



B. Sc 18-19

SYLLABUS

FOR

B.Sc BIOCHEMISTRY

UNDER CHOICE BASED CREDIT SYSTEM

(2018-2019)

PG DEPARTMENT OF BIOCHEMISTRY

ETHIRAJ COLLEGE FOR WOMEN

ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)

CHENNAI-600008

PG DEPARTMENT OF BIOCHEMISTRY

MINUTES OF THE BOARD OF STUDIES MEETING

B.Sc BIOCHEMISTRY

The Board of Studies meeting for revision of syllabus with effect from 2018 was held in the Department of Biochemistry on 20.04.2018. The following changes and additions suggested in the UG curricula have been implemented in the new curriculum.

- Few additional topics were added under Extracellular matrix in the paper Cell Biology
- Diagnostic application of radioisotope was included in the paper Biophysical and Biochemical Techniques.
- Blood Coagulation mechanism was included in the paper Physiology
- Anticoagulants ,Xylose and Mannitol absorption test were recommended to be included in the Clinical Biochemistry

ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)

CHENNAI- 6000 08

PG DEPARTMENT OF BIOCHEMISTRY

BOARD OF STUDIES MEETING – B.Sc BIOCHEMISTRY

The Board of Studies meeting was held in the Department of Biochemistry on 20.04.2018.

The Board consisted of the following members.

S.NO	MEMBER'S NAME & DESIGNATION	SIGNATURE
1.	Dr.M. SUJATHA (CHAIRMAN BOARD OF STUDIES) ASSOCIATE PROFESSOR & HEAD DEPARTMENT OF BIOCHEMISTRY ETHIRAJ COLLEGE FOR WOMEN CHENNAI -6000 08.	
2.	DR.S.SUBRAMANIAN (UNIVERSITY NOMINEE) ASSOCIATE PROFESSOR DEPARTMENT OF BIOCHEMISTRY UNIVERSITY OF MADRAS, GUINDY CAMPUS CHENNAI-6000 25	
3.	DR.K.A. FATHIMA ASSOCIATE PROFESSOR DEPARTMENT OF BIOCHEMISTRY BHARATHI WOMENS COLLEGE CHENNAI- 600 108	

4. DR.P.SUMATHI
ASSISTANT PROFESSOR
DEPARTMENT OF BIOCHEMISTRY
QUEEN MARYS COLLEGE
CHENNAI -6000 04

5. DR.GEETHA RAMACHANDRAN (INDUSTRIAL REPRESENTATIVE)
SCIENTIST –E & HEAD
DEPARTMENT OF BIOCHEMISTRY & CLINICAL PHARMACOLOGY
NATIONAL INSTITUTE FOR RESEARCH IN TUBERCULOSIS
CHETPET
CHENNAI.-6000 31

6. DR. S. VIJAYALATHA
ASSISTANT PROFESSOR
DEPARTMENT OF BIOCHEMISTRY
ETHIRAJ COLLEGE FOR WOMEN
CHENNAI – 6000 08.

8. DR. J. PRIYA
ASSISTANT PROFESSOR
DEPARTMENT OF BIOCHEMISTRY
ETHIRAJ COLLEGE FOR WOMEN
CHENNAI – 6000 08.

9. Ms. KALPANA KHATRI (ALUMNA)
B.Sc Batch (2012-2015)

ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)

CHENNAI- 600008

PG DEPARTMENT OF BIOCHEMISTRY

B.Sc BIOCHEMISTRY - REVISED SYLLABUS EFFECTIVE FROM 2018-19

• **PREAMBLE**

The PG Department of Biochemistry is revising syllabi with effect from the academic year 2018-19 with existing CBCS and part IV and Part V components as specified by the Government of Tamil Nadu.

Part IV and Part V components will seek to build the capacity of the students and provide inputs for his or her social service and analytical capabilities.

Every academic year is divided into 2 semester sessions. Each semester will have a minimum of 90 working days and each day will have 5 working hours. Teaching is organized into a modular pattern of credit courses. Credit is normally related to the number of hours a teacher teaches a particular subject. It is also related to the number of hours a student spends learning a subject or carrying out an activity.

• **REGULATIONS**

1. Eligibility for admission:

Candidates for admission to the first year of the U.G Biochemistry degree course shall be required to have passed the higher secondary examinations conducted by the Government of Tamil Nadu or an examination accepted as equivalent there to by the syndicate of the University of Madras with chemistry and biology/botany,zoology/biochemistry as one of the science subjects .

2. Eligibility for the award of degree:The candidate shall be eligible for the award of the degree only if he /she have undergone the prescribed course of the study for the period of not less than 3 academic years, passed the examinations of all the 6 semesters prescribed.

3. Course of the study :

Part I : Tamil / other languages

Part II : English

Part III: Core subjects, Allied subjects

Part IV : Non Major Elective (1a, 1b, 1c)

Soft Skill

Environmental studies

Value Education

Part V : Extension Activity.

4. Passing minimum :

A candidate shall be declared to have passed in each paper /practical of the main subject of study where ever prescribed, if she secured NOT LESS THAN 40 % of the marks prescribed for the examination.

5. Classification of successful candidates :

Part I, II, III, IV

Successful candidates passing the examination and securing the marks

- 60 % and above , 50% and above but below 60 % in the aggregate shall be declared to have passed the examination in the FIRST and SECOND Class respectively
- All other successful candidates shall be declared to have passed the examination in the THIRD CLASS.

- Candidates who pass all the examinations (Part I, II, III, IV) prescribed for the course in the FIRST APPEARANCE ITSELF ALONE are eligible for ranking.

6. Question paper pattern :

COMPONENT	NATURE OF THE QUESTION	MAXIMUM MARKS
PART A	Definition and structures	20
PART B	Understanding concepts	40
PART C	Description/synthesis	40

PART A: 10 questions, compulsory 2 questions from each unit (10X2=20)

PART B: 5 out of 8 questions, compulsory 1 question from each unit (5X8=40)

PART C: 2 out of 4 questions, each from different units (2X20=40)

REVISED SYLLABUS OF JUNE 2018

SEMESTER I

S.no	Semester	Course title	Course code	Hours	Credits	CA marks	End semester	Total
1	I	Language		5	3	40	60	100
2	I	English		5	3	40	60	100
3	I	Core Cell Biology	BC18/1C/CBL	7	5	40	60	100
4	I	Allied Chemistry I	BC18/1A/CH1	4	4	40	60	100
5	I	Core Practical I	BC18/2C/CP1	3				
6	I	Allied Chemistry Practical	BC18/2A/CHP	2				
7	I	Non Major Elective (NME) (1a/1b/1c)		2	2	-	50	50
8	I	Soft Skill		2	3	-	50	50

SEMESTER II

S.no	Semester	Course title	Course code	Hours	Credits	CA marks	End semester	Total
1	II	Language		5	3	40	60	100
2	II	English		5	3	40	60	100
3	II	Core -Biomolecules	BC18/2C/BMO	7	5	40	60	100
4	II	Allied Chemistry – II	BC18/2A/CH2	4	4	40	60	100
5	II	Core Practical I	BC18/2C/CP1	3	3	40	60	100
6	II	Allied Chemistry Practical	BC18/2A/CHP	2	2	40	60	100
7	II	NME (1a/1b/1c)		2	2	-	50	50
8	II	Soft Skill		2	3	-	50	50

SEMESTER - III

S.no	Semester	Course title	Course code	Hrs	Credits	CA marks	End semester	Total
	III	Language	-	5	3	40	60	100
	III	English	-	5	3	40	60	100
	III	Core- Biophysical & Biochemical techniques	BC18/3C/BBT	7	5	40	60	100
	III	Allied Microbiology I	MB18/3A/AM1	4	4	40	60	100
	III	Core Practical II	BC18/4C/CP2	3	-	-	-	-
	III	Allied Microbiology Practical	MB18/4A/	2	-	-	-	-
	III	Soft skill	-	2	3	-	50	50
	III	Environmental studies	-	2	2	-	50	50

SEMESTER - IV

S.no	Semester	Course title	Course code	Hours	Credits	CA marks	End semester	Total
1	IV	Language	-	5	3	40	60	100
2	IV	English	-	5	3	40	60	100
3	IV	Core- Enzymes	BC18/4C/ENZ	7	5	40	60	100
4	IV	Allied Microbiology II	MB18/4A/AM2	4	4	40	60	100
5	IV	Core Practical II	BC18/4C/CP2	3	3	40	60	100
6	IV	Allied Microbiology Practical	MB18/4A/PR2	2	2	40	60	100
7	IV	Soft skill		2	3	-	50	50
8	IV	Value Education	-	2	2	-	50	50

SEMESTER - V

S.no	Semester	Course title	Course code	Hrs	Credits	CA marks	End semester	Total
1.	V	Core -Intermediary Metabolism-I	BC18/5C/IM1	4	4	40	60	100
2.	V	Core -Intermediary Metabolism-II	BC18/5C/IM2	4	4	40	60	100
3.	V	Core-Clinical Biochemistry	BC18/5C/CBC	4	4	40	60	100
4.	V	Core - Physiology	BC18/5C/PHY	4	4	40	60	100
5.	V	Elective - Bioinstrumentation & Biostatistics	BC18/5E/BBS	5	5	40	60	100
6.	V	Core practical- III	BC18/6C/CP3	4	-	-	-	-
7.	V	Core practical- IV	BC18/6C/CP4	5	-	-	-	-

SEMESTER - VI

S.no	Semester	Course title	Course code	Hrs	Credits	CA marks	End semester	Total
1.	VI	Core -Molecular Biology	BC18/6C/MBO	4	4	40	60	100
2.	VI	Core – Genetics & Nutritional Biochemistry	BC18/6C/GNB	4	4	40	60	100
3.	VI	Core- Biotechnology	BC18/6C/BTY	4	4	40	60	100
4.	VI	Elective- Basics of Bioinformatics	BC18/6E/BBI	5	5	40	60	100
5.	VI	Elective – Immunology	BC18/6E/IMY	5	5	40	60	100
6.	VI	Core practical- III	BC18/6C/CP3	4	3	40	40	100
7.	VI	Core practical- IV	BC18/6C/CP4	4	3	60	60	100

The above courses of the UG program enrich the skills in employability / Skill development / Entrepreneurship which cater the needs of the students

ALLIED PAPERS OFFERED FOR I B. Sc MICROBIOLOGY

S.No	SEM	COURSE TITLE	COURSE CODE	HOURS/ WEEK	CREDITS	CA MARKS	END SEM MARKS	TOTAL
1	I	Allied Biochemistry -I	BC18/1A/AB1	4	4	40	60	100
2	II	Allied Biochemistry -II	BC18/2A/AB2	4	4	40	60	100
3	I&II	Allied Biochemistry Practical	BC18/2A/ABR	2	2	40	60	100

