

Chemistry 203

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Welcome to Chemistry 203 section FGH taught by Prof. J. Walker Fall 2012, [Truman College](#). If you are enrolled in this section please check this website frequently for announcements and new information. Section FGH meets Tuesday and Thursday from 8:35 a.m. to 12:20 a.m. in room 3170. Class begins Tuesday August 21st. I will hold office hours directly after class and by appointment. You may always reach me by email: jwalker@ccc.edu

Course Catalog Description

Topics include equilibrium, acid-base equilibria, solubility equilibria, kinetics, thermodynamics, electrochemistry, coordination compounds, nuclear chemistry and descriptive topics in organic chemistry. Writing assignments, as appropriate to the discipline, are part of the course.

Prerequisite: Grade of C or better in Chemistry 201 and in mathematics 140 or 143, or consent of department chair (CC).

Note: Chemistry 203 has an IAI code of CHM 912. You can learn more about IAI by visiting [iTransfer](#).

Instructor



Prof J. Walker
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Office Hours: Monday, Tuesday, Wednesday, Thursday afternoons (1:00 p.m. to 5:00 p.m.) by appointment. You may call (872) 216-1317 to leave messages.

I've been teaching at Truman College in Uptown, Chicago since 1982. Around the year 2000 I spent six years in administration, a valuable experience but ultimately not the path I wanted to follow. I have a master's degree in Chemistry from University of Illinois, Urbana-Champaign. I hold certificates in computer repair (A+), Certified Internet Webmaster (CIW), and Internet Security (CISSP). I have a variety of interests: Chemistry, Web Development, Physical Sciences (all of them), Urban Gardening, and Education. I continue to explore a variety of techniques in the classroom in a blended: high tech - high touch approach. Technology is a great tool for teaching but it does not take the place of tactile, hands-on learning that occurs when we make sometime for ourselves. I use [laboratory notebooks](#) or journals in most of my classes. I love to do demonstrations in class. What I recommend for every student is to remember what it felt like to have the curiosity of a child - and find that curiosity again! The world is truly amazing.

Truman College Mission Statement

"Our Mission dedicates us to deliver high-quality, innovative, affordable and accessible educational opportunities and services that prepare students for a rapidly changing and diverse global economy."

FERPA

FERPA (Family Educational Rights and Privacy Act) is a federal law that protects the privacy of student educational records: <http://www.ed.gov/policy/gen/guid/fpco/ferpa/index.html>. Faculty cannot reveal information about students, or discuss student records over the phone or unsecure e-mail. CCC student e-mail meets FERPA requirements.

Student Services

The [Student Services Department](#) provides a broad range of services to assist students in achieving their academic and life goals.

Students with Disabilities

The [Truman College Disability Access Center \(DAC\)](#) verifies needs pursuant to the American Disabilities Act (ADA), determines student academic accommodations, and issues accommodation letters. Phone number: (773) 907-4725. Linda Ford is the director.

Tutoring Center

The [tutoring center](#) is located in room 162, Larry McKeon Administrative Building, (773) 907-4785.

TRIO Student Support Services

[TRIO](#) is for low-income students, first generation college students, or students with disabilities who need academic support: Larry McKeon Administrative Building Room 162, (773) 907-4797. Registration is required at the start of each semester.

Student Success and Leadership Institute (SSLI)

[SSLI](#) is for students who need various other support services to achieve their educational goals: Larry McKeon Student Services Building Suite 162, (773) 907-4714

Wellness Center

The [Wellness Center](#) provides a variety of services at no cost for students including counseling, crisis intervention, support groups and more. (773) 907-4045, Room 177, McKeon Admin. Bldg.

