

M. Sc II
SEMESTER IV

BCH4T013: ADVANCED CLINICAL BIOCHEMISTRY

Unit I: Aging and Neurological Disorders

Current view and theories of aging, auto immune connection and HLA association, processes of aging and biochemical alteration, DNA damage, protein oxidation and axonal transport in aging, nutritional intervention as anti-aging therapy..

Alzheimer's disease: Causes, symptoms, diagnosis, pathogenesis, genetics, APP, ApoE, PS2, tau protein, risk factors and therapeutic approaches.

Progeria

Parkinson's disease: Causes, symptoms, diagnosis, pathogenesis, genetics and therapeutic approaches

Unit II: Obesity

Theories, lipid metabolism, adipose tissue anomalies.

Genetic basis of familial obesity, effects of neuropeptides and leptin in nutrient partitioning.

Obesity related derangements in metabolic regulation.

Therapeutic approaches

Unit III: Molecular and Metabolic Diseases

Human gene map, genetic diversity, polymorphism, genetic linkage, chromosomal disorder. Monogenetic Disorders: Autosomal dominant, autosomal recessive, X-linked, Multifactorial disorders, Genetic heterogeneity. Allelic heterogeneity, Pathogenesis of genetic disease, Galactosemia, Hemophilia, Sickle cell anemia, Muscular dystrophy, Hypercholesterolemia, Gout, Turner's syndrome.

Unit IV: Reproductive Biochemistry

Overview of reproductive system and reproduction, biochemistry of reproductive disorders (male & female), Influence of various factors in reproduction with special reference to role of prostaglandins and gonadotrophins. Mechanism and methods of birth control and possible biochemical consequences thereof. Biochemical marker's in

infertility disorders. Techniques involved in assisted reproductive technology (ART). Culture media and cell culture techniques in ART programme.

Suggested References:

1. Clinical Biochemistry – Metabolic and Clinical aspects By-William J. Marshall & Stephen K. Angert.
2. Harper's Biochemistry - 27th Ed.
3. Text book of Medical Physiology - By Guyton.
4. Text book of Physiology -By Burn & levy.
5. Biochemistry –By L .Stryer (Freeman & Co.NY.)
6. Biochemistry with clinical correlation- By Thomas Devli.
7. The Metabolic Basis of Inherited Disease 5th Ed.-By John Stanbury.
8. Teitz Fundamentals of Clinical Chemistry –By C.A.Burtis & Ashwood .
9. Biochemistry - By Lehninger.
10. Lehninger's Biochemistry –By Nelson & Cox.
11. Biochemistry –By Stanford.
12. Basic Medical Biochemistry: A Clinical approach- By Smith.
13. Principles of Internal Medicines- By Harrison.T. R.
14. Practical Biochemistry Principles & Techniques- By Wilson & Walker.
15. Practical Biochemistry –By David Plummer.

BCH4T014: CELL BIOLOGY AND CELLULAR BIOCHEMISTRY

Unit I: Cell cycle and regulation

Review of cell cycle, divisional control, regulatory proteins, cyclin/cdk complexes, positive and negative regulation, inhibitory molecules, restriction points, regulation of DNA synthesis, regulation of degradation, check points, cell cycle arrest, role of cyclically activated protein kinases, transcriptional regulation.

Unit II: Cell communication I

General principles of cell communication, extra cellular signals and their receptors, autocrine signaling and role of gap junctions, types of cell receptors, relay of signal and intracellular signal proteins, regulated proteolysis dependent signaling pathways.

Unit III: Cell communication II

Informational transactions in eukaryotic cells- cyclic AMP facet, Study of G-proteins, signaling through G-protein linked cell surface receptors, signaling through enzyme linked cell surface receptors, Calcium messenger system, signaling via GMP.

Unit IV: Cancer

Causes and types of cancer, viral carcinogenesis, tumor suppressors, oncogenes and signal transduction, growth and spread of cancer, molecular basis of cancer therapy, molecular markers.

Programmed cell death and its regulation in normal physiology, regulation and execution of mammalian apoptosis, cytokine signaling and role of apoptosis in tumor genesis.

