VEER NARMAD S0UTH GUJARAT UNIVERSITY
M.Sc. SEM- III (INORGANIC CHEMISTRY)
SYLLABUSTO BE EFFECTIVE FROM JUNE-2019
PAPER-I (INC-301)
Selected Topics in Inorganic Chemistry

Max. Marks: 70 **Total Periods: 45**

SEMESTER –III

Unit-I: Chemistry of Non-Transition Elements (11 periods)

General discussion on the properties of the non-transition elements, Polymorphism in carbon, phosphorus and sulphur, Synthesis, properties and structure of boranes, carboranes, silicates, carbides, phosphazenes, sulphur-nitrogen compounds, peroxo compounds of boron, carbon, sulphur, structure and bonding in oxyacids of nitrogen, phosphorus, sulphur and halogens, interhoalogen, pseudohalides.

Unit-II: Organometallic Compounds (12 periods)

1. Introduction, definition and scope of organometallic Chemistry.
2. Metal-Carbon multiple bonded compounds: Synthesis, bonding, Properties and applications of :
   (a) Carbenes (b) carbynes
3. ηC_nR_n carbocyclic polyenes: Synthesis, bonding, Properties and applications of:
   (a) allyls η^3-C_3R_5 (b) pentadienyls η^5-C_5R_7 (c) cyclobutadienes η^4-C_4R_4
   (d) cyclopentadienyls η^5-C_5R_5 (e) arenas η^6-C_6R_6
   (f) cycloheptatrienyls η^7- C_7R_7
4. Synthetic applications of Main group organometallic compounds.
   (a) Organolithium (b) Organomagnesium (c) Organozinc
   (d) Organoboron (e) Organothallium

Unit-III: Bioinorganic Chemistry-I (11 Periods)

1. Biological Chemistry of Iron:
   (a) Transport of Iron
   (b) Hemoglobin and Myoglobin
   (c) Storage and Transport Proteins of Iron viz.Ferritin and Transferrin
   (d) Cytochromes
   (e) Iron-Sulfur Proteins.
2. Biochemistry of Cobalt

(a) B_{12} coenzymes and Model compounds
(b) Actions of Cobalmins and Cobinamides
(c) Adenosylcobalmin as a coenzyme
(d) Ribonucleotidereductase
(e) Methylcobalmin as cofactor.

Unit-IV: Bioinorganic Chemistry-II (11 Periods)

1. Biological Chemistry of Copper
   a) Type I, II and III
   b) Blue Copper Proteins (plastocyanins, Azurins and Blue Oxidases)
   c) Models of Blue Copper compounds
   d) Non-blue copper proteins (Tyrosinase, Galactose Oxidase, SOD)
2. Biochemistry of Zinc
   Carboxypeptidase and carbonic anhydrase
3. Metal complexes in Medicine.
   a) Disease due to Metal deficiency and its treatment: Fe, Cu, Zn and Mn
   b) Metals used in diagnosis: MRI
4. Anticancer activity of Platinum complexes.

References:

1) A. F. Wells, Structural Inorganic Chemistry - 5th edition (1984)
2) J. D. Lee, Concise inorganic Chemistry, Elbs with Chapman and Hall, London
3) M. C. Day and J. Selbin, Theoretical Inorganic Chemistry, Reinhold, EWAP
4) F. A. Cotton, R. G. Wilkinson. Advanced Inorganic chemistry
5) Willam L. Jooly, Modern Inorganic Chemistry
6) Advanced Inorganic Chemistry, Bahl and Tuli, S. Chand and Company
7) Inorganic Chemistry 3rd edn. D. F. Shriver and P. W. Atkins, Oxford University Press, 1999, Chapter 16.
8) Organotransition Metal Chemistry, Anthony F. Hill, Royal Society of Chemistry,Tutorial Chemistry Text, 2002. Chapters 1 to 7.
9) Organometallics: A concise Introduction, Ch. Elshebroicn and A. Salzer, VCH, Chapters 12 to 16.
10) Organotransition Metal Chemistry: Applications to Organic Synthesis, S. G. Davies, Pergamon 1982.
11) Bioinorganic Chemistry: A Short Course -Rosette M.Roat-Malone, Wiley Interscience, 2002.
12) Biological Inorganic Chemistry -An Introduction, Robert Crichton, ElsevierScience, 2007
13) The Biological Chemistry of the Elements- The Inorganic Chemistry of Life J. J. R. Frausto da Silva and R. J. P.Williams Clarendon Press, Oxford,1991.
14) Bioinorganic Chemistry, Dr. Asim. K. Das, Books Allied Ltd, Kolkata

