INDIANA UNIVERSITY

Fall 2016

CHEM-C 106 Principals of Chemistry II

CHEM-C 126 Experimental Chemistry Laboratory II

Whiteland Community High School

Credits	C106: 3 cr C126: 2 cr	**College of Arts and Sciences Education**	Natural & Mathematical Sciences N&M
Instructor	Kate Smola	**Office**	B207
Email	ksmola@cpcsc.k12.in.us	**Office Hours**	Mon & Fri GI; 7:15-7:30
Meeting Times	Daily	**Meeting Location**	B207
Prerequisite(s)	IU credit in C105/C125	**Lab fees**	Included in book rental
Course Descriptions	C106: Must be taken concurrently with C126. Chemical equilibria, with emphasis on acids, bases, solubility, and electrochemistry, elementary thermodynamics, chemical kinetics, and selected topics in descriptive chemistry. Credit given for only one of the following: C106 or C102 or S106. C126: A continuation of C125 with emphasis on equilibria, qualitative analysis, acids and bases, oxidation reduction including electrochemistry, chemical kinetics, and synthesis. Credit given for only one of the following: C126, C122, or S126.		
Core Transfer Library Course	Yes, part of CTL Name: Chemistry 1 & 2 w/lab (2 course sequence), General		
Textbook Title & Author	Chemistry 8th edition, by Zumdahl, Steven S. and Susan A Zumdahl. Publisher: Brooks Cole, 2012 Cracking the AP Chemistry Exam, 2015 Edition Mead Graph Composition Book, Square Deal, Black Marble, 7.5 x 9.75 Inches		
Learning Objectives	• Know the kinetic molecular theory, and be able to solve problems using the ideal gas equation. • Understand intermolecular forces between matter and be able to understand phase diagrams. • Understand the energetics of solvation and properties of solutions, as well as factors affecting solubility. • Understand the kinetics of chemical reactions. • Understand and be able to solve problems involving chemical equilibria including those involving acid-base chemistry and solubility equilibria, and be able to relate these to the thermodynamic properties of the reactants and products. • Understand and be able to understand the chemistry associated with voltaic and electrolytic cells.		

Important Deadlines	**Registration ends:** Friday, August 26, 2016 **Drop**: Friday, August 26, 2016 (Self-drop online) **Automatic Withdrawal** (for any reason): Friday, October 21, 2016 **Late Withdrawal (**must be passing and must petition IU for approval): one week before IU final exam

How IU Grade will be Calculated	**C106 Principles of Chemistry I (3 credits)** 75% Exams and Quizzes 10% Homework 15% Final Exam (provided by IU)	**C126 Experimental Chemistry Lab I (2 credits)** Lab write-ups
	IU grades are not weighed by IU. There will be 10-12 lab experiments of varying lengths and complexity. Students enrolled in C106 will take their final exam at the end of the school year in May. Student's IU-ACP grade will only reflect those topics covered in the C106 course syllabus.	
How High School Grade will be Calculated	**AP Chemistry** 70% Exams and Quizzes 20% Lab write-ups (at least one formal/project) 10% Homework AP Chemistry is a 1.0 weight on a 4.0 point scale. At the end of this course, students are encouraged to take the AP Chemistry Exam which will determined whether the material has been mastered well enough to be granted college credit. Quizzes and exams are patterned after the AP Chemistry Exam. Final semester grades are determined by considering each nine-week grade as 40% and the final exam grade as 20%.	
IU Grading Scale	Suggested	
	A+: 98-100%	C+: 77-79.9%
	A: 93-97.9%	C: 73-76.9%
	A-: 90-92.9%	C-: 70-72.9%
	B+: 87-89.9%	D+: 67-69.9%
	B: 83-86.9%	D: 63-66.9%
	B-: 80-82.9%	D-: 60-62.9%
High School Grading Scale	Your high school scale. Example	
	A: 93-100%	C: 73-76%
	A-: 90-92%	C-: 70-72%
	B+: 87-89%	D+: 67-69%
	B: 83-86%	D: 63-66%
	B-: 80-82%	D-: 60-62%
	C+: 77-79%	F: 59% & below

Schedule of Assignments

Semester 1:

