1. Read each chapter/section before the material is first presented in class.

2. Take notes in class—as complete as time and activity allows. As soon after class as possible (within 2 hours is best) go over the notes, supplementing and completing them from your recollection of class comments.

3. Reread appropriate sections of the chapter, examining material in detail, and committing key equations and definitions to memory. Learn to derive other useful relationships from the key equations.

4. Now try working the problems suggested below for the chapter under discussion without looking back at the text except for information in tables. Please think about this: When the tests come, you will not have any materials except the test page and (perhaps) a data sheet. You must practice under those conditions to be properly prepared for the tests.

If you find you cannot work a problem or answer a question without referring back to the examples and discussion in the text or to material in your notes, it indicates additional study or review is needed in that area. Do not make the mistake of thinking that because the answer in the answer book looks reasonable to you, therefore you could have worked the problem or answered the question. You must be able to work these exercises under test conditions. So it is imperative that you practice this in doing homework.

The comment about "answer book" refers to books, placed on reserve at Boatwright Library and available on the bookcase in the lounge area adjacent to my office and lab, which contain worked out answers to each problem and question in the text. The point here is that you should not consult these answer books until you have wrestled with a question or problem to the point where you have an answer. If you cannot develop an answer to a question, then you should review your notes and the text until you can at least make some kind of response, but then work other problems without any aids.

An additional comment: Copies of some of the tests given in my sections of 141 in prior years are (will be) available on line at my web site (oncampus.richmond.edu/~wmymers/). Both blank tests and keys are included, but you should not look at a key until you have looked at the questions and/or problems in the blank version and have worked out and arrived at your answers to those questions.

5. Participate in a study group at least once per week, using the time to share information on problem solving, chemical concepts, and the like, as well as to formulate questions on topics that are not yet clear or under control. In addition, attend the weekly help sessions I hold for students in this course.

The questions and problems at the end of each chapter are divided into sections in much the same way as the chapter itself is divided. You should work some from each section. The questions and problems listed below are my suggestions for those you should work on first. If time permits, you should try more, since the more you wrestle with these concepts, the more likely it is that you will become proficient with them. Where a number of similar problems are included (“some of …”), you should work enough to be sure you could work any of the others if called on to do so. This is especially important when the problems or questions contain multiple parts. NOTE: Students who only work on problem sets and old tests are at a serious disadvantage in comparison to students who work textbook problems first. Both are important.
Chapter Question and Problem Numbers/McMurry & Fay, Chemistry, 6th Ed. FOR TEST #1

1. 3, 4, 5, 8, 9, 10, 14, 18, 19, 22, 25 (note that the third part of this question does not have a clear answer), 28, 29, 34, 35, 56 (this is a very important question, because it highlights the distinctions in the use of these symbols—make sure you contrast this question with the question: "which is a hotter temperature, 1°C or 1°F?"—see question 1.94a for a parallel), 62, 67, 69, 74, 83, 86, 89, 91, 93, 99, 106, and try problem 116 (and try to remember your answer—this is a nice piece of "trivia" to store away in your head).

2. 32, 33, 36, 39, 49, 51, [look at 54 & 55 and ask why the author used the word "atom" in 54, but used the word "element" in 55], 56, (some of 64-67—and check out 66d—this has special meaning for the chemistry research your professor does—ask him about it!), 64, 65, 75, 76, 77, 79, 80, 83, 84, (and about here is a good time to work on 37), 91, 92, 93, 94, 100, try 101, 102 (and make sure you know why something extra is shown in part b that is not shown in other parts), 103, (some of 104-115), 124, 125, 128.

