

# AP Chemistry Syllabus 2022-2023

## Contact Information

Teacher: Jamie O'Malley

School: [Helena High School](#)

Phone: (406) 324-2286 (classroom), (406) 422-2814 (cell for emergencies)

Email: [jomalley@helenaschools.org](mailto:jomalley@helenaschools.org)

Teams: chat with me on Teams for one-on-one instruction

## Office Hours

Monday - Friday 2:20-2:50, or schedule an alternate time directly with me

## Online Platforms

- **Teams:** we will be using Microsoft Teams and OneNote through the school district for our daily classwork. You can log into [clever.com/in/helenaschools](https://clever.com/in/helenaschools) to access this class and the Teams page, or log into your Office 365 account.
- In Teams, all of your classwork and notes can be found in your **Class Notebook** and the associated **OneNote**.
- **AP Classroom:** we will be using [APClassroom.org](https://apclassroom.org) for tests and progress checks.

## Supplies Needed

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- Electronic device such as a Chromebook for online classwork and virtual labs
  - Pencils/pens
  - Scientific calculator capable of scientific notation
  - 3 ring Binder to keep track of handouts and notes

### For labs:

- Splash resistant safety goggles (students may buy a pair from me for \$3 or borrow a used pair)
- Closed toed shoes on lab days
- Hair ties for long hair
- Non-latex gloves for labs (one box)

## Pre-requisites

Chemistry 1 and Algebra II

## Textbook

**Text:** Brown, Lemay, Bursten, Murphy, and Woodward, (2012), *Chemistry, The Central Science*, (12th edition).

**Lab Manuals:** Vonderbrink, Sally Ann, Ph.D, *Laboratory Experiments for Advanced Placement Chemistry*, (2nd edition).

College Board, *AP Chemistry Guided-Inquiry Experiments: Applying the Science Practices*, (2013).

These will be provided.

## Course Description

The purpose of Advanced Placement Chemistry is to provide a college level course in chemistry and to prepare the student to seek credit and/or appropriate placement in college chemistry courses. Emphasis is placed on depth of understanding of a topic, rather than breadth of topics. We will be using AP Classroom for online progress checks and unit assessments.

**These are the Science Practices that will be covered as suggested by the College Board.**

1. Models and Representations: Describe models and representations, including across scales.
2. Question and Method: Determine scientific questions and methods.
3. Representing Data and Phenomena: Create representations or models of chemical phenomena.
4. Model Analysis: Analyze and interpret models and representations on a single scale or across multiple scales.
5. Mathematical Routines
6. Solve problems using mathematical relationships.
7. Argumentation: Develop an explanation or scientific argument.

