

Government Degree College Baramulla

SEMESTER 4th

MAJOR/MINOR COURSE

Subject: Clinical Biochemistry

Title: CLINICAL SIGNIFICANCE OF BIOMOLECULES-I

Code: BCB22C401

CREDIT: (4+2) THEORY: 04; PRACTICAL: 02

Contact Hours: 64(T) + 64 (L)

Course Objectives:

- To acquaint the students with basic knowledge of chemistry of carbohydrates and lipids
- To acquaint students with metabolism of carbohydrates and lipids
- The students will learn functional relation between biomolecules and the disorders associated with their abnormal metabolism.

Learning outcomes: On completion of the course, the student should be able to:

- To describe the diagnostic significance of the main laboratory investigations
- Understand the principles of analytical measurement in clinical biochemistry
- Identify the use of laboratory investigations in connection with diseases associated with metabolism of biomolecules.

Unit-I: Chemistry of Carbohydrates

(16 Hours)

Definition, classification and structure of monosaccharides, disaccharides and polysaccharides, Reducing and non-reducing sugars, Epimers, Cyclic forms, mutarotation, Derivatives of monosaccharides: (Glycosides, Sugar Acids, Sugar Alcohols and Amino Sugars).

UNIT-II: Carbohydrates Metabolism and disorders

(16 Hours)

Glycolysis, Krebs cycle, Pentose phosphate pathway, Gluconeogenesis, Glycogenesis, Glycogenolysis, Lactic acid and Alcoholic fermentation, Inborn errors of carbohydrate metabolism, Glycogen storage Diseases (Type I,II,III, IV, V), Lactose intolerance.

UNIT-III: Chemistry of Lipids

(16 Hours)

Classification, structure, properties and functions of fatty acids, triacylglycerol, phospholipids, sterols, Glycolipids, complex glycolipids and Eicosanoids, Iodine number saponification number.

UNIT IV: Lipid metabolism and disorders

(16 Hours)

Biosynthesis and degradation of saturated and unsaturated fatty acids, ketone bodies and cholesterol, Disorders of lipid metabolism: Lipid storage disease, Plasma Lipoproteins with special biological functions, prostaglandins and leukotrienes.

PRACTICAL (2 Credits: 60 Hours)

1. Qualitative analysis of carbohydrates.
2. Quantitative estimation of Carbohydrates (Molisch,s test, Fehlings test, Benedict,s test, Barfoed,s test, Osazone test).
3. Qualitative analysis of Lipids
4. Quantitative estimation of Lipids
5. Determination of saponification no. and iodine No.
6. Estimation of Glucose in serum
7. Oral Glucose tolerance test

Recommended Books:

1. Nelson, D. L., and Cox, M.M. Lehninger Principles of Biochemistry, 6th Edition, W.H.Freeman and Company, NY, US2.
2. Lippincott's Illustrated Reviews: Biochemistry" by Denise R. Ferrier.
3. "Biochemistry" by Donald Voet, Judith G. Voet, and Charlotte W. Pratt.
4. Essential Biochemistry" by Charlotte W. Pratt and Kathleen Cornely.
5. Biochemistry and Molecular Biology" by William H. Elliott, Daphne C. Elliott, and Michael J. Tisdale

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SEMESTER 4th

MAJOR COURSE

Subject: Clinical Biochemistry

Title: CELL BIOLOGY AND DISORDERS

Code: BCB22C402

CREDIT: (4+2) THEORY: 04; PRACTICAL: 02

Contact Hours: 64(T) + 64 (L)

Course Objectives:

- To acquaint the students with basic knowledge of different components of cell.
- The students will understand functional dynamics of various organelles of cell.
- The students will learn the molecular basis of various cell associated disorders especially cancer.

Learning outcomes: On completion of the course, the student should be able to:

- understand the structures and purposes of basic components of various cellular forms and their components, especially macromolecules, membranes, and organelles.,
- know the molecular mechanism of cell division and its dysregulation as cause of cancer initiation
- Apply the knowledge of cell biology in understanding day to day scientific inventions in biological sciences.

UNIT I: Cellular organisation and bio-membranes

(16 Hours)

Cell Membrane Structure: Fluid Mosaic Model, Chemical components of biological membranes. Transport across cell membrane membrane: Active transport-Primary active transport and secondary active transport, Passive transport-Simple diffusion, facilitated diffusion (Ionophores, carrier protein mediated and channel protein mediated) concept of Bulk transport.

