MSc. CHEMISTRY EXAMINATION

FIRST SEMESTER

CH 500104 THERMODYNAMICS, KINETIC THEORY AND STATISTICAL THERMODYNAMICS

Max Marks 20   **Time 30 minute**

1.What is Nernst heat theorem? Explain the determination of absolute entropies using third law? (CO 1- Remember)   10 Mark

2.Derive Gibb's –Helmholtz equation. (CO 1- Remember)   10 Mark

3.Derive Maxwell's law of distribution of velocities. (CO 2-Understand)   10 Mark

4.explain maxwell boltsmann equations . (CO 2-Understand)   10 Mark

5.The free energy change Δ G accompanying a given process is -85.77 kJ at 25$_o$C and –83.68 kJ at 35$_o$C. Calculate the change in enthalpy (Δ H) for the process at 30$_o$C. (CO 3- Apply)
`   10 Mark

6.Derive Gibbs-Duhem- Margules equation. (CO 3- Apply)   10 Mark

7.Calculate the rotational partiton function for hydrogen molecule at 300K. Moment of inertia(CO4-Apply)   10 Mark

8. Calculate the translational entropy of gaseous iodine at 298K and 1 atm. of hydrogen molecule is 4.59x10$_{-47}$Kgm$_2$ symmetry number σ =2. (CO4- Apply)   10 Mark

MSc. CHEMISTRY EXAMINATION

FIRST SEMESTER

CH 500102 STRUCTURAL AND MOLECULAR ORGANIC CHEMISTRY

Max Marks 20   **Time 30 minute**

1. Discuss SN Ar mechanism   (CO 1- Remember)   10 Mark
2. What are carbon nanotubes and graphenes? Give their importance. (CO 1- Remember)   10 Mark
3. Write a note on the important photochemical reaction of butadiene(CO 2- Remember)   10 Mark
4. Discuss Di π methane re arrangement   (CO 2- Remember)   10 Mark
5. Explain stereochemistry of Allenes , Biphenyls and Spirans   (CO 3- Remember)   15 Mark
6. What is meant by Chirality and diastereomers ?   (CO 3- Remember)   5 Mark
7. Analysis the conformations of bicycic systems   (CO 4-Analyse)   10 Mark
8. Discuss the conformations studies of: (CO 4-Analyse)   10 Mark
   - Cyclohexane
   - Adamantane
   - Ethane

MSc. CHEMISTRY EXAMINATION

FIRST SEMESTER

CH 500101 ORGANOMETALLICS AND NUCLEAR CHEMISTRY

1. Discuss the mechanism of alkene hydrogenation using Wilkinson's catalyst(CO 1- Remember)   10 Mark
2. What are organometallic dendrimers?How are they prepared? (CO1- Remember) 10 Mark
3. Explain the binding of Oxygen by hemocyanin. (CO2- Remember)   10 Mark
4. Discuss metalloenzymes. (CO2- Remember)   10 Mark
5. What is radiation polymerization? (CO3- Understand)   10 Mark
6. Differentiate between Nuclear fission and nuclear fusion reactions(CO3- Understand) 10 Mark
7. Explain analytical applications of radioisotopes in industry(CO4- Apply)   10 Mark
8. Explain analytical applications of radioisotopes in audiography(CO4- Apply   10 Mark

MSc. CHEMISTRY EXAMINATION

FIRST SEMESTER

CH 50 01 03 QUANTUM CHEMISTRY AND GROUP THEORY

1) Write Symmetry Elements and Symmetry Operations (CO1 - Remember) - 10 Mark
2) Identify the point group of benzene, and write all symmetry operations. (CO1 - Remember) - 10 Mark
3) The wave function for a particle restricted to lie in a rectangular region of length 'l' and 'b' (a particle in a two dimensional box) are

   $\psi_{nxny}(x,y) = (\frac{4}{lb})^{1/2} \sin\frac{nx\pi x}{l} \sin\frac{ny\pi y}{b}$ n_x = 1,2,… and n_y = 1,2,…

