

**Detailed Course Scheme**  
**Bachelor of Science (Biotechnology)**

**Semester- I**

**2018-2021**

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**RNB**  
GLOBAL UNIVERSITY  
Educating stars for tomorrow

**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) Odd Semester, 2018 along with examination pattern is as follows.

### **Semester - I**

S. No.	Course Code	Course Name	L	T	P	Credits
1.	-	Discipline Specific Core Course-I Paper-I	4	0	0	4
2.	-	Discipline Specific Core Course-I Paper-I Lab	0	0	4	2
3.	-	Discipline Specific Core Course-II Paper-I	4	0	0	4
4.	-	Discipline Specific Core Course-II Paper-I Lab	0	0	4	2
5.	-	Discipline Specific Core Course-III Paper-I	4	0	0	4
6.	-	Discipline Specific Core Course-III Paper-I Lab	0	0	4	2
7.	13002700	Ability & Skill Enhancement- I	2	0	0	2
8.	99002200	Business Communication(AECC)	4	0	0	4
9.	99002800	Workshops & Seminars	-	-	-	1
10.	99002700	Human Values & Social Service/NCC/NSS	-	-	-	1
<b>Total</b>			<b>18</b>	<b>0</b>	<b>12</b>	<b>26</b>

### **Discipline Specific Core Course Papers (Choose any three)**

Subject	Course Code	Course Name
Chemistry	13000401	Chemistry-I
	13000900	Chemistry-I 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**

Type	Details	Marks
Mid Term	One Mid-term Sessional	25
Marks obtained in various Tests, Assignments, Presentations, Quiz, Tutorials, etc.	Average of marks obtained	20
Attendance	75% + : 5 marks	5
<b>TOTAL</b>	<b>50</b>	

### **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	45
Attendance	75%+ : 5 marks	5
<b>TOTAL</b>	<b>50</b>	

### **External Assessment**

Type	Marks
Practical	50

### **EVALUATION SCHEME- WORKSHOPS & SEMINARS & NCC/NSS**

1. NCC/NSS will be completed from Semester I – Semester IV. It will be evaluated internally by the institute. The credit for this will be given at the end of 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 to Semester-IV and credits and marks would be given after the end of Semester.

### **CURRICULUM**

**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  $\text{NH}_3$ ,  $\text{H}_3\text{O}^+$ ,  $\text{SF}_4$ ,  $\text{ClF}_3$ ,  $\text{ICl}_2^-$ , and  $\text{H}_2\text{O}$  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.  $\text{KMnO}_4$ ) 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  $\text{CaC}_2$  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  $\text{KMnO}_4$ , ozonolysis and oxidation with hot alk.  $\text{KMnO}_4$ .

### **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  $\text{KMnO}_4$ .
3. Estimation of water of crystallization in Mohr's salt by titrating with  $\text{KMnO}_4$ .
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<sub>f</sub> 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: 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 *Taeniasolium*.

**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 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 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.

**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, Taeniasolium, Male and female Ascarislumbricoides, 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: N<sub>2</sub> 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. 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 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).

## **Course Name: Ability & Skill Enhancement I**

**Course Code: 13002700**

### **Course Outline - Final Assessment - Written Paper**

#### **Unit I: Ice Breaking Session & Recap of Language Skills**

Ice Breaking Session, Phrase, Clause, Sentence, Word Classes (Parts of Speech).

#### **Unit II: Recap of Language Skills**

Tenses (Present, Past Future), Modals, Articles (a, an, the).

#### **Unit III: Reading Skills & Fluency Building**

Reading Process, Importance & Types of Reading, Techniques of Reading, and Strategies to Improve Reading Abilities, Comprehension, Reading Aloud, Reading News.

#### **Unit IV: Writing Skills**

Generating ideas/gathering data, organizing ideas, Note taking, Outlining, drafting, Editing, and Proof Reading, Story Writing (through pictures/videos), Dialogue Writing, Email Writing.

**Unit V: Listening & Speaking Skills**

Types and Essentials of good listening, Listening Process, Barriers to Listening and Strategies to improve Listening, Listening to Inspirational Movies/Clips, Listening News Techniques of Effective Speaking, Introducing Oneself and others, Extempore, Situational Conversations (Practicing Short Dialogues).

**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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