

The Ideal Chemistry Student:
Written as a letter of recommendation

To Whom It May Concern:

I am writing this letter in support of Ester Isomer, a student who has just graduated from the Carleton College chemistry department. Ester was in a number of my courses, and I have had many opportunities to interact with her during her career at Carleton. Ester has always done very well in her courses (see her G.P.A.) and has shown a remarkable ability to connect the topics in her various courses. She sees the connections between her academic experiences, is able to bring knowledge from one area into another, and, most importantly, to connect her knowledge from outside of her chemistry courses to that which she does in class. Overall, she knows how to approach problems as a mature chemist would; she knows how to ask good questions, and she knows where to go to start getting answers, whether they are found in the literature, found in conversation with other chemists, or found through experimentation in the laboratory.

Let me describe Ester's abilities in the context of some of the courses she has taken. She has experience working with many chemical theories and principles (e.g. applications of thermodynamics, kinetics, equilibrium, energy, and atomic and molecular theory), and she has been able to integrate various of these theories, as appropriate, to describe physical phenomena observed both in classes and in the laboratory. She is skilled at using evidence to evaluate situations and inform her decisions. She has gained experience using many of the modern analytical techniques, such as NMR, MS, UV-VIS, IR, and basic separation techniques, and she has brought specific of these techniques to bear on projects in various places in her academic career. For example, as a first year student, Ester engaged with a partner in a 2 week independent project in each of Principles of Chemistry and Equilibrium and Analysis. These projects gave Ester and her partner opportunities to take the skills and ideas from the course and lab in which they were engaged and try them out on a system of their choosing. The projects were self-directed, and required learning the details of the system they were investigating. Both of these projects culminated with a presentation to the class or the professor, respectively. In each project, Ester showed mastery of what she did and why she did it, and an attention to detail that characterizes her approach in all courses in which I have worked with her, since. She easily seems to understand where she could go further, had she had more time, and she presented her work in a confident and clean way.

Ester had a more significant opportunity for an independent project, also with a partner, after declaring her major, in the Chemical Kinetics Laboratory. This project required Ester and her partner to navigate the chemical literature and to find a publication that described an experiment in which measurements of chemical kinetics were used to understand a system. Most of these projects come from the J. Chem. Ed., and Ester and her partner chose a project that they were interested in, but which they didn't know much about. They chose a technique that required them to work with some instrumentation that is known to be finicky, and they were energized by this opportunity! Although the project didn't work well all the time, and the information presented in the paper was not always borne out in their experiments, Ester and her partner worked together well to push the edges of the information in the paper they were following, and

they were able to take the project in a direction of their own choosing, as well. Thus, this 5-week independent project was really a mini-research project; Ester and her partner not only based their experiments in the literature, but they took it to a new place. Their presentation about their project to their classmates was very well put together and was entertaining, as well!

I believe that Ester has graduated with the ideal set of skills that we would wish for any chemistry major, and I believe that she is, therefore, qualified to pursue any number of challenges, post-Carleton. If she chooses to pursue graduate studies in chemistry, Ester has the background to learn new sub-disciplines in Chemistry, and to be able to identify and pursue key questions in the field. She will be an excellent group-member, contributing her own knowledge and skills while also learning actively from her peers. Ester will also be a stellar TA, as she is not only likeable and easy to get along with, but she is very talented at explaining things from a variety of perspectives. She is patient when working with others, and is so cheerful as she goes about her tasks that she makes those she works with, peers and younger students alike, want to do their very best for her sake and for their own sake. Should Ester pursue medical studies, I believe that her chemistry background will help her to bring evidence to bear on her decisions about patient-care, and also to think systematically about various situations. While her specific chemistry knowledge will be useful, I believe it is more her maturity as a problem-solver, which I have seen in the laboratory in particular, that will be a very valuable skill in medicine. If Ester continues on in a non-chemical field, her knowledge of complex systems, data-driven arguments, and presentation of complex ideas will serve her well no matter what she is doing.

I believe that Ester is ready to take the next step as a Chemist. She knows enough to be able to think critically about a new problem and to get to the heart of it, and she has good hands and good instincts in the laboratory, making her well suited to pursue interesting new problems. Overall, she is curious and fearless scientifically, and is undaunted by topics that are difficult or about which she is initially unsure. I am very proud of her accomplishments and excited to see how she will apply her knowledge of chemistry to her future endeavors.

Sincerely,

Deborah Gross