

B.Sc. Part-II
(SYLLABUS- CHEMISTRY, BOTANY & ZOOLOGY)

RAJKAMAL SCIENCE & MANAGEMENT COLLEGE
BAHADRABAD (HARIDWAR)

CHEMISTRY SYLLABUS

For

UNDER GRADUATE COURSES (B.Sc. Part-II)
(Annual System)

(Applicable w.e.f. the Session 2019-2020)



Department of Chemistry
Sridev Suman Uttarakhand University Badshahithaul
Tehri-Garhwal - 249001

B.Sc. (II YEAR) CHEMISTRY

There shall be three written papers and a practical examination as follows:

Paper	Paper Code	Course	Max. Marks	Work Hrs
I	CH-201	Inorganic Chemistry	50	60
II	CH-202	Organic Chemistry	50	60
III	CH-203	Physical Chemistry	50	60
	CH-204	Laboratory Practical	50	60
		Grand Total	200	180

Candidate will be required to pass in Theory and Practical Separately.

B.Sc. – II Inorganic Chemistry Paper-IUnit – I

- I. Chemistry of Elements of First Transition Series:
Characteristic properties of d-block elements. Binary compounds (hydrides, carbides and oxides) of the elements of the first transition series and complexes with respect to relative stability of their oxidation states, coordination number and geometry.
- II. Chemistry of Elements of Second and Third Transition Series:
General characteristics, comparative treatment of Zr/Hf, Nb/Ta, Mo/W in respect of ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry.

Unit – II

- III. 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 metal complexes.

Unit – III

- IV. Chemistry of Lanthanide Elements
Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, ceric ammonium sulphate and its analytical uses.
- V. Chemistry of Actinides

Electronic configuration, oxidation states and magnetic properties, chemistry of separation of Np, Pu and Am from U.

Unit – IV

VI. Oxidation and Reduction

Electrode potential, electrochemical series and its applications, Principles involved in the extraction of the elements.

Unit - V

VII. Acids and Bases

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

VIII. Non-aqueous Solvents

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

Chemistry Paper-II (Organic Chemistry)

Unit – I

I. Electromagnetic Spectrum Absorption Spectra

Ultraviolet (UV) absorption spectroscopy – absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome, Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. U.V. spectra of conjugated enes and enones.

Infrared (I.R.) absorption spectroscopy – molecular vibrations, Hooke's law, selection rules, intensity and position of I.R. bands, measurement of I.R. spectrum, finger print region, characteristic absorptions of various functional groups and interpretation of I.R. spectra of simple organic compounds.

Unit – II

II. Alcohols

Classification and nomenclature, Monohydric alcohols – nomenclature, methods of formation by reduction of Aldehydes, Ketones, Carboxylic acids and Esters, Hydrogen bonding, Acidic nature, Reactions of alcohols.

Dihydric alcohols - – nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [Pb(OAc)₄ and HIO₄] and pinacol-

pinacolone rearrangement.

Trihydric alcohols - nomenclature, methods of formation, chemical reactions of glycerol.

III. Phenols:

Nomenclature, structure and bonding, preparation of phenols, physical properties and acidic character, Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols – electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.

Unit – III

IV. Ethers and Epoxides

Nomenclature of ethers and methods of their formation, physical properties, Chemical reactions – cleavage and autoxidation, Ziesel's method.

Synthesis of epoxides, Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organo lithium reagents with epoxides.

V. Aldehydes and Ketones:

Nomenclature and structure of the carbonyl groups, synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones uses 1, 3-dithianes, synthesis of ketones from nitrites and from carboxylic acids, Physical properties. 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.

Use of acetals as protecting group, Oxidation of aldehydes, Baeyer-Villiger oxidation of Ketones, Cannizzaro reaction, MPV, Clemmensen, Wolff-Kishner, LiAlH_4 and NaBH_4 reductions. Halogenation of enolizable ketones, An introduction to O, P unsaturated aldehydes and Ketones.

