## PAPERS, CREDITS AND MARKS DETAILS
### Semester 1

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<th>Course Code</th>
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Session/Year 2017 (Onwards)
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26 credits = 34  18 8 8 26
## SEMESTER 3

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26 credits = 34 contact hrs
# Semester 4

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28 credits = 38 contact hrs
Instructors:

AM: Akbar Masood
RH: Rabia Hamid
SA: Shajrul Amin
NAD: Nazir Ahmad Dar
SAA: Shaida Ahmad Andrabi
SAG: Showkat Ahmad Ganie
AD: Mohd Ashraf Dar
CL.: Contractual Lecturer

Abbreviations (Scope)

CR- Core (For Department students)
DCE- Discipline Centric (For Department Students)
GE- General Elective (For within Faculty students)
OE- Open Elective (For non-faculty students)
SEMESTER 1

BCH - 01- CR, Biomolecules

Unit-I
Carbohydrates
Definition, classification, characterization and biological importance of mono- and disaccharides
- Structure and conformation of sugars
- Stereo- and optical isomerisms
- Structure and function of homo- and heteropolysaccharides
  - Mucopolysaccharides and proteoglycans
- Chemical reactions of functional groups present in carbohydrates

Unit-II
Lipids
- Classification of lipids
- Chemical composition and properties of triglycerides
- Nomenclature and properties of saturated and unsaturated fatty acids
- Properties and functions of phosphoglycerides and sphingolipids
- Structure and functions of steroids (cholesterol and bile acids)
- Prostanoids

Unit-III
Amino acids
- Structure, classification and physiochemical properties
- Essential and non-essential amino acids
- Characteristics of a peptide bond
- Oligo-peptides and polypeptides
- Chemical synthesis of a peptide

Proteins
- Levels of protein structure
- Elucidation of primary structure
- Forces stabilizing the tertiary structure
- Protein denaturation and renaturation

Unit- IV
Nucleic Acids
- Primary, secondary and tertiary structure of DNA
- Various forms of DNA, structural polymorphism of DNA
- Properties of DNA
- Denaturation and annealing of DNA, Cot Curve
- DNA as a genetic material
- Primary, secondary and tertiary structure of RNA
- Functions of various types of RNA
BCH – 02 - CR, Cell Biology - I

Unit-I
Basic properties of cells
Structural organization of prokaryotic and eukaryotic cells
Introduction of viruses
Cell membrane
  Chemical composition
  Structure and function of membrane proteins
  Membrane lipids and membrane fluidity
  Dynamic nature of plasma membrane
  Movement of substance across cell membrane
  Membrane potentials
Mitochondria
  Structure and function
  Oxidative metabolism in mitochondria
  Role of mitochondria in ATP formation
  Translocation of protons and establishment of a proton motive force

Unit-II
Introduction to endomembrane system
Approaches to study endomembrane
Endoplasmic reticulum, structure, functions
Golgi complex
Types of vesicle transport and their types
Lysosomes and plant vacuoles, peroxisomes
Moving membranes and materials into the cell interior
Posttranslational uptake of proteins by peroxisome, mitochondria and chloroplasts

Unit-III
Cell wall
  Detailed structure and functions of Cell wall
  Microbodies
Chloroplast
  Structure, function
  Photosynthetic units and reaction centers
  Photophosphorylation

Unit IV
Extracellular matrix and cell interaction
  Extracellular space
  Interaction of cells with extracellular material
  Tight Junction- sealing the extracellular space
  Cell -cell adhesion
  Cell -cell communication
The cytoskeleton
  Microtubules
  Intermediate filaments
  Microfilaments

Session/Year 2017 (Onwards)
BCH – 03 - CR, Laboratory Course - I

Concept of pH and buffers
Qualitative estimations of carbohydrates and amino acids
Quantitative estimation of proteins by
  Lowry’s method
  Bradford’s methods
  Spectrophotometric methods
Quantitative estimation of cholesterol by Zlatki’s method
Quantitative estimation of glucose by
  Nelson Somogy’s method
  Enzymatic method
Determination of iodine and saponification value of oils
Titrimetric estimation of vitamin C
Paper chromatography of simple sugars/ amino acids
BCH – 04- DCE, Plant Biochemistry

