SEMESTER-I 16001
(SESSION : 2016 – 17,2017-2018)

Max.Marks : 60 ; Min.Marks - 21 **Hours - 45 ; Credits -3**

UNIT –I : PHYSICAL CHEMISTRY **09 hrs**

Mathematical concepts for chemist and computer :
A. Logarithmic relations, curve sketching, linear graphs and Properties of straight lines,Slopes and intercept, differentiation of functions, partial differentiation , Integration of some useful and relevant functions; maxima and minima, permutations and combinations, probability
B. General introduction to computers, different components of a computer, hardware and software , input-output devices: binary numbers and arithmetic, introduction to computer languages. Programming, operating systems
C: Molecular Velocities:
A. Root mean square velocity, average and most probable velocities, Maxwell's law of distribution of molecular velocities of gases (graphical interpretation),effect of temperature on distribution of molecular velocities, collision frequency, mean free path, Joule-Thomson effect, Liquifcation of gases.
B.Deviation from ideal behavior, real gasses, vander Waal equation of state, relationship, vander Waal constant ,and critical constants, law of corresponding state.

UNIT-I I: PHYSICAL CHEMISTRY **09 hrs**

Liquid State-
A.Intermolecular forces, magnitude of intermolecular force, structure of liquids ,properties of liquids, viscosity ,determination of viscosity by Ostwald viscometer method, surface tension – determination ,determination of surface tention by drop weight method.
B.Ideal and non ideal solutions,Mode of representing concentration of solution , activity and activity coefficient. Dilute solution: colligative properties, Relative lowering of vapour pressure , Roult law, osmosis ,Vant Hoff Theory of dilute solution, measurements of osmotic pressure, relationship between lowering of vapour pressure and osmotic pressure, elevation of boiling point, depression in freezing point, abnormal molar masses, dissociation and association of solutes ,Vant Hoff factor.

C: Liquid Crystal-
Difference between liquid crystal, solid and liquids. Classification, structure of nematic and cholesteric phases Thermography and seven segment cell, application of liquid crystal.

UNIT –III : INORGANIC CHEMISTRY **09 hrs**

A. Atomic Structure -
Idea of de Broglie matter waves, Heisenberg's uncertainty principle, Schrodinger's wave equation, significance of ψ and ψ^2, radial and angular wave functions and probability distribution curves, atomic orbitals, shapes of *s, p d* orbitals. Aufbau and Pauli's exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements, effective nuclear charges
. **B. Periodic Properties of elements with special reference to** Atomic radii, Ionic radii, Ionization Potential, Electron Affinity, Electronegativity - trends in periodic table and application in predicting and explaining the chemical behavior

(Dr. P.K.Har)

Dr. P.C. Ghritlahre
22/3/17

UNIT –IV: INORGANIC CHEMISTRY 09 hrs

A: Chemical Bonding-

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 and its application to $BeCl_2$, BF_3 , CH_4 , NH_3, H_3O^+, SF_4, ClF_3, ICl_2^- and H_2O. **Molecular orbital Theory**, homonuclear (H_2,N_2,O_2,F_2, O_2^+ , O_2^- , N_2^+ , N_2^-) and heteronuclear (CO and NO), bond strength and bond energy, bond order , percentage ionic character from dipole moment and electro negativity difference.

B: Chemical Bonding-

Ionic Solids – Ionic structures, radius ratio and co-ordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born- Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions. Fajan's rule. Metallic bond-free electron, valence bond and band theories.

UNIT -V :ORGANIC CHEMISTRY 09 hrs

A. Bonding in Organic compounds-covalent bond, orbital theory, sigma and pi bond ,hybridization in alkanes , alkenes , alkynes and benzene. Resonance , hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.

B. Types of organic reaction Homolytic and heterolytic bond breaking. Types of reagents-electrophiles and nucleophiles structure and reactivity of reaction intermediates - carbocations , carbanions, free radicals, carbenes, arynes and nitrenes.

C. Alkanes- nomenclature, methods of formation, chemical reactions. Cycloalkanes-nomenclature, methods of formation, chemical reaction, Baeyer's strain theory and its limitations. Ring strain in small rings (cyclo propane and cyclo butane); theory of strainless rings. The case of cyclo propane ring, banana bonds.

D. Alkenes- Nomenclature,Methods of prepration Chemical reactions of alkenes-mechanisms involved in electrophilic and free radical additions, Markownikoff's rule, Peroxide effect, hydroboration- oxidation, ozonolysis , oximercuration-reduction, epoxidation Substitution at the allylic and vinylic position of alkenes,Structure of allenes and butadiene, Chemical reactions-1,2 and 1,4 additions, Diels-Alder reaction. .

E. Alkynes- Nomenclature , Methods of preparation and chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reaction, hydroboration-oxidation with ozone and $KMnO_4$

REFERENCE BOOKS:

1. Basic inorganic chemistry; F.A. Cotton, G. Willkinson and P. I. Gaus, J.wiley.
2. Concise inorganic che mistry; J. D. Lee, ELBS. .
3. Advcence Inorganic Chemistry; Satya Prakash.
4. Advance Inorganic Chemistry ;Puri & Sharma , S. Naginchand.
5. Inorganic Chemistry ; Madan, S.Chand.
6. Selected Topics in Inorganic Chemistry ; Madan Malik &Tuli ,S. Chand
7. Organic Chemistry ; Morrison and Boyd, Prentice Hall.
8. Organic Chemistry ; F.A. Carey McGraw Hill.
9. Organic Chemistry ;P.L.Soni
10. Organic Chemistry; Bahal& Bahal.
11. Organic Chemistry: I.L.Finar Vol.I&II

NEW CURRICULUM OF B Sc (Pass Course) CHEMISTRY
SEMESTER-II 16002
(SESSION : 2016 – 17, 2017-18)

Max.Marks : 60 ; Min.Marks - 21 **Hours - 45 ; Credits -3**

UNIT- I -PHYSICAL CHEMISTRY **09 hrs**

A.Colloidal State
Classification, kinetic, optical and electrical properties of Colloids, coagulation Hardy Schulze law, floculation value, protection, Gold number, emulsion, micelle,Gel,syneresis and thixotrophy,application of collioids.
B. Solid State space lattices, unit cells, elements of symmetry in crystallized solids, X-ray diffraction ,Bragg's equation,Miller indices, identification of unit cell by Braggs spectrometer, powder method, Neutron and electron diffraction (Elementry idea only)

UNIT- II- PHYSICAL CHEMISTRY **09 hrs**

A. CHEMICAL KINETICS
Rate of a reaction, factors influencing the rate of a reaction,rate costant, Order and molecularity of reaction, zero order, first order, second order reaction, methods of determining the order of reaction,complex reaction: consecutive, opposing and side reaction ,chain reactions Tempreture dependence of reaction rate, Arrhenius theory, physical significance of activation energy, collision theory, demerits of collision theory, non mathematical concept of transition state theory.
B. **CATALYSIS**
Homogeneous and hetrogeneous catalysis,types of catalyst, characteristics of catalyst , enzyme catalysed reactions, micellor catalysed reaction, industrial application of catalysis.

UNIT - III - INORGANIC CHEMISTRY **09 hrs**

A.*s*-Block Elements
Comparative study, salient features of hydrides, solvation and complexation tendencies including their function in bio systems, and introduction to alkyls and aryls, derivatives of alkali and alkaline earth metals.
B. *p*-Block Elements
Halides, hydrides, oxides and oxyacids of Boran , Aluminium, Nitrogen and phosphorus, boranes,borazines, fullerenes and silicates, interhalogens and pseudohalogens.
C. Chemistry of Noble Gases
Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

5/12/16

UNIT- IV- ORGANIC CHEMISTRY **09 hrs**

D.Arenes- Nomenclature, Structure of benzene and naphthalene molecular formula and kekule structure, Resonance structure, MO picture, Huckle rule, Aromatic electrophilic substitution, General pattern of the mechanism, role of σ and π complexes. Electrophilic substitution in naphthalene.

C.Alkyl halides and aryl halides -Nomenclature, Classification, Method of preparation and Chemical reaction,Mechanism of nucleophilic substitution and Elimination reactions in alkyl halides and aryl halides with energy profile diagram SN^1,SN^2 and E_1 & E_2 mechanism. BHC &DDT

UNIT - V- ORGANIC STEREOCHEMISTRY AND CHEMICAL ANALYSIS **09 hrs**

Stereochemistry

A Optical isomerism-Optical activity, elements of symmetry, enantiomers, diastereomers, threo and erythro , meso compounds, resolution of enantiomers, inversion retention and racemization.Relative and absolute configuration, sequence rules, D & L and R & S system of nomenclature

B.Geometrical isomerism-Syn and anti forms ,E & Z system of nomenclature ,properties of cis and trans isomers

C. Conformational isomerism- conformation of ethane, butane and cyclohaxane

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REFERENCE BOOKS:

1. Basic inorganic chemistry; F.A. Cotton, G. Willkinson and P. I. Gaus, J.wiley.
2. Concise inorganic che mistry; J. D. Lee, ELBS. .
3. Advcence Inorganic Chemistry; Satya Prakash.
4. Advance Inorganic Chemistry ;Puri & Sharma , S. Naginchand.
5. Inorganic Chemistry ; Madan, S.Chand.
6. Selected Topics in Inorganic Chemistry ; Madan Malik &Tuli ,S. Chand
7. Organic Chemistry ; Morrison and Boyd, Prentice Hall.
8. Organic Chemistry ; F.A. Carey McGraw Hill.
9. Organic Chemistry ;P.L.Soni
10. Organic Chemistry; Bahal& Bahal.
11. Organic Chemistry : I.L. Finar Vol.I&II
12. The Element of Physical Chemistry; P. W. Atkin, Oxford
13. Physical Chemistry B.D. Khosla.
14. Physical Chemistry ; Puri &Sharma.
15. Bhautik Rasayan ; P. L. Soni.
16. Bhautik Rasayan; Bahal & Tuli.
17. Bautik Rasayan;Puri &Sharma
18. Vogel`s Text Book of Quantitative Inorganic Analysis; revised,ELBS.
19. Vogel`s Qualitative Analysis ,revised; Longman.

NEW CURRICULUM OF B. Sc. (Pass Course) CHEMISTRY

SEMESTER – I & II 16017
(SESSION : 2016 – 17, 2017-18)

LABORATORY COURSE

MM - 50 ; HOURS – 60 ; CREDIT - 4

The following experiments are to be conducted during the curriculum.

INORGANIC CHEMISTRY

(A) Calibration of fractional weight, pipette, burettes, preparation of slandered solutions. Dilution 0.1M to 0.001M solution.

(B) Quntitative Analysis: volumetric analysis-

(a) Determination of acetic acid in commercial vinegar using NaOH.
(b) Determination of alkali content in antacid tablet using HCl.
(c) Estimation of calcium content in chalk as calcium oxalate by permanganometry.
(d) Estimation of hard ness of water by EDTA.
(e) Estimation of ferrous/ ferric by dichromate method.
(f) Estimation of copper using thiosulphate.

Organic Chemistry

(i) Calibration of thermometer: Naphthalene (80-82), Acetanilide (113.5-114), Urea (132.5-133) and Distilled water (100).

(ii) Determination of melting point : Naphthalene(80-82),Benzoic acid (121.5-122),Urea, Succinic (184.5-185),Cinnamic acid (132.5-133), Salicylic acid (157.5-158), Acetanilide(113-114), m-dinitrobenzene 90,p-dichlorobenzene 52, and Aspirin 135.

(iii) Determination of boiling point: Ethanol 78, cyclohaxane 81, toluene 110.6 and benzene 80.

(iv) Mixed melting point determination: urea cinnamic acid mixture of various compositions (1:4, 1:1, 4:1).

(v) Distillation (demonstration): simple distillation of water- ethanol mixture using water condenser.Distillation of nitrobenzene and aniline using air condenser.

(vi) Crystallization: phthalic acid from hot water, acetanilide from boiling water, naphthalene from alcohol and benzoic acid from water.

(vii) Decolorisation and recrystalization using charcoal; Brown sugar with animal charcoal using gravity filtration Crystalisation and decolorization of impure naphthalene (100 gm naphthalene mixed with 0.3gm of congo red using1gm of decolorizing carbon) from ethanol.

(viii) Sublimation: camphor, naphthalene, phthalic acid, succinic acid.

(ix) Qualitative analysis: detection of N, S, and halogens and functional groups (phenolic, carboxylic, carbonyl, esters. Carbohydrates, amines, amides, nitro and anilide) in simple organic compounds.

Physical chemistry

(i) Chemical kinetics;

(a) To determine the specific rate of hydrolysis of methyl/ethyl acetate catalyzed by hydrogen ions at room temperature.

(b) To study the effect of acid strength on the hydrolysis of ester.

(c) To compare the strength of HCl &H_2SO_4 by studying the kinetic of hydrolysis of ethyl acetate.

(d) To study kinetically the reaction rate of decomposition of iodide by H_2O_2.

(ii) Distribution law:

(a) To study distribution of iodine between water and CCl4.

(b) To study distribution of benzoic acid between water and benzene.

(iii) Colloids: To prepare arsenious sulphide sol and compare the precipitating power of mono, bi, and trivalent anions.

(iv) Viscosity and surface tension:

(a) To determine the % composition of a given mixture (non interacting system) by viscosity method.

(b) To determine the viscosity of amyl alcohol in water at different concentration and calculate the excess viscosity of these solution.

(c) To determine the % composition of a given binary mixture of liquid by surface tension methods (acetone & ethyl methyl ketone).

(d) To determine the surface tension of given liquid by stalagmometer.

(e) To determine the coefficient of viscosity given liquid by Ostwalds viscometer.

Practical Examination

MM - 50

Duration – 4 hrs

Three experiments are to be preformed

(1) Inorganic volumetric analysis, [12-marks].

(2) Detection of functional group of given organic compound and determine its MPt / BPt Or: crystallization of any one compound as given in the prospectus along with the determination of mixed M.Pt. or B.Pt. : decolorisation of brown sugar along with sublimation of camphor/naphthalene [6-marks]..

(3)Anyone physical experiment that can be completed in two hours including calculations. [12-marks]

(4)Viva [10- marks]

(5)Sessional [10 – marks]

In case of Ex- students add4,2 &4 marks in the 1,2 &3 experiment respecively.

RFERENCE BOOKS:

1. Vogel`s Text Book of Quantitative Inorganic Analysis; revised,ELBS.
2. Vogel`s Qualitative Analysis ,revised; Longman.
3. Standard Method for Chemical Analysis; W. W. Scott, the technical press.
4. Experimental Organic Chemistry, Vol. I&II; P. R. Singh D. S. Gupta and K.S. Bajpai, Tata McGraw Hill.
5. Laboratory Manual in Organic Chemistry; R.K. Bansal, Wiely Estren.
6. Experimental in General Chemistry; C.N.R. Rao& U. C. Agrawal,. East –West Press.
7. Advanced Practical Physical Chemistry; J.B. Yadav, Goel Pub House.
8. Vogel`s Text Book of Practical Organic Chemistry; ELBS.

5/12/16

NEW CURRICULUM OF B. Sc.(Pass Course) CHEMISTRY

SEMESTER-I ~~CODE-BCH-1~~ 16001

(SESSION : 2018 – 19,2019-2020)

Max.Marks : 60 ; Min.Marks - 21 **Hours - 45 ; Credits -3**

UNIT –I : PHYSICAL CHEMISTRY 09 hrs

Mathematical concepts for chemist and computer :

A. Logarithmic relations, curve sketching, linear graphs and Properties of straight lines,Slopes and intercept, differentiation of functions, partial differentiation , Integration of some useful and relevant functions; maxima and minima, permutations and combinations, probability

B. General introduction to computers, different components of a computer, hardware and software , input-output devices: binary numbers and arithmetic, introduction to computer languages. Programming, operating systems

C: Molecular Velocities:

A. Root mean square velocity, average and most probable velocities, Maxwell's law of distribution of molecular velocities of gases (graphical interpretation),effect of temperature on distribution of molecular velocities, collision frequency, mean free path, Joule-Thomson effect, Liquifcation of gases.

B.Deviation from ideal behavior, real gasses, vander Waal equation of state, relationship, vander Waal constant ,and critical constants, law of corresponding state.

UNIT-I I: PHYSICAL CHEMISTRY 09 hrs

Liquid State-

A.Intermolecular forces, magnitude of intermolecular force, structure of liquids ,properties of liquids, viscosity ,determination of viscosity by Ostwald viscometer method, surface tension – determination ,determination of surface tention by drop weight method.

B.Ideal and non ideal solutions,Mode of representing concentration of solution , activity and activity coefficient. Dilute solution: colligative properties, Relative lowering of vapour pressure , Roult law, osmosis ,Vant Hoff Theory of dilute solution, measurements of osmotic pressure, relationship between lowering of vapour pressure and osmotic pressure, elevation of boiling point, depression in freezing point, abnormal molar masses, dissociation and association of solutes ,Vant Hoff factor.

C: Liquid Crystal-

Difference between liquid crystal, solid and liquids. Classification, structure of nematic and cholesteric phases Thermography and seven segment cell, application of liquid crystal.

UNIT –III : INORGANIC CHEMISTRY 09 hrs

A. Atomic Structure -

Idea of de Broglie matter waves, Heisenberg's uncertainty principle, Schrodinger's wave equation, significance of ψ and ψ^2, radial and angular wave functions and probability distribution curves, atomic orbitals, shapes of *s, p d* orbitals. Aufbau and Pauli's exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements, effective nuclear charges

. **B. Periodic Properties of elements with special reference to** Atomic radii, Ionic radii, Ionization Potential, Electron Affinity, Electronegativity - trends in periodic table and application in predicting and explaining the chemical behavior

Approved 19.9.18

UNIT –IV: INORGANIC CHEMISTRY 09 hrs

A: Chemical Bonding-

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 and its application to $BeCl_2$, BF_3 , CH_4 , NH_3, H_3O^+, SF_4, ClF_3, ICl_2^- and H_2O. **Molecular orbital Theory**, homonuclear (H_2,N_2,O_2,F_2, O_2^+ , O_2^- , N_2^+ , N_2^-) and heteronuclear (CO and NO), bond strength and bond energy, bond order , percentage ionic character from dipole moment and electro negativity difference.

B: Chemical Bonding-

Ionic Solids – Ionic structures, radius ratio and co-ordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born- Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions. Fajan's rule. Metallic bond-free electron, valence bond and band theories.

UNIT -V :ORGANIC CHEMISTRY 09 hrs

A. Bonding in Organic compounds-covalent bond, orbital theory, sigma and pi bond ,hybridization in alkanes , alkenes , alkynes and benzene. Resonance , hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.

B. Types of organic reaction Homolytic and heterolytic bond breaking. Types of reagents-electrophiles and nucleophiles structure and reactivity of reaction intermediates - carbocations , carbanions, free radicals, carbenes, arynes and nitrenes.

C. Alkanes- nomenclature, methods of formation, chemical reactions. Cycloalkanes-nomenclature, methods of formation, chemical reaction, Baeyer's strain theory and its limitations. Ring strain in small rings (cyclo propane and cyclo butane); theory of strainless rings. The case of cyclo propane ring, banana bonds.

D. Alkenes- Nomenclature,Methods of prepration Chemical reactions of alkenes-mechanisms involved in electrophilic and free radical additions, Markownikoff's rule, Peroxide effect, hydroboration- oxidation, ozonolysis , oximercuration-reduction, epoxidation Substitution at the allylic and vinylic position of alkenes,Structure of allenes and butadiene, Chemical reactions-1,2 and 1,4 additions, Diels-Alder reaction. .

E. Alkynes- Nomenclature , Methods of preparation and chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reaction, hydroboration-oxidation with ozone and $KMnO_4$

REFERENCE BOOKS:

1. Basic inorganic chemistry; F.A. Cotton, G. Willkinson and P. I. Gaus, J.wiley.
2. Concise inorganic che mistry; J. D. Lee, ELBS. .
3. Advcence Inorganic Chemistry; Satya Prakash.
4. Advance Inorganic Chemistry ;Puri & Sharma , S. Naginchand.
5. Inorganic Chemistry ; Madan, S.Chand.
6. Selected Topics in Inorganic Chemistry ; Madan Malik &Tuli ,S. Chand
7. Organic Chemistry ; Morrison and Boyd, Prentice Hall.
8. Organic Chemistry ; F.A. Carey McGraw Hill.
9. Organic Chemistry ;P.L.Soni
10. Organic Chemistry; Bahal& Bahal.
11. Organic Chemistry: I.L.Finar Vol.I&II

NEW CURRICULUM OF B Sc (Pass Course) CHEMISTRY
SEMESTER-II CODE-BCH-2 16002
(SESSION : 2018 – 19, 2019-20)

Max.Marks : 60 ; Min.Marks - 21 **Hours - 45 ; Credits -3**

UNIT- I -PHYSICAL CHEMISTRY **09 hrs**

A.Colloidal State

Classification, kinetic, optical and electrical properties of Colloids, coagulation Hardy Schulze law, floculation value, protection, Gold number, emulsion, micelle,Gel,syneresis and thixotrophy,application of collioids.

B. Solid State space lattices, unit cells, elements of symmetry in crystallized solids, X-ray diffraction ,Bragg's equation,Miller indices, identification of unit cell by Braggs spectrometer, powder method, Neutron and electron diffraction (Elementry idea only)

UNIT- II- PHYSICAL CHEMISTRY **09 hrs**

A. CHEMICAL KINETICS

Rate of a reaction, factors influencing the rate of a reaction,rate costant, Order and molecularity of reaction, zero order, first order, second order reaction, methods of determining the order of reaction,complex reaction: consecutive, opposing and side reaction ,chain reactions Tempreture dependence of reaction rate, Arrhenius theory, physical significance of activation energy, collision theory, demerits of collision theory, non mathematical concept of transition state theory.

B. **CATALYSIS**

Homogeneous and hetrogeneous catalysis,types of catalyst, characteristics of catalyst , enzyme catalysed reactions, micellor catalysed reaction, industrial application of catalysis.

UNIT - III - INORGANIC CHEMISTRY **09 hrs**

A.*s*-Block Elements

Comparative study, salient features of hydrides, solvation and complexation tendencies including their function in bio systems, and introduction to alkyls and aryls, derivatives of alkali and alkaline earth metals.

B. *p*-Block Elements

Halides, hydrides, oxides and oxyacids of Boran , Aluminium, Nitrogen and phosphorus, boranes,borazines, fullerenes and silicates, interhalogens and pseudohalogens.

C. Chemistry of Noble Gases

Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

UNIT- IV- ORGANIC CHEMISTRY **09 hrs**

D.Arenes- Nomenclature, Structure of benzene and naphthalene molecular formula and kekule structure, Resonance structure, MO picture, Huckle rule, Aromatic electrophilic substitution, General pattern of the mechanism, role of σ and π complexes. Electrophilic substitution in naphthalene.

C.Alkyl halides and aryl halides -Nomenclature, Classification, Method of preparation and Chemical reaction,Mechanism of nucleophilic substitution and Elimination reactions in alkyl halides and aryl halides with energy profile diagram SN^1,SN^2 and E_1 & E_2 mechanism. BHC &DDT

UNIT - V- ORGANIC STEREOCHEMISTRY AND CHEMICAL ANALYSIS **09 hrs**

Stereochemistry

A Optical isomerism-Optical activity, elements of symmetry, enantiomers, diastereomers, threo and erythro , meso compounds, resolution of enantiomers, inversion retention and racemization.Relative and absolute configuration, sequence rules, D & L and R & S system of nomenclature

B.Geometrical isomerism-Syn and anti forms ,E & Z system of nomenclature ,properties of cis and trans isomers

C. Conformational isomerism- conformation of ethane, butane and cyclohaxane

.

REFERENCE BOOKS:

1. Basic inorganic chemistry; F.A. Cotton, G. Willkinson and P. I. Gaus, J.wiley.
2. Concise inorganic che mistry; J. D. Lee, ELBS. .
3. Advcence Inorganic Chemistry; Satya Prakash.
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5. Inorganic Chemistry ; Madan, S.Chand.
6. Selected Topics in Inorganic Chemistry ; Madan Malik &Tuli ,S. Chand
7. Organic Chemistry ; Morrison and Boyd, Prentice Hall.
8. Organic Chemistry ; F.A. Carey McGraw Hill.
9. Organic Chemistry ;P.L.Soni
10. Organic Chemistry; Bahal& Bahal.
11. Organic Chemistry : I.L. Finar Vol.I&II
12. The Element of Physical Chemistry; P. W. Atkin, Oxford
13. Physical Chemistry B.D. Khosla.
14. Physical Chemistry ; Puri &Sharma.
15. Bhautik Rasayan ; P. L. Soni.
16. Bhautik Rasayan; Bahal & Tuli.
17. Bautik Rasayan;Puri &Sharma
18. Vogel`s Text Book of Quantitative Inorganic Analysis; revised,ELBS.
19. Vogel`s Qualitative Analysis ,revised; Longman.

NEW CURRICULUM OF B. Sc. (Pass Course) CHEMISTRY

SEMESTER – I & II
(SESSION : 2018 – 19, 2019-20)

LABORATORY COURSE 1 CODE-BCH-3 16017

MM - 50 ; HOURS – 60 ; CREDIT - 4

The following experiments are to be conducted during the curriculum.

INORGANIC CHEMISTRY

(A) Calibration of fractional weight, pipette, burettes, preparation of slandered solutions. Dilution 0.1M to 0.001M solution.

(B) Quntitative Analysis: volumetric analysis-
(a) Determination of acetic acid in commercial vinegar using NaOH.
(b) Determination of alkali content in antacid tablet using HCl.
(c) Estimation of calcium content in chalk as calcium oxalate by permanganometry.
(d) Estimation of hardness of water by EDTA.
(e) Estimation of ferrous/ ferric by dichromate method.
(f) Estimation of copper using thiosulphate.

Organic Chemistry

(i) Calibration of thermometer: Naphthalene (80-82), Acetanilide (113.5-114), Urea (132.5-133) and Distilled water (100).
(ii) Determination of melting point : Naphthalene(80-82),Benzoic acid (121.5-122),Urea, Succinic (184.5-185),Cinnamic acid (132.5-133), Salicylic acid (157.5-158), Acetanilide(113-114), m-dinitrobenzene 90,p-dichlorobenzene 52, and Aspirin 135.
(iii) Determination of boiling point: Ethanol 78, cyclohaxane 81, toluene 110.6 and benzene 80.
(iv) Mixed melting point determination: urea cinnamic acid mixture of various compositions (1:4, 1:1, 4:1).
(v) Distillation (demonstration): simple distillation of water- ethanol mixture using water condenser.Distillation of nitrobenzene and aniline using air condenser.
(vi) Crystallization: phthalic acid from hot water, acetanilide from boiling water, naphthalene from alcohol and benzoic acid from water.
(vii) Decolorisation and recrystalization using charcoal; Brown sugar with animal charcoal using gravity filtration Crystalisation and decolorization of impure naphthalene (100 gm naphthalene mixed with 0.3gm of congo red using1gm of decolorizing carbon) from ethanol.
(viii) Sublimation: camphor, naphthalene, phthalic acid, succinic acid.

(ix) Qualitative analysis: detection of N, S, and halogens and functional groups (phenolic, carboxylic, carbonyl, esters. Carbohydrates. amines, amides, nitro and anilide) in simple organic compounds.

Physical chemistry

(i) Chemical kinetics;

(a) To determine the specific rate of hydrolysis of methyl/ethyl acetate catalyzed by hydrogen ions at room temperature.

(b) To study the effect of acid strength on the hydrolysis of ester.

(c) To compare the strength of HCl &H_2SO_4 by studying the kinetic of hydrolysis of ethyl acetate.

(d) To study kinetically the reaction rate of decomposition of iodide by H_2O_2.

(ii) Distribution law:

(a) To study distribution of iodine between water and CCl4.

(b) To study distribution of benzoic acid between water and benzene.

(iii) Colloids: To prepare arsenious sulphide sol and compare the precipitating power of mono, bi, and trivalent anions.

(iv) Viscosity and surface tension:

(a) To determine the % composition of a given mixture (non interacting system) by viscosity method.

(b) To determine the viscosity of amyl alcohol in water at different concentration and calculate the excess viscosity of these solution.

(c) To determine the % composition of a given binary mixture of liquid by surface tension methods (acetone & ethyl methyl ketone).

(d) To determine the surface tension of given liquid by stalagmometer.

(e) To determine the coefficient of viscosity given liquid by Ostwalds viscometer.

Practical Examination

MM - 50 **Duration – 4 hrs**

Three experiments are to be preformed

(1) Inorganic volumetric analysis, [12-marks].

(2) Detection of functional group of given organic compound and determine its MPt / BPt Or: crystallization of any one compound as given in the prospectus along with the determination of mixed M.Pt. or B.Pt. : decolorisation of brown sugar along with sublimation of camphor/naphthalene

[6-marks]..

(3)Anyone physical experiment that can be completed in two hours including calculations.

[12-marks]

(4)Viva [10- marks]

(5)Sessional [10 – marks]

In case of Ex- students add4,2 &4 marks in the 1,2 &3 experiment respecively.

RFERENCE BOOKS:

1. Vogel`s Text Book of Quantitative Inorganic Analysis; revised,ELBS.
2. Vogel`s Qualitative Analysis ,revised; Longman.
3. Standard Method for Chemical Analysis; W. W. Scott, the technical press.
4. Experimental Organic Chemistry, Vol. I&II; P. R. Singh D. S. Gupta and K.S. Bajpai, Tata McGraw Hill.
5. Laboratory Manual in Organic Chemistry; R.K. Bansal, Wiely Estren.
6. Experimental in General Chemistry; C.N.R. Rao& U. C. Agrawal,. East –West Press.
7. Advanced Practical Physical Chemistry; J.B. Yadav, Goel Pub House.
8. Vogel`s Text Book of Practical Organic Chemistry; ELBS.

NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY

SEMESTER - III
(SESSION : 2018 – 19, 2019-20) 16003 'A'

Students will have to choose one discipline elective paper out of the four papers.

Discipline Specific Elective paper - IV : (DSE–IV)

ENVIRONMENTAL CHEMISTRY

Max.Marks 60; Min.Marks 21 **HOURS - 45 ; CREDIT -3**

UNIT-I **09 hrs**

Environment and its segments, Ecosystems. Biogeochemical cycles of carbon, nitrogen and sulphur, Phosphorus, Oxygen.

UNIT-II **09 hrs**

Air Pollution: Major regions of atmosphere. Chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature;Photochemical smog: its constituents and photochemistry. Environmental effects ofozone, Major sources of air pollution.Pollution by SO_2, CO_2, CO, NO_x, H_2S and other foul smelling gases. Methods of estimation of CO, NO_x, SO_x and control procedures.Effects of air pollution on living organisms and vegetation. Greenhouse effect and Globalwarming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and Halogens,removal of sulphur from coal. Control of particulates.

UNIT-III **09 hrs**

Water Pollution: Hydrological cycle, water resources, aquatic ecosystems, Sources andnature of water pollutants, Techniques for measuring water pollution, Impacts of water pollution on hydrological and ecosystems.Water purification methods. Effluent treatment plants (primary, secondary and tertiarytreatment). Industrial effluents from the following industries and their treatment:electroplating, textile, tannery, dairy, petroleum and petrochemicals, agro, fertilizer, etc.Sludge disposal.

UNIT-IV **09 hrs**

Industrial waste management, incineration of waste. Water treatment and purification(reverse osmosis, electro dialysis, ion exchange). Water quality parameters for wastewater, industrial water and domestic water. Nuclear Pollution: Disposal of nuclear waste, nuclear disaster and its management

UNIT-V

(A)Energy & Environment- **09 hrs**

Sources of energy: Coal, petrol and natural gas. Nuclear Fusion / Fission, Solar energy,Hydrogen, geothermal, Tidal and Hydel, etc.

(B)Biocatalysis Introduction to biocatalysis: Importance in "Green Chemistry" and Chemical Industry.

