CHEM 107
Sec 506; TTh 12:45-2:00

General Chemistry for Engineering Students

CHEMISTRY 107

- 3 credits, lecture
- Lecture: 2 ×1.25 hr/week (TTh 5:30 – 6:45);
  Room: HELD 100
- Lab course is separate: 1×3 hrs/wk, Chem 117
  - smaller classes: ≤ 24 students per section
  - graduate teaching assistants
  - experiment + recitation/discussion time
  - On-line quizzes (usually one before each lab)
Dr. Tim Hughbanks

- Grew up in and around Seattle; Graduated from High School, Yakima, WA, 1973
- B.S. in Chemistry, University of Washington, 1977
- Ph.D., Cornell University, 1983
- Faculty member at TAMU since Fall 1987
- Director of the First Year Chemistry Program, July 2009 – present.
- Associate Head of Chemistry, Fall 2016 –

Tim Hughbanks

- Office: Chemistry Building, Room 330
- Office phone: 845-0215
- Office Hours:
  - HELD 104A: Tues, Thurs, 4:00 - 5:30
  - CHEM 330: Fridays, 1:30 - 3:00
- e-mail: trh@chem.tamu.edu
  - Put ‘Chem 107’ in subject line!
Instructional Assistant (IA)

Nicki Hogan   nhogan@tamu.edu

Nicki will be dealing with course management and other issues. She will be working to get familiar with OWL so that she can answer your questions of a technical nature in dealing with OWL. Nicki is setting up a schedule of recitation sessions that we will e-mail to you soon!

Supplemental Instruction (SI)

We don’t have an SI instructor specifically assigned to this class, but we’ll pass along a schedule of SI instructor for other Chem 107 sections that you can attend as well.
CHEMISTRY 107

- Designed by largely Dr. Larry Brown in cooperation with faculty from all engineering departments
- For most engineering majors, this will be the only required chemistry course
- CHEM E’s must still take 2 semesters of general chemistry: 101/102 (or 107/102)

Required Book, etc.

- Safety Goggles for lab
Loose-leaf Option

- Same Content – cheaper!
- Same OWL, same e-book access

ALEKS (Assessment and Learning in Knowledge Spaces)

- A web-based, artificially intelligent assessment and learning system. ALEKS uses adaptive questioning to quickly and accurately determine exactly what you know and don’t know in General Chemistry, then instructs you on the topics you are most ready to learn.
- Only 43% of the class had registered by 2:40 this afternoon. If you haven’t already, you must register for ALEKS, NOW!
Registering for ALEKS

- Go to www.aleks.com
- Click on SIGN UP NOW!
- Enter Course Code: YAULJ-RKKLP
- Confirm that you are in the correct course
- Fill out the student information webpage
- Take the initial Assessment. This assessment will take 1-2 hours

►Financial Aid Code: 48C78-D1E81-FBCEC-48D10

ALEKS

► It is counterproductive to attempt to work around ALEKS by getting outside help, if you seek help in the initial assessment, you will get assignments you aren’t ready for!

► ALEKS is weighted as 55 pts of a total 570 pts in the course; 85% of your ALEKS grade will be for meeting ‘objectives’, 15% of your ALEKS grade will be for overall performance in “completing your pie”.


OWL (On Web Learning)

▶ Each student gets a personalized homework set, similar but not identical to other students.
▶ Homework is submitted by the student over an internet connection. You are allowed several attempts at each problem.
▶ You must register for OWL. (The first assignments are already there.) You can navigate to OWL from the class web site: http://chem107.chem.tamu.edu/hughbanks/

OWL Purchase options

(1) Loose-leaf Book Purchase + 6 month access to Owl ($75.00)
   This is my recommendation. You MUST register for OWL anyway; with this option you get the loose-leaf hard copy included.
   Links for each are on the class web site under “book info”. Again, you must buy and register for OWL.
An Actual e-mail:

Dr. Hughbanks;

I am extremely worried about my chemistry test. I did not know how to use the calculator I was given. I wrote down all the equations and set up the problems, because I knew exactly what to do. However, I could not give an answer due to my calculator issue. I would very much appreciate it if there is anything I could do to show you I know the material.

