

CHEM 375.01A  
CHEM 375.01B

## ENVIRONMENTAL CHEMISTRY I

Fall 2022

### LAB COURSE SYLLABUS

**Instructor:** Dr. Jeremiah K.N. Mbindyo  
**Office:** Science & Technology Building 321  
**Email:** Jmbindyo@millersville.edu  
**Office hours:** Monday 10:00 a.m.- 12:00 noon. Tuesday 12:00-1:00 p.m.  
Wednesday 10:00 a.m.- 12:00 noon.  
Other times can be scheduled by arrangement in person or by email.  
**Lab Venue:** CAPUTO 223  
**Class hours:** CHEM 375.01A – TUE 9:00-1:00 a.m.  
CHEM 375.01B – TUE 1:10-4:10 p.m.

#### Required materials:

1. **Laboratory manual:** Experimental procedures will be posted in D2L.
2. **Laboratory notebook.** Permanently bound, approximately book 7 x 9.5".
3. **Safety glasses.**
4. **Calculator.** Should be capable of doing square roots, logarithms (log, ln), and exponentials ( $10^x$ ,  $e^x$ ,  $y^x$ ).
5. **Combination lock to secure your drawer.**

#### 1. Description

This is a hands on Laboratory course in which you will learn techniques that are used to analyze samples of environmental interest. We will work on wet methods, spectroscopic and chromatographic techniques. You will have the opportunity to bring real samples that may be of interest to you. I will give you guidelines on the nature of these samples. The goal is to introduce you to these techniques and also to reinforce some of the ideas discussed in class. You will be working in teams of two or three students. For some experiments, two teams may be combined to form a group. Each team will work independently. It is important that everyone comes prepared for the experiment for the day and that each person contributes to the team effort. You will hand one report per team. By the end of the course, you should 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. Generate calibration curves and perform calculations involving Beer's law.
- f. Demonstrate safe laboratory practices.
- g. Keep a properly documented laboratory notebook.
- h. Prepare well organized reports using experimental data.
- i. Demonstrate proper methods to categorize and dispose waste generated during laboratory experiments.

#### 2. Laboratory safety

Safety is very important in the laboratory! If you are not sure of any procedure always ask! Make sure you review the laboratory safety rules attached. **Eye protection must be worn at all times in the laboratory.**

#### 3. Waste Disposal

For each experiment, pay attention to the disposal of waste. Special containers will be placed under the hood and labeled for the waste. Do not dump waste or through solids into the sink.

#### 4. The Laboratory Notebook:

- a. The laboratory notebook is a permanent record of your work in the laboratory. Always enter your data directly into the notebook. Never write data on another sheet of paper with the idea of transferring it to the notebook. All entries in the notebook should be done legibly in ink. If an error is made, do not obliterate the data or tear the page. Draw a single line through the data and write a brief note explaining why the data was wrong. Include your initials next to this data.
- b. Each page must be consecutively numbered. No page should be skipped. It is not permitted to go back and make entries on previous pages.
- c. Use the first page of your notebook to write a table of contents. You should begin each new experiment on a fresh page. Cross out any space on the last page of each report that is not used.
- d. Write the title of the experiment on the top of the page and also on the table of contents. Enter the date on the page when you do the experiment.
- e. Keep your notebook tidy.
- f. For each experiment include: title of experiment and date performed. A 2-3 sentence overview and data tables. Write down any significant changes to procedure. Do sample calculations in the lab notebook before including in your report.
- g. Instructor must sign lab notebook at end of each lab period.

#### 5. Lab reports.

All reports must be handed in 1 week after the experiment, at the beginning of the next lab period.

#### 6. Report Format

A template for lab report will be provided in D2L for each experiment. In general, the reports will follow the format below. An example of a well written lab report is posted in lab section in D2L.

*Title, date experiment done and names of team members:*

Title should be brief and descriptive.

*Introduction:*

A brief description of the purpose of the experiment and the significance of the environmental problem to be addressed.

*Results*

Use tables, graphs and charts to present your data. Do not tabulate all the raw data in your report. Tables and figures save space and give a clear picture of your results. Use graphs when necessary to show trends in your results. For most experiments, there will be guidelines in the lab manual on what data you are expected to present. Write down sample calculations to show how you processed the data.

*Conclusion and post lab*

In this section you should interpret your results and explain what you learned from your experiment. What are the consequences or implications of your results?. Mention any possible sources of error and how they may be corrected.

*Overall achievement and neatness*

It is particularly important to observe lab safety guidelines and be systematic in your work in the lab. Any obvious disregard of procedures, unpreparedness etc. will be considered under the overall achievement.

*References.* List any sources you consulted to interpret your results. Use ACS style Referencing.

Example of referencing style

Books Author, A. B.; Author, C. D. Book Title; Series Name and number; Publisher: City, STATE (2 letters), year; Vol. 1, pp xx-yy.

Bard, C. Environmental Chemistry; W.H. Freeman and Co.: New York, NY; 1999 pp 96-98.

Journals: Author, A. B.; Author, C. D. J. Abbrev. 20XX, vol, xx-yy.

McGowin, A.E.; Hess, G.W. *J. Chem. Educ.* **1999**, 76, 1695.

Herzog, H. *Environ. Sci. Technol.* **2001**, 35, 148A-153A

Online Journal: Author(s). Title of article. Journal abbreviation [Online] year, volume, pages.

- 8. Lab Report Grade Criteria:** Your report will be graded according to the criteria below. Your average lab grade will contribute 25% of the overall course grade.

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	6
Results	Data presentation, format, graphs, tables, significant figures	6
Interpretation	Calculations, accuracy, reproducibility, overall accomplishment	6
Post lab questions		2
Total per lab		20
Total - 10 labs x 20 pts each		200

**9. Attendance Policy**

You are expected to attend all laboratory sessions during the scheduled time. Due to the limited number of equipment, a missed Lab cannot be made up.

## TENTATIVE LAB SCHEDULE

WEEK	Date/ gp	A	B	C	D
1	8/23	1	1	1	1
2	8/30	2	2	2	2
3	9/6	3	3	3	3
4	9/13	4	4	4	4
5	9/20	waste water treatment			
6	9/27	5	5	6	6
7	10/4	6	6	5	5
8	10/11	fall recess			
9	10/18	waste recycling			
10	10/25	group presentations			
11	11/01	Introduction to instrumentation			
12	11/08	7	7	8	8
13	11/15	8	8	9	9
14	11/22	9	9	7	7
15	12/29	make up/checkout			
16	12/06	exam period			

## Experiments

Lab no.	Lab title	Lab no.	Lab title
1	Pipette Calibration	9	Hydrocarbons in gasoline (GC-MS)
2	Hardness of water	10	Atomic Emission Spectrophotometry
3	Alkalinity of water	11	UV-Vis study of sunscreens
4	Dissolved O <sub>2</sub> - Winkler method	12	Solvent properties of microemulsions
5	Chromium in polluted water	13	Phosphorous in detergent
6	Fluoride in water using ISE	14	Small Scale production of Biodiesel
7	Atomic Emission Spectrophotometry	15	Dissolved oxygen by DO probe
8	Atomic Absorption Spectrophotometry		

## 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>.*