

Information Competencies for Chemistry Undergraduates: *the elements of information literacy*

Special Libraries Association, Chemistry Division

American Chemical Society, Division of Chemical Information

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Special Libraries Association, Chemistry Division <http://chemistry.sla.org/>
American Chemical Society, Division of Chemical Information <http://www.acscinf.org>

Information Competencies for Chemistry Undergraduates

SLA Chemistry Division and ACS Division of Chemical Information

INTRODUCTION

The Special Libraries Association (SLA) Chemistry Division Ad Hoc Committee on Information Literacy appointed in 2004 published "*Information Competencies for Chemistry Undergraduates: The Elements of Information Literacy*" <<http://chemistry.sla.org/dchearchive/il/cheminfoit2007.pdf>> in January 2007 as written and edited by Cory Craig and Linda Maddux. This document was revised by Marion Peters, Grace Baysinger, and Cory Craig and is being reissued in 2011 in consultation with the American Chemical Society (ACS) Division of Chemical Information (CINF) Education Committee and members from the SLA Chemistry Division.

The information competencies included encompass skills and knowledge that undergraduates should have by completion of a bachelor's degree in chemistry. Students who achieve proficiency in these areas will have a firm understanding of how to navigate the scientific and chemical literature, and will be well-prepared for graduate study or employment as a chemist.

The document is divided into four sections as listed below plus supplemental readings and an index of recommended resources.

1. Big Picture: The Library and Scientific Literature;
2. Chemical Literature;
3. Properties, Spectra, Crystallographic, and Safety Information;
4. Scientific Communication and Ethical Conduct

Each section includes specific information competencies that students should develop and identifies recommended resources. Resources listed are provided as suggested titles as we realize that all resources will not be available at every institution, and that similar resources not listed may be appropriate as well. Similarly, students do not need to know every recommended resource but should be able to use their acquired skills to find information by using the resources available to them. Resources can be in any format including print, online, or CD-ROM; however, ideally students should have significant experience using both online databases and print resources.

Librarians and other educators who work with chemistry undergraduates are the intended audience for this document. Our expectation is that this document can be used to:

- a. Improve chemistry undergraduate instruction;
- b. Facilitate acquisition and assessment of information literacy skills by chemistry undergraduates;
- c. Provide a list of recommended resources for libraries working with chemistry undergraduates;
- d. Serve as a bridge between the ACS Committee on Professional Training (CPT) *Undergraduate Professional Education in Chemistry: ACS Guidelines and Evaluation Procedures for Bachelor's Degree Programs* (2008) and information literacy standards developed by the American Library Association (ALA) Association of College and Research Libraries (ACRL) and its Science and Technology Section (STS) including: *ALA/ACRL/STS Information Literacy Standards for Science and Engineering/Technology* (2006), and *ALA/ACRL Information Literacy Competency Standards for Higher Education* (2000).
- e. Assist as a resource for developing subject-specific information literacy standards in related scientific disciplines.

It is expected that this document will be updated regularly, as circumstances warrant. Comments on this document should be directed to: cheminfoit@ucdavis.edu

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Note: **Recommended resources** are free unless indicated by “\$\$”; see Recommended Resources Index for full citation, including URLs and links to publisher’s information.

1. BIG PICTURE: THE LIBRARY AND SCIENTIFIC LITERATURE

Chemistry undergraduates should understand the nature and purpose of scientific literature and be able to use library tools and services to obtain needed information. This section outlines in broad terms, what students should know about the library and scientific literature.

1.1 LIBRARY:

Undergraduate chemistry students should be able to understand and perform the tasks listed below.

- a) Understand the organization of the library and know how to use library tools (catalogs, databases, library web pages, subject guides, etc.) and library services (reserves, reference, interlibrary loan, etc.) to obtain desired information and references.
- b) Understand the purpose and characteristics of different information-finding tools, e.g. catalogs, indexing and abstracting databases, subject guides, and web search engines, and choose appropriate tools for a particular information need.
- c) Request help from librarians, faculty, and teaching assistants when needed and consult online training materials when available.

1.2 SCIENTIFIC LITERATURE:

Chemistry undergraduates should be able to understand the scope and nature of scientific literature, interpret and evaluate scientific literature, and follow a logical path of inquiry.

- a) Understand the flow of scientific information, and how information is communicated among scientists, both formally and informally.

Recommended resources:

[Library Research in the Sciences](#)
[Flow of Scientific Information](#)

- b) Understand the nature and purpose of different types of scientific literature, including journals (communications, research articles, and review articles), magazines, patents, proceedings, dissertations, monographs, handbooks, encyclopedias and dictionaries, grey literature, and technical reports.
- c) Be able to read and interpret citations for the different types of scientific literature.

Recommended resource:

[The ACS Style Guide. Chapter 14: References, by Janet S. Dodd, Leah Solla, and Paula M. Bérardon. 3rd ed. 2006](#)

- d) Understand and apply criteria for evaluating the authority and appropriateness of a document or information source.
- e) Demonstrate critical thinking by evaluating information, drawing conclusions from the literature, and following a logical path of inquiry.
- f) Understand the general nature of the peer review process.

Recommended resource:

[The ACS Style Guide. Chapter 6: Peer Review, by Barbara Booth, p.71-76. 3rd ed. 2006](#) \$\$
[Peer Review Education Resource](#)

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g) Understand scientific ethics and accountability and have an awareness of intellectual property issues and developments in scholarly communications including those affecting author's rights, the use of copyrighted materials in research and instruction, and open-access initiatives related to the scientific literature.

Recommended resources:

[ACS Ethical Guidelines](#)

[ACS Ethical Guidelines to Publication of Chemical Research](#)

The ACS Style Guide. Chapter 1: Ethics in Scientific Publication, by Gordon G. Hammes, p.3-10. 3rd ed. 2006 \$\$

The ACS Style Guide. Chapter 7: Copyright Basics, by Karen S. Buehler, C. Arleen Courtney, and Eric S. Slater, p.77-86. 3rd ed. 2006 \$\$

[Learning Module: What Chemists Need to Know about Copyright. American Chemical Society Joint Board/Council Committee on Publications. Subcommittee on Copyright.](#)

2. CHEMICAL LITERATURE

Throughout their course and laboratory work, chemistry undergraduates need to obtain various types of chemical literature using the resources available at their campus library. This section assumes students understand the nature and purpose of different types of scientific literature; are able to read and interpret citations from the scientific literature; or can ask a librarian for help in these areas. Students need to develop an understanding of the unique features of chemical literature. This section lists expected skills and recommended resources for finding chemical literature, including background information, articles and other types of chemical literature including patents.

