

Integral University, Lucknow

**Evaluation Scheme for
B.Sc. (H) Biotechnology**

(Revised w.e.f. session 2020-2021)

Department of Biosciences

Department of Biosciences
Evaluation Scheme
B. Sc. Biotechnology Semester – I
Choice Based Credit System (CBCS)

Course Code	Course Title	Type of Paper	Periods/Week			Evaluation Scheme				Maximum Marks	Credits	Total Credit
			L	T	P	UE	TA	Total	ESE			
LN104	Essential Professional Communication	Foundation	3	1	0	40	20	60	40	100	3:1:0	4
MT106	Mathematics	Foundation	3	1	0	40	20	60	40	100	3:1:0	4
CS109	Concept of Computers	Foundation	3	1	0	40	20	60	40	100	3:1:0	4
CH112	Fundamental of Inorganic Chemistry	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS101	Plant Sciences	Core	3	1	0	40	20	60	40	100	3:1:0	4
CH113	Chemistry Lab-I	Practical	0	0	6	40	20	60	40	100	0:0:3	3
BS102	Plant Sciences Lab	Practical	0	0	6	40	20	60	40	100	0:0:3	3
	Total									700		26

Department of Biosciences
Evaluation Scheme
B. Sc. Biotechnology Semester – II
Choice Based Credit System (CBCS)

Course Code	Course Title	Type of Paper	Periods			Evaluation Scheme				Maximum Marks	Credits	Total Credit	
			L	T	P	UE	TA	Total	ESE				
ES115	Fundamentals of Environmental Studies	Foundation	3	1	0	40	20	60	40	100	3:1:0	4	
CH114	Fundamental of Organic Chemistry	Core	3	1	0	40	20	60	40	100	3:1:0	4	
BS111	Animal Science	Core	3	1	0	40	20	60	40	100	3:1:0	4	
BS112	Fundamentals of Biochemistry	Core	3	1	0	40	20	60	40	100	3:1:0	4	
BS113	Fundamental of Microbiology	Core	3	1	0	40	20	60	40	100	3:1:0	4	
CH115	Chemistry Lab-II	Practical	0	0	6	40	20	60	40	100	0:0:3	3	
BS114	Animal Sciences lab.	Practical	0	0	6	40	20	60	40	100	0:0:3	3	
			Total								700	26	26

Department of Biosciences
Evaluation Scheme
B. Sc. Biotechnology Semester – III
Choice Based Credit System (CBCS)

Course Code	Course Title	Type of Paper	Periods/Week			Evaluation Scheme				Subject Total	Credit Hours	Total Credit
			L	T	P	UE	TA	Total	ESE			
CH215	Fundamentals of Physical Chemistry	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS201	Metabolism	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS202	Biophysical Chemistry	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS203	Cell Biology & Genetics	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS204	IPR & Biosafety	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS205	Microbiology Lab	Practical	0	0	6	40	20	60	40	100	0:0:3	3
BS206	Cell Biology & Genetics Lab	Practical	0	0	6	40	20	60	40	100	0:0:3	3
	Total									700	26	26

Department of Biosciences
Evaluation Scheme
B. Sc. Biotechnology Semester – IV
Choice Based Credit System (CBCS)

Course Code	Course Title	Type of Paper	Periods/Week			Evaluation Scheme				Subject Total	Credit Hours	Total Credit
			L	T	P	UE	TA	Total	ESE			
BS211	Immunology	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS212	Molecular Biology	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS213	Fundamentals of Environmental Biotechnology	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS214	Industrial Biotechnology	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS215	Food Biotechnology	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS216	Immunology Lab	Practical	0	0	6	40	20	60	40	100	0:0:3	3
BS217	Industrial and Environmental Biotechnology Lab	Practical	0	0	6	40	20	60	40	100	0:0:3	3
Total										700	26	26

Department of Biosciences
Evaluation Scheme
B. Sc. Biotechnology Semester – V
Choice Based Credit System (CBCS)

Course Code	Course Title	Type of Paper	Periods/Week			Evaluation Scheme				Subject Total	Credit Hours	Total Credit
			L	T	P	UE	TA	Total	ESE			
BS211	Immunology	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS303	Genetic Engineering	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS321	Plant Anatomy & Embryology	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS322	Comparative Anatomy and Developmental Biology	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS323	Electives: (Any one of the following) Industrial & Environmental Biotechnology	Elective	3	1	0	40	20	60	40	100	3:1:0	4
BS306	Applied Biotechnology											
BS216	Immunology Lab	Practical	0	0	6	40	20	60	40	100	0:0:3	3
BS308	Genetic Engineering Lab	Practical	0	0	6	40	20	60	40	100	0:0:3	3
		Total								700	26	26

