

JD-20 & 21 June, 2017 AC after Circulars

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DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY



CIRCULAR NO.SU/Sci./Model College/Biotech./39/2017

It is hereby informed to all concerned that, the syllabus prepared by the Committee & recommended by the Dean, Faculty of Science & Technology, the Hon'ble Vice-Chancellor **has accepted the "Revised Syllabus of B.Sc. Honors degree course in Biochemistry third year (V & VI semester)** under the Faculty of Science & Technology in his emergency powers under section 12(7) of the Maharashtra Public Universities Act, 2016 on behalf of the Academic Council **at Model College, Ghansawangi, Dist-Jalna as appended herewith.**

This shall be effective from the Academic Year 2017-2018 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.No. SU/SCI/2017/5780
Date:-19.09.2017.

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Deputy Registrar,
Syllabus Section.

Copy forwarded with compliments to :-

- 1] **The Principal, Model College, Ghansawangi, Dist- Jalna.**
- 2] **The Director, University Network & Information Centre, UNIC, with a request to upload this Circular on University Website.**

Copy to :-

- 1] The Director, Board of Examinations & Evaluation, Dr.BAMU,A'bad.
- 2] The Section Officer, [B.Sc.Unit] Examination Branch, Dr.BAMU,A'bad.
- 3] The Section officer, [Eligibility Unit], Dr.BAMU,A'bad.
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- 6] The In-charge, [E-Suvidha Kendra], Rajarshi Shahu Maharaj Pariksha Bhavan, Dr. Babasaheb Ambekar Marathwada University.
- 7] The Public Relation Officer, Dr.BAMU,A'bad.
- 8] The Record Keeper. Dr.BAMU,A'bad.

**DR. BABASAHEB AMBEDKAR
MARATHWADA UNIVERSITY,
AURANGABAD.**



**Syllabus of
B.Sc. Biochemistry [Honors]
IIIrd Year
[Vth & VII Semester]
Run at Model College, Ghansawangi ,
Dist - Jalna.**

[Effective from the Academic Year 2017-18 & onwards]

**B.SC BIOCHEMISTRY SYLLABUS FOR GHANSAWANGI MODEL
COLLEGE**

	Language	Vocational		Core	Supportive	Applied		Total credit
	English SL	JOC VOC	I	Molecules of life	Cell biology	Tools and technique of biochemistry I	Laboratory Course-I	
	8	4		5	4	4	5	30
I	English SL	JOC VOC	II	Enzymology	Protein biochemistry	Protein purification techniques	Laboratory Course-II	
	8	4		5	4	4	5	30
	English SL	JOC VOC	III	Metabolism I (Carbohydrate and lipids)	Hormone biochemistry and function	Membrane biology and bioenergetics	Laboratory Course-III	
	8	4		5	4	4	5	30
	English SL	JOC VOC	IV	Metabolism II (Aminoacids and nucleotides)	Gene organization replication and repair	Immunology	Laboratory Course-IV	
				5	4	4	5	30
	Research methodology-I	Project	V	Gene expression and regulation	Bioinformatics	Nutritional biochemistry	Laboratory Course-V/project	
				5	4	4	5	30
	Research methodology-II	Project	VI	Recombinant DNA technology	Plant biochemistry	Clinical biochemistry	Laboratory Course-VI/project	
				5	4	4	5	30

Course structure

RESEARCH METHODOLOGY SEMESTER – V

CREDITS:

Unit 1 Introduction to Research Methodology

Objectives and motivation in research.

Unit 2 Defining the Research Problem

Selecting and defining a research problem, Reviewing and conducting literature search, Developing a research plan.

Unit 3 Designing of Experiment

Different experimental designs – single and multifactorial design, Making measurements and sources of error in measurements, Methods of data collection and record keeping.

Unit 4 Data Processing and Statistical Analysis

Processing operations, tabulation, and graphical representation, Statistics in research: Concepts of sample and population, Measure of central tendency, dispersion, asymmetry (skewness, kurtosis), Normal distribution (p-value), Statistical tests and hypothesis (Standard error, t-test, chi-square test), and regression analysis, Report writing, Writing a research paper - abstract, introduction, methodology, results and discussion.

Based on the teaching above, each student will undertake the following exercises.

