

ASSIGNMENT - 1
M.Sc. DEGREE EXAMINATIONS, DECEMBER -2025

Second Semester

CHEMISTRY

PAPER -I - PHYSICAL CHEMISTRY-II

MAXIMUM MARKS: 30
ANSWER ALL QUESTIONS

1. Discuss briefly about concept of distribution in statistical thermodynamics.
2. Write a brief note on Ensemble averaging.
3. Discuss in detail about translation, rotational and electronic partition functions.
4. Derive the Sackur-Tetrode equation of entropy of monoatomic gases.
5. Explain Zeigler-Natta polymerization.
6. Discuss briefly about the number average and weight average of molecular mass of polymer.
7. Discuss in detail about glass transition temperature and the factors influencing the glass transition temperature.
8. Write a detailed discussion on the determination of molecular weight of a polymer by ultra-centrifugation method.
9. What is Over potential? Explain.
10. What is a fuel cell? Explain with an example.

ASSIGNMENT - 2
M.Sc. DEGREE EXAMINATIONS, DECEMBER -2025

Second Semester

CHEMISTRY

PAPER -I - PHYSICAL CHEMISTRY-II

MAXIMUM MARKS: 30
ANSWER ALL QUESTIONS

1. What is half wave potential? Derive an equation for half wave potential.
2. What is corrosion? Explain different forms of corrosion and prevention of corrosion.
3. What is Flash Photolysis? Explain it with an example.
4. Write a brief note on Actinometry.
5. Discuss in detail about Exciplexes and Excimers in Photochemistry.
6. Discuss in detail about the derivation of Stern-Volmer equation.
7. What are exergonic and endergonic reactions.
8. Give a note on hydrolysis of ATP.
9. Write in detail about DNA and RNA in living systems.
10. Write a detailed discussion on chain configuration of bio polymers.

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CHEMISTRY

PAPER -II - Organic Chemistry - II

MAXIMUM MARKS: 30
ANSWER ALL QUESTIONS

1. Write the mechanism of bromine addition to an alkene.
2. What are epoxides? Give one method of preparation and one reaction.
3. Describe syn and anti-hydroxylation and hydrogenation of alkenes.
4. Explain electrophilic and nucleophilic additions to C=C bonds with examples.
5. What is S_N1 mechanism? Illustrate with the hydrolysis of tert butyl chloride.
6. Discuss SET mechanism in aliphatic substitution.
7. Explain the effect of substrate structure, nucleophile, leaving group and solvent on S_N1 and S_N2 reactions.
8. Describe neighbouring group participation by O, N, S and halogen with suitable examples.
9. What is the S_NAr mechanism? State its conditions.
10. Discuss Friedel–Crafts alkylation and acylation with mechanisms.

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Second Semester

CHEMISTRY

PAPER -II - Organic Chemistry - II

MAXIMUM MARKS: 30
ANSWER ALL QUESTIONS

1. Explain the mechanism, intermediates and conditions of the benzyne mechanism with two examples.
2. Explain Von Richter and Smiles rearrangements.
3. State Hofmann rule with examples.
4. Define protecting group. Give one example each for hydroxyl and carbonyl.
5. Discuss syn and anti eliminations with suitable examples.
6. Describe mechanisms and stereochemistry of E₁, E₂ and E_{1CB} eliminations.
7. Write the general reaction and use of the Wittig reaction.
8. What is the Reformatsky reaction? Give a simple synthetic application.
9.
 - a) Convert benzaldehyde into benzoin.
 - b) Convert benzaldehyde into cinnamic acid.
10. i) Convert benzamide into aniline.

ii) Convert benzoic acid into aniline via an acyl azide.

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CHEMISTRY

PAPER -III - Essential Lab Techniques for Industry

MAXIMUM MARKS: 30
ANSWER ALL QUESTIONS

1. Define adsorption chromatography. Mention any two common adsorbents and two uses of column chromatography.
2. What is R_f value in TLC? How is TLC used to monitor the completion of an organic reaction?
3. Describe the principle, apparatus, packing, advantages and disadvantages of column chromatography.
4. Explain the principles and procedure of TLC and paper chromatography.
5. What is the basic principle of HPLC? Distinguish between normal-phase and reversed-phase HPLC.
6. What is retention time (RT) in HPLC? How is it used for identification of compounds?
7. Describe the instrumentation of an HPLC system and the selection of column and mobile phase.
8. Explain, step by step, how you would develop and validate an HPLC method for a single organic compound in a mixture..
9. Why must the sample be volatile in GC? Give two examples of GC detectors.
10. What is meant by capacity of an ion exchange resin? How does cross linking affect it?

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CHEMISTRY

PAPER -III - Essential Lab Techniques for Industry

MAXIMUM MARKS: 30
ANSWER ALL QUESTIONS

1. Explain the principle, instrumentation and applications of gas chromatography in the analysis of organic compounds.
2. Describe the preparation of cross-linked polystyrene ion exchange resins and explain how ion exchange chromatography is used to purify carboxylic acids and amines.
3. What is a hollow cathode lamp and why is it used in AAS?
4. Define detection limit. Why is ICP OES more sensitive than flame AAS?
5. Describe flame AAS and graphite furnace AAS, comparing sensitivity and applications.
6. Explain the principle of ICP OES, the role of plasma, and how emission lines are used for multi element analysis.
7. What is the difference between UV–Vis absorption and IR absorption in terms of molecular transitions?
8. State the basic idea of chemical shift in NMR with one simple example.
9. Discuss how UV, IR and NMR together can be used to elucidate the structure of an unknown organic compound.
10. Explain the principles of TEM and SEM and compare their use for observing the morphology and structure of solid samples.

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CHEMISTRY

PAPER -IV - INORGANIC CHEMISTRY-II

MAXIMUM MARKS: 30
ANSWER ALL QUESTIONS

1. Explain Isoelectronic and Iso Lobal relationships.
2. Write about Zintl ions.
3. Discuss the Wade's rule and Lauher's rule.
4. Explain the preparation, structure and bonding in Nitrosyl.
5. Write the Nephelauxetic effect.
6. Write note on applications of CFT.
7. Discuss the Jahn Teller Effect in detail.
8. Write the splitting of d-orbitals in Tetrahedral and square pyramidal Geometries.
9. Explain the π donor & π acceptor ligands on Δ_o .
10. Write the short notes on Bent rule.

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CHEMISTRY

PAPER -IV - INORGANIC CHEMISTRY-II

MAXIMUM MARKS: 30
ANSWER ALL QUESTIONS

1. Draw the MO diagram of Octahedral complexes with examples.
2. What is resonance and discuss the resonance in homo and hetero atomic molecules.
3. Write a note on trends in stepwise stability constant.
4. Explain Job's Method and their limitations.
5. Discuss the Bjerrum method in detail.
6. Write a brief note on HSAP
7. Write the preparation and structure of higher boranes.
8. Explain the Isopoly and Hetero poly salts and acids
9. Write a note on Cage compounds of P-O & P-S.
10. Explain the P-N cyclic compounds with examples.