2014

163-06 General Chemistry Lab II

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Course Description: GENERAL CHEMISTRY II LAB (1.00). A continuation of CHEM 161. The laboratory work includes qualitative and quantitative inorganic analysis. Prerequisite: CHEM 161. Corequisite: CHEM 162. Class meets Tuesday from 3:00 pm to 5:50 pm.

Overview of course: This is a laboratory course, which will serve to exemplify concepts that are covered in the lecture class. Student Learning Outcomes: At the end of this course the student will be able to: Recognize and manipulate basic laboratory equipment. Apply techniques involved in the identification of organic compounds, Analyze and interpret quantitative and qualitative data, Be effective communicators in writing and orally.

Tentative Schedule

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March 4 | Spring Break, no Lab. |

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| 04-30   | Lab Quiz II, Check-Out. | |

TEXT, PROPER ATTIRE and SAFETY GOGGLES ARE REQUIRED FOR THE COURSE. A scientific calculator is also recommended.

CHEM163 Satisfies NSTA Reporting Standards for Teaching Science Numbers 1a, 1b, 1c, 1d, 1e, 3b.

Grading Policy: Lab Quizzes (2)-75 pts each; Lab Reports (9)-50 pts each, Qualitative Lab Reports (2) 25 pts each.

Grading Scale: A = 93-100% A- = 90-92% B+ = 87-89% B = 83-86% B- = 80-82%
C+ = 77-79% C = 73-76% C- = 70-72% D+ = 67-69% D = 63-66% D- = 60-62%
F = <60%

It should be noted that according to the Xavier University Catalog, a grade of “A” is earned for EXCEPTIONAL performance. This is the grading policy of the faculty of the Chemistry Department as well. The policy can be found at http://www.xavier.edu/chemistry/dept_policies_grading.cfm
Class Policies:  

Attendance to all experiments is required.

Due Dates - A written Lab report is due for each experiment. See the Laboratory Report section for directions. Timely submission of pre-lab and post lab work, as well as consultation of documents posted on the class website is the responsibility of the student. Reports need to be turned in on the next lab period following the completion of the experiment.

Late reports - Late reports receive 10 points penalty initially. Reports which are more that one week late will not be graded, but may receive half of possible points for pre-lab preparation and raw data. No late lab reports will be accepted after the date of the final quiz.

Absences - Absence notification , for illness, conflicting events or extreme circumstances, must be delivered by e-mail, before 1:00 pm on class day. A note justifying the absence is due on the next class time attended or on the make-up day, whichever is earlier. The note needs to be signed by the appropriate authority (Primary Care Physician, Athletic Advisor or other University Counselor, etc.).

Only one make-up lab will be allowed: the absence must be excused and the missed lab experiment can be made-up during specified make-up times only, with permission from the lab instructor. The laboratory may be different from the usual lab classroom. Therefore, in addition to the pre-lab written work (see "Lab Report"), a list of needed drawer's items and glassware is required.

In case the excused missed lab cannot be made-up, students may receive minimal partial credit by submitting the required pre-lab write up.

No make-up labs will be allowed during the checkout week.

Un-excused, missed labs receive zero points.

A make-up quiz will be administered only when the absence is excused. The quiz must be made-up within one week from the originally scheduled date.

Attire/Lab Safety - In the laboratory, safety glasses/goggles, fully covered torso, long pants (not shorts) and fully covered feet (shoes or sneakers only) are required. Gloves are available. Long hair should be tied back. No food, drinks, or gum are permitted in lab.

Cellular phones, pagers, MP3 players etc. need to be turned off during class time unless the instructor has been notified of a personal emergency situation.

Five points will be deducted for each safety infraction committed during the experiment.

Equipment-storage drawer - The key will be made available, but it needs to be surrendered at the end of each class time and it cannot leave the classroom.

Special Accommodations - Anyone who feels he/she may need an academic accommodation based on the impact of a disability (e.g.: sensory, learning, psychological, medical, mobility) should inform the instructor at the beginning of the semester. Also, the student needs to contact the Disability Services Office at 513-745-3280 (Fifth Floor of the Conaton Learning Commons, Room 514) or e-mail Cassandra Jones at jonesc20@xavier.edu, for assistance in verifying his/her eligibility and to coordinate reasonable accommodations.

