SYLLABUS

B.Sc. (Honours)
CHEMISTRY/BIOCHEMISTRY
(Foundation Course)
For
Session
2018-19
2019-20
2020-21

Department of Chemistry
A.P.S. University, Rewa (M.P.)
Unit-I: Alcohols and Phenols


Unit-II: Aldehydes and Ketones


Unit-III: P-Block Elements

Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16. Hydrides of boron-diborane and higher boranes. Borazine, borohydrides Fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetra nitride, basic properties of halogens, interhalogens.

**Noble Gases:** Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

Unit-IV: Chemistry of Elements of First Transition Series

Characteristic properties of d block elements. Properties of the elements of the first transition series their Binary compounds such as Carbides, Oxides and Sulphides.

**Complexes:** Complexes illustrating relative stability of their oxidation states, coordination number and geometry.

Unit-V: Non-aqueous Solvents

Physical properties of solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH3 and liquid SO2.

**Acids and Bases:** Arrhenius, Bronsted- Lowry, the Lux-Flood solvent system and Lewis concepts of acids and bases.
Unit-I: Carbohydrates


Unit-II: Amino Acids & Proteins


Unit – III Fats Oils and Detergents

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Saponification value, iodine value, acid value. Soaps, synthesis detergents, alkyl and aryl sulphonates.

Unit-IV: Enzymes & Co-enzymes


Unit-V: Nucleic acids:

Nucleic acid, Introduction, Constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical structure of DNA.
Unit-I: Arenes and Aromaticity


Unit-II: Alkenes

Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regio-selectivity in alcohol dehydration the Saytzeff rule, Hoffmann 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, Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO4, polymerization of alkenes. Substitution at the allylic and vinyllic positions of alkenes, industrial applications of ethylene and propene.

Unit-III: Alkyl and Aryl Halides


Unit-IV: Chemical Kinetics

Chemical Kinetics-I Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction-concentration, temperature, pressure, solvent, light, catalyst concentration dependence of rates, mathematical characteristics of simple chemical reactions-zero, order, pseudo order, half life and mean life. Determination of the order of reaction differential method, method of integration, method of half life period and isolation method.

Chemical Kinetics-II Experimental methods of chemical kinetics-conductometric, potentiometric, optical methods, polarimetry and spectrophotometer. Theories of chemical kinetics: effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis.) Expression for the rate constant based on equilibrium constant and thermodynamic aspects

Unit-V Colloidal State: Definition of colloids, classification of colloids. Solids in liquids (sols): properties- Kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulz law, gold number. Liquids in liquids (emulsions) types of emulsions, preparation. Emulsifier. Liquids in solids (gels): classification, preparation and properties, inhibition, general applications of colloids. Green chemistry Introduction to green chemistry what is green chemistry? need for green chemistry. goals of green chemistry. Limitations/obstacles in the pursuit of the goals of green chemistry. Examples of green synthesis/reactions. green synthesis of the following compounds: adipic acid, catechol, BHT, methyl methacrylate, urethane, aromatic amines (4-aminodiphenylamine), benzyl bromide, acetaldehyde, disodium iminodiacetate (alternative to strecker synthesis), citral, ibuprofen, paracetamol, turtural. oxidation reagents and catalysts; biomimetic, multifunctional reagents; combinatorial green chemistry; proliferation of solvent less reactions; on covalent derivatization; green chemistry in sustainable development
Unit-I: Mathematical Concepts and Computer

Mathematical Concepts: Logarithmic relations, (rules and types), use of log table and antilog table in calculations, curves sketching, straight line and linear graphs, calculation of slopes. Differentiation of functions like Kx, ex, x^n, sinx, logx; multiplication and division in differentiation, maxima and minima, partial differentiation and reciprocity relations. Integration of some useful/relevant functions; Factorials, Probability.

Computer: General introduction to computer different components of a computer Hardware and software, input-output devices binary number and arithmetic; introduction to computer languages Programming and operating systems.

Unit-II: Gaseous States and Molecular Velocities

Gaseous States and Molecular Velocities: Critical phenomenon: PV isotherms of ideal gases, Andrew’s experiment, continuity of states, the isotherms of Vander Waals equations, relationship between critical constants and Vander Waals constants, Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell’s distribution of molecular velocities, collision numbers, mean free path and collision diameter.

Liquid State: Intermolecular forces, structure of Liquids (a qualitative description) Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholesteric phases. Thermography and seven segment cell.

