FACULTY OF SCIENCES

SYLLABUS

FOR

B.Sc. (Medical & Non Medical)
(Semester III-VI)
Session: 2018-19

KHALSA COLLEGE
AMRITSAR
(An Autonomous College)

B. Sc. (Medical & Non Medical) CHEMISTRY
Semester-III
ORGANIC CHEMISTRY–II

Time: 3 Hrs. **Marks: 30**
45 Hrs (3 Hrs/week)

The question paper shall consist of two parts as detailed below:–
Part A :- (Compulsory)
It shall consist of 6 very short answer type questions (Q. Nos. 1 to 6) from the entire syllabus and the maximum length of each question may not exceed 1/3rd of the page. Each question will be carrying one mark. (**6 x 1 = 6 Marks**)

Part B:-
It shall consist of three sections (Section I, II & III) having 9 questions in total (Q. Nos. 7 to 15) from the entire syllabus. Each section will consist of three questions from each unit of the syllabus. The maximum length of each question may not exceed 5 pages. The candidate will attempt two questions from each section. Each question will be carrying four marks. (**6 x 4 = 24 Marks**)

SECTION–I
I. Stereochemistry of Organic Compounds (15 Hrs.)
Concept of isomerism. Types of isomerism. Optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diasteremeors, meso compounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature. Geometric isomerism–determination of configuration of geometric isomers. E & Z system of nomenclature. Conformational isomerism–conformational analysis of ethane and n–butane; conformation of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives. Newman projection and Sawhorse formulae, Fischer and flying wedge formulae. Difference between configuration and conformation.

SECTION-II

II. Alcohols (8 Hrs.)
Classification and nomenclature. Monohydric alcohols—nomenclature. Acidic nature. Reactions of alcohols. Dihydric alcohols—nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAC)_4$] and [HIO_4] and pinacol-pinacolone rearrangement.

III. Phenols (7 Hrs.)
Nomenclature, structure and bonding, Preparation of phenols, physical properties and acidiccharacter, Comparative acidic strengths of alcohols and phenols, resonance stabilization ofphenoxide ion. Reactions of phenols—electrophilic aromatic substitution, acylation

andcarboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis,
Reimer Tiemann reaction.

SECTION-III

IV. Aldehydes and Ketones (15 Hrs.)

Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones withparticular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and
ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids.
Physical properties. Mechanism of nucleophilic additions to carbonyl group with particularemphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation withammoni a and its derivatives. Witting reaction. Mannich reaction. Use of acetals as protectinggroup. Oxidation of aldehydes, Baeyer-Villiger oxidation of Ketones, Cannizzaro reaction.MPV, Clemmensen, Wolff-Kishner, $LiAIH_4$ and $NaBH_4$ reductions. Halogenation of enolizableketones. Halogenation of enoliable ketones.

B. Sc. (Medical & Non Medical) CHEMISTRY
Semester-III
PHYSICAL CHEMISTRY–II

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SECTION-I
1. Thermodynamics-I   **15 Hrs.**
Definition of thermodynamic terms: System, surroundings etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.
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 of w,q,dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.
Thermochemistry: Standard state, standard enthalpy of formation-Hess's Law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy. Kirchhoff's equation.

SECTION-II
II. Thermodynamics-II & III   **15 Hrs.**
Second Law of Thermodynamics: Need for the law, different statements of the law, Carnot cycle and its efficiency, Carnot theorem. Thermodynamic 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, entropy change in physical change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.
Third Law of Thermodynamics: Nernst heat theorem, statement and 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.

SECTION-III

Equilibrium

III. Chemical Equilibrium   **5 Hrs.**

Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Determination of Kp, Kc, Ka and their relationship, Clausius-Clapeyron equation, applications.

