

Detailed Course Scheme

Bachelor of Science (B.Sc.)

**(Physics, Mathematics, Chemistry, Botany, Zoology,
Biotechnology and Computer Sciences)**

Semester I- Examination

July 2016

(2016-19)

DOC201607130007



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 (July-December) Semester, 2016 along with examination pattern is as follows:

Course Scheme

Semester - I

S. No	Course Code	Course Name	Credits
1.		Discipline Specific Core Course-I Paper-I	4
2.		Discipline Specific Core Course-II Paper-I	4
3.		Discipline Specific Core Course-III Paper-I	4
4.		Discipline Specific Core Course-I Paper-I Lab	2
5.		Discipline Specific Core Course-II Paper-I Lab	2
6.		Discipline Specific Core Course-III Paper-I Lab	2
7.	99002200	Business Communication(AECC)	4
8.	13002700	Ability & Skill Enhancement Module - I	3
9.	99002000	NSS/NCC/ Similar Activities	-
10.	99002100	Club Activities	-
Total Credits			25

Discipline Specific Core Course Papers (Choose any three)

S.no	Subject Name
1.	Physics
2.	Chemistry
3.	Mathematics
4.	Botany
5.	Zoology
6.	Computer Science
7.	Biotechnology

Discipline Specific Core Course Papers

Subject	Course Name	Course Code
Physics	Mechanics	13000301
	Mechanics Lab	13001000
Chemistry	Chemistry - I	13000401
	Chemistry - I Lab	13000900
Mathematics	Differential Calculus	13000500
Botany	Biodiversity (Microbes, Algae, Fungi and Archegoniate)	13003300
	Biodiversity (Microbes, Algae, Fungi and Archegoniate) Lab	13003400
Zoology	Animal Biodiversity	13003500
	Animal Biodiversity Lab	13003600
Computer Science	Object Oriented Programming in C++	13003700
	Object Oriented Programming in C++ Lab	13003800
Biotechnology	Biotechnology and Human Welfare	13003900
	Biotechnology and Human Welfare Lab	13004000

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:

Type	Details	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
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
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 etc.	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 IVth Semester.

CURRICULUM

Discipline Specific Core Course- Physics

Course Name: Mechanics

Course Code: 13000301

Course Outline

Unit I Vectors: Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.

Unit II Laws of Motion: Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets. Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum.

Unit III Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant).

Kepler's Laws (statement only). Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS).

Unit IV Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations. Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum-Determination of Rigidity modulus and moment of inertia - q , η and σ by Searles method. Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities.

Suggested Readings:

1. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press.
2. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
3. University Physics. FW Sears, MW Zemansky and HD Young 13/e, 1986. Addison Wesley.
4. Mechanics Berkeley Physics course, 1: Charles Kittel, et Al. 2007, Tata McGraw Hill. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley.

Discipline Specific Core Course - Chemistry

Course Name: Chemistry - I

Course Code: 13000401

Course Outline

Unit I Review of: Bohr's theory and its limitations, dual behavior of matter and radiation, de-Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure Nature and path of Electron, Heisenberg uncertainty principle, Atomic orbital's, Shapes of s, p, d orbital's. Quantum number, Aufbau and Pauli Exclusion principles, Hund's multiplicity rule, Electronic configurations of the elements; radial and angular functions and distribution curves, Variation of orbital energies with atomic number. Electronic energy level diagram and electronic configurations of hydrogen-like and poly electronic atoms and ions. Term symbols of atoms and ions for atomic numbers < 30.

Unit II (i) Ionic Bond - Types of ionic solids, radius ratio effect and coordination number, limitations of radius ratio, lattice and lattice defects, lattice energy and Born-Haber cycle, Statement of Born-Landé equation for calculation of lattice energy, solvation energy and solubility of ionic solids, polarizing power and polarizability, Fajan's rules. (ii) Covalent Bond: Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions such as NH_3 , H_3O^+ , SF_4 , ClF_3 , ICl_2^- , and H_2O by valence shell electron pair repulsion (VSEPR) theory, linear combination of atomic orbitals (LCAO), bonding, nonbonding and antibonding molecular orbitals. Applications of MO theory to explain the stability of homo and hetero dinuclear diatomic molecules, multi-centre bonding in electron-deficient molecules. (iii) Bond Energy: Dissociation and average bond energies – determination, periodic trends and Applications. Metallic Bond: Free electron, valence bond and band theories. Weak Interactions: Hydrogen Bond – experimental evidence, van der Waal's forces.