Unit – IV

VI. Carboxylic Acids:

Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength, Preparation of carboxylic acids, Reactions of carboxylic acids, Hell-Volhard-Zelinsky reaction, Synthesis of acid chlorides, esters and amides, Reduction of carboxylic acids, Mechanism

of decarboxylation. Methods of formation and chemical reactions of halo acids, Hydroxy acids: malic, tartaric and citric acids. Methods of formation and chemical reactions of unsaturated monocarboxylic acids. Dicarboxylic acids: methods of formation and effect of heat and dehydrating agents.

VII. Carboxylic Acid Derivatives

Structure and nomenclature of acid chlorides, esters, amides (urea) and acid anhydrides. Relative stability of acyl derivatives, Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives, chemical reaction. Mechanisms of esterification and hydrolysis (acidic and basic)

Unit - V

VIII. Organic Compounds of Nitrogen:

Preparation of nitroalkanes and nitroarenes, Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media, Picric acid.

Halonitroarenes: reactivity, Structure and nomenclature of amines, 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, Preparation of alkyl and aryl amines (reduction of nitro compounds, nitrites), reductive amination of aldehydic and ketonic compounds, Gabriel-phthalimide reaction, Hofmann-bromamide reaction. Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Synthetic transformations of aryl diazonium salts, azo coupling.

Physical Chemistry Paper-III

Unit – I

I. Thermodynamics – I

Definitions of thermodynamic terms: System, surroundings etc. types of systems, intensive and extensive properties, State and path functions and their differentials, Thermodynamic processes, 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 , ΔU & ΔH 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 thermochemical data, temperature dependence of enthalpy, Kirchhoff's equation

Unit – II

II. Thermodynamics – II

Second Law of Thermodynamics: Need for the law, different statements of the law, Carnot's cycle and its efficiency, Carnot's 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 criteria of spontaneity and equilibrium, Equilibrium change in ideal gases and mixing of gases.

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 .

Third Law of Thermodynamics: Nernst heat theorem, statement and concept of residual entropy. Nernst distribution law – thermodynamic derivation, applications.

Unit - III

III. Chemical Equilibrium

Equilibrium constant and free energy, Thermodynamic derivation of law of mass action, Le Chatelier's principle. Reaction isotherm and reaction isochore – Clapeyron-Clausius equation and its applications.

Unit – IV

IV. Electrochemistry – I:

Electrical transport: Conduction in metals and in electrolyte solutions, specific conductance molar and equivalent conductance, measurement of equivalent conductance, variation of molar equivalent and specific conductance with dilution.

Migration of ions and Kohlrausch's 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's method and moving boundary method.

Applications of conductivity measurements: determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

V. Solutions:

Liquid – Liquid mixtures- Ideal liquid mixtures, Raoult's and Henry's law, Non-ideal system- azeotropes – HCl-H₂O and ethanol – water systems.

Partially miscible liquids- Phenol – water, trimethylamine – water, nicotine-water systems, Immiscible liquids, steam distillation.

Unit – V

VI. Electrochemistry – II:

Types of reversible electrodes – gas-metal ion, metal-ion, metal-insoluble salt anion and redox electrodes, Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode-reference electrodes and their applications, standard electrode potential, sign conventions, electrochemical series and its significance.

Electrolytic and Galvanic cells–reversible and irreversible cells, conventional representation of electrochemical cells, EMF of a cell and its measurements, Computation of cell EMF, Calculation of thermodynamic quantities of cell reactions (QG, QH and K) Concentration cell 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 pK_a , determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods, Buffers – Mechanism of buffer action, Henderson- Hazel equation, application of buffer solution, Hydrolysis of salts

VII. Phase Equilibrium:

Statement and meaning of the terms-phase, component and degree of freedom, derivation of Gibb's phase rule, phase equilibria of one component system-water, 'CO₂' and 'S' systems Phase equilibria of two component system – 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, (FeCl₃-H₂O) and (CuSO₄-H₂O) system

B.Sc. – Part II (Chemistry Laboratory Practical)

At least three practical from each specialization should be carried out.