ALLIED PAPERS OFFERED FOR I B. Sc CLINICAL NUTRITION AND DIETETICS

S.No	SEM	COURSE TITLE	COURSE CODE	HOURS/ WEEK	CREDITS	CA MARKS	END SEM MARKS	TOTAL
1	I	Allied Basic Chemistry -I	BC18/1A/BC1	4	4	40	60	100
2	II	Allied Basic Chemistry -II	BC18/2A/BC2	4	4	40	60	100
3	I&II	Allied Chemistry Practical	BC18/2A/CHP	2	2	40	60	100

NME (1c) SUBJECT FOR OTHER DEPARTMENTS

S.No	SEM	COURSE TITLE	COURSE CODE	HOURS / WEEK	CREDITS	CA MARKS	END SEM MARKS	TOTAL
1	II	Yoga and Diet For Health	BC18/1N/YOD	2	3	-	50	50
2	III	Life Style Diseases In. Women	BC18/2N/LDW	2	3	-	50	50

EVALUATION PATTERN FOR CONTINUOUS ASSESSMENT

Theory

Test I	2hrs	50 marks	10marks
TestII	2hrs	50marks	10marks
Quiz/Assignment/Semester/Field visit			10marks
Participatory Learning			<u>10marks</u>
Total			<u>40 marks</u>

Practical

Model			20marks
Participatory Learning			20marks
Total			40marks

RUBRICS FOR CONTINUOUS ASSESSMENT EVALUATION.

- Assignment -Contents/originality/Presentation /Schematic representation and Diagram/Bibliography. (10marks)
- Seminar-Organisation/subject knowledge/Visual Aids/Confidence level/Presentation.(10marks)
- Participatory learning-Answering questions/Clearing doubts/Participation in discussion /Attendance /Communication and language.(10marks)

Template for Evaluation Pattern

Semester	Course Code	Course Title	Continuous assessment				
			Test I	Test II	Seminars /Quiz/Assignment /Field Visit	Participatory Learning	Total
I	Cell Biology	BC18/1C/CBL	10	10	10	10	40
I	Allied Chemistry I	BC18/1A/ CH1	10	10	10	10	40
II	Biomolecules	BC18/2C/BMO	10	10	10	10	40
II	Allied Chemistry II	BC18/2A/ CH2	10	10	10	10	40
III	Biophysical & Biochemical techniques	BC18/3C/BBT	10	10	10	10	40
IV	Enzymes	BC18/4C/ENZ	10	10	10	10	40
V	Intermediary Metabolism I	BC18/5C/IM1	10	10	10	10	40
V	Intermediary Metabolism II	BC18/5C/IM2	10	10	10	10	40
V	Clinical Biochemistry	BC18/5C/CBC	10	10	10	10	40
V	Physiology	BC18/5C/PHY	10	10	10	10	40
V	Elective- Bioinstrumentation & Biostatistics	BC18/5E/BBS	10	10	10	10	40
VI	Molecular Biology	BC18/6C/MBO	10	10	10	10	40
VI	Genetics & Nutritional Biochemistry	BC18/6C/GNB	10	10	10	10	40
VI	Biotechnology	BC18/6C/BTY	10	10	10	10	40
VI	Elective- Basics of Bioinformatics	BC18/6E/BI	10	10	10	10	40
VI	Elective- Immunology	BC18/6E/IMY	10	10	10	10	40

ALLIED PAPERS OFFERED FOR OTHER DEPARTMENTS

Semester	Course Code	Course Title	Continuous assessment				
			Test I	Test II	Seminars /Quiz/Assignment /Field Visit	Participatory Learning	Total
I	Allied Biochemistry-I	BC18/1A/AB1	10	10	10	10	40
II	Allied Biochemistry-II	BC18/2A/AB2	10	10	10	10	40
I	Allied Basic Chemistry -I	BC18/1A/BC1	10	10	10	10	40
II	Allied Basic Chemistry-II	BC18/2A/BC2	10	10	10	10	40

SEMESTER I

CELL BIOLOGY

TEACHING HOURS: 105

CREDITS: 5

COURSE CODE: BC18/IC/CBL

LTP : 5 2 0

OBJECTIVE

To understand the Structure & functions of Cell and Cell organelles

COURSE OUTLINE

Unit I (21 hours)

The cell and cell organelles : Prokaryotic cell – E.Coli, Eukaryotic cell-Plant cell, Animal cell. Cytoskeleton microtubules and microtubular organization. Endomembrane system - Endoplasmic reticulum, Golgi complex, Intracellular organelles – Mitochondria, Chloroplast, Lysosome, Peroxisomes and Glyoxisomes and Nucleus.

Unit II (21 hours)

Cell membrane – Functions of plasma membrane, Models of cell membrane – Lipid bilayer, Sandwich model and Fluid mosaic model. Composition of membrane – Membrane lipids, Carbohydrates, Proteins and their functions , Membrane asymmetry and fluidity. Cell boundaries: Cell coat, Cell wall –Structure, Composition and Function.

Unit III (21 hours)

Membrane transport: Passive transport – Osmosis, Simple and Facilitated diffusion (Ligand and Voltage Gated Channels), Active transport – Uniport, Symport, Antiport, Bulk transport – Exocytosis, Phagocytosis and Endocytosis (Pinocytosis and Receptor mediated endocytosis).

Unit IV (21 hours)

Cell types and function: Epithelial cell – Simple and Compound, Muscle cell – Skeletal, Cardiac, Smooth muscle cells.Nerve cell,Cancer cell. Differentiation of cell surface – Invagination, Microvilli, Basement membrane, Tight junction, Desmosome, Gap junction, Extracellular matrix and functions- Collagen,Hyaluronic acid,Heparin,Dermatin Sulphate and keratin Sulphate.

Unit V (21 hours)

Cell division: Cell cycle, Mitosis, significance of mitosis, **Meiosis** – Kinds of meiosis and Significance of meiosis. Cell death: Overview of programmed cell death-Apoptosis & Necrosis. Cell renewal, Stem cells-Embryonic and adult stem cell.

RECOMMENDED BOOKS

1. *Cell Biology, Genetics, Molecular Biology: Evolution and Ecology* by Dr P S Verma and Dr V K Agarwal. Publisher : Chand (S.) & Co Ltd , India, 2004 Edition.
2. *Cell Biology* by Channarayappa. Publisher: Orient BlackSwan/ Universities Press, 2010 Edition.
3. *Cell and Molecular Biology* by Pragya Khanna. Publisher: IK International Publishing House Pvt. Ltd. 2008 Edition

REFERENCE BOOKS

1. *The World of the Cell*, By Wayne M. Becker, Lewis J. Kleinsmith, Jeff Hardin, Gregory Paul Bertoni. Publisher: Pearson, 7th Edition (2009).
2. *The Cell: A Molecular Approach*, by Geoffrey M. Cooper (Author), Robert E. Hausman, Publisher: ASM Press, 2007 ,4th Edition

JOURNALS

1. *International journal of cell biology-Openaccess*
2. *European journal of Cell biology – Elsevier*
3. *The international journal of Biochemistry & cell biology-Elsevier*

WEBSITES

1. www.biology.arizona.edu/cell_bio/cell_bio.html
2. www.cellbiology.yale.edu
3. www.cellbio.com

QUESTION PAPER PATTERN

The pattern of question paper shall be as follows:

COMPONENT	NATURE OF THE QUESTION	MAXIMUM MARKS
PART A	Definition and structures	20
PART B	Understanding concepts	40
PART C	Description/synthesis	40

PART A: 10 questions, compulsory 2 questions from each unit (10X2=20)

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SEMESTER I

ALLIED CHEMISTRY - I

(For I B.Sc Biochemistry)

TEACHING HOURS: 60

CREDITS: 4

COURSE CODE: BC18/1A/CH1

LTP : 3 1 0

OBJECTIVES:

To have an understanding of the fundamental aspects of theoretical and practical chemistry.

COURSE OUTLINE

Unit I

(12 hours)

- a. Chemical bonding- Definition- Types of bonds - Formation of different bonds with examples --Ionic bond – NaCl, KCl-Covalent bond- Single bond- H₂S,HCl, Multiple bond, Molecular orbital theory, Bonding, Non Bonding, Anti Bonding orbitals., Molecular orbital Configuration of Nitrogen, Oxygen and Flourine. Bond order, Diamagnetism and Paramagnetism. Co ordinate bond –Hydronium ion , Ammonium ion-
-Hydrogen bond – Inter and Intra molecular Hydrogen bonding e.g. O & P Nitro phenol-
- Vanderwaals force.
- b. Shapes of molecules – VSERR Theory & Hybridization CH₄, H₂O, NH₃, BrF₃,SF₆, IF₅, IF₇.

Unit II

(12 hours)

Mechanistic basis of organic reactions – Electronic displacement effects- Inductive, Resonance and Steric effects. Definition of substrates – Electrophiles , Nucleophiles – Elementary treatments of Substitution reactions SN1 , SN2 Walden inversion - Aromatic Electrophilic substitution (Nitration, Sulphonation) - Elimination Reaction- E1 , E2 Hoffmann and saytzeff rule- Addition Reaction – Markonikoff's rule and Kharash effect.

Unit III

(12 hours)

Electrolytes and Non electrolytes examples (Strong & Weak electrolytes) Difference between Metallic conductors and Electrolytic conductors – Conductance – Definition , Electrical conductivity – Specific conductivity – Equivalent conductivity – Molar conductivity - Relationship between Equivalent and Molar conductivity – Effect of dilution on Conductance , Ostwald's dilution law – Kohlraush's law and its application.

Unit IV

(12 hours)

Acids and Bases – Arrhenius concept- Bronsted-Lowry concept- Conjugate Acids and Bases – Lewis concept Concept of pH and pOH – Determination of pH using Potentiometric

method (pH meter) – Buffer examples for Acidic and Basic buffer – Buffer action – Biological applications of buffers.

Unit V

(12 hours)

Volumetric analysis – Advantages of Volumetric analysis over other quantitative analysis – Preparation of solutions – Primary and Secondary Standards – (examples) – Definition of Mole, Molarity, Molality, Normality, Formality, Dilution, Difference between End point, Equivalence point - Types of volumetric analysis – Acidimetry and Alkalimetry – Examples & Indicators used Strong acid Vs Strong base, Strong acid Vs Weak base, Weak acid Vs Strong acid, Weak acid Vs Weak base – Redox Titrations – Permanganometry, Dichrometry, Iodometry, Iodimetry – Complexometry – EDTA Titrations.

