CHEM 150: Fundamentals of Chemistry I: Atoms and Molecules

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Office Hours: Chemistry Hall Room 144 - MWF 9-10 am, MW 12:15 pm -1:15 pm

Winter 2013
MWF 11:15-12:10 am
Chemistry Hall Room 130

**Required Lab Manual:** Available for purchase in the bookstore.
**Required Online Homework Subscription:** Register for an account at www.ALEKS.com

**Course description:** Chemistry is the study of matter, and since all physical things are composed of matter, chemistry could be considered the study of everything without too much exaggeration. In this class, I want to give you the tools to understand the world on an atomic and molecular level.

**Course goals:** 1) Be able to understand and interconvert units. 2) Understand atomic theory and bonding in molecules. 3) Use and balance chemical equations. 4) Learn about the interconversion of different kinds of energy in chemical reactions.

**Lecture and attendance:** I expect you to attend each lecture. In order to get the most out of lecture, read the chapter to be covered and arrive ready to listen and participate.

**Office hours:** Please stop by my office if you have questions about the lecture, lab, homework, quizzes, exams, life, or if you just want to introduce yourself. Stop by and ask questions!

**Grading:** Your grade will be a weighted average of your lab grade, quizzes, exams, and the comprehensive final exam.

- **Lab** = 20%
- **Online Homework** = 10%
- **Quizzes/Attendance** = 10%
- **Exams (3)** = 40%
- **Final** = 20%

In class collaborative or individual quizzes will occur regularly, could be unannounced, and will typically cover one chapter. Three exams are planned throughout the semester, each covering three chapters. **No makeup quizzes or exams will be given.** The final exam will be the American Chemical Society standardized final exam, a multiple choice exam covering all topics introduced this semester.

**Tentative Exam Schedule**

- Exam #1 – Friday, Feb. 1
- Exam #2 – Friday, Mar. 1
- Exam #3 – Friday, Apr. 19

**Cumulative Final Exam – Thursday, April 25th 7:30 – 9:30AM**
Read and Re-Read: Reading assignments will come from Tro’s Chemistry: A Molecular Approach, 2nd Ed. You are expected to read the whole chapter, but focus on the sections mentioned in lecture. In general, reading for science classes is different from other classes in that the assignments are usually short but quite dense, so it does not suffice for you to just read the words once. Make sure you read and re-read and then determine whether you really understand the concepts covered in the reading. A good way to assess your comprehension is to complete the practice problems at the end of each section in the book and then check your work in Appendix III.

Taking Notes: Lecture material will be presented on the board, so it is a good idea for you to write what goes on the board into your lecture notebook. PowerPoint slides will also be used to supplement these notes. These slides will be available to you on the course O-drive, so you can print them out before coming to class and use them when studying for quizzes and exams if you would like.

O-drive: This syllabus, all lecture slides, and practice quizzes/exams are available to download on the course O-drive. Please talk to me if you have any problems accessing these course materials. Directions for accessing the O-drive can be found here:
http://www.fortlewis.edu/it/HowDoIandFAQ/MandODriveAccess/ThroughtheWeb.aspx

Calculator: You should know how to use a calculator to do well in this class. I recommend the Texas Instruments TI 30-35, Sharp Scientific, Casio for science, all of which cost no more than $8-15. Any calculator that can do exponents and logarithms is acceptable. Bring your calculator to every class as we will be working sample problems regularly. Students may not share calculators during an exam.

Lab: Laboratory begins the second week of class (Jan.14-18). Safety goggles, lab manual and a bound lab notebook are required. These are available at the bookstore. There are no “make-up” labs beyond the week scheduled for a given experiment.

Homework: We will be using a new online homework system called ALEKS this semester, and this program is free of charge. This program should be viewed as equivalent to having your own, personalized private tutor since ALEKS customizes the questions to your current level of mastery. Please follow the instructions in the accompanying handout to register and get started. You must have the course code to register online at http://www.aleks.com. You should not be charged to register.

The course code is: EM9CM–PLQTL

You must complete an online assessment by Monday, January 14. A schedule of homework assignments is also attached. In general, homework will be due on Mondays and Wednesdays following the completion of a chapter in lecture.

For extra help and practice, I strongly encourage you to complete the odd numbered problems at the end of each chapter. The answers to these questions can be found in Appendix III of your text.

Academic Dishonesty: Academic dishonesty in any form will not be tolerated. If I suspect or catch anyone copying, cheating, plagiarizing, or engaging in any academic dishonesty otherwise described in the student handbook, I will notify the student and take decisive action. Such action might include dropping that assignment from consideration and weighing other assignments appropriately, a zero on the assignment, or a failing grade in the course, as I deem appropriate.

