

experiment 1

Scientific Writing and Integrity

LECTURE AND LAB SKILLS EMPHASIZED

- Understanding and applying course and university policies toward plagiarism and cheating.
- Writing in a scientific style.
- Learning to paraphrase and cite others' work correctly.
- Writing correct citations.

IN THE LAB

- Students will work alone.
- Parts may be completed in any order.





WASTE

- No waste is produced.

SAFETY

- Safety goggles are mandatory when anyone is performing an experiment in the lab.
- Long pants, closed-toed shoes, and shirts with sleeves. Clothing is expected to reduce the exposure of bare skin to potential chemical splashes.
- Aprons are available for students wishing to have an extra layer of personal protection.
- Even if you are not working, you cannot anticipate what others might do. This rule is understood to be effective for the remainder of the semester, unless otherwise noted, and will not be repeated for each experiment.

Additional information may be found at

<https://wp.as.uky.edu/genchem/home/che-111/1-academic-integrity/>

This course is designed to help you learn how to properly write a laboratory report, the basic format of any published scientific journal article. As the course progresses, you will be expected to write longer and longer reports, discussing the outcomes of your laboratory experiment using science and written scientific argumentation.

For each one of your projects over the coming semester, you will be given a brief outline of the objectives for each project, what you will need to be learning as part of your research project, basic safety protocol, and what to do with the waste you produce. Keep in mind, the objectives listed may not reflect what is the bigger goal (or objective) for the project.

PART I—SCIENTIFIC INTEGRITY

Scientists are constantly in the search of new knowledge. This knowledge builds off the knowledge that others created. The knowledge produced is based on experiments conducted in the lab, including frequently repeating the same experiments to ensure that the same results are produced. The results are then written up in an “article” that is submitted to **journals** like *Science*, the *Journal of the American Chemical Society* (for chemists), the *Journal of the American Medical Association* (you may have heard of them), or one of hundreds of

other “peer reviewed” journals focused on specific disciplines or subdisciplines. The submitted articles are sent out to other scientists for feedback, a process known as **peer review**. This is an extremely important part of the scientific process, as it solicits the opinion of other scientists who have years of experience producing knowledge in the same area as the submitted paper.

For example, you are a researcher studying drug design to kill cancer cells. In learning your craft, you’ve read hundreds of published articles from cancer and chemistry journals. In your research lab, you create a drug and your laboratory experiments show that your drug is killing cancer cells and leaving normal cells alone. You start to jump up and down as you feel like you’ve made an exciting discovery after years and years of work. But who are you going to tell? “Everyone!” You are thinking. Call the television stations, let’s interrupt programming to let everyone know. But wait, that’s not how scientists operate. You sit back down again. Someone else has to be able to reproduce what you did. You decide to submit an “article” to the journal *Nature*. A review of their Web site under the link for “For Authors” <https://www.nature.com/nature/for-authors> gives some information on what you need to do.¹ Wow, you think. *Nature* had tens of thousands of individuals serving as reviewers in 2011!² A quick review of their editorial



policies reveals that they are obsessed with making sure that the information published in their journal is the work of the authors writing the article. Link after link describes what is required of authors of research papers and their responsibilities in producing the publication.

You know, as you begin to write your journal article, that you developed your synthetic methods (the chemical reactions you used to make your drug) by combining steps that others have developed. The assays you used to test the effectiveness of your drug were published in another journal. To try to understand how your drug works in the cells, you read three more articles. Everything that you understand about your project came from someone else's work. So what do you write? What do you cite?