1. A teacher (adviser) who would guide the student will discuss with student and identify a topic of mutual interest.
2. The student will collect the literature, collate the information and write the same in the form of a term paper with proper incorporation of references using appropriate software such as EndNote.
3. The student will identify scope of research on the topic and will frame objectives to be addressed in the project through a work plan.
4. The student will write standard operating protocols (SOPs) and identify requirement for equipment and reagents.
5. Each student will be asked to make presentation about the project including literature available, objective sought and work plan including methodologies as described above.

SUGGESTED READINGS

1. Research in Education (1992) 6th ed., Best, J.W. and Kahn, J.V., Prentice Hall of India Pvt. Ltd.
2. At the Bench: A Laboratory Navigator (2005) Barker, K., Cold Spring Harbor Laboratory Press (New York), ISBN: 978-087969708-2.

3. Research Methodology - Methods and Techniques (2004) 2nd ed., Kothari C.R., New Age International Publishers.
4. Research Methodology: A Step by Step Guide for Beginners (2005) 2nd ed., Kumar R., Pearson Education.
5. Biostatistics: A Foundation for Analysis in the Health Sciences (2009) 9th ed., Daniel W.W., John Wiley and Sons Inc.
6. Statistics at the Bench: A Step-by-Step Handbook for Biologists (2010) Bremer, M. and Doerge, R.W., Cold Spring Harbor Laboratory Press (New York), ISBN: 978-0-879698-57-7.

**BCH-: GENE EXPRESSION AND REGULATION
(THEORY)
SEMESTER - V**

CREDITS: 5

Unit 1 Biosynthesis of RNA in prokaryotes

RNA polymerases, transcription cycle in bacteria, sigma factor, bacterial promoters, identification of DNA binding sites by DNA footprinting, the three stages of RNA synthesis, initiation, elongation and termination, rho-dependent and rho-independent termination. Inhibitors of transcription and applications as anti-microbial drugs.

Unit 2 Biosynthesis of RNA in eukaryotes

Comparison between prokaryotic and eukaryotic transcription. Transcription by RNA polymerase II, RNA polymerase II core promoters, general transcription factors, various types of RNA processing, transcription by RNA polymerase I and III. Inhibitors of eukaryotic transcription and their applications. Comparison of fidelity of transcription and replication.

Unit 3 RNA splicing

Chemistry of RNA splicing, the spliceosome machinery, splicing pathways, group I and group II introns, alternative splicing, exon shuffling, RNA editing.

Unit 4 The genetic code

Degeneracy of the genetic code, wobble in the anticodon, features of the genetic code, nearly universal code.

Unit 5 Biosynthesis of proteins

Messenger RNA, transfer RNA, attachment of amino acids to tRNA, the ribosome - initiation, elongation and termination of translation, regulation of translation. Comparison of prokaryotic and eukaryotic protein synthesis. Use of antibiotics in understanding protein synthesis and applications in medicine.

Unit 6 Protein targeting and degradation

Post translational modifications, glycosylation, signal sequences for nuclear transport, bacterial signal sequences, import of proteins by receptor mediated endocytosis, specialized systems for protein degradation.

Unit 7 Regulation of gene expression in prokaryotes

Principles of gene regulation, negative and positive regulation, concept of operons, regulatory proteins, activators, repressors, DNA binding domains, regulation of lac operon and trp operon, induction of SOS response, synthesis of ribosomal proteins, regulation by genetic recombination, transcriptional regulation in λ bacteriophage.

Unit 8 Regulation of gene expression in eukaryotes

Heterochromatin, euchromatin, chromatin remodeling, regulation of galactose metabolism in yeast, regulation by phosphorylation of nuclear transcription factors, regulatory RNAs, riboswitches, RNA interference, synthesis and function of miRNA molecules, phosphorylation of nuclear transcription factors.

BCH-: BIOINFORMATICS SEMESTER - V

CREDITS: 4

Unit 1 Introduction to bioinformatics

Computer fundamentals - programming languages in bioinformatics, role of supercomputers in biology. Historical background. Scope of bioinformatics - genomics, proteomics, computer aided drug design (structure based and ligand based approaches) and Systems Biology. Applications of bioinformatics.

Unit 2 Biological databases and data retrieval

Introduction to biological databases - primary, secondary and composite databases, NCBI, nucleic acid databases (GenBank, EMBL, DDBJ, NDB), protein databases (PIR, Swiss-Prot, TrEMBL, PDB), metabolic pathway database (KEGG, EcoCyc, and MetaCyc), small molecule databases (PubChem, Drug Bank, ZINC, CSD). Structure viewers (Ras Mol, J mol), file formats.

