Grande Prairie Regional College

DEPARTMENT OF SCIENCE & TECHNOLOGY

CHEMISTRY 2110 (Fall 1995)

INSTRUCTORS:

Dr. Barry Ramaswamy
(Office: J 218; Tel: 539-2072)

Dr. Som K. Pillay
(Office: E 309; Tel: 539-2985)

PREREQUISITE: CHEM 1000, CHEM 1040 or equivalent

TRANSFER CREDITS: U. of Alberta: CHEM 211, 3 Credits

LECTURES: MONDAYS, WEDNESDAYS & FRIDAYS
2:00 - 2:50 P.M. (J 229)

LABORATORY: THURSDAYS
2:00 - 5:50 P.M. (J 119)

TEXT BOOKS AND LABORATORY ITEMS:

Quantitative Chemical Analysis, Fourth Edition, Daniel C. Harris, W. H. Freeman and Company, 1995.

Chemistry 211, Quantitative Analysis, B. Kratochvil and W. E. Harris, University of Alberta, 1995.

A Hard-Covered Laboratory Notebook, Lab Coats and Safety Glasses.

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COURSE EVALUATION

Assignments/Quizzes	20.0%
Lab Work	40.0%
Mid-Term Examination	10.0%
Final Examination	30.0%
	100.0%

Grade	Marks(%)	Grade	Marks(%)
9	85-100	5	59-64
8	79-84	4	50-58
7	72-78	3	45-49
6	65-71	2	36-44

Quizzes:

There will be ten quizzes/term. The first quiz will be on Friday, September 22, 1995 and will be part of the practical test. Quizzes will be about fifteen minutes in length and will cover assigned readings, lectures, experiments, and problems. Absence from a quiz requires a **valid excuse.** Absence due to illness must be substantiated by **a written report** from a physician.

COURSE OUTLINE

1. INTRODUCTION AND REVIEW:

Introduction to Course, Units, Expressions of Concentration, Analytical Balance and Weighing, Buoyancy Correction, Calibration of Volumetric Glassware

Chapters: 1 & 2
Lab Manual Sections: I, II & III

2. EXPERIMENTAL ERROR:

Significant Figures, Systematic Error, Random Error, Precision and Accuracy, Absolute and Relative Uncertainty, Propagation of Uncertainty

Chapter: 3

3. STATISTICAL ANALYSIS:

Gaussian Error Curve, Standard Deviation and Probability, Variance, Student's t, Confidence Intervals, Comparison of Means, Dealing with Bad Data, Method of Least Squares, Application of Spreadsheet

Chapter: 4
Lab Manual Section: IV

4. PRINCIPLES OF VOLUMETRIC ANALYSIS:

Precipitation Titrations, Mass Titrations, Titration of Mixtures, End-Point Detection, Application of Spreadsheet

Chapter: 7

5. ACID BASE EQUILIBRIA:

Review of Fundamentals, The Dissociation Constant, Conjugate Acids and Bases, pH, Strong Acids and Bases, Weak Acids and Bases, Fraction of Dissociation, Buffers, Henderson-Hasselbalch Equation, Buffer Capacity, Polyprotic Acids and Bases, Amino Acids, Fractional Composition Equations, Isoionic and Isoelectric Points

Chapters: 5, 10 and 11

6. ACID BASE TITRATIONS:

Strong Acid with Strong Base, Weak Acid with Strong Base, Weak Base with Strong Acid, Titrations in Diprotic Systems, Titration Curves, End Point, Indicators, Titration in Non-aqueous Solvents, Application of Spreadsheet

Chapter: 12

7. COMPLEXATION EQUILIBRIA:

Metal Chelate Complexes, EDTA Complexes, Formation Constant, Titration Curves, Auxiliary Complexing Agents, Metal Ion Indicators, EDTA Titration Techniques, Application of Spreadsheet

Chapter: 13

8. ELECTROCHEMISTRY:

Review of Fundamentals, Galvanic Cells, Standard Potentials, Nernst Equation, Relation of E° and the Equilibrium Constant

Chapter: 14

9. REDOX TITRATIONS:

Redox Titration Curve, Titration of Mixtures, Redox Indicators

Chapter: 16

LECTURE SESSION

Regular attendance of lectures is essential to achieve a good understanding of the course material. You are encouraged to ask questions and to participate in class discussions. Help is also available outside the class room. **NO APPOINTMENTS ARE NEEDED.**