2.1 BACKGROUND INFORMATION:

Chemistry undergraduates should know how to find chemistry-specific sources of background information such as encyclopedias, treatises, compiled works, and review articles. Students should be able to use these resources as a starting point for gathering information, by using them to obtain an introduction or overview for an unfamiliar topic, and taking advantage of the extensive bibliographies many of these resources provide. Students should also be able to identify additional resources for background information by asking a librarian for assistance, browsing their library's reference area, and/or consulting online subject guides available at their library.

Recommended Resources:

Kirk-Othmer Encyclopedia of Chemical Technology ([also online](#)) \$\$

Ullmann's Encyclopedia of Industrial Chemistry ([also online](#)) \$\$

Hawley's Condensed Chemical Dictionary ([also online](#); also [available from Knovel](#)) \$\$

Review articles (additional resources listed in Section 2.2)

Annual Reviews in Analytical Chemistry ([also online](#)) \$\$

Annual Reviews in Biochemistry ([also online](#)) \$\$

Annual Reviews in Physical Chemistry ([also online](#)) \$\$

Annual Reviews, other titles as appropriate \$\$

Accounts of Chemical Research [American Chemical Society journal] ([also online](#)) \$\$

Chemical Reviews [American Chemical Society journal] ([also online](#)) \$\$

Chemical Society Reviews [Royal Society of Chemistry journal] ([also online](#)) \$\$

2.2 ARTICLES AND OTHER CHEMICAL LITERATURE:

To identify and obtain various types of scientific literature (including journal articles, communications, reviews, magazine articles, patents, proceedings, dissertations, monographs, handbooks, encyclopedias and dictionaries, grey literature and technical reports), chemistry students should be able to use the resources listed below as available on their campus.

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a) Students should be able to demonstrate the following skills.

- Understand the content and organization of the print and online versions of a database.
- Search for literature using searches as appropriate for each database, for example search by author, topic, chemical (name, CAS RN, structure, formula), and reaction.
- Refine/limit literature searches (by topic, author, year, document type, language, etc).
- Refine/limit substance/reaction searches (by structure, yield, steps, classification, etc.).
- Understand what a cited/citing reference search is, why it is useful, and how to do it.

Recommended Resources:

[SciFinder, web version](#) / Chemical Abstracts [info](#) \$\$
[SciFinder Content](#)
[Web of Science](#) / Science Citation Index \$\$
[Scopus info](#) \$\$

b) Undergraduate students should also be able to identify and use other chemistry related online article databases or print equivalents available at their institution.

Recommended Resources:

[BIOSIS](#) / Biological Abstracts \$\$
[Compendex](#) / Engineering Index [info](#) \$\$
 INSPEC [info](#) \$\$
[PubMed](#)

c) Students should be able to find full journal titles given an abbreviation by using tools such as CASSI (Chemical Abstracts Service Source Index), article indexes, or library catalogs.

Recommended resources:

[CAS Source Index \(CASSI\) Search Tool](#)
[CAplus Core Journal Coverage List](#)

2.3 PATENTS:

Chemistry students should be able to locate patents, by patent number or topic, and ask a librarian for additional help if needed, e.g. to identify different types or parts of a patent.

Recommended Resources:

[European Patent Office Database](#) (Espacenet)
 Worldwide coverage of patents, including U.S.
[United States Patent and Trademark Office](#) (USPTO) database

[Reaxys](#) \$\$
[SciFinder, web version](#) / Chemical Abstracts \$\$
[CAS Patent Coverage](#)

[McLeland, Le-Nhung, ed. *What Every Chemist Should Know about Patents*. ACS Joint Board–Council Committee on Patents and Related Matters. Subcommittee on Education. 3rd ed. 2002.](#)

2.4 CHEMICAL SUBSTANCES, REACTIONS, AND SYNTHESSES:

In addition to understanding the scope and nature of scientific literature, chemistry undergraduates should have an understanding of the unique features of chemical literature, and be able to use these unique features to find needed information. This includes being able to perform the tasks below.

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- a)** Understand the various systems used to classify and identify chemical information, know why they are important, and how to use them to find chemical information. This includes: Chemical Abstracts Service Registry Numbers (CAS RN), Hill system order, chemical nomenclature, and other systems as appropriate to specialized areas of chemistry (e.g., Enzyme Commission (EC) Numbers).
- b)** Know how to search for chemical structures and which databases provide structure searching. Be able to use reactions to find and communicate chemical information.

Recommended resources:

[ChemID Plus](#)

[ChemSpider](#)

[Combined Chemical Dictionary \(CCD\)](#), available in [CHEMnetBASE](#) \$\$

[Organic Syntheses](#) (also available online from Wiley) \$\$

[Merck Index Online](#) \$\$

[Properties of Organic Compounds](#), available in [CHEMnetBASE](#) \$\$

[Reaxys](#) (also for reaction searching) \$\$

[SciFinder, web version](#) (also for reaction searching) \$\$

[Marvin Suite](#); software for drawing structures

- c)** Locate syntheses for compounds of interest using the resources below: Students should be familiar with searching by structure, name, and other chemical identifiers (reactant, product, etc).

Recommended Resources:

[Reaxys](#) / Beilstein [info](#) and Gmelin [info](#), selected content available online through Reaxys
\$\$

[SciFinder, web version](#) / Chemical Abstracts \$\$

[Organic Syntheses](#) (also available in print and online from Wiley) \$\$

Inorganic Syntheses ([also online](#)) \$\$

Encyclopedia of Reagents for Organic Synthesis ([also online](#)) \$\$

Fieser and Fieser's Reagents for Organic Synthesis ([also online](#)) \$\$

3. PROPERTIES, SPECTRA, CRYSTALLOGRAPHIC, AND SAFETY INFORMATION

Throughout their coursework, undergraduate chemistry students need to obtain physical and chemical properties, syntheses, spectra, crystallographic, and safety information for various substances. This section outlines expected skills and recommended resources for finding this information.

3.1 PROPERTIES:

Chemistry undergraduates should be able to search property information for both known and "unknown" compounds for conducting laboratory experiments and confirming laboratory results. Students should be acquainted with various chemical identifiers (chemical name, CAS RN, structure, molecular formula) and be able to use them as starting points to locate physical and chemical properties using the resources listed below as available on their campus. Students should be aware that it may be necessary to search a variety of resources, and/or try several different identifiers, before locating the desired property; and that property values reported in the literature and obtained in their laboratory can vary due to differing conditions, i.e. using different pressure, temperature, or solvents can lead to different results. Students should be aware that some resources may be searched numerically by property values to obtain a listing of compounds exhibiting these values.

a) Basic Property Information

Recommended Resources:

CRC Handbook of Chemistry and Physics ([also online](#)) \$\$

[Combined Chemical Dictionary \(CCD\)](#), includes inorganic, organic, and more \$\$

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Dictionary of Inorganic and Organometallic Compounds ([also online](#)) \$\$
 Dictionary of Natural Products ([also online](#)) \$\$
 Dictionary of Organic Compounds ([also online](#)) \$\$
 (these first five resources and more available online as [CHEMnetBASE](#))
 Kaye and Laby's Table of Physical and Chemical Constants ([also online](#))
[Knovel Critical Tables](#) (registration required)
 Lange's Handbook of Chemistry \$\$
 Merck Index / [Merck Index Online](#) \$\$
[NIST Chemistry WebBook](#)
 Perry's Chemical Engineers Handbook ([also online](#)) \$\$
[Physical Reference Data \(NIST Physics Lab\)](#)

b) Comprehensive Property Information

When more property information is needed than that provided by basic handbooks, students should be familiar with and able to use the resources listed below. Students may need assistance from a librarian to locate additional property information and/or references in other resources.

