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**Chemistry 300**  
**Quantitative Analysis**  
**Fall 2004**

**2. Instructor:** Judy V. Chauvin, Ph.D. **Section:** 3M (9:40-10:35 a.m.)

**Office:** BEA 119

**Classroom:** BEA 226

**Office Hours:** Tuesday, Thursday 9:00-11:30 am , 1:00-4:30 pm

**Phone:** (985) 448-4878 **Email:** judy.chauvin@nicholls.edu

This course has been set up on the Nicholls Blackboard site.

<http://blackboard.nicholls.edu> A copy of the Nicholls Blackboard flyer will be provided to you.

On line homework URL [chem.nicholls.edu/ohw](http://chem.nicholls.edu/ohw)

Help is available from the e2PALS Learning Center, 230 Peltier from 6-9 pm M-Th, (985)-493-2529. More structured tutoring is available in the Tutorial and Academic Enhancement Center, 211 Elkins Hall, (985)-448-4107, e-mail susan.gilbert@nicholls.edu.

**3. Catalog Description:**

**Chemistry 300. Quantitative Analysis.** 3-3-0. Prerequisites: Chemistry 106 and 110. The theory of gravimetric and volumetric analysis, with emphasis on acid-base equilibria and titrations, oxidation-reduction equilibria and titrations, formation and properties of precipitates, and techniques of analysis.

**4. Prerequisites:** Chemistry 106 and 110.

**5. Required Texts and Other Materials:**

1. *Analytical Chemistry, An Introduction*, 7<sup>th</sup> ed, D. A. Skoog, D. M. West, F. J. Holler and S. R. Crouch, Saunders, New York, NY, 2000.

2. Graphing Calculator – TI 83 (or 83 plus or 82) – recommended

**6. Required Supplementary Readings:** None

**7. Course Goals:**

The student will develop problem-solving skills in the areas of classical or “wet” analytical methods as well as spectroscopic, electrochemical and chromatographic methods of analysis.

### **8. Student Outcome Objectives:**

Upon completion of this course, students will be able to:

1. Explain the role of analytical chemistry and steps for a typical quantitative analysis.
2. Explain and express quantities/concentrations of chemicals (SI units, mole, millimole, molarity, wt %, ppm)
3. Explain the principles and applications of gravimetric methods of analysis.
4. Explain the principles and applications of chemical equilibria (complex-formation, EDTA titrations, precipitation titrations, neutralization titrations, and polyfunctional acid/base titrations).
5. Explain the principles and applications of electrochemical methods (voltaic and electrolytic cells, effect of concentration on cell voltage, standard cell potentials, and batteries).
6. Explain the principles and applications of spectrochemical analysis (radiation/matter interaction, instrument components, Beer's Law).
7. Apply the principles of chromatography, GC, HPLC

Student outcome objectives from the American Chemical Society (ACS)

Division of Analytical Chemistry, found at:

ANALYTICAL CHEMISTRY STANDARDS ACS APRIL 12, 2004

[http://www.chemistry.org/portal/a/c/s/1/acdisplay.html?DOC=education%5Ccpt%5Cts\\_anlchem.html](http://www.chemistry.org/portal/a/c/s/1/acdisplay.html?DOC=education%5Ccpt%5Cts_anlchem.html)

**The La. State Grade Level Expectations (GLE) for Chemistry (Grades 11/12) covered in this course can be found at**

<http://www.doe.state.la.us/lde/ssa/1842.html#Chemistry>

### **9. Course Content:**

Chapter

1 – Intro

1. Classification of Quantitative Methods
2. Steps in a Typical Analysis
3. Quantitative Analysis

3 – Review

1. Units Solutions and Concentrations
2. Chemical Reactions
3. Stoichiometric Calculations

4A – Equil.

1. Chemical Composition of Aqueous Solutions
2. Chemical Equilibrium
3.  $K_{sp}$

8 – Grav. Methods

1. Types
2. Calculation of Results from Gravimetric Data
3. Applications of Gravimetric Methods

**Test I** – Wednesday, Sept. 15, 2004

11 – Titrations

1. Some General Aspects of Volumetric Methods
2. Standard Solutions
3. Volumetric Calculations
4. Titration Curves

4B – Equil.