VEER NARMAD S0UTH GUJARAT UNIVERSITY
M.Sc. SEM- III (INORGANIC CHEMISTRY)
PROPOSED SYLLABUSTO BE EFFECTIVE FROM JUNE-2019
PAPER- II (INC-302)

Max. Marks: 70 **Total Periods: 45**

SEMESTER –III

Unit-I: Chemical and biofertilizers (11 periods)

Definition, classification, methods of production, chemical properties and uses of urea, ammonium sulphate, ammonium sulphate nitrate, ammonium chloride, single super phosphate, triple super phosphate, biofertilizers, types of biofertilizers, nitrogen fixing biofertilizers, phosphate–solubilizing biofertilizers, preparation of a biofertilizers.

Unit-2: Magneto chemistry (12 periods)

Introduction, definition, types of magnetic bodies, Russel-saunders and LS coupling, Derivation of Russel-Saundersterms, spin-orbit interaction, thermal energy and magnetic property, magnetic moment for different multiple widths, multiple width large compared to KT, multiple width small compared to KT, multiple width comparable to KT, stereo chemical application of magnetic properties of the first transition series, lanthanides and actinides. Determination of magnetic susceptibility by different methods.

Unit-3: Corrosion Inhibitors (11 periods)

Introduction, types of corrosion principles of corrosion inhibitors, corrosion as an electrochemical process, practical aspects of corrosion inhibition, anion inhibitor properties in neutral electrolytes, some application of corrosion inhibitors (cooling water circulation-once through and open systems ,engine radiation and cooling systems, central heating systems, refrigeration plants and high chloride systems, water for steam raising ,corrosion inhibitors for paint coating)

Unit-4: Ion Exchange (11 periods)

Synthesis, characterization and properties of ion exchangers, mechanism of ion exchange: equilibria-rate theory, Donnan equilibria, liquid ion exchangers and chelate ion-exchange resins. Separation of metal and non-metals using ion exchangers.Inorganic ion exchangers: The clay minerals, zeolites, heteropolyacid salts,hydrous oxides and insoluble salts and their applications.

Reference Books:

1. C.E.Harland 1994 Ion exchange theory and practice, second Edn,Royal society of chemistry Cambridge.
2. J.Korkisch 1989 Handbook of ion exchange resins,their application to inorganic chemistry CRC press,Boca Raton FL.
3. An introduction to metallic corrosion: U. R. Evans, Cambridge, England
4. UHLIGS Corrosion hand book, R. Winston Revie., John Wiley & Sons JNC.
5. Vogel's text book of quantitative chemical analysis, sixth Edn. J.Mendham R C Denney,J.D.Barnes,M J K Thomas.
6. Advanced in inorganic chemistry vol. 1 & 2, Gurdeep Raj, Krishna Publication Meerut.
7. Collings G. H., Commercial Fertilizers, 5th edition, Mcgrew Hill, New York, 1955.

VEER NARMAD S0UTH GUJARAT UNIVERSITY

M.Sc. SEM- III (INORGANIC CHEMISTRY)
PROPOSED SYLLABUSTO BE EFFECTIVE FROM JUNE-2019
PAPER- III (INC-303)

Max. Marks: 70 **Total Periods: 45**

SEMESTER –III

Unit-I: Stereochemistry and bonding in compound (11 periods)

Wave mechanical treatment of covalent bond, valence bond theory, molecular orbital theory, VSEPR theory, Walsh diagrams, shapes of molecules having regular and irregular geometry, orbital configuration of some triatomic molecules, hybridization, Bent's rule and energetics of hybridization, dπ - pπ bonds, structure of some adducts.