Textbook*

General Chemistry 10th Ed.

by Petrucci, Herring, Madura, Bissonnette

Pearson ©2011

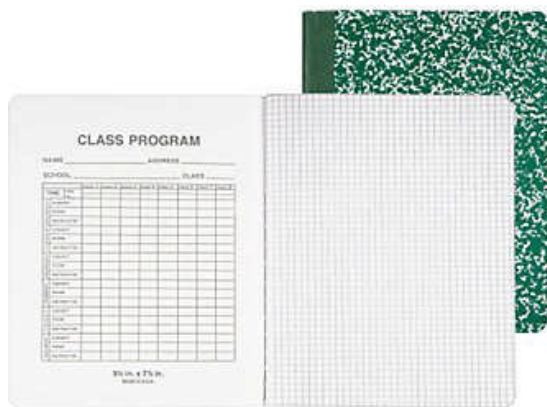
ISBN: 978-0-13-206452-1

Mastering Chemistry

*If you don't already have this textbook please note: we have created a paperback edition of Volume Two of our textbook for a considerably lower price. It begins with Chapter 14. You will find it in Beck's Bookstore.

All laboratories will be available to download from this website. There is no laboratory textbook to purchase.

Laboratory Notebook



No specific brand is required but the pages **MUST BE BOUND**. Examples will be shown in class. Spiral notebooks may **NOT** be used.

Calculator

You will need a scientific calculator (includes log and trig functions) and should bring it with you to class.

Recommended Links

Mathematics

[The Purplemath Forums](#) Helping students gain understanding and self-confidence in algebra
[Online Graphing Calculator](#)

Kinetics

[Virtual Chemistry Experiments: Chemical Kinetics](#)

[Kinetics plots](#): Using this applet you can enter data and quickly test different types of plots for zero, first and second order kinetics.

[University of Cambridge: Kinetics of Chemical Reactions](#) 51 pages of explanations on chemical kinetics.

[Simulator for half-life decay](#)

[Simulation of Collision Orientation](#)

[More Chemistry Animations](#)

Acid-Base Chemistry

[A Java Applet That Performs the Arrhenius Calculation](#)

Complex Ions

[Complex Ions](#)

Nuclear Chemistry

[National Nuclear Data Center](#)

[The Live Chart of Nuclides](#)

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Syllabus

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[View Laboratories Only](#)

COURSE OUTLINE - SUBJECT TO CHANGE

Day	Date	Topic	Text Reference Petrucchi
Tues	8-21	Lecture: Course Introduction, Main Group Elements: Alkali Metals	Chapter 21
Thurs	8-23	Lecture: Main Group Elements: Alkaline Earth Metals, Boron Family, Carbon Family	Chapters 21
Tues	8-28	Lecture: Main Group Elements: Noble Gases, Halogens, Oxygen Family, Nitrogen Family, Hydrogen Lecture: Chemical Kinetics: Reaction Rates, Effect of Concentration, Zero-Order Reactions	Chapter 22 Chapter 14
Thurs	8-30	Lecture: Chemical Kinetics: First-Order and Second-Order Reactions LAB: Check-In, Reaction Rates and Activation Energy	Chapter 14 Download pdf
Tues	9-4	Lecture: Chemical Kinetics - Models, Effect of Temperature, Reaction Mechanisms, Catalysis	Chapter 14
Thurs	9-6	Exam One: Chem One Review, Main Group Elements, Chemical Kinetics Chemical Equilibrium; Dynamic Equilibrium, The Equilibrium Constant, The Reaction Quotient, Le Châtelier's Principle	Chapter 15
Tues	9-11	Lecture: Equilibrium; Reaction Conditions LAB: Chemical Equilibrium - Le Châtelier's Principle	Chapter 15 Download pdf
Thurs	9-13	Lecture: Acids and Bases	Chapter 16
Tues	9-18	Lecture: Acids and Bases LAB: Determination of Equilibrium Constant by Spectrophotometry	Chapter 17 Download pdf
Thurs	9-20	Lecture: Solubility	Chapter 18
Tues	9-25	Lecture: Acid/Base Equilibria LAB: Properties of Buffers	Chapter 17 Download pdf
Thurs	9-27	Lecture: Acid/Base Equilibria	Chapter 17
Tues	10-2	Problem Solving: Acid/Base Equilibria and Titrations	
Thurs	10-4	Exam Two: Chemical Equilibria, Acids and Bases, Titrations	
Tues	10-9	Lecture: Solubility Products	Chapter 18
Thurs	10-11	Problem Solving: Solubility Products LAB: Measuring the Solubility Product of Silver Chromate	Chapter 18 Download pdf
Tues	10-16	Lecture: Thermodynamics	Chapter 19
Thurs	10-18	LAB: Determination of the Thermodynamic Parameters for the Solvation of Borax Lab Notebook and First Lab Report is Due!	Download pdf
Tues	10-23	Lecture: Electrochemistry	Chapter 20
Thurs	10-25	Lecture: Electrochemistry	Chapter 20
Tues	10-30	Problem Solving Practice LAB: Electrochemistry	Download pdf
Thurs	11-1	Exam Three: Thermodynamics and Electrochemistry	
Tues	11-6	Lecture: The Transition Elements	Chapter 23
Thurs	11-8	Lecture: Coordination Compounds	Chapter 24
Tues	11-13	Lecture: Nuclear Chemistry	Chapter 25
Thurs	11-15	Problem Solving Practice LAB: Coordination Compounds	Download pdf

