

FunBased Learning Chemistry Resource. By Sulan Dunn <http://funbasedlearning.com/chemistry/default.htm>

The FunBased Learning Chemistry Web site offers four educational online activities for the novice chemistry student (early secondary school level) to reinforce basic knowledge of elemental symbols and to practice balancing chemical equations. Accompanying downloadable worksheets are available on the Web site as well.

Activity: Element Quiz

Why the creator describes the activities on the homepage as “fun games” is unclear, as the four resources are in fact one multiple-choice quiz and three (nearly identical) fill-in-the-blank activities. The element quiz provides 43 questions relating to a total of 25 elements (19 main group/6 transitional). One positive aspect of the multiple-choice quiz is the occasional reference in the answer boxes to environmentally related concerns linked to the element in question, which adds current relevance and meaning to the material. The author’s tone is friendly and encouraging.

Other areas are less advantageous. Site navigation overall is poor. It is unclear to the user how to exit the quiz, nor is it possible to revisit previously answered questions. Correct answers are commented upon, while incorrectly answered questions are bypassed until later in the quiz. A variety of design elements seem pedagogically unsound, such as recording only the number of consecutive questions answered correctly, rather than the total number of correctly answered questions. Blocking the learner from dwelling upon incorrectly answered questions is another drawback as it promotes guessing rather than reflection, especially given the lack of additional guidance or learning resources. The quiz only ends when one answers all 43 questions correctly (incorrectly answered questions are repeated indefinitely).

Imprecisely written formulae (NO_3 rather than NO_3^-), the use of non IUPAC units and occasional inaccuracies in the answer boxes (“The most expensive element at the time [?] the program was created”) fail to add educational value.

Activity: Classic, Review, and Brain Boggle Chembalancer

The Chembalancer activities provide the student with the opportunity to test balancing skills for 11, 10 and 5 chemical equations respectively by adding the appropriate coefficients to reactants and products. Navigational issues similar to those encountered during the element quiz limit the resource’s usefulness. The quiz ends only by balancing all equations correctly, yet guidance to refine balancing strategies is not provided. The student who is unable to correctly balance even one of the equations cannot complete the activity. Inconsistencies in molecular structures (e.g. in the structure of Al_2O_3) and formulae (Ag_2O) add to the confusion. In Brain Boggle equation 2 is not aligned well to the correct answer (nor the worksheet), which refers to CO rather than CO_2 . The distinction made on the Web site between beginner and advanced Chembalancer activities is unclear, as meaningful learning support is unavailable and levels of difficulty are comparable for all three.

Accessibility

The site overall shows accessibility problems, such as poor distinction between foreground/background/text color hues, and inconsistent use of font style and size.

Summary

Of some benefit on this educational Web site are the accompanying, downloadable worksheets. The online quiz and semi-interactive activities, however, add less than supplementary learning value to conventional classroom based tasks and resources.

Overview

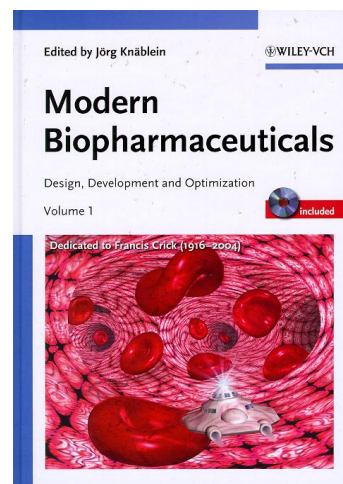
(from * poor to **** good)
Ease of navigation: *
Ease of learning: **
Content: **
Relevance: ***
Accuracy: **
Usefulness to student: **
Usefulness to teacher: **

Christina Mainka

Napier University, Edinburgh, c.mainka@napier.ac.uk

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Modern Biopharmaceuticals: Design, Development and Optimization. Dedicated to Francis Crick (1916-2004). Jörg Knäblein, Editor. Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim, Germany, 2005. <http://www.wiley-vch.de>. 4 volumes, Figures and tables, clxxxvii + 1886 pp. 17.7 x 24.5 cm.; hardcover. \$755.00; €629.00; SFR994; ISBN 3-527-31184-X.



