

Spring 2013-2014



CHEMISTRY 203

INTRODUCTORY CHEMICAL TECHNIQUES (1.3; 2cr.)

Instructor: Prof. Mazen Al-Ghoul

Office: Chem. Bldg., room 510

Office hours: By appointment

E-mail: mg05@aub.edu.lb

MEETING TIMES

Laboratory Lecture: Tuesday, 12:30-1:20, SLH Biology Department.

Thursday, 12:30-1:20, SLH Biology Department.

<u>Laboratory:</u> Section 1	Wednesday	1:00-5:00	Room 201 Chem.
Section 2	Wednesday	1:00-5:00	Room 107 Chem.
Section 3	Friday	1:00-5:00	Room 205 Chem.
Section 4	Friday	1:00-5:00	Room 207 Chem.
Section 5	Wednesday	1:00-5:00	Room 111 Chem.
Section 6	Wednesday	1:00-5:00	Room 105 Chem.
Section 7	Friday	1:00-5:00	Room 201 Chem.
Section 8	Friday	1:00-5:00	Room 105 Chem.
Section 9	Tuesday	1:00-5:00	Room 111 Chem.
Section 10	Tuesday	1:00-5:00	Room 107 Chem.
Section 11	Tuesday	1:00-5:00	Room 105 Chem.
Section 12	Monday	8:30-12:30	Room 105 Chem.
Section 13	Monday	2:30-6:30	Room 201 Chem.
Section 14	Tuesday	8:30-12:30	Room 107 Chem.
Section 15	Friday	1:00-5:00	Room 111 Chem.
Section 16	Saturday	9:00-1:00	Room 105 Chem.
Section 17	Saturday	9:00-1:00	Room 107 Chem.
Section 18	Saturday	9:00-1:00	Room 111 Chem.
Section 19	Saturday	9:00-1:00	Room 201 Chem.
Section 20	Saturday	9:00-1:00	Room 205 Chem.
Section 21	Saturday	9:00-1:00	Room 207 Chem.
Section 22	Thursday	1:00-5:00	Room 201 Chem.

RESOURCES AVAILABLE TO STUDENTS

- Laboratory Manual can be purchased from the main Chemistry office Room 102 (LL 5000).
- Raymond Chang, Chemistry, 10th Edition, McGraw Hill, 2010
- Zumdahl, Chemistry, 8th Edition, Brooks Cole, 2010
- Van Loon and Duffy, Environmental Chemistry, 2nd Edition, Oxford University Press, 2005.

SPECIFIC LEARNING OUTCOMES

- Develop basic Chemistry lab skills, and acquire a thorough training on experimental techniques, in both qualitative and quantitative chemical determinations.
- Stress the quantitative aspects of the Chemistry lab. Master the techniques of basic chemical measurements. Learn how to assess the precision of a measurement, and thus report a given measurement to the right degree of precision.
- Learn how to establish the link between theory and experiment. Study basic calculation techniques for the treatment of chemical data, and learn how to draw conclusions and report final results.
- Develop a deep understanding of the philosophy and purpose of performing a given experiment, and subsequently develop a thinking methodology for the design of simple chemical tests and measurements.
- Establish a relation between the performed experiments and the Chemistry in real life applications. Generalize the learned concepts for possible application in problems encountered in everyday life.

STUDENT ASSESSMENT

Student performance is assessed based on the following grading scheme:

Activity	Percentile
Laboratory Reports	35%
Drop Quizzes	15 %
Evaluation of Student Conduct	10 %
Comprehensive Final Examination	40 %

DROP QUIZZES & FINAL EXAMINATION: A 10-minute **quiz** will be given at the beginning of the laboratory session on the current experiment. This will be considered as a drop quiz, DQ. Coming late to the laboratory will deprive the student from the quiz and result in a missing grade (a zero). No make-up quizzes will be given. Students will sit for a comprehensive **final** exam. They are urged to take this exam on the assigned time. The final will be scheduled later.

LABORATORY REPORTS: A laboratory report is required for each experiment. Some experiments are performed as a group work, yet every student should submit his/her own report. Reports are due at the end of the current laboratory session. Reports are expected to be neat and attractive in appearance. Report forms will be posted on Moodle. Students must download the form before coming to the lab. They should complete it as the experiment is carried out. Reports should be complete. All appropriate subject matter should be included. The student will demonstrate an adequate understanding of the principles involved in the investigation and comment on his/her findings.

