

Date :- 29/06/2019

NOTIFICATION

Sub :- CBCS Syllabi of B. Sc./~~M. Sc.~~ in Biochemistry (Sem I & II)


Ref. :- Decision of the Academic Council at its meeting held on 28/06/2019.

The Syllabi of B. Sc./~~M. Sc.~~ in Biochemistry (First and Second Semesters) as per CBCS-UG/~~PG~~ Regulations, 2016 and approved by the Academic Council as referred above are hereby notified for implementation with effect from the academic year 2019-20.

Copy of the Syllabi shall be downloaded from the College Website
(www.kcesmjcollege.in)


Chairman
Board of Studies




Principal,
M. J. College, Jalgaon

To :

- 1) The Head of the Dept., M. J. College, Jalgaon.
- 2) The Director, School of Life Sciences, M. J. College, Jalgaon.
- 3) The office of the COE, M. J. College, Jalgaon.
- 4) The office of the Registrar, M. J. College, Jalgaon.
- 5) Office File.

Knowledge is Power

Khandesh College Education Society's

Moolji Jaitha College, Jalgaon

An "Autonomous College" Affiliated to
KBC North Maharashtra University, Jalgaon



SYLLABUS STRUCTURE OF

B. Sc. Biochemistry

Under Choice Based Credit System (CBCS)

[w. e. f. Academic Year: 2019-20]

F. Y. B. Sc. Biochemistry Course Structure

Term / Semester	Course Module	Subject code	Title of Paper	Credit	Hours per week
I	DSC	BC-111	Basic Biochemistry-I	2	2
	DSC	BC-112	Cell Biology	2	2
	DSC	BC-113	Practical course- Basic Techniques in Biochemistry-I	2	4
II	DSC	BC-121	Basic Biochemistry-II	2	2
	DSC	BC-122	Basic Microbiology	2	2
	DSC	BC-123	Practical course- Basic Techniques in Biochemistry-II	2	4

S. Y. B. Sc. Biochemistry Course Structure

Term / Semester	Course Module	Subject Code	Title of Paper	Credit	Hours per Week
III	DSC	BC-231	Food Biochemistry	2	2
	DSC	BC-232	Human Physiology-I	2	2
	DSC	BC-233	Practical course based on BC-231 and BC-232	2	4
	SEC	BC-230	Microbial Isolation and Identification Techniques-I	2	2
IV	DSC	BC-241	Environmental Biochemistry	2	2
	DSC	BC-242	Human Physiology-II	2	2
	DSC	BC-243	Practical course based on BC-241 and BC-242	2	4
	SEC	BC-240	Microbial Isolation and Identification Techniques-II	2	2

T. Y. B. Sc. Biochemistry Course Structure

Term / Semester	Course Module	Subject Code	Title of Paper	Credit	Hours per Week
V	DSE	BC-351	Genetics	2	2
	DSE	BC-352	Plant Biochemistry	2	2
	DSE	BC-353	Clinical Biochemistry	2	2
	DSE	BC-354	Metabolism	2	2
	DSE	BC-355	Biophysical chemistry	2	2
	DSE	BC-356	Fermentation Technology	2	2
	DSE	BC-357	Practical Course- Techniques in Molecular Biology-I	2	4
	DSE	BC-358	Practical Course-Clinical Biochemistry-I	2	4
	DSE	BC-359	Practical Course- Analytical Biochemistry and Enzymology-I	2	4
	SEC	BC-350A / BC-350B	Samples and Solutions Preparation-I OR Recombinant DNA Technology-I	2	2
VI	DSE	BC-361	Genetic Engineering	2	2
	DSE	BC-362	Agrobiotechnology	2	2
	DSE	BC-363	Immunology	2	2
	DSE	BC-364	Enzymology	2	2
	DSE	BC-365	Bioanalytical Techniques	2	2
	DSE	BC-366	Biostatistics and Bioinformatics	2	2
	DSE	BC-367	Practical Course- Techniques in Molecular Biology-II	2	4
	DSE	BC-368	Practical Course- Clinical Biochemistry-II	2	4
	DSE	BC-369	Practical Course- Analytical Biochemistry and Enzymology-II	2	4
	SEC	BC-360A / BC-360B	Samples and Solutions Preparation-II OR Recombinant DNA Technology-II	2	2

Examination Pattern for the all Courses (40:10)

Nature	Marks
External Marks	40
Internal Marks	10
Total Marks	50

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ESTD. 1945

SYLLABUS

Biochemistry

F.Y.B. Sc.

