

Detailed Course Scheme
Bachelor of Science (B.Sc.)
(Physics, Mathematics, Chemistry, Botany, Zoology,
Biotechnology & Computer Sciences)

Semester II - Examination
(2016-2019)

DOC201612020013



RNB GLOBAL UNIVERSITY

RNB Global City, Ganganagar Road,

Bikaner, Rajasthan 334601

OVERVIEW

RNB Global University follows Semester System along with Choice Based Credit System as per latest guidelines of University Grants Commission (UGC). Accordingly, each academic year is divided into two semesters, **Odd (July-December) and Even (January-June)**. Also, the university follows a system of continuous evaluation along with regular updating in course curricula and teaching pedagogy.

The curriculum for B.Sc. Program for Even (January-June) Semester, 2017 along with examination pattern is as follows:

Course Scheme

Semester - II

| S. No | Course Code | Course Name | Credits |
|----------------------|-------------|---|-----------|
| 1. | | Discipline Specific Core Course-I Paper-II | 4 |
| 2. | | Discipline Specific Core Course-II Paper-II | 4 |
| 3. | | Discipline Specific Core Course-III Paper-II | 4 |
| 4. | | Discipline Specific Core Course-I Paper-II Lab | 2 |
| 5. | | Discipline Specific Core Course-II Paper-II Lab | 2 |
| 6. | | Discipline Specific Core Course-III Paper-II Lab | 2 |
| 7. | 99001900 | Environmental Studies | 4 |
| 8. | 13002800 | Ability & Skill Enhancement Module - II | 3 |
| 9. | 99002000 | NSS/NCC*/Similar Activities as prescribed by the University | - |
| 10. | 99002100 | Club Activities* | - |
| Total Credits | | | 25 |

Discipline Specific Core Course Papers

| Subject | Course Name | Course Code |
|------------------|--|-------------|
| Physics | Electricity & Magnetism | 13000600 |
| Chemistry | Chemistry-II | 13000700 |
| Mathematics | Differential Equations | 13000800 |
| Botany | Plant Ecology and Taxonomy | 13005300 |
| Zoology | Comparative Anatomy and Developmental Biology of Vertebrates | 13005500 |
| Computer Science | Data Structures and File Processing | 13005700 |

| | | |
|---------------|-----------------------------|----------|
| Biotechnology | Biochemistry and Metabolism | 13005900 |
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EVALUATION SCHEME - THEORY

The evaluation of the theory paper of B.Sc. program would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessments as follows:

Internal Assessment

The distribution of Internal Assessment Marks is as follows:

| Area of Assessment | Marking | Maximum Marks |
|---|--|----------------------|
| Sessional-I | As per marks obtained | 10 |
| Sessional-II | As per marks obtained | 10 |
| Marks obtained in various, assignments, presentations, quizzes etc. | Average of marks obtained | 15 |
| Overall Conduct and Discipline | To be decided by concerned Faculty Member | 5 |
| Attendance | Student with 80% attendance will get 5 marks and 0.25 marks for every 1% attendance above 80 % | 10 |
| Total | | 50 |

External Assessment

| Type | Marks |
|-------------|--------------|
| Theory | 50 |

EVALUATION SCHEME - PRACTICAL

The evaluation of the practical paper of B.Sc. program would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessment is as follows:

Internal Assessment

| Type | Details | Marks |
|---|---|-------|
| Marks obtained in various manuals, practical file, participation, any model prepared, output of practical | Average of marks obtained | 35 |
| Discipline | To be decided by concerned faculty | 5 |
| Attendance | 80% - 5 marks and 0.25 percent for every one percent above 80 % | 10 |
| TOTAL | 50 | |

External Assessment

| Type | Marks |
|-----------|-------|
| Practical | 50 |

EVALUATION SCHEME - NSS/NCC AND CLUB ACTIVITIES

1. NSS/NCC /Similar activities prescribed by University will be completed from Semester I – Semester IV. It will be evaluated internally by the respective institute. The credit for this will be given after IVth Semester.
2. The students have to join club/clubs with the active participation in different activities of club. The students would be continuously assessed from Semester I – Semester IV and credits and marks would be given after IV Semester.