RECOMMENDED TEXTBOOKS

1. Allied Chemistry-Gopalan and Sundaram, 3rd edition
2. Text Book of Allied Chemistry-Dr. V. Veeraiyan et al, Highmount Publishing House

REFERENCE BOOKS

1. Modern Inorganic Chemistry-R.D.Madan, 2008
2. Textbook Organic Chemistry-P.L.Soni, H.M.Chawla, 29th edition, 2007.
3. Principles of Physical Chemistry-P.L.Soni, U.N.Dash, 23rd revised edition, 2007.

JOURNALS

1. *Journal of Chemistry – open Access*
2. *Asian journal of Chemistry*

WEBSITES

<http://www.chemistry.org>
<http://www.chemhelper.com>

QUESTION PAPER PATTERN

The pattern of question paper shall be as follows:

COMPONENT	NATURE OF THE QUESTION	MAXIMUM MARKS
PART A	Definition and structures	20
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PART A: 10 questions, compulsory 2 questions from each unit (10X2=20)

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PART C: 2 out of 4 questions, each from different units (2X20=40)

SEMESTER II
BIOMOLECULES

TEACHING HOURS: 105

CREDITS: 5

COURSE CODE: BC18/2C/BMO

LTP : 5 2 0

OBJECTIVE

To enable the students understand the structure and significance of biomolecules

COURSE OUTLINE

Unit I

(21 hours)

Carbohydrates – Classification, Biological functions, Optical isomerism of Sugars, Van't Hoff rule, Kiliani's cyanohydrin synthesis, Epimers, Enantiomers, Mutarotation, Racemic mixture, Anomeric Forms. Introduction to Haworth structures. Monosaccharides (Glucose, Fructose), Disaccharides (Lactose, Sucrose), Polysaccharides - Homopolysaccharides (Starch, Glycogen), Heteropolysaccharides.- Muco polysaccharides (Heparin, Chondroitin sulphate).

Unit II

(21 hours)

Amino acids – Amphoteric nature, Isoelectric pH, Zwitter ion, Peptide bond, Classification and Structure based on composition of side chain. Essential and Non-essential Amino acids. Proteins – Classification based on solubility, shape, composition and functions. Protein Structure – Primary, Secondary, Super secondary structures, Tertiary structure and Quaternary Structure . Forces stabilizing protein structure.

Unit III

(21 hours)

Lipids- Bloors classification, Biomedical importance of lipids,Types of Fatty acids-saturated, unsaturated, cyclic fatty acids, Essential Fatty Acids-its functions, Triglycerides. Chemical characterization of fats.

Unit IV

(21 hours)

Phospholipids-Structure and Biological functions of Lecithin, Cephalins, Phosphatidyl serine, Plasmalogens, Glycolipids (Cerebrosides, Gangliosides), Derived lipids (Cholesterol, Bile acids and Bile salts).Lipoproteins and their functions.

Unit V

(21 hours)

Structure of Purine and Pyrimidine bases, Nucleosides, Nucleotides. Cyclic nucleotides- AMP, GMP. Structure of different types of DNA-A,B and Z. Structure and role of different types of RNA- mRNA, rRNA, tRNA (Clover leaf), Heterogenous nuclear RNA. Denaturation, Melting temperature, Hyperchromicity and Annealing of DNA.

BOOKS RECOMMENDED

1. Fundamentals of Biochemistry by J L Jain, Sunjay Jain and Nithin Jain . Publisher S.chand, 2004 Edition.
2. Biochemistry by U Satyanarayana. Publisher Elsevier India, 4th Edition 2013.

REFERENCE BOOKS

1. Principles of Biochemistry by Lehninger, A.L, Publisher: W.H.Freeman, New York. . 2005, 4 th Edition
2. Biochemistry by Lubert stryer, Publisher: W.H .Freeman & company, 2001, 5 th Edition.
3. Biochemistry by Voet, D.and Voet .J.G. Publisher: , John Wiley and Sons, Inc. 2004 . 3 rd Edition

JOURNALS

1. *Journal of Biomolecules=Open access*
2. *International journal of Biological macromolecules-Elsvier*
3. *Journal of Biomolecules- Wiley*

WEB SITE

www.phschool.com/science/biology_place/
www.nios.ac.in/media/documents/313courseE/L31.pdf

QUESTION PAPER PATTERN

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SEMESTER – II

ALLIED CHEMISTRY – II

(For I B. Sc Biochemistry)

TEACHING HOURS: 60

CREDITS: 4

COURSE CODE: BC18/2A/CH2

LTP : 3 1 0

OBJECTIVES

To enable the students to understand the co-ordination chemistry, Industrial chemistry, drug chemistry and their applications in daily life.

Unit I

(12 hours)

Co-ordination Chemistry – Difference between Double salt and Co-ordination Compounds. Nomenclature, Werner's theory, Definition and Biological importance of Chelates – Haemoglobin, Application of chelates – Medicinal and Analytical – Determination of hardness of water and softening of water. TDS

Unit II

(12 hours)

Industrial Chemistry – Fuels, Classification, Fuel Gas – Natural gas, Water gas, Semi water gas, Carbureted Water gas, Producer gas, Oil gas, Gobar gas and LPG- Composition and uses. Silicones – Preparation, Properties and Uses. Synthetic Dyes – Classification of Dyes, Azo, Triphenylmethane, Vat and Mordant Dyes and their Preparation.

Unit III

(12 hours)

Drug Chemistry – Classification of Drugs, Preparation and Properties of Sulpha drugs - Sulpha pyridine, Prontosil, Sulpha diazine and Sulpha furazole. Mode of action of Sulpha drugs.

Antibiotics – Penicillin, Chloramphenicol. Definition and example for Analgesics, Antipyretics, Tranquillizers, Sedatives, Hypnotics, Local and General Anaesthetics. Steroidal drugs, Non Steroidal inflammatory drugs.

Unit IV

(12 hours)

Electrochemistry – Thermodynamic concept of electrode potential (Nernst equation). Electro motive force, Measurement of emf using Oxygen, Calomel, Quinhydrone electrodes. Single electrode potential – Standard Hydrogen electrode, Electrochemical series and its uses .

Unit V

(12 hours)

Isolation and Purification of Organic Compounds – Extraction , Differential extraction , Distillation, Fractional distillation , Steam distillation Crystallization, Sublimation, Food chemistry – Quality of lipids- rancidity, acid number, iodine number, saponification

number. Food adulteration – Definition – Intentional addition and incidental addition – Common adulteration/contaminants in food – Food simple screening test for the detection of adulterants – Diseases or health effects caused by the adulterants – Prevention of Food Adulteration Act - 1954.

RECOMMENDED TEXTBOOKS

1. Allied Chemistry-Gopalan and Sundaram, 3rd edition
2. Text Book of Allied Chemistry-Dr.V.Veeraiyan et al,Highmount Publishing House

REFERENCE BOOKS

1. Modern Inorganic Chemistry-R.D.Madan,2008
2. Textbook Organic Chemistry-P.L.Soni,H.M.Chawla,29th edition ,2007.
3. Principles of Physical Chemistry-P.L.Soni,U.N.Dash,23rd revised edition,2007.

JOURNAL

1. *Biochemistry-ACS publication*
2. *Biochemical journal*
3. *Pubs.acs.org*

WEBSITES

<http://www.chemistry.org>

<http://www.chemhelper.com>

QUESTION PAPER PATTERN

The pattern of question paper shall be as follows:

COMPONENT	NATURE OF THE QUESTION	MAXIMUM MARKS
PART A	Definition and structures	20
PART B	Understanding concepts	40
PART C	Description/synthesis	40

PART A: 10 questions, compulsory 2 questions from each unit (10X2=20)

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PART C: 2 out of 4 questions, each from different units (2X20=40)

SEMESTER I & II

CORE PRACTICAL I

TEACHING HOURS: 90

CODE: BC18/2C/CP1

CREDITS: 3

LTP: 0 0 3

1. Identification of Slides

- a. Epithelial cell-Squamous, Cuboidal, Columnar, Ciliated
- b. Cardiac muscle cell, Skeletal muscle cell, Smooth muscle cell
- c. Stages of mitosis
- d. Stages of meiosis

2. Qualitative Analysis of Carbohydrates:

Monosaccharides : Glucose, Fructose

Disaccharides : Sucrose, Maltose

Polysaccharides : Starch, Dextrin

3. Qualitative Analysis of Amino acids:

Tyrosine, Tryptophan, Cysteine and Arginine.

4. Group experiments

1. Preparation of Starch from Potato
2. Preparation of Casein from Milk

SEMESTER I & II
ALLIED CHEMISTRY PRACTICAL
(for I B.Sc Biochemistry & I B.Sc CND)

TEACHING HOURS: 60

CREDITS: 2

COURSE CODE : BC18/2A/CHP

LTP: 0 0 2

VOLUMETRIC ANALYSIS

- 1) Estimation of HCl using Standard Oxalic Acid.
- 2) Estimation of Borax – Standard Sodium Carbonate.
- 3) Estimation of Ferrous Sulphate – Standard Mohr Salt Solution.
- 4) Estimation of Oxalic Acid – Standard Ferrous Sulphate.
- 5) Estimation of Ferrous Ion – Diphenylamine Indicator.
- 6) Estimation of Zinc Using EDTA – Standard Magnesium Sulphate.

ORGANIC SUBSTANCE ANALYSIS:

Systematic analysis of Organic compounds containing one functional group and characterization by confirmatory tests.

- 7) Reaction of Aldehyde (Aromatic).
- 8) Reaction of Carbohydrates.
- 9) Reaction of Carboxylic Acid (Mono & Di).
- 10) Reaction of Phenol.
- 11) Reaction of Amine (Aromatic, primary).
- 12) Reaction of Amide (Mono & Di).
- 13) Reaction of Ketone (Not for exam)

SEMESTER III

BIOPHYSICAL AND BIOCHEMICAL TECHNIQUES

TEACHING HOURS: 105 HRS

CREDITS: 5

COURSE CODE: BC18/3C/BBT

LT P: 5:2:0

OBJECTIVES

To facilitate students to understand the principles and applications underlying analytical techniques.

COURSE OUTLINE

Unit I (21 hours)

Safety aspects of laboratory instruments - Care of instruments, Balances, types of balances. Colloids – Introduction, Classification, Properties of colloids – Tyndall effect, Brownian movement and Electrical double layer. Ultrafiltration- Biological significance. Donnan Membrane Equilibrium.

