



# RKDF UNIVERSITY, BHOPAL

B.Sc.(Chemistry)

## SCHEME

### Semester – I to VI

No	Subject Code	Subject Title	Marks Allotted						Total Marks
			Assignment Marks		Theory Marks		Practical Marks		
			Max	Min	Max	Min	Max	Min	
1	BCH 111	BASED ON INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY	20	8	80	27	50	17	150
2	BCH 121	BASED ON INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY	20	8	80	27	50	17	150
3	BCH 131	BASED ON INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY	20	8	80	27	50	17	150
4	BCH 141	BASED ON INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY	20	8	80	27	50	17	150
5	BCH 151	BASED ON INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY	20	8	80	27	50	17	150
6	BCH 161	BASED ON INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY	20	8	80	27	50	17	150



# RKDF UNIVERSITY, BHOPAL

B.Sc.(Chemistry)

Syllabus  
Semester – I

BRANCH	SUBJECT TITLE	SUBJECT CODE
B.Sc(Chemistry)	BASED ON INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY	BCH-111

## UNIT-I

### Covalent Bond

Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions ( BeF<sub>2</sub>, BF<sub>3</sub>, CH<sub>4</sub>, PF<sub>5</sub>, SF<sub>6</sub>, IF<sub>7</sub> SO<sub>4</sub>, ClO<sub>4</sub> )Valence shell electron pair repulsion (VSEPR)theory to NH<sub>3</sub>, H<sub>3</sub>O<sup>+</sup>, SF<sub>4</sub>, ClF<sub>3</sub>, ICl<sub>2</sub><sup>-</sup> and H<sub>2</sub>O. MO theory of hetero -nuclear (CO and NO) diatomic molecules, bond strength and bond energy.

## UNIT-II

### Gaseous States

Maxwell's distribution of velocities and energies (derivation excluded) Calculation of root mean square velocity, average velocity and most probable velocity. Collision diameter, collision number, collision frequency and mean free path. Deviation of Real gases from ideal behavior. Derivation of Vander Waal's Equation of State.

## UNIT-III

### Critical Phenomenon:

Critical temperature, Critical pressure, Critical volume and their determination. PV isotherms of real gases,.

**Liquid States** -Structure of liquids. Properties of liquids – surface tension, viscosity vapour pressure and optical rotations and their determination.

### Solid State

Classification of solids, Laws of crystallography – (i) Law of constancy of interfacial angles (ii) Law of rationality of indices(iii) Law of symmetry. Definition of unit cell & space lattice. X ray diffraction by crystals. Derivation of Bragg equation. Liquid crystals :,types of liquid crystals. Applications of liquid crystals.

## UNIT-IV

### Stereochemistry of Organic Compounds-I

Concept of isomerism. Types of isomerism. elements of symmetry, molecular chirality, enantiomers, stereogenic centre, , chiral and achiral molecules with two stereogeniccentres, diastereomers, mesocompounds, resolution of enantiomers, inversion, retention and racemization.

### Stereochemistry of Organic Compounds-II

Sequence rules, R & S systems of nomenclature. Geometric isomerism determination of configuration of geometric isomers. E & Z system of nomenclature, isomerism conformational analysis of ethane and n-butane, conformations of cyclohexane, Newman projection and Sawhorse formulae.



# RKDF UNIVERSITY, BHOPAL

## B.Sc.(Chemistry)

### UNIT- V

#### Mechanism of Organic Reactions

Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents – electrophiles and nucleophiles. Types of organic reactions. Energy considerations. Reactive intermediates carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (formation, structure & stability). Assigning formal charges on intermediates and other ionic species.