Although an exact definition of the term “biopharmaceutical” is still absent from dictionaries, it apparently originated in the 1980s as a class of therapeutic products produced by modern biotechnological techniques. These incorporated protein-based products produced by genetic engineering or, in the case of monoclonal antibodies (mAbs), produced by hybridoma technology. Thus biopharmaceuticals can be described as proteins or nucleic

acid-based pharmaceuticals, used for therapeutic or *in vivo* diagnostic purposes and produced by means other than direct extraction from a non-engineered biological source.

In 1982 the first biopharmaceutical product, “humilin,” recombinant human insulin, produced in *Escherichia coli* and developed by Genentech in collaboration with Eli Lilly, was approved for use in the United States, marking the beginning of the biopharmaceutical industry. Since then the biopharmaceutical market has burgeoned at an accelerating rate. More than 120 such products are currently being marketed around the world, including nine blockbuster drugs, which represent the mainstay products of the biotechnology industry. *Modern Biopharmaceuticals* is a four-volume work intended to introduce readers to a comprehensive set of recently developed technologies, which shows the paradigm shifts in the health care system and reflects these changes in industrial research.

Jörg Knäblein, Head of Microbiological Chemistry at Schering AG, Berlin, Germany and Scientific Advisor, Executive Board Member, and President of the European Association of Pharmaceutical Biotechnology, studied biotechnology/chemical engineering at the Gesellschaft für Biotechnologische Forschung (GBF). After acquiring industrial experience as a biotechnologist in research on Alzheimer’s disease at Hoechst UK (London), he decided to study biochemistry and earned his diploma in biochemistry at the Max-Planck-Institut (M-P-I) für Biochemie at Martinsried/Munich. He then worked as a biochemist at Hoechst in Somerville, NJ. Returning to the M-P-I in Munich, he received his PhD degree by working in the group of 1988 Nobel chemistry laureate Robert Huber, who wrote one of the two forewords for *Modern Biopharmaceuticals*. Together with Huber, he founded his own biotechnology company and worked for a consulting firm focusing on the Life Science business of global players, while also co-founding the PharmaManagement Network.

The recipient of numerous awards and honors, Knäblein has chaired and organized several international pharmaceutical conferences and is a member of the editorial board of the *European Journal of Pharmaceutics and Biopharmaceutics*. He advises international clients, institutions, and governments, lectures extensively around the world, and has authored many journal articles, several books, and holds a number of patents. In addition to editing the work under review he coauthored one of the articles (“Production of Recombinant Proteins in Plants,” pp 893-917).

Knäblein describes the genesis of the project that resulted in the book in the Prologue (pp xxv-xxvii):

“I have a dream...”. Once, on an early Sunday morning in 2003, “the 50th anniversary of DNA discovery”, I woke up and had the idea to bring together all the world-renowned leaders from biotech academia and industry, in order to publish a comprehensive book on modern biopharmaceuticals. As learned from nature, some things happen best—if at all—spontaneously. So, I contacted some of my friends, presented the idea and discussed with them the current hot topics in the LifeSciences arena. Very quickly a list with topics and authors emerged, which I presented to Wiley-VCH—and they spontaneously agreed to publish this book (p xxv).

Modern Biopharmaceuticals is a truly international venture. The 186 contributors are scientists and business leaders from academic, industrial, and governmental laboratories working in

17 countries—Germany (61), United States (52), the Netherlands (12), Switzerland and the United Kingdom (11 each), Japan (eight), Austria and Israel (six each), Canada (five), Korea (four), Denmark, Poland, and Spain (two each), and Australia, France, India, and Ireland (one each).

