Advanced Placement Chemistry

I. Course Description The AP Chemistry course is designed to be the equivalent of the general chemistry course usually taken during the first year of college. For most students, the course enables them to undertake, as a freshman, second year work in the chemistry sequence at their institution or to register in courses in other fields where general chemistry is a prerequisite. This course provides instruction on structure of matter (atomic theory and structure and chemical bonding), states of matter (gases, liquids, solids and solutions), and reactions (reaction types, stoichiometry, equilibrium, kinetics). A special emphasis will be placed on descriptive chemistry and student directed laboratory experiments. There will be a strong emphasis placed on topics requiring calculations and mathematical formulations. As with all AP courses, AP Chemistry is **open to all students** who wish to take part in a rigorous and academically challenging course.

II. Textbooks and Lab Books

Zumdahl, Steven and Susan Zumdahl. Chemistry, Fifth Edition. Boston: Houghton Mifflin Company, 2000.

Randall, Jack. Advanced Chemistry with Vernier. Oregon: Vernier Software and Technology, 2004.

Zumdahl, Steven and Kelter, Paul B. Study Guide Chemistry, Fifth Edition. Boston: Houghton Mifflin Company, 2000.

Hall, James F. Experimental Chemistry, Fourth Edition. Boston: Houghton Mifflin Company, 1997.

III. Required Materials

TI-83 plus or higher graphing calculator, splash proof goggles, and a carbon capable laboratory notebook

IV. Grading Policy

Major tests - 50%; Laboratory reports - 25% ; Quizzes – 25%

Homework will not be counted but it is expected that students complete the homework daily. The majority of the problem sets assigned from the text require calculations and mathematical formulations of principles like calculating empirical formula, percent composition, equilibrium constants, rate constants, enthalpy, entropy, Gibbs free energy etc. Students will be provided with solutions to all the problems and it will be up to the student to come to me with any questions regarding those problems.

Quizzes will mimic the homework and can cover any homework that was to be done by the day we have the quiz. Some of the quiz problems will be copied directly from the homework and others will be the same with different numbers used.

Labs are all hands-on/"wet labs" with a few teacher demonstrations. The labs completed require following processes and procedures, taking observations, and data manipulation. Students communicate and collaborate in groups. Each student writes a laboratory report in a lab notebook for every lab they perform. This report includes a prelab assignment AND a post lab assignment. See Laboratory Notebook Guidelines for more information.

***NOTE: Alternative to Double Block Period*:** The bulk of the labs are completed during the 47 minute time block in class, however, prelabs, lab equipment set up, chemical preparation and post lab work, is all done outside of class. Lab days are on Wednesdays and Thursdays of every week. Students must come in before or after school, or during their lunch to aid in the set up and break down process. This equates to about 1 hour a week that students contribute outside of class. In addition, any labs that are not completed in class must be done so on the student's own time.

The Laboratory Notebook

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A record of lab work is an important document, which will show the quality of the lab work that you have done. It may be necessary to show your lab book to a university for credit in a chemistry lab course, so keep you book neat and organized since it may be looked at in the future and might be of some great use.

Getting Started:

Use a quadrille-lined book with pages numbered and with carbon copy capability.

Write your name and class on the front cover in case book gets misplaced.

Always, Always, Always use black or blue ink! Pencil is not accepted.

Fill in the table of contents provided in the book. This should be kept current as you proceed during the year. In the table of contents, place the title and the page number where the lab report begins for each lab.

If you make a mistake DO NOT ERASE! Just draw ONE LINE through the error and continue. Do not scribble out the error or use white-out. It is expected that some errors will occur. You cannot produce and error free notebook. If you mess up an entire page DO NOT rip it out of the book. Simply draw a line through the page corner to corner and go to the next page.

You will keep the original copy of the lab in the book and turn in the carbon copy. If your instructor cannot read carbon copies of the lab easily, the student will receive an automatic 50% for a grade.

The 10 Parts of a Laboratory Report

A specific format will be given to you for each lab. You must follow that format and label all sections very clearly. Chem AP lab reports are much longer and more in depth than the ones completed in PreAP chemistry. Therefore, it is important that you don't procrastinate when doing your prelab and postlab work. I will NOT answer last minute questions on the days the pre labs and post labs are due. GET HELP EARLY!! ***LATE LABS NOT ACCEPTED*****!!!!!**

Labs not completed in class must be done so at lunch or before or after school!!!!

Pre-Lab Work

(PreLab work is to be completed and turned in on the day the lab is performed. If not completed, you will lose all prelab credit which usually totals around 30 points toward the final lab grade…..sometimes even more.)