EVALUATION OF STUDENT CONDUCT: At the end of the semester, each student will be evaluated by his/her laboratory Instructor based on his/her conduct and behavior in the laboratory. The Instructor will be observing the student during the laboratory sessions throughout the semester, and will then be able to grade each student's student performance

ABSENSES: Students are expected to attend all laboratory sessions and perform all experiments. Under very special circumstances (only a valid medical reason, certified

from the AUB Infirmary to the professor), a make-up experiment could be permitted. Students who miss more than one lab session should automatically withdraw from the course.

COURSE CALENDAR (tentative):

	Date	Title	Learning Outcomes <i>In the Lab, students will</i>
Lecture	Tuesday, Jan 28 Thursday, Jan. 30	<i>No lecture</i>	
Laboratory	Mon., Jan. 27 to Sat. Feb. 1	No Lab.	
Lecture	Tuesday, Feb 4 Thursday, Feb 6	Safety, Syllabus, Uncertainty, Significant Figures And Expt. 1: Acid-Base Titration	
Laboratory	Mon., Feb. 3 to Sat. Feb. 8	No Lab.	
Laboratory	Mon., Feb. 10 to Sat., Feb. 15	Check in & Experiment 1	<ul style="list-style-type: none"> • Practice the analytical technique of Acid-Base Titration. • Prepare a primary standard solution. • Determine the concentration of an unknown solution by titration.
Lecture	Tuesday, Feb 11 Thursday, Feb 13	Expt. 2: Determination of EDTA Content in Shampoo via Back Titration and Magnesium content in an Unknown via Direct Titration	
Laboratory	Mon., Feb. 17 to Sat., Feb. 22	Experiment 2	<ul style="list-style-type: none"> • Practice the volumetric analysis technique of Complexometric Titration. • To determine the % mass of EDTA in a shampoo solution. • To determine the amount of magnesium in an unknown solution.
Lecture	Tuesday, Feb 18 Thursday, Feb 20	Expt. 3: Semi-Micro Qualitative Analysis of Ag^+, Cu^{2+}, Fe^{3+} and Al^{3+}	
Laboratory	Mon., Feb. 24 to Sat., March 1	Experiment 3	<ul style="list-style-type: none"> • Apply qualitative methods of separating cations from one another in a mixture. • Write relevant stoichiometric chemical reactions.
Lecture	Tuesday, Feb 25 Thursday, Feb 27	Expt. 4: Factors Affecting Reaction Rates Expt. 5: Chemical Kinetics: Hydrolysis of Ethyl Acetate	
Laboratory	Mon., March 3 to Sat., March 8	Experiment 4	<ul style="list-style-type: none"> • To introduce the basic principles of Chemical Kinetics • To study the various factors affecting the rates of chemical reactions. • To determine the rate order of two different reactions and the rate constant of one of these reactions.
Laboratory	Mon., March 10 to Sat., March 15	Experiment 5	<ul style="list-style-type: none"> • To study experimentally the kinetics

			<p>of a chemical reaction.</p> <ul style="list-style-type: none"> To determine the rate constant and the activation energy, E_a, for the same reaction.
Lecture	Tuesday, March 4 Thursday, March 6	Expt. 6: Chemical Equilibrium	
Laboratory	Mon., March 17 to Sat., March 22	Experiment 6	<ul style="list-style-type: none"> To review the concepts and principles of chemical equilibrium. To study the effects of temperature and concentration changes on the position of equilibrium. To learn the principles of spectrophotometry and of chemical analysis by spectrophotometric means. To determine spectrophotometrically, the equilibrium constant for a reaction.
Lecture	Tuesday, March 11 Thursday, March 13	Expt. 7: Spectrophotometric Determination of the pK_a of Bromothymol Blue	
Laboratory	Mon., March 24 Tues., March 25(no lab) Wed., March 26 Thu., March 27 Fri., March 28 Sat., March 29 Tue, April 1	Experiment 7	<ul style="list-style-type: none"> To learn about indicators and buffers. To learn how to use a pH meter. To determine the pK_a of an indicator.
Lecture	Tuesday, March 18 Thursday, March 20	Expt. 8: Thermodynamics of the Dissolution of Borax	
Laboratory	Mon., March 31 Wed., April 2 Thu., April 3 Fri., April 4 Sat., April 5 Tue, April 8	Experiment 8	<ul style="list-style-type: none"> To learn about the laws of thermodynamics. To determine the solubility product of borax as a function of temperature. To determine ΔG, ΔH, and ΔS for the dissolution of borax.
Lecture	Tuesday, March 27 Thursday, April 1	Last lab lecture, Expt. 9: Impurities in Natural Water	
Laboratory	Mon., April 7 Wed., April 9 Thu., April 10 Fri., April 11 Sat., April 12 Tue, April 15	Experiment 9	<ul style="list-style-type: none"> Learn some techniques for the purification of natural water. Test for the contaminants of natural water. Learn the technique of water "softening".
Laboratory	Mon., April 14	No labs	

