

# AP Chemistry Course Syllabus

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## **Laboratory Manual:**

*Laboratory Experiments for Advanced Placement Chemistry* by Sally Ann Vonderbrink, published by Flinn Scientific 1995

## **Summer Assignment:**

Chapters 1-6 are given precursory treatment in Laboratory Chemistry, a pre-requisite for AP Chemistry. A summer assignment that covers these chapters is given before the end of the school year prior to enrollment in AP Chemistry. The assignments are due on three deadlines during the first 6 weeks of the summer vacation. Prior to each due date, an AP Chemistry "work day" is held at the school to help students with more challenging aspects of the summer assignment. While the work days are not mandatory, students are encouraged to attend as they tend to have a better understanding of the concepts as a result of their attendance.

The summer assignments are given a quick treatment at the beginning of the school year. Students are expected to have retained their understanding of their summer work, and exams are given on Chapters 1-6 during the first two weeks of school.

## **Class Schedule:**

AP Chemistry meets for 8-42 minute periods per week. In a typical week, 2-3 periods will be devoted to lecture, 2-3 periods to lab work, 1-2 periods to testing, and 1-2 periods to student problem presentations

## **Laboratory Notebook:**

Students are required to keep a notebook documenting all labs performed in AP Chemistry. Students are to keep their laboratory notebooks current. Lab notebooks are graded for completeness at the end of each 9 weeks. In addition, students will write lab reports for the labs completed in AP Chemistry. **Students are to keep all lab reports in a binder that will be checked each 9 weeks. (Requirements for the Lab Notebook and Lab Reports are included on a separate page.)**

## **Homework:**

**Homework is due every quiz and test day. Since homework is designed to prepare students for the quizzes/tests, it is of little value after the fact. Therefore, late homework will not be accepted. Homework assignments will**

be given well in advance of the due dates allowing students the opportunity to work around sports, clubs, employment, and illness.

When a homework problem poses a particular difficulty for a student, he/she should use the "AP Chem Problem Dissection" chart to help navigate a path through confusing data. In addition, students should complete the "AP Chem Concept Organizer" and the "AP Chem Problem Organizer" for each topic studied to better organize their learning and to use as a study guide for the AP Chem Exam and Final Exam.

**Teamwork:**

It is important for the students in the small class (10-14 students) to develop a rapport with one another so that they can learn from one another as well as the instructor. Teamwork is present in a number of different aspects of the course, including (but not limited to) rotating lab partners who discuss lab questions with one another; taking quizzes as a group of 2-3 students; teams of students who present information to the class. Teamwork occurs outside of the classroom as well in the form of teacher-led study sessions and informal study sessions as students prepare for exams and lab reports together. (Each student submits his/her own lab report, but often times lab groups get together to discuss lab procedures, data, and results.)

**Test Corrections:**

Students may increase their test scores by doing test corrections. Getting an answer right on a correction will never be worth as many points as getting it right on a test the first time, but there is value in looking at questions/problems a second time and learning from one's mistakes. By analyzing our mistakes, we can identify patterns of mistakes that we make and begin to correct those patterns. In addition, analyzing one's mistakes identifies areas of weakness in a concept that can then be addressed.

## Topics Covered in AP Chemistry

Time (days)	Chapter	Comments
2	1: Foundations of Chemistry	
2	2: Chemical Formulas & Composition Stoichiometry	
4	3: Chemical Equations & Reaction Stoichiometry	
5	4: Chemical Reactions (excluding redox)	
3	5: Structure of Atoms	
3	6: Chemical Periodicity	
8	12: Gases & the Kinetic Molecular Theory	
5	13: Solids & Liquids	
12	14: Solutions & 20: Solubility Product Principle	
15	7: Chemical Bonding	Chaps. 7-9 combined in one unit
	8: Molecular Structure and Covalent Bonding	
	9: Molecular Orbitals in Chemical Bonding	
6	11: Redox Reactions & 25: Coordination Compounds	
21	10: Reactions in Aqueous Solutions: Acids, Bases, Salts	chaps. 10/11 and 18/19 combined in one unit
	11: Aqueous Acid-Base Reactions	
	18: Ionic Equilibria I: Acids & Bases	
	19: Ionic Equilibria II: Buffers & Titration Curves	
10	15: Chemical Thermodynamics	
13	16: Chemical Kinetics	
13	17: Chemical Equilibrium	
12	21: Electrochemistry	
20	Review/Practice Exams/Preparation for AP Chem Exam	
12	Lab Practical	