The journal *Nature* defines plagiarism as “when an author attempts to pass off someone else's work as his or her own.”³ So, if any of those ideas you used in your research to develop this drug was someone else's ideas, you have to give them credit in your article. Here's an excerpt from an article published in the *Journal of the American Chemical Society*:⁴

■ INTRODUCTION

Carboxylates are important anions frequently encountered in Nature as well as in a number of biological processes. Their utility in the chemical, pharmaceutical, food, and beverage industry is widespread.¹ A number of drugs contain carboxylate function—notably nonsteroidal anti-inflammatory drugs (NSAIDs).² Due to their extensive use, these drugs also present a significant environmental burden.³ For this study, we selected a group of carboxylates including antimalarial artesunate,⁴ and well-known NSAIDs (ibuprofen, naproxen, diclofenac, flurbiprofen, ketoprofen, mefenamic acid) commonly used to relieve pain, inflammation, and fever.² Also included were aminoacids (alanine, tyrosine, sarcosine) and small-molecule carboxylates (mevalonate, thyroxine) known to play an important role in human metabolism. This is because sarcosine is a potential biomarker for human prostate cancer,⁵ while mevalonic acid is an intermediate in steroid biosynthesis.⁶ Tyrosine⁷ is a precursor of catecholamine neurotransmitters and hormone thyroxine.

It's okay that you don't understand a word that the authors wrote. I want to draw your attention to their citations. How many are there? Where are they located? Why are they there?

“Am I expected to write like this?” you ask yourself. In terms of paraphrasing and citing where you obtained your knowledge and information from,

the answer is “yes.” Those researchers (from seven sources incorporating 63 individual authors) deserve credit for their hard work. Don't you want credit for the work you do? You may not be able to write text as well as this, but you are expected to show your understanding of the material you are taught and give credit to other people when you use their ideas.

Not only do the guidelines outlined in journals like *Nature* and the *Journal of the American Chemical Society* talk about copying other people's work, but also about making up data. Science is built on the idea that an experiment is reproducible. While everyone wants an experiment to work and publications that make the front page of journals, we learn more about the world by experiments that don't work as expected or give weird results. Falsifying data is at best misleading and at worst results in someone being seriously hurt.

PART II—ACADEMIC INTEGRITY

Just like the policies outlined in peer-reviewed journals, the University of Kentucky also has specific policies in regards to scientific integrity and academic honesty. Those can be found in places such as the *University Senate Rules*, the *Student Code of Conduct*, as well as in individual course syllabi. Many of your courses will require you to write reports based upon information you gather either through laboratory research or library research which involves you reading others' written materials (books, journal articles, etc.). There is a reasonable expectation in every class that any time you draw upon others' work to produce a work of your own that you give them credit for their work where credit is due. Chemistry labs are no exception.

The *University Senate Rules* for the University of Kentucky state that:

“All academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression.” (Senate Rule 6.3.1)⁵

This means the lab reports that you submit must result from the data that you collected in lab and



be written by you, containing your thoughts and understanding of the material in the lab. Any time that you want to include someone else's understanding of the material, you must give them credit.

The *University Senate Rules* go on to state:

“When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgment of the fact, the students are guilty of plagiarism.

Plagiarism includes reproducing someone else's work, whether it be a published article, chapter of a book, a paper from a friend or some file, or whatever. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be. Students may discuss assignments among themselves or with an instructor or tutor, but *when the actual work is done, it must be done by the student, and the student alone.*” (Senate Rule 6.3.1)

So, as you write your lab reports, any time you use information drawn from other people, whether that's from the lab manual itself, your General Chemistry textbook, an internet site, or a friend, you need to appropriately reference that material. Failure to do so is plagiarism and getting caught plagiarizing has consequences that can be detrimental to your future at the University.

The University also does not differentiate between individuals who supply material used for cheating and those who cheat. This is considered cheating. *University Senate Rule 6.3.2* states:

“Cheating is defined by its general usage. It includes, but is not limited to, the wrongfully giving, taking, or presenting any information or material by a student with the intent of aiding himself/herself or another on any academic work which is considered in any way in the determination of the final grade. The fact that a student could not have benefited from an action is not by itself proof that the action does not constitute cheating.”

The syllabus for the General Chemistry labs at the University of Kentucky outlines the specific policies found in section VI.c.i, Offenses of Plagiarism Common in General Chemistry Labs. These include submitting someone else's work as your own, whether it is from another student, an internet site, or the lab manual, failure to reference sources, changing data, or submitting work produced in a prior semester during a semester you take the course.

