

Syllabus for CHE 260A – Physical Chemistry I

Fall 2015

2 Credit Hours

BSC308: T 8.30-9.45am

Instructor: Professor Sarah A. Winget

Office: Room 301E, Bullock Science Center

Email: swinget@agnesscott.edu

Office Hrs: M 12.30-1.30pm, R 12.45-1.45pm

Learning Assistant: Megan Smart

Office: Science Learning Center, Room G-25, Campbell Hall

Email: msmart@agnesscott.edu

Office Hrs: T 2-5pm, R 12-4pm

Course Description: This course is a continuation of the introduction to physical chemistry that began in CHE220. Topics will include general principles of thermodynamics and equilibria, kinetics and solution dynamics, and an introduction to quantum mechanics as applied in chemistry and biochemistry. More specifically, students will study such topics as the dependence of Gibbs energy on temperature and pressure, mixtures and solutions, theories of reaction rates, the Schrodinger equation, molecular orbital theory, and a brief introduction to symmetry

Prerequisites: CHE 220+L (or CHE102+L) and MAT119

Course Goals: After this course you will have a greater understanding of the fundamentals of chemistry and also the skills to think through the reasoning behind many chemical phenomena you may come across in your courses and careers. In a broader sense, you will gain an increased ability to think logically and critically, to solve complex problems, to work in groups and to communicate scientific concepts effectively.

Relevance to the departmental and college curriculum: After completing this course, you may proceed to the physical chemistry II course: CHE360. CHE260 is also required for a major in Chemistry or a major in Biochemistry and Molecular Biology.

Required Course Materials: *Physical Chemistry for the Biosciences*, R. Chang, University Science Books.

Moodle: Moodle (<http://courses.agnesscott.edu>) is a web-based course management system that will be used in this course. The syllabus, grades, in-class materials, assignments, study guides, etc. will be posted for your access.

Resource Center for Math and Science (RCMS) (<http://www.agnesscott.edu/rcms/>): The RCMS has a Science Learning Center (SLC) in Campbell G-25 where our course Learning Assistant, Megan Smart, will hold office hours.

Grading: Your performance in the course will be evaluated as follows:

Homework assignments (lowest one dropped)	25%
2 Exams	50%
Comprehensive Final Exam (25% New/75% Comprehensive)	25%

Absolute Grading Scale

A	93-100	B-	80-82	D+	67-69
A-	90-92	C+	77-79	D	63-66
B+	87-89	C	73-76	D-	60-62
B	83-86	C-	70-72	F	0-59

Note: if you have completed all exams/homeworks, you may substitute your final exam score for your lowest-scored exam.

Additional Note: Student grades will not be curved

Exams: There will be three exams, two of which will be given out during the semester and you will have one week to complete and return them. A third exam will be available on Wed Dec 9th and will be due at the end of final exams. All exams will be take home exams and you will need to find a single 3 hour window to take the exam. The exams will be of the closed-note, closed-book variety, so equation sheets will be provided in the exam envelope.

Make-up Exams: Since all students will have one week to find a timeslot to take their exams, there will be no make-up exams. Late exams will not be accepted. If a serious situation arises where you cannot complete or return an exam, please contact the Dean of Students (x6391) and we will discuss the best course of action for your circumstances at that point.

Homework assignments: Homework assignments will generally be assigned on Tuesday and due before class begins on the following Tuesday. You must show ALL working to receive full credit. I strongly encourage you to work on your homework assignments in the Science Learning Center (SLC) in Campbell G-25, and to work on problems with your classmates. However, to comply with the honor code, you should only submit work that reflects your personal understanding. No late homeworks will be accepted. Since the homework score contributes significantly to your grade, your lowest homework score will be dropped (as long as you have completed all homework assignments).

Attendance in class: Attendance is *highly recommended*, but not required, for all scheduled class times.

Workload Statement: This is a 2-credit class that meets "1.5 hours" per week. To succeed in this course, you should also expect to study around 4 hours per week outside of class on reading and homeworks.

Appointments: Appointments may be made with Professor Winget and Megan Smart by email.

Course Evaluation: Near the end of the semester you will be notified by email, and provided with a link to follow, to complete course evaluations online outside of class. You are expected to complete them as your feedback is extremely valuable to Dr. Winget, the department, and the administration. Of particular importance are constructive comments that help Dr. Winget improve the course.

Accommodations: Agnes Scott College seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in this class, please contact Kelly Deasy in the Office of Academic Advising (X6150) to make or complete the registration process. Once registered, please contact Dr. Winget by email in order to make an appointment to discuss the specific accommodations needed for this course.