Exercises

- Sequence retrieval (protein and gene) from NCBI.
- Structure download (protein and DNA) from PDB.
- Molecular file formats - FASTA, GenBank, Genpept, GCG, CLUSTAL, Swiss-Prot, FIR.
- Molecular viewer by visualization software.

Unit 3 Sequence alignment

Similarity, identity and homology. Alignment – local and global alignment, pairwise and multiple sequence alignments, alignment algorithms, amino acid substitution matrices (PAM and BLOSUM), BLAST and CLUSTALW.

Exercises

- BLAST suite of tools for pairwise alignment.
- Multiple sequence alignment using CLUSTALW.

Unit 4 Phylogenetic analysis

Construction of phylogenetic tree, dendrograms, methods of construction of phylogenetic trees - maximum parsimony, maximum likelihood and distance methods.

Exercise

- Generating phylogenetic tree using PHYLIP.

Unit 5 Protein structure prediction and analysis

Levels of protein structure. Protein tertiary structure prediction methods - homology modeling, fold recognition and *ab-initio* methods. Significance of Ramachandran map.

Exercises

- Primary sequence analyses (Protparam).
- Secondary structure prediction (GOR, nnPredict).
- Tertiary structure prediction (SWISSMODEL).
- Protein structure evaluation - Ramachandran map (PROCHECK).

Unit 6 Genomics

Introduction to genomics, comparative and functional genomics, gene structure in prokaryotes and eukaryotes, gene prediction methods and tools.

Exercise

- Gene prediction using GENSCAN and GLIMMER.

SUGGESTED READINGS

1. Bioinformatics: Sequence and Genome Analysis (2001), 1st ed., Mount, D.W. Cold Spring Harbor Laborator Press (New York), ISBN: 0-87969-608-7.
2. Bioinformatics and Functional Genomics (2003), 1st ed., Pevsner, J., John Wiley & Sons, Inc. (New Jersey), ISBN: 0-47121004-8.
3. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins (2005), 3rd ed., Baxevanis, A.D. and Ouellette, B.F., John Wiley & Sons, Inc. (New Jersey), ISBN: 0-47147878-4.
4. Bioinformatics – Principles and Applications (2008), 1st ed. Ghosh, Z. and Mallick, B., Oxford University Press (India), ISBN: 9780195692303.

BCH:- NUTRITIONAL BIOCHEMISTRY (THEORY)
SEMESTER – V

CREDITS: 4

Unit 1 Introduction to Nutrition and Energy Metabolism

Defining Nutrition, role of nutrients. Unit of energy, Biological oxidation of foodstuff. measurement of energy content of food, Physiological energy value of foods, SDA. Measurement of energy expenditure. Direct and Indirect Calorimetry, factors affecting thermogenesis, energy utilization by cells, energy output – Basal and Resting metabolism, physical activity, factors affecting energy input - hunger, appetite, energy balance Energy expenditure in man. Estimating energy requirements, BMR factors Recommended Nutrient Intakes (RNI) and Recommended Dietary Allowances for different age groups.

Unit 2 Dietary carbohydrates and health

Review functions of carbohydrates. Digestion, absorption, utilization and storage, hormonal regulation of blood glucose. Dietary requirements and source of carbohydrates, Dietary fiber, role of fibre in lipid metabolism, colon function, blood glucose level and GI tract functions.

Unit 3 Dietary lipid and health

Review of classification, sources, functions, digestion, absorption, utilization and storage. Essential Fatty Acids; Functions of EFA, RDA, – excess and deficiency of EFA. Lipotropic factors, role of saturated fat, cholesterol, lipoprotein and triglycerides. Importance of the following: a) Omega – fatty acids. Omega 3/ omega 6 ratio b) Phospholipids c) Cholesterol in the body d) Mono, Polyunsaturated and Saturated Fatty Acids. Dietary implications of fats and oils, Combination ratios of n6 and n3, MUFA, PUFA and SFA.

Unit 4 Dietary Proteins and health

Review of functions of proteins in the body, Digestion and absorption. Essential and Non-essential amino acids. Amino Acid Availability Antagonism, Toxicity and Imbalance, Amino acid Supplementation. Effects of deficiency. Food source and Recommended Dietary Allowances for different age group. Amino acid pool. NPU, Biological Value, Nitrogen balance. PEM and Kwashiorkor.