Unit-III: Atomic Structure

Elementary Quantum Mechanics: Idea of de Broglie matter waves, Heisenberg uncertainty principal, atomic orbital’s, Shapes of s, p, d orbitals, Schrodinger wave equation, significance of ψ and ψ^2, radial and angular wave functions and probability distribution curves, effective nuclear charge.

Unit IV: Periodicity of Elements

Definition, periodicity of elements long form of periodic table. Detailed discussion of the following properties of the elements, with reference to s & p- block. (a) Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table. (b) Atomic radii (van der Waals), factors affecting Atomic radii; (c) Ionic radii; (d) Covalent radii; (e) Ionization enthalpy/Ionization potential, factors affecting ionization energy; (f) Electron gain enthalpy (Electron affinity), factors affecting electron gain enthalpy, trends of Electron gain enthalpy (Electron affinity) in periodic table. (g) Electronegativity, trends of Electronegativity in periodic table, Pauling’s/ Mulliken’s and Mulliken-Jaffe’s electronegativity scales. Hund’s rules, Afaabau rule and pauli’s exclusion law.

Unit V: Chemical Bonding

Chemical Bonding: Covalent bonding as applied to valence bond theory and its limitations, directional characteristic of covalent bond. Hybridization and shapes of simple molecules and ions, Valence Shell Electron Pair Repulsion (VSEPR) theory to NH₃, SF₄, CIF₃, ICl₂, H₂O.
Unit I: Structure and Bonding

Hybridizations, Bond length, and bond angles, bond energy; Localized and delocalized chemical bond, vander Waal's interaction, inclosing compound, clatherates, charge transfer complex, resonance, hyper conjugation. Aromaticity, inductive and field effect hydrogen bonding

Mechanism of Organic reaction: Curved arrow notation . drawing electron movement with arrows half headed and double headed arrow homolytic and heterolytic bond breaking

Types of Reagents: Electrophiles and nuclophiles. Types of organic reaction. Energy consideration, Reactive intermediates carbocations, carbanions, free radicals Methods of determination of reaction mechanism .

Unit –II: Stereochemistry

Concealments of symmetry ,molecular cherallity. enantiomers estrogenic centers optical activity properties of enantiomers chiral and achiral molecule with two stereogenic centres distereoisomer mesocompound resolution of enantiomers inversion and recemization Relative and absolute configuration sequence rule D&L, R&S system of nomenclature , Nomenclature E&Z system geometrical isomerism in alicyclic compound Conformatioept of isomerism .types of isomerism optical isomerism n ,conformational analysis of ethane and n-butane Conformation of cyclohexane axial and equatorial bonds Newman projection and saw horse formula Fiecher and Flying wedge formula.

Unit-III: Alkanes and Cycloalkanes


Unit –IV: S- Block Elements

Comparative study diagonal relationship salient feature of hydrides salvation and complexation tendencies including their function in biosystems an introduction to alkyl and aryls.

Unit-V: Solid State

Definition of space lattice Unit cell Laws of crystallography –(i) Law of constancy of interfacial angles (ii) law of rationality of indices (iii) law of symmetry .Symmetry elements in crystals. X-ray diffraction by crystal Derivation of Bragg's equation Determination of crystals structure of NaCl ,KCl and CsCl (Laue's methods and powder methods.) Catalysis characteristics of catalyzed reaction classification of catalysis miscellaneous Example.
Unit-I: Electromagnetic Spectrum


Infrared (IR) absorption spectroscopy: Molecular vibrations Hooke’s law, selection rules, intensity an deposition of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

Unit-II: Thermodynamics-I

Definition of thermodynamic terms: system, surrounding 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 and dH for the expansion of ideals gases under isothermal and adiabatic conditions for reversible process.


Unit-III: Thermo dynamics-II

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.

Thermodynamics-III: 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.

Chemical Equilibrium: Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Le Chateliers principle. Reaction isotherm and reaction isochors- Clapeyron equation and Clausius- Clapeyron equation applications.
Unit-IV: Chemistry of Lanthanide Elements:

Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation of lanthanide compounds.

Chemistry of Actinides: General features and chemistry of actinides, chemistry of separation of Np, Pu, and Am from U, similarities between the later actinides and the later lanthanides.