1. Chemical Composition of Aqueous Solutions
2. Chemical Equilibrium
3. Acids and Bases

**Test 2** – Wednesday, Oct. 6, 2004

12 – A/B Titrations

1. Solutions and Indicators for Acid/Base (A/B) Titrations
2. Titration Curves for Strong Acids and Strong Bases
3. Buffer Solutions
4. Titration Curves for Weak Acids
5. Titration Curves for Weak Bases

13 – Poly A/B

1. Polyfunctional Acids and Bases
2. Calculation of the pH of Solutions of NaHA
3. Titration Curves for Polyfunctional Acids
4. Titration Curves for Polyfunctional Bases
5. The Composition of Solutions of a Polyprotic Acid as a Function of pH

21 – Spectro. Methods

1. Properties of Electromagnetic Radiation
2. The EM Spectrum
3. Optical Instruments
4. Terms Employed in Absorption Spectroscopy
5. Beer's Law

**Test 3** – Wed. Oct. 27, 2004

15 – Complx.- & Ppt. Titns.

1. Complex Formation Reactions
2. Titrations with Aminopolycarboxylic Acids (EDTA), Precipitation Titrations (Fajan's Method)

9 – Activity

1. Variables that Influence the Magnitude of the Salt Effect
2. Activity Coefficients

16 – Intro. EC

1. Redox Reactions
2. Electrochemical cells
3. Electrode Potentials
4. Nernst Equation

17 – Electrode Pot.

1. Thermodynamic Cell Potentials

19 – Cell pot.

1. Reference electrodes
2. Applications of Potentiometry

**Test 4** – Wed., Nov. 17, 2004

24F, 25 – Chromatog. GC, HPLC

Review for Final – Last Day of Class

**Final Exam** – Comprehensive, Based on ACS Exam

**10. Course Requirements: (Fall Semester Only)**

**General Education Testing** – In order to complete requirements for this course, you must take a test of General Education. Your score on this test has no bearing on your grade in this course. If you fail to take the test, you will receive an “T” in this class. You must take the test the next semester when offered and your grade will be changed. General Education Testing will occur on Tuesday, Oct. 26 and Wed. Oct. 27 with make-ups on Thursday, Nov. 4.

### **11. Methods of Evaluation:**

One Hour Tests: Four @ 100 pts each = 400 points

These tests are cumulative with emphasis on material covered since the last test. These tests consist of problems that must be set up and solved and/or discussion questions. Copies of old tests are available in the Reserve Reading Room of Ellender Library.

Daily work, Homework, Quizzes = 100 points

Daily work shall consist of the following:

Homework (HW): On line homework and problems from book.

In Class Work: Study groups will be formed for in class work and some out of class assignments.

Quizzes: Quizzes will be given on homework based on problems from the book.

Final Exam: 200 points

The final exam is comprehensive and based on an ACS test.

Grading Scale – In general, a modified 10 point scale is used, i.e. 100 – 90 A, 89 – 80 B, 79 – 65 C, 64 – 55 D, and below 55 F. The scores on each test are curved if necessary.

### **12. Make-up Policy:**

Tests: If you have an excused absence for one of the hour-long tests AND with approval of the instructor, your final exam grade will be substituted for the missed test. If you do not miss any tests, your lowest test score will be replaced with your final exam grade, provided that your final exam score is higher.

Daily Work: No make-ups are allowed on daily work. No late daily work is accepted.

### **13. Attendance Policy:**

Regular class attendance is encouraged through the daily work grade.

**14. Academic Honesty Policy:**

Academic dishonesty will not be tolerated. The University's cheating and plagiarism policy as stated in the Students Code of Conduct will be followed. The first incident will result in all guilty parties receiving a grade of 0 on the entire assignment. The second will result in a grade of F in the course. Some of your work will be performed in teams. Each team member is plays a vital role and you are expected to co-operate and help each other without copying.

**15. Semester Withdrawals:**

The last day to withdraw from the class with a "W" is Friday, Oct. 29, 2004.

**16. Disruptive Behavior:** Disruptive behavior in and around the classroom will NOT be tolerated. CELL PHONES ARE NOT ALLOWED IN CLASS. Students' whose phones go off in class may be asked to leave. Loud and continuous talking during class disrupts the learning environment and infringes upon the rights of other students who want to hear and learn. The instructor WILL drop disruptive students from the class after repeated offenses.