## Labs Performed in AP Chemistry

Time (periods)	Chapter	#/Lab Title
2	2: Chemical Formulas & Composition	2: Stoichiometry *Determination of the % Copper in a Penny
2		3: Synthesis of Alum
3		4: Analysis of Alum
1	3: Chemical Equations & Reaction	2: Finding the Ratio of Moles of Reactants in a Chemical Rxn
3	4: Chemical Reactions (excluding redox)	1: Analysis of Silver in an Alloy
1	12: Gases & the Kinetic Molecular Theory	9: Vapor Pressure & Enthalpy of Vaporization of Water
1	13: Solids & Liquids	7: Molecular Mass of a Volatile Liquid
1		*Wet Dry Ice Lab: Observing the Triple Point of CO <sub>2</sub>
2.5	14: Solutions & 20: Solubility Product Principle	8: Molecular Mass by Freezing Point Depression
1		13: Determination of the Solubility Product of an Ionic Compd
2	7-9: Chemical Bonding	* Differing between Electronic/Molecular Geometry
1.5	11: Redox Reactions & 25: Coordination Compounds	5: An Activity Series
1.5		10: Analysis of a Commercial Bleach
3	10/11 & 18/19: Acids, Bases, Salts, Buffers	*Determination of the Concentration of an Unknown Acid
1		15: Determination of the Dissociation Constant of Weak Acids
2		16: Determination of the Equivalent Mass and pKa of an Unknown Acid
1.5	15: Chemical Thermodynamics	6: Thermochemistry and Hess's Law
3	16: Chemical Kinetics	12: Study of the Kinetics of a Reaction
3	17: Chemical Equilibrium	14: Determination of the Equilibrium Constant for the Formation of FeSCN <sub>2</sub> <sup>+</sup>
1		17: Equilibrium & LeChatelier's Principle
2	21: Electrochemistry	18: Electrochemical Cells
8 to 10	Lab Practical	20: Qualitative Analysis of Cations
4 to 5		21: Qualitative Analysis of Anions

\*These labs are supplemental teacher-developed labs

All labs are student conducted.

## Writing a Laboratory Report

To write a good laboratory report, you must understand scientific concepts and laboratory procedure. You must also be able to reason logically and interpret data. Being prepared before the laboratory period and being organized while carrying out a procedure can make report writing much easier.

Before the laboratory period, read the laboratory instructions first to get an idea of what the experiment is about. Then read the procedure a second time to answer the following questions:

1. What is the purpose of the experiment?
2. What is being tested or analyzed?
3. What are the scientific principles involved?

You might want to underline (or highlight) important points or jot down notes or questions in the margin area of the lab instructions.

A lab report is to be completed by each member of a lab group. The report must be typed unless otherwise specified. Directions may vary depending on the situation, so be alert to special instructions concerning the laboratory write up. A simple lab report consists of the following eight components with the following point values:

1.	TITLE PAGE	5 points
2.	INTRODUCTION	10 points
3.	EXPERIMENTAL DESIGN	5 points
4.	PROCEDURE	20 points
5.	DATA	20 points
6.	CONCLUSION	15 points
7.	ERRORS	10 points
8.	QUESTIONS	15 points

The following is a more detailed explanation which will guide you through a successfully written lab report. Keep in mind that the recording of complete, descriptive observations is a critical part of your work. As you perform your experiment, record what you do and what you see. Taking notes in your lab notebook is a must!

**Title page.** A good title relates the independent and the dependent variables that were investigated. A title page is required. A title page also includes your name, date that the lab was performed, and other members of your lab group.