1. *Title* The title should be descriptive. "Experiment 5", for instance, is not a descriptive title.
2. *Date* This is the date you performed the experiment.
3. *Purpose* A statement summarizing the "point" of the lab. What are you trying to do?
4. *Procedure Outline* You will need to write an outline of the procedure. This is BRIEF! Use bulleted statements or outline format to make it easy for me to read. I just want to make sure you know what's going on in lab.
5. *Pre-Lab Questions* You will be given some questions to answer before the lab is done. You will need to either rewrite the question or incorporate the question in the answer you give. You MUST use completed sentences. You will not get credit for sentence fragments. The idea here is that when someone (like a college professor) looks at your lab notebook, they should be able to tell what the question was by merely looking at your lab report. I am very serious about this! It is important to produce a good record of your lab work.
6. *Data Tables* You will need to create any data tables or charts necessary for data collection in the lab. **During the Lab**
7. *Data* Record all your data **directly** in your book. You are NOT to be recording data on your lab sheet. Label all data clearly and always include proper units of measurement. Underline, use capital letters, or use any device you choose to help organize this section well. Space things out neatly and clearly.

Post-Lab Work

8. *Cals and Graphs* You should show how calculations are carried out. Your instructor needs to be able to follow you calculations and read your graphs easily. Graphs need to be titled, axis need to be labeled, and units need to be shown on axis. **To receive credit for any graphs they must be at least ½ page in size.**
9. *Conclusions* This will vary from lab to lab. You will usually be given direction as to what to write but I expect all conclusions to be well thought out and well written. This must include thesis, error analysis and application. Again, I expect neat penmanship and complete sentences.
10. *Questions* Follow the same procedure as for Pre-Lab Questions

Fall Semester

Unit 1 – Fundamentals

- Ch 1 - Chemical Foundations
- Ch 2 - Atoms, Molecules & Ions
    - Lab – Counting by weighing
- Ch 3 - Stoichiometry
    - Lab – Stoichiometric Determinations

Unit 2 – Types of Chemical Equations

- Ch 4 - Chemical Reactions & Solution Stoichiometry
    - Lab – Chemical Reactions
- Net Ionic Equations

Unit 3 – Gas Laws

- Ch 5 – Gases
    - Lab – The Molar Volume of a Gas

Unit 4 – Heat and Enthalpy

- Ch 6 – Thermochemistry
    - Lab – Calorimetry

Unit 5 – Atomic Structure & Periodicity

- Ch 7 – Atomic Structure & Periodicity
    - Lab – Properties of Representative Elements

Unit 6 – Chemical Bonding

- Ch 8 – Bonding: General Concepts
    - Lab – Molecular Shapes and Structures
- Ch 9 – Covalent Bonding: Orbitals

Unit 7 – Liquids & Solids

- Ch 10 – Liquids & Solids
    - Lab – Vapor Pressure
- Ch 11 – Properties of Solutions
    - Lab – Standardizing a Solution of Sodium Hydroxide

Unit 8 – Kinetics

- Chapter 12 – Chemical Kinetics
    - Lab - Enzymes

Spring Semester

Unit 9 – General Equilibrium

- Chapter 13 – Chemical Equilibrium
    - Lab – The Determination of an Equilibrium Constant

Unit 10 – Acid / Base Chemistry

- Chapter 14 – Acids & Bases
    - Lab – Acid Base Titration / Investigating Indicators

Unit 11 – Buffers & Ksp

- Chapter 15 – Applications of Aqueous Equilibria
    - Lab – Coordination Compounds

Unit 12 – Thermochemistry

- Chapter 16 – Spontaneity, Entropy, & Free Energy
    - Lab – Determination of Iron by REdox Titration

Unit 13 – Electrochemistry

- Chapter 17 – Electrochemistry
    - Lab – Electrochemistry: Voltaic Cells

Unit 17 – Nuclear & Organic Chemistry

- Chapter 21 – The Nucleus: A Chemist's View
    - Lab – Half-Life Web simulation
- Chapter 22 – Organic Chemistry
    - Lab – The synthesis & analysis of Aspirin

Review for AP Exam

- Green Crystal Lab
- Review Exams

AP Exam

Lab: GREEN CRYSTAL LAB
Description: A series of labs completed over a 4-week period. Students work at their own pace in pairs. The goal of this lab is to determine the empirical formula of a ferro-oxalato crystal. It also leads to an intensive review of descriptive chemistry
Includes the following experiments:

Experiment 1: Synthesis of the crystal (approx 3 periods)

Experiment 2: Standardization of $KMnO_4$ by redox titration (approx 2 periods)

Experiment 3: Determination of % oxalate in crystal by redox titration (approx 2 periods)

Experiment 4: Standardization of NaOH by acid/base titration (approx 2 periods)

Experiment 5: Determination of % K+ and Fe3+ by ion exchange chromatography and titration. (1 period)

Experiment 6: Determine the % water in the hydrated crystal. (approx 3 periods)