Unit-V: Organic Compounds of Nitrogen:


Unit-I: Electrochemistry-I

**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.

Unit-II: Electrochemistry-II


Unit-III: Electrochemistry and Corrosion


Corrosion: Types, Theories and methods of combating it.

Unit-IV: Coordination Compounds

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.

Transition Elements-II: Comparative treatment of elements of second and third transition series magnetic behavior, spectral properties and stereochemistry.

Unit-V: Carboxylic Acid


Carboxylic Acid Derivatives: Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides. Relative stability of acyl derivatives. Physical properties, inter conversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives, chemical reactions, Mechanisms of esterification and hydrolysis (acidic and basic).
Unit-I: Paint & Pigment

Classification of paints, constitution of paints. Setting of paints. Qualities of a good paint, paint failure, Methods of applies paints, baking, paint removers.

**Pigment:** Definition study of following pigments lithopone, titamiumdioxide ultramarine blue, zincoxide, white lead. Varnishes: - raw material manufacture of varnishes japaines.

Unit II: Pulp & Paper

Manufacture of pulp, sulfate pulp, rag pulp, benting, refining, flling, sizing & colouring manufacture of paper, calendaring ecological problems of Indian pulp & paper industry.

Unit-III: Cement Industries


Unit-IV: Fertilizers

Definition & classification of fertilizer manufacture of phosphate fertilizer (superphaspate triple superphaspate of calcium) manufacture of nitrogen fertilizers (urea & ammonium phosphate pollution caused by fertilizers, effects of fertilizers.

Unit-V: Soap and Detergents, Fats, Oil & Wax Soap and Detergents

Soap- manufacture, toilet and transparent soap, metal soap, cleaning action of soap. Principal group of synthetic detergent, classification of surface active agents, cationic detergents, non ionic detergents, amphoteric detergents, containing enzymes, eco friendly detergent. Manufacture of shampoos. Fat, Oil & Wax properties, Classification, Analysis, Manufacture and Refining of vegetable oils, animal and mineral oil, hydrocarbon oil, essential oil, oils as emollients, some common wax, solubility of wax, synthetic fat, oil and wax, manufacture of candel hydrogenation of oil.
Unit-I: Metal ligand bonding in transition metal complexes

Limitation of valence bond theory, an elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planer complexes, factors affecting the crystal field parameters.

Thermodynamics and kinetic aspects of metal complexes

A brief outline of Thermodynamic stability of metal complexes and factors affecting the stability, substitution reaction of square planer complexes Magnetic properties of transition metal complexes Types of magnetic behaviour, Methods of determining magnetic susceptibility, spin (only formula) LS coupling, correlation of \( \mu_s \) (spin only) and \( \mu \) effective values. Orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes.

Unit-II: Electron spectra of transition metal complexes

Types of electronic transition, selection rules for d-d transition, spectroscopic ground states, spectrochemical series, Orgel energy level diagram for d1-d9 states, discussion of the electronic spectrum of \([\text{Ti(H}_2\text{O)}_6]^{3+}\).

Unit III: Synthetic polymers


Unit IV: Organic Synthesis via Enolates

Acidity of \( \alpha \)- hydrogen’s Alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1,3- dithianes, Alkylation and Acylation of enamines.

Unit V: Photochemistry

Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of Photochemistry: Grothus-Draper law, Stark-Einstein law, 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 reaction- energy transfer processes (simple examples).
### Unit I: Organometallic Compounds


### Unit II: Spectroscopy

Nuclear magnetic resonance (NMR) Spectroscopy, proton magnetic resonance (H NMR) Spectroscopy, nuclear shielding and de-shielding, 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 acetyphenone.

**Structure elucidation**- Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

### Unit III: Spectroscopy

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


**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 an harmonic motion and isotope on the spectrum, idea of Vibrational frequencies of different functional groups.

**Raman spectrum**: Concept of polarizability, pure rotation and pure vibrational Raman spectra of diatomic molecules, selection rules.

### Unit IV: Physical Properties and Molecular Structure

Optical activity, polarization- (Clausius-Mossotti equation), orientation of dipoles in an electric field, dipole moment, induced dipole moment. Measurement of dipole moment- temperature and refractivity method, dipole moment and structure of molecules, magnetic properties-Paramagnetism, diamagnetism and ferromagnetics.