Unit III Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyper conjugation and their applications; Organic acids and bases; their relative strength. Comparative study with emphasis on factors affecting pK values, Homolytic and heterolytic bond Fission. Types of reagents electrophiles and nucleophiles. Types of organic reaction & their mechanism. Addition, Elimination and Substitution reactions, Energy considerations. Reactive intermediates – carbocation, Carbanion, free radicals, carbenes, arynes and nitrenes. Curly arrow rules and Assigning formal charges on intermediates and other ionic species.

Unit IV Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions; Geometrical isomerism: cis-trans and, syn-anti isomerism E/Z notations with C.I.P rules. Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centres, Distereoisomers, meso structures, Racemic mixture and resolution. Relative and absolute configuration: D/L and R/S designations.

Unit V Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure. Alkanes: (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation. Alkenes: (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. KMnO_4) and trans-addition (bromine), Addition of HX (Markownikoff's and antiMarkownikoff's addition), Hydration, Ozonolysis, oxymecuration-demercuration, Hydroboration-oxidation. Alkynes: (Upto 5

Carbons) Preparation: Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal dihalides. Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO_4 , ozonolysis and oxidation with hot alk. KMnO_4 .

Suggested Readings:

1. Concise Inorganic Chemistry, J. D. Lee, 5th Edition (1996), Chapman & Hall, London.
2. Modern Inorganic Chemistry, R. C. Aggarwal, 1st Edition (1987), Kitab Mahal, Allahabad.
3. Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson, and Paul L. Gaus, 3rd Edition (1995).
4. Organic Chemistry, R. T. Morrison and R. N. Boyd, 6th Edition (1992), Prentice-Hall of India (P) Ltd., New Delhi.
5. Organic Chemistry, S. M. Mukherjee, S. P. Singh, and R. P. Kapoor, 1st Edition (1985), New Age International (P) Ltd. Publishers, New Delhi.
6. Organic Chemistry – Structure and Reactivity, Seyhan N. Ege, 3rd Edition (1998), AITBS Publishers and Distributors, Delhi.
7. Organic Chemistry, Paula Y. Bruice, 2nd Edition, Prentice-Hall, International Edition.
8. Advanced Organic Chemistry, Arun Bahl and B. S. Bahl: S. Chand.

Discipline Specific Core Course Paper - Mathematics

Course Name: Differential Calculus

Course Code: 13000500

Course Outline

Unit I Limit and Continuity (ϵ and δ definition), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions.

Unit II Tangents and normals, Curvature, Asymptotes, Singular points, Tracing of curves. Parametric representation of curves and tracing of parametric curves, Polar coordinates and tracing of curves in polar coordinates.

Unit III Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder, Taylor's series, Maclaurin's series of $\sin x$, $\cos x$, e^x , $\log(1+x)$, $(1+x)^m$, Maxima and Minima, Indeterminate forms.

Suggested Readings:

1. Gorakh Prasad: Differential Calculus. Pothishasla Pvt. Ltd., Allahabad.
2. Differential and Integral Calculus: Shanti Narayan.
3. Murray R. Spiegel: Theory and Problems of Advanced Calculus. Schaun's Outline series. Schaum Publishing Co., New York.
4. N. Piskunov: Differential and integral Calculus. Peace Publishers, Moscow.
5. Gorakh Prasad: Integral Calculus. Pothishala Pvt. Ltd., Allahabad.
6. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.

Discipline Specific Core Course Paper - Botany

Course Name: Biodiversity (Microbes, Algae, Fungi and Archegoniate)

Course Code: 13003300

Course Outline

Unit I Microbes: Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.

Unit II Algae: General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: Nostoc, Chlamydomonas, Oedogonium, Vaucheria, Fucus, Polysiphonia. Economic importance of algae

Unit III Fungi: Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, life cycle of Rhizopus (Zygomycota) Penicillium, Alternaria (Ascomycota), Puccinia, Agaricus (Basidiomycota); Symbiotic Associations-Lichens:

General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance

Unit IV Introduction to Archegoniate: Unifying features of archegoniates, Transition to land habit, Alternation of generations.