#### Books:

1. Inorganic Chemistry, Huhee, Keiter and Keiter, Addition-Wesley, 1993.
2. Applied Mathematics for Physical Chemistry, J.R. Barante, Prentice Hall.
3. I. L. Levine, Quantum Chemistry, Prentice-Hall Inc., New Jersey.
4. T. Engel and P. Reid, Physical Chemistry, Benjamin-Cummings.
5. F. A. Carey and R. J Sundberg, Advanced Organic Chemistry, Part A and B, Plenum
6. P. S. Kalsi., Organic Reactions and their Mechanisms, New Age International

#### Paper (Practical's)

##### Section-A (Inorganic)

##### Volumetric Analysis

1. **Redox titrations:** Determination of  $\text{Fe}^{2+}$ ,  $\text{C}_2\text{O}_4^{2-}$  ( using  $\text{KMnO}_4$ ,  $\text{K}_2\text{Cr}_2\text{O}_7$ )
2. **Iodometric titrations:** Determination of  $\text{Cu}^{2+}$  (using standard hyposolution).
3. **Complexometric titrations:** Determination of  $\text{Mg}^{2+}$ ,  $\text{Zn}^{2+}$  by EDTA.

##### Section-B (Physical)

1. To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
2. To prepare arsenious sulphide sol and compare the precipitating power of mono-, bi – and trivalent anions.

##### Section – C (Organic)

1. Preparation and purification through crystallization or distillation and ascertaining their purity through melting point or boiling point
2. (i) Iodoform from ethanol (or acetone)  
(ii) *m*-Dinitrobenzene from nitrobenzene (use 1:2 conc.  $\text{HNO}_3$  -  $\text{H}_2\text{SO}_4$  mixture if fuming  $\text{HNO}_3$  is not available)



# RKDF UNIVERSITY, BHOPAL

## B.Sc.(Chemistry)

### Syllabus Semester – II

BRANCH	SUBJECT TITLE	SUBJECT CODE
B.Sc (Chemistry)	Based on inorganic, organic and physical chemistry	BCH-121

#### UNIT-I

Hydrogen Bonding – Definition, Types, effects of hydrogen bonding on properties of substances, application Brief discussion of various types of Vander Waals Forces

#### **Metallic Bond and Semiconductors**

Metallic Bond- Brief introduction to metallic bond, band theory of metallic bond  
Semiconductors- Introduction, types and applications.

#### UNIT-II

Rate of reaction, rate equation, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Order of a reaction, integrated rate expression for zero order, first order, second and third order reaction. Half life period of a reaction. Methods of determination of order of reaction.

#### **Kinetics-II**

Effect of temperature on the rate of reaction – Arrhenius equation. Theories of reaction rate – Simple collision theory for unimolecular and bimolecular collision. Transition state theory of Bimolecular reactions.

#### UNIT-III

Electrolytic conduction, factors affecting electrolytic, Arrhenius theory of ionization, Ostwald's Dilution Law. Debye-Huckel – Onsager's equation for strong electrolytes (elementary treatment only) Transport number, definition and determination by Hittorf's methods, (numerical included). **Electrochemistry-II** Kohlrausch's Law, calculation of molar ionic conductance and effect of viscosity. Application of Kohlrausch's Law in calculation of conductance of weak electrolytes at infinite dilution. Applications of conductivity, Definition of pH and pKa, Buffer solution, Buffer action, Henderson – Hazelequation, Buffer mechanism of buffer action.

#### UNIT-IV

Nomenclature of alkenes, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation, oxymercuration reduction, ozonolysis, hydration, hydroxylation and oxidation with  $\text{KMnO}_4$ .

#### UNIT-V

IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction Cycloalkanes nomenclature, synthesis of cycloalkanes and their derivatives –photochemical (2+2) cycloaddition reactions,



# RKDF UNIVERSITY, BHOPAL

## B.Sc.(Chemistry)

dehalogenation of  $\beta,\beta$ -dihalides, pyrolysis of calcium or barium salts of dicarboxylic acids, Baeyer's strain theory and its limitations.

### Book suggested :

1. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.
2. Chemistry of the Elements. N.N. Greenwood and A. Earnshaw, Pergamon.
3. J. March., Advanced Organic Chemistry: Reactions, Mechanisms and Structure, John Wiley.
4. P. S. Kalsi., Organic Reactions and their Mechanisms, New Age International
5. J. P. Lowe and K.Peterson, Quantum Chemistry Academic Press.

