



UNIVERSITY OF JAMMU

NOTIFICATION
(10/July/ ADP/35)

It is hereby notified for the information of all concerned that the Vice-Chancellor, in anticipation to the approval of the Academic Council, has been pleased to authorize adoption of the revised Syllabi and Courses of Study in the subject of Chemistry for B.Sc. I of Three Year (General) Degree Course and M.Sc. III semester of Master's Degree Programme for the examination to be held in the years as under alongwith %age of change:-

Chemistry

Adoption of the revised Syllabi of B.Sc. I & M.Sc. III Semester alongwith %age of Change

<u>Class</u>	<u>Part/Sem</u>	<u>For the Examinations to be held in the year</u>	<u>%age of Change</u>
B.Sc	I	2011, 2012 & 2013	10% change
M.Sc	III Semester	Dec. 2010, 2011, 2012	10% change

The alternative question papers are required to be set as per the University regulation given as under:-

- i). If the change in the Syllabi and Courses of Study is less than 25%, no alternative Question paper will be set.
- ii). if the change is 25% and above but below 50% alternative Question Paper be set for one year.
- iii). If the change is 50% and above on whole scheme is changed, alternative Question Paper are set for two years.

Sd/-
(DR. P.S. PATHANIA)
REGISTRAR

F.Acd./XXVI/10/ 5232-16
Dated: 12-08-10

For information and necessary action to:

PAPER – A (INORGANIC CHEMISTRY)

60 Hrs

Objective:- The objective of the paper is to impart detailed knowledge in atomic structure, periodic profile, chemical bonding, chemistry of s & p block elements and chemistry of noble gas.

Unit-I

(a) Atomic structure

6 Hrs

Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of Ψ and Ψ^2 , quantum numbers, radial and angular wave functions and probability distribution curves. Shapes of s, p, d orbital. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configuration of the elements (s, p d blocks only), effective nuclear charge.

(b) Periodic Properties

5 Hrs.

Atomic and ionic radii, ionization energy, electron affinity and electronegativity – definition, trends in periodic table and its applications in predicting and explaining the chemical behaviour.

Unit-II

13 Hrs

Chemical Bonding–I

Covalent Bond-valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH_3 , H_3O^+ , SF_4 , ClF_3 , ICl_2 and H_2O , MO theory, homonuclear and heteronuclear (CO and NO) diatomic molecules, multicenter bonding in electron deficient molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Unit-III

(a) Chemical Bonding–II

7 Hrs

Ionic Solids-Ionic structures [AB-Type only], radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, Fajan's rule, polarizing power and polarisability of ions.

Metallic bond-free electron, valence bond and band theories.

Weak interactions-Hydrogen bonding, van der Waals forces.

(b) s-Block Elements

6 Hrs

Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems.

Unit-IV

12 Hrs

p-Block Elements–I

Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16, hydrides of boron-diborane and higher boranes, borazine, fullerenes, carbides, fluorocarbons.

Unit-V

(a) p-Block Elements-II

8 Hrs

Silicates (Structural principle), tetrasulphur tetranitride, basic properties of Halogens, Interhalogens and polyhalides.

(b) Chemistry of Noble Gases

3 Hrs

Chemical properties of the noble gases, Chemistry of Xenon, structure and bonding in Xenon compounds.

NOTE FOR PAPER SETTING

The question paper will contain two questions from each unit (total ten questions) and the candidates will be required to answer one question from each unit (total questions to be attempted will be five) i.e. there will be internal choice within each unit. The paper shall be 3 hrs. duration.

BOOKS RECOMMENDED

1. Basic Inorganic Chemistry, F.A. Cotton, G. Wilkinson and P.L. Gaus, Wiley.
2. Concise Inorganic Chemistry, J.D. Lee, ELBS.
3. Concepts of Models of Inorganic Chemistry, B. Douglas, D. McDaniel and J. Alexander, John Wiley.
4. Inorganic Chemistry, D.E. Shriver, P.W. Atkins and C.H. Langford, Oxford.
5. Inorganic Chemistry, W.W. Porterfield, Addison-Wesley.
6. Inorganic Chemistry, A.G. Sharpe, ELBS.
7. Inorganic Chemistry, G.L. Miessler and D.A. Tarr, Prentice Hall.

