

**PELLISSIPPI STATE COMMUNITY COLLEGE
MASTER SYLLABUS**

**ANALYTICAL CHEMISTRY
CHEM 2310**

Class Hours: 3.0
Laboratory Hours: 4.0

Credit Hours: 4.0
Revised: Spring 2017

Catalog Course Description

Principles and practices of quantitative measurements in chemical systems are introduced. Chemical equilibria (acid-base, complexometric, and redox), elementary spectrophotometry, chemical separations--including chromatography, ion exchange, and solvent extraction-- are discussed. Course includes three hours of lecture and four hours of laboratory applications each week.

Prerequisites

CHEM 1120

Textbook(s) and Other Course Materials

Harris, Daniel C. *Quantitative Chemical Analysis*, 8th Edition. W. H. Freeman – 2010.
ISBN: 978-1429218153

Bound laboratory notebook, e.g. composition notebook.

Access to Microsoft Excel with Analysis Tool pack.

A scientific calculator capable of 2-dimensional statistical analysis.

Week/Unit/Topic Basis

Week	Topic
1.	Steps to chemical analysis; Measurements
2.	Experimental Error
3.	Statistics
4.	Calibration Methods; Chemical equilibrium
5.	Applications of chemical equilibrium
6.	Systematic treatment of equilibrium
7.	Acid-Base equilibrium
8.	Acid-Base titrations
9.	Fundamentals of electrochemistry
10.	Applications of electrochemistry
11.	Fundamentals of spectrophotometry
12.	Applications of spectrophotometry
13.	Fundamentals of chromatography

14. Applications of chromatography
15. Final Exam Period

Course Goals

NOTE: Roman numerals after course goals reference TBR's general education goals.

The course will

- A. Teach students to follow written analytical procedures and write lab reports of sufficient detail that others could repeat the experiment and expect similar results based on detail provided in lab report. VI.1.
- B. Highlight the purpose and importance of calibration techniques as well as be able to solve problems related to calibration methods.
- C. Enhance comprehension of the underlying principles of statistics as they apply to both lecture and lab. VI.1.
- D. Develop students' understanding of the purpose and importance of titrations and their use within analytical chemistry.
- E. Further enhance students' comprehension of chemical and ionic equilibria based on the foundation they acquired in CHEM1120. I.5.
- F. Expand students' understanding of the principles of spectrophotometry and solve problems relating light absorption and emission to concentration. III.1, III.2.
- G. Guide students to solve problems dealing with the principles of electrochemistry. I.5.
- H. Guide students to calculate efficiencies of separation for solvent extraction and chromatographic processes. I.5.

Expected Student Learning Outcomes

NOTE: Capital letters after Expected Student Learning Outcomes reference the course goals listed above.

The student will

1. Demonstrate the use and calibration of lab equipment. B
2. Prepare a lab notebook for data collection and reference. A
3. Demonstrate how solutions are prepared and solve solution problems involving dilutions. A
4. Practice the safe handling of chemicals and disposal methods of chemical wastes. A
5. Solve solution problems using the various concentration expressions. D, E
6. Complete calculations to convert given measurements to necessary units needed in solving a particular problem. D, E
7. Apply the concept of significant figures while performing mathematical operations. C, D, E, F, G, H
8. Distinguish between the different types of experimental error. C
9. Estimate the uncertainty in measurements. C
10. Prepare and apply the statistical analysis of experimental data. C
11. Apply the concepts involving the chemical equilibrium constant. E

12. Apply acid-base concepts like strength, pH and use of ionization constants. D, E
13. Solve for and use the solubility product constant, K_{sp} , and explain the effects of complex ion formation. D, E
14. Compare spectrophotometric concepts like absorbance, transmittance, and Beer's Law, and gain experience with these concepts using instrumentation. F
15. Evaluate the technique of titration and apply it to a variety of other methods to determine information about the analyte. D, E, F, G
16. Apply the concepts of electrochemistry and interpret chemical information using potentiometry. G
17. Describe two means of analytical separations - extraction and chromatography. H

Evaluation

Testing Procedures

60% of grade

3 Tests (10% of total grade each) – combination of short answer questions over definitions and long answer problems and applications.

Comprehensive final exam (20% of total grade) – combination of short answer questions over definitions and long answer problems and applications.

Weekly homework (10% of total grade) – this could include problem sets that are either instructor generated or from the textbook. There may be instances where the problem sets are completed as a group.

Laboratory Expectations

40% of grade

Lab notebook (10% of total grade) – a detailed accounting of all experiments performed each week such that another student could, with reasonable success, repeat the experiment based solely from the contents of the laboratory notebook. Details of steps taken, results of each step of an experiment and detailed interpretation of the experimental results are expected for each laboratory experiment. Attention to detail is imperative.

Data, calculations, results, accuracy, precision, and conclusions from each experiment (30% of total grade) – each experiment will have prescribed outcomes, and students will be assessed as to how well they achieve those outcomes. Depending of each experiment, these outcomes may include determining the exact amount of an analyte in a sample, obtaining a certain precision through replicate measurements, and/or successful calibration of equipment or instrumentation.

Grading Scale

90.0 – 100.0	A
87.5 – 89.9	B+
80.0 – 87.4	B
77.5 – 79.9	C+
70.0 – 77.4	C
60.0 – 69.9	D

Policies

Attendance Policy

Pellissippi State expects students to attend all scheduled instructional activities. As a minimum, students in all courses (excluding distance learning courses) must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of Academic Affairs, may have requirements that are more stringent. In very specific circumstances, an appeal of the policy may be addressed to the head of the department in which the course was taken. If further action is warranted, the appeal may be addressed to the vice president of Academic Affairs.

Academic Dishonesty

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but are not limited to the following practices:

- Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments.
- Plagiarism, including but not limited to paraphrasing, summarizing, or directly quoting published or unpublished work of another person, including online or computerized services, without proper documentation of the original source.
- Purchasing or otherwise obtaining prewritten essays, research papers, or materials prepared by another person or agency that sells term papers or other academic materials to be presented as one's own work.
- Taking an exam for another student.
- Providing others with information and/or answers regarding exams, quizzes, homework or other classroom assignments unless explicitly authorized by the instructor.
- Any of the above occurring within the Web or distance learning environment.

Please see the Pellissippi State Policies and Procedures Manual, Policy 04:02:00 Academic/Classroom Conduct and Disciplinary Sanctions for the complete policy.

Accommodations for Disabilities

Students that need accommodations because of a disability, have emergency medical information to share, or need special arrangements in case the building must be evacuated should inform the instructor immediately, privately after class or in her or his office. Students must present a current accommodation plan from a staff member in Disability Services (DS) in order to receive accommodations in this course. [Disability Services](#) (<http://www.pstcc.edu/sswd/>) may be contacted via [Disability Services email](#) or by visiting Alexander 130.