IV Introduction to Phase Equilibrium   **10 Hrs.**

Statement and meaning of the terms-phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system-water, CO_2 and S systems. Phase equilibria of two component systems-solid-liquid equilibria, simple eutectic-Bi-Cd, Pb-Ag systems, desilverisation of lead. Solid solutions-compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl-H_2O), FaCl3-H_2O) and CuSO4-H_2O) system. Freezing mixtures, acetone-dry ice. Liquid-liquid mixtures-Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system-azeotropes-HCl-H_2O and ethanol-water system. Partially miscible liquids Phenol-water, trines-thylamin-water, Nicotine-water System. Lower and upper consulate temperature, Effect of impurity on consolute temperature, immiscible liquids, steam distillation. Nernst distribution law-thermodynamic derivation and applications.

B. Sc. (Medical & Non Medical) CHEMISTRY
Semester-III
PRACTICAL

Duration: 3½ Hrs.   **Marks: 20**
6 Period/Week

Quantitative Analysis
Volumetric Analysis
a. Determination of acetic acid in commercial vinegar using NaOH.
b. Determination of alkali content-antacid tablet using HCI.
c. Estimation of calcium content in chalk as calcium oxalate by permanganometry.
d. Estimation of hardness of water by EDTA.
e. Estimation of ferrous and ferric by dichromate method.
f. Estimation of copper using sodiumthiosulphate.

Gravimetric Analysis
Analysis of Cu as CuSCN and Ni as Ni (dimethylgloxime)

Organic Chemistry Laboratory Techniques
Thin Layer Chromatography
Determination of Rf values and identification of organic compounds.
a. Separation of green leaf pigments (spinach leaves may be used).
b. Preparation and separation of 2, 4. dinitrophenylhydrazones of acetone, 2-butone, 2-Butanone, hexan-2 and 3-one using toluene and light petroleum (40 : 60).
c. Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5).

Practical Examination
1) Volumetry / Gravimetry   10
2) Thin Layer chromatography   04
3) Viva-Voce   04
4) Note Book   02

B. Sc. (Medical & Non Medical) CHEMISTRY
Semester-IV
INORGANIC CHEMISTRY–III

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45 Hrs (3 Hrs/week)

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Part B:-
It shall consist of three sections (Section I, II & III) having 9 questions in total (Q. Nos. 7 to 15) from the entire syllabus. Each section will consist of three questions from each unit of the syllabus. The maximum length of each question may not exceed 5 pages. The candidate will attempt two questions from each section. Each question will be carrying four marks. (**6 x 4 = 24 Marks**)

SECTION-I
I. Coordination Compounds 10 Hrs.
Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes.
II. Non-aqueous Solvents 5 Hrs.
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.

SECTION-II
III. Oxidation and Reduction 8 Hrs.
Use of redox potential data-analysis of redox cycle, redox stability in water-Frost, Latimer and Pourbaix diagrams.
IV. Chemistry of Lanthanide Elements 7 Hrs.
Electronic structure, oxidation states and ionic radii and lanthanide contraction. Electronic absorption and magnetic properties of lanthanides.
SECTION-III
V. Chemistry of Actinides 5 Hrs.
General features and chemistry of actinides, similarities between the later actinides and the later lanthanides. Electronic and magnetic properties of actinides and their general comparison with the lanthanide elements.
VI. Bioinorganic Chemistry 10 Hrs.
Essential and trace elements in biological processes, metalloporphyrins and special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca^{2+}.

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SECTION-I
I. Carboxylic Acids (8 Hrs.)
Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation.
II. Carboxylic Acids Derivatives (7 Hrs.)
Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides, Relative stability & reactivity of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives, chemical reactions. Mechanisms of esterification and hydrolysis (acidic and basic).

SECTION-II
III. Ethers and Epoxides (5 Hrs.)
Nomenclature of ethers and methods of their formation, physical properties. Chemical reaction- cleavage and autoxidation, Ziesel's method. Synthesis of epoxides. Acid and basecatalyzed
ring opening of epoxides, orientation of epoxide ring opening, reactions of
Grignard and organolithium reagents with epoxiedes.
IV. Organic Compounds of Nitrogen (10 Hrs.)
Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes, Mechanisms of nucleophilc substitution in nitroarenes and their reduction in acidic, neutral and alkaline media. Reactivity, Structure and nomenclature of amines, Methods of preparation of amines by Reductive amination of aldehydic and ketonic compounds, Gabriel-phthalimide reaction and Hofmann bromamide reaction. Physical properties. Stereochemistry of amines. separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysts.