(Semester I & II)

Under Choice Based Credit System (CBCS)

[w. e. f. Academic Year: 2019-20]

Prelude

The cumulative demand for trained and skilled manpower in the area of Biochemistry requires in depth functional knowledge of modern biology through hands-on training to the students.

The syllabus has been prepared anticipating the requirements of B.Sc. Biochemistry students under CBCS Program. The contents have been drawn to accommodate the widening horizons of the Biochemistry discipline and reflect the changing needs of the students. The detailed syllabus for each paper is appended with a list of suggested readings.

The degree of Bachelor of Science in Biochemistry (Choice Based Credit System) aims to introduce various aspects of Biochemistry and interdisciplinary subjects to the students. The program in Biochemistry as one of the core subject is designed to cultivate a scientific attitude and interest towards the modern areas of Biochemistry in particular and life science in general. This will help the students to become critical and curious in their outlook. The courses are designed to impart the essential basics in Biochemistry, Chemistry, Botany, Microbiology, Zoology and Biotechnology at the initial level of graduation. The basic courses are infused with application in modern life sciences, and awareness on Biochemistry and its influence in human life. The integration of various courses in the program is aimed to develop proficiency in the theory as well as practical experiments, common equipment, laboratory, along with the collection and interpretation and presentation of scientific data in proper manner. Beside this, the students will be equipped with knowledge in the newer areas of Biochemistry and its application in medical science, agriculture, industry, proteomics, genomics, metabolomics, bioinformatics, nano-biotechnology etc. This will create awareness about Biochemistry and contribution of Biochemistry among the society. At the end of the course, the students are expected to have good working knowledge in the field of Biochemistry and in addition knowledge gained from courses of interdisciplinary in nature. Students will surely have an urge to continue higher studies in Biochemistry and contribute significantly in the development.

The present syllabus is restructured anticipating the future needs of Biochemistry with more emphasis on imparting hands-on skills. The main thrust is laid on making syllabus compatible with developments in Education, Research and Industrial sectors. The Theory and Practical course in new restructured course will lead to impart skill-set essentials to further Biochemistry.

Hence, Board of Studies in Life Sciences in its meeting held on 20/06/2019 resolved to accept the revised syllabus for F. Y. B. Sc. (Biochemistry) based on Choice Based Credit System (CBCS) of UGC guidelines.

Course Structure:

Duration: The duration of B.Sc. (Biochemistry) degree program shall be three years.

Medium of instruction: The medium of instruction for the course shall be English.

The present syllabus has been prepared to (i) accommodate the advanced topic on the Biochemistry discipline, (ii) build the basic science knowledge at the level of first year of Biochemistry and (iii) reflect the changing needs of the students. The detailed syllabus for each paper is appended with a list of suggested readings.

At first year of under-graduation, students are given exposure to basic science to build the foundation of advance Biochemistry. For this purpose, more focus on relevant experimentation on the topics are included in practical course. In practical course, students will be trained in preparing laboratory manuals, standard operating practices and log books.

At second year under-graduation, students will be introduced to different areas necessary to form the basis of biotechnology like microbiology, biochemistry, human physiology. The relevant practical's are included to enrich their knowledge.

At third year under-graduation, six theory and three practical papers each for two semesters are included to uncover all applied areas of Biochemistry.