Recommended Resources:

[Reaxys](#) / Beilstein [info](#) and Gmelin [info](#), selected content available online through Reaxys
 \$\$
[SciFinder, web version](#) / Chemical Abstracts \$\$

Journal of Physical and Chemical Reference Data (NIST) ([also online](#)) \$\$
 Landolt-Börnstein [info](#)/ New Series available online through [SpringerMaterials](#) \$\$
[Using SpringerMaterials to Locate Your Landolt-Börnstein Volume and Chapter, by Teri Vogel, 2011](#)
[Landolt Börnstein Substance / Property Index](#)
[NCBI Chemical and Molecular Databases](#)
[Physical Properties Sources Index \(PPSI\)](#)

3.2 SPECTRA:

Students should be able to identify and use resources available at their campus library and online to locate spectra (e.g. infra-red, ultraviolet, nuclear magnetic resonance, mass, etc.) as needed for their laboratory and coursework.

a) Spectra Collections

Students should be able to use standard spectra collections found online and in print resources to locate spectra.

Recommended Resources:

Aldrich Library of Spectra (FTIR; IR; NMR) \$\$
 CRC Handbook of Data on Common Organic Compounds / [Properties of Organic Compounds](#) (available online in [CHEMnetBASE](#)) \$\$
 Includes spectral peaks for over 29,000 common organic compounds.
[NIST Chemistry WebBook](#)
 Spectra for organic compounds and some small inorganic compounds.
 Sadtler Spectra collections [info](#) (available online as [KnowItAllU](#)) \$\$
[SciFinder, web version](#) \$\$
 Includes spectra for some compounds, plus predicted and experimental spectral diagrams for selected compounds in detailed display of chemical substance.
[Sigma-Aldrich Catalog](#)
 Includes spectra for many compounds, and references to spectra for most compounds, including those found in the various *Aldrich Library of Spectra*.
[Spectral Database for Organic Compounds](#) (SDBS) English version
 Provides spectra for 32,000 organic compounds.

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b) Spectral Data in the Literature

If spectra are not found in the spectra collections listed above or if additional references are needed, students should be able to use the resources below or request assistance from a librarian to locate references to spectra or spectral data in the literature.

Recommended Resources:

[Reaxys](#) / Beilstein [info](#) and Gmelin [info](#) , selected content available online through Reaxys \$\$
[SciFinder, web version](#) / Chemical Abstracts

3.3 CRYSTALLOGRAPHIC DATA:

Students should be able to identify and use resources available at their campus library and online to locate crystallographic data as needed for their laboratory and coursework.

Recommended Resource:

[CSD Teaching Database](#)

WebCSD, [info](#) \$\$

[Thomas, I.R. and others. 2010. WebCSD: The Online Portal to the Cambridge Structural Database. *J. Appl. Cryst.* 43, 362-366](#) \$\$

3.4 SAFETY INFORMATION:

Undergraduates should be able to identify and locate resources on their campus which provide information on how chemical substances can be safely handled, stored, and used

Recommended Resources:

Bretherick's Handbook of Reactive Chemical Hazards (included in Elsevier's [Hazmat Navigator](#); also [available from Knovel](#)) \$\$

[CRC Handbook of Laboratory Safety](#) (also online) \$\$

[Prudent practices in the laboratory: Handling and management of chemical hazards](#)

Sax's Dangerous Properties of Industrial Chemicals ([also online](#)) \$\$

Sigma Aldrich Library of Chemical Safety Data \$\$

[TOXNET](#) (National Library of Medicine)

Various databases, including [Hazardous Substances Data Bank](#) (HSDB)

Material Safety Data Sheets (MSDS):

[Cornell University MSDS](#)

[University of Vermont SIRI MSDS Collection](#)

[University of Vermont SIRI MSDS Collection](#), alternate URL

[Sigma-Aldrich Catalog](#)

[Safety in Academic Chemistry Laboratories, Volume 1: Accident Prevention for College and University Students. ACS Joint Board – Council Committee on Chemical Safety. 7th ed. 2003](#)

4. SCIENTIFIC COMMUNICATION AND ETHICAL CONDUCT

Chemistry undergraduates should understand that being able to clearly and concisely present research conducted in an ethical manner is imperative to a scientist.

4.1 COMMUNICATION:

Students should be aware of the different methods for presenting research (articles, posters, oral presentations at scientific conferences, etc); understand the reasons for citing the literature in one's own writing; demonstrate the ability to cite using appropriate formatting and standard abbreviations; and be familiar with software that allows for storing, managing, and formatting bibliographic references or citations.

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a) Writing:

Recommended Resources:

[ACS Style Guide, Chapter 1: Writing a Scientific Paper. 2nd ed. 1997](#)

[ACS Style Guide, Chapter 14: References. 3rd ed. 2006](#)

ACS Style Guide: Effective Communication of Scientific Information. 3rd ed. 2006 \$\$

The Craft of Scientific Writing, by Michael Alley. 3rd ed. 1996 \$\$

How to Write and Publish a Scientific Paper, by Robert A. Day (various editions) \$\$

[Information for Authors. American Chemical Society. Author and Resource Reviewer Center](#)

[Writing Scientific Manuscripts: A Guide for Undergraduates](#)

On Writing Well: An Informal Guide to Writing Nonfiction, by William Zinsser \$\$

Style: Lessons in Clarity and Grace, by Joseph M. Williams and Gregory G. Colomb. 10th ed. 2010 \$\$

[Writing Guidelines for Engineering and Science Students](#)

b) Citation and reference manager software:

Recommended Resources:

[EndNote](#) \$\$

[EndNote Web](#) \$\$; [EndNote Web, included in Web of Science](#) \$\$

[Mendeley](#)

[RefWorks](#) \$\$

[Zotero](#) (use with FireFox browser)

[Citation and Document Managers, by Bioscience & Natural Resources Library, UC Berkeley](#)

c) Poster presentations:

Recommended Resources:

[Creating Effective Poster Presentations, by George Hess, Kathryn Tosney, and Leon Liegel](#)

[Designing Conference Posters, by C.B. Purrington](#)

[PosterPresentations.com](#) (research poster PowerPoint templates)

4.2 ETHICAL CONDUCT:

Chemistry undergraduates should learn the professional standards of chemists as articulated in the ACS "Chemist's Code" and in relevant works on scientific ethics; understand that science is filled with ethical judgments; recognize the ethical component of complex situations; and analyze complex ethical problems and design appropriate solutions.