Unit-I
Photosynthesis
Photosynthesis in higher plants – general concepts
Organization of the photosynthetic apparatus
Mechanism of electron transport in photosynthesis
Proton transport and ATP synthesis
Calvin cycle and its regulation
C4 and CAM pathways
Repair and regulation of photosynthetic machinery
Photorespiration and its significance

Unit-II
Assimilation of mineral nutrients
Nitrate and ammonia assimilation and their incorporation into amino acids
Biochemistry of nitrogen fixation, nitrogenase complex and its functions
Nitrogen fixation genes and their regulation
Sulfate reduction and assimilation
Sulfite oxidation

Unit-III
Special features of secondary plant metabolism
Secondary metabolites - phenolics, tannins, lignins, lignans, pigments, terpenes, alkaloids and surface waxes – their biosynthesis and physiological role
Plant defense against pathogens
Translocation of inorganic and organic substances
Pathways of translocation and mechanism of translocation in the phloem

Unit-IV
Plant growth regulators
Auxins
   Chemical nature, biosynthesis and metabolism
   Physiological and developments effects,
   Molecular basis of its action
Gibberlins
   Chemical structure, biosynthesis, metabolism and mechanism of its molecular effects
Cytokinin
   Properties and biological role
   Cellular and molecular modes of cytokinin action
Abscisic acid
   Chemical structure, metabolism and transport
   Molecular effects in the regulation of growth and development
**BCH - 05 – DCE, Biochemical Techniques**

**Unit-I**
Centrifugation
- Basic principle of centrifugation
- Factors affecting sedimentation
- Types of centrifugation including differential, density gradient and ultracentrifugation
- Analytical and preparative centrifugation
- Applications of centrifugation

Chromatographic techniques
- Basic principle and applications of chromatographic techniques:
  - Gel filtration chromatography
  - Affinity chromatography
  - Gas chromatography
  - Ion Exchange chromatography
  - High-pressure liquid chromatography

**Unit-II**
Electrophoresis
- Types of electrophoresis
- Factors affecting electrophoretic mobility
- Uses of electrophoresis

Isoelectric focusing
- Analysis of biomolecules using UV/visible, fluorescence spectroscopy
- Use of radioisotopes in biology
- Their detection, measurement and safety guidelines

**Unit-III**
Different blotting techniques
- Western, Northern, Southern

Microscopy
- Light, electron (scanning and transmission), phase contrast and fluorescence microscopy
- Freeze-fracture techniques

Polymerase chain reaction
- Principles of - RFLP, RAPD and AFLP techniques
- Single strand conformation polymorphism and heteroduplex analysis
- Gel retardation assays
- DNA Sequencing
- Next generation sequencing
- Sequencing while synthesizing

**Unit-IV**
Detection of molecules using ELISA, RIA, immunoprecipitation, flowcytometry
- Detection of molecules in living cells, in situ localization by techniques such as FISH and GISH.
- Methods for analysis of gene expression at RNA and protein level, large-scale expression analysis, such as micro array based techniques
- Coimmunoprecipitation and Chromatin immunoprecipitation
- DNA profiling, DNA footprinting
- Gene silencing
- Micro RNA
- RNA interference

Session/Year 2017 (Onwards)
BCH – 06 - GE, Nutritional Biochemistry

Unit-I
Energy content of foods
BMR and SDA and factors affecting them
Energy requirements of man and woman and factors affecting energy requirements

Protein nutrition
  Essential amino acids for man and concept of protein quality
  Cereal protein and their limiting amino acids
  Protein energy malnutrition (PEM). Etiology, clinical features, metabolic disorders and management of marasmus and kwashiorkor

Carbohydrate nutrition
  Dietary requirement and sources of carbohydrates
  Protein sparing action
  Physiological actions of dietary fibers

Unit-II
Micronutrition
  Dietary sources, biochemical functions and deficiency diseases of:
    Water soluble
    Fat soluble vitamins

Lipid nutrition
  Major classes of dietary lipids
  Essential fatty acids and their physiological functions
BCH - 07-GE, Biochemical Calculations

Unit I
Concentrations based on volume and weight
- Molarity
- Normality
- Osmolarity
- Molality
Acids and bases and their various definition theories
Various definitions
Ionization of strong acids and bases.
Ionization of H₂O, ionic product of water,
Weak acids and bases.