CURRICULUM

Course Name: Electricity and Magnetism

Course Code: 13000600

Course Outline

Unit I: Vector Analysis: Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only).

Unit II: Electrostatics: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.

Unit III: Magnetism: Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials.

Unit IV: Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.

Unit V: Maxwell's equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.

Suggested Readings:

- Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press.
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
- Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education..

- Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
- Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole. 12
- D.J. Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.

Course Name: Chemistry II

Course Code: 13000700

Course Outline:

Unit I: Chemical Energetics: Review of thermodynamics and the Laws of Thermodynamics. Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation. Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.

Unit II: Chemical Equilibrium: Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between ΔG and ΔG° , Le Chatelier's principle. Relationships between K_p , K_c and K_x for reactions involving ideal gases.

Unit III: Ionic Equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

Unit IV: Organic Chemistry: Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure.

Aromatic hydrocarbons

Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid.

Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

Alkyl and Aryl Halides: Alkyl Halides (Upto 5 Carbons) Types of Nucleophilic Substitution (SN_1 , SN_2 and SN_i) reactions.

Preparation: from alkenes and alcohols.

Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs substitution.

Aryl Halides Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions.

Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by -OH group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $\text{NaNH}_2/\text{NH}_3$). Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

Alcohols, Phenols and Ethers (Upto 5 Carbons):

Preparation: Preparation of 1°, 2° and 3° alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters.

Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk. KMnO_4 , acidic dichromate, conc. HNO_3). Oppeneauer oxidation Diols: (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.

Phenols: (Phenol case) Preparation: Cumene hydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Houben-Hoesch Condensation, Schotten - Baumann Reaction.

Ethers (aliphatic and aromatic): Cleavage of ethers with HI.

Aldehydes and ketones (aliphatic and aromatic): (Formaldehyde, acetaldehyde, acetone and benzaldehyde)

Preparation: from acid chlorides and from nitriles.

Reactions - Reaction with HCN, ROH, NaHSO_3 , NH_2 -G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-Ponndorf Verley reduction.

Suggested Readings:

- Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. Organic Chemistry, John Wiley & Sons, 2014.
- McMurry, J.E. Fundamentals of Organic Chemistry, 7th Ed. Cengage Learning India Edition, 2013.
- Finar, I.L. Organic Chemistry (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. Organic Chemistry, Pearson, 2010.
- Bahl, A. & Bahl, B.S. Advanced Organic Chemistry, S. Chand, 2010.
- Barrow, G.M. Physical Chemistry Tata McGraw-Hill, 2007.
- Castellan, G.W. Physical Chemistry 4th Ed. Narosa, 2004.

- Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry Cengage Learning India Pvt. Ltd., New Delhi, 2009.
- Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co.: New York, 1985.

Course Name: Differential Equations

Course Code: 13000800

Course Outline:

Unit I: First order exact differential equations. Integrating factors, rules to find an integrating factor. First order higher degree equations solvable for x, y, p. Methods for solving higher-order differential equations. Basic theory of linear differential equations, Wronskian, and its properties. Solving a differential equation by reducing its order.

Unit II: Linear homogenous equations with constant coefficients, Linear non-homogenous equations, The method of variation of parameters, The Cauchy-Euler equation, Simultaneous differential equations, Total differential equations.

Unit III: Order and degree of partial differential equations, Concept of linear and non-linear partial differential equations, Formation of first order partial differential equations,

Unit IV: Linear partial differential equation of first order, Lagrange's method, Charpit's method.

Unit V: Classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustrations only.

Suggested Readings:

- Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
- Sneddon, Elements of Partial Differential Equations, McGraw-Hill, International Edition, 1967.