Tues	11-20	Exam Four: Transition Elements, Coordination Compounds, Nuclear Chemistry	
Thurs	11-22	Thanksgiving Holiday - No Class	
Tues	11-27	Course Review Lab Notebook and Second Lab Report is Due!	
Thurs	11-29	LAB: Check Out and Clean Up ALL ASSIGNMENTS ARE DUE	
Tues	12-4	Comprehensive Final Exam	Chapters 14 to 25
Thurs	12-6	Student Conferences	

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Objectives and Outcomes

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Student Learning Outcomes for Chemistry 203

At the completion of this course, the successful student will be able to:

- Compare and contrast the chemical behavior and reactions of common substances.
- Collect quantitative data and organize it into meaningful charts and graphs.
- Discuss industrial processes for manufacture of major inorganic chemicals.
- Solve kinetic and equilibrium problems.
- Analyze experimental data and draw appropriate conclusions from data and chemistry theories.
- Write a formal laboratory report.

Course Objectives for Chemstiry 203

At the completion of this course, the successful student will be able to do the following:

Redox Reactions

1. (R) Determine the oxidation state of each atom in a compound.
2. Balance Redox reactions in acidic and basic solutions.

Chemical Kinetics

3. Define the two types of rate laws: differential and integrated.
4. Distinguish between a first-order reaction and a second-order reaction.
5. Give an example of a reaction mechanism.
6. Discuss the effect of a catalyst on a chemical reaction.
7. State the Arrhenius equation and use it to solve problems.
8. Discuss the collision model of chemical reactions and how various factors such as temperature can affect reaction rate.

Chemical Equilibrium

9. Define chemical equilibrium.
10. Calculate the equilibrium constant from concentration data.
11. Define and discuss Le Châtelier's Principle
12. Solve a variety of chemical equilibrium problems

Acids and Bases

13. State the definition of an Arrhenius acid, a Brønsted-Lowrey acid and a Lewis acid.
14. Solve problems using ionization constants, concentrations and pH or pOH for weak acids and weak bases.
15. Plot titration curves and label the midpoint, the buffer region and the equivalence point. Identify major species present for any point along the curve.
16. Give the conjugate base for any acid or the conjugate acid for any base.
17. Use the K_a to determine the strength of an acid or base.
18. Calculate pH and pOH.
19. Calculate percent dissociation of a weak acid.
20. Give examples of household products that are acidic or basic.
21. Define polyprotic acid.
22. Write chemical reactions for acids and bases.
23. Describe the preparation of a buffer.
24. Describe the use of acid-base indicators.
25. Discuss the common ion effect as it relates to acids and bases in solution.

Solubility

26. Use the solubility product to solve for ion concentrations in solution.
27. Determine ion concentrations when a common ion is present.
28. Describe a classic scheme for qualitative analysis of metal ions.
29. Define complex ion
30. Discuss the effect of complex ions on solubility.