Unit II
Concept of pH and buffer
pH, pK and pl of solutions
Henderson – Hasselbalch equation
Preparation of buffers,
pH changes in buffers, buffer capacity

BCH- 08 – OE, Fundamentals of Biochemistry

Unit I
Water and its role in biological systems
Introduction and roles of biomolecules of life
- Proteins
- Carbohydrates
- Lipids
- Nucleic acids
- Micronutrients

Unit II
Cell as a basic unit of life
Cell components
Functions of the various components
Cell death and its causes
Cell division as the unit of propagation
Concepts of Mitosis and Meiosis
SEMESTER II

BCH – 09 - CR, Metabolism - I

Unit-I
Bioenergetics
   Energy transformation by biological systems
   Concept and significance of free energy
   Phosphoryl transfer potential
   Coupled reactions
   ATP as energy currency
Metabolon concept

Unit-II
Carbohydrate metabolism
   Glycolysis
   Citric acid cycle, its function in energy generation and biosynthesis of energy rich-bonds
   Pentose phosphate pathway and its regulation
   Alternate pathways of carbohydrate metabolism
   Gluconeogenesis
   Biosynthesis of glycogen and starch

Unit-III
Lipid metabolism
   Fatty acid oxidation- α, β, ω, oxidation and lipo-oxidation.
   Fatty acid biosynthesis- Acetyl CoA carboxylase, Desaturase and elongase
   Biosynthesis of triacylglycerols, Phosphoglycerides and sphingolipids
   Biosynthetic pathways for terpenes, steroids and prostaglandins
   Ketone bodies- Formation and utilization

Unit-IV
Regulation of carbohydrate and lipid metabolism - hormonal/enzymatic
Interactions between carbohydrate and lipid metabolism – role of insulin and adiponectin
Inborn errors of carbohydrate and lipid metabolism
BCH – 10 - CR, Molecular Biology

Unit-I
Replication
- Unit of replication,
- Replication Origin and Replication Fork
- Enzymes involved in replication,
- Initiation, Elongation and Termination of Replication
- Fidelity of Replication,

Unit-II
Transcription
- Transcription in prokaryotes and eukaryotes
- Transcriptional factors and their role
- RNA polymerases
- Formation of initiation complex
- Elongation and termination
- Inhibitors of transcription
RNA processing, splicing, polyadenylation, capping
Structure and function of different types of RNA’s

Unit-III
Regulation of gene expression
- Prokaryotes
- Eukaryotes
- Viruses
Transcriptional activators and repressors
Role of chromatin in regulating gene expression and gene silencing
Epigenetics and its importance in regulation of gene expression

Unit- IV
Translation
Protein synthesis and genetic code
- General characteristics of genetic code
- Deciphering of genetic code
Ribosomes as the site of protein synthesis, polysomes
Activation of amino acids
Chain initiation, elongation and termination in prokaryotes and eukaryotes
Control of translation (Role of Guanine nucleotides).
Translational fidelity, Kinetic proof reading
Positive and negative regulation of translation
Inhibitors of protein synthesis

Session/Year 2017 (Onwards)
**BCH – 11 - CR, Laboratory Course - II**

Extraction and assay of enzymes.
Effect of temperature, pH, and time on enzyme activity.
Isolation and purification of proteins using ion-exchange and gel filtration columns
Polyacrylamide gel electrophoresis of purified proteins
Electrophoretic separation of serum proteins.
Molecular weight determination by gel filtration chromatography and SDS-PAGE.
Subcellular fractionation of organelles from liver cells and identification by the use of marker enzymes.
Estimation of SGPT
Estimation of SGOT
Estimation of alkaline phosphatase
BCH - 12 – DCE, Enzymology

