Upper-division Writing Requirement Review Form (12/1/08)

I. General Education Review – Upper-division Writing Requirement			
Dept/Program Subject	Chemistry and Biochemistry	Course # (i.e. ANTH 455) or sequence	Chem334
Course(s) Title	Chemical Literature and Scientific Writing		
Description of the requirement if it is not a single course			
NA			

II. Endorsement / Approvals Complete the form and obtain signatures before submitting to Faculty Senate Office.			
	Please type / print name	**Signature**	**Date**
Instructor	Dr. J.B. Alexander Ross		
Phone / Email	243-6026 sandy.ross@umontana.edu		
Program Chair	Dr. Mark Cracolice		

III Overview of the Course Purpose / Description

Purpose of Course

- Students work as a team to practice the skills of organization, development, language use, and style that are required for high-quality scientific writing.
- Students read scientific writing materials of excellent quality and learn to evaluate the organization, development, and mechanics of scientific writing.
- Students learn to edit, to use library and Internet resources with emphasis on those important to chemists and biochemists, and to assemble information in a variety of professional formats.
- Guest professionals from academia and industry present topics in environmental ethics, patents, and résumé writing.
- The class examines ethical issues in science that relate to scientific writing: integrity of laboratory notebooks, falsification of results, plagiarism, proper attribution of authorship, peer review, gender neutrality, public trust in scientific endeavor, intellectual property (patents, copyrights) and fostering scientific discourse.

Description of Approach

Writing assignments

Students submit six major writing assignments. Each assignment undergoes peer review and additional drafts. Students use a meta-linguistic rubric to evaluate each others' and their own work.

1. Edit a text; justify the editing.
2. Read a chemistry or biochemistry research paper; write a summary and a new abstract.
3. Read an example of a description of a scientific principle, and write one.
4. Read several types of technical descriptions of laboratory procedures, and write a how-to manual for a laboratory procedure.
5. Write a scientific persuasion article using library and Internet resources.
6. Write a résumé and a cover letter for two job descriptions, one academic and the other, industrial.

Reading assignments

Students read textbook excerpts, peer-reviewed scientific papers, editorials, how-to-manuals, articles in non-scholarly journals and newspapers.

(Continued on next page)

In-class work

1. Peer review of six writing assignments
2. In-class reading, discussion and related exercises
3. Abstract-writing exercise
4. Composition and word-use exercises

Final

The final is a technical portfolio that (1) gives students the opportunity to evaluate their semester's writing and (2) allows students to demonstrate scientific writing skills to prospective employers.

IV Learning Outcomes: Explain how each of the following learning outcomes will be achieved.	
Student learning outcomes : Identify and pursue more sophisticated questions for academic inquiry	Students select and define problems for individual research papers that require them to conduct an investigation of scholarly resources, take a position on a controversial issue, and defend that position on the basis of their research. Please see Assignment 5 description in syllabus package.
Find, evaluate, analyze, and synthesize information effectively from diverse sources (see http://www.lib.umt.edu/informationliteracy/)	Please see Assignment 5 description in syllabus package.
Manage multiple perspectives as appropriate	Assignments 2–6 require the students to write in different professional formats with differently defined audiences.
Recognize the purposes and needs of discipline-specific audiences and adopt the academic voice necessary for the chosen discipline	Assignments 1–5 require that students adopt a formal tone that would be appropriate in a peer-reviewed, scholarly journal.
Use multiple drafts, revision, and editing in conducting inquiry and preparing written work	Each major writing assignment undergoes peer review and at least one additional draft.
Follow the conventions of citation, documentation, and formal presentation appropriate to that discipline	The ACS Style Guide is the course standard for editorial style and discipline-specific citation and documentation.
Develop competence in information technology and digital literacy	Students attend multiple library sessions in which they learn to use electronic research tools. They also are required to learn how to use word-processing tools in Microsoft Word such as "Track and Accept Changes", "Compare Documents" and "Insert Comment". Additionally, the course uses a Blackboard interface to communicate with students, post class materials, submit assignments, update the syllabus, and engage in discussion board interactions.

V. Writing Course Requirements Check list	
Is enrollment capped at 25 students? If not, list maximum course enrollment. Explain how outcomes will be adequately met for this number of students. Justify the request for variance.	Yes
Are outcomes listed in the course syllabus? If not, how will students be informed of course expectations?	Yes
Are detailed requirements for all written assignments including criteria for evaluation in the course syllabus? If not how and when will students be informed of written assignments?	Yes
Briefly explain how students are provided with tools and strategies for effective writing and editing in the major.	In the first assignment, we introduce the students to the approaches and conventions of editing, which they apply in each subsequent assignment. We teach the students how to use the rubric, "Evaluation of Scientific Writing" (attached), for every peer review session, and they receive feedback from the instructor in the rubric format. We also illustrate the elements of the rubric in class with examples from both scientific literature and the student's papers.
Will written assignments include an opportunity for revision? If not, then explain how students will receive and use feedback to improve their writing ability.	Yes
Are expectations for Information Literacy listed in the course syllabus? If not, how will students be informed of course expectations?	No Students attend multiple library sessions devoted to learning about and using electronic and paper resources for research. Finally, students complete individual research projects in which they apply the skills introduced in the library sessions.
VI. Writing Assignments: Please describe course assignments. Students should be required to individually compose at least 20 pages of writing for assessment. At least 50% of the course grade should be based on students' performance on writing assignments. Clear expression, quality, and accuracy of content are considered an integral part of the grade on any writing assignment.	
Formal Graded Assignments	Please see attached assignment descriptions for assignments 1–6.
Informal Ungraded Assignments	In-class abstract writing exercise, in-class grammar review exercises, Blackboard discussion board posts
VII. Syllabus: Paste syllabus below or attach and send digital copy with form. ⇓ The syllabus should clearly describe how the above criteria are satisfied. For assistance on syllabus preparation see: http://teaching.berkeley.edu/bgd/syllabus.html	
Materials attached: Syllabus, Assignments 1–6, evaluation rubric, ACS ethical guidelines to publication of chemical research, UM Writing Center course evaluation of July 2007.	

