General Chemistry I CHEM103 Fall 2011

Updated 9/4/11 .

COURSE DESCRIPTION: Matter, the changes matter undergoes and the laws governing these changes with greater emphasis on atomic and molecular structure, chemical bonding and energy relationships. Properties of gases, liquids, solids and solutions. Includes 42 hours of laboratory work. COREQ: MATH114 or higher.

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

• **Class Meets**

- Lecture 010 - Lab Sections 20L-31L, MWF, (1:25 pm to 2:15 pm in 140SMI) (KRAMER)
- Lecture 011 - Lab Sections 40L-39L, TR, (8:00 am to 9:15 am in 140SMI) (WINGRAVE)
- Lecture 012 - Lab Sections 60L-49L, MWF, (8:00 am to 8:50 am in 140SMI) (WINGRAVE)
- Lecture 013 - Lab Sections 90L-102L, MWF, (2:30 pm to 3:20 pm in 140SMI) (KRAMER)
- Workshop - ALL Sections: Thursday from 5:00 pm to 6:30 pm
  - (Workshop 0 on 9/1 in **115PRN**)

• **Required Course Supplies** (Available at University Bookstore)

• **Textbook**:	Tro, Chemistry, 2nd Ed., Pearson Prentice Hall, 2010. ISBN: 978-0-321-65178-5 (Copy in Chemistry Library, 201BRL)
• **CSB eHomework**	Buy account access online at: http://www.mhhe.com/csb. ISBN: 0073206415 / 9780073206417
• **Lab Manual**:	Laboratory Manual for General Chemistry, 3rd Ed., Kramer, Wingrave ISBN: 978-0-7380-3578-9
• **Lecture Manual:**	Chem103 Lecture Manual, Wingrave, 2011
• **Workshop and Activity Based PreLab Manual**	Chem103 Workshop Manual and Activity Based PreLabs, Wingrave & Kramer, 2011
• **i>clicker Device**	rf response key pad (a.k.a, "clicker")
• **Lab Protection**:	Safety Goggles ("ANSI" or "AS/NZS" on lenses) are **REQUIRED AT ALL TIMES IN THE LAB!** **Long Pants Shoes & Shirts with Sleeves Required.** **NO Shorts, Skirts, Sandals, Open Toed Shoes or Bare midriffs.**
• **Calculators**	**ONLY Non-Programmable, Non-Graphing Calculators used on exams - NO EXCEPTIONS.** Required functions; +, -, x, ÷, log, ln, x^y, trig - Cheap about $20

• **Office Hours**

- Location (204BRL); - Time **(T, W, R, F** 9:30 am -10:30 am : **W**, 11:00 am - noon)
- TA office hours - M, T, W, R – Schedule and room to be announced

• Laboratory

- Lab meets once a week. - First Lab meets Monday, September 12, 2011.
- Report to lab promptly each week in order to hear lab instruction presentation by TA.
- Due as you **ENTER** lab each week - **2 ITEMS**;
  - A Written Lab Procedure (An example lab procedure for Lab #1 can be found on the SAKAI course website.)
  - An MSDS analysis for two chemicals used in that week's lab.
- **START OF LAB;**
  - Lab Quiz given by TA (5 Multiple choice questions - Use ONLY Procedure).
- Due as you **LEAVE** lab each week - **3 ITEMS**; Pre-Lab Demo, Lab and Post Lab reports.
- **PRE LAB DEMOS (PLD)**; Demos done by TA then groups of 4 students complete PLD.
- Labs and make-up labs can only be done during the week scheduled **AND** with a lab pass. Plan ahead!!
- **Make-up Labs -** See Professor Wingrave (or Professor Kramer or Ms. Ayers-Alexander in 104BRL) for a lab pass.
- **Missed labs** will be either EXCUSED or UNEXCUSED.
  - A score of zero (0) will be recorded for an UNEXCUSED LAB (AND Pre-Lab).
  - No score will be recorded for an EXCUSED LAB.
  - An EXCUSED LAB requires an acceptable note given to TA from parent or doctor.
- **IMPORTANT** - Each Unexcused missed lab will lower your lab score.
  - Each missed lab that is EXCUSED will NOT affect your lab score.
  - An excessive number of missed labs (excused PLUS unexcused) will result in an incomplete grade for chem103F11.
- **Safety Goggles -** Must have either "ANSI" or "AS/NZS" on the lenses.
- **MSDS Link:** http://www.mallbaker.com/Americas/catalog/default.asp?searchfor=msds
- Lab is an inseparable part of chem103. Lab grade is part of your chem103 grade.
- **NOTE**: Excessive number of missed labs will result in an incomplete grade for chem103F11.