Reference Books:

1. E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK.
2. R.M. Felder, R.W. Rousseau: *Elementary Principles of Chemical Processes*, Wiley Publishers, New Delhi.
3. J. A. Kent: Riegel's *Handbook of Industrial Chemistry*, CBS Publishers, New Delhi.
4. S. S. Dara: *A Textbook of Engineering Chemistry*, S. Chand & Company Ltd. New Delhi.
5. K. De, *Environmental Chemistry*: New Age International Pvt., Ltd, New Delhi.
6. S. M. Khopkar, *Environmental Pollution Analysis*: Wiley Eastern Ltd, New Delhi.
7. S.E. Manahan, Environmental Chemistry, CRC Press (2005).
8. G.T. Miller, Environmental Science 11th edition. Brooks/ Cole (2006).

NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY

SEMESTER - III
(SESSION : 2018 – 19, 2019-20) 16003 'B'

Discipline Specific Elective paper II (DSE –II)

MOLECULES OF LIFE

Max.Marks 60; Min.Marks 21 **HOURS - 45 ; CREDIT -3**

09 hrs

Unit-I

Amino Acids, Peptides and Proteins

Classification *of Amino Acids,* Zwitter ion structure and Isoelectric point.Overview of Primary, Secondary, Tertiary and Quaternary structure of proteins.Determination ofprimarystructure of peptides, determination of N-terminal amino acid(by DNFB and Edman method) and C–terminal amino acid (by thiohydantoin and withcarboxypeptidaseenzyme). Synthesis of simple peptides (upto dipeptides) by Nprotection(t-butyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solid phase synthesis.

09 hrs

Unit -II

Enzymes and correlation with drug action

Mechanism of enzyme action, factors affecting enzyme action, Coenzymes and cofactors and their role in biological reactions, Specificity of enzyme action(Including stereospecifity) , Enzyme inhibitors and their importance, phenomenon of inhibition(Competitive and Non competitive inhibition including allosteric inhibtion).Drug action-receptor theory. Structure – activity relationships of drug molecules, binding role of –OH group,-NH2 group, double bond and aromatic ring,

09 hrs

Unit –III

Nucleic Acids

Components of Nucleic acids: Adenine, guanine, thymine and Cytosine (Structure only),other components of nucleic acids, Nucleosides and nucleotides **(nomenclature)**,Structure of polynucleotides; Structure of DNA (Watson-Crick model) and RNA(**types of RNA**), Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation.

09 hrs

Unit IV

Lipids

Introduction to lipids, classification. Oils and fats: Common fatty acids present in oils and fats, Omega fatty acids, Trans fats, Hydrogenation, Saponification value, Iodine number. Biological importance of triglycerides, phospholipids, glycolipids, and steroids (cholesterol).

09 hrs

Unit V

Concept of Energy in Biosystems

Calorific value of food. Standard caloric content of carbohydrates, proteins and fats. Oxidation of foodstuff (organic molecules) as a source of energy for cells. Introduction toMetabolism (catabolism, anabolism), ATP: the universal currency of cellular energy, ATP hydrolysis and free energy change. Conversion of food into energy. Outline of catabolic pathways of Carbohydrate-Glycolysis, Fermentation, Krebs Cycle. Overview of catabolic pathways of Fats and Proteins. Interrelationships in the metabolic pathways of Proteins, Fats and Carbohydrates.

Recommended Texts:

1. Morrison, R. T. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. *Organic Chemistry* (*Volume 1&2*), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. *Organic Chemistry* (*Volume 2)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Nelson, D. L. & Cox, M. M. *Lehninger's Principles of Biochemistry 7th Ed.*, W. H. Freeman.
5. Berg, J. M., Tymoczko, J. L. & Stryer, L. *Biochemistry 7th Ed.*, W. H. Freeman.

NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY

SEMESTER - III
(SESSION : 2018 – 19, 2019-20)

16003 C1

Discipline Specific Elective paper-III : (DSE – III)

SYNTHETIC ORGANIC CHEMISTRY

Max.Marks 60; Min.Marks 21 **HOURS - 45 ; CREDIT -3**

UNIT –I **09 hrs**

SYNTHETIC POLYMER

(A) Organic Polymers

Addition or chain growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol- formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubbers.

(B) INORGANIC POLYMER

Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in tri-phosphazenes.

UNIT-II **09 hrs**

SYNTHETIC DRUGS:-

Introduction & Classification of drugs, synthesis and uses of following classes of drugs Sulpha drugs (sulphanilamide, sulphathiazole, sulphaguanidine), Antipyretic and Analgesics (Novalgin,paracetamol, phenacetin, Aspirin), Antimalarial(pamaquine, primaquine, chloroquine,camaquine), Antiseptic(Chloramine, iodoform, iodol, thymol), Antihistamine-(mepyramine, phenidamine)

UNIT-III **09 hrs**

SYNTHETIC DETERGENT& PESTICIDE - Introdution , Anionic surface active agents (sulphates & sulphonates), cationic surface active agents ,nonionic surface active agents General introduction to pesticides (natural and synthetic), benefits and adverse effects, synthesis and uses of representative pesticides in the following classes:Organochlorines (DDT, Gammexene,); Organophosphates (Malathion, Parathion);Carbamates (Carbofuran and carbaryl); Quinones (Chloranil), Anilides (Alachlor and Butachlor).

UNIT-IV **09 hrs**

SYNTHETIC DYES –I

Introduction, nomenclature and classification according to chemical constitution and application,Colour and chemical constitution:- relation between colour and constitution- Witt's theory, Armstrong theory, modern theories- V.B.T., M.O.T.

09 hrs

UNIT-V

SYNTHETIC DYES-II-

Synthesis and uses of following class of dyes:- Azo dyes (methyl orange, methyl red, Congo red),triphenyl methane dyes- (malachite green, pararosaniline' Crystal violet), Thalein dyes (phenolphthalein), xanthenes dyes(Fluorescein,rhodamine), Anthraquinone (Alizarine), Indigoids (Indigotin)

Reference Books:

1. T. W. Graham Solomons: *Organic Chemistry, John Wiley and Sons*.
2. Peter Sykes: *A Guide Book to Mechanism in Organic Chemistry,* Orient Longman.
3. I.L. Finar: *Organic Chemistry* (Vol. I & II), E. L. B. S.
4. R. T. Morrison & R. N. Boyd: *Organic Chemistry*, Prentice Hall.
5. Arun Bahl and B. S. Bahl: *Advanced Organic Chemistry,* S. Chand.
6. G. M. Barrow: *Physical Chemistry* Tata McGraw--□Hill (2007).
7. G. W. Castellan: *Physical Chemistry* 4th Edn. Narosa (2004).
8. J. C. Kotz, P. M. Treichel & J. R. Townsend: *General Chemistry* Cengage Lening India Pvt. Ltd., New Delhi (2009).
9. B. H. Mahan: *University Chemistry* 3rd Ed. Narosa (1998).
10. R. H. Petrucci: *General Chemistry* 5th Ed. Macmillan Publishing Co.: New York (1985).

NEW CURRICULUM OF B. Sc.(Pass Course) CHEMISTRY
SEMESTER - III CODE-BCH-4
(SESSION : 2018 – 19, 2019-20)

16003 'D'

Discipline Specific Elective paper - I : (DSE – I)

ENVIRO-ANALYTICAL CHEMISTRY

Max.Marks 60; Min.Marks 21 HOURS - 45 ; CREDIT - 3

UNIT – I : AIR POLLUTION **09 hrs**

Ecosystem, Biogeochemical Cycle of C , N , S , O and P , Major regions of atmosphere, sources and types of air pollutants , Pollution by oxides of S , C & N , effects of air pollutants , detection of air pollutants , Electrostatic precipitation method of purification of polluted air , Green house effect and green house gases , Ozone depletion , Photochemical smog - its constituent and photochemistry , Acid rain.

UNIT – II : WATER POLLUTION **09 hrs**

Hydrological cycle , Sources and nature of water pollutants , water quality parameters for hydrological and ecological system. Hardness of water ,Type of hardness of water, Determination of hardness of water - EDTA method , Softening of water – Lime soda and Zeolite method and related numerical problems , sterlisation and disinfection of water : ozonisation, chlorination, bleaching powder method , irradiation.

UNIT – III : INORGANIC CHEMICAL ANALYSIS **09 hrs**

Chemical principles involved in the detection of acid radicals : Dil. H_2SO_4 group , Conc. H_2SO_4 group and other anions not covered by Dil. & Conc H_2SO_4 group : CO_3^{--} ,HCO_3^-, S^{--}, SO_3^{--} ,NO_2^- ,CH_3COO^- ,F^-, Cl^- Br^-, I^-, NO_3^- ,PO_4^{---} ,SO_4^{--} , $C_2O_4^{--}$, BO_3^{---}, SiO_3^{--}, Sodium Carbonate Extract.

Basic Radical : Dry Tests - Charcoal Cavity Test, Cobalt Nitrate Test, Borax Bead Test and Flame Test

Concept of pH ,Solubility & Solubility Product, Common Ion Effect, Buffer Solution

Wet Test –Separation of Basic Radicals Into Groups, Analysis of Zero Group Cations, Analysis of I Group Cations Analysis of II Group Cations (Cu , Cd only), Analysis of III Group Cations, Analysis of IV Group Cations, Analysis of V Group Cations .

UNIT – IV : PRINCIPLES INVOLVED IN VOLUMETRIC ANALYSIS : 09 hrs

Different ways of representing concentration of solution : gm/l , Normality, Molarity , Mole Fraction, Equivalent weight. Acidimetry - Alkalimetry (HCl-NaOH, HCl-Na_2CO_3), Theory of acid – base indicators (Phenolphthalein, Methyl orange, Methyl Red) , Oxidation –Reduction Titration ($KMnO_4$-$C_2H_2O_4$), Precipitation Titration ($AgNO_3$-NaCl) , Adsorption Indicator –

AgCl precipitated in presence of excess of chloride ions and in excess of silver ions, Complexometry - EDTA Titrations (Zn - EDTA) ,Metal ion indicators –Eriochrome Black –T .

UNIT – V : ORGANIC CHEMICAL ANALYSIS : **09 hrs**

Qualitative and quantitative analysis of N , S & Halogens in organic compounds. Detection of elements C, H, N, S, Br, Cl, I. Preparation of Na-Extract , Estimation of S , N , Halogens , carbonyl group , carboxylic acid group.

References :

1. Advanced organic analysis by Satish Agarawala & R.C. Agrawala , Pragati prakashan , Meerut
2. Quantitative organic analysis by A.I.Vogel , Pearson , New Delhi
3. Vogel`s Text Book of Quantitative Inorganic Analysis; revised,ELBS.
4. Vogel`s Qualitative Analysis ,revised; Longman.
5. Standard Method for Chemical Analysis; W. W. Scott, the technical press.
6. Experimental Organic Chemistry, Vol. I&II; P. R. Singh D. S. Gupta and K.S. Bajpai, Tata McGraw Hill.
7. Laboratory Manual in Organic Chemistry; R.K. Bansal, Wiely Estren.
8. Experimental in General Chemistry; C.N.R. Rao& U. C. Agrawal,. East –West Press.
9. Advanced Practical Physical Chemistry; J.B. Yadav, Goel Pub House.
10. Vogel`s Text Book of Practical Organic Chemistry; ELBS.
11. E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK.
12. R.M. Felder, R.W. Rousseau: *Elementary Principles of Chemical Processes*, Wiley Publishers, New Delhi.
13. J. A. Kent: Riegel's *Handbook of Industrial Chemistry*, CBS Publishers, New Delhi.
14. S. S. Dara: *A Textbook of Engineering Chemistry*, S. Chand & Company Ltd. N. Delhi.
15. K. De, *Environmental Chemistry*: New Age International Pvt., Ltd, New Delhi.
16. S. M. Khopkar, *Environmental Pollution Analysis*: Wiley Eastern Ltd, New Delhi.
17. S.E. Manahan, Environmental Chemistry, CRC Press (2005).
18. G.T. Miller, Environmental Science 11th edition. Brooks/ Cole (2006).

NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY 16004
SEMESTER- IV CODE-~~BCH 5~~
(SESSION : 2018 – 19, 2019-20)

Max.Marks 60; Min.Marks 21 **HOURS - 45 ; CREDIT - 3**

PHYSICAL CHEMISTRY

UNIT- I **09 hrs**

(A)Thermodynamics-I

Definition of thermodynamic terms, system, surroundings etc. Types of systems, intensive and extensive properties, State and path functions Thermodynamic operations internal energy, enthalpy, heat capacity of gases at constant volume and at constant pressure and their relationship .First Law of Thermodynamics: Statement, definition of internal energy and enthalpy, Heat capacity, heat capacities at constant volume and pressure and their relationship Joule's law, Joule-Thomson coefficient and inversion temperature, Calculation ofw, q, dU & dH for the liquification expansion of ideal gases under isothermal and adiabatic conditions.

(B)Thermochemistry:

standard state, Hess's law of heat summation Enthalpy at constant pressure and constant volume. Enthalpy of neutralization, enthalpy of combustion, enthalpy of reaction,enthalpy of formation, calculation of bond enthalpy Kirchhoff's equation.

UNIT-II **09 hrs**

Thermodynamics-II

Second law of Thermodynamics : Spontaneous process need of second law, statements of Carnot cycle , efficiency of heat engine, Carnot theorem, Thermodynamic state of temperature. Concept of entropy: entropy change in a reversible and irreversible process, entropy change in isothermal reversible expansion of an ideal gas,. Entropy change isothermal mixing of ideal gases, physical signification of entropy .Gibb& Helmholtz energy, variation of G & A with pressure, volume and temperature. Gibbs – Helmholtz equation

Claussius- claperon equation and conditions of spontaneity A& G as Criterion for thermodynamic equilibrium.

INORGANIC CHEMISTRY

UNIT- III **09 hrs**

Chemistry of elements of first second & third transition series transition series

General characteristics, comparative treatment with their 3d analogues in respect of electronic configuration , ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry.

09 hrs

Chemistry of Lanthanide & Actinides::

Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds. General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from uranium, similarities between the later actinides and the later lanthanides.

ORGANIC CHEMISTRY

09 hrs

UNIT- IV

(A) Alcohols

(a) Monohydric-nomenclature, methods of formation, Properties & chemical reactions distinction between primary, secondary & tertiary alcohols

(b) Dihydric & Trihydric alcohols- nomenclature and methods of formation and chemical reactions

(B) **Phenols**

nomenclature and methods of formation, physical properties and acidic character. Comparative acidic strength of alcohols and phenols. Mechanism of Fries rearrangement, Kolbe reaction Claisen rearrangement, Gatterman synthesis, Hauben-Hoesch reaction, Lederer Manasse reaction and Reimer-Tiemann reaction.

UNIT V Aldehydes and Ketones

Nomenclature and structure & relative reactivity of the carbonyl group, synthesis of aldehydes and Ketones Mechanism of nucleophilic addition to carbonyl group benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction. Oxidation of aldehydes, Baeyer-Villiger oxi dation of ketones, Cannizzaro reaction, MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions. Halogenation of enolizable ketons.

***REFERENCE BOOKS*:**

12. Basic inorganic chemistry; F.A. Cotton, G. Willkinson and P. I. Gaus, J.wiley.
13. Concise inorganic che mistry; J. D. Lee, ELBS.
14. Concepts of Models of Inorganic Chemistry;B. Douglas, D. Medaniel and J. Alexander. J. Wley.
15. Inorganic Chemistry;D.E. Shriver, P. W. Atkins and C. H. Langford, oxford.
16. Inorganic chemistry ; W.W. Porterfield, Addison-wesley.
17. Inorganic chemistry ; A.G. Sharp, ELBS.
18. Advance inorganic chemistry ;Puri & Sharma , S. Naginchand.
19. Selected topics in inorganic chemistry ; Madan Malik &Tuli ,S. Chand
20. Physical Chemistry; G. M. Barrow, McGraw Hill.
21. University General Chemistry; C. N. Rao. Macmillan.
22. Physical Chemistry; R. A. Alberty, Wiley Estern.
23. The Element of Physical Chemistry; P. W. Atkin, Oxford
24. Physical chemistry through problems;Droga &Droga,Wiley Estern
25. Bhautik Rasayan ; P. L. Soni.
26. Physical Chemistry B.D. Khosla.Physical Chemistry ; Puri &Sharma
27. Organic Chemistry ; Morrison and Boyd, Prentice Hall.
28. Organic Chemistry; L. G.Wade ,Prentice Hall.
29. Fundamental of Organic Chemistry; Solomons ,J. Wiley.
30. Organic Chemistry, Vol. I,II, &III; Mukharjee, Singh & Kapoor, Wiely Eastern.
31. Organic Chemistry ; F.A. Carey, McGraw Hill.
32. Organic Chemistry ;P.L.Soni
33. Organic Chemistry; Bahal& Bahal.
34. Chemistry for Degree Students – Dr. R. L. Madan

NEW CURRICULUM OF B Sc(PassCourse) CHEMISTRY

SEMESTER- III & IV : (SESSION : 2018 – 19, 2019-20)

Laboratory Course 2 CODE-BCH-6 16018

MM – 50 **HOURS – 60 ; CREDIT - 4**

1. Inorganic Chemistry

Semi micro Analysis- cations analysis, separation and identification of ions form Pb, Bi, Cu, Cd, Sb, Sn, As, Fe, Al, Cr, Ni, Co, Zn, Mn, Ba, Sr, Ca, Mg, $NH_4$and anions CO_3, S, SO_3, SO_4, NO_2, NO_3, Cl, Br, I, CH_3COO, C_2O_4, F, BO_3 .

Instrumentation:

Colorometry: (a) job`s method (b) Mole- Ratio method; Adultration – foodstuff, effluent analysis, water analysis.

Solvent extraction: separation and estimation of Mg (II) and Fe (II)

Ion exchange method : Separation and estimation Mg(II)and Zn(II).

SYNTHESIS AND ANALYSIS:

(a) Preparation of sodium tri oxalate ferrate(III) $Na_3[Fe(C_2O_4)_3]$ and determination of its composition by permagnatometry.
(b) Preparation of Ni-DMG complex $[Ni(DMG)_2]$.
(c) Preparation of copper tetramine complex$[Cu(NH_3)_4SO_4]$.
(d) Preparation of cis and trans bi oxalato dis aqua chromat (III) ion.

ORGANIC CHEMISTRY

Qualitative analysis: Identification of organic compounds through the functional group analysis, determination of melting points and preparation of derivatives.

PHYSICAL CHEMISTRY

Transition Temperature: determination of the transition temperature of the given substance by thermometric / dialometric method (e.g. $MnCl_2.4H_2O$, $SrBr_2 2H_2O$)

Phase Equilibrium:

1. To study the effect of solute (e. g. NaCl, succinic acid) on the critical solution temperature of two partially miscible liquid (e.g. phenol – water system)and to determine concentration of that solute in the given water – phenol system.
2. To construct the phase diagram of two component (e. g. diphenylamine- benzophenone system) by cooling curve method.

ThermoChemistry:

1. To determine the solubility of benzoic acid at different temperatures and to determine ΔH of the dissolution process.
2. To determine the enthalpy of neutralization of a weak acid/weak base versus strong base/strong acid and determine the enthalpy of ionization of the weak acid/ weak base.
3. To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber cycle.

LABORATORY COURSE - DSE -I:
(ENVIRO-ANALYTICAL CHEMISTRY)

1. Percentage of available chlorine in bleaching powder.
2. Measurement of chloride, sulphate and salinity of water samples by simple titration method ($AgNO_3$ and potassium chromate).
3. Estimation of total alkalinity of water samples (CO_3^{2-} HCO_3^-) using double titrationmethod.

LABORATORY COURSE FOR DSE-II
(MOLECULES OF LIFE)

1. **(A)Steam distillation**-Naphthalene from its suspension in water, Clove oil from cloves and Separation of o- and p- nitrophenols.
2. ***(B) Thin layer chromatography:*** determination of R_f values and identification of organic compounds; separation of green leaf pigment (spinach leaves may be used), preparation and separation of 2, 4- dinitrophenylhydrazone of acetone, 2-butanone, hexan-2-and 3-one using toluene and light petroleum (40:60), separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5).
3. ***(C)Paper chromatography (ascending and circular);*** separation of a mixture of phenylalnine and glycine, alanine and aspartic acid, leucine and glutamic acid,spray reagent ninhydrin. separation of a mixture of D, L – alanine, glycine and L-leucine using n-butanol+ acetic acid + water (4:1:5) spray reagent ninhydrin. separation of monosccharides a mixture of D-glucose and-fructose using n-butanol+acetone+ water (4:1:5)spray reagent aniline hydrogen phthalate.
4. **(D)Column chromatography:**
5. separation of fluorescein and methylene blue, separation of leaf pigments from spinach
6. leaves and resolution of racemic mixture of (±) mandelic acid.

LABORATORY COURSE - DSE -III:
(SYNTHETIC CHEMISTRY)

Synthesis of organic compounds:

1. Acetylation of salicylic acid, aniline, glucose and hydroquinone. Benzoylation of aniline and phenol.
2. Aliphatic electrophilic substitution, preparation of iodoform from ethanol and acetone.
3. Aromatic electrophilic substitution.Nitration- preparation of m-dinitro benzene and p- nitro acetanilide.Halogenations: preparation of p- bromo acetanilide and2, 4 ,6-tribromophenol.
4. Diazotization/coupling: preparation of methyl orange and methyl red.
5. Oxidation: preparation of benzoic acid from toluene.
6. Reduction: preparation of aniline from nitro benzene and m-nitroaniline from m-dinitrobenzene.
7. Synthesis of Phenolphthalein, fluorescein

LABORATORY COURSE - DSE -IV:

(ENVIRONMENTAL CHEMISTRY)

1. Determination of dissolved oxygen in water.
2. Determination of Chemical Oxygen Demand (COD)
3. Determination of Biological Oxygen Demand (BOD)
4. Measurement of dissolved CO_2.
5. Study of some of the common bio-indicators of pollution.

Recommended Texts:

1. Furniss, B.S.; Hannaford, A.J.; Rogers, V.; Smith, P.W.G.; Tatchell, A.R. *Vogel's Textbook of Practical Organic Chemistry*, ELBS.
2. Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry,* Universities Press
3. R. Cremlyn: *Pesticides*, John Wiley.
4. E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK.42
5. R.M. Felder, R.W. Rousseau: *Elementary Principles of Chemical Processes*, Wiley Publishers, New Delhi.
6. J. A. Kent: Riegel's *Handbook of Industrial Chemistry*, CBS Publishers, New Delhi.
7. S. S. Dara: *A Textbook of Engineering Chemistry*, S. Chand & Company Ltd. New Delhi.
8. K. De, *Environmental Chemistry*: New Age International Pvt., Ltd, New Delhi.
9. S. M. Khopkar, *Environmental Pollution Analysis*: Wiley Eastern Ltd, New Delhi.

NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY
SEMESTER - III & IV : (SESSION : 2018 – 19, 2019-20)

PRACTICAL EXAMINATION

MM - 50 DURATION - 05 Hrs.

Four experiments are to be preformed:

1.Inorganic : Two acid and two basic radicals including one interfering radical [10- marks]

2. Identification of the given organic compound and determine its MPt/BPt [10-marks].
3. Any one physical experiment that can be completed in two hours [10- Marks]
4. Any one practical of 06 marks from DSE [06- Marks]
5.Viva [10Marks]
6. Sessional [04 – marks]

In case of Ex-student one mark will be added to each of the experiments.

RFERENCE BOOKS:

9. Vogel`s Text Book of Quantitative Inorganic Analysis; revised, ELBS.
10. Vogel`s Qualitative Analysis ,revised; Longman.
11. Standard Method for Chemical Analysis; W. W. Scott, the technical press.
12. Experimental Organic Chemistry, Vol. I&II; P. R. Singh D. S. Gupta and K.S. Bajpai, Tata McGraw Hill.
13. Laboratory Manual in Organic Chemistry; R.K. Banasal, Wiley Estren.
14. Experimental in General Chemistry; C.N.R. Rao & U. C. Agrawal,. East –West Press.
15. Advanced Practical Physical Chemistry; J.B. Yadav, Goel Pub Hou.
16. Vogel`s Text Book of Practical Organic; ELBS.

NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY

SEMESTER - III
(SESSION : 2016 – 17 , 2017 – 18)

Students will have to choose one discipline elective paper out of the four papers.

Discipline Specific Elective paper - IV : (DSE–IV) 16003 'A'

ENVIRONMENTAL CHEMISTRY

Max.Marks 60; Min.Marks 21 **HOURS - 45 ; CREDIT -3**

UNIT-I **09 hrs**

Environment and its segments, Ecosystems. Biogeochemical cycles of carbon, nitrogen and sulphur, Phosphorus, Oxygen.

UNIT-II **09 hrs**

Air Pollution: Major regions of atmosphere. Chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature;Photochemical smog: its constituents and photochemistry. Environmental effects ofozone, Major sources of air pollution.Pollution by SO_2, CO_2, CO, NO_x, H_2S and other foul smelling gases. Methods of estimation of CO, NO_x, SO_x and control procedures.Effects of air pollution on living organisms and vegetation. Greenhouse effect and Globalwarming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and Halogens,removal of sulphur from coal. Control of particulates.

UNIT-III **09 hrs**

Water Pollution: Hydrological cycle, water resources, aquatic ecosystems, Sources andnature of water pollutants, Techniques for measuring water pollution, Impacts of water pollution on hydrological and ecosystems.Water purification methods. Effluent treatment plants (primary, secondary and tertiarytreatment). Industrial effluents from the following industries and their treatment:electroplating, textile, tannery, dairy, petroleum and petrochemicals, agro, fertilizer, etc.Sludge disposal.

UNIT-IV **09 hrs**

Industrial waste management, incineration of waste. Water treatment and purification(reverse osmosis, electro dialysis, ion exchange). Water quality parameters for wastewater, industrial water and domestic water. Nuclear Pollution: Disposal of nuclear waste, nuclear disaster and its management

UNIT-V **09 hrs**

(A)Energy & Environment-

Sources of energy: Coal, petrol and natural gas. Nuclear Fusion / Fission, Solar energy,Hydrogen, geothermal, Tidal and Hydel, etc.

(B)Biocatalysis

Introduction to biocatalysis: Importance in "Green Chemistry" and Chemical Industry.

5/12/16

Reference Books:

1. E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK.
2. R.M. Felder, R.W. Rousseau: *Elementary Principles of Chemical Processes*, Wiley Publishers, New Delhi.
3. J. A. Kent: Riegel's *Handbook of Industrial Chemistry*, CBS Publishers, New Delhi.
4. S. S. Dara: *A Textbook of Engineering Chemistry*, S. Chand & Company Ltd. New Delhi.
5. K. De, *Environmental Chemistry*: New Age International Pvt., Ltd, New Delhi.
6. S. M. Khopkar, *Environmental Pollution Analysis*: Wiley Eastern Ltd, New Delhi.
7. S.E. Manahan, Environmental Chemistry, CRC Press (2005).
8. G.T. Miller, Environmental Science 11th edition. Brooks/ Cole (2006).

NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY

SEMESTER - III
(SESSION : 2016 – 17 , 2017 – 18)

16003 B

Discipline Specific Elective paper II (DSE –II)

MOLECULES OF LIFE

Max.Marks 60; Min.Marks 21 **HOURS - 45 ; CREDIT -3**

Unit-I **09 hrs**

Amino Acids, Peptides and Proteins

Classification *of Amino Acids,* Zwitter ion structure and Isoelectric point.Overview of Primary, Secondary, Tertiary and Quaternary structure of proteins.Determination ofprimarystructure of peptides, determination of N-terminal amino acid(by DNFB and Edman method) and C–terminal amino acid (by thiohydantoin and withcarboxypeptidaseenzyme). Synthesis of simple peptides (upto dipeptides) by Nprotection(t-butyloxycarbonyl and phthaloyl) & C-activating groups and Merrifield solid phase synthesis.

Unit -II **09 hrs**

Enzymes and correlation with drug action

Mechanism of enzyme action, factors affecting enzyme action, Coenzymes and cofactors and their role in biological reactions, Specificity of enzyme action(Including stereospecifity) , Enzyme inhibitors and their importance, phenomenon of inhibition(Competitive and Non competitive inhibition including allosteric inhibtion).Drug action-receptor theory. Structure – activity relationships of drug molecules, binding role of –OH group,-NH2 group, double bond and aromatic ring,

Unit –III **09 hrs**

Nucleic Acids

Components of Nucleic acids: Adenine, guanine, thymine and Cytosine (Structure only),other components of nucleic acids, Nucleosides and nucleotides **(nomenclature)**,Structure of polynucleotides; Structure of DNA (Watson-Crick model) and RNA(**types of RNA**), Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation.

Unit IV **09 hrs**

Lipids

Introduction to lipids, classification. Oils and fats: Common fatty acids present in oils and fats, Omega fatty acids, Trans fats, Hydrogenation, Saponification value, Iodine number. Biological importance of triglycerides, phospholipids, glycolipids, and steroids (cholesterol).

Unit V

09 hrs

Concept of Energy in Biosystems

Calorific value of food. Standard caloric content of carbohydrates, proteins and fats. Oxidation of foodstuff (organic molecules) as a source of energy for cells. Introduction toMetabolism (catabolism, anabolism), ATP: the universal currency of cellular energy, ATP hydrolysis and free energy change. Conversion of food into energy. Outline of catabolic pathways of Carbohydrate-Glycolysis, Fermentation, Krebs Cycle. Overview of catabolic pathways of Fats and Proteins. Interrelationships in the metabolic pathways of Proteins, Fats and Carbohydrates.

Recommended Texts:

1. Morrison, R. T. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. *Organic Chemistry* (*Volume 1&2*), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. *Organic Chemistry* (*Volume 2)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Nelson, D. L. & Cox, M. M. *Lehninger's Principles of Biochemistry 7th Ed.,* W. H. Freeman.
5. Berg, J. M., Tymoczko, J. L. & Stryer, L. *Biochemistry 7th Ed.,* W. H. Freeman.

NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY

SEMESTER - III
(SESSION : 2016 – 17 , 2017 – 18)

16003 'C'

Discipline Specific Elective paper-III : (DSE – III)

SYNTHETIC ORGANIC CHEMISTRY

Max.Marks 60; Min.Marks 21 **HOURS - 45 ; CREDIT -3**

UNIT –I **09 hrs**

SYNTHETIC POLYMER

(A) Organic Polymers

Addition or chain growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers. Condensation or step growth polymerization. Polyesters, polyamides, phenol- formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubbers.

(B) INORGANIC POLYMER

Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in tri-phosphazenes.

UNIT-II **09 hrs**

SYNTHETIC DRUGS:-

Introduction & Classification of drugs, synthesis and uses of following classes of drugs Sulpha drugs (sulphanilamide, sulphathiazole, sulphaguanidine), Antipyretic and Analgesics (Novalgin,paracetamol, phenacetin, Aspirin), Antimalarial(pamaquine, primaquine, chloroquine,camaquine), Antiseptic(Chloramine, iodoform, iodol, thymol), Antihistamine-(mepyramine, phenidamine)

UNIT-III **09 hrs**

SYNTHETIC DETERGENT& PESTICIDE - Introdution , Anionic surface active agents (sulphates & sulphonates), cationic surface active agents ,nonionic surface active agents General introduction to pesticides (natural and synthetic), benefits and adverse effects, synthesis and uses of representative pesticides in the following classes:Organochlorines (DDT, Gammexene,); Organophosphates (Malathion, Parathion);Carbamates (Carbofuran and carbaryl); Quinones (Chloranil), Anilides (Alachlor and Butachlor).

UNIT-IV **09 hrs**

SYNTHETIC DYES –I

Introduction, nomenclature and classification according to chemical constitution and application,Colour and chemical constitution:- relation between colour and constitution- Witt's theory, Armstrong theory, modern theories- V.B.T., M.O.T.