3. 30, 31 (and consider whether more than one answer might be correct), 32, 33, 35, (try some of 40-41), 44, 48, 49, 50, 51, 54 (and consider what, in the manufacturing process, might explain why a "300 mg" tablet has a mass greater than 300 mg), 56 (and as you work this one, try to express your answers in mmol or even µmol; then consider what advantage using those units might provide), 60, 62, 66, 69, 72, 74, 79, 80, 83, 84, 89, 90, 95, 96, 97 (and tell what you would expect to find in solution if you used exactly half that much KOH solution—then remember this when the end of October comes), 99, (some of 103, 105, 106) (106 is a neat question—can you see why the author used the word "minimum"? Can you think of several possible molar masses for this compound, based on this single piece of data?), 118, 119, 121, 126 (this is a very significant question. Can you see the point the author is making? And if so, can you suggest a different wording for the question that would reveal this point, and at the same time, reflect reality more clearly? You can expect that we will spend some class time exploring this a little), 134 (don't spend a lot of time on this, but it represents an interesting way to use titrations to analyze mixtures—problem 144 is a variation on this idea, using analysis for nitrogen as the tool).

4. 26, 27, 29 (this one is a bit tricky, but try it, and as you do so, ask yourself what, exactly, the vertical axis represents. For the record, the author has made a critical assumption that he has not shared with you in regard to the vertical axis; note that it might help to consider question 38 as you ponder this.), 31, 32, 34, 40, (some of 42-47), 53, 55, 60, 61, 66, 68, 69, (some of 70-73), (some of 74-75), 76, 81, 84, 86, 92, 100, 104, 113, 129.

18. 21, 25 (ignore part "e"), 44, 45.

14. 34 (parts a, b, c, only), 36, (some of 46-49), 50, 51, 96, (some of 97-99, but make sure to identify the one case in which acid strengths are expected to be very close together), (some of 100-101).
Chapter Questions and Problems for Chemistry 141M

8. 33, 34, 36a & 36c, 47, 48, 49, 56, 57, 58 (and note, with this and subsequent questions, that \( \Delta H^\circ \) values always have units of energy per mole, though your text does not always show this. Most texts nowadays skip the "per mole" part of the units for \( \Delta H \) or \( \Delta H^\circ \), but they shouldn't do so. The problem is that the meaning of "per mole" is challenging to understand, but we will work through this together!), 61, 62, 63, 65, 67, 69, 72, 73, 78, 79, 83, 88, 91, 92, 94, 95, 96, 97, 99, 102, 104, 105, 106, 113 (and can you go further and calculate \( \Delta G^\circ \) for this reaction at 25\(^\circ\), 50\(^\circ\), 75\(^\circ\), and 100\(^\circ\) C?), 122.

--now take a good look at question 117: I want you to recognize an inherent problem with this question, and in our work in class, I hope to help you see this problem for yourself. Parts b & g ask you to calculate \( \Delta G^\circ \) for one or another of these reactions, but it does not tell you at what temperature. Without knowing the temperature, you cannot do this calculation, because the answer will be different for each temperature you use. Steps e & j require that you consider this, but the text does not do a very good job of leading you into the concepts involved. Now it would be easy to fix most of this, if you were just asked to calculate what all these values are at 25\(^\circ\) C, but it is vital that you recognize that if the temp were changed, some but not all of the answers you get would change. Can you tell which answers would change and which would stay essentially the same? If so, you are on your way to reaching the viewpoint I am trying to help you master.

16. 21, 22, 24, 27 (I want you to look at this question, but I also want you to note that the depiction of \( \Delta G^\circ \) on the graph is wrong. I will try to show you in class a better way to think of these things, using this graph), 34, (some of 37-39), 50, (some of 54-55), 68, 69, 70, 72 (but note that the question is poorly stated. Assume the values given in problem 16.66 are for \( \Delta H^\circ \) and \( \Delta S^\circ \) of vaporization, then calculate \( \Delta G^\circ \) values for this reaction at the three temperatures given, and then answer the question posed at the end. An interesting extension of the question would be to ask the same question, but at 0.6 atm, and then again, but at 1.4 atm. Want to try that?), 74, 75, 77, (some of 78-79--but also calculate \( \Delta G^\circ \) values for the reaction at 0\(^\circ\) C and 120\(^\circ\) C), 88, 92, 93, 95, 96, 101, 104 (but note that you are calculating K\(_{act}\), not K\(_p\) when you do this—if you want to see where you are in your understanding of this, try to state what is the difference between K\(_{act}\) and K\(_p\) in this case), 114 (keep your wits around you as you try this one—the process is not complicated, but it helps if you can see the point of the question first; and while this is not the center of the challenge, it will help to assume that the entropy change they mention is a \( \Delta S^\circ \) value), try 105, 125 (this is a very important question for you—you are going to be expected to be able to work with this equation), 126 (if you want to make the question simpler, use the tables to get \( \Delta H^\circ \) for this reaction—you can answer the question with the information given, but you and I are working more from the table information, so practicing the use of table information for problems like this is a good thing for you to do).