Definition, Determination and Biological Significance of Viscosity, Surface tension and Osmotic pressure, Concept of Osmolarity and its significance.

Unit II (21 hours)

Chromatographic techniques – General Principles of Chromatography, Principles, Operational procedures and Applications of Paper, Thin layer, Gel permeation, Ion exchange, Affinity and Gas liquid chromatography.

Radioisotopes, Nature of radioactive decay, Half life, Units of Radioactivity. Detection and Measurement of Radioactivity- Methods based on Ionization (GM counter), Excitation (Scintillation counter). Applications of radioisotopes in the elucidation of Metabolic pathways and Radio dating C^{14} , I^{121} , Ba etc. Role of various radio isotopes in diagnosis.

Unit III (21 hours)

Electrophoretic techniques - General principles, Factors affecting Migration rate- Electric field, Buffer, Supporting medium. Electrophoretic mobility of samples. Paper, Cellulose acetate, Agarose gel electrophoresis, PAGE and SDS-PAGE.

Principles of Electrochemical Techniques - Measurement of pH by Glass electrode, Henderson Hassalbalch equation, pH of buffer solutions, Biological buffers.

Unit IV (21 hours)

Centrifugation techniques: Basic principles of centrifugation, Rotors, Types of centrifugation- Preparative and Analytical. Differential & Density gradient - Isopycnic, Rate zonal centrifugation technique. Analytical ultra centrifugation, Application with special reference to determination of molecular weight of Macromolecules (with derivation).

Unit V (21 hours)

Basic principles of Electromagnetic radiation – Energy , Wavelength , Wave number and Frequency. Absorption and Emission Spectra .Beer Lambert law , Absorbance and Transmittance. Colorimetry – Principle , Instrumentation and Applications. UV Spectrophotometry - Principle and Instrumentation. Spectrofluorimetry- Principle, Instrumentation and Application (Estimation of Thiamine).

RECOMMENDED TEXT BOOKS

1. Practical Biochemistry (V Edition)- Keith Wilson & John Walker, Cambridge University pres
2. Biophysical chemistry – Debajyothi Das, 10th edition, 2000.

REFERENCE BOOKS

1. Introductory Practical Biochemistry – Randhir Singh and S.K.Sawhney , 10th reprint 2014
2. Instrumental methods of Chemical analysis- Chatwal Anand , Himalaya Publishing House , 2005.

JOURNALS

1. *Biophysical journal-cell*
2. *Biophysical journal-Elsvier*

WEBSITE

1. [www.freebookcentre.net/./Biochemical- Techniques](http://www.freebookcentre.net/./Biochemical-Techniques).
2. www.cell.com

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PART C	Description/synthesis	40

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SEMESTER – IV

ENZYMES

TEACHING HOURS: 105 HOURS

CREDITS: 5

COURSE CODE: BC18/4C/ENZ

L T P: 5 2 0

OBJECTIVES

- To learn in detail about enzymes, classification, kinetic properties, mechanism of action and purification of enzymes.

COURSE OUTLINE

Unit I

(21 hours)

Rate of reaction, standard free energy, activation energy, transition state, chemical equilibrium in biological context, enzymes as biocatalyst, progress curve of uncatalysed and catalysed reaction. Classification of enzymes according to International Union of Biochemistry Convention. Definitions - Apoenzyme, holoenzyme, zymogens. Coenzymes - Role of NAD, TPP, PLP. Metal cofactors in enzyme catalysis.

Unit II

(21 hours)

ES complex formation, lock and key model and induced fit model. Active site (definition, characteristic features), Enzyme specificity. Factors influencing enzyme activity – pH, temperature, substrate, modulators (Activators, inhibitors), Enzyme units - IU & Katal.

Unit III

(21 hours)

Enzyme Kinetics - Michaelis Menten equation and its derivation, significance of K_m and V_{max} , Line weaver Burk plot and Eadie- Hofstee plot, enzyme inhibition - competitive (with applications), Non- competitive, Uncompetitive – Derivations not included. Allosteric inhibition, simple sequential model, conserted model, feedback inhibition with ATCase as an example.

Unit IV

(21 hours)

Extraction of enzymes – Nature of the extraction medium, extraction of soluble enzymes, technique for enzyme isolation, separation of cellular organelles by differential centrifugation, intracellular localization of enzymes and marker enzymes.

Unit V

(21 hours)

Purification of enzymes- dialysis, chromatography, electrophoresis - Criteria of purity of enzymes. Definition – Isoenzymes, Ribozymes, abzymes. Multienzyme complex - pyruvate dehydrogenase complex.

RECOMMENDED BOOKS

1. Enzyme – Palmer, 18th edition ,2004.London: Portland Press
- 2.Enzyme Technology-Anusha Baskar and Vg Vidhya,Mjp Publishers,2009

REFERENCE BOOKS

1. Fundamentals of Enzymology - Nicholas C.Price and Lewis Stevens., Oxford University Press, New Delhi.
2. Principles of Biochemistry - 4th edition - Lehninger, Nelson and Cox, 2005, WH Freeman and Company, New York, USA.

JOURNALS

- 1.*Enzyme Research*
2. *Journal of Enzyme and Microbial Technology*

WEBSITES

1. www.lsbu.ac.uk/biology/enztech/
2. www.lsbu.ac.uk/biology/enzyme/

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SEMESTER – III & IV
CORE PRACTICAL- II

TEACHING HOURS: 90 HOURS

CREDITS: 3

COURSE CODE: BC18/4C/CP2

L T P: 0 0 3

I. Titration

1. Estimation of Glycine
2. Estimation of Iron
3. Estimation of Copper
4. Estimation of Glucose by Benedicts method
5. Estimation of Ascorbic acid
6. Determination of Iodine number
7. Determination of Acid number

II. Preparation of buffers- Phosphate buffer, Tris buffer

III. Group Experiment

1. Estimation of Calcium in milk – Titrimetry
2. Estimation of Reducing sugars by DNSA method - Colorimetry

IV. Demo Experiments

1. Separation of Aminoacids by paper chromatography
2. Separation of Plant pigments by column chromatography
3. Separation of DNA by agarose electrophoresis

SEMESTER V

INTERMEDIARY METABOLISM I

TEACHING HOURS: 60

CREDITS: 4

COURSE CODE: BC18/5C/IMI

L T P : 4 0 0

OBJECTIVE:

To enable the student to understand the metabolism of carbohydrates and amino acids with their significance

COURSE OUTLINE

Unit I

(12 hours)

Introduction to Intermediary metabolism. Basic metabolic pathways – anabolic, catabolic and amphibolic pathways. Overview of carbohydrate, lipids and amino acid metabolism. Carbohydrate metabolism - Glycolysis , TCA Cycle and its regulation.

Unit II

(12 hours)

HMP Shunt, Glycogenesis, Glycogenolysis and Gluconeogenesis. Hormonal regulation of glycogen metabolism (Glycogen synthase and glycogen phosphorylase).

Unit III

(12 hours)

Amino acid metabolism – Transamination, Oxidative and Non - oxidative deamination, Decarboxylation. Urea cycle and its regulation.

Unit IV

(12 hours)

Degradation of glucogenic and ketogenic amino acids - Phenyl alanine, Threonine, Arginine, Tryptophan, Methionine. Biosynthesis of non essential amino acids - Asparagine, Glutamine, Serine.

Unit V

(12 hours)

Conversion of amino acids to specialized products - serotonin, GABA , dopamine, epinephrine, nor epinephrine, creatinine and creatine. Detoxification mechanism – oxidation, reduction, hydrolysis and Conjugation with examples.

RECOMMENDED TEXT BOOKS

1. Principles of Biochemistry- Lehninger, Nelson and Cox ,4th edition,2004
2. Biochemistry -Voet &Voet,IV edition ,2013

REFERENCE BOOKS

1. Harpers Biochemistry- Murray et al,25th edition,2004
2. Textbook of Biochemistry – Zubey, IV edition,1998

JOURNAL

1. *Journal of Nutrition & Intermediary metabolism=Elsevier*
2. *International journal of Biochemistry Research & Review*
3. *International journal of Biochemistry-Sciencedirect.com*

WEBSITE

1. www.wormbook.org/...intermetabolism/
2. www.science-projects.com/MetPathways.html
3. www.sciencedomain.org

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PART C: 2 out of 4 questions, each from different units (2X20=40)

SEMESTER V
INTERMEDIARY METABOLISM II

TEACHING HOURS:60

CREDITS: 4

COURSE CODE: BC18/5C/IM2

LTP : 4 0 0

OBJECTIVES

To enable the student to have a thorough understanding of lipid metabolism, nucleotide metabolism and biological oxidation.

COURSE OUTLINE

Unit I

(12 hours)

Biosynthesis of saturated fatty acids (Palmitic acid) and unsaturated fatty acids. Lipid metabolism- oxidation of fatty acids (saturated, odd and even numbered) - β oxidation. Ketogenesis. Biosynthesis and Degradation of triglyceride

Unit II

(12 hours)

Synthesis of phospholipids in E.coli (Phosphatidyl glycerol, Phosphatidyl serine, phosphatidyl ethanolamine and cardiolipin). Synthesis of Sphingolipid in E.coli.

Biosynthesis of Cholesterol – Regulation. Degradation of Cholesterol. Overview of lipoprotein metabolism.

Unit III

(12 hours)

Nucleotide metabolism – Biosynthesis of Purine and pyrimidine bases, salvage pathway. Degradation of purine and pyrimidine bases in the Uricotelic and Ureotelic systems. Synthesis of coenzyme nucleotides- NAD and FAD.

Unit IV

(12 hours)

Biological oxidation – Electron transport chain- components and reactions of ETC.

Theories of Oxidative phosphorylation- Redox loop and proton pump mechanism. Inhibitors of ETC and oxidative phosphorylation. High energy compounds and linkages.

Unit V

(12 hours)

Photosynthesis – Chloroplast , Thylakoid membrane, light and dark reactions, photo respiration and photo phosphorylation. Synthesis of Sucrose and Starch in plants.

RECOMMENDED TEXT BOOKS

1. Principles of Biochemistry- Lehninger, Nelson and Cox ,4th edition,2004
2. Biochemistry -Voet &Voet,IV edition ,2013

REFERENCE BOOKS

3. Harpers Biochemistry- Murray et al,25th edition,2004
4. Textbook of Biochemistry – Zubey, IV edition,1998

JOURNAL

1. *Journal of Nutrition & Intermediary metabolism=Elsevier*
2. *International journal of Biochemistry Research & Review*
3. *International journal of Biochemistry-Scimedirect.com*

WEBSITE

1. www.wormbook.org/...intermetabolism/
2. www.science-projects.com/
3. www.sciencedomain.org
4. pubs.acs.org

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SEMESTER-V

CLINICAL BIOCHEMISTRY

TEACHING HOURS: 60

CREDITS: 4

COURSE CODE: BC18/5C/CBC

LTP: 4 0 0

OBJECTIVE:

To enable the student to have a fundamental understanding of etiology, pathophysiology, symptoms and treatment of various diseases.

