MODEL QUESTION PAPER
ANDHRA UNIVERSITY
DEPARTMENT OF CHEMISTRY
M.Sc. (PREVIOUS) CHEMISTRY-II-SEMESTER
PAPER I: GENERAL CHEMISTRY-II
(w.e.f. 2021-2022 admitted batch)

Time: 3 Hours   Answer ALL questions   Maximum marks: 80
(5X16 =80 marks)

(1) (a) i) Derive Schrodinger wave equation?
        ii) Explain the postulates of Quantum mechanics
                        Or
    (b) i) Write notes on Hermitian operator and its properties
        ii) Explain normalization and orthogonalisation

(2) (a) i) Solve the Schrodinger wave equation for a particle in a one-dimensional box.
        ii) Write the factors influencing color
                        Or
    (b) i) Derive the Schrodinger wave equation for a simple harmonic oscillator
        ii) Describe the concept of tunnelling.

(3) (a) i) Explain the solutions of $R(r)$, $\theta(\theta)$ and $\Phi(\phi)$ equations of hydrogen atom
        ii) Explain probability density in orbitals
                        Or
    (b) i) Explain the time independent perturbation theory to evaluate the ground state energy of helium atom.
        ii) Application of above to ground state energy of hydrogen and helium atom

(4) (a) i) What is variation principle. Write its application to calculation of ground state energy of harmonic oscillator.
        ii) Compare Perturbation and variation theorems.
                        Or
    (b) i) Explain Hartee-Fock self-consistent field method for multi electron atoms.
        ii) Write a note on Density functional theory (DFT)

(5) (a) i) Explain quantum mechanical approach of molecular orbital theory.
        ii) Calculate the ionic and covalent bond contributions in hydrogen molecule
                        Or
    (b) i) Discuss the valence bond approach of H_2 molecule.
        ii) Write the electronic transitions in the hydrogen molecule.

MODEL QUESTION PAPER
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DEPARTMENT OF CHEMISTRY
M.Sc. (PREVIOUS) CHEMISTRY-II-SEMESTER
Semester-II
Paper- II: Inorganic Chemistry-II
(Effective from 2021-2022 admitted batch)

Time: 3 hours   **Answer ALL questions**   **Max. Marks**: 80
(5x16=80 Marks)

1. a) (i)Discuss the structure and magnetic property of $Cu_2(RCOO)_4 (H_2O)_2$.
    (ii)) Write a note on Chevrel phases
<div align="center">OR</div>
    (b) (i) Discuss the preparation of, structures of and bonding in $Re_2Cl_8^{2-}$.
    (ii) Describe the structures of hexanuclear metal clusters.

2. a) (i)Explain the synthesis, structure and reactions of metal carbonyls.
    (ii) Explain Isolobal relationship with suitable examples.
<div align="center">OR</div>
    b) (i) Describe the preparation of, structure of and bonding in ferrocene.
    (ii) What is 18 electron rules? Illustrate with suitable examples

3. a) (i) Explain the factors affecting the stability of coordination compounds.
    (ii) Distinguish between stepwise and overall stability constants.
<div align="center">OR</div>
    (b) (i) Describe the Irwing -William's series, Pearson's theory of hard and soft acids and bases (HSAB),
    (ii) What is chelate effect and discuss its thermodynamic origin

4. a) (i) Discuss a spectrophotometric method for the determination of binary formation constant of a metal complex.
    (ii) What are inert and labile complexes?
<div align="center">OR</div>
    (b) (i) Describe the pH – metric method for the determination of stability constants.
    (ii) Explain inert and labile complexes by using crystal field stabilization energies?

5. a) (i) What is acid hydrolysis reactions? Discuss Factors affecting acid hydrolysis reactions
    (ii)) What is trans effect? Distinguish between the trans effect and trans influence.
<div align="center">OR</div>
    b) (i) Give an account of base hydrolysis of Cobalt (III) complexes.
    (ii) Discuss the various factors affecting the rates of substitution reactions of octahedral complexes.

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M.Sc. (PREVIOUS) CHEMISTRY-II-SEMESTER
Semester -II
Paper- III: Organic Chemistry-II
(Effective from 2021-2022 admitted batch)

Time: 3 hours   **Answer ALL questions**   **Max. Marks**: 80
(5x16=80 Marks)

1. a.**(i)** Explain Aromaticity and Anti aromaticity give examples.
    (ii) Write a note on Von- Ritcher rearrangement
    (or)
    b. (i) Describe Aromatic Nucleophilic Substitution reactions give examples.
    (ii) Write a note on Non-benzenoid aromatic compounds and Annulenes.

2   a. (i)Write any two preparations and reactivity of carbocation.
    (ii) Write a note on Stork enamine reaction.
    (or)
    b. (i)Explain carbanion and nitrene

    (ii) Briefly explain Mannich Reaction with applications.

3   a. (i) Explain Pinacol-pinacolone rearrangement give examples.
    (ii) Describe mechanism and applications of Beckmann rearrangement.
    (or)
    b. (i) Discuss about Baeyer-villager rearrangement.
    (ii) Write a note on Favorskii rearrangement.

4   a. (i)Write the Woodward-Fieser rules for conjugated dienes.
    (ii) Explain types of molecular vibrations in Infrared Spectroscopy.
    (or)
    b(i)Describe factors affecting the chemical shift.
    (ii) Give the fragmentation pattern of alcohols.

5   a. (i) Write the synthesis of nicotine

    (ii) Explain Merrifield solid phase synthesis.
    (or)
    b. (i) Write about Primary, secondary and tertiary structures of proteins.
    (ii) How do you differentiate   RNA and DNA

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M.Sc. (PREVIOUS) CHEMISTRY-II-SEMESTER
Semester -II
Paper- IV: PHYSICAL CHEMISTRY-II
(Effective from 2021-2022 admitted batches)

Time: 3 hours   **Answer ALL questions**   **Max. Marks**: 80
(5x16=80 Marks)

1. (a) (i)Derive Bragg's equation
   (ii) Explain the theories of superconductivity
   (or)
   (b) (i)Describe the different methods of measurement of magnetic susceptibility.
   (ii) Write a brief note on semiconductors.

2. (a) (i) Give the the classification of polymers with examples.
   (ii) What are the factors influencing glass transition temperature.
   (or)
   (b) (i) How is molecular weight of polymers determined by osmometry and light scattering methods.
   (ii) Write a brief note on kinetics of free radical polymerization.

3. (a) (i)Explain Debye-Huckel theory of strong electrolytes
   (ii) Discuss the effect of complexation on redox potential with examples?
   (or)
   (b) (i)Derive an expression for EMF of concentration cell without transference.
   (ii) Discuss the important features of Debye-Huckel limiting law.

4 (a) (i) Derive Bulter- Volmer equation
   (ii) Explain the Stern model for double layer.
   (or)
   (b) (i)Explain in detail about polarography.
   (ii)Discuss important features of Gouy-Chapman diffuse charge model and Helmholtz parallel plate model

5. (a) (i) Derive Stern-Volmer equation
   (ii) State and explain Franck-Condon principle
   (or)
   (b) (i) Define quantum yield and explain its experimental method determination.
   (ii) Discuss the mechanism of photo addition and photo isomerization with examples