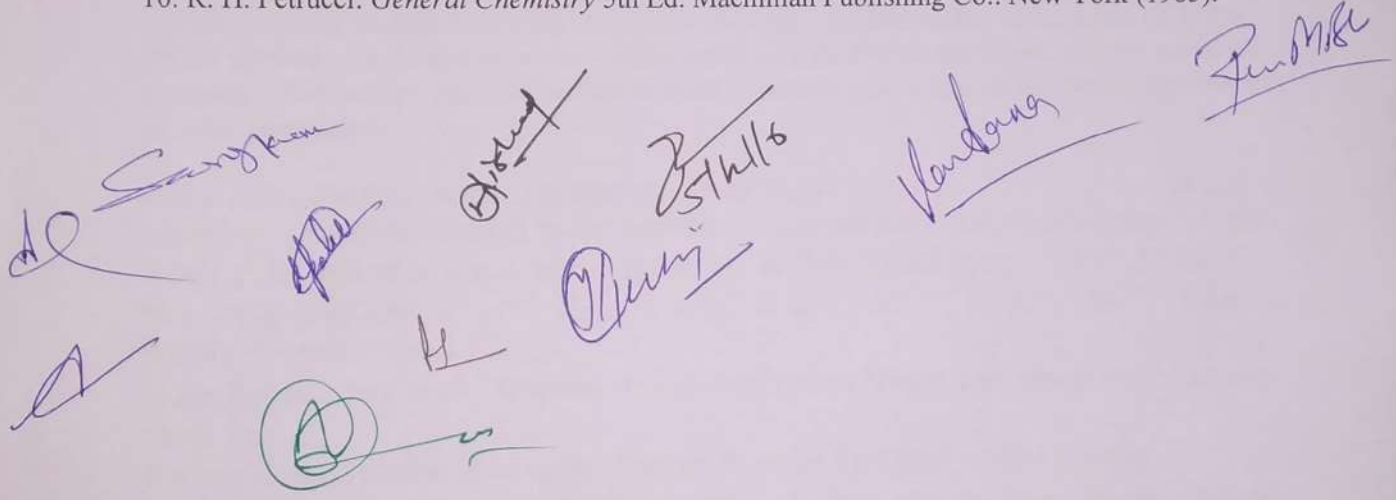
UNIT-V **09 hrs**

SYNTHETIC DYES-II-

Synthesis and uses of following class of dyes:- Azo dyes (methyl orange, methyl red, Congo red),triphenyl methane dyes- (malachite green, pararosaniline' Crystal violet), Thalein dyes (phenolphthalein), xanthenes dyes(Fluorescein,rhodamine), Anthraquinone (Alizarine), Indigoids (Indigotin)

Reference Books:

1. T. W. Graham Solomons: *Organic Chemistry, John Wiley and Sons*.
2. Peter Sykes: *A Guide Book to Mechanism in Organic Chemistry,* Orient Longman.
3. I.L. Finar: *Organic Chemistry* (Vol. I & II), E. L. B. S.
4. R. T. Morrison & R. N. Boyd: *Organic Chemistry*, Prentice Hall.
5. Arun Bahl and B. S. Bahl: *Advanced Organic Chemistry,* S. Chand.
6. G. M. Barrow: *Physical Chemistry* Tata McGraw--□Hill (2007).
7. G. W. Castellan: *Physical Chemistry* 4th Edn. Narosa (2004).
8. J. C. Kotz, P. M. Treichel & J. R. Townsend: *General Chemistry* Cengage Lening India Pvt. Ltd., New Delhi (2009).
9. B. H. Mahan: *University Chemistry* 3rd Ed. Narosa (1998).
10. R. H. Petrucci: *General Chemistry* 5th Ed. Macmillan Publishing Co.: New York (1985).



NEW CURRICULUM OF B. Sc.(Pass Course) CHEMISTRY
SEMESTER - III
(SESSION : 2016 – 17 , 2017 – 18)

16003 'D'

Discipline Specific Elective paper - I : (DSE – I)

ENVIRO-ANALYTICAL CHEMISTRY

Max.Marks 60; Min.Marks 21 **HOURS - 45 ; CREDIT - 3**

UNIT – I : AIR POLLUTION **09 hrs**

Ecosystem, Biogeochemical Cycle of C , N , S , O and P , Major regions of atmosphere, sources and types of air pollutants , Pollution by oxides of S , C & N , effects of air pollutants , detection of air pollutants , Electrostatic precipitation method of purification of polluted air , Green house effect and green house gases , Ozone depletion , Photochemical smog - its constituent and photochemistry , Acid rain.

UNIT – II : WATER POLLUTION **09 hrs**

Hydrological cycle , Sources and nature of water pollutants , water quality parameters for hydrological and ecological system. Hardness of water , Determination of hardness of water - EDTA method , Softening of water – Lime soda and Zeolite method and related numerical problems , sterlisation and disinfection of water : ozonisation, chlorination, bleaching powder method , irradiation.

UNIT – III : INORGANIC CHEMICAL ANALYSIS **09 hrs**

Chemical principles involved in the detection of acid radicals : Dil. H_2SO_4 group , Conc. H_2SO_4 group and other anions not covered by Dil. & Conc H_2SO_4 group : CO_3^{--} ,HCO_3^-, S^{--}, SO_3^{--} ,NO_2^- ,CH_3COO^- ,F^-, Cl^- Br^-, I^-, NO_3^- ,PO_4^{---} ,SO_4^{--}, $C_2O_4^{--}$, BO_3^{---}, SiO_3^{--}, Sodium Carbonate Extract.

Basic Radical : Dry Tests - Charcoal Cavity Test, Cobalt Nitrate Test, Borax Bead Test and Flame Test

Concept of pH ,Solubility & Solubility Product, Common Ion Effect, Buffer Solution

Wet Test –Separation of Basic Radicals Into Groups, Analysis of Zero Group Cations, Analysis of I Group Cations Analysis of II Group Cations (Cu , Cd only), Analysis of III Group Cations, Analysis of IV Group Cations, Analysis of V Group Cations .

UNIT – IV : PRINCIPLES INVOLVED IN VOLUMETRIC ANALYSIS : **09 hrs**

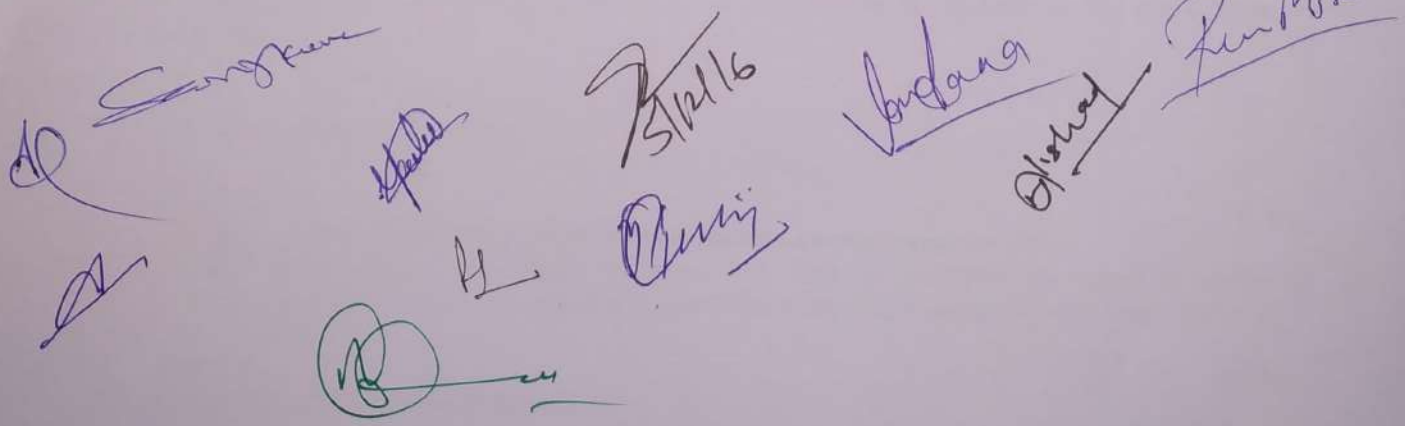
Different ways of representing concentration of solution : gm/l , Normality, Molarity , Mole Fraction, Equivalent weight, Acidimetry - Alkalimetry (HCl-NaOH, HCl-Na_2CO_3), Theory of acid – base indicators (Phenolphthalein, Methyl orange, Methyl Red) , Oxidation –Reduction Titration ($KMnO_4$-$C_2H_2O_4$), Precipitation Titration ($AgNO_3$-NaCl) , Adsorption Indicator – AgCl precipitated in presence of excess of chloride ions and in excess of silver ions, Complexometry - EDTA Titrations (Zn - EDTA) ,Metal ion indicators –Eriochrome Black –T .

UNIT – V : ORGANIC CHEMICAL ANALYSIS : **09 hrs**

Qualitative and quantitative analysis of N , S & Halogens in organic compounds. Detection of elements C, H, N, S, Br, Cl, I. Preparation of Na-Extract , Estimation of S , N , Halogens , -OH (Alcoholic) group , carbonyl group , carboxylic acid group.

References :

1. Advanced organic analysis by Satish Agarawala & R.C. Agrawala , Pragati prakashan , Meerut
2. Quantitative organic analysis by A.I.Vogel , Pearson , New Delhi
3. Vogel`s Text Book of Quantitative Inorganic Analysis; revised,ELBS.
4. Vogel`s Qualitative Analysis ,revised; Longman.
5. Standard Method for Chemical Analysis; W. W. Scott, the technical press.
6. Experimental Organic Chemistry, Vol. I&II; P. R. Singh D. S. Gupta and K.S. Bajpai, Tata McGraw Hill.
7. Laboratory Manual in Organic Chemistry; R.K. Bansal, Wiely Estren.
8. Experimental in General Chemistry; C.N.R. Rao& U. C. Agrawal,. East –West Press.
9. Advanced Practical Physical Chemistry; J.B. Yadav, Goel Pub House.
10. Vogel`s Text Book of Practical Organic Chemistry; ELBS.
11. E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK.
12. R.M. Felder, R.W. Rousseau: *Elementary Principles of Chemical Processes*, Wiley Publishers, New Delhi.
13. J. A. Kent: Riegel's *Handbook of Industrial Chemistry*, CBS Publishers, New Delhi.
14. S. S. Dara: *A Textbook of Engineering Chemistry*, S. Chand & Company Ltd. N. Delhi.
15. K. De, *Environmental Chemistry*: New Age International Pvt., Ltd, New Delhi.
16. S. M. Khopkar, *Environmental Pollution Analysis*: Wiley Eastern Ltd, New Delhi.
17. S.E. Manahan, Environmental Chemistry, CRC Press (2005).
18. G.T. Miller, Environmental Science 11th edition. Brooks/ Cole (2006).



NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY
SEMESTER- IV
(SESSION : 2016 – 17 , 2017 – 18) 16004

Max.Marks 60; Min.Marks 21 **HOURS - 45 ; CREDIT - 3**

PHYSICAL CHEMISTRY

UNIT- I

(A)Thermodynamics-I **09 hrs**

Definition of thermodynamic terms, system, surroundings etc. Types of systems, intensive and extensive properties, State and path functions Thermodynamic operations internal energy, enthalpy, heat capacity of gases at constant volume and at constant pressure and their relationship .First Law of Thermodynamics: Statement, definition of internal energy and enthalpy,
Heat capacity, heat capacities at constant volume and pressure and their relationship Joule's law, Joule-Thomson coefficient and inversion temperature, Calculation ofw, q, dU & dH for the liquification expansion of ideal gases under isothermal and adiabatic conditions.

(B)Thermochemistry:

standard state, Hess's law of heat summation Enthalpy at constant pressure and constant volume. Enthalpy of neutralization, enthalpy of combustion, enthalpy of formation, calculation of bond enthalpy Kirchhoff's equation.

UNIT-II

Thermodynamics-II **09 hrs**

Second law of Thermodynamics : Spontaneous process need of second law, statements of Carnot cycle , efficiency of heat engine, Carnot theorem, Thermodynamic state of temperature. Concept of entropy: entropy change in a reversible and irreversible process, entropy change in isothermal reversible expansion of an ideal gas,. Entropy change isothermal mixing of ideal gases, physical signification of entropy .Gibb& Helmholtz energy, variation of G & A with pressure, volume and temperature. Gibbs – Helmholtz equation
Claussius- claperon equation and conditions of spontaneity A& G as Criterion for thermodynamic equilibrium.

INORGANIC CHEMISTRY

UNIT- III **09 hrs**

Chemistry of elements of first second & third transition series transition series

General characteristics, comparative treatment with their 3d analogues in respect of electronic configuration , ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry.

UNIT- IV **09 hrs**

Chemistry of Lanthanide & Actinides::

Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds. General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from uranium, similarities between the later actinides and the later lanthanides.

ORGANIC CHEMISTRY

UNIT- V

(A) Alcohols **09 hrs**

(a)Monohydric-nomenclature, methods of formation, Properties & chemical reactions distinction between primary, secondary & tertiary alcohols

(b)Dihydric & Trihydric alcohols- nomenclature and methods of formation and chemical reactions

(B) **Phenols**

nomenclature and methods of formation, physical properties and acidic character. Comparative acidic strength of alcohols and phenols. Mechanism of Fries rearrangement, Kolbe reaction Claisen rearrangement, Gatterman synthesis, Hauben-Hoesch reaction, Lederer Manasse reaction and Reimer-Tiemann reaction.

(C) Aldehydes and Ketones

Nomenclature and structure & relative reactivity of the carbonyl group, synthesis of aldehydes and Ketones Mechanism of nucleophilic addition to carbonyl group benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction. Oxidation of aldehydes, Baeyer-Villiger oxi dation of ketones, Cannizzaro reaction, MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions. Halogenation of enolizable ketons.

REFERENCE BOOKS:

12. Basic inorganic chemistry; F.A. Cotton, G. Willkinson and P. I. Gaus, J.wiley.
13. Concise inorganic che mistry; J. D. Lee, ELBS.
14. Concepts of Models of Inorganic Chemistry;B. Douglas, D. Medaniel and J. Alexander. J. Wley.
15. Inorganic Chemistry;D.E. Shriver, P. W. Atkins and C. H. Langford, oxford.
16. Inorganic chemistry ; W.W. Porterfield, Addison-wesley.
17. Inorganic chemistry ; A.G. Sharp, ELBS.
18. Advance inorganic chemistry ;Puri & Sharma , S. Naginchand.
19. Selected topics in inorganic chemistry ; Madan Malik &Tuli ,S. Chand
20. Physical Chemistry; G. M. Barrow, McGraw Hill.
21. University General Chemistry; C. N. Rao. Macmillan.
22. Physical Chemistry; R. A. Alberty, Wiley Estern.
23. The Element of Physical Chemistry; P. W. Atkin, Oxford
24. Physical chemistry through problems;Droga &Droga,Wiley Estern
25. Bhautik Rasayan ; P. L. Soni.
26. Physical Chemistry B.D. Khosla.Physical Chemistry ; Puri &Sharma
27. Organic Chemistry ; Morrison and Boyd, Prentice Hall.
28. Organic Chemistry; L. G.Wade ,Prentice Hall.
29. Fundamental of Organic Chemistry; Solomons ,J. Wiley.
30. Organic Chemistry, Vol. I,II, &III; Mukharjee, Singh & Kapoor, Wiely Eastern.
31. Organic Chemistry ; F.A. Carey, McGraw Hill.
32. Organic Chemistry ;P.L.Soni
33. Organic Chemistry; Bahal& Bahal.
34. Chemistry for Degree Students – Dr. R. L. Madan

NEW CURRICULUM OF B Sc(PassCourse) CHEMISTRY

SEMESTER- III & IV : (SESSION : 2016 – 17 , 2017 – 18)

Laboratory Course 16018

MM – 50

HOURS – 60 ; CREDIT - 4

1. Inorganic Chemistry

Semi micro Analysis- cations analysis, separation and identification of ions form Pb, Bi, Cu, Cd, Sb, Sn, As, Fe, Al, Cr, Ni, Co, Zn, Mn, Ba, Sr, Ca, Mg, $NH_4$and anions CO_3, S, SO_3, SO_4, NO_2, NO_3, Cl, Br, I, CH_3COO, C_2O_4, F, BO_3.

Instrumentation:

Colorometry: (a) job`s method (b) Mole- Ratio method; Adultration – foodstuff, effluent analysis, water analysis.

Solvent extraction: separation and estimation of Mg (II) and Fe (II)

Ion exchange method : Separation and estimation Mg(II)and Zn(II).

SYNTHESIS AND ANALYSIS:

(a) Preparation of sodium tri oxalate ferrate(III) $Na_3[Fe(C_2O_4)_3]$ and determination of its composition by permagnatometry.

(b) Preparation of Ni-DMG complex $[Ni(DMG)_2]$.

(c) Preparation of copper tetramine complex$[Cu(NH_3)_4SO_4]$.

(d) Preparation of cis and trans bi oxalato dis aqua chromat (III) ion.

ORGANIC CHEMISTRY

Qualitative analysis: Identification of organic compounds through the functional group analysis, determination of melting points and preparation of derivatives.

PHYSICAL CHEMISTRY

Transition Temperature: determination of the transition temperature of the given substance by thermometric / dialometric method (e.g. $MnCl_2.4H_2O$, $SrBr_2.2H_2O$)

Phase Equilibrium:

1. To study the effect of solute (e. g. NaCl, succinic acid) on the critical solution temperature of two partially miscible liquid (e.g. phenol – water system)and to determine concentration of that solute in the given water – phenol system.
2. To construct the phase diagram of two component (e. g. diphenylamine- benzophenone system) by cooling curve method.

ThermoChemistry:

1. To determine the solubility of benzoic acid at different temperatures and to determine ΔH of the dissolution process.

2. To determine the enthalpy of neutralization of a weak acid/weak base versus strong base/strong acid and determine the enthalpy of ionization of the weak acid/ weak base.

3. To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber cycle.

LABORATORY COURSE - DSE -I:
(ENVIRO-ANALYTICAL CHEMISTRY)

1. Percentage of available chlorine in bleaching powder.
2. Measurement of chloride, sulphate and salinity of water samples by simple titration method ($AgNO_3$ and potassium chromate).
3. Estimation of total alkalinity of water samples (CO_3^{2-} HCO_3^-) using double titrationmethod.

LABORATORY COURSE FOR DSE-II
(MOLECULES OF LIFE)

1. **(A)Steam distillation-**Naphthalene from its suspension in water, Clove oil from cloves and Separation of o- and p- nitrophenols.
2. ***(B) Thin layer chromatography:*** determination of R_f values and identification of organic compounds; separation of green leaf pigment (spinach leaves may be used), preparation and separation of 2, 4- dinitrophenylhydrazone of acetone, 2-butanone, hexan-2-and 3-one using toluene and light petroleum (40:60), separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5).
3. ***(C)Paper chromatography (ascending and circular);*** separation of a mixture of phenylalnine and glycine, alanine and aspartic acid, leucine and glutamic acid,spray reagent ninhydrin. separation of a mixture of D, L – alanine, glycine and L-leucine using n-butanol+ acetic acid + water (4:1:5) spray reagent ninhydrin. separation of monosccharides a mixture of D-glucose and-fructose using n-butanol+acetone+ water (4:1:5)spray reagent aniline hydrogen phthalate.
4. **(D)Column chromatography:**
5. separation of fluorescein and methylene blue, separation of leaf pigments from spinach
6. leaves and resolution of racemic mixture of (±) mandelic acid.

LABORATORY COURSE - DSE -III:
(SYNTHETIC CHEMISTRY)

Synthesis of organic compounds:

1. Acetylation of salicylic acid, aniline, glucose and hydroquinone. Benzoylation of aniline and phenol.
2. Aliphatic electrophilic substitution, preparation of iodoform from ethanol and acetone.
3. Aromatic electrophilic substitution.Nitration- preparation of m-dinitro benzene and p- nitro acetanilide.Halogenations: preparation of p- bromo acetanilide and2, 4 ,6-tribromophenol.
4. Diazotization/coupling: preparation of methyl orange and methyl red.
5. Oxidation: preparation of benzoic acid from toluene.
6. Reduction: preparation of aniline from nitro benzene and m-nitroaniline from m-dinitrobenzene.

7. Synthesis of Phenolphthalein, fluorescein

LABORATORY COURSE - DSE -IV:
(ENVIRONMENTAL CHEMISTRY)

1. Determination of dissolved oxygen in water.
2. Determination of Chemical Oxygen Demand (COD)
3. Determination of Biological Oxygen Demand (BOD)
4. Measurement of dissolved CO_2.
5. Study of some of the common bio-indicators of pollution.

Recommended Texts:

1. Furniss, B.S.; Hannaford, A.J.; Rogers, V.; Smith, P.W.G.; Tatchell, A.R. *Vogel's Textbook of Practical Organic Chemistry*, ELBS.
2. Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry,* Universities Press
3. R. Cremlyn: *Pesticides*, John Wiley.
4. E. Stocchi: *Industrial Chemistry*, Vol-I, Ellis Horwood Ltd. UK.42
5. R.M. Felder, R.W. Rousseau: *Elementary Principles of Chemical Processes*, Wiley Publishers, New Delhi.
6. J. A. Kent: Riegel's *Handbook of Industrial Chemistry*, CBS Publishers, New Delhi.
7. S. S. Dara: *A Textbook of Engineering Chemistry*, S. Chand & Company Ltd. New Delhi.
8. K. De, *Environmental Chemistry*: New Age International Pvt., Ltd, New Delhi.
9. S. M. Khopkar, *Environmental Pollution Analysis*: Wiley Eastern Ltd, New Delhi.

NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY
SEMESTER - III & IV : (SESSION : 2016 – 17 , 2017 – 18)

PRACTICAL EXAMINATION

MM - 50

DURATION - 05 Hrs.

Four experiments are to be preformed:

1.Inorganic : Two acid and two basic radicals including one interfering radical [10- marks]

2. Identification of the given organic compound and determine its MPt/BPt [10-marks].
3. Any one physical experiment that can be completed in two hours [10- Marks]
4. Any one practical of 06 marks from DSE [06- Marks]
5.Viva [10Marks]
6. Sessional [04 – marks]

In case of Ex-student one mark will be added to each of the experiments.

RFERENCE BOOKS:

9. Vogel`s Text Book of Quantitative Inorganic Analysis; revised, ELBS.
10. Vogel`s Qualitative Analysis ,revised; Longman.
11. Standard Method for Chemical Analysis; W. W. Scott, the technical press.
12. Experimental Organic Chemistry, Vol. I&II; P. R. Singh D. S. Gupta and K.S. Bajpai, Tata McGraw Hill.
13. Laboratory Manual in Organic Chemistry; R.K. Banasal, Wiley Estren.
14. Experimental in General Chemistry; C.N.R. Rao & U. C. Agrawal,. East –West Press.
15. Advanced Practical Physical Chemistry; J.B. Yadav, Goel Pub Hou.
16. Vogel`s Text Book of Practical Organic; ELBS.

NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY

SEMESTER - V

16005

(SESSION : 2016 – 17 , 2017 – 18)

Max.Marks : 60; Min.Marks : 21 **HOURS - 45 ; CREDIT - 3**

PHYSICAL CHEMISTRY

UNIT- I

PhaseEquilibrium **09 hrs**

(A) Gibbs phase rule, phase component and degree of freedom, limitation of phase rule Application of phase rule to one component system-water system and Sulphur systems *Application of phase rule to two component systems*: Pb-Ag systems, Zn-Mg system, water-ferric chloride, desilverisation of congruent and incongruent, melting point, eutectic point,
Three component system- solid solution liquid pairs, Liquid- liquid mixtures: (Partially miscible liquids)- phenol-water, Trimethylamine-water, nicotine system. constant temperature. Azeotrops.
(B) Nernst distribution law-thermodynamic derivation & application, Henry law& its application.

UNIT II

09 hrs

Quantum Mechanics-I Black body radiation, Plank's radiation law, photoelectric effect,Compton effect.Heat capacity of solids,De Broglie`s hypothesis, Heisenberg's uncertainty principle, Sinusoidal wave equation, Operators: Hamiltonian operator, angular momentum operator, laplacian operators , schrodinger wave equation& its application, Basic postulates of quantum mechanics

Quantum Mechanics-II Quantum mechanical approach of molecular orbital theory : basic ideas, criteria for forming M.O and A.O. Construction of M.O'S byLCAO- formation of H^{2+} ion, calculation of energy levels from wave fuctions, Physical picture of bonding and anti bonding wave functions concept of σ, σ*,π and π* orbitals and their characteristics, Hybrid orbitals-*sp*, sp^2, sp^3; Calcultion of coffecients of A.O.'s used in these hybrid orbitals.

Photochemistry Interaction of radiation with matter, difference between thermal and photo- chemical processes, Laws of photochemistry : Grothus- Drapper law. Stark- Einstein law, Jablonski diagram depicting various processes occurring in the exited state, qualitative description of fluorescence, phosphorescence, non- radiative processes (internal conversion, intersystem crossing), quantum yield,photosensitized reactions- energy transfer processes (simple examples).

INORGANIC CHEMISTRY

UNIT- III

(A) Co-ordination Compounds: **09 hrs**

Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerismin coordination compounds, valence bond theory of transition metal complexes. Limitations 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.

(B): Thermodynamic and Kinetic Aspects of Metal Complexes:

A brief outline of thermodynamic stability of metal complexes and factors affectting the stability ,substitution reactions of square planar complexes.

(C) Oxidation and Reduction: Use of redox potential data-analysis of redox cycle, redox stability in water Frost, Latimer & Pourbaix diagrams, principles involved in the extraction of the elements.

ORGANIC CHEMISTRY

UNIT -IV **09 hrs**

(A)Carboxylic Acids

Nomenclature, structure, physical properties, acidity of carboxylic acids, effect of substituents on acid strength, method of preparation and chemical reaction Hell-Volhard Zeilinsky reaction, Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids, Mechanism of decarboxylation.Di carboxylic acids:- Methods of formation and chemical reactions, effect of heat and Dehydrating agents.

(B) Carboxylic acid Derivatives

Structure, method of preparation & physical properties of acid chlorides, esters, amides(Urea) and acid anhydrides. Relative stability of acyl derivatives.,

(C) Active methylene compounds :-Method of preparation and synthetic applications of diethyl malonate and ethyl acetoacetate. Claisen condensation. Keto-enoltautomerism of ethyl acetoacetate.

UNIT V : **09 hrs**

A. Organic Compounds of Nitrogen

(a)Preparation of nitroalkanes and nitroarenes. Chemical reaction of nitroalkanes,Mechanism of nucleophilic substitution in nitroarenes and their reduction inacidic, neutral and alkaline medium.

(b) Structure and nomenclature, Relative basisity of aliphatic and aromatic amines, physical properties.. Separation of mixture of primary, secondary and tertiary amines. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles),Gabriel-pthalimide reaction, Hofmann bromamide reaction. Reaction of amines,electrophilic aromatic substitution in aryl amines, Diazotization reaction , azo coupling.

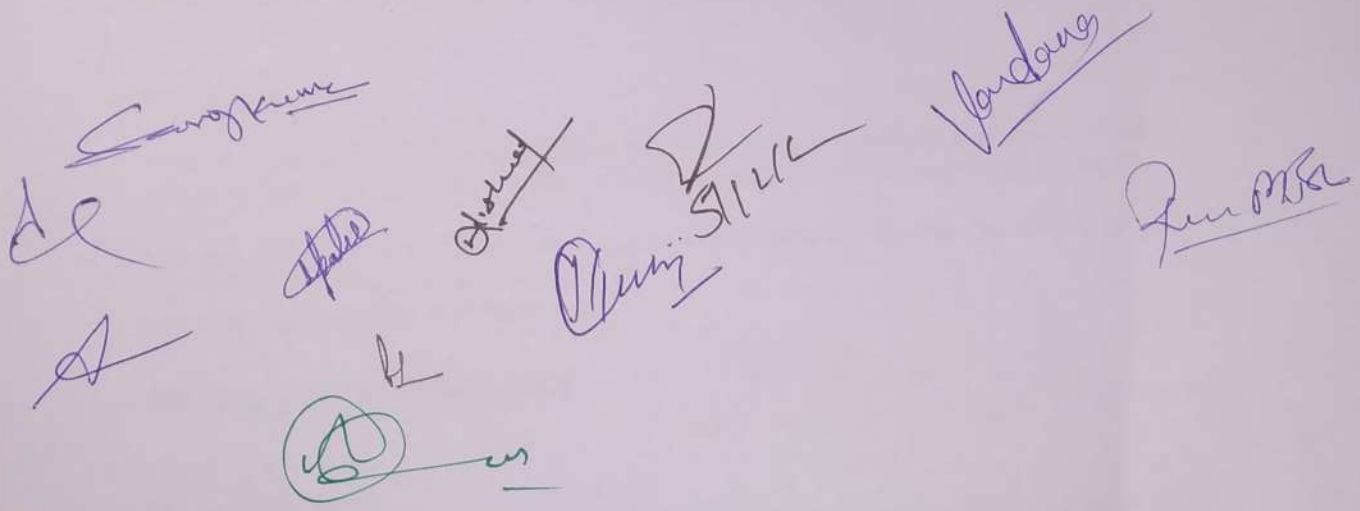
B. Carbohydrates

Classification of carbohydrates, reducing and non reducing sugars, General Properties of Glucose and Fructose, their open chain structure. Epimers, mutarotation and anomers.

Determination of configuration of Glucose (Fischer proof).Cyclic structure of glucose. Haworth projections. Cyclic structure of fructose. Linkage between monosachharides, structure of disacharrides (sucrose, maltose, lactose) and polysacharrides (starch and cellulose) excluding their structure elucidation.

***REFERENCE BOOKS*:**

1. Basic inorganic chemistry; F.A. Cotton, G. Willkinson and P. I. Gaus, J.wiley.
2. Concise inorganic che mistry; J. D. Lee, ELBS.
3. Concepts of Models of Inorganic Chemistry;B. Douglas, D. Medaniel and J. Alexander. J. Wley.
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. Sharp, ELBS.
7. Advance inorganic chemistry ;Puri & Sharma , S. Naginchand.
8. Selected topics in inorganic chemistry ; Madan Malik &Tuli ,S. Chand
9. Physical Chemistry; G. M. Barrow, McGraw Hill.
10. University General Chemistry; C. N. Rao. Macmillan.
11. Physical Chemistry; R. A. Alberty, Wiley Estern.
12. The Element of Physical Chemistry; P. W. Atkin, Oxford
13. Physical chemistry through problems;Droga &Droga,Wiley Estern
14. Bhautik Rasayan ; P. L. Soni.
15. Physical Chemistry B.D. Khosla.Physical Chemistry ; Puri &Sharma



NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY
SEMESTER - VI
(SESSION : 2016 – 17 , 2017 – 18) 16006

Max.Marks : 60; Min.Marks : 21

HOURS - 45 ; CREDIT - 3

PHYSICAL CHEMISTRY

UNIT- I

Electrochemistry-I **09 hrs**

(a)Electrolyte conductance: specific and equivalent conductance, measurement of equivalent conductance, effect of dilution on conductance, Kohlrausch law, application of Kohlraush law in determination of dissociation constant of weak electrolyte, solubility of sparingly soluble electrolyte, absolute velocity of ions, ionic product of water, conductometric titrations.

(b) Theory of strong electrolyte : limitation of Ostwald's dilution law weak and strong elecrolyte, Debye-Huckel-Onsager's(DHO) equation for strong electrolytes, relaxation and electrophoretic effect.

(c) Migration of ions : Transport number-definition and determination by Hittorf method and moving boundary method.

(d) Electrochemical cell or Galvanic cells :reversible and irreversible cells, conventional Representation of electrochemical cells. EMF of a cell, effect of tempreture on EMF of cell, Nernest equation calculation of ΔG, ΔH andΔS for cell reaction, polarization, Over potential and hydrogen overvoltage

Electrochemistry-II

Concentration cell with and without transport, liquid junction potential, application of concentration - cells, valency of ions, solubility product and activity coefficient..Determination of pH and pK_a, using

hydrogen and quinhydrone electrodes, potentiometric titrations Buffers- mechanism of buffer action, Handerson-Hazel equation , Hydrolysis of salts.