Recommended Resources:

[The Chemical Professional's Code of Conduct. American Chemical Society. 2007](#)

[Ethical Guidelines to Publication of Chemical Research. American Chemical Society. 2010](#)

[On Being a Scientist: A Guide to Responsible Conduct in Research. Committee on Science, Engineering, and Public Policy. 3rd ed. 2009](#)

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FURTHER READING

Note: Readings are free unless indicated by "\$\$"

Introduction

American Chemical Society. Committee on Professional Training. 2008. *Undergraduate Professional Education in Chemistry: ACS Guidelines and Evaluation Procedures for Bachelor's Degree Programs*, Section 7.2 Chemical Literature Skills.
http://portal.acs.org/portal/PublicWebSite/about/governance/committees/training/acsapproved/degreeprogram/WPCP_008491 (accessed February 3, 2011)

American Chemical Society. Committee on Professional Training. 2009. *Development of Student Skills in a Chemistry Curriculum*.
http://portal.acs.org/portal/PublicWebSite/about/governance/committees/training/acsapproved/degreeprogram/CNBP_025490 (accessed February 9, 2011)

American Chemical Society. Committee on Professional Training. 2010. *Excellent Undergraduate Chemistry Programs*.
http://portal.acs.org/portal/PublicWebSite/about/governance/committees/training/acsapproved/degreeprogram/CNBP_024262 (accessed February 9, 2011)

ALA/ACRL. 2000. *Information Literacy Competency Standards for Higher Education*.
<http://www.ala.org/ala/mgrps/divs/acrl/standards/informationliteracycompetency.cfm> (accessed February 9, 2011)

ALA/ACRL/STS Task Force on Information Literacy for Science and Technology. 2006. *Information Literacy Standards for Science and Engineering/Technology*.
<http://www.ala.org/ala/mgrps/divs/acrl/standards/infolitscitech.cfm> (accessed February 7, 2011)
 Shorter version: http://wikis.ala.org/acrl/index.php/Science_IL_Standards_and_Teaching_Ideas (accessed February 9, 2011)

ALA/ACRL/Instruction Section. *Information Literacy in Chemistry*.
http://wikis.ala.org/acrl/index.php/Information_Literacy_in_Chemistry (accessed February 9, 2011)

Grafstein, Ann. 2002. "A Discipline-Based Approach to Information Literacy." *Journal of Academic Librarianship* 28 (4), 197-204. \$\$

1: Big Picture: the Library and Scientific Literature

American Chemical Society. Committee on Professional Training. 2008. *Supplements to the ACS Guidelines -- Student Skills: Chemical Information Retrieval*.
http://portal.acs.org/portal/PublicWebSite/about/governance/committees/training/acsapproved/degreeprogram/CTP_005584 (accessed February 3, 2011)

Chemical Information Sources. http://en.wikibooks.org/wiki/Chemical_Information_Sources (accessed February 9, 2011)

Chemical Information Sources/Chemical Information Instructional Materials (CIIM).
http://en.wikibooks.org/wiki/Chemical_Information_Sources/CIIM (accessed February 9, 2011)

Chemical Information Sources/Chemical Information Instructional Materials (CIIM). *How to Teach Chemical Information*.
http://en.wikibooks.org/wiki/Chemical_Information_Sources/CIIM/How_to_Teach_Chemical_Information (accessed February 9, 2011)

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Smith, Eleanor M. 2003. Developing an Information Skills Curriculum for the Sciences. *Issues in Science and Technology Librarianship*, Spring 2003.
<http://www.istl.org/03-spring/article8.html#13> (accessed March 11, 2011)

Open Access Scholarly Information Sourcebook.
<http://openoasis.org/> (accessed April 14, 2011)

2: Chemical Literature

American Chemical Society. Committee on Professional Training. 2008. *CPT Recommended Journal List*.
http://portal.acs.org/portal/PublicWebSite/about/governance/committees/training/acsapproved/CTP_006024 (accessed March 14, 2011)

Journals (selected articles)
Issues in Science & Technology Librarianship [selected articles]
<http://www.library.ucsb.edu/istl/> (accessed February 9, 2011)

Journal of Academic Librarianship [selected articles] \$\$

Journal of Chemical Education [selected articles] \$\$

Science & Technology Libraries [selected articles] \$\$

XCITR (Explore Chemical Information Teaching Resources)
<http://www.xcitr.org> (accessed February 9, 2011)

3: Properties, Spectra, Crystallographic, and Safety Information

American Chemical Society. Committee on Professional Training. 2008. *Supplements to the ACS Guidelines -- Student Skills -- Safety and Safety Education*.
http://portal.acs.org/portal/PublicWebSite/about/governance/committees/training/acsapproved/degreeprogram/CTP_005607 (accessed February 9, 2011)

XCITR (Explore Chemical Information Teaching Resources)
<http://www.xcitr.org> (accessed February 9, 2011)

4: Scientific Communication and Ethical Conduct

The DOI® System. <http://www.doi.org/index.html> (accessed March 17, 2011)

DOI Lookup. <http://www.crossref.org/guestquery/> (accessed March 17, 2011)

DOI (digital object identifiers) <https://lib.stanford.edu/swain/digital-object-identifiers-doi> (accessed March 13, 2011)

American Chemical Society. Committee on Professional Training. 2008. *Supplements to the ACS Guidelines -- Student Skills -- Preparing a Research Report*.
http://portal.acs.org/portal/PublicWebSite/about/governance/committees/training/acsapproved/degreeprogram/CTP_005606 (accessed February 9, 2011)

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American Chemical Society. Committee on Professional Training. 2008. *Supplements to the ACS Guidelines -- Student Skills – Guidelines for the Teaching of Professional Ethics*.
http://portal.acs.org/portal/PublicWebSite/about/governance/committees/training/acsapproved/degreeprogram/CTP_005588 (accessed February 9, 2011)

American Chemical Society. Ethical and Professional Guidelines.
<http://portal.acs.org/portal/PublicWebSite/careers/ethics/index.htm> (accessed April 14, 2011)