### Unit V: Heterocyclic Compounds

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. Introduction to condensed five and six-membered heterocycles, Preparation and reactions of Indole, quinoline and isoquinoline. With special reference to Fischer indole synthesis skraup synthesis and Bischler- Napieralski synthesis. Mechanism electrophilic substitution reaction of indole, quinoline and no isoquinoline.
Unit I: Voltammetry

General principle of voltammetry, principle of polarography, Polarographic wave, half wave potential and its importance, Ilkovic equation, principle of cyclic voltammetry, different applications of polarography and cyclic voltammetry.

Unit II: Chromatography

Principle and types of Chromatography, Introduction and applications, Paper chromatography, TLC, Column chromatography, GLC, HPLC, Affinity chromatography, Ion-exchange chromatography, Molecular sieving chromatography.

Unit III: Electrophoresis

Introduction, Principle and Types of Electrophoresis and factors affecting the rate of electrophoresis, Free and Zonal electrophoresis, Paper electrophoresis, Gel electrophoresis, Immuno-electrophoresis, Iso-electric focusing.

Unit IV: Centrifugation

Principle of Centrifugation, Types of centrifuges, Preparative and Analytical centrifugation, sedimentation coefficient, RCF, Factors affecting RCF, Ultracentrifugation, Applications in biology.

Unit V: Radioactivity

Production of Isotopes, Synthesis of labeled compounds, measurement of radioactivity, Methods based upon Gas ionization, Ionization chamber, Proportional counters, Geiger Muller counter, Methods based upon excitation - Liquid Scintillation Counting.

Microscopy: Principle of microscopy, types, compound light phase, contrast florescence microscope, electron microscope and application.
Unit I: Environment


Unit II: Hydrosphere

Chemical composition of water bodies- lakes, streams, rivers & wet lands etc. Hydrological cycle.  

Unit III: Purification & treatment of water

Introduction, potability of water, sterilisation and disinication of water by ozonization and silver ion method, removal of gas from water determination softening of water by lime soda process, determination of hardness of water by soap and titration method.

Unit IV: Soils

Composition, micro and macro nutrients, pollution, fertilizers, pesticides, plastic and metals. Waste treatment.

Unit V: Atmosphere


Unit I: General pharmacology
Nature and sources of drugs, Routes of drug administration and Dosage forms, Absorption and Bioavailability of drugs, Factors affecting drug absorption, Distribution of drugs, Fate of drugs.

Unit II: Drug action

Unit III: Drugs in git
Digestants, Antiflatulants, Appetite suppressants, Hypolipidaemic agents. Emetics, drug therapy of vomiting, Vertigo and Diarrhea, Pharmacotherapy of constipation.

Unit IV: Dosages Certification
Dosage form consideration in preformulation, solid dosage form, solution formulations, emulsion, suspension, freeze dried products and its regulatory considerations, drug design phase, solubility analysis, dissolution and permeation, characterization scheme, stability tastings, order of reaction, antioxidants, chelating agents, impurity, GMP related to bulk drugs and APIs.

Unit V: Chemotherapy
General principles of chemotherapy of infections, Chemotherapy of UTI, Chemotherapy of Malaria, Chemotherapy of Tuberculosis, Chemotherapy of viral infections, Antiseptics, disinfectants and insecticides.
Unit – I

**Plant Classification & Taxonomy**
(A) Concept of Gymnoperm and Angiosperm structure, characters and life cycles. Methods of Plant Breeding – Introduction, Selection and Hybridisation (pedigree, backcross, mass selection, bulk method), Polyploidy, Male sterility and heterosis breeding.

(B) **Bryophytes**: Occurrence, morphology, classification, anatomy and reproduction.  
**Pteridophytes**: Occurrence, Morphology, Classification, anatomy and reproduction.

Unit – II

**Algae** – Occurrence, Structure, Classification Reproduction.  
**Cyanobacteria** - Occurrence, Structure, Classification Reproduction.  
**Fungi** – Classification, Occurrence, Structure and Reproduction.

UNIT – III

(A) Morphology, Anatomy and different function of Flowering plants, Root, Stem, Leaves, Flower, Fruit and seeds.
(B) Movement of water, food, Nutrients and exchange of gases, Plant and water, mineral nutrition.

Unit – IV

**Photosynthesis**: Photochemical reaction, Photophosphorelation, Carbon fixation Pathway; C3, C4 and CAM pathways, Respiration (aerobic, anaerobic, including fermentation), Photorespiration, Nitrogen cycle and Fixation.