SYLLABUS CHEM 334 * Fall 2008

Chemistry Literature & Scientific Writing * 2:10 - 3:00 pm * Chemistry 102

Instructor

Sandy Ross, C013 lab and office, 243-6026, sandy.ross@umontana.edu
Assistant instructor, Laurie Franklin, C013 lab, 243-4156, laurie.franklin@umontana.edu

Office hours

Sandy Ross M 3:10 – 4:00 pm, C013 or by appointment
Laurie Franklin M 3:10 – 4:00 pm, C013 or by appointment

Student Conferences

Each student will meet with the instructors for two private conferences: the first, during office hours or by appointment between October 8 and 15; and the second, during scheduled class time or by appointment between Nov 22 and Dec 5. We invite students who need accommodation for a physical or learning disability to meet with us to discuss modification(s).

Textbook

"The ACS Style Guide, Effective Communication of Scientific Information, 3rd edition", Anne M. Coghill and Lorrin R. Garson, Editors. We will place all other reading materials on Blackboard and hand them out in class. Selected lecture notes will be available on Blackboard, only.

Course Content

- We will work as a team to practice the skills of organization, development, language use, and style that are required for high-quality scientific writing.
- You will read scientific writing materials of excellent quality and will learn to evaluate the organization, development and mechanics of scientific writing.
- You will begin to develop professional-level writing skills that will enable you to communicate scientific ideas to different audiences.
- You will learn to edit, to use library and Internet resources with emphasis on those important to chemists, and to assemble information in a variety of professional formats.
- Guest professionals will present topics in environmental ethics, patents, and résumé writing.
- For your final, you will assemble a technical portfolio that allows you to demonstrate your scientific writing skills to prospective employers.

Assignments

You will submit six major writing assignments. For each assignment, you are required both to submit a draft for peer review and be a peer reviewer. Second, you are required to submit a revised draft for instructor review. Third, you will rewrite at least one instructor draft and resubmit it as part of your technical portfolio. The syllabus lists the major assignment due dates in the columns "Out" and "In". Assignment descriptions and materials will be handed out in class and will be available on Blackboard. The list of assignments appears below:

1. Edit a text; justify your editing.
2. Read a chemistry research paper; write a summary and a new abstract.
3. Read an example of a description of a scientific principle, and write your own.
4. Read several types of technical descriptions of laboratory procedures, and write a how-to manual for a laboratory procedure with which you are familiar.
5. Write a scientific persuasion essay using library and Internet resources.
6. Write a résumé and a cover letter for two different job descriptions.

ABBREVIATIONS FOR OUT-OF-CLASS ASSIGNMENTS

Assignment #	Peer Review Draft	Instructor Review Draft	Instructor Review Draft returned with editorial comments
A#	PR#	ID#	ID#e

Reading assignments Reading good scientific writing is key to developing your style. We will assign readings in the textbook and from outside sources to complement the syllabus topics and assignments. We expect you to read the assigned readings **before** the class lecture for which they have been assigned.

In-class requirements

1. Peer review of six writing assignments
2. In-class reading, discussion and related exercises
3. Abstract-writing exercise
4. Composition and word-use exercises

Writing style requirements

Submit all assignments (peer review drafts and instructor review drafts) **double-spaced**, in Times New Roman 12-point font or Arial 11-point font, and with one-inch margins. Submit hard copy in class on the due date. Simultaneously, submit an electronic copy through Blackboard, using the naming convention specified in the assignment description. **Keep a complete electronic record of every original draft, and a paper copy of every peer-reviewed and instructor-reviewed draft. All of these will be required for your final portfolio. To guard against loss, back up your electronic record with at least one extra copy.**

Final

You will assemble a technical portfolio consisting of your written work for the semester, including initial, intermediate and final drafts. The portfolio will be due on Wednesday, Dec 10 at 1:10 pm. A complete description of the portfolio specifications will be handed out in class at the start of the semester and will be posted on Backboard.

Attendance

We strongly urge you to make every effort to attend classes because we design lectures, in-class exercises, discussions and guest lectures to enhance your skills. However, if interviews, school-related travel, or illness cause you to miss a class, please talk with Sandy or Laurie in advance of the absence (Interviews, travel) or as soon as possible (illness) to find out if a make-up is possible.

Grading

We will base grades on (1) assignments [35%] and the technical portfolio [50%], with emphasis placed on completeness of assignments and demonstrated effort to improve scientific writing skills and (2) peer review, in-class exercises, and discussion [15%].

Academic Misconduct

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by a course instructor and/or a disciplinary sanction by the University. Please read the Student Conduct Code. The code is available at http://ordway.umt.edu/SA/documents/fromWeb/StudentConductCode1.pdf.

Class Schedule

Please check Blackboard regularly for updates and additions to the syllabus.

Week	*Date*	Topic	Reading	Out	In
	M Aug 25	Introduction to course aims and assignment 1	Visit the Chem 334 Blackboard Discussion Board and introduce yourself (requires SCAUID and password)	A1	
1	W Aug 27	Basics of editing / Editing rubric	Chap 3: p 31 middle; p 32, top; Appendix 3.1 pp 36 – 39, Chap 4: Writing Style and Word Usage		
	F Aug 29	Peer review assignment 1			PR1/ID 1
2	M Sept 1	Labor Day Holiday			
	W Sept 3	Scientific Paper: Introduction to assignment 2 and to parts of a journal article	Journal article, "A bioluminescent assay for monoamine oxidase" and Chapter 2: Scientific Papers	A2	
	F Sept 5	Scientific Paper: The parts of a journal article, continued; in-class exercise in abstract writing; discussion and in-class exercises about organization, development and mechanics	Strunk and White handout #1, Chapters 9 and 10, minor assignment	ID1e	
3	M Sept 8				
	W Sept 10	Peer review assignment 2			PR2
	F Sept 12	Description of a principle: Introduction to assignment 3 and example	TBA	A3	
4	M Sept 15	Development, Organization and Mechanics I	Strunk and White #2		ID2
	W Sept 17	Development, Organization and Mechanics II	Strunk and White #3		
	F Sept 19	Peer review assignment 3		ID2e	PR3
5	M Sept 22	Technical description of a procedure: Introduction to assignment 4 and example	http://www.writing.eng.vt.edu/workbooks/instruct.html, On Blackboard, "Reading Materials", read technical writing examples	A4	
	W Sept 24	Technical description continued and more issues in organization, development and mechanics	Revisit Chapters 9 and 10		ID3
	F Sept 26	*Development, Organization and Mechanics III*	In-class exercises and examples		
6	M Sept 29	Peer review assignment 4			PR 4
	W Oct 1	*Environmental ethics*	TBA	ID3e	
	F Oct 3	Scientific persuasion: Introduction to assignment 5		A 5	ID4
7	M Oct 6	Scientific persuasion, continued			