Unit-2: Cell Cycle and its regulation

(16 Hours)

Overview of cell division – mitosis and meiosis, introduction to cell cycle checkpoints (CDKs and Cyclins), Cytoskeleton: structure and functions, Regulation of cell cycle, cell cycle dysregulation as a cause of cancer initiation.

Unit-3: Cell organelles-I

(16 Hours)

Structure and function of Nucleus, Nucleolus, Endoplasmic reticulum, Golgi apparatus and mitochondria, Cell polarization, migration, centriole, cilia and flagella. Disorders: Protein sorting disorders, Mitochondrial diseases, malfunction of nucleus.

Unit-4: Cell organelles-II

(16 Hours)

Structure and function of microtubules, microfilaments, intermediate filaments, ribosomes, Lysosomes, Peroxisomes, Disorders: Ribosomal disorders, Mad cow disease (BSE), Lysosomal storage disease (LSDs), Zellweger syndrome.

Tutorials 2 Credits

TUTORIALS

Visualisation of permanent slides of prokaryotic and eukaryotic cell under microscope.

Visualisation of permanent slides of different phases of cell division.

Demonstration of Differential Centrifugation

Demonstration of Cell Viability assays (MTT assay etc).

SUGGESTED READING

1. Molecular Cell Biology by Harvey Lodish , Arnold Berk , Chris A. Kaiser, Monty Krieger, Anthony Bretscher.
2. Karp's Cell and Molecular Biology:Textbook by Gerald Karp, Janet Iwasa, and Wallace F. Marshall
3. Cell Biology: Organelle Structure and Function by David E Sadava

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SEMESTER 4th

MAJOR COURSE

Subject: Clinical Biochemistry

Title: Medical Microbiology

Code: BCB22C403

CREDIT: (4+2) THEORY: 04; PRACTICAL: 02

Contact Hours: 64(T) + 64 (L)

Course Objectives:

- To impart students with basic knowledge of different aspects of microbiology.
- To acquaint students with profound knowledge bacteriology, mechanism of bacterial growth and bacterial toxins.
- To familiarize students with host-pathogen interaction, pathogenesis and prevention of microbial diseases.
- To aware students with the emerging microbial diseases and anti microbial drugs
- To impart students the basic skills of sterilization and microbial cell culture.

Learning Outcome: On completion of the course, the student should be able to

- Have the basic knowledge of microbiology
- To understand host-pathogen interaction, pathogenesis and prevention of microbial diseases.
- To explain the basic principles of emerging microbial diseases and antimicrobial therapy
- Practice the basic skills of sterilization.
- Practice methodological skills of cell culture and their utility in laboratory diagnosis of human diseases.

(THEORY: 4 Credits)

Unit-1: Introduction to microbiology

(16 Hours)

Classification of microorganisms, importance of microorganisms in health and disease, normal human microflora, discovery of penicillin and vaccination, one gene one enzyme hypothesis, Ethical and societal implications of microbial research.

Unit-2: Bacteriology

(16 Hours)

Bacteria: classification and structure, gram positive and gram negative bacteria, bacterial culture, growth, growth curve and its stages, factors affecting growth, measurement of bacterial growth, control of microbial growth, bacterial toxins and their effects.

Unit-3: Microbial diseases

(16 Hours)

Host pathogen interaction: Infection, Invasion, Pathogen, Pathogenicity, Virulence, Toxicogenicity. common bacterial diseases (MTB, Pneumonia), Introduction and structure of virus, viral diseases (AIDS and COVID), opportunistic infections, Nosocomial infections.

Unit-4: Antimicrobial drugs

(16 Hours)

Antimicrobial chemo therapy, Antibiotics: Introduction, mechanism of action, classification and uses, Antivirals: Classification and mechanism of action, Antibiotic resistance.

PRACTICAL (Credits: 32 Hours)

1. Sterilization Techniques.
2. Preparation of Culture Media.
3. Growth of different cultures
4. Staining of Gram positive and gram negative bacteria
5. Antibiotic sensitivity tests.
6. Preparation of bacterial smear.

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Recommended Books:

1. Prescott's Microbiology: Textbook by Christopher J. Woolverton, Joanne M. Willey, and Linda Sherwood.
2. Microbiology: Book by Michael Pelczar and Roger Delbert Reid.
3. Microbiology: An Introduction: Textbook by Gerard J. Tortora