Academic Misconduct Policy- A grade of zero will be given to any student violating the University Honesty Policy. The student may appeal according to normal University procedures as stated in the University catalog.
A laboratory report is required for each experiment. A few specific activities may require to carry out the lab work in pairs, but the report is individual. It should include the following:

A) **Pre-Lab**: must be completed before coming to lab. These sections will be checked, initialed and dated by the instructor, before you are allowed to begin any laboratory work. Only initialed pre-labs can be submitted as part of the complete laboratory report.

1. **Advanced Study Assignment (ASA)**. Found at the end of each chapter, it must be completed before lab as part of your overall preparation for experimental work, and it is to be attached as the last sheet of the complete report.

2. **Cover Page**. In the middle of the page include, centered, Line 1 - Experiment ‘s Number and Title (as from the manual). Line 2: Your name, Line 3: Course and section number Line 4: Date of the experiment

3. **Purpose**. In no more than three sentences, tell the specific objective(s) of the experiment. Note key chemical equations/relationships that will be utilized in the lab. Do not report all math equations shown in the textbook as many are derived from a single equation: choose the most important. Specify the principle that will be learned or confirmed, the main parameter(s) that will be determined, and if an unknown sample’s chemical structure will be identified.

4. **Procedure**. In each report, cite the reference by indicating the text and pages in which the procedure is found. Then, briefly indicate, in paragraph format, the main experimental steps to be used. Do not just copy verbatim the procedure from your manual. Much of the manual descriptive language can be reduced to very specific instructions. The reader must be able to visualize the set-up and follow the order of events from your description. Calculations are not required at this point. Report all chemical structures and concentrations. **Use impersonal, passive voice, past tense** to describe what was done, i.e.

   if the procedure in the textbook reads:

   “Obtain an unknown solid sample, in powder form, from your lab instructor. Put a weighing paper on the balance and press the tare button. Wait until 0.000 appears, then add approximately 400.00 mg of the sample. Take a 50 ml beaker, wash it with soap and tap water, rinse it with deionized water and dry it thoroughly. Place the sample in the beaker and add 10 ml of deionized water. Stir to dissolve it completely. Obtain Hydrochloric acid 0.1M and add 20 drops with a disposable pipet, stir with a glass stirring rod after each drop until no more bubbles are visible.”

   the procedure should be written as:

   ‘A solution of an unknown powder sample (400.00 mg, exactly weighed), in deionized water (10 mL), was prepared in a clean and dry 50 ml beaker. Hydrochloric acid (20 drops, 0.1M) was added dropwise while stirring, until effervescence ceased’.

A **Waste Disposal Note** needs to be included at the end of procedure section. Report the disposal policy for each and every chemical and material used in the current experiment. (See Additional Waste Considerations file for details).

B) **Data and Observations Sheet**. All work should be recorded in permanent ink. Work submitted in pencil or erasable ink will not be graded. Strive for neat and legible handwriting. Erasures are to be avoided. Errors may be negated by simply drawing a single line through a mistake, or by using an X to omit a mistake of three lines or more. Initial and date the correction as well. At the end of each laboratory period, the data sheet is to be initialed and dated by the instructor.

As dictated by the data sheet provided in the manual for each experiment, record quantitative data (weights, densities, time, temperatures, unknown sample number, etc.), as well as unique or distinctive experimental
occurrences in the manipulation of an unknown sample (qualitative characteristics such as color, odor, physical state, if the experiment was executed differently from what stated in the procedure, etc.). For example, “the solution was added slowly with cooling” or “it was noticed that a red color developed at this point.” NOTE: Observations and data are not to be recorded on separate sheets of paper, but rather, directly onto the data sheet when the data is first acquired or observed. Most of the times the data sheet will prompt the mathematical manipulation of data. Since the calculations you make justify any quantitative answers you may report, you should write all calculations, even basic, used to determine your results. Write the math formula to the side of the line. In case of repetitive calculations across a row, report at least one numerical example. Calculations should be done during lab, as time permits. Don’t forget to mention all units of measurement (g, mL, mole/L, ...) and use the appropriate significant figures and scientific notation.