Unit V Bryophytes: General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of Marchantia and Funaria. (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of Sphagnum.

Unit VI Pteridophytes: General characteristics, classification, Early land plants (Cooksonia and Rhynia). Classification (up to family), morphology, anatomy and reproduction of Selaginella, Equisetum and Pteris. (Developmental details not to be included). Heterospory and seed habit, stelar evolution. Ecological and economical importance of Pteridophytes.

Unit VII Gymnosperms: General characteristics, classification. Classification (up to family), morphology, anatomy and reproduction of Cycas and Pinus. (Developmental details not to be included). Ecological and economical importance.

Suggested Readings

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Text book of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. Raven, P.H., Johnson, G.B., Losos, J.B., Singer, S.R., (2005). Biology. Tata McGraw Hill, Delhi, India.
5. Vashishta, PC Sinha, AK Kumar AC20101, Pteridophyte, SChand, Delhi, India
6. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
7. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

Discipline Specific Core Course Paper - Zoology

Course Name: Animal Biodiversity

Course Code: 13003500

Course Outline

Unit I Kingdom Protista: General characters and classification up to classes; Locomotory Organelles and locomotion in Protozoa.

Unit II Phylum Porifera: General characters and classification up to classes; Canal System in Sycon.

Unit III Phylum Cnidaria: General characters and classification up to classes; Polymorphism in Hydrozoa

Unit IV Phylum Platyhelminthes: General characters and classification up to classes; Life history of *Taenia solium*.

Unit V Phylum Nematelminthes: General characters and classification up to classes; Life history of *Ascaris lumbricoides* and its parasitic adaptations.

Unit VI Phylum Annelida: General characters and classification up to classes; Metamerism in Annelida.

Unit VII Phylum Arthropoda: General characters and classification up to classes; Vision in Arthropoda, Metamorphosis in Insects.

Unit VIII Phylum Mollusca: General characters and classification up to classes; Torsion in gastropods.

Unit IX Phylum Echinodermata: General characters and classification up to classes; Water-vascular system in Asteroidea.

Unit X Protochordates: General features and Phylogeny of Protochordata.

Unit XI Agnatha: General features of Agnatha and classification of cyclostomes up to classes.

Unit XII Pisces: General features and Classification up to orders; Osmoregulation in Fishes.

Unit XIII Amphibia: General features and Classification up to orders; Parental care.

Unit XIV Reptiles: General features and Classification up to orders; Poisonous and non-poisonous snakes, Biting mechanism in snakes.

Unit XV Aves: General features and Classification up to orders; Flight adaptations in birds.

Unit XVI Mammals: Classification up to orders; Origin of mammals.

Suggested Readings:

1. Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002).
3. The Invertebrates: A New Synthesis, III Edition, Blackwell Science
4. Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.
5. Pough H. Vertebrate life, VIII Edition, Pearson International.
6. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.

Discipline Specific Core Course - Computer Science

Course Name: Object Oriented Programming in C++

Course Code: 13003700

Course Outline

Unit I Programming Concepts: Algorithm and its characteristics, pseudo code / flow chart, program, identifiers, variables, constants, primitive data types, expressions, structured data types, arrays, compilers and interpreters.

Unit II Statements: Assignment statement, if then else statements, switch statement, looping statements- while, do while, for, break, continue, input/output statements, functions/ procedures.

Unit III Object Oriented Concepts: Abstraction, encapsulation, objects, classes, methods, constructors, inheritance, polymorphism, static and dynamic binding, overloading. Program Development: Object oriented analysis, design, unit testing & debugging, system testing & integration, maintenance.

Unit IV Introduction to structured programming: data types- simple data types, floating data types, character data types, string data types, arithmetic operators and operator precedence, variables and constant declarations, expressions, input using the extraction operator >> and cin, output using the insertion operator << and cout, preprocessor directives, increment (++) and decrement operations (--), creating a C++ program, input/output, relational operators, logical operators and logical expressions, if and if ... else statement, switch and break statements.