Inorganic Chemistry:

- I.** Calibration of fractional weights, pipettes and burettes, Preparation of standard solutions, Dilution – 0.1 M to 0.001 M solutions.
Quantitative Analysis:
- II.** Volumetric Analysis:
- (a) Determination of acetic acid in commercial vinegar using NaOH.
 - (b) Determination of alkali content – antacid tablet using HCl.
 - (c) Estimation of calcium content in chalk as calcium oxalate by permanganometry.
 - (d) Estimation of hardness of water by EDTA.
 - (e) Estimation of ferrous and ferric by dichromate method.
 - (f) Estimation of copper using thiosulphate.
- III.** Gravimetric Analysis:
Analysis of Cu as CuSCN and Ni as Ni (dimethylgloxime).

Organic Chemistry

Laboratory Techniques

- IV.** A. Thin Layer Chromatography
Determination of R_f values and identification of organic compounds:
- (a) Separation of green leaf pigments (spinach leaves may be used).
 - (b) Preparation of separation of 2, 4-dinitrophenylhydrazones of acetone, 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).
- V.** B. Paper Chromatography: Ascending and Circular
Determination of R_f values and identification of organic compounds:
- (a) Separation of a mixture of phenylalanine and glycine, Alanine and aspartic acid, Leucine and glutamic acid, Spray reagent – ninhydrin.
 - (b) Separation of a mixture of D, L – alanine, glycine, and L-Leucine using *n*-butanol: acetic acid:water (4:1:5), Spray reagent – ninhydrin.
 - (c) Separation of monosaccharide – a mixture of D-galactose and D-fructose using *n*- butanol:acetone:water (4:5:1), spray reagent – aniline hydrogen

phthalate.

VI. Qualitative Analysis:

Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives.

Physical Chemistry**VII. Transition Temperature**

1. Determination of the transition temperature of the given substance by thermometric /dilatometric method (e.g. $\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$ / $\text{SrBr}_2 \cdot 2\text{H}_2\text{O}$).

VIII. Phase Equilibrium

2. To study the effect of a solute (e.g. NaCl, succinic acid) on the critical solution temperature of two partially miscible liquids (e.g. phenol-water system) and to determine the concentration of that solute in the given phenol-water system.

3. To construct the phase diagram of two components (e.g. diphenylamine – benzophenone) system by cooling curve method.

IX. Thermochemistry

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

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

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

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BOTANY SYLLABUS

For

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Department of Botany
Sridev Suman Uttarakhand University Badshahithaul
Tehri-Garhwal - 249001

PAPER I (BBO-201)**TAXONOMY OF ANGIOSPERMS AND ECONOMIC BOTANY****UNIT I**

1. Angiosperms origin and evolution. Some examples of primitive angiosperms. Angiosperm taxonomy- fundamental components.
2. Comparison and evolution of the system of classification as proposed by Linnaeus, Betham and Hooker and Hutchinson.
3. Nomenclature: International Code of Botanical Nomenclature (ICBN), History, scientific naming of plants, priority, types, validity, nomina conservanda.
4. Collection and preservation techniques of specimens for Herbarium and Museum, Botanical gardens and Herbaria, Botanical Survey of India (BSI)

UNIT II

1. Taxonomy, important distinguishing characters, classification and economics importance of the following families:
Dicotyledonae
Polypetalae : Ranunculaceae, Brassicaceae, Caryophyllaceae, Rutaceae, Malvaceae, Rosaceae and Apiaceae

UNIT III

1. Gamopetalae: Solanaceae, Apocynaceae, Acanthaceae, Lamiaceae
2. Monochlamydae: Euphorbiaceae, Polygonaceae
3. Monocotyledonae: Orchidaceae, Liliaceae, and Poaceae

UNIT IV

1. Origin of cultivated plants, monophyletic and polyphyletic origin, centres of origin of some important crop plants.
2. Origin, history, botanical features and cultivation of cereals and millets: Wheat, Rice, Maize and Bajra.
3. Legumes: An introduction to the economically important legumes.
4. Oils: Castor oil, linseed oil and mustard oil.