**Introduction.** Describe the purpose and hypothesis for investigation. It should include important equations, formulas, concepts, or principles. Use the following questions to guide your writing of the introduction:

- \*What did you hope to learn? (Purpose)
- \*What did you think would happen? (Hypothesis)

**Experimental Design.** This describes your set up, including materials, chemicals, and equipment used. A diagram(s) may be used.

**Procedure.** This should be written in **past tense** to reflect what you did to complete the investigation. Any modifications to the original instructions should be included. Check both the written procedure and your lab notebook for accuracy, completeness, and precision.

**Data (Results).** The raw data comes from your notes. It must be organized and complete with labels and units. Complete a data table and an appropriate graph for the data if required. Include sample calculations. Any method that makes your data clear is acceptable. Be advised that data tables and graphs will be checked as to appropriate criteria for the construction of such items.

**Conclusion.** Describe the purpose, major findings, an explanation for the findings, and recommendation for further study. Use the following questions to guide your writing of the conclusion:

\*What was the purpose of the investigation or experiment?

\*What were the major findings? (Discuss your final quantitative data)

\*Was the hypothesis supported by the data?

\*What recommendations do you have for further study and for improving the experiment?

**Errors.** Discuss possible sources of error. Think about mistakes that were made in the experiment. Some of these will be your errors-human errors. Others will be caused by equipment or conditions beyond your control-inherent errors. How can you avoid errors? Be specific in your search for errors, and be certain that any possible errors you suggest agree with the results for your lab.

## Grading

The point value of a laboratory report varies dependent upon the extent of the report required. A complete report written out as per the above outline is valued at 100 points. Often, I will require a “short” version which will require you to only write out specific components or a cooperative lab report where your lab group will jointly submit a prepared lab write up. A lesser point value will be assigned to such an assignment.

Here are some qualities that I look for:

- 1.) Completeness
- 2.) Neatness
- 3.) Organization
- 4.) Answers to questions stated in the investigation
- 5.) Proper rules of grammar, sentence and paragraph structure, spelling, etc.
- 6.) Proper construction of data tables and graphs (see examples below)
- 7.) Inclusion of units in all sample calculations
- 8.) Your work during the lab period

Example:

Checklist for Evaluating Line Graphs:

Title

X axis correctly labeled including units

Y axis correctly labeled including units

X axis correctly subdivided into scale

Y axis correctly subdivided into scale

Data pairs correctly plotted

Data trend summarized with line-of-best-fit

Data trend summarized with sentences

## **GUIDELINES FOR AP CHEM LAB NOTEBOOKS**

Your lab notebook will be your record of all your laboratory work. An accurate record is of extreme importance in all lab work, so note the following requirements:

- 1.) Make all entries with a pen.
- 2.) Number both sides of each page in the upper outer corner. Pages should be used consecutively. Do not skip pages or tear pages out of the notebook.
- 3.) Write a short descriptive title and the date at the beginning of each experiment and also at the top of each page.
- 4.) Keep a record of your work while you are performing the experiment. Your procedure should be given in enough detail so that another student could repeat the experiment with no other reference source than your notebook. Do not merely copy the given procedure-- write what you did, in third person, past passive tense. (i.e., "The flask was weighed," rather than "Weigh the flask" or "I weighed the flask.") A sketch of any special apparatus may be helpful. Observations of colors, smells, etc. as well as comments about difficulties in the procedures should be recorded. Safety notes should be made when appropriate.
- 5.) Calculations should be done in the notebook and clearly labeled.
- 6.) Keep a table of contents in the first few pages of your notebook listing the title and date of each experiment and the page number on which the experiment is found. The primary purpose of your lab record is accuracy, authenticity and clarity, not necessarily neatness and beauty.

<b>AP Chem Problem Dissection</b>				
	What am I looking for?	What am I given?	Is anything irrelevant?	
Problem	Include units.			

What preliminary steps must I take to solve the "big picture" problem?  
**(Define a plan.)**