Having integrity comes from recognizing that the goal of education is for you, the student, to learn the material. When you write lab reports or any assignment which is submitted for a grade, the understanding between teacher and student is that that student is writing their understanding of the lab. Your understanding may not be found in using complex sentences or lots of scientific jargon and lingo. If you haven't mastered the lingo yet, don't use it. If you waited until the last minute and feel pressured to complete an assignment just to get the grade and begin to think about copying others' work, don't. You will have more integrity if you receive a zero for the assignment and don't cheat; that leads to respect in the long run.

PART III—CITING MATERIAL IN YOUR REPORT

In high school you most likely learned to reference material using the MLA format. Many disciplines have their own specific way they want material cited. Chemists, for example, use the American Chemical Society's guidebook, *The ACS Style Guide*, when writing articles for publication. Psychologists follow APA style, found in the *Publication Manual of the American Psychological Association*. You should notice that the references given in the lab manual are formatted following ACS style.

In this course, you will be expected to use MLA form, as it is what you are accustomed to using out of high school; however, you should also be familiar with APA and ACS styles. This includes any time you cite the lab manual or your General Chemistry textbook.



Just as you saw with the article from the *Journal of the American Chemical Society*, you are expected to give a reference within the text of your work clearly indicating where the ideas presented were not your own. It does not matter if you are quoting material or paraphrasing the material, the original authors deserve credit for their work and you have to indicate where the work was not your own. Here are some examples.

Original Text from Quantitative Chemical Analysis by Daniel C. Harris⁶

For many types of chemical analysis, the response of the analytical procedure must be evaluated for known quantities of analyte (called standards) so that the response to an unknown quantity can be interpreted. For this purpose, we commonly prepare a calibration curve, which is a graph [...] that shows the response of the analytical method as a function of the known quantity of analyte being measured.

Paraphrase and In-Text Citation (correct)

Experimental procedures must be tested using “standards” to determine if the procedure is able to determine known concentrations of substances before they can be used on unknown concentrations of those same substances (Harris, 93).

Quotation and In-Text Citation (correct)

To determine an unknown concentration of a solution, “the analytical procedure must be evaluated for known quantities of analyte so that the response to an unknown quantity can be determined” (Harris 93).

or

Harris states that “the analytical procedure must be evaluated for known quantities of analyte so that the response to an unknown quantity can be determined” (93).

Direct Plagiarism (incorrect)

For many chemical analyses, analytical procedures are evaluated for known amounts of analyte so

the response to an unknown concentration can be determined.

Mosaic Plagiarism (incorrect)

For many chemical procedures, to determine the concentration of an unknown, you must first determine the response of the analytical procedure to known quantities of analyte so that the response to an unknown quantity can be determined.

PART IV—WRITING A WORKS CITED PAGE

Your Works Cited or References page should include a list of all the documents that you cited within your document. Keep in mind that this list should be the same as all of the sources that you drew information from to write your document. Borrowing other people’s ideas without giving them credit for any reason is plagiarism.

Following are examples of citations in MLA format using the 9th edition of the MLA Handbook. Citations given in your work for this course must match the format below.

Any material cited for this course that was accessed on a Website requires the Supplemental items, Web address (D.O.I.) and Date of Access.

Sources with three or more authors cannot be abbreviated using “et. al.” and instead must be written out.

Book with One or More Authors

- Author(s). *Title of Book*. Title of Container, Contributors, Version (edition), Number (vol. and/or no.), Publisher, Publication Date, Location (pages, paragraph, URL, D.O.I.), Date of access.
- **Example:** Harris, Daniel C., *Quantitative Chemical Analysis*. New York: W.H. Freeman and Company, 1999; p. 93.

Journal Article

- Article in online scholarly journal that’s also in print.