Thanks.

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Chem 107
Simple Scientific Calculator

Get One!

TI-30Xa - $15
TI-30XIIS - $20
TI-30XS
TI-34
TI-36X
(The last 3 are pricier: $25-$39
Sharp EL-531XB - $15

Estimated Grade Calculations

- 3 Exams @ 100 pts. = 300 pts (52.6%)
- Final Exam @ 150 pts. = 150 pts (26.3%)
- Homework (ALEKS) = 55 pts (9.65%)
- Homework (OWL) = 35 pts (6.14%)
- Clicker questions = 30 pts (5.26%)

Total = 570 pts (100%)
Study Problems from Text

- Will be posted on the class “exams” web page
- Will not be collected or graded, BUT some exam questions will come directly from these problems (~¼ - ⅓)!
- bring study problems to recitation and review sessions - solving problems is essential in this course

Expectations

- the vast majority of Chem 107 students have had at least 1 yr of high school chem.
- Chem 107 covers a lot of ground — there is considerable overlap with both Chem 101 & 102, but emphasis is different.
- In order to cover necessary material in one semester, we can’t review as much basic material as Chem 101.
Material you should have been exposed to (brief coverage)

- **Chapter 1** – The perspective may be unfamiliar, but this should be a quick read. Units and significant figures should be familiar.
- **Chapter 3** - Sec. 3.1; digression on explosions
  - Sec. 3.2; chemical equations, balancing
  - Sec. 3.2; net ionic equations may be new (not complicated), acids and bases
  - Secs. 3.4, 3.5; Mole Concepts, molar masses

Advice

- **Don’t get behind!** Keep up with reading, and get help before you get in too deep. It is especially easy to fall behind because a lot will be covered in each 75 min. lecture.
- Ask questions. If I seem to think you know more than you really do, let me know.
- Get help if you need it classmates, IA, TA’s, me, ...
- Focus on understanding; few students are good at guessing what will be on exams.
Answers to typical Questions...

💡 No, you will NOT need to memorize the periodic table. (You will need to learn something about how it is organized.)

💡 Do I believe that anybody can pass as long as they study? Can anyone get an A?

💡 e-mail address: trh@chem.tamu.edu
Put ‘Chem 107’ in subject line!

Another Typical Question...

My name is John/Jane Doe and I was in your CHEM 107 class last spring. I ended up making a "C" in the class. Now I am a sophomore Mechanical student finishing up some of my upper level classes. When I finished my CBK however, I ended up with a 2.83 in which I needed a 2.85 to stay in mechanical. Is there anyway I can re-take a test or project to get my grade changed to an "B" so that I can stay in Mechanical? Please let me know if there is anything I can do. I really need to stay in the Mechanical Department.
Typical Answer from ANY Instructor...

Dear John/Jane,

By definition, special projects, extra credit, or special treatment (exam retakes) constitute opportunities offered to some students, but not to others. Such opportunities are clearly unfair to students to whom they are not offered. All students have the opportunity to take a class over again in order to improve their grade, and that is really your only option.

Sincerely,
Timothy Hughbanks
Professor and Director of the Chemistry First Year Program

Chemistry & Engineering
Chem 107: Relationship to Engineering courses

- ENGR 111: Conservation Principles..., Properties of Matter
- MEEN 222: Materials Science
- MEEN 315: Thermodynamics
- BMEN 282: Engineering Biology
- AERO 212: Introduction to Aerothermodynamics

Chem 107: Relationship to Eng. courses, cont.

- ESET 415, 419, 420: Eng. Tech Capstone courses
- ENTC 207: Metallic Materials
- ELEN 370: Electronic Properties of Materials
- CVEN 301: Environmental Engineering
- CVEN 306: Materials Engineering for Civil Eng.