Suggested References:

1. Molecular Biology of the Cell: Alberts 5th Edition 2007 NCBI Publication
2. Principles of Biochemistry: Lehninger WH Freeman
3. Biochemistry of Signal Transduction and Regulation - Gerhard Krauss Wiley VCH 3rd Revised Edition
4. Molecular Cell Biology: Lodish 6th Edition, WH Freeman & Company
5. The Cell: Cooper 2nd Edition ASM Press
6. **Gene IX:** Benjamin Lewin Published by Pearson Prentice Hall
7. Cell and Molecular Biology: Gerald Karp
8. Molecular Biology: Robert Weaver 1st Edition, WCB McGraw-Hill
9. Molecular Biology of the Gene: Watson 6th Edition, Pearson Publication
10. Gene Regulation: A Eukaryotic Perspective: David Latchman 5 illustrated , Taylor & Francis, 2005
11. The Cell- G. M. Cooper

BCH4T015: NUTRITION AND BIOCHEMISTRY OF MOVEMENT

Nutritional Biochemistry I:

Basic Concept: Energy content of foods. Measurements of energy expenditure: Direct & Indirect calorimetry. Definition of BMR and SDA and factors affecting these. Thermogenic effects of foods. Energy requirements of man and woman and factors affecting energy requirements.

Role of dietary fibers in nutrition.

Clinical Nutrition: Role of diet & nutrition in prevention & treatment of diseases: Dental Caries, Fluorosis, Atherosclerosis & Rheumatic disorders. Inherited metabolic Disorders: Phenylketonuria, Maple Syrup disease & Homocystinuria.

Nutritional Biochemistry II:

Protein Energy Malnutrition (PEM): Aetiology, Clinical features, Metabolic disorders and Management of Marasmus and Kwashiorkor diseases.

Starvation: Techniques for the study of starvation. Protein metabolism in prolonged fasting. Protein sparing treatments during fasting. Basic concept of High protein low caloric weight reduction diets.

Disorders of Mineral Metabolism: Hypercalcemia, Hypocalcaemia, Normocalcemia, Hyperphosphatemia.

Unit III: Cytoskeleton

Microtubules: Actin Filaments, Actin Architectures, The dynamics of Actin Assembly, Myosin-A cellular Engine that powers Motility, Actin and Myosin in Non muscle cells, Cell Motility.

Microfilaments: Microtubules structures, Microtubule Dynamics, Microtubule Associated Proteins, Kinesin, Dynein and intracellular Transport, Microtubule Dynamics and Motor Proteins during Mitosis, Intermediate Filaments.

Vesicles, the cytoplasm matrix, biochemical dynamics of the cytoskeleton.

Unit IV: Flagella, Cilia and Sperm motility

Cilia and Flagella- Structure and Movement, Amoeboid movement, pseudopod formation, Sperm motility, Cytoplasmic streaming, cytoplasmic transport of vesicles.

Suggested References:

1. Text book of Biochemistry & Human Biology – G.P .Talwar
2. Text book of Human Nutrition – M.S.Banerji, N.Pralhad Rao & V.Reddy.
3. Nutritional Biochemistry & Metabolism – Linten.
4. Human Nutrition & Dietics- Davidson & Passmore (ELBS)
5. Modern Nutrition in Health & Diseases – Maurice E Skills & V R Yong.
6. Food & Nutrition – M.S.Swaminathan
7. The Cell – By Cooper.
8. Cell and Molecular Biology – de Robertis & de Robertis.
9. Molecular Biology of the Cell: Alberts 5th Edition 2007 NCBI Publication
10. Principles of Biochemistry: Lehninger WH Freeman
11. Biochemistry of Signal Transduction and Regulation - Gerhard Krauss Wiley VCH 3rd Revised Edition
12. Molecular Cell Biology: Lodish 6th Edition, WH Freeman & Company
13. The cell: Cooper 2nd Edition ASM Press
14. **Gene IX:** Benjamin Lewin Published by Pearson Prentice Hall
15. Cell and Molecular Biology: Gerald Karp
16. Molecular Biology: Robert Weaver 1st Edition, WCB McGraw-Hill
17. Molecular Biology of the Gene: Watson 6th Edition, Pearson Publication
18. Gene Regulation: A Eukaryotic Perspective: David Latchman 5 illustrated , Taylor & Francis, 2005