- Author. "Title of article." *Journal* name, Volume number, Issue number, Year, Page numbers, Web address, Date accessed.
- **Example:** Mikami, Koichiro, Alexander T. Lonneckert, Tiffany P. Gustafson, Nathanael F. Zinnel, Pei-Jing Pai, David H. Russell, and Karen L. Wooley. "Polycarbonates Derived From Glucose Via An Organocatalytic Approach." *Journal of the American Chemical Society*, vol. 135, no. 18, 2013, pp. 6826-6829. *American Chemical Society*, <https://doi.org/10.1021/ja402319m>. Accessed 14 March 2018.

Web Site

- The information posted on Web sites should be used with care. Often Web sites can have misleading or incorrect information. Just because it is posted on the internet doesn't mean it is true. Judge the content presented carefully. When in doubt, use your textbook or the lab manual for information.
- The use of Wikipedia has its place. However, its place is not as a reference in your lab report as it is not a substitute for looking information up in your textbook or lab manual.
- Sometimes you have to search around on a Web site to find all of the publication information, particularly authorship and the date the information was published. If the source is truly legit, then you will be able to find this information.
- Author. Title of Source. Title of Container, Contributor, Version, Number, Publisher, Publication Date, Location. Web address, Date Accessed.
- Example: Kentucky American Water. "2021 Annual Water Quality Report: Central Division: Fayette and Surrounding Counties." *Kentucky American Water Water Quality Reports*, 2021, <https://www.amwater.com/ccr/lexington.pdf>. Accessed 9 May 2022.

Procedure

1. On Canvas, locate the "Journal Article to Summarize" under the "Modules" link and "Experiment 1." Write a brief summary of the

article, remembering to include proper in-text citation and references following MLA style.

2. Describe a **chemistry** topic that interests you. Ask your TA if the topic is appropriate. If you can't come up with any, your TA will be able to help you.
3. Using the UK Library's Web site, access the Web of Science database and search for your chemistry-related topic. Locate a **research journal article** on the subject. Write a brief summary of the journal article and provide a full citation. Research journal articles include sections labeled as introduction/background, methods/procedure, experimental, and discussion.

Analysis

Using what you have learned in this lab, answer the following questions. It is not appropriate to use a citation manager or Web site to produce citations in this assignment.

1. Write a full citation for this lab experiment. Remember, the lab experiment is contained within the lab manual.
2. Locate a **research journal article** in a journal published by the American Chemical Society. Include a screenshot of the first page of the article and write a full citation for the article. A list of ACS journals can be found at <http://pubs.acs.org/>. A screenshot is an image file; do not copy and paste text into your report.
3. Submit your answers to the assignment (Procedure and Analysis) as a numbered list in a Word document to the "1-Academic Integrity" link on the course Canvas site.

References

1. Nature Portfolio. "For Authors." *Springer Nature*, 2022. <https://www.nature.com/nature-portfolio/for-authors>. Accessed 9 May 2022
2. Nature Portfolio. "Peer Review." *Springer Nature*, 2022. <https://www.nature.com/nature-portfolio/editorial-policies/peer-review>. (accessed 2022-05-09).



3. Nature Portfolio. "Plagiarism and duplicate publication." *Springer Nature*, 2022. <https://www.nature.com/nature-portfolio/editorial-policies/plagiarism>. (accessed 2022-05-09).
4. Liu, Y.; Minami, T.; Nishiyabu, R.; Wang, Z.; Anzenbacher, P., Sensing of Carboxylate Drugs in Urine by a Supramolecular Sensor Array. *J. Am. Chem. Soc.* 2013, 135, 20, 7705-7712. DOI: 10.1021/ja4015748.
5. University of Kentucky Senate Council, *University Senate Rules*. University of Kentucky, Ed. <https://www.uky.edu/universitysenate/rules-regulations> (accessed 2022-05-09).
6. Harris, D. C., *Quantitative Chemical Analysis*. W. H. Freeman and Company: New York, 1999; p 93.



EXPERIMENT 1: SCIENTIFIC WRITING AND INTEGRITY