MODEL QUESTION PAPER
ANDHRA UNIVERSITY
DEPARTMENT OF CHEMISTRY
M.Sc. (PREVIOUS) CHEMISTRY
Paper- I: GENERAL CHEMISTRY-I-Semester-I
(Effective from 2021-2022 admitted batch)

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

1. (a) (i)What kind of molecules exhibit microwave spectra.
   (ii) Discuss isotope effect in microwave spectra.
   (or)
 (b) (i)Derive an expression for energy or harmonic oscillator and discuss the selection rules.
   (ii) Describe the origin of PQR structure of Vibrational-Rotational spectra.

2. (a)(i) Discuss the classical and quantum mechanical theories of Raman spectra.
   (ii) Explain rotational fine structure in electronic spectroscopy?
   (or)
 (b) (i)State and explain Franck Condon principle.
   (ii) Write a short note on charge transfer spectra.

3 (a) (i)Explain the terms spin active nuclei, resonance, larmor precession and chemical shifts in NMR.
   (ii) Explain hyperfine interactions in ESR spectroscopy taking examples.
   (or)
 (b) (i)What are the factors affecting g value in ESR spectroscopy.
   (ii) Explain spin-spin interactions in NMR spectroscopy?

4 (a) (i)State and explain the axioms of group theory.
   (ii) State the great Orthogonality theorem and discuss its implications.
   (or)
 (b) (i)Give the points groups for NH_3, XeF_4, eclipsed C_2H_6, Cis C_2H_4, $B_3N_3H_6$ and allene.
   (ii) Describe the anatomy of character table.

5 (a) (i)Write a flowchart and FORTRAN program for calculation of rate constant of a first order reaction.
   (ii) Give the syntax and rules of DO statement.
   (or)
 (b) (i)Write a flowchart and FORTRAN program for calculation of pH and hydrogen ion concentration of an aqueous solution of a strong acid taking into account the auto ionization of water.
   (ii) Write a brief note on format directed Input/output statements.

Paper- II: INORGANIC CHEMISTRY-I Semester-I
(Effective from 2021-2022 admitted batch)

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

1. (a) (i)Predict the geometries of ClF_3, XeF_4 and SF_4 molecules using VSEPR theory.

   (ii)What is LCAO method? Predict bond order and bond lengths in O_2^+ and O_2^- ions based on MO energy level diagram

OR

(b) (i)Draw the MO energy level diagram for $[Co(NH_3)_6]^{3+}$ and discuss its magnetic properties.

   (ii)Draw the Walsh diagram for H_2O molecule and predict its structure.

2. (a) (i) Discuss the preparation of, structure of, and bonding in $N_3P_3Cl_6$.

   (ii) Discuss the structure and properties of borazole.

OR

(b) (i)Explain Mialalicopause and Roscnneium theories, Pauling's theory and keggin's theory of polyacids.

   (ii)Explain the method of counting skeletal electrons in cluster compounds

3. (a) (i)Draw and explain the crystal field splitting of 'd' orbitals in square planar and trigonal bipyramidal geometries.

   (ii) Discuss the factors affecting crystal field splitting energies.

OR

(b)(i)What are static and dynamic Jahn-Teller theorem and discuss its consequences

   (ii) Write a note on nephelauxetic effect

4. (a) (i)How do Tanabe – Sugano diagrams differ from Orgel diagrams? Draw Tanabe – Sugano diagram for $[V(H_2O)_6]^{3+}$

   (ii) Draw the Orgel diagram for $[TiCl_4]^-$ ion and explain the electronic transitions.

OR

(b) (i)Write an account on Russell – Saunders coupling.

   (ii)Derive the term symbols for Ni^{2+} and identify the ground state term symbol

5. (a) (i)Discuss different types of paramagnetic behavior of transition metal complexes

   (ii)Calculate the spin only magnetic moments of the $[MnCl_6]^{3-}$ and $[Fe(CN)_6]^{3-}$

OR

(b) (i) Describe the Magnetic properties of inner transition metal complexes

   (ii) Determination of magnetic susceptibility a determination by Gouy's and Faraday's methods

MODEL QUESTION PAPER
ANDHRA UNIVERSITY
DEPARTMENT OF CHEMISTRY
M.Sc. (PREVIOUS) CHEMISTRY
Paper- III: ORGANIC CHEMISTRY-I-Semester-I
(Effective from 2021-2022 admitted batch)

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

1. a. (i) Explain SN2 reaction with stereo chemical evidence.

    (ii) What are non-classical carbocations? Explain them.

                        (or)

    b. (i)Describe neighbouring group participation reactions of
    Oxygen and Halogens with an examples

    (ii) Write a note on nucleophilic substitution reactions at
        allylic and trigonal carbons

2. a. (i) Explain SE1 and SE2 reactions with examples

    (ii) Write a note on halogenations of ketones and carboxylic
        acids with examples.

                        (or)

    b.(i) Write a note on SE^i reaction and Migration of double
        bonds

     (ii) Describe halogenations of sulphoxide and sulphones.

3. a. (i) Explain Optical isomerism of biphenyls and spirans.

     (ii) Write about racemisation and resolution with examples.

                        (or)

    .   (b) (i) Describe the properties of geometrical isomers.

              (ii) Write the conformational analysis of cyclohexane
        with an example.

4. a. (i) Write any two synthesis and reactivity of Oxirane.

    (ii) Explain any two synthesis and reactivity of Indole.

                        (or)

    b (i)Describe the synthesis and properties of Pyridine.

       (ii)Write a note on coumarins and chromones with
    examples.

5   a. (i)Explain the synthesis of α- pinene

    (ii) Write any synthesis of progesterone.

                        (or)

    b. (i) Explain triglycerides   with examples.

    (ii) Write the structure and synthesis of cholesterol.

MODEL QUESTION PAPER
ANDHRA UNIVERSITY
DEPARTMENT OF CHEMISTRY
M.Sc. (PREVIOUS) CHEMISTRY
Paper- IV: PHYSICAL CHEMISTRY-I-Semester-I
(Effective from 2021-2022 admitted batch)

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

1. (a) (i)Derive Maxwell's relations.
   (ii) Define fugacity. How do you determine the fugacity of real gases?
<div align="center">(or)</div>
 (b) (i)Derive Clausius- Clapeyron equation.
   (ii) Explain the entropy changes accompanying in different processes.

2. (a) (i)Define partial molar quantity? Explain the experimental methods for determining partial molar quantities.
   (ii) Explain briefly about thermodynamics of mixing of liquids.
<div align="center">(or)</div>
 (b) (i)State and explain third law of thermodynamics and write its limitations.
   (ii) What is effect of temperature on equilibrium constant?

3 (a) (i)Discuss the features and limitations of Langmuir adsorption isotherm.
   (ii) Give a classification of surface-active agents along with examples.
<div align="center">(or)</div>
(b) (i)What are important features of BET isotherm.
   (ii) What is CMC? What are the factors affecting CMC.

4. (a) (i)Discuss the Lindeman theory of unimolecular reaction and its limitations.
   (ii) Write a note on diffusion-controlled reactions.
<div align="center">(or)</div>
(b) (i)Derive an expression for effect of ionic strength on rate of reaction.
   (ii) Discuss the kinetics of consecutive reactions.

5. (a) (i) Explain the Michaelis-Menten mechanism for enzyme catalysis.
   (ii) Explain the mechanism of specific acid-base catalysis.
<div align="center">(or)</div>
(b) (i) Explain steady-state approximation with examples.
   (ii) Explain temperature jump method for fast reactions and derive an expression for relaxation time.