Corrosion-types, theories and prevention.

INORGANIC CHEMISTRY

UNIT I I **09 hrs**

(A) Acid and Bases:

Arrhenius, Bronsted-Lowry, the Lux-Flood, solvent system and Lewis concept of acids and bases.

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

(B)Magnetic properties of transition metal complexes :

Types of magnetic behavior ,methods of determining magnetic susceptibility , L-S coupling , magnetic moment , application of magnetic moments data for 3 – d metal complexes.

(C)Electronic spectra of transition metal complexes :

Types of electronic transition , selection rule for d-d transition , Orgel energy diagram for d^1 system - electronic spectrum of $[Ti(H_2O)_6]^{+3}$ complex) , and d^9 system - $[Cu(H_2O)_6]^{+2}$ complex .

UNIT-III

09 hrs

(A)Spectroscopy

Introduction; characterization of electromagnetic radiation, regions of the spectrum, Theory and Principles of **rotational** spectra, Rigid Rotator, Selection rule, Population at different Levels,Intensity of spectral lines,Isotopic effect,Determination of bond length and moment of inertia. **Vibrational Spectra-Harmonic oscillator, Selection rule, Force constant and bond enegy, Qualitative idea about anharmonic oscillator,** selection rules, Fundamental band, Overtones.

ORGANIC CHEMISTRY

UNIT IV **09 hrs**

(A) Organometallic Compounds:

Formation, Structure , Properties& Synthetic applications of Grignard reagents Organolithium compounds

(B) **Heterocyclic Compounds**

(A)Introduction: Molecular orbital picture and aromatic characteristics of pyrrole,furan, thiophene and pyridine.Methods of synthesis and chemical reactions withparticular emphasis on the mechanism of electrophilic substitution. Mechanismof nucleophilic substitution reaction in pyridine .Comparision of basicity of pyridine, piperidine and pyrrole. Preparation and reactions of quinoline and isoquinoline

UNIT-V **09 hrs**

Application of IR, UV&NMR spectroscopy for identification of simple organic molecules

(A) UV- Visible spectroscopy :Beers-Lamberts law, Effect of conjugation on λ_{max}, .Woodward-fieser rule for calculating λ_{max} of conjugated polyenes and carbonyl Compounds

(B) Infrared spectroscopy: IR absorption band & their position and intensity, types of bending and stretching of bonds

(C) NMR Spectroscopy: Introduction to NMR, Radiowave active nucleous, number of signal PMR, shielding , deshielding effect , chemical shift and characteristic values, splitting of signals and coupling constants, tau & delta scale, NMR spectrum of CH_3CH_2OH , CH_3CH_2Br , CH_3CHO , $CH_2BrCHBr_2$, $CH_3COOC_2H_5$, $C_6H_5CH_3$ and $C_6H_5COCH_3$.

RFERENCE BOOKS:

1. Basic inorganic chemistry; F.A. Cotton, G. Willkinson and P. I. Gaus, J.wiley.
2. Concise inorganic che mistry; J. D. Lee, ELBS.
3. Concepts of Models of Inorganic Chemistry;B. Douglas, D. Medaniel and J. Alexander. J. Wley.
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. Sharp, ELBS.
7. Advance inorganic chemistry ;Puri & Sharma , S. Naginchand.
8. Selected topics in inorganic chemistry ; Madan Malik &Tuli ,S. Chand
9. Physical Chemistry; G. M. Barrow, McGraw Hill.
10. University General Chemistry; C. N. Rao. Macmillan.
11. Physical Chemistry; R. A. Alberty, Wiley Estern.
12. The Element of Physical Chemistry; P. W. Atkin, Oxford
13. Physical chemistry through problems;Droga &Droga,Wiley Estern
14. Bhautik Rasayan ; P. L. Soni.
15. Physical Chemistry B.D. Khosla.Physical Chemistry ; Puri &Sharma
16. Organic Chemistry ; Morrison and Boyd, Prentice Hall.
17. Organic Chemistry; L. G.Wade ,Prentice Hall.
18. Fundamental of Organic Chemistry; Solomons ,J. Wiley.
19. Organic Chemistry, Vol. I,II, &III; Mukharjee, Singh & Kapoor, Wiely Estern .
20. Organic Chemistry ; F.A. Carey, McGraw Hill.

NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY 16019
SEMESTER V&VI : (SESSION : 2016 – 17 , 2017 – 18)

MM – 50

HOURS - 60 ; CREDIT- 4

Laboratory Course

GRAVIMETRIC ANALYSIS:

Analysis of Cu as CuSCN or CuO, Ni as Ni $(DMG)_2$, Ba as $BaSO_4$ and Fe as Fe_2O_3.

ORGANIC CHEMISTRY

(A)Qualitative analysis:

Analysis of an organic mixture containing two solid components using water, $NaHCO_3$, NaOH for separation and preparation of suitable derivatives.

PHYSICAL CHEMISTRY

Electrochemistry:

(i) To determine the strength of the given acid conductometrically using standard alkali solution.

(ii) To determined the solubility and solubility product of sparingly soluble electrolyte by conductometrically.

(iii) To study the saponification of ethyl acetate conductometrically.

(iv) To determine the ionization costant of weak acid conductometrically.

(v) To titrate potentiometrically the given solution of ferrous ammonium sulphate with $KMnO_4$/$K_2Cr_2O_7$as titrant and calculate the redox potential of Fe^{++} / Fe^{+++} system on hydrogen scale.

Refractrometry and polarimetry:

(i) To verify law of refraction of mixture (glycerol and water) using Abbe`s refractometer.

(ii) To determine the specific rotation of a given optically active compounds.

Molecular weight determination:

(i) Determination of molecular weight of a non-volatile solute by Rast methods/ Backmann freezing point method.

(ii) Determination of the apparent degree of dissociation of an electrolyte (e. g. NaCl) in aqueous solution at different concentration by ebullioscopy.

Colorimetry :

To verify Beer-Lambert law for $KMnO_4$ / $K_2Cr_2O_7$and determine the concentration of the given solution of the substance.

NEW CURRICULUM OF B.Sc. (Pass Course) CHEMISTRY
SEMESTER V&VI : (SESSION : 2016 – 17 , 2017 – 18)

MM – 50

HOURS - 60 ; CREDIT- 4

Laboratory Course

PRACTICAL EXAMINATION

MM -50, 08- Hrs

Three experiment to be preformed.

1.Inorganic :- Gravimetric estimation 12 marks.(manipulation 03 marks).

2.Organic Qualitative analysis of organic mixture containing two solid components.
12 marks (05 marks of each compound and 02 marks for separation).

3Physical; one physical experiment [12 marks].

4. Sessional - 04 marks

5. Viva - 10 marks

In case of Ex-students one mark each will be added to gravimetric analysis and qualitative analysis of organic mixture and two marks in physical experiment.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –I & II

SESSION 2016 -2017 AND 2017 – 2018

M.Sc. Chemistry examination will be conducted in four semester exam (Sem.I,II,III,&V). In each semester there are four theory papers and two laboratory courses. Maximum marks for each theory and laboratory courses are 100.

In each semester, four seminars of 10 marks and four Internal Assessment of 10 marks are compulsory for every student which is included in 100 marks of each Theory paper.

SEMESTER – I

5. Theory Papers

Paper	Course	Duration	Marks
I	Inorganic Chemistry	03 Hrs.	80
II	Organic Chemistry	03 Hrs.	80
III	Physical Chemistry - I	03 Hrs.	80
IV	Spectroscopy - I	03 Hrs.	80

6. Seminar: Four **4x10** **40**

7. Internal Assessment : Four **4x10** **40**

8. Laboratory Course

Paper	Course	Duration	Marks
I	Lab Course I	10 Hrs	100
II	Lab Course II	06 Hrs	100

Distribution of Marks for Laboratory Courses:

Experiments – 60
Viva -- 20
Sessional -- 20

Total Marks

Theory 320 + Seminar 40 + Internal Assessment 40+ Lab. Course 200= 600

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –I - 1601

SESSION 2016 -2017 AND 2017 – 2018

PAPER-I

INORAGANIC CHEMISTRY

Stereochemistry and Bonding in Main Group Compounds

VESPR Theory, Walsh diagram (tri-and penta-atomic molecules), dπ-pπ bonds, bent rule and energetics of hybridization, some simple reactions of covalently bonded molecules.

Metal-Ligand Bonding

General consideration of Valance Bond Theory, Limitation of crystal field theory, molecular orbital theory, octahedral, tetrahedal and square planar complexes, π-bonding and molecular orbital theory.

Stereo-chemistry in Co-ordination Compounds:

Geometrical and Optical isomerism in 4 and 6 Co-ordination compounds, resolution of racemic mixture. Methods to distinguish the cis and Trans isomers. Molecular rearrangement in 4 and 6 Co-ordination compounds.

Metal- Ligand Equilibria in solution

Stepwise and overall formation constants and their interaction, 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 with special reference to pH-metry and spectrophotometry

Isopoly and heteropoly acids and salts:

Isopoly and heteropoly acids of Mo and W. Preparation, Properties and Structure. Classification, preparation properties and structure of borides, carbides, nitrides and silicides. Silicates- classification and structure, Silicones- preparation, properties and applications.

Metal - Complexes

Structure and bonding, vibrational spectra of metal carbonyls for bonding and structural elucidation, important reactions of metal carbonyls ; preparation, bonding, structu;re and important reactions of transition metal nitrosyl, dinitrogen and dioxygen complexes, tertiary; phosphine as ligand.

Books suggested

1.Advanced Inorganic Chemistry F A Cotton and Wilkinson,John Wiley
2.Inorganic Chemistry,J E Huhey,Harps and Row.
3.Chemistry of Elements, N N Greenwood and Earnshow,Pergamon.

4.Inorganic Electronic Spectroscopy, A B P Lever,Elsevier.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –I 1602

SESSION 2016 -2017 AND 2017 – 2018

PAPER-II

ORAGANIC CHEMISTRY

Nature of bonding in Organic Molecules

Delocalized chemical bonding-conjugation, cross conjugation, resonance, hyperconjugation, bonding in fullerenes, tautomeism. Aromaticity in benzenoid and non-benzenoid compounds, Huckel's rule, energy level of π-molecular orbitals, annulenes, bonds weaker than covalent-addition compounds, crown ether complexes and cryptans, inclusion compounds, cyclodxtrins, catenanes and rotaxanes.

Reaction Mechanism:

Types of mechanism, types of reactions, thermodynamic and kinetic requirements, kinetic and thermodynamic control, potential energy diagrams, transition states and intermediates. Hard and soft acids and bases. Generation, structure stability and reactivity of carbocations, carbocations, free radicals, carbenes and nitrenes. Effect of structure on reactivity- resonance and field effects, steric effect, quantitative treatment.

Aliphatic and Aromatic Nucleophilic Substitution

The SN^2 ,SN^1,mixed SN^1 and SN^2 SET mechanisms.

The neighbouring group mechanism, neighbouring group participation by π and σ bonds, anchimeric assistance. The SN Ar, SN^1 benzyne and SN^1 mechanism. Reactivity- effect of substrate structure, leaving group and attacking nucleophil.

Classical and nonclassical carbocations, phenonium ions, norbornyl system, common carbocation rearrangements. Applications, of NMR spectroscopy in the detection of carbocation. The SN^1 mechanism. Nucleophilic substitution at an allylic,aliphatic trigoal and a vinylic carbon. Reactivity effects of substrate structure, attacking nucleophile, leaving group and reaction medium.

Aliphatic and Aromatic Electrophilic Substitution

Bimolecular mechanisms - SE^1 and SE^1 . The SE^1 mechanism, electrophilic substitution accompanied by double bond shift. Effect of substrates, leaving group

and the solvent polarity on the reactivity. The arenium ion mechanism, orientation and reactivity, energy profile diagrams. The ortho/para ratio, ipso attack, orientation in other ring systems. Quantitative treatment of reactivity in substrates and electrophiles. Diazonium coupling, vilsmeir reaction, Gattermann-koch reaction.

Free Radical Reactions

Types of free radical reactions, free radical suvstitution mechanism, mechanism at an aromatic substrate, neighbouring group assistance. Reactivity for aliphatic and aromatic substrates at a bridgehaead. Reactivity in the attacking redicals. The effect of solvents on reactivity. Allylic halognation (NBS), oxidation of aldhydes to carboxylic acids, auto oxidation, coupling of alkynes and arylation of aromatic compounds by diazonium salts. Sandmayer reaction. Free radical rearrangement. Hunsdiecker reaction.

Elimination Reaction

The E^2, E^1 and E^1 CB mechanisms. Orientation of the double bond. Reactivity – effects of substrate structures, attacking base, the leaving group and the medium. Mechanism and orientation in pyrolytic elimination.

Book Suggested :-

1.Advance organic chemistry – Reactions, Mechanism and Structure , Jerry March, John Wiley.

2.A Guide Book to Mechanism in organic chemistry, Peter Sykes, Longman.

3.Principle Reactions, S.M. Mukherji, Macmillan , India.

4.Principle of organic synthesis , R.O. C. Norman and J. M. coxon, Blackie Academic and Professional.

5.Reaction Mechanism in Organic Chemistry S. M. Mukherji and S. P. Singh, Macmillan.

6.Stereochemistry of Organic compounds , D Nasupuri , New age International.

7.Stereochemistry of Organic compounds , P.S.Kalshi , New age International.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)
DEPTT OF CHEMISTRY
M.Sc. : CHEMISTRY , SEMESTER –I 1603
SESSION 2016 -2017 AND 2017 – 2018
PAPER -III
PHYSICAL CHEMISTRY – I

Mathematics for Chemistry

Differential Calculus

Function, continuity and differentiability, rule for differentiation, applications of differential calculus including maxima and minima (examples related to maximally populated rotational energy levels, Bohr's radius and probable velocity from maxwell's distribution etc.) Exact and inexact differentials with their applications to thermodynamic properties.

Integral Calculus

Basic rules for integration, integration by parts, partial function and substitution. Reduction formulae, applications of integral calculus. Functions of several variables, partial differentiation, co-ordinate transformations (e.g. Cartesian to spherical polar), curve sketching.

Matrix Algebra:

Addition and multiplication; inverse, adjoint and transpose of matrices, special matrices (symmetric, skew-symmetric, Hermitian, skew-Hermitian, unit, diagonal, unitary etc.) and their properties. Matrix equations: Homogenous, non-homogenous linear equations and conditions for the solution, linear dependence and independence. Introduction to verctor spaces, matrix eigenvalues and eigenvectors, diagonalization, determinants (examples from Huckel theory).

Quantum Chemistry -I

Introduction to Exact Quantum Mechanical Results

The Schrodinger equation and the postulates of quantum mechanics. Discussion of solutions of the Schrodinger equation to some model systems

viz, particles in a box, the harmonic oscillator, the rigid rotor, the hydrogen atom.

Approximate Methods

The variation theoem, linear variation principle. Perturbation theory (First order and non-degenerate). Applications of variation method and perturbation theory to the He atom.

Quantum Chemistry -II

Angular Momentum

Ordinary angular momentum, generalized angular momentum, eigenfunctions for angular momentum, eigenvalues of angular momentum, operator using ladder operators, addition of angular momenta, spin, antisymmetry and Pauli exclusion principle.

Electronic structure of atoms

Electronic configuration, Russell-saunders terms and coupling schemes, slater-condon parameters, term separation energies of the p configuration, term separation energies for the d configurations, magnetic effects: spin-orbit coupling and Zeeman splitting, introduction to the methods of self-consistent field, the virial theorem.

Molecular orbital Theory

Hukel theoy of conjugated systems, bond order and charge density calculations. Applications to ethylene, butadiene, cyclopropenyl radical, cyclobutadiene etc. introduction to extended Huckel theory.

Classical Thermodynamics

Brief resume of concepts of laws of thermodynamics, Maxwell's thermodynamic relation and its application. Partial molar properties and its determination , Partial molar free energy, partial molar volume and partial molar heat content and their significance. Chemical potential, Gibbs Duhan equation, variation of Chemical potential with Temperature and Pressure Concept of fugacity and its determination.

Non-ideal systems: Excess functions for non-ideal solutions. Activity coefficient, Debye-Huckel theory for activity cofficient of electrolytic solutions; determination of activity and activity coefficients; ionic strength. Application of phase rule to three component systems; second order phase transitions

Book Suggested :-

1. Physical Chemistry, P.W. Atkins, ELBS.
2. Indroduction of Quantum Chemistry, A.K. Chandra,Tata McGraw Hill.
3. Quantum chemistry, Ira N. Levine, Prentice Hall.
4. Coulson's Valence, R. McWeeny , ELBS.
5. Chemical kinetics, K. J. Laidler, Mcgraw-Hill.
6. Kinetics and Mechanism of Chemical Transformation, J. Rajaraman and J. Kuriacose , McMillan
7. Micelles, Theoretical and Applied Aspects, V. Moroi, Plenum.
8. Mordern Electrochemistry Vol. I and Vol. II J.O.M. Bokris and A.K.N. Reddy , Plenum
9. Introduction to Polymer Science, V.R.Gowarikar, N.V. Vishwanathan and J. Sridhar, Wiley Eastern.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY, SEMESTER –I 1604

SESSION 2016 -2017 AND 2017 – 2018

PAPER-IV

SPECTROSCOPY

Unifying Principles

Electromagnetic radiation, interaction of electromagnetic radiation with matter – absorption emission, transmission, reflection, dispersion, polarization and scattering. Uncertainty relation and natural line broadening, transition probability, results of the time dependent perturbation theory, transition moment rotational, vibrational and electronic energy levels.

Microwave Spectroscopy

Classification of molecules on the basis of moment of inertia ,Linear molecules, Symmetric tops, Asymmetric tops, Spherical molecules, Interaction of rotating molecules with radiation, rigid rotor model, Intensities of spectral lines, effect of isotopic substitution on the transition frequencies, Non-rigid rotator. Spectrum of non rigid rotator, Stark effect, effect of external field. Applications.

Vibrational Spectroscopy

Infrared Spectroscopy

Interaction of radiation with different modes of vibrations .Review of linear harmonic oscillator, vibrational energies of diatomic molecules, zero point energy, force constant and bond strengths; Anharmonicity, Morse potential energy diagram, vibration-rotation spectroscopy, P,Q,R branches. Breakdown of Oppenheimer approximation;vibrations of polyatomic molecules. Selection rules, normal modes of vibration, group frequencies overtones, hot bands, factors affecting the band positions

Raman Spectroscopy

Classical and quantum theories of Raman Effect .Pure rotational, vibrational and vibrational- rotational Raman spectra, selection rules, mutual exclusion principle. Resonance Raman spectroscopy, coherent anti Strokes Raman spectroscopy (CARS).

Electronic Spectroscopy

Atomic Spectroscopy

Atomic term symbols of Equivalent and nonequivalent electrons .Term symbols of single and many electron system. Term symbols of atom and ions. vector representation of momenta and vector coupling, Energies of atomic orbitals Spectra of hydrogen atom

and alkali metal atoms atom, convergence limits, ionization energy, selection rule; Zeeman Effect

Molecular Spectroscopy

Molecular orbitals .Symmetry of atomic and molecular orbitals Molecular Term Symbols of homonuclear diatomic molecules in ground and excited states Energy levels, molecular orbitals, vibronic transitions, vibrational progressions and geometry of the excited states, Intensities of spectral lines, Franck-Condon principle, electronic spectra of polyatomic molecules. Emission spectra; radioactive and non-radioactive decay, internal conversion, spectra of transition metal complexes, charge-transfer spectra.

Photoelectron Spectroscopy

Basic principle, Photoelectron spectroscopy of atoms(Hydrogen, Argon) Idea of number of electrons in given orbitals from peak area, Photoelectron spectra of simple molecules, (O_2, N_2, F_2) Auger electron spectroscopy – basic idea.

Book Suggested :-

1.Mordern Spectroscopy, J.M. Hollas, John Wiley.

2.Applied Electron Spectroscopy for chemistry Analysis Ed. H. Windawi and F.L. Ho. Wiley Interscience.

3.NMR, NQR, EPR and Mossbauer Spectroscopy in inorganic chemistry, R.V. Parish, Ellis Harwood.

4.Chemical Application of group theory , F.A. cotton.

5.Theory and Application of UV spectroscopy, H.H Jaffe and M. Orchin, IBH-oxford.

6.Introduction to Magnetic Resonance, A. Carrington and A.D. Maclachlan, Harper and Row.

K.G. ARTS AND SCIENCE COLLEGE, RAIGARH(C.G.)

M.Sc. CHEMISTRY

SESSION 2016 -2017 AND 2017 – 2018

PRACTICAL: SEMSTER-I 1617

LAB COURSE -I

INOGANIC CHEMISTRY

1. Qualitative analysis of mixture containing eight radicals including two less common metals from among the following by semi-micro method.

Basic Radicals:

Ag, Pb, Hg, Bi, Cu, Cd, As, Sb, Sn, F, Al, Cr, Zn, Mn, Co, Ni, Ba, Sr, Ca, Mg, Na, K, Ce, Th, Zr, W, Te, Ti, Mo, U, Be, Li, Au, and Pt.

Acid Radical:

Carbonate, Sulphite, Sulphide, Nitrite, Nitrate, Acetate, Fluoride, Chloride, Bromide, Iodide, Sulphate, Boate, Oxalate, Phosphate, Silicate, Thiosulphate, ferro and Ferricynide, Sulphocynide, Chromat, Arsenate and permanganate.

2. Quantitative Analysis:

Involving separation of two component in mixture of solution one by volumetric and other by gravimetric method.

3. Estimation of:

(a) Phosphoric acid in commercial orthophosphoric acid
(b) Boric acid in borax
(c) Ammonia in ammonium salt.
(d) Manganese dioxide in pyrolustie.
(e) Available chlorine in bleaching powder.
(g) Hydrogen peroxide in a commercial sample.

K.G. ARTS AND SCIENCE COLLEGE, RAIGARH(C.G.)

M.Sc. CHEMISTRY

SESSION 2016 -2017 AND 2017 – 2018

PRACTICAL: SEMSTER-I 1618

LAB COURSE -II

ORGANIC CHEMISTRY

1. **Qualitative analysis**

   Separation, purification and identification of compounds of binary mixture

2. **Quantitative Analysis :**

   Determination of the percentage of the no. of hydroxyl group in an organic compound by Acetylation method

   Estimation of carbonyl group by hydrazone formation method

   Determination of equivalent weight of carboxyl compounds/ Estimation of carboxyl group by titration method/ Silver salt method.

3. **Organic Synthesis:**

   Grignard reaction: Synthsis of Tri phenyl methanol from benzoic acid.

   Friedel Craft Reaction : Beta-benzoyl propionic acid from succinic anhydride and benzene.

   Perkin Reaction: Cinnamic acid from Benzaldehyde

   Sulphonation Reaction: Sulphanillic acid from Aniline

   Aromatic Electrophilic Substitutions: Synthesis of para nitro aniline and para bromo aniline.

   Synthesis of phthalimide from phthalic acid.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –I

SESSION 2018 -2019 AND 2019 – 2020

M.Sc. Chemistry (MCH) examination will be conducted in four semester exam (Sem.I,II,III,&V). In each semester there are four theory papers and two laboratory courses of maximum marks 100 each paper. Each theory paper of 100 marks is divided into external examination of 80 marks and internal examination of 20 marks

SEMESTER – I

Theory Papers

Paper	Course	CODE	Duration	Marks
I	Inorganic Chemistry -1	MCH -11	03 Hrs.	80
II	Organic Chemistry- 1	MCH -12	03 Hrs.	80
III	Physical Chemistry - I	MCH -13	03 Hrs.	80
IV	Spectroscopy - I	MCH -14	03 Hrs.	80

Laboratory Course

Paper	Course	CODE	Duration	Marks
I	Lab Course -I	MCH- 15	08 Hrs	100
II	Lab Course -II	MCH -16	06 Hrs	100

Distribution of Marks for Laboratory Courses:

Experiments – 60
Viva -- 20
Sessional -- 20

Total Marks

Theory 320 + Internal Examination 80 + Lab. Course 200= 600

19.9.18

19/9/18

19.9.18

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –I ~ 1601

SESSION 2018 -2019 AND 2019 – 2020

PAPER-I , ~~CODE MCH-H~~

INORAGANIC CHEMISTRY-I

Stereochemistry and Bonding in Main Group Compounds

VESPR Theory, Walsh diagram (tri-and penta-atomic molecules), dπ-pπ bonds, bent rule and energetics of hybridization, some simple reactions of covalently bonded molecules.

Metal-Ligand Bonding

General consideration of Valance Bond Theory, Limitation of crystal field theory, molecular orbital theory, octahedral, tetrahedal and square planar complexes, π-bonding and molecular orbital theory.

Stereo-chemistry in Co-ordination Compounds:

Geometrical and Optical isomerism in 4 and 6 Co-ordination compounds, resolution of racemic mixture. Methods to distinguish the cis and Trans isomers. Molecular rearrangement in 4 and 6 Co-ordination compounds.

Symmetry; and Group Theory in chemistry

Symmetry elements and symmetry operation, definitions of group, subgroup, relation between orders of a finite group and its subgroup. Conjugacy relation and classes. Point symmetry group. Schonflies symbols, representations of groups by matrices (representation for the Cn, Cnv, Cnh, Dnh, etc. groups to be worked out explicitly) . Character of a representation. The great orthogonality theorem (without proof) and its importance. Multiplication table of C_2V & C_3V point group, Character tables and their use; spectroscopy.

Inorganic polymer

Introduction – Phophazines, Borazines, Silicates Silicones Ammonolysis, Hydrolysis

Metal - ∏-Complexes

Introdution- Carbonyl -Classification, General method of Preparation, Structure and bonding, vibrational spectra of metal carbonyls for bonding and structural elucidation, General properties and uses of metal carbonyls, Nitrosyl- Classification, General method of Preparation, Structure and bonding, vibrational spectra of metal nitrosyl for bonding and structural elucidation, General properties and uses of metal nitrosyls, dinitrogen and dioxygen complexes, tertiary phosphine as ligand.

Approved 502 1999-18

1999

Books suggested

1.Advanced Inorganic Chemistry F A Cotton and Wilkinson,John Wiley
2.Inorganic Chemistry,J E Huhey,Harps and Row.
3.Chemistry of Elements, N N Greenwood and Earnshow,Pergamon.
4.Inorganic Electronic Spectroscopy, A B P Lever,Elsevier.
5-Advance Inorganic Chemistry, S K Agrawal , Keemti Lal, Pragati Publication

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –I - 1602

SESSION 2018 -2019 AND 2019 – 2020

PAPER-II , ~~CODE MCH~~-12

ORAGANIC CHEMISTRY-1

Nature of bonding in Organic Molecules

Delocalized chemical bonding-conjugation, cross conjugation, resonance, hyperconjugation, bonding in fullerenes, tautomeism. Aromaticity in benzenoid and non-benzenoid compounds,Crag s Rule for nonbenzeniod system, Huckel's rule, energy level of π-molecular orbitals, annulenes, bonds weaker than covalent-addition compounds, crown ether complexes and cryptans, inclusion compounds, cyclodxtrins, catenanes and rotaxanes.

Reaction Mechanism:

Types of mechanism, types of reactions, thermodynamic and kinetic requirements, kinetic and thermodynamic control, potential energy diagrams, transition states and intermediates. Hard and soft acids and bases. Generation, structure stability and reactivity of carbocations, Classical and nonclassical carbocations, phenonium ions, norbornyl system, common carbocation rearrangements. Applications, of NMR spectroscopy in the detection of carbocation. free radicals, carbenes and nitrenes. Effect of structure on reactivity- resonance and field effects, steric effect, quantitative treatment.

Aliphatic and Aromatic Nucleophilic Substitution

The SN^2 ,SN^1,Mixed SN^1 and SN^2 ,SET Mechanisms, SNi Mechanism

The neighbouring group mechanism, neighbouring group/atom participation by π , σ bonds & unshared electron pair, anchimeric assistance. The SN Ar, SN^1 benzyne and SN^1 mechanism. Reactivity- effect of substrate structure, leaving group and attacking nucleophil.

The SN^1 mechanism. Nucleophilic substitution at an allylic, aliphatic trigoal and a vinylic carbon. Reactivity effects of substrate structure, attacking nucleophile, leaving group and reaction medium. Sommlet Houser Rearrangement, Smile Rearrangement

Aliphatic and Aromatic Electrophilic Substitution

Bimolecular mechanisms - SE^1 and SE^1 . The SE^1 mechanism, electrophilic substitution accompanied by double bond shift. Effect of substrates, leaving group and the solvent polarity on the reactivity. The arenium ion mechanism, orientation and reactivity, energy profile diagrams. The ortho/para ratio, ipso attack, orientation in other ring systems. Quantitative treatment of reactivity in substrates and electrophiles. Diazonium coupling, vilsmeir reaction, Gattermann-koch reaction. Name Reaction-Von Ritcher , Fridel Craft acylation and Alkylation reactions

Free Radical Reactions

Types of free radical reactions, free radical suvstitution mechanism, mechanism at an aromatic substrate, neighbouring group assistance. Reactivity for aliphatic and aromatic substrates at a bridgehaead. Reactivity in the attacking redicals. The effect of solvents on reactivity. Allylic halognation (NBS), oxidation of aldhydes to carboxylic acids, auto oxidation, coupling of alkynes and arylation of aromatic compounds by diazonium salts. Sandmayer reaction. Free radical rearrangement. Hunsdiecker reaction.

Elimination Reaction

The E^2 , E^1 and E^1 CB mechanisms. Orientation of the double bond. Reactivity – effects of substrate structures, attacking base, the leaving group and the medium. Mechanism and orientation in pyrolytic elimination. Petersion Olifien synthesis, Julia Olifien synthesis ,Mc Morry Reaction

Book Suggested :-

1.Advance organic chemistry – Reactions, Mechanism and Structure , Jerry March, John Wiley.

2.A Guide Book to Mechanism in organic chemistry, Peter Sykes, Longman.

3.Principle Reactions, S.M. Mukherji, Macmillan , India.

4.Principle of organic synthesis , R.O. C. Norman and J. M. coxon, Blackie Academic and Professional.

5.Reaction Mechanism in Organic Chemistry S. M. Mukherji and S. P. Singh, Macmillan.

6.Stereochemistry of Organic compounds , D Nasupuri , New age International.

7.Stereochemistry of Organic compounds , P.S.Kalshi , New age International.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY SEMESTER –I - 1603

SESSION 2018 -2019 AND 2019 – 2020

PAPER –III , CODE MCH-13

PHYSICAL CHEMISTRY – I

Mathematics for Chemistry

Differential Calculus

Function, continuity and differentiability, rule for differentiation, applications of differential calculus including maxima and minima (examples related to maximally populated rotational energy levels, Bohr's radius and probable velocity from maxwell's distribution etc.) Exact and inexact differentials with their applications to thermodynamic properties.

Integral Calculus

Basic rules for integration, integration by parts, partial function and substitution. Reduction formulae, applications of integral calculus. Functions of several variables, partial differentiation, co-ordinate transformations (e.g. Cartesian to spherical polar), curve sketching.

Matrix Algebra:

Addition and multiplication; inverse, adjoint and transpose of matrices, special matrices (symmetric, skew-symmetric, Hermitian, skew-Hermitian, unit, diagonal, unitary etc.) and their properties. Matrix equations: Homogenous, non-homogenous linear equations and conditions for the solution, linear dependence and independence. Introduction to verctor spaces, matrix eigenvalues and eigenvectors, diagonalization, determinants (examples from Huckel theory).

Quantum Chemistry -I

Introduction to Exact Quantum Mechanical Results

The Schrodinger equation and the postulates of quantum mechanics. Discussion of solutions of the Schrodinger equation to some model systems viz, particles in a box, the harmonic oscillator, the rigid rotor, the hydrogen atom.

Approximate Methods

The variation theoem, linear variation principle. Perturbation theory (First order and non-degenerate). Applications of variation method and perturbation theory to the He atom.