Unit-I
Enzyme classification and nomenclature
Methods of examining enzyme – substrate complexes
Enzyme kinetics
An introduction, factors influencing enzyme reaction velocity
Henri and Michealis Menten equation, Briggs-Haldane modification
Determination and significance of kinetic constants
Derivation of rate expression for Ping Pong and ordered Bi Bi reaction mechanism

Unit-II
Enzyme inhibition
Reversible inhibition, its types
Determination of inhibitor constants
Irreversible inhibition
Enzyme assays
Mechanism of catalysis of -
Serine proteases
Triose phosphate isomerases

Unit-III
Enzyme regulation
General mechanism of enzyme regulation
Allosteric enzymes
Sigmoidal kinetics and their physiological significance
Symmetric and sequential modes for action of allosteric enzymes and their significance
Feed back inhibition and feed forward stimulation
Reversible and irreversible covalent modifications of enzymes

Unit IV
Immobilization of enzymes
- Methods of enzyme immobilization
- Effects of partition on kinetics and performance with particular emphasis on changes in pH and hydrophobicity
- Applications of immobilized enzymes
BCH – 13- DCE, Cell Biology - II

Unit-I
Structure and function of:
   Nucleus
   Nucleolus
Chromosomes the physical carrier of the genes
Chromosome and chromatin structure
Structure and composition of gene
Histones and histone modifications
Concept of Epigenetics

Unit II
Cell cycle and its stages
Regulation of cell cycle
Mitosis
   Prophase, prometaphase, metaphase, anaphase, telophase, cytokinesis
   Motor proteins and their role in cell division
Cytokinesis Meiosis
   The stages of meiosis
Genetic recombination during meiosis Gene as unit of inheritance

Unit III
Cell signaling
   The basic elements of cell signaling
   Signaling molecules and their receptors
   Functions of G-protein- coupled receptors and their second messengers
   Protein \phosphorylation and its role in signal transduction
   Cytokine receptors
   Role of calcium and NO as an intracellular messenger
   Detailed mechanism of signaling in the following pathways:
      GPCR pathway
      RAS MAPK pathway
      PI3 Kinase Pathway

Unit-IV
Cancer Biology
Basic concepts of cancer biology
Causes of cancer
Genetic of cancer
Properties of cancer cell
Hallmarks of cancer
   Self-sufficiency in growth signals
   Insensitivity to antigrowth signals
   Evading apoptosis
   Sustained angiogenesis
   Limitless replicative potential
   Tissue invasion and metastasis
**BCH – 14 - GE, Protein Biochemistry**

**Unit I**

- Amino acids, the building blocks of proteins
- Protein – a molecule with myriad of functions
- Primary structure of the protein and its determination
- Secondary structure, types
- Tertiary structure, forces stabilizing tertiary structures
- Quaternary structures

**Unit II**

- Quantitative estimation of proteins by
  - Lowry’s method
  - Bradford’s method
  - Spectrophotometric method
- Polyacrylamide gel electrophoresis of purified proteins
- Molecular weight determination by gel filtration chromatography and SDS-PAGE.
**BCH – 15 - GE, Enzyme Immobilization**

**Unit I**
- Enzymes as proteins and catalysts
- Factors that affect the enzyme activity
- Characteristics of free vs. immobilized enzymes
- Methods of enzyme immobilization,
- Effect of immobilization on enzyme activity, partitioning/ diffusion limitations.
- Enzyme conformational changes. Enzyme stability and zulu effect.
- Enzyme activity dependence on pH, partitioning of protons and limitation of proton diffusion

**Unit II**
- Immobilized enzymes-
- Hydrolysis of proteins, cheese manufacture, conversion of corn-starch to dextrose, conversion of dextrose to fructose, hydrolysis of lactose in whey
- Biomedical and Analytical applications.
- Concept of Red Blood Cells as carrier of enzymes,
- Practical demonstration of immobilization process using RBCs
BCH – 16 - OE, Chronic Diseases – Cancer and Diabetes