Handwritten signature

PAPER – B (ORGANIC CHEMISTRY)

60 Hrs

Objective:- To impart teaching in structure and bonding; organic reaction mechanism; stereochemistry of organic compounds; chemistry of saturated and unsaturated hydrocarbons including cyclic compounds and arenes; alkyl and aryl halides.

Unit-I

(a) Structure and Bonding

5 Hrs.

sp^3 , sp^2 and sp hybridization of carbon compounds; bond lengths, bond angles and bond energy; localized and delocalized chemical bond; inductive and field effects, resonance and hyperconjugation.

(b) Organic Reaction Mechanism

6 Hrs.

Homolytic and heterolytic bond breaking; formation of covalent bond; electrophilic and nucleophilic reagents; reaction intermediates-carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples); methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

Unit-II

13 Hrs

Stereochemistry of Organic Compounds

Newman projection, Sawhorse, Fischer projection and Flying-Wedge formulae, Optical isomerism – elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, meso compounds, resolution of racemic mixtures; relative and absolute configurations – D&L and R&S systems of nomenclature, sequence rules; geometrical isomerism – cis-trans isomerism, E&Z system of nomenclature, geometrical isomerism in oximes and alicyclic compounds; conformational isomerism – conformational analysis of ethane, n-butane, cyclohexane (chair and boat form), axial and equatorial bonds.

Unit-III

12 Hrs

Alkanes, Cycloalkanes and Haloalkanes

IUPAC nomenclature of alkanes; classification of carbon atoms in alkanes, methods of formation of alkanes with special reference to Wurtz reaction, Kolbe's reaction, Corey-House reaction and decarboxylation of carboxylic acids; physical properties and chemical reactions of alkanes; mechanism of free radical halogenation of alkanes.

Cycloalkanes – nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations; ring strain in small rings (cyclopropane and cyclobutane); theory of strainless rings; banana bonds.

Nomenclature and classification of Haloalkanes; methods of formation and chemical reactions of haloalkanes; mechanism of nucleophilic substitution reactions of alkyl halides – S_N^2 and S_N^1 reactions with energy profile diagrams.



Unit-IV

13 Hrs

Alkenes, Cycloalkenes, Dienes and Alkynes

Nomenclature of alkenes; methods of formation of alkenes – mechanism of dehydration of alcohols and dehydrohalogenation of alkyl halides; regioselectivity in alcohol dehydration, the Saytzeff rule, Hofmann elimination; physical properties and chemical reactions – mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation, oxymercuration-reduction, epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO_4 ; polymerization and industrial applications of alkenes.

Methods of formation, chemical reactions and conformations of cycloalkenes.

Nomenclature and classification of dienes (isolated, conjugated and cumulative dienes); methods of formation and chemical reactions of butadiene including Diels-Alder reaction.

Nomenclature, methods of formation and chemical reactions of alkynes (acidic nature of terminal alkynes, electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal-ammonia reduction, oxidation and polymerization).

Unit-V

11 Hrs

Arenes, Aromaticity and Aryl halides

Nomenclature of substituted mononuclear aromatic hydrocarbons; structure of benzene – Kekule structure, stability and carbon-carbon bond lengths of benzene, resonance structure and molecular orbital structure; aromaticity – Huckel's rule and its applications to polycyclic aromatics.

Mechanism of aromatic electrophilic substitution reactions – nitration halogenations, sulphonation and Friedel-Crafts reaction; role of σ - and π - complexes and energy profile diagrams; orientation in the aromatic electrophilic substitution reaction – effects of substituents on orientation and reactivity, ortho/para ratio.

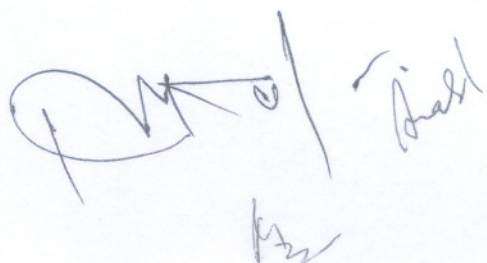
Formation and reactions of aryl halides, nuclear and side chain reactions, the additional-elimination and the elimination-addition mechanisms of aromatic nucleophilic substitution reactions; relative reactivities of alkyl halides v/s aryl halides.

NOTE FOR PAPER SETTING

The question paper will contain two questions from each unit (total ten questions) and the candidates will be required to answer one question from each unit (total questions to be attempted will be five) i.e. there will be internal choice within each unit. The paper shall be 3 hrs. duration.