Quantum Chemistry -II

Angular Momentum

Ordinary angular momentum, generalized angular momentum, eigenfunctions for angular momentum, eigenvalues of angular momentum, operator using ladder operators, addition of angular momenta, spin, antisymmetry and Pauli exclusion principle.

Electronic structure of atoms

Electronic configuration, Russell-saunders terms and coupling schemes, slater-condon parameters, term separation energies of the p configuration, term separation energies for the d configurations, magnetic effects: spin-orbit coupling and Zeeman splitting, introduction to the methods of self-consistent field, the virial theorem.

Molecular orbital Theory

Huckel theory of conjugated systems, bond order and charge density calculations. Applications to ethylene, butadiene, cyclopropenyl radical, cyclobutadiene etc. introduction to extended Huckel theory.

Classical Thermodynamics

Brief resume of concepts of laws of thermodynamics, Maxwell's thermodynamic relation and its application. Partial molar properties and its determination , Partial molar free energy, partial molar volume and partial molar heat content and their significance. Chemical potential, Gibbs Duhan equation, variation of Chemical potential with Temperature and Pressure Concept of fugacity and its determination.

Non-ideal systems: Excess functions for non-ideal solutions. Activity coefficient, Debye-Huckel theory for activity cofficient of electrolytic solutions; determination of activity and activity coefficients; ionic strength. Application of phase rule to three component systems; second order phase transitions

Book Suggested :-

1. Physical Chemistry, P.W. Atkins, E LBS.
2. Indroduction of Quantum Chemistry, A.K. Chandra,Tata McGraw Hill.
3. Quantum chemistry, Ira N. Levine, Prentice Hall.
4. Coulson's Valence, R. McWeeny , ELBS.
5. Chemical kinetics, K. J. Laidler, Mcgraw-Hill.
6. Kinetics and Mechanism of Chemical Transformation, J. Rajaraman and J. Kuriacose , McMillan
7. Micelles, Theoretical and Applied Aspects, V. Moroi, Plenum.
8. Mordern Electrochemistry Vol. I and Vol. II J.O.M. Bokris and A.K.N. Reddy , Plenum
9. Introduction to Polymer Science, V.R.Gowarikar, N.V. Vishwanathan and J. Sridhar, Wiley Eastern.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY SEMESTER –I - 1604

SESSION 2018 -2019 AND 2019 – 2020

PAPER-IV, ~~CODE MCH-14~~

SPECTROSCOPY-1

Unifying Principles

Electromagnetic radiation, interaction of electromagnetic radiation with matter – absorption emission, transmission, reflection, dispersion, polarization and scattering. Uncertainty relation and natural line broadening, transition probability, results of the time dependent perturbation theory, transition moment rotational, vibrational and electronic energy levels.

Microwave Spectroscopy

Classification of molecules on the basis of moment of inertia ,Linear molecules, Symmetric tops, Asymmetric tops, Spherical molecules, Interaction of rotating molecules with radiation, rigid rotor model, Intensities of spectral lines, effect of isotopic substitution on the transition frequencies, Non-rigid rotator. Spectrum of non rigid rotator, Stark effect, effect of external field. Applications.

Vibrational Spectroscopy

Infrared Spectroscopy

Interaction of radiation with different modes of vibrations .Review of linear harmonic oscillator, vibrational energies of diatomic molecules, zero point energy, force constant and bond strengths; Anharmonicity, Morse potential energy diagram, vibration-rotation spectroscopy, P,Q,R branches. Breakdown of Oppenheimer approximation;vibrations of polyatomic molecules. Selection rules, normal modes of vibration, group frequencies overtones, hot bands, factors affecting the band positions

Raman Spectroscopy

Classical and quantum theories of Raman Effect .Pure rotational, vibrational and vibrational- rotational Raman spectra, selection rules, mutual exclusion principle.

Resonance Raman spectroscopy, coherent anti Strokes Raman spectroscopy (CARS).

Electronic Spectroscopy -Atomic Spectroscopy

Atomic term symbols of Equivalent and nonequivalent electrons .Term symbols of single and many electron system. Term symbols of atom and ions. vector representation of momenta and vector coupling, Energies of atomic orbitals Spectra of hydrogen atom and alkali metal atoms atom, convergence limits, ionization energy, selection rule; Zeeman Effect

Molecular Spectroscopy

Molecular orbitals .Symmetry of atomic and molecular orbitals Molecular Term Symbols of homonuclear diatomic molecules in ground and excited states Energy levels, molecular orbitals, vibronic transitions, vibrational progressions and geometry of the excited states, Intensities of spectral lines, Franck-Condon principle, electronic spectra of polyatomic molecules. Emission spectra; radioactive and non-radioactive decay, internal conversion, spectra of transition metal complexes, charge-transfer spectra.

Photoelectron Spectroscopy

Basic principle, Photoelectron spectroscopy of atoms(Hydrogen, Argon) Idea of number of electrons in given orbitals from peak area, Photoelectron spectra of simple molecules, (O_2, N_2, F_2) Auger electron spectroscopy – basic idea.

Book Suggested :-

1.Mordern Spectroscopy, J.M. Hollas, John Wiley.

2.Applied Electron Spectroscopy for chemistry Analysis Ed. H. Windawi and F.L. Ho. Wiley Interscience.

3.NMR, NQR, EPR and Mossbauer Spectroscopy in inorganic chemistry, R.V. Parish, Ellis Harwood.

4.Chemical Application of group theory , F.A. cotton.

5.Theory and Application of UV spectroscopy, H.H Jaffe and M. Orchin, IBH- oxford.

6.Introduction to Magnetic Resonance, A. Carrington and A.D. Maclachlan, Harper and Row.

K.G. ARTS AND SCIENCE COLLEGE, RAIGARH(C.G.)

M.Sc. CHEMISTRY

SESSION 2018 -2019 AND 2019 – 2020

PRACTICAL: SEMSTER-I - 1617

LAB COURSE –I, ~~CODE MCH-15~~

INOGANIC CHEMISTRY

1. Qualitative analysis of mixture containing eight radicals including two less common metals from among the following by semi-micro method.

Basic Radicals:

Ag, Pb, Hg, Bi, Cu, Cd, As, Sb, Sn, F, Al, Cr, Zn, Mn, Co, Ni, Ba, Sr, Ca, Mg, Na, K, Ce, Th, Zr, W, Te, Ti, Mo, U, Be, Li, Au, and Pt.

Acid Radical:

Carbonate, Sulphite, Sulphide, Nitrite, Nitrate, Acetate, Fluoride, Chloride, Bromide, Iodide, Sulphate, Boate, Oxalate, Phosphate, Silicate, Thiosulphate, ferro and Ferricynide, Sulphocynide, Chromat, Arsenate and permanganate.

2. Quantitative Analysis:

Involving separation of two component in mixture of solution one by volumetric and other by gravimetric method.

3. Estimation of:

(a) Phosphoric acid in commercial orthophosphoric acid
(b) Boric acid in borax
(c) Ammonia in ammonium salt.
(d) Manganese dioxide in pyrolustie.
(e) Available chlorine in bleaching powder.
(g) Hydrogen peroxide in a commercial sample.

4.Chromatographic Separation of Ions

K.G. ARTS AND SCIENCE COLLEGE, RAIGARH(C.G.)

M.Sc. CHEMISTRY

SESSION 2018 -2019 AND 2019 – 2020

PRACTICAL: SEMSTER-I - 1618

LAB COURSE –II, ~~CODE MCH-16~~

ORGANIC CHEMISTRY

1. **Qualitative analysis**
   Separation, purification and identification of compounds of binary mixture

1. **Quantitative Analysis :**
   Determination of the percentage of the no. of hydroxyl group in an organic compound by Acetylation method
   Estimation of carbonyl group by hydrazone formation method
   Determination of equivalent weight of carboxyl compounds/ Estimation of carboxyl group by titration method/ Silver salt method.

3. **Organic Synthesis:**

   Grignard reaction: Synthsis of Tri phenyl methanol from benzoic acid.
   Friedel Craft Reaction : Beta-benzoyl propionic acid from succinic anhydride and benzene.
   Perkin Reaction: Cinnamic acid from Benzaldehyde
   Sulphonation Reaction: Sulphanillic acid from Aniline
   Aromatic Electrophilic Substitutions: Synthesis of para nitro aniline and para bromo aniline.
   Synthesis of phthalimide from phthalic acid.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY, SEMESTER –II

SESSION 2016 -2017 AND 2017 – 2018

M.Sc. Chemistry examination will be conducted in four semester exam (Sem.I, II,III,&V). In each semester there are four theory papers and two laboratory courses. Maximum marks for each theory and laboratory courses are 100.
In each semester, four seminars of 10 marks and four Internal Assessment of 10 marks are compulsory for every student which is included in 100 marks of each Theory paper.

SEMESTER – II

6. Theory Papers

Paper	Course	Duration	Marks
I	Inorganic Chemistry – II	03 Hrs.	80
II	Organic Chemistry - II	03 Hrs.	80
III	Physical Chemistry - II	03 Hrs.	80
IV	Spectroscopy and Computer For Chemist	03 Hrs.	80

7.

8. Seminar: **Four** **4x10** **40**

9. Internal Assessment : **Four** **4x10** **40**

10. Laboratory Course

Paper	Course	Duration	Marks
I	Lab Course III	10 Hrs	100
II	Lab Course IV	06 Hrs	100

Distribution of Marks for Laboratory Courses:

Experiments – 60
Viva -- 20
Sessional -- 20

Total Marks

Theory 320 + Seminar 40 + Internal Assessment 40+ Lab. Course 200= 600

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –II

SESSION 2016-2017 AND 2017 – 2018 · 1605

PAPER-I

INORAGANIC CHEMISTRY

Reaction Mechanism of Transition Metal Complexes: Part - I

Energy profile of a reaction, reactivity of metal complexes, 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 anation reactions, reactions without metal ligand bond cleavage.

Reaction Mechanism of Transition Metal Complexes Part - II

Substitution reactions in square planar complexes the trans effect, mechanism of the substitution reactions, substitution reaction in Tetrahedral complexes, Redox reactions , electron transfer reaction, Mechanism if one- electron transfer reaction, outer sphere type reactions, cross reactions and Marcus –Hush theory, inner sphere type reactions.

Electronic Spectra of Transition Metal Complexes:

Spectroscopic ground states, Selection rule for electronic transition, Interpretation of crystal field diagram of dn configuration in octahedral field, distorted octahedral and tetrahedral complexes. Orgel and Tanabe-Sugano digrams for transition metal complexes (d^1 to d^9 states), charge transfer spectra, Spectro-chemical series, Nephelauxatic series,

Magnetic Properties of Transition Metal Complexes:

Magnetic property of octahedral, tetrahedral, tetragonally distorted square planar, trigonal bipyramidal and square bipyramidal complexes based on CFT, Magnetic properties of free and complex ions, Anomalous magnetic moments, Quenching of orbital angular momentum by ligand field, Magnetic properties of complexes with A, E, and T terms, Spin orbit coupling.

Metal Clusters

Higher boranes, carboranes, metalloboranes and metallocarboranes. Metal carbonyl and halide cluster, compounds with metal-metal multiple bonds.

Symmetry; and Group Theory in chemistry

Symmetry elements and symmetry operation, definitions of group, subgroup, relation between orders of a finite group and its subgroup. Conjugacy relation and classes. Point symmetry group. Schonflies symbols, representations of groups by matrices (representation for the Cn, Cnv, Cnh, Dnh, etc. groups to be worked out explicitly) . Character of a representation. The great orthogonality theorem (without proof) and its importance. Character tables and their use; spectroscopy.

Books suggested

1.Advanced Inorganic Chemistry F A Cotton and Wilkinson,John Wiley

2.Inorganic Chemistry,J E Huhey,Harps and Row.

3.Chemistry of Elements, N N Greenwood and Earnshow,Pergamon.

4.Inorganic Electronic Spectroscopy, A B P Lever,Elsevier.

5.Magnetochemistry,R L Carlin,Springer Verlag

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)
DEPTT OF CHEMISTRY
M.Sc. : CHEMISTRY , SEMESTER –II · 1606
SESSION 2016 -2017 AND 2017 – 2018
PAPER-II
ORAGANIC CHEMISTRY-II

Addition to Carbon-Carbon Multiple Bonds

Mechanistic and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, regio-and chemoselectivity, orientation and reactivity. Addition to cyclopropane ring. Hydrogenation of double and triple bonds, hydrogenation of aromatic rings, Hydroboration. Michael reaction.

Addition to carbon-Hetero Multiple Bonds

Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds, acids, esters and nitriles, addition of Grignard reagents, organozinc and organolithium reagents to carbonyl and unsaturated carbonyl compounds. Witting eaction. Mechanism of condensation reaction involving enolates – Aldol, knoeveagel, Claisen, Hydolysis of esters and amides, ammonolysis of esters.

Stereochemistry

Conformational analysis of cycloalkanes, decalins, effect of conformation on reactivity, conformation of sugars, steric stain due to unavoidable crowding.

Elements of symmetry, chirality, molecules with more than one chiral enter, threo and erythro isomers, methods of resolution, optical purity, enantiotopic and diastereotopic atoms, groups and faces, stereospecific and steroselective synthesis. Asymmetric synthesis. Optical activity in the absence of chiral (biphenyls, allenes and spiranes), chirality due to helical shape. Stereochemistry of the compounds containing nitrogen, sulphur and phosphorus.

Pericyclic Reactions

Introduction of Percyclic Reaction, Construction of π Molecular Orbital of Ethylene and 1,3 Butadiene, Symmetry of π Molecular Orbital, Filling of electron in π Molecular Orbitals in Conjugated Polyenes, Construction of Molecular Orbital of Conjugated Ions and Radicals, Excited states, Symmetric in Carbon – Carbon Sigma bond, Theory of Pericyclic Reaction.

Electrocyclic Reaction

Introduction of Electrocyclic Reaction, Conrotatory and Disrotatory Motions in Ring Opening Reaction, Conrotatory and Disrotatory Motion in Closing Reaction, Open Chain conjugated System having $4n\pi$ Conjugated Electrons, Open chain conjugated system having $(4n + 2)\ \pi$ conjugated electrons. Frontier Molecular Orbital (FMO) Method – Cyclisation of $4n\pi$ Systems, Elecrocyclic Ring opening in which Polyene has $4n\pi$ Electrons, Cyclisation of $(4n+2)\pi$ Systems. Electrocyclic Ring Opening in which polyene has $(4n + 2)\pi$ Electrons, Correlation Diagram, Correlation Diagram of the Electrocyclic Reaction in which polyene has $4n\pi$ Electrons, Correlation Diagram of the Electrocyclic Reaction in which polyene has $(4n + 2)\pi$ Electrons. The woodward- Hoffmann Rule for Electrocyclic reaction, woodward- Hoffmann Rule for Electrocyclic Thermol Reactions, Photochemical Electrocyclic Reaction, Huckel-Mobius (H-M) Method or Perturbation Molecular Orbital (PMO) Method

Cycloaddition Reaction

Introduction of Cycloaddition Reaction, Theory of cycloaddition Reaction : FMO Method- [2+2] cycloaddition Reaction and [4+2] cycloaddition Reaction, Correlation Diagram of Cycloaddition Reaction – Orbital Symmetry in Cycloaddition, correlation diagram of [4+2] Cycloaddition reaction, The woodward-Haffmann Rule for Cycloaddition Reaction , The woodward-Haffmann Rule for in [4+2] Cycloaddition, Woodward-Haffmann Rule in [2+2] Cycloaddition.

Sigmatropic Rearrangement

Introduction of Sigmatropic Rearrangement , Classification of sigmatropic Rearrangement Name of the Rearrangement , Mechanism of sigmtropic Rearrangement, Sigmatropic shift of Alkyl group, Selection Rule for sigmatropic Rearrangement, Other Sigmatropic Shift, Cope Rearrangement , Claisen Rearrangement, Sigmatropic Rearrangement, The Woodward-Haffmann Rule for Sigmatropic Rearrangement

5/12/16

Book Suggested:-

1.Advance Organic chemistry , O.P. Agrawl. Jagdamba singh.

2.Advance organic chemistry – Reactions, Mechanism and Structure , Jerry March, John Wiley.

3.A Guide Book to Mechanism in organic chemistry, Peter Sykes, Longman.

4.Principle Reactions, S.M. Mukherji, Macmillan , India.

5.Principle of organic synthesis , R.O. C. Norman and J. M. coxon, Blackie Academic and Professional.

6.Reaction Mechanism in Organic Chemistry S. M. Mukherji and S. P. Singh, Macmillan.

7.Stereochemistry of Organic compounds , D Nasupuri , New age International.

8.Stereochemistry of Organic compounds , P.S.Kalshi , New age International.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)
DEPTT OF CHEMISTRY
M.Sc. : CHEMISTRY , SEMESTER –II 1607
SESSION 2016 -2017 AND 2017 – 2018
PAPER -III
PHYSICAL CHEMISTRY – II

Permutation and probability

Permutation and combination, probability and probability theorems, probability curves, average, root mean square and most probable errors, examples from the kinetic theory of gases etc., curve fitting (including least square fit etc.) with a general polynomial fit.

Statistical Thermodynamics

Partition functions- translational, rotational, vibrational and electronic partition functions, calculation of thermodynamic properties in terms of partition functions. Application of partition functions.

Heat capacity behaviour of solids-chemical equilibria and equilibrium constant in terms of partition function, Maxwell- Boltzmann Statistics Fermi-dirac statistics, distribution law and applications to metal. Bose-Einstein statistics-distribution law and application to helium.

Non Equilibrium Thermodynamics

Thermodynamic criteria for non – equilibrium states, entropy production and entropy flow, entropy balance equations for different irreversible processes

(e.g. – heat flow, chemical reaction etc.) transformations of the generalized fluxes and forces, non equilibrium stationary states, phenomenological equations microscopic reversibility and Onsager's reciprocity relations, electro kinetic phenomenon , diffusion , electric conduction, irreversible thermodynamics for biological system, coupled reactions

Electrochemistry

Electrochemistry of solutions.

Debye-Huckel theory, Test of Debye-Huckel theory, Onsager equation, validity of Onsager equation, extension of Onsager equation to higher concentration, Ion solvent interaction. Debye-Huckel-Jerum mode.

Overvoltage or Overpotential

Overpotential ,Type of overpotential, Measurement of overpotential, factos affecting overpotential, importance of overpotential

Polarography

Theory, Polarogram, Limiting current, Residual current, Migration current, Diffusion current, Ilkovic equation; half wave potential and its significance, Derivative polarogram, Application (Cation and anion analysis, Study of complex formation and stability constant, Ore analysis, purity of samples of vitamins harmones and antibiotics

Chemical Dynamics

Kinetics of reactions

Methods of determining rate laws, Kinetics of third order reactions(all reactants are same type, two reactants are same type and different from third, all reactants of different type) .Kinetics of Opposing or reversible reactions, Kinetics of parallel reaction, Kinetics of consecutive reactions, Kinetics of chain reactions(Thrmal reaction of H_2 & Br_2 to form HBr, Photochemical combinationof H_2 & Br_2 to form HBr, Photochemical decomposition of C_2H_6, Pyrolysis of CH_3CHO, Photochemical combinationof H_2 & Cl_2 to form HCl,

Theory of reaction rate

Collision theory of unimolecular reactions(Lindemann theory),Collision theory of bimolecular reactions,Theory of absolute reaction rates,Transition state theory,Hinshelwood theory,: ionic reactions, kinetic salt effects, steady state kintics,

Book Suggested :-

1. Physical Chemistry, P.W. Atkins, E LBS.
2. Indroduction of Quantum Chemistry, A.K. Chandra,Tata McGraw Hill.
3.Quantum chemistry, Ira N. Levine, Prentice Hall.
4.Coulson's Valence, R. McWeeny , ELBS.
5.Chemical kinetics, K. J. Laidler, Mcgraw-Hill.
6.inetics and Mechanism of Chemical Transformation, J. Rajaraman and J. Kuriacose , McMillan
7.Micelles, Theoretical and Applied Aspects, V. Moroi, Plenum.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –II 1608

SESSION 2016 -2017 AND 2017 – 2018

PAPER-IV

SPECTROSCOPY AND COMPUTER FOR CHEMIST

Magnetic Resonance Spectroscopy

Nuclear Magnetic Resonance Spectroscopy

Nuclear spin, Nuclear resonance, saturation, shielding of magnetic nuclei, chemical shift and its measurements, factors influencing chemical shift, deshielding, spin-pin interactions, Chemically Equivalent and nonequivalent protones ,Magnetically Equivalent and nonequivalent Protones, Homotopic enantiotopic and diastereotopic protons test of symmetry for chemical shift Equivalence protons,coupling constant, classification (AX,AB,AX2,AB2,ABX, AMX, ABC, AX3 etc.), spin decoupling; basic ideas about instrument. NMR studies of nuclei other then proton –C, F and P. FT NMR, advantages of FT NMR, use of NM in medical diagnostics.

Electron Spin Resonance Spectroscopy

Basic principle Electron spin and magnetic moments, Selection rule g-factor, Representation of spectra, Resonance frequency, Hyperfine Structure, Origin of hyperfine structure ,Radicals having one proton, Radicals having a set of equivalent protons Radicals having sets of nonequivalent protons, Hyperfine coupling constants, Spin densities and McConnel relationship

Nuclear Quadrupole Resonance Spectroscopy

Quadrupole nuclei, quarupole moments, Number and energy of quadrupole nucei with I= 1,I=3/2 ,I=5/2,I=7/2.Nuclei electric field gradient, coupling constant, splitting. Applications.

Mossbaur Spectroscopy

Principle of Mossbaur spectroscopy, Mossbaur nuclei ,formation of Mossbaur nuclei, Instrumentation , Application of Mossbaur spectroscopy(Isomer shift and to differentiate between Fe^{+2} & Fe^{+3} ,Sn^{+2}& Sn^{+4} compounds, To differentiate between octahedral and tetrahedral sites,)

Introduction to Computers and Computing

Basic structure and functioning of computers, Input & output devices, Memory Units, Primary memory(RAM,DRAM SRAM, ROM, PROM, EPROM, EEPROM, Catch memory) Secondary memory, Computer languages. Operating system with DOC as an example. Introduction to UNIX and WINDOWS. Data Representation: **Digital number system**-(Decimal number, Binary number, Octal number, hexadecimal number),**Number conversion**(Decimal to Binary conversion, Binary to decimal conversion, Decimal to octal conversion, Octal to decimal conversion, Octal to binary conversion ,Binary to octal conversion, Decimal to hexadecimal conversion, hexadecimal to decimal conversion, Binary to hexadecimal conversion ,hexadecimal to binary number conversion, Addition Multiplication Subtraction and Division of Binary numbers. ASCII-Codes principles of programming. Algorithms and flow-charts.

Computer Programming in C

Conversion of mathematical expression into Fortran equivalent, Constants & variables in C-language,Operators in C-language,

Programing in C of the following expressions

Vander walls equation for calculation of pressure $P=\frac{nRT}{(V-nb)}-\frac{an^2}{V^2}$

Vander Waal constants $a=\frac{PV^2}{n^2}$ and $b=\frac{V}{n}$

pH of solution $pH = -\log[H]^+$

pH of solution by $pH = pK_a+\log\frac{Salt}{Acid}$

Order of reactions $n = 1+\log\frac{t_1/t_2}{a_2/a_1}$

Lattice energy $\mu_0 = \frac{NAe^2Z^1Z^2}{r_0}$

Rate constant of first order reaction $K=\frac{2.303}{t}log\frac{a}{a-x}$

Rate constant of second order reaction $K=\frac{x}{at(a-x)}$

Rate constant of second order reaction $K = \frac{2.303}{t(a-b)} \log \frac{b(a-x)}{a(b-x)}$

Rate constant of third order reaction $K = \frac{x}{2ta^2} \frac{(2a-x)}{(a-x)^2}$

Rate constant of third order reaction K=

,Decay constant $K = \frac{2.303}{t} \log \frac{N_0}{N}$

Activation energy $E = \frac{2.303 T_1 T_2 R}{(T_1 - T_2) \log (\frac{K_1}{K_2})}$

Avogagro's number $N = N_0 (\frac{1}{2})^n$

Angular momentum $= \frac{nh}{2\pi}$

Calculation of Volume $V_2 = \frac{P_1 V_1 T_2}{P_2 T_1}$

Calculation of pressure $P_2 = \frac{P_1 V_1 T_2}{V_2 T_1}$

Calculation of temperature $T_2 = \frac{P_2 V_2 T_1}{P_1 V_1}$

Calculation of RMS velocity $u = (\frac{3RT}{M})^{1/2}$

Book Suggested :-

1. Mordern Spectroscopy, J.M. Hollas, John Wiley.
2. Applied Electron Spectroscopy for chemistry Analysis Ed. H. Windawi and F.L. Ho. Wiley Interscience.
3. NMR, NQR, EPR and Mossbauer Spectroscopy in inorganic chemistry, R.V. Parish, Ellis Harwood.
4. Chemical Application of group theory , F.A. cotton.
5. Theory and Application of UV spectroscopy, H.H Jaffe and M. Orchin, IBH- oxford.
6. Introduction to Magnetic Resonance, A. Carrington and A.D. Maclachlan, Harper and Row.

5/12/16

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY SEMESTER –II

SESSION 2018 -2019 AND 2019 – 2020

M.Sc. Chemistry examination will be conducted in four semester exam (Sem.I,II,III,&V). In each semester there are four theory papers and two laboratory courses of maximum marks 100 each paper. Each theory paper of 100 marks is divided into external examination of 80 marks and internal examination of 20 marks.

SEMESTER – II

Theory Papers

Paper	Course	CODE	Duration	Marks
I	Inorganic Chemistry – II	MCH -21	03 Hrs.	80
II	Organic Chemistry - II	MCH -22	03 Hrs.	80
III	Physical Chemistry - II	MCH -23	03 Hrs.	80
IV	Spectroscopy and Computer For Chemist	MCH -24	03 Hrs.	80

Laboratory Course

Paper	Course	CODE	Duration	Marks
I	Lab Course -III	MCH -25	06 Hrs	100
II	Lab Course -IV	MCH -26	06 Hrs	100

Distribution of Marks for Laboratory Courses:

Experiments – 60
Viva -- 20
Sessional -- 20

Total Marks

Theory 320 +Internal Examination 80 + Lab. Course 200= 600

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY SEMESTER –II

SESSION 2018 -2019 AND 2019 – 2020 1605

PAPER-I , CODE ~~MCH-21~~

INORAGANIC CHEMISTRY -II

Reaction Mechanism of Transition Metal Complexes: Part - I

Energy profile of a reaction, reactivity of metal complexes, 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 anation reactions, reactions without metal ligand bond cleavage.

Reaction Mechanism of Transition Metal Complexes Part - II

Substitution reactions in square planar complexes the trans effect, mechanism of the substitution reactions, substitution reaction in Tetrahedral complexes, Redox reactions , electron transfer reaction, Mechanism if one- electron transfer reaction, outer sphere type reactions, cross reactions and Marcus –Hush theory, inner sphere type reactions.

Electronic Spectra of Transition Metal Complexes:

Spectroscopic ground states, Selection rule for electronic transition, Interpretation of crystal field diagram of dn configuration in octahedral field, distorted octahedral and tetrahedral complexes. Orgel and Tanabe-Sugano digrams for transition metal complexes (d^1 to d^9 states), charge transfer spectra, Spectro-chemical series, Nephelauxatic series,

Magnetic Properties of Transition Metal Complexes:

Magnetic property of octahedral, tetrahedral, tetragonally distorted square planar, trigonal bipyramidal and square bipyramidal complexes based on CFT, Magnetic properties of free and complex ions, Anomalous magnetic moments, Quenching of orbital angular momentum by ligand field, Magnetic properties of complexes with A, E, and T terms, Spin orbit coupling.

Metal Clusters

Introduction, Isolobal Analogue, Carbonyl Cluster , Electron Counting Scheme for HNCCS (Wades Rule), Halide Type Cluster Borane Hydrides , Strcture of diborane, Types of bonds in higher boranes , Carboranes, Metalloboranes Metallocarboranes,

Metal- Ligand Equilibria in solution

Stepwise and overall formation constants and their interaction, 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 with special reference to pH-metry and spectrophotometry

Books suggested

1.Advanced Inorganic Chemistry F A Cotton and Wilkinson,John Wiley

2.Inorganic Chemistry,J E Huhey,Harps and Row.

3.Chemistry of Elements, N N Greenwood and Earnshow,Pergamon.

4.Inorganic Electronic Spectroscopy, A B P Lever,Elsevier.

5.Magnetochemistry,R L Carlin,Springer Verlag

6-Advance Inorganic Chemistry, S K Agrawal , Keemti Lal, Pragati Publication

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY SEMESTER –II 1606

SESSION 2018 -2019 AND 2019 – 2020

PAPER-II , ~~CODE MCH-22~~

ORAGANIC CHEMISTRY-II

Addition to Carbon-Carbon Multiple Bonds

Mechanistic and stereochemical aspects of addition reactions involving electrophiles, nucleophiles and free radicals, regio-and chemoselectivity, orientation and reactivity. Addition to cyclopropane ring. Hydrogenation of double and triple bonds, hydrogenation of aromatic rings, Hydroboration. Michael reaction. Epoxidation ,SAA(Sharpless Asymmetric Epoxidation)

Addition to carbon-Hetero Multiple Bonds

Mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds, acids, esters and nitriles, addition of Grignard reagents, organozinc and organolithium reagents to carbonyl and unsaturated carbonyl compounds. Witting eaction. Mechanism of condensation reaction involving enolates – Aldol, knoeveagel, Claisen, Hydolysis of esters and amides, ammonolysis of esters, Mannich Reaction, Benzoin Condensation ,Perkin Reaction, Stobbe Reaction , Dekin Reaction

Stereochemistry

Conformational analysis of cycloalkanes, decalins, effect of conformation on reactivity, conformation of sugars, steric stain due to unavoidable crowding.

Elements of symmetry, chirality, molecules with more than one chiral enter, threo and erythro isomers, methods of resolution, optical purity, enantiotopic and diastereotopic atoms, groups and faces, stereospecific and steroselective synthesis. Asymmetric synthesis. Optical activity in the absence of chiral (biphenyls, allenes and spiranes), chirality due to helical shape. Stereochemistry of the compounds containing nitrogen, sulphur and phosphorus.

Pericyclic Reactions

Introduction of Percyclic Reaction, Construction of π Molecular Orbital of Ethylene and 1,3 Butadiene, Symmetry of π Molecular Orbital, Filling of electron in π Molecular Orbitals in Conjugated Polyenes, Construction of Molecular Orbital

of Conjugated Ions and Radicals, Excited states, Symmetric in Carbon – Carbon Sigma bond, Theory of Pericyclic Reaction.

Electrocyclic Reaction Introduction of Electrocyclic Reaction, Conrotatory and Disrotatory Motions in Ring Opening Reaction, Conrotatory and Disrotatory Motion in Closing Reaction, Open Chain conjugated System having $4n\pi$ Conjugated Electrons, Open chain conjugated system having $(4n + 2)\ \pi$ conjugated electrons. Frontier Molecular Orbital (FMO) Method – Cyclisation of $4n\pi$ Systems, Elecrocyclic Ring opening in which Polyene has $4n\pi$ Electrons, Cyclisation of $(4n+2)\pi$ Systems. Electrocyclic Ring Opening in which polyene has $(4n + 2)\pi$ Electrons, Correlation Diagram, Correlation Diagram of the Electrocyclic Reaction in which polyene has $4n\pi$ Electrons, Correlation Diagram of the Electrocyclic Reaction in which polyene has $(4n + 2)\pi$ Electrons. The woodward- Hoffmann Rule for Electrocyclic reaction, woodward- Hoffmann Rule for Electrocyclic Thermol Reactions, Photochemical Electrocyclic Reaction, Huckel-Mobius (H-M) Method or Perturbation Molecular Orbital (PMO) Method

Cycloaddition Reaction

Introduction of Cycloaddition Reaction, Theory of cycloaddition Reaction : FMO Method- [2+2] cycloaddition Reaction and [4+2] cycloaddition Reaction, Correlation Diagram of Cycloaddition Reaction – Orbital Symmetry in Cycloaddition, correlation diagram of [4+2] Cycloaddition reaction, The woodward-Haffmann Rule for Cycloaddition Reaction , The woodward-Haffmann Rule for in [4+2] Cycloaddition, Woodward-Haffmann Rule in [2+2] Cycloaddition.