Free Energy, Entropy and Thermodynamics

31. Apply Hess' Law to Thermodynamic Problems
32. Apply Gibbs-Helmholtz equation to the solution of problems.
33. Discuss spontaneous chemical reactions.
34. Discuss entropy and the Second Law of Thermodynamics
35. Discuss the effect of temperature on spontaneity of a chemical reaction
36. Define free energy.
37. Relate free energy and equilibrium.

Electrochemistry

38. Draw a galvanic cell.
39. Identify the anode and cathode of a galvanic cell.
40. Write half reactions for galvanic cells.
41. Calculate EMF for galvanic cells.
42. Describe the structure and functioning of a lead acid battery.
43. Discuss the electrolysis of water.
44. Use the Nernst equation.

Coordination Compounds

45. Predict the physical properties, geometry and hybridization of coordination compounds.

Nuclear Chemistry

46. Describe the structure of the nucleus.
47. Define alpha and beta particles and gamma radiation.
48. Use isotopic notation to write a nuclear reaction.
49. Discuss the kinetics of radioactive decay and the meaning of half-life.
50. Discuss the detection of radiation.
51. Discuss radioactive dating.
52. Give examples of medical applications of nuclear chemistry.
53. Differentiate between nuclear fusion and nuclear fission.
54. Discuss the health effects of radiation.
55. Define rems and rads.

General

56. Maintain a detailed laboratory notebook.
57. Write professional laboratory reports.
58. Discuss applications of these chemistry topics to the world at large.

Teaching and Learning Goals Established by Truman College

Taking a course in Chemistry helps a student achieve all of the following general education goals. How this occurs is explained below.

- Communicate effectively in both written and oral forms
Students will keep a laboratory notebook and learn to record careful observations, draw appropriate conclusions and reflect on what they have learned.
- Gather, interpret and analyze data
Students will learn to collect data in the laboratory, create graphs, compare quantitative data and draw conclusions about the data obtained.

- Demonstrate the ability to think critically, abstractly and logically
The Scientific Method is predicated upon deductive and inductive logical reasoning. Students will study applications of the scientific method to information gathered by the scientific community. Students will read articles about chemical discoveries. Abstract thinking is developed in many ways in chemistry from the use of symbols and models to the use of mathematics to solve a variety of problems.
- Work with a variety of technologies
Students use computers, data acquisition equipment, microscopes, digital imaging devices, media, the Internet, podcasts, digital balances, all in the pursuit of scientific knowledge.
- Exhibit social and ethical responsibility
This very serious goal is addressed on many levels in the chemistry course, from the discussion of the importance of careful and precise measurements that could affect the life of a patient to the discussion of what happened when the space ship Challenger exploded or a grain elevator explodes - we examine the role of responsible use of chemical knowledge.
- Perform productively in the workforce
Because Chemistry education is comprehensive in utilizing the body (kinesiology), the mind (both spatial and analytical reasoning) and the heart (looking at the connection of chemistry to the world) it is an excellent course to prepare individuals for the workforce.
- Demonstrate the ability to learn independently
Students are given independent projects to complete in the course. They are also given questions to research independently. Reporting these results to the class develops their ability to speak confidently to their peers.
- Gain awareness of their role in the global community
By discussing the way that chemistry is connected to other occupations and careers we develop student awareness about their career choice and its dependencies on a basic understanding of chemistry.

General Education Goals Established by Truman College

- **GEG1:** The student exhibits social and ethical responsibility and is aware of her or his place in the global community.
- **GEG2:** The student performs effectively in the workplace and has the ability to work and make effective use of a wide variety of current technologies.
- **GEG3:** The student communicates effectively in both written and oral formats.
- **GEG4:** The student demonstrates the ability to think critically, abstractly, and logically.
- **GEG5:** The student gathers, interprets and analyzes data.