SECTION-III

V. Organometallic Compounds (7 Hrs.)

Organomagnesium Compounds: The Grignard reagentsformation, structure and chemical reactions.

Organolithium Compounds: Formation and chemical reactions.

Organozinc and Organocoppercompounds: Nomenclature , Structural features, methods of formation, and chemical reactions.

VI. Heterocyclic Compounds (8 Hrs.)

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. Comparison of basicity of pyridine, piperidine and pyrrole.

B. Sc. (Medical & Non Medical) CHEMISTRY
Semester-IV
PRACTICAL

Duration: 3½ Hrs.   **Marks: 20**
6 Period/Week

Qualitative Analysis

Detection of elements (N, S and halogens)

Detection of functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and anilide) in simple organic compounds and preparing their derivatives.

Practical Examination
1) Detection of Elements   04
2) Detection of functional group and derivative preparation 10
3) Viva-Voce   04
4) Note Book   02

B. Sc. (Medical & Non Medical) CHEMISTRY
Semester-V
INORGANIC CHEMISTRY–IV

Time: 3 Hrs.   **Marks: 30**
45 Hrs (3 Hrs/week)

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SECTION-I
1. Metal-ligand Bonding in Transition Metal Complexes (10 Hrs)
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.
2. Magnetic Properties of Transition Metal Complexes (5 Hrs)
Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of μs and μeff values, orbital contribution to magnetic moments, application of magnetic moment data for characterization of 3d-metal complexes.

SECTION-II
3. Thermodynamic and Kinetic Aspects of Metal Complexes (5 Hrs.)
A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes.
4. Electronic Spectra of Transition Metal Complexes (10 Hrs)
Term symbols for p^2 and d^2 systems, Spectroscopic ground states for d1-d10 electronic configurations.
Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states. Orgel diagram for d^1-d^5.

SECTION-III
5. Organometallic Compounds: (15 Hrs)
Definition, nomenclature and classification of organometallic compounds. EAN rule, Preparation, properties, and applications of alkyls aryls of lithium and aluminium, Bonding in metal-ethylenic complexes, Mechanism of homogeneous hydrogenation reactions.

B. Sc. (Medical & Non Medical) CHEMISTRY
Semester-V
PHYSICAL CHEMISTRY–III

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SECTION-I
1. Electrochemistry-I (7 hrs.)
Electrical transport-conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution. Migration of ions and Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method. Applications of conductivity measurements: determination of degree of dissociation, determination of Ka of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.
2. Electrochemistry – II (8 hrs.)
Types of reversible electrodes-gas metal ion, metal ion, metal insolblue salt-anion and redox electrodes. Electrode reactions. Nernst equation, derivation of cell E.M.F. and Single electrode potential, standard hydrogen electrode, reference electrodes, standard electrode potential, sign conventions, electrochemical series and its significance. Electrolytic and Galvanic cellsreversible and irreverisible cells, conventional representation of electrochemi cells.
EMF of a cell and its measurements. Computation of cell. EMF, Calculation of thermodynamic quantities of cell reactions (ΔG ΔH and K), polarization, over potential and hydrogen overvoltage. Concentration cells with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.
Definition of pH and pKa, determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods. Buffers-mechanism of buffer action, Henderson-Hazel equation, Hydrolysis of salts. Corrosion-types, theories and methods of combating it.

SECTION-II

3. Nuclear Chemistry (15 Hrs.)

Introduction: Radioactivity, Nuclear Structure, Size of Nucleus, Mass Defects and Binding Energy, Nuclear Stability, Nuclear Forces, Nuclear Spin and Moments of Nuclei, Nuclear Models, Nuclear Decay Processes, The Laws of Radioactive Decay, Soddy-Fajans Group Displacement Law, Rate of Nuclear Decay and Half Life Time (Kinetics of Radioactive Decay), Induced Nuclear Reactions, Types of Nuclear Processes, High Energy Nuclear Reactions, Nuclear Reaction Cross-Section, Artificial radioactivity, Detection and Measurement of Radioactivity, Nuclear Fission, Nuclear Fusion, Applications of Radioactivity.