	Wed., April 16 Thu., April 17 Fri., April 18 (Easter vacation) Sat., April 19 (Easter vacation) Mon., April 14 (Easter vacation)		
Laboratory	Tue., April 22 Wed., April 23 Thu., April 24 Fri., April 25 Sat., April 26 Mon., April 28	Make-up and Check-out	
Final Exam	To be Announced	Final Exam	

REQUIEMENTS WHILE IN THE LAB:

In each lab session, you are required to:

1. Have your lab manual and calculator.
2. Come on time, drop quizzes are given at the beginning of each lab session.
3. **Wear a white gown, safety goggles, and gloves.**
4. Bring **soap, detergent, sponge, towel** (paper or cloth), and **matches**.
5. Know the safety rules and regulations, and abide by them.
6. Come prepared to the lab, read the experiment and prepare an outline of the procedure to be followed and answer the assigned pre-lab questions.

At the end of each lab session, you are required to:

1. Hand in your report.
2. Clean any used equipment thoroughly, the bench top, and the sink next to you.
3. Return to the storeroom all items borrowed on that day.
4. Make sure that the water, steam and gas are turned off.
5. Lock your desk.

LAB CONDUCT

1. Eating, drinking, chewing and smoking are strictly forbidden in the lab.
2. All chemicals and water spilled on the benches should be wiped immediately.
3. Side benches should be kept clean at all times, and reagent bottles should be kept closed when not in use.
4. Matches, paper, broken glass and any other solid wastes should be disposed of in the proper waste containers, and not in the sink!
5. **Organic** waste and solutions containing **heavy metal ions** should be disposed of in special labeled containers do **not** pour them in the sink!
6. To prevent contamination of reagent bottles, do **not** insert **any** droppers or spatulas into them. **Never** return unused chemicals (solids or liquids) to the reagent bottle.

LABORATORY SAFETY

Prior to entering the laboratory, students are required to carefully read, understand, and abide by the attached BASIC SAFETY RULES & REGULATIONS and EMERGENCY PROCEDURES (distributed by the **Environmental Health & Safety Center**). These rules are also found as the first two pages in the laboratory manual.

You are expected to abide strictly by the appropriate dress code:

- White gown (long sleeved, knee length).
- Skirts, shorts or anything that shows the feet are **not** allowed.
- Safety goggles (provided) and gloves.
- Long hair should be tied back in a bun.
- Shoes that enclose the entire feet. Open-toed shoes, sandals, and ballerinas are **not** allowed.

If you do not comply with the safety rules you will be asked to leave the lab and **no** make-up will be allowed.

ACADEMIC INTEGRITY

You are being graded on the work you perform. Dishonesty of any kind will **not** be tolerated in this course. The penalty for any form of academic dishonesty such as cheating on exams and quizzes or copying of reports is a grade of **zero**. Cheating is a violation of the university's academic regulations and is subject to disciplinary action. Please refer to AUB policies and procedures on academic integrity.

<http://www.aub.edu.lb/pnp/generaluniversitypolicies/Documents/StudentCodeConduct/StudentCodeConduct.pdf>

Environmental Health & Safety Center

Being Safe is Smart

For a safe practice in laboratories follow these

Basic Rules and Regulations

DO:

1. Wear lab coats (knee-length) and appropriate eye protection (minimum safety goggles).
2. Keep clean work places free of unwanted chemicals, biological specimens, radios, and idle equipment.
3. Keep exits and passageways clear at all times.
4. Become familiar with the locations and operation of safety and emergency facilities such as the fire extinguishers, first aid kit, emergency wash facilities, fire alarm pull stations, telephone, and emergency exits.
5. Wash hands before leaving the laboratory.
6. Leave behind protective clothing (lab coats, gloves, etc.) when leaving the laboratory to eat.
7. Remove contaminated cloths immediately.
8. After leaving the lab, wash before eating, drinking, smoking, or applying cosmetics.
9. Tie or otherwise restrain long hair in a bun when working with chemicals, biohazards, radioisotopes, or moving machinery.
10. Work only with materials when you know their flammability, reactivity, toxicity, safe handling, storage and properly operating emergency procedures.
11. Perform all procedures involving the liberation of volatile materials or aerosols of a toxic or flammable nature in a fume hood.
12. Place sharp objects (syringe needles, broken glass, blades, etc.) in a labeled rigid container before disposal. Materials contaminated with biohazardous agents should first be autoclaved.
13. Keep wet hands and water away from electrical equipment.