### Paper (Practical's)

#### Section-A (Inorganic)

##### Paper Chromatography

Qualitative Analysis of the any one of the following Inorganic cations and anions by paper chromatography ( $\text{Pb}^{2+}$  ,  $\text{Cu}^{2+}$  ,  $\text{Ca}^{2+}$  ,  $\text{Ni}^{2+}$  ,  $\text{Cl}^-$  ,  $\text{Br}^-$  ,  $\text{I}^-$  and  $\text{PO}_4^{3-}$  and  $\text{NO}_3^-$

#### Section-B (Physical)

1. To determine the surface tension of a given liquid by drop number method.
2. To determine the viscosity of a given liquid.
3. To determine the specific refractivity of a given liquid.

#### SECTION – C (Organic)

1. Dibenzalacetone from acetone and benzaldehyde
2. Aspirin from salicylic acid. To study the process of) sublimation of camphor and phthalic acid

### Books for practical:

1. Vogel's Textbook of Quantitative Analysis, revised, J. Bassett, R.C. Denney, G.H. Jeffery and J. Mendham, ELBS.
2. Synthesis and Characterization of Inorganic Compounds, W.L. Jolly. Prentice Hall.
3. Experiments and Techniques in Organic Chemistry, D.P. Pasto, C. Johnson and M.Miller, Prentice Hall.
4. Macroscale and Microscale Organic Experiments, K.L. Williamson, D.C. Heal



# RKDF UNIVERSITY, BHOPAL

B.Sc.(Chemistry)

Syllabus  
Semester – III

BRANCH	SUBJECT TITLE	SUBJECT CODE
B.Sc(Chemistry)	Based on inorganic, and Physical Chemistry	BCH-131

## UNIT-I

Definition of transition elements, position in the periodic table, General characteristics & properties of 1st transition elements, Structures & properties of some compounds of transition elements–  $TiO_2$ ,  $VOCl_2$ ,  $FeCl_3$ ,  $CuCl_2$  and  $Ni(CO)_4$ . **Chemistry of Elements of IInd & IIIrd transition series** General characteristics and properties of the II<sup>nd</sup> and III<sup>rd</sup> transition elements Comparison of properties of 3d elements with 4d & 5d elements with reference only to ionic radii, oxidation state, magnetic and Spectral properties and stereochemistry.

## UNIT-II

Werner's coordination theory, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes. **Non-aqueous Solvents** Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid  $NH_3$  and liquid  $SO_2$ .

## UNIT-III

Definition of thermodynamic terms: system, surrounding etc. 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 for ideal gas and real gas: and inversion temperature. **Thermodynamics-II** Calculation of w.q.  $dU$  &  $dH$  for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process, Temperature dependence of enthalpy, Kirchoffs equation. Bond energies and applications of bond energies.

## UNIT-IV

Monohydric alcohols nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols. **Epoxides** Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening.

## UNIT-V

Nomenclature of Carboxylic acids, structure and bonding, physical properties, acidity of carboxylic acids,. Preparation of carboxylic acids. Reactions of carboxylic acids. **Acid Derivatives** Structure, nomenclature and preparation of acid chlorides, esters, amides and acid anhydrides. Relative stability of acyl derivatives. Physical properties, inter conversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic).



# RKDF UNIVERSITY, BHOPAL

## B.Sc.(Chemistry)

### Book suggested :

1. R. G. Mortimer, Mathematics for Physical Chemistry Elsevier.
2. F. L. Pilar, Elementary Quantum Chemistry , Dover Publication
3. E. L. Eliel, Stereochemistry of Carbon Compounds, McGraw-Hill
4. S. M. Mukherji and S. P. Singh, Reaction Mechanism in Organic Chemistry,
5. Comprehensive Coordination Chemistry eds., G. Wilkinson, R.D. Gillars and J.A. Mc Cleverty, Pergamon.

### Paper (Practicals)

#### Section – I (Inorganic)

##### 1. Gravimetric Analysis

Quantitative estimations of,  $\text{Cu}^{2+}$  as copper thiocyanate and  $\text{Ni}^{2+}$  as Ni – dimethylglyoxime.

#### Section-B (Physical)

1. To determine the CST of phenol – water system.
2. To determine the solubility of benzoic acid at various temperatures and to determine the  $\Delta H$  of the dissolution process
3. To determine the enthalpy of neutralisation of a weak acid/weak base vs. strong base/strong acid and determine the enthalpy of ionisation of the weak acid/weak base.

