

EXPERIMENTAL ANALYTICAL CHEMISTRY 227 Tentative Syllabus, Spring 2022

Professor: Dr. Huixin He (LSC II Room 219, Phone: 973 353 1254, Email: huixinhe@newark.rutgers.edu).

Teaching Assistants: Ms. Jung Yeon Lee and Mr. Zhiyuan Zhang

Reference book: “Exploring Chemical Analysis” 5th Edition, by Daniel C. Harris, Published by Freeman, NY 2009, ISBN-13: 978-1-4292-7503-3

Lab manuals: Free download and print from Canvas

Lectures: Tuesday 10:00 am – 11:20 am, Smith Hall room 244 (via Canvas, ZOOM before Jan. 31)

Labs: Thursday 8:30 am – 12:20 am, LSCII 128 (via Canvas, ZOOM before Jan. 31)

Office Hours: By appointment

(Note: If you have no or limited access to high-speed internet, please see the resources listed under “Free Internet Access for Students” found at this link: <https://coronavirus.rutgers.edu/technology-resources-for-students/>

[Technology Resources for Students – Universitywide COVID-19 Information](#)

The following webpage outlines technology resources for Rutgers students, including information about web conferencing, learning management systems, and getting help with technology services and systems.
coronavirus.rutgers.edu

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Tentative Grading

| | |
|--------------------------|-----|
| Lab* | 70 |
| Midterm | 10 |
| Final Exam (Cumulative)* | 20 |
| TOTAL | 100 |

*There will be 10 labs, which take up 70% of the total grade. Each virtual lab is worth of 7 points (100 × 70%).

For each lab:

Lab includes three parts: Prelab QUIZ (20 points) + Prelab report (20 points) + lab (performance 20 points) + Final Lab report (40 points).

- Prelab QUIZ is worth 20 points. It will be hosted in the beginning (the first 30 mins) of each lab via Canvas. There will be NO MAKE-UP PRELAB QUIZZES under any circumstances.
- Prelab report is worth 20 points.
- Lab (performance) is worth 20 points.
- Final Lab report is worth 40 points. Deadline for each lab report submission is **ONE** week after you finish that lab. The lab report should be electronically submitted on the following Thursday (till 11:59 pm) via Canvas assignment. **While the late submission will result in point deduction (10 points/late day) from this lab report.**

*Midterm exam is scheduled on **March 8, 2022 from 10:00 – 11:20 am**. The midterm exam will count for 10%. (Note: the last withdrawal date is 03/21 2022)

*Final exam will be hosted during the final exam period **Tuesday, May 10, 2022 from 8:30-11:30AM**) and is cumulative. The final will count for 20%. *If the midterm was missed for any reason, the score (as percentage) on the final exam can serve as the make-up exam.*

Attendance:

Attendance is MANDATORY for both lectures and labs (including the ones offered online). A quiz based on that missed lecture content will be provided in an office hour (by appointment). A complete failure or choosing not taking the quiz will result in losing 2 points from the final exam (total 20 points). There will be NO MAKE-UP LAB under any circumstances. Missing a lab will result in losing all the points for that experiment (100 points).

Final Letter Grades will be given based on the following scale:

A = 89.5-100
B+ = 84.5-89.49
B = 75.0-84.49
C+ = 70.0-74.99
C = 60.0-69.99
D = 50.0-59.99
F = 0-49.99

Learning goals:

The analytical chemist works to find out how much of a certain analyte is in a sample. How do I find this out, what tools do I use, how can I do this efficiently, how am I assured that the results are both accurate and precise? In this course, you will study and gain hands on experience of some of the important techniques in analytical chemistry and do qualitative and quantitative measurements. By the end of this semester, you should have an improved understanding of:

- a) the distinction between qualitative and quantitative measurements.
- b) statistical techniques for evaluating and interpreting your data.

- c) the sources of error in chemical and instrumental analyses
- d) basic concepts of stoichiometry
- e) interferences in chemical and instrumental analyses
- f) concept of instrument calibration
- g) principles of qualitative and quantitative measurements using optical measurements
- h) principles of gas and liquid chromatography
- i) concept of an electrochemistry in qualitative and quantitative measurements
- j) concept of standard addition techniques
- k) concept of internal standard method.