American Chemical Society. Materials for Ethics Education—Case Studies
http://portal.acs.org/portal/acs/corg/content?_nfpb=true&_pageLabel=PP_ARTICLEMAIN&node_id=1795&content_id=CNBP_026712&use_sec=true&sec_url_var=region1&uuid=78ad5407-8332-4dbb-9261-21ee8f837e26 (accessed April 14, 2011)

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RECOMMENDED RESOURCES INDEX

Note: Resources are free unless indicated by "\$\$"

Accounts of Chemical Research [American Chemical Society journal] (section **2.1**) \$\$

<http://pubs.acs.org/journal/achre4> (accessed March 17, 2011)

ACS Style guide: Effective Communication of Scientific Information. Anne M. Coghill and Lorrin R. Garson, Eds. American Chemical Society, Washington, D. C. 3rd ed. 2006 (section **4.1**) \$\$

Info: <http://pubs.acs.org/page/books/styleguide/index.html> (accessed March 17, 2011)

-- Chapter 1: Ethics in Scientific Publication, by Gordon G. Hammes, p.3-10 (section **1.2g**)

-- Chapter 6: Peer Review, by Barbara Booth, p.71-76 (section **1.2f**)

-- Chapter 7: Copyright Basics, by Karen S. Buehler, C. Arleen Courtney, and Eric S. Slater, p.77-86. (section **1.2g**)

The ACS Style Guide. Chapter 1: Writing a Scientific Paper. 2nd ed. 1997 (section **4.1a**)

<http://www.oup.com/us/samplechapters/0841234620/?view=usa> (accessed March 13, 2011)

The ACS Style Guide. Chapter 14: References, by Janet S. Dodd, Leah Solla, and Paula M. Bérardon. 3rd ed. 2006 (section **1.2c**; **4.1a**)

<http://pubs.acs.org/userimages/ContentEditor/1246030496632/chapter14.pdf> (accessed February 9, 2011)

Aldrich Library of Spectra (FTIR, IR, NMR) (section **3.2a**) \$\$

Info: FTIR http://www.sigmaaldrich.com/catalog/search/ProductDetail/ALDRICH/Z286001?lang=en_US

Info: IR http://www.sigmaaldrich.com/catalog/search/ProductDetail/ALDRICH/Z107506?lang=en_US

Info: NMR http://www.sigmaaldrich.com/catalog/search/ProductDetail/ALDRICH/Z231037?lang=en_US (accessed March 17, 2011)

Annual Reviews (section **2.1**) \$\$

Info: <http://www.annualreviews.org/> (accessed March 17, 2011)

Annual Reviews in Analytical Chemistry (section **2.1**) \$\$

<http://www.annualreviews.org/journal/anchem> (accessed March 17, 2011)

Annual Reviews in Biochemistry (section **2.1**) \$\$

<http://www.annualreviews.org/journal/biochem> (accessed March 17, 2011)

Annual Reviews in Physical Chemistry (section **2.1**) \$\$

<http://www.annualreviews.org/journal/physchem> (accessed March 17, 2011)

Beilstein (section **2.4c**; **3.1b**, **3.2b**) \$\$

Info: <http://www.lib.utexas.edu/chem/info/beilstein.html> (accessed March 17, 2011)

BIOSIS / Biological Abstracts (section **2.2b**) \$\$

<http://isiknowledge.com/BIOSIS> (access April 9, 2011)

Info: http://thomsonreuters.com/products_services/science/science_products/a-z/biosis/ (accessed March 17, 2011)

Bretherick's Handbook of Reactive Chemical Hazards (section **3.4**) \$\$

http://www.knovel.com/web/portal/browse/display?_EXT_KNOVEL_DISPLAY_bookid=1685 (accessed March 17, 2011)

Included in: http://www.elsevierdirect.com/hazmatnavigator/data_sources.html (accessed March 17, 2011)

Information Competencies for Chemistry Undergraduates

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CAPLUS Core Journal Coverage List (section **2.2c**)

<http://www.cas.org/expertise/cascontent/caplus/corejournals.html> (accessed March 13, 2011)

CAS Source Index (CASSI) Search Tool (section **2.2c**)

<http://cassi.cas.org> (accessed February 9, 2011)

Chemical Reviews [American Chemical Society journal] (section **2.1**) \$\$

<http://pubs.acs.org/journal/chreay> (accessed March 17, 2011)

Chemical Society Reviews [Royal Society of Chemistry journal] (section **2.1**) \$\$

<http://pubs.rsc.org/en/journals/journalissues/cs> (accessed March 17, 2011)

ChemID Plus (section **2.4b**)

<http://chem.sis.nlm.nih.gov/chemidplus/> (accessed March 13, 2011)

CHEMnetBASE (section **2.4b**; **3.1a**; **3.2a**) \$\$

<http://www.chemnetbase.com/> (accessed February 9, 2011)

ChemSpider (section **2.4b**)

<http://www.chemspider.com/> (accessed March 17, 2011)

Citation and Document Managers (section **4.1b**)

<http://www.lib.berkeley.edu/BIOS/refman.html> (accessed March 14, 2011)

Citation manager software (section **4.1b**); see Reference manager software

Combined Chemical Dictionary (CCD) (section **2.4b**; **3.1a**) \$\$

<http://ccd.chemnetbase.com/> (accessed March 17, 2011)

Compendex / Engineering Index (section **2.2b**) \$\$

<http://www.engineeringvillage2.org/controller/servlet/Controller?CID=quickSearch&database=1>

(accessed April 9, 2011)

Info: <http://www.ei.org/compendex> (accessed March 17, 2011)

Copyright (section **1.2g**) –

ACS Ethical Guidelines

<http://pubs.acs.org/page/policy/ethics/index.html> (accessed February 9, 2011)

ACS Ethical Guidelines to Publication of Chemical Research

<http://pubs.acs.org/userimages/ContentEditor/1218054468605/ethics.pdf> (accessed February 9, 2011)

Info: <http://pubs.acs.org/page/books/styleguide/index.html> (accessed March 17, 2011)

--*The ACS Style Guide*. Chapter 1: Ethics in Scientific Publication, by Gordon G. Hammes, p.3-10. 3rd ed. 2006 \$\$

--*The ACS Style Guide*. Chapter 7: Copyright Basics, by Karen S. Buehler, C. Arleen Courtney, and Eric S. Slater, p.77-86. 3rd ed. 2006 \$\$

Learning Module: What Chemists Need to Know about Copyright. American Chemical Society Joint Board/Council Committee on Publications. Subcommittee on Copyright.

http://pubs.acs.org/page/copyright/learning_module/summary.html (accessed February 11, 2011)

Cornell University MSDS (section **3.4**)

<http://www.ehs.cornell.edu/msds/msds.cfm> (accessed February 9, 2011)