	W Oct 8	*Library Resources at Mansfield Library Student Learning Center (MLSLC) with Barry Brown*			
	F Oct 10	*References, footnotes, and biblio-graphies at MLSLC with B. Brown*			
8	M Oct 13	Independent library research session to choose assignment 5 topic			
	W Oct 15	*MLSLC: Independent research to choose assignment 5 topic*			
	F Oct 17	Ethics in Scientific Communication	Chapter 1: Ethics in Scientific Communication; On Blackboard, "Reading Materials", read articles Scientific Fraud #1 and #2	ID4e	A5 Topic
9	M Oct 20	Numbers, mathematics, units, conventions in chemistry, graphics	Chapters 11, 13, 14 and 15		
	W Oct 22				
	F Oct 24				
10	M Oct 27	Research for assignment 5 at MLSLC			
	W Oct 29	Research for assignment 5 at MLSLC			
	F Oct 31	Research for assignment 5 at MLSLC			
11	M Nov 3	Beilstein &Chem Abstracts at MLSLC			
	W Nov 5	Peer review assignment 5			PR 5
	F Nov 7	Peer review assignment 5		A6	PR 5
12	M Nov 10	*Résumés and cover letter workshop: Cindy Boies, Career Counselor, Resource Library at Lommasson 154*			
	W Nov 12	Writing resumes and cover letters: Introduction to assignment 6	TBA		ID5
	F Nov 14	Resumes and cover letters, continued	TBA		
13	M Nov 17	*Employment portfolio workshop: Cindy Boies, Career Counselor, Resource Library at Lommasson 154*			
	W Nov 19	Peer review assignment 6			PR6
	F Nov 21	Scientific publishing and peer review		ID5e	
14	M Nov 24	*Intellectual property, patents, copyrights in industry and academia*	TBA		ID6
	W Nov 26	Thanksgiving Holiday			
	F Nov 28				
15	M Dec 1	Online assignment, no class.	See Blackboard, "Assignments" for online assignment		
	W Dec 3	(Conferences) Assignment 5 PowerPoint presentations		ID6e	
	F Dec 5	(Conferences) Assignment 5 PowerPoint presentations			
16	M Dec 8	Finals week begins			
	W Dec 10	**FINAL: PORTFOLIO DUE 1:10 PM PIZZA PARTY AND PowerPoint PRESENTATIONS**			

Chem 334
Chemical Literature and Scientific Writing
Fall 2008

Assignment 1: Introduction to Editing

Read, analyze and edit
Here is a scientific writing sample to read, analyze, and edit. Its author was asked to explain a scientific idea or principle to an audience of upper division chemistry majors. Use the rubric, "Evaluating Scientific Writing", to guide your editing suggestions. Begin by examining the higher order features of the sample, i.e., responsiveness, development and organization, and proceed to the lower order features, voice and mechanics.

Once you read the sample carefully, edit it manually using the proofreader's marks described on pages 36 to 39 of the ACS guide. Fill in the rubric when you finish editing the document. You can open the electronic version of the rubric posted on Blackboard, copy it into Microsoft Word, and complete it using your computer.

Then, open the electronic version of the writing sample on Blackboard and copy it into Microsoft Word. Edit the sample using the "Track Changes" feature of Microsoft Word. Save two copies, (1) a copy that tracks your editing suggestions, and (2) a copy that accepts them. Please use the following naming convention: for (1), A1_track_ first name_last name, and for (2), A1_accept_first name_last name. Submit both electronically through the Blackboard Digital Dropbox, as well as an electronic copy of the rubric with your comments and suggestions, labeled "A1_rubric_first name_last name". You might find that you edit the document differently in Microsoft Word than when you edit it manually.

Peer review
You will bring a total of four documents to the peer review session on Friday, August 29:

1. Original handout with your handwritten edits; you will submit this at the end of the class session.
2. Rubric with your notes; you will submit this at the end of the class session.
3. Printout of electronic document showing edits made through "Track Changes."
4. Printout of electronic document with all changes "Accepted."

Be prepared to explain why you made your editing suggestions. For this assignment only, the peer review draft is also the instructor review draft.

Discussion board prompt

- Which approach to editing, manual or "Track Changes", do you prefer? Why?
- Do you edit differently when you work manually versus electronically?
- Is there a reason to learn both approaches?
- Do you have observations to share about the editing process?

Please post your responses to each bulleted question on the Blackboard discussion board forum, "Introduction to Editing".

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Assignment 2: Summary of a Scientific Journal Article

In this assignment, you will read a recent, peer-reviewed scientific journal article. We chose this article because the authors write well, the science is strong, and the subject matter is accessible to an upper-division undergraduate science major. After reading the article, you will write a brief summary of the work and write an alternate abstract for the article.

How to read a journal article
First, read the "Abstract", "Introduction", and "Discussion" sections to gain an understanding of the research. Once you are familiar with the project, read the remaining sections, "Materials and Methods" and "Results". Then, reread the entire paper. If you find it difficult to understand, reread it several times. You might find it helpful to take notes. For example, I often print out a paper and write brief notes in the margins as I read. The notes in the margins form the basis of a summary.

Write a summary
An effective summary contains a short description of the work, including why its findings are novel. Describe experiments briefly, but in enough detail to communicate the nature of the techniques and approaches. The author's results and discussion are critical. **Most important, use your own words to describe the project.** If you can improve on the authors' organization or development, do so! You should be able to write a summary in three to six double-spaced pages. Assume that your audience is the same as that addressed by the authors: peer scientists with an interest in the field.

Write a new abstract
Once you read and summarize the paper, write a new abstract that does not exceed 250 words. Writing an abstract is always a challenge. The abstract is the author's opportunity to trumpet the research to others, so it must be well written, but at the same time, it must condense ideas and actions into a 100- to 250-word format. An effective abstract states the problem, the experimental approach, the main results, the conclusion and the novel information gained. It also contains key words that will enable other researchers to locate the article. Does the original abstract of the assigned paper do all these? How does your abstract improve upon the original?

Peer review and instructor review
Bring your summary and abstract to class for peer review on Wednesday, September 10. Submit a Blackboard Digital Dropbox copy of the instructor review draft, using the following naming convention: ID2_your first and last names, and submit hard copy in class on Monday, September 15.

Make your own "cheat sheet"
The ACS Style Guide has a detailed index that makes it an excellent reference tool. Using the "cheat sheet" template, create your own mini-index to the Guide. As you work on your assignments, customize it by adding the terms that are most important for you, personally.

