Anytime someone hears that I am homeschooled, I get questions. *Do you have homework? Do you take tests?* The answers are yes and yes. Basically I do work the same way it is done in a brick-and-mortar school, but my parents and I choose when we are going to study a topic, how we are going to study it, and in what depth. Also, family vacations to places like the Grand Canyon, Hawaii, and Alaska become field trips.
Another question I am frequently asked about homeschooling is how I do high school labs. I like to respond by saying that for biology class last year, I dissected a frog in my kitchen! But even I wondered how I would be able to do high school chemistry labs at home.

During my homeschooling career, I have taken many online math and computer classes through CTY. So when I wanted to take chemistry this year, naturally I looked at CTYOnline’s chemistry course. I had taken a chemistry class through Montclair State University’s Gifted and Talented Program in middle school and watched The Teaching Company’s Great Courses DVD on high school chemistry. When I read the course description for CTYOnline’s Honors Chemistry and saw that it offered the opportunity to learn about chemistry in greater depth and that it would include labs, I signed up for it.

The “Hows” and “Whys” of Chemistry
In addition to labs, the course featured online simulations, slides, videos, e-text readings, and problems to solve. It covered topics including atomic structure; states of matter; solutions; the periodic table; chemical reactions, transformations, and bonding; acid and base chemistry; and energetics. Students are assessed through quizzes, unit tests, and lab reports.

Although I had encountered many of the chemistry concepts before, the CTYOnline’s course taught the “hows” and “whys” of chemistry. For example, while I’d known that ions were atoms with a positive or negative charge, I learned that ions form because atoms attempt to fill their valence shells—the outermost orbitals, or energy levels, of atoms—completely. And while I knew that matter exists in different states, the course taught me how the states of matter change on a molecular level.

Throughout the course, my teacher, Diana Allen, always responded quickly to any questions I had, so I didn’t lose time if I got stuck on a topic. She even provided supplementary material if I needed it.

For the Alka-Seltzer lab, students had to discuss how surface area and water temperature related to reaction rates, and how the concept in the experiment could be applied outside a laboratory setting.

Conquering Complicated Concepts
But what about the labs? The materials needed for the labs were simple, affordable, and easy to obtain, and included tape, cups, a knife, and Alka-Seltzer tablets. One lab required only a piece of paper and a pencil. Although doing the labs was pretty simple, the concepts they demonstrated are quite complicated. The pencil-and-paper lab, for example, provided a simple demonstration of the complex electron cloud model. The lab involved dropping a pencil 50 times on a piece of paper that had a bull’s-eye on it. I completed a table that showed where each mark on the bull’s-eye was located and then tabulated the statistical average of each ring. The results showed that the way pencil marks were spread throughout the target was analogous to the way electrons are spread out in an atom.

One of the more challenging labs was the Alka-Seltzer lab. Not only were there more steps involved, but I had to explain reaction rates, a more difficult concept than the density I was required to explain in the first lab.

Before each lab, I had to research the topic in order to provide facts relating to the experiment and state a hypothesis. Before I began the experiment with the piece of paper and pencil, I conducted research to learn how electrons are spread out in an atom. I used outside sources, including newspapers and websites such as ck12.org, thinkwell.com, and alkaseltzer.com to find information related to a given experiment. Once my preliminary research on a topic was complete, it was time to hit the “lab.”
In the Kitchen Lab

For the Alka-Seltzer lab, in addition to dissolving Alka-Seltzer in water and discussing how surface area and water temperature related to reaction rates, I had to show how the concept in the experiment could be applied outside a laboratory setting. I explained that if I had an upset stomach, it would make sense to heat up the water and/or crush the Alka-Seltzer tablet because the higher temperature and greater surface area would cause the Alka-Seltzer to react faster and therefore make me feel better sooner.

Another lab involved making a balance using pencils, tape, a ruler, medicine cups, and a pencil grip. I also used a graduated syringe to measure the amount of water I put in the medicine cup. For this lab, I had to calculate the weight of coins in comparison to the weight of water. Since water weighs one gram per milliliter, once both sides were balanced, I could calculate the weight of the coin. This worked extremely accurately, and I was able to calculate the weight of the coin to the nearest tenth of a gram. The lab explored several chemistry topics, including density, precise measurement, and significant figures. It also made me appreciate the value of simple machines.

For each lab, I wrote a lab report, which turned out to be one of my favorite learning experiences in the course. Each report included a concept, hypothesis, procedure, summary, conclusion, application questions, and a section for errors and analysis questions. A writing guide helped me be sure that I was following the directions for scientific papers. (One of the hardest parts of the writing was that, after taking many language arts classes, I had to remember that scientific writing is done in the passive voice!)

Frozen Bubbles and Other Molecular Insights

In addition to the lab reports, I enjoyed the video reviews, which required watching a video about chemistry, summarizing the content, and answering questions about the concepts demonstrated. I watched the videos, created by The University
of Nottingham, on YouTube. For a video about the chemistry of snow, I had to explain what snow was made of and why salt was spread on roads. It really drove home the point that chemistry happens not only in a lab, but in the real world. When it snowed where I lived, people were asking why the town did not put salt on the road. The roads actually had been treated, but it was so cold that the salt wasn’t able to melt the ice on the roads.

Shortly afterward, another weather event occurred that led me to think about how chemistry works. During the course, the temperature in my neighborhood dropped to minus seven degrees Celsius. When I heard my mother talking about the trend of people blowing bubbles in freezing weather, I decided to try it. I watched as one of the bubbles gradually changed from liquid to solid. I could actually see it becoming crystallized. It looked just like a Christmas ornament! When I tried popping it, only the part I touched broke apart; the rest of it remained intact.

Because of what I had studied, I understood how this happened on a molecular level. I knew that a liquid changes to a solid when its molecules slow down, and that when temperature decreases, kinetic energy—the energy of motion—decreases as well. In the case of the bubble, as the temperature decreased, the kinetic energy decreased and the liquid bubble became a solid.

Not only did I learn a lot about chemistry through CTY Online, but learning the concepts at home helped me realize that chemistry is not confined to high-tech labs. It happens everywhere and is accessible in ways I didn’t notice before. Writing the lab reports taught me how to conduct chemistry labs as well as how to write better. These lab-writing skills will undoubtedly serve me well in college. And who knows? Maybe an online CTY physics course will be in my future...

CJ Conti is a high school junior from Little Falls, NJ. When he’s not conducting chemistry experiments in the kitchen, he can usually be found at Talium Taekwondo School where he is a 3rd dan black belt, assistant instructor, and captain of the Fairfield SWAT Demonstration Team.

Diana Allen, Instructor, CTY Online

...and now, a Word from the Teacher

One of the biggest questions I had before teaching chemistry online was What about labs? Labs were a mandatory component of chemistry courses, and I wondered if home labs with store-bought materials could successfully replicate the kinds of cooperative, hands-on activities that students complete at traditional brick-and-mortar schools.

But now that I’ve taught the course, I know that each lab enables students to employ the scientific method—from research and design to analysis of their results—and culminates with a lab report akin to an article that would appear in a peer-reviewed journal.

The greatest benefit of the individually paced Honors Chemistry course is, in my opinion, the autonomy granted to students. Given the opportunity, students take ownership of the learning process and practice skills necessary to thrive academically and professionally.

If you are thinking about enrolling in an individually paced CTYOnline course, take the survey Is Online Learning Right for You? available on the CTYOnline homepage. The survey will give you a good idea if you are ready for the responsibility—and flexibility—of an online science course.

www.ctyjhu.org/surveys/SelfAssessment/sa.cfm