Chemistry Syllabus

Mark Peever
mpeever@gmail.com

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Psalm 107:23–32

1 Overview

This is an introductory chemistry class. Our goal is to lay a strong foundation for studying "hard" sciences[1] through high school and college.

We'll keep **Psalm 107:23–32** in mind as we begin exploring chemistry together. Chemistry can feel a bit overwhelming — a bit like being lost at sea — but it's only as we take risks that we are in a position to see the wonders of God.

Our goals for this course are:

- to cultivate a love of "hard" sciences, especially chemistry,
- to build good math habits, especially as they pertain to physical sciences, and
- to build a good foundation of skills for problem-solving

2 Contact Information

Mark Peever
1164 Ruby Creek Rd.
Harvard, ID 83834
email: mpeever@gmail.com
text: 253-328-2197[2]

[1] As opposed to social sciences like Sociology.
[2] Cell phone reception in Harvard is terrible…please bias for text over voice.

3 Prerequisites/Corequisites

There will be some overlap with **Physical Science**, don't be discouraged if there's a lot of review to start!

We will use basic algebra a *lot*. I plan to use class time to review/refresh math topics as we go, so don't let that scare you. If you have finished **Algebra I**, you should be fine. If you are still working on Algebra I *and are willing to put in the effort*, you should be fine.

If you don't understand the math, you need to ask.

4 Text Book

Exploring Creation with Chemistry (second edition, 2003) by Dr. J. L. Wile.

5 Course Pace and Class Time

There are 16 modules in the text book, so we will cover one module every two weeks, with some exceptions (see Table 2, page 6). *Please plan to have read and/or worked through each module in preparation for class.* We will review the module's material in the class, answering student questions as a priority. If the module is split between two weeks, then plan to have worked through the first half on the first week, the second half on the second.

At the end of each module are practice problems: I plan to have assigned every problem in the book eventually.[3]

There are several labs scheduled for this course. As much as possible, we'll do labs as homework, but we'll dedicate some class time to learning how to write them up. Some labs will require class time: we'll schedule those as we go.

6 Expectations

This will be a math-heavy class. Come with a **scientific calculator**, a sturdy **three-ring binder**, plenty of **looseleaf paper** to go in it, **pencils** and plenty of **erasers**.

Please don't attempt to turn in any work written in ink: this will be a **pencil-only course**.[4]

I relish **questions**, especially questions that show you have been paying attention. Bring plenty of those.

[3] You have been warned.

[4] No one will get everything right the first time: you *will* need to be able to erase your answers.

7 Meeting Times

TRC Classroom 2
8:55 A.M. – 10:20 A.M. Fridays

8 Homework and Grading

I have listed homework questions for each Module in Table 1 (page 4). Those will be due the next class (*e.g.* p. 36 # 1–10 will be due September 5).

We will have quizzes on a more-or-less three-week cadence (see Table 1). The quizzes will be given in class, as a check to ensure we're all mastering the material as we go.

There will be one cumulative exam per quarter, which will be a take-home exam, to be proctored by a parent or guardian.

The grades will be calculated as:

- Homework: 40%
- Labs: 30%
- Exams: 20%
- Quizzes: 10%

8.1 A Note on Studying

The inimitable Greg Mitchell used to say, "You don't study chemistry by reading, you study chemistry by solving problems."

If you're not using a pencil, eraser, and calculator you might be reading your chemistry book, but you're not studying chemistry.

8.2 A Note on Grading

"The right answer" is of very little interest to me when it comes to Chemistry problems on homework, quizzes, or exams. I am much more interested in the process than I am in the result.

I've included an example problem in Section 10 (page 5) so you can see how I grade chemistry problems. In the example, you can see I grade the problem out of a possible five points, and *only one point is for the correct answer.* We will go over this in class.