   $0 \leq x \leq l$, $0 \leq y \leq b$ (CO2-Understand) - 10 Mark
4) What you mean by eigen function and eigen value,. e^{-2x^2} is a eigen function or not of the operator $[\frac{d2}{dx2} - 16x^2$, if it is eigen function write the corresponding eigen value. (CO2-Understand) - 10 Mark
5) In crystallographic point groups the absence of 5-fold rotation axis why? (CO3 - Analyse) 10 mark
6) NH3 molecule is belongs to non- Abelian groups prove that, on the basis of similarity transformation   (CO3 - Analyse) 10 mark
7) In character table describe the importance of region 3 and 4 with suitable example

   (CO4 – apply) 10mark
8) Using great orthogonality theorem, derive character table of C3V groups. (CO4 – Apply) (10 mark)

MSc. CHEMISTRY EXAMINATION

SECOND SEMESTER

ATTAINMENT MEASUREMENT TEST(2020-22)

CH 50 02 01 COORDINATION CHEMISTRY

1. Give the splitting of d orbitals in square pyramidal and trigonal bipyramidal complexes   (CO 1- Understand)   10 Mark

2. Explain the sigma and pi bonding ability of the ligands CO and NO with examples (CO 1- Understand)   10 Mark

3. Explain with examples substitution reactions in tetrahedral and five-coordinate complexes. (CO 2- Remember)   10 Mark

4. Explain dissociative and assosiative mechanisms in complexes.(CO 2- Remember)   10 Mark

5. Explain the formation and properties of coordination complexes of Thorium and Uranium.   (CO 3- Understand)   10 Mark

6. Give one example of a lanthanide complex used as shift reagent in NMR measurements and explain how it is helpful in simplifying complexe spectra. (CO 3 Understand)   10 Mark

7. Explain the use of the electronic spectra and magnetic measurements in elucidating the structure of complexes.(CO4-Apply)   10 Mark

8. What are the differences between ligand to metal charge transfer complex and metal to ligand charge transfer complex. How they are distinguished?(CO4- Apply)   10 Mark

MSc. CHEMISTRY EXAMINATION

SECOND SEMESTER

ATTAINMENT MEASUREMENT TEST(2020-22)

CH 50 02 02   ORGANIC REACTION MECHANISMS

1. Explain the mechanisms with examples for SN1, SN2, SE1 and SE2 reactions. (CO 1- Remember)   10 Mark
2. (CO 1- Remember)   10 Mark
3. Explain carbocations and carbanions. (CO 2- understand)   10 Mark
4. What are ylides? Exaplain synthesis and reactions of ylides. (CO 2- understand)   10 Mark
5. Elaborate on different pericyclic reactions with suitable examples and discuss their importance in organic synthesis (CO 3- Apply)   15 Mark
6. Explain Diels-Alder reaction. (CO 3- Apply)   5 Mark
7. Compare the chemistry of enolates and enamines. (CO 4-Analyse) 10 Mark
8. Explain the mechanisms of Claisen and Knoevenagel condensation.(CO 4- Analyse)   10 Mark

MSc. CHEMISTRY EXAMINATION

SECOND SEMESTER

ATTAINMENT MEASUREMENT TEST(2020-22)

CH 50 02 03 CHEMICAL BONDING AND COMPUTATIONAL CHEMISTRY

1. What are the possible electronic transitions predicted C2v point group, with suitable example non-bonded electron pair. (CO1 - Understand) - 10 Mark

2. Explain the SALC construction of C3v and D3h point groups. (CO1 - Understand) - 10 Mark

3. Determine the ground state energy of Helium atom by using variation treatment (CO2- Apply) - 10 Mark

4. What you mean trial function, for particle in a 1D-box and using the trial function $e^{-\alpha r}$, find the energy of hydrogen atom, (CO2- Apply) - 10 Mark

5. Explain Molecular Orbital (MO) theory of H_2 molecule. (CO3 - Analyse)   10 mark

6. Briefly explain the quantum mechanical treatment of SP^3 hybridization.(CO3 - Analyse) 10 mark

7. 7. What are the applications of computational chemistry (CO4 – apply) 10mark

8. Construct an input file for geometry optimization of Water at HF/6-31G (d,p) level of theory followed by frequency calculation in GAMESS(CO4 – Apply) (10 mark)