Department of Biosciences
Evaluation Scheme
B. Sc. Biotechnology Semester – VI
Choice Based Credit System (CBCS)

Course Code	Course Title	Type of Paper	Periods/week			Evaluation scheme				Subject Total	Credit Hours	Total Credit
			L	T	P	UE	TA	Total	ESE			
BS331	Computational Sciences & Bioinformatics	Core	3	1	0	40	20	60	40	100	3:1:0	4
BS332 BM337	Elective courses (Any one of the following) Plant & Animal Biotech Entrepreneurship Development	Elective	3	1	0	40	20	60	40	100	3:1:0	4
BS314	Bioinformatics Lab	Practical	0	0	4	40	20	60	40	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. (BT) 1st year

1st sem

Subject: ESSENTIAL PROFESSIONAL COMMUNICATION

Subject Code: LN104

(Revised w.e.f. session 2015-2016)

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UNIT I Introduction to Communication

4

Definition, Types of Communication, Channels of Communication, Language

UNIT II Interpersonal Communication

6

Culture- Definition and Types, Communication and Culture including Cross Cultural Communication

UNIT III Written Communication

8

Letter Writing- Informal and Formal - Letters of Enquiry, Letters of complaint, Response to complaints and enquiries, Self Exploration through description

UNIT IV Grammar through Worksheets

12

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 Grammar through Worksheets Continued

10

Sentences: Simple, Compound, Complex, Declarative, Assertive, Negative, Interrogative, Exclamatory, Imperative

Recommended books:

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
4. Swan Michael, "Practical English Usage" OUP, 2005
5. Raymond Murphy, "Intermediate English Grammar", (2007) Cambridge University Press.

Integral University, Lucknow
Department of Biosciences

B. Sc. (BT) 1st year

1st sem

Subject: MATHEMATICS

Subject Code: MT106

(Revised w.e.f. session 2015-2016)

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8

UNIT I-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,.

8

UNIT II-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.

8

Unit III-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.

8

UNIT IV- 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.

8

UNIT V- 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 Readings:

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. (BT) 1st year

1st sem

Subject: CONCEPTS OF COMPUTERS

Subject Code: CS109

(Revised w.e.f. session 2015-2016)

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8

UNIT I- 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, Floppy disc, CD-ROM

8

UNIT II- 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)

8

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

8

UNIT IV-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.

8

UNIT V-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 Readings:

- 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", Addison Wesley.
- 6 Chanchal Mittal "Foundation of Information Technology" Pragati.

Integral University, Lucknow
Department of Biosciences

B. Sc. (BT) 1st year

1st sem

Subject: FUNDAMENTALS OF INORGANIC CHEMISTRY

Subject Code: CH112

(Revised w.e.f. session 2015-2016)

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UNIT I-Inorganic: Chemical bonds and molecules, Shapes of simple molecules, bond energy, bond length, resonance and Hydrogen bond.

8

UNIT II-Radioactivity: Natural and artificial, group displacement law, half life period, binding energy, nuclear reaction equations, isotopes, tracers, radio dating, Application of radioactivity.

8

UNIT III-Periodic table: Modern periodic table, periodicity in properties of elements, atomic radii, ionic and covalent radii, ionization energies, electron affinity, electro-negativity.

8

UNIT IV-Ores and Minerals: Principles involved in the extraction of metals from ores, including their refining and purification, General trends in the Chemistry of S-block elements (Group I A & II A)

8

UNIT V-Physical: Gases: Kinetic theory of gases, van der Waal's equation, critical constants, Liquefaction of gases. Chemical-Kinetics: Velocity of a reaction, Determination of rate constants for first and second order reactions, collision theory of bimolecular reactions. Catalysis: Promoters and Poisons, Le-Chatelier's principle and its applications to physical and chemical equilibria.

8

Suggested Readings:

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. Physical Chemistry, Vemulapalli, Printice Hall of India.
9. modern Physical Chemistry, r.K. Rastogi et al., United Book Depot, Allahabad.