BOOKS RECOMMENDED

1. Organic Chemistry, Morrison and Boyd, Prentice-Hall.
2. Organic Chemistry, O.G. Wade Jr., Prentice Hall.
3. Fundamentals of Organic Chemistry, Solomons, John Wiley.
4. Organic Chemistry, Vol. I, II & III, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd. (New Age International).
5. Organic Chemistry, F.A. Carey, McGraw Hill, Inc.
6. Introduction to Organic Chemistry, Streitwieser, Heathcock and Kosover, Macmillan.



Handwritten signature and initials, possibly 'Raj' and 'Bash', with a large circular mark.

PAPER – C (PHYSICAL CHEMISTRY)

60 Hrs

Objective:- The objective of the paper is to impart knowledge in Mathematical concepts & basic knowledge of Computers, States of matter, Chemical kinetics and Thermodynamics.

Unit-I

12 Hrs

(a) Mathematical Concepts

Differentiation of functions like e^x , x^n , $\sin x$, $\cos x$, $\log x$; maxima and minima, partial differentiation and Euler's reciprocity relations, Integration of some useful/relevant functions; Factorials, Theorems of Probability.

(b) Computers

General introduction of Computers, different components of computers, hardware and software, input-output devices; binary numbers and arithmetic; introduction to computer languages, Programming, Operating systems.

Unit-II

12 Hrs

Gaseous State

Postulates of kinetic theory of gases, deviation from ideal behavior, van der waals equation of state.

Molecular Velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter, Liquification of gases, Linde's method & Claude's method.

Critical Phenomena: PV isotherms of real gases, Continuity of states, the isotherms of van der waals equation, relationship between critical constants and van der waals constants, the law of corresponding states, reduced equation of state, Numericals.

Unit-III

12 Hrs

(a) Solid State

Definition of space lattice, unit cell.

Laws of crystallography- (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements in crystals.

X-rays diffraction by crystals, Derivation of Bragg equation, Determination of crystal structure of NaCl and KCl (Laue's method and powder method).

(b) Liquid State

Intermolecular forces, structure of liquids (a qualitative description).

Structural differences between solids, liquids and gases.

Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholesteric phases. Thermography and seven segment cell.

Unit-IV

12 Hrs

Chemical Kinetics

Chemical kinetics and its scope, rate of reaction, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst and surface area.

Handwritten signatures and initials:
Ruch, f, M, p, m.

LABORATORY COURSE

Inorganic Chemistry

7 marks (60 Hrs)

Preparation of standard solutions. Dilution – 0.1M to 0.001M solutions (NaOH, Oxalic acid, KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$)

Quantitative Analysis

Volumetric Analysis

- Determination of acetic acid in commercial vinegar using NaOH.
- Determination of alkali content-antacid tablet using HCl.
- Estimation of calcium content in Chalk as calcium oxalate by permanganometry.
- Estimation of ferrous and ferric by dichromate method.
- Estimation of hardness of water by EDTA.
- Estimation of copper using thiosulphate.

Organic Chemistry

6 marks (60 Hrs)

- The preliminary examination of physical and chemical characteristics (physical state, colour, odor and ignition tests), elemental analysis (nitrogen, sulphur, chlorine, bromine, iodine), solubility tests including acid-base reactions. Functional group tests of following classes of compounds
 - phenols, carboxylic acids
 - carbonyl compounds – ketones, aldehydes
 - carbohydrates
 - aromatic amines
 - amides, ureas and anilides
 - aromatic hydrocarbons and their halo- derivatives
- Checking purity of organic solids by melting point/mixed melting point.
- Aqueous separation of organic mixture of two compounds.
- Purification of organic solids by
 - Sublimation (Naphthalene, camphor etc.)
 - Hot water (Benzoic acid, acetanilide etc.)

Physical Chemistry

7 marks (60 Hrs)

Chemical Kinetics

- To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
- To study the effect of acid strength on the hydrolysis of an ester.
- To compare the strength of HCl and H_2SO_4 by studying the Kinetics of hydrolysis of ethyl acetate.

Distribution Law

To study the distribution of benzoic acid between benzene and water.

Colloids

To prepare arsenious sulphide sol and compare the precipitating power of mono-, bi- and trivalent anions.

Viscosity, Surface Tension

1. To determine the percentage composition of a given mixture (non interacting systems) by viscosity method.
2. To determine the viscosity of amyl alcohol in water at different concentrations and calculate the excess viscosity of these solutions.
3. To determine the percentage composition of a given binary mixture by surface tension method (acetone & ethyl methyl Ketone).