SECTION-III

4. Spectroscopy (15 Hrs.)

Introduction: Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.

5. Rotational Spectrum

Diatomic molecules. Energy levels of a rigid rotor (semiclassical principles), selection rules, spectral intensity, distribution using population distribution (Maxwell-Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotor, isotope effect.

6. Vibrational Spectrum

Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, 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.

7. Electronic Spectrum

Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck-Condon principle.

Qualitative description of s, p, and n M.O., their energy levels and the respective transitions.

B. Sc. (Medical & Non Medical) CHEMISTRY
Semester-V
PRACTICAL

Duration: 3½ Hrs.   **Marks: 20**
6 Period/Week

(I) Synthesis and Analysis
(a) Preparation of Sodium trioxalatoferrate (III)
(b) Preparation of Ni-DMG Complex
(c) Preparation of Copper tetrammine complex
(d) Preparation of cis-bisoxalatodiaquachromate (III) ion

(II) Physical Chemistry

(a) Conductometric Titrations
(i) Determine the end point of the following titrations by the conductometric methods.
Strong acid-Strong base
Strong acid-Weak base
Weak acid-Strong base
Weak acid-Weak base
(ii) Determine the composition of a mixture of acetic acid and the hydrochloric acid by conductometric titration.
(b) (i) Molecular Weight Determination of acetanilide, napthalane, using camphor as solvent
(Rast's methods).
(ii) To determine the molecular weight of a polymer by viscosity measurements.
(c) Adsorption (i) To study the adsorption of acetic acid oxalic/acid from aqueous solutions by charcoal.
(d) Phase Equilibria to determine the distribution coefficient of iodine between CCI4 and water.
(e) Refractometry
(i) Determination of refractive index of a liquid by Abbe refractometer, and hence the specific and molar refraction.
(ii) To determine the composition of unknown mixture of two liquids by refractive index measurements.

Practical Examination
1) Inorganic Synthesis   06
2) Physical experiment   08
3) Viva- Voce   04
4) Note Book   02

B. Sc. (Medical & Non Medical) CHEMISTRY
Semester-VI
ORGANIC CHEMISTRY– IV

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45 Hrs (3 Hrs/week)

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SECTION-I
1. Spectroscopy (15 hrs.)
Nuclear Magnetic Resonance (NMR) spectroscopy.
Proton Magnetic Resonance (1H NMR) spectroscopy,
nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone.
2. Electromagnetic Spectrum: Absorption Spectroscopy
Ultraviolet (U.V.) absorption spectroscopy introduction- (Beer-Lambert law), molar absorptivity, analysis of UVspectra, types of electronic transitions effect of conjugation. Concept of chromophores and auxochrome, Bathochrome, hypsochrome, hyperchrome, hypochromic shifts-UV spectra of conjugated compounds, Infrared (IR) Absorption spectroscopy-introduction, Hooke's law, Selection rules, intensity and IR bands, measurement of IR spectrum time characteristic absorption of various fundamental band interpretation of IR spectra of simple organic compounds.
SECTION-II
3. Problems based on spectroscopy (4 Hrs.)
Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.
4. Organosulphur Compounds (3 Hrs.)
Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine.
5. Synthetic Polymers (4 Hrs.)
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.

6. Organic Synthesis *via* Enolates (4 Hrs.)

Acidity of α-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethylacetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1,3-dithianes. Alkylation and acylation of enamines.

SECTION-III

7. Carbohydrates (8 Hrs.)

Classification and nomenclature. Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D(+)-glucose. 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.

8. Amino Acids, Peptides, Proteins and Nucleic Acids (7 Hrs.)

Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and reactions of α-amino acids.
Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, efdsfdfsdfsdsdzz

nd group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Structures of peptides and proteins. Levels of protein structure. Protein denaturation/renaturation.
Nucleic acids : Introduction. Constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical structure of DNA.

