CHEM 265.01A/.01B/.01C QUANTITATIVE ANALYSIS LAB SYLLABUS SP-2022

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Office hours: Monday 9-11 a.m. Wednesday 9-11a.m. Friday 9-10 a.m.
Other times can be scheduled by arrangement person or by email.
Venue: Caputo 223
Class hours: Mon: 1-3:50 p.m. (.01A); Tue: 9:00 - 11:50 p.m.(01B);
Tue: 2:10 p.m. - 5:00 p.m. (.01C)

Required materials: Lab

1. Lab experimental procedures will be posted in D2L.
2. Laboratory notebook. Bound with provision for carbon copy of each page and Perforated for tear out. (e.g. ISBN: 9781930882003, available from the bookstore).
3. Safety goggles or industrial safety glasses approved by instructor (available from CHEM department prep room).
4. Combination lock to be used to secure locker. You will be asked to provide your lock combination number to the instructor. You will retain your lock at the end of the semester. Only combination locks are allowed.
5. Calculator

Course Description: This course is an integrated study of advanced chemical equilibrium, activity, experimental uncertainty and accepted practice in the analytical chemistry laboratory. Titrimetry, potentiometry, extraction theory, introductory spectroscopy and chromatography are discussed. By the end of the course, you will be able to:

(a) Describe and implement the different steps of an analytical process.
(b) Solve calculations involving concentrations, solutions and stoichiometry and apply them in chemical analysis.
(c) Demonstrate the proper technique for using common laboratory equipment.
(d) Identify the sources of experimental error and calculate standard deviations and error from experimental data.
(e) Perform statistical analysis of data including t, F and Q test and normal distribution.
(f) Generate calibration curves and perform calculations involving Beer's law.
(g) Solve chemical equilibrium problems including acid-base and solubility product.
(h) Demonstrate safe laboratory practices
(i) Discuss different techniques for analytical separations.
(j) Keep a properly documented laboratory notebook.
(k) Prepare well organized reports using experimental data.

Laboratory Schedule and Procedures

Mastering proper laboratory skills and safety procedures is an important part of this course. You are expected to review in detail the safety procedures described in the lab manual, handouts and the course text and to strictly follow them in the lab. It is important for you to be systematic and patient. These are traits that will be helpful in your career as a scientist. A good part of your lab grade will be based on the accuracy and reproducibility of your data. It is not easy to achieve this if work is done in haste.

Before the lab

1. Read related materials in the lab manual and textbook.
2. Read and understand the experiment for the day.
3. In your lab notebook, write down the date, title of experiment and goal of the experiment.

Pre-lab lecture. A pre-lab lecture will be given before each lab highlighting key procedures. It will be assumed that you have read and understood the lab in advance. Be aware that some topics may be introduced in lab before being covered in lecture. The necessary theoretical background will be covered during the pre lab lecture. You are expected to be attentive and to take the notes during the pre-lab lecture.

During the lab.
Work diligently. Observe lab safety policies. For most experiments, you will work as a team, consisting of two or three students. Two teams may be combined to form a group. Teams are numbered 1,2,3…etc. Groups are numbered A,B,C, etc. When working in groups, each team will work independently. Each team member should participate actively in executing the experiment. Treat your lab partner(s) with courtesy and respect at all times. Record data in your notebook as you make observations. For each lab, your notebook must be initialed by the instructor before you leave. Make sure you clean your lab bench area, balances used and any other common areas. Burettes must be returned to the burette rack and filled with de-ionized water then acidified by adding a few drops of dilute HCl. Burette clamps should be returned to the storage area. Follow the waste disposal directions given for each lab.

Lab reports.
Lab reports will be uploaded in D2L and will be due 1 hour before the next lab period after completing experiment. You will hand in one report per team. Present your data in neatly arranged tables and clearly labeled graphs. A significant portion of the lab grade will be on accuracy precision and interpretation of your data including correct calculations. If you wish to write separate reports, you need to request the instructor. Report templates will be posted in D2L.

On the first page be sure to clearly identify the team members, the date the experiment was completed and the title of the experiment. You do not need to write a detailed introduction or experimental section. It is acceptable to handwrite sample calculations so long as it done neatly.