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Assignment 3
Description of a Scientific Principle

For this assignment, you will craft a concise explanation of a scientific principle or concept with which you are familiar. Depending on the topic, you may wish to include figures or equations to supplement your presentation. This paper is not meant to be a report that shows a professor what you understand; it is a document designed to teach another student. The point of this exercise is to help you develop a clear, communicative expository style.

Audience
Assume that your audience is composed of university freshman that have a strong interest in the physical and biological sciences. They may have taken a high school AP course in chemistry, physics or biology but may need a review of basic information before they can follow your explanation.

Topics
Choose a topic that might appear in a first-year, rigorous general chemistry textbook: the periodicity of the elements; the mole concept; stoichiometry of a chemical reaction; Boyle's Law; Avogadro's number; kinetic theory of an ideal gas; heat of reaction; the nuclear model of the atom; the wave nature of light; the ionic bond; the covalent bond; acids and bases; valence bond theory; phase transitions; the evolution of the atmosphere; the properties of hydrogen; the physical properties of water; reaction rates; chemical equilibria; LeChatelier's principle; electrolytic cells; properties of periodic table groups of elements; crystal field theory; the cell; proteins; carbohydrates; lipids; and nucleic acids. You may write about one of the above topics or choose another.

Length
Aim for four to six pages, excluding figures, double-spaced with one-inch margins, in Arial 11-point or Times New Roman 12-point fonts.

Due dates
- Peer review, Friday September 19.
  Bring copy to class and submit electronic copy to Digital Dropbox (DD)
  Naming Convention: A3_ first and last name
- Instructor draft, Wednesday September 24.
  Submit hard copy in class and electronic copy to DD
  Naming Convention: ID3_first and last name

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Assignment 4
Technical Description of a Scientific Procedure

For this assignment, you will write a "how-to" manual for a scientific procedure with which you are familiar. You may wish to include figures to illustrate your explanation. This exercise helps you practice the craft of technical writing. All of us have had the frustrating experience of trying to follow poorly written directions; this is a chance to learn how to construct them well.

Audience
Assume that your audience is composed of university freshman or sophomore science majors who will use your technical directions to perform the task you describe.

Topics
Choose a procedure that you are familiar with, for example, calibrating a pH meter, measuring the optical density of a cell solution, identifying a compound by NMR, determining the concentration of a compound by the Beer-Lambert Law, streaking plates with bacteria, or making a buffer. Write about one of the above procedures or another of your choice.

Length
Aim for four to six pages, excluding figures, double-spaced with one-inch margins, in Arial 11-point or Times New Roman 12-point fonts.

Due dates
- Peer review, Monday Sept. 29
  Bring hard copy to class and submit electronic copy to Digital Dropbox (DD)*
- Instructor draft, Friday Oct 3
  Submit hard copy in class and electronic copy to DD*

******Naming Convention for Digital Dropbox***
- Peer review copy: PR4_your first and last name
- Instructor review copy: ID4_your first and last name

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Assignment 5
Scientific Persuasion Essay

For this assignment, you will write a persuasion essay. This project is NOT an "all about the subject" report; it is intended to give you practice in (1) scientific literature research techniques and (2) the art of constructing an informed argument. First, you will research an emerging technology. Then, on the basis of your research, you will argue an informed position about its scientific, ethical, social, and/or political consequences. The paper will be structured like a scientific paper with the following sections: an abstract, an introduction that states your thesis, background material, and discussion and conclusions. The paper will also have a bibliography, footnotes, and will include figures and/or tables. You will follow ACS style throughout. Additionally, you will prepare a 3- to 5-slide PowerPoint summary of your paper. You will have the opportunity to present your PowerPoint during the final exam pizza party, Wednesday Dec 10.

Prospectus
Early in the process, you will submit a one- or two-paragraph prospectus that describes your paper's thesis (see due date below), and we will provide feedback about the appropriateness of your proposal.

Audience
Your audience is a group of your peers.

Topics
Suggested topic areas are: nanotechnology, agricultural technology, genetic engineering, reproductive technology, and climate change amelioration technologies.

Research Resources
You will restrict your background research to scholarly, peer-reviewed journals. However, you may find it useful to read popular accounts of your subject matter to find key words for your journal searches. Aim for a minimum of six articles in your bibliography. Reference librarians at the Mansfield Library can help you conduct a search if you have trouble finding relevant materials.

Length
Aim for six to ten pages, double-spaced with one-inch margins, in Arial 11-point or Times New Roman 12-point fonts. The abstract and bibliography are not included in the page count.

Collaboration
You can choose to work with a partner if you wish, but the collaboration must take the following form: You share research resources but argue different positions on the same issue.

Due dates
- Submit prospectus in class on Wednesday Oct 15.
- Peer review, Wednesday Nov 5 and Friday Nov 7.
- Bring copy to class and submit electronic copy to Digital Dropbox (DD), with the following naming convention: PR5_first name_last name.
- Instructor draft, Wednesday Nov 12.
  Submit hard copy in class and electronic copy to DD with the following naming convention: ID5_first name_last name. Submit PowerPoint as separate file with following name: ID5PPT_first name_last name.

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Assignment 6: Resumes, Cover Letters, and Employment Portfolios

In this last exercise of our semester, you will construct a personal resume and cover letter for two currently advertised jobs. One job is a full-time academic research position; the second is an industrial summer internship. For the academic resume, assume you are graduating in May 2008; for the industrial resume, assume you have junior status. Tailor each resume and cover letter to the specific details of each job description.

If you would like to write a resume and cover letter for a job of your own choosing, you can substitute it for one of the two job descriptions in this assignment. Please submit the new job description as a separate document with your cover letter and resume.

How long
Each resume should be no more than one page long. The cover letters should be approximately one-quarter to one-half page long.

Due dates
- Peer review, Wednesday November 19
  Bring copy to class and submit electronic copy to Digital Dropbox (DD), with the following naming convention: PR6_first name_last name.
- Instructor draft, Monday November 24
  Submit hard copy in class and electronic copy to DD with the following naming convention: ID6_first name_last name.

Chem 334 Fall 2008
Evaluating Scientific Writing

Reviewer name_____ **Assignment #**_____ **Date**_____

Purpose (Please indicate) ___**Peer review** ___**Self review** ___**Instructor review**

The grid below helps you isolate the different elements in scientific writing so you can make more objective, consistent judgments. You can use it to evaluate your own writing and that of your peers. Use the questions in each box to help you decide how effective the writing is in each of five areas, Responsiveness, Development, Organization, Voice, and Mechanics. Use the Comments box to explain your evaluation.