Course Name: Plant Ecology and Taxonomy

Course Code: 13005300

Course Outline:

Unit I: Introduction of Plant Ecology and Taxonomy

Unit II: Ecological factors: Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes.

Unit III: Plant communities: Characters; Ecotone and edge effect; Succession; Processes and types.

Unit IV: Ecosystem: Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Biogeochemical cycling; Cycling of carbon, nitrogen and Phosphorous.

Unit V: Phytogeography: Principle biogeographical zones; Endemism.

Unit VI: Introduction to plant taxonomy: Identification, Classification, Nomenclature.

Unit VII: Identification: Functions of Herbarium, important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access.

Unit VIII: Taxonomic evidences from palynology, cytology, phytochemistry and molecular data.

Unit IX: Taxonomic hierarchy: Ranks, categories and taxonomic groups.

Unit X: Botanical nomenclature: Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.

Unit XI: Classification: Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series).

Unit XII: Biometrics, numerical taxonomy and cladistics: Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms, cladograms (definitions and differences).

Suggested Readings:

- Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition.
- Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
- Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.
- Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi. 3rd edition.

Course Name: Comparative Anatomy and Developmental Biology of Vertebrates

Course Code: 13005500

Course outline:

Unit I: Integumentary System: Derivatives of integument w.r.t. glands and digital tips.

Unit II: Skeletal System: Evolution of visceral arches.

Unit III: Digestive System: Brief account of alimentary canal and digestive glands.

Unit IV: Respiratory System: Brief account of Gills, lungs, air sacs and swim bladder.

Unit V: Circulatory System: Evolution of heart and aortic arches.

Unit VI: Urinogenital System: Succession of kidney, Evolution of urinogenital ducts.

Unit VII: Nervous System: Comparative account of brain.

Unit VIII: Sense Organs: Types of receptors.

Unit IX: Early Embryonic Development: Gametogenesis: Spermatogenesis and oogenesis w.r.t. mammals, vitellogenesis in birds; Fertilization: external (amphibians), internal (mammals), blocks to polyspermy; Early development of frog and humans (structure of mature egg and its membranes, patterns of cleavage, fate map, up to formation of gastrula); types of morphogenetic movements; Fate of germ layers; Neurulation in frog embryo.

Unit X: Late Embryonic Development: Implantation of embryo in humans, Formation of human placenta and functions, other types of placenta on the basis of histology; Metamorphic events in frog life cycle and its hormonal regulation.

Unit XI: Control of Development: Fundamental processes in development (brief idea) – Gene activation, determination, induction, Differentiation, morphogenesis, intercellular communication, cell movements and cell death.

Suggested Readings:

- Kardong, K.V. (2005) Vertebrates' Comparative Anatomy, Function and Evolution. IV Edition. McGraw-Hill Higher Education.
- Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies.
- Hilderbrand, M and Gaslow G.E. Analysis of Vertebrate Structure, John Wiley and Sons.
- Walter, H.E. and Sayles, L.P; Biology of Vertebrates, Khosla Publishing House.

- Gilbert, S. F. (2006). Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA.
- Balinsky, B.I. (2008). An introduction to Embryology, International Thomson Computer Press.
- Carlson, Bruce M (1996). Patten's Foundations of Embryology, McGraw Hill, Inc.

Course Name: Data Structures and File Processing

Course Code: 13005700

Course Outline:

Unit I Basic Data Structures: Abstract data structures- stacks, queues, linked lists and binary trees. Sets: Dictionary implementation, use of priority queues, hashing, binary trees, balanced trees, sets with merge-find operations.

Unit II Searching: Internal and external searching, use of hashing and balancing techniques. Memory Management: Garbage collection algorithms for equal sized blocks, storage allocation for objects with mixed size, buddy systems.

Unit III Physical Devices: Characteristics of storage devices such as disks and tapes, I/O buffering. Basic File System Operations: Create, open, close, extend, delete, read block, write-block, protection mechanisms.