COURSE OUTLINE

Unit I

(12 hours)

Biological specimen –Types of specimen - Blood, serum, plasma, urine, feces, CSF, amniotic fluid, solid tissues, specific cells, specimen collection and preservation-Different preservatives and their role,Anticoagulants and their specific function.

Hematological parameters - PCV,MCV, ESR, Hb,MCH,MCHC. Blood disorders and diagnosis - Anaemia, polycythemia, leucopenia, leucocytosis, Thrombocytopenia. Haemophilia, Thalassemia, sickle cell Anaemia.

Unit II

(12 hours)

Disorders of carbohydrate metabolism – Hyperglycemia, Hypoglycemia ,Hyperinsulinemia Hypoinsulinemia, Diabetes Mellitus: Types-T1DM,T2DM,Gestational diabetes, diagnosis - OGTT and glycated Hb-pPhysiological range; complications and treatment. Glycogen storage diseases, Galactosemia.

Hereditary disorders of Amino acid metabolism- Tyrosinemia, Phenylketonuria, Alkaptonuria, Hartnup's disease, Cystinuria, Fanconi's syndrome,albinism.

Unit III

(12hours)

Disorders of lipid metabolism - Hyper and hypo Lipoproteinemia- Types, pathology and treatment. Lipidosis- Niemann Pick's disease, Tay Sach's Disease, Gaucher's disease,

Disorders of nucleic acid metabolism – Lesch Nyhan syndrome, Gout, Xanthinuria, Orotic Aciduria.

Unit IV

(12 hours)

Gastric function test- examination of resting content, fractional gastric analysis using Xylose ,mannitol absorption test, test meal, stimulation test- alcohol, histamine and insulin. Tubeless gastric analysis.

Renal function test- Clearance test- urea, creatinine and inulin. PAH test, filtration fraction, proteinuria and hematuria.

Unit V

(12hours)

Liver function test- Fatty liver, Hepatitis, cirrhosis, bilirubin metabolism, jaundice and its differential diagnosis, VD Berg reaction, hippuric acid test. BSP retention test, prothrombin time

Marker enzymes and clinical significance of liver diseases, cardio vascular disease, pancreatic diseases –AST,ALT,GGTP,CK,ALP,LDH.

RECOMMENDED TEXT BOOKS

1. Textbook of Medical Biochemistry-M.N.Chatterjee and Rana shinde ,7th edition.
2. Clinical chemistry Concepts and Applications-Shauna C.Anderson,Susan Cockayne
3. Clinical Medicine -Pravin kumar & clark,6th edition.

REFERENCE BOOKS

1. Clinical chemistry in diagnosis and treatment (VI edition)-Philip.D.Mayne
2. Davidson's principles and practice of medicine (XX edition)-John A.A. Hunter

JOURNAL

1. *Indian Journal of Clinical Biochemistry*
2. *Annals of Clinical Biochemistry*

WEBSITE

1. www.elsevier.com/locate/clinbiochem
2. www.acb.sagepub.com

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SEMESTER-V

PHYSIOLOGY

TEACHING HOURS: 60

CREDITS: 4

COURSE CODE: BC18/5C/PHY

LTP: 4 0 0

OBJECTIVE

To study about the structure and function of vital organ systems and hormones.

COURSE OUTLINE

Unit I

(12 hours)

Blood- composition & function. Types of blood cells, morphology & function - RBC,WBC, platelets erythropoiesis. Blood groups- A B O & Rhesus system; Coomb's test, Bombay blood group, function of plasma proteins. Composition & functions of lymph & lymphoid system,Blood clotting mechanism,anticoagulants

Unit II

(12 hours)

Muscular system- types of muscle & functions. Brief outline of nervous system, structure of brain and spinal cord .Synapses- chemical and electrical synapse, nerve impulse, action potential and neuro transmitters.

Unit III

(12hours)

Urinary system – components of the urinary system, Kidney structure and organization. Structure, function and classification of nephrons. Mechanism of urine formation- functions of glomerular filtration rate and selective reabsorption and tubular secretion.

Unit IV

(12hours)

Digestive system- structure and function of different components of digestive system, Mechanism of secretion of HCL, Role of hormones and enzymes in digestive process. Digestion of carbohydrates, lipids and proteins.

Unit V

(12 hours)

General organization of endocrine system- classification of hormones. Biological functions - Thyroid, Para Thyroid, Insulin, Glucagon, hormones of the adrenal glands and gonadal hormones.

RECOMMENDED TEXT BOOKS

1. Human Anatomy & Physiology – Elaine N. Marieb, 3rd edition, 1995.
2. Text book of Medical Biochemistry Physiology – MN. Chatterjee and Rana Shinde, 7th edition.
3. Animal physiology – Mariakuttikan and Arumugam

REFERENCE BOOKS

1. Textbook of Medical Physiology – Guyton & Hall, 11th edition, 2006
2. Davidson's Principles and Practice of Medicine (XX Edition) - John.A.A. Hunter

JOURNAL

1. *National Journal of physiology pharmacy and pharmacology*
2. *Journal of physiology - Elsevier*

WEBSITE

1. physiologyonline.physiology.org
2. www.brainmac.co.uk/physoil.html

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PART C: 2 out of 4 questions, each from different units (2X20=40)

SEMESTER V

ELECTIVE - BIOINSTRUMENTATION & BIostatISTICS

TEACHING HOURS:75

CREDITS: 5

COURSE CODE: BC18/5E/BBS

LTP : 5 0 0

OBJECTIVE

To enable the students to understand the techniques in diagnosis of various clinical condition and to analyse data.

COURSE OUTLINE

Unit I (15 hours)

Hematology – Coulter counter. Biochemistry – Glucose estimation using Glucose oxidase, Kinetic assay of LDH. Flame photometry for electrolyte estimation. Serological tests- Widal test, Overview of ELISA, Immuno Fluorescence and Chemiluminescent methods.

Unit II (15 hours)

Diagnostic procedures – Histology ,Microtome ,Histopathology , X-ray , Different types of scan – Ultrasound, Computerised Axial Tomography. Methods based on electrical activity – ECG, EEG, Blood pressure measurements, Respiratory gas analyzer.

Unit III (15 hours)

Therapeutic procedures - Blood banking, Dialysis unit- Hemodialysis and Peritoneal dialysis, Ventilator, Pacemaker, Laser applications in Medicine, Radiotherapy equipment.

Unit IV (15 hours)

Statistics- Definitions of Biostatistics & Clinical Statistics– Primary and Secondary data, Population and sample. Collection of data (survey, experiment and observation method) Presentation of data - structure of table, line diagram, bar diagram (simple, subdivided and multiple). Pie diagrams, Pictogram.

Unit V (15 hours)

Measures of central tendencies- Mean, Median, Mode (individual data, discrete series, continuous series). Measures of dispersion - Range, quartile deviation, standard deviation (Individual data, discrete series, continuous series).

RECOMMENDED TEXT BOOKS

1. Introduction to Biostatistics – N.Gurumani, 2nd edition, 2005, MJP Publishers
2. Bioinstrumentation-L.Veerakumari, 2015, MJP Publishers.

REFERENCE BOOKS

1. Handbook of Biomedical instrumentation-Second edition-R.S.Khandpur, 2008.
2. Biostatistics Basics and advanced-MANJU Pandey, Mv Learning, 2015

JOURNAL

1. *International journal of Instrumentation Technology*
2. *The international journal of Biostatistics-De Gruyter*

WEBSITE

1. www.stat.isu.edu
2. www.inderscience.com
3. www.degruyter.com

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SEMESTER VI

MOLECULAR BIOLOGY

TEACHING HOURS: 60

CREDITS : 4

COURSE CODE: BC18/ 6C/MBO

L T P : 4 0 0

OBJECTIVE

- Introduction to basic molecular concepts of life processes

COURSE OUTLINE

Unit I

(12 hours)

Gene Organization - Genes, DNA sequences – Unique and repetitive sequences, coding, non coding DNA, Satellite DNAs, Cot Curves, Chromosomes – Types, properties, Gene organization in Prokaryotes and Eukaryotes.

Unit II

(12 hours)

DNA Replication - Chemistry of DNA synthesis, Modes of DNA replication, Semiconservative Replication – Meselson and Stahl experiment, Enzymes of DNA replication – DNA polymerases, Helicases, Primase, Ligases, Topoisomerases, Prokaryotic replication. Brief outline of eukaryotic replication.

Unit III

(12 hours)

Transcription - Chemistry of Transcription, RNA polymerases, Role of sigma factor, Closed and open promoter complexes, Prokaryotic Transcription, Post transcriptional modifications of mRNA – capping, tailing, splicing.

Unit IV

(12 hours)

Translation - Basic features and deciphering of the Genetic code, Genetic code dictionary, wobble hypothesis, Ribosomes, Protein synthesis in prokaryotes - Activation of amino acids, aminoacyl tRNA synthetases, tRNA as adaptor molecule, Prokaryotic translation, post translational modifications.

Unit V

(12 hours)

Mutation and DNA Repair - Mutation – Types, Physical and chemical mutagens, DNA damages and mutations, DNA repair – Direct repair systems, Excision repair – Base and nucleotide excision repair, Mismatch repair.

RECOMMENDED TEXT BOOKS

1. Biochemistry - Voet Donald and Voet Judith : 2004. Wiley International Edition , 3rd Edition : John Wiley & Sons.
2. Lehninger Principles of Biochemistry – Nelson David and Cox Michael : 2004 . W.H.Freeman & Co : New York
3. Essentials of molecular biology- V.Malathi, 2013 , First Edition, Pearson Publishers.

REFERENCE BOOKS

1. Molecular cell biology – Lodish , Harvey, Berk, Arnold, Zipursky, Lawrence, Matsudaira, Paul, Baltimore : 2006, 4th Edition, W.H Freeman & Co .
2. Lewin's Genes X– Krebs Jocelyn, Lewin Benjamin, Goldstein, Eliottt, Kilpatrick, Stephen : 2009 . Jones and Bartlett.
3. The world of cell – Becker, Wayne , Kleinsmith, Lewis, Hardin, Jeff ,Bertoni ,Gregory paul : 2009, 7th Edition, Pearson Education Inc.

