Quantitative Chemistry II **CHEM120S13** **Spring 2013**

Updated: 1/19/13

• Instructor:

- Dr. J. A. Wingrave; Office (204BRL); Phone (831-1676); e-mail (wingrave@udel.edu)

• CHEM120 Lecture

- Section 010 T,R, from 3:30-4:45 pm in 206BRL

• CHEM120 Laboratory and Workshop (problem working session)

- Section 020L
  M: Pre-Lab Demo from 12:20-1:20 pm in 106QDH
  W: Workshop from 12:20-1:20 pm in _____
  M,W, Lab from 1:25-3:25 pm in 106QDH
- Section 021L
  T, Pre-Lab Demo from 12:30-1:30 pm in 106QDH
  R, Workshop from 12:30-1:30 pm in _____
  T,R, Lab from 1:30-3:30 pm in 106QDH
- Section 022L
  M: Pre-Lab Demo from 3:35-4:35 pm in 106QDH
  W: Workshop from 3:35-4:35 pm in _____
  M,W, Lab from 4:35-6:35 pm in 106QDH

• Required Course Supplies (Available at University Bookstore)

- **Textbook**: Harris, Quantitative Chemical Analysis, 8th Ed., Freeman & Co.
- **Lecture Manual** Lecture Manual for CHEM120, Wingrave 2013
- **Lab and Workshop Manual**: Laboratory and Workshop Manual for CHEM120, Wingrave 2013
- **Lab Notebook** Notebook with numbered pages (2 pages with same number)
- **i>clicker** RF Response Key Pad (a.k.a., 'clicker')
- **Sapling** eHomework **Access on Sakai**
- **Lab Protection**: Safety Goggles are **REQUIRED AT ALL TIMES IN THE LAB!**
  Long Pants Shoes & Shirts with Sleeves Required.
  NO Shorts, Skirts, Sandals, Open Toed Shoes, Bare midriffs.
- **Calculators** **ONLY Non-Programmable, Non-Graphing Calculators**
  Required functions; +, -, x, ÷, log, ln, x^y, trig - Cheap about $15

• Office Hours

- Location (204 BRL);
- Time (**T,R,** 9:30 am -10:30 am & **W**, 8-9 am)
- TA office hours - M, T, W, R – Schedule and room to be announced

• Other Resources

- Solutions Manual: for Quantitative Chemical Analysis
- Academic Services Tutor Sessions (No Charge) - College & Main Streets
- End-of-chapter problems have answers in back of textbook
- Tutors (Private and Group) - For more info, see Mrs. Staib in BRL102 (831-2465)
- TA & Other Help Sessions - Schedule to be announced
- Bookstore - Chem. flash cards, Schaum Outlines, Chemistry Problem Solvers, etc.

• Web Resources

- Website for chem120: SAKAI
- For textbook: www.whfreeman.com/qca
  - **Sample Exams**, Chapter Summaries, Key Terms, Interesting Links
- My E-mail address: wingrave@udel.edu. **NOTE:** Make sure you have a Udel.edu account.

• Laboratory

- Lab meets twice a week. First Lab meets February 11 OR 12, 2013.
- Report to lab promptly each week in order to hear lab instruction presentation by TA.
- Previous week lab reports are due when you enter lab, unless instructed otherwise.
- Labs and make-up labs can only be done during the week scheduled.
- Missed labs CANNOT be made up and will be either EXCUSED or UNEXCUSED.
  - No score will be recorded for an EXCUSED LAB.
  - A score of zero (0) will be recorded for an UNEXCUSED LAB (AND Pre-Lab).
  - An EXCUSED LAB requires a note from parent or doctor to be given to TA.
- Lab is an inseparable part of chem120. Lab grade is part of your chem120 grade.
- Your lowest lab score will be dropped.
- **IMPORTANT** - Each Unexcused missed lab will lower your lab score. An excessive number of missed labs (excused OR unexcused) will result in an incomplete grade for chem120.

• Safety Training for Laboratory

- Not required if completed in chem115. See TA if NOT completed in chem115.