Viva

5 marks

NOTE FOR PAPER SETTING

There shall be three exercises in the examination, one each from Inorganic, Organic and Physical Chemistry sections, of the marks indicated above against the each section.

BOOKS RECOMMENDED

1. Vogel's Qualitative Inorganic Analysis, revised, Svehla, Orient Longman.
2. Vogel's Textbook of Quantative Inorganic Analysis (revised), J. Bassett, R.C. Denney, G.H. Jeffery and J. Mendham, ELBS.
3. Standard Methods of Chemical Analysis, W.W. Scott, The Technical Press.
4. Experimental Inorganic Chemistry, W.G. Palmer, Cambridge.
5. Handbook of Preparative Inorganic nChemistry, Vol. I & II, Brauer, Academic Press.
6. Inorganic Synthesis, McGraw Hill.
7. Experimental Organic Chemistry, Vol. I & II, P.R. Singh, D.S. Gupta and K.S. Bajpai, Tata McGraw Hill.
8. Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.
9. Vogel's Textbook of Practical Organic Chemistry, B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G. Smith and A.R. Tatchell, ELBS.
10. Experiments in General Chemistry, C.N.R. Rao and U.C. Agarwal, East-West Press.
11. Experiments in Physical Chemistry, R.C. Das and B. Behra, Tata McGraw Hill.
12. Advanced Practical Physical Chemistry, J.B. Yadev, Goel Publishing House.
13. Advanced Experimental Chemistry, Vol. I, Physical J.N. Gurtu and R. Kapoor, S. Chand & Co.
14. Selected Experiments in Physical Chemistry, N.G. Mukherjee, J.N. Ghosh & Sons.
15. Experiments in Physical Chemistry, J.C. Ghosh, Bharati Bhavan.

DETAILED SYLLABUS

Course No.: 500

Title: **Applications of Spectroscopy**

Credits: 04

Maximum Marks: 100

Duration of Examination: 3 hrs

a) Semester Examination: 80

b) Sessional Assessment: 20

Syllabus for the examinations to be held in Dec. 2010, Dec. 2011 and Dec. 2012.

UNIT-I

a) Electron Spin resonance Spectroscopy

8 hrs

Hyperfine coupling, spin polarization for atoms and transition metal ions, spin-orbit coupling and significance of g-tensors, application to transition metal complexes (having one unpaired electron) including biological systems and to inorganic free radicals such as PH_4 , F_2 and BH_3 .

b) Nuclear Magnetic Resonance of Paramagnetic Substances in Solution

7 hrs

The contact and pseudo contact shifts, factors affecting nuclear relaxation, some applications including biochemical system, an overview of NMR of metal nuclides with emphasis on ^{195}Pt and ^{119}Sn NMR.

UNIT-II

a) Vibrational Spectroscopy

5 hrs

Symmetry and shapes of AB_2 , AB_3 , AB_4 , AB_5 and AB_6 , mode of bonding of ambidentate ligands, ethylenediamine and diketonato complexes, application of resonance Raman spectroscopy particularly for the study of active sites of metalloproteins.

b) Mossbauer Spectroscopy

6 hrs

Basic principles, spectral parameters and spectrum display. Applications of the technique to the studies of (1) bonding and structures of Fe^{+2} and Fe^{+3} compounds including those of intermediate spin, (2) Sn^{+2} and Sn^{+4} compounds – nature of M-L bond, coordination number, structure and (3) detection of oxidation state and inequivalent MB atoms.

UNIT-III

a) Ultraviolet and Visible Spectroscopy

3 hrs

Various electronic transitions (185-800 nm), Beer-Lambert law, effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes. Fieser-Woodward rules for conjugated dienes and carbonyl compounds, ultraviolet spectra of aromatic and heterocyclic compounds. Steric effect in biphenyls.

b) Infrared Spectroscopy

5 hrs

Instrumentation and sample handling.

Characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines. Detailed study of vibrational frequencies of carbonyl compounds (ketones, aldehydes, esters, amides, acids, anhydrides, lactones, lactams and conjugated carbonyl compounds). Effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and Fermi resonance FTIR. IR of gaseous, solids and polymeric materials.

c) Optical Rotatory Dispersion (ORD) and Circular Dichorism (CD)

3 hrs

Definition, deduction of absolute configuration, octant rule for ketones.