Unit IV File Organizations: Sequential, indexed sequential, direct, inverted, multi-list, directory systems, Indexing using B-tree, B+ tree and their variants, hashing – hash function, collision handling methods, extendible hashing.

Suggested Readings:

- M.T. Goodrich, R. Tamassia and D. Mount, Data Structures and Algorithms in C++, John Wiley and Sons, Inc., 2004.
- T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, 2nd Ed., Prentice-Hall of India, 2006.
- Robert L. Kruse and A.J. Ryba, Data Structures and Program Design in C++, Prentice Hall, Inc., NJ, 1998.
- B. Stroustrup, The C++ Programming Language, Addison Wesley, 2004
- D.E. Knuth, Fundamental Algorithms (Vol. I), Addison Wesley, 1997

Course Name: Biochemistry & Metabolism

Course Code: 13005900

Course Outline:

Unit I: Introduction to Biochemistry: A historical prospective. Amino acids & Proteins: Structure & Function. Structure and properties of Amino acids, Types of proteins and their classification, Forces stabilizing protein structure and shape. Different Level of structural organization of proteins, Protein Purification. Denaturation and renaturation of proteins.

Carbohydrates: Structure, Function and properties of Monosaccharides, Disaccharides and Polysaccharides. Homo & Hetero Polysaccharides, Mucopolysaccharides, Bacterial cell wall polysaccharides, Glycoprotein's and their biological functions.

Unit II: Lipids: Structure and functions –Classification, nomenclature and properties of fatty acids, essential fatty acids. Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol.

Nucleic acids: Structure and functions: Physical & chemical properties of Nucleic acids, Nucleosides & Nucleotides, purines & pyrimidines,. Biologically important nucleotides, Double helical model of DNA structure and forces responsible for A, B & Z – DNA, denaturation and renaturation of DNA.

Unit III: Enzymes: Nomenclature and classification of Enzymes, Holoenzyme, apoenzyme, Cofactors, coenzyme, prosthetic groups, metalloenzymes, monomeric & oligomeric enzymes, activation energy and transition state, enzyme activity, specific activity, common features of active sites, enzyme specificity: types & theories, Biocatalysts from extreme thermophilic and hyperthermophilic archaea and bacteria. Role of: NAD⁺, NADP⁺, FMN/FAD, coenzymes A, Thiamine pyrophosphate, Pyridoxal phosphate, lipoic-acid, Biotin vitamin B12, Tetrahydrofolate and metallic ions.

Unit IV: Carbohydrates Metabolism: Reactions, energetics and regulation. Glycolysis: Fate of pyruvate under aerobic and anaerobic conditions. Pentose phosphate pathway and its significance, Gluconeogenesis, Glycogenolysis and glycogen synthesis. TCA cycle, Electron Transport Chain, Oxidative phosphorylation. β -oxidation of fatty acids.

Suggested Readings:

- Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H Freeman and Co.
- Buchanan, B., Gruissem, W. and Jones, R. (2000) Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists.

- Nelson, D.L., Cox, M.M. (2004) Lehninger Principles of Biochemistry, 4th Edition, WH Freeman and Company, New York, USA.
- Hopkins, W.G. and Huner, P.A. (2008) Introduction to Plant Physiology. John Wiley and Sons.
- Salisbury, F.B. and Ross, C.W. (1991) Plant Physiology, Wadsworth Publishing Co. Ltd.

Course Name: Environmental Studies

Course Code: 99001900

Course Outline:

Unit I: Introduction to environmental studies: Multidisciplinary nature of environmental studies; Scope and importance; Need for public awareness.

Ecosystems: What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems: a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit II: Natural Resources : Renewable and Non-renewable Resources, Land resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state). Energy resources : Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

Unit III: Biodiversity and Conservation: Levels of biological diversity : genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots India as a mega-biodiversity nation; Endangered and endemic species of India. Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

Unit IV: Environmental Pollution: Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution Nuclear hazards and human health risks, Solid waste management: Control measures of urban and industrial waste. Pollution case studies.