Physical Science and Engineering Departmental Learning Outcomes

Upon graduation with an Associate degree from Truman College a student should be able to:

- Organize, analyze and interpret information and use the scientific method to make inferences.
- Exhibit knowledge of scientific concepts through written and oral communication.
- Demonstrate excellent laboratory skills and techniques including the proper use of relevant instruments and related technologies.
- Use the lexicon of science to explain abstract scientific concepts.
- Relate concepts learned in Physical Science and Engineering Department classes to real world situations.

Chemistry 203 Grading Policy

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Your Grade will be based on:

- laboratory notebook (10%)
- two laboratory formal reports (10%)
- laboratory results (10%)
- examinations [best three of four] (30%)
- homework, class activities, class participation and attendance (20%)
- comprehensive final exam (20%)

GRADING SCALE	
Letter Grade	Percentage
A	90%
B	80%
C	70%
D	60%
F	below 60%
I	*Incomplete
ADW	**Administrative Withdrawal
NSW	***No Show Withdrawal

***I (Incomplete)** is a non-grade received by students who have **actively pursued** the course and are doing passing work at the end of the course, but who have not completed the course's final examination and/or other specific course assignments.

****ADW (Administrative Withdrawal)** is given to any student who is not **actively pursuing** the course objectives will be administratively withdrawn from the course at mid-term. An ADW will be given if a student does not complete at least 70% of all assignments; homework, exams, laboratories, quizzes due prior to mid-term by the mid-term date. Since make up work is NOT permitted this means that attendance is extremely important and excessive absences will most likely result in an ADW.

*****NSW (No Show Withdrawal)** is given to any student who misses the first two classes and does not discuss with me the circumstances of these absences will be given an NSW after the second class. A student who attends the first class and then fails to attend the next two classes and fails to discuss

with me the circumstances of these absences will be given an NSW. Any student who misses more than half of the classes in the first two weeks of the term will also be given an NSW if we do not discuss the circumstances of these absences. In my discussion with you I will determine if it is feasible for you to successfully pursue the course objectives under whatever circumstances are causing you to miss class. Your success is very important to me and I know, from years of experience, that your success depends on your commitment and ability to attend the class and participate in all activities.

Active Pursuit

Active Pursuit is defined as consistent attendance, communication with the instructor in person or by email about any absences, completion of assignments on time, communication with the instructor about any difficulties completing assignments on time, participating in class, taking quizzes and exams and performing laboratory experiments as assigned. Any student who misses two consecutive classes is at risk for being considered as not actively pursuing the class. The best strategy to handle any unforeseen circumstances is to communicate as soon as possible with the instructor.

Make-Up Policy

Make-Up work is not permitted under any circumstances. This includes but is not limited to hospitalization, deaths in the family, illness, family emergencies. Life happens to everyone. This is why the lowest exam and one laboratory session are dropped from your grade with no penalties. If circumstances arise that prevent you from actively participating in all aspects of this course please let me know. There is no substitute for attending classes regularly and on time. Please choose someone else in the class that will be able to exchange notes with you in the event either of you misses class. You are responsible for all missed announcements, assignments and class work. Please do not use the phrase "I didn't know" to excuse any missed work. Check the website often. Announcements and assignments are posted and updated regularly.

Success in the Laboratory

Preparation: The moment lab begins is **not** an ideal time to begin to read a laboratory. You need to read the laboratory ahead of time and look up the meaning of any unfamiliar vocabulary.

Lab Reports: Laboratory reports are formal writing assignments and need to be taken seriously. You are expected to turn laboratory reports in on time, with all questions answered clearly and legibly and all pages neatly stapled (not folded or mutilated) together. Points will be deducted for late reports, messy reports, incomplete sentences and poor grammar/spelling, handwriting that is difficult to read. Points will also be deducted for errors in content.

Methods of Assessment

During the first week of class students are given a knowledge probe assessment to determine how well they are prepared to take the course and their current knowledge of major course concepts. Throughout the course students will participate in a variety of assessment activities, quick questions on index cards, problem recognition tasks, opinion polls, skill drills, and common misconceptions assessment.

Academic Integrity

There will be no tolerance for violations of academic integrity (e.g. plagiarism, cheating of any kind). Any violation will result in an "F" for the course.

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