BCH4T016: BIOSTATISTICS, RESEARCH METHODOLOGY, TECHNICAL WRITING, COMPUTERS AND BIOINFORMATICS

Unit I: Biostatistics

Statistics in Research: Specific applications of measures of Central tendency, Dispersion, Skewness and Kurtosis in research. Measures of Relationship: Correlation, Simple, Partial and multiple- Regression, Hypothesis Testing and estimation: Fundamentals of hypothesis testing-Standard error point and interval estimates-Important non-parametric tests Parametric Tests: Testing of significance mean, proportion, variance and correlation-Testing for significance of difference between means, proportions, variances and correlation coefficients. ANOVA and Chi-Square Tests: One-way and two-way ANOVA

Unit II: Research Methodology and Technical Writing

Methodology of scientific research, nature of scientific methods, design of experiments, policies in regulating research, guidelines for use of humans and animals in research.

Preparation of scientific report. Thinking and planning, information, ideas, order of paragraph writing, proper use of nouns, pronouns and articles, tenses, spellings etc.

Presentation of review. Objective , design of the experiment, parameters used, data obtained, interpretation, summary.

Unit III: Computers

Introduction of computer networks- Topologies and designs; Basics of computer operating systems-windows and Linux; Introduction to Markup language-Hyper Text Markup Language (HTML) and Extensive Markup Language (XML); Spreadsheets and Presentation software.

Systems Biology-An introduction
Introduction to Metagenomics

Unit IV: Bioinformatics

Introduction to Bioinformatics: Applications of Bioinformatics, Bioinformatics resources

Biological Databases: Overview to Biological Databases, Nucleotide Databases (GenBank, DDBJ, ENA), Protein sequence databases (Uniprot, Swiss prot, Prosite , Pfam, Prodom), Protein structure databases (PDB, SCOP, CATH)

Sequence analysis: Sequence similarity search, BLAST, FASTA, CLUSTAL

Genomics: Introduction to Genomics, Comparative Genomic Databases, Objective of Genome Comparisons, Genome Alignments

Proteomics: Overview of Proteomics, Experimental Techniques, Bioinformatics Approaches, Protein-Protein Interaction, Databases and software

Application of bioinformatics in drug designing

Suggested References:

1. Bioinformatics: A practical guide to the analysis of genes and proteins. Baxevanis A.D and Ovellette B.F.F., Wiley-Interscience, (2002).
2. Molecular and Biotechnology. A comprehensive desk reference, R.A. Meyes (Ed.) VCH Publishers Inc. (1995)
3. Textbook of Biotechnology Das H.K., Wiley Dreamtech India Pvt Ltd, (2004).
4. Principles of Genome analysis and genomics, Primrose SB, Twyman RM, Blackwell Science (2002).
5. Biostatistics-A foundation for Health Science, Daniel WW, John Wiley (1983).
6. Statistical Methods, Medhi J, Willey Eastern Limited, (1992).

BCH4LAB7: BIOSTATISTICS, BIOINFORMATICS AND CELL BIOLOGY

- 1: Accessing the literature databases for literature survey.
- 2: Retrieval of sequences from online sequence databases (Plant, bacterial & animal databases)
- 3: To perform pair wise alignment of sequences using BLAST program.
- 4: To design primers for the given gene sequences.
- 5: To perform multiple sequence alignment and generate phylogenetic tree.
- 6: To retrieve and visualize the three dimensional structures of proteins.
- 7: To retrieve metagenomic sequences and primer designing to develop STS marker.
- 8: Downloading atom coordinates from pdb using the co-ordinate file to view the molecules using molecular visualization tools- RasMol, WebLab Viewer, ChemDraw, ISIS Draw, Deep View.
- 9: Molecular mechanics, energetics, free energy calculations
- 10: Gene finding programs
- 11: Biology workbench
- 12: Introduction to the use of software packages for statistical analysis
13. To assay cathepsin D, ATPase (Na/K/Ca/Mg), Lipid peroxidase enzymes

BCH4PROJ: PROJECT WORK

BCH4INT4: INTERNAL ASSESSMENT: FINAL PROJECT PRESENTATION

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