Chem 116, Fall 2006
Prof. Sevian
Study guide for Exam 1

The exam will consist of two sections: short answer and problems. The short answer questions could be multiple-choice, fill-in-the-blank, brief response, or short calculations. There will be two problems, which will involve showing your work on calculations and/or demonstrating complete and clear logical reasoning in an explanation. When doing calculations, if the answer you provide is off by more than one significant digit, one point will be deducted.

Exam 1 will cover material from homework assignments #1, 2, 3 and the part of #4 that comes from chapter 12. Relevant sections from text book chapters 10, 11 and 12 will be covered on the exam. Please see the course syllabus for a list of which sections in these chapters are being covered.

You will be provided with the following information on the exam:

Constants of nature

$$R = 8.314\ \frac{J}{mol \bullet K} = 0.08206\ \frac{L \bullet atm}{mol \bullet K}$$

Conversions/Metric Prefixes

1 mol of an ideal gas at STP occupies 22.4 L

1 atm = 760 mmHg

Equations

$$v_{rms} = \sqrt{\frac{3RT}{M}}$$

$$\frac{\text{rate of effusion of gas A}}{\text{rate of effusion of gas B}} = \sqrt{\frac{M_B}{M_A}}$$

Short Answer and/or Problems

Things that you should know or be able to do (though there won't necessarily be a question on every single one of these items because that would make the exam too long):

1. How do gases differ from the condensed phases of matter (solids and liquids)?
2. Using various gas laws to calculate predicted values of measurable variables in a gas
    a. Know how to translate the word problem into mathematics: figure out which variables are held constant and which ones are changing
    b. Pay attention to units
3. Use the ideal gas law in calculating density, molar mass and/or doing stoichiometric calculations
4. How are the kinetic energies of particles distributed in a gas, and how does the distribution vary with molecular mass? with temperature?
5. Use Graham's law of effusion to identify an unknown gas by comparing its effusion rate to that of a known gas under the same conditions
6. Calculate the mass of a gas produced in a reaction when the gas is collected over water
7. Say which gases are more likely than others (in a given list) to deviate[*] from ideal gas behavior, and why they do, based on which assumptions in kinetic molecular theory break down
8. Sketch a phase diagram of a substance given data on its triple point, critical point, and a comparison of solid and liquid densities

[*] Note: "Deviate" means "to be different from." So the question, "Which gas [of a list provided] deviates most from ideal behavior?" is a question asking you to determine which gas is least well modeled by the ideal gas theory/model (kinetic molecular theory). This detailed explanation of what the question is asking is provided here in the study guide, but I will not provide this detailed explanation of what the question is asking on the exam.

9. Read a phase diagram
10. What are some typical properties of molecular compounds vs. ionic compounds vs. metallic compounds? What arrangements of particles accounts for these behaviors?
11. Explain which intermolecular attractions must be overcome to vaporize (L to G) a sample of a given substance
12. Given two different substances, or a series of related substances, explain the difference (or trend) in boiling points
13. Classify materials according to their:
    a. electronic behavior (metals, semiconductors or insulators)
    b. formulas of pure materials (metals, ionic substances, polymers, molecules that are not polymers) [note: there are many other kinds of materials that could be added to this list, but won't be asked about on the exam]

Problems

1. A problem similar to one of the group problems
2. A mathematically-based problem involving one of the items in the list above

Additional Information About Exams

Exam 1 will take place during regular class time, 2:30-3:45 p.m., on Tuesday, October 3. You will have the entire class period to complete the exam, but you will need to work efficiently to complete it. All exams must be turned in by 3:50. If you arrive late to the exam, you will not be given extra time. If you arrive after the first exam has been turned in, you will not be allowed to take the exam. I urge you to leave home earlier than usual to allow for surprise commuting problems.

When you arrive at the exam, please take alternate seating in alternate rows (i.e., there should be a vacant seat to the left and right of you, and a vacant row in front of you and behind you). Bring more than one pencil and an eraser (no pens or colored pencils) and your calculator. Be sure your calculator is working and that you have spare batteries, if needed. You may bring a spare calculator if you wish.

The exam will have a cover page. You should write your answers on the test pages (there is no separate answer sheet). Make sure you write all numeric answers with the proper number of significant figures. Attached as the last page of the exam will be a copy of the periodic table, which you may tear off and use in conjunction with any question. Use the back of the periodic table if you need scrap paper (work on scrap paper will not be graded). You may not use notes, books, or your own scrap paper during the exam. Do not bring your own scrap paper to the exam. If you are seen using your own scrap paper on the exam, the proctors will take it away and it may be considered cheating.

There will be multiple versions of the exam, and yours will probably not be identical to others around you. You are bound by academic honesty principles at our university. If it is evident that you have cheated on the exam, expect a grade of zero. Further action may also be taken, which can result in your expulsion from the university. As indicated in the syllabus, anyone bringing any device capable of communicating with any other device (e.g., activated cell phone, pager, communicating calculator) will receive a zero on the exam. Furthermore, no sharing of calculators is allowed.