JOURNAL

1. Journal of Molecular Biology-Elsvier
2. Journal of Molecular Biology Research-

WEBSITE

www.ccsenet.org

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SEMESTER VI
GENETICS & NUTRITIONAL BIOCHEMISTRY

TEACHING HOURS : 60

CREDITS : 4

COURSE CODE: BC18/6C/GNB

L T P : 4 0 0

OBJECTIVE

- Understanding Genes and their role in life processes
- Understanding the basis of Genetic inheritance

COURSE OUTLINE

Unit I

(12 hours)

Mendelian Genetics : Contributions of Mendel , Genotype, Phenotype .Monohybrid cross, Dihybrid cross, , Back Cross, Test cross, Mendel's laws of Inheritance- Law of Dominance, Law of Segregation, Law of Independent assortment , Reciprocal crosses. Incomplete Dominance, Co dominance, Gene Interactions – Complementary , Supplementary genes

Unit II

(12 hours)

Chromosomal genetics - Linkage and crossing over, Chromosomal mapping, Autosomes Brief outline of Autosomal linked diseases, Structure of sex chromosomes , Sex linked inheritance- Haemophilia, Genetic Diseases- Overview of Chromosomal anomalies- Ploidy ,Chromosomal Aberrations. Down's Syndrome, Klinefelter's syndrome, Turner's syndrome

Unit III

(12 hours)

Nutrition - Balanced diet, Food pyramid, Dietary requirement and functions of Carbohydrates, Lipids and Proteins. Calorific values of food components., Biological value of proteins, NPU. Basal metabolism- Basal metabolic rate, Factors affecting BMR, Respirometer.RQ, SDA. Protein Calorie Malnutrition-Kwashiorkar & Marasmus

Unit IV

(12 hours)

Vitamins – Fat soluble vitamins (A,D,E,K) and Water soluble vitamins (B complex and C) (Sources, biological functions and RDA)

Minerals- iron, calcium, iodine, selenium (Sources, biological functions and RDA).
Nutritional requirements in infancy, childhood, pregnancy and lactation and old age.

Unit V

(12 hours)

Obesity – Causes, Anthropometric measurements and Diet management. Dietary management in – Infection, Fever, Constipation, Diabetes mellitus, Peptic Ulcer, PCOS, Hypertension, Cardiovascular diseases, Pancreatitis, Cirrhosis and Cancer.

RECOMMENDED TEXT BOOKS

1. Essentials of Molecular Biology - David Friefelder, 2nd edition, 1999
2. Fundamentals of Biochemistry – Donald Voet and Judith Voet, 4th edition, 2013.
3. Cell biology, Genetics, Molecular Biology, Evolution and Ecology– Verma & Agarwal, 2013.
4. Nutrition and Diet Therapy-Sangeetha Karnik, 1st edition, 2006.
5. Nutrition Essentials and diet Therapy-Peckenpaugh, 10th edition, 2007.

REFERENCE BOOKS

1. Lewin's Genes X– Krebs Jocelyn, Lewin Benjamin, Goldstein, Elliott, Kilpatrick, Stephen : 2009 . Jones and Bartlett

JOURNAL

1. *Journal of Genetics-Indian Academy of Science*
2. *Open journal of Genetics- an academic Publisher*
3. *Journal of Genetics & Genomics-Elsevier*

WEBSITE

1. www.ias.ac.in
2. www.scrip.org

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SEMESTER VI

BIOTECHNOLOGY

TEACHING HOURS: 60

CREDITS : 4

COURSE CODE:BC18/6C/BTY

LTP : 4 0 0

OBJECTIVE

To enable student to have an understanding of the basic aspects of recombinant DNA technology and applications of Biotechnology, in Agricultural, Pharmaceutical and Industrial sectors

COURSE OUTLINE

Unit I

(12 hours)

Introduction to Biotechnology- Scope and Importance. Tools of R-DNA technology; Enzymes, Linkers, Adaptors, Vectors - Plasmid, Phages, Cosmid, Viral, Shuttle and Expression vectors. Automated Gene Machine, Gene amplification-PCR and Application, DNA sequencing-Sanger's method.

Unit II

(12 hours)

Strategies of r-DNA Technology; Isolation and Identification of Gene of interest- Gene Library. Gene transfer methods – Electroporation, Liposome mediated transfer, Gene Gun method, Selection of recombinants - Marker gene and Reporter genes for Animal and Plant cells, Colony Hybridization Methods. Blue white selection method, Insertional inactivation method and Immunological method. Blotting- Southern, Northern, Western.

Unit III

(12 hours)

Plant Biotechnology: **Plant tissue culture**-Requirements for plant tissue culture, Types of culture, Applications of plant tissue culture. Applications of Transgenic plants- Herbicide resistant crops and Insect resistant crops.

Unit IV

(12 hours)

Animal Biotechnology: Requirement for animal tissue culture, Mammalian cell culture, Stem cell culture, Cell lines and its maintenance. Applications of animal cell culture. Transgenic animals and its applications.

Medical Biotechnology: Production of Insulin, Interferon, tPA ,Principles of Gene therapy.

Unit V

(12 hours)

Industrial Biotechnology : **Fermentation**, Fermentor and Fermentation process-types. Downstream processing- Production of Vinegar, Single Cell Protein-Algae.

Enzyme Biotechnology: Immobilization of enzymes, methods of immobilization. Industrial application of enzymes- Food industry, Textile industry, Pharmaceutical industry, Paper and Pulp industry.

RECOMMENDED BOOKS

1. Biotechnology – U.Sathyanarayana ,8th reprint 2013
2. Textbook of Biotechnology- R.C.Dubey
3. Textbook Of Biotechnology-DR.Prakash S Lohar,MJP publisher ,2012
4. Biotechnology – Kumaresan

REFERENCE BOOKS

1. Molecular Biotechnology Principles and Applications of Recombinant DNA-Bernard R Glick and Jack J Pasternak,3rd edition,2003.
2. Essentials of Biotechnology-Michael Crichton.

JOURNAL

1. *Indian journal of Biotechnology – niscair*
2. *International journal of Biotechnology (IJBT)*

Website :

1. www.niscair.res.in
2. www.gate2biotech.com/instantnotes-

QUESTION PAPER PATTERN

The pattern of question paper shall be as follows:

COMPONENT	NATURE OF THE QUESTION	MAXIMUM MARKS
PART A	Definition and structures	20
PART B	Understanding concepts	40
PART C	Description/synthesis	40

PART A: 10 questions, compulsory 2 questions from each unit (10X2=20)

PART B: 5 out of 8 questions, compulsory 1 question from each unit (5X8=40)

PART C: 2 out of 4 questions, each from different units (2X20=40)

SEMESTER VI

ELECTIVE- BASICS OF BIOINFORMATICS

TEACHING HOURS:75

CREDITS : 5

COURSE CODE: BC18/6E/BBI

L T P : 5 0 0

OBJECTIVE

To study the fundamental aspects Internet and Bioinformatics – Databases, Genomics, Proteomics and Drug development.

COURSE OUTLINE

Unit I

(15 hours)

Introduction to Internet – IP address, URL; networks - LAN, WAN; Communication protocols – TCP, IP, FTP, HTTP; www, web browsers, Search Engines. Types of Databases - Flat files, Relational, Object oriented databases.

Unit II

(15 hours)

Bioinformatics- Definition and Comparison between Computers and Biology; Principles, Applications of Bioinformatics and Challenges , NCBI, Biological databases. INSDC, GenBank, Protein sequence databases: Uniprot, PDB; Literature database – PubMed; Data retrieval systems – Entrez.

Unit III

(15 hours)

Introduction to Sequence, Alignments, Type of Alignments and their Significance, Dot plot, Pairwise alignment –**BLAST** and Multiple Sequence Alignment –**Clustal W algorithm**. **Gene prediction**, Human Genome Project and its significance, OMIM.

Unit IV

(15 hours)

Protein Structure: Primary, Secondary, Super Secondary, Tertiary, Quaternary, Peptide bond, phi, psi and chi torsion angles, Significance of Ramachandran plot; Motif and Domain. **3D Protein structure prediction (Homology Modelling)** and Structure Visualization.

Unit V

(15 hours)

Basics of Phylogenetic analysis - Definitions of Homologs, Orthologs, Paralogs and Xenologs; Definitions for Genomics, Metagenomics, Transcriptomics, Proteomics, Lipidomics, Interactomics, Pharmacogenomics, Metabolomics, Chemoinformatics.
Basic Steps in drug development- Stages, Clinical Trials, Structure based drug designing.

RECOMMENDED BOOKS

1. Essential Bioinformatics by Jin Xiong
2. Text book of Bioinformatics-Sharma, Munjal and Shankar,2008.

REFERENCE BOOKS

1. Bioinformatics: Sequence and Genome Analysis by Mount D., Cold Spring Harbor Laboratory Press, New York. 2004
2. Bioinformatics- a Practical Guide to the Analysis of Genes and Proteins by Baxevanis, A.D. and Francis Ouellette, B.F., Wiley India Pvt Ltd. 2009
3. Introduction to bioinformatics by Teresa K. Attwood, David J. Parry-Smith. Pearson Education. 1999

JOURNAL

1. *Bioinformatics-Oxford journal*
2. *BMC Bioinformatics*
3. *Bioinformatics.oxfordjournals.org*

WEBSITE:

1. www.ncbi.nlm.nih.gov
2. www.ebi.ac.uk

QUESTION PAPER PATTERN

The pattern of question paper shall be as follows:

COMPONENT	NATURE OF THE QUESTION	MAXIMUM MARKS
PART A	Definition and structures	20
PART B	Understanding concepts	40
PART C	Description/synthesis	40

PART A: 10 questions, compulsory 2 questions from each unit (10X2=20)

PART B: 5 out of 8 questions, compulsory 1 question from each unit (5X8=40)

PART C: 2 out of 4 questions, each from different units (2X20=40)

SEMESTER VI

ELECTIVE-IMMUNOLOGY

TEACHING HOURS: 75

CREDITS : 5

COURSE CODE: BC18/6E/IMY

L T P : 5 0 0

COURSE OUTLINE

Unit I

(15 hours)

Infection – Types of infection, Immunity – Innate Immunity, Active, Passive, Natural and Artificial immunity, Factors affecting Innate immunity – Physical, Mechanical, Biochemical, Cellular and Genetic factors. Inflammation, Mechanism of Phagocytosis.

