Integral University, Lucknow

Department of Biosciences
B.Sc. (Hons.) (Biochemistry)

(w.e.f 2018-2019)

Department of Biosciences Evaluation Scheme
B. Sc. (Hons.) Biochemistry Semester – I Choice Based Credit System (CBCS)
(w.e.f 2018-2019)

Course Code	Course Title	Type of Paper	Periods/ Week			Evaluation Scheme				Maximum Marks	Credits	Total Credit
			L	T	P	CT	TA	Total	ESE			
LN104	Essential Professional Communication	Foundation	3	1	0	25	15	40	60	100	3:1:0	4
MT106	Mathematics	Foundation	3	1	0	25	15	40	60	100	3:1:0	4
CS109	Concept of Computers	Foundation	3	1	0	25	15	40	60	100	3:1:0	4
CH112	Fundamental of Inorganic Chemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS112	Fundamentals of Biochemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
CH113	Chemistry Lab-I	Practical	0	0	6	25	15	40	60	100	0:0:3	3
BS141	Biochemistry Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
	Total									700		26

B. Sc. (Hons.) Biochemistry Semester – II
(w.e.f 2018-2019)

Course Code	Course Title	Type of Paper	Periods/week			Evaluation Scheme				Maximum Marks	Credits	Total Credit
			L	T	P	CT	TA	Total	ESE			
ES115	Fundamentals of Environmental Studies	Foundation	3	1	0	25	15	40	60	100	3:1:0	4
CH114	Fundamental of Organic Chemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS232	Plant Physiology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS233	Animal Physiology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS113	Fundamentals of Microbiology	Core	3	1	0	25	15	40	60	100	3:1:0	4
CH115	Chemistry Lab-II	Practical	0	0	6	25	15	40	60	100	0:0:3	3
BS205	Microbiology lab.	Practical	0	0	6	25	15	40	60	100	0:0:3	3
	Total									700	26	26

B. Sc. (Hons.) Biochemistry Semester – III
(w.e.f 2019-2020)

Course Code	Course Title	Type of Paper	Periods/Week			Evaluation Scheme				Subject Total	Credit Hours	Total Credit
			L	T	P	CT	TA	Total	ESE			
CH215	Fundamentals of Physical Chemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS202	Biophysical Chemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS241	Fundamentals of Genetics	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS242	Introduction to Cell Biology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS243	Fundamentals of Bioinformatics	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS244	Physiology Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
BS206	Cell Biology & Genetics Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
	Total									700	26	26

B. Sc. (Hons.) Biochemistry Semester – IV
(w.e.f 2019-2020)

Course Code	Course Title	Type of Paper	Periods/Week			Evaluation Scheme				Subject Total	Credit Hours	Total Credit
			L	T	P	CT	TA	Total	ESE			
BS251	Enzymes and Hormones	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS212	Molecular Biology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS252	Clinical Biochemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS253	Fundamentals of Plant Biochemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS201	Metabolism	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS255	Enzymology Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
BS308	Genetic Engineering Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
		Total								700	26	26

B. Sc. (Hons.) Biochemistry Semester – V
(w.e.f 2020-2021)

Course Code	Course Title	Type of Paper	Periods/Week			Evaluation Scheme				Subject Total	Credit Hours	Total Credit
			L	T	P							
						CT	TA	Total	ESE			
BS211	Immunology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS341	Nutritional Biochemistry	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS303	Genetic Engineering	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS306	Applied Biotechnology	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS305 BS342	Electives: (Any one of the following) Genomics, Proteomics & Metabolomics Introduction to Tissue culture technologies	Elective	3	1	0	25	15	40	60	100	3:1:0	4
BS343	Tissue Culture & Bioinformatics Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
BS216	Immunology Lab	Practical	0	0	6	25	15	40	60	100	0:0:3	3
		Total								700	26	26

B.Sc. (Hons.) Biochemistry Semester – VI
(w.e.f 2020-2021)