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CRC Handbook of Chemistry and Physics (section **3.1a**) \$\$

<http://www.hbcernetbase.com/> (accessed March 17, 2011)

Info: print <http://www.crcpress.com/product/isbn/9781439855119> (accessed March 17, 2011)

CRC Handbook of Data on Common Organic Compounds (section **3.2a**) \$\$

Info: <http://www.crcpress.com/product/isbn/9780849304040> (accessed March 17, 2011)

CRC Handbook of Laboratory Safety (print or online) (section **3.4**) \$\$

<http://www.crcnetbase.com/isbn/9781420038460> (accessed April 9, 2011)

Info: print <http://www.crcpress.com/product/isbn/9780849325236> (accessed March 17, 2011)

CSD Teaching Database (section **3.3**)

http://www.ccdc.cam.ac.uk/free_services/teaching/ (accessed March 14, 2011)

CSD, Web (section **3.3**) \$\$

Info: http://www.ccdc.cam.ac.uk/products/csd_system/webcsdl/ (accessed April 2, 2011)

--Thomas, I.R. and others. 2010. *WebCSD: the online portal to the Cambridge Structural Database*. J. Appl. Cryst. 43, 362-366 (section **3.3**) \$\$

<http://dx.doi.org/10.1107/S0021889810000452> (accessed March 14, 2011)

Dictionary of Inorganic and Organometallic Compounds (section **3.1a**) \$\$

<http://dioc.chemnetbase.com/> (accessed March 17, 2011)

Info: print (Inorganic Compounds): <http://www.crcpress.com/product/isbn/9780412301209> (accessed March 17, 2011)

Info: print (Organometallic Compounds): <http://www.crcpress.com/product/isbn/9780412430602> (accessed March 17, 2011)

Dictionary of Natural Products (section **3.1a**) \$\$

<http://dnp.chemnetbase.com/> (accessed March 17, 2011)

Info: print <http://www.crcpress.com/product/isbn/9780412466205> (accessed March 17, 2011)

Dictionary of Organic Compounds (section **3.1a**) \$\$

<http://doc.chemnetbase.com/> (accessed March 17, 2011)

Info: print <http://www.crcpress.com/product/isbn/9780849300073> (accessed March 17, 2011)

Encyclopedia of Reagents for Organic Synthesis (section **2.4c**) \$\$

<http://onlinelibrary.wiley.com/book/10.1002/047084289X> (accessed March 17, 2011)

Info: print <http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470017546.html> (accessed March 17, 2011)

Ethical Conduct (sections **4.2**) –

ACS Ethical Guidelines to Publication of Chemical Research. American Chemical Society. 2010. (section **1.2g**; **4.2**)

<http://pubs.acs.org/userimages/ContentEditor/1218054468605/ethics.pdf> (accessed February 9, 2011)

The Chemical Professional's Code of Conduct. American Chemical Society. 2007. (section **4.2**)

http://portal.acs.org/portal/PublicWebSite/careers/ethics/CNBP_023290 (accessed March 19, 2011)

On Being a Scientist: A Guide to Responsible Conduct in Research. Committee on Science, Engineering, and Public Policy. 3rd ed. 2009. (section **4.2**)

http://www.nap.edu/catalog.php?record_id=12192#toc (accessed February 9, 2011)

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SLA Chemistry Division and ACS Division of Chemical Information

Fieser and Fieser's Reagents for Organic Synthesis (section **2.4c**) \$\$

<http://onlinelibrary.wiley.com/book/10.1002/9780471264194> (accessed March 17, 2011)

Info: print <http://www.wiley.com/WileyCDA/WileyTitle/productCd-047089458X.html> (accessed March 17, 2011)

Flow of Scientific Information (section **1.2a**)

http://www.lib.uwaterloo.ca/usered/grad/researchskills/flow_of_info.html (accessed September 14, 2011)

Gmelin (section **2.4c**; **3.1b**; **3.2b**) \$\$

Info: <http://www.lib.utexas.edu/chem/info/gmelin.html> (accessed March 17, 2011)

Hawley's Condensed Chemical Dictionary (section **2.1**) \$\$

<http://onlinelibrary.wiley.com/book/10.1002/9780470114735> (accessed March 17, 2011)

http://www.knovel.com/web/portal/browse/display?EXT_KNOVEL_DISPLAY_bookid=2822 (accessed March 17, 2011)

Info: <http://www.wiley.com/WileyCDA/WileyTitle/productCd-0471768650.html> (accessed March 17, 2011)

Hazardous Substances Data Bank (HSDB) (TOXNET, section **3.4**)

<http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB> (accessed March 17, 2011)

Inorganic Syntheses (section **2.4c**) \$\$

Info: <http://onlinelibrary.wiley.com/bookseries/10.1002/SERIES2146> (accessed March 17, 2011)

INSPEC (section **2.2b**) \$\$

Available from several vendors: <http://www.theiet.org/publishing/inspec/> (accessed March 17, 2011)

Journal of Physical and Chemical Reference Data (NIST) (section **3.1b**) \$\$

<http://jpcrd.aip.org> (accessed February 9, 2011)

Kaye and Laby. Table of Physical and Chemical Constants (section **3.1a**)

<http://www.kayelaby.npl.co.uk/> (accessed March 13, 2011)

Kirk-Othmer Encyclopedia of Chemical Technology (section **2.1**) \$\$

<http://onlinelibrary.wiley.com/book/10.1002/0471238961> (accessed March 13, 2011)

Info: <http://www.wiley.com/WileyCDA/WileyTitle/productCd-0471484962.html> (accessed March 13, 2011)

Knovel Critical Tables (section **3.1a**); requires registration

<http://www.knovel.com/knovel2/Toc.jsp?BookID=761> (accessed February 9, 2011)

KnowItAll/ Sadtler Spectra collections (section **3.2a**) \$\$

<http://www.knowitallu.com/> (accessed May 6, 2011)

Info: <http://www.lib.utexas.edu/chem/info/sadtler.html> (accessed March 17, 2011)

Software (free): KnowItAll Academic Edition <http://www.knowitall.com/academic/welcome.asp> (accessed March 17, 2011)

IQ Academic Spectral Database http://www.knowitall.com/academic/IQ_database/default.asp (accessed May 6, 2011) \$\$

Landolt-Börnstein / SpringerMaterials (section **3.1b**) \$\$

Info: <http://www.lib.utexas.edu/chem/info/lb.html> (accessed March 17, 2011)

<http://www.springermaterials.com/> (accessed March 17, 2011)

Lange's Handbook of Chemistry (section **3.1a**) \$\$

Info: <http://www.mhprofessional.com/product.php?isbn=0071432205> (accessed March 17, 2011)

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Library Research in the Sciences (section **1.2a**)