Unit-2: Nuclear chemistry (11 periods)

The nature of the nucleus, nuclear stability, packing fraction, magic number, isotopes, isobars, isotones and isomers, natural radioactivity, theory of radioactivity disintegration, radioactive equilibrium, radioactive series, units of radioactivity, measurement of radioactivity, nuclear transmutation, artificial radioactivity, nuclear reaction, nuclear fission and fusion, trace elements, application of radioactive isotopes.

Unit-3: Corrosion Chemistry (11 periods)

Principles of corrosion and rate expressions, different forms of corrosion, corrosion by sea water and boilers, contact and crevice corrosion, stress corrosion, cracking and related phenomena, hydrogen cracking corrosion prevention- corrosion inhibitors and passivators, cathodic and anodic protection, metallic coating, role of paints and pigments, plastic linings, alloying for corrosion resistance.

Unit-4: Volumetric Titrimetry (12 periods)

Terminology, basic requirements of a titration reaction, standard and primary standard solution, expressing concentration of standard solution, volumetric titration co-relation, p-functions, acid-base titrations, theory of acid-base indicators, redox titration, complexometric titration, EDTA titration, indicators for EDTA titration, titration curves, EDTA titration methods, cautions in volumetric titrimetry, correction for unavoidable errors.

Reference Books:

1. Principles of inorganic chemistry: Puri, Sharma, Kalia, Thirty third Edn. (Vishal publishing co.)
2. Advanced in inorganic chemistry: S. K. Agrawal, Keemti Lal, Fifteenth Edn. (Pragati Edition)
3. An introduction to metallic corrosion: U. R. Evans, Cambridge, England
4. UHLIGS Corrosion hand book, R. Winston Revie., John Wiley & Sons JNC.
5. Vogel's text book of quantitative chemical analysis, sixth Edn.
6. Advanced in inorganic chemistry vol. 1 & 2, Gurdeep Raj, Krishna Publication Meerut.
7. Selected topics in inorganic chemistry: Malik, Tuli, Madan

VEER NARMAD S0UTH GUJARAT UNIVERSITY
M.Sc. SEM- III (INORGANIC CHEMISTRY)
PROPOSED SYLLABUSTO BE EFFECTIVE FROM JUNE-2019
PAPER-IV (304)
CO-ORDINATION CHEMISTRY (Special Paper)

Max. Marks : 70 **Total Periods:45**

SEMESTER –III

UNIT-I: Theories of Metal Ligand Bonding-I (11 Periods)

(a) Valence Bond Theory (VBT)

Theoretical principles of VBT
Inner Orbital complexes and Outer Orbital complexes, Examples of complexes of co-ordination number 2 to 6, Advantages and limitations of valence bond theory.

(b) Crystal Field Theory(CFT)

Theoretical principles of CFT
CFT of weak and strong field compounds: Splitting pattern in Octahedral(Oh), Tetrahedral(Td), Square planar(D_4h), Trigonalbipyramidal (TBP) and Square Planar(SP) complexes, limitation of crystal field theory, Structural effects of orbital splitting

UNIT-II: Theories of Metal Ligand Bonding-II (12 Periods)

(a) Advanced Theory: Jahn Teller effects and distortions in Oh complexes. Ligand Field Theory(LFT). Experimental evidences in support of metal ligand overlap. Adjusted crystal field theory (ACFT), Determination of Ligand group of orbitals, σ bonding and π bonding,

(b) Molecular Orbital Theory for complex Ions.

Qualitative Molecular Orbital energy level diagrams and their interpretation of Oh, Td and square planar complexes with examples.

UNIT III: Electronic Spectral Properties of Transition metal and metal complexes-I (11 Periods)

Theoretical aspects of spectra of complexes

Spectroscopic Terms, Coupling of terms, microstates for the p, d and f configurations. Hund's rule for ground state term, Derivation of Russel-Saunders terms, the correlation of spectroscopic terms in Mulliken symbols, Electronic transition selection rules, spin-orbit coupling. Crystal field diagram for d^1 and d^{10} configuration. Orgel diagram for Oh and Td complexes(d^1-d^9 states).

