THIRD YEAR SCIENCE, 2006-2007

CHEMISTRY

The examination shall consist of three theory papers and one practical.

Paper & Course	Hrs/week	M. Marks
Paper -I Inorganic Chemistry	2	50
Paper- II Organic Chemistry	2	50
Paper- III Physical Chemistry	2	50
Practicals	4	75

PAPER-I
INORGANIC CHEMISTRY

Time-3 Hrs. **M.M. 50**

NOTE : The paper will be divided into THREE sections.

Section-A Ten questions (short type answer) two from each Unit will be asked. Each question will be of half mark and the candidates are required to attempt all questions. **Total 5 marks**

Section-B Five questions (answer not exceeding 250 words) one from each Unit with internal choice will be asked and the candidates are required to attempt all questions. Each question will be of 5 marks.

Total 25 marks

Section-C Four questions may be in parts covering all the five Units (answer not exceeding 500 words) will be asked. The candidates are required to attempt any TWO questions. Each question will be of 10 marks.

Total 20 marks

UNIT-I

Hard and Soft Acids and Bases (HSAB) - Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

Metal - Ligand Bonding in Transition Metal Complexes - Limitation of valence bond theory, an elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal- field parameters, John- Teller effect.

UNIT-II

Magnetic Properties of Transition Metal Complex - Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of m_s and m_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d- metal complexes.

Electronic Spectra of Transition Metal Complexes - Types of electronic transitions, selection rule for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energy level diagram for d^1 and d^9 states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.

UNIT- III

Bioinorganic Chemistry - Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}.

Electroanalytical Methods - EMF measurements, pH - determination using hydrogen, glass, quinhydrone, antimony and calomel electrodes, potentiometric titrations.

Volumetric Estimation - Theory of oxidation - reduction titrations. Theory of complexometric titrations.

UNIT- IV

Organometallic Chemistry - Definition, nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyl and aryl of Li, Al, Hg, Sn and Ti, a brief account of metal - ethylenic complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls.

Thermodynamic and Kinetic Aspects of Metal Complexes - A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes.

UNIT- V

Molecular Symmetry and Group Theory - Symmetry elements, molecular point groups, group theory and basic properties, similarity transformation and classes, orthogonality theorem, multiplication tables and characters tables of C_{2v} and C_{3v} groups.

Mathematical Techniques - Least square treatment applied to linear equation $y = mx + c$, correlation coefficient, σ_m and σ_c .

Books Recommended:

1. Group theory and its chemical applications: P. K. Bhattacharya.
2. Inorganic chemistry: J. E. Huyee, Principles of structure & Reactivity, 3rd Ed.
3. Selected topics in inorganic chemistry: W. U. Malik, G. D. Tuli and R. Madan.
4. Principles of inorganic chemistry: D. Banerje.
5. Modern aspect of inorganic chemistry: H. J. Emeleus and A. G. Sharpe.
6. Inorganic chemistry (Hindi Ed.): Ameta, Sharma and Mehta.