UNIT V

1. General account of fruits (Apple, Banana, Citrus, Mango) and Vegetables (Root, stem, leaf, and fruit vegetables).
2. Fibres (Coir, Cotton, Flax, Jute) and Medicinal plants (*Aconitum*, *Atropa*, *Cinchona*, *Rauwolfia*, *Ephedra*).
3. Common Timber yielding plants of Western Himalayas (Chir, Deodar, Sal Shisham)

and Teak).

Suggested Readings

Singh, V. And Jain, D.K.2012. Taxonomy of Angiosperms. Rastogi Publications,, Meerut

Singh, G.2012. Plant Systematic: Theory and Practice. Oxford and IBH Pvt Ltd, New Delhi

Pandey, B.P.2001. A text book of Angiosperms. S. Chand Publication, New Delhi

Sharma, O.P.2016. Plants and Human Welfare, Pragati Prakshan, Meerut

Sharma, A.K. and Sharma, R. Taxonomy of Angiosperms and Utilization of Plants

PAPER II: (BBO-202)

ANATOMY, EMBRYOLOGY AND ELEMENTARY MORPHOGENESIS

UNIT I

1. The techniques for the study of plant anatomy.
2. Meristems: Primary and secondary meristems, characteristics and functions. Various types of permanent tissues- Simple and complex tissues.
3. Structure of dicot and monocot root, stem and leaf.

UNIT II

1. Secretory structures
2. Origin structure and function of vascular cambium including anomalous behaviour with special reference to the following taxa: *Bougainvillea*, *Salvadora*, *Nyctanthes*, *Dracaena*, *Orchids* and *Tinospora*.
3. Structure of xylem and phloem.

UNIT III

1. Structure of anther, micro sporogenesis and development of male gametophyte in angiosperms. Structure of ovule, mega sporogenesis and development of the female gametophyte with reference to the *Polygonum* type. Comparison with the bio sporic and tetra sporic types
2. Pollination, fertilization and life history of a typical angiosperm.

UNIT IV

1. Endosperm and embryo development with special reference to the onagrad type.
2. Polyembryony and apomixis.
3. Seed germination and dormancy, elementary plant movements.

UNIT V

- 1.** Basic body plan of a flowering plant- modular type of growth.
- 2.** Diversity in plant forms in annuals, biennials and perennials. Development of tree habit in higher plants
- 3.** Plant growth regulators: Auxin, Gibberellin, Cytokinin and Abscissic acid.
- 4.** Physiology of flowering: Photoperiodism and vernalization.

Suggested Readings

Pandey, S.N. 1992, Plant Anatomy, Rastogi Publication, Meerut
Tayal, M.S. 1996, Plant Anatomy, Rastogi Publication, Meerut
Bhojwani, S.S. and Bhatnagar, S.P.1994. Embryology of Angiosperms
Maheshwari, P. An Introduction to Embryology of Angiosperms

PAPER III: (BBO-203)

ECOLOGY AND REMOTE SENSING

UNIT 1

- 1.** Definition and scope of ecology, Principles of environment, atmosphere, light, temperature, water and soil.
- 2.** Ecosystem: Types , biotic and abiotic components, food chain, food web, ecological pyramids and ecological niche.
- 3.** Productivity, type, measurement of primary productivity, energy flow and ecological energetics, Lindeman's concept of Energy Flow.

UNIT II

- 1.** Biogeochemical cycles: A brief discussion of concept by citing examples of carbon, nitrogen and phosphorous cycles.
- 2.** Population ecology: Definition, population characteristics, growth curves, carrying capacity and population fluctuation.
- 3.** Community ecology: Structure and community characteristics, quantitative, qualitative and synthetic features, life forms, biological spectrum and ecological succession.

UNIT III

- 1.** Pollution of air, water and soil, noise incidence, thermal and radioactive pollution; prevention and control of pollution.

2. Global warming, desertification and ozone depletion.
3. Biogeographical regions of India ; Vegetation types in Uttarakhand

UNIT IV

1. Biodiversity: Basic concept, types, causes and loss of biodiversity.
2. Biodiversity conservation: In situ and ex situ conservation, gene bank, introductory account of Biosphere reserves, National parks and Sanctuaries
3. Soil erosion and conservation, conservation and management of some natural resources: forest and rangeland management.