Course Code	Course Title	Type of Paper	Periods/week			Evaluation scheme				Subject Total	Credit Hours	Total Credit
			L	T	P							
						CT	TA	Total	ESE			
BS204	IPR & Biosafety	Core	3	1	0	25	15	40	60	100	3:1:0	4
BS312 BS351	Elective courses (Any one of the following) Bionanotechnology Human Physiology	Elective	3	1	0	25	15	40	60	100	3:1:0	4
BS352	Seminar Presentation	Practical	0	0	4	25	15	40	60	100	0:0:2	2
BS315	Project & Training* (3 months)		3 Months							300	0:0:4	4
BS316	Educational Tour (8-10 days)									100	0:0:2	2
	Total									700	16	16

*** The Evaluation scheme for the Project Work**

	Course Code	Dissertation	Presentation	Viva/Discussion	Total
Project Work	BS315	200	50	50	300

Credit Précis

S.No.	Semester	Total Marks	Total Credit
1	I	700	26
2	II	700	26
3	III	700	26
4	IV	700	26
5	V	700	26
6	VI	700	16
Grand Total	-	**4200**	**146**

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc BC/BT/LS/ZBC I yr **I sem**
Subject: Essential Professional Communication **Subject Code: LN104**

(w.e.f 2018-2019)

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UNIT I	**4**	4
Introduction to Communication: Definition, Types of Communication, Channels of Communication, Language		
UNIT II	**6**	
Interpersonal Communication: Culture- Definition and Types, Communication and Culture including Cross Cultural Communication		
UNIT III	**8**	
Written Communication: Letter Writing- Informal and Formal - Letters of Enquiry, Letters of complaint, Response to complaints and enquiries, Self Exploration through description		
UNIT IV	**12**	
Grammar through Worksheets: Situational activities and modules- Parts of Speech, Tenses, Articles, Modals, Active and Passive, Subject-Verb Agreement, Direct and Indirect Speech, Degrees of comparison		
UNIT V	**10**	
Grammar through Worksheets Continued Sentences: Simple, Compound, Complex, Declarative, Assertive, Negative, Interrogative, Exclamatory, Imperative		

Suggested readings:

1. Wren PC and Martin H, "High School Grammar and Composition", S. Chand and Co.
2. K. Floyd, "Interpersonal Communication: The Whole Story" (2009), McGraw Hill,
3. Greenbaum Sidney and Nelson Gerald, "An Introduction To English Grammar", Pearson Swan Michael, "Practical English Usage" OUP, 2005
4. Raymond Murphy, "Intermediate English Grammar", (2007) Cambridge University Press.

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc BC/BT/LS I yr **I sem**
Subject: Mathematics **Subject Code: MT106**

(w.e.f 2018-2019)

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UNIT I **8**

Set Theory and finite differences: Sets and their representations, finite and infinite sets, subsets, empty set, universal set, complement of a set, difference of sets, Venn diagram, ordered pairs, cartesian product, application. Finite differences, forward and backward differences, Properties of operators.

UNIT II **8**

Interpolation and Algebraic & Transcendental Equations: Newton Gregory forward & backward Interpolation formula, Gauss forward and backward formula for equal intervals, Lagrange's formula for unequal intervals, solution of transcendental and algebraic equations by bisection method, iteration method, Newton Raphson method.

UNIT III **8**

Permutation, Combination and Binomial Theorem: Fundamental principle of counting, Permutations, permutations under certain conditions. Combinations, Combinatorial identities. Binomial theorem (without proof), some applications of Binomial theorem.

UNIT IV **8**

Curve fitting and solution of cubic and biquadratic equations: Scatter diagram, curve fitting by the principle of Least squares, reduction of cubic equation to standard form. Different methods of solving cube equations, solution of biquadratic equation.

UNIT V **8**

Probability and probability distributions: Random experiment and associated sample space, events definition of probability, algebra of events, addition and multiplication theorems on probability (without proof). Binomial, Poisson and Normal distributions analysis.