Timeline	Title and Topics	Lab(s) involved:
1 ½ week + summer HW	**Unit 1: Chemical Foundations:** Mole, nomenclature (& alkanes), balancing, stoichiometry: limiting reactants and percent yield, empirical and molecular formulas, mass spectrometry, isotopes	Decomposition of Sodium Chlorate (F Target Stoich Lab (Flinn)
2 weeks	**(mini) Unit 2: Reactions** Beer's Law, net ionic equations, solution composition, conductivity, molarity	Properties of Cu Lab (BSU101) Spec20/Beer's Law **Inquiry** Lab (CB) – Target Lab: Soln making of $CuSO_4 \cdot 5H$
4 weeks	**Unit 3: Thermochemistry and Thermodynamics** First law of thermodynamics (heat/work), enthalpy, calorimetry, Hess's law, standard enthalpies of formation, bond energy (distance/internuclear separation), entropy, Gibb's free energy, "3 Golden Ideas" linked	Enthalpy of a Reaction via Calorimetr Parts I and II Hand Warmer **Inquiry** Lab (CB) Labette : Guppy Activity (JD)
2 weeks	**Fall Break: Gases NMSI Unit** ideal gas law, ideal versus real gas law, kinetic molecular theory, mole fraction, Dalton's law of partial pressures, Graham's law of diffusion, temperature and root mean square velocity,	Podcasts & WB lessons Gas Law Target Lab (Becker, Flinn)
3 weeks	**Unit 4: Chemical Kinetics** Reaction rates, rate law, including rate constant and reactant orders, differential versus integrated rate law, half-life, reaction mechanisms, including molecularity (elementary steps), collision theory, including effective collisions and activation energy, reaction coordinates, Arrhenius equation, catalysis, Maxwell-Boltz for temperature	Micro-Mole Lab Crystal Violet Rate **Inquiry** Law (CB) Kinetics of Bleach & candle (JB)
3 weeks	**Unit 5: Intro to General Equilibrium and Solubility Equilibrium** Characteristics of equilibrium, *K*, the equilibrium constant: K_p, K_c, Le Chatelier's principle, equilibrium quotient, Equilibrium(K_{sp}), selective precipitation, and qualitative analysis	Exploring Eq: It works both ways (Flin Le Chatelier's **Inquiry** Lab (CB) or (Ca
3 weeks	**Unit 6: Electrochemistry** oxidation states, balancing redox reactions, voltaic/galvanic cells, equilibrium constant (Nernst equation) electrolysis, conductivity/dissociation, Coulomb's Law	Conductivity Review Lab Aluminum Air Battery Lab (U of L) H_2O_2 titration lab (Flinn/CB)
	Finals Week	
2 weeks	**Winter HW Assignment:** Intro to Acid-Base Properties (1st yr material)	

Semester 2:

Timeline	Topic	Lab(s) involved:
4 weeks	**Unit 7: Acid/Base/Buffer Equilibrium** Relative strengths of acids and bases, pH, pOH, $[H_3O^+]$, and $[OH^-]$, K_w,, K_a, K_b, Percent dissociation, including the effect of concentration, Polyprotic acids, including stepwise dissociation, Hydrolysis: acid-base characteristics of salts, Molecular structure and acid-base properties, Anhydrides: oxides that affect pH, Lewis acid-base model, Common ion effect, Buffers: K_w,, K_a, K_b, Titration curves	Titration-titration Lab: vinegar acid (N How weak is your acid lab? (NMSI) Acids,Bases,Buffers Lab (UofL)
4 weeks	**Unit 8: Atomic Structure, Periodicity, Bonding** Electromagnetic radiation and the relationships among wavelength, frequency, speed, and energy, the hydrogen spectrum and Bohr's model, quantum mechanical model of electron position and electron spin, PES & spectroscopy (UV-vis & IR) linking the quantum mechanical model, periodic trends and electron configuration, bond length, bond strength, bond multiplicity, electronegativity, polarity of bonds and molecules, polarizability, electron configuration of ions, ionic radius, Lewis structures and resonance (organic arrow formalism), VSEPR model, hybridization of orbitals (sp, sp^2, sp^3 only), sigma and pi bonds	Chromatography (Flinn) & paper V-SEPR Models (Flinn/BSU) Molecular Sim modeling (PhET)
3 weeks	**Unit 9/10/11: IMFs, Gases, and Solutions** Comparison of the condensed states of matter, liquids, and solids, IMFs, characteristics	Isolating the Components of a Three- Mixture (BSU)