• Quizzes – In Lecture

- There will be "Clicker" quizzes given in lecture and your **i>clicker device (clicker) is REQUIRED FOR CREDIT.**
- Quizzes will be an open-book problem working session.
- All quizzes will be summed together for a total of 40 points over the course of the semester.
- If half or more of the quiz questions are answered correctly, a quiz grade of 40 will be earned.
- No make-ups & no credit earned if absent OR if i>clicker 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.

- **ChemSkill Builders (CSB) – Electronic Homework**

  - Purchase a CSB account online. Not available at bookstore.
  - Open CSB site by logging on to http://www.mhhe.com/csb.
  - IF: You had a chem103 CSB account in a previous semester (good for 12 months):
    - Log onto your old chem103 CSB account and click on "Account Information",
    - Fill in course (chem103f11), Professor (Wingrave) and lab section (040L, 051L, 060L, etc.) number then you're ready to LOGIN and start working problems.
  - IF: You do NOT have a chem103 CSB account:
    - Click on "Purchase ChemSkill Builder", and purchase a CSB account.
    - After purchasing a CSB account, open CSB site and click "New Student Registration".
    - Fill in course (chem103f11), Professor (Wingrave) and lab section (040L, 051L, 060L, etc.) number.
    - Create your own password and you're ready to LOGIN and start working problems.
  - Units are divided into sections, each section consisting of 10-20 problems, requiring ~2 hours.
  - Each section can be worked and reworked but **ONLY** highest section score will be recorded.
  - Computer will randomly change problems in each section each time a section is reworked.
  - **CSB SECTIONS ARE DUE AT EACH EXAM AND FINAL EXAM. FOR ASSIGNED SECTIONS**: See "Topics for Exams" on SAKAI website.

- **Workshops, Thursday 5:00-6:30 pm**

  - Workshops will be held each Thursday except exam weeks.
  - Workshop problems will be worked from the Workshop and Pre-Lab Manual.
  - Workshop problems are taken from old exams given by Profs. Kramer and Wingrave.
  - **First Workshop** - Workshop 0 in 115PRN on September 1.
  - **ALTERNATE-TIME WORKSHOPS** – Scheduled ONLY during Workshop 0.
  - A total of forty (40) points TOTAL for the whole semester are possible.
  - **WORKSHOP GRADE** – Based on group work. No credit for working by yourself OR working problems prior to Workshop.
  - **MAKEUP WORKSHOPS** – Only for EXCUSABLE absences.
    - Work all Workshop problems you missed prior to next Workshop.
    - Next Workshop show your Workshop Leader:
      1. the worked problems you missed and,
      2. a note from parent or doctor explaining why you missed the previous Workshop.
    - If work and note are satisfactory, Workshop leader will give you credit for the Workshop you missed.
  - DATES: See Schedule below ROOMS: To be announced

• **Web Resources**

- For chem103F11: Syllabus : Log on to your Sakai account
- For textbook: http://www.mhhe.com/

• **Academic Enrichment Center Group Tutoring Session**

- Location and Time - TBA

• **Exams**

- Three (3) in-class exams will be given. No make-up exams will be given.
- Missed exams will either be:
  - UNEXCUSED – An exam score of zero (0) will be recorded.
  - EXCUSED – Final exam score will replace an excused/missed exam(s). Requires a satisfactory note from parent or doctor to be given to professor.
- Lowest exam score will be replaced by final exam score. An EXCUSED exam score will be considered a "lowest exam score".
- Exams Cover: textbook, lecture, laboratory, CSB, i>clicker, Workshop & Lecture Manual material.