Suggested Reading:

1. Seymour Lipschutz, 1981, Set Theory, (Schaum's Outline Series) McGraw-Hill Book Co.
2. Frank Ayres, J.R., 1974, Matrices, (Schaum's Outline Series) McGraw-Hill Inc.
3. Murray R. Spiegel, 1980, Probability and Statistics, Schaum's (Outline Series) McGraw- Hill Book Co.
4. Arora, P.N. and P.K. Malhan, 2002, Biostatistics, Himalaya Publishing House.
5. E. Kreyszig, "Advanced Engineering Mathematics", 5th Edition, Wiley Eastern, 1985.
6. Mathematics, NCERT.
7. Mathematics R.D. Sharma.
8. Higher Engineering Mathematics, B. V. Ramana. Tata McGraw Hill Publishers.
9. Mathematics, R.S. Agarwal

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc BC/BT I yr **I sem**
Subject: Concepts of Computers **Subject Code: CS109**

(w.e.f 2018-2019)

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UNIT I **8**

History of Computers and Computer system: Hardware and Software, Machine languages, essentials of computer operation, Applications, Basic Structure of Computer System, AIU memory, CPU, I/O Devices, Memory management, Booting process (BIOS), Input devices memory-RAM, ROM etc. Storage devices - Hard disc, Floopy disc, CD-ROM

UNIT II **8**

Operating Devices and Operating Environment: Features, Advantages and Drawbacks, DOS, WINDOWS & UNIX; Introduction to Data Processing and Flowchart, Operating environment, MS Office (Word, Excel & Powerpoint)

UNIT III **8**

Computer Networking: Introduction to networking, modem, Network topology concept and types with advantages and drawbacks of each, components of LAN, WAN, Medium.

UNIT IV **8**

Internet and Web Technologies: History and concept, Architecture, Application, Hypertext Markup Language, DHTML, WWW, Gopher, FTP, Telnet, Web Browsers, Net Surfing, Search Engines, Email, Digital Signatures, Network, Security, Firewall.

UNIT V **8**

Databases, Algorithms and Flowcharts: Introduction, need of database, Types of database and Introduction to biological databases: Definition, properties and principles, Converting algorithms to flowcharting, Comparison between program and algorithm, Use of basic programming in biology.

Suggested Reading:

1. Curtin, “Information Technology: Breaking News”, TMH.
2. Raja Raman, V. “Introduction To Computers”.
3. Nelson, “Data Compression”, BPB
4. Bajpai, Kushwaha & Yadav, “Introduction To Computer & C Programming”, New Age
5. Lehngart, “Internet 101”, Addision Wesley.
6. Chanchal Mittal “Foundation of Information Technology” Pragati.

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc BC/BT/LS I yr **I sem**
Subject: Fundamentals of Inorganic Chemistry **Subject Code: CH112**

(w.e.f 2018-2019)

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UNIT I **8**
Periodic Properties: An introduction to modern periodic table, periodicity in properties of elements: Atomic and ionic radii, ionization energy, electron Affinity, electronegativity, effective nuclear charge, shielding effect.

UNIT II **8**
Chemical Bonding-I: Introduction, causes of chemical combination, electronic theory of valency, general characteristics of electrovalent bond, covalent bond, coordinate bond, metallic bonding and hydrogen bonding.

UNIT III **8**
Chemical Bonding-II: Hybridization and shapes of simple molecules and ions. Valence Shell Electron Pair Repulsion (VSEPR) theory to NH_3, SF_4, ClF_3, ICl^{4-} and H_2O. Molecular Orbital theory for homonuclear and heteronuclear diatomic molecules.

UNIT IV **8**
Acid and Bases: Elementary idea of Bronsted-Lowry and Lewis concept of acids and bases (Proton-donor acceptor and electron donor acceptor systems), Relative strengths of Lewis acids bases and the effect of substitutes and the solvent on them.

UNIT-V **8**
Coordination Compounds: Double salts and coordination compounds, Werner's coordination theory, IUPAC nomenclature of coordination compounds, Discussion of inner and outer orbital complexes, Isomerism (structural, optical and geometrical).

Suggested Reading:

1. Advanced Inorganic Chemistry Vol-I & II, Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan, S. Chand & Co. Ltd.
2. Test book of Inorganic Chemistry, P.L. Soni, Sultan Chand & Sons
3. Simplified Course in Inorganic Chemistry, Madan & Tuli, S. Chand & Co. Ltd.
4. Concise Inorganic Chemistry, J.D. Lee, Black Well Sciences
4. Selected Topics in Inorganic Chemistry, Wahid U Malik, GD Tuli, RD Madan, S Chand Publication.