F. Y. B. Sc. Biochemistry Course Structure

Term / Semester	Course Module	Subject code	Title of Paper	Credit	Hours per week
I	DSC	BC-111	Basic Biochemistry-I	2	2
	DSC	BC-112	Cell Biology	2	2
	DSC	BC-113	Practical course- Basic Techniques in Biochemistry-I	2	4
II	DSC	BC-121	Basic Biochemistry-II	2	2
	DSC	BC-122	Basic Microbiology	2	2
	DSC	BC-123	Practical course- Basic Techniques in Biochemistry-II	2	4

Semester-I

BC- 111: Basic Biochemistry-I (Theory)

Total Hours: 30

Credits: 2

Course objective	To acquaint students with basic concepts of biomolecule chemistry	
Learning outcome	Student will be able to- <ul style="list-style-type: none">• Learn the elements present in biomolecules• Differentiate between monomers and polymers.• Explain the role of water in synthesis and breakdown of polymers.• Compare and contrast the structure and function of the oligo and polysaccharides.• Summarize the functions of proteins and able to recognize the importance of the three dimensional shape of a protein on its function and the role of non-covalent bonds in maintaining the shape of a protein.• Compare and contrast saturated, mono-unsaturated, and poly-unsaturated fatty acids	
Unit	Topic Particular	Hours
Unit I Carbohydrates	<ul style="list-style-type: none">• Definition, scope of Biochemistry• Biomolecules: Names of Biomolecules, their repeating units and their main function• Definition and biological importance of Carbohydrate• Classification of Carbohydrates: Monosaccharides, Oligosaccharides and Polysaccharides (definition, general formulae, and examples)• D & L forms of carbohydrates, epimers of glucose• Cyclic structure of monosaccharides: pyranose and furanose form (glucose and fructose)• Mutarotation: definition, example & mechanism• Derivatives of monosaccharides: sugar alcohols, sugar acids, sugar phosphates, deoxysugars, and amino sugars• Reactions of glucose – oxidation with bromine water and nitric acid, reduction, acetylation, addition of HCN, NH₂OH and phenyl hydrazine• Diasaccharides: sucrose, lactose, maltose• Homopolysaccharides: Starch, Glycogen, Cellulose• Heteropolysaccharides: Mucopolysaccharides, Hyaluronic acid, Chondroitin sulfate	10
Unit II	<ul style="list-style-type: none">• Definition and functions of lipids• Classification of lipids: Simple lipids, Compound lipids and Derived lipids with examples	10

Lipids	<ul style="list-style-type: none"> • Fatty acids: definition, nomenclature, Even & odd chain fatty acids, Saturated and unsaturated fatty acids • Essential fatty acids: definition, examples, functions, deficiency • Triacylglycerol: definition, occurrence, functions, structure (mono, di and triglycerols), simple and mixed triacylglycerol • Properties of triacylglycerol: hydrolysis, saponification, rancidity, antioxidant, lipid peroxidation • Purity evaluation of fats and oils: Iodine number, saponification number, Reichert-Meissl number, acid number • Comparative account on animal and plant fat • Functions of phospholipids • Classification of phospholipids - Glycerophospholipids- phosphatidic acid, lecithins, cephalins (structure and importance); Sphingophospholipids- structure and importance. • Steroids – structure and function of cholesterol and progesterone 	
Unit III Amino acids, peptides and proteins	<ul style="list-style-type: none"> • Amino acids - definition, general structure, optical isomers, classification of amino acids based on structure, nutrition and metabolic fate. • Chemical properties of amino acids – general reactions of amino acids with NaOH, alcohol, ammonia, ninhydrin, decarboxylation, transamination, oxidative deamination • Peptides – definition and formation of peptide bonds, N- and C- terminals, representation of peptide chain, naming of peptide chain • Protein - definition and levels of organization (primary, secondary, tertiary and quaternary). • Bonds responsible for protein structure - covalent bonds (peptide and disulfide), non-covalent bonds (hydrogen, hydrophobic, and electrostatic bonds. Van der Waals forces). • Classification of proteins based on shape, composition and solubility, biological functions and nutrition. • Denaturation of protein - agents and characteristics of denaturation. 	10
Suggested readings	<ul style="list-style-type: none"> • Nelson, D. L. and Cox, M.M. (2007) Lehninger's Principles of Biochemistry 4th edition, W.H. Freeman and Company, New York, USA. • Conn, E. E., Stumpf, P. K., Bruening G., Doi R. H. (2007) Outlines of Biochemistry, Wiley India (P) Ltd., New Delhi. • Stryer, L., Tymoczko J. L., Berg J. M. (2012) Biochemistry, W. H. Freeman and Company, New York, USA. • Rastogi S.C. (2001) Biochemistry, 7th edition, Tata McGraw- 	