**Integral University, Lucknow
Department of Biosciences**

B. Sc. (BT) 1st year

1st sem

Subject: PLANT SCIENCES

Subject Code: BS101

(Revised w.e.f. session 2015-2016)

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8

UNIT I-Origin of life: Origin of life, Evolution: Darwinism, Lamarckism, Classification of living organisms: Whittaker's five-kingdom concept: Monera, Protista, Fungi, Plantae and Animalia.

8

UNIT II- Plant kingdom- Plant taxonomy-aims and objectives of taxonomy, General characters and economic aspects of Algae, Fungi, Bryophytes, Pteridophytes, Gymnosperms, Angiosperms.

8

UNIT III- Cellular organization: Structure and function of animal and plant cells, Types of plant cells: parenchyma, collenchyma and sclerenchyma, Plant tissues: xylem and phloem.

8

UNIT IV- Organization of plant body: Flower: Parts, Functions, Floral whorls, Flower as a modified shoot, Fruits: Formation, Types, Parthenocarpy, Seed: Structure, Formation, Seed Physiology: Dormancy, Breaking of dormancy, Germination, Modifications of stems, leaves and roots, Anatomy of dicot and monocot stems, leaves and roots, Secondary growth and annual rings.

8

UNIT V-Plant physiology: Diffusion and water potential, Osmosis, Ascent of sap, Absorption of mineral salts, Photosynthesis, Light and dark reactions, C₃ and C₄ plants; Plant growth hormones and their mode of action, Photomorphogenesis, plant movements, Photoperiodism, Growth response to temperature, Vernalization.

Suggested Reading:

1. Biology PH Raven & G.B Johnson
2. Biological science DJ Taylor NPO Green GW Stout
3. A textbook of Botany S.N Pandey, P.S Trivedi
4. Plant Physiology By Taiz & Zeiger.
5. Devlin R.M. Fundamentals of Plant Physiology (Mac. Millan)
6. Malik C.P. Plant Physiology, Kalyani Publishers
7. Bold H.C. The Plant Kingdom, Prentice -Hall India
8. Dutta A.C. A Class book of Botany, Oxford University Press

Integral University, Lucknow
Department of Biosciences

PRACTICALS

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CH 113: CHEMISTRY LAB I

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 $\text{K}_2\text{Cr}_2\text{O}_7$
5. Iodometry titrations: Estimation of potassium dichromate and copper sulphate.
6. Preparation of the following inorganic compounds: Prussian 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

Integral University, Lucknow
Department of Biosciences

BS102: PLANT SCIENCES LAB

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1. Transverse section of dicot and monocot stems
2. Transverse section of dicot and monocot leaves
3. Transverse section of dicot and monocot roots
4. Morphology study of flower parts, inflorescence, seed, fruit types
5. Study of one example each of bryophyte, pteriodophyte, gymnosperm
6. Study of one example each of algae and fungi

Integral University, Lucknow
Department of Biosciences

B. Sc. (BT) 1st year

1st sem

Subject: Fundamentals of Environmental Studies

Subject Code: ES115

UNIT I-

(10hrs)

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-

(8hrs)

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-

(8hrs)

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-spots 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-

(8hrs)

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 h r s)

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. (BT) 1st year

2nd sem

Subject: FUNDAMENTALS OF ORGANIC CHEMISTRY

Subject Code: CH114

(Revised w.e.f. session 2015-2016)

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UNIT I-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.

8

UNIT II-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.

8

UNIT III-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,

8

UNIT IV- 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.

8

UNIT V-Heterogenous equilibria: Phase rule, phase diagrams of water and sulphur system. Nernst distribution law, solvent extraction.

Suggested Readings:

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. (BT) 1st year

2nd sem

Subject: ANIMAL SCIENCES

Subject Code: BS111

(Revised w.e.f. session 2015-2016)

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UNIT I- Animal tissue types: epithelial, connectives, muscle and nervous tissues, Animal Physiology: Membranes and Epithelial transport systems in animals, Membrane structure and function, Equilibrium potentials, Resting membrane potential, Ionic steady state.

8

UNIT II- Digestive system, Muscle system: Muscles and Movement, Skeletal, cardiac and smooth muscle, Nervous system: Action potentials and voltage dependent ion channels, Passive membrane properties, action potential propagation, Synapses, central and peripheral nervous system.