C) Calculations on Excel. Calculations should be verified using Excel. The original Data Sheet is not to be modified. The spreadsheet should prepared following the guidelines of the data sheet. The math formula used should appear to the right of the result for each line. Appendix VII in the manual provides general instructions on how to use Excel. Specific directions may be provided on the class website. Attach a printout of the spreadsheet to your lab report. If the experiment involves only qualitative observations (exp. # 17, 27, 36, 38) the excel spreadsheet is not required.

D) Results and Conclusions. Do not use first person. Write in impersonal, passive voice and past tense. This section, more than any other section of the report, will show your thoughtfulness, understanding of the work involved, and skill in organizing and communicating your ideas. Usually limited to two pages, this section should review the experimental purpose (what was to be expected theoretically; show key equations) and report the key results (what was observed). Changes in procedure, either by individual choice, or by instructor's directives, must be reported and justified (did they reduce the impact of an experimental error on the data/result? etc.). Students should state specific conclusions, based on the objective and the results obtained. Further discussion may briefly explain why things did, or did not work as expected, discuss how the theory was supported by experimental results, and evaluate the experiment as fulfilling or not fulfilling the objectives. Emotions ("This was hard.", "This was fun.", or "I was amazed by...") are not necessary and detract from the purpose of this section. Experimental data and/or results should be cited to support the conclusions made. If the results of the activity were not satisfactory, sources of error (personal skills, or math and instrument related), should be proposed, as well as how specifically the calculation of the main parameter may have been altered by that error. If the results were accurate, the main reasons of this success may be proposed. Suggest how the activity could be improved to give better data. Did the experiment raise questions that cannot be explained with the data collected? Does the technique used have limitations? Any other consulted literature (textbooks beside the manual, journal articles, websites) must be reported: specify authors, edition, title and pages. Report the original sentence in quotation marks, then explain in your own words its relevance to the experiment.

PLEASE NOTE:

1) With the exception of the ASA and the DATA sheet, the report needs to be typed (Font: Times New Roman, Font size: 12 points, Margin: 1" on all sides). It is encouraged by the University Sustainability Committee to turn in papers printed on both sides.

2) Proofread your work one more time for Grammar, Punctuation and Writing Style (ease of reading).

3) The complete lab report must be stapled.
CHEM 163- THE QUALITATIVE ANALYSIS LABORATORY REPORT

The qualitative analysis report for general chemistry lab differs slightly from the usual report required in the course, and should include the following:

1. **Cover Page.** In the middle of the page include, centered, Line 1 - Number and Title of the experiment. Line 2: Your name, Line 3: Course and section number  Line 4: Date of the experiment

2. **Advanced Study Assignment.** Must be completed before lab as part of your overall preparation for experimental work.

3. **Statement of the Objective or Purpose.** The objective will be to analyze a set of ions, which are grouped according to a particular chemical characteristic. In the objective, list the group and specific ions being investigated, and their distinguishing group characteristic. Mention the unknown analysis as well.

4. **Procedure.** Include the reference, i.e. give text title and pages for the experiment.
   a) Show the procedure in the form of a **flow diagram.** (For an example, see Slowinski, et. al., page 275 of the 10th edition). Include on the procedure diagram the chemical formulas of solid compounds, ions, complexes formed, the amount and the molarity of reagents added within each step, the glassware size used. (Review the lab text discussion for correct formulas). Incorporate symbols, if desired, to abbreviate instructions.

   \[ \Delta - \text{Heat} \quad \Theta - \text{Centrifuge} \]

   \[ \uparrow - \text{Evaporate} \quad \text{D-Decant} \quad \text{W-Wash} \]

   b) **Waste Disposal Note.** Heavy metal ions are used throughout qualitative analysis. Include the correct waste disposal note, after the procedure.

5. **Observations.** Prepare a second flow chart on the data sheet. This is an observation flow chart. Observations of physical properties and chemical reactivity for the “known” and “unknown” should be recorded on the same chart, in differently, legible, black and blue colored ink. (please do not use red ink).

6. **Results and Conclusions.** Fill in the following statement to report your results:
   “Unknown # ___ contains the following ions (or substances): ___, ___, ____&____.

7. **Post lab questions.** They will be available on the class website.

8. The submitted, stapled lab report should include items 1 through 7, in order, with the ASA (item 2), attached as the last sheet of the report. Be sure to have the instructor initial your report (flow charts and conclusions).