<http://www.lib.unc.edu/instruct/science/> (accessed September 14, 2011)

Marvin Suite (section **2.4b**)

<http://www.chemaxon.com/products/marvin/> (accessed March 13, 2011)

Merck Index (section **3.1a**) \$\$

Info: <http://www.merckbooks.com/mindex/> (accessed March 17, 2011)

Merck Index Online (section **2.4b**; **3.1a**) \$\$

<https://themerckindex.cambridgesoft.com>

Info: <http://www.merckbooks.com/mindex/online.html> (accessed April 3, 2011)

NCBI Chemical and Molecular Databases (section **3.1b**)

<http://www.ncbi.nlm.nih.gov> (accessed February 9, 2011)

NIST Chemistry WebBook (section **3.1a**; **3.2a**)

<http://webbook.nist.gov/chemistry> (accessed February 9, 2011)

Organic Syntheses (section **2.4b**; **2.4c**)

<http://www.orgsyn.org/> (accessed February 9, 2011)

Patents (section **2.3**) –

McLeland, Le-Nhung, ed. What Every Chemist Should Know about Patents. ACS Joint Board–Council Committee on Patents and Related Matters. Subcommittee on Education. 3rd ed. 2002.

https://portal.acs.org/portal/fileFetch/C/WPCP_006903/pdf/WPCP_006903.pdf (accessed February 11, 2011)

CAS Patent Coverage

<http://www.cas.org/expertise/cascontent/caplus/patcoverage/patyear.html>

European Patent Office Database (Espacenet)

<http://worldwide.espacenet.com/> (accessed May 4, 2011)

United States Patent and Trademark Office (USPTO) database

<http://www.uspto.gov/> (accessed February 9, 2011)

Peer Review Education Resource (section **1.2f**)

<http://www.senseaboutscience.net/> (accessed March 11, 2011)

Perry's Chemical Engineers Handbook (section **3.1a**) \$\$

<http://www.accessengineeringlibrary.com/html/viewbookdetails.asp?bookid=200139d8&catid=B>

(accessed March 17, 2011)

http://www.knovel.com/web/portal/browse/display?EXT_KNOVEL_DISPLAY_bookid=2203 (accessed March 17, 2011)

Info: <http://www.mhprofessional.com/book.php?isbn=0071422943> (accessed March 17, 2011)

Physical Reference Data (NIST Physics Lab) (section **3.1a**)

<http://www.nist.gov/pml/data/index.cfm> (accessed February 9, 2011)

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Posters presentations (section **4.1c**) –

Creating Effective Poster Presentations, by George Hess, Kathryn Tosney, and Leon Liegel
<http://www.ncsu.edu/project/posters/NewSite/> (accessed September 14, 2011)

Designing Conference Posters, by C.B. Purrington
<http://colinpurrington.com/tips/academic/posterdesign/> (accessed September 14, 2011)

PosterPresentations.com (research poster PowerPoint templates)
http://www.posterpresentations.com/html/free_poster_templates.html (accessed September 14, 2011)

Properties of Organic Compounds (section **2.4b**; **3.2a**) \$\$
<http://www.chemnetbase.com/tours/poc/intro.jsf> (accessed March 17, 2011)

Prudent practices in the laboratory: Handling and management of chemical hazards, updated version 2011 (section **3.4**)
http://www.nap.edu/catalog.php?record_id=12654 (accessed March 30, 2011)

PubMed (section **3.2b**)
<http://www.ncbi.nlm.nih.gov/pubmed/> (accessed February 10, 2011)

Reaxys (section **2.3**; **2.4b**; **3.1-3.2**) \$\$
<https://www.reaxys.com/>
 Info: http://www.reaxys.com/info/about_overview (accessed February 10, 2011)

Reference manager software (section **4.1b**) –

EndNote \$\$
<http://www.endnote.com> (accessed April 9, 2011)

EndNote Web \$\$
<http://www.endnote.com/enwebinfo.asp> (accessed March 17, 2011); included in Web of Science
http://wokinfo.com/products_tools/bibliographic/enw/ (accessed March 17, 2011)

Mendeley
<http://www.mendeley.com/> (accessed April 9, 2011)

RefWorks \$\$
<http://www.refworks.com/> (accessed March 17, 2011)

Zotero (use with FireFox browser)
<http://www.zotero.org/> (accessed March 17, 2011)

Sadtler Spectra collections (section **3.2a**) \$\$
 Info: <http://www.lib.utexas.edu/chem/info/sadtler.html> (accessed March 17, 2011)

Safety in Academic Chemistry Laboratories, Volume 1: Accident Prevention for College and University Students. ACS Joint Board – Council Committee on Chemical Safety. 7th ed. 2003 (section **3.4**)
http://portal.acs.org/portal/PublicWebSite/about/governance/committees/chemicalsafety/publications/WP_CP_012294 (accessed March 13, 2011)

Sax's Dangerous Properties of Industrial Chemicals (section **3.4**) \$\$
<http://onlinelibrary.wiley.com/mrw/advanced/search?doi=10.1002/0471701343> (accessed April 9, 2011)
 Info: <http://onlinelibrary.wiley.com/book/10.1002/0471701343> (accessed March 17, 2011)
 Info: print <http://www.wiley.com/WileyCDA/WileyTitle/productCd-0471476625.html> (accessed March 17, 2011)

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Science Citation Index / Web of Science (section **2.2b**) \$\$

Info: http://thomsonreuters.com/products_services/science/science_products/a-z/web_of_science/ (accessed February 10, 2011)

Info: print (accessed March 17, 2011)

http://thomsonreuters.com/products_services/science/science_products/a-z/science_citation_index/

SciFinder, web version / Chemical Abstracts (section **2.3**; **2.4b-c**; **3.1b-3.2**;) \$\$

<https://scifinder.cas.org/> (accessed April 9, 2011)

Info: <http://www.cas.org/products/sfacad/index.html> (accessed February 10, 2011)

Info: print <http://www.cas.org/products/print/index.html> (accessed March 17, 2011)

Info: <http://www.lib.utexas.edu/chem/info/ca.html> (accessed March 17, 2011)

SciFinder Content (section **2.2a**)

<https://www.cas.org/help/scifinder/content.htm> (accessed March 14, 2011)

Scopus (section 3.2b) \$\$

<http://www.scopus.com/home.url> (accessed September 14, 2011)

Info: <http://www.info.sciverse.com/scopus/> (accessed September 14, 2011)

Sigma-Aldrich Catalog (section **3.2a**; **3.4**)

<http://www.sigmaaldrich.com/> (accessed February 9, 2011)

Sigma Aldrich Library of Chemical Safety Data. 1988 (section **3.4**) \$\$

Info: print http://www.sigmaaldrich.com/catalog/search/ProductDetail/ALDRICH/Z160008?lang=en_US (accessed March 17, 2011)