13 28, 29, (some of 41-42), (some of 43, 46), 49, try 51 (but answer the question using the equation: CH\(_2\)CO\(_2\)H (aq) + H\(_2\)O (l) \(\rightarrow\) CH\(_3\)CO\(_2\) (aq) + H\(_2\)O\(^+\) (aq). 52, (some of 58-59), (some of 60-61), 63, 72, 79, 80, 81, 82, 83, 84, 86, 89 (but answer part "c" assuming the pressure does not change, and then answer it again, assuming that the volume of the system does not change—note that these two assumptions lead to different answers), 117, 130 (you may not yet have thought through all you need to know to answer this question, but if you think about it, it will come).
10. 32, 34, 35, (some of 38-39), 42, 43, 46, 47.

FOR FINAL EXAM

Chapter 10.

23, 26, 27, 28 (see questions 86 and 87), 29, 54, 58, 60, 62, 63, 71, 73, 74, 82, 86, 87 (connect this to q.28, and see if you can spot where this might not be true), 88, 91, 118.

22, 26, 30, 31, 33, 36, 38, 50, 51, 54, 55, 74, 75, 76, 77, 78, 94, 96 (this is especially interesting to students of organic chemistry; try to remember this, if you later take organic).

32, 35 (note that this is an example of resonance), 42, 43, 44, 45, (some of 46-47), 55, 56 (part c could be a challenge; why?), 57, 58, (some of 62-63), 65 (sketch the molecule for part b, then estimate the F-X-F bond angle), (some of 66-67), 68 (do you find the answer interesting?), (some of 69-73), 77, (some of 80-85), (some of 86-87), 88, 94, 95 (keep your answer simple), 96, 97, 98, 99, 101, 102, 103 (and for 102 and 103, don't be overly concerned with the term "stable"—focus on the other two parts, but if there are unpaired electrons, try to tell how many there are and what orbital(s) they occupy), try 109, 110, 111, try 117, 118, 123, 124, try 129, 132, 133, 135, and just for fun, see if you can sketch the three molecules, collectively a set of structural isomers, each with the formula C₂H₂Cl₂.

See class notes and read over section 23.5 (pp. 921-923), then: try to assign bond angles and atom hybridizations for various parts of the structures shown in problems 44, 45, 72, 77, and 106. Do not worry about names or functional groups right now.

FOR TEST #3

Chapter 14.

45, (some of 46-47), (some of 48-49), 50, 51, (some of 54-55), (some of 58-59), (some of 60-61), 62, 63, (some of 66-67), 68a, 70, 72a, 75, 77, (some of 82-83), 84, 86, 88, 90, 91, 92, 94, 102, 106.

42, 43, 44, 45, 52, 53, 54, 60, 61, 64, 65, 68, 70, 71, 73, 76, 80, 81, 86.

12. 32, 38 (and then try 39 to see if you have the concept under control), 42, 45, 48, 49, 51, 53, 58 (please use Excel to do this work), 80 (and add as part d: what would the rate law be if the second step were the slow step?), 84, 86, 87 (a very nice question—leaves out a lot, which forces you to think things through), 88 (you could use Excel for this work), 90, 91, 93, 99, 100, 104, 105, 107; and somewhere in here, work on 11, 12, 13, 14, then try 22.28.

FOR TEST #4

Chapter 23.

32, 34, 35, (some of 38-39), 42, 43, 46, 47.