Fort Lewis College is committed to providing all students a liberal arts education through a personalized learning environment. If you think you have or you do have a documented disability which will need reasonable academic accommodations, please call Dian Jenkins, the Coordinator of Disability Service, 280 Noble Hall, 247-7459, for an appointment as soon as possible.
An Introduction to ALEKS – CHEM 150 Winter 2013

This term, you will use an innovative approach to facilitating the study of chemistry called ALEKS (Assessment and LEarning in Knowledge Spaces). ALEKS addresses many of the deficiencies in traditional online homework systems where the instructor chooses a list of problems from the textbook to initiate thoughtful study on the part of the student. Under this model, every student receives the same set of problems, regardless of his or her background preparation. Some students may not feel sufficiently challenged by the homework problems, while other students may feel overwhelmed. Further, students who complete the assignments without reflecting on conceptual underpinnings of the problems can be lulled into a false sense of security in their knowledge. Simple mastery of the mechanics of a particular kind of problem does not necessarily imply mastery of the concept or that the concept will be retained long-term.

ALEKS, in contrast, is an instruction tool based on artificial intelligence, rather than a static set of homework problems. The first time you log in, ALEKS will ask you a series of math and chemistry questions designed to assess exactly what you do and do not know about the content in CHEM 150 and your proficiency with basic algebra and mathematical skills. After this initial assessment ALEKS will begin to teach you items that meet both of the following criteria: 1. You don't already know how to do an item, and 2. You are ready to learn the item, based on what you know already.

**ALEKS will tailor its approach to the unique needs of each student in the class.** ALEKS will rarely force you to "learn" material you already know – ensuring that more students are sufficiently challenged, nor will it try to teach you things for which your foundational skills make you unlikely to succeed – ensuring that fewer students will feel overwhelmed by the problems. Further, you will periodically have your mastery of the material assessed by ALEKS – ensuring that you are retaining the concepts you have learned.

**How does ALEKS work?**

There are two “modes” in ALEKS: the Assessment Mode and the Learning Mode. In the Assessment Mode, ALEKS will ask you questions designed to determine what you know and what skills you have. This means you will not receive any feedback from ALEKS during an assessment. The first time you log into ALEKS you will be automatically placed in the assessment mode to complete an Initial Assessment of your knowledge of chemistry and math (see below).

In the Learning Mode, you will complete “Objectives” designed by your instructor, rather than “homework assignments.” An ALEKS Objective will contain a list of topics relevant to the current lecture discussions and assigned reading. When you choose a particular topic to learn, ALEKS will present you with a series of practice problems on that topic. The problems will have enough variability that you will only be able to get them consistently correct by understanding the core principle defining the topic. Once you can consistently get the problems for a given topic correct, ALEKS considers that you have learned the topic, and you may then choose another topic to learn.

Periodically, ALEKS will ask you to complete an Objective Completion Assessment. These are intended to gauge how well you are retaining the material you have learned. If ALEKS determines that you are shaky in some areas that you covered in a previous topic or Objective, you will be required to relearn that material before you can move on to topics that build on those concepts.

**How do I get graded in ALEKS?**

Your grade for the ALEKS portion of the course will be based on two numbers between 0 and 100 in equal measure (half comes from one, half from the other): 1) your highest Assessment score (so please take the assessments seriously! Do not enter your answers carelessly or abuse the button marked “I haven’t learned This Yet) and 2) your performance on the Objectives (the column labeled “Total Grade,” which is simply the average of all the objective grades (In other words, you didn’t procrastinate, so we’ll give you points for that). Once an objective grade has been recorded, it will never change, even if you later forget some of the material and are forced by ALEKS to go back and relearn it (but the mastery grade goes up and down as the assessments measure your true mastery and retention over the entire semester).
The Initial Assessment

The first time you log in, ALEKS will automatically place you in the **Assessment Mode**, where it will ask you a series of math and chemistry questions designed to assess exactly what you do and do not know in chemistry and basic math. The **Initial Assessment** is meant to be a snapshot of what you understand about chemistry at the start of this course. *You will encounter questions that you will not know how to do...don't take this personally. This is just ALEKS trying to determine the edges of your understanding so that it will know where to begin teaching you.*

*It is extremely important that you complete the initial assessment carefully and honestly!* This is how ALEKS finds out about YOU, how it determines what you already know, and what you are therefore ready to learn! Other online homework systems will make you solve problems whether or not you already know how to do it, or whether or not you are ready to learn them.