		of liquids in relation to intermolecular forces (bp, surface tension, cap action, vp), Coulomb's Law, bonding and types of component parts in crystalline solids, phase change as an equilibrium between two phases, heating-cooling curve, miscible, homoegeneous/heterogeneous, energetics of solution formation	Molar Volume of a Gas (Flinn) Solid Bonding Lab (Flinn)
	4 weeks	**AP Chemistry Review: AP Exam on Mon, May 2nd** Review Study Plans "5 steps to 5" and Princeton review	Qualitative Analysis of Unknown Mix (Flinn) Reactions Lab (Flinn)
	3 weeks	**Unit 12: Additional IU-ACP info: (not tested on the AP Exam)** 12.1 Combustion analysis 12.2 Organic functional groups 12.3 Lewis acids and bases 12.4 Quantum numbers, blackbody radiation 12.5 Magnetic properties of atoms 12.6 Exceptions to the Octet 12.7 Formal Charge 12.8 Unit cells 12.9 Phase Diagrams	Esterification (BSU) Synthesis of Aspirin (BSU)
		Finals week	
Classroom Policies & Information	IU CHEM 105/125 and CHEM 106/126 are taught concurrently with Advanced Placement Chemistry. All students are expected to take the AP Chemistry exam upon completion of the course. This course will mirror the college experience wherever possible, requiring students to put forth a significant amount of academic effort outside of class in order to be successful. We will cover material at a fast pace, and you will be expected to keep up with the lab work and homework assignments. Successful students take responsibility for their own learning, and have the time necessary to devote to the course. Questions, study groups, and extra help sessions are encouraged. Check Google Classroom for information, assignments, study aids, power points, etc. Students may use scientific calculators on exams, except in the multiple choice sections. Calculators may not have wifi capability.	
Attendance Policy	All class attendance policies follow WCHS's attendance policy: "It is the student's responsibility to make arrangements with his/her teachers on the day of his/her return to school to make up missed assignments. Teaches are required to give students a minimum of the number of days that they were absent to make up the work that was missed. However, assignments, including tests, which were assigned prior to the absence and were due on or before the day the student returns, will be due on the date the student returns to school. If a review day is part of the absence, teachers will allow for the day and the review materials. Students who fail to complete make work will receive an F."	
Late Work Policy	Late homework is accepted 1 day late, with a 20% loss of points. No work is taken two days past the due date.	
Make-up/Re-take Exam Policy	Most exams and quizzes are not eligible for retakes. Tests and quizzes missed due to absence will be made up according to the WCHS attendance policy above.	
Dual Credit-High School Credit Policy Statement	The rigor of this course will be periodically reviewed by Indiana University faculty in an effort to maintain the high quality of education that each student receives. Due to the unique format of this course, students must decide during the IU enrollment period whether they wish to receive dual credit (high school and IU credit) or only high school credit. Students who choose to take the course only for high school credit and receive a passing grade may **not** register at a later date or repeat the course (while in high school) for college credit.	

IU Academic Misconduct Statement	The rights and responsibilities of Indiana University students are explained in the ***Indiana University Code of Student Rights, Responsibilities, and Conduct***, http://www.indiana.edu/~code/. The Code describes the types of misconduct for which students may be penalized, including cheating, fabrication, plagiarism and interference with other students' work, as well as actions which endanger the University and the University community and possession of firearms. The Code also indicates the procedures to be followed in these cases. **All students are required to adhere to the responsibilities outlined in the *Code*** The definition and clarification related to academic misconduct is here: http://www.indiana.edu/~code/code/responsibilities/academic/index.shtml Examples of Plagiarism: http://www.indiana.edu/~wts/pamphlets/plagiarism.pdf Per IU policy, ACP instructors are required to investigate and then report all incidents of academic misconduct to the Dean of Students. *Adopted by the Board of Trustees, effective August 1, 2009*