SECOND SEMESTER

ATTAINMENT MEASUREMENT TEST(2020-22)

CH 50 02 04 MOLECULAR SPECTROSCOPY

1. What is meant by signal to noise ratio   (CO1- Remember)   10 Mark

2. What is meant by population inversion and frequency doubling   (CO1- Remember)   10 Mark

3. What are overtones and hot bands in IR spectra (CO2- Understand)   10 Mark

4. What are Rayleigh scattering and inelastic scattering ? Explain.   (CO2- Understand)   10 Mark

5. The g factor of 1H and 13C are 5.6 and 1.4 respectively. For the same value of the magnetic field strength. If the 1H resonates at 600MHz, determine the resonate frequency of 13C nuclei.   (CO3- Apply)   10 Mark

6. Explain the relaxation methods and its importance in NMR spectroscopy.(CO3- Apply)   10 Mark

7. How to distinguish [Fe(CN)6]3- and [Fe(CN)6]4- on the basis of Mossbauer spectroscopy. (CO4- Analyse)   10 Mark

8. What you mean fine structure and hyperfine structure. Number of hyperfine structure possible in naphthalene and anthracene (CO4- Analyse)   10 Mark

CH 50 02 05 INORGANIC CHEMISTRY PRACTICAL 1 10 marks each

1.How NMR spectroscopy help determine structure of the molecule? CO 1(Apply)

2.Factors affecting IR spectroscopy? CO 1(Apply)

3.Why Lithium cation precipitate in 6th group? CO 2(Analyse)

4.What you mean by ionic products and solubility product? CO 2(Analyse)

5.Basic principle of colorimetric method. CO 3(Apply)

6.why you keep in blank in colorimetric method? CO 3(Apply)

CH 50 02 06 ORGANIC CHEMISTRY PRACTICAL 1 10 marks each

1) Differnces between coloum chromatography and Thin Layer Chromatography? CO 1(Understanding)
2) What you mean by Rf value in TLC? CO 1(Understanding)
3) Any application for membrane dialysis? CO 2 (Apply)
4) What is the chemical name of urea? And urea is polar or not? CO 2 (Apply)
5) Draw the reaction mechanism of Pinacol – Pinacolone rearrangement and discuss its spectral data. CO 3 (Apply)
6) Show the shifting of π electrons in Diels – Alder reaction, what are the changes in this reaction discussed based on spectral data. CO3 (Apply)

CH 50 02 06 PHYSCIAL CHEMISTRY PRACTICAL 1 10 marks each

1) Compare "Chemisorption and Physisorption" CO 1(Understands)
2) What are the difference between Freundlich and Langmuir adsorption isotherm?
3) Any application of Koopmann theorem CO 2(Analyse)
4) Determine vibrational frequencies of NH_3 molecule. CO 2(Analyse)

CH 50 03 01 STRUCTURAL INORGANIC CHEMISTRY

1. Comment on the magnetic properties of Garnets. (CO 1- Understand)
10 Mark
2. Define piezoelectricity. Write one application.   (CO 1- Understand)
10 Mark

3. Explain different types of silicates with structure .   (CO 2- Remember)
10 Mark

4.Explain the isopolyacids and heteropolyacids. (CO 2- Remember)   10 Mark

5. Write a note on boron cluster compunds. (CO 3- Understand)   10 Mark

6. . How is diborane prepared? Explain its structure. (CO 3 Understand)   10 Mark

7. Explain the applications of C2B10 for Drug Design (CO4-Apply)   10 Mark

8. Write the applications of rigid-rod polyynes, polygermanes. (CO4- Apply)
10 Mark

CH 50 03 02 ORGANIC SYNTHESES

1. Explain Birch reduction with mechanism.   (CO 1- Remember)
   10 Mark
2. Write a note on Bergman cyclisation. (CO 1- Remember)   10 Mark
3. What is meant by chemo and region selective protection? (CO 2- Remember)
   10 Mark
4. Give two protecting groups for Hydroxyl group and carbonyl group. (CO 2-
   Remember)   10 Mark
5. Enumerate the important strategies of Retro Synthesis. (CO 3- Remember)
   15 Mark
6. Explain the retrosynthesis of D-Luciferin. (CO 3- Remember)   5 Mark
7. What is Peterson Olefination ? Exaplain with suitable examples.(CO 4- Apply)
   10 Mark
8. Give the mechanism of Wacker oxidation and Bayer-Villiger oxidation.   (CO
   4- Apply)   10 Mark