Knäblein’s work may be unprecedented in having such an impressive group of individuals contribute to one biotechnology book. Contributors include leading authorities from internationally prestigious academic institutes such as the California Institute of Technology, Cambridge University, Charité Campus Benjamin Franklin, the Eidgenössische Technische Hochschule (ETH), Fraunhofer Institute for Molecular Biology and Applied Ecology, Harvard University, Imperial College London, Johns Hopkins, Karolinska Institutet, Kyoto University, Max-Planck-Institut für Biochemie, Massachusetts Institute of Technology, Moscow and Polish Academies of Science, National Cancer Institute, National Institutes of Health, Oxford University, Princeton University, Scripps Institute, Seoul National University, Stanford University, the Technion, the Weizmann Institute of Science, and Yale University, as well as biotechnology companies such as Amgen, Astex Technology, Bayer, Baxter, Berlex, Crucell, DSM Biologics, DuPont, Merck, Genentech, Genzyme, Hoffmann-La Roche, Invitrogen, Lonza Biologics, McKinsey, Mologen, Monsanto, MorphoSys, Novartis, Novo Nordisk, Philips, Roche, SmithKline, Schering, and the U.S Food and Drug Administration (FDA). Moreover, authors include three Nobel chemistry laureates—Robert Huber (1988) (Foreword, “History of Modern Biopharmaceuticals: Where Did We Come From and Where Will We Go,” pp xxxi-xxxiii), Thomas R. Cech (1989) (“Beginning to Understand the End of the Chromosome,” pp 37-48), and Manfred Eigen (1967) (“Design of Modern Biopharmaceuticals by Ultra-high-throughput Screening,” pp 583-603).

A number of the essays deal with controversial topics on the cutting edge of research, for example, “The First Cloned Human Embryo: An Unlimited Source of Stem Cells for Therapeutic Cloning” by Woo Suk Hwang *et al.* (pp 269-281. Since the book’s publication the Seoul National University on March 20, 2006 dismissed Hwang for fraudulently fabricating data on embryonic stem cells.) and “Myocardial Regeneration Strategies using Human Embryonic Stem Cells” by Izhak Kehat, Oren Caspi, and Lior Gepstein (pp 283-303).

Knäblein’s book, the volumes of which are cumulatively paginated, is printed on heavy, acid-free paper and includes a host of tables and figures, some in color and some full-page. The meticulously documented essays include references as recent as 2004. Each of the set’s four volumes contains a table of contents for the entire set (16 pp).

Volume 1 (373 pp) contains a Prologue (3 pp) and Dedication (2 pp) to Francis Crick, both by Knäblein; two Forewords (3 pp and 2 pp, by Robert Huber and Günter Stock, respectively); four pages of quotes by Nobelists James D. Watson, Sir Aaron Klug, Stanley Cohen, Kary Mullis, and Paul Lauterbur as well as Ian Wilmut (“clone-father of sheep Dolly”), Chris Walsh, and Detlev Ganten; and a list of contributors and their postal addresses (16 double-column pages). The most unusual and interesting introductory section in this volume is an extremely long (71 pages) “Executive Summary” by Knäblein, which describes in detail each of the 75 signed and cross-referenced essays and thus provides a complete summary of the entire book’s contents.

- Introduction, “Current Status of Biopharmaceuticals: Approved Products and Trends in Approvals” (34 pp), presents definitions, history, and lists of products, the companies producing them, therapeutic indications, and dates of approval. Extensive cross-references to essays in the book are given.
- Part I, “Biopharmaceuticals used in Molecular Medicine” (15 essays)

Volume 2 (342 pp, the shortest volume)

- Part II, “Biopharmaceuticals and their Mode of Action” (8 essays)
- Part III, “Improving the Development of Biopharmaceuticals” (7 essays)

Volume 3 (635 pp, the longest volume)

- Part IV, “Production of Biopharmaceuticals” (16 essays)
- Part V, “Biopharmaceuticals used for Diagnostics and Imaging” (9 essays)

Volume 4 (471 pp)

- Part VI, “Advanced Application Routes for Biopharmaceuticals” (9 essays)
- Part VII, “From Transcription to Prescription for Biopharmaceuticals” (5 essays)
- Part VIII, “From Bench to Bedside—the Aftermaths” (5 essays)
- “Epilog” (2 pp)
- “More about the Editor” (2 pp)
- “Supplement CD-ROM” (4 pp)