Unit I
Cancer - an Introduction
Various known causes of cancer
Cancers in Kashmir
Signs and symptoms
Cancer diagnosis
Management of cancer patients
Cancer prognosis
Responsibility of patients and attendants
Facilities of cancer care in developing world

Unit II
Glucose Metabolism
Organs and enzymes
What is diabetes?
Causes of diabetes
Diagnosis of diabetes
Incidence of diabetes in Kashmir
Treatment of diabetic patients
Diet control and physical exercise
Impact of diabetes on society
Preventive measures
SEMESTER III

BCH – 17 - CR, Physiology And Clinical Biochemistry

Unit-I
Hematology
Composition of blood
Mechanism and regulation of blood coagulation, fibrinolysis
Neuro-muscular system
Mechanism of conduction of nerve impulse along axon, neurotransmitters
Biochemistry of vision
Ultra structure and molecular mechanism of contraction of skeleton and smooth muscles and its regulation

Unit-II
Gastrointestinal physiology
Digestion and absorption
Gastrointestinal disorders
Excretory system
Formation of urine
Normal and abnormal constituents of urine

Unit – III
Introduction to clinical biochemistry
Water and electrolyte balance
Regulation of water and electrolyte balance, role of kidney and hormones
Acid base balance regulation by human body, concept of metabolic and respiratory acidosis and alkalosis

Unit – IV
Principles of diagnostic enzymology
Evaluation of organ function tests
Clinical presentation and diagnosis of renal, hepatic and pancreatic diseases
Cardiac function tests and Thyroid function tests
Diagnostic significance and interpretation of glucose tolerance test
Diagnostic tests for Apo lipoproteins, HDL cholesterol, LDL cholesterol and triglyceride disorders
BCH – 18 - CR, Immunology

Unit-I
Historical perspective, terms associated with immunology, Antigenicity, Features of Antigeneticity, super antigens, adjuvants. Cells of immune system: Myeloid, Mononuclear cells, T-Lymphocytes, B-Lymphocytes, NK-Cells Primary and secondary lymphoid organs: Thymus, Bursa of fabricus, Peyers Patch, spleen, lymph nodes, mucosal associated and cutaneous associated lymphoid tissues.

Unit - II
Immunoglobulin, structure, classes and subclasses Multigene organization of Ig gene, variable region gene rearrangements, allelic exclusion, generation of diversity of Ig, Assembly and secretion of Ig, class switch, regulation of Ig transcription. Humoral and cell mediated immunity: B cell development and activation, BCR, T cell development and activation, TCR. Regulation of system: complement cascade, Biological function and its regulation. Complement fixation test. Introduction to cytokines.

Unit - III

Unit-IV
Immunoblotting and diagnosis of various important diseases, only infectious and few cancerous types Techniques – ELISA, RIA, fluorescent IA, agglutination of pathogenic bacteria, Haemagglutination and its inhibition. Affinity, avidity Immunoelectron microscopy Enumeration of total T-cell numbers by sRBC, resetting technique Determination of total number of B-lymphocytes by staining for surface IgG. Antigen – antibody interaction and its applications. Total hemolytic assay
BCH – 19 - CR, Laboratory Course - III

Isolation of DNA: Different Methods, Different sources
Quantification of DNA by Spectroscopy
Electrophoresis of Isolated DNA
Amplification of a DNA segment by PCR
Purification of PCR product
Restriction digestion of PCR product
Isolation of RNA from leukocytes
cDNA synthesis from mRNA
BCH – 20 - DCE, Biotechnology

Unit I
Recombinant DNA Technology:
Vectors: Plasmids, bacteriophages, phagemids, cosmids, YACs, and BACs
Methods of creating recombinant DNA molecule
Transformation and screening of recombinant vector
Confirmation of insert
Expression strategies in different hosts, vector and host engineering

Unit II:
Types of restriction endonucleases
Library construction
Types of libraries:
cDNA and genomic libraries
Primary, secondary and tertiary screening methods

Unit III:
Animal Cell Culture:
Primary and established cell lines
Types of various cell lines
Biology and characterization of the cultured cells.
Introduction to balanced salt solutions and simple growth medium.
Role of CO2, serum and supplements. Serum and serum free media, defined media and their applications, antibiotics
Immortalization and methods used to immortalize cells.
Viability and cytotoxicity assays: Trypan blue, MTT, TUNEL and ELISA based assays.