Academic Honesty: The Agnes Scott College honor code embodies an ideal of character, conduct, and citizenship, and is an important part of the College's mission and core identity. This applies especially to academic honesty and integrity. Passing off someone else's work as your own represents intellectual fraud and theft, and violates the core values of our academic community. To be honorable, you should understand not only what counts as academic dishonesty, but also how to avoid engaging in these practices. Please note that in this course you are sometimes encouraged to work with others, but the work completed is your own. In particular, the copying of another student's homework assignment answers (or copying from any other source, for that matter) is an Honor Code violation.

The examinations and quizzes are not proctored, although the faculty member will often be close by during an exam to answer any questions. You are expected not to seek aid from anyone (or anything) during these examinations and should not give aid to anyone else taking a quiz or examination. Please pledge ALL your quizzes and exams with "I pledge that I have neither given nor received any unauthorized aid on this assignment. (signed)_____"

This course adheres to the principles of diversity and inclusion integral to the Agnes Scott community. We respect people from all backgrounds and affirm people's decisions about gender expression and identity. Please feel free to correct D. WInget if your preferred name or gender pronoun are different from that listed on the class roster.

For the safety of the entire community, any incidence of or information about sexual misconduct must be reported immediately to Title IX Coordinator Karen Gilbert (kgilbert@agnesscott.edu)

Prior Physical Chemistry Knowledge:

The following *physical chemistry* topics are assumed to have been covered in CHE150 and CHE220, so they may not be explicitly discussed in CHE260 (though the instructor may assume a basic understanding of these topics):

Topics
Energy, light, intro to quantum theory, Bohr's theory of the atom
Electron Configurations of atoms (Aufbau principle, Hund's rule, Pauli principle)
Periodic properties of the elements, electron configurations of ions, ionic radii
Valence bond theory, hybridization of orbitals
1 st law of thermodynamics, enthalpy, calorimetry, Hess's law, ΔH_f , bond enthalpy
Kinetic molecular theory of gases (KMT)
Gas laws, ideal gases, real gases, gas mixtures and Dalton's law, stoichiometric calculations for gaseous rxns
Intermolecular forces, properties of liquids (inc surface tension, vapor pressure)
Solutions, concentration units, factors that affect solubility, colligative properties
Reaction rates, collision theory, rate laws, integrated rate equations, Arrhenius equation, reaction mechanisms
Equilibrium, equilibrium constants, equilibrium expressions (and problem solving using equilibrium expressions), Le Chatelier principle
Entropy and entropy changes, 2 nd law of thermodynamics, 3 rd law of thermodynamics, Gibbs energy, predicting spontaneity, relating ΔG and K

Very tentative schedule for CHE260:

#	Date	Due	Topics	Chapter
1	9/1	--	Introduction and welcome. Molecular Collisions and the Mean Free Path.	2.8
2	9/8	A1	Work and heat. The First Law of Thermodynamics	3.1-3.2
--	9/15	--	Dr Winget out of town – Students will work on a mini project	--
3	9/22	A2 and project	Constant pressure vs. constant volume heat capacities. Gas expansions. Dependence of $\Delta_r H$ on temp	3.3-3.6
4	9/29	A3	Entropy and entropy changes. Gibbs. Dependence of G and $\Delta_r G$ on T and P	4.2, 4.4, 4.6, 4.8
5	10/6	A4	Partial Molar Quantities. Thermodynamics of Mixing. Real solutions	5.2-5.3, 5.5
6	10/13	A5	Reversible and consecutive reactions in kinetics. Potential Energy Surfaces.	9.4, 9.6
7	10/20	E1 (on class 1-5)	Schrodinger Wave Equation. Particle in a 1-D box. Using the model of Particle in a 1-D box and online calculator to probe MOs in polyenes	11.7-11.8
8	10/27	A6	Particle in a 1-D box contd.	11.8
9	11/3	A7	Schrodinger Wave Equation for an H-atom	11.10
10	11/10	A8	Schrodinger Wave Equation for an H-atom contd. Many Electron Atoms and the Periodic Table. Introduction to Quantum Mechanical Calculations	11.10-11.11
11	11/17	A9	Molecular Orbital Theory, Diatomic Molecules	12.5-12.6
12	11/24	E2 (on class 6-10)	Resonance and Electron Delocalization.	12.7
13	12/1	A10	A Brief introduction to symmetry.	--