



University of California, Santa Barbara
Program Learning Outcomes

B.S. in Biochemistry

Students graduating with a B.S. in Biochemistry should be able to:

1. Master broad biochemical knowledge concerning fundamentals in basic areas of the chemical discipline (organic, inorganic, analytical, and physical chemistry) and biochemistry as outlined:
 - a. Organic:
 - i. Solve problems involving the nomenclature, reactivity, stereochemistry, mechanisms, and synthesis of the various classes of organic compounds.
 - b. Inorganic:
 - i. Solve problems involving Lewis acids/bases, group theory, and molecular orbital theory for inorganic compounds.
 - c. Analytical:
 - i. Explain when and how to use the techniques of spectrophotometry, mass spectrometry, scattering and separation processes.
 - d. Physical:
 - i. Solve problems involving classical thermodynamics, equilibrium statistical mechanics, quantum mechanics, diffusion, and chemical kinetics.
 - e. Biochemistry:
 - i. List the physical and chemical properties of proteins, nucleic acids, carbohydrates, and biomembranes and explain their origins and biological (e.g., evolutionary) ramifications;
 - ii. Describe how nature synthesizes and degrades biomolecules;
 - iii. Describe the chemical logic underlying enzymatic catalysis and the chemical and regulatory logic underlying metabolism;
 - iv. Describe information flow in the cell as per the central dogma of biology.
2. Apply critical thinking to solve word problems by identifying variables and useful equations.
3. Collect, process, and present data and perform appropriate statistical analysis, such as linear and nonlinear regression, using modern computer software.
4. Employ modern literature-search tools to retrieve scientific information about a biochemical topic and critique biochemical literature for quality.
5. Successfully pursue career objectives in advanced education in professional and/or graduate schools, in a career in government or industry, in a teaching career, or in a related career following graduation.

In the laboratory, students graduating with a B.S. in Biochemistry should be able to:

1. Describe the objective of their biochemical or computational experiments, carry out the experiments, and record and analyze the results.
2. Collect, process, and analyze data using contemporary computer software.
3. Use standard laboratory equipment, modern instrumentation, and classical techniques to carry out experiments.

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4. Communicate the concepts and results of their laboratory experiments through writing and oral communication.
5. Use and analyze results (when appropriate) from a minimum of 5 of the following:
 - a. Spectroscopy (e.g., fluorescence)
 - b. Mass spectrometry (e.g., MS-MS)
 - c. Mutagenesis and protein cloning
 - d. Structure methods (e.g., NMR, X-ray)
 - e. Chromatographic separations
 - f. DNA electrophoresis
 - g. Enzyme kinetics