This final volume includes a detailed index (46 double-column pages) from “Abacavir” to “Zystic fibrosis” that facilitates location of information. Attached to the inside back cover is a supplementary CD-ROM disk with a PowerPoint presentation that Knäblein assembled over the years and that he has used to share the fascination of biotechnology with students. It includes vivid video animations such as those showing the entire process from DNA unwinding in the nucleus through transcription into mRNA to the expression of a biopharmaceutical. Also, the mechanism of the cancer drug Herceptin in CHO cells is shown in a fascinating and educational manner. By focusing on key aspects the animations help one to understand such complex processes.

In Knäblein’s words,

I hope that the reader will agree that this book is the first of its kind, introducing a comprehensive set of technologies recently developed, showing their impact on drug development, discussing paradigm shifts in the healthcare system and also reflecting these changes in industrial research. Compiling this wealth of information in a sophisticated manner was only possible if all chapters were written by the experts themselves, and most of them are working in academic institutes and (often in their own) biotech companies at the same time.... It is my hope that [the book] will serve as an inspiration for all professionals in the field, since it offers a very good framework for understanding the complex nature of biopharmaceuticals, the mainstay of modern medicine (pp xxvi).

In my opinion, he has eminently succeeded in attaining his goal and has produced an authoritative sourcebook dealing with the entire broad range of biopharmaceuticals now available.

The next edition of *Modern Biopharmaceuticals*, which is intended to be even more comprehensive, is already in preparation, and Knäblein asks readers to suggest additional topics and content and to visit the biotechnology hub at his website <http://www.get-gps.net/> to discuss current trends with a particular Global Pharma Specialist from a world-wide network.

Modern Biopharmaceuticals is an impressive compilation of outstanding results written by brilliant, creative thinkers who are shaping present and future biotechnology. I am pleased to recommend strongly this complete and comprehensive basic reference source for this new, exciting field to biotechnologists, clinicians, physicians, pharmacists, pharmaceutical chemists, molecular biologists, medicinal chemists, and anyone working in the biotechnological and pharmaceutical industries or in medicinal institutes. It should also be invaluable to undergraduate and graduate students, postdoctoral fellows, and researchers looking for quick, clear, and concise ideas on topics that lie outside their areas of expertise. It also belongs in academic, industrial, and governmental libraries.

George B. Kauffman

California State University, Fresno, georgek@csufresno.edu

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Infrared Spectroscopy: Fundamentals and Applications.

By Barbara Stuart. John Wiley and Sons Ltd, Chichester, England, 2004. xv + 224 pp. £34.99. ISBN 0-470-85428-6.

Analytical chemistry is one of the most fundamental areas in science. The work of analytical chemists is of vital importance throughout the manufacturing industry and in the environmental, medical, and biological sciences. Because analytical chemistry appears in the chemistry course at most colleges and universities, many publishers offer texts that address the needs of students taking these courses.

Barbara Stuart, in her preface to *Infrared Spectroscopy: Fundamentals and Applications*, argues that IR spectroscopy has a central role in this area:

“Infrared spectroscopy is one of the most important and widely used analytical techniques available to scientists working in a whole range of fields. There are a number of texts on the subject available, ranging from instrumentation to specific applications. The present book aims to provide an introduction to those needing to use infrared spectroscopy for the first time, by explaining the fundamental aspects of the technique, how to obtain a spectrum and how to analyze infrared data obtained for a wide number of materials.”

This concisely sums up the author’s aims for the book, but the slightly curious phraseology of the final sentence in the preface hints that all is not quite right with this book, and so it proves.

There is a lucrative market for textbooks in analytical chemistry, and the level and style adopted by Stuart suggest that this book might be a useful addition to the field. The coverage of topics is appropriate, the level at which the book is written, while undemanding, is suitable for students taking a first course in the subject, and a range of examples helps to illustrate the discussion. Unhappily though, the book contains so many errors or misleading explanations that one can only conclude that it was inadequately proofread.