#### Section-C (Organic)

Systematic identification (detection of extra elements, functional groups, determination of melting point or boiling point and preparation of at least one pure solid derivative) of the following simple mono and bifunctional organic compounds: Naphthalene , anthracene, acenaphthene, benzyl chloride, *p*-dichlorobenzene, *m*-dinitrobenzene, *p*-nitrotoluene, resorcinol , hydroquinone,  $\alpha$ -naphthol,  $\beta$ -naphthol, benzophenone, ethyl methyl ketone, benzaldehyde, vanillin, oxalic acid, succinic acid,



# RKDF UNIVERSITY, BHOPAL

B.Sc.(Chemistry)

## Syllabus Semester – IV

BRANCH	SUBJECT TITLE	SUBJECT CODE
B.Sc(Chemistry)	BASED ON INORGANIC, AND PHYSICAL CHEMISTRY	BCH-141

### UNIT-I

Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds. **Actinides**-General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Comparison of properties of Lanthanides and Actinides and with transition elements .

### UNIT-II

Second law of thermodynamics, need for the law, , Carnot's cycles and its efficiency, Carnot's theorem, .Thermodynamics scale of temperature. Concept of entropy - entropy as a state function, entropy as a function of V & T, entropy as a function of P & T,

**Thermodynamics-IV** Third law of thermodynamics: Nernst heat theorem, statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function(G) and Helmholtz function (A) as thermodynamic quantities, A &G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.

### UNIT-III

Electrolytic and Galvanic cells – reversible & Irreversible cells ,conventional representation of electrochemical cells. EMF of cell and its measurement, Weston standard cell, activity and activity coefficients .Calculation of thermodynamic quantities of cell reaction ( $\Delta G$ ,  $\Delta H$  & K). Types of reversible electrodes – metal- metal ion gas electrode, metal –insoluble salt-anion and redox electrodes. Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential. Standard Hydrogen electrode, reference electrodes, standard electrodes potential, sign conventions electrochemical series and its applications.

### UNIT-IV

Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Gabrielphthalimide reaction, **Diazonium Salts** Mechanism of diazotisation, structure of benzene diazoniumchloride, Replacement of diazo group by H, OH, F, Cl, Br, I, NO<sub>2</sub>reaction and its synthetic application.

**Nitro Compounds** Preparation of nitro alkanes and nitro arenes and their chemical reactions.





# RKDF UNIVERSITY, BHOPAL

## B.Sc.(Chemistry)

### UNIT-V

Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, **Ketones** Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction. Mannich reaction. Oxidation of aldehydes, Baeyer–Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner,  $\text{LiAlH}_4$  and  $\text{NaBH}_4$  reductions.

#### Book suggested :

1. I. L. Levine, Quantum Chemistry , Prentice-Hall Inc., New Jersey.
2. T. Engel and P. Reid, Physical Chemistry, Benjamin-Cummings.
3. S. M. Mukherji and S. P. Singh, Reaction Mechanism in Organic Chemistry, Macmillan
4. Advanced Inorganic Chemistry, F.A. Cotton and Wilkinson, John Wiley.

(Practicals)

#### SECTION – I (Inorganic)

##### Colorimetry:

1. To verify Beer - Lambert law for  $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$  and determine the concentration of the given  $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$  solution.
2. Preparations: Preparation of Cuprous chloride, prussian blue from iron fillings, tetraammine cupric sulphate, chrome alum, potassium trioxalatochromate (III).

#### Section-B (Physical)

3. To determine the enthalpy of solution of solid calcium chloride
- 4 .To study the distribution of iodine between water and  $\text{CCl}_4$ .

#### Section-C (Organic)

Systematic identification (detection of extra elements, functional groups, determination of melting point or boiling point and preparation of at least one pure solid derivative) of the following simple mono and bifunctional organic compounds: benzoic acid, salicylic acid, aspirin, phthalic acid, cinnamic acid, benzamide, urea, acetanilide, benzanilide, aniline hydrochloride, p-toluidine, phenyl salicylate (salol), glucose, fructose, sucrose, *o*-, *m*-, *p*nitroanilines, thiourea.