TENTATIVE LECTURE SCHEDULE

WEEK OF	MONDAY	WEDNESDAY	FRIDAY
Sept.4	-	-	Introduction
11	Analytical Balance	Volumetric Glassware	Experimental Error
18	Statistical Analysis	Statistical Analysis	Titration Theory
25	Titration Theory	Determination of Chloride	Determination of Acid Mixture
Oct. 2	Analysis of Acid Mixture Data	Determination of Ca & Mg	Determination of Benzimidazole
9	**NO LECTURE**	Acids & Bases	Acids & Bases
16	Titration of Cu^{2+}	Acids & Bases	Buffers
23	Ethylene Glycol Titration	Buffers	Diprotic Acids
30	Fractional Compositions	Acid-Base Titrations	Acid-Base Titrations
Nov. 6	Acid-Base Titrations	Acid-Base Titrations	Diprotic Titrations
13	Diprotic Titrations	Endpoint Indicators	Complexation Equilibria
20	Complexation Equilibria	Complexation Titrations	Auxiliary Ligands
27	Fundamentals of Electrochemistry	Electrochemistry	Electrochemical Cells
Dec. 4	Redox Titrations	Redox Titrations	-
11	*	**FINAL EXAM**	*

READING AND PROBLEM ASSIGNMENTS

Problem solving will guide your study in the right direction and also will help you to monitor your performance in the course.

Approximately five to ten questions will be assigned as homework every week. However, you are encouraged to solve as many additional problems as you can. It is important that you work out these problems independently. Seek help with the ones you cannot solve yourself. Unless instructed otherwise, assignments are due on Fridays at 1:00 P.M. **NO LATE ASSIGNMENTS ARE ACCEPTED. DON'T ASK!**

PROBLEM SET #	CHAPTER*	PROBLEMS
1	1 2	13, 21 and 32 7, 12, 13, 15, 16 and 21
2	3 4	2, 11 and 14 3, 12, 18, 21 and 23
3	7	2, 4, 6, 7, 10 and 32
4	5 10	H, I and K B, D, 7, 18, 19, 32, 35 and 36
5	11	B, C, 5, 22, 27 and 29
6	12	2, 11, 12, 14, 19, 20, 22, and 40
7	13	2, 4, 9, 14, 15, 24, 26 and 31
8	14	5, 10, 11, 12, 16, 24, 28, 33 and 36
9	16	A, 2, 13, 15 and 28

*TEXT: ***Quantitative Chemical Analysis*, Fourth Edition, Daniel C. Harris, W. H. Freeman and Company, 1995.**

LABORATORY SESSION

Laboratory sessions start at 2:00 P.M. sharp. All students are expected to come to the laboratory well prepared for the experiment that is to be performed and on time. It is a requirement of the course that you complete the assigned work within the allotted amount of time. Fairness demands that all students receive the same amount of lab time. For this reason, students are not permitted to work past 5:50 P.M., and the lab must be vacated by 6:00 P.M. **This rule is enforced without exceptions.**

Students are expected to attend all laboratory periods. Absence due to illness must be substantiated by presenting suitable evidence to the Instructor/Lab Technician. An opportunity to make up a lab will be given only for **excused absence.**

The laboratory experiments are designed to allow a well-prepared student to finish all the work within the allotted time. **IT IS YOUR RESPONSIBILITY TO COMPLETE THE LAB ON TIME.**

LABORATORY REPORT:

You must record everything you do and observe as you carry out your experiment. Use a hard-cover laboratory note book for this purpose. Do not copy the procedure from the laboratory manual. Keep your note book neat. Your notebook will be checked periodically and graded.

The first term lab assignment comprises six analyses and must be completed in nine four-hour lab periods. You are expected to hand-in the results for two analyses after every three lab periods. A late penalty of one mark minimum (out of five) will be assessed for each late report.

LABORATORY MARKS:

	Fall
Practical Test	5.0
Experiments	35.0
Supplementary Calculation Report	5.0
Laboratory Notebook	5.0
Total	50.0

LABORATORY EXPERIMENTS*

FALL
Preliminary Exercises
Determination of Chloride by Precipitation Titration
Determination of Ca & Mg by EDTA Titration
Determination of Acids in a Mixture by Potentiometric Titration
Non-aqueous Titration of Benzimidazole
Iodometric Determination of Copper in Brass
Determination of Ethylene glycol by periodate cleavage
Determination of Total Salt In a Mixture by Ion Exchange

*TEXT: ***Chemistry 211, Quantitative Analysis*, B. Kratochvil and W. E. Harris, University of Alberta, 1995**