CH 01 03 03 CHEMICAL KINETICS, SURFACE CHEMISTRY AND CRYSTALLOGRAPHY

1. Compare transition state theory and collision theory. (CO1- Remember)10 Mark
2. Explain the significance of rate determining step in a multistep reaction, and how to determine concentration of intermediate species in multistep reaction. (CO1- Remember)10 Mark
3. Define Screw axis and glide planes with example. (CO2- Understand)10 Mark
4. Determination of structure of NaCl by powder method. (CO2- Understand)10 Mark
5. The energy of activation of a non-catalysed reaction at 37˚C is 85 kJ/mol and the activation energy for the same reaction catalysed by enzyme is 25kJ/mol. Calculate the ratio of the constants of the two reactions. (CO3- Analyse) 10 Mark
6. A monolayer of N_2 molecule (effective area $0.162nm^2$) is adsorbed on the surface of 1 g of an Fe/Al_2O_3 catalyst at 77K. the boiling point of liquid nitrogen occupies $2.86cm^{-3}$ at 0˚C and 1 atm. What is the surface area of the catalyst? (CO3- Analyse) 10 Mark
7. Examples and application of liquid crystals. (CO4- Apply) 10 Mark
8. Different types of liquid crystals how they categorized. (CO4- Apply)10 Mark

CH 50 03 04 SPECTROSCOPIC METHODS IN CHEMISTRY

1. Give the important methods available in the determination of molecular formula in mass spectrometry. (CO1 - Remember) - 10 Mark

2. Arrange the following compounds in the order of increasing stretching frequencies of the carbonyl group. β – lactam, γ – lactam and δ – lactam. Give the rationale behind this order. (CO1 - Remember) - 10 Mark

3. What is optical rotator dispersion (ORD)? Explain the use of plane curves and cotton curves.(CO2-Understand) - 10 Mark

4. What structural features may produce Bathochromic shift and Hypsochromic shift?(CO2-Understand) - 10 Mark

5. Explain Aniline absorbs at 280 nm (ε_{max} =8600) but in acidic solution, the main absorption band is seen at 203 nm (ε_{max} = 7500) which is comparable to benzene.(CO3 - Apply)-10 mark

6. How can Methylbutanol and 3 – Methylbutanol be distinguished by their mass spectra. (CO3 - Apply)-10 mark

7. Deduce the structure of the compound having M.F. $C_9H_8N_2O_4$. The spectral details are as follows IR : 3654 cm^{-1}, 2202 cm^{-1} and 1683 cm^{-1} (CO4 – Apply)-10mark
   ^{1}HNMR: δ = 4.5 (s, 2H), δ = 6.0 (m, 2H) and δ = 7.1 – 8.1 (m, 4H)
   Mass: m/z , 176 (M-1), 132, 118, 102 and 77

8. An organic compound with molecular mass 60 absorbs at 222nm ε_{max} = 62. In IR medium absorption bands formed are 3490 cm^{-1} and 3385 cm^{-1}. Also strong absorption band is formed at 1675 cm^{-1}. It shows a broad band at 2.5 τ in its NMR spectrum. Arrive at the molecular formula and structure. (CO4 – Apply)-(10 mark)

MSc. CHEMISTRY EXAMINATION

FOURTH SEMESTER

CH 80 04 03 ADVANCED PHYSICAL CHEMISTRY

1. Write a note on Quantum yield and chemi-luminescence.   (CO 1- Remember)   10 Mark

2. Explain the dimerization of anthracene. (CO 1- Remember)   10 Mark

3. Write a short note on the following parts of a fluorescent spectrometer a) photomultiplier tube b) monochromators . (CO 2 - Understand)   10 Mark