	<p>Hill Publishing Company Ltd., New Delhi.</p> <ul style="list-style-type: none">• Satyanarayana, U. and Chakrapani U. (2010) Biochemistry, Books and Allied Pvt. Ltd., Kolkata, India.• Agarwal, G. R. Agarwal K., Agarwal O. P. (2005) Text Book of Biochemistry, 13th edition, Goel Publishing House, A unit of, Krishna Prakashan Media Pvt. Ltd., Meerut, India.• Jain, J. L., Jain, S. And Jain, N. (2005) Fundamentals of Biochemistry, 6th edition, S. Chand and Company Ltd., Delhi.	
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BC-112: Cell Biology (Theory)**Total Hours: 30****Credits: 2**

Course objective	To complement the students with the basic understanding on the general aspects of animals and plants cell biology	
Learning outcome	Student will be able to- <ul style="list-style-type: none">• Differentiate prokaryotic from eukaryotic cells and plant cells from animal cells• Discern structure and functions of cell organelles• Understand mitosis and meiosis processes.• Explain types of tissues and types of cell junctions	
Unit	Topic Particular	Hours
Unit I Ultra structure of cell	<ul style="list-style-type: none">• Definition of cell and its elemental composition• Characteristics of prokaryotic and eukaryotic cell• Comparative account on plant and animal cell• Structure and functions of - cell wall, cell membrane (Fluid Mosaic model), cytoplasm, mitochondria, golgi complex, endoplasmic reticulum (smooth and rough), chloroplast, nucleus, ribosomes, lysosomes	10
Unit II Cell division	<ul style="list-style-type: none">• Introduction to cell division• Mitosis- interphase, different phases and significance of mitosis• Meiosis- different phases of meiosis-I and II and its significance• Comparative account on mitosis and meiosis	08
Unit III Tissues and cell junctions	<ul style="list-style-type: none">• Tissues- definition and types• Epithelial tissues- general characteristics, functions and classification• Simple and compound epithelial tissues- types, brief description, functions and locations• Connective tissues- general characteristics and functions• Types of connective tissues (cartilage, bone and blood)- brief overview, functions and locations• Muscular tissues (skeletal, cardiac and smooth)- concise description, functions and locations• Nervous tissues (neuron and neuroglia)- introductory description, functions and locations• Cell junctions (complexes)- definition and types- tight junction, belt desmosome, spot desmosome and gap junction	12
Suggested	<ul style="list-style-type: none">• Powar C.B. (2012) Cell Biology, 3rd edition, Himalaya Publishing House, Mumbai	

readings	<ul style="list-style-type: none">• Chatterjee C.C. (2004) Human physiology Vol. I, 11th edition, Medical allied Agency, Kolkata, India.• Nelson,D.L. and Cox, M.M. (2007) Lehninger's Principles of Biochemistry 4th edition, W.H. Freeman and Company, New York, USA.• Conn, E. E., Stumpf, P. K., Bruening G., Doi R. H. (2007) Outlines of Biochemistry, Wiley India (P) Ltd., New Delhi.• Stryer, L., Tymcozko J. L., Berg J. M. (2012) Biochemistry, W. H. Freeman and Company, New York, USA.• Rastogi S.C. (2001) Biochemistry, 7th edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi.• Satyanarayana, U. and Chakrapani U. (2010) Biochemistry, Books and Allied Pvt. Ltd., Kolkata, India.	
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BC- 113: Basic Techniques in Biochemistry-I (Practical)**Total Hours: 60****Credits: 2**