Sigmatropic Rearrangement

Introduction of Sigmatropic Rearrangement , Classification of sigmatropic Rearrangement Name of the Rearrangement , Mechanism of sigmtropic Rearrangement, Sigmatropic shift of Alkyl group, Selection Rule for sigmatropic Rearrangement, Other Sigmatropic Shift, Cope Rearrangement , Claisen Rearrangement,Aza Cope Rearangement ,Oxy Cope Rearrangement ,Claisen Cope Rearrangement Sigmatropic Rearrangement, The Woodward-Haffmann Rule for Sigmatropic Rearrangement , Ireland Claisen rearrangement

Book Suggested:-

1.Advance Organic chemistry , O.P. Agrawl. Jagdamba singh.

2.Advance organic chemistry – Reactions, Mechanism and Structure , Jerry March, John Wiley.

3.A Guide Book to Mechanism in organic chemistry, Peter Sykes, Longman.

4.Principle Reactions, S.M. Mukherji, Macmillan , India.

5.Principle of organic synthesis , R.O. C. Norman and J. M. coxon, Blackie Academic and Professional.

6.Reaction Mechanism in Organic Chemistry S. M. Mukherji and S. P. Singh, Macmillan.

7.Stereochemistry of Organic compounds , D Nasupuri , New age International.

8.Stereochemistry of Organic compounds , P.S.Kalshi , New age International.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY SEMESTER –II 1607

SESSION 2018 -2019 AND 2019 – 2020

PAPER –III , C~~ODE MCH-23~~

PHYSICAL CHEMISTRY – II

Permutation and probability

Permutation and combination, probability and probability theorems, probability curves, average, root mean square and most probable errors, examples from the kinetic theory of gases etc., curve fitting (including least square fit etc.) with a general polynomial fit.

Statistical Thermodynamics

Partition functions- translational, rotational, vibrational and electronic partition functions, calculation of thermodynamic properties in terms of partition functions. Application of partition functions.

Heat capacity behaviour of solids-chemical equilibria and equilibrium constant in terms of partition function, Maxwell- Boltzmann Statistics Fermi-dirac statistics, distribution law and applications to metal. Bose-Einstein statistics-distribution law and application to helium.

Non Equilibrium Thermodynamics

Thermodynamic criteria for non – equilibrium states, entropy production and entropy flow, entropy balance equations for different irreversible processes

(e.g. – heat flow, chemical reaction etc.) transformations of the generalized fluxes and forces, non equilibrium stationary states, phenomenological equations microscopic reversibility and Onsager's reciprocity relations, electro kinetic phenomenon , diffusion , electric conduction, irreversible thermodynamics for biological system, coupled reactions

Electrochemistry

Electrochemistry of solutions.

Debye-Huckel theory, Test of Debye-Huckel theory, Onsager equation, validity of Onsager equation, extension of Onsager equation to higher concentration, Ion solvent interaction. Debye-Huckel-Jerum mode.

Overvoltage or Overpotential

Overpotential ,Type of overpotential, Measurement of overpotential, factos affecting overpotential, importance of overpotential

Polarography

Theory, Polarogram, Limiting current, Residual current, Migration current, Diffusion current, Ilkovic equation; half wave potential and its significance, Derivative polarogram, Application (Cation and anion analysis, Study of complex formation and stability constant, Ore analysis, purity of samples of vitamins harmones and antibiotics

Chemical Dynamics

Kinetics of reactions

Methods of determining rate laws, Kinetics of third order reactions(all reactants are same type, two reactants are same type and different from third, all reactants of different type) .Kinetics of Opposing or reversible reactions, Kinetics of parallel reaction, Kinetics of consecutive reactions, Kinetics of chain reactions(Thermal reaction of H_2 & Br_2 to form HBr, Photochemical combination of H_2 & Br_2 to form HBr, Photochemical decomposition of C_2H_6, Pyrolysis of CH_3CHO, Photochemical combination of H_2 & Cl_2 to form HCl,

Theory of reaction rate

Collision theory of unimolecular reactions (Lindemann theory),Collision theory of bimolecular reactions,Theory of absolute reaction rates,Transition state theory,Hinshelwood theory,: ionic reactions, kinetic salt effects, steady state kintics,

Book Suggested :-

1. Physical Chemistry, P.W. Atkins, E LBS.
2. Indroduction of Quantum Chemistry, A.K. Chandra,Tata McGraw Hill.
3.Quantum chemistry, Ira N. Levine, Prentice Hall.
4.Coulson's Valence, R. McWeeny , ELBS.
5.Chemical kinetics, K. J. Laidler, Mcgraw-Hill.
6.inetics and Mechanism of Chemical Transformation, J. Rajaraman and J. Kuriacose , McMillan
7.Micelles, Theoretical and Applied Aspects, V. Moroi, Plenum.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY SEMESTER –II 1608

SESSION 2018 -2019 AND 2019 – 2020

PAPER-IV , ~~CODE MCH-24~~

SPECTROSCOPY AND COMPUTER FOR CHEMIST

Magnetic Resonance Spectroscopy

Nuclear Magnetic Resonance Spectroscopy

Nuclear spin, Nuclear resonance, saturation, shielding deshielding, of magnetic nuclei, chemical shift and its measurements, factors influencing chemical shift, spin-pin interactions, Chemically Equivalent and nonequivalent protones ,Magnetically Equivalent and nonequivalent Protones, Homotopic enantiotopic and Diastereotopic protons test of symmetry for chemical shift Equivalence protons,coupling constant, classification (AX,AB,AX2,AB2,ABX, AMX, ABC, AX3 etc.), spin decoupling; basic ideas about instrument. use of NMR in medical diagnostics.

Electron Spin Resonance Spectroscopy

Basic principle Electron spin and magnetic moments, Selection rule g-factor, Representation of spectra, Resonance frequency, Hyperfine Structure, Origin of hyperfine structure ,Radicals having one proton, Radicals having a set of equivalent protons Radicals having sets of nonequivalent protons, Hyperfine coupling constants, Spin densities and McConnel relationship

Nuclear Quadrupole Resonance Spectroscopy

Quadrupole nuclei, quarupole moments, Number and energy of quadrupole nucei with I= 1,I=3/2 ,I=5/2,I=7/2.Nuclei electric field gradient, coupling constant, splitting. Applications.

Mossbaur Spectroscopy

Principle of Mossbaur spectroscopy, Mossbaur nuclei ,formation of Mossbaur nuclei, Instrumentation , Application of Mossbaur spectroscopy(Isomer shift and to differentiate between Fe^{+2} & Fe^{+3} ,Sn^{+2}& Sn^{+4} compounds, To differentiate between octahedral and tetrahedral sites,)

Introduction to Computers and Computing

Basic structure and functioning of computers, Input & output devices, Memory Units, Primary memory(RAM,DRAM SRAM, ROM, PROM, EPROM, EEPROM, Catch memory) Secondary memory, Computer languages. Operating system with DOC as an example. Introduction to UNIX and WINDOWS.
Data Representation: **Digital number system**-(Decimal number, Binary number, Octal number, hexadecimal number),**Number conversion**(Decimal to Binary conversion, Binary to decimal conversion, Decimal to octal conversion, Octal to decimal conversion, Octal to binary conversion ,Binary to octal conversion, Decimal to hexadecimal conversion, hexadecimal to decimal conversion, Binary to hexadecimal conversion ,hexadecimal to binary number conversion, Addition Multiplication Subtraction and Division of Binary numbers. ASCII-Codes principles of programming. Algorithms and flow-charts.

Computer Programming in C

Conversion of mathematical expression into Fortran equivalent, Constants & variables in C-language, Operators in C-language,
Programming in C of the following expressions

Vander walls equation for calculation of pressure $P=\frac{nRT}{(V-nb)}-\frac{an^2}{V^2}$

Vander Waal constants $a=\frac{PV^2}{n^2}$ and $b=\frac{V}{n}$

pH of solution $pH = -\log[H]^+$

pH of solution by $pH = pK_a+\log\frac{Salt}{Acid}$

Order of reactions $n = 1+\log\frac{t_1/t_2}{a_2/a_1}$

Lattice energy $\mu_0 = \frac{NAe^2Z^1Z^2}{r_0}$

Rate constant of first order reaction $K = \frac{2.303}{t}\log\frac{a}{a-x}$

Rate constant of second order reaction $K = \frac{x}{at(a-x)}$

Rate constant of second order reaction $K = \frac{2.303}{t(a-b)} \log \frac{b(a-x)}{a(b-x)}$

Rate constant of third order reaction $K = \frac{x}{2ta^2} \frac{(2a-x)}{(a-x)^2}$

Rate constant of third order reaction K=

,Decay constant $K = \frac{2.303}{t} \log \frac{N_0}{N}$

Activation energy $E = \frac{2.303 T_1 T_2 R}{(T_1 - T_2) \log(\frac{K_1}{K_2})}$

Avogagro's number $N = N_0(\frac{1}{2})^n$

Angular momentum $= \frac{nh}{2\pi}$

Calculation of Volume $V_2 = \frac{P_1 V_1 T_2}{P_2 T_1}$

Calculation of pressure $P_2 = \frac{P_1 V_1 T_2}{V_2 T_1}$

Calculation of temperature $T_2 = \frac{P_2 V_2 T_1}{P_1 V_1}$

Calculation of RMS velocity $u = (\frac{3RT}{M})^{1/2}$

Book Suggested :-

1. Mordern Spectroscopy, J.M. Hollas, John Wiley.
2. Applied Electron Spectroscopy for chemistry Analysis Ed. H. Windawi and F.L. Ho. Wiley Interscience.
3. NMR, NQR, EPR and Mossbauer Spectroscopy in inorganic chemistry, R.V. Parish, Ellis Harwood.
4. Chemical Application of group theory , F.A. cotton.
5. Theory and Application of UV spectroscopy, H.H Jaffe and M. Orchin, IBH- oxford.
6. Introduction to Magnetic Resonance, A. Carrington and A.D. Maclachlan, Harper and Row.

K.G. ARTS AND SCINCE COLLEGE, RAIGARH(C.G.)

M.Sc. CHEMISTRY

SESSION 2018 -2019 AND 2019 – 2020

PRACTICAL: SEMSTER-II 1619

Lab Course III , ~~CODE MCH-25~~

Inorganic Preparation

1 Preparation of hexathiourea plumbousnitrate
2 Preparation of Thiooxalatochromate(III)
3 Preparation of Potassiumoxalatoaluminate
4 Preparation of Chrome alum
5 Preparation of Prussian Blue
6 Preparation of Pentathiourea Dicuprous Nitrate
7 Preparation of Sodium tetrathionate
8 Preparation of Mohr"s salt
9 Preparation of Cuprous Mercuric Iodide
10 Preparation of Cis Potassium Dioxalato Diaqueous Chromate

Spectrophotometry

Verification of Lambert Beer Law
Determination of Iron Concentration using 1,10-phenethrolein
Determination of Coper Concentration using cupferron
Determination of Chomium Concentration using 2,4-Dinitrophenylhydrazine

Conductomtry

Titration of Strong Acid with Strong Base

Titration of Strong Acid with Weak Base

Titration of Weak Acid with Strong Base

Titration of Weak Acid with Weak Base

Colorimetry

Determination of Formula and Stability Constants of Complexes

K.G. ARTS AND SCINCE COLLEGE, RAIGARH(C.G.)

M.Sc. CHEMISTRY

SESSION 2018 -2019 AND 2019 – 2020

PRACTICAL: SEMSTER-II 1620

Lab Course IV ~~CODE MCH-26~~

Conductometry -

Determination of composition of Acetic acid and Hydrochloric Acid

Determination of composition of Nitric acid and Sulphuric Acid

Determination of composition of Oxalic Acid and Acetic Acid

Determination of composition of Oxalic Acid and Hydrochloric Acid

Spectrophotometric titration

Estimation of Carbohydrate by Anthrone method

Estimation of Amino acid by Ninhydrin method

Estimation of Protein by Biuret Method

Extraction of Organic Compounds

Isolation of Caffeine from Tea Leaves
Isolation of Casein from Milk
Isolation of Lactose from milk
Isolation of Peperine from Black Pepper
Isolation of Lycopene from Tomato
Isolation of Caffeine from Tea Leaves

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –III

SESSION 2016 -2017 AND 2017 – 2018

M.Sc. Chemistry examination will be conducted in four semester exam (Sem.I,II,III,&V). In each semester there are four theory papers and two laboratory courses. Maximum marks for each theory and laboratory courses are 100.

In each semester, four seminars of 10 marks and four Internal Assessment of 10 marks are compulsory for every student which is included in 100 marks of each Theory paper.

SEMESTER – III

1. **Theory Papers**

Paper	Course	Duration	Marks
I	Biochemistry Chemistry-1	03 Hrs.	80
II	Natural Product	03 Hrs.	80
III	Environmental Chemistry	03 Hrs.	80
IV	Spectroscopy –II	03 Hrs.	80

2. **Seminar:** **Four**
3. **Internal Assessment : Four** **4x10** **40**
4. **Laboratory Course** **4x10** **40**

Paper	Course	Duration	Marks
I	Lab Course V	10 Hrs	100
II	Lab Course VI	06 Hrs	100

Distribution of Marks for Laboratory Courses:

Experiments – 60
Viva -- 20
Sessional -- 20

Total Marks

Theory 320 + Seminar 40 + Internal Assessment 40+ Lab. Course 200= 600

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , **SEMESTER –III** 1609

SESSION 2016 -2017 AND 2017 – 2018

PAPER - I

BIOCHEMISTRY - I

Metals Ions in Biological System:- Essential and trace metals.

Metal storage Transport and Biomineralization:- Ferritia, transferring and siderophores.

Na^+ /K^+ Pump :- Role of Metals Ions in Biological processes.

Calcium in Biology :- Calcium in living cells, Transport and Regulation, Molecular aspects of intramolecular processes, extracellular binding proteins.

Metal- Nucleic Acid Interaction :- Metal Ion and metal complex interactions. metal complexes – nucleic acid.

Metals in Medicines :- Metal deficiency and disease , toxic effects of metals for diagnosis and chemotherapy with particular reference to anti cancer drugs.

Bioenergetics and ATP Cycle :- DNA polymerization, glucose storage metal complexes in transmission of energy, chlorophylls, Photosystem-I , and Photosystem-II in cleavage of water model system.

Bioenergetics :- standard free energy change in biochemical reactions exergonic endergonic hydrolysis of ATP, Synthesis of ATP from ADP

Electron Transfer in Biology :- Structure and function of metalloproteins in electron transport process- cytochoromes and iron- sulphur proteins, synthetic models.

Transport and storage of Dioxygen :- Heme proteins and oxygen uptake, structure and function of hemoglobin , Myoglobin , Haemocyanines and Haemoerythrin .

Nitrogenase :- Biological Nitrogen fixation, Molybdenum nitrogenase spectroscopic and other evidences, other nitrogenase model systems.

Book Suggested:-

1. Principles of Organic Bioinorganic Chemistry. S.Lippard and J.M.Berg.
2. Bioinorganic Chemistry .I.Bertini, H.B.Gray, S.L.Lippard, J.S.Valentine, University Science Books.
3. Inorganic Biochemistry Vol-II and I.Ed G.L.Eichhorn, Elsevier.
4. Progress in inorganic Chemistry, Vol.18 & 38 ed J.J.Lippard Wiley.
5. Understanding Enzyme,Trevor Palmer, Prentice Hall.
6. Enzyme Chemistry Impact and Applications, Ed. Collin J.Suckling Chapman and Hall
7. Enzyme Mechanisms M.I.Page.and A Williams Royal Society of chemistry.
8. Fundamentals of enzymology, N.C.Price and L.Stevenc Oxford University Press
9. An Introduction and applications in Biotechnology , Michael D. Trevan and John wiley.
10. Enzymatic reaction Mechanism ,C. Walsh, W.H.Freeman.
11. Enzyme Structure and Mechanism , A.Fersht, W.H.Freeman.
12. Outlines of Biochemistry,E.E.Conn and P.K.Stimf,John Wiley.
13. Macromolecules: Structure and Function, F.Wold. Prentice Hall.
14. Fundamentals of Biochemistry, Voet & Voet.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)
DEPTT OF CHEMISTRY
M.Sc. : CHEMISTRY , SEMESTER –III 1610
SESSION 2016 -2017 AND 2017 – 2018
PAPER - II

NATURAL PRODUCTS

Terpenoids and Carotenoids

Classification, nomenclature, occurrence, isolation, general Methods of structure. determination, isoprene rule. Structure determination, stereochemistry, biosyntheses and synthesis of the following representative molecules: Citral, Geraniol, α- Terpeneol, Methol, Farnesol, Zingiberene, Santonin, Phytol Abietic acid and β- Carotene.

Alkaloids

Definition, nomenclature and Physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, role of alkaloids in plants. Structure stereochemistry, synthesis and biosynthesis of the following : Ephedrine , (+) – Coniine, Nicotine, Atropine, Quinine and Morphine.

Steroids

Occurrence, nomenclature, basic skeleton, Diel's hydrocarbon and stereochemistry . Isolation, Structure determination and synthesis of Cholesterol, Bile acid, Androsterone, Testosterone, Estrone, Progesterone, Aldostreone.

Porphyrins

Structure and synthesis of Haemoglobin and Chlorophyll.

Plant Pigment

Structure of Quercetin, myrcetin, Cyanidin, Histidin

Books suggested:-

1-Natural Products Chemistry and Biological Significance, J.Mann, R.S. Devidson, J.B. Hobbs.
2-Organic Chemistry, D.V. Banthrope, Longman Essex,J.B.Harbrone.
Stereoselective Synthesis,M.Nogardi and CHV. Odds Chemistry of Carbon compounds, ED.S Coffey Elsevier.

3-Biological and Pharmacological Properties of medicinal p;ants from Americans, M.P. Gupta, A. Marston, Harwood Academic Publishers.
4-Introduction to Flavonoids, B.A. Bohm. Harwood Academic Publishers.
5-N-ew Trends in Natural Products, Rahman and M.I. Choudhary.
6-Insecticides of Natural Origin, Sukh dev.
7-Text book of Medicinal and Pharmaceutical Chemistry, Robert F.Dorde.
8-An introduction to Drug Design,S.S. Pandeya and J.R. Demmock.
9-Berger's Medicinal Chemistry and Drug Discovery, Vol. I (Chapter-9 and Ch. 14.)Goodman and Gillman's Pharmacological Basis of Therapeutics, Mc Graw Hill.
10-The Organic Chemistry of Drug Action, R.B. Silverman.Strategies for Organic Synthesis and Design D. Lendnicer, John Wiley.
11- Natural Product, Vol.-I & II, O.P. Agrawal.

5/11/16

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)
DEPTT OF CHEMISTRY
M.Sc. : CHEMISTRY , SEMESTER –III 1611
SESSION 2016 -2017 AND 2017 – 2018
PAPER -III

Environmental Chemistry

Environment

Introduction. Composition of atmosphere, vertical temperature, heat budget of the earth atmospheric system, vertical stability atmosphere. Biogeochemical cycle of C,N,P,S, and O . Biodistribution of element.

Hydrosphere

Chemical composition of water bodies – lakes, Streams, rivers and wet lands etc. Hydrological cycle.Aquatic pollution - Inorganic , Organic , Pesticide, Agricultural, Industrial and sewage, Detergents, Oil spills and Oil Pollutants. Water quality parameters - dissolved Oxygen, biochemical Oxygen demand, solids, metals, content of chloride, Sulphate, Phosphate, Nitrate and micro – Organism . Water quality standards.

Analytical method for measuring BOD, DO,COD , F, Oils , Metals (As,Cd, Cr,Hg, Pb, Se etc.) , Residual chloride and chlorine demand.Purification and treatment of water.

Soils

Composition, micro and macro nutrients, Pollution – fertilizers , Pesticides, Plastics, and Metals. Waste treatment.

Atmosphere

Chemical composition of atmosphere - particles, Ions and radicals and their formation . Chemical and Photochemical reaction in atmosphere, smog formation, oxides of N,C,S,O and their effects, Pollution by chemicals, petroleum, minerals, chlorofluorohydrocarbons . Green house effects, acid rain , air pollution

5/12/16

controls and their chemistry. Analytical methods for measuring air pollutants. Continuous monitoring I nstruments.

Industrial Pollution

Cement, Sugar, distillery, Drug, Paper, and pulp, thermal power plants, Nuclear power plants, Metallurgy. Polymers , drugs etc. Radionuclide analysis. Disposal of wastes and their management.

Environmental Toxicology

Chemical solutions to environmental problems , biodegradability, Principles of Decomposition, better Industrial processes. Bhopal gas tragedy, Chernobyl, three mile island, sewozo and Minamata disasters.

Book Suggested :-

1.Environmental Chemistry, S.E. Manahan, Lewis Publishers.

2.Environmental Chemistry, Sharma and 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, W. H. freeman.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –III 1612

SESSION 2016 -2017 AND 2017 – 2018

PAPER -IV

SPECTROSCOPY-II

Electron Spin Resonance Spectroscopy

Hyperfine Structure of radicals containing hydrogen and other nuclei like N,C ,D,and P .Fine structure , electron- electron coupling, zero field splitting ,Kramer's degeneracy , ESR of Transition Metal complexes, Applications

Ultraviolet And Visible Spectroscopy

Various electronic transition (180-800 nm) Beer-Lambert law, effect of solvent on electronic transitions ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, Ultraviolet spectra of aromatic and heterocyclic compounds , steric effects in biphenyls, Fisher Kunn Rule – for conjugated polyenes, Absorption maximum for derivation of Acyl Benzenes.

Infra Red Spectroscopy

Instrumentation and sample handling characteristics vibrational frequencies of alkenes, alkenes, alkynes, aromatic compounds alcohols, ethers, phenols and amines. Detailed study of vibrational frequencies of carbonyl compounds (Ketones , aldehydes , esters, amides, acid anhydrides, lactones, lactums and vibrational frequencies, overtones, combination bonds and fermiresonance, FTIR, IR os gases, solids and polymeric materials)

Nuclear Magnetic Resonance Spectroscopy

General Introduction and definition , chemical shift spin-spin interaction, shielding mechanism, of measurements. chemical shift value and co relation for protons bonded to carbon (Aliphatic , Olifinic , Aldehydeic and Aromatic) and other nuclei. (Alcohol, Phenols, Enols, Carboxylic acid, Amines, Amides and Mercaptol) chemical exchange, effect of deterioration, complex spin-spin interaction between 2,3,4 and 5 nuclei (First order spectra), vitual coupling. Stereo chemistry, Hindered rotation , Karplus curvevariation of coupling constant with dihedral angle. Simplification of complex spectra, nuclear magnetic double resonance contact shift reagent solvent effect. Fourier transform technique , nuclear Oberhauser effect (NOE) resonance of other nuclei.

5/12/16

^{13} CNMR Spectroscopy

General consideration, chemical shift of " straight chain alkanes,branched . alkanes,alkanes containing different substituents,Alkenes,Benzene and its derivatives, DEPT(Distortionless Enhancement by Polarisation transfer),Applications

^{19}FNMR,^{31}PNMR Spectroscopy And its Applications

Mass Spectroscopy

Introduction, Ion production EI,CI, FD, and FAB, factor effecting fragmentation, ion analysis, ion abundance. Mass spectrum fragmentation of organic compounds, common functional groups, molecular ion peak, metastable peak, machalafferty rearrangement. Nitrogen rule, high resolution of mass spectrometry. Examples of mass spectra fragmentation of organic compounds with respect to their structure determination. Ring rule double bond equivalent. Mass spectra of saturated and unsaturated hydrocarbons,Aromatic hydrocarbons,Alcohols,Ethers,Ketones Aldehydes Carboxylic acid,Esters ,Amides Amines,Halogen compounds .Applications.

Book Suggested :-

1-Elementary Organic Spectroscopy, Y.R. Sharma.

2-Infrared and Raman Spectra : Inorganic and Coordination compounds, K. Nakamoto, Wiley.

3-Inorganic Electronic Spectroscopy , A.P. B. Lever, Elsevier.

4-NMR, NOR, EPR, and Mossbauer Spectroscopy in Inorganic chemistry, R. V. Parish, Eillis Horwood.

5-Application of spectroscopy of Organic compounds, J. R. Dyer, Prentice hall.

6-Spectroscopic Methods in organic chemistry, D. H. Williams, I. Fleming, Tata Mc Graw-Hill.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY SEMESTER –III

SESSION 2018 -2019 AND 2019 – 2020

M.Sc. Chemistry examination will be conducted in four semester exam (Sem.I,II,III,&V). In each semester there are four theory papers and two laboratory courses of maximum marks 100 each paper. Each theory paper of 100 marks is divided into external examination of 80 marks and internal examination of 20 marks.

SEMESTER – III

Theory Papers

Paper	Course	CODE	Duration	Marks
I	Biochemistry Chemistry-1	MCH -31	03 Hrs.	80
II	Natural Product	MCH -32	03 Hrs.	80
III	Environmental Chemistry	MCH -33	03 Hrs.	80
IV	Spectroscopy –II	MCH -34	03 Hrs.	80

Laboratory Course

Paper	Course	CODE	Duration	Marks
I	Lab Course -V	MCH -35	06 Hrs	100
II	Lab Course -VI	MCH -36	06 Hrs	100

Distribution of Marks for Laboratory Courses:

Experiments – 60
Viva -- 20
Sessional -- 20

Total Marks Theory 320 +Internal Examination 80+ Lab. Course 200= 600

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY **SEMESTER –III** 1609

SESSION 2018 -2019 AND 2019 – 2020

PAPER – I , ~~CODE MCH-~~31

BIOCHEMISTRY - I

Metals Ions in Biological System:- Essential and trace metals.

Metal storage Transport and Biomineralization:- Ferritia, transferring and siderophores.

Na^+ /K^+ Pump :- Role of Metals Ions in Biological processes.

Calcium in Biology :- Calcium in living cells, Transport and Regulation, Molecular aspects of intramolecular processes, extracellular binding proteins.

Metal- Nucleic Acid Interaction :- Metal Ion and metal complex interactions. metal complexes – nucleic acid.

Metals in Medicines :- Metal deficiency and disease , toxic effects of metals for diagnosis and chemotherapy with particular reference to anti cancer drugs.

Bioenergetics and ATP Cycle :- DNA polymerization, glucose storage metal complexes in transmission of energy, chlorophylls, Photosystem-I , and Photosystem-II in cleavage of water model system.

Bioenergetics :- standard free energy change in biochemical reactions exergonic endergonic hydrolysis of ATP, Synthesis of ATP from ADP

Electron Transfer in Biology :- Structure and function of metalloproteins in electron transport process- cytochoromes and iron- sulphur proteins, synthetic models.

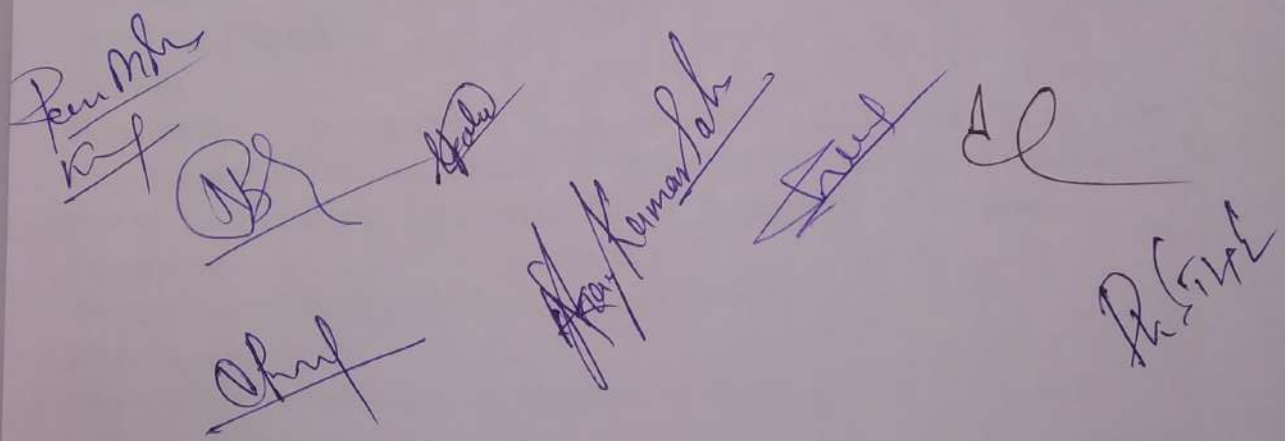
Transport and storage of Dioxygen :- Heme proteins and oxygen uptake, structure and function of hemoglobin , Myoglobin , Haemocyanines and Haemoerythrin .

Nitrogenase :- Biological Nitrogen fixation, Molybdenum nitrogenase spectroscopic and other evidences, other nitrogenase model systems.

Book Suggested:-

Fundamentals of Biochemistry, Voet & Voet.

1 Principles of Organic Bioinorganic Chemistry. S.Lippard and J.M.Berg.
2. Bioinorganic Chemistry .I.Bertini, H.B.Gray, S.L.Lippard, J.S.Valentine, University Science Books.
3. Inorganic Biochemistry Vol-II and I.Ed G.L.Eichhorn, Elsevier.
4. Progress in inorganic Chemistry, Vol.18 & 38 ed J.J.Lippard Wiley.
5. Understanding Enzyme,Trevor Palmer, Prentice Hall.
6. Enzyme Chemistry Impact and Applications, Ed. Collin J.Suckling Chapman and Hall
7. Enzyme Mechanisms M.I.Page.and A Williams Royal Society of chemistry.
8. Fundamentals of enzymology, N.C.Price and L.Stevenc Oxford University Press
9. An Introduction and applications in Biotechnology , Michael D. Trevan and John wiley.
10. Enzymatic reaction Mechanism ,C. Walsh, W.H.Freeman.
11. Enzyme Structure and Mechanism , A.Fersht, W.H.Freeman.
12. Outlines of Biochemistry,E.E.Conn and P.K.Stimf,John Wiley.
13. Macromolecules: Structure and Function, F.Wold. Prentice Hall.



K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –III 1610

SESSION 2018 -2019 AND 2019 – 2020

PAPER – II ~~CODE MCH-32~~

NATURAL PRODUCTS

Terpenoids and Carotenoids

Classification, nomenclature, occurrence, isolation, general Methods of structure. determination, isoprene rule. Structure determination, stereochemistry, biosyntheses and synthesis of the following representative molecules: Citral, Geraniol, α- Terpeneol, Methol, Farnesol, Zingiberene, Santonin, Phytol Abietic acid and β- Carotene.

Alkaloids

Definition, nomenclature and Physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, role of alkaloids in plants. Structure stereochemistry, synthesis and biosynthesis of the following : Ephedrine , (+) – Coniine, Nicotine, Atropine, Quinine and Morphine.

Steroids

Occurrence, nomenclature, basic skeleton, Diel's hydrocarbon and stereochemistry . Isolation, Structure determination and synthesis of Cholesterol, Bile acid, Androsterone, Testosterone, Estrone, Progesterone, Aldostreone.

Porphyrins

Structure and synthesis of Haemoglobin and Chlorophyll.

Plant Pigment

Structure of Quercetin, myrcetin, Cyanidin, Histidin

Books suggested:-

1-Natural Products Chemistry and Biological Significance, J.Mann, R.S. Devidson, J.B. Hobbs.

2-Organic Chemistry, D.V. Banthrope, Longman Essex,J.B.Harbrone. Stereoselective Synthesis,M.Nogardi and CHV. Odds Chemistry of Carbon compounds, ED.S Coffey Elsevier.