Unit V “for”, “while” and “do – while” loops, break and continue statement, nested control statement, value returning functions, void functions, value versus reference Parameters, local and global variables, static and automatic variables, enumeration type, one dimensional array, two dimensional array, character array, pointer data and pointer variables.

Suggested Readings

1. Richard Johnson: An Introduction to Object-Oriented Application Development Thomson Learning, 2006
2. B. Stroustrup, The C++ Programming Language, Addison Wesley ,2004.

Discipline Specific Core Course - Biotechnology

Course Name: Biotechnology and Human Welfare

Course Code: 13003900

Course Outline

Unit I Definition & scope of Biotechnology; Modern Biotechnology, Branches of Biotechnology Definition, Scope, Terminologies in biotech, Techniques used in biotechnology, Instruments used in biotechnology – principle & working., principle of bioinformatics, Ethical issues in biotechnology

Unit II Application of biotechnology in agriculture; animal and veterinary sciences, pharmaceutical industry, food industry and chemical industry. Bioremediation and waste treatment biotechnology. Biotechnology research in India. Biotechnology in context of developing world. Brief account of safety guidelines and risk assessment in biotechnology. Ethics in Biotechnology, Current Status of Biotechnology and Future of Biotechnology in Developing World.

Unit III Industry: protein engineering; enzyme and polysaccharide synthesis, activity and secretion, alcohol and antibiotic formation. Agriculture: N₂ fixation: transfer of pest resistance genes to plants; interaction between plants and microbes; qualitative improvement of livestock.

Unit IV Environments: e.g. chlorinated and non-chlorinated organ pollutant degradation; degradation of hydrocarbons and agricultural wastes, stress management, development of biodegradable polymers such as PHB.

Unit V Forensic science: e.g. solving violent crimes such as murder and rape; solving claims of paternity and theft etc. DNA finger printing introduction. Health: e.g.

development of non-toxic therapeutic agents, recombinant live vaccines, gene therapy, diagnostics, monoclonal in *E.coli*, human genome project.

Suggested Readings

1. Sateesh MK (2010) Bioethics and Biosafety, I. K. International Pvt Ltd.
2. Sree Krishna V (2007) Bioethics and Biosafety in Biotechnology, New age international publishers.

Course Name: Business Communication (AECC)

Course Code: 99002200

Course Outline

Unit I Introduction: Theory of Communication, Types and modes of Communication
Fundamentals of Communication: Communication defined, Models of Communication, barriers in communication, perception and communication, essentials of good communication.

Unit II Language of Communication: Verbal and Non-verbal (Spoken and Written)
Personal, Social and Business Barriers and Strategies Intra-personal, Inter-personal and Group Communication
Modes of human communication: Basic differences in the principal modes of human communication – reading, writing, listening, speaking and non-verbal communication. Spoken communication: Importance of spoken communication, designing receiver-oriented messages, comprehending cultural dimension. Speaking Skills Monologue Dialogue Group Discussion Effective Communication/ Mis-communication Interview Public Speech

Unit III Making Oral presentations: Functions of presentations, defining objective, audience analysis, collection of materials, organization of materials, body language, effective delivery techniques. Written communication: Fundamentals of sentence structure, writing as a process. Reading and Understanding Close Reading Comprehension Summary Paraphrasing Analysis and Interpretation Translation (from Indian language to English and vice-versa) Literary/Knowledge Texts Writing Skills Documenting Report Writing Making notes Letter writing

Unit IV Fundamental of technical writing: Special features of technical writing, the word choice, developing clarity and conciseness, Report writing, Business letters, Applications and resumes. Transactional Analysis: Three human ego states, 4 life positions, different types of transactions

Unit V The significance of communication in a business organization: Channels of communication – Downwards, Upwards, Horizontal, Consensus, and Grapevine. Literary discussions: Analysis and discussion of the novel The Funda of Mix-ology and short stories from the books Under the banyan tree and other stories and Popular short stories.

Suggested Readings:

1. Sen, L., Communication Skills. Prentice Hall of India (2004).
2. Dhar, M., The Funda of Mixology: What bartending teaches that IIM does not, Srishti Publications (2008).
3. Narayan, R. K., Under the banyan tree and other stories. Penguin Classics. (2007).

