ANALYTICAL CHEMISTRY 217 51 2192
A- 2019 *COURSE SYLLABUS*

Instructor: Dr. M. McClory
Office Hours: SP 201.14; Wednesdays, before class, 4 – 6p.m.;
after class if necessary.   **e-mail:** mcclorymichael@gmail.com
Lecture Room: CC 308
Required Text: Quantitative Chemical Analysis, D.C.Harris, 9th Ed, Freeman.

Majority of Course Topics: concentration; experimental error; significant figures; uncertainty; systematic errors; statistics; error curves; confidence intervals; Grubbs test; least squares; uncertainties; calibration curves; calibration methods; chemical equilibria re. acids and bases; acid, base definitions; pH calculations; charge balance and mass balance; salts and hydrolysis; buffers- preparation, reactions, capacity; polyprotic acids and bases; principal species in solution; isoionic point; isoelectric point; electrophoresis; titrations and calculations; titration curves; indicators; end point; calculations re. all previous topics.
Chelation; EDTA titrations; metal-chelate complexes; calculations to determine conc. of metal ions; conditional formation constant; end-point detection and titration techniques; back titration; displacement titration; masking agents; solubility and gravimetric analysis; common ion effect; separation by precipitation; ionic strength and its effect on solubility; activity and activity constants; gravimetric analysis and calculations; precipitation methods; crystal growth methods.

N.B. **Course Notes** will be posted online.
- These Notes mention in detail the topics to be covered. Also, the Notes specify the chapters and sections that are to be read in Harris as well as listing suitable problems to attempt.

Marking Scheme

Laboratory: 25%   **Final Exam: 45%**
Mid-term: 20%
October 23, Topics: Course Notes (pages 1 to 54, to be verified).
Assignments (2): 10%   assignments are due as follows:
Assignment #1, p. 3 of Syllabus. Due Wednesday, Oct 2 @ 6 p.m.
Assignment #2, WILL BE POSTED LATER.

Note the following:

- A passing grade (50%) is required in both theory and laboratory.
- **Attendance at the Seminar on Academic Practices is compulsory. Also the accompanying online test must be passed. Schedule (TBA).**

<u>MANDATORY QUIZ AND SEMINAR</u>

As part of this course, you are *required* to i) attend a Chemistry and Biochemistry Departmental Seminar on the academic conduct code and the appropriate use of information sources and ii) pass the online quiz associated with this seminar (the passing grade for the quiz is 100%). (**Note:** This is **not** the University's quiz you may have been asked to take when you first registered and logged into the my Concordia portal; the one you must take is similar, but graded by the Department of Chemistry and Biochemistry, and you cannot take it until after you have attended the seminar.) The aim of this seminar is to clarify the academic conduct code in terms of what practices will be considered unacceptable with regards to work submitted for grading in Chemistry and Biochemistry courses. **You are only exempt from repeating the seminar and the quiz if you have done both in Autumn 2014 or more recently,*** otherwise you are required to repeat both this term. This short seminar (1 hour) will be held at the following times(TBA). Note that late-comers will not be admitted.

A sign-up sheet will be available at SP 201.01 (Departmental office).

Failure to attend the seminar and pass the quiz will result in a lowering of your grade and an INC Grade. Example: a grade of C would be lowered to C- INC.

- Lab supervisor is Khalil Rahman.
- Labs start in week two.
- Purchase in bookstore Lab Manual & a hard covered book, lab coat, glasses, spatula, bulb, and a computer memory stick.
- Missed experiments require a valid excuse (medical form) and still need to be performed later.
- Pre-labs include (i) a written summary describing the goal of the experiment and the experimental procedure and (ii) on a separate page a flowchart of the procedure. No prelab → no entry to lab.
- Must fill a Lab Report form (triplicate results, average, deviation).
- Any rejected value must be explained via Grubbs-test (Section 4-6, Harris).
- Grading of lab work is based on accuracy of the results.

Assignment #1 Due on Wednesday, Oct 2 @ 6.p.m. in class.

Student Name: _____   Student # _____

Neatness matters! Show all your work.   40 Marks

Include a typed title page and staple all your pages.

(10)   1. A class of 28 students measures the molar mass of a polymer with the
following results: Molar mass, number of students reporting

Molar mass	number of students reporting
995	1
996	2
997	2
998	3
999	4
1000	5
1001	4
1002	3
1003	2
1004	1
1005	1

Use the Excel program to: a) Find the average or arithmetic mean x, and the standard deviation. Submit a printout of your work.

b) Find the deviation of each measurement. Then construct an error curve by plotting the frequency(number) of each deviation on the y-axis vs. the magnitude of each deviation on the x-axis. A crude Gaussian Curve results (it should be a smooth curve). Submit your properly titled graph(no photocopies). Use the proper scale for each axis, label your axes.

(10)   2. a) Use Excel to make a graph of the following points.

x	y
0.352	1.09
0.803	1.78
1.08	2.60
1.38	3.03
1.75	4.01

Submit your properly labeled graph(no photocopies); use proper scales and label axes. Include the equation of the straight line and the R^2 value.

b) Now use LINEST as described in the notes or in the text. Include the LINEST printout with your graph from part a).

(5) 3. Sea water contains an average of 2.12×10^2 ppm of Na^+ and 318 ppm of SO_4^{2-}. Calculate the molar concentrations of Na^+ and SO_4^{2-} given that the average density of sea water is 1.04 g/mL. Molar masses: Na^+, 23.0 g/mol; SO_4^{2-}, 96.0g/mol.

(5) 4. Six students report the following results for the % of Pb in a sample:
Student 1, 20.20%; Student 2, 19.78%; Student 3, 19.89%; Student 4, 20.07%;
Student 5, 20.66%; Student 6, 20.55%. Calculate the confidence intervals at 95%.

(10) 5. Calculate e and %e and state the answer for the following problem.

$$y = \frac{157(\pm 6)g - 59(\pm 3)g}{1220(\pm 1)mL + 77(\pm 8)mL}$$