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc BC I yr **I sem**
B.Sc BT I yr **II sem**
B.Sc LS II yr **III sem**
Subject: Fundamentals Of Biochemistry **Subject Code: BS112**

(w.e.f 2018-2019)

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UNIT I **8**

Introduction to Biomolecules. Carbohydrates: Structure, classification and properties of Monosaccharides, Disaccharides, and Polysaccharides (starch, glycogen, peptidoglycan, cellulose).

UNIT II **8**

Amino acids and Proteins: Structure, classification and properties of amino acids, peptide bond, proteins: primary, secondary (α-Helix, β-pleated sheet), tertiary and quaternary structures, Ramachandran plot, structure of hemoglobin and myoglobin.

UNIT III **8**

Lipids: Structure, function, classification and properties of Fatty acids, Glycerolipid, Cholesterol, Sphingolipid, phospholipids, lipoproteins, glycoproteins, isoprene

UNIT IV **8**

Nucleic acids: Purines and pyrimidines, nucleosides, nucleotides, polynucleotides, DNA types: A DNA, B DNA and Z DNA and their function, RNA types: mRNA, rRNA and tRNA and their function, Forces stabilizing nucleic acid structure.

UNIT V **8**

Structure, sources, dietary requirements, function and deficiency disorders of water (B, C) and fat soluble vitamins (A, D, E and K).

Suggested Readings:

1. Principles of Biochemistry- AlbertL. Lehninger CBS Publishers & Distributors
2. Biochemistry – Lubert stryer Freeman International Edition.
3. Biochemistry – Keshav Trehan Wiley Eastern Publications
4. Fundamentals of Bochemistry-J.L.Jain S.Chand and Company

Integral University, Lucknow
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B.Sc. (Hons.) Biochemistry

PRACTICALS

B.Sc BC/BT/LS I yr **I sem**
Subject: Chemistry Lab I **Subject Code: CH113**

(w.e.f 2018-2019)

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1. Acid-base titrations
2. Molarity, molality, normality
3. Preparation of solutions, buffers- sensitivity, specificity, accuracy, pH measurements
4. Volumetric analysis: Oxidation-reduction titration using $KMnO_4$ and $K_2Cr_2O_7$
5. Iodometry titrations: Estimation of potassium dichromate and copper sulphate.
6. Preparation of the following inorganic compounds: Prussion blue from iron fillings, chrome alum, cuprammonium sulphate, cuprous chloride
7. Heat of neutralisation of a strong acid and a strong base.
8. Freezing point depression

Subject: Biochemistry Lab. **Subject Code: BS 141**

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1. Qualitative test for carbohydrates (Molisch test, Benedict test, Fehling test, Barfoed and Iodine tests)
2. Estimation of vitamin C
3. Determination of pKa of glycine
4. Tests for Amino Acids and Proteins (Biuret, Xanthoproteic and Ninhydrin tests)
5. Qualitative test for lipid
6. DNA and RNA estimation

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc BC/BT/LS/ZBC I yr **II sem**
Subject: Fundamentals of Environmental Studies **Subject Code: ES115**

(w.e.f 2018-2019)

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UNIT I- **10**

Environment its components & segments, Physical, Chemical and biological study of Environment, Multidisciplinary nature of environmental studies, Concept of Sustainable development & Sustainable life styles, Public awareness & Environmental movements like Chipko, Silent valley, Narmada Bachao Andolan.6

Natural Resources:

Renewable and non-renewable resources: Natural resources and associated problems.

a. **Forest resources**: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forest and tribal people.
b. **Water resources**: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
c. **Mineral resources**: Use and exploitation, environmental effects of extracting and using mineral resources.
d. **Food resources**: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
e. **Energy resources**: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources.
f. **Land resources**: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT II **8**

Ecosystems:

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem:
  a. Terrestrial Ecosystem
  b. Aquatic ecosystems

UNIT III **8**

Biodiversity and its conservation:

- Introduction – Definition: genetic, species and ecosystem diversity.
- Bio-Geographical classification of India.
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.