	Comments
I. Responsiveness (Relevance) ▪ Did the author follow the assignment instructions about content and audience? ▪ Did the author achieve what s/he set out to do?	
II. Development (Ideas) ▪ Is there a thesis statement or clear introduction? ▪ Is there compelling support for the thesis or a coherent progression from the introduction? ▪ Are the statements or arguments logical and clear? ▪ Is the information accurate?	
III. Organization (Order) ▪ Is the organization obvious? ▪ Is the focus consistent? ▪ Are the ideas linked to one another? ▪ Is the paragraphing justifiable?	
IV. Voice (Language) ▪ Is the tone appropriate? ▪ Is the author's word choice precise? ▪ Are the sentences fluent?	
V. Mechanics (Conventions) ▪ Are there errors in grammar? ▪ Is the punctuation correct? ▪ Is the spelling correct? ▪ Is ACS style followed?	

ACS PUBLICATIONS
HIGH QUALITY. HIGH IMPACT.

Ethical Guidelines to Publication of Chemical Research

The guidelines embodied in this document were revised by the Editors of the Publications Division of the American Chemical Society in January 2006.

Preface

The American Chemical Society serves the chemistry profession and society at large in many ways, among them by publishing journals which present the results of scientific and engineering research. Every editor of a Society journal has the responsibility to establish and maintain guidelines for selecting and accepting papers submitted to that journal. In the main, these guidelines derive from the Society's definition of the scope of the journal and from the editor's perception of standards of quality for scientific work and its presentation.

An essential feature of a profession is the acceptance by its members of a code that outlines desirable behavior and specifies obligations of members to each other and to the public. Such a code derives from a desire to maximize perceived benefits to society and to the profession as a whole and to limit actions that might serve the narrow self-interests of individuals. The advancement of science requires the sharing of knowledge between individuals, even though doing so may sometimes entail forgoing some immediate personal advantage.

With these thoughts in mind, the editors of journals published by the American Chemical Society now present a set of ethical guidelines for persons engaged in the publication of chemical research, specifically, for editors, authors, and manuscript reviewers. These guidelines are offered not in the sense that there is any immediate crisis in ethical behavior, but rather from a conviction that the observance of high ethical standards is so vital to the whole scientific enterprise that a definition of those standards should be brought to the attention of all concerned.

We believe that most of the guidelines now offered are already understood and subscribed to by the majority of experienced research chemists. They may, however, be of substantial help to those who are relatively new to research. Even well-established scientists may appreciate an opportunity to review matters so significant to the practice of science.

Guidelines

A. Ethical Obligations of Editors of Scientific Journals

1. An editor should give unbiased consideration to all manuscripts offered for publication, judging each on its merits without regard to race, religion, nationality, sex, seniority, or institutional affiliation of the author(s). An editor may, however, take into account relationships of a manuscript immediately under consideration to others previously or concurrently offered by the same author(s).
2. An editor should consider manuscripts submitted for publication with all reasonable speed.
3. The sole responsibility for acceptance or rejection of a manuscript rests with the editor. Responsible and prudent exercise of this duty normally requires that the editor seek advice from reviewers, chosen for their expertise and good judgment, as to the quality and reliability of manuscripts submitted for publication. However, manuscripts may be rejected without external review if considered by the Editors to be inappropriate for the journal. Such rejections may be based on the failure of the manuscript to fit the scope of the journal, to be of current or sufficiently broad interest, to provide adequate depth of content, to be written in acceptable English, or other reasons.
4. The editor and members of the editor's staff should not disclose any information about a manuscript under consideration to anyone other than those from whom professional advice is sought. (However, an editor who solicits, or otherwise arranges beforehand, the submission of manuscripts may need to disclose to a prospective author the fact that a relevant manuscript by another author has been

received or is in preparation.) After a decision has been made about a manuscript, the editor and members of the editor's staff may disclose or publish manuscript titles and authors' names of papers that have been accepted for publication, but no more than that unless the author's permission has been obtained.

5. An editor should respect the intellectual independence of authors.
6. Editorial responsibility and authority for any manuscript authored by an editor and submitted to the editor's journal should be delegated to some other qualified person, such as another editor of that journal or a member of its Editorial Advisory Board. Editorial consideration of the manuscript in any way or form by the author-editor would constitute a conflict of interest, and is therefore improper.
7. Unpublished information, arguments, or interpretations disclosed in a submitted manuscript should not be used in an editor's own research except with the consent of the author. However, if such information indicates that some of the editor's own research is unlikely to be profitable, the editor could ethically discontinue the work. When a manuscript is so closely related to the current or past research of an editor as to create a conflict of interest, the editor should arrange for some other qualified person to take editorial responsibility for that manuscript. In some cases, it may be appropriate to tell an author about the editor's research and plans in that area.
8. If an editor is presented with convincing evidence that the main substance or conclusions of a report published in an editor's journal are erroneous, the editor should facilitate publication of an appropriate report pointing out the error and, if possible, correcting it. The report may be written by the person who discovered the error or by an original author.
9. An author may request that the editor not use certain reviewers in consideration of a manuscript. However, the editor may decide to use one or more of these reviewers, if the editor feels their opinions are important in the fair consideration of a manuscript. This might be the case, for example, when a manuscript seriously disagrees with the previous work of a potential reviewer.

B. Ethical Obligations of Authors

Authors are expected to adhere to the following ethical guidelines; infractions may result in the application of sanctions by the editor(s), including but not limited to the suspension or revocation of publishing privileges.

1. An author's central obligation is to present an accurate account of the research performed as well as an objective discussion of its significance.
2. An author should recognize that journal space is a precious resource created at considerable cost. An author therefore has an obligation to use it wisely and economically.
3. A primary research report should contain sufficient detail and reference to public sources of information to permit the author's peers to repeat the work. When requested, the authors should make a reasonable effort to provide samples of unusual materials unavailable elsewhere, such as clones, microorganism strains, antibodies, etc., to other researchers, with appropriate material transfer agreements to restrict the field of use of the materials so as to protect the legitimate interests of the authors.
4. An author should cite those publications that have been influential in determining the nature of the reported work and that will guide the reader quickly to the earlier work that is essential for understanding the present investigation. Except in a review, citation of work that will not be referred to in the reported research should be minimized. An author is obligated to perform a literature search to find, and then cite, the original publications that describe closely related work. For critical materials used in the work, proper citation to sources should also be made when these were supplied by a nonauthor.
5. Any unusual hazards inherent in the chemicals, equipment, or procedures used in an investigation should be clearly identified in a manuscript reporting the work.