Course objective	To acquaint with various techniques used in biochemistry	
Learning outcome	Student will be able to- <ul style="list-style-type: none">• Understand hazards and safety measure in laboratory.• Do normality, molarity, and percent solution based calculations.• Perform qualitative tests for carbohydrates, lipids and amino acids• Use, handling and care of compound microscope• Identify various phases of mitosis• Temporary mount available tissue	
Sr. No.	Title	Hours
1	Safety measures in the laboratory	4
2	Introduction of laboratory instruments - water bath, autoclave, hot-air oven, incubator, refrigerator, centrifuge, laminar air flow cabinet, pH meter, weighing balance, spectrophotometer.	4
3	Preparation of normal and molar, and percent solutions.	4
4	Preparation of buffers.	4
5	Qualitative tests for carbohydrates- anthrone test, iodine test, Barfoed test, Seliwanoff's test, Fehling's test, Bial's test	4
6	Isolation of starch from potato.	4
7	Qualitative tests for lipids- solubility test, acrolein test, presence of free fatty acids and unsaturated fatty acids	4
8	Qualitative tests for amino acids- Ninhydrin test, Xanthoproteic test, Ehrlich's test, Sodium nitroprusside test, Sullivan and McCarthy's test, Millon's test	4
9	Isolation of casein from milk.	4
10	Estimation of protein by Biuret method.	4
11	Use, handling and care of compound microscope.	4
12	Study of various phases of mitosis using suitable sample.	4

13	Temporary mounting of available tissues.	4
14	Differential staining for DNA and RNA in human cheek epithelial cells.	4
15	Visualization of mitochondria by Janus green stain	4
Suggested readings	<ul style="list-style-type: none"> • Cappuccino J. G. and Sherman N. (2014) Microbiology – a Laboratory Manual, 10th edition, Addison Wesley Publishing Company Inc., Boston, USA. • Wilson K. and Walker J. (2003) Practical Biochemistry: Principles and techniques, 5th edition, Cambridge University Press, UK. • Plummer D. T. (2005) An Introduction to Practical Biochemistry, 3rd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi. • Baker F. J. (1967) Handbook of bacteriological techniques, 2nd edition, Butterworth & Co Publishers Ltd., UK. • Oser B. L. (ed.) (1965) Hawk's physiological chemistry, 14th edition, McGraw-Hill Book Company, New York, USA. • Jayaraman J. (2008) Laboratory Manual in Biochemistry, New Age International (P) Ltd. Publishers, New Delhi. • Sadashivam S. and Manikam A. (2008) Biochemical Methods, 3rd edition, New Age International (P) Ltd. Publishers, New Delhi. • Aneja K. R. (2007) Experiments in Microbiology, Plant Pathology, and Biotechnology, 4th edition, New Age International (P) Ltd. Publishers, New Delhi. • Gunasekaran P. (2005) Laboratory Manual in Microbiology, 1st edition, New Age International (P) Ltd. Publishers, New Delhi. • Rao B. S. and Deshpande V. (2005) Experimental Biochemistry: A student companion, I. K. International Pvt. Ltd., New Delhi. 	

Note: Mandatory to perform at least 12 practical

Semester-II

BC-121: Basic Biochemistry-II (Theory)

Total Hours: 30

Credits: 2

Course objective	To complement the students with the fundamental concepts of biochemistry	
Learning outcome	Student will be able to- <ul style="list-style-type: none">• Recall DNA structure and functions• Discuss types and functions of RNA• Describe classification and properties of enzymes• Understand industrial applications of enzymes• Differentiate water soluble vitamins from fat soluble vitamins and understand clinical significance of the vitamins	
Unit	Topic Particular	Hours
Unit I Enzymes	<ul style="list-style-type: none">• Definition and historical background of enzyme.• Terminologies - intracellular enzymes, extracellular enzymes, holoenzymes, apoenzymes, prosthetic group, cofactor, coenzymes, isoenzymes, katal, international unit, turnover number and active site.• Nomenclature on the basis of – substrate acted upon by enzyme, type of reaction catalysed, substrate acted upon and type of reaction catalysed, substance (product) that is synthesized, over all chemical reaction taken into consideration (Enzyme commission number).• Classification of enzymes - six major classes with description and examples each with EC number and reaction.• Factors affecting enzyme activity - effect of substrate concentration, enzyme concentration, product concentration, pH, temperature, activators, time, and inhibitors.• Specificity of enzyme action - absolute specificity, group specificity, optical specificity and geometrical specificity.• Active site - definition and salient features of active site.• Mechanism of enzyme action – lock and key model, induced fit model.• Industrial applications of enzymes.	10
Unit II Nucleic	<ul style="list-style-type: none">• Definition and types of nucleic acid - DNA and RNA.• Structural components of DNA and RNA - phosphoric acid, pentose sugar, nitrogenous bases - purines and pyrimidine (numbering of purine and pyrimidine rings	10