* Exam corrections must be made prior to next exam.

- You will need ONLY a pen/pencil and non-programmable calculator 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, calculator lids 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.
- Exams for regrading must be received by the professor before the subsequent exam.
- An exam regrade will constitute a regrade of the ENTIRE exam by the professor.
- 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. The makeup exam date(s) will be announced after the start of the semester.
- **MAKEUP FINAL EXAM DATE(S)** will be scheduled after the end of the semester and announced during the semester.
- **Makeup Final Exams** given by Reservation ONLY in, February, 2012. Contact Prof. Wingrave.
- An Excessive Number of MISSED LABS or a MISSED FINAL EXAM will result in a grade of "INCOMPLETE" for chem103F11.
- An "INCOMPLETE" grade in chem103F11 converts to a grade of "F" in February, 2012.

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- **Minimum requirements for obtaining a passing grade in CHEM-103F11 are:**
  - Successful completion of all eleven (11) laboratory experiments.
  - Successful completion of the final examination
  - Earning a total of at least 400 points on the "Grading Schedule" outlined below.
  - MISSED FINAL EXAM or Excessive Number of MISSED LABS (EXCUSED plus UNEXCUSED MISSED exams) will result in a grade of "INCOMPLETE" for chem103F11.
  - An "INCOMPLETE" grade in chem103F11 converts to a grade of "F" in February, 2012.

- **Tentative Grading Scheme**
  - **Three Examinations (3 x 120 points, 45 %)**
  - **Laboratory Grade (200 points, 25 %)**
  - **Final Examination (120 points, 15 %)**
  - **CSB eHomework (40 points, 5%)**
  - **Workshops (40 points, 5%)**
  - **Quizzes in Lecture (40 points, 5%)**
  - **Midterm Grade Will Be Estimated from Exam #1 Grade – ONLY – No Lab Grade !**
  - **If You Have No Exam #1 Score, Your Midterm Grade Will Be An "N".**

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

- **Other Resources**
  - Workshop sessions for problem help. (More information on following pages.)
  - End-of-chapter problems with red numbers have answers in back of textbook
  - Tutors (Private and Group) - For more info, see Mrs. Staib in BRL102 (831-2465)
  - Academic Enrichment Center
  - Student Solutions Manual for, Tro, Chemistry, 2nd Ed..
    (Copy in Chemistry Library, 201BRL)

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Tro	Lecture Topics & Number	CSB
1	0. Syllabus	**- -**
1	{1. Graphs, Scientific Notation, Precision, Accuracy, Significant Figures, Uncertainty, Balances, Measurement Units, Temperature, Density}	**1**
1	2. Dimensional Analysis, Statistical Data Analysis	**2**
2,3	{3. Sub-Atomic Particles, Atoms, Molecules, Ions, Periodic Table, The Mole}	**2**
3	4. Periodic Table. Inorganic Nomenclature, Balancing Chemical Equations	**3, 4.1-3**
3	5. % Composition, Empirical & Chemical Formulas, Limiting Reagents & Yields, Hydrates	**4.4-6**
20	6. Organic 1 Hydrocarbon Nomenclature and Isomers	**24.1,2,6**
20	7. Organic 2 Functional Groups & Common Names	**24.1,2,6**
20	8. Organic 3 Natural and Synthetic Polymer Nomenclature	**25.1,2**
4	9. Electrolyte Strength, Solubility, Net Ionic Equations, Molarity Calculations	**5.1-5**
4,12.5	10. Concentration Units & Conversions	**6.1-4**
4,15	11. Dilution, Neutralization & Strong Acids/Bases, pH	**18**
15, 16	12. Chemical Equilibrium, Weak A/B, K_{eq}, Salt Hydrolysis, Buffers & Titration	**17.1, 19.1-4**
7,8	13. Light, Spectroscopy, Quantum Mechanics, Atomic Orbitals, Electron Configuration, Electronegativity, Polarity	**9, 12.1**
9, 10	14. Lewis & VSEPR Structure, Formal Charge	**12**
6	15. Thermodynamics 2 – Calorimetry	**8**
13	16. Kinetics	**16.1-3,5**
17	17. Thermodynamics 1 - Thermodynamic Variables & Laws.	**21.1-4**
17	18. Thermodynamics 3 – Formation Property Calculations	**21.1-4**
Green	19. Environmental Chemistry	**22**
18	20. EleChem1 - Half Rxns, Redox Eqns, Ox#	**5.6, 10**
18	21. EleChem2-Volt. Cells, Nernst Eqn, Bnd Theo.	**6.5, 22**
	FINAL EXAM	