**Units and topics to be covered:**

Unit	Topics
1 Atomic Structure and Properties	<ol style="list-style-type: none"> <li>1. Moles and Molar Mass</li> <li>2. Mass Spectroscopy of Elements</li> <li>3. Elemental Composition of Pure Substances</li> <li>4. Composition of Mixtures</li> <li>5. Atomic Structure and Electron Configuration</li> <li>6. Photoelectron Spectroscopy</li> <li>7. Periodic Trends</li> <li>8. Valence Electrons and Ionic Compounds</li> </ol>
2 Molecular and Ionic Compound Structure and Properties	<ol style="list-style-type: none"> <li>1. Types of Chemical Bonds</li> <li>2. Intramolecular Force and Potential Energy</li> <li>3. Structure of Ionic Solids</li> <li>4. Structure of Metals and Alloys</li> <li>5. Lewis Diagrams</li> <li>6. Resonance and Formal Charge</li> <li>7. VSEPR and Bond Hybridization</li> </ol>
3 Intermolecular Forces and Properties	<ol style="list-style-type: none"> <li>1. Intermolecular Forces</li> <li>2. Properties of Solids</li> <li>3. Solids, Liquids, and Gases</li> <li>4. Ideal Gas Law</li> <li>5. Kinetic Molecular Theory</li> <li>6. Deviation from Ideal Gas Law</li> <li>7. Solutions and Mixtures</li> <li>8. Representations of Solutions</li> <li>9. Separation of Solutions and Mixtures Chromatography</li> <li>10. Solubility</li> <li>11. Spectroscopy and the Electromagnetic Spectrum</li> <li>12. Photoelectric Effect</li> <li>13. Beer-Lambert Law</li> </ol>
4 Chemical Reactions	<ol style="list-style-type: none"> <li>1. Introduction for Reactions</li> <li>2. Net Ionic Equations</li> <li>3. Representations of Reactions</li> <li>4. Physical and Chemical Changes</li> <li>5. Stoichiometry</li> <li>6. Introduction to Titration</li> <li>7. Types of Chemical Reactions</li> <li>8. Introduction to Acid-Base Reaction</li> <li>9. Oxidation-Reduction Reactions</li> </ol>
5 Kinetics	<ol style="list-style-type: none"> <li>1. Reaction Rates</li> <li>2. Introduction to Rate Law</li> <li>3. Concentration Changes Over Time</li> <li>4. Elementary Reactions</li> <li>5. Collision Model</li> <li>6. Reaction Energy Profile</li> <li>7. Introduction to Reaction Mechanisms</li> <li>8. Reaction Mechanism and Rate Law</li> <li>9. Steady-State Approximation</li> <li>10. Multistep Reaction Energy Profile</li> <li>11. Catalysis</li> </ol>
6 Thermodynamics	<ol style="list-style-type: none"> <li>1. Endothermic and Exothermic Processes</li> <li>2. Energy Diagrams</li> <li>3. Heat Transfer and Thermal Equilibrium</li> <li>4. Heat Capacity and Calorimetry</li> <li>5. Energy of Phase Changes</li> <li>6. Introduction to Enthalpy</li> <li>7. Bond Enthalpies</li> <li>8. Enthalpy of Formation</li> <li>9. Hess's Law</li> </ol>
7 Equilibrium	<ol style="list-style-type: none"> <li>1. Introduction to Equilibrium</li> <li>2. Direction of Reversible Reactions</li> <li>3. Reaction Quotient and Equilibrium Constant</li> <li>4. Calculating the Equilibrium Constant</li> <li>5. Magnitude of the Equilibrium Constant</li> <li>6. Properties of the Equilibrium Constant</li> <li>7. Calculating Equilibrium Concentrations</li> <li>8. Representations of Equilibrium</li> <li>9. Introduction to Le Chatelier's Principle</li> <li>10. Reaction Quotient and Le Chatelier's Principle</li> <li>11. Introduction to Solubility Equilibria</li> <li>12. Common-ion Effect</li> <li>13. pH and Solubility</li> <li>14. Free Energy of Dissolution</li> </ol>
8 Acids and Bases	<ol style="list-style-type: none"> <li>1. Introduction to Acids and Bases</li> <li>2. pH and pOH of Strong Acids and Bases</li> <li>3. Weak Acid and Base Equilibria</li> <li>4. Acid-Base Reactions and Buffers</li> <li>5. Acid-Base Titrations</li> <li>6. Molecular Structure of Acids and Bases</li> <li>7. pH and <math>K_a</math></li> <li>8. Properties of Buffers</li> <li>9. Henderson-Hasselbalch Equation</li> <li>10. Buffer Capacity</li> </ol>
9 Applications of Thermodynamics	<ol style="list-style-type: none"> <li>1. Introduction to Entropy</li> <li>2. Absolute Entropy and Entropy Change</li> <li>3. Gibbs Free Energy and Thermodynamic Favorability</li> <li>4. Thermodynamic and Kinetic Control</li> <li>5. Free Energy and Equilibrium</li> <li>6. Coupled Reactions</li> <li>7. Galvanic (Voltaic) and Electrolytic Cells</li> <li>8. Cell Potential Under Nonstandard Conditions</li> <li>9. Electrolysis and Faraday's Law</li> </ol>

## Laboratory Requirement

AP Chemistry students will be spending at least 25% of their class time performing hands-on laboratory experiments. Students will be collecting, process, manipulating, and graphing data from both qualitative and quantitative observations. The students will be also designing, carrying out, and analyzing data from inquiry-based labs.