Academic integrity:

As an academic community dedicated to the creation, dissemination, and application of knowledge, Rutgers University is committed to fostering an intellectual and ethical environment based on the principles of academic integrity. Academic integrity is essential to the success of the University's educational and research missions, and violations of academic integrity constitute serious offenses against the entire academic community. The entire Academic Integrity Policy can be found here: <http://academicintegrity.rutgers.edu/academic-integrity-policy/>

Laboratory Safety:

Nothing is more important than your safety when you are working with chemicals. You MUST, at all times, remember that some of them are extremely dangerous, if handled ***Incorrectly***. The safety rules should be learned and grasped. Knowledge and compliance with the safety rules in the laboratory are mandatory. The instructors (both the professor and the teaching assistants) will be available to review rules and to guide you in the use of chemicals in a safe manner. We will ask students who do not abide by these safety regulations to leave the laboratory.

LABORATORY RULES

- 1) Eye protection (Goggles) and Lab-coat MUST be worn AT ALL TIMES in the laboratory. It does not matter if you are just cleaning glassware or anything because other students might spill some chemicals on you.
- 2) Visitors are welcome only in extraordinary cases (with the permission of the instructor), and they MUST WEAR eye protection in the laboratory.
- 3) No drink, food and gum
- 4) No contact lenses may be worn!
- 5) Not shorts, No slippers, sandals, or open-toed shoes!
- 6) No cellphone in the lab even as a calculator (you should bring your real calculator).
- 7) Long hair must be restrained using rubber bands or bobby pins.
- 8) Keep coats, books, book bags, etc., on the side-shelves or in lockers, NOT on benches, above benches, or on reagent shelves.
- 9) Put all data directly into your laboratory notebook. If we find that you recorded your data onto a piece of paper, **10 points will be deducted from this lab.**
- 10) Have your notebook witnessed and signed by the Teaching Assistants (TAs).
- 11) Make sure that your bench-top area is clean when you leave. If not, up to **10 points will be deducted from this lab.**

- 12) Be on time! The labs **START** at 8:30 and **END** at 12:20 PM (start to clean up at 12:00pm). Prelab quiz will be given at the first 30 minutes (8:30-9:00 am) via Canvas. You absolutely cannot be late for a lab with instruments involved. To finish the lab in the designed time frame, if you are late more than 15 minutes, **the experiment will be started regardless, and you are going to get 10 points deducted for being late, in addition to the prelab quiz points.**
- 13) Doing Pre-labs for this lab course is mandatory! **You cannot start a new experiment if you did not get the signature from the TAs for the pre-lab.** After you prepared the pre-lab, you should know the basic concept of the lab and what you would learn from this lab. It also essential for you to get ready for the pre-lab quizzes. The questions in the pre-lab quizzes are about some key procedures, principle of the designed lab, and/or working principle of the major instruments you will use in that specific lab. Most importantly, by understanding what you would do, which step you need pay special attention to avoid mistakes, you can have a good time management to finish the lab on time.
- 14) Deadline for each submission after finishing the lab is **ONE** week after you finish that lab. Ask one of the TAs to date and sign it for you. **Note that it is your responsibility to ask them to sign for you.** The lab reports will be graded only if they have at least **TWO** signatures (one with your pre-lab before you are allowed to perform the lab, and the other one when the experiment is completed.) The lab report should be electronically submitted on the following Thursday (till 11:59 pm) via Canvas assignment. **Late submission of your lab report will result in 10 points deduction from this lab report. (Note the Canvas records precisely the time of your submission).**
- 15) Paired students will be in charge of cleaning the lab after the experiments (The cleaning duty and schedule is posted in the laboratory). **Failing to do this duty will cause deduction of 20 points from one of your lab reports.**

When you go to the lab on Feb. 3, 2022, you will bring the following items with you:

- 1) A small roll of paper towels; liquid dishwashing detergent (small bottle).
- 2) **Two** locks for your lockers. The instructor will NOT unlock your locker after the 3rd laboratory meeting.
- 3) A laboratory notebook with pages numbered. You may NOT use a ring-bound notebook, and you **MUST** have a carbon copy of your lab data. Such a lab notebook may be purchased at the Rutgers Barnes & Noble's Bookstore.
- 4) Laboratory Manual. (Download from course Canvas and print)

Experiments to be done tentatively.