• Quizzes – In Lecture (PRS)

- There will be 0-4 quizzes per lecture and **PRS device REQUIRED FOR CREDIT.**
- Quizzes will be a problem working session - Bring pen/pencil, PRS 'clicker' and calculator.
- Quiz score is 5% of grade - A total of forty (40) points TOTAL for the whole semester.
- No make-ups & no credit earned if absent OR if PRS response device ('clicker") doesn't work.
- Answer ONLY with your own 'clicker'. Do NOT answer with more than one 'clicker'.
- Answering with more than one 'clicker' constitutes a breach of academic ethics and will result in a zero Quiz Score.

Quantitative Chemistry II **CHEM120** **Spring 2013**

Updated: 1/20/13

• Workshops

- Workshops will be the first hour of the second lab period of each week:
  - Section 020L W, from 12:20-1:20 pm in _____
  - Section 021L R, from 12:30-1:30 pm in _____
  - Section 022L W, from 3:35-4:35 pm in _____
- Workshops will begin February 13 OR 14, 2013
- A total of forty (40) points TOTAL for the whole semester are possible.
- No Workshop sessions will be held on weeks when exams are given.
- NO MAKEUP OR EXCUSED ABSENCES.
- DATES: See Schedule below

• eHomework - Sapling™

1. Go to http://saplinglearning.com
2a. If you already have a Sapling Learning account, log in then skip to step 3.
2b. If you have Facebook account, you can use it to quickly create a SaplingLearning account. Click the blue button with the Facebook symbol on it (just to the left of the username field). The form will auto-fill with information from your Facebook account (you may need to log into Facebook in the popup window first). Choose a password and timezone, accept the site policy agreement, and click "Create my new account". You can then skip to step 3.
2c. Otherwise, click "create account". Supply the requested information and click "Create my new account". Check your email (and spam filter) for a message from Sapling Learning and click on the link provided in that email.
3. Find your course in the list (you may need to expand the subject and term categories) and click the link.
4. Select a payment option and follow the remaining instructions.

Once you have registered and enrolled, you can log in at any time to complete or review your homework assignments. During sign up - and throughout the term - if you have any technical problems or grading issues, send an email to support@saplinglearning.com explaining the issue. The Sapling support team is almost always more able (and faster) to resolve issues than your instructor.

• Language Dictionary Use During Exams

The University's policy is that a language barrier does not constitute a "special needs/learning disability" case, so students in this situation are not referred to the DSS Office. The chem103 policy for language dictionary use on exams will be to approve INSPECTED PAPER language dictionaries. ELECTRONIC language dictionaries will NOT be allowed at any time.

• Exam Regrading

- Exams for regrading must be received by the professor before the subsequent exam.
- An exam regrade will constitute a complete regrade of the ENTIRE exam by the professor. Your exam score might increase OR decrease after regrading.

Quantitative Chemistry II **CHEM120** **Spring 2013**

Updated: 1/20/13

• Exams

- Three (3) in-class exams of 120 points each will be given.
- No make-up exams (Final exam score will replace exam(s) missed for ANY reason).
- Exams Cover: textbook, lecture, laboratory, PRS and Lecture Manual material.
- * Exam corrections must be made prior to the next exam date.
- Final Exam will be cumulative over all course material.
- You will need ONLY a pen/pencil and non-programmable calculator at your desk for an exam.
- Everything except a pen/pencil and a non-programmable calculator must go to the front of the exam room prior to the start of the exam.
- "Everything else" includes but is not limited to: book bags, clothing, cell phones & other electronic devices, books, notebooks, scratch paper, water & beverage bottles, etc.
- Possessing items during an exam OTHER THAN a pen/pencil and a non-programmable calculator constitutes a breach of academic ethics and will result in a zero score for the exam in question.
- The final exam must be taken on the date scheduled by the University or on a later make-up date. The makeup exam date(s) will be announced after the start of the semester.
- A MISSED FINAL EXAM will result in a grade of "INCOMPLETE" for ALL OF chem120S13.
- Makeup Final Exams given by Reservation ONLY in early, September, 2013. Contact Prof. Wingrave.