Discipline Specific Core Course- Physics

Course Name: Mechanics Lab

Course Code: 13001000

List of Experiments

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To determine the Height of a Building using a Sextant.
3. To determine the Moment of Inertia of a Flywheel.
4. To determine the Young's Modulus of a Wire by Optical Lever Method.
5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine the Elastic Constants of a Wire by Searle's method.
7. To determine g by Bar Pendulum.
8. To determine g by Kater's Pendulum.
9. To determine g and velocity for a freely falling body using Digital Timing Technique
10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g and (c) Modules of rigidity.

Suggested Readings:

1. Advanced Practical Physics for students, B.L.Flint and H.T.Workshop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
3. Engineering Practical Physics, S. Panigrahi & B.Mallick,2015, Cengage Learning India Pvt. Ltd.
4. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition,2011, Kitab Mahal, New Delhi.

Discipline Specific Core Course - Chemistry

Course Name: Chemistry - I Lab

Course Code: 13000900

List of Experiments

Section A: Inorganic Chemistry - Volumetric Analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Estimation of oxalic acid by titrating it with KMnO_4 .
3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4 .
4. Estimation of Fe (II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal indicator.
5. Estimation of Cu (II) ions iodometrically using $\text{Na}_2\text{S}_2\text{O}_3$.

Section B: Organic Chemistry

1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two
2. extra elements)
3. Separation of mixtures by Chromatography: Measure the R_f value in each case (combination of two compounds to be given)
(a) Identify and separate the components of a given mixture of 2 amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography (b) Identify and separate the sugars present in the given mixture by paper chromatography.

Suggested Readings:

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
2. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
3. 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.
4. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.

Discipline Specific Core Course Paper - Botany

Course Name: Biodiversity (Microbes, Algae, Fungi and Archegoniate Lab)

Course Code: 13003400

List of Experiments

1. EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle.
2. Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.
3. Gram staining
4. Study of vegetative and reproductive structures of Nostoc, Chlamydomonas (electron micrographs), Oedogonium, Vaucheria, Fucus* and Polysiphonia through temporary preparations and permanent slides. (* Fucus - Specimen and permanent slides)
5. Rhizopus and Penicillium: Asexual stage from temporary mounts and sexual structures through permanent slides.
6. Alternaria: Specimens/photographs and tease mounts.
7. Puccinia: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts.
8. Agaricus: Specimens of button stage and full grown mushroom; Sectioning of gills of Agaricus.
9. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)
10. Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)
11. Marchantia- morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemma cup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides).
12. Funaria- morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema.
13. Selaginella- morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m. microsporophyll and megasporophyll (temporary slides), l.s. strobilus (permanent slide).
14. Equisetum- morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m. spores (wet and dry) (temporary slides); t.s rhizome (permanent slide).
15. Pteris- morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores (temporary slides), t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide).
16. Cycas- morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s. microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide).
17. Pinus- morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. female cone, t.l.s. & r.l.s. stem (permanent slide).

Discipline Specific Core Course Paper- Zoology

Course Name: Animal Diversity Lab

Course Code: 13003600

List of Experiments

1. Study of the following specimens:

Amoeba, Euglena, Plasmodium, Paramecium, Sycon, Hyalonema, and Euplectella, Obelia, Physalia, Aurelia, Tubipora, Metridium, Taenia solium, Male and female Ascaris lumbricoides, Aphrodite, Nereis, Pheretima, Hirudinaria, Palaemon, Cancer, Limulus, Palamnaeus, Scolopendra, Julus, Periplaneta, Apis, Chiton, Dentalium, Pila, Unio, Loligo, Sepia, Octopus, Pentaceros, Ophiura, Echinus, Cucumaria and Antedon, Balanoglossus, Herdmania, Branchiostoma, Petromyzon, Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla, Ichthyophis/Ureotyphlus, Salamandra, Bufo, Hyla, Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus, Gavialis, Any six common birds from different orders, Sorex, Bat, Funambulus, Loris

2. Study of the following permanent slides

T.S. and L.S. of Sycon, Study of life history stages of Taenia, T.S. of Male and female Ascaris

3. Key for Identification of poisonous and non-poisonous snakes

An "animal album" containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose

Discipline Specific Core Course - Computer Science

Course Name: Object Oriented Programming in C++ Lab

Course Code: 13003800

List of Experiments

1. WAP to print the sum and product of digits of an integer.
2. WAP to reverse a number.
3. WAP to compute the sum of the first n terms of the following series $S = 1 + 1/2 + 1/3 + 1/4 + \dots$
4. WAP to compute the sum of the first n terms of the following series $S = 1 - 2 + 3 - 4 + 5 - \dots$

5. Write a function that checks whether a given string is Palindrome or not. Use this function to find whether the string entered by user is Palindrome or not.
6. Write a function to find whether a given no. is prime or not. Use the same to generate the prime numbers less than 100.
7. WAP to compute the factors of a given number.
8. Write a macro that swaps two numbers. WAP to use it.
9. WAP to print a triangle of stars as follows (take number of lines from user):

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*
***
*****
*****
*****

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10. WAP to perform following actions on an array entered by the user:
 - i) Print the even-valued elements
 - ii) Print the odd-valued elements
 - iii) Calculate and print the sum and average of the elements of array
 - iv) Print the maximum and minimum element of array
 - v) Remove the duplicates from the array
 - vi) Print the array in reverse order The program should present a menu to the user and ask for one of the options. The menu should also include options to re-enter array and to quit the program.
11. WAP that prints a table indicating the number of occurrences of each alphabet in the text entered as command line arguments.
12. Write a program that swaps two numbers using pointers.
13. Write a program in which a function is passed address of two variables and then alter its contents.
14. Write a program which takes the radius of a circle as input from the user, passes it to another function that computes the area and the circumference of the circle and displays the value of area and circumference from the main() function.
15. Write a program to find sum of n elements entered by the user. To write this program, allocate memory dynamically using malloc() / calloc() functions or new operator.
16. Write a menu driven program to perform following operations on strings: 13
 - a) Show address of each character in string
 - b) Concatenate two strings without using strcat function.
 - c) Concatenate two strings using strcat function.
 - d) Compare two strings
 - e) Calculate length of the string (use pointers)
 - f) Convert all lowercase characters to uppercase
 - g) Convert all uppercase characters to lowercase
 - h) Calculate number of vowels
 - i) Reverse the string
17. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array
18. WAP to display Fibonacci series (i)using recursion, (ii) using iteration
19. WAP to calculate Factorial of a number (i)using recursion, (ii) using iteration

20. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
21. Create Matrix class using templates. Write a menu-driven program to perform following
Matrix operations (2-D array implementation):
 - a) Sum b) Difference c) Product d) Transpose
22. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).
23. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.
24. Create a class Box containing length, breath and height. Include following methods in it:
 - a) Calculate surface Area
 - b) Calculate Volume
 - c) Increment, Overload ++ operator (both prefix & postfix)
 - d) Decrement, Overload -- operator (both prefix & postfix)
 - e) Overload operator == (to check equality of two boxes), as a friend function
 - f) Overload Assignment operator
 - g) Check if it is a Cube or cuboid

Write a program which takes input from the user for length, breath and height to test the above class.

25. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
26. Write a program to retrieve the student information from file created in previous question and print it in following format: Roll No. Name Marks
27. Copy the contents of one text file to another file, after removing all whitespaces.
28. Write a function that reverses the elements of an array in place. The function must accept only one pointer value and return void.

Discipline Specific Core Course – Biotechnology

Course Paper: Biotechnology and Human Welfare Lab

Course Code: 13004000

List of Experiments

(Wherever wet lab experiments are not possible the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs etc.)

1. Practical knowledge of various instruments used in a biotechnology lab.
2. To know the various working rules of a biotechnology lab

3. Isolation of DNA from plant
4. Demonstration of the fermentation experiment in lab
5. Making of compost in lab
6. To study the blood smear under microscope
7. Separation of compounds by thin layer chromatography
8. Perform of ethanolic fermentation using Baker's yeast
9. Study of a plant part infected with a microbe
10. To perform quantitative estimation of residual chlorine in water samples
11. Calculation of Total Dissolved Solids (TDS) of water sample.
12. Calculation of BOD of water sample.
13. Calculation of COD of water sample.
14. Bacterial Examination of Water by MPN Method

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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