

CHEM 375.01A  
CHEM 375.01B

## ENVIRONMENTAL CHEMISTRY I

Fall 2024

### 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. The type of samples will be explained in class. The goal is to introduce you to techniques used in the analysis of environmental samples and to reinforce 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. Your 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:*

2-3 sentence 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 - 9 labs x 20 pts each		180
Lab notebook		20
Total		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.

#### Millersville University Policies

1. Academic Honesty Policy link [Governance Manual \(millersville.edu\)](#); for additional information please see the following: [What is Academic Integrity? | Millersville University](#)
2. Attendance Policy link: [Class Attendance Policy | Millersville University](#)
3. Inclusion Statement: [Millersville University Inclusion Statement | Millersville University](#)
4. Land Acknowledgement: [Land Acknowledgement | Millersville University](#)
5. Policy on Delays and Cancellations link [Policy on Delays & Cancellations | Millersville University](#)
6. Chosen Name FAQs link [Preferred Name FAQs | Millersville University](#)
7. Privacy Rights under FERPA link [Annual Notification of Student Rights Under FERPA | Millersville University](#)
8. Student Conduct and Community Standards Handbook link [studentcodeofconduct.pdf \(millersville.edu\)](#)

## 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 and to comply with Title IX of the Education Amendments of 1972 and guidance from the Office for Civil Rights, Title IX requires University faculty members to report incidents of sexual discrimination, including sexual violence, shared by students to the University's Title IX Coordinator. Accordingly, if a student shares information about any incidents of sexual discrimination or sexual violence during a classroom discussion, in a writing assignment for a class, or in other contexts, faculty must report that information to the Title IX Coordinator. This information will only be shared with the Title IX Coordinator, who is the individual on campus designated to respond to reports of discrimination or sexual violence. While the Title IX Coordinator is not a confidential source of support, they will address matters reported to them with sensitivity and will keep your information as private as possible.

Additionally, faculty members are obligated to report 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, to the person designated in the University's [Protection of Minors policy](#).

Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at: [www.millersville.edu/titleix](http://www.millersville.edu/titleix)

## TENTATIVE LAB SCHEDULE

WEEK	Date/ gp	A	B	C	D
1	8/27	1	1	1	1
2	9/3	2	2	2	2
3	9/10	3	3	3	3
4	9/17	4	4	4	4
5	9/24	waste water treatment			
6	10/1	5	5	5	5
7	10/8	6	6	6	6
8	10/15	<b>fall recess</b>			
9	10/22	waste recycling			
10	10/29	group presentations			
11	11/5	Introduction to instrumentation			
12	11/12	7	7	8	8
13	11/19	8	8	9	9
14	11/26	9	9	7	7
15	12/3	make up/checkout			
16	12/10	exam period			

### Experiments

Lab no.	Lab title	Lab no.	Lab title
1	Pipette Calibration	6	Fluoride or chloride in water using ISE
2	Hardness of water	7	Atomic Emission Spectrophotometry
3	Alkalinity of water	8	Atomic Absorption Spectrophotometry
4	Dissolved O <sub>2</sub> - Winkler method	9	Hydrocarbons in gasoline (GC-MS)
5	Chromium in polluted water	10	Phosphorous in detergent