Unit 5 Fat and water soluble Vitamins

Vitamin A, C, E, K and D Dietary sources, RDA, Adsorption, Distribution, Metabolism and excretion (ADME), Deficiency. Role of Vitamin A as an antioxidant, in Visual cycle, dermatology and immunity. Role of Vitamin K in Gamma carboxylation. Role of Vitamin E as an antioxidant. Extra-skeletal role of Vitamin D and its effect on bone physiology. Hypervitaminosis. Vitamin C role as cofactor in amino acid modifications. Niacin-Metabolic interrelation between tryptophan, Niacin and NAD/ NADP. Vitamin B6-Dietary source, RDA, conversion to Pyridoxal Phosphate. Role in metabolism, Biochemical basis for deficiency symptoms. Vitamin B12 and folate; Dietary source, RDA, absorption, metabolic role Biochemical basis for deficiency symptoms.

Unit 6 Minerals

Calcium, Phosphorus and Iron - Distribution in the body digestion, Absorption, Utilization, Transport, Excretion, Balance, Deficiency, Toxicity, Sources, RDA. Calcium: Phosphorus ratio, Role of iron in prevention of anemia. Iodine and iodine cycle. Iodine, Fluoride, Mg, Cu,

Zn, Se, Manganese, Chromium, Molybdenum Distribution in the human body, Physiology, Function, deficiency, Toxicity and Sources

Unit 7 Assessment of Nutritional status

Anthropometric measurements; Z scores, BMI, skinfold, circumference ratios. Biochemical assessment; Basal metabolic panel, Comprehensive metabolic panel, CBC, Urine Analysis, Assessment of Anemia, ROS assessment, GTT and glycosylated Hb, Differential diagnosis of B12 and folate.

Unit 8 Food and drug interactions and Nutraceuticals

Nutrient interactions affecting ADME of drugs, Alcohol and nutrient deficiency, Anti-depressants, psychoactive drugs and nutrient interactions, Appetite changes with drug intakes and malnutrition. Food as medicine.

BCH- LABORATORY COURSE - V

CREDITS: 5

1. Bioassay for vitamin B12/B1.
2. Homocystiene estimation.
3. Serum/ urine MMA estimation.
4. Anthropometric identifications for Kwashiorkor, Marasmus and Obesity.
5. Determination of oxidative stress: TBARS, antioxidant enzymes in hemolysate.
6. Vitamin A/E estimation in serum.
7. Bone densitometry /bone ultrasound test demonstration (visit to a nearby clinic)

SUGGESTED READINGS

1. Textbook of Biochemistry with Clinical Correlations (2011) Devlin, T.M. John Wiley & Sons, Inc. (New York), ISBN: 978-0-4710-28173-4.
2. Nutrition for health, fitness and sport (2013) ; Williams.M.H,Anderson,D.E, Rawson,E.S. McGraw Hill international edition. ISBN-978-0-07-131816-7.
3. Krause's Food and Nutrition Care process.(2012); Mahan, L.K Strings,S.E, Raymond,J. Elsevier's Publications. ISBN- 978-1-4377-2233-8.
4. The vitamins, Fundamental aspects in Nutrition and Health (2008); G.F. Coombs Jr. Elsevier's Publications. ISBN-13- 978-0-12- 183493-7.
5. Principles of Nutritional Assessment (2005) Rosalind Gibson. Oxford University Press.

**BCH-: RESEARCH PROJECT
SEMESTER – V**

CREDITS: 6

This paper would focus on the project work / dissertation to be carried out by the students in the supervision of the teachers in the colleges. The topic of the project would be selected by each student in consultation with the teacher (Advisor). This would train the student to retrieve the literature and collate the information sufficient to make a presentation, the collated literature would also prepare the base for initiating the research. The student would carryout experiments to achieve the planned objectives, collation and analysis of data, presentation of the result in the form of a Dissertation. The grading would be based on continuous evaluation that would include punctuality, hard work, record keeping, intellectual inputs, data presentation, interpretation etc.

RESEARCH METHODOLOGY – II SEMESTER –VI

CREDITS:

Unit 1 Introduction to Research Methodology

Objectives and motivation in research.

Unit 2 Defining the Research Problem

Selecting and defining a research problem, Reviewing and conducting literature search, Developing a research plan.

Unit 3 Designing of Experiment

Different experimental designs – single and multifactorial design, Making measurements and sources of error in measurements, Methods of data collection and record keeping.