- Biodiversity at global, National and local levels.
- India as a mega-diversity nation.
- Hot-sports of biodiversity.
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India.
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT IV **8**

Environmental Pollution

Definition:

- Cause, effects and control measures of
  - a) Air pollution
  - b) Water pollution
  - c) Soil pollution
  - d) Marine pollution
  - e) Noise pollution
- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Disaster management: floods, earthquake, cyclone and landslides.

UNIT V **6**

Social Issues and the Environment:

- From Unsustainable to Sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns, case studies.
- Environmental ethics: Issues and possible solutions.
- Green house effect and global warming, effects of acid rain and their remedial measures and ozone layer depletion.
- Ill-effects of fire works
- Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of Environmental legislation. Case studies.

Human Population and the Environment:

- Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health. Human Rights.
- Value Education.
- HIV/AIDS. Women and Child Welfare.

Suggested Reading:

1. Environmental Studies by Benny Joseph, Tata McGraw Hill, 2005.
2. Environmental Studies by Dr. D.L. Manjunath, Pearson Education, 2006.
3. Principles of Environmental Science and Engineering by P. Venugopal Rao, Prentice Hall of India.
4. Environmental Science and Engineering by Meenakshi, Prentice Hall of India.

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc BC/BT/LS I yr **II sem**
Subject: Fundamentals of Organic Chemistry **Subject Code: CH114**

(w.e.f 2018-2019)

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UNIT I **8**
Inorganic: Acid and Bases: Elementary idea of Bronsted-Lowry and Lewis concept of acids and bases (Proton-donor acceptor and electron donor acceptor systems), Relative strengths of Lewis acids bases and the effect of substitutes and the solvent on them.
UNIT II **8**
General properties of 3rd group elements & Co-ordination Compounds: Molecular compounds, Werners coordination theory, IUPAC system of nomenclature of coordination compounds. Discussions of outer and inner orbit complexes. Role of tracer elements (Ne, K, Mg, Ca Mn, Fe, Co, Ca, Xn, Cr, P,S, Cl, and I) in biological systems.
UNIT III **8**
General trends in the Chemistry of p-block elements: Preparation, properties, uses and structure of the following compounds. Tin Chlorides, hydrazine, hydroxylamine and acids, Oxides, Oxyacids hydrogen sulphide (analytical applications), Oxides and Oxyacids of sulphur,
UNIT IV **8**
Physical: Liquids: Vapor pressure, variation of vapour pressure of liquids with temperature, Solutions: Henry's Law, Raoult's Law, critical solutions temperatures, fractional distillation and steam distillation.Osmosis and measurement of osmotic pressure. Effect of solutes on boiling points and freezing points of solutions.
UNIT V **8**
Heterogenous equilibria: Phase rule, phase diagrams of water and sulphur system.Nernst distribution law, solvent extraction.

Suggested Reading:

1. Advanced Inorganic Chemistry Vol-I & II, Satya Prakash, G.D. Tuli, S.K. Basu, R.D. Madan, S. Chand & Co. Ltd.
2. Test book of Inorganic Chemistry, P.L. Soni, Sultan Chand & Sons
3. Simplified Course in Inorganic Chemistry, Madan & Tuli, S. Chand & Co. Ltd.
4. Concise Inorganic Chemistry, J.D. Lee, Black Well Sciences
5. Essentials of Physical Chemistry, Bahl & Tuli, S. Chand & Co. Ltd.
6. Principles of Physical Chemistry, Puri, Sharma & Pathania, Vishal Publishing Co.
7. Simplified course in Physical Chemistry, Madan & Tuli, S. Chand & Co. Ltd.
8. Atkin's Physical Chemistry, Atkin, Oxford Press.
9. Physical Chemistry, Vemulapalli, Printice Hall of India

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc BC I yr **II sem**
B.Sc LS II yr **IV sem**
Subject: Plant Physiology **Subject Code: BS232**

(w.e.f 2018-2019)

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UNIT I **8**

Plant-water relations: Importance of water, Diffusion and water potential, Osmosis, Ascent of sap, Transpiration and its significance; Factors affecting transpiration, guttation.