Lab report Grading Criteria

Criteria	Variables	pts
Pre-lab and lab procedures	Pre-lab summary, demonstrate proper procedures, observe lab safety, tidy work area, hand in non frivolous lab report, team effort	8
Results	Data presentation, format, graphs, tables, significant figures	6
Interpretation	Calculations, accuracy, reproducibility, overall accomplishment and post lab questions	6
Total per lab		20
Lab Notebook	Date, lab summary, signature, lab notes	20
Total – 9 labs x 20 pts each + Lab notebook		200

Tentative order of Labs

Week No.	Dates	Lab No.	Lab Title
1	1/18,24	1	Check in, Calibration of glassware. Discussion of statistics
2	1/25,31	2	Titration of NaCl with $AgNO_3$ - Youden plots
3	2/1,7	3	Spectrophotometric determination of iron in vitamin tablets
4	2/8,14	4	Analysis of a Co(II)/Cr(III) mixture
5	2/15,21		Analysis of a Co(II)/Cr(III) mixture
6	2/22,28	5	Potentiometric titrations - HCl
7	3/1,14		Potentiometric titration - soda ash
8	3/7-13	-	SPRING BREAK (March 7- 13) – NO LAB
9	3/15,21	6	Determination of $_pK_a$ of an indicator
10	3/22,28	6	Determination of$_pK_a$ of an indicator
11	3/29,;4/04	-	Introduction to Instrumentation
More than 1 lab going on each day starting 4-5. Consult chart below for your scheduled lab.			
12	4/5,11	7	Determination of Na in water by AES
13	4/12,18	8	Atomic Absorption Spectroscopy analysis of metals
14	4/19,25	9	GC-MS analysis of alcohol mixture
15	4/26;5/2	-	Check out /make up
16		Exam Period. No labs	
Alternate Labs			
-	-	-	Titration of KHP with NaOH
-	-	-	HPLC analysis of analgesics
-	-	-	Determination of water hardness by titrating with EDTA

Lab rotation schedule - each team works on their own sample					
		Group/Experiment no.			
Lab Session no./Date					
Week	Dates	**A**	**B**	**C**	**D**
12	4/4,11	7	8	9	9
13	4-/12,18	8	9	7	7
14	4/19,25	9	7	8	8
15	4/26;5/2	Make up and check out			

Revised University Class Attendance Policy

The University supports departmental and faculty class attendance policies that are reflective of and consistent with University approved guidelines. Faculty will include their class attendance policy in their syllabi given to all students in their classes at the start of the semester.

University approved guidelines:

1. **Students are expected to attend all classes.** It is the student's responsibility to complete all course requirements even if a class is missed. If a student misses class for an officially excused reason, then he/she is entitled to make up the missed work but only at the convenience of the faculty member. Responsibility for materials presented in, assignments made for, and tests/quizzes given in regularly scheduled classes lies solely with the student.

2. **The University policy is that faculty will excuse absences for the following reasons:**
    a. personal illness,
    b. death or critical illness in the family,
    c. participation in a university-sponsored activity,
    d. jury duty,
    e. military duties, or
    f. religious holidays

3. **Faculty judge the validity of student absences from class within the University's approved guidelines and may require documentation for excused absences.** Faculty will evaluate any reason, other than those listed above, for a student missing class and determine whether the absence is justified. In these circumstances, a student may make up missed work at the discretion of the instructor.

4. **In the case of foreseeable absences, students are encouraged to notify the faculty member in advance.** A student who will miss class due to participation in an official University activity must notify the instructor well in advance of the activity to assure that the absence is excused.

Appeals:

As with any academic issue, students may exercise their right to appeal adverse attendance decisions. Please refer to the current undergraduate catalog for the complete Academic Appeal procedure.

Title IX Statement

Millersville University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment, comply with Title IX of the Education Amendments of 1972, 20 U.S.C. §1681, et seq., and act in accordance with guidance from the Office for Civil Rights, the University requires faculty members to report to the University's Title IX Coordinator incidents of sexual violence shared by students. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. Faculty members are obligated to report to the person designated in the University Protection of Minors policy incidents of sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred.

Information regarding the reporting of sexual violence, and the resources that are available to victims of sexual violence, is available at http://www.millersville.edu/socialeq/title-ix-sexual-misconduct/index.php.