Spectral Database for Organic Compounds (SDBS) (section **3.2a**)

http://riodb01.ibase.aist.go.jp/sdbs/cgi-bin/cre_index.cgi?lang=eng (English version) (accessed February 9, 2011)

Springer Materials / Landolt-Börnstein (section **3.1b**) \$\$

<http://www.springermaterials.com> (accessed March 17, 2011)

Info: print <http://www.lib.utexas.edu/chem/info/lb.html> (accessed March 17, 2011)

TOXNET (National Library of Medicine) (section **3.4**)

<http://toxnet.nlm.nih.gov/> (accessed March 13, 2011)

Ullmann's Encyclopedia of Industrial Chemistry (section **2.1**) \$\$

Info: <http://onlinelibrary.wiley.com/book/10.1002/14356007> (accessed March 17, 2011)

Info: print <http://www.wiley.com/WileyCDA/Section/id-407379.html> (accessed March 17, 2011)

Info: print <http://www.wiley.com/WileyCDA/WileyTitle/productCd-3527329439.html> (accessed March 17, 2011)

University of Vermont SIRI MSDS Collection (section **3.4**)

<http://siri.org/msds/> or <http://hazard.com/msds/>

Using SpringerMaterials to Locate Your Landolt-Börnstein Volume and Chapter, by Teri Vogel. 2011 (section **3.1b**)

<http://www.xcitr.org/node/120> (accessed March 14, 2011)

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Web of Science / Science Citation Index (section **3.2b**) \$\$

<http://isiknowledge.com/wos> (accessed April 9, 2011)

Info: http://thomsonreuters.com/products_services/science/science_products/a-z/web_of_science/ (accessed February 10, 2011)

Writing (section **4.1a**) –

ACS Style Guide, Chapter 1: Writing a Scientific Paper. 2nd ed. 1997

<http://www.oup.com/us/samplechapters/0841234620/?view=usa> (accessed March 13, 2011)

ACS Style Guide, Chapter 14: References. 3rd ed. 2006 (also section **1.2**)

<http://pubs.acs.org/userimages/ContentEditor/1246030496632/chapter14.pdf> (accessed February 9, 2011)

ACS Style Guide: *Effective Communication of Scientific Information*. 3rd ed. 2006 \$\$

Info: print <http://pubs.acs.org/page/books/styleguide/index.html> (accessed March 17, 2011)

The Craft of Scientific Writing, by Michael Alley. 3rd ed. 1996 \$\$

Info: print <http://www.springer.com/new+%26+forthcoming+titles+%28default%29/book/978-0-387-94766-2> (accessed March 17, 2011)

How to Write and Publish a Scientific Paper, by Robert A. Day (various editions) \$\$

Info: print <http://www.abc-clio.com/product.aspx?id=2147494076> (accessed March 17, 2011)

Information for Authors. American Chemical Society. Author and Resource Reviewer Center

<http://pubs.acs.org/page/books/submission/authors/index.html> (accessed February 9, 2011)

Writing Scientific Manuscripts: A Guide for Undergraduates

<http://www.jyi.org/resources/320/Guide%20to%20Science%20Writing.pdf> (accessed April 16, 2011)

On Writing Well: An Informal Guide to Writing Nonfiction, by William Zinsser (various editions) \$\$

Info: print http://www.harpercollins.com/books/On-Writing-Well-30th-Anniversary-Edition-William-Zinsser?isbn=9780060891541&HCHP=TB_On+Writing+Well,+30th+Anniversary+Edition (accessed March 17, 2011)

Style: Lessons in Clarity and Grace, by Joseph M. Williams and Gregory G. Colomb. 10th ed. 2010 \$\$

Info: print <http://www.pearsonhighered.com/educator/product/Style-Lessons-in-Clarity-and-Grace-10E/9780205747467.page> (accessed March 17, 2011)

Writing Guidelines for Engineering and Science Students

<http://www.writing.engr.psu.edu> (accessed February 9, 2011)

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SLA Chemistry Division and ACS Division of Chemical Information

PUBLICATION HISTORY

Editions of *Information Competencies for Chemistry Undergraduates* are listed below.

The URL for the current edition will remain: <http://chemistry.sla.org/wp-content/uploads/cheminfoit.pdf>

When a new edition is issued, it will be assigned the URL given above. The previous edition will have the year of publication added to the URL for that document, as shown below in the citation to the 2007 edition. This allows the URL given above to access the most current edition, while previous editions remain available.

2007:

Craig, Cory; Maddux, Linda, Eds. *Information Competencies for Chemistry Undergraduates: the elements of information literacy*. January 2007. Special Libraries Association, Chemistry Division, Ad Hoc Committee on Information Literacy.
[\[http://chemistry.sla.org/dchearchive/il/cheminfoit2007.pdf\]](http://chemistry.sla.org/dchearchive/il/cheminfoit2007.pdf)

Information Competencies for Chemistry Undergraduates was written and edited by Cory Craig and Linda Maddux in consultation with the Ad Hoc Committee on Information Literacy, SLA Chemistry Division. Membership of the Ad Hoc Committee is included in the 2007 document.

2011, second edition:

Information Competencies for Chemistry Undergraduates: the elements of information literacy. Special Libraries Association, Chemistry Division and American Chemical Society, Division of Chemical Information. 2nd ed. May 2011. [\[http://chemistry.sla.org/wp-content/uploads/cheminfoit.pdf\]](http://chemistry.sla.org/wp-content/uploads/cheminfoit.pdf)
[Minor additions made and links revised September, 2011.]

Information Competencies for Chemistry Undergraduates: the elements of information literacy. Special Libraries Association, Chemistry Division and American Chemical Society, Division of Chemical Information. 2nd ed. May 2011. [\[http://chemistry.sla.org/dchearchive/il/cheminfoit2011-May.pdf\]](http://chemistry.sla.org/dchearchive/il/cheminfoit2011-May.pdf)

For the 2011 revision of *Information Competencies for Chemistry Undergraduates*, Marion Peters, Grace Baysinger, and Cory Craig served as editors in consultation with the ACS CINF Education Committee and members of the SLA Chemistry Division.

Among the changes from the first edition are the following—

- Content for chemical literature consolidated in Section 2, including structure and reaction searching and software for drawing structures;
- Added content on Crystallographic Data to Section 3;
- Added content on Ethical Conduct; Poster Presentations; Citation/Reference Manager Software to Section 4;
- New sections include Further Reading and an Index to Recommended Resources with links for resources or information on where to purchase print or online versions if unavailable for free.

Generally, the second edition is not inclusive of all possible resources but includes representative resources suggested for libraries serving undergraduates, similar to the first edition.