UNIT II **8**

Mineral nutrition and transport: Essential elements, macro and micronutrients, Role of essential elements; Absorption of mineral salts, Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps. Translocation in phloem, Composition of phloem sap.

UNIT III **8**

C and N metabolism: Photosynthesis Photosynthetic Pigments (Chl a, b); Photosystem I and II, Electron transport and mechanism of ATP synthesis; C3, C4 and CAM pathways of carbon fixation; Photorespiration. Nitrogen metabolism Biological nitrogen fixation; Nitrate and ammonia assimilation.

UNIT IV **8**

Plant growth regulators: Enzymes: general structure and properties, Plant growth regulators: Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA, ethylene. role and applications in agri-horticulture. Seed Physiology: Dormancy, Breaking of dormancy, Germination.

UNIT V **8**

Growth and Development: Plant response to light and temperature: Photomorphogenesis, Plant movements, Photoperiodism, (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure), red and far red light responses on photomorphogenesis; Growth response to temperature, Vernalization. Introduction to Stress physiology.

Suggested Reading:

1. Taiz, L., Zeiger, E.,. Plant Physiology. Sinauer Associates Inc., U.S.A. 5th Edition.
2. Hopkins, W.G., Huner, N.P.,. Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.
3 Bajracharya, D.,. Experiments in Plant Physiology- A Laboratory Manual. Narosa Publishing House, New Delhi.
4. Frank B. Salisbury, Cleon W. Ross: Plant Physiology. Wadsworth Publishing Company

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc BC I yr **II sem**
B.Sc LS II yr **IV sem**
Subject Name: Animal Physiology **Subject Code: BS233**

(w.e.f 2018-2019)

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UNIT I **8**
Digestion and absorption: Role of salivary glands, liver, pancreas and intestinal glands. Digestion and absorption of carbohydrates, lipids and proteins.
UNIT II **8**
Blood: Composition of blood, blood cells, plasma proteins and Rh factor; Blood coagulation – mechanism and regulation. Circulatory & Cardiovascular System: Heart and circulation;cardiaccycle.
UNIT III **8**
Respiration: Respiratory volumes, Haemoglobin and oxygen transport, carbon dioxide transport, Bohr's effect and chloride shift. Excretion and osmoregulation: Structure of nephron, urine formation and its regulation; excretory product.
UNIT IV **8**
Muscle system: Muscles and Movement, Skeletal, cardiac and smooth muscle. Nervous system: central and peripheral nervous system, nerve impulse – its conduction and synaptic transmission, neurotransmitters.
UNIT V **8**
Endocrine system: Endocrine glands and their functions; Nature of hormones; Regulation of hormone secretion; Mode of action of hormones. Reproductive system: testis, ovary, Spermatogenesis, Oogenesis, Totipotency.

Suggested Reading:

1. Textbook of Medical Physiology by Guyton. A.C., H. Sanders Philadelphia. 1988.
2. Physiological basis of Medical practice, West J.B., Best and Taylor.
3. Introduction to Physiology by Davidson H and Segal M.B. Academic Press.
4. Fox S I – Human Physiology, (McGraw Hill, 1998, ISBN: 0071157069)
5. Moffett D and Schauf C L – *Human Physiology: Foundations & Frontiers*, (Mosby, 1993, ISBN: 801669030)
6. Seeley R, Stephens T and Tate P – *Anatomy & Physiology*, (McGraw-Hill, 1999, ISBN: 0071169881)
7. Sherwood L – Human Pysiology*: From Cells to Systems*, (Wadsworth Publishing, 2000,ISBN: 0534568262)
8. Tortora G J *Principles of* Anatomy & Physiology, (John Wiley & Sons, 1999, ISBN: 0471366927)

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

B.Sc BC/ BT/ LS I yr **II sem**
Subject: Fundamentals of Microbiology **Subject Code: BS113**

(w.e.f 2018-2019)

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UNIT I **8**
History and classification of microbiology: Pasteur's experiments, Various forms of microorganisms (bacteria, fungi, viruses, protozoa, PPLOs); Nutritional classification of microorganisms; Nature of the microbial cell surface, gram positive and gram negative bacteria; Growth curve.