• Grading Schedule for CHEM120

- **Examinations (360 points, 45%) = 3 x 120 points**
- **Final Examination (120 points, 15%)**
- **Laboratory (200 points, 25%)**
- **eHomework (Sapling) (40 points, 5%)**
- **Workshops (40 points, 5%)**
- **Quizzes (40 points, 5%)**

TTL POINTS (%)	GRADE	TTL POINTS (%)	GRADE	TTL POINTS (%)	GRADE
800-720 (90)	A	625-600 (75)	B -	475-450 (56)	D +
720-700 (88)	A -	600-575 (72)	C +	450-425 (53)	D
700-675 (84)	B +	575-500 (63)	C	425-400 (50)	D -
675-625 (78)	B	500-475 (59)	C -	400-0	F

• Final Exam

- The FINAL EXAM will be cumulative over all course material. The Final Exam is mandatory.
- The Final exam will be given on the date scheduled by the University.
- **NO EARLY OR LATE FINAL EXAM** will be given for any reason.
- **MAKEUP FINAL EXAM DATE(S)** will be scheduled after the end of the semester and announced during the semester. Contact Professor Wingrave.
- An Excessive Number of MISSED LABS or a MISSED FINAL EXAM will result in a grade of "INCOMPLETE" for chem120S13.
- An "INCOMPLETE" grade in chem120S13 converts to a grade of "F" in September, 2013.
- Makeup Final Exams given by Reservation ONLY in early, September, 2013. Contact Prof. Wingrave.

Quantitative Chemistry II **CHEM120** **Spring 2013**

Updated: 1/20/12

• Lecture Topics and Problems

Lecture. LECTURE TOPIC	PROBLEMS
0. Syllabus	- - -
{1. **Review:** Uncertainty, Data Rejection, Statistical Error Analysis, Confidence Limits }	**3.** 1-7, 9-21, 23, 24 **4.** 1-4, 8-14, 18-25, 28-31, 36, Appendix A, B, C
{2. Review: pH Calculations and Activity for Strong & Weak Acids & Bases }	**7.** 1-7, 9-13 **8.** 1-5, 7-24, (20-24 long probs) Appendix E, F, G, K
3. Polyfunctional Acids & Bases	**9.** 1-9, 11, 13-16, 17-23, 24-27, 28-41 **10.** 1-8, 11-14, 15-19, 22-24, 26-32, 36-39
4. EDTA Titrations	**11.** 1-4, 6-10, 23-28 Appendix I
5. Redox, Voltaic Cells & Nernst Equation	**13.** 4, 5, 8, 10, 16, 18, 24, 28, 43, Appendix D,H
6. Potentiometry & Electrodes	**14.** 2-4, 8, 15, 17, 31-32, 35, 48 **15.** 2, 3, 13, 24
7. Fundamentals of Spectroscopy	**17.** 2, 6, 7, 11, 13-14, 23 **18.** 2, 3, 17, 19, 20 **19.** 1-3, 5, 9
8. Optical & Atomic Spectroscopy	**20.** 3, 5, 6, 7, 9, 11, 12, 23, 24
9. Molecular & Mass Spectroscopy	**21.** 8-12
10. Simple & pH Dependent Extractions	**22.** 7-9, 13, 18, 27, 36-40
11. Chromatography Fundamentals	**22.** 7-9, 13, 18, 27, 36-40
12. Gas Chromatography	**23.** 4-9, 18, 20, 25, 27
13. High Perform Liquid Chromatography	**24.** 1-2, 4-6, 10, 12
14. Ion Exchange Chromatograpy	**25.** 10-12, Appendix III
FINAL EXAM: Lectures 1-14	Chapters 3,4,7-11,13-15,17-25