9 Topic Schedule

The schedule for the first quarter is given in Table 1. Please note I've included both labs and homework problems in the Q1 schedule.[5]

Date	Topic & Assignments
2025-08-22	Module 1: Measurement and Units Experiment 1.1 & 1.2 (to be done in class, as time permits)
2025-08-29	Module 1: Measurement and Units Experiment 1.4 (do at home) Assignment: p. 36 # 1–10
2025-09-05	Module 2: Energy, Heat, and Temperature Experiment 2.1 (at home)
2025-09-12	Module 2: Energy, Heat, and Temperature Quiz Assignment: p. 68 # 1–10
2025-09-19	Module 3: Atoms and Molecules Experiment 3.2
2025-09-26	Module 3: Atoms and Molecules Assignment: p. 98 # 1–10
2025-10-03	Module 4: Classifying Matter and Its Changes Experiment 4.3 Quiz
2025-10-10	Module 4: Classifying Matter and Its Changes * p. 132 # 1–10 Take-home Quarter 1 Exam
2025-10-17	**Fall Break**

Table 1: First Quarter Class Schedule

I have included a weekly break-down of topics for the whole year in Table 2 (page 6). We'll refine our schedule as we go: I anticipate some topics will take less time to cover than others.

[5] We'll assume the labs are to be done at home and the results brought to class on the listed day. There will be labs to be done in class, but we'll plan on doing the labs at home to start.

10 Example Problem

Question:

Lead has a density of $11.4g/mL$. If we cast a statue from $3.45L$ of lead, what is the statue's mass? (p. 36 # 9)

Answer:

1. identify what we're asked to find: *we're looking for the statue's mass* (1 point)
2. organize the information we've been given (1 point):
   - let ρ be the density of lead, $\rho = 11.4\frac{g}{mL}$
   - let V be the volume of the statue, $V = 3.45L$
   - let m be the mass of the statue, $m = ?$
3. identify the correct equation to relate what we have to what we want (1 point):
$$\rho = \frac{m}{V} \tag{1}$$
4. solve the equation for the quantity we want (1 point):
$$\begin{aligned} \rho &= \frac{m}{V} \\ (V)(\rho) &= (\frac{m}{V})(V) \\ \rho V &= (\frac{m}{\cancel{V}})(\cancel{V}) \\ \rho V &= m \\ m &= \rho V \end{aligned} \tag{2}$$
5. substitute the correct values into the resulting equation, being careful with units of measure and significant figures (1 point):
$$\begin{aligned} m &= \rho V \\ &= (V)(\rho) \\ &= (3.45L)(11.4\frac{g}{mL}) \\ &= (3.45L)(11.4\frac{g}{mL})(\frac{1000mL}{1L}) \\ &= (3.45\cancel{L})(11.4\frac{g}{\cancel{mL}})(\frac{1000\cancel{mL}}{1\cancel{L}}) \\ &= 39300g \end{aligned} \tag{3}$$

Date	Topic
2025-08-22	Module 1: Measurement and Units
2025-08-29	Module 1: Measurement and Units
2025-09-05	Module 2: Energy, Heat, and Temperature
2025-09-12	Module 2: Energy, Heat, and Temperature
2025-09-19	Module 3: Atoms and Molecules
2025-09-26	Module 3: Atoms and Molecules
2025-10-03	Module 4: Classifying Matter and Its Changes
2025-10-10	Module 4: Classifying Matter and Its Changes *
2025-10-17	**Fall Break**
2025-10-24	Module 5: Counting Molecules and Atoms in Chemical Equations
2025-10-31	Module 5: Counting Molecules and Atoms in Chemical Equations
2025-11-07	Module 6: Stoichiometry
2025-11-14	Module 6: Stoichiometry
2025-11-21	Module 7: Atomic Structure
2025-12-05	Module 7: Atomic Structure
2025-12-12	Module 8: Molecular Structure
2025-12-19	Module 8: Molecular Structure
2025-12-26	**Winter Break**
2026-01-02	**Winter Break**
2026-01-09	**Winter Break**
2026-01-23	Module 9: Polyatomic Ions and Molecular Geometry
2026-01-30	Module 9: Polyatomic Ions and Molecular Geometry *
2026-02-06	Module 10: Acid/Base Chemistry
2026-02-13	Module 10: Acid/Base Chemistry
2026-02-20	Module 11: The Chemistry of Solutions
2026-02-27	Module 12: The Gas Phase
2026-03-06	Module 13: Thermodynamics
2026-03-13	Module 13: Thermodynamics *
2026-03-20	**Spring Break**
2026-03-27	Module 14: Kinetics
2026-04-03	**Good Friday**
2026-04-10	Module 14: Kinetics
2026-04-17	Module 15: Chemical Equilibrium
2026-04-24	Module 15: Chemical Equilibrium
2026-05-01	Module 16: Reduction/Oxidation Reactions
2026-05-08	Final Review

Table 2: (Tentative) Year-long Class Schedule