UNIT IV:Electronic Spectral Properties of Transition metal and metal complexes-II

(11 Periods)

Tanabe Sugano energy level diagram for Oh and Td complexes(d^1-d^9 states). Charge transfer spectra and interligand spectra, factors affecting charge transfer spectra, Calculation of Dq, B' and β parameters for Co(II) and Ni(II) complexes using electronic spectral data under different geometries.

Spectrochemical series and Nephelauxatic series, Intensity of spectral peak: Oscillator strength and band width.

REFERENCE BOOKS

1. Inorganic Chemistry (Principles of structure and coordination compounds) J.E HuheeyHarper and Row International series, New York (1983).
2. Advanced Inorganic Chemistry F.A.Cotton and G.Wildinson, Interscience, New York (1988).
3. Theoretical Inorganic Chemistry (New Edition) M. C. Day and J. Selbin East-WestPressPvt. Ltd. (New Delhi) 1971.
4. A modern Introduction Inorganic Chemistry T. Moeller John Wiley and Sons, NewYork,
5. Principle of Inorganic Chemistry, Puri, Kalia and sharma, Vishal Publishing Co. Jalandhar
6. Advanced Inorganic Chemistry, S. K Agrawal and Keemtilal, Pragati Prakashan
7. Co-ordination Chemistry Pimplapure, Jain, Pragati Prakasham
8. General and Inorganic Chemistry, R Sarkar, New Central Book Agency
9. Advanced Inorganic Chemistry, TuliBasu and Madan(Volume II)
10. Inorganic Electronic Spectroscopy (II Edition), A.B.P. Lever, Elsevier, Amsterdam
11. Introduction to Ligand Field, B. N. Feggis, Interscience, New York (1966).
12 Physical Methods in Inorganic Chemistry (Both Edition), R.S. Drago, W. B. Saunders, Philadelphia (1977).
13. Introduction to Ligand Field Theory, C.G. Ballhenson, McGraw-Hill, New York (1962).
14. Electron Absorption Spectroscopy and Related Techniques, D.N. SathyanarayanaUniversities Press (India) Ltd. Hyderabad (2001).
15. Organometallic Compound, IndrajeetKumar, Pragati Prakashan

VEER NARMAD S0UTH GUJARAT UNIVERSITY
M.Sc. SEM- III (INORGANIC CHEMISTRY)
PROPOSED SYLLABUSTO BE EFFECTIVE FROM JUNE-2019
(INORGANIC PRACTICALS)

1. Analysis of Brass alloy
2. Analysis of Ultramarine sample
3. Analysis of Hydrogen peroxide (H_2O_2)
4. Analysis of Dolomite Ore
5. Analysis of fertilizer sample
6. Analysis of Stainless Steel
7. Analysis of German Silver
8. Analysis of Portland Cement.
9. Analysis of Available lime
10. Analysis of PO_4^{-3} for K_2HPO_4 spectrometrically
11. Determine the λmax for Cu-en complex[(1:1), (1:2),(1:3)] complex
12. Determine the composition of Cu-en complex by Job's method
13. Determine the λmax for Ni-en complex[(1:1), (1:2),(1:3)] complex
14. Determine the composition of Ni-en complex by Job's method.

VEER NARMAD S0UTH GUJARAT UNIVERSITY
M.Sc. SEM- IV (INORGANIC CHEMISTRY)
PROPOSED SYLLABUSTO BE EFFECTIVE FROM JUNE-2019
PAPER-I (INC-401)
Selected Topics in Inorganic Chemistry

Max. Marks : 70 **Total Periods:45**

SEMESTER –IV

Unit-I : Photochemistry of Inorganic compounds and co-ordination compounds (11 periods)

Introduction: Photochemistry laws and photochemical kinetics, Absorption of light, quantum yield and reactivity, life time, kinetic aspects of photochemical process, temperature dependence of photochemical process and photochemical equipment.

Photo physical process : Introduction , theory and relative process stimulated absorption, spontaneous emission, selection rules, oscillator strength and radiative life time, Frank Condon principle, theory of non-radiative processes, radiationless transitions and bimolecular.

Unit-II : Environmental Chemistry (12 periods)

Various types of pollution: Introduction, definition and classification
(a) Air Pollution: Sources and sinks of gases pollutants on living and non-living things, Green House Effect, Acid rain, Ozone layer Depletion and their consequences on environment. Effect of air pollution, photochemical smog and major air pollution.

