

M Sc biotechnology course of study

Course Title: Molecular Biochemistry

Course No.: MBT 513

Credits: 2

Objectives

- To acquaint students with basic knowledge of biochemistry emphasizing on its importance in biotechnology.
- To provide the students the basic knowledge of biomolecules and their synthesis.
- To provide the students an insight of biochemical techniques, their uses and general applications.
- Synthesis and metabolism
- To expose the students to practical methods used in biochemistry laboratory

Course Description

Water:

2hrs

Water as a molecule of life (Structure, properties and reactivity). Weak acids and bases and buffering in biological systems.

Amino acids and proteins

8 hrs

Structure, properties and classification of amino acids. Biological role of peptides and proteins; Protein structure: primary and secondary structure, Ramachandran's Plot, super-secondary-, tertiary- and quaternary structure; structure of proteins such as keratins, Collagens. Elastin and Hemoglobin; Forces stabilizing of 3-D and quaternary structure of proteins, Protein denaturation and folding; Chemical synthesis of peptides. Peptide sequencing.

Carbohydrates

4 hrs

Biological function. Monosaccharides: classification, structures and reactions, sugar derivatives and their physiological function. Disaccharides: structure and biological role of some common disaccharides. Oligosaccharides and polysaccharides: classification, properties and structures of some common carbohydrates of biological interest. Glycosaminoglycans, Proteoglycans and glycoproteins: structures and biological role..

Lipids

3 hrs

Biological role of lipids. General properties, distribution, classification and nomenclature of lipids. Structure, properties and functions of: fatty acids, waxes, neutral fats, phospholipids, sphingolipids, glycolipids, steroids and its derivatives, eicosanoids and other lipids. Lipoproteins.

Nucleic acids.

3 hrs

Biological role of. General properties, distribution, classification . Structure, properties and functions of: DNA and RNA.

Enzymes and enzyme technology

15 hrs

Nomenclature and classification of enzymes, enzyme specificities, Mechanisms of enzyme action (acid base catalysis, Covalent catalysis, electrostatic catalysis, Proximity and orientation effect, metal ion catalysis), investigation of active site of enzymes, enzyme kinetics: single substrate enzyme catalyzed reaction- Michaelies-Menton kinetics (kintetic constants: Km, Vmax, Kcat, turn over number),

M Sc biotechnology course of study

determination of kinetic constants (Lineweaver-burk Plot, Dixon plot, etc.) Mechanism of Bi-substrate enzyme catalyzed reactions. Methods of determination of enzyme activity, Factors influencing the enzyme activity. Enzyme inhibitors and types of enzyme inhibition, Determination of K_i , factors influencing enzyme inhibition. Regulation of enzymes: Cooperative (allostery) effects (KNF and WMC model), Multi enzyme systems (occurrence, properties and importance with appropriate examples), cascade systems (mono- and multi-cyclic, feedback and feed forward regulation with appropriate examples). Isoenzymes: classification, occurrence and clinical applications. Enzyme immobilization: methods of enzyme immobilization, kinetics and applications of immobilized enzymes.