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• Lab and Workshop Schedule - CHEM103F11

Lab Dates	Week	Experiment Subject	Workshop/Exam
8/29 M	1	**Holiday**	
8/30 T - 9/3 Sa	1	**NO LAB**	**Workshop 0 9/2**
9/5 M	2	**Labor Day**	
9/6 T – 9/9 F	2	**NO LAB**	**Workshop 1 9/9**
9/12 M - 9/16 F	3 **(*)**	1) Lab Safety Lab # 2 - Density **(*) Lab #1 Lab Techniques**	**Workshop 2 9/16**
9/19 M - 9/23 F	4	2) Lab #3 Physical & Chem. Properties	**Workshop 3 9/23**
9/26 M - 9/30 F	5	3) Lab #5 Properties of Hydrates	**Workshop 4 9/30**
10/3 M – 10/7 F	6	4) Lab #6 Limiting Reagents	**Exam #1 10/6**
10/10 M – 10/14 F	7	5) Lab #32 Phosphates in Water w/Statistical Data Analysis	**Workshop 5 10/14**
10/17 M – 10/21 F	8	6) Lab # 27 Vitamin C Analysis w/Computer Analysis	**Workshop 6 10/21**
10/24 M – 10/28 F	9	7) Lab #13 Types of Reactions	**Workshop 7 10/28**
10/31 M – 11/4 F	10	8) Lab #19 Equivalent Weight w/Statistical Data Analysis	**Exam #2 11/3**
11/1 T	10	***** Election Day *****	
11/7 M – 11/11 F	11	9) Lab #10 Spectroscopy	**Workshop 8 11/11**
11/14 M – 11/18 F	12**(§)**	10) Lab#15 Calorimetry w/Computer Analysis **(§) Lab # 11 Lewis Structures**	**Workshop 9 11/18**
11/21 M – 11/22 T	13	**NO LAB**	**NO Workshop**
11/23 W – 11/27 Su	13	***** THANKSGIVING *****	**NO Workshop**
11/28 M – 12/2 F	14	**NO LAB**	**Exam #3 12/1**
12/5 M – 12/7 W	15	**NO LAB**	**NO Workshop**

(*) Lab #1 Lab Techniques, on Sakai. Lab #1 done outside of lab. (Due in Lab September 12-17)

(§) Lab # 11 Lewis Structures, Due in Lab this Week (Due in Lab November 14-19)