(b) Method of control of air pollution: Different methods of control air pollution, precipitation wet and dry scrubber, filters, gravity and cyclonic separation, adsorption, absorption and condensation of gaseous effluent.

(c) Water pollution : types, sources and classification of water pollution, constituent and oxygen control of water and aquatic life, oxygen electrode and its use. Effect of water pollutants on life and environment.

(d) Method of control of water pollution: Principle of coagulation, flocculation, softening, disinfection, demineralization, and fluoridation. Objective analysis: color, turbidity, total solids, conductivity, acidity, alkalinity, hardness, chlorine, sulphate, fluoride, silica, phosphate and different form. DO, BOD, COD and significance.

Unit-III: Homogeneous Catalysis (11 Periods)

Introduction, types of catalysts, Catalytic steps, Hydrogenation of alkene, Ziegler-Natta polymerization of olefins, Hydrocarbonylation of olefins, The wacker process, Monsanto Acetic Acid Synthesis, Water-gas Shift Reaction, Hydrosilation, Activation of C-H bond.

Unit-IV: Transition metal compounds with Bond to Hydrogen and Reactions of Homogeneous catalysis (11 Periods)

(a)Transition metal compounds with Bond to Hydrogen:

Introduction, characterization of transition metal hydride complexes, methods of preparation, properties, Mononuclear polyhydrides, Homoleptic polyhydrido anions, Metal carbonyl hydrides, Dihydrogen complexes.

(b) Reactions of Homogeneous catalysis

Oxidative-Addition Reaction : Energetics and Mechanism, Reductive-Elimination Reaction, Insertion Reaction: classification and some examples, Deinsertion Reaction, Nucleophilic and Electrophilic Attack on Coordinated ligands

REFERENCE BOOKS

1. Fundamentals of photochemistry, K. K. RohatgiMu kerjee. Wiley Eastern Limited, New Delhi, (1978).
2. Photochemistry, J. G. Calvents and J. N. Pitts. John-Wiley & Sons.
3. Introduction to photochemistry. Wells
4. Photochemistry of solutions. C. A. Parker, Elsevier.
5. Photochemistry of coordination compounds, V. Balzani and V. Carassitti, Academic Press, London (1970).
6. Concept of Inorganic photochemistry, A. W.Adamson and Paur D.Fleischauer, A Wiley Interscience Publication, New Delhi, 1975
7. Water pollution. J. E. Jajic, Marcel-Dekker,
8. Air pollution. H. W. Parker, Prentice-Hall
9. Environmental chemistry. A. K. De, Wiley Eastern Ltd, New Delhi.
10. Environmental pollution control in process industries. S. P. Mahajan.
11. Introduction to air pollution. P. K. Trivedi.
12. Environmental pollution Analysis, S. M. Khopkar
13. A text book of Environmental pollution. D.D.Tyagi and M. Mehre.
14. Environmental pollution Engineering and control. C. S. Rao.
15. Environmental Chemistry, B. K. Sharma, Goel Publishing house,
16. Environmental Chemistry, S.C Bhatia, CBS Publisher and Distributer
17. Elements of Magnetochemistry, R.L. Datta& A. Syamal, Affiliated East- West Press Pvt. Ltd., New Delhi (1993).

VEER NARMAD S0UTH GUJARAT UNIVERSITY
M.Sc. SEM- IV (INORGANIC CHEMISTRY)
PROPOSED SYLLABUSTO BE EFFECTIVE FROM JUNE-2019
PAPER- II (INC-402)

Max. Marks: 70 **Total Periods: 45**

SEMESTER-IV

Unit-I: Basic of Supramolecular chemistry (12 periods)

Definition and development of supramolecular chemistry, classification of supramolecular Host-Guest compounds, Receptors, coordination and lock and key analogy, binding constant, cooperativity and the chelate effect, preorganization and complementarity, Thermodynamic and kinetic selectivity and discrimination, nature of supramolecular interactions, solvation and hydrophobic effects, supramolecular concepts and design.