<p>acids</p>	<p>and chemical names).</p> <ul style="list-style-type: none"> • Nucleosides - deoxyribonucleosides, ribonucleosides and nomenclature of nucleosides. • Nucleotides - deoxyribonucleotides, ribonucleotides, nomenclature of nucleotides, mono-, di- and tri- ribo and deoxyribonucleotides, functions of nucleotides. • DNA - formation of 3'5'-phosphodiester bond, Watson and Crick model of DNA, Chargaff's rule. • Forms of DNA - A-DNA, B-DNA, C-DNA and Z-DNA (condition, shape, helix diameter, rise per base pair, base pair per turn of helix, helix pitch, major and minor grooves). • Denaturation of DNA: definition and its effect on UV absorption, viscosity, and specific optical rotation. • Effect of pH and temperature on DNA denaturation, definition of renaturation of DNA. • RNA - : structure, differences with DNA and types of RNA. rRNA - prokaryotic and eukaryotic rRNA and types. tRNA - cloverleaf structure. mRNA - hnRNA, exons, introns, splicing, 5' capping, 3' poly A tail. 	
<p>Unit III Vitamins</p>	<ul style="list-style-type: none"> • Definition, history and nomenclature. Classification - fat-soluble and water soluble vitamins. • Fat-soluble vitamins - chemistry, dietary sources, recommended dietary allowance, biochemical functions, deficiencies, hypervitaminosis of vitamin A, D, E and K. • Water-soluble vitamins - chemistry, dietary sources, recommended dietary allowance, biochemical functions, deficiencies, hypervitaminosis of vitamin C, B1, B6, and B12. 	<p>10</p>
<p>Suggested readings</p>	<ul style="list-style-type: none"> • Nelson, D. L. and Cox, M.M. (2007) Lehninger's Principles of Biochemistry 4th edition, W.H. Freeman and Company, New York, USA. • Conn, E. E., Stumpf, P. K., Bruening G., Doi R. H. (2007) Outlines of Biochemistry, Wiley India (P) Ltd., New Delhi. • Stryer, L., Tymoczko J. L., Berg J. M. (2012) Biochemistry, W. H. Freeman and Company, New York • Rastogi S.C. (2001) Biochemistry, 7th edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi. • Satyanarayana, U. and Chakrapani U. (2010) Biochemistry, Books and Allied Pvt. Ltd., Kolkata, India. • Agarwal, G. R. Agarwal K., Agarwal O. P. (2005) Text Book of Biochemistry, 13th edition, Goel Publishing House, Krishna Prakashan Media Pvt. Ltd., Meerut, India. • Jain, J. L., Jain, S. and Jain, N. (2005) Fundamentals of Biochemistry, 6th edition, S. Chand & Company Ltd., Delhi. 	

BC-122: Basic Microbiology (Theory)

Total Hours: 30

Credits: 2

Course objective	To complement the students with the various concepts about microorganisms	
Learning outcome	Student will be able to- <ul style="list-style-type: none">• Explain types, characteristics and significance of microorganisms• Describe the structure and functions of major components of microbial cells• Understand microbial growth, its measurement and bacterial growth curves• Classify microorganisms based on nutrition• Apply isolation techniques to screen bacteria on solid media• Acquainted with various methods of sterilization and disinfection	
Unit	Topic Particular	Hours
Unit I Characteristics of Microorganisms	<ul style="list-style-type: none">• Types of microorganisms. General characteristics and significance of bacteria, algae, fungi, virus and protozoa. Nutrition, classification and mode of reproduction.• Major characteristics of microorganisms – morphological, chemical, metabolic, antigenic, and genetic characteristics.• Role of microorganisms in infection, fermentation, environment and agriculture.• Morphology and fine structure of bacteria - size, shape, arrangements, structure of bacterial cell,• Structure and functions of flagella, pilli, fimbriae, glycocalyx, capsule and cell wall of Gram positive and Gram negative bacteria.	10
Unit II Growth, Nutrition and Isolation of microorganisms	<ul style="list-style-type: none">• Concept of growth. Growth curve – lag, log, stationary and death phase.• Mathematical expression of growth – growth rate and generation time.• Measurement of growth<ul style="list-style-type: none">○ Methods for determination of cell number- direct (breed method, counting chamber method, Coulter method, proportion counting method) and indirect (total viable count)○ Determination of cell mass – direct (measurement of dry weight of cell, measurement of cell nitrogen) and indirect (turbidometric) methods.○ Determination of cell activity• Nutritional classification of microorganisms. Media – ingredients, types on the basis of physical state, composition and use.	10