Unit IV:
Immunobiotechnology
Development of Monoclonal Antibodies by:
Hybridoma Technology
Applications of MCA and Antibody Fragments.
Vaccination: Conventional and genetically engineered vaccines.
Lymphokines – production and applications
BCH - 21 – DCE, Metabolism - II

Unit-I
Amino acid metabolism
Specific aspects
Metabolic fates of amino groups
Pathways of amino acid catabolism
Inborn errors of amino acid metabolism

Unit II
Overview of Nitrogen Metabolism
Nitrogen excretion and urea cycle,
Biosynthesis of amino acids
Derivatives of Amino acids

Unit III
Nucleic Acid metabolism
Biosynthesis of purines and pyrimidines
Degradation of purines and pyrimidines
Structure and regulation of ribonucleotide reductase
Biosynthesis of ribonucleotides, deoxy ribonucleotides and polynucleotides
Inhibitors of nucleic acid biosynthesis

Unit-IV
Metabolite transport across mitochondrial membrane
Oxidative phosphorylation
Structural organization of respiratory chain
Electron flow in respiratory chain
Coupling of oxidation and phosphorylation
Structure and function of ATP-synthase complex
Short-circuiting of proton gradient
Regulation of rate of oxidative phosphorylation
**BCH – 22 - GE, Metabolic Disorders**

**Unit I**
Introduction to carbohydrates, lipids and their metabolism
Disorders of carbohydrate metabolism
- Diabetes
- Hereditary fructose intolerance
- Lactose intolerance
- Glycogen storage diseases
Disorders of Lipid Metabolism
- Hypercholesterolemia,
- Atherosclerosis,
- Carnitine related diseases

**Unit II**
Introduction to amino acids, proteins and nucleic acids
Inherited disorders of amino acid metabolism- Phenylketonuria, Alkaptonuria, Maple syrup urine disease
Nonketotic hyperglycinemia, Propionic acidemia, Hyperprolinemia
Urea cycle disorders-
- Hyperammonemia Argininemia,
- Deficiency diseases related to Urea cycle enzymes
Disorders of nucleic acid metabolism
- Purine and Pyrimidine metabolism related diseases,
- Hypo and Hyperuricemia,
- Gout, Lesch Nyhan Syndrome, Severe Combined Immunodeficiency Disease (SCID),
- Xeroderma pigmentosum.
BCH-23-GE, Enzyme Regulation

**Unit I**
Enzyme regulation
General mechanism of enzyme regulation
Allosteric enzymes
Sigmoidal kinetics and their physiological significance
Symmetric and sequential modes for action of allosteric enzymes and their significance

**Unit II**
Feed back inhibition and feed forward stimulation
Zymogens, Isozymes
Enzyme repression, induction and degradation
Control of enzymatic activity by products and substrates
Reversible and irreversible covalent modifications of enzymes

BCH-24-OE, Diet, Physical Activity and health

**Unit-I**
Balanced diet
Components of diet
Diet requirement: young, old, men, women
Diseases due to diet deficiency
Diseases due to over eating
Diet as medicine

**Unit-II**
Body systems and energy for physical activity
Types of physical activity
Physical activity for health
Physical fitness
Nutrition and physical activity
Participating in physical activity with safety
SEMESTER IV

BCH – 25 - CR, Designing And Drafting Of Research Project

A student will have to pick up a problem in biological sciences and develop a grant application on the theme under mentorship of allotted supervisor. Grant application will have following components.
- Introduction
- National and international scenario
- Review of literature
- Objective
- Possible outcome
- Significance of the study
- Material and methods
- Summary

BCH – 26 - CR, Journal Club

The recent and advanced scientific papers in high profile journals will be chosen by the students in consultation with mentor teachers and then presented by the student. The presenter is supposed to have all the relevant knowledge of the article. The audience will include faculty, research scholars and PG students.