Unit 4 Data Processing and Statistical Analysis

Processing operations, tabulation, and graphical representation, Statistics in research: Concepts of sample and population, Measure of central tendency, dispersion, asymmetry (skewness, kurtosis), Normal distribution (p-value), Statistical tests and hypothesis (Standard error, t-test, chi-square test), and regression analysis, Report writing, Writing a research paper - abstract, introduction, methodology, results and discussion.

Based on the teaching above, each student will undertake the following exercises.

6. A teacher (adviser) who would guide the student will discuss with student and identify a topic of mutual interest.
7. The student will collect the literature, collate the information and write the same in the form of a term paper with proper incorporation of references using appropriate software such as EndNote.
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9. The student will write standard operating protocols (SOPs) and identify requirement for equipment and reagents.
10. Each student will be asked to make presentation about the project including literature available, objective sought and work plan including methodologies as described above.

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3. Research in Education (1992) 6th ed., Best, J.W. and Kahn, J.V., Prentice Hall of India Pvt. Ltd.
4. At the Bench: A Laboratory Navigator (2005) Barker, K., Cold Spring Harbor Laboratory Press (New York), ISBN: 978-087969708-2.

7. Research Methodology - Methods and Techniques (2004) 2nd ed., Kothari C.R., New Age International Publishers.
8. Research Methodology: A Step by Step Guide for Beginners (2005) 2nd ed., Kumar R., Pearson Education.
9. Biostatistics: A Foundation for Analysis in the Health Sciences (2009) 9th ed., Daniel W.W., John Wiley and Sons Inc.
10. Statistics at the Bench: A Step-by-Step Handbook for Biologists (2010) Bremer, M. and Doerge, R.W., Cold Spring Harbor Laboratory Press (New York), ISBN: 978-0-879698-57-7.

BCH-: RECOMBINANT DNA TECHNOLOGY SEMESTER - VI

CREDITS: 5

Unit 1 : Recombinant DNA Technology

Structure of DNA: A-,B-,Z-, and triplex DNA, Types of restriction enzyme, Cohesive and blunt end ligation, linkers, adaptors, homopolymeric tailing. Labeling of DNA: Nick translation, random priming, radioactive and non-radioactive probes, use of Klenow enzyme, T4 DNA polymerase, bacterial alkaline phosphatase, polynucleotide kinase. Hybridization techniques: Northern, Southern and Colony hybridization, Fluorescence in situ hybridization Restriction maps and mapping techniques, DNA fingerprinting, chromosome walking & chromosome Jumping.

Unit 2 : Cloning Vectors

Gene Cloning Vectors: Plasmids, bacteriophages, Cloning in M13 mp vectors, phagemids, Lambda vectors; insertion and replacement vectors, EMBL, RDASH, Rgt10/11, RZAP etc. Cosmid vectors. Artificial chromosome vectors (YACs, BACs), Animal Virus derived vectors- SV-40, vaccinia/baculo & retroviral vectors. Expression vectors

Unit 3 : Cloning Methods and Strategies

Insertion of Foreign DNA into Host Cells: Transformation, Transfection: Chemical and physical methods, liposomes, microinjection, macroinjection, electroporation, biolistics, somatic cell fusion, gene transfer by pronuclear microinjection, Plant transformation technology: Basis of tumor formation, hairy root, features of Ti and Ri plasmids, mechanism of DNA transfer, role of virulence genes, use of Ti and Ri as vectors.

Unit 4: Cloning and Expression

Cloning and expression in yeasts (*Saccharomyces*, *Pichia* etc.), animal and plants cells, methods of selection and screening, cDNA and genomic cloning, expression cloning, jumping and hopping libraries, southwestern and far western cloning, yeast two hybrid system, phage display, Construction of cDNA libraries in plasmids and screening methodologies,

Construction of cDNA and genomic DNA libraries in lambda vector. Principles in maximizing gene expression, Site-directed mutagenesis.