UNIT-IV

10 hrs

Nuclear Magnetic Resonance Spectroscopy

General introduction and definition, chemical shift, spin-spin interaction, shielding mechanism, mechanism of measurement, chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines, amides and mercapto), chemical exchange, effect of deuteration, complex spin-spin interaction between two, three, four and five nuclei (first order spectra), virtual coupling. Spectrochemistry, hindered rotation Karplus curve-variation of coupling constant with dihedral angle. Simplification of complex spectra nuclear magnetic double resonance, contact shift reagents, solvent effects, Fourier transform techniques, nuclear Overhauser effect (NOE). Resonance of other nuclei –F, P.

Unit-V

a) Carbon-13 NMR Spectroscopy

5 hrs

general considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon), coupling constants.

Two dimension NMR spectroscopy – COSY, NOESY, DEPT, INEPT, APT and INADEQUATE techniques.

b) Mass Spectroscopy

Introduction, ion production – EI, CI, FD and FAB, factors affecting fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, McLafferty rearrangement. Nitrogen rule. High resolution mass spectroscopy. Examples of mass spectral fragmentation of organic compounds with respect to their structure determination.

NOTE FOR PAPER SETTING

The question paper will contain two questions from each unit (total ten questions) and the candidates will be required to answer one question from each unit (total five questions) i.e. there will be internal choice within each unit.

BOOKS RECOMMENDED

1. Physical Methods for Chemistry, R.S. Drago, Saunders Company.
2. Structural Methods in Inorganic Chemistry, E.A.V. Ebsworth, D.W.H. Rankin and S. Cradock, ELBS.
3. Infrared and Raman Spectra: Inorganic and Coordination Compounds, K. Nakamoto, Wiley.
4. Progress in Inorganic Chemistry, Vol. 8 ed., F.A. Cotton, Vol. 15 ed., S.J. Lippard, Wiley.
5. Transition Metal Chemistry, ed. R.L. Carlin, Vol. 3, Dekker.
6. Inorganic electronic Spectroscopy, A.P.B. Lever, Elsevier.
7. NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic Chemistry, R.V. Parish, Ellis Horwood.
8. Practical NMR Spectroscopy, M.L. Martin, J.J. Delpeuch and G.J. Martin, Heyden.
9. Spectrometric Identification of Organic Compounds, R.M. Silverstein, G.C. Bassler and T.C. Morrill, John Wiley.
10. Introduction to NMR Spectroscopy, R.J. Abraham, J. Fisher and P. Loftus, Wiley.
11. Application of Spectroscopy of Organic Compounds, J.R. Dyer, Prentice Hall.
12. Spectroscopic Methods in Organic Chemistry, D.H. Williams, I. Fleming, Tata McGraw Hill.

DETAILED SYLLABUS

Course No.: **501**

Credits: **04**

Duration of Examination: **3 hrs**

Title: **Solid State Chemistry**

Maximum Marks: **100**

a) Semester Examination: **80**

b) Sessional Assessment: **20**

Syllabus for the examinations to be held in May 2010, May 2011 and May 2012.

UNIT-I

a) Solid State Reactions

6 hrs

general principles, Preparation of materials in the solid state: precursor, ceramic, sealed tube, hydrothermal and high pressure methods; kinetics of solid state reactions; tarnishing reactions.

b) Crystal Defects and Non-stoichiometry

8 hrs

Perfect and imperfect crystals, intrinsic and extrinsic defects – point defects, line and plane defects, vacancies- Schottky and Frenkel defects, Thermodynamics of Schottky and Frankel defect formation, colour centres, non-stoichiometry and defects, ionization of defects.

UNIT-II

12 hrs

Structure of Solids

Crystal systems, Bravais lattice, symmetry: point symmetry and point groups. Representation of point groups – space symmetry; space groups for the various systems. Space groups and crystal structures.

UNIT-III

10 hrs

Electronic Properties and Band Theory

Metals, insulators and semiconductors, electronic structure of solids; chemical and physical approaches- band theory, band structure of metals, insulators and semiconductors, intrinsic and extrinsic semiconductors, doping of semiconductors, p-n junctions, superconductors.

UNIT-IV

12 hrs

Optical and Magnetic Properties

Optical properties – Optical reflectance, photoconduction.

Magnetic properties – classifications of materials. Behaviour of substances in a magnetic field, effect of temperature: Curie and Curie-Weiss laws, calculation of magnetic moments.