UNIT V

1. Definition of remote sensing, aerial photography, principles and fundamentals of aerial photo interpretation.
2. Electromagnetic spectrum, satellite and sensors, remote sensing data acquisition, physical basis of remote sensing, aerial and space platforms.
3. Image interpretation, role of remote sensing in ecology.

Suggested Readings

Odum, E.P. 1983, Basics of Ecology, Saunders College Publication, New York
Tiwari, S.C.2005. Concepts of Modern Ecology, Bishen Singh Mahendra Pal Singh, Dehradun
Sharma, P. D, 2014.Ecology and Environment, Rastogi Publications, Meerut
Shukla, R.S. and Chandel. P.S. 2014. Plant Ecology. S Chand Publications, New Delhi
Shukla, R.S. and Chandel. P.S. Biostatistics. S Chand Publications, New Delhi

RAJKAMAL SCIENCE & MANAGEMENT COLLEGE
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ZOOLOGY SYLLABUS

For
UNDER GRADUATE COURSES (B.Sc. Part-II)
(Annual System)

(Applicable w.e.f. the session 2019-2020)



Department of Zoology
Sridev Suman Uttarakhand University Badshahithaul
Tehri-Garhwal - 249001

B.Sc. 2nd Year (Zoology)**Paper -I: Chordata****Unit- I**

Protochordates: General features and Phylogeny of Protochordats. Body organization of Balanoglossus, Herdmania and Amphioxus.

Unit - II

Agnatha: General features of Agnatha and classification of cyclostomes up to Classes, Comparison between Lampreys and Hagfishes.

Pisces: General features and Classification up to orders; Scales and fins of fishes, Hill stream adaptations

Unit - III

Amphibia: General features and Classification up to orders; Parental care; Neoteny
Reptiles: General features and Classification up to orders; Poisonous and nonpoisonous snakes; Biting mechanism in snakes; Venum and antivenum.

Unit - IV

Aves: General features and Classification up to orders; Feathers in Birds; Adaptations for aerial mode of life;

Unit - V

Mammalia: General features; Origin of mammals; distribution and affinities of Prototheria, Metatheria and Eutheria; Aerial and aquatic adaptations in mammals.

Books Recommended:

1. Pandey B.N. and Mathur V. Biology of Chordates, PHI Learning, 2018
2. R.L. Kotpal: Modern Text-book of Zoology, Vertebrates. Rastogi Publication.
3. E.L. Jordan and P.S. Verma: Chordate Zoology. S. Chand & Co. Ltd.
4. Hildebrand: Analysis of Vertebrate structure.
5. Romer & Parsons: The Vertebrate Body, Saunders.

Paper -II: Animal Physiology & Biochemistry

Unit - I

Digestion: Intracellular and Extracellular digestion. Digestion and absorption of Carbohydrates, Lipids and Proteins.

Respiration: Pulmonary ventilation, Respiratory volumes and capacities, Transport of Oxygen and Carbon dioxide in Blood. Dissociation of oxyhaemoglobin

Unit - II

Circulation: Composition of blood; Blood coagulation; Structure of Heart; Origin and conduction of the cardiac impulse, Cardiac cycle.

Excretion: Structure of nephron; Physiology of urine formation

Unit - III

Nervous system: Types of neurons; Myelinated and non-myelinated nerve fibres. Initiation and conduction of nerve impulse; Resting and action potential; Synapse and chemical transmission.

Muscles: Types of muscles; Ultrastructure of skeletal muscles; Molecular and Chemical basis of muscle contraction; Brief idea of tetanus and fatigue

Unit – IV

Carbohydrates Metabolism: Glycolysis, Kreb's Cycle, Gluconeogenesis, Glycogenesis and Glycogenolysis; Lipids: Biological significance, structure and classification.

Unit-V

Proteins: structure and classification; Transamination and Deamination

Enzymes: types and properties, factors affecting their functions.