Unit-2: Isomerism Among inorganic complexes (11 periods)

Structural isomerism, stereoisomerism or space isomerism, geometrical isomerism in 4- and 6- coordinates compound, distinguish between cis and trans- isomers, optical or mirror image isomerism. Condition for a molecule to show optical isomerism. Optical isomerism in4- and 6- coordinates compounds. Resolution of racemic mixtures.

Unit-3: Chemistry of solid state (12 periods)

Crystalline and amorphous solids, size and shape of crystals, symmetry in crystals, space lattice and unit cell, Bravais lattices, Miller indices, types of crystals, close packing of identical solid spheres, interstitial sites in close packing of spheres, limiting radius ratio, radius ratio rule and the shape of an ionic crystal, structure of metallic crystals and ionic crystals, lattice energy of an ionic crystal and calculation, Born equation and its application, experimental determination of lattice energy, defect structures of crystals, semiconductors ,fabrication of transistors.

Unit-4: Oxidation and Reduction (10 periods)

Oxidation number, Galvanic cell, single electrode potential, sign of electrode potential, standard electrode potentials, electrochemical series, Nernst equation, application of electrochemical series, source of electrical energy in a galvanic cell, hydrogen over voltage, oxygen over voltage, redox stability in water, oxidation by atmospheric oxygen, Latimer diagram, Frost diagram, pourbaix diagram

Reference Books:

1. Supramolecular chemistry by Jonathan W. steed, Jerry L. Atwood, John Wiley & sons Ltd.
2. A. F. Wells, Structural Inorganic chemistry, 3rd Edn, oxford Fair Lawn, N. J. 1962.
3. Principles of inorganic chemistry: Puri, Sharma, Kalia, Thirty third Edn. (Vishal publishing co.)
4. Advanced in inorganic chemistry: S. K. Agrawal, Keemti Lal, Fifteenth Edn. (Pragati Edition)
5. A. I. Vogel's text book of quantitative inorganic analysis, ELBS III Edn. 1987.
6. Advanced in inorganic chemistry vol. 1 & 2, Gurdeep Raj, Krishna Publication Meerut.
7. Selected topics in inorganic chemistry: Malik, Tuli, Madan

VEER NARMAD S0UTH GUJARAT UNIVERSITY
M.Sc. SEM- IV (INORGANIC CHEMISTRY)
PROPOSED SYLLABUSTO BE EFFECTIVE FROM JUNE-2019
PAPER- III (INC-403)

Max. Marks: 70 **Total Periods: 45**

SEMESTER-IV

Unit-I : Pollution from agriculture pesticides and fertilizers (11 periods)

Pesticides: general aspects and classification, structural features of some common insecticides, mode of action-general aspects,fate of insecticides in environment and environment hazards, characteristics features of some commonly used insecticides, some important fungicides herbicides and their characteristics features,major disasters with the pesticides and herbicides, alternative to chemical pesticides, fertilizers and environmental hazards from the fertilizers, eutrophication.

Unit-2 : Electron Spin resonance (11 periods)

Principle and presentation of the spectrum. Hyperfine splitting. Anisotropy and interpretation of g values. Hyperfine coupling and zero field splitting. Survey of EPR spectra of first row transition metal ion complexes. Double Resonance and Fourier transform EPR techniques.

Unit-3: (12 periods)

(A) NMR spectroscopy

Principle and application of FT-NMR, Chemical shift, contact shift and pseudo contact shift. lanthanide complexes as shift reagents. Double resonance technique, Proton, Boron, Carbon, Nitrogen, Phosphorous NMR of inorganic compounds

(B) Chemistry of Lanthanides and Actinides

Separations, spectral and magnetic properties, organometallic chemistry of lanthanides and actinides, transurenium elements

Unit-4: Mossbauer spectroscopy (11 periods)

Basic principle, Spectral parameters and spectrum display. Interpretation of Isomer shift. Application of technique to the studies of bonding and structure of Fe^{+2} and Fe^{+3} compounds, Sn^{+2} and Sn^{+4} compounds and detection of oxidation states. FAB and electron spray, mass spectrometry of metal complexes

Reference Books:

1. Structural methods in inorganic chemistry. E. A. V. Ebsworth, D. W. H. Rankin and S. Cardock.
2. Spectroscopic identification of organic compounds-R. M. Silverstein, G. C. Bassler and Morril.
3. Physical methods in Inorganic chemistry- R. S. Drago.
4. Application of absorption spectroscopy of organic compounds- J. Dyers.
5. Electron Spin Resonance-Elementary theory and Practical Applications- Wertz and olton.
6. Principles of inorganic chemistry: Puri, Sharma, Kalia, Thirty third Edn. (Vishal publishing co.)
7. Advanced in inorganic chemistry: S. K. Agrawal, Keemti Lal, Fifteenth Edn. (Pragati Edition)
8. Advanced in inorganic chemistry vol. 1 & 2, Gurdeep Raj, Krishna Publication Meerut.
9. Environmental chemistry with green chemistry:Asim K.Das, Books and allied (p) ltd.

VEER NARMAD S0UTH GUJARAT UNIVERSITY
M.Sc. SEM- IV (INORGANIC CHEMISTRY)
PROPOSED SYLLABUSTO BE EFFECTIVE FROM JUNE-2019
PAPER- IV (INC-404)
CO-ORDINATION CHEMISTRY (Special paper)

Max. Marks: 70 **Total Periods: 45**

SEMESTER-IV

Unit-I: **(11 Periods)**

Kinetics and Reaction Mechanism of Transition Metal Complexes:

Reactivity of metal complexes, ligand replacement reaction, classification of mechanism.

Kinetics of octahedral substitution reaction:

Complementary reaction, Non-complementary reaction, Anation reaction, reactions without metal-ligand bond cleavage.

Stereochemical changes in octahedral complexes:

Molecular rearrangement in complexes, reaction of geometrical and optical isomers. Isomerization and racemization of octahedral complexes, Ligand stereo specificity.

Redox reaction:

Electron transfer reactions, mechanism of one electron transfer reactions, outer sphere electron transfer reactions, tunneling effect, cross reaction, Marker-Hush theory, inner sphere electron transfer reactions, bridged activated mechanism, experimental Techniques.

UNIT-II: Metal-ligand complex equilibria in solution:

Stability of complex ions in solution, Basic principles, mathematical function and interrelationship.

Determination of stability constants of binary complex by experimental methods:

Spectrophotometric methods, Potentiometric method (pH-metric titration technique. i.e. Irving-Rossotti methods), Polarographic method. Factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand. Statistical, electronic, chelate effect and its thermodynamics (ΔG, ΔH and ΔS)

UNIT-III: Magnetic properties of Transition metal complexes.

Anomalous magnetic behavior:

Solute-Solvent interaction, Solute-Solute interaction, configurationl equilibrium, Equilibrium between two spin states, magnetically non-equivalent sites in the unit -cell, Quenching of Orbital moments, Spin cross-over, Magnetic exchange coupling, stereochemical applications of magnetic properties.

UNIT-IV: Selected topic in Inorganic chemistry

1. Stereochemistry of unusual co-ordination number 2 to 9.
2. Metal sequestration and its industrial applications.
3. Catalysis and Green Chemistry:

Biocatalysts- Enzyme, Synthesis, Advantages and Disadvantages, Uses.

Photocatalysts: Synthesis, Photochemical Reactions, Advantages and Challenges.