	<ul style="list-style-type: none"> • Methods of isolation of bacteria on solid media - streak plate method, pour plate method, roll tube method and spread plate method. • Staining - concept of stains, acidic and basic stain, leuco compounds, intensifiers and mordant, aims of staining. 	
Unit III Control of Microorganisms	<ul style="list-style-type: none"> • Definitions- sterilization, disinfection, antiseptics, sanitization, decontamination, pasteurization, preservation, germicidal and bactericides • Sterilization <ul style="list-style-type: none"> ○ Heat- thermal death point, thermal death time, decimal reduction time <ul style="list-style-type: none"> ▪ Moist heat- mode of action, steam under pressure, Fractional sterilization, Boiling water, Pasteurization and canning ▪ Dry heat- mode of action, incineration, hot air oven ○ Radiation- ionizing radiations, non-ionizing radiations ○ Chemical sterilization- ethylene oxide, formaldehyde ○ Filtration • Disinfection: characteristics of an ideal disinfectant <ul style="list-style-type: none"> ○ Disinfectants- phenol and phenolic compounds, alcohol, heavy metals, halogens, dyes, detergents, hydrogen peroxide 	10
Suggested readings	<ul style="list-style-type: none"> • Stanier R. Y., Ingraham J. L., Wheelis M. L. and Painter P. R. (1992) General Microbiology, 5th edition, Macmillan Press Ltd. UK. • Pelczar M. J. Jr, Chan E. C. S., Krieg N. R. (1985) Microbiology, 5th edition, Tata McGraw-Hill Education Pvt. Ltd, India • Madigan M. T., Martinko J. M., Dunlap P. V. and Clark D. P. (2008) Brock Biology of Microorganisms 12th edition, Pearson Benjamin-Cummings, USA. • Chincholkar S. B., Chaudhari A. B., and Patil U. K. (2006) Foundation of Microbiology, 4th edition, Nirali Prakashan, Pune, India. • Wiley J. M., Sherwood L. M. and Woolverton C. J. (2017) Prescott's Microbiology 10th edition, McGraw Hill International, USA. • Frobisher M. Hindsill R., Crabtree K. T. and Goodheart C.R. (1974) Fundamentals of Microbiology, 9th edition, W. B. Saunder's Co. USA. • Powar C. B. & Dagainawala H. F. (1995) General Microbiology Vol. I and II, 2nd edition, Himalaya Publishing House, Mumbai 	

BC-123: Basic Techniques in Biochemistry-II (Practical)**Total Hours: 60****Credits: 2**

Course objective	To impart practical knowledge on basic techniques adopted in Biochemistry	
Learning outcome	Student will be able to understand- <ul style="list-style-type: none">• Working principle of spectrophotometer and able to handle spectrophotometer• Various staining techniques and Isolate bacteria by streak plate method• Viable counting technique of the micro-organisms.• Analysis quality of drinking water/potable water	
Sr. No.	Title	Hours
1	Qualitative test for amylase	4
2	Effect of substrate concentration on enzyme activity	4
3	Quantitative determination of DNA and RNA by spectrophotometric method	4
4	Thermal denaturation of DNA	4
5	Estimation of ascorbic acid by volumetric method	4
6	Monochrome staining	4
7	Negative staining	4
8	Gram staining techniques	4
9	To study motility of bacteria by hanging drop method	4
10	Preparation of culture media for bacterial cultivation (Nutrient broth and nutrient agar/ MacConkeys broth and MacConkes agar)	4
11	Isolation of bacteria by spread plate method from water/soil sample	4
12	Isolation and culture characterization of bacteria by streak plate techniques	4
13	Determination of viable count	4