UNIT II **8**
Control of Microorganisms: Physical agents (Autoclave, Hot air oven, Laminar airflow and membrane filter.), chemical agents (Alcohol, Halogens and Gaseous agents, antibiotics), Radiation Methods (UV rays). **Pathogenesis of microorganisms:** Some common pathogenic microorganisms: Bacterial (tuberculosis, gall), viral (SARS, TMV), fungal (red rot of sugar cane, dermatitis) and protozoan (malaria).

UNIT III **8**
Microbes in extreme environments and microbial interactions: The thermophiles alkalophiles, acidophiles and symbiosis and antibiosis among microbial population, N_2 fixing microbes in agriculture and forestry.

UNIT IV **8**
Recombination in Prokaryotes: Transformation, Conjugation and Transduction.

UNIT V **8**
Bacteriophage: Lytic and lysogenic cycle. Stains and staining techniques: Principles of staining, Types of stains – simple stains, structural stains and Differential stains.

Suggested Reading:

1. Introduction to Microbiology, Ingraham, 2ed.
2. Brock Biology of Microorganisms, Madigan et al, 9th ed.
3. General Microbiology, R.Y. Stanier, J.L. Ingraham, M.L.Wheelis and P.R. Painter, Macmillian
4. Microbiology VI Edition, M.J. Pelczar, E.C.S. Chan and N.R. Kreig, Tata McGraw Hill
5. Principles of Microbiology, R.M. Atlas, Wm C. Brown Publisher.
6. The Microbial World, Roger Y. Stanier, Prentice Hall
7. Howe.C. (1995) Gene Cloning and manioulation, Cambridge University Press, USA
8. Lewin, B., Gene VI New York, Oxford University Press.
9. Sambrooket al (2000) Molecular cloning Volumes I, II, & III Cold spring Harbor Laboratory Press, New York, USA
10.Walker J.M. and Gingold, E.B. (1983) Molecular Biology & Biotechnogy (Indian Edition) Royal Society of Cemistry U.K

Integral University, Lucknow
Department of Biosciences
B.Sc. (Hons.) Biochemistry

PRACTICALS

B.Sc BC/ BT/ LS I yr **II sem**
Subject: Chemistry Lab-II **Subject Code: CH115**

(w.e.f 2018-2019)

L T P
0 0 6

1. Qualitative analysis of inorganic mixtures, containing not more than four ionic species (excluding insoluble substances) out of the following : Pb^{2+}, Ag^{+}, Cu^{2+}, Cd^{2+}, As^{3+}, Sn^{2+}, Fe^{3+}, Zn^{2+}, Ba^{2+}, Sr^{2+}, Ca^{2+}, Mg^{2+}, NH_4 , Co_3 , S, NO_2 , CH_3COO , Cl , Br , I, NO_3, SO_4^{2-}, PO_4
2. Purification of Organic compounds by crystallization (from water or alcohol) and distillation.
3. Detection of functional groups in mono-functional Organic Compounds.

B.Sc BC I yr **II sem**
B.Sc BT II yr **III sem**
Subject Name: Microbiology Lab **Subject Code: BS205**

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1. Isolation and purification of genomic DNA. Estimation of DNA and RNA
2. Enzyme assay (one example)
3. Biochemical tests–starch hydrolysis, gelatin liquefaction.
4. Cleaning and sterilization of glass ware.
5. Study of instruments: Compound microscope, Autoclave, Hot air oven, pH meter, Laminar airflow and centrifuge
6. Media preparation: Nutrients agar, Nutrient broth and LB.
7. Staining Techniques: Simple, Negative staining, Gram staining, Endospore staining, fungal staining.
8. Isolation of bacteria and fungi from soil/ air/water – dilution and pour plate methods
9. Study of *Rhizobium* from root nodules of legumes
10. Growth curve of bacteria