6. Fragmentation of research reports should be avoided. A scientist who has done extensive work on a system or group of related systems should organize publication so that each report gives a well-rounded account of a particular aspect of the general study. Fragmentation consumes journal space excessively and unduly complicates literature searches. The convenience of readers is served if reports on related studies are published in the same journal, or in a small number of journals.
7. In submitting a manuscript for publication, an author should inform the editor of related manuscripts that the author has under editorial consideration or in press. Copies of those manuscripts should be supplied to the editor, and the relationships of such manuscripts to the one submitted should be indicated.
8. It is improper for an author to submit manuscripts describing essentially the same research to more than one journal of primary publication, unless it is a resubmission of a manuscript rejected for or withdrawn from publication. It is generally permissible to submit a manuscript for a full paper expanding on a previously published brief preliminary account (a “communication” or “letter”) of the same work. However, at the time of submission, the editor should be made aware of the earlier communication, and the preliminary communication should be cited in the manuscript.
9. An author should identify the source of all information quoted or offered, except that which is common knowledge. Information obtained privately, as in conversation, correspondence, or discussion with third parties, should not be used or reported in the author’s work without explicit permission from the investigator with whom the information originated. Information obtained in the course of confidential services, such as refereeing manuscripts or grant applications, should be treated similarly.
10. An experimental or theoretical study may sometimes justify criticism, even severe criticism, of the work of another scientist. When appropriate, such criticism may be offered in published papers. However, in no case is personal criticism considered to be appropriate.
11. The co-authors of a paper should be all those persons who have made significant scientific contributions to the work reported and who share responsibility and accountability for the results. Other contributions should be indicated in a footnote or an “Acknowledgments” section. An administrative relationship to the investigation does not of itself qualify a person for co-authorship (but occasionally it may be appropriate to acknowledge major administrative assistance). Deceased persons who meet the criterion for inclusion as co-authors should be so included, with a footnote reporting date of death. No fictitious name should be listed as an author or coauthor. The author who submits a manuscript for publication accepts the responsibility of having included as co-authors all persons appropriate and none inappropriate. The submitting author should have sent each living co-author a draft copy of the manuscript and have obtained the co-author’s assent to co-authorship of it.
12. The authors should reveal to the editor and to the readers of the journal any potential and/or relevant competing financial or other interest that might be affected by publication of the results contained in the authors’ manuscript. Sources of funding of the research reported should be clearly stated. In addition, all authors should declare (1) the existence of any significant financial interest (>$10,000 or >5% equity interest) in corporate or commercial entities dealing with the subject of the manuscript; (2) any employment or other relationship (within the past three years) with entities that have a financial or other interest in the results of the manuscript (to include paid consulting, expert testimony, honoraria, and membership of advisory boards or committees of the entity). The authors should advise the editor in writing either that there is no conflict of interest to declare, or should disclose potential conflict of interests that will be acknowledged in the published article, whether by insertion of a footnote, or incorporation of a sentence or paragraph in the “acknowledgments” section, or by other format of disclosure to the reader as specified by the journal.

C. Ethical Obligations of Reviewers of Manuscripts

1. Inasmuch as the reviewing of manuscripts is an essential step in the publication process, and therefore in the operation of the scientific method, every scientist has an obligation to do a fair share of reviewing.
2. A chosen reviewer who feels inadequately qualified to judge the research reported in a manuscript should return it promptly to the editor.
3. A reviewer (or referee) of a manuscript should judge objectively the quality of the manuscript, of its experimental and theoretical work, of its interpretations and its exposition, with due regard to the maintenance of high scientific and literary standards. A reviewer should respect the intellectual independence of the authors.
4. A reviewer should be sensitive to the appearance of a conflict of interest when the manuscript under review is closely related to the reviewer's work in progress or published. If in doubt, the reviewer should return the manuscript promptly without review, advising the editor of the conflict of interest or bias. Alternatively, the reviewer may wish to furnish a signed review stating the reviewer's interest in the work, with the understanding that it may, at the editor's discretion, be transmitted to the author.
5. A reviewer should not evaluate a manuscript authored or co-authored by a person with whom the reviewer has a personal or professional connection if the relationship would bias judgment of the manuscript.
6. A reviewer should treat a manuscript sent for review as a confidential document. It should neither be shown to nor discussed with others except, in special cases, to persons from whom specific advice may be sought; in that event, the identities of those consulted should be disclosed to the editor.
7. Reviewers should explain and support their judgments adequately so that editors and authors may understand the basis of their comments. Any statement that an observation, derivation, or argument had been previously reported should be accompanied by the relevant citation. Unsupported assertions by reviewers (or by authors in rebuttal) are of little value and should be avoided.
8. A reviewer should be alert to failure of authors to cite relevant work by other scientists, bearing in mind that complaints that the reviewer's own research was insufficiently cited may seem self-serving. A reviewer should call to the editor's attention any substantial similarity between the manuscript under consideration and any published paper or any manuscript submitted concurrently to another journal.
9. A reviewer should act promptly, submitting a report in a timely manner. Should a reviewer receive a manuscript at a time when circumstances preclude prompt attention to it, the unreviewed manuscript should be returned immediately to the editor. Alternatively, the reviewer might notify the editor of probable delays and propose a revised review date.
10. Reviewers should not use or disclose unpublished information, arguments, or interpretations contained in a manuscript under consideration, except with the consent of the author. If this information indicates that some of the reviewer's work is unlikely to be profitable, the reviewer, however, could ethically discontinue the work. In some cases, it may be appropriate for the reviewer to write the author, with copy to the editor, about the reviewer's research and plans in that area.
11. The review of a submitted manuscript may sometimes justify criticism, even severe criticism, from a reviewer. When appropriate, such criticism may be offered in published papers. However, in no case is personal criticism of the author considered to be appropriate.