Theory of Diamagnetism, Langevin's theory of paramagnetism, Quantum mechanical approach for paramagnetism. Theory of ferro, antiferro and ferri magnetism.

Unit-V

10 hrs

Organic Solids

Topochemical control of solid state organic reactions, electrically conducting solids, new superconductors.

Electric Properties

Thermoelectric effects: Thomson effect, Peltier effect, Seebeck effect; Thermocouples; Hall effect; Dielectric materials, Ferroelectricity, Pyroelectricity, Piezoelectricity. Applications of Ferro, Piezo and Pyroelectrics.

NOTE FOR PAPER SETTING

3

The question paper will contain two questions from each unit (total ten questions) and the candidates will be required to answer one question from each unit (total five questions) i.e. there will be internal choice within each unit.

BOOKS RECOMMENDED

1. New Directions in Solid State Chemistry: C.N.R. Rao and J. Gopalakrishnan, Cambridge University Press, Cambridge.
2. Solid State Chemistry, A.R. West, John Wiley, New York.
3. Solid State Physics, N.J. Dekker, Macmillan, London.
4. Solid State reactions, H. Schmalzer, A.P., London.
5. Magnetochemistry, R.L. Catin, Springer-Verlag, Berlin.
6. Solid State Chemistry, N.B. Hannay, Prentice Hall (India) Ltd., New Delhi.
7. Solid State Chemistry, H.V. Keer.

hss

DETAILED SYLLABUS

Course No.: 502

Credits: 04

Duration of Examination: 3 hrs

Title: **Bio-Organic & Medicinal Chemistry**

Maximum Marks: 100

a) Semester Examination: 80

b) Sessional Assessment: 20

Syllabus for the examinations to be held in May 2010, May 2011 and May 2012.

UNIT-I

12 hrs

Enzymes & kinds and mechanism of enzymatic reactions

Introduction and historical perspectives, chemical and biological catalysis, remarkable properties of enzymes like catalytic power, specialization and regulation. Nomenclature and classification. Fischer's lock and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors, affinity labelling and enzyme modification by site-directed mutagenesis.

Orientation and steric effect in enzyme catalysis, acid base catalysis, covalent catalysis, strain or distortion.

Nucleophilic displacement on a phosphorus atom, multiple displacement reactions and coupling of ATP cleavage to endergonic processes. β -cleavage and condensation. Enzyme catalyzed carboxylation and decarboxylation.

UNIT-II

13 hrs

Chemistry of Vitamins B-Complex and Coenzymes

Introduction, classification and nomenclature of vitamins. Occurrence, chemistry, functions and mechanism of action of thiamine, Riboflavin and Pantothenic acid. Cofactors as derived from vitamins, coenzymes, prosthetic groups, apoenzymes. Structure and biological functions of coenzyme A, thiamine pyrophosphate, pyridoxal phosphate. NAD^+ , NADP^+ , FMN, FAD, lipoic acid, vitamin B_{12} . Mechanisms of reactions catalyzed by the above cofactors.

UNIT-III

10 hrs

Drug-design

Introduction, concept of Lead compounds, Factors governing drug design and rational approach. Drug design through method of variations, disjunction and conjunction. Bioisosteric replacement, rigid analogs, homologation of alkyl chains, changes in ring size and ring position isomers, alteration of spectrochemistry, fragments of lead molecules.

UNIT-IV

12 hrs

Synthesis and mode of following classes of drugs:

1. Cardiovascular drugs: Antihypertensive and hypotensive drugs: Hydralazine (Apresoline hydrochloride), Methyldopa (Aldomet), Procainamide (Pronestyl); Antisymphathetic drugs- Propranolol (Inderal), Verapamil (Isoptin) and Prenylaminelactate (Synadrin).
2. Antiparkinsonian Agents: Biperiden hydrochloride (Akineton hydrochloride), Ethopropazine hydrochloride (Profenamine) and Levodopa (Bendopa).
3. Anticancer drugs: Adriamycin, Methotrexate, Tamoxifen.
4. Antihistaminic drugs: Cimetidine, (Promethazine hydrochloride) and Chlorpheniramine maleate (Alermine).
5. Antimalarials: Chloroquine phosphate (Resochin) and Mepacrine hydrochloride (Quinacrine).

hm

Unit-V**13 hrs**

- (a) **Antibiotics:** Introduction, classification, isolation and chemistry of Pencillin, Cephalosporin C, Chloramphenicol and tetracycline (oxy tetracycline).
- (b) **Vitamins:** Occurrence, Chemistry functions and mechanism of action of Ascorbic acid, α -Tocopherol and Vitamin K₁ & K₂.