Environmental Policies & Practices: Sustainability and sustainable development. Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

Unit V: Human Communities and the Environment: Human population growth: Impacts on environment, human health and welfare. Resettlement and rehabilitation of project affected persons; case studies. Disaster management: floods, earthquake, cyclones and landslides. Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan. Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

Field work; Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems-pond, river, Delhi Ridge, etc.

Suggested Readings:

1. Environmental Geography, H.M. Saxena, Rawat Pub.
2. A Textbook Of Environment, K.M. Agrawal; P.K. Sikdar; S.C. Deb, McMillanPub.
3. A Textbook of Environmental Studies, D K Asthana & Meera Asthana, S. Chand Pub.
4. Environmental Studies, V. K. Ahluwalia, The Energy and Resources Institute, Pub, (2012).
5. Environmental Chemistry, A.K. Dey, New Age Pub.
6. Environmental Biology, K.C. Agarwal, Nidi Pub. Ltd. Bikaner

Course Name: Electricity and Magnetism Lab

Course Code: 13001200

List of Practical's

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2. Ballistic Galvanometer:
 - 2.1. Measurement of charge and current sensitivity
 - 2.2. Measurement of CDR
 - 2.3. Determine a high resistance by Leakage Method
 - 2.4. To determine Self Inductance of a Coil by Rayleigh's Method.
3. To compare capacitances using De'Sauty's bridge.
4. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).
5. To study the Characteristics of a Series RC Circuit.
6. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor

7. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q
8. To determine a Low Resistance by Carey Foster's Bridge.
9. To verify the Thevenin and Norton theorem
10. To verify the Superposition, and Maximum Power Transfer Theorem

Suggested Readings:

1. Advanced Practical Physics for students, B.L.Flint & H.T.Worsnop, 1971, Asia Publishing House.
2. A Text Book of Practical Physics, InduPrakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.
3. Engineering Practical Physics, S.Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
4. Advanced level Physics Practical's, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers

Course Name: Biochemistry & Metabolism Lab

Course Code:13006000

List of Practicals

1. To study activity of any enzyme under optimum conditions.
2. To study the effect of pH, temperature on the activity of salivary amylase enzyme.
3. Determination of - pH optima, temperature optima, Km value, Vmax value, Effect of inhibitor (Inorganic phosphate) on the enzyme activity.
4. Estimation of blood glucose by glucose oxidase method.
5. Principles of Colorimetry: (i) Verification of Beer's law, estimation of protein. (ii) To study relation between absorbance and % transmission.
6. Preparation of buffers.
7. Separation of Amino acids by paper chromatography.
8. Qualitative tests for Carbohydrates, lipids and proteins.

Course Name: Chemistry –II Lab

Course Code: 13001100

List of Experiments

Section A: Physical Chemistry Thermochemistry

1. Determination of heat capacity of calorimeter for different volumes
2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide
3. Determination of enthalpy of ionization of acetic acid.
4. Determination of integral enthalpy of solution of salts (KNO_3 , NH_4Cl)
5. Determination of enthalpy of hydration of copper sulphate
6. Study of the solubility of benzoic acid in water and determination of ΔH . Ionic equilibria pH measurements a) Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter. b) Preparation of buffer solutions: (i) Sodium acetate-acetic acid (ii) Ammonium chloride-ammonium hydroxide Measurement of the pH of buffer solutions and comparison of the values with theoretical values.

Section B: Organic Chemistry

1. Purification of organic compounds by crystallization (from water and alcohol) and distillation
2. Criteria of Purity: Determination of melting and boiling points
3. Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done. (a) Bromination of Phenol/Aniline (b) Benzoylation of amines/phenols (c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone

Suggested Readings:

1. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996
2. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960
3. Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).

