

## Review of *Biochemistry: Concepts and Connections*, First Edition

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**Biochemistry: Concepts and Connections**, 1st edition, by Dean R. Appling, Spencer J. Anthony-Cahill, and Christopher K. Mathews. Pearson: Boston, 2015. 912 pp. ISBN: 9780321839923 (hardcover). \$202.60.

The first edition of *Biochemistry: Concepts and Connections* (26 chapters, 912 pages, best for a one-semester course) was written by three educators to provide mixed-science-majors with a highly visual, precise, and clear understanding of the biochemical mechanisms and pathways in living cells. The same authors wrote a more detailed biochemistry textbook for majors, *Biochemistry*, 4th ed.<sup>1</sup> (29 chapters, 1368 pages, for a two-semester course), which is a comprehensive textbook that preserves details and requires a strong physical chemistry background as suggested by the authors.

The preface of *Biochemistry: Concepts and Connections* lists names of more than 80 reviewers who provided feedback on the book manuscript at various stages throughout the writing process, and an additional 8 members of the foundation figure advisory board. The authors, Appling, Anthony-Cahill, and Mathews, have experience teaching biochemistry courses using textbooks prepared for two distinct audiences of students, namely biochemistry majors and mixed-science-majors, at the University of Texas, Western Washington University, and Oregon State University, respectively. Additionally, each author has had an outstanding career in biochemical research. The authors describe their vision of the textbook using a title that provides emphasis on the fundamental concepts and shows how biochemistry connects to applications of other life sciences, including medicine, agriculture, environmental sciences, and forensics. This approach aims to help students prepare for and engage with the challenges of the 21st century through qualitative reasoning skills and applications related to their future careers.

The book consists of four distinct sections. In the first section (Chapters 1–3), the book presents an introduction to biochemistry and life. The authors start by introducing biochemistry and the language of chemistry in Chapter 1. Chapters 2 and 3 introduce the chemical foundation and energetics of life. The second section (Chapters 4–10) discusses the major biochemistry macromolecules, including nucleic acids (Chapter 4), proteins (Chapter 5–8), carbohydrates (Chapter 9), and lipids (Chapter 10). The proteins are discussed in four chapters, including an introductory chapter (Chapter 5), three-dimensional structures (Chapter 6), function and evolution (Chapter 7), and enzymes as biological protein catalysts (Chapter 8). The third section of the book (Chapters 11–19) introduces metabolism and concepts of the major metabolic pathways in living cells, including carbohydrates, amino acids, nucleotides, and lipid metabolisms, as well as photosynthesis, electron transport, and oxidative phosphorylation. And, finally, the fourth section (Chapters 20–26)

focuses on DNA duplication, repair, and related topics, such as genes and chromosomes, transcription, translation, and gene regulations. The last 50 pages of the book have answers to some end-of-chapter questions, a detailed glossary, a list of useful equations, and a common abbreviation list.

Studying these 26 detailed chapters of a biochemistry textbook of this kind can easily overwhelm its own audience of “mixed-science-majors”. Credit should be given to the authors for simplifying the topics, figures, study tools, and features, and organizing the discussions neatly and systemically to enable the students to learn through concise presentations. This approach organizes the concepts in students’ minds and allows them to build upon their understanding of the fundamentals of each chapter. In addition, the textbook chapters provide several features to improve students’ understanding including groundbreaking visual narratives, foundation figures, and tools of biochemistry. The *visual narratives* include 3D maps and charts that highlight the overarching themes to help students grasp the bigger picture. The *foundation figures* provide students with a way to organize the concepts and make highly complex and detailed material more manageable. Additionally, boxes of *concept and connection statements* are highlighted in each chapter to demonstrate how individual topics are related to real-world applications. Also, the textbook provides unique end-of-chapter references, including links to Nobel Prize lectures. And finally, the textbook includes 15 separate sections on the most important research techniques, called *Tools of Biochemistry*. These tools include the following: electrophoresis and isoelectric focusing; manipulating DNA; an introduction to X-ray diffraction; protein expression and purification; sequencing and amino acid analyses of purified proteins; spectroscopic methods for studying macromolecular conformation in solution; determining molecular masses and the number of subunits in a protein molecule; immunological methods; how to measure the rates of enzyme-catalyzed reactions; the emerging field of glycomics, metabolomics, radioactive and stable isotopes; detecting and analyzing protein–protein interactions; polymerase chain reaction; DNA microarrays; and chromatin immunoprecipitation.

Several of my colleagues currently use similar textbooks, for example, *Principles of Biochemistry*, 5th ed.<sup>2</sup> (22 chapters, 832 pages, for a one-semester course) by Moran, Horton, Scrimgeour, and Perry. However, in my opinion, *Biochemistry: Concepts and Connections* textbook offers more focus on applications and includes more detailed research techniques in its Tools of Biochemistry feature. In conclusion, this book covers biochemistry for all students at the college level. This first edition provides an increased emphasis on fundamentals, concepts, and applications. I recommend this textbook to

instructors who want to match biochemistry principles to real-world applications for students with a variety of career aspirations.

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### Notes

The authors declare no competing financial interest.

## ■ REFERENCES

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