Exp. #

0. Introductory of the virtual lab course: Rules, How to prepare Pre-lab quiz, Pre-lab report, and Final-lab report (Via Canvas ZOOM).
1. Weighing, Solution preparation with a volumetric flask, and Buret cleaning and reading (100 points). (Via Canvas ZOOM).
2. Traditional titration vs. semi-modern titration: A Volumetric Acid-Base Titration (100 points).
3. Traditional titration vs. semi-modern titration: Equivalent Weight of an Unknown Weak Acid: pH Titration (100 points).
4. A traditional redox titration: Preparation, purification, and standardization of KMnO_4 solution with a primary standard (100 points).

5. Traditional redox titration vs. semi-modern titration: Find the concentration of Fe, FeO, Fe₂O₃ in a rust unknown with the standardized KMnO₄ (100 points).
6. Analysis of low levels of Cu, Pb, and Cd in solution by Anodic Stripping Voltammetry (ASV) (100 points)
7. Analysis of low levels of Cu, Pb, and Cd in solution by Atomic Absorption Spectroscopy (AAS) (100 points).
8. Simultaneous Determination of Co (II) and Cr (III) (UV-Vis Spectroscopy) (100 points).
9. Using High Performance Liquid Chromatography (HPLC) for separation and quantitatively measurements with an internal standard method (100 points).
10. Analysis of a Multi-Component System by GC/MS for Separation and Identification of Impurities-Similarity and Difference from HPLC (Demo/or virtual presentation, 100 points).

COVID-Safety Statement:

In order to protect the health and well-being of all members of the Rutgers-Newark community, masks must be worn by all persons inside campus buildings (e.g., classrooms) when in the presence of others, and in buildings in non-private enclosed settings (e.g., common workspaces, workstations, meeting rooms, classrooms, etc.). Masks should securely cover the nose and mouth. Masks must be worn during class meetings. Each day before you arrive on campus or leave your residence hall, you must complete the brief survey on the My Campus Pass symptom checker self-screening app found at: myRutgers Portal. Violations will be reported immediately with the COVID Observation Reporting Form.

Absences: Per the University's Course Attendance policy (10.2.7), students are responsible for communicating with their instructors regarding absences. The Division of Student Affairs is available to verify extended absences: (973) 353-5063 or DeanofStudents@newark.rutgers.edu.

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Accommodation Statement:

Rutgers University Newark (RU-N) is committed to the creation of an inclusive and safe learning environment for all students. RU-N has identified the following resources to further the mission of access and support:

- **Students with Disabilities:** Rutgers University welcomes students with disabilities into all of the University's educational programs. The Office of Disability Services (ODS) is responsible for the determination of appropriate accommodations for students who encounter barriers due to disability. In order to receive consideration for reasonable accommodations, a student with a disability must contact ODS, register, have an initial appointment, and provide documentation. Once a student has completed the ODS process (registration, initial appointment, and documentation submitted) and reasonable accommodations are determined to be necessary and

appropriate, a Letter of Accommodation (LOA) will be provided to the student. The student must give the LOA to each course instructor, followed by a discussion with the instructor. This should be completed as early in the semester as possible as accommodations are not retroactive. More information can be found at ods.rutgers.edu. Contact ODS: (973) 353-5375 or ods@newark.rutgers.edu.

- Religious Holiday Policy and Accommodations: Students are advised to provide timely notification to instructors about necessary absences for religious observances and are responsible for making up the work or exams according to an agreed-upon schedule. The Division of Student Affairs is available to verify absences for religious observance, as needed: (973) 353-5063 or DeanofStudents@newark.rutgers.edu.
- Counseling Services: Counseling Center Room 101, Blumenthal Hall, (973) 353-5805 or <http://counseling.newark.rutgers.edu/>.
- Students with Temporary Conditions/Injuries: Students experiencing a temporary condition or injury that is adversely affecting their ability to fully participate in their courses should submit a request for assistance at: <https://temporaryconditions.rutgers.edu>.
- Students Who are Pregnant: The Office of Title IX and ADA Compliance is available to assist students with any concerns or potential accommodations related to pregnancy: (973) 353-1906 or TitleIX@newark.rutgers.edu.
- Gender or Sex-Based Discrimination or Harassment: Students experiencing any form of gender or sex-based discrimination or harassment, including sexual assault, sexual harassment, relationship violence, or stalking, should know that help and support are available. To report an incident, contact the Office of Title IX and ADA Compliance: (973) 353-1906 or TitleIX@newark.rutgers.edu. To submit an incident report: tinyurl.com/RUNReportingForm. To speak with a staff member who is confidential and does NOT have a reporting responsibility, contact the Office for Violence Prevention and Victim Assistance: (973) 353-1918 or run.vpva@rutgers.edu