14. Secure your compressed cylinders.
15. Perform a safety check at the end of each experiment - make sure that gas, water, electricity, vacuum lines, air and heaters have been turned off and decontaminate any equipment or work areas which may have been in contact with hazardous materials.
16. Lock laboratory when unoccupied.
17. Store coats, packs, etc., in areas provided, not around the lab bench.
18. Pay strict attention to all instructions before undertaking an experiment. If you do not understand, ask.
19. Clean up apparatus and work areas at the end of the lab period.
20. Set up apparatus so that it is not necessary to reach through the assembly to turn water, gas or electricity off.
21. Assemble apparatus so that control valves and switches will remain accessible if a fire should occur.
22. Be aware of what neighboring laboratory personnel are doing.

DO NOT:

1. Wear open shoes, such as sandals or ballerinas or ballerinas with socks, in the lab.
2. Block access to emergency equipment (eyewashes, safety showers and fire extinguishers).
3. Pipette by mouth.
4. Pour water into acid
5. Return unused chemicals to stock bottles.
6. Run, walk in the lab.
7. Carry hazardous chemicals between the lab and storage rooms by hand. Use secondary containers.
8. Place chemicals where they will cause trip hazards, or are liable to cause personal injury. Reagent bottles, empty or full should not be left on the floor.
9. Place chemicals near incompatible substances that may cause them to react.
10. Leave chemicals or experiments unattended.
11. Store food, food containers, drinking glasses in the laboratory.
12. Keep food in refrigerators at the laboratory.
13. Sniff or taste chemicals.
14. Smoke, eat, or drink, food, beverages or tobacco in laboratories.
15. Apply cosmetics or lip-balm in the laboratory.
16. Engage in horseplay or other act or mischief in the lab.
17. Perform unauthorized experiments.

18. Remove chemicals from the lab unless directed otherwise from the instructor/supervisor.
19. Use damaged or broken equipment when handling or experimenting with chemicals.

EHSC ext.2360

Environmental Health & Safety Center

Emergency Procedures

Read carefully, it may save your life!

1. **Remain calm** - Do not shout "Fire".
2. **Rescue**: Rescue personnel who are in immediate danger. This step is usually performed simultaneously with step 3 "Alarm".
3. **Alarm**: Give the **alarm** - Dial 5555 and inform operator of exact location of fire.
4. **Contain**: Close doors and windows to isolate fire and smoke from rest of the building.
5. **Evacuate**: Evacuate the building using the nearest exit (Do not use elevators). Do not reenter the building until the alarm is silenced and you are told that it is safe to reenter.
6. **Extinguish**: You may fight the fire if you have been trained to do so, your exit is assured and that the alarm has been given.
7. Once the ERT / Beirut Fire Brigade arrive, they will be in charge until they declare the area safe and leave the scene.

Hazardous Materials Emergencies: Chemical, biological and radioactive materials are present in laboratories. If a hazardous material is spilled or released the following precautions or actions are recommended:

If you are unsure about the danger of the material:

1. Do not approach the spill and avoid contact with the material. Avoid breathing gases, fumes or smoke that may be generated. Vapors may be harmful even if there is no odor.
2. If others may be in danger, activate alarm or inform personnel to evacuate the area. Close doors to contain the area of the spill.
3. From a safe location call the EH&SC x 2360 (during working hours) or the protection office x 2400 (24 hours/day), describe the nature of the emergency.
4. Stay in a safe area near the vicinity so that you can assist emergency response personnel.

If you are certain that the spill or leak poses no immediate danger or personal injury report it as in 3 above and:

1. Use absorbent material to keep the contamination from spreading or entering drains. Absorbents such as sand, vermiculite, towel papers etc ... may be used.
2. Working from the outside in absorbing the spilled material and using a shovel or dust pan place the spilled material inside a plastic bag or container.
3. EH&SC personnel will advise on further actions.

If the spill is in a lab, shop or chemical storeroom:

1. Evacuate all personnel from the room.
2. Be sure hood/local exhaust is on.
3. If flammable liquids are spilled, disconnect the electricity to sources of ignition.
4. Call EH&SC @ ext. 2360 to request additional assistance if you cannot manage the clean up yourself.

If spill is in a corridor or other public passageway:

1. Evacuate all people from the area. Close off area to keep others out.
2. Call the EH&SC at ext. 2360.
3. Call Physical Plant @ ext. 2015 to request to have the air system in the area shut down (to prevent contamination of other areas) and to request additional assistance.