



Course Documentation Outline

School of Business, Biosciences and Justice Studies

SECTION I

1. Program: Chemical
2. Course Name: Analytical Chemistry 2
3. Course Code: CHEM 2005
4. Credit Value: 4 Course Hours: 60

Class	Lab	Field	Other	Total
30	45			75

5. Prerequisites/Co-requisites/Equivalent Courses

PR/CO/EQ	Course Code	Title
PR	CHEM2000	Analytical Chemistry 1

6. **Faculty:** Elinor Brunet **Date:** Jan 12, 2011 **Effective Date:** Jan 13, 2011
7. **Dean/Chair Approval:** *Jim Whiteway* **Date:** Jan 2011
9. **Revision Number:** **Date:** **Effective Date:**
- 10: **Notes**

Section II

11. Calendar Description:

Specific types of qualitative analysis and associated calculations are stressed. Electrochemistry and its associated calculations (Nernst Equation), as well as basic spectroscopy are discussed.

12. Provincial Context:

This course meets the following Ministry of Education and Training requirements:

a). Prior Learning Assessment (PLA)

Students may apply to receive credit by demonstrating achievement of the course learning outcomes through previous life and work experiences.

This course is eligible for challenge through the following method(s) indicated by *

Challenge Exam	Portfolio	Interview	Other	Not Eligible
*	*	*		

PLAR Contact:

13. Employability Skills emphasized in this course

	communication - written		communication - visual		communication - oral
*	analytical		creative thinking	*	decision making
*	interpersonal	*	numeracy	*	organizational
*	problem solving	*	technological		other (specify)

14. Required Texts, Materials, Resources or Technical Materials Required:

Lab manual produced at the college, lab coat and safety eyewear (CSA approved) with colourless lenses, as well as a scientific calculator capable of linear regression. A formal textbook is not required for this course.

15. Evaluation Plan (Passing Grade is 60%)

Students will demonstrate learning in the following ways:

Assignment Description	Evaluation Methodology	Due Date
Assignments, quizzes and midterm test	35%	On going
Lab reports	30%	Weekly
Final Test	35%	Apr 2011

16. **Other**

Policy for missed tests/work and submission of assignments:

Students are expected to make every reasonable effort not to miss tests and to submit all assigned work on time. Students must advise the instructor **in advance** if they are unable to meet scheduled deadlines, **otherwise late assignments will not be accepted for evaluation and a grade of zero will be assigned**. Every effort will be made to accommodate students unable to meet specified deadlines as a result of extenuating circumstances; however, the instructor reserves the right to refuse late assignments and to refuse to reschedule assessments.

The total of the marks for the quizzes, midterm, assignments, lab reports and final test must be equal to or **greater than 60%** to obtain a pass in this course

The midterm test will cover material from the beginning of the semester to that point. The final test will cover material from the entire semester. The style of the questions will be exactly the same as those contained in the assignments and quizzes.

All labs must be performed, and the associated report for each lab must be submitted for grading. The format to be used for the lab report will be discussed in the lab period. The lab reports must be typed. Only one lab may be 'made up' during the scheduled make up period at the end of the semester

Loyalist College has a Violence Prevention policy:

- All College members have a responsibility to foster a climate of respect and safety, free from violent behaviour and harassment.
- Violence (e.g. physical violence, threatening actions or harassment) is not, in any way, acceptable behaviour.
- Weapons or replicas of weapons are not permitted on Loyalist College property.
- Unacceptable behaviour will result in disciplinary action or appropriate sanctions.
- More information can be found in the "Student Manual and Guide - Rights & Responsibilities".