Mechanism of enzyme Action,

Books recommended:

1. Singh & Neeraj: Graduate Animal Physiology & Biochemistry, Vishal Publ
2. Prosser and Brown: Comparative Animal Physiology, Wiley.
3. Nielson: Animal Physiology, Cambridge.
4. Jain A.K: Textbook of Physiology 6/E, Avichal Publishing Company

5. Conn and Stumpf: Outlines of Biochemistry. John Wiley.

6. Pandey B N: B.Sc. Zoology Series-Biochemistry, Physiology, Endocrinology; Tata McGraw Hill Edu Pvt. Ltd. N. Delhi

Paper -III: Molecular Biology, Biotechnology and Microbiology

Unit I

Structure of DNA: nucleosides, nucleotides, polynucleotide chain, Watson and Crick DNA double helix model. DNA as genetic material, Packaging of DNA, Types of DNA

Unit II

Enzymes involved in prokaryotic and eukaryotic DNA replication; Mechanism & Type of replication.

DNA damage and repair: causes and types of DNA damage, mechanism of DNA repair:

Unit III

RNA: Structure and types of RNA, Clover leaf model of tRNA,

Transcription in prokaryotes: Prokaryotic RNA polymerase, role of sigma factor, promoter, Initiation, elongation and termination of RNA chains.

Processing of pre-mRNA: 5' cap formation, polyadenylation, splicing, rRNA and tRNA splicing.

Unit IV

Biotechnology: Definition and scopes; Enzyme used in genetic engineering, Recombinant DNA technology, DNA fingerprinting. A Brief knowledge of PCR and its significance.

Biotechnological innovations in the area of medical, agriculture, industrial and forensic sciences

Unit V

General account of Cyanobacteria, fungi, yeast and viruses,

Bacteria: Structure, classification, nutrition and reproduction.

Books recommended:

1. Alberts et al.: Molecular Biology of the cell. Garland Publ., New York.
2. De Robertis- Cell and Molecular Biology
3. Friefelder: Molecular Biology. Narosa Publ. House.
4. Smith: Biotechnology. Cambridge.
5. Verma, P.S. and Agrwal, V. K. Cell Biology, Genetics, Molecular biology, Evolution and Ecology (S. Chand & Co.)
6. Tortora- Microbiology: an Introduction

PRACTICAL SYLLABUS of B.Sc. 2nd year (Zoology)**A. Chordata:**

Protochordata: Balanoglossus, Herdmania, Branchiostoma, Agnatha:
Petromyzon

Pisces: Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla, Tor putitora,
Hill stream fishes

Amphibia: Ichthyophis/Ureotyphlus, Salamandra, Bufo, Hyla, Axolotal larva

Reptilia: Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja,
Crocodylus, Gavialis

Key for Identification of poisonous and non-poisonous snakes

Aves: Study of six common birds from different orders

Mammalia: Sorex, Bat, Funambulus, Loris,

An "animal album" containing photographs, cut outs, with appropriate write up about the above mentioned taxa.

B. Physiology

Preparation of hemin crystals, Estimation of Hemoglobin percentage, Blood group test

Examination of permanent slides of spinal cord, duodenum, liver, lung, kidney, bone, cartilage etc.

C. Biochemistry

Identification of unknown carbohydrates in given solutions (Starch,

Sucrose, Lactose, Galactose, Glucose, Fructose)

Colour reactions to identify functional group in the given solution of proteins

Study of activity of salivary amylase under optimum conditions

D. Molecular biology and Biotechnology:

Study of Watson & Crick Model of DNA through model/photographs

Study of Clover leaf structure of tRNA through model/photographs

Agarose gel electrophoresis of genomic DNA & plasmid DNA

Preparation of restriction enzyme digests of DNA samples

E. Microbiology

Media preparation and sterilization, Gram's staining of Bacterial Cell

Distribution of marks: Duration 4 hrs.

- | | |
|--|----|
| 1. Spotting (05) | 15 |
| 2. Exercise on Molecular Biology/Biotechnology | 05 |
| 3. Exercise on Immunology | 05 |
| 4. Exercise on Microbiology | 05 |
| 5. Record and Collection | 05 |
| 6. Viva Voice | 05 |
| 7. Sessional Marks | 10 |
| Total | 50 |