(only a partial listing - many of these courses, such as Thermodynamics, are required in several engineering programs)
Chemist’s Viewpoint: Atoms & Molecules

- All matter is composed of atoms.
- Two or more atoms joined by a chemical bond form a molecule.
- “Think Molecules”

Chemistry: Three “Representations”

- Macroscopic or bulk: observations of what happens
- Symbolic: written description (formulas, equations, ...)
- Microscopic/molecular: what are the atoms or molecules doing?
Boiling Water

- Macroscopic description?
- What is in the bubbles?
  - air?
  - hydrogen and oxygen?
  - water vapor?
  - nothing/vacuum?
- Symbolic description?
- Molecular description?

Solids vs. Liquids vs. Gases

- Increasing motion and disorder

![Solid](image1.png) ![Liquid](image2.png) ![Gas](image3.png)
Problem

✿ In any gas at 1 atmosphere pressure and 25 °C (298 K) there are roughly $2.5 \times 10^{22}$ molecules per liter. How much space (volume) does the average molecule take up? (In cm$^3$ and Å$^3$)

✿ In liquid water there are roughly $3.3 \times 10^{26}$ molecules per liter. How much volume does the average molecule take up? (In cm$^3$ and Å$^3$)

\[
1 \text{ Å} = 10^{-10} \text{ m} \\
1 \text{ m} = 10^{10} \text{ Å}
\]

Classification of Matter

✿ Pure Substances - can’t be broken down by physical methods

✿ Chemical Elements
✿ Chemical Compounds: contain 2 or more elements

Pure substances have fixed composition.
Classification of Matter

- Mixtures - can be separated into 2 or more pure substances by physical methods
  - Heterogeneous
  - Homogeneous

Mixtures have variable composition.

Mixture or Pure Substance?
Homogeneous or Heterogeneous?

- Air?
- Water?
- Copper wire?
- Silicon wafer?
- Coffee?
Homogeneous mixture of gases (on human scale).

Exact composition varies with location, weather, etc. Primary components of dry air* (percentages based on numbers of atoms or molecules):

- Nitrogen (N\textsubscript{2}) 78.079%
- Oxygen (O\textsubscript{2}) 20.945%
- Argon (Ar) 0.9339%
- Carbon dioxide (CO\textsubscript{2}) 0.0400%, 402 ppm – increasing by at least 0.0002% (2 ppm) per year

Other gases > 1 ppm: Ne, He, CH\textsubscript{4}, Kr

*Water (H\textsubscript{2}O) varies (~ 0.40% over full atmosphere, 1-4 % at surface)

<table>
<thead>
<tr>
<th>Substance</th>
<th>Inhaled Air</th>
<th>Exhaled Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>N\textsubscript{2}</td>
<td>78 %</td>
<td>75 %</td>
</tr>
<tr>
<td>O\textsubscript{2}</td>
<td>21</td>
<td>16</td>
</tr>
<tr>
<td>Ar</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>CO\textsubscript{2}</td>
<td>0.04</td>
<td>4</td>
</tr>
<tr>
<td>H\textsubscript{2}O</td>
<td>0 - 4</td>
<td>4</td>
</tr>
</tbody>
</table>
Trace Components

The average concentration of CO in the U.S. is about 6 parts per million. (Levels above 9 ppm are considered dangerous.)

 Estimate the number of CO molecules you inhale in one breath. Assume there are about $2.5 \times 10^{22}$ molecules per liter.

The Dunning-Kruger Effect†

Comments following on-line news articles concerned with climate change are a source of boundlessly confident ignorance†. In response to an article* authored by A. R. Ingraffea (professor of civil and environmental engineering at Cornell) an individual identifying himself as ‘Danram’ offered this gem: “The fact is that the actual increase in CO$_2$ content of the atmosphere ... about 100 parts per million ... only accounts for about 1/100th of 1 percent of our planet's total atmosphere. Now, if you truly believe that a change of 1/100th of 1 percent in the composition of Earth's atmosphere can, in and of itself, cause the planet to heat up, then I've got a bridge in Brooklyn that I need to sell.”