

Detailed Course Scheme
Bachelor of Science
**(Chemistry, Botany, Zoology,
Biotechnology)**

Semester I

2017- 2020

DOC201706160009



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-Dec.) Semester, 2017 along with examination pattern is as follows

Semester – I

S. No	Course Code	Course Name	Credits
1.	-	Discipline Specific Core Course-I Paper-I	4
2.	-	Discipline Specific Core Course-I Paper-I Lab	2
3.	-	Discipline Specific Core Course-II Paper-I	4
4.	-	Discipline Specific Core Course-II Paper-I Lab	2
5.	-	Discipline Specific Core Course-III Paper-I	4
6.	-	Discipline Specific Core Course-III Paper-I Lab	2
7.	13002700	Ability & Skill Enhancement Module – I	2
8.	99002200	Business Communication(AECC)	4
Total Credits			24

Discipline Specific Core Course Papers (Choose any three)

Subject	Course Code	Course Name
Chemistry	13000401	Chemistry-I
	13000900	Chemistry-I Lab
Botany	13003300	Biodiversity (Microbes, Algae, Fungi and Archegoniate)
	13003400	Biodiversity (Microbes, Algae, Fungi and Archegoniate Lab)
Zoology	13003500	Animal Biodiversity
	13003600	Animal Biodiversity Lab
Biotechnology	13003900	Biotechnology and Human Welfare
	13004000	Biotechnology and Human Welfare Lab

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

Area of Assessment	Marking	Maximum Marks
Sessional-I	As per marks obtained	10
Sessional-II	As per marks obtained	10
Assignment + Presentation	15	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

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 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, oxymercuration-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.

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 extra elements)
2. 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

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 archegoniate, 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. Bhatnagar, S.P. and Moitra, A. (1996). Gymnosperms. New Age International (P) Ltd Publishers, New Delhi, India.
6. Parihar, N.S. (1991). An introduction to Embryophyta. Vol. I. Bryophyta. Central Book Depot, Allahabad.

Course Name: Biodiversity (Microbes, Algae,) Lab

Course Code: 13003400

List of Experiments

1. EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and
2. Lysogenic Cycle.
3. Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.
4. Gram staining
5. 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)
6. Rhizopus and Penicillium: Asexual stage from temporary mounts and sexual structures through permanent slides.
7. Alternaria: Specimens/photographs and tease mounts.

8. 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.
9. Agaricus: Specimens of button stage and full grown mushroom; Sectioning of gills of Agaricus.
10. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)
11. Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)
12. 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).
13. Funaria- morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema.
14. 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).
15. Equisetum- morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore,
16. w.m. spores (wet and dry)(temporary slides); t.s rhizome (permanent slide).
17. Pteris- morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores
18. (temporary slides), t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide).
19. 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).
20. 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.
21. microspores (temporary slides), l.s. female cone, t.l.s. & r.l.s. stem (permanent slide).

Course Name: Animal Bio Diversity

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 Nemathelminthes: 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 Asterozoa.

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

Unit 16: 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 Hallgrímsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.

Course Name: Animal Bio 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.

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 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. solation 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 Fermentaion 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

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.

Laboratory work:

Audio-visual aids for effective communication: The role of technology in communication, the role of audio-visuals, designing transparencies, computer-aided presentation software, Software-aided activities in developing communication skills: Proper pronunciation, Learning to use the correct tense, Business writing, Report writing, Connected speech, Building up vocabulary, Awareness about the common errors in the usage of English, etc. Case studies, group discussions, presentations.

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).

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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