Suggested readings:

1. Sambrook J, Fritsch E. F. and Maniatis (1989) Molecular cloning, vol. I, II, III, II nd edition, Cold spring harbor laboratory press, New York.
2. DNA Cloning : A practical approach D.M. Glover and D.B. Hames, RL Press, Oxford, 1995
3. Molecular and cellular methods in Biology and Medicine, P.B. Kaufman, W. Wu , D. Kim and L.J. Cseke, CRC Press Florida 1995
4. Methods in Enzymology Guide to Molecular Cloning Techniques, Vol. 152 S.L. Berger and A. R. Kimmel, Academic Press Inc, San Diego, 1996
5. Methods in Enzymology Gene Expression Technology, Vol. 185D. V. Goedel, Academic Press Inc, San Diego, 1990
6. DNA Science: A First Course in Recombinant Technology, D. A. Mickloss and G. A Freyer, Cold Spring Harbor Laboratory Press, New York, 1990
7. Molecular Biotechnology, 2nd Ed. S. B. Primrose, Blackwell Scientific publishers, Oxford, 1994
8. Milestones in Biotechnology, Classic Papers on Genetic Engineering, J. A. Davis and W. S. Reznikoff, Butterworth-Heinemann Boston 1992
9. Route Maps in Gene Technology, M. R. Walker, and R. Rapley, Blakwell Science, Oxford, 1997
10. Genetic Engineering : An Introduction to Gene Analysis and Exploitation in Eukaryotes, S. M. Kingsman, Blackwell Scientific Publications, Oxford, 1998.

BCH-: PLANT BIOCHEMISTRY (THEORY)
SEMESTER – VI

CREDITS: 4

Unit 1 Introduction to Plant cell structure

Plasma membrane, Vacuole and tonoplast membrane, cell wall, plastids and peroxisomes.

Unit 2 Photosynthesis and Carbon assimilation

Structure of PSI and PSII complexes, Light reaction, Cyclic and non cyclic photophosphorylation, Calvin cycle and regulation; C4 cycle and Crassulacean acid metabolism (CAM), Photorespiration.

Unit 3 Respiration

Overview of glycolysis, Alternative reactions of glycolysis, Regulation of plant glycolysis, Translocation of metabolites across mitochondrial membrane, TCA cycle, Alternative NAD(P)H oxidative pathways; Cyanide resistant respiration.

Unit 4 Nitrogen metabolism

Biological Nitrogen fixation by free living and in symbiotic association, structure and function of enzyme Nitrogenase. Nitrate assimilation: Nitrate and Nitrite reductase. Primary and secondary ammonia assimilation in plants; ammonia assimilation by Glutamine synthetase- glutamine oxoglutarate amino transferase (GS-GOGAT) pathway. Seed storage proteins in legumes and cereals.

Unit 5 Regulation of plant growth

Introduction to plant hormones and their effect on plant growth and development, Regulation of plant morphogenetic processes by light.

Unit 6 Secondary metabolites

Representatives alkaloid group and their amino acid precursors, function of alkaloids, Examples of major phenolic groups; simple phenylpropanoids, Coumarins, Benzoic acid derivatives, flavonoids, tannins and lignin, biological role of plant phenolics, Classification of terpenoids and representative examples from each class, biological functions of terpenoids.

Unit 6 Plant tissue culture

Cell and tissue culture techniques, types of cultures: organ and explants culture, callus culture, cell suspension culture and protoplast culture. Plant regeneration pathways: organogenesis and somatic embryogenesis. Applications of cell and tissue culture and somoclonal variation.

BCH : CLINICAL BIOCHEMISTRY (THEORY)

SEMESTER – VI

Unit 1 NUTRITION

Major and minor nutrients, composition of food - calorific values, physiological fuel value, biological value and nitrogen balance. Protein calorie malnutrition, Kwashiorkor and Marasmus. Nutrition in childhood, pregnancy old age and disorders such as diabetes, obesity, coronary disorders and in starvation.

Unit 2 LABORATORY SETUP AND SAFETY, ENZYMES AND ANALYTES

Requirements of setting up of clinical laboratory, SI units in clinical laboratory, collection preparation, preservation, and handling of clinical samples, quality control, Safety measures in clinical laboratory. Formulation of clinical and diagnostic kits, Safety aspects. Use of LDH, SGPT, SGOT, acid and alkaline phosphatase, amylase, lipase, cholesterol, albumin, creatinine etc. in diagnosis and monitoring of disorders.

Unit 3 INBORN ERRORS OF METABOLISM

Disorders associated with carbohydrate metabolism-glycogen storage diseases, galactosemia. Protein metabolism – phenylketonuria, albinism, alcaptonuria Lipid metabolism – Niemann – Pick disease, Tay-Sach's disease, I-cell disease Disorders due to chromosomal aberrations – Down's syndrome, Turner's syndrome, Klinefelter's syndrome molecular basis and symptoms.