3-Biological and Pharmacological Properties of medicinal p;ants from Americans, M.P. Gupta, A. Marston, Harwood Academic Publishers.

4-Introduction to Flavonoids, B.A. Bohm. Harwood Academic Publishers.

5-N-ew Trends in Natural Products, Rahman and M.I. Choudhary.

6-Insecticides of Natural Origin, Sukh dev.

7-Text book of Medicinal and Pharmaceutical Chemistry, Robert F.Dorde.
8-An introduction to Drug Design,S.S. Pandeya and J.R. Demmock.
9-Berger's Medicinal Chemistry and Drug Discovery, Vol. I (Chapter-9 and Ch. 14.)Goodman and Gillman's Pharmacological Basis of Therapeutics, Mc Graw Hill.
10-The Organic Chemistry of Drug Action, R.B. Silverman.Strategies for Organic Synthesis and Design D. Lendnicer, John Wiley.
11- Natural Product, Vol.-I & II, O.P. Agrawal.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , **SEMESTER –III** 1611

SESSION 2018 -2019 AND 2019 – 2020

PAPER –III ~~CODE MCH-33~~

Environmental Chemistry

Ecosystem

Concept of ecosystem,Structure and function of an ecosystem .Producers, Consumers and Decomposers, Biogeochemical cycles, Hydrological cycles , Carbon cycle, Oxygen cycle,nitrogen cycle, Phosphorus cycle, Sulphur cycle, Ecological Energetics: Energy flow in an ecosystem, Single-channel energy model, Food chains: Graqzing food chain, Detritus food chain , food webs ,Ecological pyramid: Pyramids of numbers, pyramides of biomass, pyramides of energy, Major ecosystems: forest ecosystem, grassland ecosystem, Desert ecosystem, Aquqtic ecosystem, Riverine and stream ecosystem, Marin ecosystem, Stuarin ecosystem

Energy Resources :Introdction, Renewable – Nonrenewable energy resources, Renewable resoures Solar energy, Ocean Thermal energy, Wind energy,Geothermal energy, Hydel energy, Hydrogen energy, Tidal energy, Biomass energy, Nuclear energy

Atmosphere

Introduction. Composition of atmosphere, vertical temperature, heat budget of the earth atmospheric system, vertical stability atmosphere, Chemical composition of atmosphere - particles, Ions and radicals and their formation . Chemical and Photochemical reaction in atmosphere, smog formation, oxides of N,C,S,O and their effects, Pollution by chemicals, petroleum, minerals, Stratospheric ozone depletion, Ozone distribution and temperature profile in the atmosphere,

Production of ozone in atmosphere, Ozone hole, Effect of ozone depletion, Protecting ozone layer, Green house effects, acid rain .

Industrial Pollution

Cement, Sugar, distillery, Drug, Paper, and pulp, thermal power plants, Nuclear power plants, Metallurgy. Polymers , drugs etc. Radionuclide analysis. Disposal of wastes and their management.

Environmental Toxicology

Chemical solutions to environmental problems , biodegradability, Principles of Decomposition, better Industrial processes. Bhopal gas tragedy, Chernobyl, three mile island, sewozo and Minamata disasters.

Book Suggested :-

1.Environmental Chemistry, S.E. Manahan, Lewis Publishers.

2.Environmental Chemistry, Sharma and 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, W. H. freeman.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –III 1612

SESSION 2018 -2019 AND 2019 – 2020

PAPER –IV ~~CODE MCH-34~~

SPECTROSCOPY-II

Electron Spin Resonance Spectroscopy

Hyperfine Structure of radicals containing hydrogen and other nuclei like N,C, D and P .Fine structure , electron- electron coupling, zero field splitting ,Kramer's degeneracy , ESR of Transition Metal complexes, Applications

Ultraviolet And Visible Spectroscopy

Various electronic transition (180-800 nm) Beer-Lambert law, effect of solvent on electronic transitions ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, Ultraviolet spectra of aromatic and heterocyclic compounds , steric effects in biphenyls, Fisher Kunn Rule – for conjugated polyenes, Absorption maximum for derivation of Acyl Benzenes.

Infra Red Spectroscopy

Instrumentation and sample handling characteristics,Factors affecting Vibrational frequencies(Coupled Vibration &Fermi resonance, Electronic effect, Hydrogen Bonding) , vibrational frequencies of alkanes, Alkenes, Alkynes, Haloalkanes, Alcohols, Ethers, Aldehydes & Ketones, Ester & Lactones,carboxylic Acids,Acid halides, Acid anhydrides, Amides and lactames, Anilides and Nitrcompounds. Comparative study of vibrational frequencies of carbonyl compounds (Ketones , aldehydes , esters, amides, acid anhydrides, lactones, lactums and vibrational frequencies, overtones, combination bonds ,Applications of IR Spectroscopy

Nuclear Magnetic Resonance Spectroscopy

General Introduction and definition , chemical shift, spin-spin interaction, shielding mechanism, of measurements. chemical shift value and co relation for protons bonded to carbon (Aliphatic , Olifinic , Aldehydeic and Aromatic) and other nuclei. (Alcohol, Phenols, Enols, Carboxylic acid, Amines, Amides and Mercaptol) chemical exchange, effect of deterioration, complex spin-spin interaction between 2,3,4 and 5 nuclei (First order spectra), vitual coupling. Stereo chemistry, Hindered rotation , Karplus curvevariation of coupling constant

with dihedral angle. Simplification of complex spectra, nuclear magnetic double resonance contact shift reagent solvent effect. Nuclear Oberhauser effect (NOE).

^{13}CNMR Spectroscopy

General consideration, chemical shift of " straight chain alkanes,branched . alkanes,alkanes containing different substituents,Alkenes,Benzene and its derivatives, DEPT(Distortionless Enhancement by Polarisation transfer), Applications

^{19}FNMR, ^{31}PNMR Spectroscopy And its Applications

Mass Spectroscopy

Introduction, Ion production EI,CI, FD, and FAB, factor effecting fragmentation, ion analysis, ion abundance. Mass spectrum fragmentation of organic compounds, common functional groups, molecular ion peak, Metastable peak, Mclafferty rearrangement. Nitrogen rule, high resolution of mass spectrometry. Examples of mass spectra fragmentation of organic compounds with respect to their structure determination. Ring rule double bond equivalent. Mass spectra of saturated and unsaturated hydrocarbons, Aromatic hydrocarbons, Alcohols, Ethers, Ketones Aldehydes Carboxylic acid, Esters ,Amides Amines, Halogen compounds .Applications.

Book Suggested :-

1-Elementary Organic Spectroscopy, Y.R. Sharma.

2-Infrared and Raman Spectra : Inorganic and Coordination compounds, K. Nakamoto, Wiley.

3-Inorganic Electronic Spectroscopy , A.P. B. Lever, Elsevier.

4-NMR, NOR, EPR, and Mossbauer Spectroscopy in Inorganic chemistry, R. V. Parish, Eillis Horwood.

5-Application of spectroscopy of Organic compounds, J. R. Dyer, Prentice hall.

6-Spectroscopic Methods in organic chemistry, D. H. Williams, I. Fleming, Tata Mc Graw-Hill.

K.G. ARTS AND SCINCE COLLEGE, RAIGARH(C.G.)

M.Sc. CHEMISTRY

SESSION 2018 -2019 AND 2019 – 2020

PRACTICAL: SEMSTER-III 1621

Lab Course V CODE MCH-35

Chemical Kinetics

Determination of Order of hydrolysis of ester (ethyl acetate,methyl acetate) by sodium hydroxide

Determination of velocity constant of hydrolysis of ethyl acetate by sodium hydroxide

Determination of activation energy of hydrolysis of ester (ethyl acetate,methyl acetate) by sodium hydroxide

Spectrophotometry

Titration of hydrochloric acid by sodium hydroxide using phenolphthalein indicator

Titration of Fe(II) with potassium permanganate

Determination of concentration of Fe(III) titrating with EDTA

Titration of Cu(II) solution with EDTA

Determination of Concentration of Ni(II) titrating with EDTA

Determination of composition of copper and iron with EDTA

Determination of composition of copper and Bismuth with EDTA

pH Metry

Titration of Strong Acid with Strong Base

Titration of Strong Acid with Weak Base

Titration of Weak Acid with Strong Base

Titration of Weak Acid with Weak Base

K.G. ARTS AND SCINCE COLLEGE, RAIGARH(C.G.)

M.Sc. CHEMISTRY

SESSION 2018 -2019 AND 2019 – 2020

PRACTICAL: SEMSTER-III 1622

Lab Course VI ~~CODE MCH-36~~

pH Metry

Determination of Concentration of HCl and CH_3COOH titrating with NaOH

Determination of Concentration of HCl and Oxalic Acid titrating with NaOH

Conductometry

Titration of $AgNO_3$ with HCl

Titration of $AgNO_3$ with KCl

Titration of $BaCl_2$ with K_2SO_4

Titration of $MgSO_4$ with $BaCl_2$

Titration of $AgNO_3$ with KCl and KI

Titration of Sodium Acetate with HCl

Titration of Sodium Oxalate with HCl

Surface Tension

Study of variation of surface of surface tension of liquid with composition and determination of limiting cross sectional area

Determination of CMC of soap and detergents

Determination of Cleaning Power of two soap and detergents

Chemical Kinetics

Study on influence of ionic strength on rate constant of hydrolysis of ester (ethyl acetate,methyl acetate) by sodium hydroxide

Determination of Order of hydrolysis of ester (ethyl acetate,methyl acetate) by hydrochloric Acid

Determination of Activation energy of hydrolysis of ester (ethyl acetate,methyl acetate) by hydrochloric Acid

Determination of velocity constant of hydrolysis of ester (ethyl acetate,methyl acetate) by Hydrochloric acid

Study on influence of ionic strength on rate constant of hydrolysis of ester (ethyl acetate,methyl acetate) by hydrochloric acid

Determination of velocity constant and order of reaction between potassium persulphate and potassium iodide

Study of influence of ionic strength of velocity constant of reaction between potassium persulphate and potassium iodide

Determination of relative strength of two acids by hydrolysis of an ester

Determination of velocity constant of hydrolysis of ester in micellar media

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –I V

SESSION 2016 -2017 AND 2017 – 2018

M.Sc. Chemistry examination will be conducted in four semester exam (Sem.I,II,III,&V). In each semester there are four theory papers and two laboratory courses. Maximum marks for each theory and laboratory courses are 100.

In each semester, four seminars of 10 marks and four Internal Assessment of 10 marks are compulsory for every student which is included in 100 marks of each Theory paper.

SEMESTER – IV

1. Theory Papers

Paper	Course	Duration	Marks
I	Analytical Chemistry	03 Hrs.	80
II	Biochemistry Chemistry II	03 Hrs.	80
III	Polymer Chemistry **or** Medicinal Chemistry	03 Hrs.	80
IV	Photo Chemistry & Solid State Chemistry	03 Hrs.	80

2. Seminar: **Four** **4x10** **40**

3. Internal Assessment : Four **4x10** **40**

4. Laboratory Course

Paper	Course	Duration	Marks
I	Lab Course VII	10 Hrs	100
II	Lab Course VIII	06 Hrs	100

Distribution of Marks for Laboratory Courses:

Experiments – 60
Viva -- 20
Sessional -- 20

Total Marks

Theory 320 + Seminar 40 + Internal Assessment 40+ Lab. Course 200= 600

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHMISTRY , SEMESTER –IV 1613

SESSION 2016 -2017 AND 2017 – 2018

PAPER – I

ANALYTICAL CHEMISTRY

Introduction

Role of analytical Chemistry. Classification of analytical methods – classical and instrumental. Types of Instrumental analysis . Selecting an analytical method. Neatness and cleanliness. Laboratory operations and practices. Analytical balance . Techniques of weighing, errors . Volumetric glassware– cleaning and calibration of glassware . sample preparation – dissolution and decompositions. Gravimetric techniques. Selecting and Handling of reagents. Laboratory notebooks . Safety and analytical laboratory .

Errors and Evaluation

Definition of terms in mean and median. Precision - standard deviation, Relative standard deviation. Accuracy – Absolute error, Relative error . Types of error in experimental data – determinate (systematic) , Indeterminate (or random) and gross. Sources of errors and the effects upon the analytical results. Methods for reporting analytical data . Statistical evaluation of data - indeterminate errors. The uses of statistics. Test of significance, the **f- test** the student **t- test** the **chi square test**, the correlation coefficient, confidence limit of the mean, Comparison of two standard values, Comparison of standard deviation with average deviation. Significance figure regression analysis (least square method for linear and non – linear Plots)

Food Analysis

Moisture , ash , Crude Protein , Fat, Crude , Fibre, Carbohydrates , Calcium , Potassium , Sodium and Phosphate. Food adulteration – common adulterants in food, contamination of food stuffs. Microscopic examination of food for

adulterants. Pesticide analysis in food products. Extraction and Purification of sample. HPLC. Gas chromatography for organophosphates. Thin- layer chromatography for identification of chlorinated pesticides in food products.

Analysis of Water Pollution

Origin of waste water, types, water pollutants and their effects. Sources of water pollution – domestic , Industrial , Agricultural soil and radioactive wastes as sources of pollution. Objectives of analysis – Parameter for analysis – colour, turbidity, total solids, conductivity , acidity, alkalinity, Hardness , Chloride, Sulphate, Fluoride , Silica, Phosphate and different forms of Nitrogen. Heavy metal pollution – Public health significance of cadmium, chromium, copper , lead , zinc , manganese, mercury and arsenic. General survey of Instrumental technique for the analysis of heavy metals in aqueous systems. Measurements of DO , BOD, and COD . Pesticide as water pollutants and analysis. Water pollution laws and standards.

Analysis of Soil, Fuel, Body Fluids and Drugs

(a) Analysis of soil : moisture, pH, total Nitrogen, Phosphorus, silica , lime magnesia, manganese, Sulphur and alkali salts.

(b) Fuel analysis : solid, Liquid, and gas. Ultimate and proximate analysis- heating values-grading of coal. Liquid fuels- flash point, aniline point, octane number and carbon residue. Gaseous fuels-producer gas and water gas – calorific value.

(c) Clinical chemistry : Composition of blood – collection and preservation of samples. Clinical analysis. serum electrolytes, blood Glucose, blood urea Nitrogen, uric acid, albumin, globulins, barbiturates, acid and alkaline phosphatases.

Immunoassay: Principles of radio immunoassay (RIA) and applications. The blood gas analysis – trace elements in body.

(d) Drug analysis : Narcotics and dangerous drugs . classification of drugs . Screening by gas and thin- layer chromatography and spectrophotometric measurements.

Treatment of Equilibria

General treatment of equilibria in aqueous medium involving monoprotic weak acid and weak base, and Salt of weak acid and weak base . Effect of electrolytes on chemical equilibria – Solubility product , Common Ion effect. Calculation of pH. Constructing titration curves. Acid base titration and theory of pH Indicators. Complexation equlibria and complexometric titration , Redox equilibria and Redox titration, Theory of redox indicators , Precipitation reaction and precipitation titration and theory of adsorption indicators.

Book Suggested

1.Analytical chemistry , G.D. Christian, J. Wiley.

2.Fundamentals of analytical chemistry, D.A. skoog, D.M. west and F.J. Holler, W. B. Saunders.

3.Analytical chemistry – Principles, J. H. Kennedy , W.B. Saunders.

4.Analytical chemistry – Principles and techniques, L.G. Hargis , Prentice Hall.

5.Principles of Instrumental Analysis, D.A. skoog and J.L. Loary ,W. B. Saunders.

6.Principles of Instrumental Analysis, D.A. skoog and W. B. Saunders.

7.Quantitative Analysis, R.A. Day, Jr. and A.L. Underwood, Prentice Hall.

8.Environmental solution Analysis , S.M.Khopkar, Wiley Eastern.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)
DEPTT OF CHEMISTRY
M.Sc. : CHEMISTRY , SEMESTER –IV 1614
SESSION 2016 -2017 AND 2017 – 2018
PAPER – II
BIOCHEMISTRY -II

Introduction :- Basic consideration, Basic Molecules of life and limitations of biochemical reactions.

Biological cell and its constituents :- Biological cell, structure and function of protein enzymes.

Enzymes:-

Remarkable properties of enzymes like catalytic power, specificity and regulation. Nomenclature and classification of enzyme, extraction and purification. Fischer's look and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors , affinity and enzyme modification by sits direct mutagenesis, enzyme kinetics , Michaelis- Menten and Lineweaver- Burk plots, reversible and irreversible inhibitions.

Mechanism of enzyme Action:-

Transition state theory, Orientation and steric effect Example of some typical enzyme mechanisms for chymotripsin, Ribonuclease. Lysozyme and carboxypeptidase A.

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

Co- enzyme Chemistry :- co factors as derived from vitamins, coenzymes, prosthetic groups, and apoenzymes. Structure and biological function of coenzyme A. Thiamine pyrophosphate, pyridoxal phosphate, NAD+, NADP+, FMN, FAD, Lipoic acid, Vitamin B 12.

Biotechnological Application of Enzymes:-
Techniques and Method of immobilization of enzymes, effects of immobilization on enzyme activity application of immobilization enzymes, use of enzymes in food and drink Industry- brewing and cheese- making syrups from corn starch, enzyme as targets for drug design. Clinical use of enzymes, enzyme therapy, enzymes and recombinant DNA technology.

Thermodynamic of Biopolymer Solutions :- Thermodynamics of biopolymer solutions osmotic pressure, membrane equilibrium, muscular contraction and energy generation in mechanochemical system.

Cell membrane and Transport of Ions:- Structure and function of cell membrane ion transport through cell membrane irreversible thermodynamics treatment of membrane transport and Nerve Conductions.

Metalloenzymes :- Zinc Enzymes- carboxypeptidass and carbonic anhydrase.Iron Enzymes- catalyses, Peroxidase and cytochrome P-450. Copper Enzyme – super oxide dismutase, Molybdenum oxatransferase enzymes – xanthine oxidase, co enzyme vitamin B 12.

Enzyme Models :- Host guest chemistry , chiral recognition and catalysis, Molecular recognition, Molecular asymmetry and prochirality. Biomimertic chemistry crown ethers, cryptates. Cyclodextrins, cyclodexrin based enzyme models.

Book Suggested:-

1. Principles of Organic Bioinorganic Chemistry. S.Lippard and J.M.Berg.
2. Bioinorganic Chemistry .I.Bertini, H.B.Gray, S.L.Lippard, J.S.Valentine, University Science Books.
3. Inorganic Biochemistry Vol-II and I.Ed G.L.Eichhorn, Elsevier.
4. Progress in inorganic Chemistry, Vol.18 & 38 ed J.J.Lippard Wiley.
5. Understanding Enzyme,Trevor Palmer, Prentice Hall.
6. Enzyme Chemistry Impact and Applications, Ed. Collin J.Suckling

Chapman and Hall
Enzyme Mechanisms M.I.Page.and A Williams Royal Society of chemistry.

7.Fundamentals of enzymology, N.C.Price and L.Stevenc Oxford University Press

8 An Introduction and applications in Biotechnology , Michael D. Trevan and John wiley.

9.Enzymatic reaction Mechanism ,C. Walsh, W.H.Freeman.

10. Enzyme Structure and Mechanism , A.Fersht, W.H.Freeman.

11. Outlines of Biochemistry,E.E.Conn and P.K.Stimf,John Wiley.
12. Macromolecules: Structure and Function, F.Wold. Prentice Hall.
13. Fundamentals of Biochemistry, J.L.Jain.
14. Enzyme Chemistry, J. Suckling.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHMISTRY , SEMESTER –IV 1615 'B'

SESSION 2016 -2017 AND 2017 – 2018

PAPER – III

MEDICINAL CHEMISTRY

Drug design

Development of new drugs, procedure followed in drug design, factors governing in drug design , concepts of lead compounds and lead modification. Concept of prodrugs and soft drugs, structure –activity relationship (SAR). Factors affecting bioactivity , resonance , inductive effect, isosterism, bioisosterism, application of bioisosterism in drug design, Theories of drug activity , Occupancy theory,Rate theory , Induced fit theory. Quantitative Structure Activity Relationship (QSAR), concept of drug receptor, Elementary treatment of drug receptor interaction. Physiochemical parameters, Lipophilicity, Partition coefficient, Electronic ionization constant, steric, Shelton and surface activity parameters and redox potential ,free Wilson analysis, hansch analysis, relationship between free Wilson and hansch analysis. LD-50 and ED-50 (mathematical derivation of equation excluded).

Pharmacokinetics

Introduction of drug absorption, Disposition, Elimination using pharmacokinetics, important pharmacokinetic parameter in defining the drug disposition and in therapeutics . Mention uses of pharmacokinetics in drug development process.

Pharmacodynamics

Introduction , Elementary treatment of enzyme stimulation , enzyme inhibition , Sulphonamides, membrane active drugs, Drug metabolism, Drug metabolism organ and enzymes, Xenobiotics, Chemical pathways of drug Bio-transformation, Significance of drug metabolism in medicinal chemistry.

Anti –neoplastic agents

Introduction, Cause of cancer and treatment, Cancer chemotherapy , Special problems, Role of alkylating agents and antimetabolites in the treatment of cancer. Synthesis of Meclorethamines, Cyclophosamide, Malphlan, Chlorambucil,

Methotextrate, Uracil, Mustards and 6- Mercaptopurine, Recent development in cancer chemotherapy , Hormone and natural products.

Cardiovascular Drugs

Introduction, Heart anatomy and cardiac cycle , E.C.G., cardiovascular disease, Cardiovascular output . Direct acting arteriolar dilators. Synthesis of Amyl Nitrate, Sorbitrate, Diltiazem, Quinidin, Varapamil, Methyldepa, Propanolol.

Local anti infective drugs

Introduction and general mode of action , Synthesis of Sulphonamides, Furazolidone, Nalidoxic acid, Ciprofloxation , Norfloxation, Dapson, Amino Salicylic acid, Isoniazid, Etionamide, Ethambutal, Fluconazole, Econozole, Grisofulavin, Chloroquine and Primaquine.

Psychoactive drug – the chemotherapy of mind

Introduction, Neurotransmitters, CNS depressant, General anesthetics, Mode of action of hypnotics, Sedatives, Anti anxiety drugs, Benzodiazipines, Buspiron, Neurochemistry of mental disease. Antipsychotic drugs. The neuroleptics, antidepressants, Butyrophenones and drug development. Stereochemical aspects of psycotropic drugs. Synthesis of Diazepam, Alprazolam, Barbiturates, Thiopental Sodium.

Antibiotics

Cell wall, Biosynthesis, inhibitors, β- Lactam rings. Antibiotic inhibiting protein. Synthesis of Penicillin – 5, Ampicilline, Amoxycilline, Chloroamphenicol, Cephalosporine, Tetracycline and Streptomycin.

Books suggested

1. Introduction to Medicinal Chemistry , A Gringuage, Wiley – VCH.

2.Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry, Ed Robert F. Dorge.

3.An Introduction to Drug Design, S.S. Pandeya and J.R. Dimmock, New Age International.

4.Burgers Medicinal Chemistry and Drug Discovery, Vol-1 (chapter -9 and ch-14), Ed. M.E.Wolff, John Wiley.

5.Goodman and Gilman's Pharmacological Basis of Therapeutics, McGraw-Hill.

6.The Organic Chemistry of Drug Design and Drug Action, R.B. Silverman, Acedemic Press.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)
DEPTT OF CHEMISTRY
M.Sc. : CHMISTRY , **SEMESTER –IV** 1615 'A'
SESSION 2016 -2017 AND 2017 – 2018

PAPER – III
POLYMER CHEMISTRY

Macromolecules

Polymer-

Definition,typeofpolymers(Elastomer,Fiber,Resins,Plastics,Thermoplastics&Thermosettings,Natural rubber & Synthetic rubber), electrically conducting, fire resistant, liquid crystal polymers, kinetics of condensation polymerization, kinetics of addition polymerization ,free radical mechanism of polymerization ,ionic mechanism of polymerization , distribution of molecular size in step growth polymerization(probability of forming k-monomer molecule kmer, identification of probability with number fraction, average value of k, total number of monomer molecules , Number of kmer).

Molecular mass, number and mass average molecular mass, molecular mass determination (osmotic pressure method, viscosity method, light scattering methods, sedimentation method), chain configuration of macromolecules, calculation of average dimensions of various chain structures.

Surface Chemistry

(A) Adsorption

Surface tension, Curved surface, Laplace-Young Equation, capillary action and pressure difference across curved surface ,Laplace equation, vapour pressure of droplets, Kelvin equation, Langmuir adsorption isotherm, Gibbs adsorption equation for adsorption and surface tention, Multilayer theory of adsorption and BET equation, surface films on liquids (Electro-kinetic phenomenon, catalytic activity at surfaces.

(B) Micelles

Surface active agents, classification of Surface active agents, Micellization hydrophobic interaction, critical micellar concentration (CMC), factor affecting the

5/12/16

CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization - phase separation and mass action models, solubilization , micro emulsion , reverse micelles.

CatalysisCatalyst and catalysis, Type of catalysis, Kinetics of homogeneous catalysis Kinetics of acid-base catalysis,

Electrocatalysis

Electrocatalysis ,relative power of electrocatalysis, mechanism of electrocatalysis, Bioelectrocatasis enzyme catalysis, kinetics of enzyme catalysis, Michaelis-Menten equation, immobilization.

Corrosion

.Introduction to corrosion, Types of corrosion,(Galvanic corrosion, Erosion corrosion, Pitting corrosion, Crevice corrosion, Intergranular, Selective leaching, Stress corrosion, Waterline corrosion, Soil corrosion, Microbiological corrosion) Theories of corrosion, Direct chemical attack theory, Electrochemical theory ,Acid theory, Factors affecting corrosion, corrosion monitoring and prevention methods. (Designe and material selection, Cathodic & Anodic corrosion, Modifying the environment, Metallic Coating,)

Books Sugested

1. Textbook of polymer science , F.W. Billmeyer Jr.wiley.
2. Polymer science, V.R. Gowariker, N.V. Vishwanathan and J.Sreedhar,Wiley-Eastern.
3. Function Monomers and Polymer,K. Takemoto,Y. Inaki and RM. Ottanbrite.
4. Contemporary Polymer Chemistry, H.R. Alcock and F.W. Lambe, Prentice Hall.
5. Physics and Chemistry of Polymer, J.M.G. Cowie, Blackie Academic and Professional.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , **SEMESTER –IV** 1616

SESSION 2016 -2017 AND 2017 – 2018

PAPER – IV

PHOTOCHEMISTRY AND SOLID STATE CHEMISTRY

Photochemistry of Carbonyl Compounds

α-Cleavage or Norrish Type I Process- Norrish Type I process given by Acyclic Saturated Ketones, Reaction of Saturated Cyclic Ketones, Norrish type I process given by Cyclopentones, α-Cleavage given by Cyclobutanones. β-Cleavage Reaction, Intramolecular hydrogen abstraction (γ- Hydrogen Abstraction), Intermolecular Hydrogen Transfer: Intermolecular Photo Reduction. Photocycloaddition Reaction (Paterno-Buchi Reaction) – Addition to Electron-Rich Alkenes, Addition to Electron Deficient Alkenes, Oxitane Formation with Dienes and Alkynes, Intramolecular Paterno- Buchi Reaction. [2+2] Cycloaddition of Enones with Alkenes.

Photo Reduction and Photo Oxidation

Photo Reduction of Carbonyl Compounds and Aromatic hydrocarbons. Photochemical Oxidation. Photo oxidation of alkenes and polyenes.

Photochemistry of Alkenes, Dienes and Aromatic Compouds.

Photochemistry of alkenes , Cis-Trans Isomerisation of alkenes, Cis- Trans Isomerisation of alkenes by Direct Irradiation, Sensitised Cis-Trans Isomerisation. Dimerisation of alkenes , Intramolecular Dimerisation. Photochemistry of Conjugated Dienes in solution. Photochemistry of Benzene and substituted Benzene 1,2- Alkyl Group shift, Mechanism of 1, 3- Alkyl Group shift. Photoaddition of alkenes to Aromatic Benzenoid Compouds 1,2- Cycloaddition Reaction, 1,3- Photoaddition of Benzene, 1,4- Photoaddition of Benzene.

Photochemistry in Nature and Applied Photochemistry.

Photochemistry Reaction in the Atmosphere, Chemistry of Vision , Photography, Light Absorbing Compounds , Photochromism , Photoimaging , Photochemistry of polymers.

5/12/16

Solid state Chemistry

X-ray Diffraction

Bagg condition, Miller indices, Laue method, bragg method, Debye-Scherrer method of X-ray Structural analysis of crystals, index reflections, identification of unit cell from systematic absences in diffraction pattern. Structure of simple lattices and X-ray intensities, structure factor and its relation to intensity and electron density, phase problem. Description of the procedure for an X-ray structure analysis, absolute configuration of molecules,

Crystal defects and non- Stoichiometric Compounds – perfect & Imperfect crystal, Intrinsic and Extrinsic effects – point defects, line and plain defects, vacancies, Schottky and Frenkel defects, Thermodynamic of schotty and frankle defects formation, colour centers, non-stoicheometry and defects.

Electronic Properties of Bond Thepory

Metals, Insulators and semiconductors, electronic structure of solid band theory, band structure of metals, insulator and semiconductors. Intrinsic and extrinsic semiconductors, dopping semiconductors, p-n junction, superconductors. Optical properties – optical reflectance, photoconduction, photoelectric effects. Magnetic Properties - classification of materials quantum theories of paramagnetic cooperative phenomenon – magnetic domains hysteresius .

Book Suggested :-

1.Spectroscopy of Organic compounds, P.S. Kalshi, Y.R. Sharma.

2.Photochemistry and Pericylic Reaction, Jagdamba singh.

3.A. Gilbert and J.Baggott Essentials of Molecular Photochemistry, CRC Press, Boca Rotan, Florida 1991.

4.L. Salum, Electron in chemical Reaction, John Wiley and sons, New York, 1982.

5.J.M. Caxon and B. Halton, Organic Photochemistry, Cambridge Uneversity, Press, London 1974.

6.N.J. Turno, Molecular Photochemistry , W.A. 10 Benjamin New. York 1965.

05/12/16

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY , SEMESTER –I V

SESSION 2018 -2019 AND 2019 – 2020

M.Sc. Chemistry examination will be conducted in four semester exam (Sem.I,II,III,&V). In each semester there are four theory papers and two laboratory courses of maximum marks 100 each paper. Each theory paper of 100 marks is divided into external examination of 80 marks and internal examination of 20 marks.

SEMESTER – IV

Theory Papers

Paper	Course	CODE	Duration	Marks
I	Analytical Chemistry	MCH -41	03 Hrs.	80
II	Biochemistry Chemistry II	MCH -42	03 Hrs.	80
III	Polymer & Nuclear Chemistry **or** Medicinal Chemistry	MCH -43A MCH-43B	03 Hrs.	80
IV	Photo Chemistry & Solid State Chemistry	MCH -44	03 Hrs.	80

Laboratory Course

Paper	Course	CODE	Duration	Marks
I	Lab Course -VII	MCH -45	06 Hrs	100
II	Lab Course -VIII	MCH -46	06 Hrs	100

Distribution of Marks for Laboratory Courses:

Experiments – 60
Viva -- 20
Sessional -- 20

Total Marks -Theory 320 +Internal Examination 80+ Lab. Course 200= 600

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHMISTRY SEMESTER –IV 1613

SESSION 2018 -2019 AND 2019 – 2020

PAPER – I ~~CODE MCH-41~~

ANALYTICAL CHEMISTRY

Errors and Evaluation

Definition of terms in mean and median. Precision - standard deviation, Relative standard deviation. Accuracy – Absolute error, Relative error . Types of error in experimental data – determinate (systematic) , Indeterminate (or random) and gross. Sources of errors and the effects upon the analytical results. Methods for reporting analytical data . Statistical evaluation of data - indeterminate errors. The uses of statistics. Test of significance, the **f- test,** the student **t- test,** the **chi square test**, the correlation coefficient, confidence limit of the mean, Comparison of two standard values, Comparison of standard deviation with average deviation. Significance figure regression analysis (least square method for linear and non – linear Plots)

Food Analysis

Moisture , ash , Crude Protein , Fat, Crude , Fibre, Carbohydrates , Calcium , Potassium , Sodium and Phosphate. Food adulteration – common adulterants in food, contamination of food stuffs.