8

UNIT III- Respiratory system: Haemoglobin and oxygen transport, carbon dioxide transport and chloride shift, Circulatory & Cardiovascular System: Heart and circulation, Excretory system: Nephron, Reproductive system: testis, ovary, Spermatogenesis, hormonal regulation of female reproductive cycle.

8

UNIT IV- Host parasite relationship: Global feature of parasite and host interaction
Protozoan parasite, Nematode parasite, Plathelminths parasite.

8

UNIT V-Economic Zoology: Beneficial and harmful organisms, Vermiculture, Aquaculture, Sericulture, Apiculture.

Suggested Reading:

1. Fox S I – Human Physiology, (McGraw Hill, 1998, ISBN: 0071157069)
2. Moffett D and Schauf C L – *Human Physiology: Foundations & Frontiers*, (Mosby, 1993, ISBN: 801669030)
3. Seeley R, Stephens T and Tate P – *Anatomy & Physiology*, (McGraw-Hill, 1999, ISBN: 0071169881)
4. Sherwood L – *Human Pysiology: From Cells to Systems*, (Wadsworth Publishing, 2000, ISBN: 0534568262)
5. Tortora G J *Principles of Anatomy & Physiology*, (John Wiley & Sons, 1999, ISBN: 0471366927)
6. Lincoln Taiz and Eduardo Zeiger *Plant Physiology* (Panima Publishing Cooperation)
7. *Plant Physiology* - by Frank Salisbury, Cleon Ross
8. *Introduction to Plant Physiology* -- by William G. Hopkins, Norman P. A. Hüner
9. Devlin R.M. *Fundamentals of Plant Physiology* (Mac. Millan)
10. Malik C.P. *Plant Physiology*, Kalyani Publishers

Integral University, Lucknow
Department of Biosciences

B. Sc. (BT) 1st year

2nd sem

Subject: FUNDAMENTALS OF BIOCHEMISTRY

Subject Code: BS112

(Revised w.e.f. session 2015-2016)

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8

UNIT I- Introduction to Biomolecules: Carbohydrates, Proteins, Lipids and Nucleic acids.

8

UNIT II- Carbohydrates: Structure, classification and properties of Monosaccharides, Disaccharides, and Polysaccharides (starch, glycogen, peptidoglycan, cellulose).

8

UNIT III – Amino acids and Proteins: Structure, classification and properties of amino acids, Structures and functions of proteins (Hb and Myoglobin).

8

UNIT IV- Lipids: Structure, classification and properties of Fatty acids, Glycerolipid, Cholesterol, Sphingolipid, phospholipids, lipoproteins, glycoproteins, isoprene.

8

UNIT V- Nucleic acids: Purines and pyrimidines, nucleosides, nucleotides, polynucleotides, DNA, types and function, RNA types and functions, Forces stabilizing nucleic acid structure.

Suggested Reading:

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 Biochemistry-J.L.Jain S.Chand and Company

Integral University, Lucknow
Department of Biosciences

B. Sc. (BT) 1st year

2nd sem

Subject: FUNDAMENTALS OF MICROBIOLOGY

Subject Code: BS113

(w.e.f. session 2015-2016)

(Revised w.e.f. session 2018-19)

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UNIT I-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.

8

UNIT II- 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).

8

UNIT III- Microbes in extreme environments and microbial interactions: The thermophiles alkalophiles, acidophiles and symbiosis and antibiosis among microbial population, N₂ fixing microbes in agriculture and forestry.

8

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

8

UNIT V-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 manipulation, Cambridge University Press, USA
8. Lewin, B., Gene VI New York, Oxford University Press.
9. Sambrook et 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 & Biotechnology (Indian Edition) Royal Society of Chemistry U.K

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PRACTICALS

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CH115: CHEMISTRY LAB-II

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^{2-} , S^{2-} , 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.

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Department of Biosciences

BS114: ANIMAL SCIENCES LAB.

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1. Spot test for carbohydrates
2. Estimation of reducing sugars by Benedict's Method
3. Spot tests for Amino Acids
4. Protein estimation
5. Estimation of Cholesterol
6. Cell structure-prokaryotes and eukaryotes
7. Isolation of nuclei from goat liver
8. Cell harvesting–methodology
9. Cell lysis–methodology
10. Cell viability by Trypan Blue
11. Salivary amylase assay
12. Transportation of salts and sugars by dialysis membrane
13. Osmosis by potato osmometer