REFERENCE BOOKS

1. Inorganic reaction mechanism, Basello and Pearson, Wiley Eastern Ltd. New Delhi-1977.
2. Kinetic and Mechanism of Inorganic reactions: A study of metal complexes in solution, A. A. Frost and R. G. Pearson, Wiley, New York-(1953, 1961).
3. Inorganic reaction mechanism, S. k. Skyes.
4. Electron Transfer reaction of metal complex ions in solution, H. Taube, Academic press, London-1970.
5. Modern Inorganic Chemistry, J. Lewis and R. G. Wilkinson, Interscience, New York.
6. Inorganic Reaction Mechanism, M. L. Obe, Nelson, London-1972.
7. Mechanism of Inorganic Reactions in solutions: An Introduction, D. Benson, Mc GrowHill, Chapter-15, P-455, 1968.
8. "Comprehensive coordination Chemistry" G. Wilkinson, R. D. Gillard and J. A. Mcclevertypergamon, London, Vol-1. P-281-322, 331-374,385-411, 415-458 (Chapter-7-4) and P-463-471-1987.
9. Coordination Chemistry, Rajbir Singh, Mittal Publication, New Delhi.
10. Coordination Chemistry, G with more
11. Instability constants of complex compounds, K.B. Yatsimirskil and V.P.A. Vasilis (Translated from Russian), D. Van Mostrand Co. Inc. Princeton, New Jersey.
12. Chemistry of complex Equilibria, M.T. Beck (Hungary), translated by R.A., van Nostrand Co., London, 1970.
13. Rossotti F.J.C. and Rossotti H.S., The determination of stability constants, McGrow Hill, New York, P-108, 1961.
14. Irving H. and Rossotti H. S. J. Chem. Soc, 3397, 1953.
15. Elements of Magnetochemistry, R.L. Datta & A. Syamal, Affiliated East-West press Ltd., New Delhi (1993).
16. Magnetochemistry, R. L. Karlin, Springer-Verlag, New York (1993).
17. Introduction to Magnetochemistry, A. Earnashaw, Academic Press, New York (1968).
18. Magnetism and Transition metal Complexes, F. E. Mabbs & D. J. Machin, Chapman and Hall, London (1973).
19. Stereo chemistry and bonding in Inorganic chemistry, J. E. Fergusion. Prentice Hall, Inc. Eryleword Cliffs, N. J. 1974.
20. Inorganic chemistry (Principles of structure and coordination compounds), J. E. HuheeHarper and Row Intermediated series, N.Y. 1963.
21. Organic sequestering agents, Chaberck S. and Martell, John Wiley and Sons, Inc, New York (1959).
22. Green Chemistry, K. R. Desai, Tarulata Chhowala, Bhavanaben Mistry, Himalaya Publication, Mumbai.

VEER NARMAD S0UTH GUJARAT UNIVERSITY
M.Sc. SEM- IV (INORGANIC CHEMISTRY)
PROPOSED SYLLABUSTO BE EFFECTIVE FROM JUNE-2019

INORGANIC PRACTICALS

1. Preparation and Estimation of chloro-penta ammine Cobalt-II chloride $[CoCl(NH_3)_5]Cl_2$
2. Preparation and Estimation of Reineck's salt [Ammonium tetrathiocyanato diammne chromate] $[NH_4(NH_3)_2Cr(CNS)_4]$
3. Preparation and Estimation of Bis[Ethylene diammine]copper sulphate.
4. Preparation and Estimation of potassium trioxalato ferrate $[K_3(Fe(C_2O_4)_3.3H_2O]$
5. Preparation and Estimation of Potassium trioxalato aluminate $K_3[Al(C_2O_4).3H_20$
6. Preparation and Estimation of Cu[Resacetophenone]$_2$ $[Cu(C_8H_7O_3)_2$
7. Preparation and Estimation of Cu[Salicylaldehyde]$_2$ $[Cu(C_7H_5O_2)_2]$
8. Preparation and Estimation of Cu[Salicylaldehyde]$_2$Schiff base $[Cu(C_7H_6ON)_2]$
9. Preparation and Estimation of Ni[Salicylaldehyde]$_2$ $[Ni(C_7H_5O_2)_2]$
10. Preparation and Estimation of Ni[Salicylaldehyde]$_2$Schiff base $[Ni(C_7H_6ON)_2]$
11. Preparation and Estimation of Potash alum $[K_2SO_4.Al_2(SO4)_3.24H_2O]$
12. Preparation and Estimation of Co[Salicylaldehyde]$_2$ $[Co(C_7H_5O_2)_2]$
13. Preparation and Estimation of Co[Salicylaldehyde]$_2$Schiff base $[Co(C_7H_6ON)_2]$
14. Analysis of water sample
15. Determine the stability constant of Ni-glycine complex by using Irving-Rossoti method
16. Determine the stability constant of Co-glycine complex by using Irving-Rossoti method
17. Determine the stability constant of Cu-glycine complex by using Irving-Rossoti method