Instructor: **Tyler Meldrum,** ISC 1060, 221-2561 *tkmeldrum@wm.edu*
Grader: **Jacob Blackshaw** *kjblackshaw@email.wm.edu*

Office hours: Wednesdays, 11:00 am–12:20 pm, or make an appointment.

Meetings: Mondays, Wednesdays, Fridays 10:00–11:00 am, Small 111 (smaller lecture hall)
Thursdays 6:00–7:00 pm, ISC 1127 (review session)

Course Description
This course is intended for chemistry majors. In it, we will discuss the ideal gas and equations of state, kinetic molecular theory, statistical and classical thermodynamics, chemical kinetics, and molecular transport. It will draw on math and principles of quantum mechanics that you studied in CHEM 301.

Texts
(Required) McQuarrie, D.A.; Simon, J.D. *Physical Chemistry: A Molecular Approach*; University Science Books: 1997. ISBN: 978-0935702996.
(Recommended) Atkins, P. The Laws of Thermodynamics: A Very Short Introduction; Oxford University Press: 2010. ISBN: 978-0199572199.
*Note: This book provides a very useful conceptual framework for thermodynamics **and** is available for free online through Swem. It's only ~$10, in case you want a hard copy.*
(Optional) Cox, H.; McQuarrie, D.A.; Simon, J.D. *Problems and Solutions to Accompany Physical Chemistry: A Molecular Approach*; University Science Books: 1997. ISBN: 978-0935702439.
Note: I have a copy of this in my office that you are welcome to use (not borrow).

Course Details
Blackboard site: This course makes extensive use of Blackboard. Please check the Blackboard site regularly for announcements, practice problems, lecture notes, grades, and other course supplements.

Lecture recordings: Barring major technical problems, I will be recording each lecture and posting it to Blackboard after each class period. Please use those recordings to help you study. Also, consider research that indicates that students who take notes by hand tend to outperform those who take notes on the computer. I suggest you focus on main concepts and their applications during lectures, then you can revisit the videos to catch any details that you may have missed.

Midterm exams: Four (4) in-class midterm exams will be given on **February 8, March 1, March 29, and April 19**. Each is worth 20% of the final grade. (See grading notes below.)

Final exam: A final exam will be given on **Friday, May 3 from 2:00 pm–5:00 pm,** location to be announced (probably our regular lecture hall, Small 111). The final exam will be worth 30% of the course grade and will be comprehensive. This time slot is assigned by the registrar and, with the few exceptions designated by the registrar, cannot be moved. Please notify me of any registrar-approved final exam exceptions well in advance.

Exam grades: I will drop an exam in your favor. This will be done automatically in one of two ways (I'll use whichever method maximizes your score):

1. Drop the lowest midterm score completely. This will make the other three midterms collectively worth 60% of your grade and the final will be worth 30% of your grade. (Homework is still 10% of your grade.)
2. Keep all four midterms (collectively 80% of your grade) and make the final worth only 10% of your grade. (Homework is still 10% of your grade.)

Homework: Several homework assignments will be made throughout the semester. These will be approximately weekly with adjustments made for exam weeks and the pace of material. Collectively, the homework assignments will be worth 10% of the course grade. You may work on these assignments collaboratively but must submit them individually.

Tips for success: The best guarantors of success in CHEM 302 are reading the assigned material *before* the corresponding lecture, attending every lecture, thoughtfully completing the assigned homework for submission, and working practice problems as necessary.

This is a challenging course. Just like last year, I am assigning four midterms *plus* a final exam precisely because I want you to work with the content in smaller, more frequent pieces. I don't want you to slip behind. Please keep up with the material, know that the pace of the course is fast, and come see me if you feel like things are getting away from you.

Tentative course schedule (as of 04 January 2019)

Dates	Topics	Sections (McQ/S)
W, 1/16	Course introduction, gases	
R, 1/17	*No review session*	
F, 1/18	Gases and equations of state	16.1, 16.2, 16.5
M, 1/21	*No class*	
W, 1/23	Kinetic molecular theory, ideal gas law	27.1
F, 1/25	Maxwell-Boltzmann speed distribution	27.2, 27.3
M, 1/28	Gas collisions, energy, and reactions *[Add/drop deadline]*	27.6, 27.7
W, 1/30	Internal energy, heat capacity, equipartition	
F, 2/1	Ensembles and Boltzmann	17.1–17.4
M, 2/4	Partition functions, populations	17.5–17.8
W, 2/6	Partition functions: translations and electronic excitations	18.1, 18.2
F, 2/8	***EXAM (Chapters 16, 27, 17)***	
M, 2/11	Partition functions: rotations and vibrations in diatomics	18.3–18.6
W, 2/13	Partition functions: polyatomics	18.7–18.9
F, 2/15	The Ising model	Posted to Blackboard
M, 2/18	Work and heat, state and path functions, the first law	19.1–19.3
W, 2/20	Energy and enthalpy, adiabatic and isothermal processes	19.4–19.7
F, 2/22	More adiabatic and isothermal processes	19.4–19.7
M, 2/25	First law calculations	19.8–19.12
W, 2/27	Entropy and the second law	20.1–20.4
F, 3/1	***EXAM (Chapters 18, 19)***	
3/4 - 3/8	***SPRING BREAK***	
M, 3/11	Statistics, counting coins, and my favorite equation	20.5
W, 3/13	Calculations with entropy, partition functions	20.6–20.9
F, 3/15	Absolute entropy, the third law *[Withdraw deadline]*	21.1–21.5
M, 3/18	Statistical mechanics and absolute entropy	21.6–21.9
W, 3/20	Helmholtz and Gibbs Energies, temperature dependence	22.1, 22.2, 22.6, 22.7
F, 3/22	Phase diagrams, chemical potential	23.1–23.3
M, 3/25	Chemical equilibrium, Gibbs energy of formation	26.1–26.3
W, 3/27	Spontaneity, equilibrium constants	26.4–26.7
F, 3/29	***EXAM (Chapters 20, 21, 22, 23)***	
M, 4/1	Using tabulated data, real systems	26.9
W, 4/3	Rate laws, half-life	28.1–28.4
F, 4/5	Reversible reactions, dynamic equilibrium, rate constants	28.5–28.7
M, 4/8	Transition state theory	28.8
W, 4/10	Reaction mechanisms, detailed balance	29.1–29.3
F, 4/12	Steady state	29.4, 29.5
M, 4/15	Unimolecular reaction mechanisms, chain reactions	29.6, 29.7
W, 4/17	Catalysis, enzyme kinetics	29.8, 29.9
F, 4/19	***EXAM (Chapters 26, 28, 29)***	
M, 4/22	Molecular diffusion, Einstein equation	Posted to Blackboard
W, 4/24	Fick's laws, viscosity	Posted to Blackboard
R, 4/25	*No review session*	
F, 4/26	Review/buffer	
F, 5/3	***FINAL EXAM 2:00–5:00 pm, Small 111***	