Unit II

(15 hours)

Cells involved in Immune response – T, B and Null cells, Structure and functions of lymphoid organs- Thymus, Bone Marrow, Spleen, Lymph nodes, Mucous Associated Lymphoid Tissue, Gut Associated Lymphoid Tissue.

Unit III

(15 hours)

Antigen, Factors affecting Antigenicity, Epitope , Haptens , Adjuvants. Clonal Selection Theory, Antibody – Classes, Structure and Biological function. Humoral and Cell Mediated Immunity.

Unit IV

(15 hours)

Principles of Ag-Ab interactios – Affinity, Avidity, Precipitation – Precipitation curve, Agglutination, Principle – ELISA, RIA, Immuno electrophoresis and Immunofluorescence . Monoclonal Ab production- Hybridoma technology.

Unit V

(15 hours)

Hypersensitivity – Gel- Coomb's classification, Immediate Type – I (Allergic Asthma), II (Erythroblastosis Foetalis), III & Delayed Type – IV (Contact Dermatitis). Autoimmune Diseases – Hashimotos Thyroiditis and Rheumatic Arthritis.

RECOMMENDED BOOKS

1. Immunology- Peter ,Alex and Micheal,2nd edition,2004
2. Fundamentals of Medical Immunology-Venugopal Jayapal,2007
3. Text book of Microbiology-Ananthanarayanan and Panickar,9th edition,2013.

REFERENCE BOOKS

1. Immunology - Kuby ,5th edition,2003.
2. Essential Immunology –Roitt,3rd edition

JOURNAL

1. *Journal of Immunology Research*
2. *Open journal of Immunology-scientific Research Publishing*

WEBSITE

1. www.whfreemen.com/kuby
2. www.immunologylink.com
3. www.hindawi.com

QUESTION PAPER PATTERN

The pattern of question paper shall be as follows:

COMPONENT	NATURE OF THE QUESTION	MAXIMUM MARKS
PART A	Definition and structures	20
PART B	Understanding concepts	40
PART C	Description/synthesis	40

PART A: 10 questions, compulsory 2 questions from each unit (10X2=20)

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PART C: 2 out of 4 questions, each from different units (2X20=40)

SEMESTER -V & VI

CORE PRACTICAL -III

TEACHING HOURS: 120

CREDITS: 3

COURSE CODE: BC18/6C/CP3

LTP : 0 0 4

I. COLORIMETRY

- a) Estimation of Creatinine (Jaffe's method)
- b) Estimation of Urea
- c) Estimation of Cholesterol
- d) Estimation of Glucose (Orthotoluidine method)
- e) Estimation of Protein(Lowry method)
- f) Estimation of Vitamin C
- g) Estimation of Iron (Dipyridyl method)

II. HEMATOLOGY (Group Experiments)

- a) Total count of RBC, WBC and Platelets
- b) Differential count of WBC
- c) Hematocrit and ESR
- d) Estimation of Hemoglobin (Drabkin's reagent)

III. DEMONSTRATION EXPERIMENTS

- a) Isolation of DNA from Spleen
- b) Isolation of Albumin from Egg
- c) Isolation of Lecithin form Egg yolk

SEMESTER –V & VI

CORE PRACTICAL –IV

TEACHING HOURS: 135

CREDITS: 3

COURSE CODE: BC18/6C/CP4

LTP : 0 0 5

I. QUANTITATIVE ANALYSIS

1. Estimation of DNA (Diphenyl amine method)
2. Estimation of RNA (Orcinol method)
3. Estimation of xylose (Orcinol method)
4. Estimation of aminoacid (Ninhydrin method)

II. Enzymology

Activity of

- i) SGOT
- ii) SGPT
- iii) Specific activity of ALP
- iv) Effect of Temperature, pH , & Substrate concentration of Salivary amylase.

III. URINE ANALYSIS

- a) Analysis of normal and abnormal constituents

SEMESTER I
ALLIED BIOCHEMISTRY I
(For I B.Sc. Microbiology)

TEACHING HOURS: 60

CREDITS: 4

COURSE CODE: BC18/1A/AB1

LTP :3 1 0

OBJECTIVES

To enable the students to learn the Chemistry of Biomolecules & Metabolic cycles.

COURSE OUTLINE

Unit I

(12 hours)

Carbohydrates – Definition, Biomedical importance of carbohydrates, Classification of carbohydrates (Monosaccharides, Disaccharides, Polysaccharides), Vant Hoff's rule, Stereoisomerism, Optical isomerism, Mutarotation, Epimers, Aldose, Ketose.

Unit II

(12 hours)

Monosaccharides- Linear structure and Haworth structure of Glucose and Fructose, Disaccharides – Lactose and Sucrose, Inversion of Sucrose , Polysaccharides – Homoglycans- Structure of Starch and Glycogen, Heteropolysaccharides – Chondroitin sulphate .

Unit III

(12 hours)

Definition of Catabolism, Anabolism and Amphibolic cycle. Glycolysis and TCA cycle with energetics, Glycogenesis and Glycogenolysis (Structure not required)

Unit IV

(12 hours)

Amino acids- Functions of amino acids, Classification of Amino acids based on side chain, Essential, Semi-essential and Non-essential amino acids, Zwitter ion, Amphoteric nature and Isoelectric point

Unit V

(12 hours)

Proteins- Biomedical importance of Protein, Classification based on Shape and Size (Fibrous and Globular), Based on Function and Based on Physical properties. Structural organization of Proteins- Primary, Secondary, Tertiary and Quarternary structure, - Basic concepts.

BOOKS RECOMMENDED

1. Fundamentals of Biochemistry by J L Jain, Sunjay Jain and Nithin Jain . Publisher S.chand, 2004 Edition.
2. Biochemistry by U Satyanarayana. Publisher Elsevier India, 4th Edition 2013.

REFERENCE BOOKS

1. Principles of Biochemistry by Lehninger, A.L, Publisher: W.H.Freeman, New York. . 2005, 4 th Edition
2. Biochemistry by Lubert stryer, Publisher: W.H .Freeman & company, 2001, 5 th Edition.
3. Biochemistry by Voet, D.and Voet .J.G. Publisher: , John Wiley and Sons, Inc. 2004 . 3 rd Edition

JOURNAL

1. *Journal of Biomolecules-Open access*
2. *International journal of Biological macromolecules-Elsevier*
3. *Journal of Biomolecules- Wiley*
4. *Journal of Biomolecular Techniques*

WEBSITE

1. www.phschool.com/science/biology_place/
2. www.wtec.org/te/usws/usws

QUESTION PAPER PATTERN

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COMPONENT	NATURE OF THE QUESTION	MAXIMUM MARKS
PART A	Definition and structures	20
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PART C	Description/synthesis	40

PART A: 10 questions, compulsory 2 questions from each unit (10X2=20)

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PART C: 2 out of 4 questions, each from different units (2X20=40)

SEMESTER II
ALLIED BIOCHEMISTRY II
(For I B.Sc. Microbiology)

TEACHING HOURS: 60

CREDITS: 4

COURSE CODE: BC18/2A/AB2

LTP :3 1 0

OBJECTIVES

To understand the Chemistry of Biomolecules and the basic aspects of Enzyme action

COURSE OUTLINE

Unit I

(12 hours)

Enzymes- Definition of enzyme, Active site, Holoenzyme, Apoenzyme, Coenzyme, Exo and Endo enzymes, Zymogen, Turnover number. Specificity of enzymes, Industrial applications of enzymes, Factors affecting enzyme activity- pH, Temp, substrate. Enzyme inhibition- Competitive, Non-competitive and Uncompetitive inhibition(no derivation).

Unit II

(12 hours)

Lipids- Biomedical importance of Lipids, Bloor's classification of lipids (Simple, Compound and Derived), Saturated and Unsaturated fatty acids, Essential fatty acids (EFA) and their functions, Deficiency manifestation of EFA, Properties- Saponification and Rancidity, Iodine number, Acetyl number,. Phospholipids- Functions, Biological importance of Cholesterol, Bile acids and Bile salts.

Unit III

(12 hours)

Purine and Pyrimidine bases with structures, Nucleosides, Nucleotides, DNA- Structure (Watson and Crick model), Chargaff's rule, Types of DNA- A , B and Z- DNA.

Unit IV

(12 hours)

Physical properties of DNA – Shape, Size, Effect of Temperature, Denaturation and Renaturation of DNA, Chemical properties of DNA – Hydrolysis by acids, alkali, enzymes and pH.

RNA- types of RNA- m-RNA, r-RNA and t-RNA, Clover leaf model of t- RNA. Biological importance of RNA.

Unit V**(12 hours)**

Hormones – Classification, Pituitary hormones, Thyroid, Parathyroid hormones, Insulin, Glucagon, Adrenocortical hormones, Testosterone and Estrogen (Biological Significance only).

BOOKS RECOMMENDED

1. Fundamentals of Biochemistry by J L Jain, Sunjay Jain and Nithin Jain . Publisher S.chand, 2004 Edition.
2. Biochemistry by U Satyanarayana. Publisher Elsevier India, 4th Edition 2013.

REFERENCE BOOKS

1. Principles of Biochemistry by Lehninger, A.L, Publisher: W.H.Freeman, New York. . 2005, 4 th Edition
2. Biochemistry by Lubert stryer, Publisher: W.H .Freeman & company, 2001, 5 th Edition.
3. Biochemistry by Voet, D.and Voet .J.G. Publisher: John Wiley and Sons, Inc. 2004. 3 rd Edition

JOURNAL

1. *Journal of Biomolecules - Open access*
2. *International journal of Biological macromolecules-Elsevier*
3. *Journal of Biomolecules- Wiley*
4. *Journal of Biomolecular Techniques*

WEBSITE

1. www.phschool.com/science/biology_place/
2. www.wtec.org/te/usws/usws

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PART C: 2 out of 4 questions, each from different units (2X20=40)

SEMESTER I & II

ALLIED BIOCHEMISTRY PRACTICAL

TEACHING HOURS: 60

CREDITS: 2

COURSE CODE: BC18/2A/ABR

LTP: 0 0 2

I Qualitative Analysis of carbohydrates –

Monosaccharides - Glucose, fructose

Disaccharides - Maltose, Sucrose

Polysaccharides - Starch

II Qualitative Analysis of Amino acids –

Arginine, Cysteine, Tryptophan, Tyrosine

III Spotters –

Centrifuge, Compound microscope, pH meter, Weighing balance, Colorimeter, Incubator

IV Group experiment

Preparation of starch from potato

Preparation of casein from milk

SEMESTER -I

ALLIED BASIC CHEMISTRY-I

(For I B.Sc Clinical Nutrition and Dietetics)

TEACHING HOURS: 60

CREDITS: 4

COURSE CODE: BC18/1A/BC1

LTP : 3 1 0

OBJECTIVES

- To enable students understand the fundamental aspects of Inorganic, Food and Analytical chemistry.
- Students gain knowledge in the uses of chemistry in daily life

COURSE OUTLINE

Unit I

(12 hours)

a. Chemical bonding- Definition- Types of bonds - Formation of different bonds with examples --Ionic bond – NaCl, KCl -Covalent bond- Single bond- H₂S,HCl, Multiple bond , Molecular orbital theory, Bonding, Non Bonding, Anti Bonding orbitals., Molecular orbital Configuration of Nitrogen, Oxygen and Flourine. Bond order, Diamagnetism and Paramagnetism. Co ordinate bond –Hydronium ion, ammonium ion--Hydrogen bond – Inter and Intra molecular Hydrogen bonding e.g. O & P Nitrophenol-- Vanderwaals force.

b. Shapes of molecules – VSERR Theory & Hybridization CH₄ , H₂O, NH₃, BrF₃ , SF₆ ,IF₅ , IF₇.