D. Ethical Obligations of Scientists Publishing outside the Scientific Literature

1. A scientist publishing in the popular literature has the same basic obligation to be accurate in reporting observations and unbiased in interpreting them as when publishing in a scientific journal.
2. Inasmuch as laymen may not understand scientific terminology, the scientist may find it necessary to use common words of lesser precision to increase public comprehension. In view of the importance of scientists' communicating with the general public, some loss of accuracy in that sense can be condoned. The scientist should, however, strive to keep public writing, remarks, and interviews as accurate as possible consistent with effective communication.
3. A scientist should not proclaim a discovery to the public unless the experimental, statistical, or theoretical support for it is of strength sufficient to warrant publication in the scientific literature. An account of the experimental work and results that support a public pronouncement should be submitted as quickly as possible for publication in a scientific journal. Scientists should, however, be aware that disclosure of research results in the public press or in an electronic database or bulletin board might be considered by a journal editor as equivalent to a preliminary communication in the scientific literature.

The University of Montana-Missoula
Intracampus Memorandum

TO: Laurie Franklin and Sandy Ross, Chemistry

FROM: Nancy Mattina, The Writing Center

DATE: July 3, 2007

RE: Evaluation of Chem 334

Attached please find my written evaluation of Chem 334 which you requested earlier this summer. Given the amount of "data" from your course, it may be that I have missed aspects of your course or student performance that color my evaluation. I hope that you find my evaluation useful, as that is the spirit in which it is offered. Please do not hesitate to contact me for clarification or further discussion. And congratulations for designing such a stimulating writing course for your majors.

Evaluation of *Chemistry Literature and Scientific Writing* (CHEM 334) Spring 2007

1. Overview

Chemistry Literature and Scientific Writing is the required upper-division writing course in the Chemistry major. For spring 2007, it was designed and taught by professor Sandy Ross and assistant instructor Laurie Franklin. Nineteen students completed the course; the lowest grade in the course was A-. Students were required to complete and submit six writing assignments all but one of which were subject to in-class peer review and review by the instructor(s). The required final for this course was a portfolio containing 1) the original, peer-reviewed, and instructor-reviewed drafts for each assignment, 2) a brief reflection on each assignment based on an "editing" rubric, 3) a reflection on the portfolio and its usefulness in a job interview, and 4) a CD copy. Students had the option of including a final revision of assignments 2 through 6 as part of the final portfolio.

The final portfolio comprised 22-33 double-spaced pages of formal writing; the required and optional revisions potentially tripled or quadrupled that page count. (Another 4-6 pages of informal, in-class, and Blackboard discussion board writing was not included in the portfolio.) The portfolio was worth 1,000 points or 50% of the course grade. Points for writing/editing assignments 1 through 6 comprised the other half of the course grade. Texts for the course were the *ACS Style Guide* and a selection of scientific articles (available on Blackboard) supplemented by lectures and guest speakers.

Ross and Franklin's Chem 334 was a model of organization, clarity, and focus, which is reflected in the organized and coherent body of work students produced. The particular strengths of Ross and Franklin's course as an upper-division writing course include:

Portfolio requirement: The act of compiling a writing portfolio served as a powerful heuristic for reflection, self-evaluation, and improvement in the context of scientific writing. The portfolio requirement and the revision of assignments 2 through 6 allowed students to compose a body of work for the course rather than a stack of disconnected, once-off papers. As is clear from the student reflection essays, both the process and product of portfolio assessment convinced students that scientific writing is demanding and open-ended work that is scrutinized by different readers in different ways. Identifying prospective employers as one potential audience for the portfolio was a particularly wise move on the part of the instructors.

Assignment design: Each writing assignment included clear written guidelines on audience, purpose, format (spacing, length, ACS conventions, etc.), and evaluative criteria. Assignments were thoroughly integrated into the course content and supported by class time spent on technical writing, evaluation rubrics, model papers, and peer-review, alongside the discussion of scientific ideas and ethics. The instructors seamlessly demonstrated the breadth of scientific writing by assigning a variety of authentic genres: article summary; expository essay; abstract; procedural description; popular science essay; resume; letter of application for employment. Students did not question the relevance of their assignments because they were not taught as abstract "modes" of

writing but as examples of ways they would be called upon to demonstrate their credibility as professional scientists.

Peer review: Designated class time for structured peer-review sessions provided students with the opportunity to practice the metalinguistic vocabulary of the evaluation rubric while experiencing a live audience. To the extent that students embraced the role of reviewer during peer-review sessions, these sessions also allowed students to experience the responsibility scientists have when called upon to make high-stakes judgements about the written work of others.

Instructor feedback: Written feedback from the instructors was copious, consistent with the course standards (i.e. those spelled out in the assignment evaluation rubric, the ACS style guide, and the lectures on technical writing), and constructive. In addition, the syllabus states that each student had two scheduled private conferences with instructors, one at the beginning of the semester and one at the end. The reasonable class size and the amount of individual attention given to each student undoubtedly helped foster the high level of engagement with the material that students showed in their final portfolios.

2. Effectiveness

In requesting this evaluation of Chem 334, the instructors specifically wanted to know 1) if the course improved "the students' scientific writing skills" and 2) how useful the portfolio was as a course final. Each of these questions is addressed in turn, below.

Improvement of student writing: The sheer volume of written work students produced in this course—more than 2,000 pages in final portfolios alone—make it both difficult and easy to answer the question of whether students improved their writing in this course. The difficulty stems from the fact that writing skill is not an undifferentiated mass such that students have x amount of writing skill at point A and y amount at point B. To attempt to answer the instructors' question as asked, we would need a criterion-referenced instrument administered to students before they began the course followed by the results of a corresponding post-test. Because the writing instruction in the course emphasized an apparatus of metalinguistic concepts (e.g. development, organization, and voice), proof-readers marks, and usage conventions, a pre- and post-test evaluation might measure the degree of mastery of these tools, which in themselves constitute important rhetorical content relevant to scientific writing.

Clearly, the students' *papers* improved from draft to draft in response to a given assignment. This is due to the extensive suggestions and corrections of the instructor, and, to a lesser extent, the peer reviewer. Although there are a few cases where a student inserts or deletes a paragraph or sentence between drafts, the majority of changes visible in the portfolio reflect the adoption of the instructor's advice and no more. Across assignments, students can be seen to be making the same kinds of mechanical and usage mistakes late in the semester that they made early in the semester. Despite the instructors' emphasis on proofreading and ACS style, the students' portfolio reflections (unedited by the instructor) have numerous mechanical errors in them that suggest that the *habit* of meticulous proofreading is not easily acquired.

It is impossible to measure how many errors and types of errors students might have made had the instructors not spent so much effort in class and out alerting students to the myriad rhetorical conventions that nest in the label "good writing." Moreover, the level of writing in the students' first drafts is strong, lacking the fragments, run-ons, thin development, or poor progression of ideas commonly seen at this level in other courses. Most students state in their reflections, accurately enough, that their strengths lie in development and organization. They gauge less accurately the improvement they have made in mechanics and diction, although all student state that they have a new appreciation for problems of tone and mechanics as a result of the course.