Course Name: Plant Ecology and Taxonomy Lab

Course Code: 13005400

List of Experiments

1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.
2. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.
3. Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.
 - (a) Study of morphological adaptations of hydrophytes and xerophytes (four each).
 - (b) Study of biotic interactions of the following: Stem parasite (Cuscuta), Root parasite (Orobanche), Epiphytes, Predation (Insectivorous plants)
4. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (species to be listed)
5. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law
6. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Brassicaceae -Brassica, Alyssum / Iberis; Asteraceae -Sonchus/Launaea, Vernonia/Ageratum, Eclipta/Tridax; Solanaceae -Solanum nigrum, Withania; Lamiaceae -Salvia, Ocimum; Liliaceae - Asphodelus / Lilium / Allium.
7. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).

Course name: Comparative Anatomy and developmental biology of vertebrates Lab

Course Code: 13005600

List of Practicals

1. Osteology: a) Disarticulated skeleton of fowl and rabbit b) Carapace and plastron of turtle /tortoise c) Mammalian skulls: One herbivorous and one carnivorous animal.
2. Frog - Study of developmental stages - whole mounts and sections through permanent slides - cleavage stages, blastula, gastrula, neurula, tail bud stage, tadpole external and internal gill stages.
3. Study of the different types of placenta- histological sections through permanent slides or photomicrographs.

4. Study of placental development in humans by ultrasound scans.
5. Examination of gametes - frog/rat - sperm and ova through permanent slides or photomicrographs

Course Name: Data Structures and File Processing Lab

Course Code: 13005800

List of Experiments

1. Write a program to search an element from a list. Give user the option to perform Linear or Binary search. Use Template functions.
2. WAP using templates to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.
3. Implement Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list and concatenate two linked lists (include a function and also overload operator +).
4. Implement Doubly Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
5. Implement Circular Linked List using templates. Include functions for insertion, deletion and search of a number, reverse the list.
6. Perform Stack operations using Linked List implementation.
7. Perform Stack operations using Array implementation. Use Templates.
8. Perform Queues operations using Circular Array implementation. Use Templates.
9. Create and perform different operations on Double-ended Queues using Linked List implementation.
10. WAP to scan a polynomial using linked list and add two polynomial.
10. WAP to calculate factorial and to compute the factors of a given no. (i)using recursion, (ii) using iteration
11. (ii) WAP to display fibonacci series (i)using recursion, (ii) using iteration
12. WAP to calculate GCD of 2 number (i) with recursion (ii) without recursion
13. WAP to create a Binary Search Tree and include following operations in tree:

- (a) Insertion (Recursive and Iterative Implementation)
- (b) Deletion by copying (c) Deletion by Merging
- (d) Search a no. in BST
- (e) Display its preorder, postorder and inorder traversals Recursively
- (f) Display its preorder, postorder and inorder traversals Iteratively
- (g) Display its level-by-level traversals
- (h) Count the non-leaf nodes and leaf nodes
- (i) Display height of tree
- (j) Create a mirror image of tree
- (k) Check whether two BSTs are equal or not

- 14. WAP to convert the Sparse Matrix into non-zero form and vice-versa
- 15. WAP to reverse the order of the elements in the stack using additional stack.
- 16. WAP to reverse the order of the elements in the stack using additional Queue.
- 17. WAP to implement Diagonal Matrix using one-dimensional array.
- 18. WAP to implement Lower Triangular Matrix using one-dimensional array.
- 19. WAP to implement Upper Triangular Matrix using one-dimensional array.
- 20. WAP to implement Symmetric Matrix using one-dimensional array.
- 21. WAP to create a Threaded Binary Tree as per in order traversal, and implement operations like finding the successor / predecessor of an element, insert an element, in order traversal.
- 22. WAP to implement various operations on AVL Tree

Note: The review of Syllabus happens on periodic basis for the benefit of the students. In case there are changes in curriculum due to review, students would be intimated in writing.

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