4. Explain the principle and instrumentation of AAS. (CO 2- Understand)   10 Mark

5. Compare neutron, electron and XRD techniques. (CO3- Analyse)   10 Mark
6. Explain the rotating crystal method for the X-Ray diffraction studies of crystal.
(CO 3 Analyse)   10 Mark

7. Explain electro capillary.   (CO4 - Apply)   10 Mark
8. Explain dry corrosion and electrochemical reaction. (CO4 - Apply)   10 Mark

CH 80 04 02 ADVANCED ORGANIC CHEMISTRY

1. What are supramolecular devices? Exaplaim with examples and give its uses.
   (CO 1- Remember)   10 Mark
2. Explain the forces involved in molecular recognition. (CO 1- Remember)   10 Mark
3. Explain Biogenesis and Biomimetic synthesis. (CO 2- Remember)   10 Mark
4. Discuss the biosynthesis of monoterpenoids. (CO 2- Remember)   10 Mark
5. Write on the phase II drug metabolism. (CO 3- Remember)   15 Mark
6. Discuss the mode of action of chloramphenicol.(CO 3- Remember)
   5 Mark
7. What are the problems faced by researchers in India? (CO 4-Apply)
   10 Mark
8. What are the major sections of research paper?(CO 4-Apply)   10 Mark

CH 80 04 01 ADVANCED INORGANIC CHEMISTRY

1. Differentiate SEM and TEM for characterization of nanomaterials.(CO1- Understand)   10 Mark
2. Explain synthesis, properties and applications of nanomaterials. (CO1- Understand)   10 Mark
3. Write a note on porous coordination polymers.(CO2- Remember) 10 Mark
4. Explain the applications of metal organic frameworks in pharmaceutical industry.(CO2- Remember)   10 Mark
5. Discuss the pi- bonding in tetrahral complexes with reference to MOT. (CO3- Understand)   10 Mark
6. Discuss the hybridization for sigma bonding in square planar complexes. (CO3- Understand)   10 Mark
7. Explain the structure using the IR and Raman spectral details of complexes of CO,CN. (CO4- Apply)   10 Mark
8. Determine the IR and Raman active vibrations using character tables in octahedral complexes. (CO4- Apply)   10 Mark

CH   **01 04 05**

INORGANIC CHEMISTRY
PRACTICAL-2

1.analyse the procedure for estimation of fe-cu mixture co1-Analyse   10 marks

2.Analyse the compositions in brass   co1-Analyse   5marks

3.Analyse the compositrions in dolomite   co1-Analyse   5 marks

4.Explain the principles of paper chromatography co 2 Understand 10 marks

5.Explain various chromatographic techniqes co 2 Understand 10 marks

CH   **01 04**

06ORGANIC CHEMISTRY
PRACTICAL-2

1.Analyse the spectral data of acetanilide co1-Analyse   10 marks

2. prepare p nitro acetanilide co1-Analyse   10 marks

3. write mechanisms of two step synthesis co 2 Understand 10 marks

4.Describe the methods of preparation various organic products co 2 Understand 10 marks

CH 01 04 03 PHYSICAL CHEMISTRY PRACTICAL 2

1. Write the mechanisms of hydrolysis of ester co1-Analyse   10 marks
2. How to find out rate constsnt or ester hydrolysis co1-Analyse   10 marks
3. Describe various electro anaslytical methods co 2 Understand 10 marks
4. Explain the theory of potebtiometric and conductometric titrations co 2 Understand 10 marks

CH010404 Project

1.How can we identify the presence of impurities in the synthesis of medicines ?(Apply)

2. How can we test the quality of materials such as glass and plastics?(Apply)

3. Determine a method for identifying chemical contamination in watersuch as pesticides.(Analyse)

4.Explain a method to find the quality and quantity of preservatives and additives present in food.(Analyse)

CH010405 Viva

1. Explain the basic principle of spectrophotometer.(Apply)

2. Explain the basic principle of Gas chromatography.(Apply)

3. What are the medicinal applications of nuclear chemistry?(Analyse)

4. What are the uses of polymers in medicinal chemistry?(Analyse)