmium and beryllium from water.

Or

(b) List out the health impacts of the manganese and tellurium.

14. (a) Write a note on the choice of catalyst in designing a green systhesis.

Or

(b) Describe the Friedel-craft reaction by using super critical CO_2.

15. (a) Write the advantages of microwave exposure.

Or

(b) Give an account of Microbial oxidation.

Part C

$(3 \times 10 = 30)$

Answer any **three** questions.

16. (a) Explain environmental protection laws.

    (b) Write a note on pollution a prize tag of madern society.

17. Discuss any ten principles of green chemistry.

18. Write the any three methods of removal of mercury, vanadium and uranium from water.

19. (a) What are the types of ionic liquids with suitable examples.

    (b) Explain the Claisen-Schimidt condensation reaction by using ionic liquids. (5 + 5)

20. (a) Write the Hoffmann elimination reaction in water by green method.

    (b) Give the application in conversion of nitriles from aryl halides. (5 + 5)

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