Unit – V

Importance of secondary metabolites, Pigments as photoreceptors (plastidial pigments and phytochromes), Plant movements; photoperiodism and flowering, Vernalisation, senescence, Growth substances (Plant Hormones) – their chemical nature and role, Fruit Ripening, Dormancy, Storage and Germination of seeds.
Unit – I


Unit - II

Origin, Structure, Cellular organization and Functions of mitochondria, golgi apparatus, Chloroplast, endoplasmic reticulum, lysosomes, nucleus, ribosome, Chromosome structure and its models.

Unit – III

Cell Cycle, Cell division: Interphase, Mitosis, Meosis and its regulation, Ageing of cell, cell death, cytoskeleton, cell adhesion, cell junctions, cell check point, cell cycle regulation.

Unit – IV

Structural organization and chemical composition of chromosome,s nucleosomes organization, special chromosomes, chromosome staining, Banding pattern in human chromosomes.

Unit – V

Transport by vesicles formation, Endocytosis, Exocytosis, Receptor mediate eno-exo cytosis, Basics of signal transduction, Protein trafficking, Protein sorting, Stem cell biology, Cancer cell biology.
Unit – I

Genetic code: Basic features, Biological significance, various types of genes, Wobble hypothesis. Organization of DNA and RNA in prokaryotes and in eukaryotes, Types of DNA & RNA.

Unit – II

Central dogma, DNA replication in prokaryotes and eukaryotes, conservative, semi conservative and dispersive types, Enzymology of DNA replication. Errors & regulation of DNA replication, DNA repair.

Unit – III

Transcription in Prokaryotes: Mechanism of Transcription (Initiation, Elongation, Termination), RNA polymerases, Promoters, Post transcriptional modification, Inhibitors of transcription.

Unit – IV


Unit – V

Regulation of Gene Expression – Concept of operon, promoters, Operator, Repressors, Structural genes, inducers, lac operon, trp operon, Attenuation, ara operon, positive regulation, negative regulation, cascade regulation.
Unit – I

General Properties of Enzymes, Structural properties of enzymes, Nomenclature and Classification of Enzymes, Protein nature of Enzymes, Non-protein enzymes, Metalloenzymes and metal activated enzymes, turn over no.

Unit – II

Models proposed for Enzymatic Reactions, Factors affecting the rate of enzyme catalyzed reaction. Mechanism of action of enzymes: Lock & Key model, induced fit model, enzyme-substrate model, active site, active site determination.

Unit – III

Acid-base catalysis of enzymes, Covalent catalysis, Metal ion catalysis, Serine Protease, Ribonuclease, Chymotrypsin, Lysozyme, measurement of enzyme activity, Machalis Menten equation, significance of Vmax and Km.

Unit – IV

Enzyme inhibition: Reversible-Irreversible inhibition, Feedback Inhibition, Concept of Coenzymes and Cofactors activity and binding efficiency, Allosteric Inhibition, rate of enzyme action.

Unit – V

Enzyme Biotechnology – Immobilization, immobilization techniques, Uses of enzymes in milk industry, food industry, leather industry, enzymes in cellulose & metal degradation, Designer enzymes, Biosensors, Morden enzyme tools & technology, enzyme extraction and purification.
Unit – I

Unit – II
Digestion and absorption of carbohydrates, Concept of Carbohydrate Metabolism, Glycolysis – aerobic & anaerobic Glycolysis, TCA cycle, Glycogen Metabolism.

Unit - III
Digestion, absorption and mobilization of Lipids, Transport of Fatty Acids, Role of Hormones in Digestion and mobilization, Elementary idea of metabolism of Triglycerides, β-oxidation of Fatty acids, Cholesterol, Ketone Bodies.

Unit – IV
Digestion, absorption and mobilization of Proteins and Amino Acids, Oxidation, Reduction, Decarboxylation, deamination and transamination of amino acids, Concept of Glucogenic and Ketogenic amino acids, Nitrogen excretion and Urea cycle.

Unit – V
Heam Metabolism – Source of Bilirubin, Transport of Bilirubin, Conjugation of Bilirubin, Secretion and excretion of Bilirubin, Detoxication, xenobiotics metabolism.
Unit I

Linear independence of row and column Matrices, row & column rank of matrix. Equivalence of column and row rank. Eigen values eigen vectors. Characteristic equation of matrix, Cayley Hamilton theorem and its use in finding inverse of matrix, application of matrix to a system of linear equation, solving the linear equation. Theorem on consistency and inconsistency of a system of linear equations, solving the linear equations with three unknowns.

