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CHEMISTRY (FIRST SEM)
Nov

B.A. M.Sc. Exam, Dec., 2016

First Semester (FIRST SEM)

Pages 12

FOR COLLEGE ONLY

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SEMESTER I

Paper-I

MCH-401: INORGANIC CHEMISTRY

Unit - I

Stereochemistry and Bonding in Main Group Compounds :

Valence shell electron pair repulsion (VSEPR) theory and its applications, Walsh diagram (triatomic molecules), $d\pi-p\pi$ bond, Bent rule and energetic of hybridization, some simple reactions of covalently bonded molecules such as Atomic inversion, Berry pseudorotation, Nucleophilic displacement, free radical mechanisms.

Unit - II

Metal Ligand bonding :

Limitation of crystal field Theory, Jahn -Teller effect, molecular orbital theory for bonding in octahedral, tetrahedral and square planar complexes,

Unit - III

Metal -Ligand Equilibrium in Solution :

Stepwise and overall formation constants and their relationship, trends in stepwise constant, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand. Chelate effect and its thermodynamic origin, determination of binary formation constants by pH metry and Spectrometry.

Unit - IV

Reaction Mechanism of Transition Metal Complexes - I :

Energy profile of a reaction, reactivity of metal complex, inert and labile complexes, Kinetic application of valence bond and crystal field theories. Kinetics of octahedral substitution, acid hydrolysis, factors affecting acid hydrolysis, base hydrolysis, conjugate base mechanism, direct and indirect evidences in favour of conjugate mechanism, anion reactions, reactions without metal ligand bond cleavage. Substitution reaction in square planer complexes, the trans effect, Mechanism of substitution reactions.

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Unit-V

Reaction Mechanism of Transition Metal Complexes - II and HSAB theory :

Redox reaction, Electron transfer reaction, mechanism of one electron transfer reaction, outer and inner sphere type reactions, cross reactions and Marcus - Hush theory, HSAB principle, Theoretical basis of hardness and softness, Lewis - acid base reactivity approximation; donor acceptor numbers, E and C equation : applications of HSAB concept.

Books suggested :

1. Advanced Inorganic Chemistry, F. A. Cotton and Wilkinson, John Wiley.
2. Inorganic Chemistry, J.E. Huhey, Harpes & Row.
3. Chemistry of Elements. N. N. Greenwood and A. Earnshaw, Pergamon
4. Inorganic Electronic Spectroscopy, A.B. P. Lever, Elsevier.
5. Comprehensive Co-ordination Chemistry eds., G. Wilkinson, R.D. Gillars and J. A. Mc cleverty, Pergamon.
6. Inorganic Chemistry, D. F. Shriver & P.W. Atkins, Oxford University Press 3rd 1999.
7. Inorganic Chemistry by A.G. Sharpe. Addition Wesley England 3rd 1992
8. Inorganic Chemistry G.L. Misseler and D. A. Tarr Pearson Education, 2009.

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Paper - II

MCH - 402 : ORGANIC CHEMISTRY I

Unit - I

Nature of Bonding in Organic Molecules :

Delocalised chemical bonding-conjugation, cross conjugation, resonance, hyperconjugation, bonding in fullerenes, tautomerism. Aromaticity in benzenoid and non-benzenoid compounds, alternate and non-alternate hydrocarbons. Huckel's rule, energy level of π -molecular orbitals, annulenes, anti-aromaticity, homo-aromaticity, PMO approach. Bonds weaker than covalent-addition compounds, crown ether and Cryptands complexes, inclusion compounds, catenanes and rotaxanes.

Unit - II

Stereochemistry :

Strain due to unavoidable crowding Elements of symmetry, Chirality, Molecules with more than one chiral centre, Threo and erythro isomers, Methods of resolution, Optical purity, enantiotopic and diastereotopic atoms, groups and faces, stereospecific and stereoselective synthesis, Asymmetric synthesis. Optical activity in the absence of chiral carbon biphenyls, allenes and spirane chirality due to helical shape. Stereochemistry of compounds containing nitrogen, sulphur and phosphorus.

Unit - III

Conformational analysis and Linear free energy relationship :

Conformational analysis of cycloalkanes, decalines, effect of conformation on reactivity, conformation of sugars. Generation, structure, stability and reactivity of carbocations, carbanions, free radicals, carbenes and nitrenes. The Hammett equation and linear free energy relationship, substituent and reaction constants, Taft equation.

Unit - IV

Reaction Mechanism - Structure and Reactivity :

Types of mechanism, types of reactions, thermodynamic and kinetic requirements, Kinetic and thermodynamic control, Hammond's Postulate, Curtius-Hammett principle. Potential energy diagram, transition states and intermediates, methods of determining mechanisms, isotopic effects.

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Unit - V

Aliphatic Nucleophilic Substitution :

The SN₂, SN₁, mixed SN₁ and SN₂ and SET mechanism. Neighbouring group mechanism, Neighbouring group participation by pi and sigma bonds, anchimeric assistance. Classical and non classical carbocations, phenonium ions, norbornyl system, common carbocation rearrangements. Application of NMR spectroscopy in the detection of carbocations. The SN_i mechanism. Nucleophilic substitution at an allylic, aliphatic trigonal and a vinylic carbon. Reactivity effects of substrate, structure, attacking nucleophile, leaving group and reaction medium, phase transfer catalysis and ultrasound, ambident nucleophiles, regioselectivity.

Book suggested :

1. Advanced Organic Chemistry - Reactions, Mechanism and Structure, Jerry March, John Wiley.
2. Advanced Organic Chemistry, F.A. Carey and R.J. Sundberg, Plenum.
3. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
4. Structure and Mechanism in Organic Chemistry, C.K. Ingold, Cornell University Press.
5. Organic Chemistry, R.T. Morrison and R.N. Boyd, Prentice - Hall.
6. Modern Organic Reactions, H.O. House, Benjamin.
7. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, Blackie Academic & Professionals.
8. Reaction Mechanism in Organic Chemistry, S.M. Mukherji and S.P. Singh, Macmillan.
9. Pericyclic Reactions, S. M. Mukherji, Macmillan, India
10. Stereochemistry of Organic Compounds, D. Nasipuri, New Age International.
11. Stereochemistry of Organic Compounds, P.S. Kalsi, New Age International.

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