### Safety for In-Person Labs

It is my responsibility to teach you the techniques for safe use of the chemistry lab, it is your responsibility to be mature and follow the rules. Failure to follow the safety rules will get you kicked out and you will **not receive credit!** Wearing closed-toed shoes and safety goggles are a **must** for every lab. Points will be taken off your lab report for not wearing safety goggles or wearing closed toed shoes. A lab safety contract must be signed before performing in-person labs.

## Classroom Expectations

### Effort

***What you put into this class is what you'll get out!*** AP Chemistry is a tough subject and it will take more hours of studying than a typical high school class. Please dedicate some time **every day** to studying AP Chem, whether it's reading, watching videos, completing assignments, or taking notes. There is a direct correlation between how much time you study outside of class and AP exam scores.

### Grading

Q1 (40%) Q2 (40%) Final Exam (20%). A: 90-100%; B: 80-90%; C: 70-79%; D: 60-69%; F: Below 60%. (Approximate) Tests or quizzes 80%, classwork 10%, labs 10%. Students who take the AP test in May will not be required to take a final exam.

**Classwork:** Classwork only counts for about 10% of your grade. This work will be corrected or an answer key will be provided so you can see what you are doing correctly and/or incorrectly. If you work hard on the classwork and turn it in on time, the assessments will be much easier!

**Assessments:** You will be taking most of your big tests on apclassroom.org. I will teach you how to use this website in class. The majority of your grade will be based on assessments, it concentrates more on what you know, than what you can complete as assignments. You can retake assessments once per test and I will put your highest score in powerschool. You have one week from the assessment for the retake. ***If you can't find the time to retake or make up a test within ONE WEEK, you will not receive credit for the test.***

**Late Work:** All unit classwork is due on the day of the unit test. Your score on classwork gets reduced by 70% if you turn it in late, which is after the day of the test. There is a direct correlation between chronic late work and poor test scores.

**Food and Drinks:** There will be no food or drinks in the classroom except for water.

**Communication:** Please tell me if you need help! I am usually very quick to reply to emails and Teams chat. Any messages after 8:00pm will be answered the following morning.

**Copying/Cheating:** How can you learn anything if you go through life **copying** others? We have 182 days of school, use them to get smarter! The lender and the copier will both receive zeroes if caught. Please exercise self-control when using the internet. You might be tempted to copy answers off the internet on your assignments, but this does not help you understand the material at a deeper level and will not help you be successful on the AP Exam in May.

**Cell Phones:** No cell phones in class unless we are using them for a particular website or app.

## AP Exam

The AP Chemistry exam is on Monday, May 1<sup>st</sup> at 12:00 pm. The exam is not required but highly recommended. Exam registration is in the fall! More info to come. Visit the College Board website for more detailed information: [College Board](https://collegeboard.org/apcentral)

## About Your Teacher

I am originally from the Whidbey Island, WA but have lived near Winston, MT for close to 11 years. I have two herd dogs, one cat, one cockatiel, and approximately 35 chickens. I taught Biology and Math at North Kitsap High School for one year and Biology and AP Biology at Sultan High School for 6.5 years. After moving to Montana, I was the Director of Education at ExplorationWorks, and taught STEM at Starbase for 1.5 years. I have been teaching at HHS for six years. Here at HHS I have taught Chemistry 1, AP Chemistry, and Biology. I am also the advisor for Key Club and Science Olympiad. I have several year's experience working in a laboratory in Seattle performing microbiology quality control and immunology research, as well as providing support materials for chemical and biological testing at the Montana DPHHS. My most challenging career to date was being a stay-at-home mom for close to seven years.

I enjoy hiking, camping, fishing, gardening, hunting, riding horses, winter sports, and of course, teaching! I have been married to Dan O'Malley for 27 years. We have two kids, Jake and Katie, who graduated from HHS in 2016 and 2017. Katie lives in Bozeman and is a 2022 graduate of MSU with a degree in Graphic Design. Jake lives in Missoula with his Schnauzer puppy, Otto, and works in the insurance technology industry.



## Syllabus Signature Page

I have read and I understand Mrs. O'Malley's AP Chemistry syllabus:

Student Name Printed: \_\_\_\_\_

Period: \_\_\_\_\_

Student Signature: \_\_\_\_\_

Parent Signature: \_\_\_\_\_

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