Lectures on Course Capture in { } brackets

Quantitative Chemistry II **CHEM120** **Spring 2013**

Updated: 1/19/13

• Lab, Exam and Workshop Schedule

DATE	Wk	LAB EXPERIMENTS	Workshop
Feb. 4 - 8	1	NONE	Wkshp 0 Feb 6, 7
Feb. 11 - 15	2	1. Acid/Base Titration with Computer Analysis	Wkshp 1 Feb 13, 14
Feb. 18 - 22	3	2. EDTA Titration of Ca^{+2} and Mg^{+2}	Wkshp 2 Feb 20, 21
Feb. 25 - Mar. 2	4	3. Cu by Ion Exchange Chromatography	Wkshp 3 Feb 27, 28
Mar 4 - 8	5	4. Iodometric Determination of Hypochlorite in Bleach	**Exam #1** **Mar. 6** Wkshp 4 Mar 6, 7
Mar. 11 - 15	6	5. Coulometry	Wkshp 5 Mar 13,14
Mar. 18 - 22	7	6. Spectroscopic Assay of Aspirin	Wkshp 6 Mar 20, 21
Mar. 23- 31	8	**SPRING BREAK – NO LAB 3 / 23 - 3 / 31**	- -
Apr. 1 - 5	9	7. Spectroscopic EDTA Titration of Cu	Wkshp 7 Apr. 3, 4
Apr. 8 - 12	10	8. Turbidimetric Analysis of Sulfate in River Water	**Exam #2** **Apr. 10** Wkshp 4 Apr. 10, 11
Apr. 15 - 19	11	9. Spectroscopic Determination of Fe	Wkshp 8 Apr 17, 18
Apr. 22 - 26	12	10. Two Component Spectroscopy	Wkshp 9 Apr 24, 25
Apr. 29 - May 3	13	11. Gas Chromatography	**Exam #3** **May 1** Wkshp 10 May 1, 2
May 6 - 10	14	NONE	Wkshp 11 May 8, 9
May 13 - 14	15	NONE	
		Updated: 1/19/13	

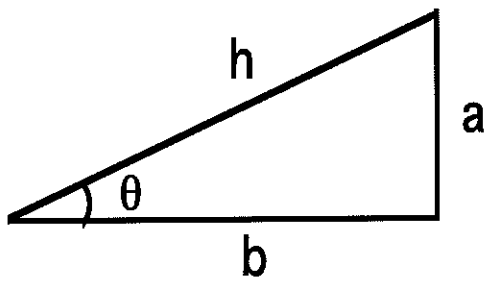
BASIC MATH FUNCTIONS

A. Exponents

1. $x^2 \bullet x^3 = x^{2+3} = x^5$
2. $x^5 \bullet y^5 = (xy)^5$
3. $x^3 \bullet y^4 = x^3 y^4 = y\left(x^3 y^3\right) = y(x\,y)^3$
4. $\left(x^2\right)^5 = x^{(2\bullet 5)} = x^{10}$
5. $\sqrt[3]{x^6} = \left(x^6\right)^{1/3} = x^{(6/3)} = x^2$
6. $\sqrt{x^6} = \left(x^6\right)^{1/2} = x^{(6/2)} = x^3$
7. $x^{-4} = \dfrac{1}{x^4}$
8. $\dfrac{x^5}{x^3} = x^{5-3} = x^2$

B. Logs

1. $\log 1000 = +3.0$ ⋮ $10^{+3} = 10^{\log 1000} = 1000$
2. $\ln 1000 = +6.91$ ⋮ $e^{+6.91} = e^{\ln 1000} = 1000$
3. $pH = -\log\left[H^+\right]$ ⋮ $\left[H^+\right] = 10^{-pH}$
4. $\log x^7 = 7 \bullet \log x$
5. $\ln x^6 = 6 \bullet \ln x$
6. $\ln x = 2.303 \log x$
7. $\log xy = \log x + \log y$
8. $\log \dfrac{y}{x} = \log y - \log x$
9. $\log (x+y) = \log (x+y)$



10. $\sin\theta = \dfrac{\text{opposite}}{\text{hypotenuse}} = \dfrac{a}{h} = \dfrac{1}{\sec\theta}$
11. $\cos\theta = \dfrac{\text{adjacent}}{\text{hypotenuse}} = \dfrac{b}{h} = \dfrac{1}{\csc\theta}$
12. $\tan\theta = \dfrac{\text{opposite}}{\text{adjacent}} = \dfrac{a}{b} = \dfrac{1}{\cot\theta} = \dfrac{\sin\theta}{\cos\theta} = \left(\dfrac{a}{h}\right)\left(\dfrac{h}{b}\right) = \dfrac{a}{b}$
13. $1 = \sin^2\theta + \cos^2\theta$