Unit II

De-Moiver’s theorem and its application. Direct and inverse circular and hyperbolic functions, logarithm of a complex quantity, expansion of trigonometrically function.

Unit III


Unit IV

Integration of irrational algebraic and transcendental function, reduction formula definite integral Quadrature, Rectification.

Unit V

Unit I

Linear equation and equation reducible to the linear form, Exact differential equations. First order higher degree equation for x,y,p Clairaut’s form and singular solutions. Geometrical meaning of a differential equation, orthogonal trajectories, Linear differential equations with constant coefficients.

Unit II

Homogeneous Linear ordinary differential equation. Linear differential equations of second order. Transformation of the equation by changing the dependent and independent variables. Method of variation of parameters, ordinary simultaneous differential equations.

Unit III


Unit IV

Definition and basic properties of group, subgroup, cyclic groups, simple properties. Coset decomposition and related theorems. Lagrange’s theorem and Fermat’s theorem, Normal subgroup, Quotient groups.

Unit V

Homomorphism and Isomorphism of groups, kernel of homomorphism. Fundamental theorem of homomorphism of groups.
Unit I

Definition of a sequence, theorems on limits of sequences, Bounded and monotonic sequence, Cauchy’s convergence criterion series of nonnegative terms, Comparison test Cauchy’s integral test, Ratio test, Raabe’s test, Logarithmic test De-Morgan and Bertrand’s test.

Unit II

Alternating series Leibnitz’s theorem, Absolute and conditional convergence, Continuity of function of one variable, sequential continuity, properties of continuous functions, uniform continuity.

Unit II

Chain rule of differentiability, mean value theorems and their geometrical interpretation, Darboux’s intermediate, Value theorem for derivatives, Limit and continuity of function of two variables.

Unit IV

Analytical conditions of equilibrium of coplanar forces, virtual work, Catenary.

Unit V

Velocities and Accelerations along radial and transverse direction and along tangential and normal directions, Simple harmonic motion.
Unit I

Partial differential equation of the first order, Lagrange’s solution, Some special types of equations, Charpit’s general methods of solution

Unit II

Partial differential equation of the second and higher order, Classification of linear partial differential equations of second order, Homogeneous and non homogeneous equations with constant coefficient, Partial differential equations reducible to equations with constant coefficient.

Unit III

Calculus of variations-variational problems with fixed boundaries, Euler’s equation for functions containing first order derivative and one independent variable, Extremals.

Unit IV

Series solution of differential equations, Power series methods, Bessel’s equations, Bessel’s function and its properties.

Unit V

Recurrence and generating relations, Legendre’s equations, Legendre’s function and its properties recurrence and generating relations, Orthgonality of functions, Sturm-liouville problem, Orthgonality of eigen functions, Reality of eigen value.
Linear Algebra

Unit I

Definition of Vector Space and example, Vector subspace, Addition of vector space, linear span, linear dependence and independence, Basis, finite dimensional vector space, existence and extension theorem.

Unit II

Dimension of addition of vector space, quotient space and dimension, Isomorphism, Linear transformation and matrix representation, algebra of linear transformation, rank and nullity the theorem.

Real Analysis

Unit II

Riemann integral, Interability of continuous and monotonic functions, The fundamental theorem of integral calculus, Mean value theorems of integral calculus.

Unit IV:

Partial derivation and differentiability of real-valued functions of two variables, Schwarz and Young’s theorem, Fourier series of half and full intervals.

Discrete Mathematics

Unit V

Countability, theory of mathematical induction, inclusion and exclusion.
Paper FC- 1

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Unit-I

1- Lora=rkiqdjkjrh ¼dfork½ & t;'kadjizlkn
2- iq"i dh vfHkyk"kk ¼ dfork½ &ek[kuykyprqosZnh
3- okD; lajpukvSj v'kqf);kj ¼ladfyr½
4- o.kZ&fopkj ¼Loj&O;atu] oxhZdj.k] mPPkkj.k LFkku½

Unit-II

1- ueddknjksxk ¼dgkuh½ &izsepan
2- ,d FksjktkHkkst ¼fuca/k½ &MkW- f=HkouukFk 'kqDy
3- i;kZ;okph] foykse] ,dkFkhZ] vusdkFkhZ ,oa 'kCn;qXe 'kCn
   ¼ladfyr½
4- fojkefpUg& ¼ladfyr½ laf/k ¼ladfyr½