Analysis of Water Pollution

Origin of waste water, types, water pollutants and their effects. Sources of water pollution – domestic , Industrial , Agricultural soil and radioactive wastes as sources of pollution. Parameter for analysis – colour, turbidity, total solids, conductivity , acidity, alkalinity, Hardness , Chloride, Sulphate, Fluoride , Silica, Phosphate and different forms of Nitrogen. Heavy metal pollution – Public health significance of cadmium, chromium, copper , lead , zinc , manganese, mercury and arsenic. General survey of Instrumental technique for the analysis of heavy metals in aqueous systems. Measurements of DO , BOD, and COD , Total organic

carbon(TOC) ,Chlorine Demand. . Pesticide as water pollutants and analysis. Water pollution laws and standards.

Analysis of Soil, Fuel, Body Fluids

(a) Analysis of soil :

Composition, micro nutrients (Zn, Fe, Cu, Mn, B, Ca, Mg, Na) and macro nutrients (N P K), Texture, Bulk Density, Moisture, Water Holding Capacity, Electrical Conductivity, Redox potential, Alkalinity, Chlorine, Sulphate, Nitrogen , Nitrate, Total Phosphorus Phosphate , Organic Matter, fertilizers , Pesticides

(b) Fuel analysis : solid, Liquid, and gas. Ultimate and proximate analysis- heating values-grading of coal. Liquid fuels- flash point, aniline point, octane number and carbon residue. Gaseous fuels-producer gas and water gas – calorific value.

(c) Clinical chemistry : Composition of blood – collection and preservation of samples. Clinical analysis. serum electrolytes, blood Glucose, blood urea Nitrogen, uric acid, albumin, globulins, barbiturates, acid and alkaline phosphatases.

Treatment of Equilibria

General treatment of equilibria in aqueous medium involving monoprotic weak acid and weak base, and Salt of weak acid and weak base . Effect of electrolytes on chemical equilibria – Solubility product , Common Ion effect. Calculation of pH. Constructing titration curves. Acid base titration and theory of pH Indicators. Complexation equlibria and complexometric titration , Redox equilibria and Redox titration, Theory of redox indicators , Precipitation reaction and precipitation titration and theory of adsorption indicators.

Book Suggested

1.Analytical chemistry , G.D. Christian, J. Wiley.

2.Fundamentals of analytical chemistry, D.A. skoog, D.M. west and F.J. Holler, W. B. Saunders.

3.Analytical chemistry – Principles, J. H. Kennedy , W.B. Saunders.

4.Analytical chemistry – Principles and techniques, L.G. Hargis , Prentice Hall.

5.Principles of Instrumental Analysis, D.A. skoog and J.L. Loary ,W. B. Saunders.

6.Principles of Instrumental Analysis, D.A. skoog and W. B. Saunders.

7.Quantitative Analysis, R.A. Day, Jr. and A.L. Underwood, Prentice Hall.

8.Environmental solution Analysis , S.M.Khopkar, Wiley Eastern.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY SEMESTER –IV 1614

SESSION 2018 -2019 AND 2019 – 2020

PAPER – II ~~CODE MCH-42~~

BIOCHEMISTRY -II

Introduction :- Basic consideration, Basic Molecules of life and limitations of biochemical reactions.

Biological cell and its constituents :- Biological cell, structure and function of protein enzymes.

Enzymes:-

Remarkable properties of enzymes like catalytic power, specificity and regulation. Nomenclature and classification of enzyme, extraction and purification. Fischer's look and key and Koshland's induced fit hypothesis, concept and identification of active site by the use of inhibitors , affinity and enzyme modification by sits direct mutagenesis, enzyme kinetics , Michaelis- Menten and Lineweaver- Burk plots, reversible and irreversible inhibitions.

Mechanism of enzyme Action:-

Transition state theory, Orientation and steric effect Example of some typical enzyme mechanisms for chymotripsin, Ribonuclease. Lysozyme and carboxypeptidase A.

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

Co- enzyme Chemistry :- co factors as derived from vitamins, coenzymes, prosthetic groups, and apoenzymes. Structure and biological function of coenzyme A. Thiamine pyrophosphate, pyridoxal phosphate, NAD+, NADP+, FMN, FAD, Lipoic acid, Vitamin B 12.

Biotechnological Application of Enzymes:-
Techniques and Method of immobilization of enzymes, effects of immobilization on enzyme activity application of immobilization enzymes, use of enzymes in food and drink Industry- brewing and cheese- making syrups from corn starch, enzyme as targets for drug design. Clinical use of enzymes, enzyme therapy, enzymes and recombinant DNA technology.

Thermodynamic of Biopolymer Solutions :- Thermodynamics of biopolymer solutions osmotic pressure, membrane equilibrium, muscular contraction and energy generation in mechanochemical system.

Cell membrane and Transport of Ions:- Structure and function of cell membrane ion transport through cell membrane irreversible thermodynamics treatment of membrane transport and Nerve Conductions.

Metalloenzymes :- Zinc Enzymes- carboxypeptidass and carbonic anhydrase.Iron Enzymes- catalyses, Peroxidase and cytochrome P-450. Copper Enzyme – super oxide dismutase, Molybdenum oxatransferase enzymes – xanthine oxidase, co enzyme vitamin B 12.

Enzyme Models :- Host guest chemistry , chiral recognition and catalysis, Molecular recognition, Molecular asymmetry and prochirality. Biomimertic chemistry crown ethers, cryptates. Cyclodextrins, cyclodexrin based enzyme models.

Book Suggested:-

1. Principles of Organic Bioinorganic Chemistry. S.Lippard and J.M.Berg.
2. Bioinorganic Chemistry .I.Bertini, H.B.Gray, S.L.Lippard, J.S.Valentine, University Science Books.
3. Inorganic Biochemistry Vol-II and I.Ed G.L.Eichhorn, Elsevier.
4. Progress in inorganic Chemistry, Vol.18 & 38 ed J.J.Lippard Wiley.
5. Understanding Enzyme,Trevor Palmer, Prentice Hall.
6. Enzyme Chemistry Impact and Applications, Ed. Collin J.Suckling

Chapman and Hall
Enzyme Mechanisms M.I.Page.and A Williams Royal Society of chemistry.

7.Fundamentals of enzymology, N.C.Price and L.Stevenc Oxford University Press
8 An Introduction and applications in Biotechnology , Michael D. Trevan and John wiley.
9.Enzymatic reaction Mechanism ,C. Walsh, W.H.Freeman.

10. Enzyme Structure and Mechanism , A.Fersht, W.H.Freeman.

11. Outlines of Biochemistry,E.E.Conn and P.K.Stimf,John Wiley.
12. Macromolecules: Structure and Function, F.Wold. Prentice Hall.
13. Fundamentals of Biochemistry, J.L.Jain.
14. Enzyme Chemistry, J. Suckling.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHMISTRY , SEMESTER –IV 1615 'B'

SESSION 2018 -2019 AND 2019 – 2020

PAPER – III ~~CODE MCH-43~~A

MEDICINAL CHEMISTRY

Drug design

Development of new drugs, procedure followed in drug design, factors governing in drug design , concepts of lead compounds and lead modification. Concept of prodrugs and soft drugs, structure –activity relationship (SAR). Factors affecting bioactivity , resonance , inductive effect, isosterism, bioisosterism, application of bioisosterism in drug design, Theories of drug activity , Occupancy theory,Rate theory , Induced fit theory. Quantitative Structure Activity Relationship (QSAR), concept of drug receptor, Elementary treatment of drug receptor interaction. Physiochemical parameters, Lipophilicity, Partition coefficient, Electronic ionization constant, steric, Shelton and surface activity parameters and redox potential ,free Wilson analysis, hansch analysis, relationship between free Wilson and hansch analysis. LD-50 and ED-50 (mathematical derivation of equation excluded).

Pharmacokinetics

Introduction of drug absorption, Disposition, Elimination using pharmacokinetics, important pharmacokinetic parameter in defining the drug disposition and in therapeutics . Mention uses of pharmacokinetics in drug development process.

Pharmacodynamics

Introduction , Elementary treatment of enzyme stimulation , enzyme inhibition , Sulphonamides, membrane active drugs, Drug metabolism, Drug metabolism organ and enzymes, Xenobiotics, Chemical pathways of drug Bio-transformation, Significance of drug metabolism in medicinal chemistry.

Anti –neoplastic agents

Introduction, Cause of cancer and treatment, Cancer chemotherapy , Special problems, Role of alkylating agents and antimetabolites in the treatment of cancer. Synthesis of Meclorethamines, Cyclophosamide, Malphlan, Chlorambucil,

Methotextrate, Uracil, Mustards and 6- Mercaptopurine, Recent development in cancer chemotherapy , Hormone and natural products.

Cardiovascular Drugs

Introduction, Heart anatomy and cardiac cycle , E.C.G., cardiovascular disease, Cardiovascular output . Direct acting arteriolar dilators. Synthesis of Amyl Nitrate, Sorbitrate, Diltiazem, Quinidin, Varapamil, Methyldepa, Propanolol.

Local anti infective drugs

Introduction and general mode of action , Synthesis of Sulphonamides, Furazolidone, Nalidoxic acid, Ciprofloxation , Norfloxation, Dapson, Amino Salicylic acid, Isoniazid, Etionamide, Ethambutal, Fluconazole, Econozole, Grisofulavin, Chloroquine and Primaquine.

Psychoactive drug – the chemotherapy of mind

Introduction, Neurotransmitters, CNS depressant, General anesthetics, Mode of action of hypnotics, Sedatives, Anti anxiety drugs, Benzodiazipines, Buspiron, Neurochemistry of mental disease. Antipsychotic drugs. The neuroleptics, antidepressants, Butyrophenones and drug development. Stereochemical aspects of psycotropic drugs. Synthesis of Diazepam, Alprazolam, Barbiturates, Thiopental Sodium.

Antibiotics

Cell wall, Biosynthesis, inhibitors, β- Lactam rings. Antibiotic inhibiting protein. Synthesis of Penicillin – 5, Ampicilline, Amoxycilline, Chloroamphenicol, Cephalosporine, Tetracycline and Streptomycin.

Books suggested

1. Introduction to Medicinal Chemistry , A Gringuage, Wiley – VCH.

2.Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry, Ed Robert F. Dorge.

3.An Introduction to Drug Design, S.S. Pandeya and J.R. Dimmock, New Age International.

4.Burgers Medicinal Chemistry and Drug Discovery, Vol-1 (chapter -9 and ch-14), Ed. M.E.Wolff, John Wiley.

5.Goodman and Gilman's Pharmacological Basis of Therapeutics, McGraw-Hill.

6.The Organic Chemistry of Drug Design and Drug Action, R.B. Silverman, Acedemic Press.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)
DEPTT OF CHEMISTRY
M.Sc. : CHMISTRY , SEMESTER –IV 1615 'A'
SESSION 2018 -2019 AND 2019 – 2020
PAPER – III ~~CODE MCH-43B~~
POLYMER & NUCLEAR CHEMISTRY

Macromolecules

Polymer-

Definition,typeofpolymers(Elastomer,Fiber,Resins,Plastics,Thermoplastics&Thermosettings,Natural rubber & Synthetic rubber), electrically conducting, fire resistant, liquid crystal polymers, kinetics of condensation polymerization, kinetics of addition polymerization ,free radical mechanism of polymerization ,ionic mechanism of polymerization , distribution of molecular size in step growth polymerization(probability of forming k-monomer molecule kmer, identification of probability with number fraction, average value of k, total number of monomer molecules , Number of kmer).

Molecular mass, number and mass average molecular mass, molecular mass determination (osmotic pressure method, viscosity method, light scattering methods, sedimentation method), chain configuration of macromolecules, calculation of average dimensions of various chain structures.

Surface Chemistry

(A) Adsorption

Surface tension, Curved surface, Laplace-Young Equation, capillary action and pressure difference across curved surface ,Laplace equation, vapour pressure of droplets, Kelvin equation, Langmuir adsorption isotherm, Gibbs adsorption equation for adsorption and surface tention, Multilayer theory of adsorption and BET equation, surface films on liquids (Electro-kinetic phenomenon, catalytic activity at surfaces.

(B) Micelles

Surface active agents, classification of Surface active agents, Micellization hydrophobic interaction, critical micellar concentration (CMC), factor affecting the CMC of surfactants, counter ion binding to micelles, thermodynamics of micellization - phase separation and mass action models, solubilization , micro emulsion , reverse micelles.

Corrosion

Introduction to corrosion, Types of corrosion,(Galvanic corrosion, Erosion corrosion, Pitting corrosion, Crevice corrosion, Intergranular, Selective leaching, Stress corrosion, Waterline corrosion, Soil corrosion, Microbiological corrosion) Theories of corrosion, Direct chemical attack theory, Electrochemical theory ,Acid theory, Factors affecting corrosion, corrosion monitoring and prevention methods. (Designe and material selection, Cathodic & Anodic corrosion, Modifying the environment, Metallic Coating,)

Nuclear Chemistry

The nature of nucleus , nuclear stability, packing Fraction ,Magic number, Isotope, Isobar, Isotone ,Isomer, Nture of radioactivity, Theory of Radioactive Disintigration , radioactive Equilibrium, Radiactive Series , Units of radioactivity, Measurement of radioactivity, Nuclear Transmutation, Artificial Radioactivity, Nuclear Reactions, Nuclear fusion, Nuclear fission , Tracer Elements, application of Radioactive Isotopes,

Books Sugested

1. Textbook of polymer science , F.W. Billmeyer Jr.wiley.
2. Polymer science, V.R. Gowariker, N.V. Vishwanathan and J.Sreedhar,Wiley-Eastern.
3. Function Monomers and Polymer,K. Takemoto,Y. Inaki and RM. Ottanbrite.
4. Contemporary Polymer Chemistry, H.R. Alcock and F.W. Lambe, Prentice Hall.
5. Physics and Chemistry of Polymer, J.M.G. Cowie, Blackie Academic and Professional.

K.G.ARTS AND SCIENCE COLLEGE, RAIGARH (C.G.)

DEPTT OF CHEMISTRY

M.Sc. : CHEMISTRY SEMESTER –IV 1616

SESSION 2018 -2019 AND 2019 – 2020

PAPER – IV ~~CODE MCH~~-44

PHOTOCHEMISTRY AND SOLID STATE CHEMISTRY

Photochemistry of Carbonyl Compounds

α-Cleavage or Norrish Type- I Process- Norrish Type- I process given by Acyclic Saturated Ketones, Reaction of Saturated Cyclic Ketones, Norrish type I process given by Cyclopentones, α-Cleavage given by Cyclobutanones. β-Cleavage Reaction, Intramolecular hydrogen abstraction (γ- Hydrogen Abstraction), Intermolecular Hydrogen Transfer: Intermolecular Photo Reduction. Photocycloaddition Reaction (Paterno-Buchi Reaction) – Addition to Electron-Rich Alkenes, Addition to Electron Deficient Alkenes, Oxitane Formation with Dienes and Alkynes, Intramolecular Paterno- Buchi Reaction. [2+2] Cycloaddition of Enones with Alkenes.

Photo Reduction and Photo Oxidation

Photo Reduction of Carbonyl Compounds and Aromatic hydrocarbons. Photochemical Oxidation. Photo oxidation of alkenes and polyenes.

Photochemistry of Alkenes, Dienes and Aromatic Compouds.

Photochemistry of alkenes , Cis-Trans Isomerisation of alkenes, Cis- Trans Isomerisation of alkenes by Direct Irradiation, Sensitised Cis-Trans Isomerisation. Dimerisation of alkenes , Intramolecular Dimerisation. Photochemistry of Conjugated Dienes in solution. Photochemistry of Benzene and substituted Benzene 1,2- Alkyl Group shift, & 1, 3- Alkyl Group shift. Photoaddition of alkenes to Aromatic Benzenoid Compouds 1,2- Cycloaddition Reaction, 1,3- Photoaddition of Benzene, 1,4- Photoaddition of Benzene.

Photochemistry in Nature and Applied Photochemistry.

Photochemistry Reaction in the Atmosphere, Chemistry of Vision , Photography, Light Absorbing Compounds , Photochromism , Photoimaging , Photochemistry of polymers.

Solid state Chemistry

X-ray Diffraction

Bagg condition, Miller indices, Bragg method, Debye-Scherrer method of X-ray Structural analysis of crystals, index reflections, identification of unit cell from systematic absences in diffraction pattern. Structure of simple lattices and X-ray intensities, structure factor and its relation to intensity and electron density, phase problem. Description of the procedure for an X-ray structure analysis, absolute configuration of molecules,

Crystal defects and non- Stoichiometric Compounds – perfect & Imperfect crystal, Intrinsic and Extrinsic effects – point defects, line and plain defects, vacancies, Schottky and Frenkel defects, Thermodynamic of Schotty and frenkle defects formation, colour centers, non-stoicheometry and defects.

Electronic Properties of Bond Thepory

Metals, Insulators and semiconductors, electronic structure of solid band theory, band structure of metals, insulator and semiconductors. Intrinsic and extrinsic semiconductors, doping semiconductors, p-n junction, superconductors. Optical properties – photoconduction, photoelectric effects. Magnetic Properties - classification of materials quantum theories of paramagnetic cooperative phenomenon – magnetic domains hysteresius .

Book Suggested :-

1.Spectroscopy of Organic compounds, P.S. Kalshi, Y.R. Sharma.

2.Photochemistry and Pericylic Reaction, Jagdamba singh.

3.A. Gilbert and J.Baggott Essentials of Molecular Photochemistry, CRC Press, Boca Rotan, Florida 1991.

4.L. Salum, Electron in chemical Reaction, John Wiley and sons, New York, 1982.

5.J.M. Caxon and B. Halton, Organic Photochemistry, Cambridge Uneversity, Press, London 1974.

6.N.J. Turno, Molecular Photochemistry , W.A. 10 Benjamin New. York 1965.

K.G. ARTS AND SCINCE COLLEGE, RAIGARH(C.G.)

M.Sc. CHEMISTRY

SESSION 2018 -2019 AND 2019 – 2020 1623

PRACTICAL: SEMSTER-IV

Lab Course VII ~~CODE MCH-45~~

1.Fuels

Proximate Analysis of Coal.

Ultimate Analysis of Coal.

Determination of Calorific value of a solid or liquid fuel by Bomb Calorimeter.

Determination of Sulphur in a Coal sample by Eschka Mixture Method.

Flue gas analysis by orsat's apparatus.

Water Quality parameters

Determination of Saponification value of oil and Fat

Determination of Acid value of oil and Fat

Determination of Iodine value of oil and Fat

Determination of Dissolved Oxygen(DO) in Water Sample

Determination of Chemical Oxygen Demand(COD) in Water Sample

Determination of Hardness in Water Sample

Determination of Chloride in Water Sample

Determination of Fluoride in Water Sample

Nephelomtry/Turbiditymtry

Determination of Turbidity of water sample

Determination of Sulphate of water sample

Determination of Siver ion of water sample

Determination of Phosphate of water sample

Flame Photometry

Determination of Na & K in Sample

Determination of Li/Ca/Sr/Ba in Sample

Determination of Cd & Mn in Sample

Viscometry

Determination of Molecular weight of polymer

Polymer , Resins and Plastics

Preparation of phenol- formaldehyde resin.

Preparation of Urea- formaldehyde resin.

Synthesis and Hydrolysis of Nylon- 66.

K.G. ARTS AND SCINCE COLLEGE, RAIGARH(C.G.)

M.Sc. CHEMISTRY

SESSION 2018 -2019 AND 2019 – 2020 1624

PRACTICAL: SEMSTER-IV

Lab Course VIII CODE MCH-46

Conductometry

Determination of Concentration of NH_4Cl titrating with NaOH

Determination of Concentration of NH_4Cl & HCl titrating with NaOH

Determination of Concentration of NH_4Cl & HCl titrating with NaOH

Determination of Concentration of H_2SO_4 ,CH_3COOH and $CuSO_4$ titrating with NaOH

Determination of Concentration of HCl, CH_3COOH and $CuSO_4$ titrating with NaOH

Determination of Order of saponification of ethyl acetate by sodium hydroxide

Determination of Kinetics of saponification of ethyl acetate by sodium hydroxide at different temperatures

Determination of solubility of sparingly soluble salt

Error Analysis and Statistical data Analysis

Linear Regression analysis , Curve Fitting $y=a+bx$, $y=a+bx^2$, $y = ax + bx^2$, $y = ax + b/x$,

$y = ax^2 + b/x$, $y = ax^b$, $y = a + bx + cx^2$, $y = ae^{bx}$, $xy^n = b$, Students t- Test

Polarimetry

Determination of specific and molecular rotation of optically active compounds

Determination of velocity constant of inversion of cane sugar

Determination of concentration of given solution of optically active substance

Determination of percentage composition of of two optically active substances

Refrectmetry

Determination of concentration of sucrose in given sample (cold drink, sugar solution ,can sugar, fruit juice)

19.9.18

19.9.18

PD – 262

M.Sc. (Second Semester)
CHEMISTRY
Examination June 2021
Paper- I
Inorganic Chemistry

Time : Three Hours] **[Maximum Marks : 80**
[Minimum Pass Marks : 29

नोट : दोनों खण्डों से निर्देशानुसार उत्तर दीजिए। प्रश्नों के अंक उनके दाहिनी ओर अंकित है।
Note : Answer from both the Sections as directed. The figures in the right-hand margin indicate marks.

Section-A

1. Answer the following questions:- [1x10=10]

(a) Metals with high charge to radius ratio forms ---------- complexes. (More stable/less stable)
(b) Replacement of monodentate ligands by cycle polydentate ligands leads to.-
1- Greater stability 2- Greater lability 3- Greater inertness 4- Non of these
(c) Which has a great Tran's diseting influence among the following pair. Explain why? H_2O Or NH_3
(d) What do you mean by the term inest and labile?
(e) Give the example of redox reaction.
(f) Give examples of oxidation reduction reactions for metal complores in which-
1- No net chemical change by the transfer for metal complores in which
2- There is a net chemical change.
(g) Define metal elusters with suitable exampla.
(h) What are metal π – complexes? Give example.
(i) How many electrons are there in the valence shell of the metal carbonyls? Explain with are example.
(j) What is Keggin Ion?

2. Answer the following question:- [2x5=10]

(a) Drive relation between stepwise and overall for mation constants for complex compouns.
(b) Explain EAN rule for structure of carbonyl compounds with one example.
(c) What are redox reactions? Explain with examples.
(d) Discuss SN^1 mechanism for octahedral complexes
(e) What are isopoly vanadates? Discuss in berief.

Section-B

Answer the following questions:- [12x5=60]

Unit-I

3. a- Explain the term stepwise formation and overall for mation constant.
b- How will you determine the stability constant of a complex.

Or

What do you mean by stability of a ciomplex ion? Discuss the factors which affect the stability of complexes.

Unit-II

4. What are hydrolysis reactions? Discuss acid hydrolysis of six co-ordinated C_o (III) amine complexes.

Or

Give evidence to suggest that the substitution in square planar complexes proceeds through SN^2 mechanism. Why are Ni (II) and pd (II) square planar complexes more labile than square planar complexes of pt(II)

Unit-III

4. Name the mechanisms involved in one electron transfer reactionis. Discuss the inner sphere mechanism of such reactioins.

Or

Write notes on (any two)
1- Carbosanes
2- Higher boranes
3- Metalloboranes

Unit-IV

6. Desc4ribe the uses of vilrational spectra of metal carbonyls for bonding and structural elucidation.

Or

Write notes on (any two)

1- Metal nitrosyls
2- Dinitrogen complees
3- Dioxygen complexes

Unit-V

7. Write an essay on isopoly acids.

Or

Write are Heteropoly salls and acids? Discuss their structures.

PD – 263 CV-19

(532) M.Sc. CHEMISTRY (SECOND SEMESTER)

Examination June - 2021

Paper - II ORGANIC CHEMISTRY

Time : Three Hours] [Maximum Marks : 080 [Minimum Pass Marks : 29

नोटः– दोनों खण्डों से निर्देशानुसार उत्तर दीजिए। प्रश्नों के अंक उनके दाहिनी ओर अंकित हैं।

Note: Answer From Both the Section as Directed. The Figures in the right-hand margin indicate marks.

SECTION-A

2x10 = 20

1. Answer the following question .

(a) Justify the STability of the $3^0, 2^0, 1^0$, freeradical.

(b) Write role of $AlcI_3$ in the friedol Craft reaction.

(c) What is ipso attack.

(d) Explain directive influence of $-NO_2$ group.

(e) Explain Give Potential energy diagrams SN, Aliphaticreaction.

(f) Give one example SEi mechanism vilhreaction.

(g) Give on example of Bengyne mechanism.

(h) complete the reaction $CH{=}C{-}CH_3 \xrightarrow[ccl_4]{NBS}$

(i) What is Saytreffrule.

(j) Complete the reaction-

$R - CH = CH_2 + HBr \xrightarrow{Peroxide}$

SECTION-B

12x5=60

1. Answer the following question .

UNIT - I

I (a) Explain SE^2 reaction Mechanism (Aliphatic) niths with Suitable examples.

(b) Discuss ortho/para rationin Aromatic SE Reactions.

OR

Explain following reaction Mechanism with Suitable example,

(i) Arenium ion mechanism. (ii) Sattarmann Coch reaction.

UNIT - II

II Discuss following reaction Mechanism in Aliphatic compounds - with example.

(i) SN_2 (ii) SN_1 (iii) Neighboring group mechanism.

OR

Discuss Mechanism of following reaction.

(i) The Von-Richev rearrangment. (ii) Sommelet Hauser rearrangmels.

UNIT - III

III Write notes on following.

(a) Effect of solvent on reaction. (b) Auto oxidation. (c) Coupling of Alkynes.

OR

Explain to the followings.

(a) Sundmeyer reaction (b) Arylation of Aromatic Compound. (c) Hunsdiecker reaction.

UNIT - IV

IV Explain to the following reaction with example.

(i) Hydroboration. (ii) Hydrogenation of Aromatic ring. (iii) Addition to cyclopropone ring.

OR

Discuss Mechanism of following reactions with examples.

(i) Aldol condensation (ii) Perkin reactions.

UNIT - V

(V) (a) Discuss E_2E_1 Mechanism with Suitable examples and reaction effect of attacking base & Medium.

OR

Discuss EICB Machanism and reaction effect of Substrate Structure and Leaving groups.

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PD-264 CV-19

(532) M.Sc. Chemistry (Second Semester)

Examination June 2021

PHYSICAL CHEMISTRY

Paper - III

Time : Three Hours] **Maximum Marks : 80**

Minimum Passing Marks : 29

नोट : दोनों खण्डों से निर्देशानुसार उत्तर दीजिये। प्रश्नों के अंक उनके दाहिनी ओर अंकित हैं।

Note : Answer from both the Sections as directed. The figures in the right hand margin indicate marks.

SECTION-A

1. Answer the following questions:- [1 X 10]
   (a) State third law of Thermodynamics.
   (b) What is 'ionic atmosphere'?
   (c) Describe a property of Helmhotz Free Energy.
   (d) Give expression for activity.
   (e) What is 'hole'?
   (f) Write expression for Lipmann equation.
   (g) Explain the term corrosion.
   (h) Write Ilkovic equation.
   (i) What is Scattering Intensity?
   (j) Write Wierl equation.

2. Answer the following questions :- [2 X 5]
   (a) Write general form of Boltzmann distribution law.
   (b) What are the two conditions for the ensemble to be in statistical equilibrium?
   (c) Explain Relaxation effect.
   (d) Explain the term Electro-catalysis.
   (e) What are low energy electrons.

SECTION-B

Answer all questions :- [12 X 5]

UNIT-I

3. (a) Discuss the concept of fugacity.
   (b) Derive the expression for calculation of fugacity of a gas.

OR

Explain the significance partial molar properties. Describe a method to determine the partial molar properties.

UNIT-II

4. (a) What is partition function?
   (b) Calculate the translational partition function of a molecule of oxygen gas at 1 atm. and 298 k moving in a vessel & volume 24.4 dm^3. ($k=1.38 \times 10^{-23} jk^1$; $h = 6.62 \times 10^{-26}$ js, $m = 5.313 \times 10^{-26}$ kg for O_2)

OR

Discuss Bose – Einstein statistics.

UNIT-III

5. Write notes on following:-
   (a) Tafel Plot
   (b) Electrocapillary curve

OR

Discuss Debye-Huckel-Onsagar treatment and its extension.

UNIT-IV

6. Write notes on following:-
   (a) Core conducter model
   (b) Nernst plank equation

OR

(a) What are the conditions for performing polarographic determinations.
(b) Describe two applications of polarography briefly.

UNIT-V

7. What do you understand by electron diffraction? Describe the measurement technique for diffraction intensity.

OR

Explain neutron diffraction. Discuss magnetic scattering and it's measurement.

PD – 265 CV-19

(532) M.Sc. CHEMISTRY (SECOND SEMESTER)

Examination JUNE 2021

Compulsory/ Optional

Group-

Paper- IV

Name/Title of Paper- SPECTROSCOPY & COMPUTER FOR CHEMISTS

Time: Three hours **Maximum Marks-80**

Minimum Passing Marks-29

Note: Answer From Both the Section as Directed. The Figures in the right-hand margin indicate marks.

Section-A

1. Answer the following questions: **1x10=10**

a) Which electronic state is to be expected of lowest energy in d^2 case?

b) Write the mathematical formula for the calculation of number of microstates?

c) Write the name of element which mostly gives photoelectric effect?

d) Identify different types of hydrogen in toluene with reference to NMR spectroscopy?

e) Who invented photo acoustic spectroscopy?

f) How the lattice spacing (d) is connected to cell edge (a) for simple cubic lattice?

g) Processing is done in which part of computer?

h) How many digits is present in Binary systems?

i) What is the name of first menu of MS-Excel?

j) Who is the father of 'C' Language?

2. Answer the following questions: **2x5=10**

a) In a hydrogen atom, an electron jumps from a third orbit to the first orbit. Find out the frequency of the spectral fine?

b) Write four complications in NMR analysis?

c) The intercept ratios of a crystal plane are a:b:∞c. Calculate the Miller indices of the plane?

d) Write short notes on Algorithm & Flow chart?

e) Explain how you can prepare a graph and chart by using MS-Excel?

Section-B

Answer all questions:- **12x5=60**

3. Describe scheme of vector coupling of orbital angular momentum and spin angular momentum and hence total angular momentum for p^n d^n configuration?

Or

Discuss the basic principles, classifications and instrumentation of photo electronic spectroscopy?

4. (a) Explain the factors affecting the chemical shift in NMR spectroscopy?

(b) Discuss the instrumentation for photo acoustic spectroscopy?

Or

(a) Which of the following system will show Electron spin Resonance spectroscopy and why:-

O_2, O_2^+, O_2^-, NO, CH_3 radical and Co_2

(b) Explain the instrumentation and applications of Nuclear Quadruple Resonance spectroscopy?

5. (a) Derive Bragg's equation?

(b) The interplanar spacing of a crystal was found to be 1.85 A^0. If the first order reflection takes place at an angle of 30^0 find out the wavelength of X-rays? [Given Sin 30^0= 0.5]

Or

(a) Explain Ramchandran diagram of protein?

(b) Discuss Laue's method of X-ray structural analysis of crystal?

6. (a) Explain constants and variable used in "c" programming?

(b) Write short notes on "pointers"?

Or

What are operating systems? Discuss in detail the salient features of any one of the operating systems that are prescribed in your syllabus?

7. Write a program in "c" to execute results for calculation of:-

(a) pH Titration

(b) Secular equation

Or

Describe the facilities available in word processor? Write the salient features and uses of M.S.-Word?