Contact Information for Elinor Brunet:

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Section III

17. Curriculum Delivery, Learning Plan and Learning Outcomes:

Course Components/Content	Related Learning Outcomes	Learning Activities/Resources
Review of Selected Activities from Analytical Chemistry 1	<p>The student will be able to:</p> <ul style="list-style-type: none"> - express the results of all calculations with the correct number of significant figures or decimal points - display an appreciation for the difference between the accuracy with which they have determined the concentration of their unknown, and the precision displayed during their titrations (or other measurements) - perform conversions within the metric system - perform the calculations required to accurately prepare solutions by dissolution or dilution using the appropriate glassware and balances regardless of whether the concentration units are mol/L, mg/L, % w/w, % w/v, % v/v or eq/L. - review the concept of standardizing a titrant using a standard solution 	<p>Curriculum objectives will be achieved through a combination of the following teaching strategies:</p> <ol style="list-style-type: none"> 1. Lecture 2. Laboratory activities (guided and discovery) 3. Cooperative study 4. Independent study (i.e. required readings and exercises) <p>Lab: Solution Preparation Sodium Thiosulfate</p>
Theory of REDOX Reactions	<ul style="list-style-type: none"> - Basic definitions, terms and concepts; electrodes and electrode potentials - Nernst equation - Combining half reactions to form a complete reaction 	<p>Lab: Electrodeposition of Copper</p>
Redox Equations (Review)	<ul style="list-style-type: none"> - calculate oxidation numbers of elements in a compound or a polyatomic ion - balance simple redox equations, identifying the $\frac{1}{2}$ reactions and oxidizing or reducing agents - balance redox equations in an acidic or alkaline environment 	

Redox Titrations	<ul style="list-style-type: none"> - Identify procedures employing an oxidizing titrant - Identify procedures employing a reducing titrant - Plot potentiometric titration curves, their first derivative curves and second derivative curves - Determine the equivalence point of the titration from the curves visually and mathematically - Discuss the construction and use of some common electrodes: Standard Hydrogen, Calomel, Glass Specific Ion, Platinum 	<p>Lab:</p> <p>Potentiometric Titration of Iron</p>
Atomic Absorption	<ul style="list-style-type: none"> - apply their understanding of the basic theory behind Atomic Absorption - prepare standards containing the analyte - prepare a sample of their unknown - perform start up, and calibration procedures, obtain absorbance measurements on the standards and unknown, perform shut down procedures 	<p>Labs:</p> <p>Copper by Furnace AA Calcium by Flame AA</p>
Beer's Law One Component Mixture	<p>Use linear regression on the results of a Beer's Law determination (absorbance measurements vs. concentration of standards) to calculate the concentration of an unknown</p>	<p>Labs:</p> <p>Acetone Iron Colorimetric</p>

Equilibrium	<ul style="list-style-type: none"> - display competence in writing equilibrium constant expressions and given enough data, manipulating it to calculate K_{eq} - be able to examine a reaction equation and deduce which equilibrium constant is appropriate (K_a, K_b, K_w, K_{sp}) - Given enough data, find the solubility in water of a slightly soluble salt - recognize that a particular solvent contains a "common ion" with respect to a slightly soluble salt and adjust the calculation for solubility accordingly - express the concentrations of the ions as the $-\log$ molar concentration or 'p' function - from a pH titration plot determine the pK_a (s) of organic acids accurately enough to be able to identify the acid when comparisons are made to literature values 	Lab: Organic Acid
Iodine Numbers	<ul style="list-style-type: none"> - review the concept of unsaturation in organic compounds 	Lab: Iodine Numbers
Chlorine	<ul style="list-style-type: none"> - investigate the set-up, standardization and use of a pre-programmed colorimeter (Hach DR 2000) to determine chlorine in a tap water sample using commercially available pre-packaged complexing agents. 	Lab: Chlorine
pH Neutralization Reactions	<ul style="list-style-type: none"> - utilize an acid/base reaction to confirm the concentration of antacid present in commercially available antacid tablets 	Lab: Antacid Tablet Titration
Conductivity	<ul style="list-style-type: none"> - accurately prepare KCl standards - use a conductivity meter to measure the conductivity of the KCl standards, deionized water (and appreciate why it has a measurable conductivity) and a solution of unknown KCl concentration - plot the conductivity vs. concentration of the standards on log-log paper - determine the concentration of KCl in the unknown from the plot 	Lab: Conductivity