Unit-III

1- Hkxokucq) ¼fuca/k½ &LokehfoosdkuUn
2- yksdra= ,d /keZgS ¼fuca/k½ &MkW- loZiYYkhjk/kkd``.ku
3- ugha :dh gS unh &ghjkykyckNksfr;k
4- iYYkou

Unit-IV

1- vQlj ¼fuca/k½ & 'kjntks'kh
2- gekjh ¼lkaLd`frd ,drk ¼fuca/k½ &jke/kkjh flag fnudj
3- la{ksi.k ¼ladfyr½
4- lekl ¼ladfyr½

Unit-V

1- uSfrdeWY; ifj; ,oaoxhZdj.k ¼vkys[k½ &MkW- 'kflkj;
2- vkpj.k dh IH;rk ¼fuca/k½ &ljnkjiw.kZ flag
3- varKkZuvkSjuSfrd thou ¼ys[k½ &MkW- loZiYYkhjk/kkd``.ku
4- vllknhiksHko ¼ys[k½ &Lokeh J)kuan
F C - 2
English Language

Unit – I

1. Where the mind is without fear: Rabindranath Tagore
2. The Hero: R.K.Narayan
3. Trust with destiny: Jawaharlal Nehru
4. Indian Weavers:Sarojini Naidu
5. The Portrait of a lady: Khushwant Singh
6. The Solitary Reaper: William Wordsworth

Unit – II

Basic Language Skills: Vocabulary, Synonyms, Antonyms, Word Formation, Prefixes, Suffixes.

Unit – III


Unit – IV

Comprehension/Unseen Passage, Translation of sentences (English to Hindi & Hindi to English).

Unit – V

Composition and Paragraph Writing
F C-3
Entrepreneurship Development

Unit – I
Entrepreneurship Development - Concept and importance, function of enterpriser, Goal determination – problems, challenges and solutions.

Unit – II

Unit – III
Role of regulatory institutions, Role of development organizations, Self employment oriented schemes, Various growth schemes.

Unit – IV
Financial management of project - Financial institution and their role, Capital estimation and arrangement, Cost and price determination, Accounting management.

Unit – V
Problem of entrepreneurs - Problem relating capital, Problem relating registration, Administration problem and how to overcome from above problems.
Unit – I    Study of Environment & Ecology

(a) Definition and Importance.
(b) Public participation and Public awareness.
(c) Ecology – Introduction.

Unit – II    Environmental Pollution and Population

(a) Air, Water, Noise, Heat and Nuclear Pollution, Definition, causes, effects and prevention of pollution.
(b) Population Growth, Disparities between countries.
(c) Population Explosion, Family Welfare Programme.
(d) Environment and human health.
(e) Cleanliness and disposal of domestic waste.

Unit – III    Natural Resources, Problems and Conservation

(a) Water Resources
(b) Forest Resources
(c) Land Resources
(d) Food Resources
(e) Energy Resources

Unit – IV    Bio-diversity and its protection

(a) Introduction – Genetic species and ecosystem diversity.
(b) Value of Bio-diversity – Consumable use, Productive use, Social, Moral and Aesthetic Values.
(c) India as a nation of mega bio-diversity centre, Bio-diversity at national and local levels.
(d) Threats to Bio-diversity – Loss of Habitat, Poaching of wild life, Man and wild life conflicts.

Unit – V    Disaster Management and Environmental Laws

(a) Disaster Management – Flood, Earthquake, Cyclones and Landslides.
(b) Conservation of laws for air and water pollution.
(c) Wildlife Conservation Laws.
(d) Role of information technology in protecting environment and health.
Department of Chemistry  
A.P.S. University Rewa (M.P.)  
(Academic Session 2018-19)  

Class             –   B.Sc.(Honors) Chemistry  I & II SEM.  
Subject            –   Chemistry  
Paper               –   Practical  
Max. Marks: 200 (100 + 100) –     Time: 6 Hours  

**Physical Chemistry**  
(A) Any one Experiment 24 Marks  
(i) Determination of melting point  
(ii) Determination of boiling point  
(iii) Weighing and preparation of solution  
(B) Any one Experiment 24 Marks  
(i) Determination of surface tension /percentage composition of given liquid mixture using surface tension method.  
(ii) Determination of viscosity/percentage composition of given liquid mixture using viscosity method.