Unit 4 GERIATRIC BIOCHEMISTRY AND PHYSIOLOGY, AGEING

Physiological and biochemical changes in ageing. Different theories of ageing, Importance of superoxide dismutase in ageing, plasticity and regeneration.

Unit 5 ENDOCRINE DISORDERS AND DIAGNOSTIC METHODS

Disorders of pituitary, thyroid, pancreatic and adrenal secretions, biochemical assessment, handling of samples, biological and immunological assays, use of ELISA, RIA and IRMA techniques in assay of hormones.

BCH-: LABORATORY COURSE VI

CREDITS: 5

1. Induction of hydrolytic enzymes proteinases /amylases/lipase during germination
2. Extraction and assay of Urease from Jack bean
3. Estimation of carotene/ascorbic acid/phenols/tannins in fruits and vegetables
4. Separation of photosynthetic pigments by TLC
5. Culture of plant plants (explants).

SUGGESTED READINGS

1. Plant Biochemistry (2008), Caroline Bowsher, Martin steer, Alyson Tobin, Garland science ISBN 978-0-8153-4121-5
2. Biochemistry and molecular Biology of plant-Buchanan. (2005) 1 edition. Publisher: I K International. ISBN-10: 8188237116, ISBN-13: 978-8188237111.
3. Plant Biochemistry by P.M Dey and J.B. Harborne (Editors) (1997) Publisher: Academic Press ISBN-10:0122146743, ISBN-13:978-0122146749

BCHA-: PRACTICAL SEMESTER – VI

CREDITS: 4

Unit 1 Introduction

Organization of clinical laboratory, Introduction to instrumentation and automation in clinical biochemistry laboratories safety regulations and first aid. General comments on specimen collection, types of specimen for biochemical analysis. Precision, accuracy, quality control, precautions and limitations.

Exercises

- Collection of blood and storage.
- Separation and storage of serum.

Unit 2 Evaluation of biochemical changes in diseases

Basic hepatic, renal and cardiovascular physiology. Biochemical symptoms associated with disease and their evaluation. Diagnostic biochemical profile.

Unit 3 Assessment of glucose metabolism in blood

Clinical significance of variations in blood glucose. Diabetes mellitus.

Exercises

- Estimation of blood glucose by glucose oxidase peroxidase method.

Unit 4 Lipid profile

Composition and functions of lipoproteins. Clinical significance of elevated lipoprotein.

Exercises

- Estimation of triglycerides.

Unit 5 Liver function tests

Exercises

- Estimation of bilirubin (direct and indirect).

Unit 6 Renal function tests and urine analysis

Use of urine strip / dipstick method for urine analysis.

Exercises

- Quantitative determination of serum creatinine and urea.

Unit 7 Tests for cardiovascular diseases

Involvement of enzymes in diagnostics of heart disease including aspartate transaminase, isoenzymes of creatine kinase and lactate dehydrogenase and troponin.

Exercises

- Estimation of creatine kinase MB.

SUGGESTED READINGS

1. Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests Vol. I (2010), Mukherjee, K.L., Tata Mc Graw–Hill Publishing Company Limited (New Delhi). ISBN:9780070076594 / ISBN:9780070076631
2. Medical Laboratory Technology - a Procedure Manual for Routine Diagnostic Tests Vol. II (2010), Mukherjee, K.L., Tata Mc Graw – Hill Publishing Company Ltd. (New Delhi), ISBN: 9780070076648.
3. Medical Biochemistry (2005) 2nd ed., Baynes, J.W. and Dominiczak, M.H., Elsevier Mosby Ltd. (Philadelphia), ISBN:0-7234-3341-0.
4. Experimental Biochemistry: A Student Companion (2005) Rao, B.S. and Deshpande, V., IK International Pvt. Ltd. (New Delhi), ISBN:81-88237-41-8.

**BCH-: RESEARCH PROJECT
SEMESTER – VI**

CREDITS:

This paper would focus on the project work / dissertation to be carried out by the students in the supervision of the teachers in the colleges. The topic of the project would be selected by each student in consultation with the teacher (Advisor). This would train the student to retrieve the literature and collate the information sufficient to make a presentation, the collated literature would also prepare the base for initiating the research. The student would carryout experiments to achieve the planned objectives, collation and analysis of data, presentation of the result in the form of a Dissertation. The grading would be based on continuous evaluation that would include punctuality, hard work, record keeping, intellectual inputs, data presentation, interpretation etc.