D. Mensuration:

1. $C = \pi d = 2\pi r$ ⋮ Circumference of circle
2. $A = \pi r^2 = \dfrac{\pi}{4} d^2$ ⋮ Area of circle
3. $A = 2\pi r L$ ⋮ Area of cylinder
4. $A = 4\pi r^2$ ⋮ Area of sphere
5. $A = \dfrac{1}{2} bh$ ⋮ Area of RIGHT triangle
6. $A = 6L^2$ ⋮ Area of cube
7. $V = L^3$ ⋮ Volume of cube
8. $V = \dfrac{4}{3}\pi r^3$ ⋮ Volume of sphere
9. $V = \pi r^2 L$ ⋮ Volume of cylinder

E. Quadratic Equation : $ax^2 + bx + c = 0$ ⋮ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Lab Schedule - S13

12/15/12

Lab Dates	Wk	Chem103 Experiment Subject	Chem104 Experiment Subject	Chem120 Experiment Subject
2/4 M - 2/9 Sa	1	**NO LAB**	**NO LAB**	**NO LAB**
2/11 M - 2/16 Sa	2	1) Lab Safety 1) Lab#1 Lab Techniques	1) Lab#23 - Anion Qualitative Analysis	1) Acid/Base Titration with Computer Analysis
2/18 M - 2/23 Sa	3	2) Lab # 2 - Density	2) Lab#25 - Cation I & III Analysis	2) EDTA Titration of Ca^{+2} and Mg^{+2}
2/25 M - 3/2 Sa	4	3) Lab #3 Physical & Chemical Properties	3) Lab#9 – Chemical Trends §13) Lab#12. Using Lewis Structures	3) Cu by Ion Exchange Chromatography
3/4 M - 3/9 Sa	5	4) Lab #10 Spectroscopy	4) Lab #8 – Gas Laws Volatile Liquids	4) Iodometric Determination of Hypochlorite in Bleach
3/11 M - 3/16 Sa	6	5) Lab#11. Lewis Structures	5) Lab #14 - Colligative Prop. **w/Comp Analy**	5) Coulometry
3/18 M - 3/23 Sa	7	6) Lab #6 Limiting Reagents	6) Lab #22 - Ester Synthesis	6) Spectroscopic Assay of Aspirin
3/24 Su - 3/31 Su	8	**** SPRING BREAK ****	**** SPRING BREAK ****	**** SPRING BREAK ****
4/1 M - 4/6 Sa	9	7) Lab #5 Properties of Hydrates	7) Lab #21 Chemical Kinetics	7) Spectroscopic EDTA Titration of Cu
4/8 M - 4/13 Sa	10	8) Lab # 27 Vita C Analy **with Computer Analysis**	8) Lab#16 - Determination of Equilibrium Constant **w/ Statistical Analysis**	8) Turbidimetric Analysis of Sulfate in River Water
4/15 M - 4/20 Sa	11	9) Lab #13 Types of Reactions	9) Lab #17 - LeChatelier's Principle	9) Spectroscopic Determination of Fe
4/22 M - 4/27 Sa	12	10) Lab #33 Detn of Solution Concentration **w / Statistical Analysis**	10) Lab #30 Acid/Base Titration **with Computer Analysis**	10) Two Component Spectroscopy
4/29 M - 5/4 Sa	13	11) Lab #19 Eq. Wt. **with Statistical Data Analysis**	11) Lab #18 Solubility Product **with Statistical Analysis**	11) Gas Chromatography
5/6 M - 5/11 Sa	14	12) Lab#15 Calorimetry **w/Computer Analysis**	12) Lab #26 Voltaic Cells	**NO LAB**
5/13 M - 5/14 T	15	Last Lecture 5/15 T	Last Lecture 5/15 T	Last Lecture 5/15 T
5/15 W	15	**Reading Day**	**Reading Day**	**Reading Day**
5/16 R - 5/23 R	15-16	**FINAL EXAMS 5/16 R - 5/23 R**	**FINAL EXAMS 5/16 R - 5/23 R**	**FINAL EXAMS 5/16 R - 5/23 R**

§13) Lab#12 Using Lewis Structures **DUE IN LAB**