UCLA

Student Learning Outcomes for the B.S. in Biochemistry

The knowledge learned by graduates with a B.S. major in Biochemistry will enable them to:

- understand atomic structure, bonding, and non-covalent forces.
- be familiar with the essential molecular components of living systems – including DNA, RNA and proteins – their chemical structures and hierarchical organization into supramolecular machines, organelles, and cells.
- understand central metabolic processes, including their relationship to energy conversions in the cell, and mechanisms by which cellular processes are energetically coupled. Be familiar with the chemical and biophysical principles underlying respiration and photosynthesis.
- understand the ways in which information is encoded and transmitted in biology, including how linear protein sequences encode three-dimensional structures, and how nucleic acid sequences and their modifications encode genetic and epigenetic traits. Be familiar with genomic structure and organization.
- understand the molecular basis for control and signaling processes in the cell, including mechanisms of genetic regulation, posttranslational modification, and molecular transport.
- have an atomic level understanding of the chemistry and interactions involved in recognition and catalysis by macromolecules and their cofactors.
- be familiar with techniques for macromolecular separation, identification, and assays for activity.
- understand the principles of molecular evolution and the use of DNA and protein sequences in inferring biological function and common ancestry. Understand the role of genomic sequence data in biological discovery.
- understand the elements of hypothesis-driven and discovery-driven modes of acquiring biochemical knowledge.
- understand the role of biochemistry in addressing contemporary societal and global issues.

The skills learned by graduates with a B.S. major in Biochemistry will enable them to:

- prepare solutions and complex mixtures of defined concentration, and perform elementary chemical syntheses.
- purify macromolecules from complex mixtures based on physical and chemical properties.
- characterize purified macromolecules with regard to biophysical properties and biological activities; identify macromolecules based on sequence data.
- design rigorous controls for biochemical experiments; use them to interpret results critically.
- model simplified biochemical and biophysical systems – chemical reactions and other cellular processes – with appropriate equations in order to extract physical parameters such as equilibrium and rate constants.
- conduct literature searches and computational studies (e.g. using sequence databases) to gain information about the functions of biological molecules.
- handle chemicals and biological reagents safely.