#### Books for practical:

1. Vogel's Textbook of Practical Organic Chemistry, A.R. Tatchell, John Wiley.
2. Practical Physical Chemistry, A.M. James and F.E. Prichard, Longman.
3. Findley's Practical Physical chemistry, B.P. Levitt, Longman.
4. Macroscale and Microscale Organic Experiments, K.L. Williamson, D.C. Heath.



# RKDF UNIVERSITY, BHOPAL

B.Sc.(Chemistry)

## Syllabus Semester – V

BRANCH	SUBJECT TITLE	SUBJECT CODE
B.Sc(Chemistry)	BASED ON INORGANIC, ORGANIC & PHYSICAL CHEMISTRY	BCH-151

### UNIT-I

Limitations of valence bond theory, an elementary idea of crystal-field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, **Magnetic Properties of Transition Metal Complex** Types of magnetic behavior, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, **Electron Spectra of Transition Metal Complexes** Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energy level diagram for d1 and d9 states, discussion of the electronic spectrum of  $[Ti(H_2O)_6]^{3+}$  complex ion.

### UNIT-II

Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Compton effect, wave function and its significance of Postulates of quantum mechanics, quantum mechanical operator, commutation relations, Hamiltonian operator, Hermitian operator, average value of square of Hermitian as apposite quantity, Role of operators in quantum mechanics, To show quantum mechanically that position and momentum cannot be predicated simultaneously, Determination of wave function & energy of a particle in one dimensional box, Pictorial representation and its significance.

### UNIT-III

**Introduction:** Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, **Rotational Spectrum** Diatomic molecules. Energy levels of rigid rotator (semi-classical principles), selection rules. **Vibrational spectrum** Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, effects of an harmonic motion and isotopic effect on the spectra., idea of vibrational frequencies of different functional groups. **Raman Spectrum:** Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra.

### UNIT-IV

Classification and nomenclature. Monosaccharides, mechanism of osazone formation, inter conversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose in to mannose. Formation of glycosides, ethers and esters. Determination of ring size of glucose and fructose. Open chain and cyclic structure of D(+)-glucose & D(-) fructose. Mechanism of mutarotation. Structures of ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.



# RKDF UNIVERSITY, BHOPAL

## B.Sc.(Chemistry)

### UNIT-V

Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.

#### Books:

1. P. S. Kalsi., Organic Reactions and their Mechanisms, New Age International
2. Chemistry of the Elements. N.N. Greenwood and A. Earnshaw, Pergamon.
3. Chemistry of the Elements. N.N. Greenwood and A. Earnshaw, Pergamon.
4. P.W. Atkins , Physical Chemistry, ELBS.

#### (Practical)

##### SECTION – I (Inorganic)

Semimicro qualitative analysis of mixture containing not more than four radicals (including interfering, Combinations and excluding insolubles):

Pb<sup>2+</sup>, Hg<sup>2+</sup>, Hg<sub>2</sub><sup>2+</sup>, Ag<sup>+</sup>, Bi<sup>3+</sup>, Cu<sup>2+</sup>, Cd<sup>2+</sup>, As<sup>3+</sup>, Sb<sup>3+</sup>, Sn<sup>2+</sup>, Fe<sup>3+</sup>, Cr<sup>3+</sup>, Al<sup>3+</sup>, Co<sup>2+</sup>, Ni<sup>2+</sup>, Mn<sup>2+</sup>, Zn<sup>2+</sup>, Ba<sup>2+</sup>, Sr<sup>2+</sup>, Ca<sup>2+</sup>, Mg<sup>2+</sup>, NH<sub>4</sub><sup>+</sup>, CO<sub>3</sub><sup>2-</sup>, S<sup>2-</sup>, SO<sub>3</sub><sup>2-</sup>, S<sub>2</sub>O<sub>3</sub><sup>2-</sup>, NO<sub>2</sub><sup>-</sup>, CH<sub>3</sub>COO<sup>-</sup>, Cl<sup>-</sup>, Br<sup>-</sup>, I<sup>-</sup>, NO<sub>3</sub><sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, C<sub>2</sub>O<sub>4</sub><sup>2-</sup>, PO<sub>4</sub><sup>3-</sup>, BO<sub>3</sub>

##### Section-B (Physical)

1. To determine the strength of the given acid solution (mono and dibasic acid) conductometrically.
2. To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically
3. To determine the strength of given acid solution (mono and dibasic acid)/KMnO<sub>4</sub> – Mohr salt potentiometrically.

