

General Chemistry 2 (CHEM 1312) Spring 2012 NRG
Professor Arthur L Meyer
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Office Hours (NRG) M,W 750-1020a // (SAC) T,TH by appointment
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COURSE DESCRIPTION

Covers the fundamental facts, laws, principles, theories, and concepts of chemistry necessary for further work in science or science-related subjects. Stresses kinetics, thermodynamics, and equilibria. Nuclear chemistry and electrochemistry with additional topics as time permits.

PREREQUISITES

General Chemistry 1 (CHEM 1311 or the equivalent) with a minimum passing grade of "C"

General Chemistry 1 laboratory

College Algebra

TEXTS/ REQUIRED MATERIALS

Departmental: Chemistry, *The Molecular Nature of Matter and Change*. 6th ed. Silberberg. McGraw Hill 2011.

In addition to the departmental text, there are excellent used textbooks on the market, including

Chemistry, *The Central Science*, Brown, LeMay, et. al. Pearson/Prentice Hall Publishing, 2009.

General Chemistry, Whitten, Davis, et. al., Eighth Edition, Saunders College Publishing, 2007

Calculator- scientific type **NOTE: NO Cell Phone or Internet Calculators**

Homework Notebook- separate from your lecture notebook.

INSTRUCTIONAL METHODOLOGY

Lectures will be presented in PowerPoint format. Class Handouts are posted on the website and are to be printed out in advance of lectures. They contain all of the PowerPoint slides with some of the details and notes missing ... for you to fill in. All in-class practice problems are contained in the Class Handouts.

CLASS PARTICIPATION Students are expected to work all problems on quizzes and exams as done in class, showing class participation. Points will be deducted if a different method is used.

HOMEWORK- Homework assignments are found on the website

Homework is to be kept in a spiral notebook and is to be turned in at the end of the semester, on the day of the final exam. Bring your homework notebook to my office when seeking help during office hours. See section on how to keep your notebook.

COURSE EVALUATION/GRADING SCHEME

A=90-100 B=80-89 C=70-79 D=60-69 F<60

3 Mid-term Quizzes = 70%; Final Exam = 25%; Homework = 5%

COURSE POLICIES

- There are no make-up or retest quizzes or exams given
- One quiz grade may be replaced by the grade on the final exam.
- The final exam will be comprehensive, covering all chapters (including reading assignments)
- Failure to take the final exam will result in a grade of "F" assigned for the course.
- Attendance is required (the student is responsible for all announcements made in class.)
- No recording devices allowed, except for documented special needs students
- Shut off all cell phones, beepers, watch chimes. Repeated offenses will have points deducted

COURSE RATIONALE

This course covers the fundamental facts, laws, principles, theories and concepts of chemistry necessary for further work in science or science-related subjects.

COMMON COURSE OBJECTIVES

See <http://www3.austincc.edu/catalog/descchem.htm>

Statement on Scholastic Dishonesty- See Student Handbook/College Catalog-latest edition

Statement on Students with Disabilities- See Student Handbook/College Catalog -latest edition

Statement on Academic Freedom- See Student Handbook/College Catalog -latest edition

Student Discipline Policy- See Student Handbook/College Catalog -latest edition

COURSE OUTLINE and Reading List

Topic

- Kinetics- reaction rates- appearance of products, disappearance of reactants, general relationships
rate law expressions, order of reactants
method of initial rates-rate equations from experimental data, rate constants
concentration vs. time, integrated rate equations 0, 1st and 2nd order, half life
graphical considerations- instantaneous rates, rate constants, activation energy
energy diagrams, activation energy, transition states
Arrhenius equation-temperature dependence on rate constants
reaction mechanisms- how a reaction proceeds
- Thermodynamics- endothermic and exothermic reactions
energy diagrams
1st Law of Thermodynamics
state functions
standard Enthalpies of Formation, calculating ΔH_r° from tables
Hess' Law
bond energies and ΔH_r
entropy and spontaneity- the 2nd Law of Thermodynamics
the 3rd Law of Thermodynamics, calculations of ΔS
 ΔG - free energy and spontaneous reactions and events
- General Equilibrium- reversible reactions, graphical analysis
general expression K_{eq} , K_c and K_p
relationship between K_p and K_c
heterogeneous equilibria
 K - function of coefficients and reversed equations
calculating equilibrium constants
Q vs. K- is the system at equilibrium?
equilibrium concentration calculations
Le Chatelier's Principle
temperature dependence of equilibrium constants- van't Hoff equation
 ΔG and equilibria
- Ionic Equilibria
Acid/Base Equilibria- acid/base definitions
measuring acidity-pH,pOH, K_w
weak acids and bases-ionization, K_a , K_b
calculations involving weak acids and bases
% ionization
polyprotic acids
conjugates of weak acids and bases- hydrolysis reactions and problems
buffer solutions
- Solubility Equilibria- K_{sp} expressions
calculations involving (molar) solubility and K_{sp}
common ion effect
double displacement reaction and precipitates
fractional precipitation
pH and solubility

Electrochemistry-	balancing redox equations batteries and cells- definitions electrolytic cells and reactions at cathode and anode coulometry- Faraday's Laws and calculations Voltaic and Galvanic cells- cell design half reactions and standard reduction potentials, calculating E° for $E^\circ_{1/2}$ non-standard conditions-Nernst equation concentration cells disproportionation ΔG , K_{eq} and E relationship practical applications
Nuclear Chemistry-	history, comparison with ordinary chemical reactions structure of the atom and nucleus nuclear stability- n/p ratio binding energy and mass defect- calculation and plot radioactive decay- natural radioactivity and emissions reducing and increasing n/p ratios kinetics of nuclear decay and half-life- calculations artificial transmutation, chain reactions bombs and nuclear power plants- how they work

Additional assignments may be announced in class, as time permits

Homework Notebook

Your homework notebook must be in the following format:

1. The notebook must be bound- spiral or composition (no loose leaf notebooks or 3 ring binders!)
2. All pages are to be numbered consecutively (no torn out pages, no additional pages).
3. Each page should be dated and the chapter being worked, indicated.

Hint: I should be able to open your homework notebook to any page and know what chapter the homework is from and the date you worked on the assignment.

Examination Schedule

All quizzes and final examination are given in class, on the following dates, subject to change.

Quiz 1 February 22

Quiz 2 March 28

Quiz 3 April 25

Final Exam May 9