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Semester-VI
PHYSICAL CHEMISTRY–IV

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SECTION-I
1. Quantum Mechanics-I (15 hrs.)
Black-body radiation, Planck's radiation law, Photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects, Compton effect.
de Broglie hypothesis, Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box, quantization of energy levels, extension to two and three dimensional boxes, degeneracy.

SECTION-II
2. Quantum Mechanics-II (15 hrs.)
Simple harmonic oscillator model of vibrational motion, setting up Schrodinger equation and discussion of solution and wave functions. Rigid rotator model of rotation of diatomic molecules transformation to spherical polar coordinates spherical harmonics and their discussion. Qualitative investigation H-atom, setting up Schrodinger equation, radial and angular part, radial distribution functions of 1s, 2s, 2p, 3s, 3p and 3d.

SECTION-III
3. Solid State (8 Hrs.)
Definition of space lattice and unit cell, Law of crystallography- (i) Law of constancy of interfacial angles, (ii) Law of rationality of indices, (iii) Symmetry elements in crystals. X-ray diffraction by crystals. Derivation of Bragg's Law in Reciprocal space. Determination of crystal structure of NaCl, KCl by use of Powder method; Laue's method.

4. Photochemistry (7 Hrs.)
Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus–Drapper law, Stark–Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of flourescence,

phosphorescence, non–radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions–energy transfer processes (simple examples).

B. Sc. (Medical & Non Medical) CHEMISTRY
Semester-VI
PRACTICAL

Duration: 3½ Hrs.   **Marks: 20**
6 Period/Week

Organic Chemistry Laboratory Techniques
1. Column Chromatography
Separation of o & p nitrophenol
Separation of Leaf pigments from Spinnach leaves
Separation of o & p nitro aniline
Separation of dyes.

2. Synthesis of Organic Compounds
Preparation of p-nitroacetanilide
Preparation of p-bromoacetanilide
Green Chemistry Experiment: Preparation of benzilic acid from Benzyl-using greenapproach.
Preparation of Methyl Orange, Methyl Red
Preparation of benzilic acid from benzyl-using green approach

Practical Examination
1) Column Chromatography   05
2) Organic Synthesis   09
3) Viva-Voce   04
4) Note Book   02

Books Suggested (Theory Courses)
1. Basic Inorganic Chemistry, F.A. Cotton, G. Wilkinson and P.L. Gaus, Wiley.
2. Concise Inorganic Chemistry, J.D. Lee, ELBS.
3. Concepts of Models of Inorganic Chemistry, B. Douglas, D. McDaniel and J. Alexander, John Wiley.
4. Inorganic Chemistry, D.E. Shriver, P.W. Alkins and C.H. Langford, Oxford.
5. Inorganic Chemistry, W.W. Porterfield Addison-Wesley.
6. Inorganic Chemistry, A.G. Sharpe, ELBS.
7. Inorganic Chemistry, G.L. Miessler and D.A. Tarr, Prentice Hall.
8. Organic Chemistry, Morrison and Boyd, Prentice-Hall.
9. Organic Chemistry, L.G. Wade Jr. Prentice-Hall.
10. Fundamentals of Organic Chemistry, Solomons, John Wiley.
11. Organic Chemistry Vol. I, II & III, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd. (New Age International).
12. Organic Chemistry, F.A. Carey, McGraw-Hill, Inc.
13. Introduction to Organic Chemistry, Sireitwieser, Heathcock and Kosover, Macmilan.
14. Physical Chemistry, G.M. Barrow, International Student Edition, McGraw Hill.
15. Basic Programming with Application, V.K. Jain, Tata McGraw Hill.
16. Computers and Common Sense, R. Hunt and Shelly, Prentice Hall.
17. University General Chemistry, C.N.R. Rao, Macmillan.
18. Physical Chemistry R.A. Alberty, Wiley Eastern Ltd.
19. The Elements of Physical Chemistry, P.W. Atkins, Oxford.
20. Physical Chemistry Through Problems, S.K. Dogra and S. Dogra, Willey Eastern Ltd.

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