The easier way to respond to the instructors' question about effectiveness is to answer the question "Was it a good writing course?" Here the answer is an unequivocal *yes*. The instructors planned and executed the course so that each student had ample direct instruction, opportunity, support, and incentive to identify his/her areas for improvement. Those who took advantage of the opportunity improved the most; those who were satisfied with their early performance gained the least. By reading, writing, discussing, and revising as much as all students did, the students *experienced* the complexities of scientific rhetoric and *practiced* the conventions of professional, scientific writing. These were not rote exercises as students had the additional challenge of writing for audiences outside the classroom on topics of their choice. It is clear from the student reflections that the students cared about their papers, which might be the highest goal of any writing course. Increased self-awareness is another. What each student learned about his/her own writing ability differed, inevitably, as illustrated by some of their observations:

After taking this course I have a much better understanding of dashes and number usage but I am going to need a lot of work on commas and semicolons.

There is an obvious trend in the development of my writing. Clearly, by using multiple drafts, i am able to progress my idea ***forward,*** *using more precise language and better sentence structure*

This course gave an appreciation for the amount of work that goes in to each scientific document that gets written and submitted...I see the value of having others read through my papers before submission. My background in English composition is not as fluent as I would like it to be.

I began this semester with a good base for writing, but over the semester, I have put that base to the test...In order to better captivate the reader, I need to work on being concise and crisp in my word choices, having a better grasp for comma usage, and conveying a more professional tone in my writing.

I think by the end of this class, the fifth assignment, I fully understood how to look for places that may need a comma and correct them...I am now confident that I could compete professionally if need be...Like everything practice makes perfect, and I do think that the mechanics still need a little work.

The portfolio as a final: If the instructors emphasized correctness in the course, their grading of the final portfolio suggests that they also appreciated process and individual development. Completeness appeared to be the chief criterion for the portfolio grade, and many students did not revise any papers for the final portfolio. The organization and completeness of the portfolios varied (several CDs were unreadable and it was often difficult to tell which papers were final revisions—perhaps some were located on the CDs only?) but the grades given (all As) suggest that the instructors recognized the real utility of the portfolio was in the making of it. The exercise of compiling and reflecting on the portfolio was a fitting, if not demanding. As an evaluation, the final portfolio did give students another chance to improve their grades, although there was not much need for this in this case.

The key benefit from using writing portfolios for instruction and assessment is that students are given more responsibility for their writing than in other practices. In typical portfolio practice, instructors assign papers that students submit during the semester for comments *but not grades.* For the final portfolio, each student chooses a subset of papers to revise for submission, usually those papers the student feels represent the best or most interesting work he/she composed in that semester. Students are generally asked to include a reflection on their semester's writing in the final portfolio. Student and instructor usually conference to discuss a final grade and why. Frequently, the criteria for evaluating the final portfolio are developed by students in the course with the guidance of the instructor. The philosophical impulse in such practice is to "share power" with the students as a way of engaging students in written discourse. Portfolio practice is said to preclude passivity and apathy by empowering students to play an active role in revising and "publishing" their writing.

By contrast, the final portfolio in Chem 334 was a top-down assessment. All decisions except the one to submit a final revision were made by the instructors; those students who followed instructions received 90% or more of the points possible. During the semester, grades given by the instructor(s) usually dictated how much work a student needed to put into a revision. That is, low grades elicited extra work from a student, while higher grades elicited less. The great majority of scores were very high and the revisions apparent from the portfolios were quite shallow, usually at the level of the word or sentence. Instructor feedback implied that good writing equaled surface correctness; challenges to the students' critical thinking, logic, and argumentation were minimal. Yet, students reported that they struggled with the development and organization of their papers until they got it right, something that is not apparent from the drafts in their portfolios. It seems that this group of highly-motivated students did not need to share power with the instructors in order to be active, responsible learners. In making the kind of portfolio requirement they did, the instructors appear to have accurately judged the maturity of their students.

3. Recommendations for improving and developing the course

The excellence of Ross and Franklin's course notwithstanding, several changes of emphasis could improve the course and make it more sustainable in terms of instructor workload, without sacrificing quality, as follows:

Rethink the portfolio contents: The absence of pre-writing and other evidence of planning and revision make the portfolio neat but overemphasizes the editing stage in the writing process. Peer-reviewed copies were unenlightening to the portfolio reader; the evaluation sheets would have been more telling. Also, consider allowing students to submit only a few papers from the semester in the final portfolio, or requiring them to revise at least one paper, regardless of their grade. Less 'do-over' in portfolio requirement

Grade less: Use grades more sparingly because a grade makes students feel they are finished with a piece of writing. Have students give themselves grades during the course with which the instructor can agree or disagree. In giving grades, be more explicit about when the grade reflects performance (individual papers) and when it reflects effort (final portfolio); or, distribute points on a more consistent basis.

Rethink the feedback: Written feedback by peers and instructors was heavily slanted towards form-based errors at the level of the typed character, word, or phrase. The instructors took responsibility for fixing all such errors, leaving the student to merely retype the paper with the correct form supplied by the instructor. Although students need considerable coaching in mechanics and usage, a course of this caliber can aspire to more. To make students practice attentive copy-editing, copy-edit one page and direct the student to correct the rest of the draft following your example and the style manual. As the semester goes on, copy-edit less (circle errors if necessary) and provide incentives for students to copy-edit themselves. Avoid substituting words and phrases for students' words as a way of teaching usage. Instead, circle usage errors and require students to find the correct forms in the style guide. Spend more time questioning the critical thinking and logic of a student's argument and organization. For example: the thesis statements in some of the papers for assignment 5 were forecasting statements ("what I am going to cover") rather than thesis statements (the central claim of the paper), yet students were not called on this. Revisions in the higher-order aspects of writing will introduce new sentences, paragraphs, and form-based errors, providing fodder for further revisions and corrections for the final portfolio.

The instructors for this course are to be commended for designing and successfully delivering a demanding yet student-centered writing course for Chemistry. Attached is a section on encouraging revision by professor John Bean of Seattle University, an expert on teaching writing and critical thinking across the curriculum. Many of the best practices suggested by Prof. Bean are already features of Chem 334. It is to be hoped that this evaluation will allow Ross and Franklin to further refine Chem 334 for the benefit of their students.