NOTE FOR PAPER SETTING

The question paper will contain two questions from each unit (total ten questions) and the candidates will be required to answer one question from each unit (total five questions) i.e. there will be internal choice within each unit.

BOOKS RECOMMENDED

1. Bio-organic Chemistry: A Chemical Approach to enzyme Action, Hermann Dugas and C. Penny, Springer-Verlag.
2. Enzyme Chemistry: Impact and Applications, Ed. Collin J. Suckling, Chapman and Hall.
3. Enzymatic Reaction Mechanism, C. Walsh and W.H. Greeman.
4. Immobilised Enzymes: An Introduction and Application in Biotechnology, M.D. Travan, John Wiley.
5. Enzyme Structure and Mechanism, A. Fersht and W.H. Freeman.
6. Textbook of Organic Medicinal and Pharmaceuticals Chemistry, 8th Ed., Edited by R.F. Doerge, J.B. Lippincott Co., Philadelphia 1982.
7. Pharmaceutical Chemistry in Perspective, B.G. Reuben and H.A. Wittcoff, John Wiley and Sons., N.Y.
8. Principles of Medicinal Chemistry, Lea and Febiger, Philadelphia, USA.
9. Strategies of Organic Drug Synthesis and design, D. Lendnicer, John Wiley and Sons, N.Y.

DETAILED SYLLABUS

Course No: 503

Title: Environmental Chemistry

Credits: 4

Maximum Marks: 100

Duration of

a) Semester Examination: 80

Examination: 3 hrs

b) Sessional Assessment: 20

Syllabus for the examinations to be held in Dec. 2010, 2011 & 2012.

Unit - I

a) Environment:

8Hrs

Introduction, Composition of atmosphere, vertical temperature and stability of atmosphere, heat budget of the earth atmospheric system. Biogeochemical cycle of C, N, O and S, Bio-distribution of elements.

b) Soils:

6 Hrs

Composition of soil, micro and macro nutrients, NPK in soil, Acid-base and ion exchange reactions in soils, Soil pollution due to fertilizers, pesticides, plastics and metals.

Unit - II

Hydrosphere

12 Hrs

Chemical composition of water bodies – lakes, streams and rivers; Hydrological cycle; Aquatic pollution due to inorganic, organic, pesticide, industrial sewage, detergent, oil pollutants; Water quality parameter and their analytical methods: Dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demands, contents of chloride and chlorine demand and solids; Purification and treatment of water and criteria of water quality.

Unit - III

Industrial Pollution

12 Hrs

- a) Environmental implications and abatement of Cement industry, sugar mill, distillery industry, paper and pulp mill, thermal power plant and polymer/plastic industry.
- b) Disposal of wastes and their management.

Continued

7

Unit - IV

8 Hrs

Atmosphere

Chemical composition of atmosphere – particles, ions and radicals and their formation. Chemical and photochemical reactions in atmosphere, smog formation, oxides of N, C, S, O and their effects and analytical methods, Chlorofluoro hydrocarbons, Green house effect, acid rains.

Unit - V

10 Hrs

Environmental Toxicology

- a) Hazardous waste: Introduction, origin, transport, effects and fates; Biodegradation and principles of decomposition; Chemical treatment of hazardous wastes.
- b) Bhopal gas tragedy, Chernobyl, Three Mile Island and Minamata disasters.

NOTE FOR PAPER SETTING

The question paper will contain two questions from each unit (total ten questions) and the candidates will be required to answer one questions from each unit (total five questions) i.e., there will be an internal choice with in each unit.

Books Recommended

1. Environmental Chemistry, S. E. Manahan, Lewis Publishers
2. Environmental Chemistry, Sharma & Kaur, Krishna Publishers
3. Environmental Chemistry, A. K. De, Wiley Eastern.
4. Environmental Pollution Analysis, S. M. Khopkar, Wiley Eastern.
5. Standard Method of Chemical Analysis, F. J. Welcher, Vol. III, Van Nostrand Reinhold Co.
6. Environmental Toxicology, Ed. J. Rose, Gordon and Breach Science Publication.
7. Elemental Analysis of Airborne Particles, Ed. S. Landsberger and M. Creatchman, Gordon and Breach Science Publication.
8. Environmental Chemistry, C. Baird and W. H. Freeman.