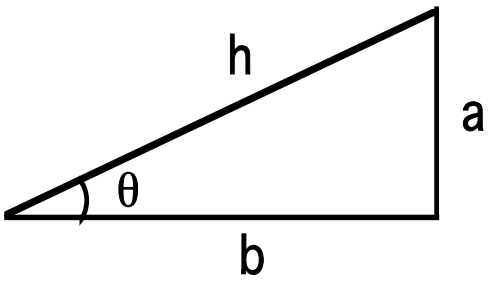
BASIC MATH FUNCTIONS

A. Exponents

1. $x^2 \cdot x^3 = x^{2+3} = x^5$
2. $x^5 \cdot y^5 = (xy)^5$
3. $x^3 \cdot y^4 = x^3\, y^4 = y\left(x^3\, y^3\right) = y(x\, y)^3$
4. $\left(x^2\right)^5 = x^{(2 \cdot 5)} = x^{10}$
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. $pH \equiv -\log\left[H^+\right]$ ⋮ $\left[H^+\right] = 10^{-pH}$
4. $\log x^7 = 7 \cdot \log x$
5. $\ln x^6 = 6 \cdot \ln x$
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 : $ax^2 + bx + c = 0$ ⋮ $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

• Learning Goals for Chemistry 103F11

(Numbers in parentheses indicate the departmental learning goals (http://www.udel.edu/chem/goals.html) with which each course goal is aligned.)

1. Describe key historical ideas and interpret/evaluate experimental evidence related to the atomic model of matter and the physical structure of atoms. (1)
2. Explain/apply the connection between electronic structure and periodic trends in the prediction/analysis of the physical and chemical behavior of elements and compounds. (1)
3. Assign/interpret names and formulas for ionic/binary compounds, know charges of common mono- and polyatomic ions, and use in balanced equations. (1)
4. Assign/interpret names and formulas for organic and polymeric compounds; use in balanced equations. (1)
5. Define/calculate/convert among different concentration units (1)
6. Recognize and apply fundamental stoichiometric relationships in analyzing and solving quantitative problems for both irreversible and equilibrium systems. (1)
7. Explain the characteristic features of a system at equilibrium, evaluate a system's status with respect to equilibrium, and interpret/predict/calculate effects of the perturbations. (1)
8. Explain the nature of and driving forces behind common reactions of aqueous ionic compounds; predict/rationalize products for same based on solubility rules and equilibrium constants; apply/synthesize ideas in qualitative analysis, unknown determinations and separation schemes. (1)
9. Describe/explain/apply key observations and concepts of quantum theory; explain/apply the electronic structures of a one-electron and multielectron atoms; describe the key features of photoelectron spectroscopy, explain its relationship to electronic structure. (1)
10. Write/analyze Lewis structures and explain/predict molecular geometries and polarities for covalent compounds; explain/apply valence bond theory in evaluating bonding in covalent molecules and extended solids. (1)
11. Identify species as acids or bases according to various classification systems, and predict/interpret their chemical behavior; predict/rationalize pK_a, pK_b values for compounds based on molecular structure and inductive, resonant and steric effects. (1)
12. Understand the concept of hydrolysis; use hydrolysis to understanding the behavior of salts in aqueous solutions; explore the application of hydrolysis to understand acid/base buffer behavior; calculate pH for salt hydrolysis and buffer behavior in aqueous solutions. (1)
13. Interpret/propose experiments and analyze kinetic data to determine reaction orders, rate laws, activation energies and mechanism. (1, 5)
14. Describe and apply fundamental relationships (both qualitative and quantitative) in thermodynamics to simple systems under well-defined conditions, with particular emphasis on energy transfer through heat and work, and changes in enthalpy, entropy and free energy. (1, 5)
15. The ability to use instrumentation for chemical analysis and characterization. (6)
16. Evaluation/description of MSDS for chemical safety and hygiene. (7)
17. Calculate/interpret statistical data analysis of experimental data. Perform/explain/calculate standard deviation and confidence intervals for replicate experimental data. (2,4)
18. Perform/explain statistical data rejection; discuss scientific ethics of data rejection. (9)
19. Work together with other students in discussing ideas, evaluating information and formulating solutions to problems. (8)
20. Communicate ideas clearly and effectively in written and oral formats. (10)
21. Find and evaluate sources and information needed in solving problems. (3)