BCH – 27 - CR, Laboratory Course - IV

Bacterial culture methods
Preparation of plasmid DNA by:
  - Manual
  - Kit
Plasmid Transformation
Cloning in plasmid
Western blotting
Simple staining
Gram staining
BCH – 28 - DCE, Microbiology

Unit-I
Historical perspectives of microbiology
Importance of microbiology in agriculture, human and animal health industry and environment
Microbial classification
Types of microorganisms
General characteristics of main groups of microorganisms
Criteria used in the classification of microorganisms- cytology, genetics, host specialization, serology
Microbial growth
Different phases of microbial growth
Measurement of microbial growth
Effects of various environmental factors on microbial growth
Control of microbial growth, physical control, chemical control and antibiotics
Mechanism of drug resistance

Unit-II
Isolation, culture, identification and preservation of bacteria
Gram positive and gram negative organisms
Structure and functions of peptidoglycan in gram positive and gram negative organisms
Functions of polymeric components in outer membrane and acidic polymers in gram negative organisms
Special features of bacterial metabolism

Unit-III
Microbial nutrition
Nutritional types of microorganisms
Uptake of nutrients by the microbial cells
Nutritional requirement of bacteria
Resident flora
The human as a habitat
Pathogenicity and virulence factors
Bacterial toxigenecity (pathogenesis of infectious diseases)
Food spoilage, fermentation, food-borne infection
Biochemistry of nitrogen fixation and sulfur reduction

Unit-IV
Virus classification
Structure of virus
Viral proteins and methods of assay
Virus- host interaction
Microbial diseases
Respiratory diseases caused by viruses and bacteria – tuberculosis, small pox
Sexually transmitted diseases including AIDS
**BCH – 29 - DCE, Endocrinology**

**Unit I**
Introduction to endocrinology
Mechanism of action of hormones - hormone receptors, second messenger mechanisms for mediating intracellular hormone functions
Structure, biosynthesis, secretion, transport, mechanism of action and physiological role of Pancreatic and Thyroid hormones

**Unit II**
Pituitary hormones and their control by hypothalamus
Structure, biosynthesis, secretion, transport, mechanism of action and physiological role of Adrenal,
Gastrointestinal,
Sex hormones

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**BCH – 30 - DCE, Micro Nutrition**

**Unit I**
Vitamins
Introduction to vitamins
Definition, classification
Nutritional sources, DRI recommendations and deficiency and health problems of:
— Vitamin A.
— Vitamin D.
— Vitamin C
— Vitamin E.
— Vitamin K
Role in human nutrition, recommendation, physiology and biochemistry of:
— Thiamine
— Riboflavin
— Niacin
— B6 vitamin
— B12 Vitamin
— Folic acid

**Unit II**
Minerals:
Nutritional sources, DRI recommendations and role in human nutrition of:
— Calcium
— Iron
— Zinc
— Iodine
— Selenium
— Fluoride
— Magnesium
BCH – 31 - GE, Biology of Chronic Diseases

Unit I
Diabetes: Types causes and prevention.
Diseases linked to functioning of Heart: Cardiomyopathy, Hypertension
Hepatitis

Unit II
Neurological disorders–
Alzheimer’s disease
Parkinson’s disease
Epilepsy
BCH-32-GE, Signal Transduction

Unit-I

Cell signaling:

- Basic concepts of Signal Transduction
- Components and general mechanism of Signal Transduction
- Signaling motifs: SH2, SH3, PH and PDZ domains
- Role of protein kinases in cell signaling: Serine/ Threonine and Tyrosine kinases

Unit-II

Pathways of intra cellular signal transduction:

- GPCR pathway
- RAS MAPK pathway
- PI3 Kinase Pathway
- Techniques to study Signal Transduction
BCH - 33- OE, Biochemical Laboratory Tests and Interpretation

Unit I
Concept of reference values
Observed values
Blood biochemistry
Electrolytes estimation and clinical significance
Blood gas analysis
Blood sugar and its clinical importance

Unit II
Cardiac function tests and clinical uses
Liver function tests: diagnostic importance
Kidney function test importance
Tumor markers – PSA, carbohydrate markers