DETAILED SYLLABUS

Course No.: 504

Credits: 08

Duration of Examination: 14 hrs

Title: **Practical Course**

Maximum Marks: 200

a) Semester Examination: 100
(including 20 in viva-voce)

b) Sessional Assessment: 100

Syllabus for the examinations to be held in May 2010, May 2011 and May 2012.

INORGANIC CHEMISTRY

90 hrs (26 marks)

Preparation

Preparation of selective inorganic compounds and their study by IR, electronic spectra, Mossbauer, ESR and magnetic susceptibility measurement. Handling of air and moisture sensitive compounds involving vacuum lines.

Selection can be made from the following:

1. Sodium amide, Inorganic Synthesis, 1946, 2, 128.
2. Synthesis and thermal analysis of group II metal oxalate hydrate. J. Chem. Ed., 1988, 65, 1024.
3. Atomic absorption analysis of Mg and Ca.
4. Trialkoxyboranes-Preparation, IR and NMR spectra.
5. PhBCl_2 Dichlorophenylborane-synthesis in vacuum line.
6. Preparation of Tin(IV) iodine, Tin(IV) chloride and Tin(II) iodide. Inorg. Synth., 1953, 4, 119.
7. Relative stability of Tin(IV) and Pb(IV). Preparation of ammonium hexachlorostannate $(\text{NH}_4)_2\text{SnCl}_6$, ammonium hexachloroplumbate $(\text{NH}_4)_2\text{PbCl}_6$.
8. Hexa-bis(4-nitrophenoxy) cyclotriphosphazene.
9. Synthesis of trichlorodiphenylatimony (V) hydrate. Inorg. Synth., 1985, 23, 194.
10. Sodium tetrathionate $\text{Na}_2\text{S}_4\text{O}_6$.
11. Metal complexes of dimethyl culfoxide (IR): $\text{CuCl}_2 \cdot 2\text{DMSO}$, $\text{PdCl}_2 \cdot 2\text{DMSO}$, $\text{RuCl}_2 \cdot 4\text{DMSO}$. J. Chem. Educ., 1982, 59, 57.
12. Synthesis of metal acetylacetonate: Magnetic moment, IR, NMR. Inorg. Synth., 1957, 5, 130; 1963, 1, 183.
13. Bromination of $\text{Cr}(\text{acac})_3$. J. Chem. Edu., 1986, 63, 90.

Flame Photometric Determinations

- a) Sodium and potassium when present together.
- b) Lithium/calcium/barium/strontium.
- c) Cadmium and magnesium in tap water.
- d) Zinc and magnesium.
- e) Thin-layer chromatography-separation of nickel.
- f) Separation and identification of the sugars present in the given mixture of glucose, fructose and sucrose by paper chromatography and determination of R_f values.

ORGANIC CHEMISTRY

90 hrs (27 marks)

Qualitative Analysis

Separation, purification and identification of the components of a mixture of three organic compounds (three solids or two liquids and one solid, two solids and one liquid), using TLC for checking the purity of the separated compounds, chemical analysis, IR, PMR and mass spectral data.

Paper Chromatography

2020-2021

Separation and identification of the sugars present in the given mixture of glucose, fructose and sucrose by paper chromatography and determination of R_f values.

Spectroscopy

Identification of organic compounds by the analysis of their spectral data (UV, IR, PMR, CMR and MS).

PHYSICAL CHEMISTRY

90 hrs (27 marks)

Physical Chemistry

Number of hours for each experiment – 3-4 hours.

A list of experiments under different headings are given below. Typical experiments are to be selected from each type.

Thermodynamics

- i) Determination of partial molar volume of solute (e.g. KCl) and solvent in a binary mixture.
- ii) Determination of the temperature dependence of the solubility of a compound in two solvents having similar intermolecular interactions (benzoic acid in water and in DMSO-water mixture) and calculate the partial molar heat of solution.

Spectroscopy

- i) Determination of pK_a of an indicator (e.g. methyl red) in (a) aqueous and (b) micellar media.
- ii) Determination of stoichiometry and stability constant of inorganic (e.g. amine-iodine) complexes.
- iii) Characterization of the complexes by electronic and IR spectral data.

Conductivity

Measurement of the conductivity of crystals as function of temperature, estimation of band gap.