##### Section-C (Organic)

#### 1. Laboratory Techniques

(a) Steam distillation (non evaluative) Naphthalene from its suspension in water Separation of *o*- and *p*-nitrophenols

(b) Column chromatography (non evaluative)

Separation of fluorescein and methylene blue Separation of leaf pigments from spinach leaves

#### 2. Chromatography Method

Determination of R<sub>f</sub> values and identification of organic compounds

(a) Separation of green leaf pigments (spinach leaves may be used) by paper chromatographic method

(b) Separation of a mixture of coloured organic compounds using common organic solvents by TLC.

#### 3. Synthesis of the following organic compounds:

1. To prepare *p*-bromoaniline from *p*-bromoacetanilide.
2. To prepare *m*-nitroaniline from *m*-dinitrobenzene.



# RKDF UNIVERSITY, BHOPAL

## B.Sc.(Chemistry)

### Syllabus Semester – VI

BRANCH	SUBJECT TITLE	SUBJECT CODE
B.Sc(Chemistry)	Based on inorganic, Organic & Physical Chemistry	BCH-161

#### UNIT-I

Arrhenius, Bronsted – Lowry, the Lux – Flood, Solvent system and Lewis concepts of acids & bases, relative strength of acids & bases, Concept of Hard and Soft Acids & Bases. Symbiosis, electronegativity and hardness and softness.

#### Bioinorganic Chemistry

Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca<sup>2+</sup>. Nitrogen fixation.

#### UNIT-II

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

#### UNIT-III

Statement and meaning of the terms – phase component and degree of freedom, thermodynamic derivation of Gibbs phase rule, phase equilibria of one component system – Example – water and Sulphur systems. Phase equilibria of two component systems solid-liquid equilibria, simple eutectic Example Pb-Ag system, desilverisation of lead.

#### UNIT-IV

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. **Heterocyclic Compounds-II** Introduction to condensed five and six- membered heterocyclic. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis.



# RKDF UNIVERSITY, BHOPAL

## B.Sc.(Chemistry)

### UNIT-V

Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine. Synthetic detergents alkyl and aryl sulphonates. **Amino Acids, Peptides & Proteins**

Classification, of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation of  $\beta$ -amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Structures of peptides and proteins: Primary & Secondary structure.

#### Books:

1. Ira N. Levine, Quantum Chemistry, Prentice Hall.
2. F. A. Carey and R. J Sundberg, Advanced Organic Chemistry, Part A and B, Plenum
3. K.J. Laidler, Chemical Kinetics. McGraw-Hill.
4. Inorganic Chemistry, J.E. Huhey, Harper & Row.
5. Valence, C. A. Coulson, Oxford University Press.

#### (Practical)

##### Section-B (Physical)

1. To determine the molecular weight of a non-volatile solute by Rast method.
2. To standardize the given acid solution (mono and dibasic acid) pH metrically.

##### Section-C (Organic)

##### 2. Chromatography Method

Determination of  $R_f$  values and identification of organic compounds

- (a) Separation of green leaf pigments (spinach leaves may be used) by paper chromatographic method
- (b) Separation of a mixture of coloured organic compounds using common organic solvents by TLC.

##### 3. Synthesis of the following organic compounds:

1. To prepare o-chlorobenzoic acid from anthranilic acid.
2. To prepare S-Benzyl-iso-thiourea chloride from thiourea.

##### Book for practical:

1. Synthesis and Characterization of Inorganic Compounds, W.L. Jolly. Prentice Hall.
2. Experiments and Techniques in Organic Chemistry, D.P. Pasto, C. Johnson and M. Miller, Prentice Hall.
3. Practical Physical Chemistry, A.M. James and F.E. Prichard, Longman.