14	Demonstration of bacterial growth by spectrophotometer	4
15	Demonstration of quality of drinking water	4
Suggested readings	<ul style="list-style-type: none"> • Cappuccino J. G. and Sherman N. (2014) Microbiology – a Laboratory Manual, 10th edition, Addison Wesley Publishing Company Inc., Boston, USA. • Wilson K. and Walker J. (2003) Practical Biochemistry: Principles and techniques, 5th edition, Cambridge University Press, UK. • Plummer D. T. (2005) An Introduction to Practical Biochemistry, 3rd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi. • Baker F. J. (1967) Handbook of bacteriological techniques, 2nd edition, Butterworth & Co Publishers Ltd., UK. • Oser B. L. (ed.) (1965) Hawk's physiological chemistry, 14th edition, McGraw-Hill Book Company, New York, USA. • Jayaraman J. (2008) Laboratory Manual in Biochemistry, New Age International (P) Ltd. Publishers, New Delhi. • Sadashivam S. and Manikam A. (2008) Biochemical Methods, 3rd edition, New Age International (P) Ltd. Publishers, New Delhi. • Aneja K. R. (2007) Experiments in Microbiology, Plant Pathology, and Biotechnology, 4th edition, New Age International (P) Ltd. Publishers, New Delhi. • Gunasekaran P. (2005) Laboratory Manual in Microbiology, 1st edition, New Age International (P) Ltd. Publishers, New Delhi. • Rao B. S. and Deshpande V. (2005) Experimental Biochemistry: A student companion, I. K. International Pvt. Ltd., New Delhi. 	

Note: Mandatory to perform at least 12 practical

Skills acquired and Job prospectus for the Biochemistry students

Biochemistry is the molecular basis of life. Degree program in Biochemistry teaches students how inanimate, lifeless chemicals combine to produce a functional living organism. A significant attraction of the course is the ability to combine in-depth scientific knowledge with practical laboratory skills and the career opportunity in all sectors.

After successful completion of three years degree course in Biochemistry, student will be well versed with laboratory skills and transferable skills.

Laboratory Skills:

- Laboratory safety practices
- Accurate weighing and reagent preparation
- Skillful handling of basic and advanced instruments
- Calibration of basic instruments like pH meter, micropipettes etc
- Advanced techniques like:
 - Chromatography
 - Electrophoresis
 - Spectrometry
 - Polymerase Chain Reaction (PCR)
 - Plant Tissue Culture
 - Animal Tissue Culture
- Aseptic techniques
- Logical thinking
- Analysis and interpretation of results
- Collection, organization and presentation of data

Transferable Skills:

During the course student will develop skills other than laboratory skills that are transferable across the number of career areas. These are:

- Analytical skill
- Report writing skill
- Presentation skill
- Time management
- Creative thinking
- Problem solving
- IT skills
- Planning
- Observational skill

Job Opportunities:

After successful completion of B.Sc. in Biochemistry, student may continue further studies like M.Sc. in Biochemistry and then Ph.D. in Biochemistry and make career in research field. Students have opportunities in private as well as public (Government) sectors.

Private Sector:

Biochemist can work in quality control, quality assurance and R & D divisions of companies like- Biotech companies, Pharmaceutical companies, Chemical manufacturing companies, Food and Drink (includes brewing), Health and Beauty Care, Medical Instrument companies, Agricultural companies, Research Companies and Laboratories etc.

Public Sectors:

Blood Service, Cancer research institutes, Environmental Pollution Control, Forensic Science, Hospitals, National Blood Services, Overseas Development, Public Health Entities, Public Health Laboratories, Agriculture and fisheries etc.

Job profiles:

Biochemist, Biologist, Biomedical Scientist, Biotechnologist, Chemical Examiners, Chemist, Clinical Scientist, Food Scientist, Forensic Scientist, Laboratory Technician, Microbiologist, Research Associates, Research Officers, Research Scientist etc.