Always read and follow the onscreen instructions very carefully. **IT IS A WASTE OF TIME** to play games with the ALEKS assessments. For example:

- If you complete the Initial Assessment carelessly or answer randomly, you will give ALEKS the impression that you do not have a solid background in the skills necessary to be successful in Chem 150. **This means you will waste time later because ALEKS will force you to work through material you already know and don’t really need to review.** Therefore, it will take you much longer than necessary to complete the Objectives and earn your points.

- Conversely, if you consult outside resources – such as a textbook, the internet, or a friend – while working through the Initial Assessment, then you will give ALEKS the impression that you have a very strong background in math and chemistry. **This means that when you enter the Learning Mode, ALEKS will try to teach you things you are not really ready to learn.** The Objective Completion Assessments will discover this, and you’ll end up spending far more time in the Learning Mode than necessary. Again, this means it will take you much longer than necessary to complete the Objectives and earn your points.

- **NEVER** click the “I don't know” button during any ALEKS assessment unless you *truly have no idea* how to do the problem. Otherwise, ALEKS will think you don't know a bunch of things you actually do know and **take you way back** and make you "learn" them.

The Initial Assessment should take about an hour. I will be able to see how long it took to complete your assessment. If your time to complete the assessment is significantly longer than an hour, I will start you over with a brand new initial assessment.

**Getting Started with ALEKS**

You must complete your Initial Assessment by **8:00 am on the second day of Classes (Jan. 9, 2013).**

**ALEKS IS VERY UNFRIENDLY TO PROCRASTINATORS.**

ALEKS was designed by psychologists who specialize in learning, who know that procrastinating until the night before an assignment is due and then cramming until the wee hours is not a good way to learn. You can't do ALEKS that way. You must put in some time every day, or else you will fall so far behind on basic topics that you won't have time to complete the Objectives. It is impossible to earn a good score in ALEKS by cramming all night right before the due date.
ALEKS – Registration and Software Installation

To register as an ALEKS user (course code: EM9CM–PLQTL):

2. Click on the link marked "SIGN UP NOW" (upper left corner of the screen).
3. On the next screen you will be asked to provide the following course code: EM9CM–PLQTL
4. The next screen will ask for your full name, your email address, and your student ID number. Please provide all the information requested, even the information that is listed as optional.
5. On the next screen you will receive your ALEKS login name and a temporary password, and you will have the chance to change your temporary password. We recommend that you change your temporary password.
6. After you change your password, ALEKS will check your computer to see if you have the latest version of the ALEKS Java plug-in installed (see below). The plug-in will be installed automatically if it is not already installed. NOTE: The internet browsers Internet Explorer and Safari are fully supported by ALEKS, so they should run ALEKS with no problems. The plug-in for Google's Chrome browser has a few bugs, but appears to run most features with no trouble. The first thing to try if you have trouble is another browser and another machine if possible.
7. After the plug-in has been installed, you will learn how to input mathematical and chemical answers into ALEKS. This should take approximately 10 minutes.
8. Once you have completed the input tutorial, ALEKS will prompt you to complete the Initial Assessment. You may choose to complete the Initial Assessment later.

Installing the ALEKS Java Plug-in

Installation of the ALEKS plug-in is automatic. When you access ALEKS, it will automatically check to see if the current plug-in is installed on your computer. If it isn't, the plug-in will be downloaded, and you will be asked for your permission to install the plug-in on your system. This is a safe operation for your computer. Your browser uses the ALEKS plug-in when you are logged on to ALEKS. It is inactive at other times, and does not do anything except provide functionality for ALEKS.

If you need to access ALEKS in the library, a computer lab, or another place where you don't have authorization to install software, use the ALEKS "streaming" plug-in. To use the "streaming" plug-in, follow these steps:

1. Go to  http://www.aleks.com/plugin and simply log in to or register with ALEKS as you normally would.
2. Upon first login, ALEKS will automatically retrieve the ALEKS plug-in from the server and store it in the browser's "cache" memory. You don't need to grant any special user rights or privileges on a computer for this installation to occur.
3. The plug-in will be available in the browser's cache until an updated version is available on the ALEKS server or until the browser's cache is cleared.
4. Important: When you restart the browser and return to ALEKS, you must go to http://www.aleks.com/plugin. If you do not add "/plugin" to the end of the URL, ALEKS will attempt to install the standard ALEKS plug-in on the computer instead of using the streaming version of the plug-in.
ALEKS – Schedule of Learning Objectives

Most weeks you will have two online homework assignments, one due on Monday and the other due on Wednesday. You should not wait until the day that these assignments are due to begin them. The best way to use ALEKS is to devote one hour per day and make incremental progress. Below is the tentative homework schedule. I have purposely given you about 4-5 days after we complete a chapter to finish the assigned homework so that everyone has enough time to finish each assignment and master the material, but I reserve the right to change the due dates of assignments if I feel the need to.