Unit II

(12 hours)

Mechanistic basis of organic reactions – Electronic displacement results- Inductive, Resonance and Steric effects. Definition of substrates – Electrophiles , Nucleophiles – Elementary treatments of Substitution reactions SN₁ , SN₂ Walder inversion - Aromatic Electrophilic substitution (Nitration, sulphonation) - Elimination Reaction- E₁ , E₂ Hoffmann and saytzeff rule- Addition Reaction – Markonikoff's rule and Kharash effect.

Unit III

(12 hours)

Food chemistry- Quality of lipids- rancidity, acid number, iodine number, saponification number. Food adulteration – Definition – Intentional addition and incidental addition – Common adulteration/contaminants in food – Food simple screening test for the detection of adulterants – Diseases or health effects caused by the adulterants – Prevention of Food Adulteration Act - 1954.

Unit IV

(12 hours)

Acids and bases – Arrhenius concept- Bronsted-Lowry concept- conjugate acids and bases – Lewis concept Concept of pH and pOH – Determination of pH using Potentiometric method (pH meter) – Buffer examples for acidic and basic buffer – Buffer action – Biological applications of buffers.

Unit V

(12 hours)

Volumetric analysis – Advantages of Volumetric analysis over other quantitative analysis – Preparation of solutions – Primary and Secondary Standards – (examples) – Definition of Mole, Molarity, Molality, Normality, Formality Dilution – Difference between end point , equivalence point - Types of volumetric analysis – Acidimetry and Alkalimetry – Examples & Indicators used Strong acid Vs Strong base , Strong acid Vs Weak base, Weak acid Vs Strong acid , Weak acid Vs Weak base – Redox Titrations – Permanganometry ,Dichrometry,Iodometry Iodimetry – Complexometry – EDTA Titrations.

RECOMMENDED BOOKS

1. Allied Chemistry-Gopalan and Sundaram, 3rd edition
2. Text Book of Allied Chemistry-Dr.V.Veeraiyan et al,Highmount Publishing House

REFERENCE BOOKS

1. Modern Inorganic Chemistry-R.D.Madan,2008
2. Textbook Organic Chemistry-P.L.Soni,H.M.Chawla,29th edition ,2007.
3. Principles of Physical Chemistry-P.L.Soni,U.N.Dash,23rd revised edition,2007.

JOURNALS

1. *Biochemistry-ACS publication*
2. *Biochemical journal*
3. *Pubs.acs.org*

WEBSITES

<http://www.chemistry.org>
<http://www.chemhelper.com>

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PART C: 2 out of 4 questions, each from different units (2X20=40)

SEMESTER – II
ALLIED BASIC CHEMISTRY-II
(For I B.Sc Clinical Nutrition and Dietetics)

TEACHING HOURS: 60

CREDITS: 4

COURSE CODE: BC18/2A/BC2

LTP :3 1 0

OBJECTIVES

To enable students to

1. Understand the basics Co-ordination, Industrial and Drug chemistry
2. Students gain knowledge in the uses of chemistry in daily life

COURSE OUTLINE

Unit I

(12 hours)

Co-ordination Chemistry – Difference between Double salt and Co-ordination Compounds. Nomenclature Werner's theory, Definition and Biological importance of Chelates – Haemoglobin, Application of chelates – medicinal and analytical – Determination of hardness of water and softening of water.

Unit II

(12 hours)

Industrial Chemistry – Fuels, Classification, Fuel Gas – natural gas, Water gas, Semi water gas, Carbureted Water gas, Producer gas, Oil gas, Gobar gas and LPG- Composition and uses. Silicones – Preparation, properties and uses. Synthetic Dyes – Classification of Dyes, Azo, Triphenylmethane, Vat and Mordant Dyes and their preparation.

Unit III

(12 hours)

Drug Chemistry – Classification of drugs, Preparation and Properties of Sulpha drugs, Sulpha pyridine, Prontosil, Sulpha diazine and Sulpha furazole. Mode of action of Sulpha drugs.

Antibiotics – Penicillin, Chloramphenicol. Definition, example each for analgesics, antipyretics, tranquillizers, sedatives, hypnotics, local and general anaesthetics. Steroidal drugs and Non Steroidal inflammatory drugs.

Unit IV

(12 hours)

Food Chemistry – Food additive – Definition – Purpose of addition – Examples – Food colours – Flavours – Sweeteners – Fat emulsifiers – Stabilizing agents – Flour improvers- Anti staling agents – antioxidants – Preservatives- Nutritional supplements – Food Fortification –

Biological importance of Sodium (Na), Potassium (K), Calcium (Ca), Magnesium (Mg), Potassium (P).

Unit V

(12 hours)

Isolation and Purification of Organic Compounds – Extraction, Differential extraction, Distillation, Fractional distillation, Steam distillation, Crystallization, Sublimation, Separation Technique – Chromatography – Paper, TLC, Column and Ion exchange.

RECOMMENDED BOOKS

1. Allied Chemistry-Gopalan and Sundaram, 3rd edition
2. Text Book of Allied Chemistry-Dr.V.Veeraiyan et al, Highmount Publishing House

REFERENCE BOOKS

1. Modern Inorganic Chemistry-R.D.Madan, 2008
2. Textbook Organic Chemistry-P.L.Soni, H.M.Chawla, 29th edition, 2007.
3. Principles of Physical Chemistry-P.L.Soni, U.N.Dash, 23rd revised edition, 2007.

JOURNALS

1. *Biochemistry-ACS publication*
2. *Biochemical journal*
3. *Pubs.acs.org*
4. www.biochemj.org

WEBSITES

1. <http://www.chemistry.org>
2. <http://www.chemhelper.com>

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PART C: 2 out of 4 questions, each from different units (2X20=40)

SEMESTER I & II
ALLIED CHEMISTRY PRACTICAL
(for I B.Sc Biochemistry & I B.Sc CND)

TEACHING HOURS: 60

CREDITS: 2

COURSE CODE: BC18/2A/CHP

LTP: 0 0 2

VOLUMETRIC ANALYSIS

1. Estimation of HCl using Standard Oxalic Acid.
2. Estimation of Borax – Standard Sodium Carbonate.
3. Estimation of Ferrous Sulphate – Standard Mohr Salt Solution.
4. Estimation of Oxalic Acid – Standard Ferrous Sulphate.
5. Estimation of Ferrous Ion – Diphenylamine Indicator.
6. Estimation of Zinc Using EDTA – Standard Magnesium Sulphate.

ORGANIC SUBSTANCE ANALYSIS:

Systematic analysis of organic compounds containing one functional group and characterization by confirmatory tests.

1. Reaction of Aldehyde (Aromatic).
2. Reaction of Carbohydrates.
3. Reaction of Carboxylic Acid (Mono & Di).
4. Reaction of Phenol.
5. Reaction of Amine (Aromatic, primary).
6. Reaction of Amide (Mono & Di).
7. Reaction of Ketone (not for exam)

SEMESTER I
YOGA AND DIET
(For Other Department Students)

TEACHING HOURS: 30

CREDITS: 3

COURSE CODE: BC18/1N/YOD

LTP:2 0 0

OBJECTIVE

To create an awareness on

1. Yogasanas
2. Balanced diet for complete well being.

COURSE OUTLINE

Unit I

(10 hours)

Yoga-definition, Types of Yogas, Prerequisites for Yoga, Pranayama, and Benefits, Work place yoga.

Unit II

(10 hours)

Basic Asanas and their Benefits – Padmasana, Vajrasana, Bhujangasana, Dhanurasana Shavasana.

Unit III

(10 hours)

Different classes of Nutrients in food and their Basic functions, Food sources of Carbohydrates, Proteins, Lipids, Vitamins, Minerals- Iron and Calcium, Food pyramid, Types of Vegetarian diets.

RECOMMENDED BOOKS

1. Yoga – Master the Yogic Powers – Jack Peter, First Edition, Abishek Publications\
2. Nutrition Essentials and Diet Therapy – Pecken Paugh, Saunders Elsevier

WEB SITES

1. www.artofliving.org/in-en/yoga
2. www.artofliving.org

QUESTION PAPER PATTERN

Ten out of twelve questions (5x10=50)

SEMESTER III
LIFE STYLE DISEASES IN WOMEN
(For Other Department Students)

TEACHING HOURS: 30 HOURS

CREDITS: 3

COURSE CODE: BC18/2N/LDW

LTP: 2 0 0

OBJECTIVE:

To create awareness about

1. Lifestyle diseases and disorders in women.
2. Food habits and Health

COURSE OUTLINE

Unit I

(10 hours)

Health problems in Women -Anaemia, Skin and Hair problems, Cancer- Breast cancer, Cervical cancer-Symptoms, Diagnosis and Treatment, Significance of breast feeding, Obesity.

Unit II

(10 hours)

Food habits and Health- Balanced diet for Women-Carbohydrates, Lipids, Proteins, Vitamin and Minerals-Sources, Requirements and Deficiency symptoms.

Unit III

(10 hours)

Adverse effects of Junk food, Eating disorders-Anorexia and Bulimia nervosa. Modern lifestyle habits. Health Hazards of Smoking and Alcoholism, Tight clothing, High heels, Hair coloring, Face bleach, Tattooing, Mobile phone radiation.

RECOMMENDED BOOKS

1. Understanding Nutrition-Eleanor, Noss, Whitney
2. Encyclopedia of Women health-Parvesh Handa

WEBSITE

1. www.helpguide.org
2. www.healthsite.com

QUESTION PAPER PATTERN

Ten out of twelve questions (5X 10 = 50)