**17. Academic Disabilities Policy:**

If you have a documented disability that requires assistance, you will need to register with the Office of Disability Services for coordination of your academic accommodations. The Office of Disability Services is located in Peltier Hall, Room 100 – A. The phone number is (985) 448-4430 or TDD (985) 449-7002.

NOTE This syllabus is not a contract and no part of it should be construed as such. The syllabus is subject to change. Students will be notified of these changes in a timely manner.

<b>Ch</b>	<b>Topic</b>
<b>1</b>	<b>Intro</b>
<b>3</b>	<b>Review</b>
<b>4A</b>	<b>Equilibria</b>
<b>8</b>	<b>Grav</b>
	<b>Test 1</b>
<b>11</b>	<b>Volum.</b>
<b>4B</b>	<b>A/B Equil.</b>
	<b>Test 2</b>
<b>12</b>	<b>A/B Ttrn</b>
<b>13</b>	<b>Poly A/B</b>
<b>21</b>	<b>Spectro. Beer's Law</b>
	<b>Test 3</b>
<b>15</b>	<b>Cmplx/Ppt.</b>
<b>9</b>	<b>Activity</b>
<b>16</b>	<b>EC Intro.</b>
<b>17</b>	<b>Elec. Pot.</b>
<b>19.</b>	<b>EC Pot.</b>
	<b>Test 4</b>
<b>24F</b>	<b>Chrom. Separations</b>
<b>25</b>	<b>GC, HPLC</b>

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<b>X</b>	<b>Prelim Ex</b>
<b>1</b>	<b>Grav Cl</b>
<b>2</b>	<b>Bayou</b>
<b>3</b>	<b>Egrav Cu</b>
<b>4</b>	<b>Soda Ash</b>
<b>5</b>	<b>Spec Fe</b>
<b>6</b>	<b>AA Cu</b>
<b>7</b>	<b>GC</b>

<b>CHEM</b>	<b>300/302</b>	<b>200/202</b>	<b>FALL 2004 JVC</b>		
23 Ch 1 Check In	24	25 Ch 3 Pre Ex	26	27 Ch 3	
30 Ch 3	31	Sept. 1 Ch 3 X1	2	3 Ch 3	
6 Labor Day	7	8 Ch 4A X1	9	10 Ch 8	
13 Ch 8 X1	14	15 TEST 1 X2 BYU 1	16	17 Ch 11	
20 Ch 11 LR1, X2 BYU2	21	22 Ch 11 CPR X2 BYU 3	23	24 Ch 11	
27 Ch 4B X2 BYU 4	28	29 Ch 4B CPR X3,4,4	30	Oct. 1 Ch 4B BYU Results Due	2 Family Day
4 Mid Sem (MS) Clh 12 Lab MS	5 MS	6 MS TEST 2 X3,4,4	7 MjS	8 MS Ch 12	
11 Fall Break	12 Fall Break	13 Ch 12/13 X3,4,4 Career Day	14	15 Ch 13	
18 Nat. Chem. Week (NCW) Ch 13 X4,3,5	19	20 Ch 13 X4,3,5	21	22 Ch 21	
25 Ch 21 BYU LR Due X4,3,5	26 GenEd Test	27 GenEd Test TEST 3 X4,3,5	28	29 W day Ch 15	
Nov. 1 Ch 15 X5,5,3	2	3 Ch 15 X5,5,3	4 GenEd Test	5 Ch 15	6 Homecoming
8 Ch 9 X5,5,3 (Eval)	9 (Eval)	10 Ch 16 X6 (Eval)	11 (Eval)	12 Ch 16 (Eval)	
15 Ch 16, 17 X6,X7	16	17 TEST 4 X7	18	19 Ch 19	
22 Thanks- giving	23 Thanks- giving	24 Thanks- giving	25 Thanks- giving	26 Thanks- giving	

29 Ch 24, 25 Lab Review Check Out	30	Dec. 1 Last Class Day Lecture Review Lab Final	2 Finals	3 Finals	4 Finals
6 Finals	7 Finals End	8	9	10	11 Com- mence-ment