Introduction to Biochemistry

Biochemistry is the branch of science that focuses on all the chemical/ life processes associated with living organisms. It can be understood as the chemistry of life and its functions. It is a branch that combines both biology and chemistry to study the life processes in organisms. Biochemists make use of chemical knowledge and techniques to solve any biological problems associated with a living organism. The branch focuses on studying organisms' cells, thereby understanding their structures and various interactions. The term “Biochemistry” was coined by Carl Neuberg in 1930. He is referred to as the ‘Father of Modern Biochemistry’. It is the study of the internal structures and interactions of various macromolecules like carbohydrates, protein, lipids, nucleic acids, organelles present in the body of organisms. The branch focuses on investigating the chemical reactions involved in different life processes like metabolism, reproduction, heredity, growth.

Branches of Biochemistry

Due to the continuous progress in Biology, Chemistry, and Physics, the branches of biochemistry are growing diversely and vastly. The significant branches include:

- **Molecular Biology**

This scientific discipline attempts to study and analyze the processes in living organisms from a molecular level. The branch is often considered as the ‘root of biochemistry’. It aims to study and investigate in detail the biochemical, metabolic cycles in living beings, the integration-disintegration of molecules, thereby understanding the functions of the living systems. It focuses on analyzing the behavior, interactions of biological macromolecules like DNA, RNA, Proteins, enzymes, hormones, etc., and their synthesis within the cells, thereby explaining the biological living functions of organisms at the molecular level.

- **Cell Biology**

The branch deals with the structure and functions of cells in living organisms. The cell biology branch of biochemistry is also called Cytology. An area that focuses on studying the morphology and psychology of eukaryotes and prokaryotes at the cellular level. The study reveals the properties, functions, structure, biochemical composition, the lifecycle of cells in organisms.

Cell biology is essential to understand the intrinsic cellular processes that cells carry out during their life cycle, like respiration, nutrition, cell division, synthesis of compounds, defense mechanisms, cell death, etc. The branch is closely associated with fields like physiology, histology, and microbiology.

- **Genetics**

Genetics, an important branch of biochemistry focuses on the study of genes, their mutations/variations, and the characteristics of heredity in living organisms. Here, the structure, function, variation, and distribution of genes are studied within the context of the cell, the organism, and the population. Genetics is a broad field, having several subfields like molecular genetics, population genetics, and epigenetics. Molecular genetics and genetic engineering are fields under biochemistry and molecular biology that study genes, heritage, and expressions.

- **Metabolism**

Metabolism is one of the most essential and fundamental processes taking place in living beings. It refers to the series of activities that happen in the body when food gets converted into energy. The process involves many interconnected cellular pathways to provide cells with the required energy to carry out their functions.

Metabolism can be the array of biochemical processes that take place in living beings. It includes both anabolisms or builds up of substances and catabolism or breakdown of substances.

Importance of Biochemistry

At present, biochemistry is one of the most developing and critical areas of study in science. The field offers a significant avenue for research. It helps understand the chemical aspects of different biological processes such as digestion, respiration, reproduction, excretion, the behavior of hormones, contraction, and relaxation of muscles, and many more. It plays a vital role in health and nutrition. The field generally studies different body substances like enzymes, amino acids, carbohydrates, proteins, fats, DNA, RNA, Pigments, hormones, etc., at the fundamental level.

Biochemists make use of chemical information and procedures to solve biological problems. Biochemistry solves fundamental problems in biology and medicine. Biochemistry provides interdisciplinary knowledge in science as it has many branches underneath, covering everything regarding organisms and their existence. It is essential in designing and manufacturing various chemical and biological products, clinical diagnosis, nutrition, treatment of diseases, agriculture, etc.

Biochemistry ensures sustainability. It is a vast branch of science that offers endless possibilities-enormous scope for employment, hence reducing global poverty and starvation. Therefore biochemistry is essential as a sustainable tool.

Scope of Biochemistry

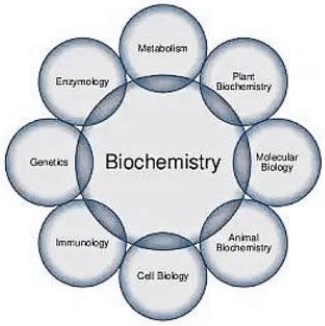
Biochemistry is the study of life; hence the scope it offers is as broad as life itself. The field has seen unprecedented growth, especially in the present times. Biochemistry offers a lot of scope in fields like:

Medical Sciences: There is a huge scope in areas like pathology, immunology, pharmacy, vaccine development, etc. People can also find a job as Biochemists, lab assistants, medical transcriptionists, clinical coordinators, marketing executives after having relevant degrees in any field of biochemistry. Another advanced scope of biochemistry is in Genetic Engineering or Recombinant DNA Technology.

Agriculture: Plant biochemistry offers enormous scope. Students of this branch can become agricultural scientists and develop agricultural crop variants that are high-yielding and disease-resistant. Knowledge of biochemistry can also help in setting up own farms or nurseries.

Food Industry: Nutritionists and dieticians help in monitoring and regulating the nutrient richness in the body. These roles have an enormous scope, especially in today's world where everyone is leading a sedentary lifestyle. Being a Food analyst or a Food security officer are other job prospects in this area.

Academics and Research: The field offers plenty of research opportunities. Every area underneath biochemistry is worth learning and researching.



Fields of Biochemistry