**Inorganic Chemistry** 32 + 16 Marks  
(i) Inorganic mixture analysis  
(Mixture analysis for two cations and two anions)  
(ii) Separation of cations by paper chromatography

**Organic Chemistry (Any two)** 48 Marks  
(i) Crystallization  
(ii) Sublimation  
(iii) Detection of elements  
(iv) Identification of functional group

**Viva-voce** 26 Marks  
**Record** 30 arks  

*Practical examination will be held at the end of II SEM.*
Inorganic Chemistry

(i) Analysis of inorganic mixture containing five radicals with at least one interfering radical
(ii) Determination of acetic acid in commercial vinegar using NaOH
(iii) Redox titrations
(iv) Estimation of Hardness of water by EDTA.

Physical Chemistry

(i) Determination of transition temperature of given substance by thermometric method.
(ii) To determine the enthalpy of neutralization of strong acid, strong base.
(iii) Verification of Beer’s – Lambert law.
(iv) To study the phase diagram of two component system by cooling curve method.

Organic Chemistry (Any two)

(i) Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives.
(ii) Use of paper chromatography/Thin layer chromatography: determination of $R_f$ values, separation and identification of organic compounds.
   a. Separation of green leaf pigments (spinach leave may be used)
   b. Separation of dyes.

Viva-voce

Record

*Practical examination will be held at the end of IV SEM.
# Department of Chemistry

**A.P.S. University Rewa (M.P.)**

(Academic Session 2020-21)

<table>
<thead>
<tr>
<th>Class</th>
<th>B.Sc.(Honors) Chemistry V SEM.</th>
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<tr>
<td>Subject</td>
<td>Chemistry</td>
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<tr>
<td>Paper</td>
<td>Practical</td>
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<td>Max. Marks: 200 (100 + 100)</td>
<td>Time: 6 Hours</td>
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### Inorganic Chemistry

1. **Gravimetric analysis:**
   - Barium as Barium sulphate, Copper as cuprous-thiocynate.

2. **Complex compound preparation**
   - Potassium chlorochromate(IV)
   - Tetramine copper(II) sulphate monohydrate
   - Hexamminenickel(II)chloride

3. **Effluent water analysis, Identification of cations and anions in different samples**.

4. **Water analysis, to determine dissolved oxygen in water sample in ppm.**

### Physical Chemistry

1. **To determine** the velocity constant (Specific reaction rate) of hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.

2. **Determination of partition coefficient of iodine between** carbon tetra chloride and water.

3. **Job’s method**

4. **pH- metric titrations, conductometric titrations.**

### Organic Chemistry (Any two)

1. **Binary mixture analysis containing two solids:**
   - Separation, identification and preparation of derivatives

2. **Preparation**
   - Acetylation, (ii) Benzoylation (iii) meta dinitro benzene
   - (iv) Picric acid

### Viva-voce

**26 Marks**

### Record

**30 Marks**

*Practical examination will be held at the end of VI SEM.*
A.P.S. University Rewa (M.P.)
(Academic Session 2018-19)

Class – B.Sc.(Honors) Chemistry I & II SEM.
Subject – Botany /Cell Biology (Subsidiary)
Paper – Practical
Max. Marks: 200 (100 + 100) – Time: 6 Hours

(A) Botany: Any two Experiments

(i) To study the tissue organization in root and shoot apices using permanent slides.
(ii) Morphology and anatomy of the following Hibiscus, Pinus.
(iii) Section cutting of Bryophytes and Pteridophytes.
(iv) Comparative study of mitosis and meiosis cell division in plant cell by using permanent slides.
(v) Systematic study of locally available plants belonging to families prescribed theory practical.
(vi) Demonstration of herbarium techniques.

(B) Cell Biology: Any two Experiments

(i) Identify and comment upon spots.
(ii) Preparation of blood film (Leishmen’s stain) prepared slides showing the parasites.
(iv) Comparative examination of mitosis and meiosis in an animal cell by using prepared slides.
(v) Study of living animals – Amoeba, Paramecium, Euglena, Hydra, Starfish, Octopus.
(vi) Demonstration of different developmental stages of embryo of frog by prepared slides.

Viva-voce 14 Marks
Record 16 Marks

*Practical examination will be held at the end of II SEM.