

# Department of Biochemistry

## University of Kashmir

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*Courses having focus on Employability*

**Syllabus for ~~Value added Courses~~:**

### 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. 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 developmental 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

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Department of Biochemistry  
University of Kashmir  
Srinagar

## 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, flow cytometry

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 foot printing

Gene silencing

Micro RNA

RNA interference

## 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-11-CR,LaboratoryCourse-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 – 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 – 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

Session/

### 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

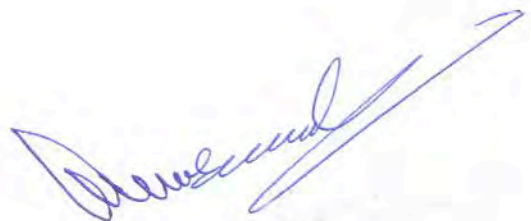
Unit III:

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 CO<sub>2</sub>, 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-27-CR,LaboratoryCourse-IV**

Bacterial culture methods  
Preparation of plasmid  
DNA by: Manual Kit  
Plasmid  
Transformation  
Cloning in plasmid  
Western blotting  
Simple staining  
Gram staining