The two keys to success for ALEKS:

1. DO NOT wait until the due date to begin an assignment
2. Plan to devote at least one hour per day to working problems on ALEKS to prevent work piling up

All homework assignments are due by 11:59 pm of the indicated date.

You must register for ALEKS and complete the initial assessment by: Monday, January 14

Chapter 1, Part I: Due Monday, January 14
Chapter 1, Part II: Due Wednesday, January 16
Chapter 2, Part I: Due Monday, January 21
Chapter 2, Part II: Due Wednesday, January 23
Chapter 3, Part I: Due Monday, January 28
Chapter 3, Part II: Due Wednesday, January 30
Chapter 4, Part I: Due Monday, February 11
Chapter 4, Part II: Due Wednesday, February 13
Chapter 5, Part I: Due Monday, February 18
Chapter 5, Part II: Due Wednesday, February 20
Chapter 6, Part I: Due Monday, February 25
Chapter 6, Part II: Due Wednesday, February 27
Chapter 7: Due Monday, March, 18
Chapter 8, Part I: Due Monday, March 25
Chapter 8, Part II: Due Wednesday, March 27
Chapter 9, Part I: Due Monday, April 1
Chapter 9, Part II: Due Wednesday, April 3
Chapter 10: Due Wednesday, April 17
NATURAL/PHYSICAL SCIENCES - GT Course Criteria for Chemistry 150 (SC1)

State-level Goal:
Collectively, the general education requirement in natural and physical sciences is designed to help students master scientific knowledge at a level that facilitates communication in an increasingly technological society, including:

- to instill a clear understanding of the basic scientific viewpoint.
- to enable students to learn and use the scientific method.
- to evaluate the impacts of science and technology on society.
- to increase the level of science literacy.

The content of Chemistry 150, designated by the State as a GT-SC1 pathways course includes:

1. Lecture material designed so that students:
   a). develop a foundational knowledge in the fundamental aspects of chemistry.
   b). develop an understanding of and ability to use the scientific method.
   c). recognize that science as a process involves the interplay of observation, experimentation and theory (this content is reinforced via the rigorous lab component accompanying the lecture portion of the course)
   d). develop quantitative approaches to study natural phenomena.
   e). identify and highlight interconnections between specific science courses being taught and larger areas of scientific endeavor (e.g. analytical, organic, inorganic, physical and bio-chemistry and interfaces amongst the other physical and natural sciences).
   f). distinguish among scientific, nonscientific, and pseudoscientific presentations, arguments and conclusions.

2. The laboratory tied to Chemistry 150 (GT-SC1) is designed so that students:
   a). develop concepts of accuracy, precision, and the role of repeatability in the acquisition of scientific data.
   b). carry out hands-on and inquiry-based projects and work with state-of-the-art equipment with faculty demonstrations playing a small secondary role.
   c). formulate and test hypotheses with scientific rigor.
   d). generate and analyze real data, and use abstract reasoning to interpret these data, and communicate the results of experimentation (via a combination of lab notebooks, reports sheets and written summaries).
   e). develop modern laboratory skills including the hands on use of modern instrumentation.
   f). are made fully aware of procedures for laboratory safety.

Competency Criteria:
Chemistry 150 is also designed to provide students competency in:

Critical Thinking
Guiding Principle – The goal of instruction in “critical thinking” is to help students become capable of critical and open-minded questioning and reasoning. An understanding of argument is central to critical thinking. As a core science course, emphasis is on critical thinking including data acquisition, analysis, and evaluation. Specifically, this is accomplished through the use of the scientific method. The laboratory component, as an application of course material, encourages synthesis of lecture concepts and communication of experimental results. Open-ended lab experiments and problem-based learning in the laboratory are used to encourage students to develop critical thinking skills including identifying important questions, evaluating the appropriateness of tools and techniques, communicating findings and evaluating data such that appropriate conclusions can be draw.

Mathematics
Fundamentals of chemistry emphasizes mathematical competency including data acquisition, analysis and evaluation. Dimensional analysis, balancing equations and skills required for energy calculations are core to the course. These skills are used in weekly laboratory exercises and are central to calculations performed on quizzes and exams.